California Multimedia Evaluation of E10 - E15 Gasoline-Ethanol Blends
Tier II Report

Submitted to the Multimedia Working Group

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Table of Contents

Table of Contents 1
1 Introduction 1
1.1 Background 1
1.2 Purpose 2
2 Test Fuels 3
3 Tailpipe Emissions Testing 6
3.1 General 6
3.2 Vehicle Selection and Procurement 6
3.3 Vehicle Testing 7
3.4 Emissions Analyses 8
3.5 Statistical Analysis 9
3.6 Results 10
4 Evaporative Emissions Testing 11
4.1 General 11
4.2 Vehicles and Fuels 11
4.3 Test Plan 12
4.4 Measurements and Test Parameters 14
4.5 Testing Chronology 14
4.6 Results 15
4.7 Statistical Analysis 16
5 Conclusions 18
6 Appendix A - Final Report Comparison of Exhaust Emissions Between E10 CaRFG and Splash Blended E15
7 Appendix B – ATDS Laboratory Results for Evaporative Emissions Testing
8 Appendix C – Fuel Analysis Chain of Custody and Laboratory Results

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1 Introduction

The Renewable Fuels Association (RFA) and Growth Energy have proposed that an E15 gasoline-ethanol blend be permitted for sale in California. The proposed blend would consist of denatured fuel ethanol added to California Reformulated Gasoline Blendstocks for Oxygenate Blending (CARBOBs) that are approved for use in producing E10 (10% ethanol) blends under the California Reformulated Gasoline (CaRFG) Regulations, between 10 and 15v/v% ethanol.

The California Health and Safety Code (CHSC) requires that a multimedia evaluation be conducted and reviewed by the California Environmental Policy Council (CEPC) before specifications for new motor fuels can be adopted by the California Air Resources Board (CARB).[1] The purpose of the multimedia evaluation is to enable CEPC to determine whether a new fuel would create any significant new environmental or public health impacts. The multimedia risk assessment includes three required components or tiers, each designed to provide input to the next stage of the decision-making process. The Tier I Report, a summary of the scientific literature on the impact of E15 fuel was submitted to CARB in June 2020, and posted online by CARB in August 2022[2]. The Tier 1 report resulted in two CARB-identified areas in which additional information would be required: the impact of E15 versus E10 on tailpipe and evaporative emissions.

An experimental plan which included both tailpipe and evaporative emissions vehicle testing was proposed and then reviewed and approved by CARB. The testing was completed in 2021 and final reports outlining the procedures, results and statistical analysis submitted to CARB. The CE-CERT laboratory at the University of California Riverside (UCR) conducted the tailpipe testing and produced a detailed report including an extensive statistical analysis (included as Appendix A). Evaporative emissions testing was conducted at Automotive Testing and Development Services (ATDS) in Ontario, California. ATDS provided laboratory reports for all testing (included as Appendix B). This document is the Tier II Report, which summarizes the experimental procedures, results and analysis. Following the approval of this Tier II Report, this analysis will be combined with the information in Tier I to draw conclusions regarding the human health and environmental risks associated with the use of the proposed fuel and submitted as the final Tier III Report.

1.1 Background

E15 has been available in many states for over a decade. The U.S. EPA (Environmental Protection Agency) issued a waiver in 2010 approving the use of E15 in 2007 model year and newer light-duty vehicles.[3] In 2011, U.S. EPA issued a second waiver extending the approval to 2001 model year and newer light-duty vehicles.[4,5]

[1] HSC Section 43830.8
[2] https://ww2.arb.ca.gov/resources/documents/fuels-multimedia-evaluation-e15
[3] 75 Federal Register 68094. November 4, 2010.
[4] 76 Federal Register 4662. January 26, 2011.
[5] These waivers all E15 use in all model years of FFVs and expressly prohibit the use of E15 in heavy-duty vehicles, motorcycles and non-road applications.

Gasoline-ethanol blends have a long history of being used successfully nationally and internationally, as well as in California. In 1999, the State of California performed a multimedia evaluation regarding the use of ethanol in gasoline and approved the use of blends of up to ten percent ethanol in gasoline (E10). Today, virtually all gasoline sold in California is E10. In addition, both eighty-five percent ethanol blends (E85) and ethanol itself (E100) has been permitted in California since 1992. Ethanol is a renewable fuel with low carbon intensity and thus increased use of ethanol in blends with gasoline is one way in which California can make progress towards achieving its goals regarding greenhouse gas emissions and lower criteria and toxic pollutant emissions from vehicles and refineries. In addition, increased use of ethanol in E15 blends with gasoline will reduce dependence on petroleum.

1.2 Purpose

The purpose of this document is to present the experimental procedures and results that have addressed the data gaps identified in the Tier 1 Report. The data gaps are:

1. The impact on tailpipe emissions of adding ethanol to E10 CaRFG to make E15.
2. The impact on evaporative emissions of adding ethanol to E10 CaRFG to make E15.

2 Test Fuels

The same E10 and E15 test fuels were used for all vehicles, for both tailpipe and evaporative emissions testing. The RFA provided UCR with denatured ethanol from commercial California sources. In order to ensure representative fuels for testing, UCR procured four regular-grade E10 California reformulated gasolines in approximately equal amounts, including three from southern California sources: PBF Energy (Los Angeles), Phillips 66 (Los Angeles), and Marathon (Wilmington) and a fourth from the Bay Area: Chevron (Richmond). These sources were chosen by CARB staff. The four E10 fuels were combined by splash blending and E15 was created by splash blending the E10 mixture with the additional fuel-grade ethanol. All blending was done at 3C Fuels in southern California. After splash blending, 3C fuels placed the fuel in drums, and the drums were stored at UC Riverside for the duration of the testing. Drums necessary for evaporative emissions testing were brought to ATDS.

The E10 and E15 blends were analyzed for the fuel properties shown in Table 1, by Southwest Research Institute (SwRI). The SwRI analytical report is included as Appendix C. The E10 CaRFG was required to meet the applicable standard for cap limits for CaRFG3 and the ethanol was analyzed to ensure it met the standards set for denatured ethanol to be used as a blend component in CaRFG in the California Code of Regualtions 13 Section 2262.9. Individual samples were collected from three different drums of each blended fuel (the blended E10, the blended E15) and one sample of the denatured ethanol was collected. Analytic results for the seven samples were reported to CARB and are summarized below in Table 1 (E10 and E15) and Table 2 (ethanol) prior to vehicle testing.

Table 1. Average E10 and E15 properties for test fuels. Cap limits for CA RFG3 included for comparison. Individual sample results included in Appendix A.

Property	Test Method	Unit	E10-avg	E10-stdev	E15-avg	E15-stdev	Cap Limits Ca RFG3 (all maxima)
RVP (EPA Equation	D5191	psi	7.43	0.02	7.35	0.02	
DVPE (ASTM Equation)		psi	7.3	0.02	7.22	0.02	
CARVP (California Equation)		psi	7.19	0.02	7.11	0.02	7.2
Research Octane Number	D2699Mdp	ON	91.13	0.06	93.63	0.40	
Motor Octane Number	D2700Mdp	ON	83.53	0.06	85.07	0.06	
API Gravity	D4052		59.15	0.00	58.48	0.00	
Specific Gravity			0.74	0.00	0.74	0.00	
Density at 15C		g/ml	0.74	0.00	0.74	0.00	
Heat of Combustion, Gross	D4809	BTU/lb	19264.33	9.50	18877.33	13.43	
		MJ/kg	44.81	0.02	43.91	0.03	
		cal/g	10702.5	5.30	10487.43	7.47	
Heat of Combustion, Gross		BTU/lb.	17982	13.11	17605.33	11.93	
		MJ/kg	41.83		0.03		0.03
		cal/g	9990.3	7.31		6.65	
Methanol	D4815	Vol%	<0.2	NA	<0.2	NA	
Ethanol		Vol%	9.66	0.047	14.45	0.206	
Isopropanol		Vol%	<0.2	NA	<0.2	NA	
tert-Butanol		Vol%	<0.2	NA	<0.2	NA	

n-Propanol		Vol%	<0.2	NA	<0.2	NA	
Methyl tert-butyl ether		Vol%	<0.2	NA	<0.2	NA	
sec-Butanol		Vol%	<0.2	NA	<0.2	NA	
Diisopropylether		Vol%	<0.2	NA	<0.2	NA	
Isobutanol		Vol%	<0.2	NA	<0.2	NA	
Ethyl tert-butyl ether		Vol%	<0.2	NA	<0.2	NA	
tert-Pentanol		Vol%	<0.2	NA	<0.2	NA	
n-Butanol		Vol%	<0.2	NA	<0.2	NA	
tert-amyl methyl ether		Vol%	<0.2	NA	<0.2	NA	
Total Oxygen		wt.%	3.59	0.02	5.35	0.08	3.5% (not applicable to E15)
Carbon	D5291 CH	wt.%	82.8	0.05	80.91	0.19	
Hydrogen		wt.%	14.05	0.05	13.94	0.02	
Sulfur	D5453	ppm	6.25	0.48	4.47	0.15	20
Benzene	D5580	Vol%	0.6	0.01	0.56	0.00	1.1
Toluene		Vol%	4.04	0.01	3.81	0.00	
Ethylbenzene		Vol%	0.94	0.00	0.89	0.00	
p,m-Xylene		Vol%	3.85	0.00	3.65	0.01	
o-Xylene		Vol%	1.36	0.01	1.29	0.00	
C9 plus Aromatics		Vol%	8.74	0.01	8.26	0.01	
Total Aromatics		Vol%	19.53	0.01	18.46	0.01	35
Olefin	D6550	Mass %	5.03	0.06	4.63	0.06	10
DHA	D6730		File attached		File attached		
Distillation	D86			0.74		0.55	
IBP		deg F	101.63	0.42	102.27	1.22	
0.05		degF	129.53	0.50	129.3	0.72	
0.1		degF	135.33	0.40	136	0.67	
0.15		degF	139.07	0.40	139.97	0.62	
0.2		degF	142.7	0.46	143.6	0.51	
0.3		degF	149.2	0.75	150.37	0.49	
0.4		degF	157.27	0.69	156.07	1.33	
0.5		degF	204.5	0.51	161.13	0.51	220
0.6		degF	228.07	0.66	218.97	1.30	
0.7		degF	248.7	0.46	244	1.41	
0.8		degF	275.2	0.60	271.3	0.40	
0.9		degF	313.63	0.46	310.5	0.93	330
0.95		degF	342.07	2.54	339.57	1.03	
Final Boiling Point		degF	394.07	0.12	393.93	0.46	
Recovered		mL	99.07	0.00	98.4	0.00	
Residue		mL	0.7	0.12	0.7	0.46	
Loss		mL	0.23	0.01	0.9	0.02	
Particulate Matter Index			1.15	0.02	1.1	0.02	

Table 2. Denatured Ethanol Properties

Property	Test method	Unit	Denatured Ethanol	Allowable in ethanol used as a blend component in California fuel
Acidity	D1613	mgKOH/g	0.04	
Acidity as Acetic Acid		wt.%	0.00	Acidity (as acetic acid) mass 0.007%, (max)

Copper	D1688 M	mg/L	<0.05	0.1 (max, ppm)
Unwashed Gum	D381	mg/100 mL	0.50	
Washed Gum		mg/100 mL	<0.5	5.0 (max)
Clear and Bright	D4176		Pass	
Particulate			Pass	
Free Water			Pass	
Haze Rating			1.00	
Temperature of Sample		°C	6.00	
Sulfur	D5453	ppm	0.75	10 ppm (max)
Ethanol	D5501	Vol%	97.49	92.1 (min)
Methanol		Vol%	0.02	0.5 (max)
pH	D6423		8.55	pHe between 6.5 and 9.0
Total Chloride	D7319	ppm	<0.5	Inorganic chloride content, mass 40 ppm (max)
Total Sulfate		ppm	<0.5	
Potential Sulfate		ppm	<1.0	
Olefin Content	D7347	mass%	<0.1	0.5 (max)
Benzene	D7576	Vol%	0.01	0.06 (max)
Toluene		Vol%	<0.01	
Ethylbenzene		Vol%	<0.01	
p,m-Xylene		Vol%	<0.01	
o-Xylene		Vol%	<0.01	
C9 plus Aromatics		Vol%	<0.01	
Total Aromatics		Vol%	<0.29	1.7 (max)
Water	E1064	wt.%	0.69	1 vol%(max)

3 Tailpipe Emissions Testing

3.1 General

Tailpipe emissions testing was performed by UCR. Evaporative emissions testing was conducted at ATDS and is described in Section 4, below.

Twenty light-duty vehicles, selected by CARB and UCR, and recruited by UCR were tested in triplicate on both E10 and E15. Emissions were measured over the FTP cycle. A subset of the vehicles was shuttled to ATDS for evaporative emissions testing.

Although the cost of tailpipe testing was shared by CARB, the RFA, Growth Energy, the Corn Growers Association, and U.S. Council for Automotive Research (USCAR), the work was conducted as one unified test program.

3.2 Vehicle Selection and Procurement

The makes, models and model years of twenty light-duty vehicles were specified by CARB and recruited by UCR. The CARB vehicle list consisted of five vehicles each from four technology groups: SULEV (Super Ultra Low Emission Vehicle) 30, ULEV (Ultra Low Emission Vehicle) 125, ULEV 70 and ULEV 50. These technology groups were expected to represent at least 5 percent of the predicted VMT (vehicle miles travelled) in 2025, per EMFAC (EMission FACtor model, run in April 2020). Within each technology group CARB selected five of the most common vehicles based on confidential state registration data, with some modifications to ensure that the test matrix included a variety of different manufacturers, models, vehicle types, fuel injection types, engine sizes and model years.

Several of the specified vehicles could not be located by UCR. In those cases, an alternative selection was proposed by UCR and approved by CARB. The replacement vehicles were always of the same technology group, and generally from the same manufacturer and model year of the original selection. The final vehicle selections met the requirements for representativeness as outlined in California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years, Section VI. The original and final vehicle list is shown in Table 3. A subset of the vehicles was made available to ATDS for evaporative emissions testing.

The primary source for vehicles was rental fleets. Vehicles were also sourced from private dealerships operated in the greater Riverside area, from UCR's fleet services, and from private sources through long-term loan agreements. Vehicle odometers at the onset of testing ranged from 7,352 miles (Ford F150) to 63,491 miles (Nissan Rogue). All vehicles acquired for testing were inspected to ensure that they were in sound mechanical and operational condition using a standard checklist.

Following vehicle recruitment, UCR verified the following:

1. Odometer check to ensure vehicle meets the minimum miles travelled based on its age as specified in California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years, March 22, 2012 [6]

[6] https://ww3.arb.ca.gov/regact/2012/leviiighg2012/lev12.pdf

2. Emissions equipment working based on a CARB smog check
3. VIN/VECI check to ensure appropriate technology group and optional equipment
4. Diagnostic check to verify current ECM calibration and no pending codes
5. Check to see all relevant repairs/OEM recalls completed. All vehicles were tested in their original configuration, with no lubricant oil changes prior to the emissions testing.

Table 3 shows the vehicles that were tested Table 3. Vehicles selected for tailpipe emissions testing. Strikethroughs show originally proposed vehicles that could not be readily rented or otherwise obtained for testing and were replaced with similar vehicles, as shown.

Technology Group	Model Year	Vehicle Type*	Make	Model	Engine Displacement	Fuel Injection Type**	Evap Vehicle
SULEV 30	2019	LDA	Chevrolet	Impala	3.6L	DFI	
	2018	LDA	Honda	Fit	1.5L	DFI	
	~~2018~~ 2020	LDT2	Jeep	Cherokee	~~2.4L~~ 3.6L	SFI	Yes
	~~2017~~ 2016	LDA	Mazda	Mazda3	2.5L	DFI	
	~~2016~~ 2020	LDA	Toyota	Prius	1.8L	SFI	
ULEV 125	~~2020~~ 2021	LDA	Hyundai	~~Elantra~~ Accent	~~1.4L~~ 1.6L	~~DFI~~ SFI	Yes
	~~2019~~ 2018	LDT3	Chevrolet	~~Silverado~~ Suburban	~~6.2L~~ 5.3L	DFI	
	2018	LDA	Honda	Civic 4dr	1.5L	DFI	
	~~2018~~ 2020	LDT2	Nissan	~~Pathfinder~~ Armada	~~3.5L~~ 5.6L	DFI	
	2017	LDT4	Ford	F150 Pickup 4WD	3.5L	DFI/SFI	
ULEV 70	2020	LDA	Ford	Fusion FWD	2.0L	DFI	
	2019	LDT4	Dodge	Ram 1500	5.7L	SFI	
	~~2018~~ 2020	LDA	Kia	~~Soul~~ Optima	~~2.0L~~ 2.4L	DFI	
	~~2017~~ 2021	LDA	Chevrolet	Spark	1.4L	SFI	
	2016	LDT2	Nissan	Rogue	2.5L	SFI	Yes
ULEV 50	2020	LDA	~~Honda~~ Buick	~~Accord~~ Enclave	~~1.5L~~ 3.6L	DFI	
	2020	LDT2	Jeep	Compass	2.4L	SFI	Yes
	2021	LDT2	~~Ford~~ Chevrolet	~~Transit~~ Colorado	~~2.0L~~ 3.6L	DFI	
	2019	LDT1/LDT2	Toyota	RAV4	2.5L	DFI/SFI	Yes
	~~2018~~ 2020	LDT1	~~Chevrolet~~ GMC	~~Malibu~~ Acadia	~~1.5L~~ 3.6L	DFI	

*as defined in 40 CFR 86.1803-01: LDA =passenger cars; LDT1=light-duty truck 1; LDT2=light-duty truck 2; LDT3=light-duty truck 3;LDT4=light-duty truck 4.
** DFI = direct fuel injection; SFI=sequential fuel injection

3.3 Vehicle Testing

The laboratory followed the light-duty test procedures, including preconditioning, equipment requirements, calibration methods, test procedures and data calculations for the selected vehicles, pollutants and test cycle as outlined in the California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas

Exhaust Emissions Standards and Test Procedures for Passenger Cars[7] , March 22, 2012, except where changes in analytical methods were explicitly approved by CARB. The change in analytical methods was made to collect information on emissions of specific pollutants. These additional pollutants were specified by CARB, and would not have been quantified using the standard methodologies.

3.4 Emissions Analyses

Each vehicle was tested in triplicate on the E10 blend and the E15 blend and emissions of the following pollutants were measured:

Table 4.Tailpipe emissions testing measurement methods and pollutants.

Pollutant	Analytical Method	Reported for each bag or Cumulative
NOx (nitrogen oxides)	40 CFR 1066	Reported for each bag and weighted composite
THC (total hydrocarbon)	40 CFR 1066	Reported for each bag and weighted composite
NMHC (non-methan hydrocarbon)	40 CFR 1066	Reported for each bag and weighted composite
CO (carbon monoxide)	40 CFR 1066	Reported for each bag and weighted composite
CH4 (methane)	40 CFR 1066	Reported for each bag and weighted composite
CO2 (carbon dioxide)	40 CFR 1066	Reported for each bag and weighted composite
PM (particulate matter()mass	40 CFR 1066	Reported for each bag and weighted composite
Ethylene Acetylene Ethane Propylene Propane Isobutane 1-Butene 1,3 Butadiene n-Butane trans-2-Butene cis-2-Butene Isopentane 1-Pentene n-Pentane Isoprene trans-2-Pentene cis-2-Pentene 2,2-Dimethylbutane Cyclopentane 2,3-Dimethylbutane 2-Methylpentane 3-Methylpentane 1-Hexene n-Hexane Methylcyclopentane 2,4-Dimethylpentane	EPA TO-12/PAMS	Cumulative

[7] https://ww2.arb.ca.gov/sites/default/files/2019-04/ldtps_2015+_CP_or_2017+_GHG_MY_lev_iii_clean_complete_4-19.pdf

Benzene Cyclohexane 2-Methylhexane 2,3-Dimethylpentane 3-Methylhexane 2,2,4-Trimethylpentane n-Heptane Methylcyclohexane 2,3,4-Trimethylpentane Toluene 2-Methylheptane 3-Methylheptane n-Octane Ethylbenzene m/p-Xylenes Styrene o-Xylene Nonane Isopropylbenzene n-Propylbenzene m-Ethyltoluene p-Ethyltoluene 1,3,5-Trimethylbenzene o-Ethyltoluene 1,2,4-Trimethylbenzene n-Decane 1,2,3-Trimethylbenzene m-Diethylbenzene p-Diethylbenzene n-Undecane n-Dodecane		
ethanol naphthalene	EPA TO-15A	Cumulative
Formaldehyde acetaldehyde acrolein acetone propionaldehyde butyraldehyde hexanaldehyde benzaldehyde methyl-ethyl ketone methacrolein crotonaldehyde valeraldehyde m-tolualdehyde	EPA TO-11A	Cumulative

3.5 Statistical Analysis

Under CARB direction and funding, a statistical analysis of the tailpipe emissions results was conducted by a UCR statistician using the Mixed Procedure in PC/SAS from SAS Institute, Inc. Mixed models are a type of model that include both fixed (in this case, the fuel) and random factors (in this case, the vehicles).

In order to ensure all statistical test parameters were normally distributed, the normality and homogeneity of variance of residuals of all pollutants was assessed. Based on this assessment all

regulated, particulate, and toxic emissions pollutants were analyzed on the natural logarithm scale with the exception of weighted NMHC, phase 1, phase 3; weighted CO, phase 1; NOx, phase 1; and weighted PM mass, *m/p*-xylenes, *o*-xylene, and ethylbenzene that were analyzed on the original scale. Carbon-balance weighted fuel economy was analyzed in the inverse scale (i.e., gallons/mile). For emissions components that included zeros (non-detects) or negative values (where the background was larger than detected level) for individual bags or weighted emissions, a small constant was added prior to taking the logarithm to allow the analyses to be done in the logarithm scale. Any added constants were selected to be as small as possible.

Analysis results were considered to be statistically significant for $p \leq 0.05$, and marginally significant for $0.05 < p \leq 0.1$.The percentage differences between fuels, where statistically significant differences were found, are provided. These percentage differences were determined from the least square means from the statistical analysis and represent a rough estimate of the magnitude of change shown by the tested vehicles. Figures 3-1 through 3-28 in Appendix A show the range of emissions effects on the twenty tested vehicles.

A more detailed description of the statistical analysis is included in Appendix A.

3.6 Results

This section is based on the statistical analysis conducted by UCR under CARB direction and we have quoted their conclusions verbatim below in italics. The numerical statistical results for the regulated emissions, fuel economy, particulates, and toxics are summarized in Table ES-1 and Table ES-2 in Appendix A.

For the statistical analyses, results are statistically significant for $p \leq 0.05$ or marginally statistically significant for $0.05 < p \leq 0.1$. The fleet of twenty vehicles showed statistically significant effects for some pollutants, but not for others. NOx emissions, a target pollutant of concern for this program, did not show any statistically significant difference between the fuels for the FTP and nor for each individual FTP phase.

Cold-start and weighted THC emissions showed statistically significant reductions of 6% and 5%, respectively, for E15 compared to E10. For the cold-start NMHC emissions, E15 showed a 7% statistically significant reduction compared to E10, while for the hot-start NMHC emissions, E15 showed a 15% marginally statistically significant reduction compared to E10. The weighted NMHC emissions showed a marginally statistically significant reduction of 8% for E15 compared E10.

Cold-start and hot-start CO emissions showed statistically significant reductions of 12% and 27%, respectively, for E15 compared to E10. The weighted CO emissions showed a statistically significant reduction of 17% for E15 compared to E10 across the fleet of 20 vehicles.

CO_2 emissions showed a marginally statistically significant reduction of 1% for E15 compared to E10 over the hot-start phase. Carbon-balance weighted fuel economy showed a statistically significant reduction of 1% for E15 compared to E10 across the fleet of 20 vehicles.

The PM mass showed strong, statistically significant fuel trends over the entire FTP cycle and each individual phase. For the cold-start and hot-running phases, PM mass emissions showed statistically significant reductions of 17% and 54%, respectively, for E15 compared to E10. Hot-start PM mass emissions were 43% lower for E15 compared to E10, at a marginally statistically significant level. The weighted PM mass emissions showed a statistically significant reduction of 18% for E15 compared to E10 across the fleet of 20 vehicles.

Only the weighted solid particle number emissions were included in the statistical analyses. Results showed that E15 was 12% lower than E10, at a statistically significant level.

For the BTEX and 1,3-butadiene emissions, only ethylbenzene, m/p-xylenes and o-xylene emissions showed statistically significant results between the fuels. For ethylbenzene emissions, E15 showed a statistically significant reduction of 11% compared to E10. For m/p-xylenes and o-xylene emissions, E15 showed marginally statistically significant reductions of 10% and 9%, respectively, compared to E10. Ethanol emissions showed a strong, statistically significant increase of 77%, on average, for E15 compared to E10 [The average value of the ethanol emissions increase represents a wide range of values found in the 20 vehicles tested, from increases of greater than 300% (Mazda 3) to a small decrease in ethanol emissions (Nissan Armada).] *. Acetaldehyde emissions also showed a strong, statistically significant increase of 32% for E15 compared to E10 across the fleet of 20 vehicles.*

*Calculated NMOG[*non-methane organic gases*] and ozone forming potential (OFP) emissions data were not included in the comprehensive statistical analysis, but were examined for fuel effects using a two-sample equal variance t-test. Both NMOG emissions and OFP showed statistically significant fuel effects for some vehicles, but not for others. Overall, NMOG emissions trended lower for E15 compared to E10. Similar to NMOG, OFP showed a decreasing trend for E15 compared to E10, indicating that the introduction of E15 in the California gasoline market will likely not contribute to increases in ozone formation.*

4 Evaporative Emissions Testing

4.1 General

This report summarizes the results of evaporative emissions testing of two fuels, E10 and E15, tested on five modern spark-ignition vehicles at Automotive Testing and Development Services, Inc. in Ontario, California. Five attachments in Appendix B, one for each vehicle, provide additional detail on the day-by-day chronology, laboratory QA procedures and test results. A paired t-test shows no statistically significant difference between the two fuels.

4.2 Vehicles and Fuels

The vehicles were procured by the CE-CERT laboratory at the University of California-Riverside (UCR), and consisted of a subset of the vehicles included in the E10/E15 tailpipe testing program, and included a 2020 Jeep Compass , 2016 Nissan Rogue, 2020 Jeep Cherokee, 2019 Toyota RAV4, and 2021 Hyundai Accent. The five vehicles for evaporative emissions testing were selected by CARB representatives from

the larger group of twenty that were tailpipe tested at CE-CERT. The E10 and E15 fuels used in evaporative emissions testing were supplied by CE-CERT and delivered to ATDS in drums. These fuels were the same as those used in CE-CERT's tailpipe testing program and described in Section 2 of this report.

4.3 Test Plan

The plan proposed to test the five vehicles on both E10 and E15 on each fuel over the 3-day diurnal test procedure two times in a row. All testing followed the procedures for 3-day diurnal in California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles, last amended September 2, 2015 with the exception that the running loss test was not included. Figure 1 provides an outline of the required procedures. Windshield wiper fluid was drained prior to beginning testing**.** Preconditioning of the vehicles followed the requirements in California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles, last amended September 2, 2015, with the exception of the heat build, which was simplified to avoid the need for thermocouples to be placed in the fuel tank of borrowed vehicles. In addition, the following preparatory and preconditioning steps were used to ensure the vehicles had been properly adapted to each test fuel:

(A) Purge the vehicle's evaporative canister for 60 minutes at 0.8 cfm.

(B) Drain the fuel tank(s) and fill with 3 gallons of the test fuel.

(C) Start the vehicle and allow it to idle for 1 minute.

(D) Drain the fuel tank(s) and fill with the new test fuel to the "tank fuel volume" defined in 40 CFR § 86.082-2. The average temperature of the dispensed fuel shall be less than 60 °F.

(E) Conduct a heat build according to the procedure specified in 40 CFR § 86.133-96, with the exception that the temperature within the fuel tank will not be monitored, rather the temperature of the SHED will be raised to 105 °F over a one-hour period.

(E) The vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through four UDDS, specified in 40 CFR § 86.115.

(F) Following the dynamometer drive, the vehicle shall be turned off for 5 minutes, then restarted and allowed to idle for 1 minute. The vehicle shall then be turned off for 1 minute, and allowed to idle again for 1 minute.

(G) 21 day constant temperature soak with each fuel before starting testing

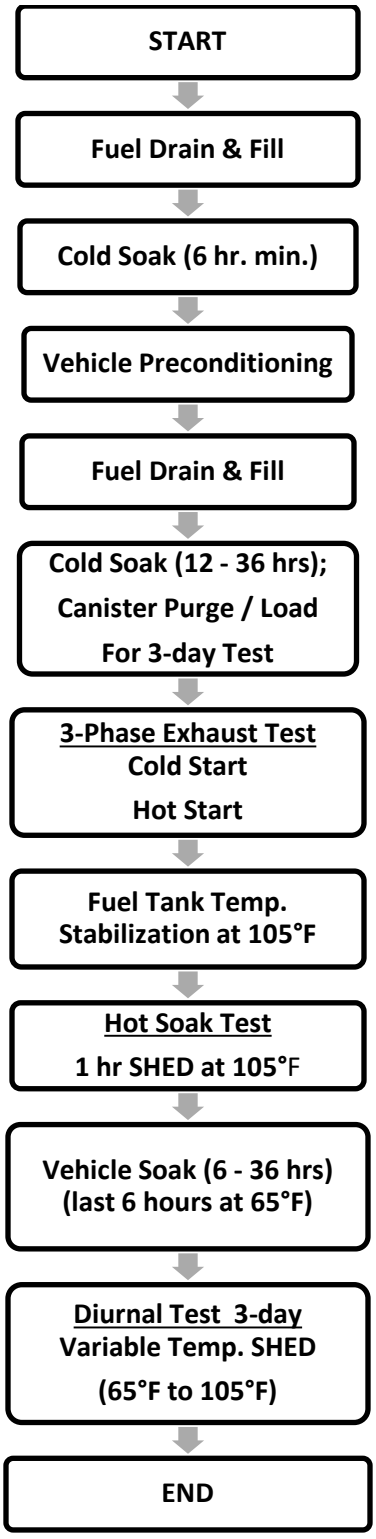

Figure 1. Outline of Evaporative Emissions Test Procedures

4.4 Measurements and Test Parameters

Total hydrocarbon (THC) was measured using a flame ionization detector.

Ethanol Emissions were measured using the Innova Photoacoustic Analyzer Model 1314/34 with the following filters to account for potential interference of other compounds:

UA0974 Alcohols (as Ethanol)

UA0981 Hydrocarbons (as Toluene)

UA0971 Freons (as R134a)

UA0983 Carbon Dioxide

SB0527 Water

Samples for ethanol analysis were drawn directly from the SHED through a sample port in the side of the SHED and directly into the Innova Analyzer. Four separate readings at the beginning and four separate readings at the end of each cycle were collected. The first reading was disregarded, and the final three readings were averaged.

The FID measures ethanol, but it undercounts the amount of ethanol, with a response factor of only 0.75 (response factor = measured/actual). Normally, evaporative emissions are corrected with an automatic addition of 8% to the FID measurement to account for the undercounted ethanol when evaporative testing E10 fuel (40 CFR § 86.1813-17 (a)(iv)). However, in this case it was necessary to carefully account for the ethanol emissions difference between E10 and E15 so ethanol emissions were measured using the photoacoustic analyzer. To accurately estimate the total gaseous organic emissions we adjusted the FID emissions by the amount of ethanol measured by the Innova as follows:

THC plus ethanol = FID measurement plus 0.25 times ethanol measured in photoacoustic analyzer

Statistical analyses were based on a test parameter consisting of THC plus ethanol for the first hour plus the highest THC plus ethanol any of the three days of the 3-day diurnal.

4.5 Testing Chronology

2020 Jeep Compass (2/8/2021 to 4/6/2021)

Testing of the Jeep Compass was aborted due to extremely high SHED measurements, suggesting a fuel leak or another source of organic compounds other than the fuel system. This determination was made only after the normal vehicle check-in, canister purge, 21-day soak with new fuel and preconditioning cycle. The first SHED test resulted in emissions well above regulatory limits (4.203 g in first 24 hours). In an effort to identify and remove the source of emissions, the AC refrigerant was drained by the dealer and two additional preconditioning cycles were run. A second test resulted in similarly high emissions in the first 24 hours (2.395 g). Additional attempts to locate the source of the leak with a hydrocarbon

tester, and a pressure test of the vehicles EVAP system were unsuccessful. After consultation with CARB representatives, testing of this vehicle was aborted.

2016 Nissan Rogue (2/25/2021 to 8/1/2021)

Following the normal 21-day soak and preconditioning protocols for the Nissan Rogue, the initial E10 test also resulted in unusually high emissions (2.26 grams). A hydrocarbon tester was used to try to find a source of these emissions, but no leaks in fuel or evaporative emissions systems were found. The following two additional tests resulted in emissions within expected levels. Because no specific cause of the initial high emissions test was found, it was determined that there was no valid reason for not including the initial test in our analyses, however statistical analyses were performed both with and without the initial test.

During the first E15 test, the Innova computer crashed, and ethanol measurements could not be made on the second and third day of the 3-day diurnal. In order to estimate the amount of ethanol in the Day 2 and Day 3 emissions, the proportion of ethanol to the total FID emissions was assumed to be the same as that on the first day. In every other test conducted in this program, results on the second and third day had no impact on the test parameter (which was based on the day of the diurnal test which had the highest emissions). Similarly, in this test the FID measurement found the highest emissions on the first day, and thus this estimate is not reflected in the test parameter.

2019 Toyota RAV4 (2/24/2021 to 6/7/2021)

2021 Hyundai Accent 6/21/2021 to 9/26/2021)

2020 Jeep Grand Cherokee (4/30/2021 to 9/6/2021)

Testing of the other three vehicles proceeded without any deviations from the planned protocols.

4.6 Results

All test results are shown in Table 1, and summarized graphically in Figure 1.

Table 5. THC plus Ethanol. Chronologically, E10 was the first fuel tested in the Toyota RAV4 and the Nissan Rogue; E15 was the first fuel tested in the Jeep Cherokee and Hyundai Accent.

		E10	**E15**
Toyota RAV4	Test #1	0.180	0.216
	Test #2	0.226	0.235
	Average	0.203	0.226
Nissan Rogue	Test #1	2.260	0.766
	Test #2	0.614	0.567
	Test#3	0.324	
	Average	1.066	0.667

	Average w/out Test #1	0.469	
Jeep Cherokee	Test #1	0.730	0.576
	Test #2	0.892	0.643
	Average	0.811	0.610
Hyundai Accent	Test #1	0.232	0.376
	Test #2	0.230	0.313
	Average	0.231	0.345

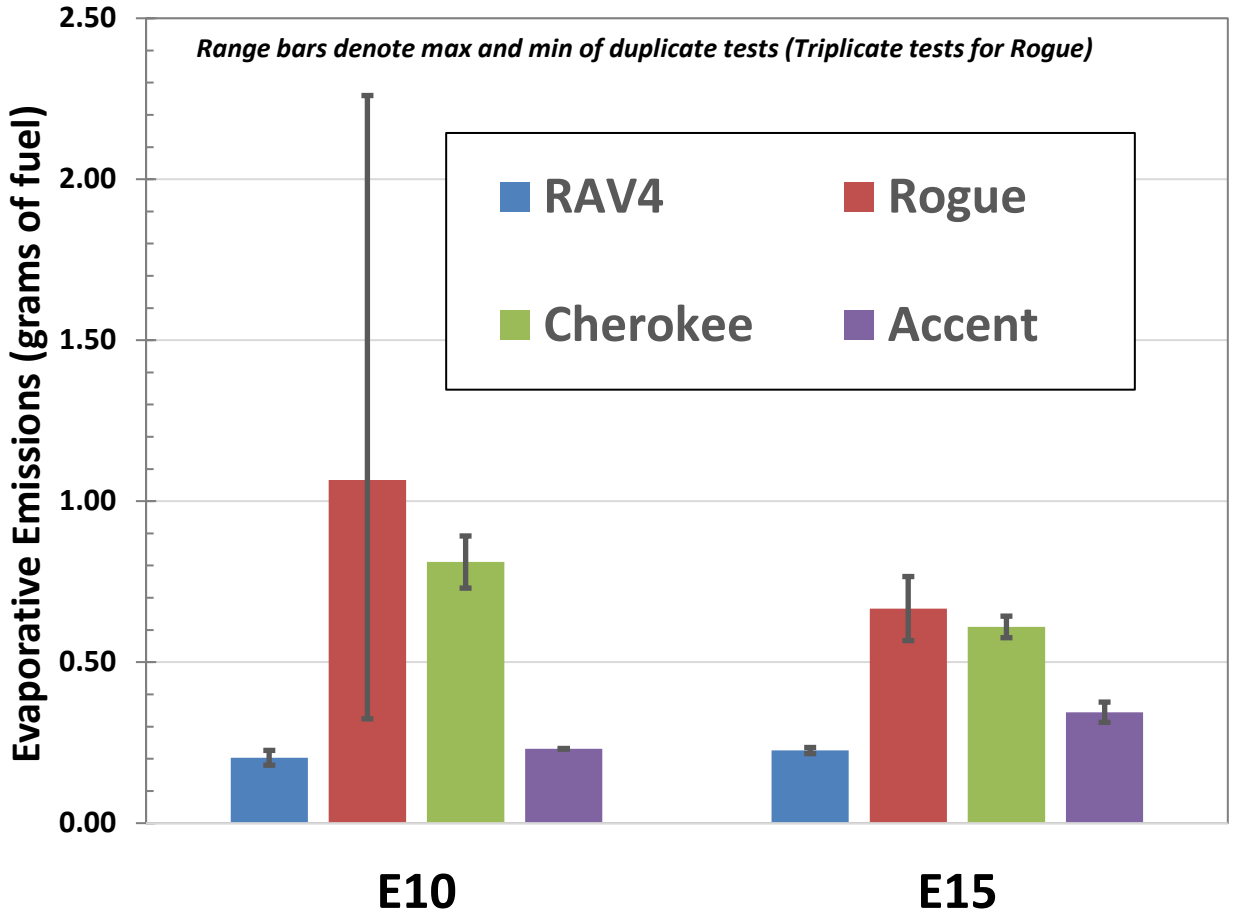

Figure 2. Evaporative emissions for four vehicles.

4.7 Statistical Analysis

Emissions from two vehicles declined when using E15 in place of E10 in two vehicles and increased in the other two vehicles. On average emissions declined 22%. A paired t-test was conducted, based on the average of the tested values for each vehicle/fuel combination and resulted in a p-value of 0.38, a value that indicates there is no statistically significant difference between the two fuels.

Although, we cannot justify discarding the Nissan Rogue E10 Test #1 on statistical or scientific grounds, other than it seems somewhat suspect given that emissions declined on each subsequent test, without this value average emissions increased 5% (E15 vs. E10), and the p-value of the t-test is 0.81, suggesting even less statistical significance in the difference between the two fuels.

5 Conclusions

Emissions testing of twenty late-model vehicles by the University of California – Riverside found that increasing the ethanol content of fuel from 10 to 15% will result in air quality improvement due to the following changes in tailpipe emissions:

- statistically significant reduction of 18% in weighted particulate emission (total mass)
- statistically significant reduction of 12% in weighted particulate emissions (number of particles),
- statistically significant reduction of 17% in weighted carbon monoxide emissions.
- statistically significant reduction of 5% in weighted THC emissions,
- statistically significant reduction of 8% in weighted NMHC emissions,
- statistically significant reduction of 1% in weighted CO_2 emission.

The change in weighted NOx emissions was not statistically significantly different between the two fuels.

In their analysis of over 70 specific organic compounds emitted from the tailpipe, UCR found statistically significant differences across the 20 vehicles for only the following compounds:

- statistically significant increase of 77% in ethanol
- statistically significant increase of 32% in acetaldehyde
- statistically significant decrease of 11% in ethylbenzene

As well as marginally significant reductions in the following two compounds:

- marginally significant decrease of 10% in m/p-xylenes
- marginally significant decrease of 9% in o-xylene.

Additionally, the UCR analysis found E15 in place of E10 resulted in reductions in

- Total ozone forming potential of the emissions
- NMOG emissions

Carbon-balance weighted fuel economy, declined 1% with E15 versus E10.

Testing of the evaporative emissions of four in-use vehicles tested on E15 versus E10 found hydrocarbon plus ethanol emissions increased in two vehicles, and was reduced in two vehicles. There was no statistically measurable difference in evaporative emissions between the two fuels.

Overall, the testing results show the use of E15 versus E10 will reduce the tailpipe emissions of most pollutants, have no statistically significant impact on evaporative emissions, while reducing the carbon intensity of the fuel supply.

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6 Appendix A - Final Report Comparison of Exhaust Emissions Between E10 CaRFG and Splash Blended E15

7 Appendix B – ATDS Laboratory Results for Evaporative Emissions Testing

8 Appendix C – Fuel Analysis Chain of Custody and Laboratory Results

Final Report

Comparison of Exhaust Emissions Between E10 CaRFG and Splash Blended E15

Prepared for:

California Air Resources Board (CARB), Growth Energy Inc./Renewable Fuels Association (RFA), and USCAR

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Table of Contents

Acknowledgments i
Executive Summary **v**
1 Introduction **1**
2 Experimental Procedures **1**
2.1 Test Fuels 1
2.2 Test Vehicles 6
2.3 Test Sequence, Randomization, and Fuel Conditioning 9
2.5 Emissions Testing 13
2.6 Statistical Analysis 18
3 Emissions Testing Results **20**
3.1 THC, NMHC and CH_4 Emissions 25
3.2 CO Emissions 28
3.3 NO**x** Emissions 29
3.4 CO_2 Emissions and Fuel Economy 30
3.5 PM Mass, Particle Number and Black Carbon Emissions 33
3.6 Nitrous oxide (N_2O) and ammonia (NH_3) emissions 41
3.7 Aromatic Hydrocarbon Species, 1,3-Butadiene, and Ethanol Emissions 43
3.8 Formaldehyde and Acetaldehyde Emissions 48
3.9 NMOG Emissions 49
3.10 Ozone Forming Potential 50
4 Summary and Conclusions **52**
5 References **54**
Appendix A **1**
Appendix B **1**

List of Tables

Table 2-1 Main Physicochemical Properties of the Test Fuels for Each Drum 2
Table 2-2 Average Physicochemical Properties of the Test Fuels 4
Table 2-3 Denatured Ethanol Properties 6
Table 2-4 Test Vehicle Specifications 8
Table 2-5 Test matrix randomization sequence 10
Table 2-6 Hydrocarbon species analysis methods 16
Table 3-1 Summary of Statistical Comparisons for Different Fuels by Bag 21
Table 3-2 Summary of Statistical Comparisons for Different Fuels for the Weighted and Cumulative Emissions 22

List of Figures

Figure 2-1. FTP cycle 9
Figure 2-2. Prep and test procedure 11
Figure 2-3. Schematic of Experimental Setup 14
Figure 3-1. Average THC Weighted Emission Results 25
Figure 3-2. Average NMHC Weighted Emission Results 26
Figure 3-3. Average CH_4 Weighted Emission Results 27
Figure 3-4. Average CO Weighted Emission Results 28
Figure 3-5. Average NOx Weighted Emission Results 29
Figure 3-6. Average CO_2 Weighted Emission Results 30
Figure 3-7. Average Fuel Economy Results Based on Carbon Balance Method 32
Figure 3-8. Average Weighted PM Mass Emissions Results 34
Figure 3-9. Average Cold-Start (Bag 1) PM Mass Emissions Results 35
Figure 3-10. Average Hot-Running (Bag 2) PM Mass Emissions Results 36
Figure 3-11. Average Hot-Start (Bag 3) PM Mass Emissions Results 37
Figure 3-12. Fleet PM mass weighted emissions for different fuel injection types 38
Figure 3-13. Fleet PM mass weighted emissions for different technology groups 38
Figure 3-14. Average Solid Particle Number (>23 nm) Weighted Emissions Results 39
Figure 3-15. Average Black Carbon Weighted Emissions Results 40
Figure 3-16. Average N_2O weighted Emissions Results 41
Figure 3-17 Average NH_3 weighted Emissions Results 42
Figure 3-18. Average Benzene Cumulative Emissions Results 44
Figure 3-19. Average Toluene Cumulative Emissions Results 45
Figure 3-20. Average Ethylbenzene Cumulative Emissions Results 45
Figure 3-21. Average m/p-xylenes Cumulative Emissions Results 46
Figure 3-22. Average o-xylene Cumulative Emissions Results 46
Figure 3-23. Average 1-3 Butadiene Cumulative Emissions Results 47
Figure 3-24. Average Ethanol Cumulative Emissions Results 47
Figure 3-25. Average Formaldehyde Cumulative Emissions Results 48
Figure 3-26. Average Acetaldehyde Cumulative Emissions Results 49
Figure 3-27. Average NMOG Emissions Results 50
Figure 3-28. Ozone Forming Potential Test Results 51

Executive Summary

For this program, two fuels, namely an E10 and E15, were tested on twenty modern gasoline fueled vehicles over triplicate Federal Test Procedure (FTP) cycles. The E10 fuel was a California Reformulated Gasoline. The summer-grade E10 fuel was sourced from four (4) different refineries that were selected by CARB. The E10 fuels were blended together in four equal parts to create the final E10 fuel. The E15 fuel was created by splash blending denatured ASTM D4806 fuel grade ethanol with the final E10 fuel. Testing was performed on twenty light-duty gasoline vehicles that included a mixture of technologies, such as gasoline direct injection (GDI), port fuel injection (PFI) as well as PFI+GDI fuel systems that are representative of the current California gasoline fleet. One hybrid electric vehicle (HEV) equipped with a PFI engine was also used. The vehicle test matrix had provisions for five vehicles on each emissions standards category (i.e., SULEV30, ULEV50, ULEV70, and ULEV125).

Emissions measurements were conducted in CE-CERT's new state-of-the-art Light-Duty Laboratory (LDL) according to the U.S. EPA protocols for light-duty emission testing as given in the CFR, Title 40, Part 1065/1066. Measurements included regulated emissions of NOx, CO, THC, NMHC, CO_2, CH_4, and PM mass. Gravimetric PM mass samples were collected for each of the three individual phases of the FTP (i.e., cold-start, hot-running, and hot-start) and weighted PM mass over FTP cycle was calculated based on PM mass data from each phase of the FTP. Real-time soot mass or black carbon emissions were measured using an AVL Micro-Soot Sensor (MSS). Solid particle number emissions were measured according to the European Particle Measurement Programme (PMP) from the CVS tunnel using a AVL Particle Counter (APC plus) with a cut-off particle diameter of 23 nm. Carbonyl compounds (aldehydes and ketones) were sampled on 2,4-dinitrophenylhydrazine (DNPH) coated silica cartridges (Waters Corp., Milford, MA) from the main CVS tunnel using a mass flow controller to regulate the flow to 1 L/min through the cartridge. Hydrocarbon species and ethanol were collected using a 6 L specially prepared SUMMA passivated canister, which was connected to the CVS system. Analysis of the hydrocarbon species was conducted using a Gas Chromatography/Mass Spectrometry/Flame Ionization Detector (GC/MS/FID) analytical system according to the EPA TO-12/PAMS and EPA TO-15A methods. Nitrous oxide (N_2O) and ammonia (NH_3) emissions were measured at the tailpipe using a Horiba FTX-ONE-CS Fourier Transform Infrared (FTIR) system.

Statistical analyses for each pollutant were run using the Mixed procedure in PC/SAS from SAS Institute, Inc. Mixed models are a type of model that include both fixed and random factors. The fuel type was treated as a fixed factor in the model, while vehicles were treated as a random factor. The pollutants of phase 1, phase 2, phase 3, and weighted THC, phase 1, phase 2, and phase 3 NMHC, phase 2 CO, phase 2, phase 3, and weighted NOx, phase 2 and phase 3 PM mass, weighted fuel economy, weighted solid particle number, 1,3-butadiene, benzene, toluene, ethanol, formaldehyde, and acetaldehyde were all analyzed on the original scale. All the other emissions (weighted NMHC, phase 1, phase 3, and weighted CO, phase 1 NOx, phase 1 and weighted PM mass, *m/p*-xylenes, *o*-xylene, and ethylbenzene) were analyzed on the original natural log scale. For some variables that include zeros or negative values, a constant was added to the original value before taking the logarithm.

The results for the regulated emissions, fuel economy, particulates, and toxics are summarized in Table ES-1 and Table ES-2. Table ES-1 shows the statistical comparison between E10 and E15 for all vehicles by FTP phase or bag, whereas Table ES-2 shows the statistical comparisons for the weighted emissions. For the statistical analyses, results are statistically significant for $p \leq 0.05$ or marginally statistically significant for $0.05 < p \leq 0.1$. The fleet of twenty vehicles showed statistically significant effects for some pollutants, but not for others. NOx emissions, a target pollutant of concern for this program, did not show any statistically significant difference between the fuels for the FTP and nor for each individual FTP phase.

Cold-start and weighted THC emissions showed statistically significant reductions of 6% and 5%, respectively, for E15 compared to E10. For the cold-start NMHC emissions, E15 showed a 7% statistically significant reduction compared to E10, while for the hot-start NMHC emissions, E15 showed a 15% marginally statistically significant reduction compared to E10. The weighted NMHC emissions showed a marginally statistically significant reduction of 8% for E15 compared E10.

Cold-start and hot-start CO emissions showed statistically significant reductions of 12% and 27%, respectively, for E15 compared to E10. The weighted CO emissions showed a statistically significant reduction of 17% for E15 compared to E10 across the fleet of 20 vehicles.

CO_2 emissions showed a marginally statistically significant reduction of 1% for E15 compared to E10 over the hot-start phase. Carbon-balance weighted fuel economy showed a statistically significant reduction of 1% for E15 compared to E10 across the fleet of 20 vehicles.

The PM mass showed strong, statistically significant fuel trends over the entire FTP cycle and each individual phase. For the cold-start and hot-running phases, PM mass emissions showed statistically significant reductions of 17% and 54%, respectively, for E15 compared to E10. Hot-start PM mass emissions were 43% lower for E15 compared to E10, at a marginally statistically significant level. The weighted PM mass emissions showed a statistically significant reduction of 18% for E15 compared to E10 across the fleet of 20 vehicles.

Only the weighted solid particle number emissions were included in the statistical analyses. Results showed that E15 was 12% lower than E10, at a statistically significant level.

For the BTEX and 1,3-butadiene emissions, only ethylbenzene, m/p-xylenes and o-xylene emissions showed statistically significant results between the fuels. For ethylbenzene emissions, E15 showed a statistically significant reduction of 11% compared to E10. For m/p-xylenes and o-xylene emissions, E15 showed marginally statistically significant reductions of 10% and 9%, respectively, compared to E10. Ethanol emissions showed a strong, statistically significant increase of 77% for E15 compared to E10. Acetaldehyde emissions also showed a strong, statistically significant increase of 32% for E15 compared to E10 across the fleet of 20 vehicles.

Calculated NMOG and ozone forming potential (OFP) emissions data were not included in the comprehensive statistical analysis, but were examined for fuel effects using a two-sample equal variance t-test. Both NMOG emissions and OFP showed statistically significant fuel effects for some vehicles, but not for others. Overall, NMOG emissions trended lower for E15 compared to

E10. Similar to NMOG, OFP showed a decreasing trend for E15 compared to E10, indicating that the introduction of E15 in the California gasoline market will likely not contribute to increases in ozone formation.

Table ES-1 Summary of Statistical Comparisons for Different Fuels by Bag

	Bag 1 (Cold-start)		Bag 2 (Hot-running)		Bag 3 (Hot-start)	
NO_x g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	0.02302	0.02153	0.00271	0.00258	0.00411	0.00349
	Statistical Analysis					
	Not Significant		**Not Significant**		**Not Significant**	
THC g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	0.06212	0.05833	0.00178	0.00157	0.00646	0.00644
	Statistical Analysis					
	E15 6% lower than E10		**Not Significant**		**Not Significant**	
NMHC g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	0.04882	0.04563	0.00033	0.00028	0.00175	0.00148
	Statistical Analysis					
	E15 7% lower than E10		**Not Significant**		E15 15% lower than E10	
CO g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	1.08473	0.95372	0.00600	0.00576	0.29189	0.21421
	Statistical Analysis					
	E15 12% lower than E10		**Not Significant**		**E15 27% lower than E10**	
CO_2 g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	363.11232	361.39357	352.36935	354.63303	311.48928	309.88805
	Statistical Analysis					
	Not Significant		**Not Significant**		E15 1% lower than E10	
PM Mass mg/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	3.34140	2.78603	0.02930	0.01338	0.07267	0.04171
	Statistical Analysis					
	E15 17% lower than E10		**E15 54% lower than E10**		E15 43% lower than E10	

Table ES-2 Summary of Statistical Comparisons for Different Fuels for the Weighted and Cumulative Emissions

	Weighted	
NO_x g/mi	**Least Square Means**	
	E10	E15
	0.00737	0.00713
	Statistical Analysis	
	Not Significant	
THC g/mi	**Least Square Means**	
	E10	E15
	0.01607	0.01530
	Statistical Analysis	
	E15 5% lower than E10	
NMHC g/mi	**Least Square Means**	
	E10	E15
	0.01267	0.01164
	Statistical Analysis	
	E15 8% lower than E10	
CO g/mi	**Least Square Means**	
	E10	E15
	0.33341	0.27698
	Statistical Analysis	
	E15 17% lower than E10	
CO_2 g/mi	**Least Square Means**	
	E10	E15
	343.38230	343.75008
	Statistical Analysis	
	Not Significant	
Fuel Economy mpg	**Least Square Means**	
	E10	E15
	26.69902	26.38465
	Statistical Analysis	
	E15 1% lower than E10	
PM Mass mg/mi	**Least Square Means**	
	E10	E15
	0.85757	0.69974
	Statistical Analysis	

	E15 18% lower than E10	
SPN #/mile	**Least Square Means**	
	E10	E15
	9.58485E+11	8.38733E+11
	Statistical Analysis	
	E15 12% lower than E10	
1,3-Butadiene mg/mi	**Least Square Means**	
	E10	E15
	0.02506	0.02521
	Statistical Analysis	
	Not Significant	
Benzene mg/mi	**Least Square Means**	
	E10	E15
	0.87110	0.87372
	Statistical Analysis	
	Not Significant	
Toluene mg/mi	**Least Square Means**	
	E10	E15
	0.89446	0.98200
	Statistical Analysis	
	Not Significant	
Ethylbenzene mg/mi	**Least Square Means**	
	E10	E15
	0.23142	0.20529
	Statistical Analysis	
	E15 11% lower than E10	
m/p-xylenes mg/mi	**Least Square Means**	
	E10	E15
	0.73946	0.66601
	Statistical Analysis	
	E15 10% lower than E10	
o-xylene mg/mi	**Least Square Means**	
	E10	E15
	0.25398	0.23079
	Statistical Analysis	
	E15 9% lower than E10	
Ethanol mg/mi	**Least Square Means**	
	E10	E15

	0.46772	0.82775
	Statistical Analysis	
	E15 77% higher than E10	
Formaldehyde mg/mi	**Least Square Means**	
	E10	E15
	0.20882	0.22576
	Statistical Analysis	
	Not Significant	
Acetaldehyde mg/mi	**Least Square Means**	
	E10	E15
	0.28386	0.37337
	Statistical Analysis	
	E15 32% higher than E10	

* Bold values are statistically significant $p \leq 0.05$; Underlined values are marginally statistically significant $0.05 < p \leq 0.10$

1 Introduction

The primary objective of this program is to better understand the impact of increasing ethanol blending on gaseous and particulate emissions from current GDI and port fuel injection (PFI) light-duty vehicles in California. For this project, two fuels, namely an E10 and E15, were tested on twenty modern gasoline fueled vehicles over triplicate FTP cycles. Measurements included regulated emissions, fuel economy, PM mass, particle number, black carbon, and emissions of benzene, toluene, ethylbenzene, xylene isomers, 1,3-butadiene, ethanol, and carbonyl compounds.

2 Experimental Procedures

2.1 Test Fuels

Two fuels were used in this program, namely an E10 and an E15 fuel. The E10 fuel was a California Reformulated Gasoline. The summer-grade E10 fuel was sourced from four (4) different refineries that were selected by CARB. Three refineries were in the South Coast Air Basin (SCAB) and one refinery was in the Northern California (Bay Area). The SCAB refineries included PBF Energy (Los Angeles), Phillips 66 (Los Angeles), and Marathon (Wilmington). The Bay Area refinery was Chevron (Richmond). The E10 fuels from all four refineries were collected by C3 Fuels. E10 fuel samples from each refinery were collected by C3 Fuels and provided to CE-CERT for storage. The E10 samples from each refinery have been stored in refrigerated conditions, if additional fuel properties analyses are requested by the sponsors.

The E10 fuels were blended together in four equal parts by C3 Fuels to create the final E10 fuel. The E15 fuel was created by splash blending denatured ASTM D4806 fuel grade ethanol with the final E10 fuel. Blending took place at C3 Fuels facility. Denatured ethanol (E98) was supplied in-kind by the ethanol industry. A sample of the denatured ethanol was collected and analyzed for fuel properties at Southwest Research Institute (SwRI) in San Antonio, TX.

Three samples from three separate drums of E10 fuel and three samples from three separate drums of E15 fuel were collected and shipped to SwRI for fuel property analysis and detailed hydrocarbon analysis (DHA). All samples were tested for fuel properties according to the ASTM D4814 standard. Table 2-1 lists the fuel properties and test methods for each of the three E10 and E15 fuel samples. Table 2-2 lists the average fuel properties for E10 and E15 fuels. Table 2-3 shows the properties and test methods for the denatured ethanol sample.

Table 2-1 Main Physicochemical Properties of the Test Fuels for Each Drum

Property	Test Method	Unit	E10 Drum#2	E10 Drum#3	E10 Drum#4	E15 Drum#1	E15 Drum#2	E15 Drum#3
RVP (EPA Equation)	D5191	Psi	7.43	7.44	7.41	7.33	7.35	7.36
DVPE (ASTM Equation)		Psi	7.31	7.32	7.28	7.20	7.22	7.23
CARVP (California Equation)		Psi	7.20	7.21	7.17	7.09	7.11	7.12
Research Octane Number	D2699Mdp	ON	91.10	91.20	91.10	94.10	93.40	93.40
Motor Octane Number	D2700Mdp	ON	83.60	83.50	83.50	85.10	85.10	85.00
API Gravity	D4052		59.15	59.15	59.15	58.48	58.48	58.48
Specific Gravity			0.74	0.74	0.74	0.74	0.74	0.74
Density at 15C		g/ml	0.74	0.74	0.74	0.74	0.74	0.74
Heat of Combustion, Gross	D4809	BTU/lb.	19255.00	19264.00	19274.00	18883.00	18862.00	18887.00
		MJ/kg	44.79	44.81	44.83	43.92	43.87	43.93
		cal/g	10697.20	10702.50	10707.80	10490.60	10478.90	10492.80
Heat of Combustion, Net		BTU/lb.	17970.00	17980.00	17996.00	17609.00	17592.00	17615.00
		MJ/kg	41.80	41.82	41.86	40.96	40.92	40.97
		cal/g	9983.60	9989.20	9998.10	9782.80	9773.30	9786.10
Methanol	D4815	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethanol		Vol%	9.61	9.70	9.68	14.54	14.59	14.21
Isopropanol		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
tert-Butanol		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
n-Propanol		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Methyl tert-butyl ether		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
sec-Butanol		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Diisopropylether		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Isobutanol		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethyl tert-butyl ether		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
tert-Pentanol		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
n-Butanol		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
tert-amyl methyl ether		Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total Oxygen		wt.%	3.57	3.60	3.59	5.38	5.40	5.26
Carbon	D5291 CH	wt.%	82.80	82.76	82.85	81.08	80.71	80.93
Hydrogen		wt.%	14.08	14.08	14.00	13.96	13.92	13.94
Sulfur	D5453	ppm	6.23	5.79	6.74	4.47	4.62	4.33
Benzene	D5580	Vol%	0.59	0.60	0.60	0.56	0.56	0.56
Toluene		Vol%	4.03	4.04	4.04	3.81	3.81	3.81
Ethylbenzene		Vol%	0.94	0.94	0.94	0.89	0.89	0.89
p,m-Xylene		Vol%	3.85	3.85	3.85	3.65	3.65	3.64

o-Xylene		Vol%	1.36	1.36	1.37	1.29	1.29	1.29
C9 plus Aromatics		Vol%	8.73	8.74	8.74	8.27	8.27	8.25
Total Aromatics		Vol%	19.52	19.53	19.53	18.47	18.47	18.45
Olefin	D6550	Mass %	5.00	5.00	5.10	4.60	4.70	4.60
Distillation	D86							
IBP		deg F	100.80	101.90	102.20	101.90	102.90	102.00
5%		degF	129.20	130.00	129.40	130.70	128.50	128.70
10%		degF	134.80	135.80	135.40	136.80	135.80	135.40
15%		degF	138.60	139.30	139.30	140.70	139.80	139.40
20%		degF	142.30	143.10	142.70	144.30	143.40	143.10
30%		degF	148.80	149.70	149.10	150.80	150.50	149.80
40%		degF	156.40	157.70	157.70	156.40	156.30	155.50
50%		degF	204.10	205.30	204.10	162.00	161.80	159.60
60%		degF	227.50	228.50	228.20	219.40	219.10	218.40
70%		degF	248.10	249.40	248.60	244.70	244.80	242.50
80%		degF	274.80	275.70	275.10	272.60	271.50	269.80
90%		degF	313.70	314.20	313.00	310.50	310.90	310.10
95%		degF	341.80	342.60	341.80	340.60	339.30	338.80
Final Boiling Point		degF	392.60	397.00	392.60	394.80	394.20	392.80
Recovered		mL	99.00	99.20	99.00	98.80	97.90	98.50
Residue		mL	0.70	0.70	0.70	0.70	0.70	0.70
Loss		mL	0.30	0.10	0.30	0.50	1.40	0.80
Particulate matter Index			1.15	1.16	1.16	1.07	1.11	1.10

Table 2-2 Average Physicochemical Properties of the Test Fuels

Property	Test Method	Unit	E10-avg	E15-avg
RVP (EPA Equation	D5191	psi	7.43	7.35
DVPE (ASTM Equation)		psi	7.30	7.22
CARVP (California Equation)		psi	7.19	7.11
Research Octane Number	D2699Mdp	ON	91.13	93.63
Motor Octane Number	D2700Mdp	ON	83.53	85.07
API Gravity	D4052		59.15	58.48
Specific Gravity			0.74	0.74
Density at 15C		g/ml	0.74	0.74
Heat of Combustion, Gross	D4809	BTU/lb.	19264.33	18877.33
		MJ/kg	44.81	43.91
		cal/g	10702.50	10487.43
Heat of Combustion, Net		BTU/lb.	17982.00	17605.33
		MJ/kg	41.83	40.95
		cal/g	9990.30	9780.73
Methanol	D4815	Vol%	<0.2	<0.2
Ethanol		Vol%	9.66	14.45
Isopropanol		Vol%	<0.2	<0.2
tert-Butanol		Vol%	<0.2	<0.2
n-Propanol		Vol%	<0.2	<0.2
Methyl tert-butyl ether		Vol%	<0.2	<0.2
sec-Butanol		Vol%	<0.2	<0.2
Diisopropylether		Vol%	<0.2	<0.2
Isobutanol		Vol%	<0.2	<0.2
Ethyl tert-butyl ether		Vol%	<0.2	<0.2
tert-Pentanol		Vol%	<0.2	<0.2
n-Butanol		Vol%	<0.2	<0.2
tert-amyl methyl ether		Vol%	<0.2	<0.2
Total Oxygen		wt.%	3.59	5.35
Carbon	D5291 CH	wt.%	82.80	80.91
Hydrogen		wt.%	14.05	13.94
Sulfur	D5453	ppm	6.25	4.47
Benzene	D5580	Vol%	0.60	0.56
Toluene		Vol%	4.04	3.81
Ethylbenzene		Vol%	0.94	0.89
p,m-Xylene		Vol%	3.85	3.65
o-Xylene		Vol%	1.36	1.29
C9 plus Aromatics		Vol%	8.74	8.26

Total Aromatics		Vol%	19.53	18.46
Olefin	D6550	Mass %	5.03	4.63
DHA	D6730		File attached	File attached
Distillation	D86			
IBP		deg F	101.63	102.27
5%		degF	129.53	129.30
10%		degF	135.33	136.00
15%		degF	139.07	139.97
20%		degF	142.70	143.60
30%		degF	149.20	150.37
40%		degF	157.27	156.07
50%		degF	204.50	161.13
60%		degF	228.07	218.97
70%		degF	248.70	244.00
80%		degF	275.20	271.30
90%		degF	313.63	310.50
95%		degF	342.07	339.57
Final Boiling Point		degF	394.07	393.93
Recovered		mL	99.07	98.40
Residue		mL	0.70	0.70
Loss		mL	0.23	0.90
Particulate Matter Index			1.15	1.10

Table 2-3 Denatured Ethanol Properties

Property	Test method	Unit	Denatured Ethanol
Acidity	D1613	mgKOH/g	0.04
Acidity as Acetic Acid		wt.%	0.00
Copper	D1688 M	mg/L	<0.05
Unwashed Gum	D381	mg/100 mL	0.50
Washed Gum		mg/100 mL	<0.5
Clear and Bright	D4176		Pass
Particulate			Pass
Free Water			Pass
Haze Rating			1.00
Temperature of Sample		°C	6.00
Sulfur	D5453	ppm	0.75
Ethanol	D5501	Vol%	97.49
Methanol		Vol%	0.02
pH	D6423		8.55
Total Chloride	D7319	ppm	<0.5
Total Sulfate		ppm	<0.5
Potential Sulfate		ppm	<1.0
Olefin Content	D7347	mass%	<0.1
Benzene	D7576	Vol%	0.01
Toluene		Vol%	<0.01
Ethylbenzene		Vol%	<0.01
p,m-Xylene		Vol%	<0.01
o-Xylene		Vol%	<0.01
C9 plus Aromatics		Vol%	<0.01
Total Aromatics		Vol%	<0.29
Water	E1064	wt.%	0.69

2.2 Test Vehicles

Twenty light-duty vehicles were acquired for testing. The original vehicle list was selected by CARB in order to provide a wide range of makes, models, technology standards, and size. Some of the vehicles in the original list were difficult to acquire, so it was necessary for these vehicles to be replaced with vehicles of the same emissions technology standards, as well as match injection type, size, and model year to the extent possible. All changes have been reviewed by the program sponsors and finally, approved by CARB. A list of the vehicles that were used for this testing is provided in Table 2-4. The test matrix included vehicles with gasoline direct injection (GDI), port fuel injection (PFI) as well as PFI+GDI fuel systems that are representative of the current California gasoline fleet. One hybrid electric vehicle (HEV) equipped with a PFI engine was also used. All vehicles were equipped with three-way catalysts (TWCs). For this

program, each category (i.e., SULEV30, ULEV50, ULEV70, and ULEV125) included five (5) vehicles.

The test matrix included a mix of different manufacturers and passenger cars. The test matrix included 9 vehicles from domestic manufacturers (GM, Ford, and FCA) and 11 vehicles from foreign manufacturers (Kia, Honda, Nissan, Toyota, Mazda and Hyundai). The vehicles also represented a range of different engine displacements.

The vehicles were certified to meet the Federal Tier 3 exhaust emission standards or the California LEV-III, SULEV exhaust emissions standards.

The primary source for vehicles was rental fleets. Vehicles were also sourced from private dealerships operated in the greater Riverside area, from UCR's fleet services, and from private sources through long-term loan agreements. Vehicle odometers at the onset of testing ranged from 7,352 miles (Ford F150) to 63,491 miles (Nissan Rogue). All vehicles acquired for testing were inspected to ensure that they were in sound mechanical and operational condition using a standard checklist.

All vehicles were tested in their original configuration, with no lubricant oil changes prior to the emissions testing.

Table 2-4 Test Vehicle Specifications

	PFI#1	GDI#1	PFI#2	PFI#3	PFI+GDI#1	GDI#2	GDI#3	GDI#4	GDI#5	PFI#4	GDI#6	PFI#5	GDI#7	PFI_Hybrid#1	GDI#8	GDI#9	GDI#10	PFI+GDI#2	PFI#6	GDI#11
Year	2019	2018	2020	2016	2019	2018	2016	2020	2019	2021	2020	2020	2020	2020	2020	2020	2021	2017	2021	2018
Make	Dodge	Honda	Jeep	Nissan	Toyota	Honda	Mazda	Ford	Chevrolet	Chevrolet	KIA	Jeep	Nissan	Toyota	GMC	Buick	Chevrolet	Ford	Hyundai	Chevrolet
Model	Ram1500	Fit	Compass	Rogue	Rav4	Civic	Mazda3	Fusion	Impala	Spark	Optima	Cherokee	Armada	Prius	Acadia	Enclave	Colorado	F-150	Accent	Suburban
vehicle class (EPA)	LDT	LDV	LDT	LDT1	LDT1	LDV	LDV	LDV	LDV	LDV	LDV	LDT	LDT4	LDV	LDT	LDT	LDT	LDT	LDV	LDT
Miles at start (mi)	32234	35547	29174	63491	37329	35776	74339	33029	25728	4073	29377	23272	32731	10015	34942	32621	17603	7352	12226	34477
Engine size (L)	5.7	1.5	2.4	2.5	2.5	1.5	2.5	2	3.6	1.4	2.4	3.6	5.6	1.8	3.6	3.6	3.6	3.5	1.6	5.3
Fuel injection type	PFI	GDI	PFI	PFI	GDI+PFI	GDI	GDI	GDI	GDI	PFI	GDI	PFI	GDI	PFI	GDI	GDI	GDI	GDI+PFI	PFI	GDI
AIR system	Naturally aspirated	Naturally aspirated	Naturally aspirated	Naturally aspirated	Naturally aspirated	Turbo-charged	Naturally aspirated	Turbo-charged	Naturally aspirated	Naturally aspirated	Naturally aspirated	Naturally aspirated	Naturally aspirated	Naturally aspirated	Naturally aspirated	Naturally aspirated	Naturally aspirated	Turbo-charged	Naturally aspirated	Naturally aspirated
Number of cylinders	8	4	4	4	4	4	4	4	6	4	4	6	8	4	6	6	6	6	4	8
Engine compression ratio	10.5-1	11.5:1	10:1	10:1	13:1	10.3:1	13:1	9.3:1	11.5:1	10.6:1	11.3:1	10.2:1	11.2:1	13:1	11.5:1	11.5:1	11.5:1	10.5:1	11.2:1	11:1
Emission standard	USEPA: T3 B70 CA: ULEV70	USEPA: T3B30 CA: SULEV30 PC	USEPA: T3 B50 CA: ULEV50	USEPA: For sale only in states with California emission standards CA: LEV3-ULEV70	USEPA: T3B50 CA: ULEV50	USEPA: IT3B125 CA: ULEV125 PC	USEPA: N/A CA: SULEV30 /PZEV	USEPA: T3B70 CA: ULEV70 PC	USEPA: TIER3 CA: PC/SULEV30	USEPA: TIER3 CA: PC/ULEV70	USEPA: T3B70 CA: ULEV70 PC	USEPA: T3 B30 CA: SULEV30	USEPA: T3 B125 CA: LEV3-ULEV125	USEPA: T3 B30 CA: SULEV30 PC	USEPA: TIER3 CA: ULEV50	USEPA: TIER3 CA: ULEV50	USEPA: TIER3 CA: ULEV50	USEPA: T2B5 CA: ULEV125	USEPA: T3B125 CA: ULEV125 PC	USEPA: TIER3 CA: ULEV125
Aftertreatment systems	HO2S TWC	WU-TWC TWC WR-HO2S EGR	HO2S TWC WR-HO2S	TWC(2) HO2S WR-HO2S	EGR EGRC WR-HO2S(2) TWC(2)	TWC WR-HO2S HO2S TC CAC	TWC WU-TWC HO2S WR-HO2S	TWC HO2S WR-HO2S CAC TC	HO2S TWC	HO2S TWC	WR-HO2S HO2S WU-TWC TWC	EGR EGRC HO2S TWC	2TWC(2) 2HO2S 2WR-HO2S	EGR EGRC WR-HO2S TWC(2) HO2S	HO2S TWC	HO2S TWC	HO2S TWC	TWC WR-HO2S HO2S TC CAC	WR-HO2S HO2S WU-TWC TWC EGR EGRC	HO2S TWC

2.3 Test Sequence, Randomization, and Fuel Conditioning

Each vehicle/fuel combination was tested three times using the Federal Test Procedure (FTP) emissions test cycle, which is used for emission certification and fuel economy testing of light-duty vehicles in the U.S. The entire FTP consists of three segments, including a cold-start transient phase (0-505 s), a stabilized or hot-running phase (506-1372 s), a hot-soak phase with the engine off (9-10 min), and a hot-start transient phase (0-505 s). The FTP has a duration of 1877 s, total distance of 11.04 miles, an average speed of 21.2 mph, and a maximum speed of 56.7 mph. The FTP test cycle is shown in Figure 2-1.

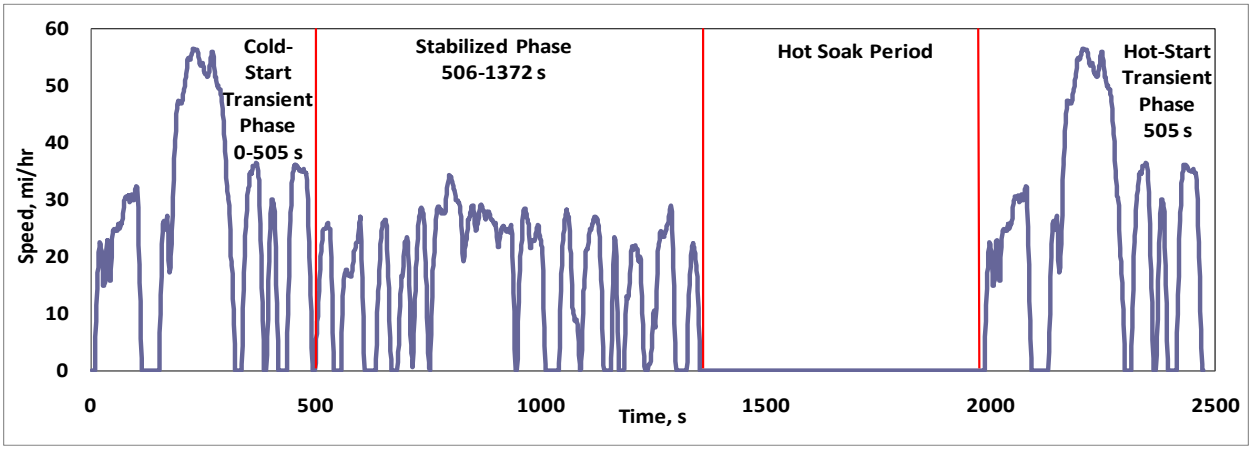


Figure 2-1. FTP cycle

The fuel testing sequence for each vehicle is provided in Table 2-5. The testing order of the fuels for each vehicle was randomized, subject to logistical considerations.

Table 2-5 Test matrix randomization sequence

Vehicle	Test Sequence	
Dodge Ram1500	E10	E15
Honda Fit	E10	E15
Jeep Compass	E10	E15
Nissan Rogue	E15	E10
Toyota Rav4	E10	E15
Honda Civic	E15	E10
Mazda3	E15	E10
Ford Fusion	E15	E10
Chevrolet Impala	E10	E15
Chevrolet Spark	E10	E15
KIA Optima	E10	E15
Jeep Cherokee	E10	E15
Nissan Armada	E15	E10
Toyota Prius	E10	E15
GMC Acadia	E15	E10
Buick Enclave	E10	E15
Chevrolet Colorado	E10	E15
Ford F-150	E10	E15
Hyundai Accent	E15	E10
Chevrolet Suburban	E15	E10

Before each test on a specific vehicle/fuel combination, the vehicle was preconditioned with a procedure that included a fuel drain and fill (40%), followed by a highway fuel economy test (HWFET) cycle, one additional drain and fill (40%), followed by a HWFET and two back-to-back LA4 cycles on the dynamometer. More details on the preconditioning procedure are outlined below:

A. Upon receiving the vehicle, CE-CERT's technical staff checked-in and inspected the vehicle, and prepared the vehicle for testing.
B. The existing fuel in the tank was drained from the vehicle and the tank was flushed with the first test fuel. The tank was filled 40% full of the test fuel in CE-CERT's outdoor prep area.

C. Vehicle preconditioning was them performed as specified below using 2 HWFET (highway fuel economy test cycles), 2 LA4s, and two additional drain and 40% fills, as shown in Figure 2-2 and described in greater detail below. During the prep procedure, side fan cooling was applied to the fuel tank. Following the prep cycle, the vehicle was idled for two minutes, then shut down in preparation for the soak. After the 12 to 24 hours soak the first FTP test cycle was performed.

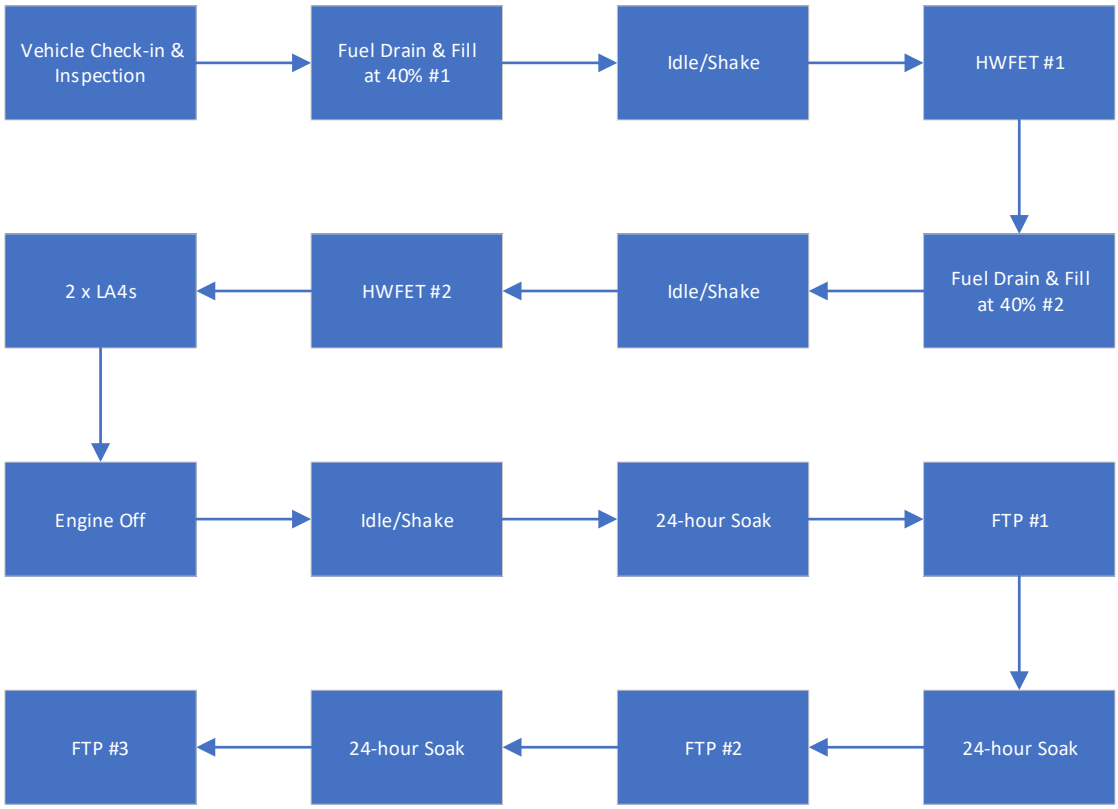


Figure 2-2. Prep and test procedure

Fuel Change, Conditioning, and Test Procedure

1. Drain vehicle fuel completely by disconnecting the fuel fill hose at the tank and then inserting a small plastic tube to pump out the residual fuel. Reattach the fuel fill hose.
2. Turn vehicle ignition to RUN position for 30 seconds to allow controls to allow fuel level reading to stabilize. Confirm the return of fuel gauge reading to zero.
3. Drain fuel and refill to 40% with test fuel. Start vehicle and idle for 10 minutes to purge fuel lines.
4. Move vehicle in the test lab without starting the engine. Start vehicle and perform a HWFET cycle.
5. Drain fuel again and refill to 40% with test fuel. Shake and then allow the vehicle to idle for two minutes.
6. Move vehicle in the test lab without starting the engine. Start vehicle and perform a HWFET cycle.
7. Perform the preconditioning 2 LA4 cycles. During the prep cycle, apply side fan cooling to the fuel tank to alleviate the heating effect of the exhaust system. Following the prep cycle, allow the vehicle to idle for two minutes, then shut down the engine in preparation for the soak.
8. Move vehicle to soak area without starting the engine.
9. Park vehicle in soak area at proper temperature (75°F) for at least 8 hours and no more than 24 hours.
10. Move vehicle to test area without starting engine.
11. Perform #1 FTP cycle emissions test.
12. Move vehicle to soak area without starting the engine.

13. Park vehicle in soak area of proper temperature for 12-36 hours.
14. Move vehicle to test area without starting the engine.
15. Perform #2 FTP emissions test.
16. Move vehicle to test area without starting the engine.
17. Perform #3 FTP emissions test.

D. While performing the FTP test cycle all tailpipe gaseous emissions were measured along with instantaneous and gravimetric PM emissions. Fuel economy and GHG emissions (carbon dioxide (CO_2), nitrous oxide (N_2O), and methane (CH_4)) were also measured. For particulate emissions, characterization included solid particle number (>23 nm in diameter), gravimetric PM mass for each individual phase of the FTP cycle, and real-time soot mass emissions.
E. Additional emission measurements included carbonyl compounds, benzene, toluene, ethylbenzene, m/p/o-xylenes, and 1,3-butadiene.
F. The test matrix was designed to provide for randomization of the test fuels over the test fleet.

2.5 Emissions Testing

Vehicle emissions measurements were conducted in CE-CERT's new state-of-the-art Light-Duty Laboratory (LDL). The centerpiece of this laboratory is an AVL CVS i60 generation AMA SL (Slim Line) system using AVL's iGEM test cell automation software and an AVL dilution tunnel. The AVL CVS SL system was used to obtain standard bag measurements for THC, CO, NOx, non-methane hydrocarbons (NMHC), CH_4, and CO_2. The AVL CVS AMA SL system includes a flame ionization detection (FID) for THC and NMHC emissions, a methane cutter (Cutter FID SL) for CH_4 emissions, a chemiluminescence analyzer for NOx emissions, and a non-dispersive infrared (NDIR) analyzer for CO and CO_2 emissions. All gaseous emissions were determined according to the U.S. EPA protocols for light-duty emission testing as given in the CFR, Title 40, Part 1065/1066. The LDL is equipped with a 48-inch Burke E. Porter single-roll electric chassis dynamometer, capable of testing vehicles weighing up to 12,000 lbs.

Ambient concentrations were collected and analyzed during each FTP test through the AVL AMA system. The AMA system can automatically correct background concentrations for each test, following CFR 1066.610 protocols. All gaseous regulated emissions are reported background corrected. The background correction calculation is shown below:

$$Emissions_{background\ corrected} = Emissions_{dexh} - Emissions_{bkgnd} \cdot (1 - \left(\frac{1}{DF}\right))$$

Where,
$Emissions_{dexh}$ = Measured emission concentration in dilute exhaust
$Emissions_{bkgnd}$ = Measured emission concentration in dilution air
DF = Dilution factor

Fuel economy was determined using the carbon mass balance method, as discussed later in the report.

Nitrous oxide (N_2O) and ammonia (NH_3) emissions were measured at the tailpipe using a Horiba FTX-ONE-CS Fourier Transform Infrared (FTIR) system with a rate of one scan per 0.2 seconds, a cell volume of approximately 65 milliliters, and a pathlength of 2.4 meters. The FTIR has high sensitivity, permitting the detection of changes in gas concentration at the ppb (parts per billion) volume concentration level. The FTIR sampled from the raw exhaust (before the CVS tunnel).

A schematic of the experimental setup is shown in Figure 2-3.

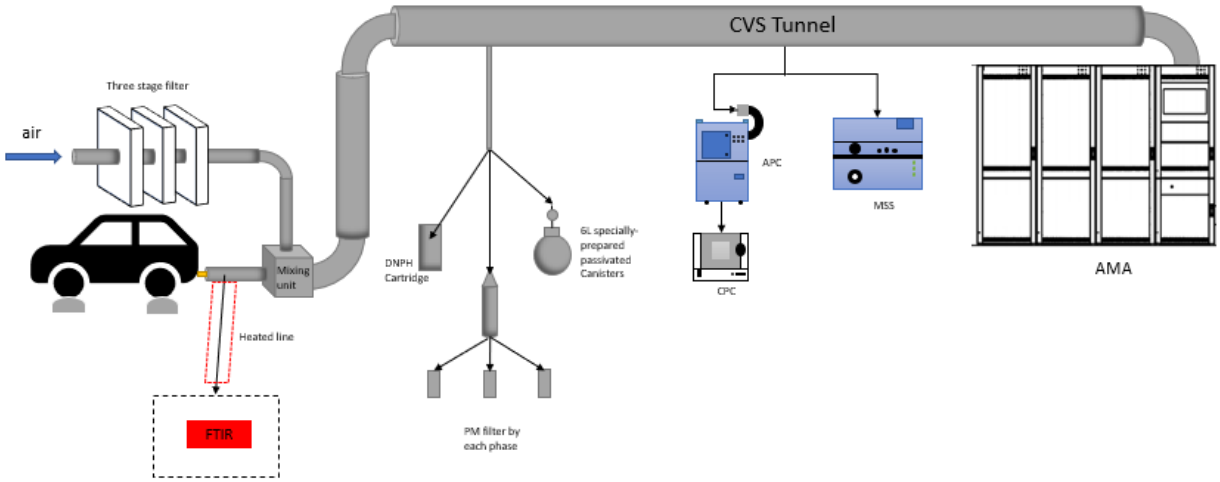


Figure 2-3. Schematic of Experimental Setup

Gravimetric PM mass samples were collected for each of the three individual phases of the FTP (i.e., cold-start, hot-running, and hot-start) and weighted PM mass over FTP cycle was calculated based on PM mass data from each phase of the FTP. Samples were flow weighted based on CE-CERT's new PM sampling system that was built following the procedures in 40 CFR 1066 and associated references in 40 CFR Part 1065. PM samples were collected on 47 mm diameter 2 µm pore Teflon filters (Whatman brand) with flow-weighting MFCs and weighed with a 1065-compliant ultra-precision microbalance in a temperature and humidity controlled clean chamber. Buoyancy corrections for barometric pressure differences were also made for the PM filter weights as per CFR 1065.

PM mass emissions were reported after background corrections. For this program, a total of six (6) blank filters were collected throughout the entire test campaign. The tunnel blank tests were performed just like regular FTP tests, except the exhaust sample line was collecting ambient air. Three filters were used to sample each phase of the FTP during the six tunnel blank tests. Tunnel blank tests were performed after emissions testing was completed in three vehicles. PM mass background correction was calculated based on 40 CFR 1066.610:

$$PM_{background\ corrected} = PM_{dexh} - PM_{bkgnd} \cdot \left(1 - \left(\frac{1}{DF}\right)\right)$$

Where,
PM_{dexh} = Measured PM mass in dilute exhaust
PM_{bkgnd} = Measured PM mass in dilution air
DF = Dilution factor

For NMOG emissions, the calculation was derived from the 40 CFR 1066.635 NMOG Eq. 1066.635-1 equation:

$$NMOG_{mass} = NMHC_{mass} - \rho_{NMHC} \times \left(\frac{EtOH_{mass}}{\rho_{EtOH}} \times RF_{EtOH} + \frac{FormHO_{mass}}{\rho_{FormOH}} \times RF_{FormOH} + \frac{AcetHO_{mass}}{\rho_{AcetOH}} \times RF_{AcetOH}\right) + EtOH_{mass} + FormHO_{mass} + AcetHO_{mass}$$

Where,

$NMOG_{mass}$ is the mass of non-methane organic gas, $NMHC_{mass}$ is the mass of non-methane hydrocarbon, $EtOH_{mass}$ is the mass of ethanol emissions, $FormHO_{mass}$ is the mass of formaldehyde emissions, $AcetHO_{mass}$ is the mass of acetaldehyde emissions. ρ_{NMHC} is the the effective C1-equivalent density of NMHC, ρ_{EtOH} is the C^1 equivalent density of ethanol, ρ_{FromOH} is the C^1 equivalent density of formaldehyde, ρ_{AcetOH} is the C^1 equivalent density of acetaldehyde. RF_{EtOH} is the response factor of a THC-FID to ethanol, RF_{FormOH} is the response factor of a THC-FID to formaldehyde, RF_{AcetOH} is the response factor of a THC-FID to acetaldehyde.

Response factors and C^1 equivalent densities for ethanol, formaldehyde, and acetaldehyde were provided by 40 CFR 1066.845 and 40 CFR 1066.1005 (f) and were utilized in the calculations. We excluded all other oxygenates compounds in the equation due to lack of information for the response factors and C^1 equivalent density of these species. Although acetone was detected, for some vehicles, in relatively high concentrations, it was decided to be neglected in the calculation of NMOG emissions due to acetone contamination during sample handling and analysis. This phenomenon has been reported in a previous study (Sluder and West, 2012).

Real-time soot mass or black carbon emissions were measured using an AVL Micro-Soot Sensor (MSS). The MSS 483 is an instrument that measures soot mass concentration at a frequency of one Hertz using a photo acoustic detection technique, where the light-absorbing PM components (such as soot particles) are exposed to laser light that is periodically modulated at an acoustical resonant frequency. Sampling for black carbon emissions was done from the CVS.

Solid particle number emissions were measured according to the European Particle Measurement Programme (PMP) from the CVS tunnel using a AVL Particle Counter (APC plus) with a cut-off particle diameter of 23 nm. The APC Plus consists of a volatile particle remover (VPR) and a particle number counter.

Carbonyl compounds (aldehydes and ketones) were sampled on 2,4-dinitrophenylhydrazine (DNPH) coated silica cartridges (Waters Corp., Milford, MA) from the main CVS tunnel using a mass flow controller to regulate the flow to 1 L/min through the cartridge. Organic carbonyl compounds react with DNPH-coated silica gel cartridges in the presence of a strong acid to form a stable derivative. The DNPH cartridges were eluted with 2 mL of acetonitrile and analyzed with a high-performance liquid chromatography, HPLC, (Waters 2690 Alliance System with 996 Photodiode Array Detector) following the US EPA TO-11A method. A total of six (6) blanks were collected throughout the test campaign. For each vehicle, a cumulative sample was collected throughout the entire FTP cycle. A list of aldehydes and ketones analyzed is shown in Table 2-6.

Hydrocarbon species were collected using a 6 L specially prepared SUMMA passivated canister, which was connected to the CVS system. Analysis of the hydrocarbon species was conducted using a Gas Chromatography/Mass Spectrometry/Flame Ionization Detector (GC/MS/FID) analytical system according to the EPA TO-12/PAMS and EPA TO-15A methods. A total of six (6) blanks were collected throughout the test campaign. For each vehicle, a cumulative sample was collected throughout the whole FTP cycle. Table 2-6 provides a list of species analyzed for this program.

Tunnel blanks for the carbonyl compounds and hydrocarbon species were treated and calculated in a similar manner as those of the PM mass samples described above. The major difference was that tunnel blank tests were performed during the entire duration of the FTP cycle. The calculation is shown below, following 40 CFR 1066.610:

$$Pollutants_{background\ corrected} = Pollutants_{dexh} - Pollutants_{bkgnd} \cdot \left(1 - \left(\frac{1}{DF}\right)\right)$$

Where,
$Pollutants_{dexh}$ = Measured carbonyls and hydrocarbons mass in dilute exhaust
$Pollutants_{bkgnd}$ = Measured carbonyls and hydrocarbons mass in dilution air
DF = Dilution factor

We used weighted dilution factor (DF_w) as DF in the calculation.

$$DF_w = \left(\frac{t_1}{t_1 + t_2 + t_3}\right) \cdot DF_1 + \left(\frac{t_2}{t_1 + t_2 + t_3}\right) \cdot DF_2 + \left(\frac{t_3}{t_1 + t_2 + t_3}\right) \cdot DF_3$$

Where,

t_1, t_2, t_3 = Total time of each phase in FTP cycle
DF_w = Weighted dilution factor
DF_1 = Dilution factor over the first phase of FTP
DF_2 = Dilution factor over the second phase of FTP
DF_3 = Dilution factor over the third phase of FTP

Table 2-6 Hydrocarbon species analysis methods

Formaldehyde Acetaldehyde Acetone Acrolein Propionaldehyde Crotonaldehyde Methacrolein Butyraldehyde Methyl Ethyl Ketone (MEK) Benzaldehyde	EPA TO-11A

Valeraldehyde m-Tolualdehyde Hexanaldehyde	
Ethylene Acetylene Ethane Propylene Propane Isobutane 1-Butene 1,3-Butadiene n-Butane trans-2-Butene cis-2-Butene Isopentane 1-Pentene n-Pentane Isoprene trans-2-Pentene cis-2-Pentene 2,2-Dimethylbutane Cyclopentane 2,3-Dimethylbutane 2-Methylpentane 3-Methylpentane 1-Hexene n-Hexane Methylcyclopentane 2,4-Dimethylpentane Benzene Cyclohexane 2-Methylhexane 2,3-Dimethylpentane 3-Methylhexane 2,2,4-Trimethylpentane n-Heptane Methylcyclohexane 2,3,4-Trimethylpentane Toluene 2-Methylheptane 3-Methylheptane n-Octane Ethylbenzene m/p-Xylenes Styrene o-Xylene	EPA TO-12/PAMS

Nonane Isopropyl n-Propylbenzene m-Ethyltoluene p-Ethyltoluene 1,3,5-Trimethylbenzene o-Ethyltoluene 1,2,4-Trimethylbenzene n-Decane 1,2,3-Trimethylbenzene m-Diethylbenzene p-Diethylbenzene n-Undecane n-Dodecane	
Ethanol naphthalene	EPA TO-15A

2.6 Statistical Analysis

Statistical analyses for each pollutant were run using the Mixed procedure in PC/SAS from SAS Institute, Inc. Mixed models are a type of model that include both fixed and random factors. The fuel type was treated in the model as a fixed factor, that is, the levels of this factor were the specific fuel types of interest. On the contrary, vehicles were included as a random factor, since the vehicles were chosen at random from a large population of possible models from different manufacturers made in different years. This allows the extrapolation of the results of the fuel effects onto a larger population of vehicle types, not just those that were used in the experiment. The mixed models were performed for each pollutant to determine the statistical significance of any fuel effect. The fixed effect included in the model was the fuel type and the random effect was vehicle.

The normality and homogeneity of variance of residuals were checked in the models for all regulated, particulate, and toxic emissions to determine if a transformation was necessary. QQ plot and residual plot were drawn to examine the normality and homogeneity of variance of residuals, respectively. QQ plot draws the correlation between the residuals and the normal distribution and all the points should fall approximately along the reference line if residuals are normal distributed. If homogeneity of variance is satisfied, all points in the residual plot should be randomly dispersed without any pattern. Analyses using the logarithmic transform of the data in similar previous studies have shown that the emissions standard deviation is relatively constant as a percentage of the emission level. For example, vehicles with higher emission levels will tend to have a higher variability on an absolute basis than those with lower emissions levels. Examination of the current data revealed that this relationship between the emissions level and variability held true even for the very low emitting vehicles.

Most of the emissions were analyzed on the natural logarithm scale, with the exception of the weighted NMHC, phase 1, phase 3, and weighted CO, phase 1 NOx, phase 1 and weighted PM

mass, *m/p*-xylenes, *o*-xylene, and ethylbenzene that were analyzed on the original scale. Fuel economy was analyzed in the inverse scale (i.e., gallons/mile). For emissions components that included zeros or negative values for individual bags or weighted emissions, a small constant was added prior to taking the logarithm to allow the analyses to be done in the logarithm scale. Any added constants were selected to be as small as possible, and in all cases did not exceed the background levels.

Statistical analysis results were considered to be statistically significant for $p \leq 0.05$, although we also note cases where $0.05 < p \leq 0.1$ as marginally statistically significant in the text. The results from the ln or inverse models were "back transformed" to provide least square means for all pollutants on each fuel. This provides an arithmetic measure to evaluate the magnitude of any statistically significant effects. Any constants added to facilitate the analysis in logarithm scale were subsequently subtracted from the least square means once the back transformation to the arithmetic scale was made.

3 Emissions Testing Results

This section outlines the experimental results of this program and discusses their statistical significance. Emissions of interest are NOx, CO, THC, NMHC, CH_4, CO_2, N_2O, NH_3, PM mass, solid particle number, black carbon, formaldehyde, acetaldehyde, 1,3-butadiene, benzene, toluene, ethylbenzene, m/p-xylenes, and o-xylene. All emissions reported in the following section are background corrected. The datapoints that were measured below detection limit or at negative values after background corrections have been zeroed. There was only one datapoint omitted as an outlier for ethanol emissions from the first FTP test of GDI #8 (2020 GMC Acadia) on E15. An outlier analysis (Grubbs' test or extreme studentized deviate method) was performed to determine that this single value was a significant outlier ($p<0.05$) from the rest.

The weighted FTP emission results for the testing of the twenty vehicles are presented in the figures in this section. The results for each test cycle/fuel combination represent the average of all test runs done on that combination. The error bars represent the standard deviation (STDEV.P) over the triplicate tests for each fuel. This same format is used for the figures throughout this section.

The percentage differences between fuels, where statistically significant differences were found, are provided in Table 3-1 and Table 3-2. These percentage differences were determined from the least square means from the statistical analysis. For the statistical analyses, results are considered to be statistically significant for $p \leq 0.05$ or marginally statistically significant for $0.05 < p \leq 0.1$ for this discussion.

The individual emissions test results for each vehicle are provided in Appendix A. The more detailed statistical analysis results are provided in Appendix B.

Table 3-1 Summary of Statistical Comparisons for Different Fuels by Bag

	Bag 1 (Cold-start)		Bag 2 (Hot-running)		Bag 3 (Hot-start)	
NO_x g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	0.02302	0.02153	0.00271	0.00258	0.00411	0.00349
	Statistical Analysis					
	Not Significant		**Not Significant**		**Not Significant**	
THC g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	0.06212	0.05833	0.00178	0.00157	0.00646	0.00644
	Statistical Analysis					
	E15 6% lower than E10		**Not Significant**		**Not Significant**	
NMHC g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	0.04882	0.04563	0.00033	0.00028	0.00175	0.00148
	Statistical Analysis					
	E15 7% lower than E10		**Not Significant**		E15 15% lower than E10	
CO g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	1.08473	0.95372	0.00600	0.00576	0.29189	0.21421
	Statistical Analysis					
	E15 12% lower than E10		**Not Significant**		**E15 27% lower than E10**	
CO_2 g/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	363.11232	361.39357	352.36935	354.63303	311.48928	309.88805
	Statistical Analysis					
	Not Significant		**Not Significant**		E15 1% lower than E10	
PM Mass mg/mi	**Least Square Means**					
	E10	E15	E10	E15	E10	E15
	3.34140	2.78603	0.02930	0.01338	0.07267	0.04171
	Statistical Analysis					
	E15 17% lower than E10		**E15 54% lower than E10**		E15 43% lower than E10	

Table 3-2 Summary of Statistical Comparisons for Different Fuels for the Weighted and Cumulative Emissions

	Weighted	
NO_x g/mi	**Least Square Means**	
	E10	E15
	0.00737	0.00713
	Statistical Analysis	
	Not Significant	
THC g/mi	**Least Square Means**	
	E10	E15
	0.01607	0.01530
	Statistical Analysis	
	E15 5% lower than E10	
NMHC g/mi	**Least Square Means**	
	E10	E15
	0.01267	0.01164
	Statistical Analysis	
	E15 8% lower than E10	
CO g/mi	**Least Square Means**	
	E10	E15
	0.33341	0.27698
	Statistical Analysis	
	E15 17% lower than E10	
CO_2 g/mi	**Least Square Means**	
	E10	E15
	343.38230	343.75008
	Statistical Analysis	
	Not Significant	
Fuel Economy mpg	**Least Square Means**	
	E10	E15
	26.69902	26.38465
	Statistical Analysis	
	E15 1% lower than E10	
PM Mass mg/mi	**Least Square Means**	
	E10	E15
	0.85757	0.69974
	Statistical Analysis	

	E15 18% lower than E10	
SPN #/mile	**Least Square Means**	
	E10	E15
	9.58485E+11	8.38733E+11
	Statistical Analysis	
	E15 12% lower than E10	
1,3-Butadiene mg/mi	**Least Square Means**	
	E10	E15
	0.02506	0.02521
	Statistical Analysis	
	Not Significant	
Benzene mg/mi	**Least Square Means**	
	E10	E15
	0.87110	0.87372
	Statistical Analysis	
	Not Significant	
Toluene mg/mi	**Least Square Means**	
	E10	E15
	0.89446	0.98200
	Statistical Analysis	
	Not Significant	
Ethylbenzene mg/mi	**Least Square Means**	
	E10	E15
	0.23142	0.20529
	Statistical Analysis	
	E15 11% lower than E10	
m/p-xylenes mg/mi	**Least Square Means**	
	E10	E15
	0.73946	0.66601
	Statistical Analysis	
	E15 10% lower than E10	
o-xylene mg/mi	**Least Square Means**	
	E10	E15
	0.25398	0.23079
	Statistical Analysis	
	E15 9% lower than E10	
Ethanol mg/mi	**Least Square Means**	
	E10	E15

	0.46772	0.82775
	Statistical Analysis	
	E15 77% higher than E10	
Formaldehyde mg/mi	**Least Square Means**	
	E10	E15
	0.20882	0.22576
	Statistical Analysis	
	Not Significant	
Acetaldehyde mg/mi	**Least Square Means**	
	E10	E15
	0.28386	0.37337
	Statistical Analysis	
	E15 32% higher than E10	

* Bold values are statistically significant $p \leq 0.05$; Underlined values are marginally statistically significant $0.05 < p \leq 0.10$

3.1 THC, NMHC and CH_4 Emissions

The weighted THC, NMHC and CH_4 emission results for the testing on the twenty vehicles are presented in **Error! Reference source not found.**, **Error! Reference source not found.** and Figure 3-3, respectively.

Cold-start and weighted THC emissions showed statistically significant reductions of 6% and 5%, respectively, for E15 compared to E10. Results showed that the cold-start phase in THC emissions drove the statistics for the weighted THC emissions.

For the cold-start NMHC emissions, E15 showed a 7% statistically significant reduction compared to E10, while for the hot-start NMHC emissions, E15 showed a 15% marginally statistically significant reduction compared to E10. The weighted NMHC emissions showed a marginally statistically significant reduction of 8% for E15 compared E10.

Overall, the use of E15 resulted in lower THC and NMHC emissions compared to E10. These reductions can be attributed to the higher oxygen content in the fuel, which likely increased the local oxygen in the fuel-rich regions leading to more complete combustion (Schifter et al., 2011; Liu et al., 2011; Catapano et al., 2014; Karavalakis et al., 2014).

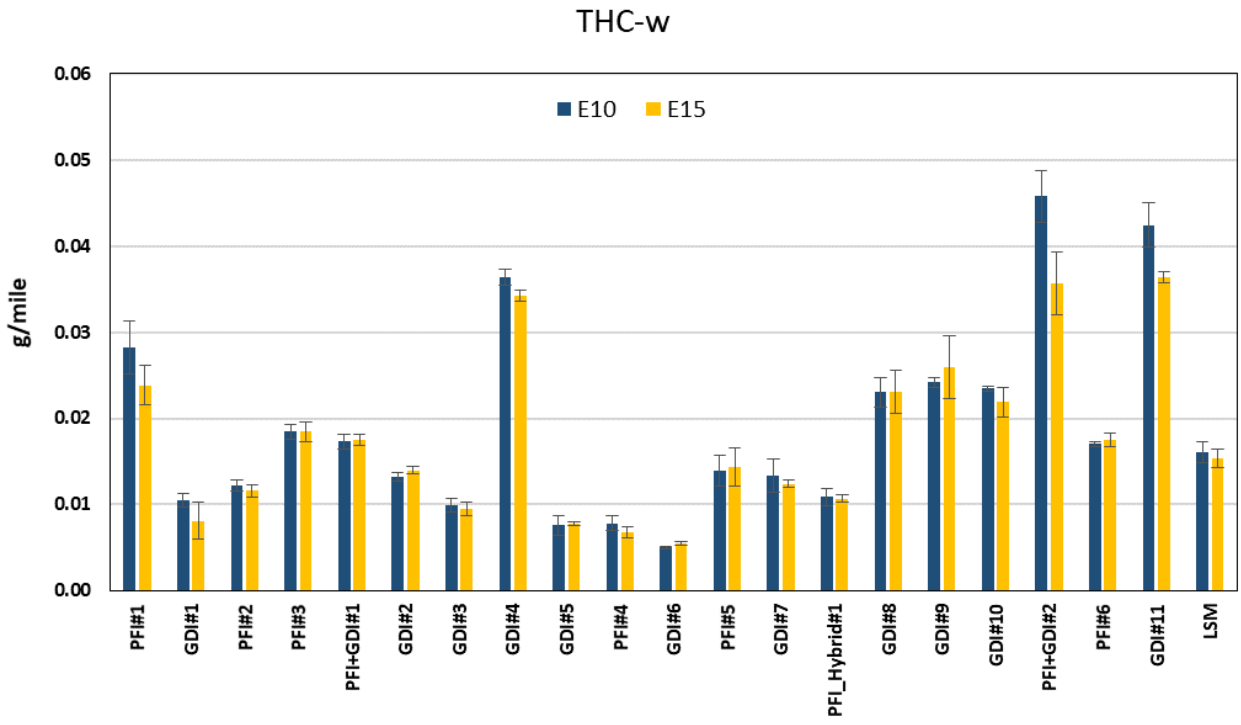


Figure 3-1. Average THC Weighted Emission Results

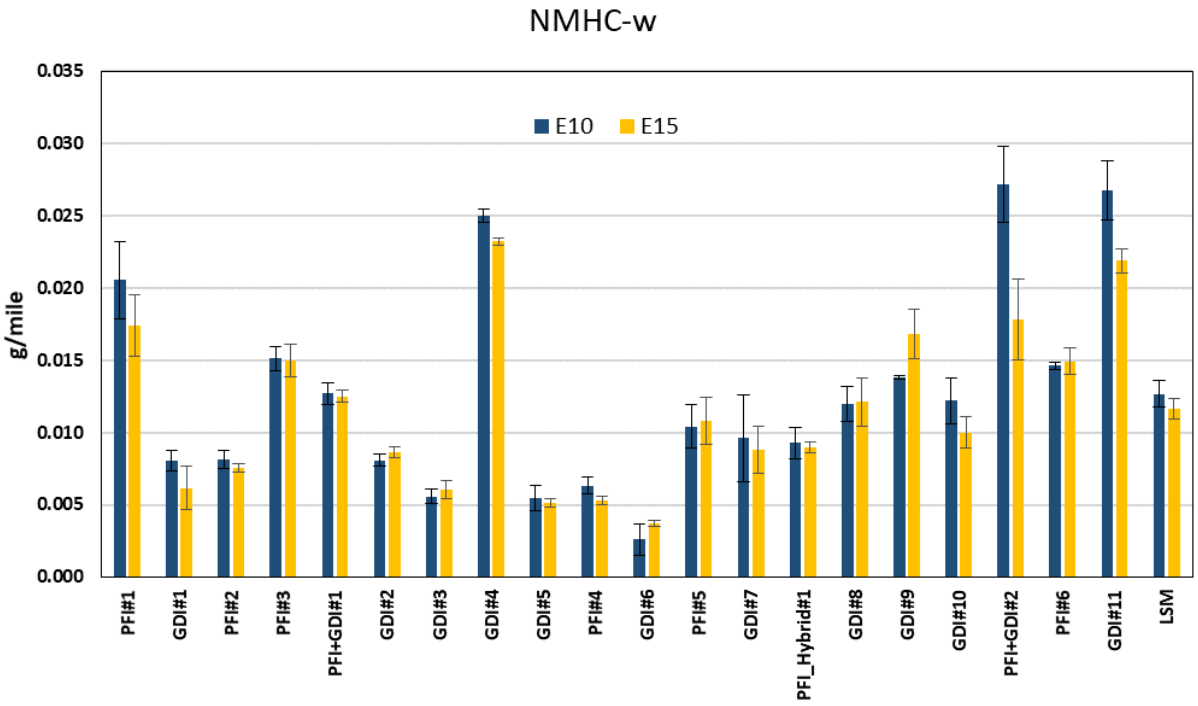


Figure 3-2. Average NMHC Weighted Emission Results

Emissions of CH_4 were not included in the comprehensive statistical analysis, but the results were analyzed using a two-sample equal variance t-test. For CH_4 emissions, PFI#1 and GDI#3 showed statistically significant reductions in weighted CH_4 emissions of 16% and 20%, respectively, for E15 compared to E10. For PFI+GDI#1, weighted CH_4 emissions showed an 8% increase for E15 compared to E10, whereas for GDI#11 the use of E15 showed a 7% reduction compared to E10, both at marginally statistically significant levels.

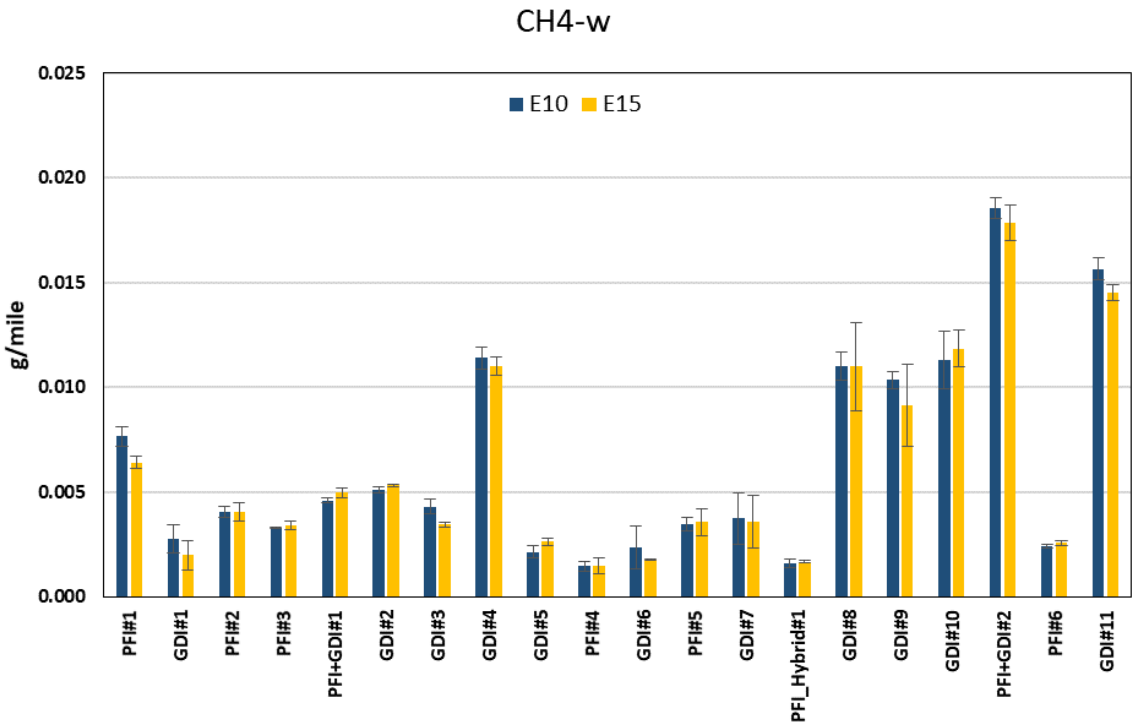


Figure 3-3. Average CH_4 Weighted Emission Results

3.2 CO Emissions

CO emission results for the twenty test vehicles are shown in Figure 3-4. Cold-start and hot-start CO emissions showed statistically significant reductions of 12% and 27%, respectively, for E15 compared to E10. The weighted CO emissions showed a statistically significant reduction of 17% for E15 compared to E10 across the fleet of 20 vehicles.

In previous studies with higher ethanol blends, CO emissions tend to decrease as the oxygen content increase in the fuel (Catapano et al., 2014; Karavalakis et al., 2014 Yang et al., 2019). The presence of oxygen in the fuel will improve the oxidation of CO to CO_2 in the fuel-rich regions of the combustion chamber, leading to a more complete combustion. Also, the lower C/H ratio for E15 was another contributing factor for the lower CO emissions for this fuel due to the lower carbon available to form CO during combustion (Najafi et al., 2009).

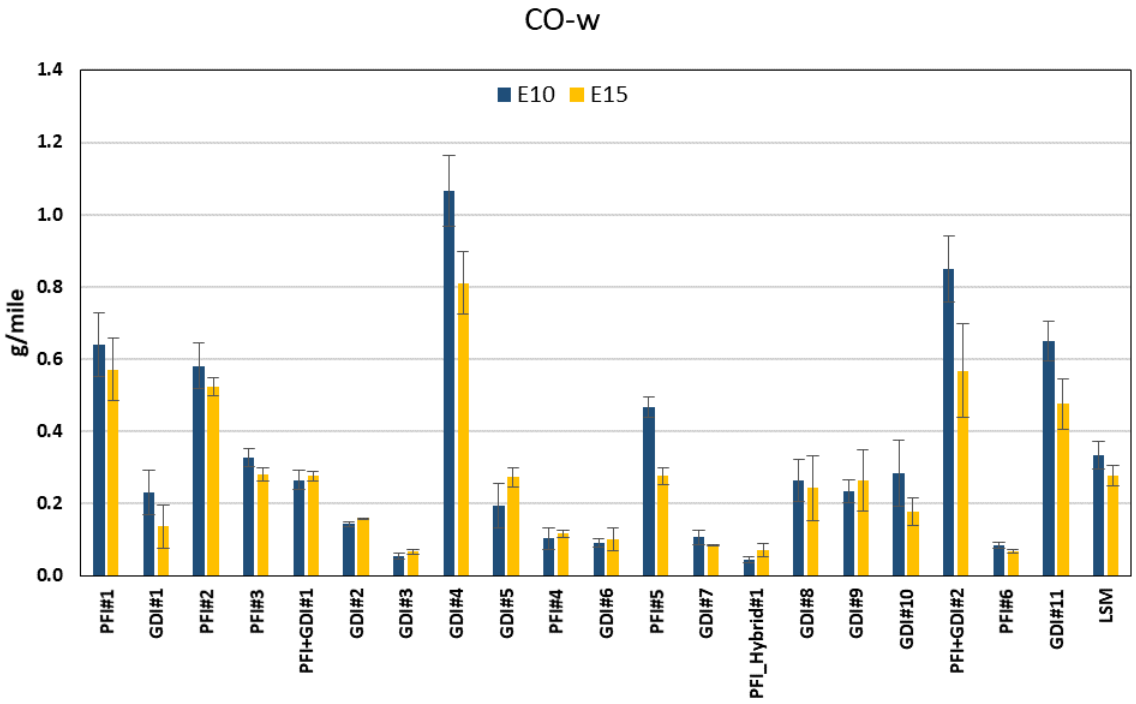


Figure 3-4. Average CO Weighted Emission Results

3.3 NOx Emissions

Weighted NO_x emission results for the twenty vehicles are presented in Figure 3-5. Overall, NOx emissions did not show any strong fuel differences across the twenty-vehicle fleet. The analysis showed that NOx emissions did not show any statistically significant difference between the fuels for the FTP and its individual FTP phase. However, it is worth noting that despite the non-statistically significant effect, NOx emissions trended 6%, 5%, 15%, and 3% lower for E15 compared to E10 over the cold-start, hot-running, hot-start, and weighted FTP, respectively.

Our results suggest that low ethanol content blends will likely not have a strong effect on NOx emissions from Tier 3 PFI and GDI vehicles. These findings agree with those of Yang et al. (2019) that did not show any significant ethanol effects on NOx emissions from Tier 3 GDI vehicles.

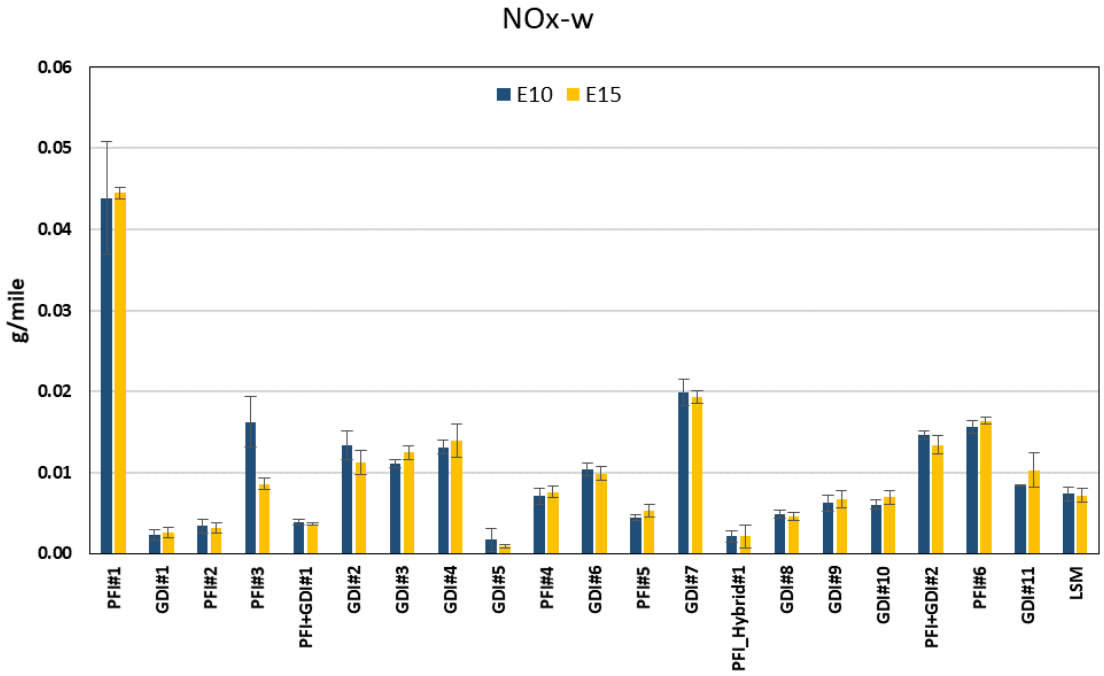


Figure 3-5. Average NOx Weighted Emission Results

3.4 CO_2 Emissions and Fuel Economy

Weighted CO_2 emission results for the twenty vehicles are presented in Figure 3-6. CO_2 emissions showed a marginally statistically significant reduction of 1% for E15 compared to E10 over the hot-start phase. No statistically significant differences in CO_2 emissions were seen for the weighted FTP.

From a theoretical standpoint, it might be expected that CO_2 emissions would trend with either the C/H ratio or carbon/energy content in the fuel. However, the difference between E10 and E15 may not be significant enough to yield a statistically significant CO_2 emissions difference between the two fuels.

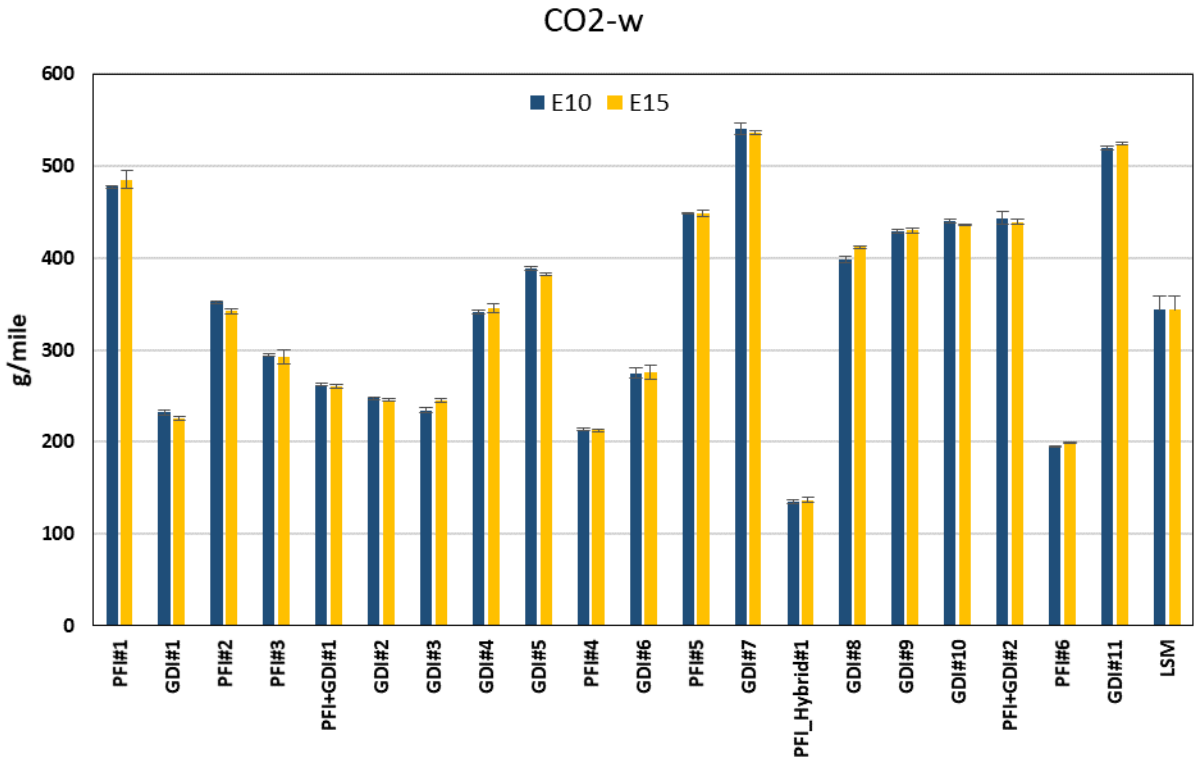


Figure 3-6. Average CO_2 Weighted Emission Results

The fuel economy results for the twenty test vehicles are presented in Figure 3-7. Fuel economy was calculated based on the carbon balance method. The carbon balance equation more directly accounts for the differences in energy content between different fuels, with the equation shown below. Carbon-balance weighted fuel economy showed a statistically significant reduction of 1% for E15 compared to E10 across the fleet of 20 vehicles.

$$Fuel\ economy\ (mpg) = \frac{CWF_{fuel} \times SG_{fuel} \times 3781.8}{(CWF_{HC} \times HC) + (0.429 \times CO) + (0.273 \times CO_2)}$$

HC: $HC\ Emission\ Rate\ \left(\frac{g}{mile}\right)$
CO: $CO\ Emission\ Rate\ \left(\frac{g}{mile}\right)$
CO_2 : $CO_2\ Emission\ Rate\ (\frac{g}{mile})$
CWF_{fuel}, CWF_{HC}: $Carbon\ Weight\ Fraction\ of\ the\ Test\ Fuel$
SG_{fuel}: $Specific\ Gravity\ of\ the\ Test\ Fuel$

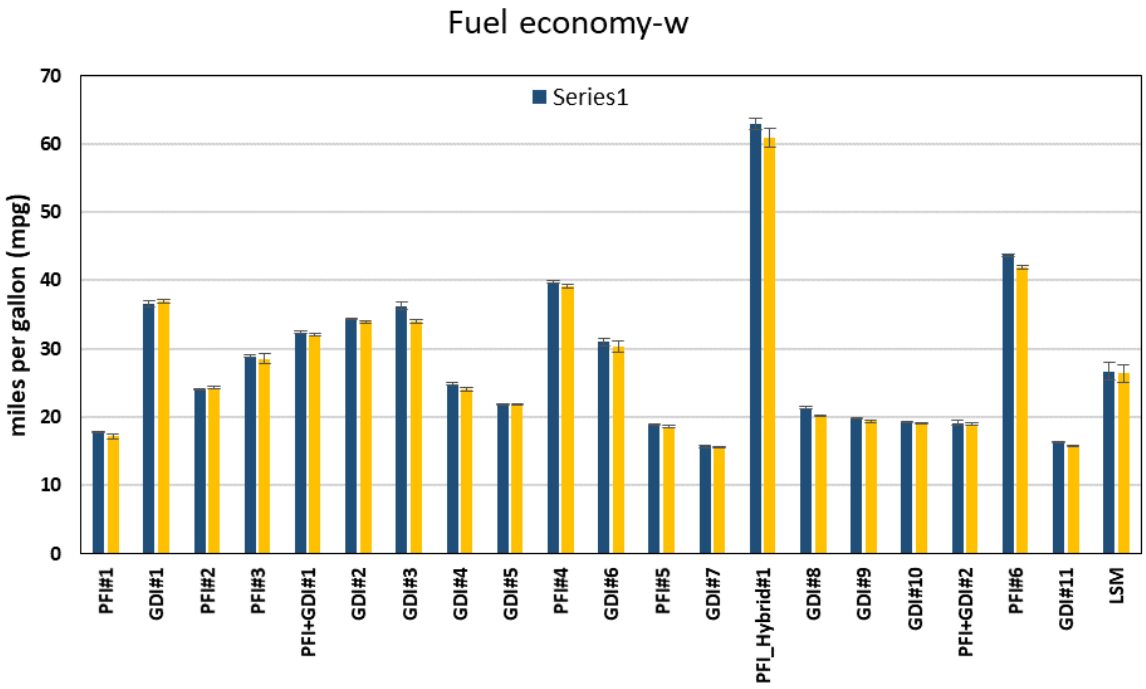


Figure 3-7. Average Fuel Economy Results Based on Carbon Balance Method

3.5 PM Mass, Particle Number and Black Carbon Emissions

Weighted PM mass, cold-start PM mass, hot-running PM mass, and hot-start PM mass emissions for all test vehicles are shown in Figure 3-8, Figure 3-9, Figure 3-10, and Figure 3-11, respectively. The PM mass showed strong, statistically significant fuel trends over the entire FTP cycle and each individual phase. For the cold-start and hot-running phases, PM mass emissions showed statistically significant reductions of 17% and 54%, respectively, for E15 compared to E10. Hot-start PM mass emissions were 43% lower for E15 compared to E10, at a marginally statistically significant level. The weighted PM mass emissions showed a statistically significant reduction of 18% for E15 compared to E10 across the fleet of 20 vehicles.

The cold-start period significantly contributed to the total PM mass emissions for all vehicle/fuel combinations. The higher PM emissions during the cold-start phase were due to poor fuel vaporization from the cold cylinder and piston surfaces, leading to insufficient fuel-air mixtures and pool burning, generating more soot emissions. Hot-running and hot-start PM emissions were significantly lower than cold-start. As the engine warmed up, the lower PM emissions were attributed to the warming of the engine and exhaust surfaces, as well as the less rich fuel-air mixtures during combustion and the improved fuel vaporization. In addition, the TWC being above its light-off temperature likely reduced the semi-volatile hydrocarbon species that contribute to PM mass.

Overall, the lower PM mass emissions for E15 compared to E10 suggests that the presence of oxygen and the dilution of aromatics (soot precursors) were the dominant factors for these observations. The availability of oxygen atoms in the fuel aids the oxidation of local fuel rich pockets (Fatouraie et al., 2015; Leach et al., 2018). Aromatics and polyaromatics have a higher sooting tendency than non-aromatic hydrocarbons. Diluting the aromatics in the fuel stream for E15 will lower the soot precursor formation and reduce the soot surface growth through the HACA (hydrogen abstraction acetylene addition) mechanism (Khosousi et al., 2015). Our results agree with the majority of the published literature showing a positive effect of ethanol on particulate emissions (Karavalakis et al., 2014; Maricq et al., 2012; Wang et al., 2014; Jin et al., 2017).

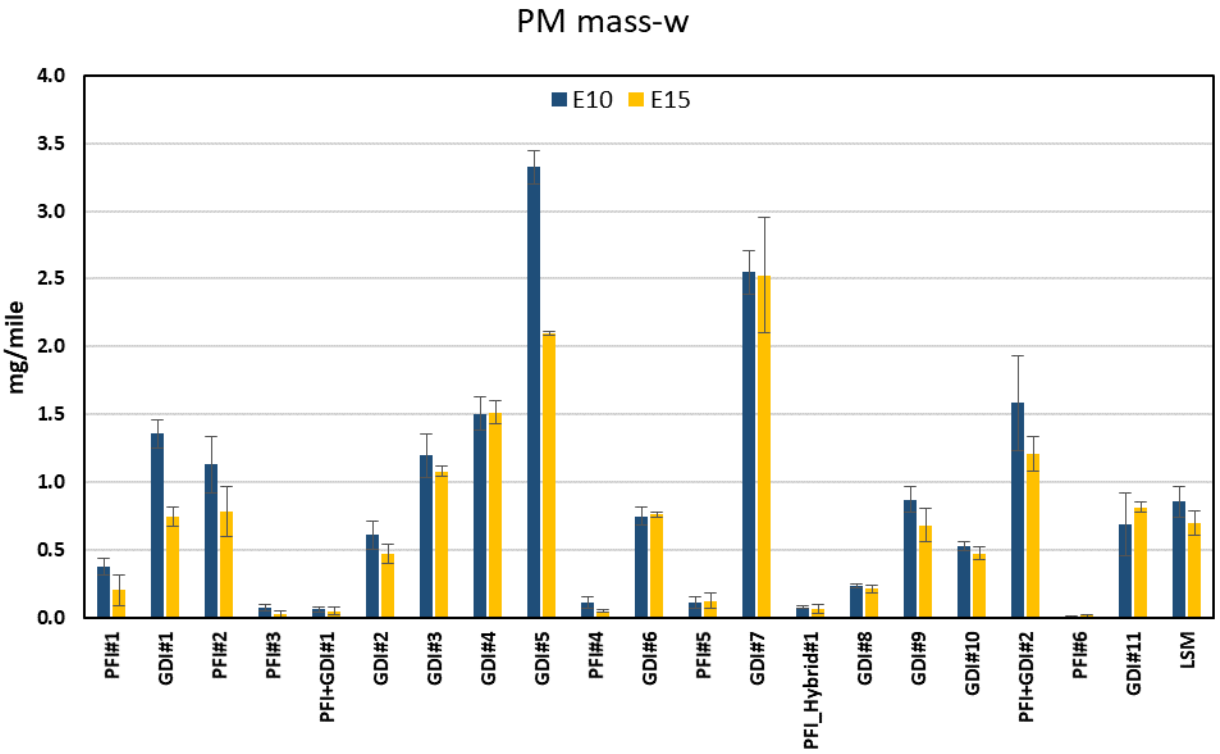


Figure 3-8. Average Weighted PM Mass Emissions Results

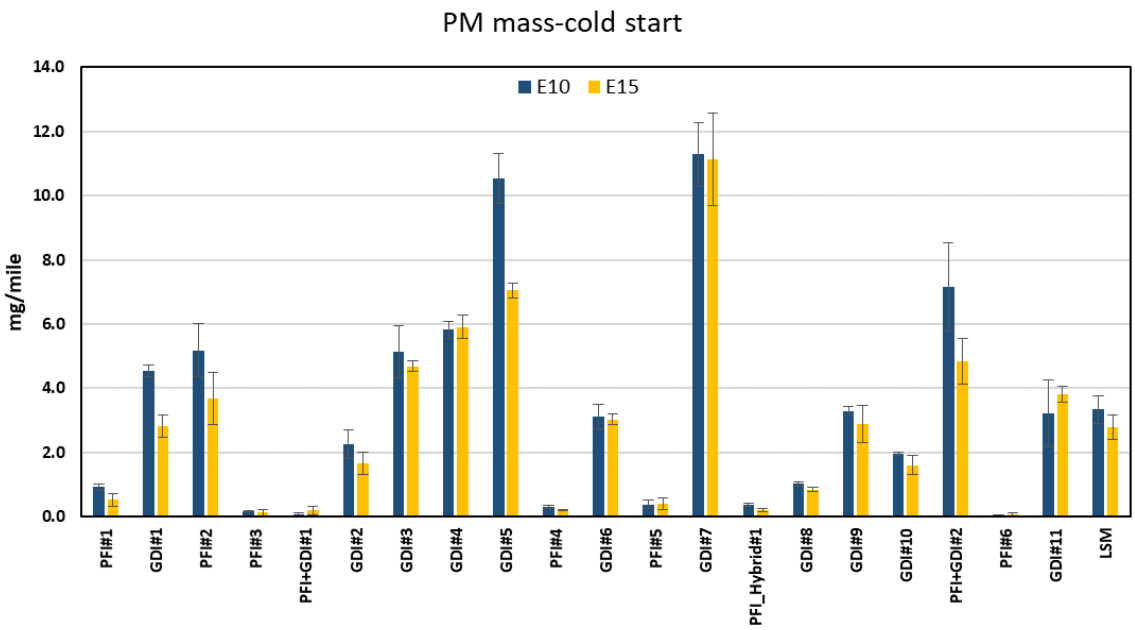


Figure 3-9. Average Cold-Start (Bag 1) PM Mass Emissions Results

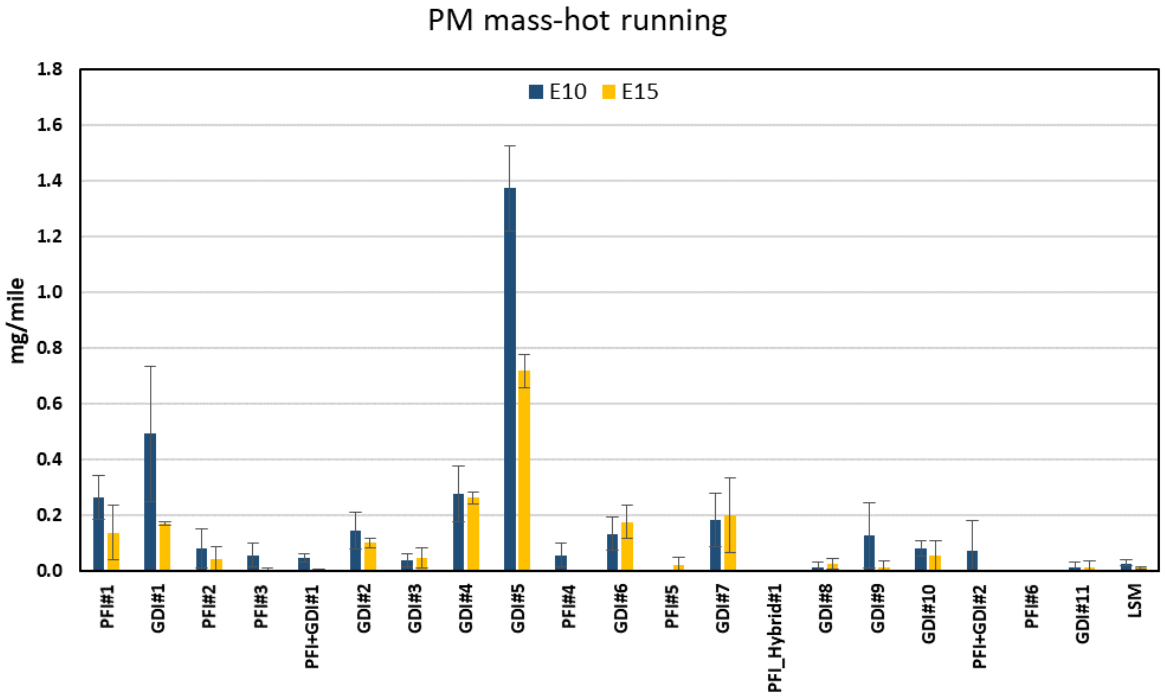


Figure 3-10. Average Hot-Running (Bag 2) PM Mass Emissions Results

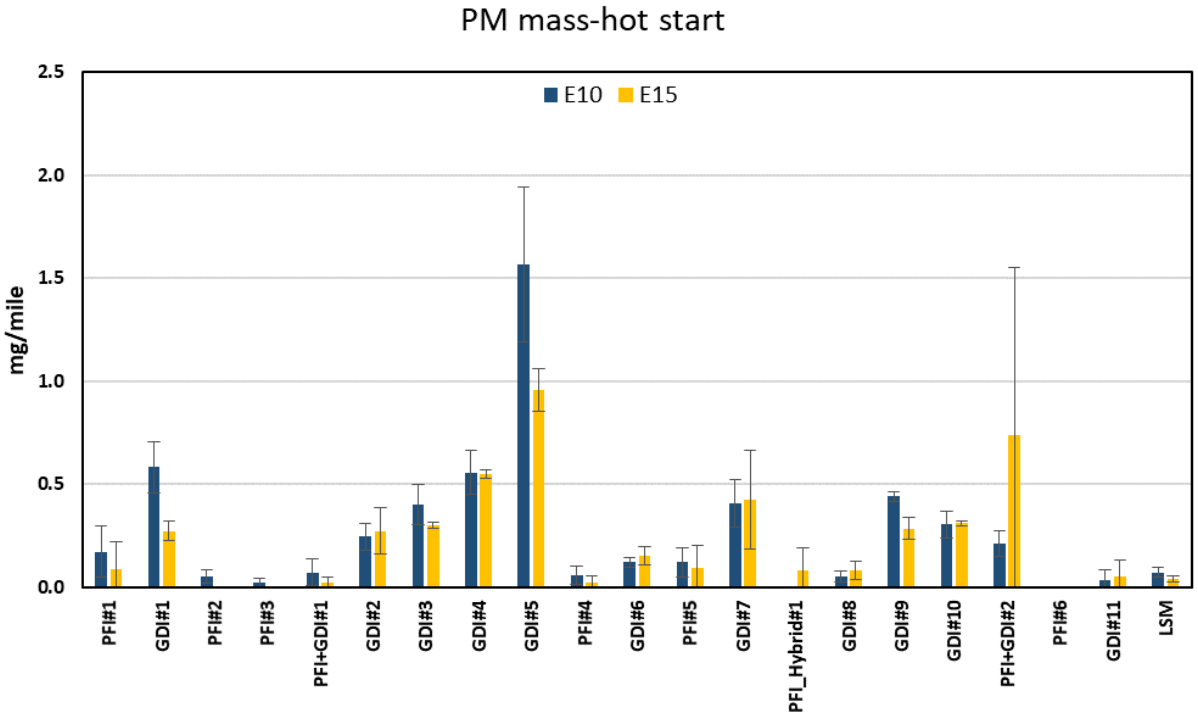


Figure 3-11. Average Hot-Start (Bag 3) PM Mass Emissions Results

As shown in Figure 3-12, PM mass emissions for the GDI vehicles were higher than those of their PFI counterparts. A number of previous studies have also shown that GDI engines have higher PM emissions than PFI engines (Karavalakis et al., 2014; Saliba et al., 2017; Chen et al., 2017). The higher PM emissions for GDI engines were largely due to diffusive combustion of the liquid fuel film (fuel impingement) on the piston crown or cylinder walls. Figure 3-13 shows a comparison of PM mass emissions as a function of vehicle emissions certification classification. The results as a function of certification classification do not show strong trends, which could be attributed to a mix of GDI and PFI vehicles being tested in the different certification categories.

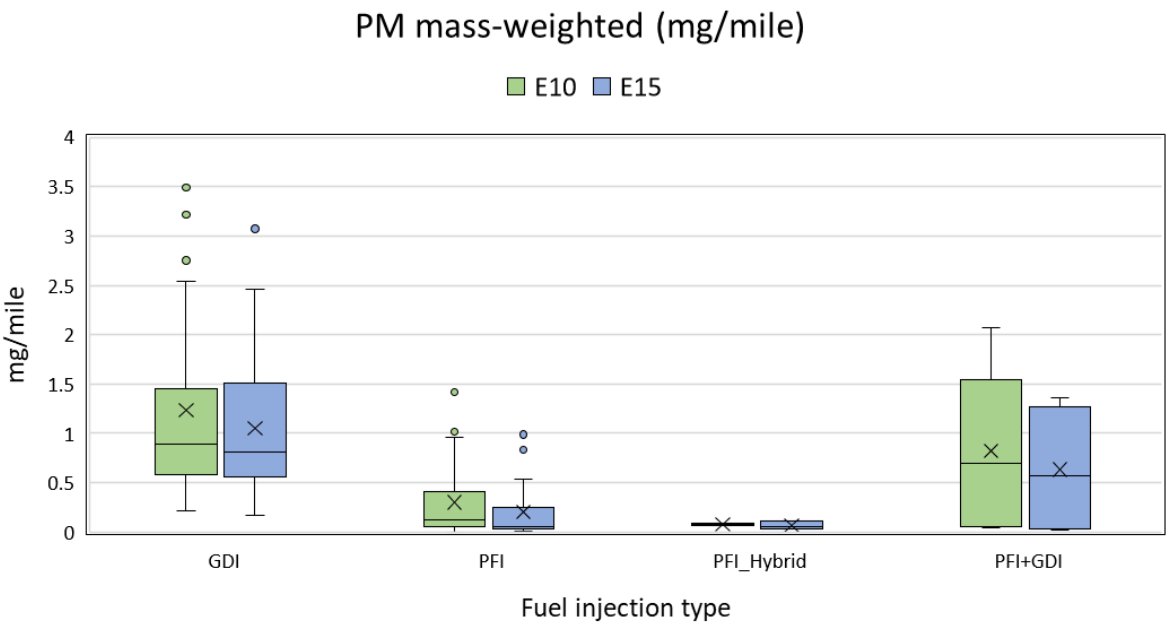


Figure 3-12. Fleet PM mass weighted emissions for different fuel injection types

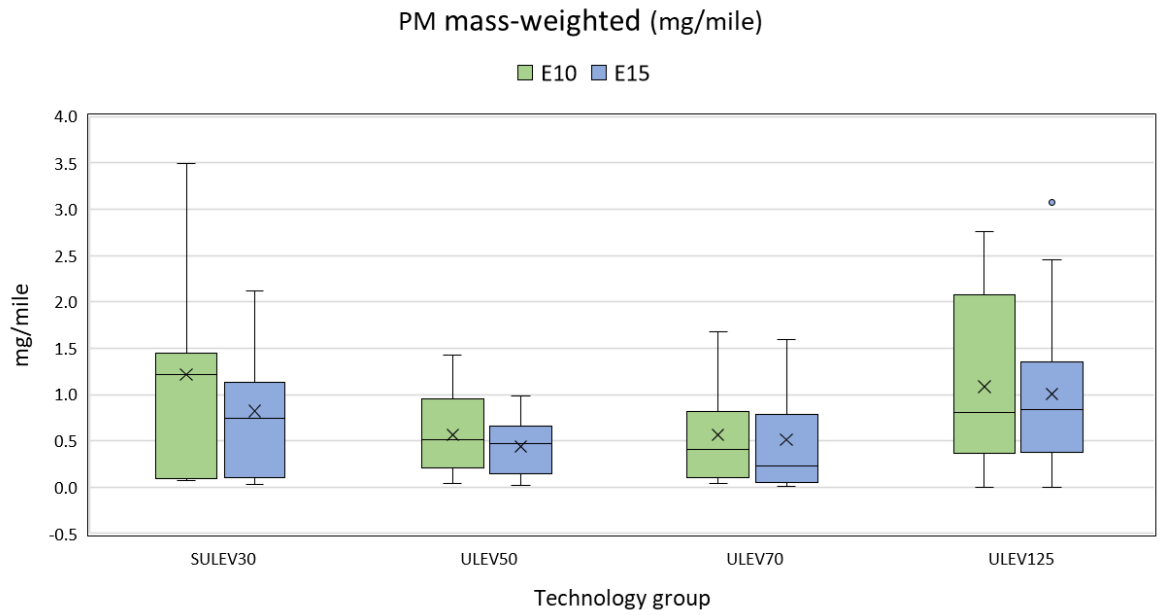


Figure 3-13. Fleet PM mass weighted emissions for different technology groups

Solid particle number (SPN>23 nm) emissions are shown in Figure 3-14. SPN emissions were measured according to the European PMP method. For the purpose of this program, only the weighted SPN emissions were included in the statistical analysis. Results showed that E15 was 12% lower than E10, at a statistically significant level.

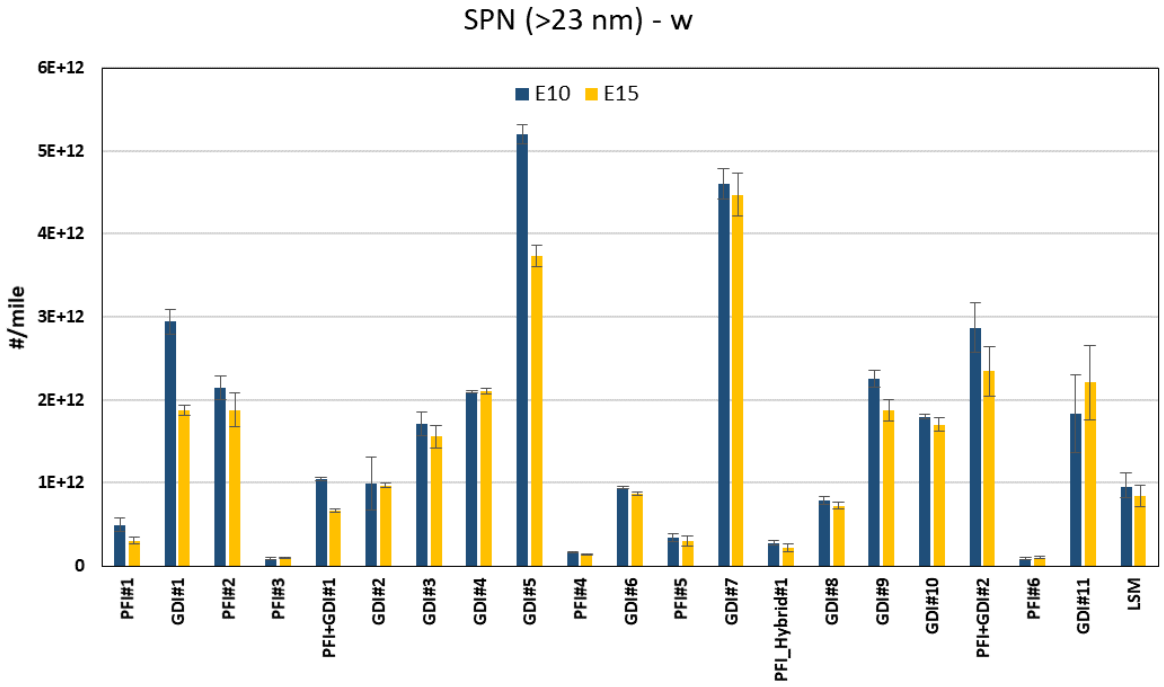


Figure 3-14. Average Solid Particle Number (>23 nm) Weighted Emissions Results

Black carbon (BC) is a ubiquitous component of ambient particulate matter, that is produced by the combustion of fossil fuels. BC emissions were not included in the comprehensive statistical analysis, but the fuel differences were analyzed with the use of a two-sample equal variance t-test. Weighted BC emission results are provided in Figure 3-15. For the weighted BC emissions, GDI#1, PFI+GDI#1, and GDI#5 showed statistically significant differences between E10 and E15. For GDI#1, PFI+GDI#1, and GDI#5, E15 showed reductions of 30%, 38%, and 39%, respectively, compared to E10. For PFI#4, PFI_Hybrid#1, and PFI+GDI#2, E15 showed marginally statistically significant reductions of 11%, 26%, and 33%, respectively, compared to E10.

For the cold-start BC emissions, GDI#1, GDI#5, and GDI#8 showed statistically significant reductions when tested with E15 compared to E10. The reductions in cold-start BC emissions were 34%, 35%, and 20% for GDI#1, GDI#5, and GDI#8, respectively. For PFI#1, PFI#4, and PFI+GDI#2, E15 showed marginally statistically significant reductions of 45%, 14%, and 33%, respectively, compared to E10.

For the hot-running BC emissions, GDI#1, PFI+GDI#1, GDI#4, GDI#5, GDI#6, and GDI#9 showed statistically reductions when tested with E15 compared to E10. For GDI#1, PFI+GDI#1, GDI#4, GDI#5, GDI#6, and GDI#9, the use of E15 showed reductions of 29%, 55%, 9%, 48%, 18%, and 39%, respectively, compared to E10. GDI#7 and GDI#11 showed marginally statistically significant reductions of 11% and 20%, respectively, compared to E10.

For the hot-start BC emissions, GDI#1, PFI+GDI#1, GDI#5, GDI#6, GDI#7, GDI#9 and PFI+GDI#2 showed statistically significant reductions with E15 compared to E10. The differences in hot-start BC emissions were 23%, 55%, 39%, 19%, 16%, 17%, and 47% for GDI#1, PFI+GDI#1, GDI#5, GDI#6, GDI#7, GDI#9, and PFI+GDI#2, respectively. For GDI#10, E15 showed a statistically significant increase of 35% compared to E10.

BC emissions reduced with the use of E15 across the vehicle fleet. The GDI vehicles produced significantly higher BC emissions than the PFI vehicles, indicating that PM emissions from GDI combustion were primarily BC or soot in nature.

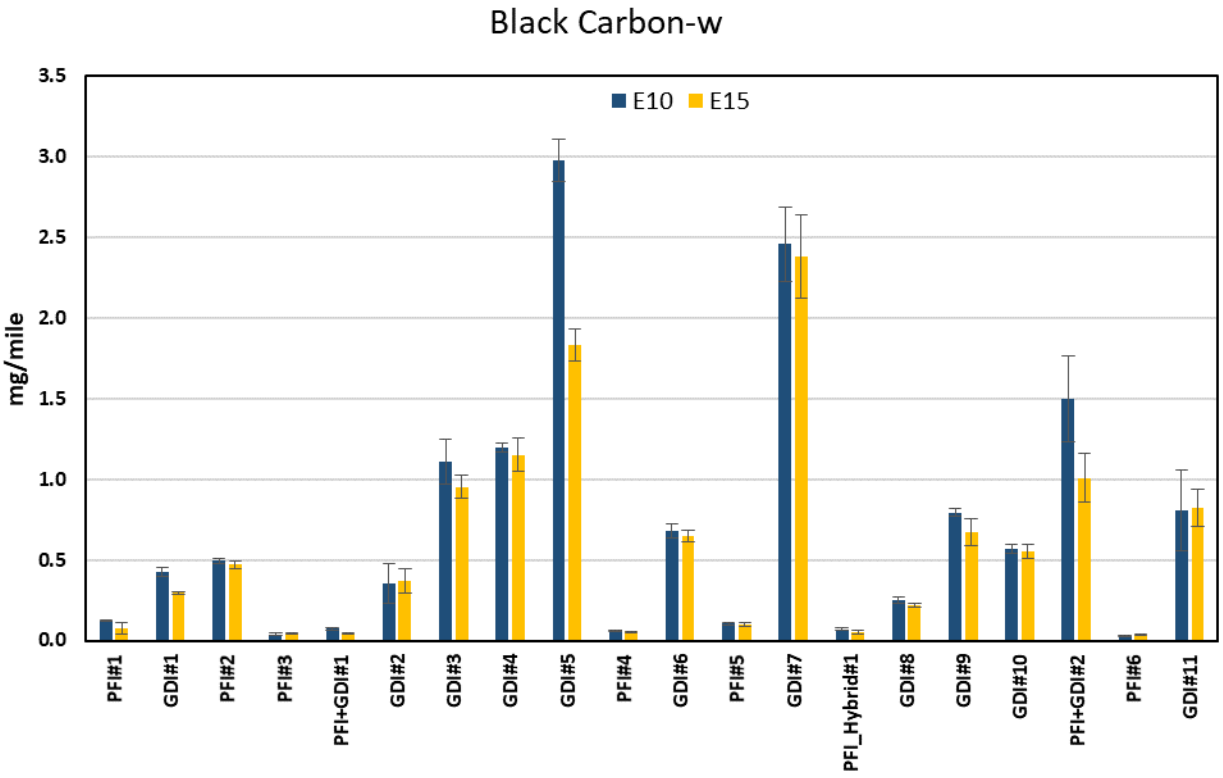


Figure 3-15. Average Black Carbon Weighted Emissions Results

3.6 Nitrous oxide (N_2O) and ammonia (NH_3) emissions

Nitrous oxide (N_2O) emissions in recent years have gained increased attention as an important GHG, along with CH_4 and CO_2. In fact, N_2O's global warming potential (GWP) is much higher than that of CO_2 or CH_4. Thus, N_2O is a significant contributor to total radiative forcing, despite its low concentration in the atmosphere. N_2O is primarily formed in the TWC, since precious metals present in the catalyst can promote its formation by reaction of NO and NH_3 or with hydrogen (Hoekman, 2020). Neither of these pollutants were included in the comprehensive statistical analysis. Under the present test conditions, N_2O emissions were seen in very low levels for all vehicles/fuel combinations and showed mixed results with both increases and decreases for E15 (Figure 3-16). Thirteen vehicles showed trends of lower N_2O emissions with E15. Only GDI#7 showed a statistically significant reduction of 37% for E15 compared to E10, however.

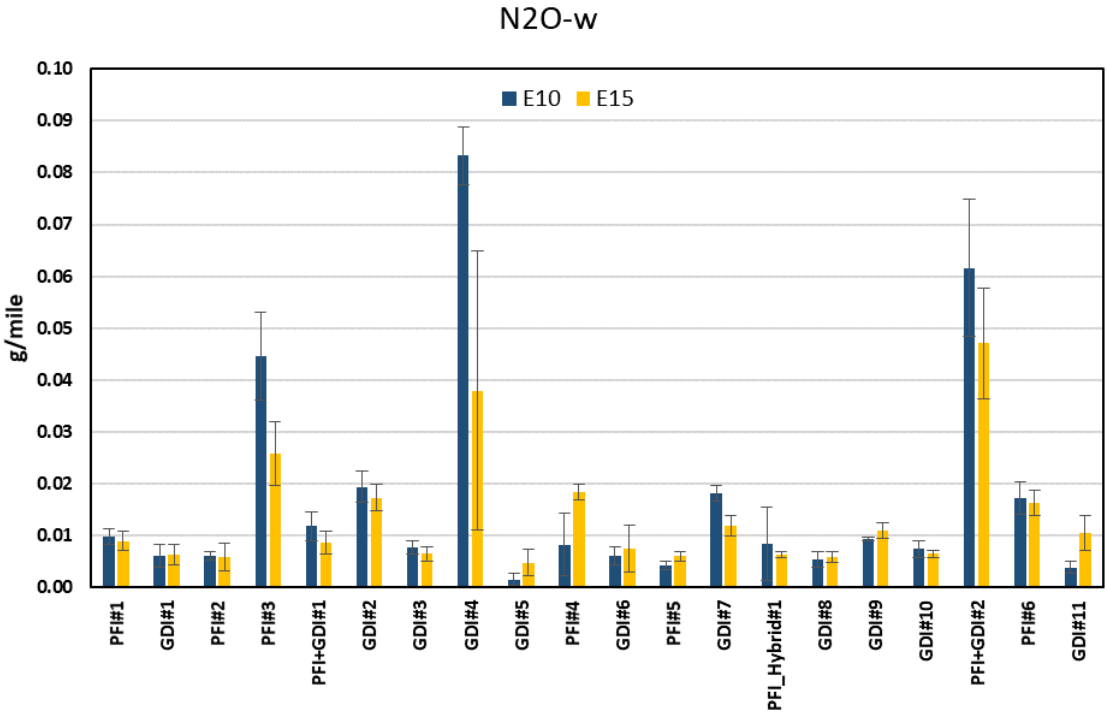


Figure 3-16. Average N_2O weighted Emissions Results

Ammonia (NH_3) emissions are shown in Figure 3-17. NH_3 is not a combustion by-product but it forms inside the TWC as a result of the reduction of NO by hydrogen, which is generated from CO and H_2O via the water-gas shift reaction or from hydrocarbons via steam reforming (Suarez-Bertoa et al., 2014). NH_3 emissions contribute significantly to the formation of secondary ambient PM. NH_3 emissions were detected in relatively low concentrations and did not show a clear fuel trend. For GDI#5, PFI#4, GDI#10, and PFI+GDI#2, the use of E15 showed statistically significant increases of 180%, 188%, 42%, and 104%, respectively, compared to E10.

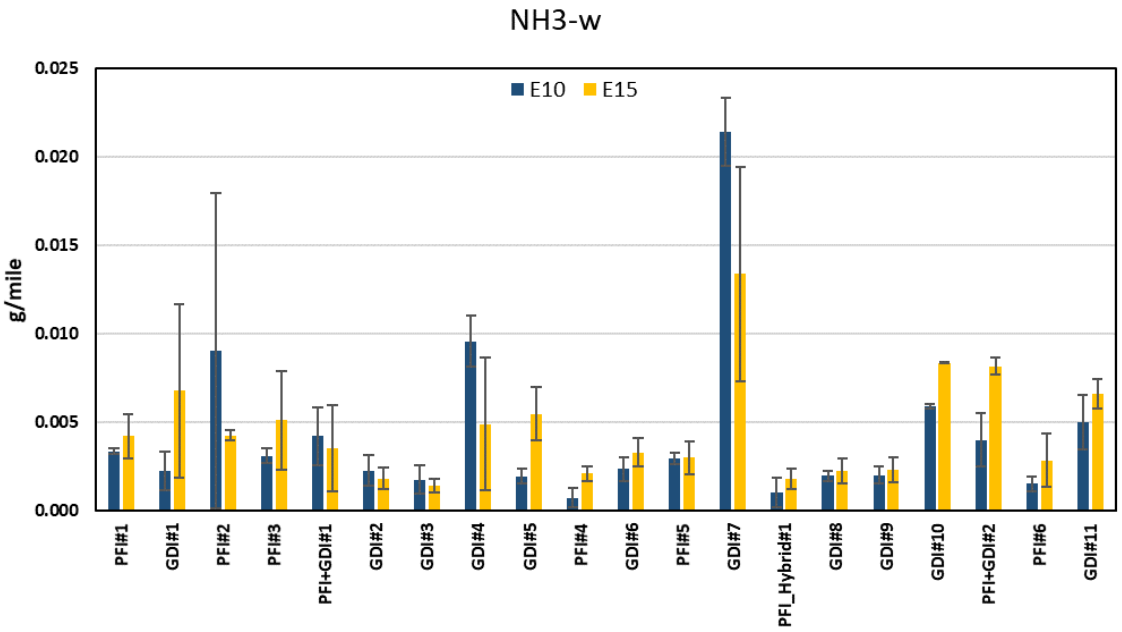


Figure 3-17 Average NH_3 weighted Emissions Results

3.7 Aromatic Hydrocarbon Species, 1,3-Butadiene, and Ethanol Emissions

Figure 3-18, Figure 3-19, Figure 3-20, Figure 3-21, Figure 3-22, Figure 3-23, and Figure 3-24 show the cumulative benzene, toluene, ethylbenzene, *m/p*-xylenes, *o*-xylene (commonly known as BTEX), 1,3-butadiene, and ethanol emission results, respectively. Naphthalene was found to be well below detection limit and no results are reported here.

For the cumulative BTEX emissions, only ethylbenzene, m/p-xylenes and o-xylene emissions showed statistically significant results between the fuels. For ethylbenzene emissions, E15 showed a statistically significant reduction of 11% compared to E10. For m/p-xylenes and o-xylene emissions, E15 showed marginally statistically significant reductions of 10% and 9%, respectively, compared to E10. Cumulative 1,3-butadiene emissions did not show any statistically significant difference between fuels. Ethanol emissions showed a strong, statistically significant increase of 77% for E15 compared to E10.

The benzene, toluene, ethylbenzene, m/p xylenes, and o-xylene are reactive aromatic volatile organic compounds that contain a C=C bond. These species are highly reactive in the troposphere and have been recognized as important photochemical precursors for ozone and organic aerosols. They are also known as toxic and potentially carcinogenic compounds from vehicle exhaust. Benzene and toluene were the main BTEX in the exhaust followed by ethylbenzene and xylenes. Overall, BTEX species trended lower with E15, consistent with previous studies (Jin et al., 2017; Yang et al., 2019; Poulopoulos et al., 2001). The lower BTEX emissions for E15 can be attributed in part to the dilution of these compounds when more ethanol was added in E10. In addition, the higher oxygen content for E15 led to the more efficient oxidation of BTEX species during combustion.

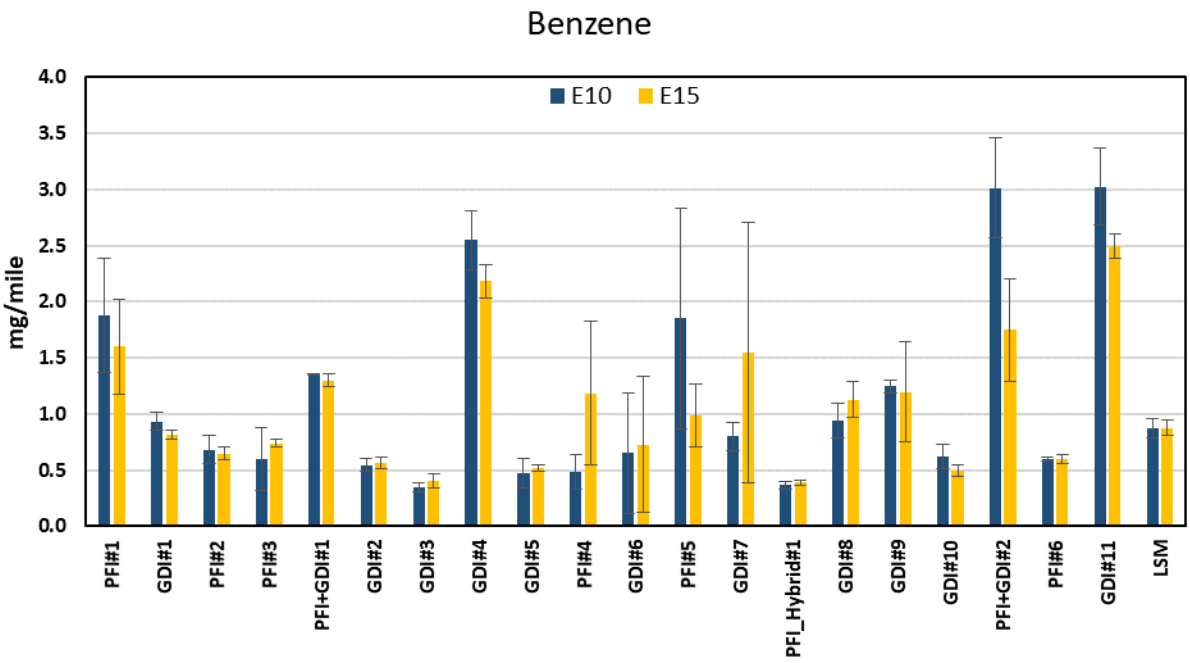


Figure 3-18. Average Benzene Cumulative Emissions Results

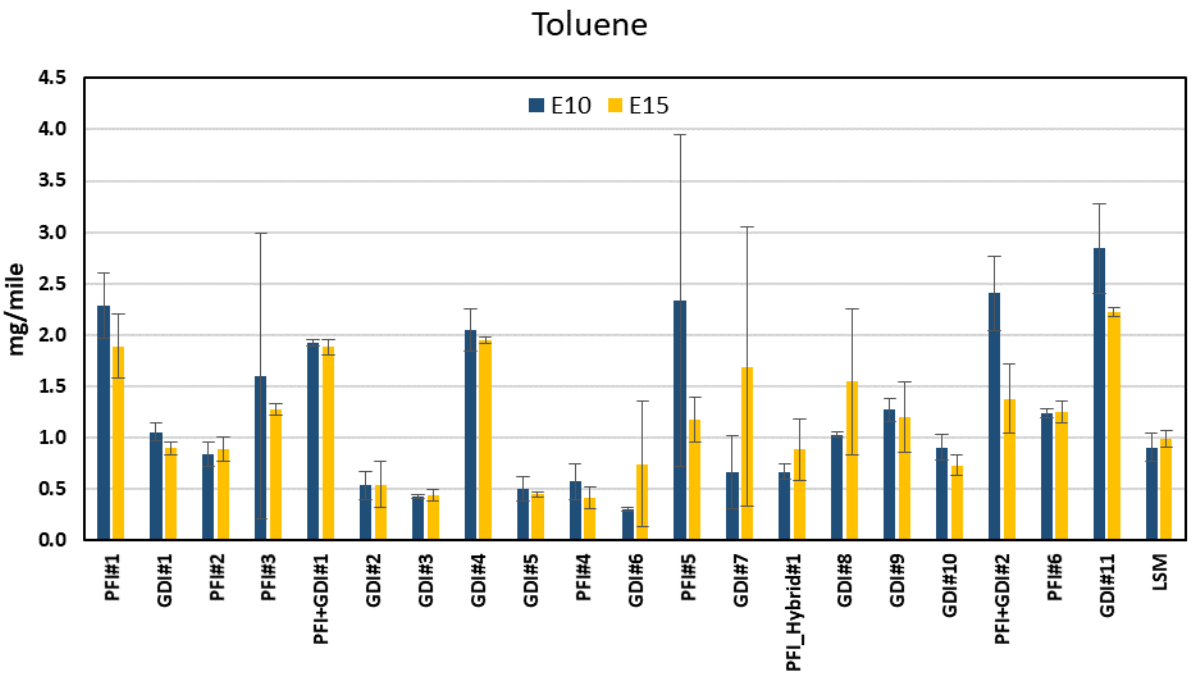


Figure 3-19. Average Toluene Cumulative Emissions Results

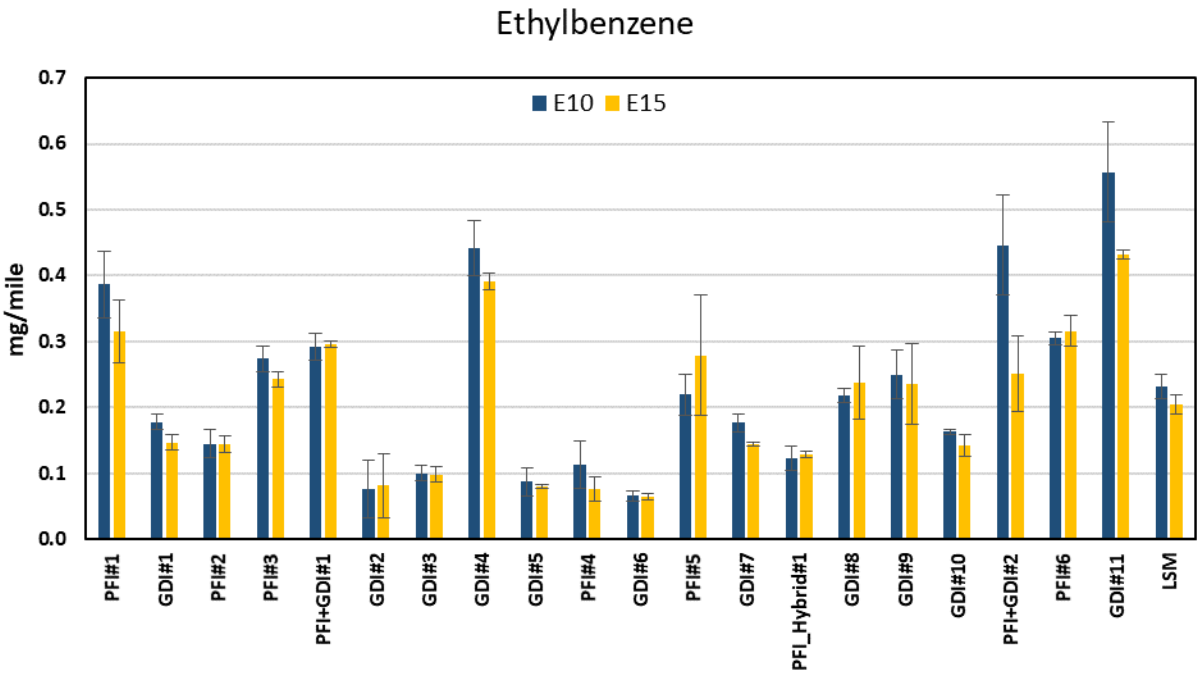


Figure 3-20. Average Ethylbenzene Cumulative Emissions Results

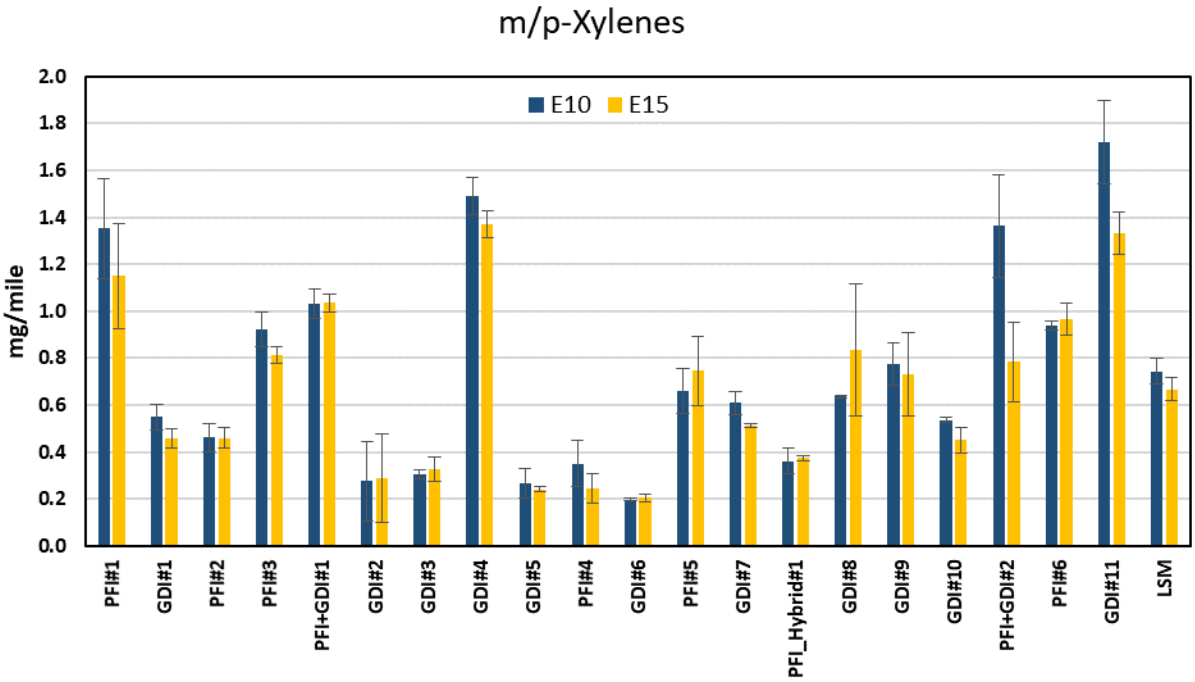


Figure 3-21. Average m/p-xylenes Cumulative Emissions Results

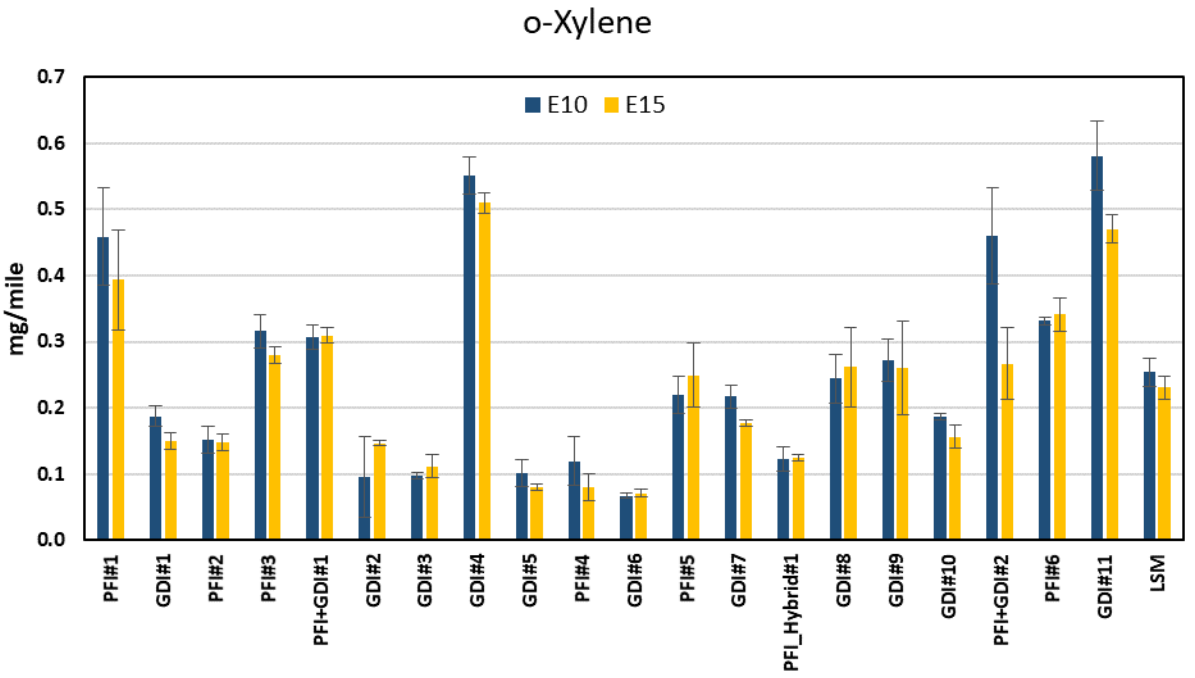


Figure 3-22. Average o-xylene Cumulative Emissions Results

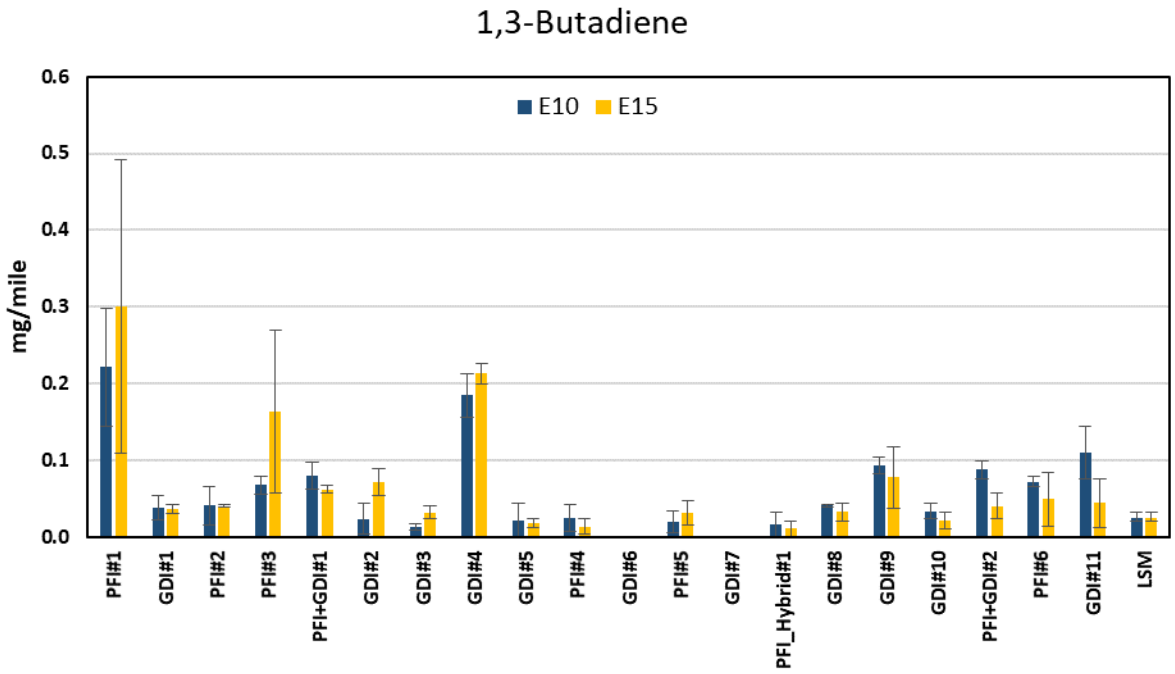


Figure 3-23. Average 1-3 Butadiene Cumulative Emissions Results

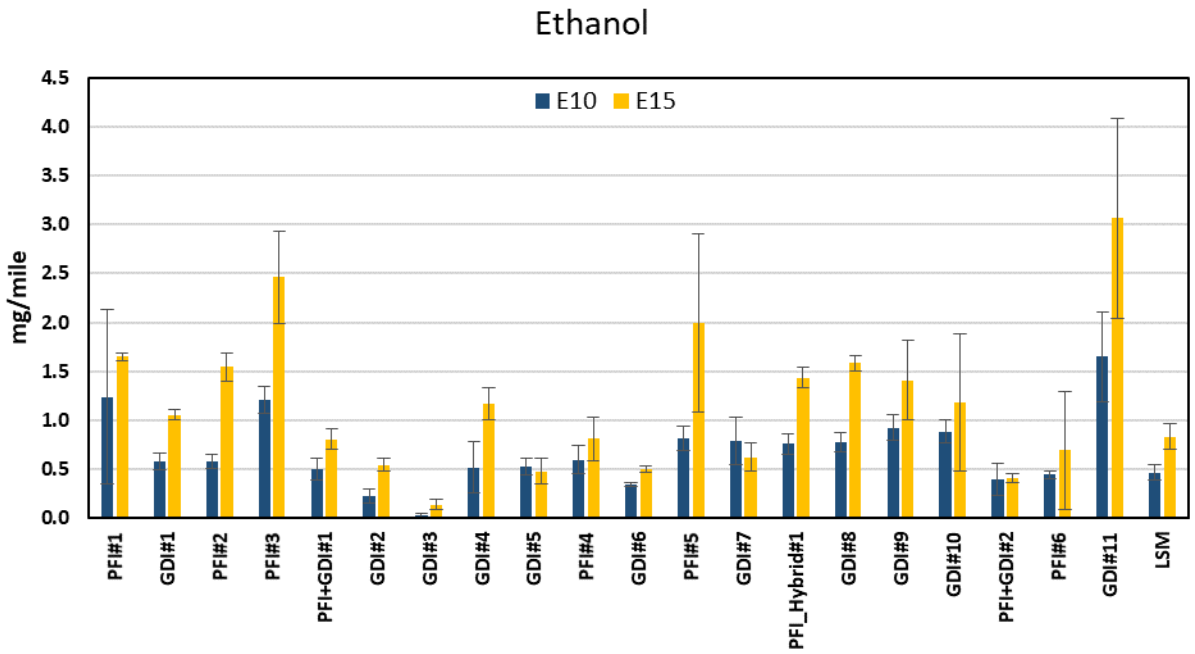


Figure 3-24. Average Ethanol Cumulative Emissions Results

3.8 Formaldehyde and Acetaldehyde Emissions

Cumulative formaldehyde and acetaldehyde emissions are shown in Figure 3-25 and Figure 3-26, respectively. These aldehydes are not present in the fuel, but are formed during combustion. Formaldehyde and acetaldehyde are classified as a human carcinogen or as probably carcinogenic, respectively, in terms of health impacts. While a number of aldehydes and ketones were measured from the tailpipe, the low molecular weight formaldehyde and acetaldehyde were the predominant aldehydes detected, with heavier compounds being below the limits of detection or below the CVS tunnel backgrounds.

Formaldehyde emissions did not show any statistically significant effects between E10 and E15. Acetaldehyde emissions showed a strong, statistically significant increase of 32% for E15 compared to E10 across the fleet of 20 vehicles. Acetaldehyde emissions are mainly a function of ethanol content and are attributed to the hydroxyl moiety in ethanol. Ethanol combustion will result in hydrogen abstraction, which will form radicals that either react with oxygen or unimolecularly decompose yielding acetaldehyde (Hass et al., 2009). Previous studies have shown elevated acetaldehyde emissions as a function of ethanol content (Storey et al., 2010; Karavalakis et al., 2014; Yang et al., 2019).

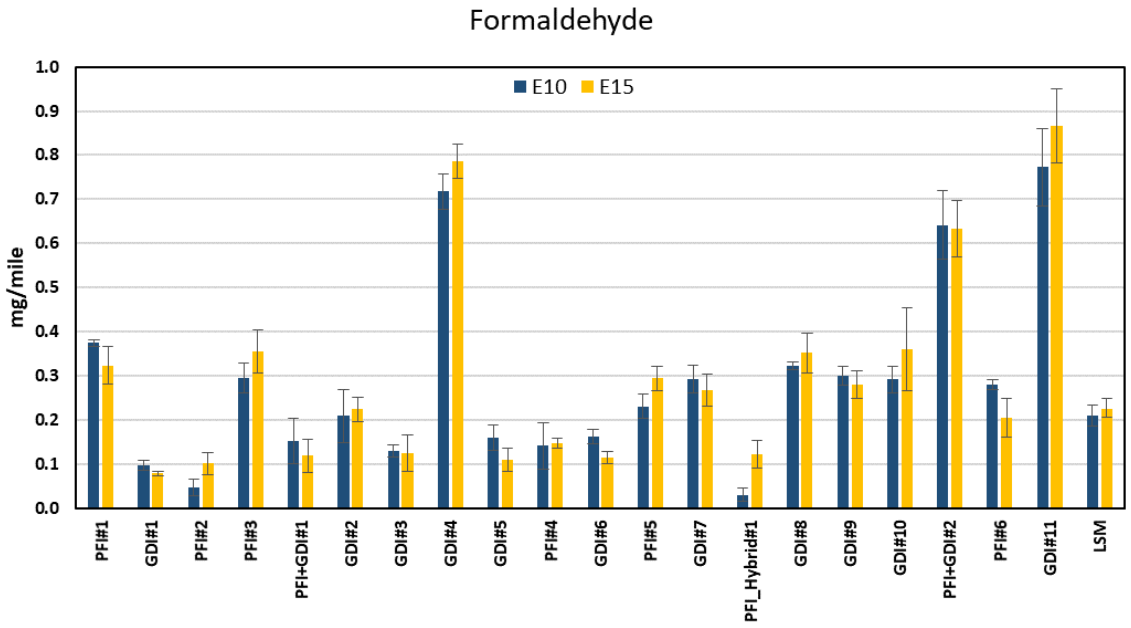


Figure 3-25. Average Formaldehyde Cumulative Emissions Results

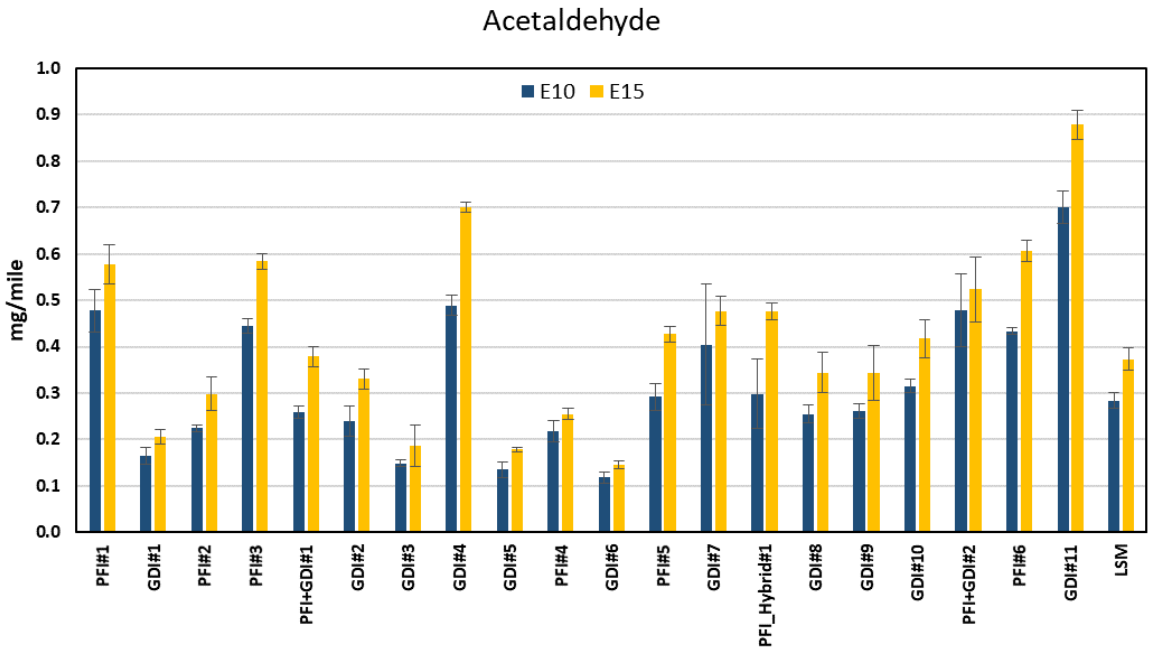


Figure 3-26. Average Acetaldehyde Cumulative Emissions Results

3.9 NMOG Emissions

The California and EPA LEV III and Tier 3 emissions standards have established a combined standard for non-methane organic gases (NMOG) + NOx emissions. The light-duty fleet average is required to be below 30 mg/mile over the certification FTP cycle by 2025. NMOG emissions are presented in Figure 3-27. It should be noted that NMOG emissions were not included in the statistical analysis, but were rather analyzed with the use of a two-sample equal variance t-test. Overall, NMOG emissions were below the 30 mg/mile standard for all test vehicles. For PFI+GDI#2, E15 showed a statistically significant reduction of 34% in NMOG emissions compared to E10. For GDI#4, E15 showed a statistically significant reduction of 5% compared to E10. For GDI #9, E15 showed a statistically significant increase of 22% compared to E10. For GDI#11, E15 showed a marginally statistically significant reduction of 14% compared to E10.

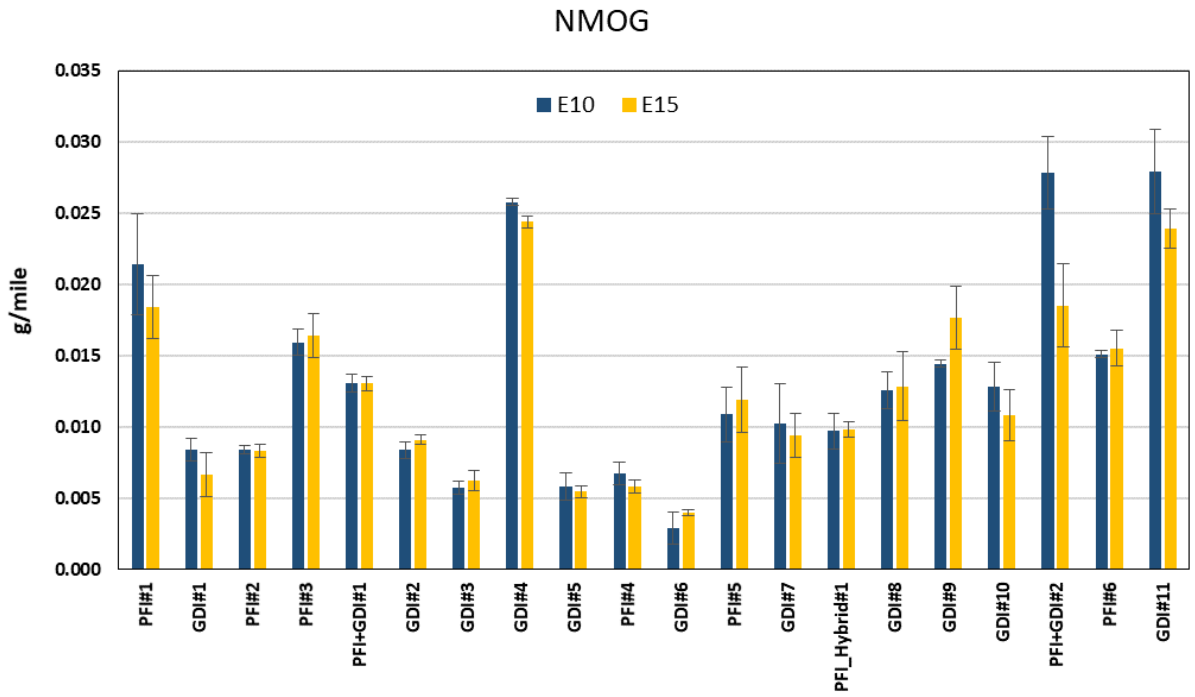


Figure 3-27. Average NMOG Emissions Results

3.10 Ozone Forming Potential

The ozone forming potential (OFP) for all vehicle/fuel combinations is shown in Figure 3-28. The OFP was calculated using the maximum incremental reactivity (MIR) factors for each individual exhaust species, and then summing these values. The calculation model is shown in the following equation:

$$OFP = \sum MIR_i \times E_i$$

Where,
OFP – Ozone forming potential, in mg O_3/mile
MIRi – maximum incremental reactivity of species i, in mg O_3/mg
Ei – mass emission rate of species I, in mg/mile

OFP data was not included in the comprehensive statistical analysis. This data was analyzed with the use of a two-sample equal variance t-test to identify fuel effects between vehicles. For GDI#1 and PFI+GDI#2, E15 showed statistically significant reductions of 23% and 33%, respectively, compared to E10. For GDI#4, E15 showed a marginally statistically significant reduction of 9% compared to E10.

Overall, the OFP for E15 trended lower compared to E10 across the vehicle fleet, indicating that the introduction of E15 in the California gasoline market will likely not contribute to increases in ozone formation. Previous studies have also shown reduced OFP with higher ethanol fuels (Costagliola et al., 2016; Wang et al., 2016; Yang et al., 2019).

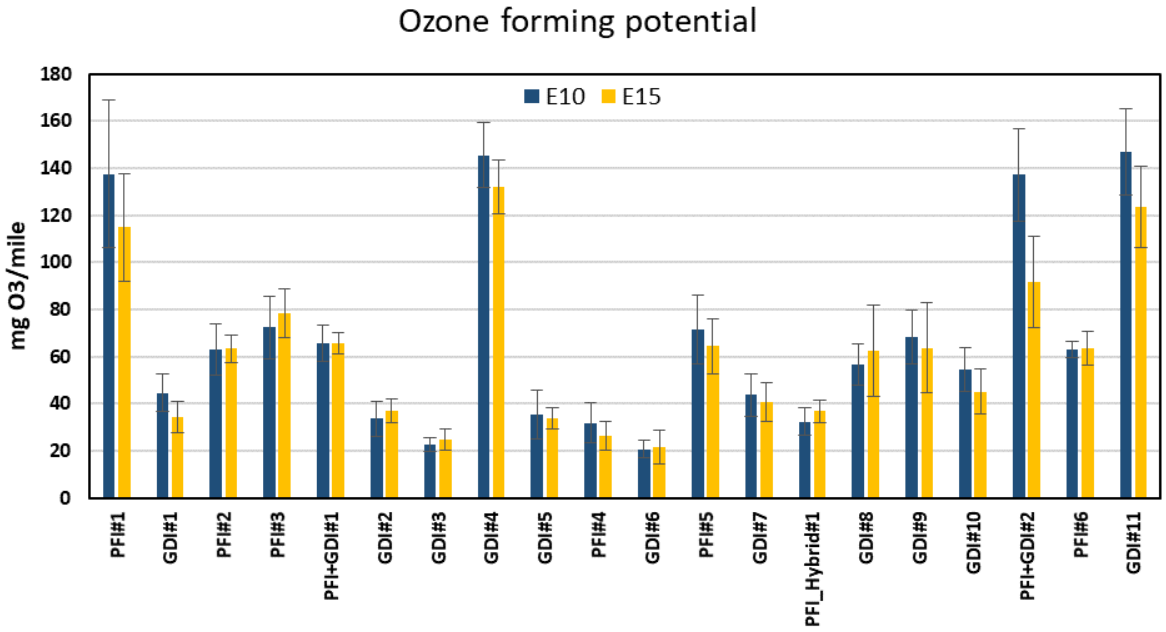


Figure 3-28. Ozone Forming Potential Test Results

4 Summary and Conclusions

The primary objective of this study was to characterize the impacts of changes in the ethanol contents in gasoline for current technology Tier 3 vehicles in California. For this study, two gasoline fuels, E10 and E15 (10% V/V and 15% V/V ethanol), that meet the specifications to be classified as a California Reformulated Gasoline (CaRFG) were tested in a fleet of twenty vehicles from four different technology groups (SULEV30, ULEV50, ULEV70 and ULEV125). Vehicles were tested over triplicate FTP cycles on each of the test fuels. Measurements included NOx, CO, THC, NMHC, CH_4, CO_2, N_2O, NH_3, fuel economy, SPN, BC, formaldehyde, acetaldehyde, 1,3-butadiene, and BTEX. The main findings of this study are summarized below.

- NOx emissions did not show any statistically significant effect between fuels for the weighted FTP and each individual phase.
- Statistically significant and marginally statistically significant reductions in THC and NMHC emissions were seen for E15 compared to E10.
- CO emissions showed statistically significant reductions for E15 for the weighted, cold-start, and hot-start FTP.
- CO_2 emissions showed a marginally statistically significant reduction of 1% for E15 compared to E10 over the hot-start phase. Carbon-balance weighted fuel economy showed a statistically significant reduction of 1% for E15 compared to E10 across the fleet of 20 vehicles.
- For the cold-start and hot-running phases, PM mass emissions showed statistically significant reductions of 17% and 54%, respectively, for E15 compared to E10. Hot-start PM mass emissions were 43% lower for E15 compared to E10, at a marginally statistically significant level. The weighted PM mass emissions showed a statistically significant reduction of 18% for E15 compared to E10 across the fleet of 20 vehicles.
- Weighted SPN emissions showed that E15 was 12% lower than E10, at a statistically significant level.
- For ethylbenzene emissions, E15 showed a statistically significant reduction of 11% compared to E10.
- For m/p-xylenes and o-xylene emissions, E15 showed marginally statistically significant reductions of 10% and 9%, respectively, compared to E10.
- Cumulative 1,3-butadiene, benzene, and toluene emissions did not show any statistically significant difference between fuels.
- Ethanol emissions showed a strong, statistically significant increase of 77% for E15 compared to E10.
- Formaldehyde emissions did not show any statistically significant difference between fuels. Acetaldehyde emissions showed a strong, statistically significant increase of 32% for E15 compared to E10 across the fleet of 20 vehicles.
- Calculated NMOG emissions were below the 30 mg/mile standard for all test vehicles. Statistically significant fuel effects were seen for some vehicles, but not for others. Overall, NMOG emissions trended lower for E15 compared to E10.
- The estimated OFP showed some statistically significant fuel effects for some vehicles, but not for others. Overall, a decreasing trend in OFP was observed with E15 compared

to E10, indicating that the introduction of E15 in the California gasoline market will likely not contribute to increases in ozone formation.

5 References

Catapano, F.; Di Iorio, S.; Sementa, P.; Vaglieco, B.M. Characterization of ethanol-gasoline blends combustion processes and particle emissions in a GDI/PFI small engine. SAE Technical Paper 2014, 2014-01-1382.

Costagliola, M.; Prati, M.; Murena, F. Bioethanol/gasoline blends for fueling conventional and hybrid scooter: Regulated and unregulated exhaust emissions, Atmos. Environ. 2016, 132, 133-140.

Chen, L.; Liang, Z.; Zhang, X.; Shuai, S. Characterizing particulate matter emissions from GDI and PFI vehicles under transient and cold start conditions. Fuel 2017, 189, 131-140.

Fatouraie, M.; Wooldridge, M.S.; Petersen, B.R.; Wooldridge, S.T. Effects of ethanol on in-cylinder and exhaust gas particulate emissions of a gasoline direct injection spark ignition engine. Energy and Fuels 2015, 29, 3399-3412.

Hoekman, S. Review of nitrous oxide (N2O) emissions from motor vehicles. SAE Int. J. Fuels Lubr. 2020, 13, 79-98.

Haas, F.M.; Chaos, M.; Dryer, F.L. Low and intermediate temperature oxidation of ethanol and ethanol-PRF blends: An experimental and modeling study. Combustion and Flame 2009, 156, 2346-2350.

Karavalakis, G.; Short, D.; Russell, R.L.; Jung, H.; Johnson, K.C.; Asa-Awuku, A.; Durbin, T.D. Assessing the Impacts of Ethanol and Iso-butanol on Gaseous and Particulate Emissions from Flexible Fuel Vehicles. Environ. Sci. Technol. 2014, 48, 14016-14024.

Khosousi, A.; Liu, F.; Dworkin, S.B.; Eaves, N.A.; Thomson, M.J.; He, X., Dai, Y.; Gao, Y.; Liu, F.; Shuai, S.; Wang, J. Experimental and numerical study of soot formation in laminar coflow diffusion flames off gasoline/ethanol blends. Combustion and Flame 2015, 162, 3925-3933.

Liu, F.-J.; Liu, P.; Wei, Y.-J.; Liu, S.-H. Regulated and unregulated emissions from a spark-ignition engine fuelled with low-blend ethanol-gasoline mixtures. Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering 2011, 226, 517-528.

Leach, F.C.P.; Stone, R.; Richardson, D.; Turner, J.W.C.; Lewis, A.; Akehurst, S.; Remmert, S.; Cambell, S.; Cracknell, R. The effect of oxygenate fuels on PN emissions from a highly boosted GDI engine. Fuel 2018, 225, 277-286.

Najafi, G.; Ghobadian, B.; Tavakoli, T.; Buttsworth, D.R.; Yusaf, T.F.; Faizollahnejad, M. Performance and exhaust emissions of a gasoline engine with ethanol blended fuels using artificial neural network. Applied Energy 2009, 86, 630-639.

Poulopoulos, S.G.; Samaras, D.P.; Philipopoulos, C.J. Regulated and unregulated emissions from an internal combustion engine operating on ethanol-containing fuels. Atmospheric Environment 2001, 35, 4399-4406.

Saliba, G.; Saleh, R.; Zhao, Y.; Presto, A.A.; Lamber, A.T.; Frodin, B.; Sardar, S.; Maldonado, H.; Maddox, C.; May, A.A.; Drozd, G.T.; Goldstein, A.H.; Russell, L.M.; Hagen, F.; Robinson, A.L. Comparison of gasoline direct-injection (GDI) and port fuel injection (PFI) vehicle emissions: Emission Certification standards, cold-start, secondary organic aerosol formation potential, and potential climate impacts. Environ. Sci. Technol. 2017, 51, 6542-6552.

Schifter, I.; Diaz, L.; Rodriguez, R.; Gómez, J.P.; Gonzalez, U. Combustion and emissions behavior for ethanol–gasoline blends in a single cylinder engine, Fuel 2011, 90, 3586-3592.

Sluder, C.S., West, B.H. NMOG emissions characterizations and estimation for vehicles using ethanol-blended fuels. SAE int. J. Fuels Lubr. 2012, 5, 721-732.
Storey, J.M.; Barone, T.; Norman, K.; Lewis, S. Ethanol Blend Effects on Direct Injection Spark-Ignition Gasoline Vehicle Particulate Matter Emissions, SAE Int. 2010, 3, 650-659.
Suarez-Bertoa, R., Zardini, A.A., Astorga, C. Ammonia exhaust emissions from spark ignition vehicles over the New European Driving Cycle. Atmospheric Environment 2014, 92 43-53.

Wang, X.; Ge, Y.; Zhang, C.; Liu, J.; Peng, Z.; Gong H. Estimating ozone potential of pipe-out emissions from Euro-3 to Euro-5 passenger cars fueled with gasoline, alcohol-gasoline, methanol and compressed natural gas, SAE Int. 2016, 11.
Wang, C.; Xu, H.; Herreros, J.M.; Wang, J.; Cracknell, R. Impact of fuel and injection system on particle emissions from a GDI engine. Applied Energy 2014, 132, 178-191.
Yang, J.; Roth, P.; Durbin, T.; Karavalakis, G. Impacts of gasoline aromatic and ethanol levels on the emissions from GDI vehicles: Part 1. Influence on regulated and gaseous toxic pollutants, Fuel 2019,252, 99-811.

Appendix A
Individual Test Results for each Test Vehicle

2019MY Dodge Ram1500

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
THC Emissions (g/mile)	THC-1	0.111	0.131	0.098	0.087	0.090	0.110
	THC-2	0.003	0.003	0.002	0.002	0.003	0.003
	THC-3	0.011	0.013	0.012	0.009	0.010	0.010
	3THC-w	0.028	0.032	0.025	0.022	0.023	0.027
NMHC Emissions (g/mile)	NMHC-1	0.090	0.106	0.078	0.069	0.071	0.087
	NMHC-2	0.001	0.002	0.000	0.001	0.001	0.002
	NMHC-3	0.004	0.004	0.005	0.003	0.003	0.004
	3NMHC-w	0.020	0.024	0.017	0.016	0.016	0.020
CH4 Emissions (g/mile)	CH4-1	0.021	0.025	0.020	0.018	0.019	0.022
	CH4-2	0.002	0.001	0.002	0.001	0.002	0.001
	CH4-3	0.007	0.009	0.007	0.006	0.007	0.006
	3CH4-W	0.007	0.008	0.007	0.006	0.007	0.007
CO Emissions (g/mile)	CO-1	2.243	2.976	2.115	1.921	2.398	2.583
	CO-2	0.003	0.000	0.000	0.000	0.009	0.000
	CO-3	0.433	0.543	0.488	0.191	0.474	0.351
	3CO-w	0.585	0.765	0.572	0.451	0.630	0.633
NOx Emissions (g/mile)	NOx-1	0.058	0.053	0.067	0.063	0.064	0.048
	NOx-2	0.030	0.040	0.046	0.045	0.040	0.050
	NOx-3	0.024	0.065	0.037	0.029	0.035	0.036
	3NOx-w	0.034	0.049	0.048	0.044	0.044	0.045
CO2 Emissions (g/mile)	CO2-1	513.974	506.210	495.645	487.620	498.982	503.044
	CO2-2	494.922	495.185	497.591	525.960	493.064	534.961
	CO2-3	424.093	422.677	418.638	411.412	413.241	420.420
	3CO2-w	479.488	477.607	475.553	486.578	472.420	496.893

Fuel economy-carbon balanced method (miles per gallon)	FE-1	16.440	16.651	17.052	17.005	16.595	16.451
	FE-2	17.201	17.192	17.109	15.871	16.929	15.604
	FE-3	20.041	20.099	20.297	20.274	20.162	19.828
	3FE-w	17.718	17.777	17.866	17.128	17.630	16.763

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.418	0.507	problematic (MSS not sampling)	0.364	0.175	0.232
	PM-soot 2	0.045	0.031	problematic (MSS not sampling)	0.073	0.004	0.020
	PM-soot 3	0.026	0.028	problematic (MSS not sampling)	0.053	0.004	0.021
	3PM-soot-w	0.117	0.129	problematic (MSS not sampling)	0.128	0.040	0.064
PM mass (mg/mile)	PM-1	1.011	0.974	0.785	0.725	0.577	0.276
	PM-2	0.154	0.303	0.337	0.206	0.208	0.000
	PM-3	0.000	0.282	0.243	0.277	0.000	0.000
	3PM mass-w	0.289	0.436	0.404	0.333	0.228	0.057

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	2.14E+12	2.21E+12	1.58E+12	1.56E+12	1.05E+12	1.30E+12
	SPN-2	6.01E+10	2.06E+10	2.61E+10	1.73E+10	1.64E+10	2.46E+10
	SPN-3	3.47E+11	2.51E+11	1.39E+11	7.03E+10	1.13E+11	8.01E+10
	3SPN-w	5.70E+11	5.37E+11	3.79E+11	3.51E+11	2.57E+11	3.05E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	3.606	3.042	2.188	2.020	2.148	2.506
Acetylene	1.322	1.119	0.766	0.685	0.542	0.718
Ethane	1.853	1.627	1.048	0.940	1.131	1.214
Propylene	1.994	2.142	1.512	1.346	1.433	1.858

Propane	0.431	0.661	0.000	0.000	0.000	0.069
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.416	0.385	0.299	0.261	0.291	0.349
1,3-Butadiene	0.259	0.290	0.114	0.233	0.561	0.108
n-Butane	0.226	0.254	0.199	0.198	0.309	0.308
trans-2-Butene	0.185	0.224	0.162	0.132	0.146	0.200
cis-2-Butene	0.223	0.295	0.238	0.146	0.176	0.217
Isopentane	1.689	1.632	0.951	1.059	0.922	1.050
1-Pentene	0.060	0.052	0.038	0.037	0.031	0.038
n-Pentane	0.650	0.622	0.408	0.427	0.395	0.401
Isoprene	0.058	0.048	0.031	0.019	0.030	0.038
trans-2-Pentene	0.093	0.087	0.055	0.055	0.050	0.060
cis-2-Pentene	0.055	0.052	0.034	0.033	0.030	0.036
2,2-Dimethylbutane	0.105	0.117	0.085	0.073	0.078	0.088
Cyclopentane	0.106	0.081	0.053	0.057	0.052	0.061
2,3-Dimethylbutane	0.306	0.295	0.198	0.201	0.189	0.217
2-Methylpentane	0.902	0.826	0.553	0.599	0.544	0.604
3-Methylpentane	0.534	0.514	0.353	0.353	0.224	0.394
1-Hexene	0.081	0.037	0.031	0.000	0.029	0.028
n-Hexane	0.480	0.430	0.305	0.288	0.286	0.326
Methylcyclopentane	0.511	0.615	0.347	0.330	0.330	0.396
2,4-Dimethylpentane	0.332	0.326	0.236	0.228	0.223	0.268
Benzene	1.613	2.597	1.425	1.148	1.486	2.162
Cyclohexane	0.168	0.168	0.119	0.110	0.113	0.134
2-Methylhexane	0.322	0.316	0.239	0.219	0.221	0.277
2,3-Dimethylpentane	0.498	0.509	0.367	0.353	0.361	0.411
3-Methylhexane	0.570	0.388	0.268	0.246	0.250	0.287
2,2,4-Trimethylpentane	0.742	0.747	0.576	0.535	0.569	0.641
n-Heptane	0.225	0.230	0.154	0.135	0.146	0.183
Methylcyclohexane	0.217	0.242	0.176	0.156	0.175	0.194
2,3,4-Trimethylpentane	0.237	0.230	0.188	0.168	0.170	0.205
Toluene	2.361	2.634	1.866	1.594	1.751	2.326
2-Methylheptane	0.200	0.186	0.160	0.144	0.154	0.184
3-Methylheptane	0.174	0.172	0.140	0.125	0.135	0.164

n-Octane	0.151	0.174	0.135	0.120	0.132	0.152
Ethylbenzene	0.416	0.430	0.316	0.279	0.286	0.382
m/p-Xylenes	1.422	1.572	1.064	0.966	1.021	1.467
Styrene	0.000	0.010	0.000	0.000	0.000	0.000
o-Xylene	0.483	0.533	0.358	0.339	0.341	0.500
Nonane	0.084	0.108	0.083	0.071	0.076	0.093
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.046	0.047	0.033	0.030	0.033	0.038
m-Ethyltoluene	0.334	0.362	0.249	0.238	0.237	0.335
p-Ethyltoluene	0.157	0.165	0.112	0.111	0.116	0.148
1,3,5-Trimethylbenzene	0.300	0.266	0.194	0.173	0.194	0.241
o-Ethyltoluene	0.055	0.124	0.288	0.078	0.080	0.138
1,2,4-Trimethylbenzene	0.455	0.514	0.313	0.277	0.283	0.467
n-Decane	0.009	0.031	0.028	0.000	0.008	0.008
1,2,3-Trimethylbenzene	1.517	0.528	0.688	0.650	0.907	0.394
m-Diethylbenzene	2.337	0.721	1.023	1.064	1.423	0.572
p-Diethylbenzene	0.101	0.085	0.051	0.127	0.067	0.026
n-Undecane	0.000	0.212	0.000	0.000	0.000	0.000
n-Dodecane	0.082	0.037	0.072	0.028	0.033	0.000
Ethanol	1.652	2.063	0.000	1.694	1.644	1.609
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.377	0.382	0.364	0.296	0.290	0.383
Acetaldehyde	0.510	0.511	0.412	0.545	0.551	0.638
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000
Propionaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.035	0.035	0.035	0.000	0.000	0.000
MEK & Butyraldehyde	0.021	0.016	0.016	0.004	0.008	0.012
Benzaldehyde	0.056	0.041	0.051	0.043	0.039	0.043

Valeraldehyde	0.042	0.000	0.041	0.000	0.000	0.000
m-Tolualdehyde	0.061	0.045	0.000	0.036	0.000	0.000
Hexaldehyde	0.460	0.119	0.236	0.172	0.238	0.089

NMOG

		NMOG (g/mile)
E10	Run 1	0.021
	Run 2	0.025
	Run 3	0.018
E15	Run 1	0.017
	Run 2	0.017
	Run 3	0.021

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.033	0.035	0.032	0.021	0.035	0.033
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.005	0.016	0.010	0.008	0.014	0.008
	3N2O-w	0.008	0.012	0.010	0.007	0.011	0.009
NH3	NH3-1	0.007	0.008	0.005	0.005	0.007	0.018
	NH3-2	0.002	0.002	0.002	0.002	0.004	0.002
	NH3-3	0.003	0.003	0.004	0.002	0.003	0.002
	3NH3-w	0.004	0.003	0.003	0.003	0.005	0.006

OFP

	E10	E15
Total OFP (mg O3/mile)	137.434 ± 31.347	114.908 ± 22.752

2018MY Honda Fit

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.051	0.044	0.041	0.039	0.043	0.013
	THC-2	0.001	0.001	0.001	0.001	0.001	0.003
	THC-3	0.002	0.002	0.003	0.003	0.002	0.002
	3THC-w	0.012	0.010	0.010	0.009	0.010	0.005
NMHC Emissions (g/mile)	NMHC-1	0.042	0.037	0.035	0.032	0.036	0.011
	NMHC-2	0.000	0.000	0.000	0.000	0.000	0.003
	NMHC-3	0.001	0.001	0.001	0.001	0.001	0.001
	3NMHC-w	0.009	0.008	0.007	0.007	0.008	0.004
CH4 Emissions (g/mile)	CH4-1	0.008	0.007	0.007	0.007	0.007	0.002
	CH4-2	0.003	0.001	0.001	0.001	0.001	0.000
	CH4-3	0.001	0.001	0.002	0.001	0.001	0.001
	3CH4-W	0.004	0.002	0.002	0.003	0.002	0.001
CO Emissions (g/mile)	CO-1	0.719	0.676	0.719	0.576	0.657	0.102
	CO-2	0.013	0.057	0.208	0.019	0.039	0.024
	CO-3	0.021	0.181	0.191	0.125	0.126	0.072
	3CO-w	0.161	0.219	0.309	0.163	0.191	0.053
NOx Emissions (g/mile)	NOx-1	0.006	0.009	0.012	0.014	0.012	0.007
	NOx-2	0.000	0.000	0.000	0.000	0.000	0.000
	NOx-3	0.001	0.002	0.001	0.001	0.001	0.001
	3NOx-w	0.002	0.003	0.003	0.003	0.003	0.002
CO2 Emissions (g/mile)	CO2-1	249.365	252.123	258.992	240.084	249.881	247.426
	CO2-2	232.468	227.173	235.202	222.212	224.522	225.845
	CO2-3	219.245	214.070	218.064	210.693	212.091	212.994
	3CO2-w	232.337	228.758	235.444	222.759	226.364	226.788
Fuel economy-carbon balanced method (miles per gallon)	FE-1	33.966	33.608	32.713	34.622	33.252	33.710
	FE-2	36.618	37.460	36.146	37.560	37.169	36.954

	FE-3	38.824	39.715	38.986	39.581	39.320	39.170
	3FE-w	36.597	37.155	36.080	37.426	36.823	36.792

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.978	0.901	0.863	0.543	0.650	0.623
	PM-soot 2	0.377	0.319	0.323	0.261	0.208	0.252
	PM-soot 3	0.242	0.221	0.207	0.180	0.158	0.175
	3PM-soot-w	0.464	0.413	0.403	0.297	0.286	0.308
PM mass (mg/mile)	PM-1	4.772	4.489	4.348	2.354	3.208	2.873
	PM-2	0.157	0.600	0.725	0.169	0.179	0.167
	PM-3	0.531	0.757	0.463	0.317	0.297	0.209
	3PM mass-w	1.215	1.449	1.404	0.662	0.839	0.739

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	6.82E+12	6.62E+12	6.41E+12	4.52E+12	5.08E+12	4.70E+12
	SPN-2	2.52E+12	2.04E+12	2.27E+12	1.17E+12	1.04E+12	1.30E+12
	SPN-3	1.54E+12	1.35E+12	1.37E+12	9.23E+11	1.12E+12	1.08E+12
	3SPN-w	3.14E+12	2.80E+12	2.88E+12	1.79E+12	1.90E+12	1.94E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	1.149	0.946	0.815	0.930	0.980	0.910
Acetylene	0.667	0.399	0.420	0.469	0.503	0.431
Ethane	0.400	0.242	0.223	0.280	0.253	0.276
Propylene	0.873	0.696	0.652	0.640	0.692	0.639
Propane	0.142	0.000	0.000	0.132	0.006	0.055
Isobutane	0.000	0.000	0.000	0.000	0.056	0.072
1-Butene	0.146	0.148	0.121	0.122	0.125	0.127

1,3-Butadiene	0.059	0.022	0.034	0.029	0.041	0.041
n-Butane	0.097	0.070	0.100	0.077	0.057	0.062
trans-2-Butene	0.077	0.068	0.065	0.065	0.068	0.064
cis-2-Butene	0.064	0.062	0.054	0.056	0.056	0.057
Isopentane	0.401	0.353	0.359	0.311	0.329	0.287
1-Pentene	0.019	0.017	0.016	0.015	0.015	0.013
n-Pentane	0.168	0.157	0.175	0.144	0.134	0.113
Isoprene	0.031	0.020	0.020	0.013	0.019	0.016
trans-2-Pentene	0.029	0.026	0.025	0.022	0.025	0.023
cis-2-Pentene	0.017	0.016	0.015	0.013	0.015	0.014
2,2-Dimethylbutane	0.037	0.035	0.029	0.029	0.032	0.027
Cyclopentane	0.029	0.025	0.025	0.024	0.024	0.021
2,3-Dimethylbutane	0.103	0.097	0.094	0.079	0.089	0.075
2-Methylpentane	0.307	0.276	0.264	0.224	0.255	0.214
3-Methylpentane	0.192	0.180	0.171	0.145	0.164	0.139
1-Hexene	0.000	0.011	0.000	0.000	0.000	0.000
n-Hexane	0.164	0.153	0.135	0.125	0.138	0.118
Methylcyclopentane	0.213	0.191	0.181	0.156	0.177	0.151
2,4-Dimethylpentane	0.150	0.140	0.131	0.109	0.129	0.105
Benzene	1.047	0.892	0.860	0.784	0.869	0.787
Cyclohexane	0.076	0.067	0.069	0.054	0.062	0.052
2-Methylhexane	0.179	0.163	0.154	0.122	0.151	0.117
2,3-Dimethylpentane	0.248	0.237	0.228	0.183	0.215	0.171
3-Methylhexane	0.184	0.169	0.163	0.127	0.153	0.113
2,2,4-Trimethylpentane	0.382	0.375	0.370	0.290	0.337	0.265
n-Heptane	0.120	0.112	0.106	0.080	0.102	0.075
Methylcyclohexane	0.114	0.107	0.090	0.081	0.092	0.070
2,3,4-Trimethylpentane	0.132	0.129	0.123	0.098	0.115	0.088
Toluene	1.178	1.009	0.972	0.852	0.981	0.855
2-Methylheptane	0.113	0.108	0.125	0.082	0.098	0.075
3-Methylheptane	0.100	0.096	0.695	0.075	0.087	0.067
n-Octane	0.086	0.084	0.074	0.075	0.076	0.057
Ethylbenzene	0.194	0.172	0.170	0.135	0.162	0.143
m/p-Xylenes	0.624	0.522	0.501	0.420	0.512	0.438

Styrene	0.021	0.005	0.000	0.000	0.007	0.000
o-Xylene	0.209	0.177	0.175	0.140	0.168	0.141
Nonane	0.040	0.039	0.030	0.028	0.034	0.023
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.018	0.017	0.000	0.012	0.014	0.012
m-Ethyltoluene	0.132	0.118	0.082	0.086	0.107	0.087
p-Ethyltoluene	0.056	0.054	0.025	0.038	0.047	0.037
1,3,5-Trimethylbenzene	0.090	0.080	0.063	0.057	0.068	0.048
o-Ethyltoluene	0.048	0.037	0.027	0.028	0.033	0.040
1,2,4-Trimethylbenzene	0.157	0.131	0.123	0.092	0.119	0.091
n-Decane	0.008	0.016	0.000	0.025	0.018	0.014
1,2,3-Trimethylbenzene	0.100	0.108	0.072	0.076	0.037	0.023
m-Diethylbenzene	0.104	0.142	0.058	0.078	0.003	0.000
p-Diethylbenzene	0.006	0.009	0.000	0.002	0.001	0.000
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.012	0.000	0.000	0.000	0.000	0.012
Ethanol	0.694	0.481	0.563	1.091	1.089	0.990
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.104	0.081	0.108	0.074	0.075	0.087
Acetaldehyde	0.190	0.155	0.148	0.185	0.222	0.212
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.254	0.276	0.301	0.313	0.307	0.171
Propionaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.019	0.014	0.006	0.009	0.014	0.003
Benzaldehyde	0.015	0.000	0.000	0.000	0.000	0.000
Valeraldehyde	0.017	0.023	0.000	0.000	0.021	0.017
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.017	0.023	0.009	0.013	0.002	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.009
	Run 2	0.008
	Run 3	0.008
E15	Run 1	0.007
	Run 2	0.008
	Run 3	0.005

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.013	0.020	0.021	0.030	0.032	0.011
	N2O-2	0.000	0.001	0.000	0.000	0.000	0.000
	N2O-3	0.001	0.013	0.010	0.003	0.005	0.005
	3N2O-w	0.003	0.008	0.007	0.007	0.008	0.004
NH3	NH3-1	0.002	0.002	0.001	0.001	0.001	0.001
	NH3-2	0.001	0.001	0.005	0.002	0.003	0.005
	NH3-3	0.003	0.002	0.003	0.005	0.043	0.004
	3NH3-w	0.002	0.001	0.004	0.003	0.014	0.004

OFP

	E10	E15
Total OFP (mg O3/mile)	44.525 ± 8.004	34.386 ± 6.682

2020MY Jeep Compass

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.052	0.053	0.047	0.044	0.051	0.051
	THC-2	0.002	0.001	0.001	0.001	0.002	0.001
	THC-3	0.005	0.003	0.003	0.003	0.004	0.003
	3THC-w	0.013	0.012	0.011	0.011	0.012	0.012
NMHC Emissions (g/mile)	NMHC-1	0.039	0.038	0.034	0.034	0.036	0.037
	NMHC-2	0.001	0.000	0.001	0.000	0.000	0.000
	NMHC-3	0.001	0.000	0.000	0.000	0.001	0.000
	3NMHC-w	0.009	0.008	0.008	0.007	0.008	0.008
CH4 Emissions (g/mile)	CH4-1	0.013	0.015	0.013	0.010	0.014	0.014
	CH4-2	0.001	0.001	0.001	0.001	0.001	0.001
	CH4-3	0.003	0.003	0.003	0.003	0.003	0.003
	3CH4-W	0.004	0.004	0.004	0.003	0.005	0.004
CO Emissions (g/mile)	CO-1	1.691	2.294	1.687	1.283	1.731	1.741
	CO-2	0.131	0.148	0.138	0.244	0.190	0.218
	CO-3	0.560	0.404	0.315	0.355	0.307	0.253
	3CO-w	0.572	0.662	0.508	0.490	0.541	0.543
NOx Emissions (g/mile)	NOx-1	0.007	0.010	0.004	0.004	0.009	0.003
	NOx-2	0.002	0.002	0.001	0.002	0.002	0.002
	NOx-3	0.005	0.004	0.003	0.005	0.003	0.002
	3NOx-w	0.004	0.004	0.002	0.003	0.004	0.002
CO2 Emissions (g/mile)	CO2-1	371.188	393.442	383.242	355.765	367.147	364.265
	CO2-2	361.352	360.932	363.457	354.474	360.273	358.772
	CO2-3	312.558	309.694	307.007	296.342	301.201	299.135
	3CO2-w	349.976	353.598	352.056	338.776	345.489	343.534
Fuel economy-carbon balanced method (miles per gallon)	FE-1	22.763	21.433	22.054	23.323	22.560	22.736
	FE-2	23.546	23.572	23.409	23.523	23.151	23.245
	FE-3	27.160	27.433	27.685	28.115	27.669	27.868

	3FE-w	24.261	24.003	24.125	24.582	24.100	24.236

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run 2	Run 3	Run1	Run 1	Run 2
Black carbon (mg/mile)	PM-soot 1	problematic (MSS not operating, fuse burned)	1.099	1.067	problematic (secondary dilution not operating)	1.095	0.840
	PM-soot 2	problematic (MSS not operating, fuse burned)	0.356	0.422	problematic (secondary dilution not operating)	0.390	0.396
	PM-soot 3	problematic (MSS not operating, fuse burned)	0.229	0.262	problematic (secondary dilution not operating)	0.240	0.243
	3PM-soot-w	problematic (MSS not operating, fuse burned)	0.474	0.512	problematic (secondary dilution not operating)	0.495	0.446
PM mass (mg/mile)	PM-1	6.299	4.890	4.353	2.578	4.516	3.956
	PM-2	0.170	0.000	0.082	0.000	0.106	0.022
	PM-3	0.101	0.029	0.036	0.000	0.000	0.000
	3PM mass-w	1.422	1.019	0.954	0.534	0.988	0.830

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	9.34E+12	8.14E+12	7.52E+12	5.24E+12	7.20E+12	6.41E+12
	SPN-2	6.01E+11	4.91E+11	7.56E+11	4.85E+11	6.84E+11	6.00E+11
	SPN-3	3.59E+11	4.18E+11	3.39E+11	2.29E+11	2.03E+11	1.93E+11
	3SPN-w	2.35E+12	2.05E+12	2.04E+12	1.40E+12	1.90E+12	1.69E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	1.025	0.638	0.895	0.801	0.917	0.923
Acetylene	0.295	0.238	0.362	0.266	0.625	0.514
Ethane	0.558	0.338	0.451	0.280	0.556	0.434

Propylene	0.844	0.527	0.728	0.578	0.709	0.693
Propane	0.151	0.100	0.159	0.000	0.174	0.187
Isobutane	0.000	0.000	0.000	0.000	0.000	0.071
1-Butene	0.138	0.080	0.112	0.101	0.116	0.103
1,3-Butadiene	0.011	0.072	0.041	0.038	0.044	0.040
n-Butane	0.147	0.137	0.135	0.159	0.166	0.135
trans-2-Butene	0.085	0.053	0.071	0.062	0.071	0.066
cis-2-Butene	0.067	0.041	0.057	0.052	0.057	0.052
Isopentane	0.531	0.649	0.466	0.623	0.589	0.772
1-Pentene	0.020	0.000	0.000	0.000	0.000	0.019
n-Pentane	0.237	0.246	0.225	0.272	0.259	0.296
Isoprene	0.014	0.011	0.016	0.013	0.017	0.017
trans-2-Pentene	0.034	0.035	0.031	0.038	0.034	0.042
cis-2-Pentene	0.019	0.020	0.000	0.022	0.020	0.024
2,2-Dimethylbutane	0.045	0.048	0.040	0.046	0.044	0.050
Cyclopentane	0.034	0.037	0.031	0.038	0.037	0.044
2,3-Dimethylbutane	0.117	0.120	0.105	0.126	0.118	0.135
2-Methylpentane	0.330	0.324	0.293	0.352	0.328	0.371
3-Methylpentane	0.210	0.261	0.182	0.219	0.207	0.229
1-Hexene	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.170	0.156	0.149	0.176	0.166	0.179
Methylcyclopentane	0.214	0.188	0.188	0.219	0.207	0.225
2,4-Dimethylpentane	0.143	0.126	0.124	0.139	0.135	0.139
Benzene	0.826	0.527	0.694	0.569	0.684	0.690
Cyclohexane	0.072	0.060	0.062	0.071	0.068	0.072
2-Methylhexane	0.136	0.105	0.113	0.126	0.128	0.126
2,3-Dimethylpentane	0.208	0.176	0.182	0.200	0.197	0.197
3-Methylhexane	0.137	0.098	0.127	0.119	0.135	0.117
2,2,4-Trimethylpentane	0.320	0.262	0.277	0.292	0.302	0.289
n-Heptane	0.078	0.048	0.063	0.061	0.075	0.068
Methylcyclohexane	0.091	0.050	0.073	0.080	0.079	0.075
2,3,4-Trimethylpentane	0.100	0.077	0.086	0.088	0.094	0.088
Toluene	0.968	0.675	0.874	0.773	1.050	0.844
2-Methylheptane	0.090	0.067	0.075	0.074	0.082	0.075

3-Methylheptane	0.079	0.060	0.073	0.065	0.073	0.066
n-Octane	0.078	0.058	0.073	0.066	0.081	0.071
Ethylbenzene	0.167	0.117	0.152	0.127	0.156	0.150
m/p-Xylenes	0.526	0.380	0.481	0.399	0.497	0.481
Styrene	0.000	0.000	0.000	0.000	0.000	0.000
o-Xylene	0.174	0.125	0.158	0.131	0.159	0.154
Nonane	0.035	0.030	0.032	0.027	0.032	0.029
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
m-Ethyltoluene	0.117	0.090	0.106	0.087	0.103	0.101
p-Ethyltoluene	0.053	0.042	0.055	0.042	0.049	0.047
1,3,5-Trimethylbenzene	0.082	0.044	0.063	0.052	0.061	0.055
o-Ethyltoluene	0.043	0.029	0.159	0.024	0.033	0.031
1,2,4-Trimethylbenzene	0.125	0.096	0.117	0.088	0.106	0.106
n-Decane	0.023	0.004	0.020	0.026	0.046	0.044
1,2,3-Trimethylbenzene	0.269	0.031	0.216	0.251	0.191	0.141
m-Diethylbenzene	0.423	0.000	0.264	0.381	0.213	0.185
p-Diethylbenzene	0.026	0.000	0.011	0.018	0.004	0.000
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.022	0.000	0.034	0.000	0.019	0.023
Ethanol	0.000	0.506	0.649	1.335	1.632	1.666
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.064	0.020	0.055	0.111	0.125	0.066
Acetaldehyde	0.214	0.233	0.225	0.279	0.348	0.268
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.097	0.196	0.347	0.440	0.625	0.165
Propionaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.005	0.000	0.011	0.000	0.007	0.000

Benzaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.058	0.003	0.050	0.067	0.051	0.025

NMOG

		NMOG (g/mile)
E10	Run 1	0.009
	Run 2	0.008
	Run 3	0.008
E15	Run 1	0.008
	Run 2	0.009
	Run 3	0.009

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.023	0.021	0.024	0.012	0.038	0.025
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.003	0.004	0.008	0.001	0.005	0.001
	3N2O-w	0.006	0.005	0.007	0.003	0.009	0.006
NH3	NH3-1	0.004	0.004	0.004	0.005	0.007	0.012
	NH3-2	0.001	0.035	0.002	0.002	0.002	0.003
	NH3-3	0.001	0.009	0.006	0.007	0.007	0.002
	3NH3-w	0.002	0.022	0.004	0.004	0.005	0.004

OFP

	E10	E15
Total OFP (mg O3/mile)	63.072 ± 10.961	63.407 ± 5.860

2016MY Nissan Rogue

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.070	0.075	0.080	0.081	0.071	0.069
	THC-2	0.001	0.001	0.001	0.002	0.001	0.001
	THC-3	0.008	0.008	0.009	0.008	0.009	0.008
	3THC-w	0.017	0.018	0.019	0.020	0.018	0.017
NMHC Emissions (g/mile)	NMHC-1	0.063	0.067	0.071	0.073	0.062	0.062
	NMHC-2	0.000	0.001	0.000	0.001	0.000	0.000
	NMHC-3	0.004	0.004	0.004	0.004	0.005	0.004
	3NMHC-w	0.014	0.015	0.016	0.017	0.014	0.014
CH4 Emissions (g/mile)	CH4-1	0.008	0.008	0.009	0.008	0.009	0.008
	CH4-2	0.001	0.001	0.000	0.001	0.001	0.001
	CH4-3	0.004	0.004	0.005	0.004	0.005	0.004
	3CH4-W	0.003	0.003	0.003	0.003	0.004	0.003
CO Emissions (g/mile)	CO-1	0.680	0.831	0.809	0.766	0.791	0.610
	CO-2	0.049	0.109	0.024	0.023	0.010	0.000
	CO-3	0.468	0.462	0.543	0.452	0.439	0.472
	3CO-w	0.296	0.355	0.329	0.295	0.290	0.256
NOx Emissions (g/mile)	NOx-1	0.055	0.060	0.082	0.041	0.037	0.046
	NOx-2	0.000	0.001	0.000	0.000	0.000	0.000
	NOx-3	0.004	0.011	0.011	0.000	0.000	0.000
	3NOx-w	0.013	0.016	0.020	0.009	0.008	0.010
CO2 Emissions (g/mile)	CO2-1	316.785	313.073	317.639	306.398	314.439	323.699
	CO2-2	299.331	296.412	294.582	289.652	300.738	305.213
	CO2-3	273.936	273.423	269.372	250.764	271.512	272.936
	3CO2-w	295.968	293.557	292.445	282.439	295.544	300.170
Fuel economy-carbon balanced method (miles per gallon)	FE-1	27.116	26.425	25.696	26.766	27.061	26.675
	FE-2	28.815	27.755	27.350	28.434	28.705	28.896
	FE-3	33.191	30.664	30.499	30.992	31.051	31.502

	3FE-w	29.501	28.196	27.767	28.714	28.940	29.054

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.099	0.066	0.120	0.090	0.087	0.141
	PM-soot 2	0.027	0.018	0.033	0.031	0.036	0.023
	PM-soot 3	0.024	0.019	0.028	0.030	0.031	0.024
	3PM-soot-w	0.041	0.028	0.050	0.043	0.045	0.048
PM mass (mg/mile)	PM-1	0.212	0.176	0.169	0.016	0.256	0.115
	PM-2	0.079	0.097	0.000	0.000	0.016	0.000
	PM-3	0.000	0.051	0.024	0.001	0.000	0.000
	3PM mass-w	0.085	0.101	0.042	0.004	0.061	0.024

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	4.68E+11	3.16E+11	3.89E+11	3.55E+11	3.46E+11	4.86E+11
	SPN-2	8.57E+09	4.43E+09	9.30E+09	1.40E+10	2.69E+10	1.28E+10
	SPN-3	1.39E+10	1.24E+10	1.56E+10	1.91E+10	2.75E+10	2.19E+10
	3SPN-w	1.06E+11	7.12E+10	8.98E+10	8.64E+10	9.33E+10	1.14E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	1.377	1.304	1.530	1.327	1.286	1.328
Acetylene	1.101	1.235	0.784	0.927	1.082	0.858
Ethane	0.686	0.538	0.658	0.688	0.539	0.558
Propylene	1.038	0.999	1.161	0.925	0.895	0.978
Propane	0.133	0.000	0.043	0.251	0.000	0.025
Isobutane	0.000	0.000	0.000	0.000	0.383	0.146
1-Butene	0.162	0.153	0.181	0.145	0.143	0.151
1,3-Butadiene	0.056	0.000	0.080	0.101	0.076	0.312

n-Butane	0.121	0.093	0.108	0.276	0.261	0.242
trans-2-Butene	0.078	0.079	0.090	0.077	0.074	0.082
cis-2-Butene	0.058	0.060	0.068	0.059	0.059	0.059
Isopentane	1.204	1.263	1.371	1.908	1.249	1.177
1-Pentene	0.037	0.035	0.038	0.049	0.036	0.038
n-Pentane	0.488	0.445	0.502	0.686	0.524	0.422
Isoprene	0.060	0.037	0.074	0.055	0.051	0.056
trans-2-Pentene	0.057	0.057	0.063	0.091	0.056	0.056
cis-2-Pentene	0.033	0.033	0.037	0.052	0.032	0.033
2,2-Dimethylbutane	0.098	0.083	0.111	0.137	0.102	0.097
Cyclopentane	0.073	0.075	0.078	0.099	0.072	0.070
2,3-Dimethylbutane	0.261	0.179	0.300	0.373	0.275	0.259
2-Methylpentane	0.715	0.418	0.827	1.011	0.747	0.829
3-Methylpentane	0.455	0.276	0.528	0.637	0.475	0.492
1-Hexene	0.000	0.000	0.000	0.024	0.020	0.000
n-Hexane	0.357	0.131	0.416	0.494	0.375	0.359
Methylcyclopentane	0.443	0.387	0.519	0.614	0.462	0.472
2,4-Dimethylpentane	0.312	0.045	0.359	0.398	0.316	0.303
Benzene	0.754	0.200	0.842	0.691	0.752	0.771
Cyclohexane	0.148	0.130	0.173	0.200	0.157	0.150
2-Methylhexane	0.339	0.000	0.401	0.435	0.347	0.334
2,3-Dimethylpentane	0.496	0.029	0.580	0.625	0.512	0.478
3-Methylhexane	0.343	0.000	0.403	0.479	0.369	0.401
2,2,4-Trimethylpentane	0.712	0.032	0.834	0.858	0.737	0.726
n-Heptane	0.199	0.000	0.239	0.277	0.214	0.198
Methylcyclohexane	0.191	0.000	0.230	0.276	0.231	0.201
2,3,4-Trimethylpentane	0.230	0.000	0.266	0.270	0.243	0.230
Toluene	3.382	0.000	1.415	1.353	1.256	1.220
2-Methylheptane	0.167	0.000	0.210	0.208	0.188	0.195
3-Methylheptane	0.162	0.000	0.187	0.184	0.171	0.164
n-Octane	0.129	0.000	0.149	0.160	0.166	0.140
Ethylbenzene	0.254	0.000	0.294	0.259	0.232	0.237
m/p-Xylenes	0.850	0.000	0.995	0.863	0.778	0.798
Styrene	0.012	0.000	0.016	0.000	0.000	0.001

o-Xylene	0.290	0.000	0.341	0.298	0.266	0.276
Nonane	0.058	0.000	0.068	0.063	0.056	0.063
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.032	0.000	0.038	0.035	0.031	0.031
m-Ethyltoluene	0.209	0.000	0.250	0.200	0.182	0.190
p-Ethyltoluene	0.102	0.000	0.123	0.098	0.093	0.096
1,3,5-Trimethylbenzene	0.120	0.000	0.148	0.150	0.138	0.116
o-Ethyltoluene	0.062	0.000	0.064	0.052	0.047	0.048
1,2,4-Trimethylbenzene	0.249	0.000	0.300	0.221	0.200	0.219
n-Decane	0.036	0.000	0.030	0.051	0.105	0.063
1,2,3-Trimethylbenzene	0.047	0.000	0.047	0.529	0.496	0.156
m-Diethylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
p-Diethylbenzene	0.000	0.000	0.000	0.066	0.070	0.015
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.000	0.000	0.032	0.000	0.043	0.000
Ethanol	1.039	1.223	1.370	3.121	2.222	2.039
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.337	0.254	0.297	0.300	0.419	0.349
Acetaldehyde	0.451	0.423	0.459	0.592	0.561	0.600
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.339	0.058	0.045	0.524	0.290	0.315
Propionaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.028	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.022	0.007	0.004	0.003	0.000	0.000
Benzaldehyde	0.038	0.036	0.040	0.026	0.028	0.031
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.027	0.000	0.106	0.076	0.004

NMOG

		NMOG (g/mile)
E10	Run 1	0.015
	Run 2	0.016
	Run 3	0.017
E15	Run 1	0.018
	Run 2	0.016
	Run 3	0.015

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.134	0.130	0.217	0.153	0.101	0.083
	N2O-2	0.011	0.003	0.000	0.000	0.000	0.000
	N2O-3	0.019	0.035	0.042	0.010	0.000	0.017
	3N2O-w	0.039	0.038	0.057	0.034	0.021	0.022
NH3	NH3-1	0.001	0.006	0.002	0.007	0.014	0.005
	NH3-2	0.003	0.001	0.004	0.001	0.001	0.001
	NH3-3	0.004	0.003	0.006	0.025	0.002	0.002
	3NH3-w	0.003	0.003	0.004	0.009	0.004	0.002

OFP

	E10	E15
Total OFP (mg O3/mile)	72.396 ± 13.385	78.596 ± 10.443

2019MY Toyota Rav4

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.068	0.071	0.075	0.068	0.073	0.073
	THC-2	0.001	0.002	0.002	0.002	0.002	0.002
	THC-3	0.006	0.005	0.007	0.006	0.007	0.007
	3THC-w	0.017	0.017	0.018	0.017	0.018	0.018
NMHC Emissions (g/mile)	NMHC-1	0.056	0.058	0.061	0.056	0.059	0.059
	NMHC-2	0.000	0.000	0.001	0.000	0.000	0.000
	NMHC-3	0.002	0.001	0.003	0.002	0.002	0.002
	3NMHC-w	0.012	0.012	0.014	0.012	0.013	0.013
CH4 Emissions (g/mile)	CH4-1	0.012	0.012	0.014	0.012	0.014	0.014
	CH4-2	0.001	0.002	0.001	0.002	0.002	0.002
	CH4-3	0.005	0.004	0.005	0.004	0.005	0.005
	3CH4-W	0.004	0.005	0.005	0.005	0.005	0.005
CO Emissions (g/mile)	CO-1	1.122	1.268	1.449	1.255	1.259	1.278
	CO-2	0.000	0.000	0.000	0.018	0.000	0.000
	CO-3	0.000	0.000	0.000	0.081	0.000	0.036
	3CO-w	0.233	0.263	0.300	0.291	0.261	0.275
NOx Emissions (g/mile)	NOx-1	0.006	0.006	0.006	0.007	0.006	0.005
	NOx-2	0.003	0.004	0.003	0.003	0.004	0.004
	NOx-3	0.002	0.005	0.002	0.002	0.002	0.002
	3NOx-w	0.004	0.004	0.004	0.004	0.004	0.004
CO2 Emissions (g/mile)	CO2-1	278.183	276.321	274.536	271.206	274.465	274.590
	CO2-2	269.736	269.301	265.573	263.781	268.712	267.625
	CO2-3	242.529	240.782	239.129	238.280	238.709	239.592
	3CO2-w	264.012	262.914	260.179	258.323	261.655	261.372
Fuel economy-carbon balanced method (miles per gallon)	FE-1	30.389	30.566	30.730	30.535	30.173	30.156
	FE-2	31.562	31.613	32.056	31.642	31.065	31.191
	FE-3	35.100	35.355	35.599	35.011	34.967	34.830

	3FE-w	32.196	32.324	32.655	32.251	31.847	31.878

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.116	0.099	0.108	0.103	0.115	0.102
	PM-soot 2	0.079	0.074	0.068	0.033	0.030	0.037
	PM-soot 3	0.058	0.037	0.040	0.019	0.017	0.024
	3PM-soot-w	0.081	0.069	0.069	0.044	0.044	0.047
PM mass (mg/mile)	PM-1	0.041	0.148	0.062	0.362	0.052	0.195
	PM-2	0.063	0.026	0.056	0.000	0.012	0.000
	PM-3	0.000	0.062	0.161	0.060	0.000	0.012
	3PM mass-w	0.041	0.061	0.086	0.092	0.017	0.044

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	9.45E+11	9.35E+11	1.12E+12	9.87E+11	1.05E+12	9.00E+11
	SPN-2	1.30E+12	1.29E+12	1.22E+12	6.91E+11	7.17E+11	7.42E+11
	SPN-3	7.40E+11	5.86E+11	6.63E+11	2.71E+11	2.90E+11	4.34E+11
	3SPN-w	1.07E+12	1.02E+12	1.05E+12	6.37E+11	6.69E+11	6.90E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	2.518	2.580	2.744	2.612	1.871	2.579
Acetylene	0.971	1.013	0.879	0.942	0.945	0.958
Ethane	0.615	0.598	0.828	0.743	0.296	0.643
Propylene	1.484	1.531	1.610	1.429	1.515	1.516
Propane	0.037	0.000	0.244	0.261	0.000	0.032
Isobutane	0.226	0.109	0.000	0.000	0.000	0.000
1-Butene	0.275	0.264	0.278	0.269	0.265	0.256
1,3-Butadiene	0.072	0.105	0.063	0.059	0.070	0.057

n-Butane	0.181	0.156	0.040	0.056	0.022	0.074
trans-2-Butene	0.199	0.210	0.240	0.208	0.203	0.207
cis-2-Butene	0.181	0.183	0.212	0.196	0.180	0.183
Isopentane	0.394	0.450	0.429	0.368	0.400	0.440
1-Pentene	0.022	0.023	0.023	0.021	0.000	0.023
n-Pentane	0.160	0.182	0.156	0.171	0.158	0.188
Isoprene	0.024	0.029	0.026	0.022	0.024	0.026
trans-2-Pentene	0.035	0.039	0.042	0.035	0.036	0.038
cis-2-Pentene	0.021	0.023	0.024	0.021	0.022	0.023
2,2-Dimethylbutane	0.038	0.041	0.042	0.033	0.040	0.041
Cyclopentane	0.035	0.039	0.036	0.029	0.031	0.036
2,3-Dimethylbutane	0.094	0.108	0.106	0.085	0.104	0.106
2-Methylpentane	0.263	0.310	0.294	0.246	0.289	0.292
3-Methylpentane	0.169	0.197	0.194	0.169	0.185	0.192
1-Hexene	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.154	0.167	0.169	0.173	0.165	0.165
Methylcyclopentane	0.184	0.202	0.203	0.178	0.198	0.201
2,4-Dimethylpentane	0.128	0.151	0.147	0.119	0.145	0.142
Benzene	1.359	1.355	1.361	1.233	1.364	1.300
Cyclohexane	0.068	0.084	0.074	0.063	0.071	0.072
2-Methylhexane	0.126	0.160	0.148	0.115	0.145	0.142
2,3-Dimethylpentane	0.199	0.229	0.226	0.179	0.218	0.218
3-Methylhexane	0.143	0.164	0.148	0.103	0.136	0.138
2,2,4-Trimethylpentane	0.324	0.357	0.364	0.299	0.358	0.356
n-Heptane	0.073	0.089	0.092	0.059	0.090	0.087
Methylcyclohexane	0.086	0.093	0.103	0.076	0.082	0.097
2,3,4-Trimethylpentane	0.105	0.115	0.120	0.099	0.117	0.116
Toluene	1.890	1.911	1.967	1.773	1.918	1.948
2-Methylheptane	0.099	0.214	0.108	0.091	0.104	0.103
3-Methylheptane	0.089	0.157	0.096	0.081	0.094	0.092
n-Octane	0.090	0.135	0.095	0.084	0.083	0.087
Ethylbenzene	0.280	0.277	0.322	0.290	0.295	0.301
m/p-Xylenes	1.012	0.971	1.117	0.981	1.050	1.075
Styrene	0.016	0.006	0.021	0.016	0.018	0.029

o-Xylene	0.300	0.289	0.333	0.293	0.314	0.320
Nonane	0.038	0.032	0.039	0.036	0.040	0.042
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.024	0.000	0.027	0.021	0.023	0.024
m-Ethyltoluene	0.191	0.167	0.222	0.195	0.203	0.208
p-Ethyltoluene	0.095	0.082	0.109	0.095	0.098	0.099
1,3,5-Trimethylbenzene	0.112	0.065	0.132	0.110	0.109	0.120
o-Ethyltoluene	0.072	0.043	0.054	0.042	0.066	0.136
1,2,4-Trimethylbenzene	0.235	0.170	0.271	0.231	0.249	0.269
n-Decane	0.052	0.000	0.071	0.058	0.025	0.035
1,2,3-Trimethylbenzene	0.177	0.000	0.225	0.174	0.030	0.083
m-Diethylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
p-Diethylbenzene	0.020	0.000	0.031	0.021	0.000	0.006
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.024	0.000	0.029	0.000	0.021	0.000
Ethanol	0.642	0.492	0.377	0.726	0.735	0.960
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.215	0.152	0.090	0.117	0.074	0.165
Acetaldehyde	0.246	0.276	0.256	0.353	0.377	0.406
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.234	0.513	0.000	0.130	0.029	0.129
Propionaldehyde	0.000	0.028	0.000	0.000	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.000	0.016	0.000	0.000	0.003	0.000
Benzaldehyde	0.031	0.032	0.065	0.033	0.034	0.025
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.000	0.034	0.029	0.000	0.004

NMOG

		NMOG (g/mile)
E10	Run 1	0.013
	Run 2	0.013
	Run 3	0.014
E15	Run 1	0.012
	Run 2	0.013
	Run 3	0.013

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.075	0.037	0.052	0.038	0.027	0.052
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.000	0.004	0.002	0.004	0.001	0.002
	3N2O-w	0.016	0.009	0.011	0.009	0.006	0.011
NH3	NH3-1	0.019	0.010	0.006	0.002	0.012	0.006
	NH3-2	0.003	0.002	0.001	0.001	0.007	0.001
	NH3-3	0.003	0.003	0.002	0.001	0.004	0.002
	3NH3-w	0.006	0.004	0.002	0.001	0.007	0.002

OFP

	E10	E15
Total OFP (mg O3/mile)	65.692 ± 7.465	65.705 ± 4.458

2018MY Honda Civic

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.056	0.050	0.052	0.055	0.057	0.058
	THC-2	0.002	0.002	0.002	0.002	0.002	0.002
	THC-3	0.005	0.005	0.005	0.005	0.005	0.005
	3THC-w	0.014	0.013	0.013	0.014	0.014	0.014
NMHC Emissions (g/mile)	NMHC-1	0.042	0.036	0.038	0.040	0.042	0.043
	NMHC-2	0.000	0.000	0.000	0.000	0.000	0.000
	NMHC-3	0.001	0.000	0.000	0.000	0.000	0.001
	3NMHC-w	0.009	0.008	0.008	0.008	0.009	0.009
CH4 Emissions (g/mile)	CH4-1	0.014	0.014	0.014	0.015	0.015	0.015
	CH4-2	0.002	0.002	0.002	0.002	0.002	0.002
	CH4-3	0.004	0.004	0.004	0.005	0.005	0.004
	3CH4-W	0.005	0.005	0.005	0.005	0.005	0.005
CO Emissions (g/mile)	CO-1	0.551	0.564	0.547	0.576	0.594	0.671
	CO-2	0.000	0.004	0.000	0.051	0.019	0.000
	CO-3	0.137	0.087	0.075	0.055	0.096	0.076
	3CO-w	0.152	0.143	0.134	0.161	0.159	0.159
NOx Emissions (g/mile)	NOx-1	0.033	0.040	0.029	0.021	0.033	0.027
	NOx-2	0.008	0.012	0.009	0.007	0.008	0.011
	NOx-3	0.004	0.006	0.005	0.004	0.004	0.005
	3NOx-w	0.012	0.016	0.012	0.009	0.012	0.012
CO2 Emissions (g/mile)	CO2-1	249.307	246.154	250.288	251.998	247.922	243.396
	CO2-2	259.711	266.573	259.234	258.285	259.830	257.230
	CO2-3	217.897	217.610	222.404	218.164	221.817	220.333
	3CO2-w	246.056	248.902	247.297	245.979	246.973	244.301
Fuel economy-carbon balanced method (miles per gallon)	FE-1	32.986	33.521	34.124	34.007	34.441	33.877
	FE-2	32.309	32.123	32.451	32.780	31.935	32.840
	FE-3	38.245	37.604	37.863	39.030	39.095	38.257
	3FE-w	33.896	33.760	34.128	34.560	34.168	34.391

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	1.996	1.373	0.540	1.930	1.207	1.061
	PM-soot 2	0.083	0.124	0.084	0.082	0.087	0.093
	PM-soot 3	0.099	0.173	0.112	0.116	0.198	0.106
	3PM-soot-w	0.484	0.396	0.186	0.474	0.348	0.296
PM mass (mg/mile)	PM-1	2.460	1.653	2.671	2.113	1.559	1.302
	PM-2	0.079	0.121	0.236	0.080	0.103	0.123
	PM-3	0.166	0.324	0.252	0.241	0.426	0.156
	3PM mass-w	0.596	0.494	0.744	0.545	0.492	0.375

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	4.69E+12	3.48E+12	1.30E+12	3.55E+12	3.15E+12	3.06E+12
	SPN-2	3.96E+11	6.29E+11	3.50E+11	3.63E+11	4.20E+11	3.96E+11
	SPN-3	3.46E+11	4.51E+11	3.24E+11	2.72E+11	3.74E+11	3.41E+11
	3SPN-w	1.27E+12	1.17E+12	5.39E+11	9.98E+11	9.70E+11	9.31E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	1.301	0.980	0.687	0.832	0.729	0.786
Acetylene	0.342	0.201	0.303	0.395	0.425	0.445
Ethane	0.691	0.511	0.462	0.466	0.386	0.469
Propylene	0.528	0.375	0.489	0.573	0.487	0.528
Propane	0.132	0.000	0.221	0.021	0.000	0.065
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.081	0.053	0.066	0.087	0.071	0.080
1,3-Butadiene	0.049	0.000	0.023	0.096	0.068	0.054
n-Butane	0.058	0.043	0.050	0.066	0.055	0.059

trans-2-Butene	0.047	0.036	0.042	0.050	0.045	0.048
cis-2-Butene	0.037	0.028	0.033	0.040	0.036	0.039
Isopentane	0.890	0.817	0.755	0.813	0.883	0.812
1-Pentene	0.016	0.012	0.011	0.016	0.015	0.014
n-Pentane	0.307	0.289	0.268	0.284	0.317	0.286
Isoprene	0.019	0.007	0.013	0.020	0.016	0.014
trans-2-Pentene	0.026	0.020	0.022	0.026	0.026	0.024
cis-2-Pentene	0.015	0.011	0.012	0.015	0.015	0.014
2,2-Dimethylbutane	0.072	0.069	0.066	0.068	0.075	0.068
Cyclopentane	0.043	0.040	0.037	0.046	0.044	0.041
2,3-Dimethylbutane	0.183	0.168	0.164	0.164	0.189	0.173
2-Methylpentane	0.488	0.445	0.437	0.441	0.502	0.465
3-Methylpentane	0.313	0.284	0.280	0.277	0.321	0.297
1-Hexene	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.240	0.216	0.221	0.208	0.251	0.231
Methylcyclopentane	0.287	0.258	0.258	0.255	0.296	0.273
2,4-Dimethylpentane	0.214	0.160	0.191	0.171	0.223	0.202
Benzene	0.602	0.461	0.576	0.505	0.567	0.622
Cyclohexane	0.097	0.087	0.087	0.087	0.101	0.093
2-Methylhexane	0.237	0.144	0.209	0.159	0.250	0.228
2,3-Dimethylpentane	0.358	0.238	0.317	0.253	0.369	0.337
3-Methylhexane	0.238	0.137	0.218	0.153	0.256	0.234
2,2,4-Trimethylpentane	0.530	0.236	0.468	0.307	0.549	0.503
n-Heptane	0.151	0.061	0.130	0.071	0.156	0.143
Methylcyclohexane	0.141	0.095	0.115	0.092	0.136	0.131
2,3,4-Trimethylpentane	0.176	0.044	0.150	0.065	0.181	0.165
Toluene	0.665	0.342	0.591	0.223	0.678	0.717
2-Methylheptane	0.132	0.017	0.111	0.031	0.132	0.121
3-Methylheptane	0.119	0.018	0.099	0.027	0.119	0.108
n-Octane	0.097	0.000	0.081	0.000	0.091	0.087
Ethylbenzene	0.122	0.016	0.092	0.013	0.115	0.117
m/p-Xylenes	0.444	0.044	0.343	0.020	0.430	0.415
Styrene	0.003	0.000	0.000	0.000	0.000	0.000
o-Xylene	0.156	0.012	0.118	0.000	0.151	0.143

Nonane	0.045	0.000	0.032	0.000	0.043	0.038
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.013	0.000	0.000	0.000	0.012	0.011
m-Ethyltoluene	0.097	0.000	0.061	0.000	0.082	0.077
p-Ethyltoluene	0.047	0.000	0.029	0.000	0.039	0.038
1,3,5-Trimethylbenzene	0.086	0.000	0.053	0.000	0.073	0.063
o-Ethyltoluene	0.028	0.000	0.026	0.000	0.023	0.019
1,2,4-Trimethylbenzene	0.138	0.000	0.089	0.000	0.126	0.104
n-Decane	0.035	0.000	0.025	0.000	0.017	0.019
1,2,3-Trimethylbenzene	0.138	0.000	0.008	0.000	0.009	0.037
m-Diethylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
p-Diethylbenzene	0.025	0.000	0.000	0.000	0.000	0.000
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.000	0.000	0.020	0.000	0.000	0.000
Ethanol	0.316	0.141	0.219	0.621	0.459	0.548
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.286	0.140	0.202	0.242	0.184	0.245
Acetaldehyde	0.278	0.198	0.245	0.325	0.307	0.358
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.009	0.000	0.000	0.024	0.000	0.000
Propionaldehyde	0.019	0.016	0.017	0.018	0.000	0.020
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.017	0.016	0.016	0.000	0.000	0.000
MEK & Butyraldehyde	0.020	0.016	0.010	0.010	0.001	0.011
Benzaldehyde	0.024	0.015	0.016	0.019	0.021	0.020
Valeraldehyde	0.000	0.000	0.017	0.000	0.000	0.016
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.008	0.010	0.000	0.000	0.000	0.011

NMOG

		NMOG (g/mile)
E10	Run 1	0.009
	Run 2	0.008
	Run 3	0.008
E15	Run 1	0.009
	Run 2	0.009
	Run 3	0.010

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.081	0.084	0.113	0.100	0.078	0.072
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.001	0.001	0.001	0.000	0.000	0.000
	3N2O-w	0.017	0.018	0.024	0.021	0.016	0.015
NH3	NH3-1	0.004	0.002	0.006	0.002	0.004	0.001
	NH3-2	0.002	0.001	0.003	0.003	0.002	0.001
	NH3-3	0.002	0.001	0.002	0.001	0.001	0.001
	3NH3-w	0.002	0.001	0.003	0.002	0.002	0.001

OFP

	E10	E15
Total OFP (mg O3/mile)	33.625 ± 7.251	36.910 ± 5.066

2016MY Mazda3

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.029	0.035	0.038	0.030	0.038	0.039
	THC-2	0.001	0.001	0.001	0.001	0.000	0.001
	THC-3	0.008	0.008	0.009	0.007	0.005	0.007
	3THC-w	0.009	0.010	0.011	0.009	0.010	0.010
NMHC Emissions (g/mile)	NMHC-1	0.021	0.026	0.028	0.023	0.029	0.031
	NMHC-2	0.000	0.000	0.000	0.000	0.000	0.000
	NMHC-3	0.001	0.001	0.001	0.001	0.001	0.001
	3NMHC-w	0.005	0.006	0.006	0.005	0.006	0.007
CH4 Emissions (g/mile)	CH4-1	0.008	0.009	0.010	0.006	0.009	0.008
	CH4-2	0.001	0.001	0.001	0.001	0.001	0.001
	CH4-3	0.007	0.006	0.008	0.006	0.004	0.005
	3CH4-W	0.004	0.004	0.005	0.003	0.004	0.004
CO Emissions (g/mile)	CO-1	0.196	0.250	0.259	0.187	0.343	0.316
	CO-2	0.000	0.000	0.000	0.021	0.000	0.000
	CO-3	0.001	0.025	0.023	0.031	0.005	0.007
	3CO-w	0.041	0.059	0.060	0.058	0.072	0.067
NOx Emissions (g/mile)	NOx-1	0.014	0.016	0.015	0.022	0.015	0.012
	NOx-2	0.009	0.010	0.010	0.013	0.012	0.011
	NOx-3	0.010	0.012	0.011	0.009	0.010	0.014
	3NOx-w	0.010	0.012	0.011	0.014	0.012	0.012
CO2 Emissions (g/mile)	CO2-1	242.479	258.155	253.165	259.585	267.505	258.679
	CO2-2	235.109	238.981	238.463	249.290	255.458	251.715
	CO2-3	210.566	219.706	220.153	217.975	218.215	218.668
	3CO2-w	229.902	237.663	236.480	242.835	247.729	244.091
Fuel economy-carbon balanced method (miles per gallon)	FE-1	32.110	31.129	32.194	35.052	32.915	33.559
	FE-2	33.481	32.677	33.162	36.210	35.623	35.701
	FE-3	38.284	38.250	38.169	40.426	38.738	38.659
	3FE-w	34.359	33.677	34.180	37.016	35.803	35.981

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	3.814	4.910	5.643	4.303	4.575	3.869
	PM-soot 2	0.059	0.071	0.105	0.062	0.071	0.046
	PM-soot 3	0.377	0.330	0.150	0.216	0.155	0.100
	3PM-soot-w	0.923	1.144	1.264	0.982	1.027	0.852
PM mass (mg/mile)	PM-1	4.057	5.338	6.026	4.714	4.876	4.469
	PM-2	0.020	0.028	0.073	0.000	0.071	0.076
	PM-3	0.453	0.488	0.269	0.307	0.317	0.285
	3PM mass-w	0.974	1.254	1.359	1.060	1.134	1.043

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	5.07E+12	6.60E+12	7.11E+12	6.09E+12	7.01E+12	5.87E+12
	SPN-2	2.94E+11	3.15E+11	4.05E+11	2.48E+11	2.45E+11	1.82E+11
	SPN-3	1.13E+12	9.83E+11	5.23E+11	6.63E+11	4.99E+11	2.89E+11
	3SPN-w	1.51E+12	1.80E+12	1.82E+12	1.57E+12	1.72E+12	1.39E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	0.727	0.473	0.518	0.470	0.458	0.992
Acetylene	0.217	0.245	0.361	0.159	0.216	0.241
Ethane	0.399	0.217	0.351	0.195	0.256	0.456
Propylene	0.302	0.350	0.387	0.345	0.369	0.382
Propane	0.057	0.000	0.035	0.000	0.107	0.036
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.049	0.055	0.060	0.055	0.060	0.062
1,3-Butadiene	0.011	0.009	0.020	0.024	0.040	0.000
n-Butane	0.020	0.010	0.014	0.010	0.014	0.020
trans-2-Butene	0.031	0.035	0.037	0.035	0.039	0.041

cis-2-Butene	0.021	0.025	0.026	0.023	0.028	0.030
Isopentane	0.356	0.380	0.425	0.395	0.372	0.431
1-Pentene	0.011	0.012	0.013	0.012	0.013	0.014
n-Pentane	0.138	0.139	0.141	0.142	0.127	0.177
Isoprene	0.000	0.004	0.006	0.002	0.002	0.004
trans-2-Pentene	0.016	0.020	0.021	0.019	0.019	0.022
cis-2-Pentene	0.000	0.011	0.012	0.000	0.011	0.012
2,2-Dimethylbutane	0.030	0.036	0.040	0.035	0.035	0.038
Cyclopentane	0.016	0.021	0.022	0.021	0.021	0.023
2,3-Dimethylbutane	0.084	0.091	0.101	0.090	0.093	0.099
2-Methylpentane	0.224	0.243	0.270	0.235	0.248	0.265
3-Methylpentane	0.145	0.154	0.175	0.151	0.160	0.170
1-Hexene	0.029	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.108	0.121	0.137	0.118	0.127	0.136
Methylcyclopentane	0.139	0.143	0.159	0.139	0.153	0.165
2,4-Dimethylpentane	0.102	0.115	0.129	0.111	0.125	0.128
Benzene	0.296	0.367	0.387	0.309	0.438	0.449
Cyclohexane	0.041	0.049	0.055	0.047	0.053	0.057
2-Methylhexane	0.101	0.121	0.135	0.111	0.139	0.140
2,3-Dimethylpentane	0.163	0.190	0.214	0.180	0.213	0.219
3-Methylhexane	0.098	0.118	0.138	0.113	0.152	0.144
2,2,4-Trimethylpentane	0.262	0.307	0.343	0.289	0.345	0.351
n-Heptane	0.055	0.073	0.083	0.064	0.087	0.091
Methylcyclohexane	0.079	0.065	0.085	0.063	0.080	0.098
2,3,4-Trimethylpentane	0.090	0.109	0.124	0.103	0.130	0.129
Toluene	0.407	0.427	0.457	0.371	0.453	0.494
2-Methylheptane	0.060	0.083	0.093	0.076	0.098	0.102
3-Methylheptane	0.084	0.076	0.085	0.069	0.089	0.091
n-Octane	0.075	0.068	0.091	0.060	0.074	0.082
Ethylbenzene	0.116	0.089	0.097	0.084	0.099	0.114
m/p-Xylenes	0.329	0.284	0.302	0.265	0.320	0.394
Styrene	0.000	0.000	0.000	0.000	0.000	0.000
o-Xylene	0.091	0.098	0.104	0.092	0.108	0.135
Nonane	0.024	0.033	0.037	0.032	0.041	0.043

Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.000	0.011	0.013	0.000	0.011	0.015
m-Ethyltoluene	0.067	0.077	0.084	0.078	0.085	0.109
p-Ethyltoluene	0.034	0.035	0.041	0.041	0.041	0.055
1,3,5-Trimethylbenzene	0.056	0.062	0.077	0.057	0.069	0.100
o-Ethyltoluene	0.000	0.018	0.022	0.034	0.024	0.032
1,2,4-Trimethylbenzene	0.069	0.094	0.098	0.087	0.101	0.132
n-Decane	0.018	0.027	0.067	0.022	0.017	0.034
1,2,3-Trimethylbenzene	0.147	0.028	0.168	0.067	0.004	0.242
m-Diethylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
p-Diethylbenzene	0.022	0.002	0.026	0.006	0.000	0.041
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.019	0.000	0.032	0.000	0.000	0.023
Ethanol	0.055	0.007	0.037	0.073	0.139	0.208
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.145	0.111	0.133	0.117	0.077	0.177
Acetaldehyde	0.146	0.143	0.158	0.204	0.127	0.232
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.016	0.000	0.000	0.000	0.000	0.000
Propionaldehyde	0.000	0.015	0.016	0.000	0.000	0.017
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.014	0.015	0.000	0.000
MEK & Butyraldehyde	0.006	0.007	0.007	0.004	0.003	0.012
Benzaldehyde	0.017	0.016	0.015	0.016	0.000	0.018
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.019	0.000	0.024	0.009	0.000	0.030

NMOG

		NMOG (g/mile)
E10	Run 1	0.005
	Run 2	0.006
	Run 3	0.006
E15	Run 1	0.005
	Run 2	0.006
	Run 3	0.007

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.022	0.032	0.025	0.016	0.014	0.027
	N2O-2	0.001	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.005	0.007	0.012	0.006	0.011	0.009
	3N2O-w	0.006	0.009	0.009	0.005	0.006	0.008
NH3	NH3-1	0.001	0.006	0.004	0.001	0.002	0.003
	NH3-2	0.001	0.002	0.001	0.001	0.002	0.001
	NH3-3	0.001	0.002	0.001	0.001	0.002	0.001
	3NH3-w	0.001	0.003	0.002	0.001	0.002	0.001

OFP

	E10	E15
Total OFP (mg O3/mile)	22.569 ± 3.004	24.787 ± 4.746

2020MY Ford Fusion

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.138	0.142	0.142	0.139	0.128	0.133
	THC-2	0.003	0.004	0.003	0.004	0.003	0.004
	THC-3	0.018	0.017	0.024	0.015	0.019	0.019
	3THC-w	0.035	0.036	0.038	0.035	0.033	0.035
NMHC Emissions (g/mile)	NMHC-1	0.111	0.110	0.110	0.106	0.100	0.103
	NMHC-2	0.000	0.000	0.000	0.000	0.000	0.000
	NMHC-3	0.006	0.006	0.010	0.005	0.008	0.006
	3NMHC-w	0.025	0.025	0.026	0.024	0.023	0.023
CH4 Emissions (g/mile)	CH4-1	0.027	0.032	0.032	0.033	0.028	0.029
	CH4-2	0.004	0.004	0.003	0.004	0.003	0.003
	CH4-3	0.012	0.011	0.014	0.010	0.011	0.013
	3CH4-W	0.011	0.011	0.012	0.011	0.010	0.011
CO Emissions (g/mile)	CO-1	1.892	3.089	3.011	2.766	2.010	2.055
	CO-2	0.006	0.022	0.000	0.000	0.000	0.028
	CO-3	2.150	1.280	2.118	0.724	1.137	1.780
	3CO-w	0.985	1.005	1.205	0.772	0.729	0.929
NOx Emissions (g/mile)	NOx-1	0.039	0.037	0.041	0.038	0.040	0.042
	NOx-2	0.005	0.008	0.006	0.005	0.006	0.005
	NOx-3	0.007	0.010	0.003	0.003	0.017	0.013
	3NOx-w	0.013	0.014	0.013	0.011	0.016	0.015
CO2 Emissions (g/mile)	CO2-1	362.250	361.791	371.797	374.556	370.648	365.181
	CO2-2	354.885	352.294	356.649	364.319	358.537	351.843
	CO2-3	296.953	296.538	299.016	308.313	298.918	297.969
	3CO2-w	340.514	338.931	343.962	351.070	344.679	339.817
Fuel economy-carbon balance method (miles per gallon)	FE-1	22.007	22.309	22.634	23.283	23.192	22.584
	FE-2	22.912	23.282	23.722	23.988	24.163	23.870
	FE-3	26.971	27.755	27.749	28.342	28.511	28.152
	3FE-w	23.689	24.131	24.452	24.881	24.994	24.607

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	4.401	4.625	4.672	3.711	4.727	4.729
	PM-soot 2	0.299	0.278	0.285	0.257	0.267	0.264
	PM-soot 3	0.347	0.368	0.417	0.362	0.407	0.382
	3PM-soot-w	1.162	1.206	1.230	1.002	1.230	1.222
PM mass (mg/mile)	PM-1	5.494	5.852	6.142	5.410	6.209	6.134
	PM-2	0.255	0.167	0.410	0.240	0.294	0.259
	PM-3	0.453	0.523	0.701	0.546	0.577	0.528
	3PM mass-w	1.395	1.446	1.677	1.396	1.598	1.551

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	7.81E+12	7.78E+12	7.88E+12	7.84E+12	8.01E+12	8.23E+12
	SPN-2	5.76E+11	5.49E+11	5.65E+11	5.38E+11	5.33E+11	5.31E+11
	SPN-3	6.33E+11	6.40E+11	6.81E+11	6.08E+11	6.24E+11	6.21E+11
	3SPN-w	2.09E+12	2.08E+12	2.11E+12	2.07E+12	2.11E+12	2.15E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	2.039	1.618	1.980	1.719	1.697	1.644
Acetylene	0.684	0.995	0.818	0.562	0.752	0.772
Ethane	0.944	0.852	0.992	0.851	0.830	0.786
Propylene	1.882	1.643	1.822	1.540	1.557	1.652
Propane	0.037	0.045	0.046	0.032	0.062	0.074
Isobutane	0.000	0.000	0.000	0.016	0.000	0.000
1-Butene	0.349	0.243	0.260	0.233	0.230	0.242
1,3-Butadiene	0.209	0.201	0.143	0.198	0.211	0.229
n-Butane	0.084	0.086	0.099	0.154	0.118	0.110
trans-2-Butene	0.173	0.132	0.141	0.126	0.123	0.128
cis-2-Butene	0.151	0.102	0.106	0.095	0.091	0.095

Isopentane	1.374	1.419	1.542	1.449	1.245	1.281
1-Pentene	0.055	0.047	0.051	0.048	0.049	0.049
n-Pentane	0.463	0.472	0.523	0.504	0.439	0.447
Isoprene	0.078	0.071	0.006	0.076	0.078	0.084
trans-2-Pentene	0.073	0.060	0.064	0.062	0.059	0.061
cis-2-Pentene	0.043	0.036	0.038	0.037	0.035	0.036
2,2-Dimethylbutane	0.116	0.119	0.128	0.117	0.107	0.109
Cyclopentane	0.067	0.066	0.073	0.070	0.061	0.064
2,3-Dimethylbutane	0.302	0.304	0.332	0.298	0.271	0.278
2-Methylpentane	0.821	0.847	0.904	0.826	0.752	0.773
3-Methylpentane	0.529	0.526	0.572	0.514	0.474	0.484
1-Hexene	0.032	0.024	0.026	0.028	0.027	0.027
n-Hexane	0.424	0.418	0.453	0.411	0.385	0.389
Methylcyclopentane	0.524	0.522	0.558	0.506	0.460	0.481
2,4-Dimethylpentane	0.407	0.396	0.425	0.385	0.355	0.368
Benzene	2.348	2.383	2.921	2.376	2.153	2.019
Cyclohexane	0.183	0.177	0.190	0.177	0.165	0.170
2-Methylhexane	0.511	0.499	0.541	0.486	0.449	0.465
2,3-Dimethylpentane	0.708	0.697	0.764	0.682	0.628	0.647
3-Methylhexane	0.538	0.530	0.568	0.522	0.476	0.496
2,2,4-Trimethylpentane	1.099	1.081	1.169	1.057	0.977	1.009
n-Heptane	0.353	0.342	0.381	0.332	0.312	0.328
Methylcyclohexane	0.325	0.308	0.338	0.309	0.283	0.304
2,3,4-Trimethylpentane	0.399	0.391	0.418	0.383	0.349	0.369
Toluene	2.233	1.761	2.141	1.915	1.931	1.992
2-Methylheptane	0.300	0.301	0.309	0.287	0.292	0.289
3-Methylheptane	0.300	0.293	0.310	0.287	0.267	0.272
n-Octane	0.248	0.241	0.255	0.238	0.232	0.232
Ethylbenzene	0.499	0.400	0.427	0.392	0.375	0.405
m/p-Xylenes	1.588	1.393	1.497	1.377	1.296	1.435
Styrene	0.122	0.113	0.104	0.112	0.109	0.128
o-Xylene	0.585	0.516	0.553	0.491	0.510	0.529
Nonane	0.138	0.136	0.141	0.132	0.122	0.129
Isopropylbenzene	0.012	0.011	0.010	0.010	0.011	0.011

n-Propylbenzene	0.060	0.048	0.054	0.052	0.050	0.052
m-Ethyltoluene	0.442	0.366	0.396	0.358	0.285	0.320
p-Ethyltoluene	0.199	0.164	0.186	0.154	0.144	0.155
1,3,5-Trimethylbenzene	0.323	0.297	0.325	0.307	0.281	0.303
o-Ethyltoluene	0.137	0.110	0.124	0.112	0.111	0.128
1,2,4-Trimethylbenzene	0.558	0.489	0.528	0.508	0.440	0.521
n-Decane	0.060	0.058	0.059	0.077	0.088	0.060
1,2,3-Trimethylbenzene	0.120	0.093	0.110	0.257	0.322	0.168
m-Diethylbenzene	0.027	0.000	0.009	0.239	0.387	0.110
p-Diethylbenzene	0.145	0.088	0.106	0.106	0.089	0.170
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.015	0.000	0.000	0.028	0.032	0.011
Ethanol	0.744	0.667	0.152	1.406	1.076	1.039
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.662	0.735	0.756	0.839	0.749	0.767
Acetaldehyde	0.462	0.491	0.514	0.687	0.711	0.703
Acrolein	0.052	0.059	0.066	0.063	0.074	0.071
Acetone	0.012	0.000	0.000	0.065	0.021	0.000
Propionaldehyde	0.043	0.034	0.036	0.037	0.039	0.038
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.041	0.041	0.045	0.044	0.051	0.050
MEK & Butyraldehyde	0.032	0.018	0.018	0.023	0.027	0.022
Benzaldehyde	0.058	0.058	0.064	0.061	0.066	0.065
Valeraldehyde	0.018	0.000	0.000	0.000	0.018	0.020
m-Tolualdehyde	0.018	0.019	0.024	0.022	0.020	0.021
Hexaldehyde	0.001	0.000	0.000	0.001	0.008	0.003

NMOG

NMOG (g/mile)

E10	Run 1	0.025
	Run 2	0.026
	Run 3	0.026
E15	Run 1	0.025
	Run 2	0.024
	Run 3	0.024

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.217	0.197	0.213	Instrument problematic	0.184	0.140
	N2O-2	0.005	0.005	0.005	Instrument problematic	0.003	0.003
	N2O-3	0.112	0.135	0.161	Instrument problematic	0.070	0.087
	3N2O-w	0.078	0.081	0.091	Instrument problematic	0.059	0.055
NH3	NH3-1	0.005	0.006	0.002	Instrument problematic	0.003	0.004
	NH3-2	0.010	0.014	0.016	Instrument problematic	0.005	0.014
	NH3-3	0.005	0.006	0.008	Instrument problematic	0.008	0.005
	3NH3-w	0.008	0.010	0.011	Instrument problematic	0.006	0.009

OFP

	E10	E15
Total OFP (mg O3/mile)	145.504 ± 13.766	132.095 ± 11.178

2019MY Chevrolet Impala

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.029	0.028	0.040	0.033	0.032	0.031
	THC-2	0.001	0.001	0.001	0.001	0.001	0.001
	THC-3	0.002	0.002	0.002	0.003	0.003	0.003
	3THC-w	0.007	0.007	0.009	0.008	0.008	0.008
NMHC Emissions (g/mile)	NMHC-1	0.023	0.021	0.031	0.025	0.023	0.023
	NMHC-2	0.001	0.000	0.000	0.000	0.000	0.001
	NMHC-3	0.000	0.000	0.000	0.000	0.000	0.000
	3NMHC-w	0.005	0.005	0.007	0.005	0.005	0.005
CH4 Emissions (g/mile)	CH4-1	0.006	0.007	0.010	0.007	0.009	0.008
	CH4-2	0.000	0.000	0.000	0.001	0.001	0.000
	CH4-3	0.002	0.002	0.002	0.002	0.003	0.003
	3CH4-W	0.002	0.002	0.003	0.003	0.003	0.003
CO Emissions (g/mile)	CO-1	0.429	0.767	1.022	0.801	1.156	1.054
	CO-2	0.000	0.000	0.018	0.020	0.035	0.029
	CO-3	0.113	0.133	0.172	0.216	0.157	0.178
	3CO-w	0.120	0.195	0.268	0.236	0.301	0.282
NOx Emissions (g/mile)	NOx-1	0.017	0.003	0.003	0.004	0.004	0.003
	NOx-2	0.000	0.000	0.000	0.000	0.000	0.000
	NOx-3	0.001	0.000	0.001	0.001	0.001	0.000
	3NOx-w	0.004	0.001	0.001	0.001	0.001	0.001
CO2 Emissions (g/mile)	CO2-1	396.787	398.541	395.511	387.665	389.675	393.421
	CO2-2	414.801	413.452	408.632	407.259	402.723	405.805
	CO2-3	336.365	338.320	334.046	331.860	328.988	333.710
	3CO2-w	389.517	389.767	385.463	382.472	379.770	383.487
Fuel economy-carbon balanced method (miles per gallon)	FE-1	21.415	21.293	21.431	21.458	21.317	21.124
	FE-2	20.524	20.591	20.832	20.495	20.725	20.568
	FE-3	25.296	25.148	25.465	25.128	25.354	24.993

	3FE-w	21.845	21.824	22.061	21.803	21.952	21.741

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	8.211	10.085	9.414	6.016	6.306	5.654
	PM-soot 2	1.320	1.482	1.200	0.771	0.743	0.584
	PM-soot 3	1.734	1.113	1.243	0.823	0.841	0.816
	3PM-soot-w	2.862	3.162	2.912	1.872	1.923	1.697
PM mass (mg/mile)	PM-1	9.459	11.288	10.840	6.906	7.381	6.856
	PM-2	1.392	1.552	1.179	0.797	0.657	0.704
	PM-3	2.097	1.267	1.332	0.991	0.821	1.067
	3PM mass-w	3.257	3.490	3.221	2.116	2.096	2.077

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	1.34E+13	1.51E+13	1.48E+13	1.12E+13	1.13E+13	1.08E+13
	SPN-2	2.80E+12	3.03E+12	2.49E+12	1.85E+12	1.72E+12	1.49E+12
	SPN-3	3.27E+12	2.39E+12	2.78E+12	2.04E+12	2.02E+12	2.00E+12
	3SPN-w	5.12E+12	5.36E+12	5.12E+12	3.84E+12	3.80E+12	3.55E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	0.306	0.391	0.606	0.496	0.472	0.488
Acetylene	0.280	0.063	0.146	0.060	0.057	0.072
Ethane	0.103	0.146	0.187	0.123	0.149	0.148
Propylene	0.201	0.360	0.553	0.428	0.397	0.398
Propane	0.000	0.014	0.061	0.000	0.000	0.000
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.027	0.055	0.100	0.068	0.076	0.072
1,3-Butadiene	0.000	0.013	0.051	0.026	0.012	0.015
n-Butane	0.046	0.015	0.029	0.013	0.009	0.007
trans-2-Butene	0.000	0.033	0.064	0.039	0.044	0.041
cis-2-Butene	0.000	0.024	0.046	0.028	0.033	0.031
Isopentane	0.356	0.318	0.526	0.459	0.373	0.337
1-Pentene	0.000	0.013	0.024	0.015	0.014	0.012
n-Pentane	0.149	0.131	0.199	0.165	0.130	0.119
Isoprene	0.000	0.008	0.017	0.011	0.005	0.008
trans-2-Pentene	0.000	0.021	0.033	0.028	0.024	0.022
cis-2-Pentene	0.000	0.012	0.019	0.016	0.013	0.013
2,2-Dimethylbutane	0.027	0.025	0.039	0.034	0.029	0.027
Cyclopentane	0.021	0.020	0.030	0.026	0.023	0.021
2,3-Dimethylbutane	0.066	0.070	0.110	0.095	0.078	0.074
2-Methylpentane	0.187	0.194	0.303	0.261	0.214	0.205
3-Methylpentane	0.120	0.124	0.195	0.167	0.137	0.130
1-Hexene	0.000	0.000	0.081	0.000	0.000	0.000
n-Hexane	0.098	0.101	0.241	0.130	0.107	0.103
Methylcyclopentane	0.109	0.123	0.200	0.165	0.132	0.128
2,4-Dimethylpentane	0.075	0.084	0.132	0.108	0.090	0.086
Benzene	0.347	0.416	0.649	0.486	0.520	0.547
Cyclohexane	0.036	0.041	0.067	0.054	0.043	0.042
2-Methylhexane	0.069	0.078	0.140	0.108	0.085	0.086
2,3-Dimethylpentane	0.109	0.124	0.207	0.165	0.134	0.130
3-Methylhexane	0.080	0.084	0.153	0.119	0.088	0.081
2,2,4-Trimethylpentane	0.169	0.180	0.290	0.226	0.197	0.192

n-Heptane	0.041	0.041	0.079	0.057	0.044	0.044
Methylcyclohexane	0.035	0.051	0.086	0.067	0.046	0.046
2,3,4-Trimethylpentane	0.051	0.058	0.095	0.072	0.061	0.060
Toluene	0.427	0.407	0.664	0.479	0.438	0.427
2-Methylheptane	0.043	0.048	0.076	0.056	0.048	0.041
3-Methylheptane	0.038	0.042	0.067	0.050	0.043	0.044
n-Octane	0.041	0.046	0.060	0.045	0.037	0.039
Ethylbenzene	0.072	0.073	0.118	0.084	0.078	0.079
m/p-Xylenes	0.225	0.220	0.356	0.256	0.232	0.233
Styrene	0.000	0.000	0.000	0.000	0.000	0.000
o-Xylene	0.092	0.083	0.131	0.088	0.076	0.080
Nonane	0.021	0.017	0.021	0.016	0.016	0.016
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.000	0.000	0.011	0.000	0.000	0.000
m-Ethyltoluene	0.026	0.049	0.063	0.041	0.047	0.050
p-Ethyltoluene	0.022	0.026	0.030	0.022	0.022	0.025
1,3,5-Trimethylbenzene	0.036	0.051	0.054	0.038	0.029	0.033
o-Ethyltoluene	0.012	0.017	0.027	0.018	0.014	0.017
1,2,4-Trimethylbenzene	0.047	0.063	0.090	0.057	0.053	0.059
n-Decane	0.025	0.049	0.025	0.021	0.011	0.018
1,2,3-Trimethylbenzene	0.238	0.332	0.183	0.142	0.049	0.086
m-Diethylbenzene	0.422	0.460	0.238	0.227	0.064	0.120
p-Diethylbenzene	0.026	0.067	0.034	0.028	0.008	0.016
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.025	0.072	0.026	0.000	0.000	0.000
Ethanol	0.598	0.410	0.581	0.623	0.299	0.522
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.200	0.135	0.143	0.075	0.138	0.117
Acetaldehyde	0.130	0.118	0.158	0.180	0.185	0.171
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000
Propionaldehyde	0.000	0.000	0.015	0.000	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.000	0.006	0.005	0.006	0.002	0.003
Benzaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.018	0.033	0.019	0.015	0.000	0.004

NMOG

		NMOG (g/mile)
E10	Run 1	0.006
	Run 2	0.005
	Run 3	0.007
E15	Run 1	0.006
	Run 2	0.005
	Run 3	0.005

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.016	0.002	0.004	0.039	0.020	0.009
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.000	0.000	0.000	0.000	0.001	0.000
	3N2O-w	0.003	0.000	0.001	0.008	0.004	0.002

NH3	NH3-1	0.002	0.002	0.003	0.020	0.025	0.009
	NH3-2	0.001	0.001	0.002	0.002	0.002	0.002
	NH3-3	0.002	0.002	0.004	0.002	0.004	0.003
	3NH3-w	0.002	0.002	0.003	0.006	0.007	0.004

OFP

	E10	E15
Total OFP (mg O3/mile)	35.645 ± 10.360	33.882 ± 4.475

2021MY Chevrolet Spark

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.027	0.036	0.037	0.027	0.030	0.032
	THC-2	0.001	0.001	0.001	0.000	0.000	0.000
	THC-3	0.002	0.002	0.002	0.002	0.002	0.002
	3THC-w	0.007	0.008	0.009	0.006	0.007	0.008
NMHC Emissions (g/mile)	NMHC-1	0.024	0.030	0.031	0.026	0.025	0.028
	NMHC-2	0.001	0.000	0.001	0.000	0.000	0.000
	NMHC-3	0.001	0.000	0.001	0.000	0.000	0.000
	3NMHC-w	0.006	0.007	0.007	0.005	0.005	0.006
CH4 Emissions (g/mile)	CH4-1	0.003	0.005	0.005	0.002	0.005	0.005
	CH4-2	0.000	0.000	0.000	0.000	0.000	0.001
	CH4-3	0.001	0.001	0.002	0.002	0.002	0.002
	3CH4-W	0.001	0.002	0.002	0.001	0.002	0.002
CO Emissions (g/mile)	CO-1	0.253	0.581	0.578	0.447	0.475	0.492
	CO-2	0.000	0.000	0.000	0.049	0.028	0.000
	CO-3	0.030	0.009	0.016	0.036	0.025	0.000
	3CO-w	0.061	0.123	0.124	0.128	0.120	0.102
NOx Emissions (g/mile)	NOx-1	0.023	0.014	0.013	0.011	0.014	0.014
	NOx-2	0.005	0.006	0.004	0.006	0.008	0.006
	NOx-3	0.004	0.003	0.005	0.006	0.005	0.006
	3NOx-w	0.008	0.007	0.006	0.007	0.009	0.007
CO2 Emissions (g/mile)	CO2-1	227.279	231.951	230.156	227.089	230.557	226.510
	CO2-2	210.859	214.497	211.781	209.421	213.663	213.241
	CO2-3	205.812	204.756	202.196	199.515	202.229	203.110
	3CO2-w	212.875	215.439	212.957	210.358	214.025	213.204
Fuel economy-carbon balanced method (miles per gallon)	FE-1	37.379	36.543	36.827	36.633	36.076	36.712
	FE-2	40.375	39.690	40.199	39.846	39.061	39.146
	FE-3	41.354	41.574	42.098	41.827	41.269	41.097

	3FE-w	39.971	39.477	39.936	39.642	38.965	39.120

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.220	0.257	0.221	0.208	0.201	0.189
	PM-soot 2	0.020	0.021	0.021	0.020	0.023	0.023
	PM-soot 3	0.019	0.019	0.020	0.016	0.018	0.019
	3PM-soot-w	0.061	0.069	0.062	0.058	0.059	0.056
PM mass (mg/mile)	PM-1	0.384	0.256	0.320	0.189	0.236	0.209
	PM-2	0.095	0.000	0.080	0.000	0.000	0.000
	PM-3	0.081	0.000	0.097	0.000	0.000	0.074
	3PM mass-w	0.151	0.053	0.135	0.039	0.049	0.063

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	7.41E+11	7.59E+11	7.45E+11	6.59E+11	6.74E+11	6.00E+11
	SPN-2	8.79E+09	9.19E+09	1.10E+10	8.76E+09	9.36E+09	9.35E+09
	SPN-3	1.30E+10	1.46E+10	1.54E+10	1.22E+10	9.01E+09	9.87E+09
	3SPN-w	1.62E+11	1.66E+11	1.64E+11	1.44E+11	1.47E+11	1.32E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	0.370	0.713	0.737	0.329	0.581	0.682
Acetylene	0.025	0.339	0.164	0.023	0.153	0.294
Ethane	0.124	0.277	0.346	0.097	0.228	0.283
Propylene	0.252	0.483	0.530	0.198	0.368	0.397
Propane	0.000	0.026	0.057	0.000	0.000	0.013
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.040	0.080	0.097	0.040	0.064	0.066
1,3-Butadiene	0.001	0.038	0.037	0.000	0.023	0.018

n-Butane	0.040	0.034	0.039	0.004	0.034	0.041
trans-2-Butene	0.028	0.053	0.063	0.025	0.041	0.045
cis-2-Butene	0.020	0.041	0.061	0.026	0.032	0.034
Isopentane	0.805	0.727	0.677	0.391	0.598	0.718
1-Pentene	0.017	0.019	0.018	0.010	0.016	0.018
n-Pentane	0.279	0.254	0.255	0.122	0.194	0.252
Isoprene	0.007	0.015	0.013	0.001	0.010	0.009
trans-2-Pentene	0.041	0.040	0.039	0.022	0.032	0.038
cis-2-Pentene	0.023	0.022	0.025	0.012	0.018	0.021
2,2-Dimethylbutane	0.050	0.046	0.044	0.027	0.038	0.045
Cyclopentane	0.037	0.034	0.032	0.021	0.029	0.037
2,3-Dimethylbutane	0.130	0.119	0.113	0.068	0.099	0.119
2-Methylpentane	0.346	0.322	0.327	0.182	0.266	0.319
3-Methylpentane	0.212	0.199	0.188	0.114	0.164	0.192
1-Hexene	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.156	0.149	0.154	0.085	0.127	0.148
Methylcyclopentane	0.185	0.177	0.181	0.100	0.148	0.174
2,4-Dimethylpentane	0.116	0.114	0.117	0.065	0.098	0.113
Benzene	0.273	0.525	0.649	1.104	2.012	0.444
Cyclohexane	0.056	0.056	0.064	0.031	0.047	0.055
2-Methylhexane	0.098	0.102	0.100	0.047	0.084	0.099
2,3-Dimethylpentane	0.159	0.160	0.158	0.087	0.136	0.157
3-Methylhexane	0.102	0.106	0.121	0.041	0.082	0.099
2,2,4-Trimethylpentane	0.215	0.225	0.245	0.127	0.197	0.221
n-Heptane	0.047	0.052	0.060	0.016	0.039	0.051
Methylcyclohexane	0.052	0.052	0.053	0.017	0.041	0.048
2,3,4-Trimethylpentane	0.063	0.068	0.069	0.038	0.059	0.066
Toluene	0.349	0.594	0.770	0.269	0.479	0.508
2-Methylheptane	0.040	0.046	0.052	0.028	0.045	0.049
3-Methylheptane	0.038	0.045	0.048	0.026	0.041	0.044
n-Octane	0.041	0.041	0.051	0.022	0.042	0.040
Ethylbenzene	0.071	0.113	0.158	0.051	0.091	0.090
m/p-Xylenes	0.225	0.358	0.464	0.159	0.293	0.286
Styrene	0.000	0.002	0.016	0.000	0.000	0.000

o-Xylene	0.077	0.118	0.165	0.052	0.096	0.092
Nonane	0.016	0.020	0.025	0.011	0.019	0.018
Isopropylbenzene	0.000	0.000	0.013	0.000	0.000	0.000
n-Propylbenzene	0.000	0.011	0.036	0.000	0.000	0.000
m-Ethyltoluene	0.061	0.091	0.110	0.041	0.080	0.073
p-Ethyltoluene	0.031	0.042	0.059	0.019	0.039	0.036
1,3,5-Trimethylbenzene	0.045	0.053	0.078	0.016	0.043	0.042
o-Ethyltoluene	0.022	0.030	0.046	0.009	0.027	0.017
1,2,4-Trimethylbenzene	0.070	0.106	0.140	0.050	0.095	0.085
n-Decane	0.029	0.012	0.044	0.004	0.032	0.020
1,2,3-Trimethylbenzene	0.196	0.078	0.079	0.000	0.046	0.074
m-Diethylbenzene	0.274	0.104	0.081	0.000	0.045	0.103
p-Diethylbenzene	0.049	0.020	0.008	0.000	0.010	0.017
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.029	0.000	0.031	0.000	0.000	0.000
Ethanol	0.467	0.533	0.793	0.499	0.900	1.034
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.075	0.145	0.205	0.157	0.155	0.132
Acetaldehyde	0.186	0.231	0.239	0.237	0.262	0.265
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000
Propionaldehyde	0.000	0.020	0.016	0.016	0.015	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.000	0.009	0.002	0.003	0.000	0.001
Benzaldehyde	0.000	0.014	0.019	0.000	0.017	0.015
Valeraldehyde	0.000	0.025	0.000	0.000	0.000	0.016
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.009	0.033	0.000	0.000	0.000	0.004

NMOG

		NMOG (g/mile)
E10	Run 1	0.006
	Run 2	0.007
	Run 3	0.007
E15	Run 1	0.005
	Run 2	0.006
	Run 3	0.006

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	Instrument problematic	0.027	0.024	0.030	0.027	0.031
	N2O-2	Instrument problematic	0.000	0.000	0.001	0.001	0.001
	N2O-3	Instrument problematic	0.031	0.020	0.047	0.039	0.047
	3N2O-w	Instrument problematic	0.014	0.011	0.019	0.016	0.020
NH3	NH3-1	Instrument problematic	0.003	0.001	0.001	0.001	0.001
	NH3-2	Instrument problematic	0.001	0.001	0.004	0.003	0.002
	NH3-3	Instrument problematic	0.001	0.001	0.001	0.001	0.001
	3NH3-w	Instrument problematic	0.001	0.001	0.002	0.002	0.002

OFP

	E10	E15
Total OFP (mg O3/mile)	31.919 ± 8.573	26.611 ± 6.099

2020MY KIA Optima

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.020	0.023	0.021	0.022	0.021	0.023
	THC-2	0.001	0.000	0.000	0.000	0.000	0.000
	THC-3	0.002	0.001	0.002	0.002	0.004	0.004
	3THC-w	0.005	0.005	0.005	0.005	0.005	0.006
NMHC Emissions (g/mile)	NMHC-1	0.015	0.017	0.016	0.016	0.016	0.017
	NMHC-2	0.000	0.000	0.000	0.000	0.000	0.000
	NMHC-3	0.000	0.000	0.000	0.000	0.002	0.002
	3NMHC-w	0.001	0.004	0.003	0.003	0.004	0.004
CH4 Emissions (g/mile)	CH4-1	0.005	0.006	0.006	0.006	0.005	0.006
	CH4-2	0.005	0.000	0.000	0.000	0.000	0.000
	CH4-3	0.001	0.001	0.001	0.002	0.002	0.002
	3CH4-W	0.004	0.002	0.002	0.002	0.002	0.002
CO Emissions (g/mile)	CO-1	0.398	0.308	0.362	0.535	0.234	0.361
	CO-2	0.000	0.035	0.000	0.000	0.000	0.050
	CO-3	0.082	0.036	0.010	0.056	0.026	0.079
	3CO-w	0.105	0.092	0.078	0.126	0.056	0.122
NOx Emissions (g/mile)	NOx-1	0.011	0.013	0.014	0.011	0.010	0.012
	NOx-2	0.014	0.010	0.010	0.012	0.011	0.013
	NOx-3	0.008	0.007	0.006	0.005	0.005	0.006
	3NOx-w	0.011	0.010	0.010	0.010	0.009	0.011
CO2 Emissions (g/mile)	CO2-1	287.652	290.619	274.798	288.802	280.969	304.688
	CO2-2	290.067	288.694	278.685	282.358	280.274	297.623
	CO2-3	251.777	250.230	238.856	242.858	236.027	249.825
	3CO2-w	279.058	278.517	266.938	272.834	268.232	285.964
Fuel economy-carbon balanced method (miles per gallon)	FE-1	29.526	29.238	30.909	28.814	29.664	27.340
	FE-2	29.350	29.484	30.549	29.564	29.784	28.040
	FE-3	33.795	34.014	35.640	34.359	35.359	33.396

	3FE-w	30.488	30.549	31.877	30.572	31.109	29.170

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	2.576	3.024	2.597	2.500	2.646	2.931
	PM-soot 2	0.168	0.154	0.157	0.129	0.129	0.133
	PM-soot 3	0.118	0.125	0.113	0.102	0.097	0.090
	3PM-soot-w	0.653	0.741	0.651	0.614	0.642	0.699
PM mass (mg/mile)	PM-1	2.731	3.635	2.993	2.841	2.993	3.249
	PM-2	0.135	0.062	0.210	0.210	0.227	0.097
	PM-3	0.109	0.104	0.154	0.196	0.173	0.096
	3PM mass-w	0.666	0.814	0.771	0.752	0.786	0.748

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	2.80E+12	3.08E+12	2.81E+12	2.73E+12	2.90E+12	3.06E+12
	SPN-2	5.10E+11	4.68E+11	5.05E+11	3.78E+11	3.97E+11	3.49E+11
	SPN-3	3.22E+11	3.24E+11	3.14E+11	2.74E+11	2.68E+11	2.17E+11
	3SPN-w	9.33E+11	9.70E+11	9.30E+11	8.38E+11	8.81E+11	8.76E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	0.334	0.341	0.355	0.320	0.383	0.426
Acetylene	0.147	0.263	0.205	0.253	0.230	0.237
Ethane	0.113	0.170	0.155	0.142	0.214	0.169
Propylene	0.241	0.260	0.259	0.244	0.281	0.267
Propane	0.000	0.061	0.000	0.029	0.031	0.000
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.036	0.041	0.044	0.038	0.043	0.044
1,3-Butadiene	0.000	0.000	0.000	0.000	0.000	0.000

n-Butane	0.008	0.017	0.011	0.006	0.004	0.001
trans-2-Butene	0.022	0.023	0.024	0.022	0.023	0.025
cis-2-Butene	0.015	0.017	0.018	0.016	0.017	0.018
Isopentane	0.270	0.312	0.295	0.284	0.290	0.370
1-Pentene	0.000	0.011	0.012	0.000	0.000	0.012
n-Pentane	0.104	0.109	0.091	0.094	0.102	0.114
Isoprene	0.003	0.005	0.005	0.004	0.000	0.005
trans-2-Pentene	0.015	0.016	0.016	0.015	0.015	0.017
cis-2-Pentene	0.000	0.000	0.000	0.000	0.000	0.000
2,2-Dimethylbutane	0.022	0.024	0.023	0.023	0.024	0.028
Cyclopentane	0.016	0.018	0.019	0.019	0.017	0.028
2,3-Dimethylbutane	0.054	0.061	0.059	0.058	0.061	0.068
2-Methylpentane	0.145	0.164	0.159	0.156	0.164	0.187
3-Methylpentane	0.092	0.103	0.100	0.098	0.104	0.119
1-Hexene	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.078	0.086	0.081	0.079	0.083	0.095
Methylcyclopentane	0.089	0.101	0.096	0.096	0.150	0.126
2,4-Dimethylpentane	0.065	0.073	0.070	0.071	0.071	0.085
Benzene	0.273	0.274	1.411	0.274	1.585	0.320
Cyclohexane	0.031	0.035	0.033	0.033	0.034	0.037
2-Methylhexane	0.055	0.064	0.062	0.063	0.067	0.081
2,3-Dimethylpentane	0.098	0.113	0.110	0.107	0.116	0.134
3-Methylhexane	0.060	0.062	0.069	0.058	0.075	0.078
2,2,4-Trimethylpentane	0.153	0.174	0.170	0.170	0.180	0.204
n-Heptane	0.024	0.031	0.028	0.030	0.032	0.040
Methylcyclohexane	0.028	0.037	0.029	0.030	0.035	0.035
2,3,4-Trimethylpentane	0.052	0.060	0.056	0.057	0.060	0.068
Toluene	0.281	0.331	0.300	0.290	1.604	0.323
2-Methylheptane	0.038	0.044	0.041	0.043	0.046	0.052
3-Methylheptane	0.034	0.040	0.038	0.038	0.041	0.045
n-Octane	0.028	0.040	0.033	0.033	0.043	0.035
Ethylbenzene	0.077	0.063	0.059	0.058	0.064	0.072
m/p-Xylenes	0.194	0.204	0.191	0.191	0.196	0.224
Styrene	0.000	0.000	0.000	0.000	0.000	0.000

o-Xylene	0.064	0.072	0.066	0.066	0.069	0.079
Nonane	0.018	0.016	0.016	0.017	0.019	0.017
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
m-Ethyltoluene	0.043	0.050	0.048	0.047	0.051	0.059
p-Ethyltoluene	0.021	0.024	0.023	0.020	0.026	0.026
1,3,5-Trimethylbenzene	0.031	0.038	0.024	0.024	0.031	0.029
o-Ethyltoluene	0.031	0.000	0.011	0.013	0.019	0.019
1,2,4-Trimethylbenzene	0.058	0.064	0.055	0.056	0.054	0.068
n-Decane	0.038	0.036	0.016	0.012	0.037	0.000
1,2,3-Trimethylbenzene	0.118	0.155	0.009	0.000	0.081	0.000
m-Diethylbenzene	0.219	0.251	0.000	0.000	0.135	0.000
p-Diethylbenzene	0.032	0.035	0.000	0.000	0.016	0.000
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.038	0.016	0.000	0.000	0.000	0.000
Ethanol	0.324	0.373	0.331	0.491	0.544	0.477
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.166	0.181	0.141	0.097	0.131	0.119
Acetaldehyde	0.100	0.128	0.127	0.154	0.151	0.134
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.015
Propionaldehyde	0.000	0.000	0.014	0.000	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.000	0.005	0.005	0.003	0.003	0.002
Benzaldehyde	0.000	0.016	0.016	0.000	0.016	0.015
Valeraldehyde	0.000	0.000	0.000	0.000	0.016	0.015
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.006	0.014	0.000	0.000	0.015	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.001
	Run 2	0.004
	Run 3	0.003
E15	Run 1	0.004
	Run 2	0.004
	Run 3	0.004

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.037	0.013	0.025	0.066	0.014	0.018
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.004	0.006	0.000	0.000	0.005	0.002
	3N2O-w	0.009	0.005	0.005	0.014	0.004	0.004
NH3	NH3-1	0.003	0.001	0.003	0.012	0.005	0.003
	NH3-2	0.001	0.002	0.004	0.002	0.001	0.003
	NH3-3	0.002	0.002	0.002	0.003	0.002	0.004
	3NH3-w	0.002	0.002	0.003	0.004	0.002	0.003

OFP

	E10	E15
Total OFP (mg O3/mile)	20.668 ± 3.805	21.726 ± 7.057

2020MY Jeep Cherokee

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.056	0.048	0.063	0.047	0.065	0.063
	THC-2	0.001	0.000	0.001	0.001	0.001	0.001
	THC-3	0.007	0.005	0.009	0.003	0.008	0.007
	3THC-w	0.015	0.011	0.016	0.011	0.016	0.016
NMHC Emissions (g/mile)	NMHC-1	0.049	0.041	0.054	0.040	0.055	0.053
	NMHC-2	0.000	0.000	0.000	0.000	0.000	0.000
	NMHC-3	0.003	0.001	0.004	0.001	0.003	0.002
	3NMHC-w	0.011	0.008	0.012	0.009	0.012	0.012
CH4 Emissions (g/mile)	CH4-1	0.008	0.007	0.009	0.008	0.009	0.010
	CH4-2	0.001	0.001	0.001	0.001	0.001	0.002
	CH4-3	0.004	0.004	0.005	0.002	0.005	0.004
	3CH4-W	0.003	0.003	0.004	0.003	0.004	0.004
CO Emissions (g/mile)	CO-1	0.650	0.756	0.764	0.548	0.597	0.663
	CO-2	0.434	0.402	0.264	0.191	0.184	0.156
	CO-3	0.416	0.473	0.482	0.106	0.290	0.245
	3CO-w	0.474	0.495	0.428	0.242	0.299	0.286
NOx Emissions (g/mile)	NOx-1	0.009	0.008	0.006	0.010	0.008	0.006
	NOx-2	0.004	0.004	0.004	0.007	0.004	0.005
	NOx-3	0.003	0.003	0.003	0.003	0.004	0.003
	3NOx-w	0.005	0.004	0.004	0.006	0.005	0.005
CO2 Emissions (g/mile)	CO2-1	452.021	452.090	449.603	459.204	452.041	448.486
	CO2-2	475.150	472.891	469.293	477.659	469.795	466.034
	CO2-3	399.279	403.428	403.561	400.960	405.138	400.606
	3CO2-w	449.493	449.549	447.188	452.775	448.383	444.442
Fuel economy-carbon balanced method (miles per gallon)	FE-1	18.785	18.776	18.877	18.139	18.420	18.562
	FE-2	17.891	17.979	18.125	17.465	17.757	17.902
	FE-3	21.286	21.063	21.055	20.810	20.580	20.816

	3FE-w	18.907	18.904	19.007	18.420	18.596	18.761

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.314	0.326	0.290	0.343	0.291	0.179
	PM-soot 2	0.047	0.032	0.048	0.049	0.044	0.056
	PM-soot 3	0.085	0.046	0.068	0.066	0.050	0.070
	3PM-soot-w	0.113	0.097	0.104	0.115	0.097	0.085
PM mass (mg/mile)	PM-1	0.565	0.297	0.276	0.624	0.441	0.186
	PM-2	0.000	0.000	0.000	0.059	0.000	0.016
	PM-3	0.213	0.044	0.110	0.044	0.246	0.000
	3PM mass-w	0.176	0.074	0.088	0.172	0.159	0.047

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	1.18E+12	1.64E+12	1.41E+12	1.23E+12	1.61E+12	8.69E+11
	SPN-2	1.47E+10	1.20E+10	1.40E+10	1.69E+10	1.20E+10	1.53E+10
	SPN-3	9.65E+10	1.38E+11	1.85E+11	1.37E+11	1.32E+11	1.43E+11
	3SPN-w	2.78E+11	3.84E+11	3.51E+11	3.01E+11	3.77E+11	2.27E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	1.245	0.973	0.975	1.131	1.493	1.634
Acetylene	0.051	0.049	0.094	0.120	0.047	0.091
Ethane	0.526	0.464	0.703	0.655	0.665	0.664
Propylene	0.987	0.800	1.214	0.804	1.198	1.257
Propane	0.000	0.000	0.091	0.150	0.000	0.000
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.204	0.168	0.257	0.155	0.237	0.271
1,3-Butadiene	0.024	0.000	0.035	0.009	0.037	0.047

n-Butane	0.020	0.000	0.003	0.005	0.023	0.022
trans-2-Butene	0.133	0.117	0.156	0.104	0.156	0.181
cis-2-Butene	0.091	0.067	0.121	0.060	0.108	0.140
Isopentane	0.747	0.673	0.794	0.676	0.825	0.845
1-Pentene	0.029	0.024	0.032	0.024	0.030	0.034
n-Pentane	0.280	0.238	0.270	0.274	0.312	0.270
Isoprene	0.024	0.000	0.025	0.018	0.027	0.029
trans-2-Pentene	0.045	0.041	0.049	0.039	0.048	0.056
cis-2-Pentene	0.026	0.023	0.029	0.022	0.026	0.033
2,2-Dimethylbutane	0.057	0.053	0.064	0.055	0.067	0.064
Cyclopentane	0.042	0.040	0.046	0.036	0.046	0.047
2,3-Dimethylbutane	0.145	0.137	0.164	0.141	0.173	0.166
2-Methylpentane	0.401	0.385	0.454	0.383	0.477	0.462
3-Methylpentane	0.253	0.241	0.292	0.246	0.306	0.299
1-Hexene	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.210	0.199	0.236	0.198	0.252	0.244
Methylcyclopentane	0.258	0.246	0.296	0.241	0.305	0.311
2,4-Dimethylpentane	0.175	0.164	0.199	0.167	0.210	0.199
Benzene	1.020	3.229	1.308	0.591	1.189	1.180
Cyclohexane	0.089	0.084	0.101	0.080	0.102	0.101
2-Methylhexane	0.178	0.168	0.206	0.164	0.227	0.218
2,3-Dimethylpentane	0.269	0.260	0.299	0.258	0.337	0.309
3-Methylhexane	0.184	0.167	0.205	0.175	0.241	0.221
2,2,4-Trimethylpentane	0.407	0.394	0.454	0.395	0.509	0.465
n-Heptane	0.100	0.093	0.113	0.092	0.141	0.121
Methylcyclohexane	0.104	0.091	0.115	0.086	0.129	0.101
2,3,4-Trimethylpentane	0.131	0.124	0.144	0.125	0.163	0.141
Toluene	1.121	4.612	1.274	0.863	1.316	1.331
2-Methylheptane	0.110	0.103	0.119	0.100	0.125	0.106
3-Methylheptane	0.099	0.095	0.107	0.090	0.122	0.095
n-Octane	0.089	0.099	0.095	0.080	0.126	0.093
Ethylbenzene	0.227	0.179	0.253	0.180	0.402	0.256
m/p-Xylenes	0.695	0.531	0.753	0.554	0.917	0.765
Styrene	0.006	0.000	0.001	0.000	0.012	0.006

o-Xylene	0.231	0.182	0.247	0.186	0.301	0.261
Nonane	0.044	0.039	0.042	0.044	0.115	0.051
Isopropylbenzene	0.000	0.000	0.000	0.933	0.000	0.000
n-Propylbenzene	0.023	0.018	0.022	0.023	0.046	0.024
m-Ethyltoluene	0.176	0.143	0.184	0.139	0.221	0.176
p-Ethyltoluene	0.077	0.071	0.087	0.064	0.106	0.077
1,3,5-Trimethylbenzene	0.094	0.074	0.088	0.068	0.122	0.079
o-Ethyltoluene	0.107	0.043	0.054	0.057	0.146	0.156
1,2,4-Trimethylbenzene	0.227	0.150	0.199	0.149	0.336	0.293
n-Decane	0.039	0.094	0.065	0.018	0.209	0.020
1,2,3-Trimethylbenzene	0.111	0.019	0.000	0.000	0.011	0.000
m-Diethylbenzene	0.159	0.013	0.000	0.000	0.000	0.000
p-Diethylbenzene	0.023	0.004	0.000	0.000	0.115	0.015
n-Undecane	0.000	0.000	0.000	0.037	0.362	0.000
n-Dodecane	0.000	0.000	0.000	0.038	0.259	0.000
Ethanol	0.692	0.000	0.944	1.040	1.722	3.225
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.269	0.205	0.217	0.256	0.319	0.309
Acetaldehyde	0.304	0.253	0.319	0.416	0.449	0.415
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.008	0.000	0.000	0.000	0.000	0.000
Propionaldehyde	0.037	0.028	0.033	0.000	0.028	0.028
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.015	0.000	0.005	0.000	0.000	0.000
Benzaldehyde	0.000	0.000	0.029	0.000	0.000	0.000
Valeraldehyde	0.000	0.025	0.027	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.001	0.000	0.000	0.000	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.012
	Run 2	0.009
	Run 3	0.012
E15	Run 1	0.009
	Run 2	0.013
	Run 3	0.013

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.017	0.017	0.025	0.022	0.031	0.028
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.000	0.000	0.000	0.001	0.003	0.000
	3N2O-w	0.004	0.004	0.005	0.005	0.007	0.006
NH3	NH3-1	0.005	0.002	0.003	0.002	0.010	0.003
	NH3-2	0.002	0.003	0.003	0.003	0.003	0.002
	NH3-3	0.002	0.005	0.002	0.002	0.002	0.002
	3NH3-w	0.003	0.003	0.003	0.003	0.004	0.002

OFP

	E10	E15
Total OFP (mg O3/mile)	71.637 ± 14.645	64.424 ± 11.575

2020MY Nissan Armada

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.045	0.073	0.060	0.054	0.056	0.060
	THC-2	0.003	0.000	0.000	0.000	0.000	0.000
	THC-3	0.002	0.002	0.002	0.002	0.002	0.002
	3THC-w	0.011	0.016	0.013	0.012	0.012	0.013
NMHC Emissions (g/mile)	NMHC-1	0.031	0.069	0.042	0.040	0.041	0.057
	NMHC-2	0.001	0.000	0.000	0.000	0.000	0.000
	NMHC-3	0.000	0.000	0.000	0.000	0.000	0.000
	3NMHC-w	0.007	0.014	0.008	0.008	0.008	0.011
CH4 Emissions (g/mile)	CH4-1	0.013	0.003	0.018	0.014	0.015	0.003
	CH4-2	0.002	0.001	0.001	0.001	0.002	0.000
	CH4-3	0.003	0.003	0.002	0.003	0.003	0.003
	3CH4-W	0.004	0.002	0.005	0.004	0.005	0.002
CO Emissions (g/mile)	CO-1	0.383	0.553	0.580	0.414	0.404	0.413
	CO-2	0.000	0.000	0.000	0.000	0.000	0.000
	CO-3	0.000	0.000	0.016	0.000	0.000	0.000
	3CO-w	0.079	0.115	0.125	0.086	0.084	0.086
NOx Emissions (g/mile)	NOx-1	0.037	0.044	0.038	0.039	0.039	0.040
	NOx-2	0.015	0.017	0.014	0.014	0.017	0.017
	NOx-3	0.010	0.016	0.014	0.012	0.013	0.007
	3NOx-w	0.018	0.022	0.019	0.018	0.020	0.019
CO2 Emissions (g/mile)	CO2-1	580.244	557.360	559.782	558.826	565.093	564.438
	CO2-2	567.168	555.821	562.981	556.381	556.637	559.132
	CO2-3	490.962	475.311	478.217	472.993	479.494	477.803
	3CO2-w	548.958	534.040	539.038	533.982	537.246	537.932
Fuel economy-carbon balanced method (miles per gallon)	FE-1	14.916	14.751	14.768	14.654	15.245	15.179
	FE-2	15.003	14.996	14.930	15.010	15.317	15.122
	FE-3	17.648	17.409	17.471	17.340	17.911	17.801
	3FE-w	15.628	15.533	15.513	15.504	15.935	15.787

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	9.071	11.588	11.131	8.889	10.364	11.901
	PM-soot 2	0.272	0.294	0.310	0.263	0.241	0.272
	PM-soot 3	0.414	0.388	0.380	0.330	0.329	0.339
	3PM-soot-w	2.134	2.663	2.575	2.071	2.362	2.704
PM mass (mg/mile)	PM-1	9.964	12.317	11.558	9.337	11.154	12.868
	PM-2	0.265	0.240	0.053	0.132	0.087	0.390
	PM-3	0.546	0.270	0.411	0.164	0.378	0.737
	3PM mass-w	2.352	2.753	2.538	2.050	2.458	3.075

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	1.62E+13	1.79E+13	1.82E+13	1.56E+13	1.74E+13	1.85E+13
	SPN-2	1.01E+12	1.08E+12	1.16E+12	9.55E+11	1.06E+12	1.04E+12
	SPN-3	1.79E+12	1.43E+12	1.55E+12	1.37E+12	1.44E+12	1.34E+12
	3SPN-w	4.36E+12	4.67E+12	4.80E+12	4.12E+12	4.55E+12	4.75E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	0.706	0.709	0.713	0.627	0.656	0.738
Acetylene	0.065	0.122	0.058	0.045	0.065	0.065
Ethane	0.295	0.441	0.359	0.218	0.292	0.276
Propylene	0.571	0.541	0.564	0.498	0.515	0.498
Propane	0.000	0.074	0.000	0.000	0.000	0.000
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.110	0.095	0.102	0.083	0.081	0.087
1,3-Butadiene	0.000	0.000	0.000	0.000	0.000	0.000
n-Butane	0.090	0.000	0.000	0.000	0.000	0.001
trans-2-Butene	0.068	0.063	0.072	0.054	0.054	0.057

cis-2-Butene	0.050	0.043	0.049	0.037	0.039	0.041
Isopentane	1.553	0.797	0.892	0.835	0.883	0.826
1-Pentene	0.038	0.000	0.000	0.026	0.000	0.000
n-Pentane	0.534	0.247	0.313	0.245	0.283	0.281
Isoprene	0.000	0.000	0.000	0.000	0.000	0.000
trans-2-Pentene	0.058	0.037	0.039	0.038	0.037	0.036
cis-2-Pentene	0.034	0.000	0.000	0.000	0.000	0.000
2,2-Dimethylbutane	0.122	0.067	0.074	0.067	0.073	0.063
Cyclopentane	0.061	0.044	0.045	0.045	0.046	0.048
2,3-Dimethylbutane	0.282	0.151	0.178	0.163	0.180	0.149
2-Methylpentane	0.737	0.422	0.464	0.431	0.469	0.392
3-Methylpentane	0.464	0.279	0.297	0.270	0.289	0.248
1-Hexene	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.347	0.284	0.227	0.213	0.226	0.196
Methylcyclopentane	0.372	0.238	0.264	0.246	0.265	0.230
2,4-Dimethylpentane	0.307	0.252	0.213	0.196	0.213	0.177
Benzene	0.892	0.622	0.884	0.693	0.770	3.187
Cyclohexane	0.129	0.077	0.090	0.083	0.090	0.080
2-Methylhexane	0.277	0.161	0.196	0.177	0.196	0.153
2,3-Dimethylpentane	0.472	0.332	0.340	0.298	0.324	0.273
3-Methylhexane	0.346	0.137	0.203	0.163	0.180	0.134
2,2,4-Trimethylpentane	0.718	0.274	0.553	0.491	0.532	0.442
n-Heptane	0.165	0.018	0.104	0.088	0.099	0.073
Methylcyclohexane	0.148	0.118	0.092	0.079	0.089	0.068
2,3,4-Trimethylpentane	0.237	0.042	0.184	0.167	0.181	0.150
Toluene	0.997	0.168	0.830	0.705	0.747	3.620
2-Methylheptane	0.155	0.000	0.125	0.122	0.133	0.108
3-Methylheptane	0.149	0.000	0.122	0.112	0.122	0.098
n-Octane	0.128	0.000	0.107	0.101	0.111	0.082
Ethylbenzene	0.191	0.000	0.162	0.143	0.147	0.141
m/p-Xylenes	0.660	0.000	0.556	0.513	0.523	0.502
Styrene	0.000	0.000	0.000	0.000	0.000	0.000
o-Xylene	0.235	0.000	0.199	0.177	0.183	0.171
Nonane	0.072	0.000	0.055	0.049	0.053	0.044

Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.025	0.000	0.000	0.000	0.000	0.000
m-Ethyltoluene	0.153	0.000	0.133	0.129	0.136	0.124
p-Ethyltoluene	0.070	0.000	0.060	0.066	0.068	0.050
1,3,5-Trimethylbenzene	0.093	0.000	0.080	0.074	0.082	0.070
o-Ethyltoluene	0.245	0.000	0.147	0.035	0.028	0.032
1,2,4-Trimethylbenzene	0.209	0.000	0.183	0.163	0.169	0.162
n-Decane	0.028	0.000	0.014	0.048	0.074	0.018
1,2,3-Trimethylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
m-Diethylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
p-Diethylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.000	0.000	0.033	0.000	0.000	0.000
Ethanol	1.079	0.489	0.793	0.826	0.520	0.522
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.267	0.335	0.275	0.231	0.254	0.317
Acetaldehyde	0.583	0.355	0.275	0.485	0.511	0.434
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.025
Propionaldehyde	0.039	0.000	0.000	0.039	0.036	0.036
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.035	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.015	0.001	0.000	0.008	0.001	0.000
Benzaldehyde	0.000	0.000	0.000	0.038	0.000	0.036
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.000	0.000	0.000	0.000	0.000

NMOG

NMOG (g/mile)

E10	Run 1	0.008
	Run 2	0.014
	Run 3	0.009
E15	Run 1	0.008
	Run 2	0.008
	Run 3	0.012

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.078	0.068	0.086	0.052	0.070	0.049
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.001	0.022	0.000	0.000	0.000	0.000
	3N2O-w	0.016	0.020	0.018	0.011	0.015	0.010
NH3	NH3-1	0.009	0.007	0.012	0.007	0.016	0.003
	NH3-2	0.030	0.035	0.034	0.005	0.027	0.027
	NH3-3	0.005	0.008	0.014	0.004	0.005	0.006
	3NH3-w	0.019	0.022	0.024	0.005	0.019	0.016

OFP

	E10	E15
Total OFP (mg O3/mile)	43.717 ± 8.843	40.857 ± 8.123

2020MY Toyota Prius

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.034	0.047	0.040	0.041	0.039	0.043
	THC-2	0.001	0.001	0.001	0.001	0.001	0.001
	THC-3	0.007	0.007	0.008	0.006	0.006	0.007
	3THC-w	0.010	0.012	0.011	0.010	0.010	0.011
NMHC Emissions (g/mile)	NMHC-1	0.029	0.042	0.035	0.036	0.035	0.038
	NMHC-2	0.001	0.001	0.001	0.000	0.001	0.001
	NMHC-3	0.006	0.006	0.006	0.004	0.004	0.005
	3NMHC-w	0.008	0.011	0.009	0.009	0.009	0.010
CH4 Emissions (g/mile)	CH4-1	0.005	0.005	0.005	0.005	0.005	0.005
	CH4-2	0.001	0.000	0.001	0.000	0.000	0.001
	CH4-3	0.002	0.001	0.002	0.002	0.002	0.002
	3CH4-W	0.002	0.001	0.002	0.002	0.002	0.002
CO Emissions (g/mile)	CO-1	0.109	0.199	0.200	0.228	0.249	0.277
	CO-2	0.000	0.000	0.004	0.000	0.046	0.000
	CO-3	0.031	0.036	0.026	0.019	0.080	0.022
	3CO-w	0.031	0.051	0.051	0.052	0.097	0.063
NOx Emissions (g/mile)	NOx-1	0.011	0.011	0.004	0.015	0.002	0.002
	NOx-2	0.000	0.000	0.000	0.000	0.000	0.000
	NOx-3	0.001	0.002	0.001	0.003	0.005	0.001
	3NOx-w	0.003	0.003	0.001	0.004	0.002	0.001
CO2 Emissions (g/mile)	CO2-1	198.531	181.795	196.567	197.760	171.716	173.158
	CO2-2	100.932	96.746	94.331	102.027	100.912	112.271
	CO2-3	158.790	164.381	167.952	161.413	164.350	167.206
	3CO2-w	137.105	133.039	135.708	138.173	132.932	139.907
Fuel economy-carbon balanced method (miles per gallon)	FE-1	42.823	46.713	43.215	42.108	48.469	48.052
	FE-2	84.346	87.995	90.240	81.815	82.660	74.350
	FE-3	53.591	51.767	50.670	51.701	50.747	49.907

	3FE-w	62.059	63.936	62.681	60.364	62.709	59.608

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.286	0.335	0.271	0.288	0.155	0.190
	PM-soot 2	0.010	0.013	0.011	0.010	0.012	0.013
	PM-soot 3	0.012	0.008	0.016	0.008	0.010	0.010
	3PM-soot-w	0.068	0.079	0.066	0.067	0.041	0.049
PM mass (mg/mile)	PM-1	0.323	0.374	0.437	0.274	0.132	0.208
	PM-2	0.000	0.000	0.000	0.000	0.000	0.000
	PM-3	0.000	0.000	0.004	0.000	0.013	0.235
	3PM mass-w	0.067	0.078	0.092	0.057	0.031	0.107

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	1.30E+12	1.34E+12	1.07E+12	1.28E+12	7.18E+11	8.50E+11
	SPN-2	2.52E+10	4.94E+10	2.70E+10	2.35E+10	3.91E+10	5.18E+10
	SPN-3	1.77E+10	2.30E+10	1.37E+10	1.00E+10	1.51E+10	1.51E+10
	3SPN-w	2.87E+11	3.09E+11	2.40E+11	2.80E+11	1.73E+11	2.07E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	0.595	0.823	0.737	0.794	0.763	0.748
Acetylene	0.023	0.183	0.015	0.041	0.036	0.039
Ethane	0.546	0.487	0.618	0.615	0.551	0.483
Propylene	0.446	0.558	0.547	0.580	0.515	0.568
Propane	0.000	0.022	0.375	0.227	0.125	0.037
Isobutane	0.000	0.000	0.000	0.000	0.000	0.156
1-Butene	0.090	0.107	0.115	0.114	0.110	0.117
1,3-Butadiene	0.000	0.039	0.009	0.005	0.003	0.026

n-Butane	0.054	0.072	0.044	0.063	0.083	0.122
trans-2-Butene	0.068	0.057	0.077	0.085	0.072	0.072
cis-2-Butene	0.040	0.039	0.042	0.047	0.040	0.043
Isopentane	1.095	1.382	1.035	1.102	1.232	1.374
1-Pentene	0.014	0.027	0.018	0.017	0.021	0.023
n-Pentane	0.361	0.485	0.352	0.373	0.417	0.453
Isoprene	0.000	0.017	0.010	0.011	0.010	0.016
trans-2-Pentene	0.038	0.059	0.040	0.040	0.047	0.055
cis-2-Pentene	0.020	0.032	0.022	0.021	0.025	0.030
2,2-Dimethylbutane	0.083	0.098	0.082	0.079	0.088	0.090
Cyclopentane	0.048	0.061	0.049	0.049	0.053	0.061
2,3-Dimethylbutane	0.196	0.249	0.202	0.199	0.211	0.230
2-Methylpentane	0.525	0.679	0.546	0.543	0.577	0.619
3-Methylpentane	0.327	0.419	0.351	0.336	0.353	0.383
1-Hexene	0.000	0.012	0.000	0.000	0.000	0.012
n-Hexane	0.251	0.326	0.274	0.261	0.268	0.295
Methylcyclopentane	0.289	0.386	0.321	0.302	0.315	0.353
2,4-Dimethylpentane	0.203	0.262	0.234	0.219	0.222	0.242
Benzene	0.325	0.396	0.371	0.416	0.376	0.373
Cyclohexane	0.096	0.127	0.111	0.102	0.105	0.119
2-Methylhexane	0.209	0.279	0.256	0.232	0.231	0.255
2,3-Dimethylpentane	0.319	0.410	0.377	0.345	0.345	0.375
3-Methylhexane	0.222	0.293	0.275	0.244	0.245	0.261
2,2,4-Trimethylpentane	0.467	0.584	0.558	0.514	0.500	0.536
n-Heptane	0.126	0.165	0.155	0.143	0.134	0.150
Methylcyclohexane	0.114	0.155	0.151	0.128	0.125	0.141
2,3,4-Trimethylpentane	0.135	0.175	0.172	0.156	0.150	0.161
Toluene	0.557	0.715	0.727	1.304	0.642	0.697
2-Methylheptane	0.087	0.111	0.115	0.107	0.098	0.107
3-Methylheptane	0.085	0.110	0.111	0.101	0.095	0.101
n-Octane	0.070	0.086	0.089	0.078	0.073	0.077
Ethylbenzene	0.097	0.134	0.137	0.124	0.126	0.135
m/p-Xylenes	0.282	0.400	0.398	0.371	0.361	0.389
Styrene	0.000	0.000	0.000	0.000	0.000	0.000

o-Xylene	0.096	0.135	0.135	0.123	0.120	0.130
Nonane	0.031	0.032	0.040	0.031	0.030	0.031
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.000	0.013	0.013	0.011	0.012	0.013
m-Ethyltoluene	0.052	0.077	0.081	0.076	0.070	0.076
p-Ethyltoluene	0.027	0.036	0.038	0.036	0.032	0.036
1,3,5-Trimethylbenzene	0.038	0.045	0.052	0.047	0.038	0.040
o-Ethyltoluene	0.024	0.028	0.033	0.033	0.025	0.024
1,2,4-Trimethylbenzene	0.060	0.083	0.086	0.090	0.078	0.083
n-Decane	0.024	0.017	0.030	0.013	0.008	0.003
1,2,3-Trimethylbenzene	0.077	0.030	0.091	0.000	0.000	0.000
m-Diethylbenzene	0.095	0.014	0.123	0.000	0.000	0.000
p-Diethylbenzene	0.017	0.010	0.026	0.000	0.000	0.000
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.064	0.016	0.018	0.021	0.020	0.000
Ethanol	0.708	0.908	0.655	1.406	1.320	1.573
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.009	0.040	0.041	0.099	0.100	0.165
Acetaldehyde	0.225	0.400	0.270	0.460	0.469	0.502
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000
Propionaldehyde	0.000	0.017	0.000	0.018	0.016	0.017
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.000	0.002	0.000	0.002	0.000	0.000
Benzaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.000	0.000	0.000	0.000	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.008
	Run 2	0.011
	Run 3	0.010
E15	Run 1	0.010
	Run 2	0.009
	Run 3	0.010

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	Instrument problematic	0.076	0.033	0.030	0.027	0.024
	N2O-2	Instrument problematic	0.003	0.002	0.000	0.002	0.001
	N2O-3	Instrument problematic	0.000	0.000	0.000	0.002	0.000
	3N2O-w	Instrument problematic	0.017	0.008	0.006	0.007	0.006
NH3	NH3-1	Instrument problematic	0.001	0.001	0.001	0.001	0.001
	NH3-2	Instrument problematic	0.001	0.003	0.001	0.001	0.001
	NH3-3	Instrument problematic	0.001	0.001	0.001	0.006	0.006
	3NH3-w	Instrument problematic	0.001	0.002	0.001	0.002	0.002

OFP

	E10	E15
Total OFP (mg O3/mile)	32.401 ± 5.702	36.924 ± 4.718

2020MY GMC Acadia

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.064	0.075	0.076	0.061	0.067	0.074
	THC-2	0.007	0.007	0.006	0.005	0.006	0.008
	THC-3	0.014	0.018	0.020	0.016	0.025	0.023
	3THC-w	0.021	0.024	0.024	0.020	0.024	0.026
NMHC Emissions (g/mile)	NMHC-1	0.044	0.050	0.052	0.043	0.045	0.045
	NMHC-2	0.001	0.001	0.003	0.001	0.003	0.002
	NMHC-3	0.002	0.004	0.003	0.004	0.013	0.006
	3NMHC-w	0.010	0.012	0.013	0.010	0.014	0.012
CH4 Emissions (g/mile)	CH4-1	0.019	0.025	0.024	0.019	0.022	0.029
	CH4-2	0.006	0.006	0.003	0.004	0.003	0.007
	CH4-3	0.012	0.013	0.016	0.012	0.012	0.017
	3CH4-W	0.010	0.012	0.011	0.009	0.010	0.014
CO Emissions (g/mile)	CO-1	0.892	1.250	1.137	0.696	1.011	1.300
	CO-2	0.000	0.000	0.074	0.000	0.000	0.000
	CO-3	0.000	0.073	0.183	0.000	0.033	0.343
	3CO-w	0.185	0.279	0.324	0.145	0.219	0.364
NOx Emissions (g/mile)	NOx-1	0.012	0.015	0.017	0.017	0.014	0.017
	NOx-2	0.002	0.002	0.002	0.001	0.002	0.000
	NOx-3	0.004	0.003	0.003	0.004	0.003	0.001
	3NOx-w	0.004	0.005	0.006	0.005	0.005	0.004
CO2 Emissions (g/mile)	CO2-1	398.102	408.478	412.806	409.569	412.903	419.143
	CO2-2	424.237	421.584	426.903	434.551	443.539	439.229
	CO2-3	340.962	341.819	349.636	360.981	354.153	360.670
	3CO2-w	395.974	397.031	402.802	409.121	412.634	413.456
Fuel economy-carbon balanced method (miles per gallon)	FE-1	20.318	20.130	19.809	21.300	20.731	20.523
	FE-2	19.209	18.820	19.004	20.067	20.193	19.936
	FE-3	23.122	23.562	23.106	24.966	24.894	24.325

	3FE-w	20.389	20.210	20.158	21.481	21.415	21.105

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.737	0.743	0.715	0.811	1.009	0.933
	PM-soot 2	0.083	0.072	0.060	0.062	0.063	0.076
	PM-soot 3	0.131	0.114	0.096	0.094	0.095	0.107
	3PM-soot-w	0.232	0.223	0.205	0.226	0.268	0.262
PM mass (mg/mile)	PM-1	0.928	0.762	0.838	0.964	1.126	0.988
	PM-2	0.040	0.000	0.045	0.041	0.000	0.000
	PM-3	0.057	0.042	0.144	0.081	0.065	0.020
	3PM mass-w	0.229	0.169	0.236	0.243	0.251	0.210

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	2.31E+12	2.68E+12	2.60E+12	2.35E+12	2.25E+12	2.21E+12
	SPN-2	2.46E+11	2.46E+11	3.23E+11	2.78E+11	2.62E+11	2.14E+11
	SPN-3	4.38E+11	4.47E+11	4.64E+11	5.01E+11	4.79E+11	3.61E+11
	3SPN-w	7.26E+11	8.05E+11	8.33E+11	7.70E+11	7.33E+11	6.68E+11

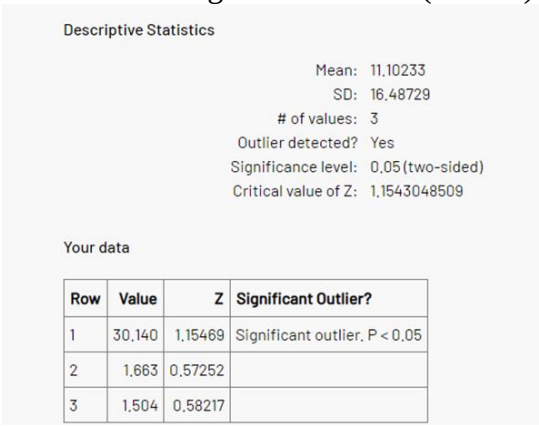
Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	1.116	1.381	1.057	0.942	1.312	1.049
Acetylene	0.831	1.046	0.739	0.654	0.912	0.908
Ethane	0.564	0.675	0.653	0.623	0.713	0.630
Propylene	0.707	0.836	0.690	0.604	0.897	0.748
Propane	0.000	0.045	0.019	6.290	0.317	1.323
Isobutane	0.000	0.000	0.000	0.008	0.000	0.105
1-Butene	0.105	0.167	0.124	0.084	0.125	0.121
1,3-Butadiene	0.039	0.042	0.041	0.017	0.045	0.037

n-Butane	0.029	0.003	0.054	0.038	0.025	0.047
trans-2-Butene	0.061	0.079	0.066	0.045	0.074	0.064
cis-2-Butene	0.049	0.092	0.062	0.037	0.058	0.050
Isopentane	0.823	0.822	1.345	1.044	0.870	0.792
1-Pentene	0.027	0.033	0.034	0.031	0.026	0.025
n-Pentane	0.300	0.347	0.415	0.383	0.294	0.262
Isoprene	0.020	0.020	0.021	0.015	0.020	0.020
trans-2-Pentene	0.043	0.047	0.062	0.070	0.043	0.040
cis-2-Pentene	0.026	0.028	0.037	0.039	0.026	0.024
2,2-Dimethylbutane	0.060	0.061	0.084	0.073	0.066	0.059
Cyclopentane	0.042	0.043	0.063	0.056	0.045	0.039
2,3-Dimethylbutane	0.148	0.159	0.215	0.219	0.174	0.148
2-Methylpentane	0.400	0.432	0.578	0.594	0.466	0.396
3-Methylpentane	0.251	0.270	0.358	0.381	0.301	0.254
1-Hexene	0.000	0.018	0.000	0.000	0.000	0.000
n-Hexane	0.206	0.223	0.279	0.361	0.241	0.205
Methylcyclopentane	0.248	0.274	0.348	0.464	0.304	0.248
2,4-Dimethylpentane	0.176	0.193	0.233	0.286	0.206	0.176
Benzene	0.801	1.160	0.859	1.040	1.355	0.992
Cyclohexane	0.086	0.095	0.119	0.123	0.100	0.086
2-Methylhexane	0.169	0.197	0.237	0.277	0.214	0.178
2,3-Dimethylpentane	0.272	0.305	0.363	0.491	0.332	0.280
3-Methylhexane	0.182	0.203	0.237	0.298	0.249	0.185
2,2,4-Trimethylpentane	0.408	0.452	0.516	0.654	0.500	0.427
n-Heptane	0.095	0.108	0.128	0.216	0.126	0.097
Methylcyclohexane	0.093	0.108	0.128	0.176	0.122	0.093
2,3,4-Trimethylpentane	0.135	0.151	0.168	0.222	0.167	0.143
Toluene	0.998	1.022	1.061	2.545	1.113	0.969
2-Methylheptane	0.083	0.097	0.107	0.144	0.119	0.100
3-Methylheptane	0.091	0.103	0.110	0.125	0.117	0.097
n-Octane	0.079	0.087	0.088	0.138	0.097	0.081
Ethylbenzene	0.232	0.216	0.206	0.316	0.199	0.197
m/p-Xylenes	0.644	0.635	0.632	1.234	0.670	0.602
Styrene	0.000	0.000	0.000	0.000	0.000	0.000

o-Xylene	0.296	0.217	0.219	0.345	0.236	0.205
Nonane	0.055	0.043	0.043	0.052	0.052	0.045
Isopropylbenzene	0.020	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.042	0.027	0.027	0.038	0.025	0.026
m-Ethyltoluene	0.155	0.162	0.156	0.192	0.153	0.152
p-Ethyltoluene	0.063	0.073	0.068	0.094	0.069	0.072
1,3,5-Trimethylbenzene	0.131	0.095	0.093	0.118	0.106	0.084
o-Ethyltoluene	0.089	0.059	0.058	0.070	0.080	0.051
1,2,4-Trimethylbenzene	0.238	0.199	0.193	0.276	0.213	0.194
n-Decane	0.118	0.035	0.009	0.264	0.035	0.029
1,2,3-Trimethylbenzene	0.077	0.085	0.000	0.161	0.079	0.005
m-Diethylbenzene	0.128	0.125	0.000	0.210	0.082	0.000
p-Diethylbenzene	0.031	0.028	0.017	0.047	0.028	0.005
n-Undecane	0.194	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.070	0.025	0.000	0.030	0.132	0.000
Ethanol	0.800	0.651	0.879	Outlier*	1.663	1.504
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

*Outlier: Ethanol emissions for this datapoint were calculated at 30.14 mg/mile. While no analytical issue was reported, this value was removed from the dataset as an outlier. Additional analysis detected this value as a significant outlier (P<0.05).



Descriptive Statistics

Mean: 11.10233
SD: 16.48729
# of values: 3
Outlier detected? Yes
Significance level: 0.05 (two-sided)
Critical value of Z: 1.1543048509

Your data

Row	Value	Z	Significant Outlier?
1	30.140	1.15469	Significant outlier, P < 0.05
2	1.663	0.57252	
3	1.504	0.58217	

Carbonyls

Pollutants (mg/mile)	E10	E15

	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.314	0.317	0.334	0.300	0.348	0.410
Acetaldehyde	0.229	0.267	0.270	0.295	0.399	0.340
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.000	0.000	0.075	0.000	0.000	0.000
Propionaldehyde	0.000	0.031	0.033	0.000	0.025	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.000	0.001	0.001	0.000	0.000	0.000
Benzaldehyde	0.000	0.000	0.025	0.000	0.000	0.000
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.000	0.000	0.000	0.000	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.011
	Run 2	0.013
	Run 3	0.014
E15	Run 1	0.011
	Run 2	0.015
	Run 3	0.013

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.020	0.015	0.017	0.019	0.025	0.024
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.012	0.003	0.005	0.001	0.007	0.004
	3N2O-w	0.007	0.004	0.005	0.004	0.007	0.006
NH3	NH3-1	0.003	0.003	0.002	0.002	0.009	0.002
	NH3-2	0.001	0.001	0.003	0.001	0.002	0.001
	NH3-3	0.002	0.002	0.002	0.002	0.002	0.003

	3NH3-w	0.002	0.002	0.002	0.002	0.003	0.002

OFP

	E10	E15
Total OFP (mg O3/mile)	56.448 ± 8.818	62.567 ± 19.504

2020MY Buick Enclave

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.081	0.081	0.082	0.112	0.073	0.073
	THC-2	0.006	0.005	0.006	0.007	0.007	0.006
	THC-3	0.017	0.015	0.018	0.016	0.018	0.016
	3THC-w	0.024	0.023	0.025	0.031	0.024	0.023
NMHC Emissions (g/mile)	NMHC-1	0.059	0.059	0.059	0.085	0.051	0.070
	NMHC-2	0.000	0.000	0.000	0.001	0.002	0.000
	NMHC-3	0.006	0.005	0.006	0.005	0.016	0.004
	3NMHC-w	0.014	0.014	0.014	0.019	0.016	0.016
CH4 Emissions (g/mile)	CH4-1	0.022	0.022	0.022	0.028	0.022	0.004
	CH4-2	0.005	0.005	0.006	0.006	0.006	0.006
	CH4-3	0.011	0.010	0.012	0.012	0.003	0.012
	3CH4-W	0.011	0.010	0.011	0.012	0.008	0.007
CO Emissions (g/mile)	CO-1	0.972	0.959	1.325	1.717	0.966	0.969
	CO-2	0.000	0.000	0.000	0.043	0.000	0.000
	CO-3	0.046	0.038	0.018	0.028	0.019	0.000

	3CO-w	0.214	0.209	0.279	0.385	0.206	0.200
NOx Emissions (g/mile)	NOx-1	0.023	0.021	0.012	0.019	0.026	0.017
	NOx-2	0.002	0.002	0.002	0.002	0.002	0.002
	NOx-3	0.006	0.005	0.005	0.004	0.007	0.005
	3NOx-w	0.007	0.006	0.005	0.006	0.008	0.006
CO2 Emissions (g/mile)	CO2-1	417.458	424.235	420.868	429.026	420.920	420.380
	CO2-2	461.154	462.185	465.925	468.223	463.922	459.892
	CO2-3	366.043	370.518	370.953	373.602	370.430	369.195
	3CO2-w	426.051	429.222	430.581	434.171	429.381	426.812
Fuel economy-carbon balanced method (miles per gallon)	FE-1	20.307	19.985	20.117	19.321	19.750	19.775
	FE-2	18.460	18.419	18.271	17.825	17.993	18.150
	FE-3	23.250	22.971	22.945	22.338	22.530	22.607
	3FE-w	19.963	19.816	19.748	19.196	19.423	19.540

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	2.920	2.857	2.921	3.105	2.339	2.216
	PM-soot 2	0.180	0.135	0.154	0.106	0.100	0.082
	PM-soot 3	0.452	0.382	0.402	0.319	0.345	0.363
	3PM-soot-w	0.821	0.765	0.794	0.785	0.632	0.601
PM mass (mg/mile)	PM-1	3.496	3.177	3.224	3.692	2.529	2.418
	PM-2	0.282	0.101	0.000	0.050	0.000	0.000
	PM-3	0.473	0.437	0.414	0.252	0.244	0.362
	3PM mass-w	0.999	0.829	0.780	0.859	0.591	0.600

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	7.11E+12	7.02E+12	6.98E+12	7.34E+12	6.17E+12	5.74E+12
	SPN-2	9.25E+11	6.85E+11	6.91E+11	4.79E+11	4.45E+11	4.12E+11
	SPN-3	1.63E+12	1.42E+12	1.32E+12	1.03E+12	1.12E+12	1.27E+12

	3SPN-w	2.40E+12	2.20E+12	2.16E+12	2.05E+12	1.82E+12	1.75E+12

Hydrocarbon species

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	1.476	1.448	1.595	2.297	1.107	1.108
Acetylene	1.274	1.270	1.167	1.970	0.813	0.873
Ethane	0.652	0.650	0.672	0.772	0.641	0.577
Propylene	0.862	0.890	1.094	1.208	0.647	0.642
Propane	0.000	0.001	0.004	0.000	0.105	0.000
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.133	0.143	0.211	0.240	0.113	0.111
1,3-Butadiene	0.088	0.108	0.082	0.135	0.046	0.053
n-Butane	0.056	0.048	0.058	0.057	0.030	0.072
trans-2-Butene	0.070	0.071	0.137	0.107	0.056	0.056
cis-2-Butene	0.056	0.058	0.134	0.121	0.048	0.046
Isopentane	1.368	1.214	1.342	0.000	0.882	1.125
1-Pentene	0.037	0.036	0.039	0.044	0.026	0.032
n-Pentane	0.488	0.392	0.452	0.479	0.292	0.363
Isoprene	0.034	0.036	0.033	0.046	0.022	0.023
trans-2-Pentene	0.061	0.054	0.069	0.074	0.037	0.053
cis-2-Pentene	0.036	0.032	0.041	0.043	0.022	0.030
2,2-Dimethylbutane	0.086	0.082	0.086	0.096	0.065	0.076
Cyclopentane	0.065	0.056	0.059	0.069	0.041	0.050
2,3-Dimethylbutane	0.219	0.209	0.218	0.258	0.161	0.194
2-Methylpentane	0.671	0.564	0.672	0.700	0.430	0.520
3-Methylpentane	0.371	0.357	0.425	0.444	0.272	0.330
1-Hexene	0.000	0.000	0.020	0.025	0.000	0.000
n-Hexane	0.293	0.288	0.303	0.350	0.217	0.254
Methylcyclopentane	0.358	0.353	0.359	0.433	0.265	0.308
2,4-Dimethylpentane	0.240	0.249	0.246	0.291	0.195	0.215
Benzene	1.211	1.199	1.330	1.823	0.886	0.877
Cyclohexane	0.123	0.123	0.127	0.147	0.092	0.104
2-Methylhexane	0.258	0.264	0.285	0.319	0.202	0.217

2,3-Dimethylpentane	0.379	0.399	0.393	0.463	0.316	0.340
3-Methylhexane	0.264	0.310	0.328	0.330	0.216	0.234
2,2,4-Trimethylpentane	0.544	0.585	0.577	0.673	0.483	0.500
n-Heptane	0.142	0.159	0.159	0.190	0.116	0.215
Methylcyclohexane	0.142	0.154	0.148	0.187	0.112	0.115
2,3,4-Trimethylpentane	0.179	0.197	0.191	0.224	0.169	0.167
Toluene	1.178	1.209	1.431	1.688	0.926	0.978
2-Methylheptane	0.123	0.132	0.136	0.162	0.113	0.110
3-Methylheptane	0.123	0.138	0.135	0.160	0.116	0.112
n-Octane	0.102	0.125	0.145	0.134	0.099	0.094
Ethylbenzene	0.212	0.237	0.301	0.322	0.193	0.192
m/p-Xylenes	0.684	0.747	0.898	0.981	0.608	0.606
Styrene	0.006	0.018	0.037	0.038	0.000	0.000
o-Xylene	0.239	0.260	0.315	0.360	0.212	0.209
Nonane	0.052	0.081	0.138	0.069	0.056	0.049
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.027	0.032	0.043	0.039	0.027	0.024
m-Ethyltoluene	0.169	0.194	0.197	0.242	0.162	0.157
p-Ethyltoluene	0.077	0.087	0.082	0.107	0.070	0.073
1,3,5-Trimethylbenzene	0.114	0.131	0.157	0.157	0.112	0.096
o-Ethyltoluene	0.076	0.075	0.147	0.078	0.057	0.061
1,2,4-Trimethylbenzene	0.228	0.243	1.043	0.299	0.220	0.192
n-Decane	0.045	0.108	0.106	0.041	0.042	0.027
1,2,3-Trimethylbenzene	0.103	0.149	0.128	0.147	0.114	0.040
m-Diethylbenzene	0.209	0.381	0.302	0.281	0.244	0.103
p-Diethylbenzene	0.016	0.039	0.041	0.044	0.024	0.015
n-Undecane	0.000	0.071	0.057	0.000	0.000	0.000
n-Dodecane	0.035	0.052	0.067	0.025	0.024	0.027
Ethanol	0.937	0.765	1.077	1.961	1.003	1.261
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3

Formaldehyde	0.329	0.295	0.276	0.323	0.252	0.262
Acetaldehyde	0.284	0.254	0.247	0.426	0.306	0.299
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000
Acetone	0.026	0.040	0.030	0.000	0.000	0.060
Propionaldehyde	0.026	0.000	0.000	0.025	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.000	0.000	0.000	0.000
MEK & Butyraldehyde	0.000	0.001	0.002	0.008	0.000	0.005
Benzaldehyde	0.000	0.031	0.033	0.039	0.032	0.030
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.025
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.002	0.000	0.000	0.000	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.014
	Run 2	0.014
	Run 3	0.015
E15	Run 1	0.020
	Run 2	0.016
	Run 3	0.016

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.043	0.046	0.037	0.047	0.045	0.038
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.001	0.001	0.005	0.003	0.013	0.006
	3N2O-w	0.009	0.010	0.009	0.011	0.013	0.009
NH3	NH3-1	0.002	0.001	0.005	0.002	0.002	0.008
	NH3-2	0.002	0.002	0.002	0.001	0.002	0.002
	NH3-3	0.002	0.002	0.002	0.002	0.002	0.003
	3NH3-w	0.002	0.002	0.003	0.002	0.002	0.003

OFP

	E10	E15
Total OFP (mg O3/mile)	68.385 ± 11.518	63.742 ± 19.072

2021MY Chevrolet Colorado

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.070	0.066	0.075	0.059	0.070	0.072
	THC-2	0.009	0.008	0.008	0.009	0.008	0.010
	THC-3	0.016	0.020	0.014	0.012	0.011	0.014
	3THC-w	0.024	0.023	0.024	0.020	0.022	0.024
NMHC Emissions (g/mile)	NMHC-1	0.050	0.044	0.053	0.038	0.048	0.050
	NMHC-2	0.006	0.000	0.001	0.001	0.001	0.001
	NMHC-3	0.002	0.006	0.002	0.001	0.001	0.001
	3NMHC-w	0.014	0.011	0.012	0.008	0.011	0.011
CH4 Emissions (g/mile)	CH4-1	0.021	0.022	0.023	0.021	0.023	0.022
	CH4-2	0.003	0.008	0.008	0.008	0.007	0.009
	CH4-3	0.014	0.013	0.012	0.010	0.010	0.013
	3CH4-W	0.009	0.013	0.012	0.011	0.011	0.013
CO Emissions (g/mile)	CO-1	0.299	0.479	0.452	0.278	0.372	0.426
	CO-2	0.072	0.331	0.275	0.174	0.074	0.193
	CO-3	0.215	0.364	0.308	0.094	0.055	0.134
	3CO-w	0.158	0.371	0.321	0.173	0.131	0.225
NOx Emissions (g/mile)	NOx-1	0.026	0.025	0.031	0.036	0.028	0.028

	NOx-2	0.000	0.000	0.000	0.000	0.001	0.000
	NOx-3	0.001	0.001	0.001	0.002	0.002	0.001
	3NOx-w	0.006	0.006	0.007	0.008	0.006	0.006
CO2 Emissions (g/mile)	CO2-1	470.886	468.653	460.672	457.292	462.624	457.924
	CO2-2	450.877	448.778	446.871	446.160	448.569	445.511
	CO2-3	405.707	401.313	404.843	399.865	397.560	399.121
	3CO2-w	442.618	439.870	438.212	435.734	437.482	435.359
Fuel economy-carbon balanced method (miles per gallon)	FE-1	18.053	18.129	18.443	18.230	18.013	18.194
	FE-2	18.876	18.947	19.032	18.697	18.604	18.723
	FE-3	20.964	21.181	21.002	20.866	20.991	20.902
	3FE-w	19.220	19.326	19.402	19.143	19.069	19.155

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	1.643	1.846	1.809	1.362	1.797	1.412
	PM-soot 2	0.195	0.197	0.218	0.196	0.217	0.210
	PM-soot 3	0.320	0.343	0.389	0.448	0.466	0.506
	3PM-soot-w	0.529	0.579	0.595	0.507	0.613	0.540
PM mass (mg/mile)	PM-1	2.006	1.883	1.962	1.317	2.015	1.507
	PM-2	0.048	0.086	0.118	0.126	0.047	0.000
	PM-3	0.262	0.258	0.397	0.322	0.300	Problematic (PM filter damaged)
	3PM mass-w	0.512	0.506	0.577	0.427	0.524	Problematic (No results due to no phase 3 PM mass data)

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	4.70E+12	4.86E+12	4.83E+12	4.20E+12	4.82E+12	4.19E+12
	SPN-2	8.07E+11	8.27E+11	8.87E+11	8.05E+11	8.15E+11	7.53E+11
	SPN-3	1.32E+12	1.39E+12	1.33E+12	1.38E+12	1.43E+12	1.34E+12
	3SPN-w	1.75E+12	1.82E+12	1.82E+12	1.67E+12	1.81E+12	1.62E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	0.861	0.904	0.766	0.823	0.931	0.843
Acetylene	0.311	0.234	0.248	0.311	0.344	0.238
Ethane	0.606	0.652	0.539	0.593	0.614	0.572
Propylene	0.600	0.623	0.570	0.503	0.615	0.575
Propane	0.017	0.000	0.000	0.091	0.005	0.000
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.097	0.105	0.101	0.080	0.100	0.125
1,3-Butadiene	0.048	0.027	0.026	0.019	0.036	0.010
n-Butane	0.095	0.072	0.030	0.000	0.019	0.048
trans-2-Butene	0.056	0.059	0.056	0.043	0.055	0.056
cis-2-Butene	0.041	0.047	0.044	0.031	0.044	0.052
Isopentane	1.439	1.243	1.247	0.763	0.982	1.180
1-Pentene	0.039	0.034	0.035	0.024	0.031	0.036
n-Pentane	0.458	0.400	0.508	0.317	0.313	0.389
Isoprene	0.025	0.020	0.020	0.016	0.024	0.016
trans-2-Pentene	0.065	0.050	0.060	0.035	0.047	0.057
cis-2-Pentene	0.037	0.029	0.035	0.021	0.028	0.044
2,2-Dimethylbutane	0.097	0.088	0.097	0.064	0.074	0.082
Cyclopentane	0.062	0.053	0.059	0.037	0.046	0.051
2,3-Dimethylbutane	0.244	0.215	0.244	0.158	0.186	0.206
2-Methylpentane	0.684	0.568	0.654	0.415	0.497	0.628
3-Methylpentane	0.401	0.354	0.416	0.272	0.309	0.344
1-Hexene	0.000	0.000	0.000	0.000	0.000	0.000
n-Hexane	0.309	0.272	0.314	0.203	0.239	0.275
Methylcyclopentane	0.368	0.332	0.374	0.239	0.286	0.337
2,4-Dimethylpentane	0.252	0.237	0.262	0.174	0.204	0.206
Benzene	0.550	0.774	0.535	0.422	0.541	0.520
Cyclohexane	0.124	0.113	0.121	0.079	0.094	0.103
2-Methylhexane	0.263	0.236	0.261	0.163	0.197	0.222
2,3-Dimethylpentane	0.401	0.372	0.404	0.270	0.313	0.327
3-Methylhexane	0.296	0.252	0.265	0.172	0.201	0.251
2,2,4-Trimethylpentane	0.561	0.551	0.587	0.408	0.468	0.475

n-Heptane	0.138	0.130	0.140	0.084	0.103	0.119
Methylcyclohexane	0.133	0.123	0.129	0.079	0.099	0.102
2,3,4-Trimethylpentane	0.178	0.177	0.182	0.131	0.147	0.147
Toluene	0.777	0.853	1.076	0.592	0.773	0.826
2-Methylheptane	0.109	0.110	0.110	0.077	0.089	0.090
3-Methylheptane	0.113	0.115	0.114	0.081	0.093	0.094
n-Octane	0.096	0.097	0.091	0.066	0.074	0.093
Ethylbenzene	0.161	0.159	0.169	0.119	0.150	0.159
m/p-Xylenes	0.520	0.538	0.550	0.376	0.479	0.495
Styrene	0.000	0.000	0.000	0.000	0.000	0.000
o-Xylene	0.184	0.183	0.193	0.132	0.166	0.171
Nonane	0.042	0.045	0.045	0.032	0.034	0.044
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.024	0.021	0.023	0.000	0.021	0.023
m-Ethyltoluene	0.134	0.132	0.137	0.094	0.120	0.119
p-Ethyltoluene	0.061	0.060	0.063	0.041	0.055	0.057
1,3,5-Trimethylbenzene	0.078	0.087	0.079	0.056	0.069	0.058
o-Ethyltoluene	0.000	0.055	0.050	0.034	0.045	0.050
1,2,4-Trimethylbenzene	0.189	0.174	0.174	0.113	0.154	0.141
n-Decane	0.039	0.038	0.013	0.009	0.009	0.041
1,2,3-Trimethylbenzene	0.015	0.000	0.000	0.092	0.035	0.000
m-Diethylbenzene	0.061	0.000	0.000	0.208	0.097	0.000
p-Diethylbenzene	0.011	0.000	0.000	0.028	0.011	0.000
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.043
n-Dodecane	0.067	0.033	0.000	0.023	0.000	0.000
Ethanol	0.899	0.730	1.020	0.497	0.909	2.138
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.318	0.308	0.248	0.230	0.442	0.409
Acetaldehyde	0.335	0.300	0.310	0.384	0.475	0.393
Acrolein	0.000	0.000	0.000	0.000	0.000	0.000

Acetone	0.000	0.063	0.109	0.000	0.000	0.000
Propionaldehyde	0.000	0.027	0.028	0.000	0.000	0.000
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.000	0.000	0.027	0.000	0.000	0.000
MEK & Butyraldehyde	0.000	0.002	0.016	0.000	0.000	0.001
Benzaldehyde	0.026	0.000	0.029	0.000	0.027	0.026
Valeraldehyde	0.000	0.000	0.000	0.000	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.000	0.000	0.000	0.000	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.015
	Run 2	0.011
	Run 3	0.012
E15	Run 1	0.009
	Run 2	0.011
	Run 3	0.012

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.023	0.025	0.038	0.032	0.032	0.027
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.004	0.007	0.007	0.001	0.001	0.000
	3N2O-w	0.006	0.007	0.010	0.007	0.007	0.006
NH3	NH3-1	0.002	0.002	0.007	0.019	0.019	0.007
	NH3-2	0.006	0.006	0.005	0.005	0.005	0.008
	NH3-3	0.008	0.009	0.008	0.007	0.007	0.010
	3NH3-w	0.006	0.006	0.006	0.008	0.008	0.008

OFP

	E10	E15
Total OFP (mg O3/mile)	54.634 ± 9.262	45.182 ± 9.458

2017MY Ford F150

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.137	0.172	0.142	0.081	0.119	0.101
	THC-2	0.013	0.012	0.012	0.012	0.014	0.012
	THC-3	0.028	0.030	0.032	0.029	0.030	0.032
	3THC-w	0.043	0.050	0.045	0.031	0.040	0.036
NMHC Emissions (g/mile)	NMHC-1	0.104	0.133	0.108	0.055	0.087	0.071
	NMHC-2	0.001	0.001	0.002	0.001	0.001	0.000
	NMHC-3	0.008	0.010	0.012	0.008	0.009	0.011
	3NMHC-w	0.024	0.031	0.027	0.014	0.021	0.018
CH4 Emissions (g/mile)	CH4-1	0.033	0.039	0.034	0.026	0.032	0.030
	CH4-2	0.012	0.011	0.010	0.011	0.013	0.011
	CH4-3	0.020	0.019	0.020	0.021	0.021	0.021
	3CH4-W	0.019	0.019	0.018	0.017	0.019	0.018
CO Emissions (g/mile)	CO-1	2.331	3.045	3.022	1.094	1.749	2.166
	CO-2	0.033	0.083	0.000	0.000	0.000	0.000
	CO-3	0.851	1.028	0.828	0.603	0.869	0.944
	3CO-w	0.735	0.957	0.855	0.393	0.603	0.707
NOx Emissions (g/mile)	NOx-1	0.029	0.033	0.032	0.026	0.027	0.026
	NOx-2	0.009	0.011	0.010	0.009	0.009	0.009
	NOx-3	0.016	0.009	0.009	0.007	0.010	0.018
	3NOx-w	0.015	0.015	0.014	0.012	0.013	0.015
CO2 Emissions (g/mile)	CO2-1	471.522	503.339	489.589	485.108	478.680	473.469

	CO2-2	432.414	442.780	442.569	441.396	442.360	435.580
	CO2-3	407.016	424.720	420.541	408.434	411.756	404.156
	3CO2-w	433.548	450.376	446.280	441.419	441.492	434.814
Fuel economy-carbon balanced method (miles per gallon)	FE-1	17.900	16.737	17.207	17.138	17.327	17.494
	FE-2	19.684	19.220	19.235	18.910	18.869	19.163
	FE-3	20.844	19.965	20.177	20.386	20.202	20.574
	3FE-w	19.579	18.834	19.013	18.880	18.862	19.144

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	5.891	8.257	5.411	3.641	5.263	4.240
	PM-soot 2	0.118	0.160	0.128	0.086	0.124	0.134
	PM-soot 3	0.223	0.297	0.305	0.132	0.173	0.135
	3PM-soot-w	1.346	1.876	1.274	0.838	1.205	0.984
PM mass (mg/mile)	PM-1	6.386	9.077	6.011	4.017	5.751	4.797
	PM-2	0.000	0.225	0.000	0.000	0.000	0.000
	PM-3	0.127	0.283	0.229	1.890	0.143	0.189
	3PM mass-w	1.361	2.076	1.312	1.356	1.235	1.045

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	1.18E+13	1.43E+13	1.10E+13	8.84E+12	1.13E+13	1.13E+13
	SPN-2	3.06E+11	3.74E+11	3.10E+11	2.38E+11	3.57E+11	3.57E+11
	SPN-3	4.31E+11	5.02E+11	5.32E+11	3.14E+11	3.96E+11	3.96E+11
	3SPN-w	2.74E+12	3.29E+12	2.59E+12	2.05E+12	2.64E+12	2.64E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	2.797	3.994	3.451	1.293	2.281	2.391
Acetylene	0.973	1.148	1.134	0.409	0.654	0.854

Ethane	1.241	1.565	1.268	0.845	0.984	1.153
Propylene	1.577	2.287	1.881	0.807	1.272	1.366
Propane	0.014	0.176	0.240	0.030	0.084	0.053
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000
1-Butene	0.282	0.472	0.366	0.122	0.228	0.247
1,3-Butadiene	0.078	0.105	0.082	0.022	0.035	0.064
n-Butane	0.140	0.118	0.104	0.103	0.088	0.120
trans-2-Butene	0.162	0.251	0.206	0.085	0.136	0.142
cis-2-Butene	0.154	0.273	0.238	0.069	0.145	0.136
Isopentane	2.188	2.215	1.981	1.812	1.627	1.877
1-Pentene	0.043	0.050	0.047	0.036	0.034	0.039
n-Pentane	0.702	0.735	0.665	0.795	0.577	0.707
Isoprene	0.036	0.044	0.043	0.025	0.026	0.037
trans-2-Pentene	0.071	0.089	0.081	0.053	0.058	0.064
cis-2-Pentene	0.042	0.052	0.048	0.031	0.034	0.037
2,2-Dimethylbutane	0.169	0.179	0.154	0.151	0.134	0.153
Cyclopentane	0.095	0.098	0.083	0.059	0.069	0.080
2,3-Dimethylbutane	0.414	0.451	0.385	0.290	0.299	0.355
2-Methylpentane	1.099	1.210	1.087	0.763	0.789	0.935
3-Methylpentane	0.705	0.773	0.653	0.466	0.500	0.590
1-Hexene	0.023	0.026	0.024	0.000	0.000	0.019
n-Hexane	0.538	0.619	0.518	0.341	0.386	0.455
Methylcyclopentane	0.637	0.726	0.605	0.478	0.469	0.568
2,4-Dimethylpentane	0.474	0.532	0.452	0.292	0.333	0.400
Benzene	2.506	3.586	2.948	1.108	1.996	2.138
Cyclohexane	0.220	0.253	0.202	0.225	0.171	0.213
2-Methylhexane	0.535	0.628	0.507	0.306	0.360	0.443
2,3-Dimethylpentane	0.783	0.901	0.741	0.476	0.540	0.658
3-Methylhexane	0.586	0.693	0.572	0.350	0.388	0.466
2,2,4-Trimethylpentane	1.154	1.329	1.096	0.712	0.812	0.976
n-Heptane	0.351	0.408	0.315	0.174	0.214	0.272
Methylcyclohexane	0.310	0.374	0.284	0.166	0.202	0.252
2,3,4-Trimethylpentane	0.383	0.443	0.365	0.229	0.269	0.322
Toluene	1.933	2.813	2.464	0.912	1.519	1.703

2-Methylheptane	0.288	0.298	0.241	0.134	0.175	0.202
3-Methylheptane	0.258	0.319	0.252	0.130	0.178	0.217
n-Octane	0.207	0.270	0.218	0.117	0.146	0.186
Ethylbenzene	0.355	0.540	0.444	0.174	0.273	0.309
m/p-Xylenes	1.122	1.652	1.319	0.555	0.843	0.952
Styrene	0.029	0.054	0.053	0.000	0.000	0.025
o-Xylene	0.382	0.556	0.443	0.193	0.284	0.322
Nonane	0.101	0.135	0.101	0.057	0.073	0.087
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.033	0.048	0.039	0.020	0.027	0.030
m-Ethyltoluene	0.246	0.406	0.318	0.142	0.201	0.230
p-Ethyltoluene	0.112	0.198	0.152	0.065	0.100	0.110
1,3,5-Trimethylbenzene	0.215	0.290	0.223	0.095	0.139	0.171
o-Ethyltoluene	0.085	0.185	0.091	0.046	0.059	0.074
1,2,4-Trimethylbenzene	0.326	0.512	0.373	0.198	0.247	0.303
n-Decane	0.037	0.109	0.124	0.019	0.035	0.052
1,2,3-Trimethylbenzene	0.156	0.042	0.117	0.000	0.000	0.015
m-Diethylbenzene	0.200	0.000	0.232	0.000	0.000	0.000
p-Diethylbenzene	0.045	0.090	0.061	0.003	0.005	0.026
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.000	0.000	0.018	0.000	0.000	0.000
Ethanol	0.563	0.172	0.467	0.364	0.407	0.471
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.541	0.654	0.730	0.542	0.672	0.684
Acetaldehyde	0.369	0.540	0.527	0.427	0.589	0.554
Acrolein	0.025	0.032	0.025	0.028	0.033	0.029
Acetone	0.000	0.000	0.000	0.154	0.068	0.000
Propionaldehyde	0.033	0.044	0.041	0.033	0.044	0.043
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.027	0.030	0.027	0.028	0.030	0.028

MEK & Butyraldehyde	0.005	0.010	0.007	0.001	0.007	0.008
Benzaldehyde	0.046	0.053	0.052	0.034	0.053	0.042
Valeraldehyde	0.000	0.000	0.000	0.026	0.030	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.000	0.000	0.000	0.000	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.025
	Run 2	0.031
	Run 3	0.027
E15	Run 1	0.015
	Run 2	0.022
	Run 3	0.019

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.138	0.126	0.055	0.058	0.097	0.052
	N2O-2	0.004	0.005	0.003	0.000	0.002	0.001
	N2O-3	0.099	0.184	0.125	0.073	0.133	0.145
	3N2O-w	0.058	0.079	0.047	0.032	0.058	0.051
NH3	NH3-1	0.003	0.005	0.013	0.012	0.021	0.019
	NH3-2	0.002	0.003	0.004	0.006	0.006	0.006
	NH3-3	0.003	0.005	0.005	0.007	0.004	0.005
	3NH3-w	0.002	0.004	0.006	0.008	0.009	0.008

OFP

	E10	E15
Total OFP (mg O3/mile)	137.135 ± 19.783	91.661 ± 19.293

2021MY Hyundai Accent

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.075	0.073	0.070	0.078	0.070	0.079
	THC-2	0.001	0.002	0.004	0.002	0.002	0.002
	THC-3	0.003	0.003	0.003	0.003	0.003	0.003
	3THC-w	0.017	0.017	0.017	0.018	0.016	0.018
NMHC Emissions (g/mile)	NMHC-1	0.069	0.067	0.063	0.071	0.063	0.072
	NMHC-2	0.000	0.001	0.003	0.001	0.000	0.001
	NMHC-3	0.001	0.001	0.001	0.001	0.001	0.001
	3NMHC-w	0.014	0.015	0.015	0.016	0.014	0.015
CH4 Emissions (g/mile)	CH4-1	0.006	0.007	0.007	0.007	0.007	0.007
	CH4-2	0.001	0.001	0.001	0.001	0.001	0.001
	CH4-3	0.002	0.002	0.002	0.002	0.002	0.002
	3CH4-W	0.002	0.002	0.003	0.002	0.003	0.003
CO Emissions (g/mile)	CO-1	0.298	0.411	0.405	0.297	0.354	0.334
	CO-2	0.000	0.006	0.000	0.000	0.000	0.000
	CO-3	0.040	0.018	0.000	0.000	0.000	0.003
	3CO-w	0.073	0.093	0.084	0.061	0.074	0.070
NOx Emissions (g/mile)	NOx-1	0.022	0.023	0.022	0.022	0.022	0.023
	NOx-2	0.020	0.017	0.018	0.020	0.019	0.020
	NOx-3	0.005	0.004	0.006	0.006	0.005	0.006
	3NOx-w	0.016	0.015	0.016	0.017	0.016	0.017
CO2 Emissions (g/mile)	CO2-1	213.806	211.330	209.496	217.305	214.539	214.163
	CO2-2	194.357	192.420	190.772	199.524	199.875	196.364
	CO2-3	185.190	184.181	187.461	189.204	188.933	186.661

	3CO2-w	195.866	194.077	193.736	200.369	199.913	197.388
Fuel economy-carbon balanced method (miles per gallon)	FE-1	38.291	38.771	38.840	39.690	40.121	40.474
	FE-2	41.836	41.763	42.510	43.802	44.241	44.623
	FE-3	44.117	44.181	44.717	45.954	46.214	45.412
	3FE-w	41.630	41.722	42.255	43.429	43.821	43.902

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	0.099	0.080	0.070	0.103	0.076	0.122
	PM-soot 2	0.018	0.014	0.020	0.020	0.017	0.017
	PM-soot 3	0.013	0.012	0.015	0.014	0.013	0.012
	3PM-soot-w	0.033	0.027	0.029	0.036	0.028	0.037
PM mass (mg/mile)	PM-1	0.063	0.010	0.000	0.014	0.054	0.136
	PM-2	0.000	0.000	0.000	0.000	0.000	0.000
	PM-3	0.000	0.000	0.000	0.000	0.000	0.000
	3PM mass-w	0.013	0.002	0.000	0.003	0.011	0.028

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	4.71E+11	3.94E+11	3.15E+11	4.88E+11	3.80E+11	5.73E+11
	SPN-2	2.89E+09	3.35E+09	2.80E+09	2.75E+09	2.51E+09	2.46E+09
	SPN-3	2.34E+09	2.31E+09	2.24E+09	1.85E+09	1.86E+09	1.85E+09
	3SPN-w	9.95E+10	8.41E+10	6.73E+10	1.03E+11	8.07E+10	1.20E+11

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	1.399	1.386	1.327	1.469	1.245	1.485
Acetylene	0.045	0.119	0.103	0.098	0.101	0.108
Ethane	0.449	0.478	0.452	0.437	0.376	0.447
Propylene	1.135	1.096	1.072	1.148	1.028	1.189

Propane	0.031	0.085	0.037	0.000	0.129	0.000
Isobutane	0.000	0.007	0.020	0.000	0.000	0.000
1-Butene	0.272	0.252	0.248	0.279	0.244	0.272
1,3-Butadiene	0.063	0.076	0.077	0.082	0.067	0.000
n-Butane	0.093	0.093	0.127	0.072	0.048	0.062
trans-2-Butene	0.163	0.148	0.147	0.157	0.146	0.169
cis-2-Butene	0.210	0.199	0.206	0.198	0.189	0.209
Isopentane	1.536	1.321	1.397	1.454	1.108	1.402
1-Pentene	0.041	0.037	0.038	0.042	0.032	0.042
n-Pentane	0.508	0.439	0.475	0.490	0.370	0.472
Isoprene	0.034	0.037	0.034	0.037	0.032	0.000
trans-2-Pentene	0.083	0.068	0.068	0.080	0.063	0.078
cis-2-Pentene	0.049	0.041	0.042	0.047	0.037	0.046
2,2-Dimethylbutane	0.106	0.092	0.092	0.100	0.079	0.099
Cyclopentane	0.071	0.060	0.062	0.068	0.053	0.066
2,3-Dimethylbutane	0.288	0.242	0.236	0.276	0.214	0.270
2-Methylpentane	0.783	0.659	0.643	0.744	0.582	0.736
3-Methylpentane	0.483	0.410	0.401	0.458	0.362	0.458
1-Hexene	0.019	0.019	0.018	0.020	0.017	0.000
n-Hexane	0.383	0.330	0.323	0.367	0.295	0.365
Methylcyclopentane	0.475	0.405	0.400	0.454	0.360	0.451
2,4-Dimethylpentane	0.319	0.276	0.270	0.306	0.247	0.300
Benzene	0.615	0.596	0.583	0.624	0.548	0.633
Cyclohexane	0.154	0.136	0.139	0.149	0.120	0.147
2-Methylhexane	0.360	0.314	0.307	0.341	0.275	0.342
2,3-Dimethylpentane	0.507	0.441	0.434	0.484	0.394	0.486
3-Methylhexane	0.370	0.321	0.322	0.349	0.279	0.361
2,2,4-Trimethylpentane	0.712	0.639	0.628	0.684	0.570	0.689
n-Heptane	0.223	0.195	0.187	0.213	0.171	0.213
Methylcyclohexane	0.210	0.183	0.181	0.205	0.160	0.205
2,3,4-Trimethylpentane	0.242	0.216	0.212	0.229	0.191	0.226
Toluene	1.303	1.193	1.219	1.287	1.111	1.354
2-Methylheptane	0.161	0.144	0.142	0.159	0.128	0.151
3-Methylheptane	0.167	0.152	0.149	0.166	0.137	0.164

n-Octane	0.142	0.128	0.128	0.149	0.118	0.138
Ethylbenzene	0.317	0.306	0.293	0.326	0.285	0.338
m/p-Xylenes	0.960	0.943	0.913	0.993	0.873	1.036
Styrene	0.016	0.027	0.017	0.023	0.012	0.000
o-Xylene	0.339	0.330	0.324	0.353	0.306	0.364
Nonane	0.072	0.066	0.068	0.072	0.060	0.095
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.045	0.046	0.043	0.044	0.036	0.050
m-Ethyltoluene	0.292	0.279	0.267	0.286	0.249	0.296
p-Ethyltoluene	0.140	0.132	0.129	0.126	0.112	0.134
1,3,5-Trimethylbenzene	0.175	0.167	0.167	0.191	0.153	0.181
o-Ethyltoluene	0.089	0.084	0.077	0.086	0.078	0.092
1,2,4-Trimethylbenzene	0.353	0.346	0.326	0.358	0.308	0.354
n-Decane	0.072	0.054	0.046	0.046	0.044	0.048
1,2,3-Trimethylbenzene	0.077	0.045	0.055	0.106	0.059	0.049
m-Diethylbenzene	0.061	0.000	0.046	0.131	0.051	0.000
p-Diethylbenzene	0.079	0.068	0.076	0.135	0.091	0.075
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.015
n-Dodecane	0.000	0.000	0.000	0.012	0.015	0.000
Ethanol	0.421	0.414	0.495	1.470	0.605	0.000
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.297	0.269	0.275	0.266	0.167	0.182
Acetaldehyde	0.438	0.439	0.423	0.631	0.575	0.614
Acrolein	0.000	0.000	0.000	0.031	0.000	0.000
Acetone	0.000	0.000	0.000	0.000	0.000	0.000
Propionaldehyde	0.035	0.030	0.030	0.038	0.031	0.032
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.015	0.000	0.015	0.000	0.000	0.016
MEK & Butyraldehyde	0.013	0.008	0.008	0.017	0.007	0.009
Benzaldehyde	0.024	0.022	0.021	0.030	0.024	0.025

Valeraldehyde	0.000	0.014	0.000	0.023	0.000	0.000
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000
Hexaldehyde	0.000	0.000	0.000	0.027	0.000	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.015
	Run 2	0.015
	Run 3	0.015
E15	Run 1	0.017
	Run 2	0.014
	Run 3	0.016

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.090	0.090	0.058	0.063	0.069	0.091
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.003	0.003	0.002	0.003	0.003	0.002
	3N2O-w	0.019	0.019	0.013	0.014	0.015	0.020
NH3	NH3-1	0.001	0.001	0.001	0.001	0.001	0.002
	NH3-2	0.002	0.002	0.001	0.004	0.001	0.007
	NH3-3	0.002	0.002	0.001	0.002	0.001	0.002
	3NH3-w	0.002	0.002	0.001	0.003	0.001	0.005

OFP

	E10	E15
Total OFP (mg O3/mile)	62.971 ± 3.438	63.476 ± 7.141

2018MY Chevrolet Suburban

Gaseous and fuel economy

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
THC Emissions (g/mile)	THC-1	0.175	0.153	0.180	0.141	0.144	0.142
	THC-2	0.007	0.006	0.007	0.005	0.007	0.006
	THC-3	0.017	0.014	0.013	0.014	0.014	0.013
	3THC-w	0.044	0.039	0.044	0.036	0.037	0.036
NMHC Emissions (g/mile)	NMHC-1	0.135	0.114	0.137	0.104	0.107	0.102
	NMHC-2	0.000	0.000	0.000	0.000	0.001	0.000
	NMHC-3	0.002	0.002	0.001	0.001	0.002	0.000
	3NMHC-w	0.028	0.024	0.028	0.021	0.023	0.021
CH4 Emissions (g/mile)	CH4-1	0.040	0.039	0.042	0.036	0.037	0.040
	CH4-2	0.007	0.007	0.008	0.006	0.007	0.006
	CH4-3	0.015	0.012	0.012	0.013	0.012	0.013
	3CH4-W	0.016	0.015	0.016	0.014	0.014	0.015
CO Emissions (g/mile)	CO-1	2.900	1.983	2.397	1.834	1.811	2.033
	CO-2	0.073	0.119	0.159	0.190	0.000	0.000
	CO-3	0.189	0.358	0.369	0.316	0.063	0.166
	3CO-w	0.692	0.571	0.681	0.566	0.393	0.467
NOx Emissions (g/mile)	NOx-1	0.017	0.021	0.017	0.018	0.029	0.038
	NOx-2	0.006	0.006	0.007	0.005	0.006	0.007
	NOx-3	0.006	0.004	0.004	0.005	0.005	0.004
	3NOx-w	0.008	0.009	0.008	0.008	0.010	0.013
CO2 Emissions (g/mile)	CO2-1	542.531	557.435	548.138	556.535	555.002	560.452
	CO2-2	526.540	531.994	527.903	533.860	529.141	534.759
	CO2-3	481.678	478.386	478.093	482.482	485.296	483.005
	3CO2-w	517.520	522.521	518.404	524.431	522.459	525.874
Fuel economy-carbon balanced method (miles per gallon)	FE-1	14.911	14.952	14.799	15.546	15.175	15.410

	FE-2	15.627	15.775	15.609	16.164	15.997	16.119
	FE-3	17.282	17.196	17.272	17.662	17.774	17.784
	3FE-w	15.887	15.955	15.848	16.412	16.261	16.384

PM mass and black carbon

Pollutants	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run1	Run2
Black carbon (mg/mile)	PM-soot 1	1.677	3.865	4.269	3.606	2.652	3.954
	PM-soot 2	0.176	0.222	0.214	0.179	0.153	0.160
	PM-soot 3	0.078	0.089	0.120	0.103	0.121	0.095
	3PM-soot-w	0.461	0.941	1.031	0.870	0.662	0.928
PM mass (mg/mile)	PM-1	1.752	4.131	3.790	3.899	3.468	4.090
	PM-2	0.000	0.003	0.044	0.047	0.000	0.000
	PM-3	0.000	0.105	0.000	0.000	0.165	0.000
	3PM mass-w	0.364	0.887	0.810	0.833	0.765	0.848

SPN

Pollutant	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
SPN (#/mile)	SPN-1	6.98E+12	5.49E+12	9.00E+12	9.31E+12	1.07E+13	5.64E+12
	SPN-2	6.60E+11	1.38E+11	8.51E+11	7.19E+11	5.22E+11	5.81E+11
	SPN-3	2.68E+11	1.35E+11	3.07E+11	4.25E+11	4.41E+11	4.35E+11
	3SPN-w	1.86E+12	1.25E+12	2.39E+12	2.42E+12	2.61E+12	1.59E+12

Hydrocarbon species and ethanol

Pollutants (mg/mile)	E10			E15		
	Run1	Run2	Run3	Run1	Run2	Run3
Ethylene	4.812	3.608	21.551	3.264	3.005	3.191
Acetylene	1.612	1.081	1.840	1.160	0.966	0.897
Ethane	1.668	1.578	8.103	1.309	1.301	1.254
Propylene	2.869	2.046	2.628	1.696	1.893	1.896
Propane	0.105	0.001	0.013	0.078	0.104	0.011
Isobutane	0.000	0.000	0.000	0.000	0.000	0.000

1-Butene	0.527	0.348	0.485	0.295	0.334	0.326
1,3-Butadiene	0.107	0.070	0.154	0.000	0.070	0.062
n-Butane	0.122	0.110	0.132	0.371	0.133	0.111
trans-2-Butene	0.396	0.226	0.300	0.138	0.206	0.213
cis-2-Butene	0.360	0.187	0.265	0.131	0.170	0.178
Isopentane	2.171	2.124	2.649	1.977	2.449	2.022
1-Pentene	0.066	0.059	0.081	0.000	0.072	0.054
n-Pentane	0.964	0.824	1.017	0.904	1.158	0.983
Isoprene	0.113	0.072	0.110	0.016	0.070	0.103
trans-2-Pentene	0.130	0.099	0.151	0.058	0.101	0.092
cis-2-Pentene	0.073	0.058	0.086	0.034	0.060	0.053
2,2-Dimethylbutane	0.229	0.207	0.240	0.207	0.224	0.224
Cyclopentane	0.100	0.090	0.136	0.082	0.094	0.087
2,3-Dimethylbutane	0.489	0.480	0.589	0.382	0.428	0.466
2-Methylpentane	1.233	1.229	1.532	0.982	1.073	1.140
3-Methylpentane	0.785	0.778	0.961	0.622	0.679	0.720
1-Hexene	0.035	0.031	0.041	0.000	0.031	0.028
n-Hexane	0.561	0.554	0.706	0.453	0.504	0.497
Methylcyclopentane	0.872	0.782	0.991	0.695	0.784	0.827
2,4-Dimethylpentane	0.471	0.465	0.583	0.383	0.432	0.423
Benzene	3.339	2.550	3.184	2.570	2.343	2.585
Cyclohexane	0.360	0.296	0.362	0.308	0.366	0.360
2-Methylhexane	0.506	0.511	0.632	0.400	0.462	0.451
2,3-Dimethylpentane	0.742	0.775	0.918	0.623	0.695	0.679
3-Methylhexane	0.537	0.534	0.653	0.433	0.493	0.472
2,2,4-Trimethylpentane	1.131	1.169	1.325	0.961	1.053	1.044
n-Heptane	0.308	0.307	0.382	0.242	0.277	0.270
Methylcyclohexane	0.344	0.326	0.405	0.238	0.271	0.308
2,3,4-Trimethylpentane	0.373	0.391	0.421	0.305	0.351	0.346
Toluene	3.242	2.239	3.042	2.213	2.164	2.274
2-Methylheptane	0.247	0.248	0.276	2.442	0.231	0.218
3-Methylheptane	0.258	0.258	0.289	0.210	0.236	0.234
n-Octane	0.209	0.204	0.231	0.177	0.192	0.193
Ethylbenzene	0.631	0.453	0.587	0.441	0.428	0.425

m/p-Xylenes	1.896	1.478	1.785	1.206	1.384	1.406
Styrene	0.017	0.014	0.027	0.000	0.007	0.002
o-Xylene	0.630	0.507	0.605	0.442	0.479	0.490
Nonane	0.106	0.106	0.107	0.086	0.098	0.101
Isopropylbenzene	0.000	0.000	0.000	0.000	0.000	0.000
n-Propylbenzene	0.058	0.054	0.061	0.048	0.051	0.051
m-Ethyltoluene	0.449	0.374	0.418	0.301	0.346	0.361
p-Ethyltoluene	0.207	0.174	0.193	0.151	0.156	0.163
1,3,5-Trimethylbenzene	0.256	0.243	0.242	0.152	0.236	0.238
o-Ethyltoluene	0.134	0.119	0.142	0.094	0.097	0.117
1,2,4-Trimethylbenzene	0.529	0.496	0.522	0.351	0.495	0.517
n-Decane	0.023	0.026	0.051	0.061	0.040	0.045
1,2,3-Trimethylbenzene	0.000	0.000	0.000	0.057	0.000	0.000
m-Diethylbenzene	0.000	0.000	0.000	0.171	0.000	0.000
p-Diethylbenzene	0.063	0.043	0.066	0.048	0.060	0.061
n-Undecane	0.000	0.000	0.000	0.000	0.000	0.000
n-Dodecane	0.000	0.000	0.000	0.000	0.000	0.000
Ethanol	1.195	0.000	2.112	4.425	2.801	1.972
Naphthalene	0.000	0.000	0.000	0.000	0.000	0.000

Carbonyls

	E10			E15		
Pollutants (mg/mile)	Run1	Run2	Run3	Run1	Run2	Run3
Formaldehyde	0.865	0.655	0.801	0.938	0.911	0.750
Acetaldehyde	0.713	0.653	0.737	0.917	0.877	0.840
Acrolein	0.058	0.065	0.000	0.057	0.062	0.052
Acetone	0.597	0.329	0.365	5.538	0.282	0.914
Propionaldehyde	0.065	0.056	0.000	0.068	0.061	0.060
Crotonaldehyde	0.000	0.000	0.000	0.000	0.000	0.000
Methacrolein	0.043	0.044	0.047	0.043	0.041	0.039
MEK & Butyraldehyde	0.024	0.023	0.021	0.014	0.014	0.015
Benzaldehyde	0.068	0.070	0.076	0.067	0.068	0.058
Valeraldehyde	0.040	0.036	0.045	0.000	0.042	0.039
m-Tolualdehyde	0.000	0.000	0.000	0.000	0.000	0.000

Hexaldehyde	0.000	0.000	0.000	0.000	0.000	0.000

NMOG

		NMOG (g/mile)
E10	Run 1	0.030
	Run 2	0.024
	Run 3	0.030
E15	Run 1	0.024
	Run 2	0.025
	Run 3	0.023

N2O and NH3

Pollutants (g/mile)	Phase	E10			E15		
		Run1	Run2	Run3	Run1	Run2	Run3
N2O	N2O-1	0.014	0.026	0.016	0.057	0.055	0.027
	N2O-2	0.000	0.000	0.000	0.000	0.000	0.000
	N2O-3	0.000	0.000	0.000	0.005	0.004	0.000
	3N2O-w	0.003	0.005	0.003	0.013	0.013	0.006
NH3	NH3-1	0.003	0.003	0.003	0.008	0.010	0.004
	NH3-2	0.005	0.011	0.004	0.009	0.007	0.006
	NH3-3	0.004	0.003	0.003	0.004	0.004	0.005
	3NH3-w	0.005	0.007	0.003	0.007	0.007	0.005

OFP

	E10	E15
Total OFP (mg O3/mile)	146.866 ± 18.323	123.465 ± 17.128

Appendix B
Detailed Statistical Analysis Results for the Twenty Vehicles

1 THC

1) THC_1

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	4.76	0.0315

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-2.7787	0.1187	99	-23.41	<.0001
Fuel	E15	-2.8416	0.1187	99	-23.94	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.06292	0.02884	99	2.18	0.0315	Tukey-Kramer	0.0315

2) THC_2

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	2.25	0.1364

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-6.2750	0.2545	99	-24.66	<.0001
Fuel	E15	-6.3948	0.2545	99	-25.13	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.1198	0.07977	99	1.50	0.1364	Tukey-Kramer	0.1364

3) THC_3

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.00	0.9538

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|

Fuel	E10	-5.0422	0.1931	19	-26.11	<.0001
Fuel	E15	-5.0451	0.1931	19	-26.13	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.002979	0.05070	19	0.06	0.9538	Tukey-Kramer	0.9538

4) THC_w

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	5.45	0.0216

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-4.1307	0.1295	99	-31.89	<.0001
Fuel	E15	-4.1800	0.1295	99	-32.27	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.04935	0.02114	99	2.33	0.0216	Tukey-Kramer	0.0216

2 NMHC

1) NMHC_1

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	4.62	0.0340

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-3.0197	0.1179	99	-25.61	<.0001
Fuel	E15	-3.0871	0.1179	99	-26.18	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.06746	0.03137	99	2.15	0.0340	Tukey-Kramer	0.0340

2) NMHC_2

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	0.33	0.5674

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|

Fuel	E10	-6.6219	0.08004	99	-82.74	<.0001
Fuel	E15	-6.6592	0.08004	99	-83.20	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.03734	0.06507	99	0.57	0.5674	Tukey-Kramer	0.5674

3) NMHC_3

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	3.37	0.0694

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-6.0988	0.2111	99	-28.89	<.0001
Fuel	E15	-6.2236	0.2111	99	-29.48	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.1249	0.06802	99	1.84	0.0694	Tukey-Kramer	0.0694

4) NMHC_w

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	3.25	0.0875

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	0.01267	0.001443	19	8.79	<.0001
Fuel	E15	0.01164	0.001443	19	8.07	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.001033	0.000573	19	1.80	0.0875	Tukey-Kramer	0.0875

3 CO

1) CO_1

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	6.66	0.0113

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|

Fuel	E10	1.0847	0.1724	99	6.29	<.0001
Fuel	E15	0.9537	0.1724	99	5.53	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.1310	0.05076	99	2.58	0.0113	Tukey-Kramer	0.0113

2) CO_2

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	0.02	0.8934

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-4.9612	0.4107	99	-12.08	<.0001
Fuel	E15	-4.9975	0.4107	99	-12.17	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.03627	0.2700	99	0.13	0.8934	Tukey-Kramer	0.8934

3) CO_3

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	8.44	0.0045

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	0.2919	0.08372	99	3.49	0.0007
Fuel	E15	0.2142	0.08372	99	2.56	0.0120

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.07768	0.02674	99	2.91	0.0045	Tukey-Kramer	0.0045

4) CO_w

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	6.49	0.0196

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	0.3334	0.05590	19	5.96	<.0001
Fuel	E15	0.2770	0.05590	19	4.95	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.05643	0.02215	19	2.55	0.0196	Tukey-Kramer	0.0196

4 NOx

1) NOx_1

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	1.07	0.3148

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	0.02302	0.003585	19	6.42	<.0001
Fuel	E15	0.02153	0.003585	19	6.01	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.001492	0.001445	19	1.03	0.3148	Tukey-Kramer	0.3148

2) NOx_2

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.28	0.6028

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-5.8745	0.4036	19	-14.55	<.0001
Fuel	E15	-5.9202	0.4036	19	-14.67	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.04567	0.08629	19	0.53	0.6028	Tukey-Kramer	0.6028

3) NOx_3

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.56	0.4619

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-5.4955	0.2577	19	-21.33	<.0001

Fuel	E15	-5.6566	0.2577	19	-21.95	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.1611	0.2145	19	0.75	0.4619	Tukey-Kramer	0.4619

4) NOx_w

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.47	0.4997

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-4.9107	0.1989	19	-24.68	<.0001
Fuel	E15	-4.9441	0.1989	19	-24.85	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.03337	0.04849	19	0.69	0.4997	Tukey-Kramer	0.4997

5 CO2

1) CO2_1

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.97	0.3360

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	363.11	26.1488	19	13.89	<.0001
Fuel	E15	361.39	26.1488	19	13.82	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	1.7188	1.7413	19	0.99	0.3360	Tukey-Kramer	0.3360

2) CO2_2

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	1.75	0.2015

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	352.37	28.5271	19	12.35	<.0001
Fuel	E15	354.63	28.5271	19	12.43	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	-2.2637	1.7109	19	-1.32	0.2015	Tukey-Kramer	0.2015

3) CO2_3

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	99	3.25	0.0746

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	311.49	22.2356	99	14.01	<.0001
Fuel	E15	309.89	22.2356	99	13.94	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	1.6012	0.8885	99	1.80	0.0746	Tukey-Kramer	0.0746

4) CO2_w

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.08	0.7793

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	343.38	26.1706	19	13.12	<.0001
Fuel	E15	343.75	26.1706	19	13.13	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	-0.3678	1.2938	19	-0.28	0.7793	Tukey-Kramer	0.7793

6 PM

1) PM_1

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	6.52	0.0194

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	3.3414	0.7024	19	4.76	0.0001
Fuel	E15	2.7860	0.7024	19	3.97	0.0008

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.5554	0.2175	19	2.55	0.0194	Tukey-Kramer	0.0194

2) PM_2

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	6.21	0.0221

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-3.4967	0.4714	19	-7.42	<.0001
Fuel	E15	-4.2422	0.4714	19	-9.00	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.7455	0.2991	19	2.49	0.0221	Tukey-Kramer	0.0221

3) PM_3

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	3.44	0.0794

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-2.6081	0.4880	19	-5.34	<.0001
Fuel	E15	-3.1283	0.4888	19	-6.40	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.5202	0.2806	19	1.85	0.0794	Tukey-Kramer	0.0794

4) PM_w

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	5.70	0.0275

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	0.8576	0.1788	19	4.80	0.0001
Fuel	E15	0.6958	0.1789	19	3.89	0.0010

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard	DF	t Value	Pr > |t|	Adjustment	Adj P

				Error					
Fuel	E10	E15	0.1617	0.06772	19	2.39	0.0275	Tukey-Kramer	0.0275

6 FEw

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	8.40	0.0092

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	3.2846	0.08353	19	39.32	<.0001
Fuel	E15	3.2728	0.08353	19	39.18	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.01184	0.004086	19	2.90	0.0092	Tukey-Kramer	0.0092

7 SPN_w

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	9.16	0.0069

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	27.5886	0.2710	19	101.81	<.0001
Fuel	E15	27.4552	0.2710	19	101.32	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.1335	0.04409	19	3.03	0.0069	Tukey-Kramer	0.0069

8 1,3-Butadiene

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.01	0.9192

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-3.6269	0.3324	19	-10.91	<.0001
Fuel	E15	-3.6464	0.3324	19	-10.97	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.01949	0.1896	19	0.10	0.9192	Tukey-Kramer	0.9192

9 Benzene

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.00	0.9658

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-0.1380	0.1400	19	-0.99	0.3365
Fuel	E15	-0.1350	0.1400	19	-0.96	0.3469

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	-0.00300	0.06908	19	-0.04	0.9658	Tukey-Kramer	0.9658

10 Toluene

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.37	0.5508

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-0.1115	0.1557	19	-0.72	0.4825
Fuel	E15	-0.01816	0.1557	19	-0.12	0.9084

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	-0.09337	0.1537	19	-0.61	0.5508	Tukey-Kramer	0.5508

11 Ethylbenzene

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	4.39	0.0498

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	0.2312	0.02798	19	8.26	<.0001
Fuel	E15	0.2053	0.02795	19	7.34	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.02588	0.01236	19	2.09	0.0498	Tukey-Kramer	0.0498

12 m/p-Xylenes

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	3.84	0.0649

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	0.7400	0.09193	19	8.05	<.0001
Fuel	E15	0.6660	0.09185	19	7.25	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.07402	0.03778	19	1.96	0.0649	Tukey-Kramer	0.0649

13 o-Xylene

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	4.36	0.0504

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	0.2543	0.03186	19	7.98	<.0001
Fuel	E15	0.2291	0.03184	19	7.19	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	0.02521	0.01207	19	2.09	0.0504	Tukey-Kramer	0.0504

14 Ethanol

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	8.56	0.0087

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-0.7293	0.2028	19	-3.60	0.0019
Fuel	E15	-0.1815	0.2012	19	-0.90	0.3783

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	-0.5478	0.1872	19	-2.93	0.0087	Tukey-Kramer	0.0087

15 Formaldehyde

Type 3 Tests of Fixed Effects

Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	0.62	0.4393

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-1.5663	0.1762	19	-8.89	<.0001
Fuel	E15	-1.4883	0.1762	19	-8.44	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	-0.07799	0.09872	19	-0.79	0.4393	Tukey-Kramer	0.4393

16 Acetaldehyde

Type 3 Tests of Fixed Effects				
Effect	Num DF	Den DF	F Value	Pr > F
Fuel	1	19	131.48	<.0001

Least Squares Means						
Effect	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|
Fuel	E10	-1.2593	0.1084	19	-11.62	<.0001
Fuel	E15	-0.9852	0.1084	19	-9.09	<.0001

Differences of Least Squares Means									
Effect	Fuel	Fuel	Estimate	Standard Error	DF	t Value	Pr > |t|	Adjustment	Adj P
Fuel	E10	E15	-0.2741	0.02390	19	-11.47	<.0001	Tukey-Kramer	<.0001

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Comparison of Evaporative Emissions Between E10 CaRFG and Splash Blended E15

Prepared for:
Multimedia Working Group
California Air Resources Board (CARB)

January 2022

Submitted by:
Automotive Testing and Development Services, Inc.
400 S. Etiwanda Avenue,
Ontario CA 91761
and

This report summarizes the results of evaporative emissions testing of two fuels, E10 and E15, tested on five modern spark-ignition vehicles at Automotive Testing and Development Services, Inc. in Ontario, California. **Five attachments, one for each vehicle, provide additional detail on the day-by-day chronology, laboratory QA procedures and test results.** A paired t-test shows no statistically significant difference between the two fuels.

1.1 Vehicles and Fuels

The vehicles were procured by the CE-CERT laboratory at the University of California-Riverside (UCR), and consisted of a subset of the vehicles included in the E10/E15 tailpipe testing program, and included a 2020 Jeep Compass , 2016 Nissan Rogue, 2020 Jeep Cherokee, 2019 Toyota RAV4, and 2021 Hyundai Accent. The five vehicles for evaporative emissions testing were selected by CARB representatives from the larger group of twenty that were tailpipe tested at CE-CERT. The E10 and E15 fuels used in evaporative emissions testing were supplied by CE-CERT and delivered to ATDS in drums. These fuels were the same as those used in CE-CERT's tailpipe testing program. Fuel specifications can be found in the UCR CE-CERT laboratory report: Final Report Comparison of Exhaust Emissions Between E10 CaRFG and Splash Blended E15, January 2022.

1.2 Test Plan

The plan proposed to test the five vehicles on both E10 and E15 on each fuel over the 3-day diurnal test procedure two times in a row. All testing followed the procedures for 3-day diurnal in California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles, last amended September 2, 2015 with the exception that the running loss test was not included. Figure 1 provides an outline of the required procedures. Windshield wiper fluid was drained prior to beginning testing**.** Preconditioning of the vehicles followed the requirements in California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles, last amended September 2, 2015, with the exception of the heat build, which was simplified to avoid the need for thermocouples to be placed in the fuel tank. In addition, the following preparatory and preconditioning steps were used to ensure the vehicles had been properly adapted to each test fuel:

(A) Purge the vehicle's evaporative canister for 60 minutes at 0.8 cfm.

(B) Drain the fuel tank(s) and fill with 3 gallons of the test fuel.

(C) Start the vehicle and allow it to idle for 1 minute.

(D) Drain the fuel tank(s) and fill with the new test fuel to the "tank fuel volume" defined in 40

CFR § 86.082-2. The average temperature of the dispensed fuel shall be less than 60 °F.

(E) Conduct a heat build according to the procedure specified in 40 CFR § 86.133-96, with the exception that the temperature within the fuel tank will not be monitored, rather the temperature of the cell will be raised to 105 °F over a one-hour period.

(E) The vehicle shall be placed, either by being driven or pushed, on a dynamometer and operated through four UDDS, specified in 40 CFR § 86.115.

(F) Following the dynamometer drive, the vehicle shall be turned off for 5 minutes, then restarted and allowed to idle for 1 minute. The vehicle shall then be turned off for 1 minute, and allowed to idle again for 1 minute.

(G) 21 day constant temperature soak with each fuel before starting testing

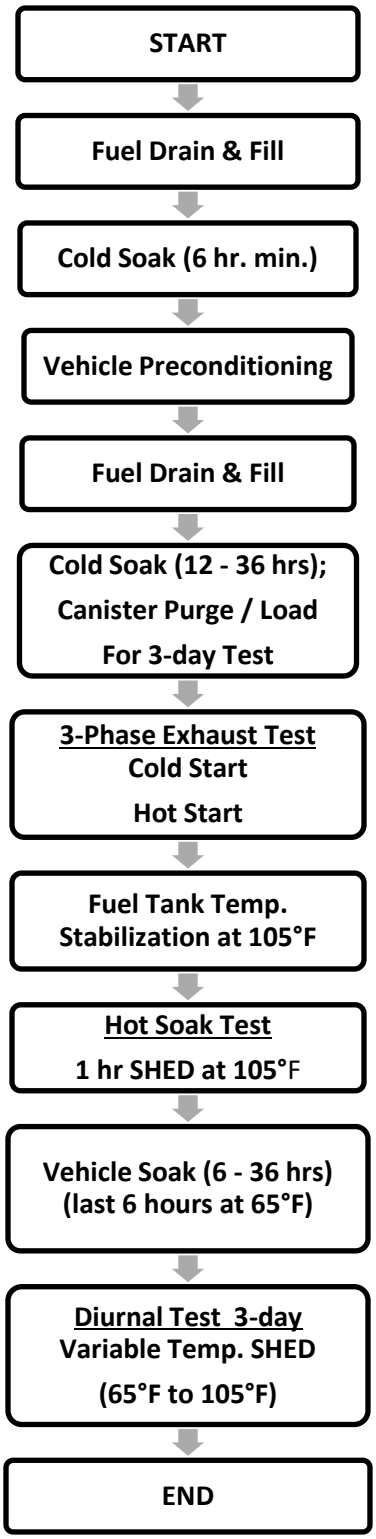

Figure 1. Outline of Evaporative Emissions Test Procedures

1.3 Measurements and Test Parameters

Total hydrocarbon (THC) was measured using a flame ionization detector.

Ethanol Emissions were measured using the Innova Photoacoustic Analyzer Model 1314/34 with the following filters to account for potential interference of other compounds:

UA0974 Alcohols (as Ethanol)

UA0981 Hydrocarbons (as Toluene)

UA0971 Freons (as R134a)

UA0983 Carbon Dioxide

SB0527 Water

Samples for ethanol analysis were drawn directly from the SHED through a sample port in the side of the SHED and directly into the Innova Analyzer. Four separate readings at the beginning and four separate readings at the end of each cycle were collected. The first reading was disregarded, and the final three readings were averaged.

The FID measures ethanol, but it undercounts the amount of ethanol, with a response factor of only 0.75 (response factor = measured/actual). Normally, evaporative emissions are corrected with an automatic addition of 8% to the FID measurement to account for the undercounted ethanol when evaporative testing E10 fuel **(40 CFR § 86.1813-17 (a)(iv))**. However, in this case we wanted to carefully account for the ethanol emissions difference between E10 and E15 so we also measured ethanol using the photoacoustic analyzer. To accurately estimate the total gaseous organic emissions we adjusted the FID emissions by the amount of ethanol measured by the Innova as follows:

THC plus ethanol = FID measurement plus 0.25 times ethanol measured in photoacoustic analyzer

The test parameter consists of the THC plus ethanol for the first hour plus the highest THC plus ethanol any of the three days of the 3-day diurnal.

1.4 Testing Chronology

2020 Jeep Compass (2/8/2021 to 4/6/2021)

Testing of the Jeep Compass was aborted due to extremely high SHED measurements, suggesting a fuel leak or another source of organic compounds other than the fuel system. This determination was made only after the normal vehicle check-in, canister purge, 21-day soak with new fuel and preconditioning cycle. The first SHED test resulted in emissions well above regulatory limits (4.203 g in first 24 hours). In

an effort to identify and remove the source of emissions, the AC refrigerant was drained by the dealer and two additional preconditioning cycles were run. A second test resulted in similarly high emissions in the first 24 hours (2.395 g). Additional attempts to locate the source of the leak with a hydrocarbon tester, and a pressure test of the vehicles EVAP system were unsuccessful. After consultation with CARB representatives, testing of this vehicle was aborted.

2016 Nissan Rogue (2/25/2021 to 8/1/2021)

Following the normal 21-day soak and preconditioning protocols for the Nissan Rogue, the initial E10 test also resulted in unusually high emissions (2.26 grams). A hydrocarbon tester was used to try to find a source of these emissions, but no leaks in fuel or evaporative emissions systems were found. The following two additional tests resulted in emissions within expected levels. Because no specific cause of the initial high emissions test was found, it was determined that there was no valid reason for not including the initial test in our analyses, however statistical analyses were performed both with and without the initial test.

During the first E15 test, the Innova computer crashed, and ethanol measurements could not be made on the second and third day of the 3-day diurnal. In order to estimate the amount of ethanol in the Day 2 and Day 3 emissions, the proportion of ethanol to the total FID emissions was assumed to be the same as that on the first day. In every other test conducted in this program, results on the second and third day had no impact on the test parameter (which was based on the day of the diurnal test which had the highest emissions). Similarly, in this test the FID measurement found the highest emissions on the first day, and thus this estimate is not reflected in the test parameter.

2019 Toyota RAV4 (2/24/2021 to 6/7/2021)

2021 Hyundai Accent 6/21/2021 to 9/26/2021)

2020 Jeep Grand Cherokee (4/30/2021 to 9/6/2021)

Testing of the other three vehicles proceeded without any deviations from the planned protocols.

1.5 Results

All test results are shown in Table 1, and summarized graphically in Figure 1.

Table 1. THC plus Ethanol

		E10	E15
Toyota RAV4	Test #1	0.180	0.216
	Test #2	0.226	0.235
	Average	0.203	0.226
Nissan Rogue	Test #1	2.260	0.766
	Test #2	0.614	0.567
	Test#3	0.324	
	Average	1.066	0.667
	Average w/out Test #1	0.469	
Jeep Cherokee	Test #1	0.730	0.576
	Test #2	0.892	0.643
	Average	0.811	0.610
Hyundai Accent	Test #1	0.232	0.376
	Test #2	0.230	0.313
	Average	0.231	0.345

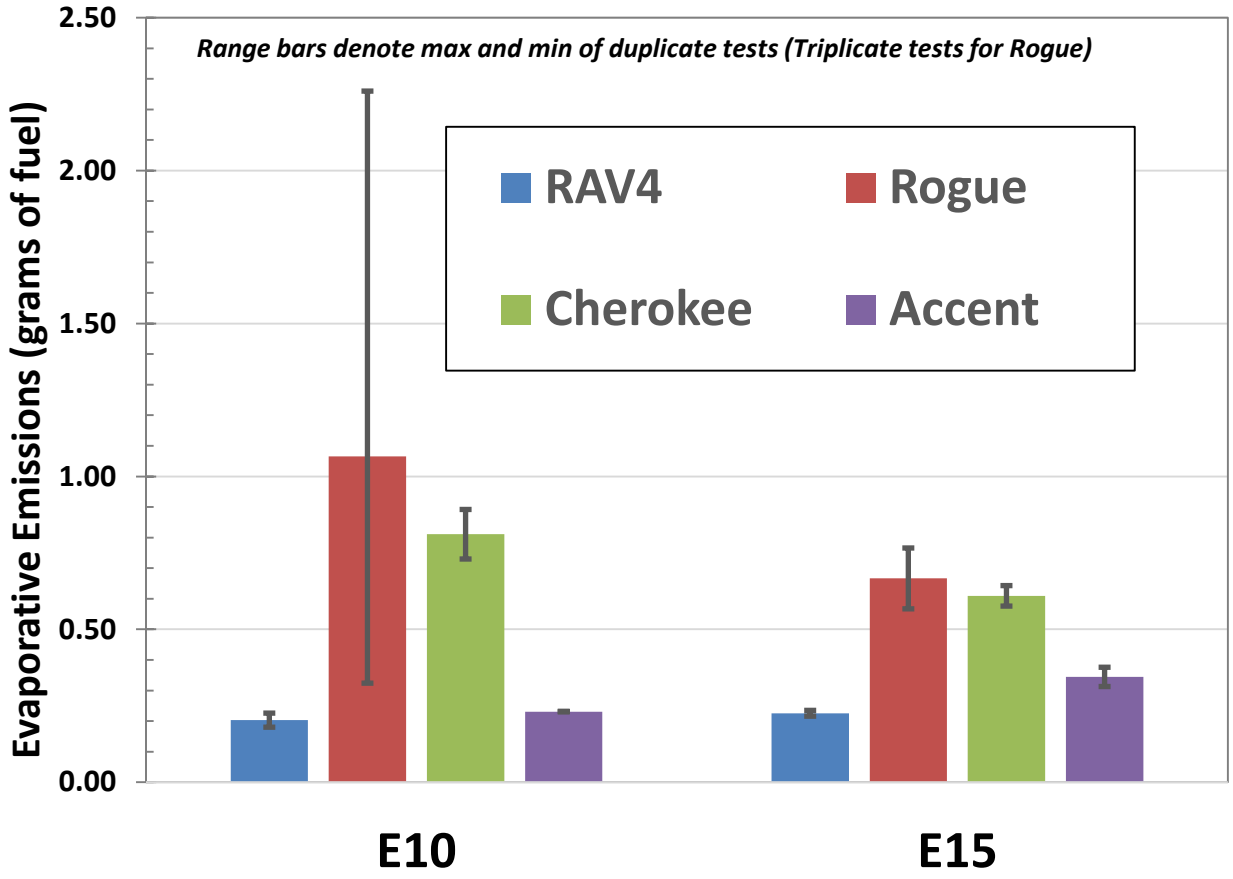

Figure 1. Evaporative emissions for four vehicles.

1.6 Statistical Analysis

Emissions from two vehicles declined when using E15 in place of E10 in two vehicles, and increased in the other two vehicles. On average emissions declined 22%. A paired t-test was conducted, based on the average of the tested values for each vehicle/fuel combination and resulted in a p-value of 0.38, a value that indicates there is no statistically significant difference between the two fuels.

Although, we cannot justify discarding the Nissan Rogue E10 Test #1 on statistical or scientific grounds, other than it seems somewhat suspect given that emissions declined on each subsequent test, without this value average emissions increased 5%, and the p-value of the t-test is 0.81, suggesting even less statistical significance in the difference between the two fuels.

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Emissions
- *FTP Protocol*
- *SFTP Protocol*
- *Euro Protocols*
- *Asia Protocols*
- *Evaporative Emissions*
- *NMOG Determination*
- *Electric Vehicle Range*

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- *New Vehicle Certification*
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- *Heavy-Duty*
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- *Agency In-Use*
- *Component Collection*
- *Data Collection*
- *Usage Surveys*

Staffing
- *Drivers*
- *Mechanics*
- *Data Technicians*
- *Maintenance*
- *Administrative*
- *Lab Technicians*

January 28, 2022

Chris Bliley
Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

Kelly Davis
Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

Final Report on Evaporative Emissions Test Procedure Performed for Growth Energy and the Renewable Fuels Association.

Dear Chris Bliley and Kelly Davis,

Automotive Testing and Development Services, Inc. (ATDS) is pleased to provide this final report for the evaporative emissions testing conducted on vehicles for Renewable Fuels Association. This testing was conducted in strict accordance with 40 CFR 86 and California Title 13. ATDS' QA representatives have subjected all tests to a rigorous quality audit.

Sincerely,

Jose Haro
Test Engineer

Approved by:

Linwood E Farmer Jr.

Linwood Farmer
Vice President

Evaporative Emissions Testing

Project Number: 3081 - 170527

CONDUCTED FOR:

Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

&

Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

REPORT PREPARED BY:

Jose Haro, Test Engineer
Automotive Testing and Development Services, Inc.
400 South Etiwanda Avenue
Ontario, California 91761

Automotive Testing and Development Services, Inc. submitted this Report in fulfillment of Project 3081 - 170527 Evaporative Emissions Test Procedure. In ATDS' professional opinion this testing was conducted in a valid manner according to the listed methodology.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
PROJECT OVERVIEW 4
TEST VEHICLE INFORMATION 4
TEST SEQUENCE AND CHRONOLOGY 4
TEST PARAMETERS 5
E15 SHED TEST RESULTS 5
DATA REVIEW AND CONCLUSION 6
APPENDIX 7

PROJECT OVERVIEW

This testing was conducted on behalf of Growth Energy and the Renewable Fuels Association. The project consisted of the 3-day evaporative emissions test sequence performed with two different fuels. Work commenced on February 8th, 2021 and was completed on April 6th, 2021.

TEST VEHICLE INFORMATION

The following vehicle was used for this project:

ATDS Vehicle ID:	3081-170527
VIN:	3C4NJDCB1LT170527
MY/Make/Model:	2020 Jeep Compass
Test Group:	LCRXT02.45P1
Evaporative Family:	LCRXR0106PP1
Tires:	225 55 18 98H
Odometer:	4,600 miles

TEST SEQUENCE AND CHRONOLOGY

The following test sequence and chronology were used in this program:

2/8/2021
- Vehicle check in
- Flushed windshield washer fluid system and fluid bottle removed

2/18/2021
- Canister Purge
- Fuel changed to E15
- FTP-72 (X4)

2/18/2021 – 3/15/2021
- 21-day soak

3/16/2021
- Performed road load derivation (Test ID: ONT3_001632)
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001633)
- Canister loading (21031701.ST3)

3/17/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001634)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001635)

3/17/2021
- Start 3-Day Diurnal evaporative emissions test with E15 fuel. Test aborted after day one due to abnormally high results.

3/22/2021
- AC refrigerant drained by dealer

3/28/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001679)
- Canister loading (21032801.ST4)

3/29/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001681)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001682)

3/29/2021
- Start 3-Day E-15 Diurnal evaporative emissions test #2.
- Abnormally high results, test aborted after day two.

3/30/2021 – 4/6/2021
- Troubleshooting to find possible leak. Performed hot sniff with hydrocarbon tester and pressure test vehicle's EVAP system.

TEST PARAMETERS

ETW (lb)	A (ft-lb) track/set	B (ft-lb/mph) track/set	C (ft-lb/mph^2) track/set
4,250	26.770 / 1.000	0.40300 / 0.17600	0.024860 / 0.024600

E15 SHED TEST RESULTS

	E15 SHED TEST #1 Diurnal Mass HC (g)	E15 SHED TEST #2 Diurnal Mass HC (g)
0-1 Hour Hot Soak	0.08	0.117
0-24 Hour Diurnal	4.203	2.395
24-48 Hour Diurnal	*	6.432
48-72 Hour Diurnal	*	**

*Test #1 aborted after day 1
**Test #2 aborted after day 2

Total test results are obtained by adding the hot soak result with the highest value from each of the three day diurnals. Total results for this vehicle (2020 Jeep Compass) was not obtained since both E15 tests were aborted before completion due to very high unusual results.

Troubleshooting was done on vehicle but no leaks were found. Testing continued on other vehicles for RFA and Growth Energy which yielded much lower results. This vehicle (Jeep Compass) was then rejected by RFA and Growth Energy due to possible fault affecting SHED results.

All tests were conducted in strict accordance with the provisions of 40 CFR 86 and/or California Title 13 and have been reviewed by ATDS' in-house Quality Auditor. Detailed test results are in the Appendix attached to this report.

DATA REVIEW AND CONCLUSION

Based upon ATDS' review of the test data above, the vehicle tested (2020 Jeep Compass) has failed to complete emissions testing. Tests were aborted and program for this vehicle halted. Possible vehicle failure might be affecting SHED emissions.

It has been a pleasure working with Growth Energy and the Renewable Fuels Association on this project and we look forward to future efforts.

Sincerely,

Jose Haro
Test Engineer

APPENDIX

Report for Growth Energy and the Renewable Fuels Association

Performed on a

2020 Jeep Compass [3081-170527]

APPENDIX A
Vehicle Check In

APPENDIX B
Test Check Sheet

APPENDIX A

Vehicle Check In

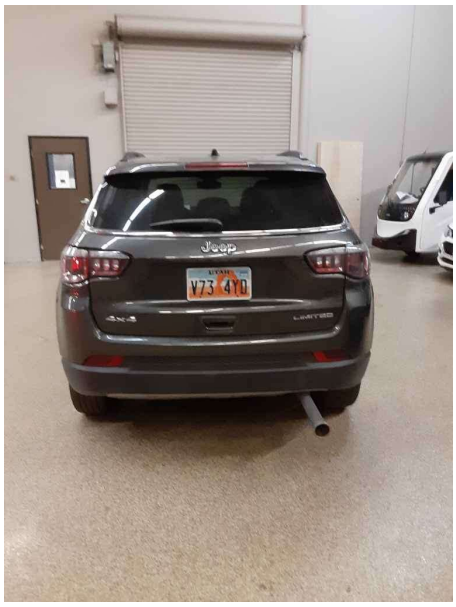
Project Information

Project ID	3081
ATDS Vehicle Number (-01, …)	01
Project Name	Renewable Fuels Ass
Date	02-08-2021
Vehicle Manufacturer	Jeep
Vehicle Model	Compass
Model Year	2020
Body Style (Sedan, SUV, Hatchback, etc..)	SUV
VIN	3C4NJDCB1LT170527
Odometer	29314
Engine Family	LCRXT02.45P1
Evaporative Family	LCRXR0106PP1
GVWR (Trucks/Leave Blank)	4600

Vehicle Body Photos

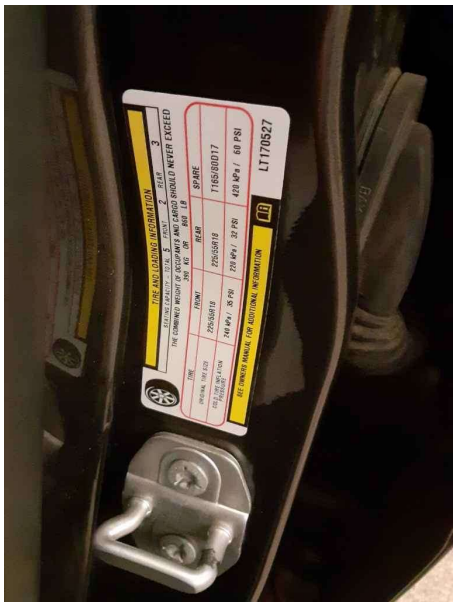
Front (Photo)	

Driver Side Corner (Photo)	
Driver Side (Photo)	
Rear Side Corner -Driver Side (Photo)	

Rear (Photo)	
Rear Side Corner - Passenger Side (Photo)	
Passenger Side (Photo)	

Passenger Side Corner (Photo)	

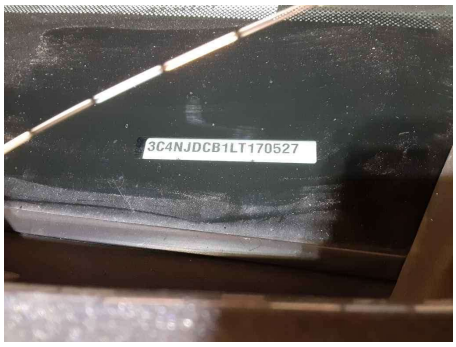
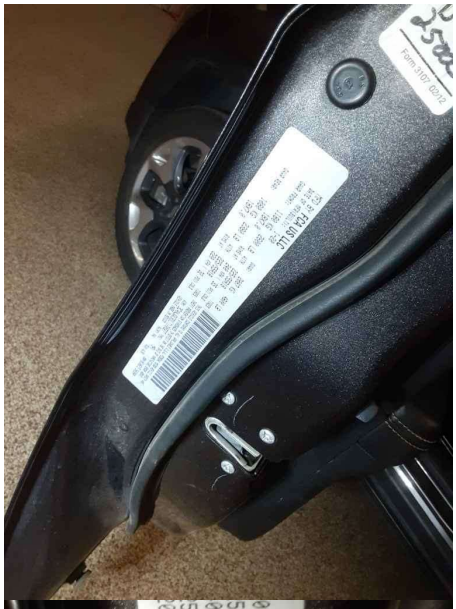
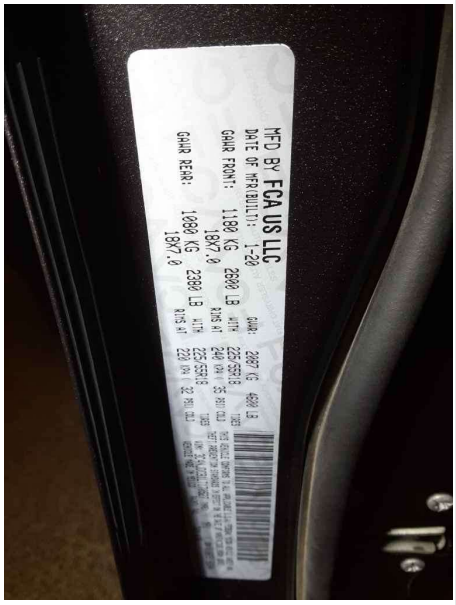
Tires and Wheels

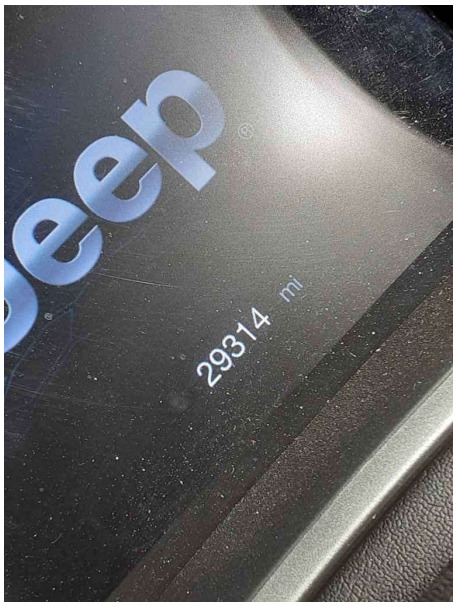
Tire Label from Door (Photo)	
ACTUAL Tire Size	225 55 18 98H

Tire Condition (Photos)	
Tire Condition	Good
Drive Wheel	All
Brakes?	>2mm (Usable)

Odometer and VIN

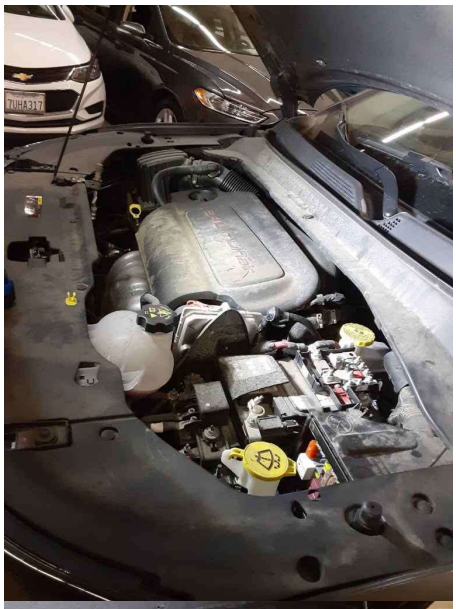
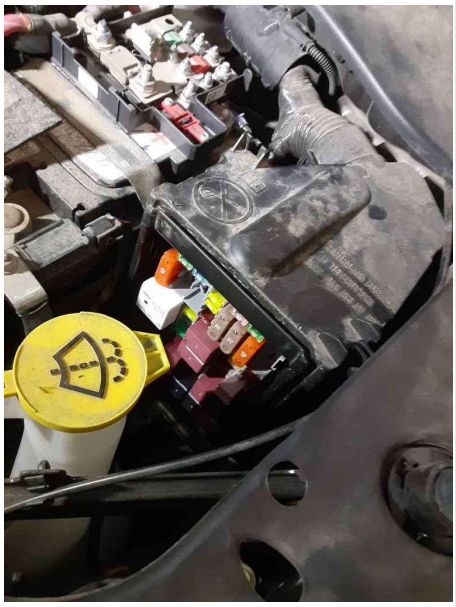
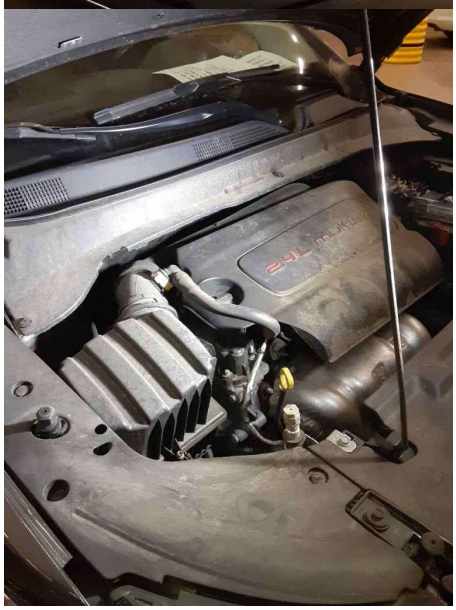
License Plate Number	V73 4YD UTAH PLATE
VIN	3C4NJDCB1LT170527

VIN Plate from Windshield (Photo)	
Vehicle Information Sticker from Door (Photo)	 

Odometer (Photo)	
Odometer	29314

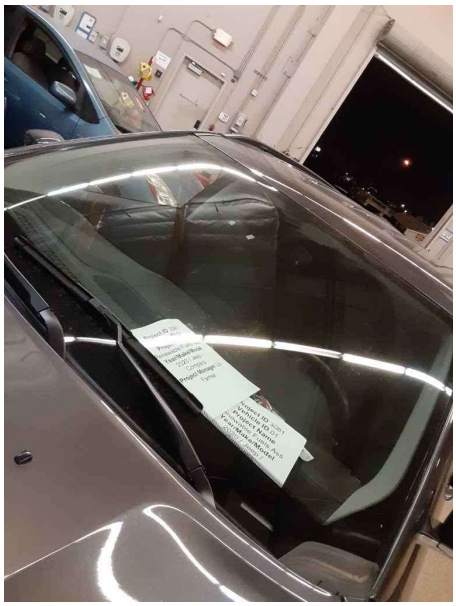
Engine and Emissions

VECI (Photo)	

Engine Bay (Photo)	  
Engine Family	LCRXT02.45P1
Evaporative Family	LCRXR0106PP1
Engine Oil Level	Good
Coolant Level	Good
Transmission Fluid Level	No Dipstick
Transmission Type	Automatic
Belts and Hoses	Good
VECI Label Status	Both

Noise Leaks on Exhaust?	No
Visual Leaks on Exhaust?	No
Transmission Fluid Condition	No Dipstick

Windshield and Headlights

Windshield Wiper Fluid?	Yes
Do the windshield wipers work?	Yes
Any windshield cracks?	No
Windshield Photos	
Do the headlights work?	Yes
Are the headlights damaged?	No
Headlight Photos	
Do the tail lights work?	Yes
Are the tail lights damaged?	No
Tail Light Photos	

OBD

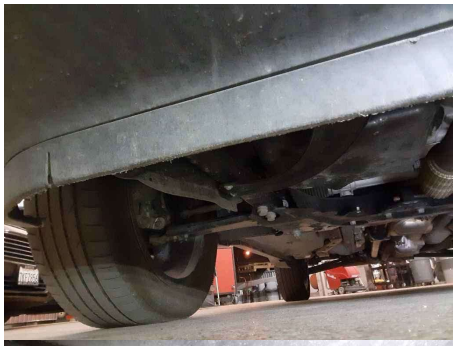
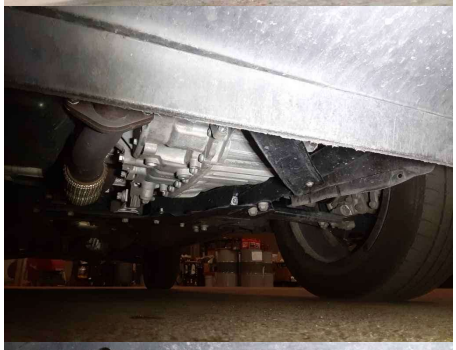
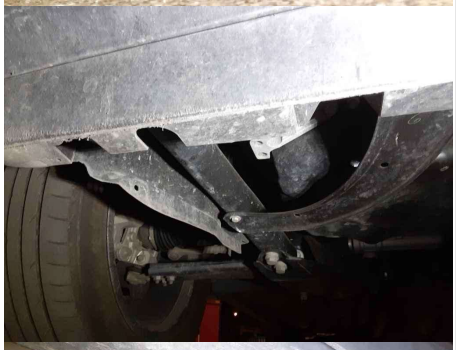
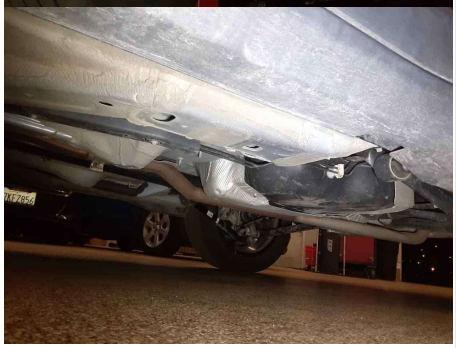
OBD Status Monitors Set	Yes
Mode 3 DTCs?	No

Mode 7 DTCs?	No

ABS/Traction Control

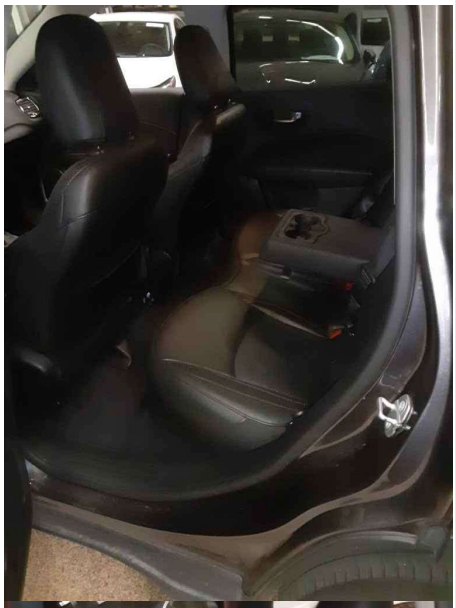
ABS?	Yes
Traction Control?	Yes

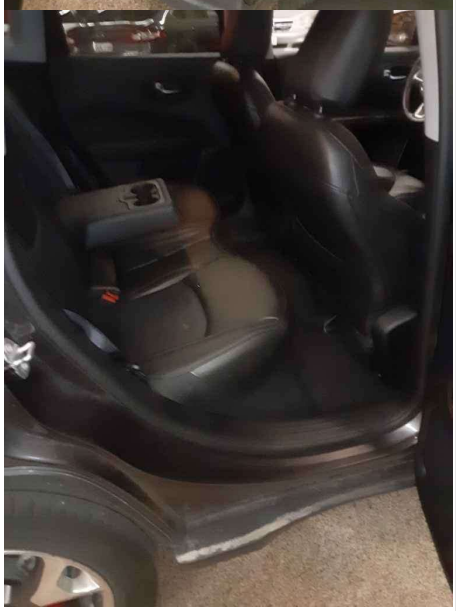
Underbody

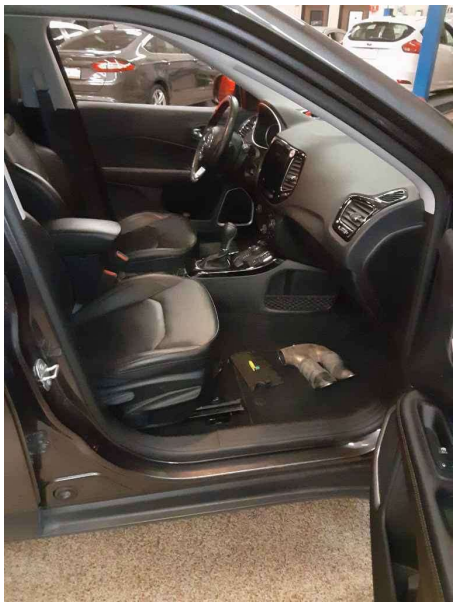
Underbody (Photos)	   

Interior

Interior (Photos)

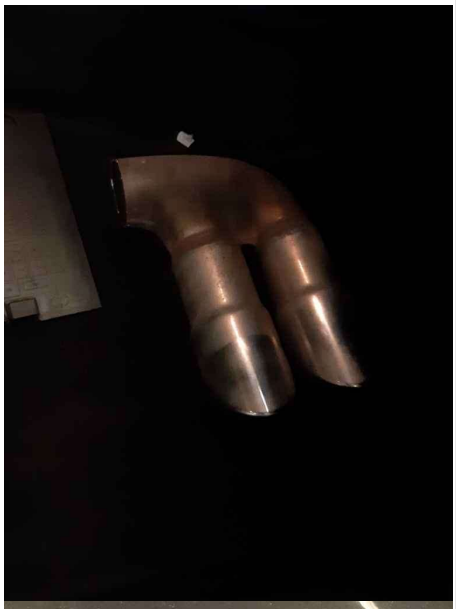


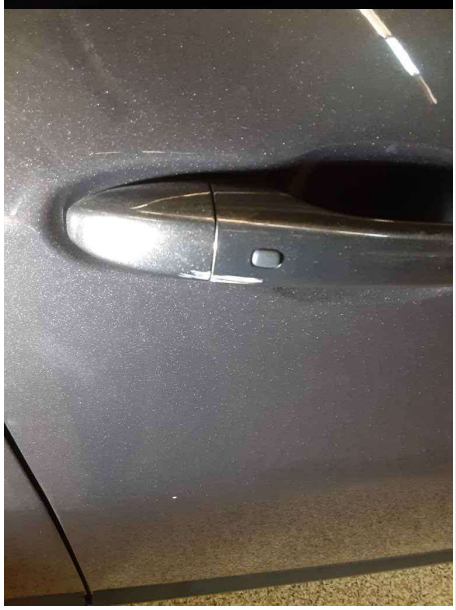


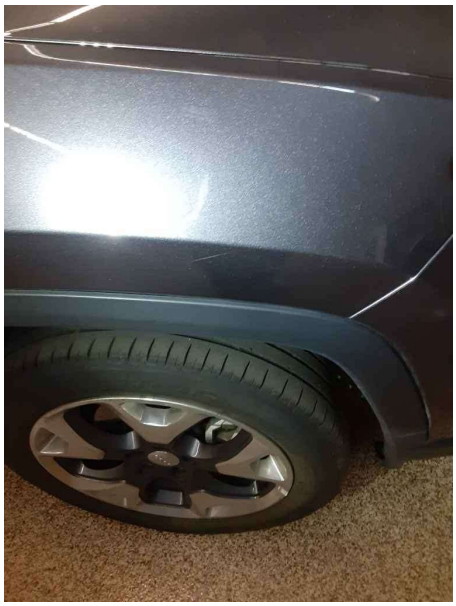
	

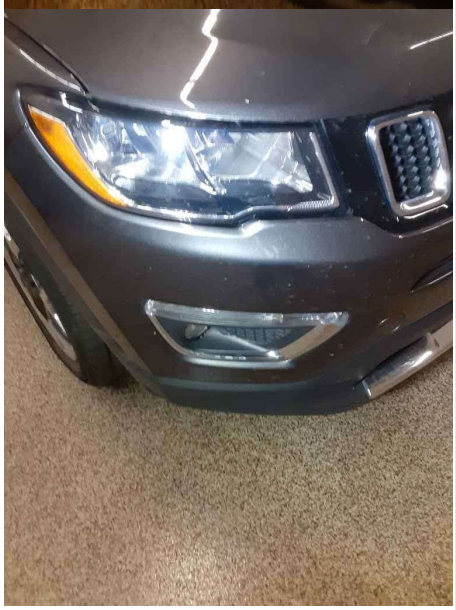
Damage Report

Any Damage (scratches/dents)?	Yes
Damage Area	

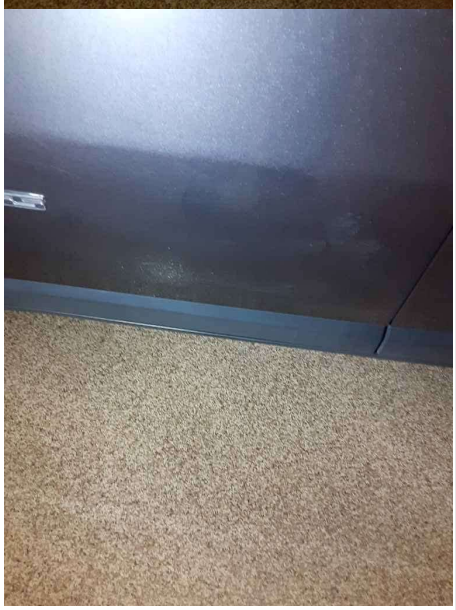


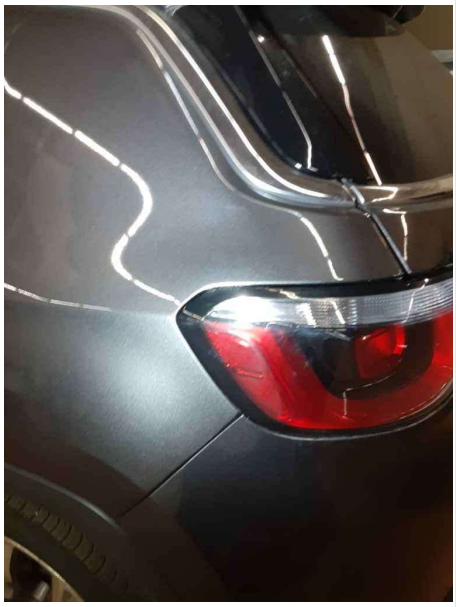


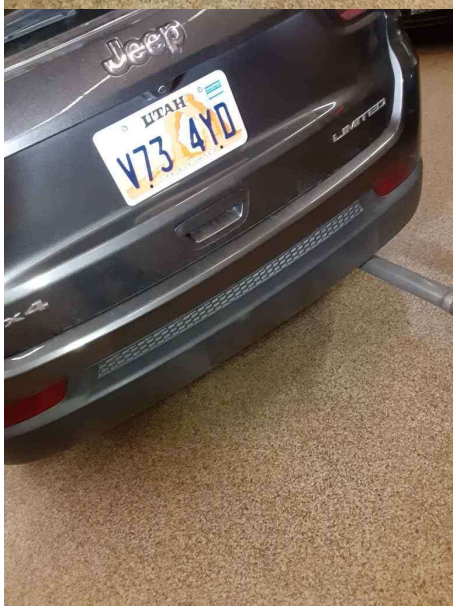




COMPASS

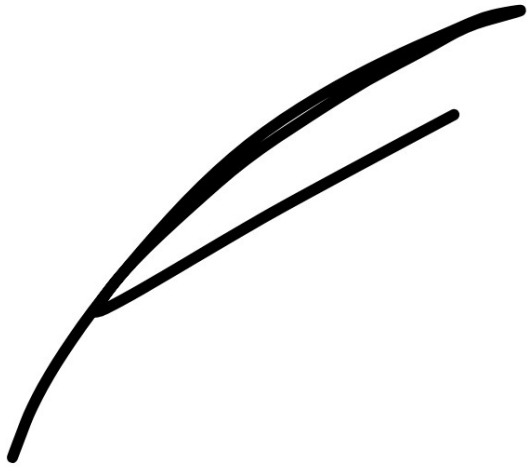






Confirmation

Start Form Timestamp	02-08-2021 07:07 PM
End Form Timestamp	02-08-2021 07:52 PM
Submission Id	7f2efc96-0a5c-41f1-ac16-a49fcca6e690
Name of Inspector	JMCKEOWN

Signature	
Comments	

Measurement values

Application:	Silver Scan-Tool Version 6.21.36.26940
Date/Time:	02/08/2021, 07:49:29 pm
Author:	Shop
Department:	Automotive Testing and Development Services Inc
Location:	400 Etiwanda Ave, Ontario CA 91761 United States
Comment:	Check in odo 29314

33: Scan-Tool

Communication	
Address word	33
Name	Scan-Tool
Protocol	ISO 15765-4 (CAN)
Baudrate	500 kbps
Interface	ATI Leaf Light HS v2, Ser.No 10217, Channel 1
Vehicle	
Vehicle	3081 01 Renewable Fuel Ass
Description	2020 Jeep Compass Project Manager Lin Farmer
Vehicle Identification Number	3C4NJDCB1LT170527

Contents

- Module 10 ECM-EngineControl
- Module 18 TCM-TransmisCtrl

Module 10: ECM-EngineControl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

10 ECM-EngineControl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0111 1110 0101 0000 0000	Bit	Monitor status since DTCs cleared
PID 03	0000 0010	Bit	Fuel system A status
PID 03	0000 0000	Bit	Fuel system B status
PID 04	19.6	%	Calculated load value
PID 05	72	°C	Engine coolant temperature
PID 06	-1.6	%	Short term fuel trim - Bank 1
PID 07	-8.6	%	Long term fuel trim - Bank 1
PID 0B	46	kPa	Intake manifold absolute pressure
PID 0C	2764	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 0E	46.5	°KW	Ignition timing advance for #1 cylinder
PID 0F	24	°C	Intake air temperature
PID 11	15.7	%	Absolute throttle position
PID 13	0000 0011	Bit	Location of oxygen sensors
PID 15	0.780	V	Oxygen sensor output voltage
PID 15	99.2	%	Short term fuel trim

Name	Measured value	Unit	Comment
PID 1C	1		OBD requirements to which vehicle or engine is certified
PID 1F	225	s	Time since engine start
PID 21	0	km	Distance traveled while MIL is activated
PID 2E	81.6	%	Commanded evaporative purge
PID 2F	15.7	%	Fuel level input
PID 30	255	dec	Number of warm-ups since DTCs cleared
PID 31	47071	km	Distance traveled since DTCs cleared
PID 32	-1625.00	Pa	Evap system vapor pressure
PID 33	97	kPa	Barometric pressure
PID 34	1.000	Lambda	Equivalence ratio
PID 34	0.06	mA	Oxygen sensor current
PID 3C	680.0	°C	Catalyst temperature Bank 1 Sensor 1
PID 41	0000 0000 0000 0100 1110 0001 1110 0101	Bit	Monitor status this driving cycle
PID 42	14.499	V	Control module voltage
PID 43	17.3	%	Absolute load value
PID 44	1.000	Lambda	Fuel/Air commanded equivalence ratio
PID 45	5.5	%	Relative throttle position
PID 46	20	°C	Ambient air temperature
PID 47	15.7	%	Absolute throttle position B
PID 49	22.0	%	Accelerator pedal position D
PID 4A	10.6	%	Accelerator pedal position E
PID 4C	5.9	%	Commanded throttle actuator control
PID 51	1		Type of fuel currently being utilized by the internal combustion engine
PID 62	19	%	Actual engine - percent torque
PID 63	230	Nm	Engine reference torque
PID 8E	14	%	Engine Friction - Percent Torque

Name	Measured value	Unit	Comment
PID 9D	0.70	g/s	Engine fuel rate
PID 9D	0.70	g/s	Vehicle fuel rate
PID 9E	133.0	kg/h	Engine Exhaust Flow Rate

10 ECM-EngineControl: Mode 2 - Current freeze frame data

No data

10 ECM-EngineControl: Mode 3 - Emission-related diagnostic trouble codes

No data

10 ECM-EngineControl: Mode 6 - Monitoring test results for specific monitored systems

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 01	91	2F	89.05	0.00	143.00	%	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 02	07	0B	0.529	0.000	0.529	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	08	0B	0.686	0.647	65.535	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	81	04	8.428	1.000	65.535		Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	82	01	46	0	480		Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	83	8A	0.137329	0.000000	0.156860	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 21	92	2F	0.00	0.00	0.70	%	Catalyst Monitor Bank 1
MID 35	85	01	32768	32768	65535		VVT Monitor Bank 1
MID 35	86	01	65535	32768	65535		VVT Monitor Bank 1
MID 35	87	01	32768	32768	65535		VVT Monitor Bank 1
MID 35	88	01	65535	32768	65535		VVT Monitor Bank 1
MID 35	89	10	1.430	1.257	1.982	s	VVT Monitor Bank 1

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 35	90	10	1.472	1.257	1.982	s	VVT Monitor Bank 1
MID 35	91	10	1.461	1.257	1.980	s	VVT Monitor Bank 1
MID 35	92	10	1.608	1.392	2.195	s	VVT Monitor Bank 1
MID 35	93	10	1.000	0.793	1.528	s	VVT Monitor Bank 1
MID 35	94	10	0.964	0.793	1.528	s	VVT Monitor Bank 1
MID 35	95	10	1.037	0.793	1.528	s	VVT Monitor Bank 1
MID 35	96	10	1.009	0.793	1.528	s	VVT Monitor Bank 1
MID 39	87	35	0.00	0.00	0.00	s	EVAP Monitor (Cap Off, 0.150")
MID 3A	87	35	0.00	0.00	655.35	s	EVAP Monitor (0.090")
MID 3C	85	34	0	0	0	min	EVAP Monitor (0.020")
MID 3C	86	34	0	0	0	min	EVAP Monitor (0.020")
MID 3C	90	34	40	6	4300	min	EVAP Monitor (0.020")
MID 3D	89	35	0.00	0.00	655.35	s	Purge Flow Monitor
MID 3D	90	81	0	0	0		Purge Flow Monitor
MID 3D	91	81	0	0	0		Purge Flow Monitor
MID 3D	92	81	0	0	0		Purge Flow Monitor
MID 3D	93	81	0	0	0		Purge Flow Monitor
MID 3D	94	81	1160	27	32767		Purge Flow Monitor
MID 41	99	14	0.003	0.000	0.095	kOhm	Exhaust Gas Sensor Heater Monitor Bank 1 - Sensor 1
MID 42	97	16	30.0	-40.0	150.0	°C	Exhaust Gas Sensor Heater Monitor Bank 1 - Sensor 2
MID 81	90	05	1.0121573	0.0000000	1.0799661		Fuel System Monitor Bank 1
MID 81	91	05	0.9898799	0.9199960	1.9999316		Fuel System Monitor Bank 1
MID 81	92	05	0.0000000	0.0000000	0.0000000		Fuel System Monitor Bank 1
MID A2	0B	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A2	0C	24	1	0	65535	counts	Misfire Cylinder 1 Data
MID A3	0B	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A3	0C	24	7	0	65535	counts	Misfire Cylinder 2 Data

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID A4	0B	24	0	0	65535	counts	Misfire Cylinder 3 Data
MID A4	0C	24	1	0	65535	counts	Misfire Cylinder 3 Data
MID A5	0B	24	0	0	65535	counts	Misfire Cylinder 4 Data
MID A5	0C	24	0	0	65535	counts	Misfire Cylinder 4 Data

10 ECM-EngineControl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

10 ECM-EngineControl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 02	3C4NJDCB1LT170527	Vehicle Identification Number(VIN)
InfoType 04	68457671AC	Calibration Identification (CALID)
InfoType 06	9E C0 C7 64	Calibration Verification Numbers (CVN)
InfoType 08	02 A2 08 46 02 55 02 98 00 00 00 00 02 80 02 A2 00 00 00 00 03 86 02 A2 00 00 00 00 00 36 00 7E 02 11 02 A2 00 00 00 00 02 80 02 A2 00 00 00 00 00 00 00 00 00 00 00 00	In-use Performance Tracking
	Values for InfoType 08	

Name	Measured value	Comment
OBDCOND	674	General Denominator, OBD Monitoring Conditions Encountered Counts
IGNCNTR	2118	Ignition Cycle Counter
CATCOMP1	597	Numerator, Catalyst Monitor Completion Counts Bank 1
CATCOND1	664	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 1
	0.899	- Calculated Ratio -

Name	Measured value		Comment
	CATCOMP2	0	Numerator, Catalyst Monitor Completion Counts Bank 2
	CATCOND2	0	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	O2SCOMP1	640	Numerator, O2 Sensor Monitor Completion Counts Bank 1
	O2SCOND1	674	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 1
		0.950	- Calculated Ratio -
	O2SCOMP2	0	Numerator, O2 Sensor Monitor Completion Counts Bank 2
	O2SCOND2	0	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	EGRCOMP	902	Numerator, EGR/VVT Monitor Completion Condition Counts
	EGRCOND	674	Denominator, EGR/VVT Monitor Conditions Encountered Counts
		1.338	- Calculated Ratio -
	AIRCOMP	0	Numerator, Secondary Air Monitor Completion Condition Counts
	AIRCOND	0	Denominator, Secondary Air Monitor Conditions Encountered Counts
		7.995	- Calculated Ratio -
	EVAPCOMP	54	Numerator, EVAP Monitor Completion Condition Counts
	EVAPCOND	126	Denominator, EVAP Monitor Conditions Encountered Counts
		0.429	- Calculated Ratio -
	SO2SCOMP1	529	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 1
	SO2SCOND1	674	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 1
		0.785	- Calculated Ratio -
	SO2SCOMP2	0	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 2
	SO2SCOND2	0	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	AFRICOMP1	640	Numerator, Air Fuel Ratio Imbalance Monitor Completion Counts Bank 1
	AFRICOND1	674	Denominator, Air Fuel Ratio Imbalance Monitor Conditions Encountered Counts Bank 1
		0.950	- Calculated Ratio -

Name	Measured value		Comment
	AFRICOMP2	0	Numerator, Air Fuel Ratio Imbalance Monitor Completion Counts Bank 2
	AFRICOND2	0	Denominator, Air Fuel Ratio Imbalance Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
InfoType 0A	ECM-EngineControl		ECU Name
InfoType 13	4C 43 52 58 54 30 32 2E 34 35 50 31		Hybrid/EV Battery DTCs and Location
InfoType 14	1		Distance Traveled Since Evap Monitoring Decision

10 ECM-EngineControl: Readiness - Readiness

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Misfire monitoring	yes	yes	no	yes
Fuel system monitoring	yes	yes	no	yes
Comprehensive component monitoring	yes	yes	yes	yes
Catalyst monitoring	yes	yes	yes	no
Heated catalyst monitoring	no	yes	no	yes
Evaporative system monitoring	yes	yes	no	no
Secondary air system monitoring	no	yes	no	yes
Oxygen sensor monitoring	yes	yes	yes	no
Oxygen sensor heater monitoring	yes	yes	yes	no
EGR and/or VVT system monitoring	yes	yes	yes	no

Module 18: TCM-TransmisCtrl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

18 TCM-TransmisCtrl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0100 0000 0000 0000 0000	Bit	Monitor status since DTCs cleared
PID 04	19.6	%	Calculated load value
PID 05	72	°C	Engine coolant temperature
PID 0C	2767	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 21	0	km	Distance traveled while MIL is activated
PID 30	255	dec	Number of warm-ups since DTCs cleared
PID 31	47512	km	Distance traveled since DTCs cleared
PID 42	14.358	V	Control module voltage
PID 49	22.0	%	Accelerator pedal position D

18 TCM-TransmisCtrl: Mode 2 - Current freeze frame data

No data

18 TCM-TransmisCtrl: Mode 3 - Emission-related diagnostic trouble codes

No data

18 TCM-TransmisCtrl: Mode 6 - Monitoring test results for specific monitored systems

No data

18 TCM-TransmisCtrl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

18 TCM-TransmisCtrl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 04	68457682AC	Calibration Identification (CALID)
InfoType 06	A9 16 C7 1A	Calibration Verification Numbers (CVN)
InfoType 0A	TCM-TransmisCtrl	ECU Name

18 TCM-TransmisCtrl: Readiness - Readiness

Monitor	PID 01	
	supported	complete
Misfire monitoring	no	yes
Fuel system monitoring	no	yes
Comprehensive component monitoring	yes	yes
Catalyst monitoring	no	yes
Heated catalyst monitoring	no	yes
Evaporative system monitoring	no	yes

Monitor	PID 01	
	supported	complete
Secondary air system monitoring	no	yes
Oxygen sensor monitoring	no	yes
Oxygen sensor heater monitoring	no	yes
EGR and/or VVT system monitoring	no	yes

APPENDIX B

Test Check Sheet

Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Jeep Compass
Vehicle #: 3081-170527 ~~3081-01~~ VB		**Engine Size**	2.4L
VIN:	3C4NJDCB1LT170527	**Model Year**	2020
Engine Family:	LCRXT02.45P1	**Requested By:**	J. Link

Documentation

		Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Vehicle check in	E		2021-02-08	19:52	29314			JM
OBD download								JM
Prepare vehicle for Lab								JM
Canister Purge 1 Hour	E		2021-02-18	13:28	—			VB
Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S		2021-02-18	14:52		3		
	E		2021-02-18	15:20		Fuel Spec:	E15	JM
Idle 1 min								VB
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S		2021-02-18	15:33		5.4		
	E		2021-02-18	16:03		Fuel Spec:	<60F 59.5°F E15	JM
Heat Build 60F-105F in 1 Hour	S		2021-02-18	16:33	—			
	E		2021-02-18	17:33	—		—	VB
Precon FTP 72 (UDDS) 1	S		2021-02-18	18:40	29314			
	E		↓	19:09	29322		ONT3-001458	VE
Dyno Sets			A: 0 B: 0 C: 0.02486				ETW: 4250	
Precon FTP 72 (UDDS) 2	S		2021-02-18	19:10	29322			
	E		✓	19:37	29329		ONT3_001459	VB
Precon FTP 72 (UDDS) 3	S		2021-02-18	19:38	29329			
	E		↓	20:05	29336		ONT3-001460	VE

Precon FTP 72 (UDDS) 4

S	2021-02-18	20:06	29336
E	2021-02-18	20:32	29344

ONTS-00 H61 JB

↓

Eng Off 5 min JB

↓

Idle 1 min JB

↓

Eng Off 1 min JB

↓

Idle 1 min JB

↓

Vehicle Soak 21 Days 68-86°F

S	2021-02-18	20:44
E	2021-03-15	14:25

↓

Set tire pressure 7psi over sticker

Front 42 Back 39

↓

Fuel Drain and 40% Fill, Fuel Type: See Notes!

S	2021-03-15	14:28	5.4
E	2021-03-15	15:29	Fuel Spec: EIS M1

↓

Vehicle Soak 68-86°F min 6 hr.

S	2021-03-15	15:30
E	2021-03-16	17:00

↓

Set tire pressure to sticker

Front 35 Back 32

↓

2x HFET warmup
J2264 Dyno Coastdown
Dyno Sets for Warmup HWY

S	2021-03-16	17:05	29344
E	↓	17:40	29364

ONTS-001632

A: 0 B: 0 C: 0.02486 ETW: 4250

↓

Precon FTP 72 (UDDS)
Dyno Sets

S	2021-03-16	18:00	29371
E	↓	18:35	29378

ONTS-001633

A: 1.0 B: 0.176 C: 0.02446 ETW: 4250

↓

Vehicle Soak 68-86°F

S	2021-03-16	18:40
E	2021-03-17	

T 78.50
D 29.03
H 32.90

↓

Canister Loading with Butane
Type: 1.5x Load 12-36 hr

S	2021-03-16	19:31
E	2021-03-17	06:40

21031701.ST3

Cap 107 Vol 2.0

Purge 300 Flow Rate 15 LCRXR0106PP1

Canister Loading Specs

↓

Set tire pressure to sticker

Front 35 Back 32

No Bag Cold Start FTP 75

S 2021-03-17 08:42 29378

E ↓ 09:36 29389 ONT3.001634 JC

Dyno Sets

A: B: C: ETW: 4250

Test Options

PM N2O Dilute Modal

CVS Flow P1:9.3 P2:9.3 P3:9.3

Pre Test Comments

E15 Test

Fuel Tank Temp. Stabilization at 105F

S 2021-03-17 10:49 LL

E ↓ 11:49

max 1 hr

Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle

S 11:53

E 13:03 29406 ONT3-001635 JC

Dyno Sets

A: B: C: ETW: 4250

Test Options

PM N2O Dilute Modal

CVS Flow 9.3

Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff

max 7 min

Hot Soak in VT Shed

S

E

Cold Soak 6-36 Hours

6-36 Hr

S

E

3 Day Diurnal Test

S

E

QC Check

E 2021-11-10 — J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081	~~3081-01~~	3081-170527	
VIN:	3C4NJDCB1LT170527			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Jeep	Compass	4WD	2020
Test Group / Engine Size (L):	LCRXT02.45P1	2.4L		
EVAP Family:	LCRXR0106PP1			
Standard Tire Size (front) / Pressure:	225/55-18	35		
Standard Tire Size (rear) / Pressure:	225/55-18	32		
Transmission / Shift File / Inertia Weight:	Auto	Auto	4250	
Target Coefficients A / B / C:	26.77	0.4030	0.024860	
Warmup Coefficients A / B / C:	0.00	0.0000	0.024860	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E15 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	13.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	107
Canister volume (Liter)	2
Soak after drain / refills	Y
Test Fan Setup	P-Fixed, FTTP-Roadspe
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - 4WD
5.4 of See Notes!
E15 Fuel
103.8" Wheelbase
FTP-Fixed, FTTP-Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

										Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐		1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS CANISTER WORKSHEET

Station number 3

----PURGE ONLY----

J.H. 170527

VT#	3081-01
Project	3081
Evap Family	LCRXR0106PP1
Ambient Temperature-Deg F	77
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	29.4
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0
Canister Volume-Liters	1.4
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	12:28:09
Start date	02-18-2021
Bed Purges/Cycle	1000
Purge End/Load Start	13:28:18
Test Time Minutes	60
HC Loaded-Grams	0.0
Scale Reading-Grams	-1.42
Butane Flow Actual-Gm/Hr	0.0
Cycles Completed	1
Finish time	13:28:18
Finish date	02-18-2021
Disk File Name	21021801.ST3

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/10/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	2/18/2021	**Time:**	18:40:34
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	UDDS 1		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001458*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*2/18/2021*	CH_4 Response Factor	
Test Start	*18:40:34*	Odometer Position [mi]	*29314*
Start Time Cycle	*2021-02-18 18|47-45-(000)*	Delay Time Method	
Test End	*19:09:54*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*UDDS 1*		

J.H.

Vehicle Data *~~3081-01~~ 170527* ✓

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527* ✓	Engine Family	*LCRXT02.45P1* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-01*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*4250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*26.770* ✓	*0.40300* ✓	*0.024860* ✓
Road Load	*0.000* ✓	*0.00000* ✓	*0.024860* ✓

Fuel Data *~~91_Pump_Gas~~ E15* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001458	Driver	Joseph Bishop	Shift Table Auto		Cold Start	

Vehicle	3C4NJDCB1LT170527	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*		91_Pump_Gas	Start Time	*18:40:34*
		A [lbf]	*0.000*	Fuel type	GASOLINE	End Time	*19:09:54*
Model	COMPASS	B [lbf/mph]	*0.00000*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024860*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*29314*	Remark	UDDS 1				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	77.47	Volume[scf]	2694
Zero Read	*0.00*							Press.[inHg]	29.26	D.F.	
Span Read	*0.00*							RH[%]	*13.49*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*2.732*	Ph. End[s]	505.5
Mass.	*0.000*							Dist.[mi]	*3.56*	Ph. Length[s]	505.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7921*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_X[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	76.35	Volume[scf]	4602
Zero Value	*0.00*							Press.[inHg]	29.27	D.F.	
Span Value	*0.00*							RH[%]	*13.70*	Ph. Start[s]	505.6
Sample	*0.00*							AH[g/kg]	*2.672*	Ph. End[s]	1374.7
Mass.	*0.000*							Dist.[mi]	*3.84*	Ph. Length[s]	869.2
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7909*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_X$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.41*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*13.49*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*2.73*
CVS Volume[scf]	*2694.07*	Act. Dist.[mi]	*3.56*	Pressure[inHg]	*29.26*
CVS Flow[scfm]	*319.77*			Temp.[°F]	*77.47*
CVS Inlet Pressure	*29.18*			Temp. Min.[°F]	*75.38*
CVS Inlet Temp.[°F]	*77.16*			Temp. Max.[°F]	*78.80*
CVS Inlet Temp. Min.[°F]	*73.49*			NO_X Corr. F	*0.7921*
CVS Inlet Temp. Max.[°F]	*81.77*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*13.70*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*2.67*
CVS Volume[scf]	*4601.79*	Act. Dist.[mi]	*3.84*	Pressure[inHg]	*29.27*
CVS Flow[scfm]	*317.66*			Temp.[°F]	*76.35*
CVS Inlet Pressure	*29.19*			Temp. Min.[°F]	*74.12*
CVS Inlet Temp.[°F]	*78.73*			Temp. Max.[°F]	*79.34*
CVS Inlet Temp. Min.[°F]	*77.27*			NO_X Corr. F	*0.7909*
CVS Inlet Temp. Max.[°F]	*80.33*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

Test Data: FTP72 Operator: Joseph Bishop Date: 2/18/2021
Test Number: ONT3_001458 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001458

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*0.000*	*0.000*
B [lbf/mph]	*0.00000*	*0.00000*
C [lbf/mph2]	*0.024860*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.04		
Driven	5734.52	6183.01		
Distance Rating (%)	-0.7722	-0.4514		
Cycle Energy (MJ)				
Target	2.62	2.38		
Driven	2.57	2.38		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.2648	0.0962		
Driven	0.2725	0.0934		
Inertial Work (MJ)				
Target	1.92	2.15		
Driven	1.87	2.16		
Inertial Work Fraction				
Target	0.7352	0.9038		
Driven	0.7275	0.9066		
Inertial Work Rating	-2.6918	0.4658		
Absolute Speed Change (m/s2)				
Target	204.87	340.91		
Driven	201.80	340.10		
Absolute Speed Change Rating (%)	-1.5019	-0.2377		
Energy Rating	-0.9017	0.6077		
Energy Economy Rating	-0.9017	0.6077		-0.1899

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001458

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	77.47	75.38	78.80	68.00	86.00	Passed
Barometer	(inHg)	29.26	29.26	29.27	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	19.12	18.95	19.35	38.50	87.50	Review ok
CVS Inlet Temperature	(°F)	77.16	73.49	81.77	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.56					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No humidity Requirement

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001458

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	76.35	74.12	79.34	68.00	86.00	Passed
Barometer	(inHg)	29.27	29.27	29.27	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.71	18.35	19.07	38.50	87.50	Review
CVS Inlet Temperature	(°F)	78.73	77.27	80.33	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.84					Passed
Sample Phase Time	(s)	869.2					
Duration Phase 2	(s)	869.10					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

N: humidity requirement

J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	2/18/2021	**Time:**	19:10:29
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	UDDS 2		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001459*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*2/18/2021*	CH_4 Response Factor	
Test Start	*19:10:29*	Odometer Position [mi]	*29322*
Start Time Cycle	*2021-02-18 19|14-48-(000)*	Delay Time Method	
Test End	*19:37:32*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*UDDS 2*		

J. H.

Vehicle Data *~~3081-01~~ 170527* ✓

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527* ✓	Engine Family	*LCRXT02.45P1* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-01*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*		Inertia [lb]	*4250.00* ✓	
	A [lbf]		B [lbf/mph]	C [lbf/mph2]	
Street Load	*26.770*		*0.40300*	*0.024860*	
Road Load	*0.000* ✓		*0.00000* ✓	*0.024860* ✓	

Fuel Data *~~91_Pump_Gas~~* E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001459	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*	91_Pump_Gas		Start Time	*19:10:29*
		A [lbf]	*0.000*	Fuel type	GASOLINE	End Time	*19:37:32*
Model	COMPASS	B [lbf/mph]	*0.00000*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024860*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*29322*	Remark	UDDS 2				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	77.13	Volume[scf]	2689
Zero Read	*0.00*							Press.[inHg]	29.27	D.F.	
Span Read	*0.00*							RH[%]	*13.33*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*2.669*	Ph. End[s]	505.6
Mass.	*0.000*							Dist.[mi]	*3.57*	Ph. Length[s]	505.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7908*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.75	Volume[scf]	4597
Zero Value	*0.00*							Press.[inHg]	29.27	D.F.	
Span Value	*0.00*							RH[%]	*14.89*	Ph. Start[s]	505.7
Sample	*0.00*							AH[g/kg]	*2.662*	Ph. End[s]	1375.3
Mass.	*0.000*							Dist.[mi]	*3.83*	Ph. Length[s]	869.7
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7907*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.41*

Test Data: FTP72 Operator: Joseph Bishop Date: 2/18/2021
Test Number: ONT3_001459 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001459

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*0.000*	*0.000*
B [lbf/mph]	*0.00000*	*0.00000*
C [lbf/mph2]	*0.024860*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.04		
Driven	5750.50	6165.35		
Distance Rating (%)	-0.4957	-0.7356		
Cycle Energy (MJ)				
Target	2.62	2.38		
Driven	2.65	2.38		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.2648	0.0962		
Driven	0.2566	0.0929		
Inertial Work (MJ)				
Target	1.92	2.15		
Driven	1.97	2.16		
Inertial Work Fraction				
Target	0.7352	0.9038		
Driven	0.7434	0.9071		
Inertial Work Rating	2.3068	0.4644		
Absolute Speed Change (m/s2)				
Target	204.87	340.91		
Driven	208.52	341.38		
Absolute Speed Change Rating (%)	1.7785	0.1367		
Energy Rating	1.6472	0.8347		
Energy Economy Rating	1.6472	0.8347		1.2726

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001459

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	77.13	73.58	79.16	68.00	86.00	Passed
Barometer	(inHg)	29.27	29.27	29.27	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.68	17.79	19.14	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	79.54	75.83	84.11	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.57					Passed
Sample Phase Time	(s)	505.6					
Duration Phase 1	(s)	505.50					
Crank Time Phase1	(s)	0.60				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

NO humidity Requirement

J. H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001459

Vehicle ID: 3C4NJDCB1LT170527

Phase 2		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	73.75	67.64	78.26	68.00	86.00	Passed
Barometer	(inHg)	29.27	29.27	29.28	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.64	17.04	19.67	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	80.68	79.43	82.49	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.83					Passed
Sample Phase Time	(s)	869.7					
Duration Phase 2	(s)	869.60					
Crank Time Phase1	(s)	0.6000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No humidity Requirement

J. H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	2/18/2021	**Time:**	19:38:04
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	UDDS 3		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001460*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*2/18/2021*	CH_4 Response Factor	
Test Start	*19:38:04*	Odometer Position [mi]	*29329*
Start Time Cycle	*2021-02-18 19|41-59-(000)*	Delay Time Method	
Test End	*20:05:30*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*UDDS 3*		

Vehicle Data

J.H.

3081-01 170527 ✓

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527* ✓	Engine Family	*LCRXT02.45P1* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-01*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data

3081

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*4250.00* ✓
Street Load	*26.770* ✓	*0.40300* ✓	*0.024860* ✓
Road Load	*0.000*	*0.00000*	*0.024860*

Fuel Data

~~*91 Pump Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*e-15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data

FTP75

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001460	Driver	Victor Escudero	Shift Table Auto		Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*		91_Pump_Gas	Start Time	*19:38:04*
		A [lbf]	*0.000*	Fuel type	GASOLINE	End Time	*20:05:30*
Model	COMPASS	B [lbf/mph]	*0.00000*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024860*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*29329*	Remark	UDDS 3				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.04	Volume [scf]	2688
Zero Read	*0.00*							Press. [inHg]	29.28	D.F.	
Span Read	*0.00*							RH [%]	*14.51*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*2.618*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7898*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.90	Volume [scf]	4598
Zero Value	*0.00*							Press. [inHg]	29.28	D.F.	
Span Value	*0.00*							RH [%]	*15.05*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*2.615*	Ph. End [s]	1375.0
Mass.	*0.000*							Dist. [mi]	*3.86*	Ph. Length [s]	869.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7897*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.45*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*14.51*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*2.62*
CVS Volume[scf]	*2687.99*	Act. Dist.[mi]	*3.59*	Pressure[inHg]	*29.28*
CVS Flow[scfm]	*319.05*			Temp.[°F]	*74.04*
CVS Inlet Pressure	*29.20*			Temp. Min.[°F]	*70.88*
CVS Inlet Temp.[°F]	*79.64*			Temp. Max.[°F]	*77.36*
CVS Inlet Temp. Min.[°F]	*76.01*			NO_X Corr. F	*0.7898*
CVS Inlet Temp. Max.[°F]	*84.11*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_X[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_X[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*15.05*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*2.61*
CVS Volume[scf]	*4597.86*	Act. Dist.[mi]	*3.86*	Pressure[inHg]	*29.28*
CVS Flow[scfm]	*317.28*			Temp.[°F]	*72.90*
CVS Inlet Pressure	*29.20*			Temp. Min.[°F]	*66.38*
CVS Inlet Temp.[°F]	*80.48*			Temp. Max.[°F]	*76.82*
CVS Inlet Temp. Min.[°F]	*78.89*			NO_X Corr. F	*0.7897*
CVS Inlet Temp. Max.[°F]	*82.49*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

Test Data: FTP72 Operator: Joseph Bishop Date: 2/18/2021
Test Number: ONT3_001460 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001460

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*0.000*	*0.000*
B [lbf/mph]	*0.00000*	*0.00000*
C [lbf/mph2]	*0.024860*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5775.14	6217.58		
Distance Rating (%)	-0.0695	0.1051		
Cycle Energy (MJ)				
Target	2.62	2.38		
Driven	2.58	2.41		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.2648	0.0962		
Driven	0.2839	0.0960		
Inertial Work (MJ)				
Target	1.92	2.15		
Driven	1.85	2.18		
Inertial Work Fraction				
Target	0.7352	0.9038		
Driven	0.7161	0.9040		
Inertial Work Rating	-3.8292	1.2948		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	200.45	342.00		
Absolute Speed Change Rating (%)	-2.1609	0.3224		
Energy Rating	-1.2114	1.1527		
Energy Economy Rating	-1.2114	1.1527		-0.0784

ATDS Emission Lab Test Report
Phase 1

Validation

Test Record #: ONT3_001460

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	74.04	70.88	77.36	68.00	86.00	Passed
Barometer	(inHg)	29.28	29.28	29.28	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.33	17.71	19.09	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	79.64	76.01	84.11	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No humidity requirement

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001460

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	72.90	66.38	76.82	68.00	86.00	Passed
Barometer	(inHg)	29.28	29.28	29.28	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.30	16.86	19.36	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	80.48	78.89	82.49	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	869.5					
Duration Phase 2	(s)	869.40					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity Requirement

J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	2/18/2021	**Time:**	20:06:08
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	UDDS 4		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001461*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*2/18/2021*	CH_4 Response Factor	
Test Start	*20:06:08*	Odometer Position [mi]	*29336*
Start Time Cycle	*2021-02-18 20|09-26-(000)*	Delay Time Method	
Test End	*20:32:41*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*UDDS 4*		

J. H.

Vehicle Data — ~~3081-01~~ 170527 ✓

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527* ✓	Engine Family	*LCRXT02.45P1* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-01*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data — *3081*

Dyno Type	*SVOR*	Inertia [lb]	*4250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*26.770* ✓	*0.40300* ✓	*0.024860* ✓
Road Load	*0.000*	*0.00000*	*0.024860*

Fuel Data — ~~91 Pump Gas~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data — *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001461	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle	3C4NJDCB1LT170527	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*	91_Pump_Gas		Start Time	*20:06:08*
		A [lbf]	*0.000*	Fuel type	GASOLINE	End Time	*20:32:41*
Model	COMPASS	B [lbf/mph]	*0.00000*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024860*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*29336*	Remark	UDDS 4				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]	Temp. [°F]	73.36	Volume [scf]	2685
Range	*0*							Press. [inHg]	29.28	D.F.	
Zero Read	*0.00*							RH [%]	*14.78*	Ph. Start [s]	0.1
Span Read	*0.00*							AH [g/kg]	*2.607*	Ph. End [s]	505.5
Sample	*0.00*							Dist. [mi]	*3.59*	Ph. Length [s]	505.5
Mass.	*0.000*							NO_x Corr.	*0.7895*	Bag An. Delay [s]	
Mass per Dist.	*0.0000*							Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]	Temp. [°F]	72.81	Volume [scf]	4599
Range	*0*							Press. [inHg]	29.29	D.F.	
Zero Value	*0.00*							RH [%]	*15.12*	Ph. Start [s]	505.6
Span Value	*0.00*							AH [g/kg]	*2.619*	Ph. End [s]	1375.3
Sample	*0.00*							Dist. [mi]	*3.86*	Ph. Length [s]	869.8
Mass.	*0.000*							NO_x Corr.	*0.7898*	Bag An. Delay [s]	
Mass per Dist.	*0.0000*							Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.45*

Test Data: FTP72 Operator: Joseph Bishop Date: 2/18/2021
Test Number: ONT3_001461 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001461

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*0.000*	*0.000*
B [lbf/mph]	*0.00000*	*0.00000*
C [lbf/mph2]	*0.024860*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.04		
Driven	5781.32	6209.14		
Distance Rating (%)	0.0375	-0.0305		
Cycle Energy (MJ)				
Target	2.62	2.38		
Driven	2.66	2.41		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.2648	0.0962		
Driven	0.2607	0.0901		
Inertial Work (MJ)				
Target	1.92	2.15		
Driven	1.97	2.19		
Inertial Work Fraction				
Target	0.7352	0.9038		
Driven	0.7393	0.9099		
Inertial Work Rating	2.2892	1.8889		
Absolute Speed Change (m/s2)				
Target	204.87	340.91		
Driven	208.88	343.63		
Absolute Speed Change Rating (%)	1.9558	0.7975		
Energy Rating	1.6582	1.2194		
Energy Economy Rating	1.6582	1.2194		1.4527

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001461

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	73.36	70.88	76.82	68.00	86.00	Passed
Barometer	(inHg)	29.28	29.28	29.28	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.25	17.63	19.11	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	80.50	77.27	85.55	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40				5	Passed
Crank Time Phase1	(s)	0.50				5	
Crank Time Phase3	(s)					1	Passed
Crank Counts		1				5	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3							
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No humidity requirement

D.H.

2/18/2021 8:44 PM

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001461

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	72.81	66.56	76.64	68.00	86.00	Passed
Barometer	(inHg)	29.29	29.28	29.29	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.33	16.65	19.61	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	80.90	79.43	83.03	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	869.8					
Duration Phase 2	(s)	869.70				5	Passed
Crank Time Phase1	(s)	0.5000				1	Passed
Crank Counts		1				5	Passed
Shutdown Time Phase 2							
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J.H.

2/18/2021 8:44 PM

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/16/2021	**Time:**	17:05:28
Test Legislation:	EPA		
Test Cycle:	HWFET+HWFET		
Test Purpose:	Preconditioning		
Test Name:	HWFET_HWFET		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	ROADLOAD PREP		

QUALITY ASSURANCE

INSPECTED BY: J.H

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001632*		
Test Name	*HWFET_HWFET*		
Test Cell	*iGEM-V-TC1*		
Test Type	*HWFET_HWFET*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/16/2021*	CH_4 Response Factor	
Test Start	*17:05:28*	Odometer Position [mi]	*29344*
Start Time Cycle	*2021-03-16 17|29-03-(000)*	Delay Time Method	
Test End	*17:40:12*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*ROADLOAD PREP*		

Vehicle Data *3081-170527*

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527*	Engine Family	*LCRXT02.45P1*
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-170527*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1*	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*4250.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*26.770*	*0.40300*	*0.024860*
Road Load	*0.000*	*0.00000*	*0.024860*

Fuel Data ~~*91_Pump_Gas*~~ E15

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	HWFET_HWFET	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001632	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle	3C4NJDCB1LT170527	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*	91_Pump_Gas		Start Time	*17:05:28*
		A [lbf]	*0.000*	Fuel type	GASOLINE	End Time	*17:40:12*
Model	COMPASS	B [lbf/mph]	*0.00000*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024860*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*29344*	Remark	ROADLOAD PREP				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]	Temp.[°F]	72.39	Volume[scf]	3990
Range	*0*							Press.[inHg]	29.00	D.F.	
Zero Read	*0.00*							RH[%]	*23.55*	Ph. Start[s]	779.2
Span Read	*0.00*							AH[g/kg]	*4.071*	Ph. End[s]	1544.1
Sample	*0.00*							Dist.[mi]	*10.25*	Ph. Length[s]	765.0
Mass.	*0.000*							NO_X Corr.	*0.8207*	Bag An. Delay[s]	
Mass per Dist.	*0.0000*							Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *10.25*

Test Data: HWFET_HWFET Operator: Joseph Bishop Date: 3/16/2021
Test Number: ONT3_001632 Driver: Joseph Bishop

Driver Violations

		P1	I1	Phase1
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001632

Test Cycle HWFET+HWFET
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*0.000*	*0.000*
B [lbf/mph]	*0.00000*	*0.00000*
C [lbf/mph2]	*0.024860*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	16506.54			
Driven	16491.48			
Distance Rating (%)	-0.0913			
Cycle Energy (MJ)				
Target	5.88			
Driven	5.95			
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.6141			
Driven	0.6117			
Inertial Work (MJ)				
Target	2.27			2.27
Driven	2.31			2.31
Inertial Work Fraction				
Target	0.3859			
Driven	0.3883			
Inertial Work Rating	1.9233			1.9233
Absolute Speed Change (m/s2)				
Target	130.69			130.69
Driven	133.38			133.38
Absolute Speed Change Rating (%)	2.0553			2.0553
Energy Rating	1.3715			
Energy Economy Rating	1.3715			1.3715

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001632

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	72.39	71.42	73.40	68.00	86.00	Passed
Barometer	(inHg)	29.00	29.00	29.00	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	28.50	28.09	29.13	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	84.86	78.35	92.03	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	10.25					Passed
Sample Phase Time	(s)	765.0					
Duration Phase 1	(s)	764.90					
Crank Time Phase1	(s)	0.00				5	Not App
Crank Counts		0				1	Passed
Shutdown Time Phase 1						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no humidity Requirement

J. K.

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/10/2021

COMMENTS: OK

Data of automatic adaptation 03-16-2021

	Road	measured	act. set	
F0	26.8	25.8	1.0	lbs
F1	0.403	0.437	0.176	lbs/mph
F2	0.0249	0.0244	0.0246	lbs/(mph)²
Rw	4186.2			lbs

v max -	31.1	- 0.0	mph
Max. Devi.	0.85	-0.44	lbs
Turn	3		

Close

Print

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/10/2021

COMMENTS: OK

~~Results Coastdown 03-16-2021~~

mph | Force deviation (lbs) | select

GRAPHIC | Close | Save to File | Help | Break | Print | Get Data

Data Transfer running

vu	vl	1	2	3	4	5	Average
70.0	60.0	0.44	0.18	0.14	0.00	0.00	0.25
60.0	50.0	0.98	0.61	0.68	0.00	0.00	0.75
50.0	40.0	1.12	0.85	0.85	0.00	0.00	0.94
40.0	30.0	0.34	0.21	0.17	0.00	0.00	0.24
30.0	20.0	-0.31	-0.43	-0.44	0.00	0.00	-0.40
20.0	10.0	0.23	-0.05	-0.07	0.00	0.00	0.03

Set values (mph)

F0	26.2	25.9	25.8	0.0	0.0	26.0	26.8	lbs
F1	0.427	0.434	0.437	0.000	0.000	0.432	0.403	lbs/mph
F2	0.0246	0.0245	0.0244	0.0000	0.0000	0.0245	0.0249	lbs/(mph)²
					Rw		4186.2	lbs

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/16/2021	**Time:**	18:00:06
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001633*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/16/2021*	CH_4 Response Factor	
Test Start	*18:00:06*	Odometer Position [mi]	*29371*
Start Time Cycle	*2021-03-16 18|08-23-(000)*	Delay Time Method	
Test End	*18:33:24*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-170527*

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527*	Engine Family	*LCRXT02.45P1*
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-170527*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1*	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*4250.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*26.770*	*0.40300*	*0.024860*
Road Load	*1.000*	*0.17600*	*0.024600*

Fuel Data *~~91_Pump_Gas~~ E15*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001633	Driver	Joseph Bishop	Shift Table Auto		Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*		91_Pump_Gas	Start Time	*18:00:06*
		A [lbf]	*1.000*	Fuel type	GASOLINE	End Time	*18:33.24*
Model	COMPASS	B [lbf/mph]	*0.17600*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024600*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*29371*	Remark	PRECON				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.77	Volume[scf]	2665
Zero Read	*0.00*							Press.[inHg]	29.01	D.F.	
Span Read	*0.00*							RH[%]	*21.43*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*4.147*	Ph. End[s]	505.6
Mass.	*0.000*							Dist.[mi]	*3.59*	Ph. Length[s]	505.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8224*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	71.87	Volume[scf]	4562
Zero Value	*0.00*							Press.[inHg]	29.02	D.F.	
Span Value	*0.00*							RH[%]	*24.84*	Ph. Start[s]	505.7
Sample	*0.00*							AH[g/kg]	*4.216*	Ph. End[s]	1375.7
Mass.	*0.000*							Dist.[mi]	*3.86*	Ph. Length[s]	870.1
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8240*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.45*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*21.43*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*4.15*
CVS Volume[scf]	*2664.85*	Act. Dist.[mi]	*3.59*	Pressure[inHg]	*29.01*
CVS Flow[scfm]	*316.24*			Temp.[°F]	*75.77*
CVS Inlet Pressure	*28.92*			Temp. Min.[°F]	*72.50*
CVS Inlet Temp.[°F]	*79.47*			Temp. Max.[°F]	*79.16*
CVS Inlet Temp. Min.[°F]	*75.29*			NO_X Corr. F	*0.8224*
CVS Inlet Temp. Max.[°F]	*84.47*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_X[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_X[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*24.84*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*4.22*
CVS Volume[scf]	*4562.01*	Act. Dist.[mi]	*3.86*	Pressure[inHg]	*29.02*
CVS Flow[scfm]	*314.59*			Temp.[°F]	*71.87*
CVS Inlet Pressure	*28.93*			Temp. Min.[°F]	*70.88*
CVS Inlet Temp.[°F]	*79.63*			Temp. Max.[°F]	*73.22*
CVS Inlet Temp. Min.[°F]	*77.99*			NO_X Corr. F	*0.8240*
CVS Inlet Temp. Max.[°F]	*82.31*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_X[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_X[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

Test Data: FTP72 Operator: Joseph Bishop Date: 3/16/2021
Test Number: ONT3_001633 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001633

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*1.000*	*0.000*
B [lbf/mph]	*0.17600*	*0.00000*
C [lbf/mph2]	*0.024600*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5783.32	6209.67		
Distance Rating (%)	0.0722	-0.0222		
Cycle Energy (MJ)				
Target	2.62	2.38		
Driven	2.62	2.40		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.2648	0.0962		
Driven	0.2685	0.0906		
Inertial Work (MJ)				
Target	1.92	2.15		
Driven	1.92	2.18		
Inertial Work Fraction				
Target	0.7352	0.9038		
Driven	0.7315	0.9094		
Inertial Work Rating	-0.3912	1.5990		
Absolute Speed Change (m/s2)				
Target	204.88	340.92		
Driven	204.83	342.62		
Absolute Speed Change Rating (%)	-0.0255	0.5011		
Energy Rating	0.0396	0.9833		
Energy Economy Rating	0.0396	0.9833		0.4948

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001633

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	75.77	72.50	79.16	68.00	86.00	Passed
Barometer	(inHg)	29.01	29.01	29.01	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	29.03	28.13	30.10	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	79.47	75.29	84.47	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.6					
Duration Phase 1	(s)	505.50					
Crank Time Phase1	(s)	0.60				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No humidity requirement

J.H.

ATDS Emission Lab Test Report
Phase 2

Validation

Test Record #: ONT3_001633

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	71.87	70.88	73.22	68.00	86.00	Passed
Barometer	(inHg)	29.02	29.01	29.02	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	29.51	28.76	30.26	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	79.63	77.99	82.31	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	870.1					
Duration Phase 2	(s)	870.00					
Crank Time Phase1	(s)	0.6000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J. H.

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-170527 ✓
Project	3081
Evap Family	LCRXR0106PP1 ✓
Ambient Temperature-Deg F	79
Barometric Pressure-In/Hg	29.03
Humidity-Grains/Lb	32.9 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	107 ✓
Canister Volume-Liters	2.0
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	19:31:45
Start date	03-16-2021
Bed Purges/Cycle	300
Purge End/Load Start	19:58:14
Test Time Minutes	669
HC Loaded-Grams	160.5 ✓
Scale Reading-Grams	-1.38
Butane Flow Actual-Gm/Hr	15.0 ✓
Cycles Completed	1
Finish time	06:40:51
Finish date	03-17-2021
Disk File Name	21031701.ST3

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/10/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/17/2021	**Time:**	8:42:47
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Certification		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 Test		

QUALITY ASSURANCE

INSPECTED BY: J K

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001634*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/17/2021*	CH_4 Response Factor	
Test Start	*8:42:47*	Odometer Position [mi]	*29378*
Start Time Cycle	*2021-03-17 08|55-24-(000)*	Delay Time Method	
Test End	*9:36:24*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 Test*		

Vehicle Data *3081-170527*

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527*	Engine Family	*LCRXT02.45P1*
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-170527*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1*	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*4250.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*26.770*	*0.40300*	*0.024860*
Road Load	*1.000*	*0.17600*	*0.024600*

Fuel Data *~~91_Pump_Gas~~ E15*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Domenic Coppola	Speed Table		Date:	
Test Number	ONT3_001634	Driver	Jennifer Chappell	Shift Table Auto		Cold Start	

Vehicle	3C4NJDCB1LT170527	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*		91_Pump_Gas	Start Time	*8:42:47*
		A [lbf]	*1.000*	Fuel type	GASOLINE	End Time	*9:36:24*
Model	COMPASS	B [lbf/mph]	*0.17600*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024600*	NHV	18085	Soak Time	546.8
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*29378*	Remark	E15 Test				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	78.36	Volume [scf]	2668
Zero Read	*0.00*							Press. [inHg]	29.11	D.F.	
Span Read	*0.00*							RH [%]	*21.72*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*4.567*	Ph. End [s]	505.8
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8319*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.05	Volume [scf]	4591
Zero Value	*0.00*							Press. [inHg]	29.10	D.F.	
Span Value	*0.00*							RH [%]	*25.00*	Ph. Start [s]	505.9
Sample	*0.00*							AH [g/kg]	*4.555*	Ph. End [s]	1375.6
Mass.	*0.000*							Dist. [mi]	*3.87*	Ph. Length [s]	869.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8316*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.23	Volume [scf]	2667
Zero Value	*0*							Press. [inHg]	29.10	D.F.	
Span Value	*0.00*							RH [%]	*23.40*	Ph. Start [s]	1920.1
Sample	*0*							AH [g/kg]	*4.586*	Ph. End [s]	2425.9
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8323*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_x [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.06*

Test Data: FTP75 Operator: Domenic Coppola Date: 3/17/2021
Test Number: ONT3_001634 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001634

Test Cycle FTP75
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*1.000*	*0.000*
B [lbf/mph]	*0.17600*	*0.00000*
C [lbf/mph2]	*0.024600*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6210.95	5779.15	
Driven	5784.01	6229.07	5788.80	
Distance Rating (%)	0.0841	0.2917	0.1669	
Cycle Energy (MJ)				
Target	2.62	2.38	2.62	
Driven	2.58	2.39	2.66	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.2648	0.0962	0.2648	
Driven	0.2642	0.0903	0.2624	
Inertial Work (MJ)				
Target	1.92	2.15	1.92	4.07
Driven	1.90	2.18	1.96	4.11
Inertial Work Fraction				
Target	0.7352	0.9038	0.7352	
Driven	0.7358	0.9097	0.7376	
Inertial Work Rating	-1.3149	1.3582	1.8849	0.9570
Absolute Speed Change (m/s2)				
Target	204.87	340.91	204.88	545.79
Driven	202.15	342.29	206.93	547.17
Absolute Speed Change Rating (%)	-1.3293	0.4061	1.0020	0.2535
Energy Rating	-1.5023	0.4054	1.3743	
Energy Economy Rating	-1.5023	0.4054	1.3743	0.2693

ATDS Emission Lab Test Report

Validation

Phase 1

Test Record #: ONT3_001634

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	78.36	77.72	79.52	68.00	86.00	Passed
Barometer	(inHg)	29.11	29.10	29.11	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	31.97	31.70	32.27	38.50	87.50	Review ok
CVS Inlet Temperature	(°F)	76.27	74.39	81.23	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.8					
Duration Phase 1	(s)	505.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	546.80			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no humidity requirement

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001634

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	74.05	70.52	80.24	68.00	86.00	Passed
Barometer	(inHg)	29.10	29.10	29.10	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	31.89	30.63	33.47	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	75.53	73.85	78.17	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	869.8					
Duration Phase 2	(s)	869.70					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	546.80			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J.H.

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001634

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	76.23	72.68	79.16	68.00	86.00	Passed
Barometer	(inHg)	29.10	29.10	29.10	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	32.10	31.17	33.10	38.50	87.50	Review
CVS Inlet Temperature	(°F)	76.86	74.21	82.85	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.9					
Duration Phase 3	(s)	505.80					
Crank Time Phase3	(s)	0.90				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)	546.80			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ok

NO humidity requirement

J. H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/17/2021	**Time:**	9:53:05
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 Test		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001635*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/17/2021*	CH_4 Response Factor	
Test Start	*9:53:05*	Odometer Position[mi]	*29389*
Start Time Cycle	*2021-03-17 11|51-10-(000)*	Delay Time Method	
Test End	*13:03:11*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 Test*		

Vehicle Data *3081-170527* ✓

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527* ✓	Engine Family	*LCRXT02.45P1* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-170527*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight[lbs]	
Tire Pressure [psi]	*0*	Tank Volume[gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*4250.00* ✓
Street Load	*26.770* ✓	*0.40300* ✓	*0.024860* ✓
Road Load	*1.000* ✓	*0.17600* ✓	*0.024600* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Domenic Coppola	Speed Table		Date:	
Test Number	ONT3_001635	Driver	Jennifer Chappell	Shift Table Auto		Cold Start	
Vehicle	3C4NJDCB1LT170527	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*		91_Pump_Gas	Start Time	*9:53:05*
		A [lbf]	*1.000*	Fuel type	GASOLINE	End Time	*13:03:11*
Model	COMPASS	B [lbf/mph]	*0.17600*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024600*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*29389*	Remark	E15 Test				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	106.26	Volume[scf]	7784
Zero Read	*0.00*							Press.[inHg]	29.09	D.F.	
Span Read	*0.00*							RH[%]	*10.01*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*5.013*	Ph. End[s]	1489.8
Mass.	*0.000*							Dist.[mi]	*7.47*	Ph. Length[s]	1489.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8422*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	105.13	Volume[scf]	6888
Zero Value	*0.00*							Press.[inHg]	29.08	D.F.	
Span Value	*0.00*							RH[%]	*10.44*	Ph. Start[s]	1489.9
Sample	*0.00*							AH[g/kg]	*5.057*	Ph. End[s]	2811.8
Mass.	*0.000*							Dist.[mi]	*2.37*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8432*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	104.64	Volume[scf]	7727
Zero Value	*0*							Press.[inHg]	29.07	D.F.	
Span Value	*0.00*							RH[%]	*10.48*	Ph. Start[s]	2811.9
Sample	*0*							AH[g/kg]	*5.007*	Ph. End[s]	4300.8
Mass.	*0.000*							Dist.[mi]	*7.48*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8420*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	HC+NO_x[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.32*

Test Data: ORVR_Prep Operator: Domenic Coppola Date: 3/17/2021
Test Number: ONT3_001635 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001635

Test Cycle RL
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*1.000*	*0.000*
B [lbf/mph]	*0.17600*	*0.00000*
C [lbf/mph2]	*0.024600*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.76	11990.13	
Driven	12015.38	3814.52	12034.69	
Distance Rating (%)	0.2106	0.5737	0.3717	
Cycle Energy (MJ)				
Target	4.99	2.31	4.99	
Driven	4.97	2.18	5.03	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.1845	0.0290	0.1845	
Driven	0.1833	0.0272	0.1842	
Inertial Work (MJ)				
Target	4.07	2.24	4.07	6.31
Driven	4.06	2.12	4.10	6.21
Inertial Work Fraction				
Target	0.8155	0.9710	0.8155	
Driven	0.8167	0.9728	0.8158	
Inertial Work Rating	-0.3779	-5.1676	0.6888	-1.6854
Absolute Speed Change (m/s2)				
Target	545.78	469.45	545.78	1015.23
Driven	543.87	443.87	546.23	989.08
Absolute Speed Change Rating (%)	-0.3498	-5.4494	0.0822	-2.5755
Energy Rating	-0.7400	-6.2615	0.2747	
Energy Economy Rating	-0.7400	-6.2615	0.2747	-1.9929

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001635

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	106.26	103.82	107.60	100.00	109.99	Passed
Barometer	(inHg)	29.09	29.08	29.09	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	35.09	34.53	35.53	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	85.85	82.67	89.33	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.47					
Sample Phase Time	(s)	1489.8					
Duration Phase 1	(s)	1489.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No humidity Requirement

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001635

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	105.13	104.36	106.34	100.00	109.99	Passed
Barometer	(inHg)	29.08	29.08	29.08	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	35.40	35.03	35.68	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	88.58	86.09	94.19	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.37					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No humidity requirement

J.H.

3/17/2021 1:09 PM

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001635

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	104.64	100.58	107.42	100.00	109.99	Passed
Barometer	(inHg)	29.07	29.07	29.08	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	35.05	33.62	36.09	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	92.67	88.25	102.65	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

NO humidity requirement

J.H.

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

2-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001635

ATDS Vehicle ID	3081-170527	***VIN***	3C4NJDCB1LT170527
Model Year	2020	***Make/Model***	Jeep Compass
Test Group	LCRXT02.45P1	***Engine Size***	2.4
Evaporative Family	LCRXR0106PP1	***Canister Capacity***	107
Odometer	29406	***Vehicle Test Volume***	50 ft3
Test Start Date	Wednesday, March 17, 2021	***Profile***	CA
		Fuel	E-15

0 – 1 Hour Diurnal / (2-Day Supplemental) **3/17/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	13:03:11	0:00:00	0:00:00	
Engine Key-off	13:09:00	0:05:49	0:05:49	
SHED Door Sealed	13:10:00	0:01:00	0:06:49	
Final Sample	14:10:00	1:00:00	1:06:49	
Initial				
Zero = 0.000 ppm	Span = 9.550 ppm	Re-Zero = 0.000 ppm		
Read = 11.534 ppm	Volume = 1793.7 ft3	Temp. = 104 °F	Baro. = 29.12 in/Hg	Mass = 0.32 grams
Post Read Zero = 0.000 ppm	Post Read Span = 9.525 ppm			
Final				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 14.449 ppm	Volume = 1791.4 ft3	Temp. = 105.2 °F	Baro. = 29.08 in/Hg	Mass = 0.4 grams
Post Read Zero = -0.027 ppm	Post Read Span = 93.287 ppm			
Test Temperatures	Allowable Limit			
Min Ambient Temp = 104.2 °F	Minimum = 102 °F			
Max Ambient Temp = 106.4 °F	Maximum = 108 °F			
Min Interior Temp = 104.2 °F	Minimum = 68 °F			**Final Mass = 0.08±0.01 grams**

HOT SOAK TEST STATUS = COMPLETE

6 Hour Cold Soak / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Wednesday, March 17, 2021	15:10:00	0:00:00	
End Cold Soak	Wednesday, March 17, 2021	21:10:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63.2 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.7 °F	Maximum = 68 °F			
Min. Internal Temp = 63.2 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

2-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-170527	***VIN***	3C4NJDCB1LT170527
Model Year	2020	***Make/Model***	Jeep Compass
Test Group	LCRXT02.45P1	***Engine Size***	2.4
Evaporative Family	LCRXR0106PP1	***Capacity***	107
Odometer	29406	***Vehicle Test Volume***	50 ft3
Test Start Date	Wednesday, March 17, 2021		

0 – 24 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	**Test Control Clock (PDT)**	**Total Soak Time**	
End Cold Soak	Wednesday, March 17, 2021	21:10:00	0:00:00	
Start Time Diurnal	Wednesday, March 17, 2021	21:10:00	0:00:00	
End Time Diurnal	Thursday, March 18, 2021	21:10:00	24:00:00	
24 Hour Sample	Thursday, March 18, 2021	21:10:00	24:00:00	
Initial				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 14.567 ppm	Volume = 1632.4 ft3	Temp. = 65 °F	Baro. = 29.09 in/Hg	Mass = 0.039 grams
Post Read Zero = 0.000 ppm	Post Read Span = 93.290 ppm			
Final				
Zero = 0.000 ppm	Span = 934.2 ppm	Re-Zero = 0.000 ppm		
Read = 159.78 ppm	Volume = 1606.8 ft3	Temp. = 64.9 °F	Baro. = 29.15 in/Hg	Mass = 4.242 grams
Post Read Zero = -0.044 ppm	Post Read Span = 934.1 ppm			
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.9 °F	± 3 °F			
Avg. Δ Profile Underbody = 0 °F	± 2 °F			
Max. Δ Profile Sidewall = 1.2 °F	± 5 °F			
Min Water Temperature 64.7 °F	Minimum = 40 °F			**Final Mass = 4.203±0.01 grams**

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

*Test aborted after day 1

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

Emission Test Check Sheet
FTP with 3 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Jeep Compass
Vehicle #:	3081-170527	**Engine Size**	2.4L
VIN:	3C4NJDCB1LT170527	**Model Year**	2020
Engine Family:	LCRXT02.45P1	**Requested By:**	J. Link

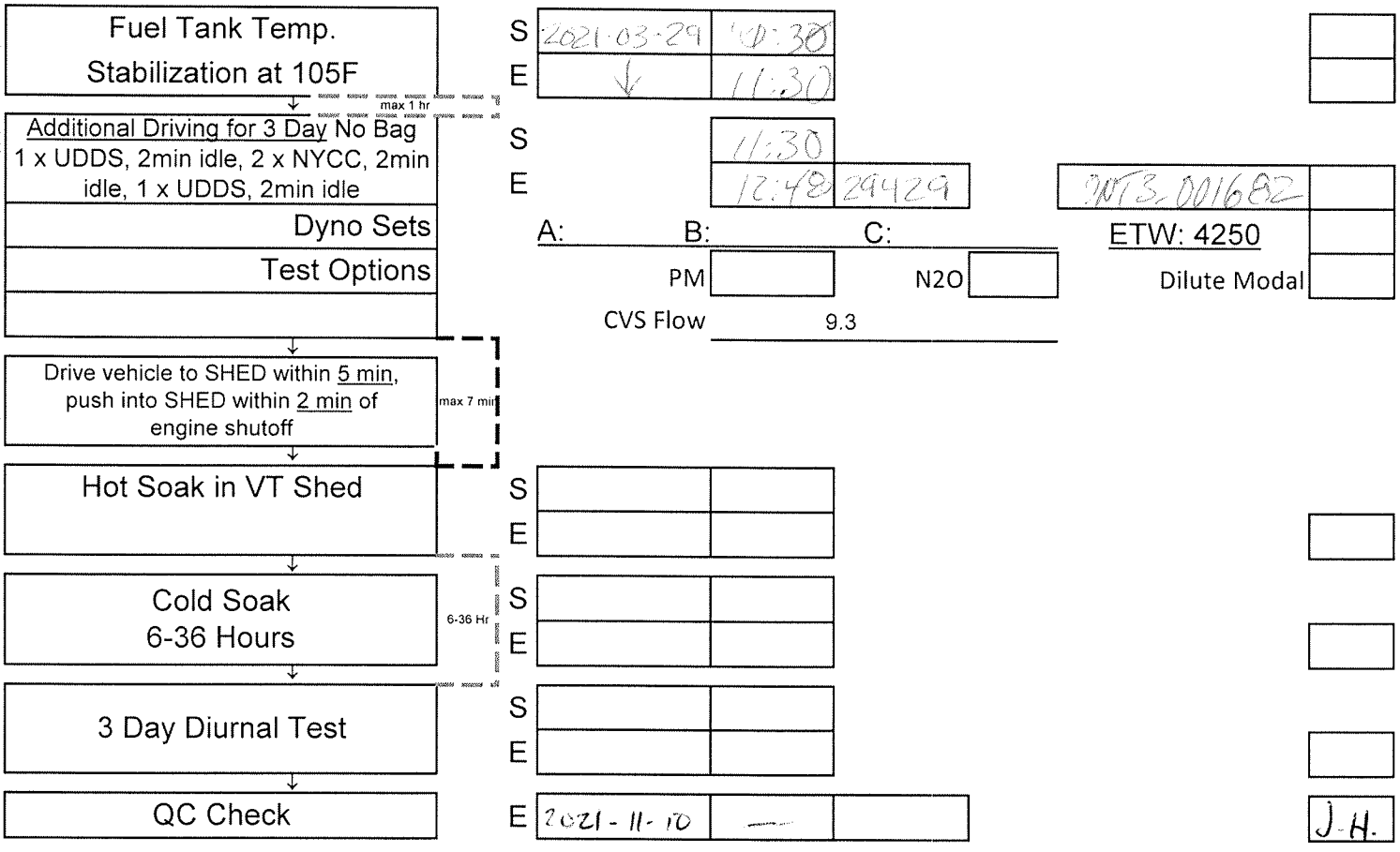
Documentation

	Duration		Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Precon FTP 72 (UDDS)		S	3/28/21	09:30	29411			
		E	↓	10:01	29418		ONT3.001679	JB
Dyno Sets		A: 1.00	B: 0.1760	C: 0.0246			ETW: 4250	JL
Vehicle Soak 68-86°F		S	3/28/21	10:05				JB
		E	2021-03-29	09:10				
Canister Loading with Butane Type: 1.5x Load	12-36 hr	S	2021-03-28	10:10				
		E	↓	21:21			21032801.ST4	JB
Canister Loading Specs		Cap		107	Vol	2.0		
		Purge		300	Flow Rate	15	LCRXR0106PP1	
Set tire pressure to sticker		Front		35	Back	32		
No Bag Cold Start FTP 75		S	2021-03-29	09:10	29418			
		E	↓	09:58	29429		ONT3_001681	DC
Dyno Sets		A:	B:	C:			ETW: 4250	
Test Options		PM		N2O			Dilute Modal	
		CVS Flow	P1:9.3 P2:9.3 P3:9.3					
Pre Test Comments		E15 Test						

T - 78.4

H - 27.3

S - 29.1


Fuel Tank Temp.
Stabilization at 105F
S
E
2021-03-29
10:30
11:30
max 1 hr
Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
S
E
11:30
12:48
29429
NT3.001682
Dyno Sets
Test Options
A:
B:
C:
ETW: 4250
PM
N2O
Dilute Modal
CVS Flow
9.3
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
S
E
Cold Soak
6-36 Hours
6-36 Hr
S
E
3 Day Diurnal Test
S
E
QC Check
E
2021-11-10
J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081		3081-170527		
VIN:	3C4NJDCB1LT170527				
Test Cell:	Cell 3				
Make / Model / Wheel drive / MY:	Jeep	Compass		4WD	2020
Test Group / Engine Size (L):	LCRXT02.45P1		2.4L		
EVAP Family:	LCRXR0106PP1				
Standard Tire Size (front) / Pressure:	225/55-18		35		
Standard Tire Size (rear) / Pressure:	225/55-18		32		
Transmission / Shift File / Inertia Weight:	Auto	Auto	4250		
Target Coefficients A / B / C:	26.77	0.4030	0.024860		
Warmup Coefficients A / B / C:	0.00	0.0000	0.024860		
Set Coefficients A / B / C:					
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2		
Test Remarks	E15 Test				

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	13.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	107
Canister volume (Liter)	2
Soak after drain / refills	Y
Test Fan Setup	P-Fixed, FTTP-Roadspe
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - 4WD
5.4 of See Notes!
E15 Fuel
103.8" Wheelbase
FTP-Fixed, FTTP-Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐	Test Quantity:	1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags	☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags	☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags	☐
Diurnal 24h	☐	Fuel type 24H Diurnal				
Diurnal 48h	☐	Fuel type 48h Diurnal				
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!			

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/28/2021	**Time:**	9:30:52
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001679*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/28/2021*	CH_4 Response Factor	
Test Start	*9:30:52*	Odometer Position [mi]	*29411*
Start Time Cycle	*2021-03-28 09|38-50-(000)*	Delay Time Method	
Test End	*10:01:00*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-170527*

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527*	Engine Family	*LCRXT02.45P1*
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-170527*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1*	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*4250.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*26.770*	*0.40300*	*0.024860*
Road Load	*1.000*	*0.17600*	*0.024600*

Fuel Data ~~*91_Pump_Gas*~~ E15

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001679	Driver	Joseph Bishop	Shift Table Auto		Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*	91_Pump_Gas		Start Time	*9:30:52*
		A [lbf]	*1.000*	Fuel type	GASOLINE	End Time	*10:01:00*
Model	COMPASS	B [lbf/mph]	*0.17600*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024600*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*29411*	Remark	PRECON				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	77.38	Volume [scf]	2676
Zero Read	*0.00*							Press. [inHg]	29.19	D.F.	
Span Read	*0.00*							RH [%]	*17.80*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*3.608*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.57*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8106*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.17	Volume [scf]	4579
Zero Value	*0.00*							Press. [inHg]	29.19	D.F.	
Span Value	*0.00*							RH [%]	*18.74*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*3.649*	Ph. End [s]	1375.1
Mass.	*0.000*							Dist. [mi]	*3.85*	Ph. Length [s]	869.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8115*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.41*

Test Data: FTP72 Operator: Joseph Bishop Date: 3/28/2021
Test Number: ONT3_001679 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001679

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*1.000*	*0.000*
B [lbf/mph]	*0.17600*	*0.00000*
C [lbf/mph2]	*0.024600*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.14	6211.05		
Driven	5742.19	6188.38		
Distance Rating (%)	-0.6395	-0.3649		
Cycle Energy (MJ)				
Target	2.62	2.38		
Driven	2.63	2.40		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.2648	0.0962		
Driven	0.2703	0.0915		
Inertial Work (MJ)				
Target	1.92	2.15		
Driven	1.92	2.18		
Inertial Work Fraction				
Target	0.7352	0.9038		
Driven	0.7297	0.9085		
Inertial Work Rating	-0.3411	1.5500		
Absolute Speed Change (m/s2)				
Target	204.88	340.91		
Driven	204.67	342.92		
Absolute Speed Change Rating (%)	-0.1017	0.5898		
Energy Rating	1.0489	1.3821		
Energy Economy Rating	1.0489	1.3821		1.1966

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001679

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	77.38	73.40	78.62	68.00	86.00	Passed
Barometer	(inHg)	29.19	29.19	29.19	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	25.26	24.38	25.85	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	76.80	73.13	83.39	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.57					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no humidity requirement

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001679

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	76.17	73.22	78.44	68.00	86.00	Passed
Barometer	(inHg)	29.19	29.19	29.19	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	25.55	24.45	26.21	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	77.60	76.37	80.33	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.85					Passed
Sample Phase Time	(s)	869.6					
Duration Phase 2	(s)	869.50					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

NO humidity requirement

J.H.

ATDS CANISTER WORKSHEET

Station number 4

--PURGE AND FILL--

VT#	3081-170527 ✓
Project	3081
Evap Family	LCRXR0106PP1 ✓
Ambient Temperature-Deg F	78
Barometric Pressure-In/Hg	29.10
Humidity-Grains/Lb	27.3 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	107 ✓
Canister Volume-Liters	2.0
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	10:10:09
Start date	03-28-2021
Bed Purges/Cycle	300
Purge End/Load Start	10:36:40
Test Time Minutes	671
HC Loaded-Grams	160.5 ✓
Scale Reading-Grams	-3.07
Butane Flow Actual-Gm/Hr	15.0 ✓
Cycles Completed	1
Finish time	21:21:05
Finish date	03-28-2021
Disk File Name	21032801.ST4

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/10/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/29/2021	**Time:**	9:10:24
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 Test		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001681*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/29/2021*	CH_4 Response Factor	
Test Start	*9:10:24*	Odometer Position [mi]	*29418*
Start Time Cycle	*2021-03-29 09|18-14-(000)*	Delay Time Method	
Test End	*9:58:40*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 Test*		

Vehicle Data *3081-170527* ✓

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527* ✓	Engine Family	*LCRXT02.45P1* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-170527*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*4250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*26.770* ✓	*0.40300* ✓	*0.024860* ✓
Road Load	*1.000* ✓	*0.17600* ✓	*0.024600* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Domenic Coppola	Speed Table		Date:	
Test Number	ONT3_001681	Driver	Jennifer Chappell	Shift Table Auto		Cold Start	

Vehicle	3C4NJDCB1LT170527	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*	91_Pump_Gas		Start Time	*9:10:24*
		A [lbf]	*1.000*	Fuel type	GASOLINE	End Time	*9:58:40*
Model	COMPASS	B [lbf/mph]	*0.17600*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024600*	NHV	18085	Soak Time	544.4
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*29418*	Remark	E15 Test				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	76.66	Volume[scf]	2651
Zero Read	*0.00*							Press.[inHg]	28.92	D.F.	
Span Read	*0.00*							RH[%]	*19.68*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*3.934*	Ph. End[s]	505.7
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8177*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.17	Volume[scf]	4524
Zero Value	*0.00*							Press.[inHg]	28.92	D.F.	
Span Value	*0.00*							RH[%]	*20.93*	Ph. Start[s]	505.8
Sample	*0.00*							AH[g/kg]	*3.982*	Ph. End[s]	1375.5
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	869.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8188*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.86	Volume[scf]	2628
Zero Value	*0*							Press.[inHg]	28.92	D.F.	
Span Value	*0.00*							RH[%]	*20.54*	Ph. Start[s]	1918.2
Sample	*0*							AH[g/kg]	*3.999*	Ph. End[s]	2423.8
Mass.	*0.000*							Dist.[mi]	*3.61*	Ph. Length[s]	505.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8191*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***	
Mass per Dist.	*0.0000*							0.0000	mile/gal	
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi]	*11.07*

Test Data: FTP75 Operator: Domenic Coppola Date: 3/29/2021
Test Number: ONT3_001681 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001681

Test Cycle FTP75
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*1.000*	*0.000*
B [lbf/mph]	*0.17600*	*0.00000*
C [lbf/mph2]	*0.024600*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.14	6210.96	5779.15	
Driven	5787.61	6224.88	5803.32	
Distance Rating (%)	0.1464	0.2242	0.4181	
Cycle Energy (MJ)				
Target	2.62	2.38	2.62	
Driven	2.66	2.37	2.62	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.2648	0.0962	0.2648	
Driven	0.2558	0.0878	0.2611	
Inertial Work (MJ)				
Target	1.92	2.15	1.92	4.07
Driven	1.98	2.17	1.94	4.12
Inertial Work Fraction				
Target	0.7352	0.9038	0.7352	
Driven	0.7442	0.9122	0.7389	
Inertial Work Rating	2.7247	0.8001	0.7568	1.1794
Absolute Speed Change (m/s2)				
Target	204.88	340.92	204.88	545.79
Driven	207.25	341.29	204.72	547.10
Absolute Speed Change Rating (%)	1.1564	0.1091	-0.0764	0.2384
Energy Rating	1.3150	-0.3534	-0.1690	
Energy Economy Rating	1.3150	-0.3534	-0.1690	0.0853

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001681

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	76.66	73.76	78.98	68.00	86.00	Passed
Barometer	(inHg)	28.92	28.92	28.92	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	27.54	26.81	28.22	38.50	87.50	Review ok
CVS Inlet Temperature	(°F)	79.81	76.01	84.83	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.7					
Duration Phase 1	(s)	505.60					
Crank Time Phase1	(s)	0.70				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	544.40			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no humidity requirement

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001681

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	75.17	72.50	78.80	68.00	86.00	Passed
Barometer	(inHg)	28.92	28.92	28.92	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	27.88	27.03	29.10	38.50	87.50	Review
CVS Inlet Temperature	(°F)	80.74	79.25	83.03	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	869.8					
Duration Phase 2	(s)	869.70					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	544.40			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

NO humidity requirement

J.H.

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001681

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	75.86	73.76	78.08	68.00	86.00	Passed
Barometer	(inHg)	28.92	28.91	28.92	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	27.99	27.44	28.85	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	81.61	78.17	87.17	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61					Passed
Sample Phase Time	(s)	505.7					
Duration Phase 3	(s)	505.60					
Crank Time Phase3	(s)	0.70				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)	544.40			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

NO humidity requirement

J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/29/2021	**Time:**	11:30:43
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 Test		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/10/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001682*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/29/2021*	CH_4 Response Factor	
Test Start	*11:30:43*	Odometer Position[mi]	*29429*
Start Time Cycle	*2021-03-29 11|37-51-(000)*	Delay Time Method	
Test End	*12:48:43*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 Test*		

Vehicle Data *3081-170527* ✓

Manufacturer	*COMPASS*	Displacement	
Vehicle Model	*3C4NJDCB1LT170527* ✓	Engine Family	*LCRXT02.45P1* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-170527*	Transmission	*Automatic*
Evaporative Family	*LCRXR0106PP1* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight[lbs]	
Tire Pressure[psi]	*0*	Tank Volume[gal]	*0*
Engine Code	*LCRXT02.45P1*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*4250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*26.770* ✓	*0.40300* ✓	*0.024860* ✓
Road Load	*1.000* ✓	*0.17600* ✓	*0.024600* ✓

Fuel Data ~~91_Pump_Gas~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Domenic Coppola	Speed Table	Date:
Test Number	ONT3_001682	Driver	Jennifer Chappell	Shift Table Auto	Cold Start

Vehicle	3C4NJDCB1LT170527	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3C4NJDCB1LT170527***	Inertia [lb]	*4250.00*	91_Pump_Gas		Start Time	*11:30:43*
		A [lbf]	*1.000*	Fuel type	GASOLINE	End Time	*12:48:43*
Model	COMPASS	B [lbf/mph]	*0.17600*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.024600*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT02.45P1						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*29429*	Remark	E15 Test				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	105.26	Volume [scf]	7683
Zero Read	*0.00*							Press. [inHg]	28.89	D.F.	
Span Read	*0.00*							RH [%]	*8.19*	Ph. Start [s]	0.0
Sample	*0.00*							AH [g/kg]	*4.001*	Ph. End [s]	1489.7
Mass.	*0.000*							Dist. [mi]	*7.47*	Ph. Length [s]	1489.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8192*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	104.53	Volume [scf]	6790
Zero Value	*0.00*							Press. [inHg]	28.88	D.F.	
Span Value	*0.00*							RH [%]	*8.18*	Ph. Start [s]	1489.8
Sample	*0.00*							AH [g/kg]	*3.914*	Ph. End [s]	2811.6
Mass.	*0.000*							Dist. [mi]	*2.37*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8173*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	103.64	Volume [scf]	7626
Zero Value	*0*							Press. [inHg]	28.87	D.F.	
Span Value	*0.00*							RH [%]	*8.65*	Ph. Start [s]	2811.8
Sample	*0*							AH [g/kg]	*4.033*	Ph. End [s]	4300.6
Mass.	*0.000*							Dist. [mi]	*7.45*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8199*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.29*

Test Data: ORVR_Prep Operator: Domenic Coppola Date: 3/29/2021
Test Number: ONT3_001682 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001682

Test Cycle RL
Test Legislation EPA

Vehicle ID 3C4NJDCB1LT170527

DYNO Data

	Road Load	Street Load
Inertia [lb]	*4250.00*	
A [lbf]	*1.000*	*0.000*
B [lbf/mph]	*0.17600*	*0.00000*
C [lbf/mph2]	*0.024600*	*0.024860*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.77	11990.13	
Driven	12014.92	3814.68	11986.80	
Distance Rating (%)	0.2068	0.5778	-0.0277	
Cycle Energy (MJ)				
Target	4.99	2.31	4.99	
Driven	5.05	2.25	5.08	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.1845	0.0290	0.1845	
Driven	0.1840	0.0251	0.1762	
Inertial Work (MJ)				
Target	4.07	2.24	4.07	6.31
Driven	4.12	2.19	4.19	6.35
Inertial Work Fraction				
Target	0.8155	0.9710	0.8155	
Driven	0.8160	0.9749	0.8238	
Inertial Work Rating	1.2085	-2.1276	2.7785	0.6019
Absolute Speed Change (m/s2)				
Target	545.78	469.43	545.78	1015.20
Driven	547.95	454.38	553.93	1005.74
Absolute Speed Change Rating (%)	0.3981	-3.2055	1.4931	-0.9326
Energy Rating	0.9293	-3.1766	1.7351	
Energy Economy Rating	0.9293	-3.1766	1.7351	0.0246

ATDS Emission Lab Test Report
Phase 1

Validation

Test Record #: ONT3_001682

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	105.26	103.10	106.88	100.00	109.99	Passed
Barometer	(inHg)	28.89	28.89	28.90	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	28.01	27.42	28.99	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	91.53	86.27	95.09	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.47					
Sample Phase Time	(s)	1489.7					
Duration Phase 1	(s)	1489.60					
Crank Time Phase1	(s)	0.70				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no humidity requirement

J.H.

3/29/2021 12:53 PM

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001682

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	104.53	103.82	105.62	100.00	109.99	Passed
Barometer	(inHg)	28.88	28.87	28.89	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	27.40	26.94	27.86	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	93.30	91.49	98.15	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.37					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J.H.

ATDS Emission Lab Test Report

Validation

Phase 3

Test Record #: ONT3_001682

Vehicle ID: 3C4NJDCB1LT170527

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	103.64	101.16	105.62	100.00	109.99	Passed
Barometer	(inHg)	28.87	28.86	28.88	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	28.23	26.77	29.54	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	96.05	92.93	101.21	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.45					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J.H.

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

2-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001682

ATDS Vehicle ID	3081-170527	***VIN***	3C4NJDCB1LT170527
Model Year	2020	***Make/Model***	Jeep Compass
Test Group	LCRXT02.45P1	***Engine Size***	2.4
Evaporative Family	LCRXR0106PP1	***Canister Capacity***	107
Odometer	29446	***Vehicle Test Volume***	50 ft3
Test Start Date	Monday, March 29, 2021	***Profile***	CA
		Fuel	E-15

0 – 1 Hour Diurnal / (2-Day Supplemental) **3/29/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	12:48:43	0:00:00	0:00:00	
Engine Key-off	12:54:00	0:05:17	0:05:17	
SHED Door Sealed	12:55:00	0:01:00	0:06:17	
Final Sample	13:55:00	1:00:00	1:06:17	
Initial				
Zero = 0.000 ppm	Span = 9.550 ppm	Re-Zero = 0.000 ppm		
Read = 5.200 ppm	Volume = 1803 ft3	Temp. = 104.6 °F	Baro. = 28.9 in/Hg	Mass = 0.144 grams
Post Read Zero = 0.000 ppm	Post Read Span = 9.523 ppm			
Final				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 9.639 ppm	Volume = 1799.7 ft3	Temp. = 104.7 °F	Baro. = 28.85 in/Hg	Mass = 0.261 grams
Post Read Zero = -0.028 ppm	Post Read Span = 93.257 ppm			
Test Temperatures	Allowable Limit			
Min Ambient Temp = 104.2 °F	Minimum = 102 °F			
Max Ambient Temp = 106.6 °F	Maximum = 108 °F			
Min Interior Temp = 104.2 °F	Minimum = 68 °F			**Final Mass = 0.117±0.01 grams**

HOT SOAK TEST STATUS = COMPLETE

6 Hour Cold Soak / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Monday, March 29, 2021	14:55:00	0:00:00	
End Cold Soak	Monday, March 29, 2021	20:55:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.7 °F	Maximum = 68 °F			
Min. Internal Temp = 63 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

2-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-170527	***VIN***	3C4NJDCB1LT170527
Model Year	2020	***Make/Model***	Jeep Compass
Test Group	LCRXT02.45P1	***Engine Size***	2.4
Evaporative Family	LCRXR0106PP1	***Capacity***	107
Odometer	29446	***Vehicle Test Volume***	50 ft3
Test Start Date	Monday, March 29, 2021		

0 – 24 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Monday, March 29, 2021	20:55:00	0:00:00	
Start Time Diurnal	Monday, March 29, 2021	20:55:00	0:00:00	
End Time Diurnal	Tuesday, March 30, 2021	20:55:00	24:00:00	
24 Hour Sample	Tuesday, March 30, 2021	20:55:00	24:00:00	
Initial				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 10.723 ppm	Volume = 1683.5 ft3	Temp. = 64.8 °F	Baro. = 28.84 in/Hg	Mass = 0.295 grams
Post Read Zero = 0.000 ppm	Post Read Span = 93.267 ppm			
Final				
Zero = 0.000 ppm	Span = 934.2 ppm	Re-Zero = 0.000 ppm		
Read = 97.854 ppm	Volume = 1670.1 ft3	Temp. = 64.9 °F	Baro. = 29.03 in/Hg	Mass = 2.69 grams
Post Read Zero = -0.027 ppm	Post Read Span = 934.1 ppm			
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = N/A	± 3 °F			
Avg. Δ Profile Underbody = N/A	± 2 °F			
Max. Δ Profile Sidewall = 1.4 °F	± 5 °F			
Min Water Temperature 64.59 °F	Minimum = 40 °F			**Final Mass = 2.395±0.01 grams**

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

2-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-170527	***VIN***	3C4NJDCB1LT170527
Model Year	2020	***Make/Model***	Jeep Compass
Test Group	LCRXT02.45P1	***Engine Size***	2.4
Evaporative Family	LCRXR0106PP1	***Capacity***	107
Odometer	29446	***Vehicle Test Volume***	50 ft3
Test Start Date	Monday, March 29, 2021		

24 – 48 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Tuesday, March 30, 2021	20:55:00	24:00:00	
Start Time Diurnal	Tuesday, March 30, 2021	20:55:00	24:00:00	
End Time Diurnal	Wednesday, March 31, 2021	20:55:00	48:00:00	
48 Hour Sample	Wednesday, March 31, 2021	20:55:00	48:00:00	
Initial				
Zero = 0.000 ppm	Span = 934.2 ppm	Re-Zero = 0.000 ppm		
Read = 97.854 ppm	Volume = 1670.1 ft3	Temp. = 64.9 °F	Baro. = 29.03 in/Hg	Mass = 2.69 grams
Post Read Zero = 0.000 ppm	Post Read Span = 934.1 ppm			
Final				
Zero = 0.000 ppm	Span = 934.2 ppm	Re-Zero = 0.000 ppm		
Read = 334.20 ppm	Volume = 1658.7 ft3	Temp. = 65 °F	Baro. = 29.07 in/Hg	Mass = 9.122 grams
Post Read Zero = -0.091 ppm	Post Read Span = 934.2 ppm			
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = N/A	± 3 °F			
Avg. Δ Profile Underbody = N/A	± 2 °F			
Max. Δ Profile Sidewall = 1.1 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Final Mass = 6.432±0.01 grams**

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

Final diurnal emissions results: 0.117 grams + 6.432 grams = 6.549 grams {hot soak + highest 24 hour mass}

*Test aborted after day 2

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Automotive Testing and Development Services, Inc.

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Emissions
- *FTP Protocol*
- *SFTP Protocol*
- *Euro Protocols*
- *Asia Protocols*
- *Evaporative Emissions*
- *NMOG Determination*
- *Electric Vehicle Range*

Hydrocarbon Speciation
- *New Vehicle Certification*
- *In-Use Verification*
- *Gasoline*
- *Diesel*

Durability
- *Passenger Cars*
- *Light-Duty*
- *Medium-Duty*
- *Heavy-Duty*
- *Highway Motorcycles*
- *Non-road Motorcycles*
- *Non-road UTV/ATV*
- *Component*
- *On-road (Public Roads)*
- *Proving Grounds*
- *Temporary Test Sites*
- *OBD System Download*
- *Custom Data Logging*

Engineering
- *SAE Coast-Downs*
- *SAE Fuel Economy*
- *SAE OBD Compliance*
- *CFR Testing and Procedures*
- *CCR Testing and Procedures*
- *SAE J2807 Trailer Tow Rating*

Procurement
- *OEM In-Use*
- *Agency In-Use*
- *Component Collection*
- *Data Collection*
- *Usage Surveys*

Staffing
- *Drivers*
- *Mechanics*
- *Data Technicians*
- *Maintenance*
- *Administrative*
- *Lab Technicians*

January 28, 2022

Chris Bliley
Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

Kelly Davis
Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

Final Report on Evaporative Emissions Test Procedure Performed for Growth Energy and the Renewable Fuels Association.

Dear Chris Bliley and Kelly Davis,

Automotive Testing and Development Services, Inc. (ATDS) is pleased to provide this final report for the evaporative emissions testing conducted on vehicles for Renewable Fuels Association. This testing was conducted in strict accordance with 40 CFR 86 and California Title 13. ATDS' QA representatives have subjected all tests to a rigorous quality audit.

Sincerely,

Jose Haro
Test Engineer

Approved by:

Linwood E Farmer Jr.

Linwood Farmer
Vice President

Evaporative Emissions Testing

Project Number: 3081 - 597164

CONDUCTED FOR:

Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

&

Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

REPORT PREPARED BY:

Jose Haro, Test Engineer
Automotive Testing and Development Services, Inc.
400 South Etiwanda Avenue
Ontario, California 91761

Automotive Testing and Development Services, Inc. submitted this Report in fulfillment of Project 3081 - 597164 Evaporative Emissions Test Procedure. In ATDS' professional opinion this testing was conducted in a valid manner according to the listed methodology.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
PROJECT OVERVIEW 4
TEST VEHICLE INFORMATION 4
TEST SEQUENCE AND CHRONOLOGY 4
TEST PARAMETERS 6
E10 SHED TEST # 1 RESULTS 6
E10 SHED TEST # 2 RESULTS 6
E10 SHED TEST # 3 RESULTS 6
E15 SHED TEST # 1 RESULTS 7
E15 SHED TEST # 2 RESULTS 7
RESULTS SUMMARY 8
DATA REVIEW AND CONCLUSION 9
APPENDIX 10

PROJECT OVERVIEW

This testing was conducted on behalf of Growth Energy and the Renewable Fuels Association. The project consisted of the 3-day evaporative emissions test sequence performed with two different fuels. Work commenced on February 25th, 2021 and was completed on August 1st, 2021.

TEST VEHICLE INFORMATION

The following vehicle was used for this project:

ATDS Vehicle ID:	3081-597164
VIN:	KNMAT2MT2GP597164
MY/Make/Model:	2016 Nissan Rogue
Test Group:	GNSXT02.525A
Evaporative Family:	GNSXR0120PBB
Tires:	225/65R/17 102H
Odometer:	63,638 miles

TEST SEQUENCE AND CHRONOLOGY

The following test sequence and chronology were used in this program:

2/25/2021
- Vehicle check in
- Flushed windshield washer fluid system and fluid bottle removed

3/2/2021
- Canister Purge
- Fuel changed to E10
- FTP-72 (X4)

3/25/2021 – 4/13/2021
- 21-day soak

4/14/2021
- Performed road load derivation (Test ID: ONT3_001765)
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001766)
- Canister loading (21041501.ST2)

4/15/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001772)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001774)

4/15/2021 – 4/19/2021
- 3-Day Diurnal evaporative emissions test run. E10 Test #1.

4/19/2021
- Vehicle failed SHED test. Checked vehicle for leaks. Performed hot sniff with hydrocarbon tester on fuel and EVAP system.

5/9/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001814)

- Canister loading (21050901.ST3)

5/10/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001817)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001818)

5/10/2021 – 5/14/2021
- 3-Day Diurnal evaporative emissions test run (E10 Test #2)

5/18/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001835)
- Canister loading (21051901.ST3)

5/19/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001836)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001838)

5/19/2021 – 5/23/2021
- 3-Day Diurnal evaporative emissions test run (E10 Test #2)

6/14/2021
- Canister Purge
- Fuel changed to E-15
- FTP-74 (X4)

6/14/2021 – 7/12/2021
- 21-day soak

7/12/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001907)
- Canister loading (21071301.ST3)

7/13/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001910)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001911)

7/13/2021 – 7/17/2021 (Void – Wrong EVAP Test Profile run)
- 3-Day Diurnal evaporative emissions test run (E15 Test #1)

7/18/2021 – 7/23/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001926)
- Canister loading (21071901.ST3)
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001939)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001942)
- 3-Day Diurnal evaporative emissions test run (E15 Test #2)
    - Innova Computer crashed and failed to record EtOH data for Day 2 and Day 3

7/28/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001972)
- Canister loading (21072901.ST2)

7/29/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001973)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001974)

7/29/2021 – 8/1/2021
- 3-Day Diurnal evaporative emissions test run (E15 Test #3)

TEST PARAMETERS

ETW (lb)	A (ft-lb) track/set	B (ft-lb/mph) track/set	C (ft-lb/mph^2) track/set
3,875	35.590 / 13.000	-0.15770 / 0.06400	0.028000 / 0.024200

E10 SHED TEST # 1 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.58	0.229	0.63725
0-24 Hour Diurnal	1.449	0.694	1.623
24-48 Hour Diurnal	1.274	0.591	1.422
48-72 Hour Diurnal	1.123	0.517	1.252
		Final HC + EtOH Result:	2.26 grams

E10 SHED TEST # 2 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.037	0	0.037
0-24 Hour Diurnal	0.554	0.09	0.577
24-48 Hour Diurnal	0.329	0.066	0.346
48-72 Hour Diurnal	0.212	0.044	0.223
		Final HC + EtOH Result:	0.614 grams

E10 SHED TEST # 3 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.031	0	0.031
0-24 Hour Diurnal	0.281	0.046	0.293
24-48 Hour Diurnal	0.208	0.043	0.219
48-72 Hour Diurnal	0.182	0.039	0.192
		Final HC + EtOH Result:	0.324 grams

E15 SHED TEST # 1 RESULTS

	Diurnal Mass (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.098	0.042	0.1085
0-24 Hour Diurnal	0.605	0.206	0.657
24-48 Hour Diurnal	0.473	0.172*	0.516*
48-72 Hour Diurnal	0.405	0.144*	0.441*
		Final HC + EtOH Result:	0.766 grams

E15 SHED TEST # 2 RESULTS

	Diurnal Mass (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.092	0.04	0.102
0-24 Hour Diurnal	0.418	0.188	0.465
24-48 Hour Diurnal	0.355	0.181	0.4
48-72 Hour Diurnal	0.323	0.166	0.365
		Final HC + EtOH Result:	0.567 grams

RESULTS SUMMARY

	E-10 Test 1	E-10 Test 2	E-10 Test 3	E10 AVG	E-15 Test 1	E-15 Test 2	E15 AVG
Start	4/15/2021	5/10/2021	5/19/2021		7/20/2021	7/29/2021	
End	4/19/2021	5/14/2021	5/23/2021		7/23/2021	8/1/2021	
Hot Soak HC	0.58	0.04	0.031	0.034	0.098	0.092	0.095
Hot Soak EtOH	0.229	0	0	0.000	0.042	0.04	0.041
Day 1 HC	1.449	0.554	0.281	0.418	0.605	0.418	0.512
Day 1 EtOH	0.694	0.09	0.046	0.068	0.206	0.188	0.197
Day 2 HC	1.274	0.329	0.208	0.269	0.473	0.355	0.414
Day 2 EtOH	0.591	0.066	0.043	0.055	0.172*	0.181	0.181
Day 3 HC	1.123	0.212	0.182	0.197	0.405	0.323	0.364
Day 3 EtOH	0.517	0.044	0.039	0.042	0.144*	0.166	0.166
Final Total HC plus EtOH	2.260	0.614	0.324	0.469	0.766	0.567	0.667
EtOH Multiplier	1.11	1.04	1.04	1.06	1.09*	1.11	1.10

* EtOH multiplier obtained from the results of hot soak and day 1 diurnal were used to calculate EtOH results of day 2 and 3 diurnals. EtOH multiplier = 1.09.

Total test results are obtained by adding the hot soak result with the highest value from each of the three day diurnals.

All tests were conducted in strict accordance with the provisions of 40 CFR 86 and/or California Title 13 and have been reviewed by ATDS' in-house Quality Auditor. Detailed test results are in the Appendix attached to this report.

DATA REVIEW AND CONCLUSION

Based upon ATDS' review of the test data above, the vehicle tested (2016 Nissan Rogue) has successfully completed emissions testing.

It has been a pleasure working with Growth Energy and the Renewable Fuels Association on this project and we look forward to future efforts.

Sincerely,

Jose Haro
Test Engineer

APPENDIX

Report for Growth Energy and the Renewable Fuels Association

Performed on a

2016 Nissan Rogue [3081-597164]

APPENDIX A
Vehicle Check In

APPENDIX B
Test Check Sheet

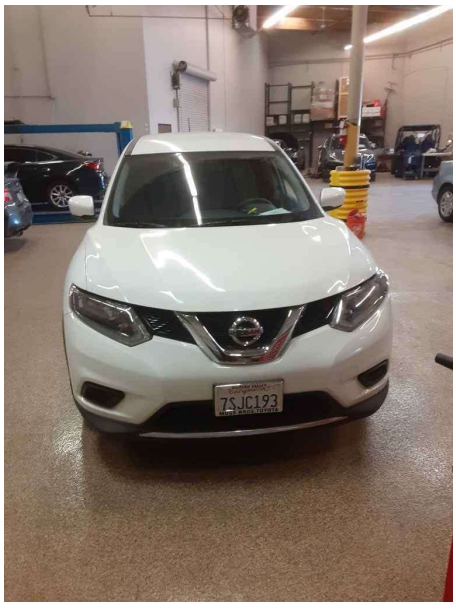
APPENDIX A

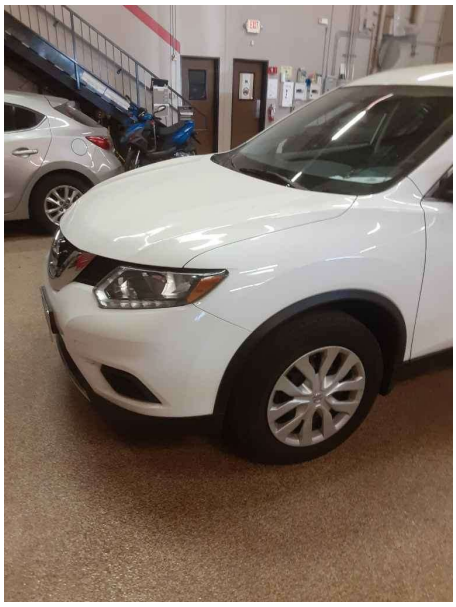
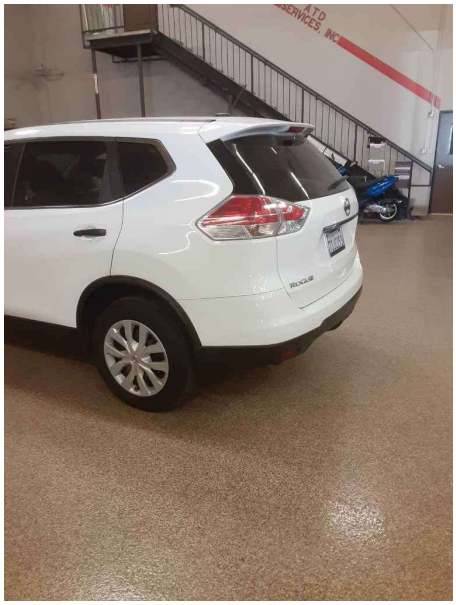
Vehicle Check In

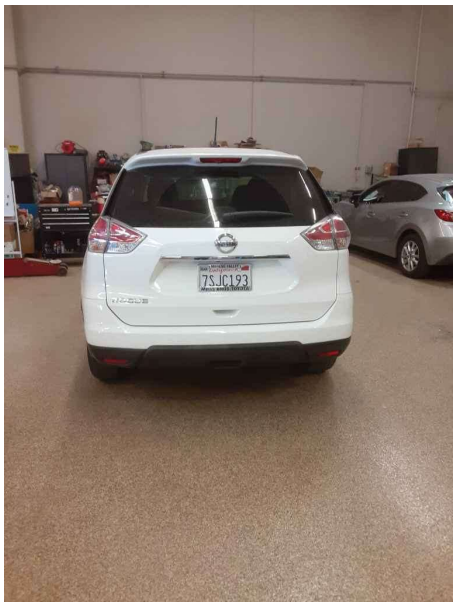
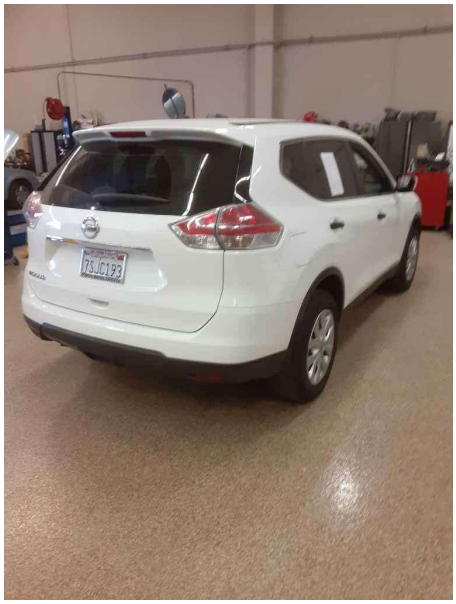
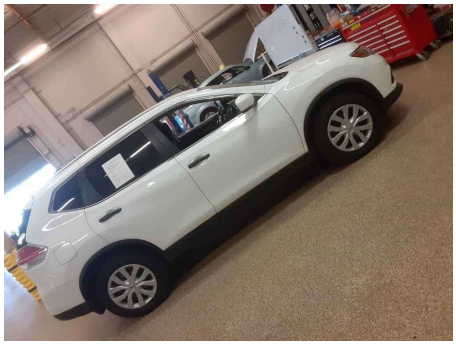
Project Information

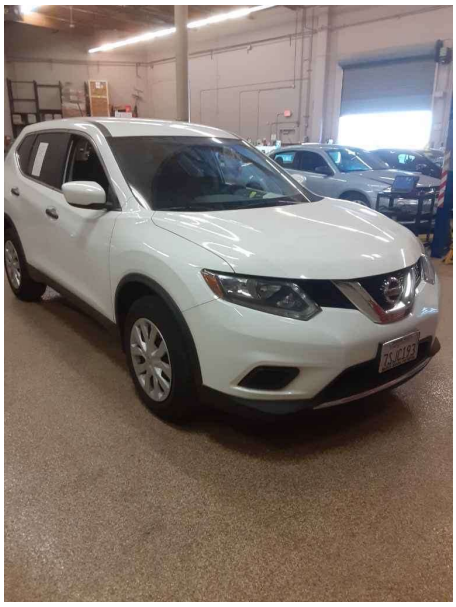
Project ID	3081
ATDS Vehicle Number (-01, …)	3081-597164
Project Name	RFA Ethanol Evap Testing
Date	02-25-2021
Vehicle Manufacturer	Renault Samsung for Nissan
Vehicle Model	Rogue
Model Year	2016
Body Style (Sedan, SUV, Hatchback, etc..)	SUV
VIN	KNMAT2MT2GP597164
Odometer	63638
Engine Family	GNSXT02.525A
Evaporative Family	GNSXR0120PBB
GVWR (Trucks/Leave Blank)	4489

Vehicle Body Photos

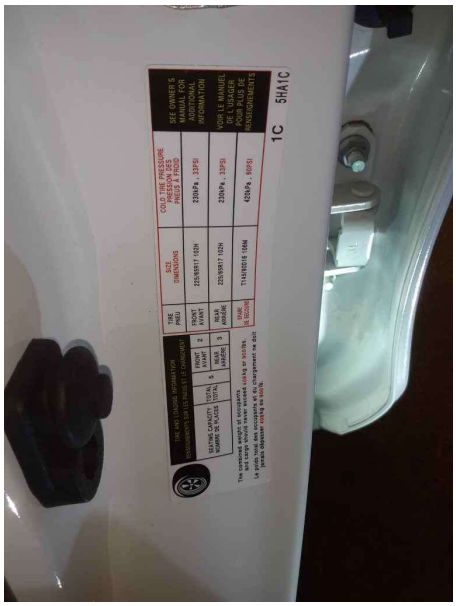
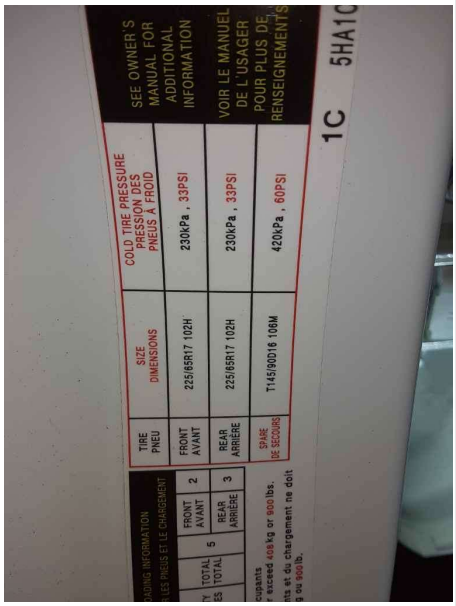
Front (Photo)	

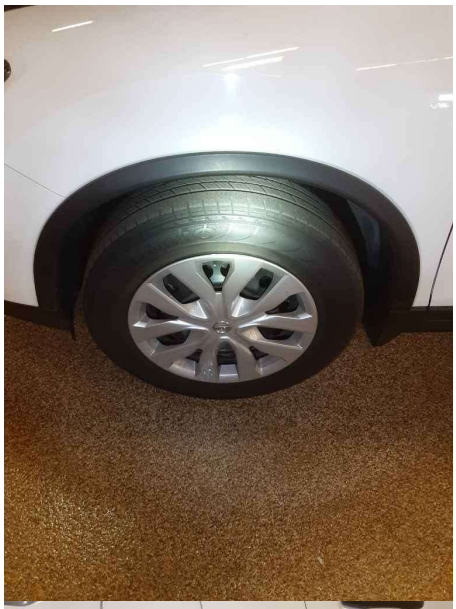
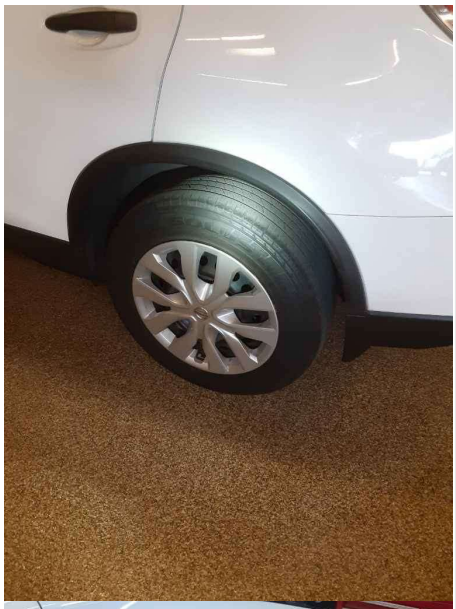
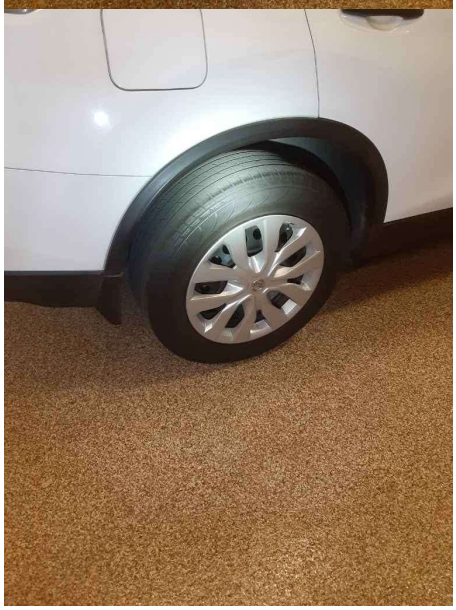
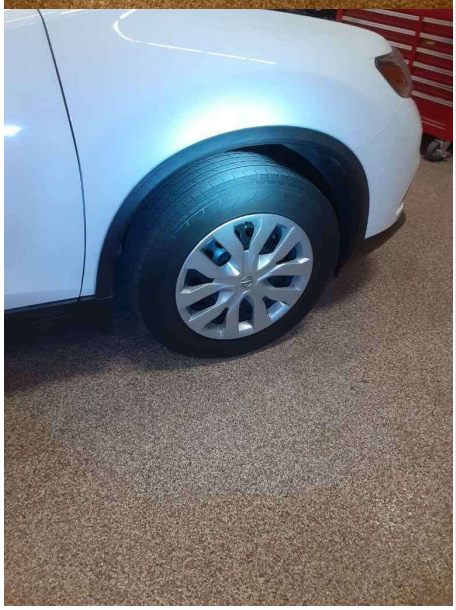
Driver Side Corner (Photo)	
Driver Side (Photo)	
Rear Side Corner -Driver Side (Photo)	

Rear (Photo)	
Rear Side Corner - Passenger Side (Photo)	
Passenger Side (Photo)	

Passenger Side Corner (Photo)	

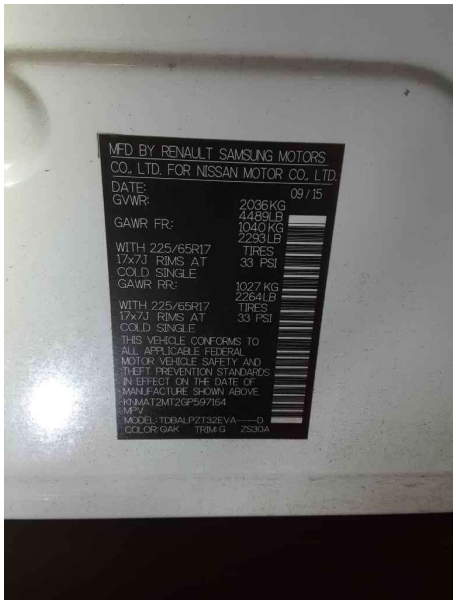
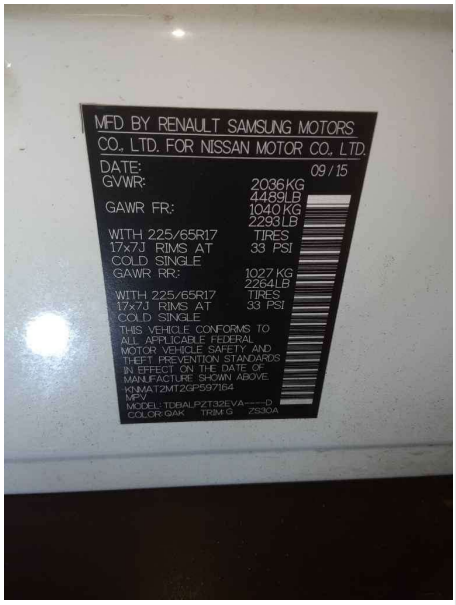
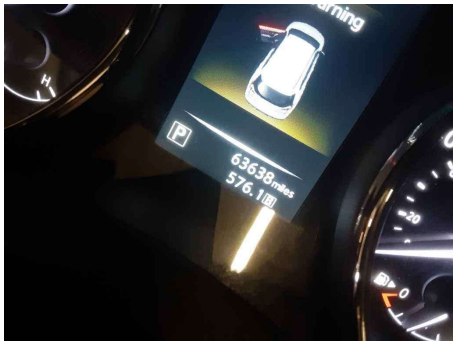
Tires and Wheels

Tire Label from Door (Photo)	 
ACTUAL Tire Size	225/65R/17 102H

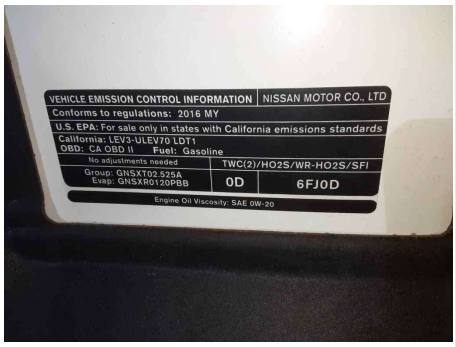
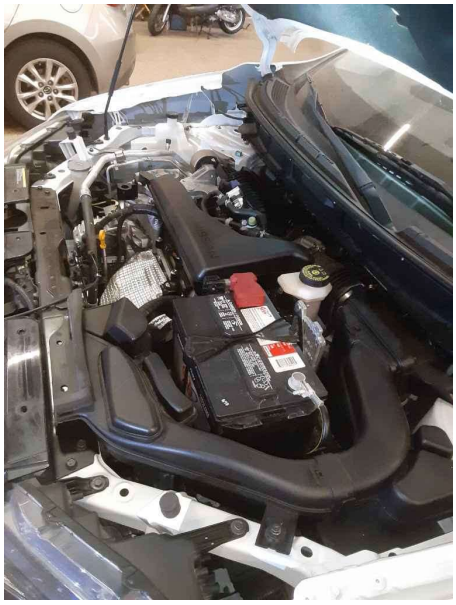
Tire Condition (Photos)	   
Tire Condition	Good
Drive Wheel	Front
Brakes?	>2mm (Usable)

Odometer and VIN

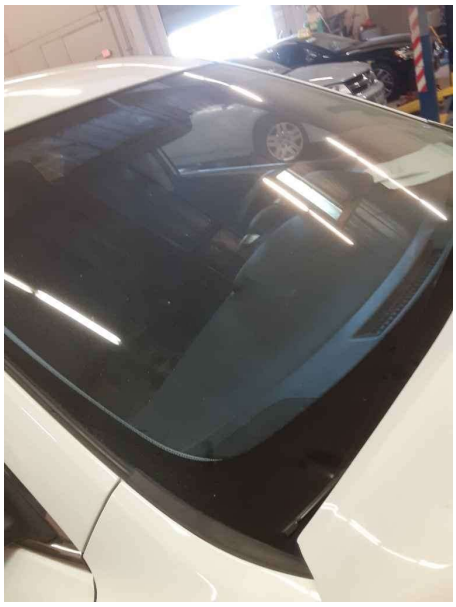
License Plate Number	7SJC193
VIN	KNMAT2MT2GP597164

VIN Plate from Windshield (Photo)	
Vehicle Information Sticker from Door (Photo)	 
Odometer (Photo)	
Odometer	63638

Engine and Emissions

VECI (Photo)	
Engine Bay (Photo)	
Engine Family	GNSXT02.525A
Evaporative Family	GNSXR0120PBB
Engine Oil Level	Good
Coolant Level	Good
Transmission Fluid Level	No Dipstick
Transmission Type	Automatic
Belts and Hoses	Good
VECI Label Status	CA
Noise Leaks on Exhaust?	No
Visual Leaks on Exhaust?	No
Transmission Fluid Condition	No Dipstick

Windshield and Headlights

Windshield Wiper Fluid?	Yes
Do the windshield wipers work?	Yes
Any windshield cracks?	No
Windshield Photos	
Do the headlights work?	Yes
Are the headlights damaged?	No
Headlight Photos	
Do the tail lights work?	Yes
Are the tail lights damaged?	No
Tail Light Photos	

OBD

OBD Status Monitors Set	Yes
Mode 3 DTCs?	No
Mode 7 DTCs?	No

ABS/Traction Control

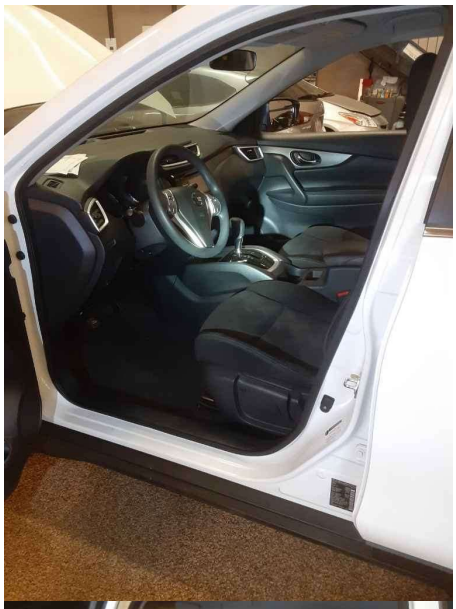
ABS?	Yes
Traction Control?	Yes

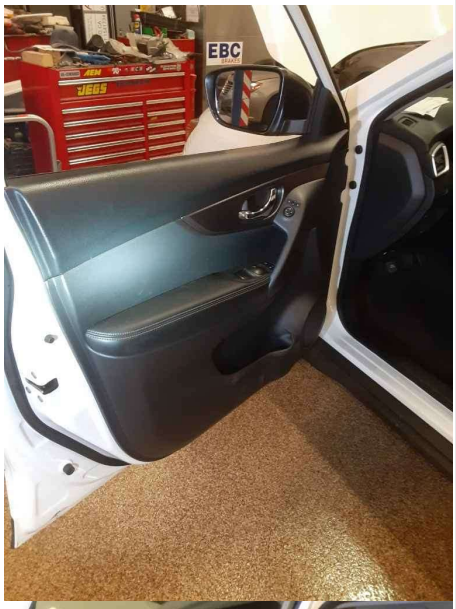
Underbody

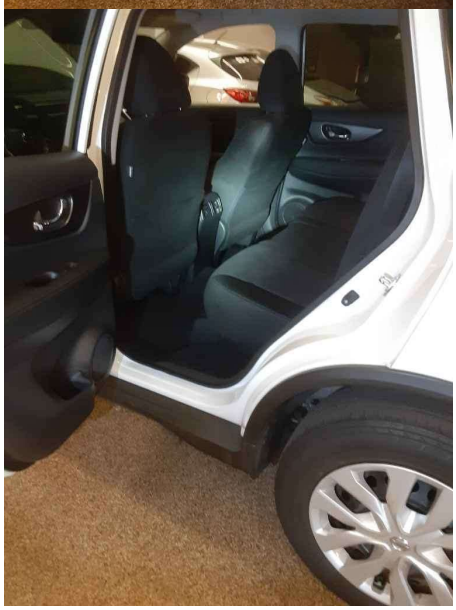
Underbody (Photos)	

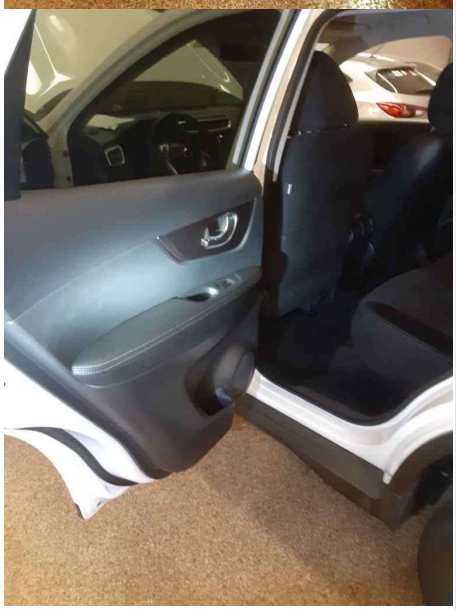
Interior

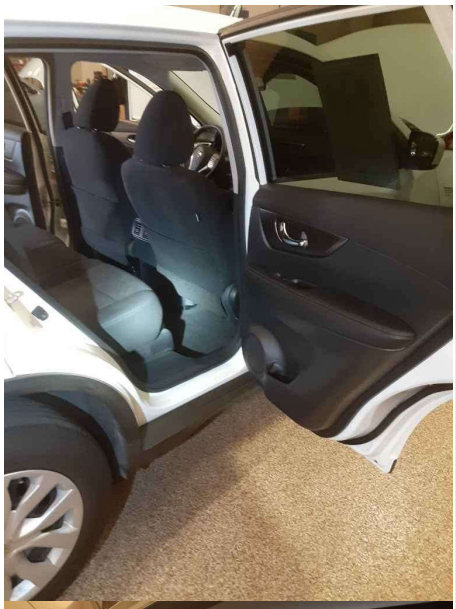
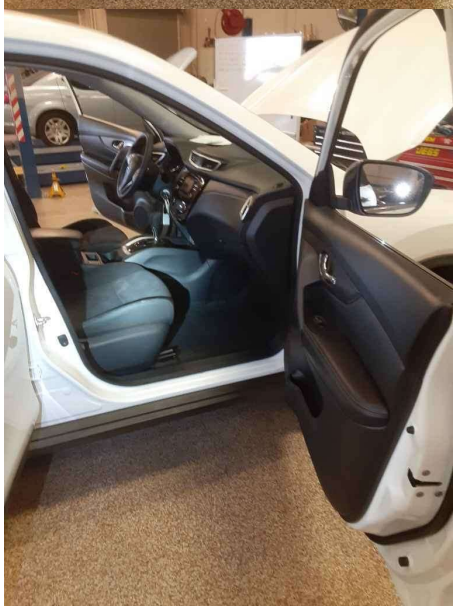
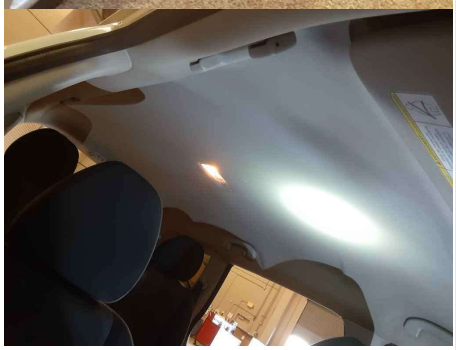
Interior (Photos)







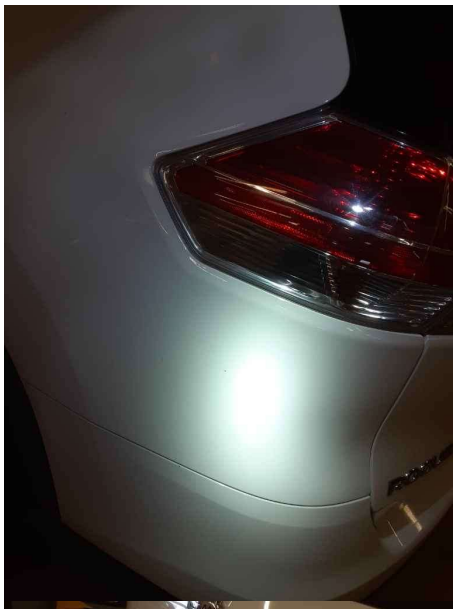


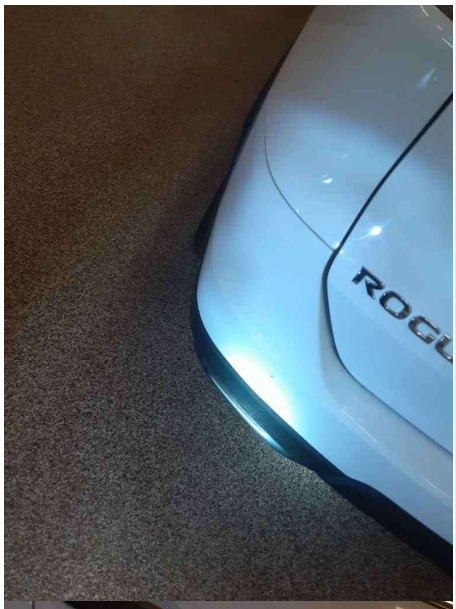




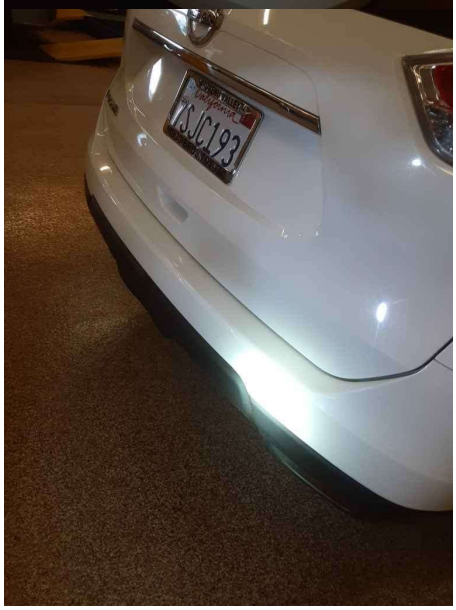
Damage Report

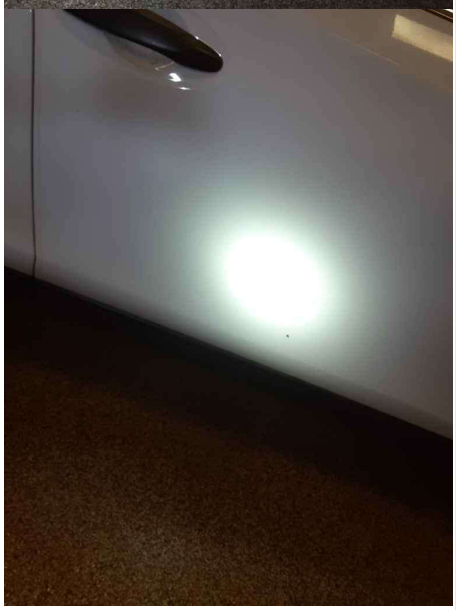
Any Damage (scratches/dents)?	Yes

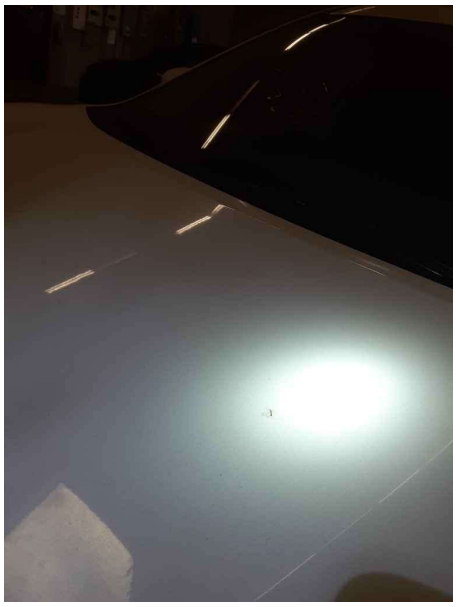
Damage Area	




ROGU

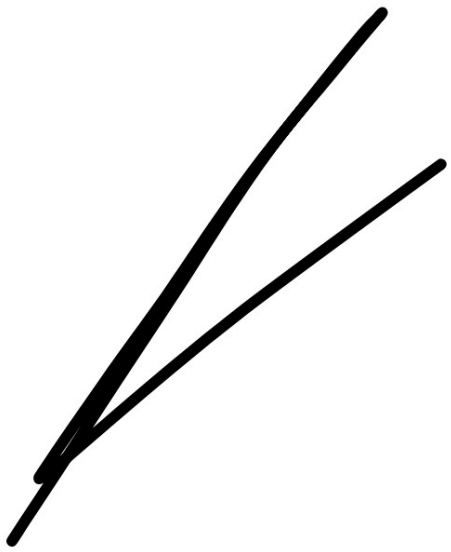

KSJC193



Confirmation

Start Form Timestamp	02-25-2021 03:06 PM
End Form Timestamp	02-25-2021 04:16 PM
Submission Id	0a0fc231-3f51-4033-9360-1dddf8b328d2
Name of Inspector	JMCKEOWN

Signature	
Comments	

Measurement values

Application:	Silver Scan-Tool Version 6.21.36.26940
Date/Time:	02/25/2021, 04:11:04 pm
Author:	Shop
Department:	Automotive Testing and Development Services Inc
Location:	400 Etiwanda Ave, Ontario CA 91761 United States
Comment:	Check in odo 63638

33: Scan-Tool

Communication	
Address word	33
Name	Scan-Tool
Protocol	ISO 15765-4 (CAN)
Baudrate	500 kbps
Interface	ATI Leaf Light HS v2, Ser.No 10217, Channel 1
Vehicle	
Vehicle	3081 597164 Renewable Fuel Ass
Description	2016 Nissan RogueProject Manager Lin Farmer
Vehicle Identification Number	KNMAT2MT2GP597164

Contents

- Module E8 ECM-EngineControl
- Module E9 TCM-TransmisCtrl

Module E8: ECM-EngineControl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

E8 ECM-EngineControl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0111 1110 0101 0000 0000	Bit	Monitor status since DTCs cleared
PID 03	0000 0001	Bit	Fuel system A status
PID 03	0000 0000	Bit	Fuel system B status
PID 04	0.0	%	Calculated load value
PID 05	24	°C	Engine coolant temperature
PID 06	0.0	%	Short term fuel trim - Bank 1
PID 07	0.0	%	Long term fuel trim - Bank 1
PID 0C	0	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 0E	63.5	°KW	Ignition timing advance for #1 cylinder
PID 0F	21	°C	Intake air temperature
PID 10	0.56	g/s	Air flow rate from mass air flow sensor
PID 11	6.3	%	Absolute throttle position
PID 13	0000 0011	Bit	Location of oxygen sensors
PID 15	0.280	V	Oxygen sensor output voltage
PID 15	99.2	%	Short term fuel trim

Name	Measured value	Unit	Comment
PID 1C	1		OBD requirements to which vehicle or engine is certified
PID 1F	0	s	Time since engine start
PID 21	0	km	Distance traveled while MIL is activated
PID 24	1.004	Lambda	Equivalence ratio
PID 24	2.251	V	Oxygen sensor voltage
PID 2E	0.0	%	Commanded evaporative purge
PID 2F	43.1	%	Fuel level input
PID 30	255	dec	Number of warm-ups since DTCs cleared
PID 31	65535	km	Distance traveled since DTCs cleared
PID 32	0.00	Pa	Evap system vapor pressure
PID 33	98	kPa	Barometric pressure
PID 3C	16.0	°C	Catalyst temperature Bank 1 Sensor 1
PID 41	0000 0000 0010 0111 1100 0001 1010 0101	Bit	Monitor status this driving cycle
PID 42	12.080	V	Control module voltage
PID 43	0.0	%	Absolute load value
PID 44	1.157	Lambda	Fuel/Air commanded equivalence ratio
PID 45	0.0	%	Relative throttle position
PID 46	20	°C	Ambient air temperature
PID 47	6.3	%	Absolute throttle position B
PID 49	0.0	%	Accelerator pedal position D
PID 4A	0.0	%	Accelerator pedal position E
PID 4C	6.3	%	Commanded throttle actuator control
PID 4D	0	min	Engine run time while MIL is activated
PID 51	1		Type of fuel currently being utilized by the internal combustion engine

E8 ECM-EngineControl: Mode 2 - Current freeze frame data

No data

E8 ECM-EngineControl: Mode 3 - Emission-related diagnostic trouble codes

No data

E8 ECM-EngineControl: Mode 6 - Monitoring test results for specific monitored systems

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 01	89	84	-0.050	-32.768	0.399		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	8A	84	-0.050	-0.450	32.767		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	8D	04	0.248	0.040	65.535		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	8E	04	0.248	0.040	65.535		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	8F	84	-0.142	-32.768	-0.040		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	90	84	-0.142	-32.768	-0.040		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	91	01	247	0	500		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	92	01	247	0	500		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	93	01	270	0	500		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	94	01	270	0	500		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 02	07	0C	0.17	0.00	0.17	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	08	0C	0.73	0.73	2.55	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	81	0C	0.49	0.48	2.55	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	82	11	1.4	0.0	4.1	s	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 21	80	01	136	19	255		Catalyst Monitor Bank 1
MID 21	82	01	0	0	0		Catalyst Monitor Bank 1
MID 35	80	9D	0.0	-13.0	13.0	°	VVT Monitor Bank 1
MID 35	81	9D	1.0	-13.0	13.0	°	VVT Monitor Bank 1

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 35	82	9D	1.5	-13.0	13.0	°	VVT Monitor Bank 1
MID 35	83	9D	0.0	-13.0	13.0	°	VVT Monitor Bank 1
MID 35	86	9D	-1.0	-13.0	13.0	°	VVT Monitor Bank 1
MID 35	87	9D	-0.5	-8.0	8.0	°	VVT Monitor Bank 1
MID 3C	81	FD	0.456	0.430	32.767	kPa	EVAP Monitor (0.020")
MID 3C	82	FD	0.000	0.000	0.000	kPa	EVAP Monitor (0.020")
MID 3D	83	0C	0.04	0.02	655.35	V	Purge Flow Monitor
MID A2	0B	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A2	0C	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A3	0B	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A3	0C	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A4	0B	24	0	0	65535	counts	Misfire Cylinder 3 Data
MID A4	0C	24	0	0	65535	counts	Misfire Cylinder 3 Data
MID A5	0B	24	0	0	65535	counts	Misfire Cylinder 4 Data
MID A5	0C	24	0	0	65535	counts	Misfire Cylinder 4 Data

E8 ECM-EngineControl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

E8 ECM-EngineControl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 02	KNMAT2MT2GP597164	Vehicle Identification Number(VIN)
InfoType 04	15HJ2B	Calibration Identification (CALID)
InfoType 06	0C 76 6B 16	Calibration Verification Numbers (CVN)

Name	Measured value		Comment
InfoType 08	0A 7E 18 52 0E 7B 0A 7C 00 00 00 00 0A 29 0A 7A 00 00 00 00 09 04 0A 7E 00 00 00 00 00 03 12 04 52 09 C4 0A 7C 00 00 00 00		In-use Performance Tracking
	Values for InfoType 08		
	Name	**Measured value**	**Comment**
	OBDCOND	2686	General Denominator, OBD Monitoring Conditions Encountered Counts
	IGNCNTR	6226	Ignition Cycle Counter
	CATCOMP1	3707	Numerator, Catalyst Monitor Completion Counts Bank 1
	CATCOND1	2684	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 1
		1.381	- Calculated Ratio -
	CATCOMP2	0	Numerator, Catalyst Monitor Completion Counts Bank 2
	CATCOND2	0	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	O2SCOMP1	2601	Numerator, O2 Sensor Monitor Completion Counts Bank 1
	O2SCOND1	2682	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 1
		0.970	- Calculated Ratio -
	O2SCOMP2	0	Numerator, O2 Sensor Monitor Completion Counts Bank 2
	O2SCOND2	0	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	EGRCOMP	2308	Numerator, EGR/VVT Monitor Completion Condition Counts
	EGRCOND	2686	Denominator, EGR/VVT Monitor Conditions Encountered Counts
		0.859	- Calculated Ratio -
	AIRCOMP	0	Numerator, Secondary Air Monitor Completion Condition Counts
	AIRCOND	0	Denominator, Secondary Air Monitor Conditions Encountered Counts
		7.995	- Calculated Ratio -
	EVAPCOMP	786	Numerator, EVAP Monitor Completion Condition Counts
	EVAPCOND	1106	Denominator, EVAP Monitor Conditions Encountered Counts

Name	Measured value		Comment
		0.711	- Calculated Ratio -
	SO2SCOMP1	2500	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 1
	SO2SCOND1	2684	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 1
		0.931	- Calculated Ratio -
	SO2SCOMP2	0	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 2
	SO2SCOND2	0	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
InfoType 0A	ECM-EngineControl		ECU Name

E8 ECM-EngineControl: Readiness - Readiness

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Misfire monitoring	yes	yes	yes	yes
Fuel system monitoring	yes	yes	yes	no
Comprehensive component monitoring	yes	yes	yes	yes
Catalyst monitoring	yes	yes	yes	no
Heated catalyst monitoring	no	yes	no	yes
Evaporative system monitoring	yes	yes	no	no
Secondary air system monitoring	no	yes	no	yes
Oxygen sensor monitoring	yes	yes	no	no
Oxygen sensor heater monitoring	yes	yes	yes	yes
EGR and/or VVT system monitoring	yes	yes	yes	no

Module E9: TCM-TransmisCtrl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

E9 TCM-TransmisCtrl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0100 0000 0000 0000 0000	Bit	Monitor status since DTCs cleared
PID 04	0.0	%	Calculated load value
PID 05	24	°C	Engine coolant temperature
PID 0C	0	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 11	6.3	%	Absolute throttle position
PID 1C	13		OBD requirements to which vehicle or engine is certified
PID 1F	0	s	Time since engine start
PID 21	0	km	Distance traveled while MIL is activated
PID 41	0000 0000 0000 0100 0000 0000 0000 0000	Bit	Monitor status this driving cycle
PID 42	12.082	V	Control module voltage
PID 45	0.0	%	Relative throttle position
PID 47	6.3	%	Absolute throttle position B

Name	Measured value	Unit	Comment
PID 51	1		Type of fuel currently being utilized by the internal combustion engine

E9 TCM-TransmisCtrl: Mode 2 - Current freeze frame data

No data

E9 TCM-TransmisCtrl: Mode 3 - Emission-related diagnostic trouble codes

No data

E9 TCM-TransmisCtrl: Mode 6 - Monitoring test results for specific monitored systems

No data

E9 TCM-TransmisCtrl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

E9 TCM-TransmisCtrl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 04	8Q3V02	Calibration Identification (CALID)
InfoType 06	00 00 77 F1	Calibration Verification Numbers (CVN)
InfoType 0A	TCM-TransmisCtrl	ECU Name

E9 TCM-TransmisCtrl: Readiness - Readiness

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Misfire monitoring	no	yes	no	yes
Fuel system monitoring	no	yes	no	yes
Comprehensive component monitoring	yes	yes	yes	yes
Catalyst monitoring	no	yes	no	yes
Heated catalyst monitoring	no	yes	no	yes
Evaporative system monitoring	no	yes	no	yes
Secondary air system monitoring	no	yes	no	yes
Oxygen sensor monitoring	no	yes	no	yes
Oxygen sensor heater monitoring	no	yes	no	yes
EGR and/or VVT system monitoring	no	yes	no	yes

APPENDIX B

Test Check Sheet

Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Nissan Rogue
Vehicle #:	3081-597164	**Engine Size**	2.5L
VIN:	KNMAT2MT2GP597164	**Model Year**	2016
Engine Family:	GNSXT02.525A	**Requested By:**	J. Link

		Documentation						
		Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Vehicle check in	E		2021-02-25	16:16	63638			JM
↓ OBD download								JM
↓ Prepare vehicle for Lab								JM
↓ Canister Purge 1 Hour	E		2021-03-02	16:58	63638			JM
↓ Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S		2021-03-02	16:58		3		
	E		2021-03-02	17:15		Fuel Spec:	E10	JM
↓ Idle 1 min								JM
↓ Fuel Drain and 40% Fill, Fuel Type: See Notes!	S		2021/3/02	1720		5.8		
	E		2021/03/02	1740		Fuel Spec:	<60F 54.2F	
↓ Heat Build 60F-105F in 1 Hour	S							
	E							
↓ Precon FTP 72 (UDDS) 1	S		3/2/21	19:56	63638			
	E		V	20:35	63646		ONT3-001533	JR
Dyno Sets			A: 17.795 B: -0.03154 C: 0.028				ETW: 3875	
↓ Precon FTP 72 (UDDS) 2	S		3/2/21	20:36	63646			
	E			21:05	63654		ONT3-001534	JR
↓ Precon FTP 72 (UDDS) 3	S			21:06	63654			
	E		V	21:34	63661		ONT3-001535	JR
↓								

Precon FTP 72 (UDDS) 4	S	3/2/21	21:35	63666	ONT3-001536	JB
	E	↓	22:03	63669		
Eng Off 5 min						JB
Idle 1 min						JB
Eng Off 1 min						JB
Idle 1 min						JB
Vehicle Soak 21 Days 68-86°F	S	3/2/21	22:15			
	E					
Set tire pressure 7psi over sticker	Front	40	Back	40		LQ
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S	4/13/21	20:10		5.8	
	E	4/13/21	20:51		Fuel Spec: E10	LQ
Vehicle Soak 68-86°F (min 6 hr.)	S	4/13/21	21:15			
	E	4/14/21	16:00			JB
Set tire pressure to sticker	Front	33	Back	33		JB
2x HFET warmup J2264 Dyno Coastdown Dyno Sets for Warmup HWY	S	4/14/21	17:07	63669		
	E	↓	17:46	63690	ONT3-001765	JB
	A: 17.795 B: -0.03154 C: 0.028				ETW: 3875	
Precon FTP 72 (UDDS) Dyno Sets	S	4/14/21	18:06	63698		
	E	↓	18:32	63706	ONT3-001766	JB
	A: 13.0 B: 0.064 C: 0.0242				ETW: 3875	JB
Vehicle Soak 68-86°F	S	4/14/21	18:40		T 75.38	JB
	E	4/15/21	15:00		B 28.92	JB
					H 44.10	
Canister Loading with Butane Type: 1.5x Load (12-36 hr)	S	4/14/21	18:44			
	E	4/15/21	07:08		2104150I.STZ	JB
Canister Loading Specs	Cap	120	Vol	2.4		
	Purge	300	Flow Rate	15	GNSXR0120PBB	

Set tire pressure to sticker

Front 33 Back 33 JB

No Bag Cold Start FTP 75

S 4/15/21 17:45 63706

E ↓ 18:28 63717

Dyno Sets ONT3-001772 JB

Test Options A: B: C: ETW: 3875

PM N2O Dilute Modal

Pre Test Comments CVS Flow P1:9.3 P2:9.3 P3:9.3

E10 Test

Fuel Tank Temp. Stabilization at 105F

S 4/15/21 18:53 JB

E ↓ 19:53 JD

max 1 hr

Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle

S 19:54

E 21:07

Dyno Sets ONT3-001774 JB

Test Options A: B: C: ETW: 3875

PM N2O Dilute Modal

CVS Flow 9.3

Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff

max 7 min

Hot Soak in VT Shed

S 4/15/21 21:12

E 4/15/21 22:12 J.H.

Cold Soak 6-36 Hours

6-36 Hr

S 4/15/21 23:12

E 4/16/21 5:12 J.H.

3 Day Diurnal Test

S 4/16/21 5:12

E 4/19/21 5:12 J.H.

QC Check

E 11/12/21 J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081		3081-597164	
VIN:	KNMAT2MT2GP597164			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Nissan	Rogue	FWD	2016
Test Group / Engine Size (L):	GNSXT02.525A		2.5L	
EVAP Family:	GNSXR0120PBB			
Standard Tire Size (front) / Pressure:	225/65-17		33	
Standard Tire Size (rear) / Pressure:	225/65-17		33	
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	35.59	-0.1577	0.028000	
Warmup Coefficients A / B / C:	17.80	-0.0315	0.028000	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E10 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	14.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	120
Canister volume (Liter)	2.4
Soak after drain / refills	Y
Test Fan Setup	Fixed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
5.8 of See Notes!
E10 Fuel
106.5" Wheelbase
Fixed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

Emissions Test Data:

									Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐	1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS CANISTER WORKSHEET

Station number 4

----PURGE ONLY----

****
VT# 3081-597164
****

Project	3081
Evap Family	GNSXR0120PBB
Ambient Temperature-Deg F	78
Barometric Pressure-In/Hg	29.00
Humidity-Grains/Lb	29.2 ✓
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0
Canister Volume-Liters	14.2
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	15:55:53
Start date	03-02-2021
Bed Purges/Cycle	100
Purge End/Load Start	16:58:42
Test Time Minutes	63 ✓
HC Loaded-Grams	0.0
Scale Reading-Grams	-4.27
Butane Flow Actual-Gm/Hr	0.0
Cycles Completed	1
Finish time	16:58:42
Finish date	03-02-2021
Disk File Name	21030201.ST4

****

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/12/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/2/2021	**Time:**	19:56:30
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon 1		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	ONT3_001533		
Test Name	FTP72		
Test Cell	iGEM-V-TC1		
Test Type	FTP72		
Legislation	EPA		
Requirements (Bag)	SIMPLE		
Date	3/2/2021	CH_4 Response Factor	
Test Start	19:56:30	Odometer Position [mi]	63638
Start Time Cycle	2021-03-02 20|25-00-(000)	Delay Time Method	
Test End	20:35:57		
Operator	Victor Escudero	Air Condition	OFF
Driver	Joseph Bishop	Particle Measurement	USUAL
Shifttable	Auto		
Flow Stream	PreCon		
Calibrated Ranges	autorange		
Remark	precon 1		

Vehicle Data — 3081-597164

Manufacturer	ROGUE	Displacement	
Vehicle Model	KNMAT2MT2GP597164	Engine Family	GNSXT02.525A
Order Number	3081	Manufacturer	NISSAN
Test Group	3081-597164	Transmission	Automatic
Evaporative Family	GNSXR0120PBB	Engine Code	
Made Date	2016	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	1
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	0	Tank Volume [gal]	0
Engine Code	GNSXT02.525A	Tank Material	
Number of Cylinders	4		

Dyno Data — 3081

Dyno Type	SVOR	Inertia [lb]	3875.00
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	35.590	-0.15770	0.028000
Road Load	17.795	-0.03154	0.028000

Fuel Data — E10

Fuel Type	GASOLINE	Fuel Temperature [°C]	15.00
Fuel Analyze Date		Fuel Density [kg/l]	0.7453
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	17916
Fuel Tank Number		Carb. Weight Frac.	0.8312
Fuel Charge		HC Ratio	1.8400
Remarks:	E10	OC Ratio	-1.0000

Weather Limit Data

Temp Min [deg F]	68.00	Dew Point Max [deg F]	77.00
Temp Max [deg F]	86.00	Pressure Min [mbar]	800.0
Dew Point Min [deg F]	21.20	Pressure Max [mbar]	1100.0

Fan Speed Data — FTP75

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Victor Escudero	Speed Table	Date:
Test Number	ONT3_001533	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*19:56:30*
		A [lbf]	*17.795*	Fuel type	GASOLINE	End Time	*20:35:57*
Model	ROGUE	B [lbf/mph]	*-0.03154*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.028000*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*63638*	Remark	precon 1				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]
Range	*0*						
Zero Read	*0.00*						
Span Read	*0.00*						
Sample	*0.00*						
Mass.	*0.000*						
Mass per Dist.	*0.0000*						

Temp. [°F]	75.08	Volume [scf]	2642
Press. [inHg]	28.84	D.F.	
RH [%]	*10.11*	Ph. Start [s]	0.1
AH [g/kg]	*1.916*	Ph. End [s]	505.5
Dist. [mi]	*3.60*	Ph. Length [s]	505.5
NO_x Corr.	*0.7756*	Bag An. Delay [s]	
Dr. Viola.	*0*	Vio. Durat. [s]	0.0
Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]
Range	*0*						
Zero Value	*0.00*						
Span Value	*0.00*						
Sample	*0.00*						
Mass.	*0.000*						
Mass per Dist.	*0.0000*						

Temp. [°F]	78.08	Volume [scf]	4519
Press. [inHg]	28.84	D.F.	
RH [%]	*9.30*	Ph. Start [s]	505.6
AH [g/kg]	*1.946*	Ph. End [s]	1375.1
Dist. [mi]	*3.87*	Ph. Length [s]	869.6
NO_x Corr.	*0.7762*	Bag An. Delay [s]	
Dr. Viola.	*0*	Vio. Durat. [s]	0.0
		FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]
Mass per Dist.	*0.0000*						
Mass per Dist. (rounded)	*0.0000*						

$HC+NO_x$ [g/mile]	***Fuel Economy***
0.0000	mile/gal
0.0000	Dist. [mi] 7.47

Test Data: FTP72 Operator: Victor Escudero Date: 3/2/2021
Test Number: ONT3_001533 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001533

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*17.795*	*35.590*
B [lbf/mph]	*-0.03154*	*-0.15770*
C [lbf/mph2]	*0.028000*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5793.53	6222.57		
Distance Rating (%)	0.2488	0.1855		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.09	2.76		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4335	0.2969		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.75	1.94		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5665	0.7031		
Inertial Work Rating	-0.1622	-0.9725		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	204.25	339.07		
Absolute Speed Change Rating (%)	-0.3060	-0.5378		
Energy Rating	-1.5201	-2.1449		
Energy Economy Rating	-1.5201	-2.1449		-1.8119

ATDS Emission Lab Test Report

Validation

Phase 1

Test Record #: ONT3_001533

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	75.08	73.76	78.44	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.84	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	13.41	13.07	13.87	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	78.16	75.65	80.51	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No humidity Requirement

J. H.

3/2/2021 8:41 PM

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001533

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	78.08	74.30	80.42	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.84	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	13.62	12.81	14.00	38.50	87.50	Review ok
CVS Inlet Temperature	(°F)	79.71	78.53	80.87	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	869.6					
Duration Phase 2	(s)	869.50					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J. H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/2/2021	**Time:**	20:36:48
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon 2		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001534*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/2/2021*	CH_4 Response Factor	
Test Start	*20:36:48*	Odometer Position [mi]	*63646*
Start Time Cycle	*2021-03-02 20|43-51-(000)*	Delay Time Method	
Test End	*21:05:56*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*precon 2*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*17.795*	*-0.03154*	*0.028000*

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001534	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*20:36:48*
		A [lbf]	*17.795*		Fuel type GASOLINE	End Time	*21:05:56*
Model	ROGUE	B [lbf/mph]	*-0.03154*		Density *0.7453*		
Year	*2016*	C [lbf/mph2]	*0.028000*		NHV 17916	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63646*	Remark	precon 2				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.32	Volume[scf]	2640
Zero Read	*0.00*							Press.[inHg]	28.84	D.F.	
Span Read	*0.00*							RH[%]	*10.01*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*1.912*	Ph. End[s]	505.5
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7755*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	76.65	Volume[scf]	4516
Zero Value	*0.00*							Press.[inHg]	28.84	D.F.	
Span Value	*0.00*							RH[%]	*9.72*	Ph. Start[s]	505.6
Sample	*0.00*							AH[g/kg]	*1.942*	Ph. End[s]	1375.2
Mass.	*0.000*							Dist.[mi]	*3.85*	Ph. Length[s]	869.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7761*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.45*

Test Data: FTP72 Operator: Joseph Bishop Date: 3/2/2021
Test Number: ONT3_001534 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001534

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*17.795*	*35.590*
B [lbf/mph]	*-0.03154*	*-0.15770*
C [lbf/mph2]	*0.028000*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.04		
Driven	5785.39	6197.25		
Distance Rating (%)	0.1081	-0.2221		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.07	2.78		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4354	0.2843		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.74	1.99		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5646	0.7157		
Inertial Work Rating	-1.0397	1.7338		
Absolute Speed Change (m/s2)				
Target	204.87	340.91		
Driven	202.57	344.56		
Absolute Speed Change Rating (%)	-1.1270	1.0705		
Energy Rating	-1.9436	-0.8140		
Energy Economy Rating	-1.9436	-0.8140		-1.3917

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001534

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	75.32	74.48	77.72	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.84	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	13.38	13.10	13.56	38.50	87.50	Review ok
CVS Inlet Temperature	(°F)	78.85	76.55	81.41	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no humidity requirement

J.H

3/2/2021 9:09 PM

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001534

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	76.65	73.94	79.88	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.84	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	13.60	12.87	14.00	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	80.46	79.25	81.77	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.85					Passed
Sample Phase Time	(s)	869.7					
Duration Phase 2	(s)	869.60					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/2/2021	**Time:**	21:06:31
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon 3		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001535*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/2/2021*	CH_4 Response Factor	
Test Start	*21:06:31*	Odometer Position [mi]	*63654*
Start Time Cycle	*2021-03-02 21|11-59-(000)*	Delay Time Method	
Test End	*21:34:46*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*precon 3*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*17.795*	*-0.03154*	*0.028000*

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001535	Driver	Joseph Bishop	Shift Table Auto		Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*21:06:31*
		A [lbf]	*17.795*	Fuel type	GASOLINE	End Time	*21:34:46*
Model	ROGUE	B [lbf/mph]	*-0.03154*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.028000*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63654*	Remark	precon 3				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.94	Volume[scf]	2640
Zero Read	*0.00*							Press.[inHg]	28.84	D.F.	
Span Read	*0.00*							RH[%]	*9.79*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*1.910*	Ph. End[s]	505.4
Mass.	*0.000*							Dist.[mi]	*3.59*	Ph. Length[s]	505.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7755*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.79	Volume[scf]	4516
Zero Value	*0.00*							Press.[inHg]	28.84	D.F.	
Span Value	*0.00*							RH[%]	*10.30*	Ph. Start[s]	505.5
Sample	*0.00*							AH[g/kg]	*1.934*	Ph. End[s]	1375.3
Mass.	*0.000*							Dist.[mi]	*3.86*	Ph. Length[s]	869.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7760*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.45*

Test Data: FTP72 Operator: Joseph Bishop Date: 3/2/2021
Test Number: ONT3_001535 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001535

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*17.795*	*35.590*
B [lbf/mph]	*-0.03154*	*-0.15770*
C [lbf/mph2]	*0.028000*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5774.52	6208.81		
Distance Rating (%)	-0.0801	-0.0361		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.09	2.78		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4334	0.2917		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.75	1.97		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5666	0.7083		
Inertial Work Rating	-0.2840	0.6280		
Absolute Speed Change (m/s2)				
Target	204.88	340.91		
Driven	203.07	342.72		
Absolute Speed Change Rating (%)	-0.8799	0.5307		
Energy Rating	-1.3298	-1.0442		
Energy Economy Rating	-1.3298	-1.0442		-1.1964

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001535

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	75.94	73.58	78.62	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.84	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	13.37	12.84	14.00	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	79.54	77.09	82.31	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.4					
Duration Phase 1	(s)	505.30					
Crank Time Phase1	(s)	0.40				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no humidity requirement
no phase 3
J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001535

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	74.79	72.32	77.72	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.83	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	13.54	13.00	14.16	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	80.66	79.79	81.95	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	869.9					
Duration Phase 2	(s)	869.80					
Crank Time Phase1	(s)	0.4000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement
End of the test
J. H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/2/2021	**Time:**	21:35:29
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon 4		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001536*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/2/2021*	CH_4 Response Factor	
Test Start	*21:35:29*	Odometer Position [mi]	*63661*
Start Time Cycle	*2021-03-02 21|41-16-(000)*	Delay Time Method	
Test End	*22:03:35*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*precon 4*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*17.795*	*-0.03154*	*0.028000*

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001536	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*21:35:29*
		A [lbf]	*17.795*		Fuel type GASOLINE	End Time	*22:03:35*
Model	ROGUE	B [lbf/mph]	*-0.03154*		Density *0.7453*		
Year	*2016*	C [lbf/mph2]	*0.028000*		NHV 17916	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63661*	Remark	precon 4				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.28	Volume[scf]	2637
Zero Read	*0.00*							Press.[inHg]	28.83	D.F.	
Span Read	*0.00*							RH[%]	*10.22*	Ph. Start[s]	0.0
Sample	*0.00*							AH[g/kg]	*1.951*	Ph. End[s]	505.2
Mass.	*0.000*							Dist.[mi]	*3.59*	Ph. Length[s]	505.3
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7763*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.30*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.14	Volume[scf]	4515
Zero Value	*0.00*							Press.[inHg]	28.83	D.F.	
Span Value	*0.00*							RH[%]	*10.44*	Ph. Start[s]	505.3
Sample	*0.00*							AH[g/kg]	*1.983*	Ph. End[s]	1374.9
Mass.	*0.000*							Dist.[mi]	*3.85*	Ph. Length[s]	869.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7769*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.44*

Test Data: FTP72 Operator: Joseph Bishop Date: 3/2/2021
Test Number: ONT3_001536 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001536

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*17.795*	*35.590*
B [lbf/mph]	*-0.03154*	*-0.15770*
C [lbf/mph2]	*0.028000*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5776.36	6198.30		
Distance Rating (%)	-0.0483	-0.2053		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.09	2.80		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4346	0.2870		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.75	1.99		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5654	0.7130		
Inertial Work Rating	-0.3095	1.7335		
Absolute Speed Change (m/s2)				
Target	204.88	340.92		
Driven	203.83	344.06		
Absolute Speed Change Rating (%)	-0.5151	0.9225		
Energy Rating	-1.1680	-0.4358		
Energy Economy Rating	-1.1680	-0.4358		-0.8133

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001536

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	75.28	72.50	78.26	68.00	86.00	Passed
Barometer	(inHg)	28.83	28.83	28.83	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	13.65	13.06	14.21	38.50	87.50	Review ok
CVS Inlet Temperature	(°F)	79.21	76.55	81.95	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.3					
Duration Phase 1	(s)	505.20					
Crank Time Phase1	(s)	0.30				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no humidity requirement

J.H.

3/2/2021 10:07 PM

ATDS Emission Lab Test Report
Phase 2

Validation

Test Record #: ONT3_001536

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	75.14	72.14	77.72	68.00	86.00	Passed
Barometer	(inHg)	28.83	28.83	28.83	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	13.88	13.18	14.52	38.50	87.50	Review cl
CVS Inlet Temperature	(°F)	80.44	79.61	81.77	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.85					Passed
Sample Phase Time	(s)	869.7					
Duration Phase 2	(s)	869.60					
Crank Time Phase1	(s)	0.3000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	4/14/2021	**Time:**	17:07:46
Test Legislation:	EPA		
Test Cycle:	HWFET+HWFET		
Test Purpose:	Preconditioning		
Test Name:	HWFET_HWFET		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	ROADLOAD PREP		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001765*		
Test Name	*HWFET_HWFET*		
Test Cell	*iGEM-V-TC1*		
Test Type	*HWFET_HWFET*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*4/14/2021*	CH_4 Response Factor	
Test Start	*17:07:46*	Odometer Position [mi]	*63669*
Start Time Cycle	*2021-04-14 17|39-38-(000)*	Delay Time Method	
Test End	*17:46:08*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*ROADLOAD PREP*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*17.795*	*-0.03154*	*0.028000*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	HWFET_HWFET	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001765	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*17:07:46*
		A [lbf]	*17.795*	Fuel type	GASOLINE	End Time	*17:46:08*
Model	ROGUE	B [lbf/mph]	*-0.03154*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.028000*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*63669*	Remark	ROADLOAD PREP				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.42	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.91	D.F.	
Span Read	*0.00*							RH[%]	*35.16*	Ph. Start[s]	779.3
Sample	*0.00*							AH[g/kg]	*6.334*	Ph. End[s]	1544.2
Mass.	*0.000*							Dist.[mi]	*10.26*	Ph. Length[s]	765.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8741*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_X$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *10.26*

Test Data: HWFET_HWFET Operator: Joseph Bishop Date: 4/14/2021
Test Number: ONT3_001765 Driver: Joseph Bishop

Driver Violations

		P1	I1	Phase1
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001765

Test Cycle HWFET+HWFET
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*17.795*	*35.590*
B [lbf/mph]	*-0.03154*	*-0.15770*
C [lbf/mph2]	*0.028000*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	16506.54			
Driven	16513.22			
Distance Rating (%)	0.0404			
Cycle Energy (MJ)				
Target	8.11			
Driven	8.09			
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.7451			
Driven	0.7338			
Inertial Work (MJ)				
Target	2.07			2.07
Driven	2.15			2.15
Inertial Work Fraction				
Target	0.2549			
Driven	0.2662			
Inertial Work Rating	4.1237			4.1237
Absolute Speed Change (m/s2)				
Target	130.69			130.69
Driven	135.23			135.23
Absolute Speed Change Rating (%)	3.4741			3.4741
Energy Rating	-0.3121			
Energy Economy Rating	-0.3121			-0.3121

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001765

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	73.42	71.96	79.34	68.00	86.00	Passed
Barometer	(inHg)	28.91	28.91	28.91	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	44.34	43.05	45.75	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	10.26					Passed
Sample Phase Time	(s)	765.0					
Duration Phase 1	(s)	764.90					
Crank Time Phase1	(s)	0.00				5	Not App
Crank Counts		0				1	Passed
Shutdown Time Phase 1						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: 6K

Data of automatic adaptation 04-14-2021

	Road	measured	act. set	
F0	35.6	35.2	13.0	lbs
F1	-0.158	-0.185	0.064	lbs/mph
F2	0.0280	0.0282	0.0242	lbs/(mph)²
Rw	3875.0			lbs
v max -		31.1	- 0.0	mph
Max. Devi.		-0.70	-1.48	lbs
Turn		3		

Close

Print

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

Results Coastdown 04-14-2021

mph | Force deviation (lbs) | select

vu	vl	1	2	3	4	5	Average
70.0	60.0	-0.07	-0.50	-0.70	0.00	0.00	-0.42
60.0	50.0	0.25	-0.16	-0.45	0.00	0.00	-0.12
50.0	40.0	-0.02	-0.24	-0.59	0.00	0.00	-0.29
40.0	30.0	-0.13	-0.43	-0.60	0.00	0.00	-0.39
30.0	20.0	-1.07	-1.31	-1.48	0.00	0.00	-1.29
20.0	10.0	-0.27	-0.52	-0.77	0.00	0.00	-0.52

GRAPHIC | Close | Save to File | Help | Break | Print | Get Data

Data Transfer running

							Set values	(mph)
F0	35.6	35.3	35.2	0.0	0.0	35.4	35.6	lbs
F1	-0.185	-0.179	-0.185	0.000	0.000	-0.183	-0.158	lbs/mph
F2	0.0282	0.0281	0.0282	0.0000	0.0000	0.0282	0.0280	lbs/(mph)²
						Rw	3875.0	lbs

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	4/14/2021	**Time:**	18:06:10
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001766*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*4/14/2021*	CH_4 Response Factor	
Test Start	*18:06:10*	Odometer Position [mi]	*63698*
Start Time Cycle	*2021-04-14 18|09-42-(000)*	Delay Time Method	
Test End	*18:32:42*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001766	Driver	Joseph Bishop		Shift Table Auto	Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*18:06:10*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*18:32:42*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*63698*	Remark	PRECON				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.46	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.91	D.F.	
Span Read	*0.00*							RH [%]	*31.87*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*6.353*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8746*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.63	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.92	D.F.	
Span Value	*0.00*							RH [%]	*32.94*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*6.385*	Ph. End [s]	1375.0
Mass.	*0.000*							Dist. [mi]	*3.86*	Ph. Length [s]	869.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8754*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.47*

Test Data: FTP72 Operator: Joseph Bishop Date: 4/14/2021
Test Number: ONT3_001766 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001766

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5796.70	6219.25		
Distance Rating (%)	0.3036	0.1322		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.10	2.76		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4267	0.2957		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.77	1.94		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5733	0.7043		
Inertial Work Rating	1.2000	-0.8061		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	206.07	339.69		
Absolute Speed Change Rating (%)	0.5833	-0.3568		
Energy Rating	-1.4209	-2.1039		
Energy Economy Rating	-1.4209	-2.1039		-1.7350

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001766

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	76.46	73.94	78.98	68.00	86.00	Passed
Barometer	(inHg)	28.91	28.91	28.92	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	44.47	42.92	46.01	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001766

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	75.63	73.22	78.26	68.00	86.00	Passed
Barometer	(inHg)	28.92	28.92	28.92	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	44.70	43.21	46.05	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	869.5					
Duration Phase 2	(s)	869.40					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS CANISTER WORKSHEET

Station number 2

--PURGE AND FILL--

VT#	3081-597164
Project	3081
Evap Family	GNSXR0120PBB
Ambient Temperature-Deg F	75
Barometric Pressure-In/Hg	28.92
Humidity-Grains/Lb	44.1 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.4
Overfill/Cycle	1.5 ✓
Test Cycles	1 of 1
Start time	18:44:01
Start date	04-14-2021
Bed Purges/Cycle	300
Purge End/Load Start	19:15:50
Test Time Minutes	744
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	-1.43
Butane Flow Actual-Gm/Hr	15.2
Cycles Completed	1
Finish time	07:08:05
Finish date	04-15-2021
Disk File Name	21041501.ST2

QUALITY ASSURANCE

INSPECTED BY: J H.

DATE: 11/12/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	4/15/2021	**Time:**	17:45:21
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Certification		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:			

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001772*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*4/15/2021*	CH_4 Response Factor	
Test Start	*17:45:21*	Odometer Position [mi]	*63706*
Start Time Cycle	*2021-04-15 17|47-58-(000)*	Delay Time Method	
Test End	*18:28:43*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark			

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001772	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*17:45:21*
Model	ROGUE	A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*18:28:43*
		B [lbf/mph]	*0.06400*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	17916	Soak Time	544.2
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*63706*	Remark					

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	76.03	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.92	D.F.	
Span Read	*0.00*							RH[%]	*34.22*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*6.729*	Ph. End[s]	505.6
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8842*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.31	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	28.92	D.F.	
Span Value	*0.00*							RH[%]	*36.38*	Ph. Start[s]	505.7
Sample	*0.00*							AH[g/kg]	*6.753*	Ph. End[s]	1375.8
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	870.2
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8848*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.13	Volume[scf]	
Zero Value	*0*							Press.[inHg]	28.92	D.F.	
Span Value	*0.00*							RH[%]	*35.66*	Ph. Start[s]	1920.2
Sample	*0*							AH[g/kg]	*6.803*	Ph. End[s]	2426.7
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	506.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8861*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.60*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *11.07*

Test Data: FTP75 Operator: Joseph Bishop Date: 4/15/2021
Test Number: ONT3_001772 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001772

Test Cycle FTP75
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.14	6210.96	5779.14	
Driven	5794.42	6232.38	5788.53	
Distance Rating (%)	0.2642	0.3449	0.1625	
Cycle Energy (MJ)				
Target	3.13	2.81	3.13	
Driven	3.10	2.80	3.11	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037	0.4397	
Driven	0.4348	0.2834	0.4329	
Inertial Work (MJ)				
Target	1.75	1.96	1.75	3.71
Driven	1.75	2.01	1.77	3.77
Inertial Work Fraction				
Target	0.5603	0.6963	0.5603	
Driven	0.5652	0.7166	0.5671	
Inertial Work Rating	-0.0919	2.5726	0.6596	1.5163
Absolute Speed Change (m/s2)				
Target	204.88	340.92	204.88	545.80
Driven	203.80	346.16	205.17	550.74
Absolute Speed Change Rating (%)	-0.5279	1.5378	0.1418	0.9057
Energy Rating	-1.2320	-0.6708	-0.7092	
Energy Economy Rating	-1.2320	-0.6708	-0.7092	-0.8151

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001772

Vehicle ID: KNMAT2MT2GP597164

Phase 1		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	76.03	73.94	78.26	68.00	86.00	Passed
Barometer	(inHg)	28.92	28.92	28.92	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	47.11	45.87	48.63	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							Passed
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60				5	Passed
Sample Phase Time	(s)	505.6				1	Passed
Duration Phase 1	(s)	505.50			540.00	660.00	Passed
Crank Time Phase1	(s)	0.60				60	Passed
Crank Counts		1					
Hot Soak Time	(s)	544.20					
Test Hold Counts		0					
Duration Test Hold	(s)	0.00					
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001772

Vehicle ID: KNMAT2MT2GP597164

Phase 2		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	74.31	72.32	77.90	68.00	86.00	Passed
Barometer	(inHg)	28.92	28.92	28.92	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	47.27	46.09	49.24	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	870.2					
Duration Phase 2	(s)	870.10					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	544.20			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001772

Vehicle ID: KNMAT2MT2GP597164

Phase 3		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	75.13	72.68	77.90	68.00	86.00	Passed
Barometer	(inHg)	28.92	28.92	28.92	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	47.62	46.53	49.06	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					
Sample Phase Time	(s)	506.6					Passed
Duration Phase 3	(s)	506.50					
Crank Time Phase3	(s)	1.60					
Crank Counts		1				5	Passed
Shutdown Time Phase 3						1	Passed
Hot Soak Time	(s)	544.20				5	Passed
Test Hold Counts		0			540.00	660.00	Passed
Duration Test Hold	(s)	0.00					
						60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	4/15/2021	**Time:**	19:49:31
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 Test		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001774*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*4/15/2021*	CH_4 Response Factor	
Test Start	*19:49:31*	Odometer Position [mi]	*63717*
Start Time Cycle	*2021-04-15 19|55-59-(000)*	Delay Time Method	
Test End	*21:07:07*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E10 Test*		

Vehicle Data — *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data — *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data — *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data — *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Joseph Bishop	Speed Table	Date:	
Test Number	ONT3_001774	Driver	Joseph Bishop	Shift Table Auto	Cold Start	

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*19:49:31*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*21:07:07*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*63717*	Remark	E10 Test				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	106.22	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.96	D.F.	
Span Read	*0.00*							RH [%]	*13.49*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*6.796*	Ph. End [s]	1489.5
Mass.	*0.000*							Dist. [mi]	*7.47*	Ph. Length [s]	1489.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8859*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	105.79	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.97	D.F.	
Span Value	*0.00*							RH [%]	*13.56*	Ph. Start [s]	1489.6
Sample	*0.00*							AH [g/kg]	*6.743*	Ph. End [s]	2811.5
Mass.	*0.000*							Dist. [mi]	*2.34*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8846*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	106.07	Volume [scf]	
Zero Value	*0*							Press. [inHg]	28.98	D.F.	
Span Value	*0.00*							RH [%]	*13.47*	Ph. Start [s]	2811.6
Sample	*0*							AH [g/kg]	*6.751*	Ph. End [s]	4300.5
Mass.	*0.000*							Dist. [mi]	*7.49*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8848*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.29*

Test Data: ORVR_Prep Operator: Joseph Bishop Date: 4/15/2021
Test Number: ONT3_001774 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001774

Test Cycle RL
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.12	3792.75	11990.12	
Driven	12016.72	3767.96	12044.45	
Distance Rating (%)	0.2218	-0.6536	0.4531	
Cycle Energy (MJ)				
Target	5.94	2.43	5.94	
Driven	5.87	2.34	5.94	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3753	0.1585	0.3753	
Driven	0.3696	0.1519	0.3627	
Inertial Work (MJ)				
Target	3.71	2.04	3.71	5.76
Driven	3.70	1.98	3.79	5.73
Inertial Work Fraction				
Target	0.6247	0.8415	0.6247	
Driven	0.6304	0.8481	0.6373	
Inertial Work Rating	-0.2574	-3.0256	1.9566	-0.4258
Absolute Speed Change (m/s2)				
Target	545.78	469.50	545.78	1015.28
Driven	544.05	456.37	552.63	1005.31
Absolute Speed Change Rating (%)	-0.3178	-2.7960	1.2541	-0.9822
Energy Rating	-1.4021	-3.2495	-0.5124	
Energy Economy Rating	-1.4021	-3.2495	-0.5124	-1.6111

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001774

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	106.22	104.00	107.60	100.00	109.99	Passed
Barometer	(inHg)	28.96	28.95	28.96	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	47.57	46.81	48.53	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.47					
Sample Phase Time	(s)	1489.5					
Duration Phase 1	(s)	1489.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001774

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	105.79	105.26	106.34	100.00	109.99	Passed
Barometer	(inHg)	28.97	28.96	28.97	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	47.20	46.76	47.50	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.34					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001774

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	106.07	104.72	108.14	100.00	109.99	Passed
Barometer	(inHg)	28.98	28.97	28.98	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	47.25	46.63	48.06	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.49					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001774

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Canister Capacity***	120g
Odometer	63743	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, April 15, 2021	***Profile***	CA
		Fuel	E10

0 – 1 Hour Diurnal / (3-Day Supplemental) **4/15/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	21:07:07	0:00:00	0:00:00	
Engine Key-off	21:11:00	0:03:53	0:03:53	
SHED Door Sealed	21:12:00	0:01:00	0:04:53	
Final Sample	22:12:00	1:00:00	1:04:53	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 12.663 ppm	Volume = 1811.5 ft3	Temp. = 104.7 °F	Baro. = 29.01 in/Hg	Mass HC=0.318 grams
Post Read Zero = 0 ppm	Post Read Span = 9.555 ppm			Mass EtOH= 0.001 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 34.188 ppm	Volume = 1809.2 ft3	Temp. = 105 °F	Baro. = 29.03 in/Hg	Mass HC =0.898 grams
Post Read Zero = -0.034 ppm	Post Read Span = 93.293 ppm			Mass EtOH = 0.23 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 104.3 °F	Minimum = 102 °F			
Max Ambient Temp = 106.7 °F	Maximum = 108 °F			
Min Interior Temp = 104.3 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.58±0.01 grams**
				Diurnal Mass EtOH = 0.229 grams
				Diurnal Total Mass HC plus EtOH = 0.63725 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, April 15, 2021	23:12:00	0:00:00	
End Cold Soak	Friday, April 16, 2021	5:12:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63.1 °F	Minimum = 62 °F			
Max. Ambient Temp = 68 °F	Maximum = 68 °F			
Min. Internal Temp = 63.1 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Capacity***	120g
Odometer	63743	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, April 15, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Friday, April 16, 2021	5:12:00	0:00:00	
Start Time Diurnal	Friday, April 16, 2021	5:12:00	0:00:00	
End Time Diurnal	Saturday, April 17, 2021	5:12:00	24:00:00	
24 Hour Sample	Saturday, April 17, 2021	5:12:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 39.863 ppm	Volume = 1692.7 ft3	Temp. = 64.8 °F	Baro. = 28.93 in/Hg	Mass HC =1.105 grams
Post Read Zero = 0 ppm	Post Read Span = 93.294 ppm			Mass EtOH= 0.385 grams
Final				
Zero = 0 ppm	Span = 934.2 ppm	Re-Zero = 0 ppm		
Read = 92.38 ppm	Volume = 1681.4 ft3	Temp. = 65 °F	Baro. = 28.99 in/Hg	Mass HC=2.554 grams
Post Read Zero = -0.029 ppm	Post Read Span = 934.1 ppm			Mass EtOH= 1.079 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.8 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.6 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.73 °F	Minimum = 40 °F			**Diurnal Mass HC= 1.449±0.01 grams**
				Diurnal Mass EtOH = 0.694 grams
				Diurnal Total Mass HC plus EtOH = 1.623 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Capacity***	120g
Odometer	63743	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, April 15, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Saturday, April 17, 2021	5:12:00	24:00:00	
Start Time Diurnal	Saturday, April 17, 2021	5:12:00	24:00:00	
End Time Diurnal	Sunday, April 18, 2021	5:12:00	48:00:00	
48 Hour Sample	Sunday, April 18, 2021	5:12:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 934.2 ppm	Re-Zero = 0 ppm		
Read = 92.38 ppm	Volume = 1681.4 ft3	Temp. = 65 °F	Baro. = 28.99 in/Hg	Mass HC=2.554 grams
Post Read Zero = 0 ppm	Post Read Span = 934.1 ppm			Mass EtOH= 1.079 grams
Final				
Zero = 0 ppm	Span = 934.2 ppm	Re-Zero = 0 ppm		
Read = 139.87 ppm	Volume = 1665.8 ft3	Temp. = 65.3 °F	Baro. = 29.03 in/Hg	Mass HC=3.828 grams
Post Read Zero = -0.047 ppm	Post Read Span = 934.2 ppm			Mass EtOH= 1.67 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.8 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.6 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.7 °F	Minimum = 40 °F			**Diurnal Mass HC = 1.274±0.01 grams**
				Diurnal Mass EtOH = 0.591 grams
				Diurnal Total Mass HC plus EtOH = 1.422 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Capacity***	120g
Odometer	63743	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, April 15, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Sunday, April 18, 2021	5:12:00	48:00:00	
Start Time Diurnal	Sunday, April 18, 2021	5:12:00	48:00:00	
End Time Diurnal	Monday, April 19, 2021	5:12:00	72:00:00	
72 Hour Sample	Monday, April 19, 2021	5:12:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 934.2 ppm	Re-Zero = 0 ppm		
Read = 139.87 ppm	Volume = 1665.8 ft3	Temp. = 65.33 °F	Baro. = 29.03 in/Hg	Mass HC=3.828 grams
Post Read Zero = -0.047 ppm	Post Read Span = 934.2 ppm			Mass EtOH= 1.67 grams
Final				
Zero = 0 ppm	Span = 934.2 ppm	Re-Zero = 0 ppm		
Read = 181.77 ppm	Volume = 1656.7 ft3	Temp. = 65.2 °F	Baro. = 29.04 in/Hg	Mass HC=4.951 grams
Post Read Zero = -0.06 ppm	Post Read Span = 934.2 ppm			Mass EtOH= 2.187 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.8 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.6 °F	± 2 °F			
Max. Δ Profile Sidewall = 1.1 °F	± 5 °F			
Min Water Temperature 64.9 °F	Minimum = 40 °F			**Diurnal Mass HC= 1.123±0.01 grams**
				Diurnal Mass EtOH = 0.517 grams
				Diurnal Total Mass HC plus EtOH = 1.252 grams

QUALITY ASSURANCE

INSPECTED BY: J H.

DATE: 11/12/2021

COMMENTS: ~~(hot soak + highest 24 hour mass)~~ OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

3-Day Diurnal Standard **0.65**

Final Diurnal Total Mass HC plus EtOH emissions results: 2.26 grams

VS Standard **348%**

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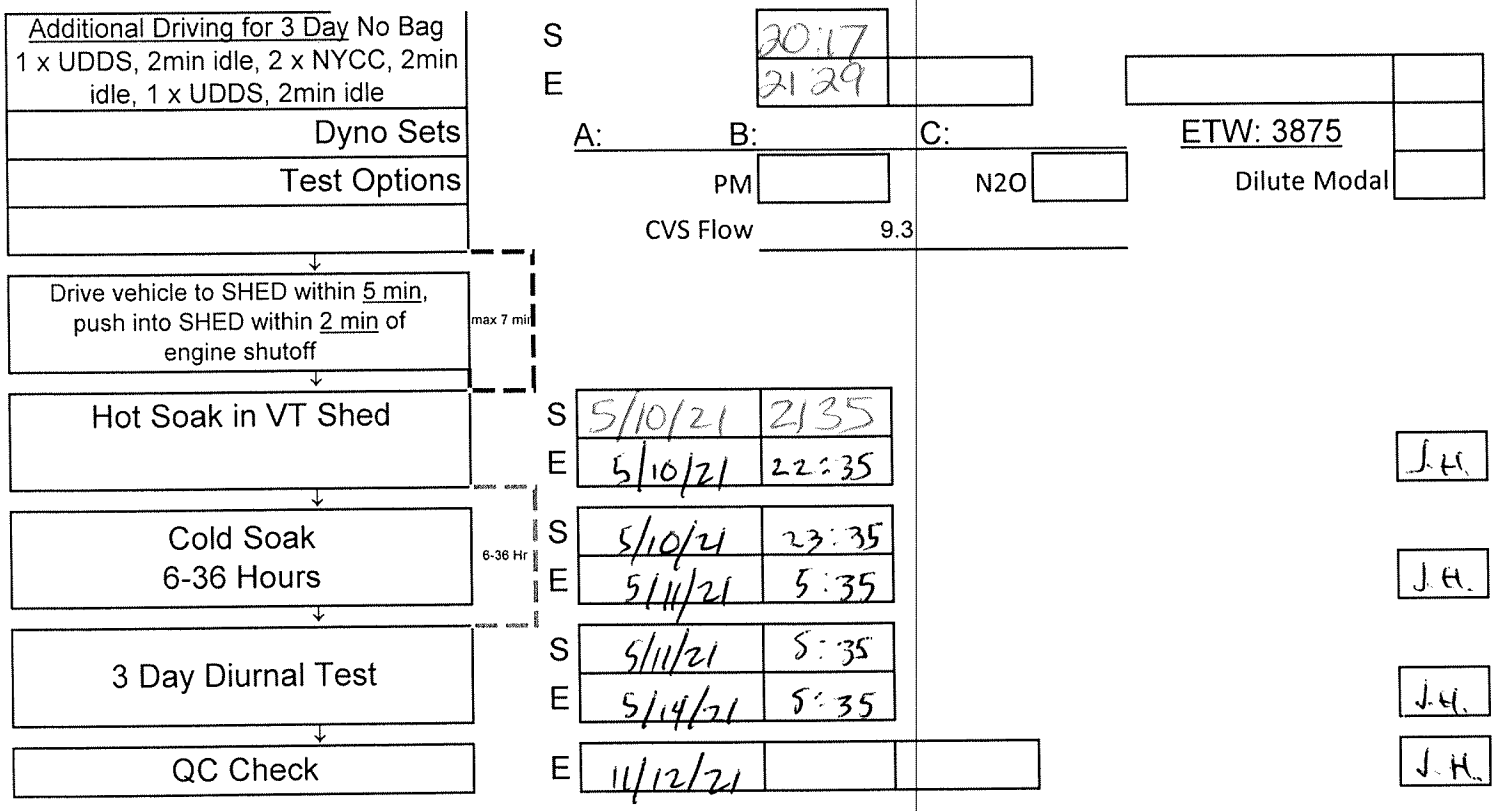
Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Nissan Rogue
Vehicle #:	3081-597164	**Engine Size**	2.5L
VIN:	KNMAT2MT2GP597164	**Model Year**	2016
Engine Family:	GNSXT02.525A	**Requested By:**	J. Link

Documentation

	Duration		Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Fuel Drain and 40% Fill, Fuel Type: See Notes!		S	2021-05-07	16:17		5.8		
		E	2021-05-07	16:42		Fuel Spec:	E10	JM
Vehicle Soak 68-86°F	min 6 hr.	S	2021-05-07	17:50				VE
		E	5/9/21	6:40				
Set tire pressure to sticker		Front		33	Back	33		VE
Precon FTP 72 (UDDS)		S	5/9/21	6:48	63743			
		E	↓	7:18	63750		ONT3 001814	VE
Dyno Sets		A:		B:		C:	ETW: 3875	VE
Vehicle Soak 68-86°F		S	5/9/21	7:19				VE
		E	5/10/21	16:00				JB
Canister Loading with Butane Type: 1.5x Load	12-36 hr	S	5/9/21	7:23				
		E	↓	19:57			21050901.STR	JB
Canister Loading Specs		Cap		120	Vol	2.4		
		Purge		300	Flow Rate	15	GNSXR0120PBB	
Set tire pressure to sticker		Front		33	Back	33		
No Bag Cold Start FTP 75		S	5/10/21	17:32	63750			
		E	↓	18:18	63762		ONT3-001817	JB
Dyno Sets		A:		B:		C:	ETW: 3875	
Test Options		PM			N2O		Dilute Modal	
		CVS Flow	P1:9.3 P2:9.3 P3:9.3					
Pre Test Comments		E10 Test						
Fuel Tank Temp. Stabilization at 105F	max 1 hr	S	5/9/21	19:12				
		E	5/9/21	20:12				

T - 80.7
H - 37.9
B - 28.9


Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
S
E
20:17
21:29
A:
B:
C:
ETW: 3875
PM
N2O
Dilute Modal
CVS Flow
9.3
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
S
E
5/10/21
2135
5/10/21
22:35
J.H.
Cold Soak
6-36 Hours
6-36 Hr
S
E
5/10/21
23:35
5/11/21
5:35
J.H.
3 Day Diurnal Test
S
E
5/11/21
5:35
5/14/21
5:35
J.H.
QC Check
E
11/12/21
J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081		3081-597164	
VIN:	KNMAT2MT2GP597164			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Nissan	Rogue	FWD	2016
Test Group / Engine Size (L):	GNSXT02.525A		2.5L	
EVAP Family:	GNSXR0120PBB			
Standard Tire Size (front) / Pressure:	225/65-17		33	
Standard Tire Size (rear) / Pressure:	225/65-17		33	
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	35.59	-0.1577	0.028000	
Warmup Coefficients A / B / C:	17.80	-0.0315	0.028000	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E10 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	14.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	120
Canister volume (Liter)	2.4
Soak after drain / refills	Y
Test Fan Setup	Fixed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
5.8 of See Notes!
E10 Fuel
106.5" Wheelbase
Fixed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

										Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐		1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/9/2021	**Time:**	6:48:50
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon		

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 6-14-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001814*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/9/2021*	CH_4 Response Factor	
Test Start	*6:48:50*	Odometer Position [mi]	*63743*
Start Time Cycle	*2021-05-09 06|56-03-(000)*	Delay Time Method	
Test End	*7:18:45*		
Operator	*Victor Escudero*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*precon*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Victor Escudero		Speed Table	Date:	
Test Number	ONT3_001814	Driver	Victor Escudero		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*			E10	Start Time *6:48:50*
		A [lbf]	*13.000*		Fuel type	GASOLINE	End Time *7:18:45*
Model	ROGUE	B [lbf/mph]	*0.06400*		Density	*0.7453*	
Year	*2016*	C [lbf/mph2]	*0.024200*		NHV	17916	Soak Time
Displacement:					CWF	*0.8312*	
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63743*	Remark	precon				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	77.75	Volume[scf]	65535
Zero Read	*0.00*							Press.[inHg]	28.91	D.F.	
Span Read	*0.00*							RH[%]	*42.79*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.939*	Ph. End[s]	508.2
Mass.	*0.000*							Dist.[mi]	*1.59*	Ph. Length[s]	508.2
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9450*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*3.20*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_X[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	80.52	Volume[scf]	65535
Zero Value	*0.00*							Press.[inHg]	28.91	D.F.	
Span Value	*0.00*							RH[%]	*39.82*	Ph. Start[s]	508.3
Sample	*0.00*							AH[g/kg]	*9.114*	Ph. End[s]	1377.6
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	869.4
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9501*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	HC+NO_X[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *5.46*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-14-21

COMMENTS: Okay

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*42.79*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*8.94*
CVS Volume[scf]	*65535.00*	Act. Dist.[mi]	*1.59*	Pressure[inHg]	*28.91*
CVS Flow[scfm]	*65535.00*			Temp.[°F]	*77.75*
CVS Inlet Pressure	*65535.00*			Temp. Min.[°F]	*76.64*
CVS Inlet Temp.[°F]	*65535.00*			Temp. Max.[°F]	*78.98*
CVS Inlet Temp. Min.[°F]	*65535.00*			NO_X Corr. F	*0.9450*
CVS Inlet Temp. Max.[°F]	*65535.00*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*39.82*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*9.11*
CVS Volume[scf]	*65535.00*	Act. Dist.[mi]	*3.87*	Pressure[inHg]	*28.91*
CVS Flow[scfm]	*65535.00*			Temp.[°F]	*80.52*
CVS Inlet Pressure	*65535.00*			Temp. Min.[°F]	*78.98*
CVS Inlet Temp.[°F]	*65535.00*			Temp. Max.[°F]	*82.04*
CVS Inlet Temp. Min.[°F]	*65535.00*			NO_X Corr. F	*0.9501*
CVS Inlet Temp. Max.[°F]	*65535.00*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

Test Data: FTP72 Operator: Victor Escudero Date: 5/9/2021
Test Number: ONT3_001814 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001814

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5804.84	6222.89		
Distance Rating (%)	0.4445	0.1905		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.08	2.72		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4692	0.3085		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.63	1.88		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5308	0.6915		
Inertial Work Rating	-6.8555	-3.9838		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	195.87	332.39		
Absolute Speed Change Rating (%)	-4.3962	-2.4961		
Energy Rating	-2.1618	-3.6206		
Energy Economy Rating	-2.1618	-3.6206		-2.8346

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001814

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	77.75	76.64	78.98	68.00	86.00	Passed
Barometer	(inHg)	28.91	28.91	28.91	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	62.58	59.16	65.76	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61					Passed
Sample Phase Time	(s)	508.2					
Duration Phase 1	(s)	508.10					
Crank Time Phase1	(s)	3.20				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001814

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	80.52	78.98	82.04	68.00	86.00	Passed
Barometer	(inHg)	28.91	28.91	28.91	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	63.80	62.76	66.24	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	869.4					
Duration Phase 2	(s)	869.30					
Crank Time Phase1	(s)	3.2000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-597164
Project	3081
Evap Family	GNSXR0120PBB
Ambient Temperature-Deg F	81
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	37.9
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.4 ✓
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	07:23:50
Start date	05-09-2021
Bed Purges/Cycle	300
Purge End/Load Start	07:55:38
Test Time Minutes	753
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	1.03
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	19:57:23
Finish date	05-09-2021
Disk File Name	21050901.ST3

QUALITY ASSURANCE
INSPECTED BY: GJ
DATE: 6-14-21
COMMENTS: Okay

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/10/2021	**Time:**	17:32:43
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Certification		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 Test		

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 6-14-21

COMMENTS: okay

General Data

Test Number	*ONT3_001817*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/10/2021*	CH_4 Response Factor	
Test Start	*17:32:43*	Odometer Position [mi]	*63750*
Start Time Cycle	*2021-05-10 17|38-11-(000)*	Delay Time Method	
Test End	*18:18:28*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E10 Test*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001817	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*17:32:43*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*18:18:28*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	17916	Soak Time	549.4
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*63750*	Remark	E10 Test				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	78.52	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.85	D.F.	
Span Read	*0.00*							RH [%]	*38.05*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*8.161*	Ph. End [s]	505.8
Mass.	*0.000*							Dist. [mi]	*3.61*	Ph. Length [s]	505.8
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9226*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	81.09	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*34.89*	Ph. Start [s]	505.9
Sample	*0.00*							AH [g/kg]	*8.139*	Ph. End [s]	1375.6
Mass.	*0.000*							Dist. [mi]	*3.88*	Ph. Length [s]	869.8
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9220*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	82.31	Volume [scf]	
Zero Value	*0*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*33.41*	Ph. Start [s]	1925.1
Sample	*0*							AH [g/kg]	*8.110*	Ph. End [s]	2431.1
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	506.1
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9212*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.10*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_X [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***	
Mass per Dist.	*0.0000*							0.0000	mile/gal	
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi]	*11.07*

QUALITY ASSURANCE
INSPECTED BY: GS
DATE: 6-14-21
COMMENTS: Okay

Test Data: FTP75 Operator: Joseph Bishop Date: 5/10/2021
Test Number: ONT3_001817 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001817

Test Cycle FTP75
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6210.96	5779.15	
Driven	5808.04	6239.33	5770.10	
Distance Rating (%)	0.4998	0.4567	-0.1565	
Cycle Energy (MJ)				
Target	3.13	2.81	3.13	
Driven	3.14	2.82	3.10	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037	0.4397	
Driven	0.4178	0.2849	0.4289	
Inertial Work (MJ)				
Target	1.75	1.96	1.75	3.71
Driven	1.83	2.02	1.77	3.81
Inertial Work Fraction				
Target	0.5603	0.6963	0.5603	
Driven	0.5822	0.7151	0.5711	
Inertial Work Rating	4.0928	2.8733	0.8003	2.5628
Absolute Speed Change (m/s2)				
Target	204.88	340.91	204.87	545.78
Driven	209.19	346.93	204.97	553.71
Absolute Speed Change Rating (%)	2.1074	1.7658	0.0472	1.4532
Energy Rating	-0.3274	-0.2872	-0.9580	
Energy Economy Rating	-0.3274	-0.2872	-0.9580	-0.5110

ATDS Emission Lab Test Report

Validation

Phase 1

Test Record #: ONT3_001817

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	78.52	77.90	79.52	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.85	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	57.13	56.78	57.50	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61					Passed
Sample Phase Time	(s)	505.8					
Duration Phase 1	(s)	505.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	549.40			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001817

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	81.09	79.52	82.22	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.85	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	56.97	56.58	57.44	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.88					Passed
Sample Phase Time	(s)	869.8					
Duration Phase 2	(s)	869.70					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	549.40			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001817

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	82.31	81.14	83.84	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.85	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	56.77	56.42	57.24	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	506.1					
Duration Phase 3	(s)	506.00					
Crank Time Phase3	(s)	1.10				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)	549.40			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/10/2021	**Time:**	20:12:27
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 Test		

QUALITY ASSURANCE
INSPECTED BY: GS
DATE: 6-14-21
COMMENTS: Okay

General Data

Test Number	*ONT3_001818*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/10/2021*	CH_4 Response Factor	
Test Start	*20:12:27*	Odometer Position [mi]	*63762*
Start Time Cycle	*2021-05-10 20|19-00-(000)*	Delay Time Method	
Test End	*21:29:55*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E10 Test*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	ORVR_Prep	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001818	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*20:12:27*
		A [lbf]	*13.000*		Fuel type GASOLINE	End Time	*21:29:55*
Model	ROGUE	B [lbf/mph]	*0.06400*		Density *0.7453*		
Year	*2016*	C [lbf/mph2]	*0.024200*		NHV 17916	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*63762*	Remark	E10 Test				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]			
Range	*0*							Temp.[°F]	108.28	Volume[scf]
Zero Read	*0.00*							Press.[inHg]	28.88	D.F.
Span Read	*0.00*							RH[%]	*16.11*	Ph. Start[s] 0.1
Sample	*0.00*							AH[g/kg]	*8.665*	Ph. End[s] 1489.8
Mass.	*0.000*							Dist.[mi]	*7.46*	Ph. Length[s] 1489.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9370*	Bag An. Delay[s]
								Dr. Viola.	*0*	Vio. Durat.[s] 0.0
								Crank [s]	*0.80*	FE [mile/gal]

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]			
Range	*0*							Temp.[°F]	106.46	Volume[scf]
Zero Value	*0.00*							Press.[inHg]	28.88	D.F.
Span Value	*0.00*							RH[%]	*17.04*	Ph. Start[s] 1489.9
Sample	*0.00*							AH[g/kg]	*8.695*	Ph. End[s] 2811.8
Mass.	*0.000*							Dist.[mi]	*2.34*	Ph. Length[s] 1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9378*	Bag An. Delay[s]
								Dr. Viola.	*0*	Vio. Durat.[s] 0.0
										FE [mile/gal]

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]			
Range	*0*							Temp.[°F]	105.88	Volume[scf]
Zero Value	*0*							Press.[inHg]	28.89	D.F.
Span Value	*0.00*							RH[%]	*17.29*	Ph. Start[s] 2811.9
Sample	*0*							AH[g/kg]	*8.668*	Ph. End[s] 4300.8
Mass.	*0.000*							Dist.[mi]	*7.47*	Ph. Length[s] 1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9370*	Bag An. Delay[s]
								Dr. Viola.	*0*	Vio. Durat.[s] 0.0
								Crank [s]	*0.00*	FE [mile/gal]

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.28*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-14-21

COMMENTS: Okay

Test Data: ORVR_Prep Operator: Joseph Bishop Date: 5/10/2021
Test Number: ONT3_001818 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001818

Test Cycle RL
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.14	3792.75	11990.14	
Driven	12008.25	3766.91	12026.27	
Distance Rating (%)	0.1511	-0.6812	0.3014	
Cycle Energy (MJ)				
Target	5.94	2.43	5.94	
Driven	5.88	2.31	5.91	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3753	0.1585	0.3753	
Driven	0.3631	0.1489	0.3555	
Inertial Work (MJ)				
Target	3.71	2.04	3.71	5.76
Driven	3.75	1.97	3.81	5.75
Inertial Work Fraction				
Target	0.6247	0.8415	0.6247	
Driven	0.6369	0.8511	0.6445	
Inertial Work Rating	0.9074	-3.6763	2.6081	-0.0939
Absolute Speed Change (m/s2)				
Target	545.78	469.45	545.78	1015.23
Driven	549.08	454.79	553.45	1006.36
Absolute Speed Change Rating (%)	0.6049	-3.1223	1.4054	-0.8733
Energy Rating	-1.1869	-4.2874	-0.8522	
Energy Economy Rating	-1.1869	-4.2874	-0.8522	-1.9690

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001818

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	108.28	106.52	109.76	100.00	109.99	Passed
Barometer	(inHg)	28.88	28.87	28.88	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	60.65	60.12	61.13	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.46					
Sample Phase Time	(s)	1489.8					
Duration Phase 1	(s)	1489.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001818

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	106.46	106.16	106.70	100.00	109.99	Passed
Barometer	(inHg)	28.88	28.88	28.89	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	60.86	60.44	61.18	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.34					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001818

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	105.88	104.54	107.42	100.00	109.99	Passed
Barometer	(inHg)	28.89	28.89	28.89	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	60.68	60.12	61.33	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.47					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001818

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Canister Capacity***	120g
Odometer	63779	***Vehicle Test Volume***	50 ft3
Test Start Date	Monday, May 10, 2021	***Profile***	CA
		Fuel	E10

0 – 1 Hour Diurnal / (3-Day Supplemental) **5/10/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	21:29:55	0:00:00	0:00:00	
Engine Key-off	21:34:00	0:04:05	0:04:05	
SHED Door Sealed	21:35:00	0:01:00	0:05:05	
Final Sample	22:35:00	1:00:00	1:05:05	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 4.398 ppm	Volume = 1807 ft3	Temp. = 105.4 °F	Baro. = 28.92 in/Hg	Mass HC=0.126 grams
Post Read Zero = 0 ppm	Post Read Span = 9.55 ppm			Mass EtOH= 0 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.87 ppm	Volume = 1799.1 ft3	Temp. = 104.8 °F	Baro. = 28.93 in/Hg	Mass HC =0.163 grams
Post Read Zero = -0.013 ppm	Post Read Span = 9.55 ppm			Mass EtOH = 0 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 104.4 °F	Minimum = 102 °F			
Max Ambient Temp = 106.9 °F	Maximum = 108 °F			
Min Interior Temp = 104.4 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.037±0.01 grams**
				Diurnal Mass EtOH = 0 grams
				Diurnal Total Mass HC plus EtOH = 0.037 grams

HOT SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Monday, May 10, 2021	23:35:00	0:00:00	
End Cold Soak	Tuesday, May 11, 2021	5:35:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 62.8 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.7 °F	Maximum = 68 °F			
Min. Internal Temp = 62.8 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Capacity***	120g
Odometer	63779	***Vehicle Test Volume***	50 ft3
Test Start Date	Monday, May 10, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Tuesday, May 11, 2021	5:35:00	0:00:00	
Start Time Diurnal	Tuesday, May 11, 2021	5:35:00	0:00:00	
End Time Diurnal	Wednesday, May 12, 2021	5:35:00	24:00:00	
24 Hour Sample	Wednesday, May 12, 2021	5:35:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 6.621 ppm	Volume = 1678.9 ft3	Temp. = 65 °F	Baro. = 28.93 in/Hg	Mass HC =0.181 grams
Post Read Zero = 0 ppm	Post Read Span = 9.55 ppm			Mass EtOH= 0.009 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 26.743 ppm	Volume = 1660.6 ft3	Temp. = 65.1 °F	Baro. = 29.01 in/Hg	Mass HC=0.735 grams
Post Read Zero = -0.024 ppm	Post Read Span = 93.314 ppm			Mass EtOH= 0.099 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.9 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.7 °F	± 5 °F			
Min Water Temperature 64.63 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.554±0.01 grams**
				Diurnal Mass EtOH = 0.09 grams
				Diurnal Total Mass HC plus EtOH = 0.577 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Capacity***	120g
Odometer	63779	***Vehicle Test Volume***	50 ft3
Test Start Date	Monday, May 10, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Wednesday, May 12, 2021	5:35:00	24:00:00	
Start Time Diurnal	Wednesday, May 12, 2021	5:35:00	24:00:00	
End Time Diurnal	Thursday, May 13, 2021	5:35:00	48:00:00	
48 Hour Sample	Thursday, May 13, 2021	5:35:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 26.743 ppm	Volume = 1660.6 ft3	Temp. = 65.1 °F	Baro. = 29.01 in/Hg	Mass HC=0.735 grams
Post Read Zero = 0 ppm	Post Read Span = 93.314 ppm			Mass EtOH= 0.099 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 39.348 ppm	Volume = 1645.8 ft3	Temp. = 65 °F	Baro. = 29.01 in/Hg	Mass HC=1.064 grams
Post Read Zero = -0.026 ppm	Post Read Span = 93.28 ppm			Mass EtOH= 0.165 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.3 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.9 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.6 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.329±0.01 grams**
				Diurnal Mass EtOH = 0.066 grams
				Diurnal Total Mass HC plus EtOH = 0.346 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Capacity***	120g
Odometer	63779	***Vehicle Test Volume***	50 ft3
Test Start Date	Monday, May 10, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Thursday, May 13, 2021	5:35:00	48:00:00	
Start Time Diurnal	Thursday, May 13, 2021	5:35:00	48:00:00	
End Time Diurnal	Friday, May 14, 2021	5:35:00	72:00:00	
72 Hour Sample	Friday, May 14, 2021	5:35:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 39.348 ppm	Volume = 1645.8 ft3	Temp. = 65.03 °F	Baro. = 29.01 in/Hg	Mass HC=1.064 grams
Post Read Zero = -0.026 ppm	Post Read Span = 93.28 ppm			Mass EtOH= 0.165 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 47.817 ppm	Volume = 1629.9 ft3	Temp. = 64.8 °F	Baro. = 28.99 in/Hg	Mass HC=1.276 grams
Post Read Zero = -0.022 ppm	Post Read Span = 93.301 ppm			Mass EtOH= 0.209 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 1.1 °F	± 5 °F			
Min Water Temperature 64.9 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.212±0.01 grams**
				Diurnal Mass EtOH = 0.044 grams
				Diurnal Total Mass HC plus EtOH = 0.223 grams

QUALITY ASSURANCE

INSPECTED BY: J H.

DATE: 11/12/2021

COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

3-Day Diurnal Standard **0.65**

Final Diurnal Total Mass HC plus EtOH emissions results: **0.614 grams {Soak + highest 24 hour mass}**

VS Standard **94%**

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Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Nissan Rogue
Vehicle #:	3081-597164	**Engine Size**	2.5L
VIN:	KNMAT2MT2GP597164	**Model Year**	2016
Engine Family:	GNSXT02.525A	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Set tire pressure to sticker	min 6 hr.	Front 33 Back 33					
Precon FTP 72 (UDDS)	S	5/18/21	18:40	63779		ONT3.001835	JB
Dyno Sets	E	↓	19:09	63787		ETW: 3875	JB
	A: B: C:						
Vehicle Soak 68-86°F	S	5/18/21	19:15				JB
	E	5/19/21	16:00				JB
Canister Loading with Butane Type: 1.5x Load	12-36 hr S	5/18/21	19:14				
	E	5/19/21	07:49			21051901.SL3	JB
Canister Loading Specs	Cap	120 Vol			2.4		
	Purge	300 Flow Rate			15	GNSXR0120PBB	
Set tire pressure to sticker	Front 33 Back 33						JB
No Bag Cold Start FTP 75	S	5/19/21	18:39	63787			
Dyno Sets	E	5/19/21	19:26	63798		ONT3.001836	JB
Test Options	A: B: C:					ETW: 3875	
	PM		N2O			Dilute Modal	
Pre Test Comments	CVS Flow P1:9.3 P2:9.3 P3:9.3						
	E10 Test						
Fuel Tank Temp. Stabilization at 105F	S	5/19/21	20:15				JB
max 1 hr	E	↓	21:15				JB

T 75.92

B 28.84

T 64.40

Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle

Dyno Sets

Test Options

S 21:15
E 22:27 63813

ONT3.001838 JLB

A: B: C:

ETW: 3875

PM N2O

Dilute Modal

CVS Flow 9.3

↓

Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff

max 7 min

↓

Hot Soak in VT Shed

S 5/19/21 22:32
E 5/19/21 23:32 J.H.

↓

Cold Soak
6-36 Hours

6-36 Hr

S 5/20/21 00:32
E 5/20/21 6:32 J.H.

↓

3 Day Diurnal Test

S 5/20/21 6:32
E 5/23/21 6:32 J.H.

↓

QC Check

E 11/12/21 J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081	3081-597164		
VIN:	KNMAT2MT2GP597164			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Nissan	Rogue	FWD	2016
Test Group / Engine Size (L):	GNSXT02.525A	2.5L		
EVAP Family:	GNSXR0120PBB			
Standard Tire Size (front) / Pressure:	225/65-17	33		
Standard Tire Size (rear) / Pressure:	225/65-17	33		
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	35.59	-0.1577	0.028000	
Warmup Coefficients A / B / C:	17.80	-0.0315	0.028000	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E10 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	14.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	120
Canister volume (Liter)	2.4
Soak after drain / refills	Y
Test Fan Setup	Fixed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
5.8 of See Notes!
E10 Fuel
106.5" Wheelbase
Fixed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:

FTP-1	FTP-2	FTP-3	HWY	SC03	US06
9.3	9.3	9.3			

Emissions Test Data:

FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐	Test Quantity: 1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/18/2021	**Time:**	18:40:08
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 5-27-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001835*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/18/2021*	CH_4 Response Factor	
Test Start	*18:40:08*	Odometer Position [mi]	*63779*
Start Time Cycle	*2021-05-18 18|48-57-(000)*	Delay Time Method	
Test End	*19:09:50*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*		
	A [lbf]	B [lbf/mph]	C [lbf/mph2]		
Street Load	*35.590*	*-0.15770*	*0.028000*		
Road Load	*13.000*	*0.06400*	*0.024200*		

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001835	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*18:40:08*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*19:09:50*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*63779*	Remark	PRECON				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.05	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.84	D.F.	
Span Read	*0.00*							RH [%]	*46.80*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.268*	Ph. End [s]	505.9
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9547*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.34	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*47.84*	Ph. Start [s]	506.0
Sample	*0.00*							AH [g/kg]	*9.255*	Ph. End [s]	1375.5
Mass.	*0.000*							Dist. [mi]	*3.88*	Ph. Length [s]	869.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9543*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.48*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 5-27-21

COMMENTS: Okay

Test Data: FTP72 Operator: Joseph Bishop Date: 5/18/2021
Test Number: ONT3_001835 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001835

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5798.35	6237.87		
Distance Rating (%)	0.3322	0.4318		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.11	2.79		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4272	0.2872		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.78	1.99		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5728	0.7128		
Inertial Work Rating	1.6881	1.4191		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	206.84	344.41		
Absolute Speed Change Rating (%)	0.9567	1.0281		
Energy Rating	-0.8612	-1.3610		
Energy Economy Rating	-0.8612	-1.3610		-1.1017

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001835

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	76.05	73.40	78.08	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.84	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.88	59.77	67.26	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.9					
Duration Phase 1	(s)	505.80					
Crank Time Phase1	(s)	0.90				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001835

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	75.34	73.04	77.72	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.84	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.78	59.83	69.07	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.88					Passed
Sample Phase Time	(s)	869.6					
Duration Phase 2	(s)	869.50					
Crank Time Phase1	(s)	0.9000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-597164
Project	3081
Evap Family	GNSXR0120PBB
Ambient Temperature-Deg F	76
Barometric Pressure-In/Hg	28.84
Humidity-Grains/Lb	64.4
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.4 ✓
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	19:14:32
Start date	05-18-2021
Bed Purges/Cycle	300
Purge End/Load Start	19:46:20
Test Time Minutes	753
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	-0.83
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	07:49:08
Finish date	05-19-2021
Disk File Name	21051901.ST3

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 5-27-21

COMMENTS: Okay

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/19/2021	**Time:**	18:39:29
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Certification		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST		

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 5-27-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001836*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/19/2021*	CH_4 Response Factor	
Test Start	*18:39:29*	Odometer Position [mi]	*63787*
Start Time Cycle	*2021-05-19 18|47-25-(000)*	Delay Time Method	
Test End	*19:26:50*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Joseph Bishop	Speed Table	Date:	
Test Number	ONT3_001836	Driver	Joseph Bishop	Shift Table Auto	Cold Start	

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*18:39:29*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*19:26:50*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	17916	Soak Time	544.1
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*63787*	Remark	E10 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.33	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.81	D.F.	
Span Read	*0.00*							RH [%]	*46.26*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.258*	Ph. End [s]	505.9
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9544*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.70	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.81	D.F.	
Span Value	*0.00*							RH [%]	*47.36*	Ph. Start [s]	506.0
Sample	*0.00*							AH [g/kg]	*9.283*	Ph. End [s]	1375.8
Mass.	*0.000*							Dist. [mi]	*3.88*	Ph. Length [s]	869.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9552*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.73	Volume [scf]	
Zero Value	*0*							Press. [inHg]	28.81	D.F.	
Span Value	*0.00*							RH [%]	*47.00*	Ph. Start [s]	1920.1
Sample	*0*							AH [g/kg]	*9.219*	Ph. End [s]	2425.9
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9532*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_x [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.06*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 5-27-21

COMMENTS: Okay

Test Data: FTP75 Operator: Joseph Bishop Date: 5/19/2021
Test Number: ONT3_001836 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001836

Test Cycle FTP75
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.14	6210.96	5779.15	
Driven	5787.26	6238.45	5775.61	
Distance Rating (%)	0.1405	0.4426	-0.0612	
Cycle Energy (MJ)				
Target	3.13	2.81	3.13	
Driven	3.11	2.81	3.11	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3036	0.4397	
Driven	0.4252	0.2872	0.4313	
Inertial Work (MJ)				
Target	1.75	1.96	1.75	3.71
Driven	1.79	2.00	1.77	3.78
Inertial Work Fraction				
Target	0.5603	0.6964	0.5603	
Driven	0.5748	0.7128	0.5687	
Inertial Work Rating	2.0614	2.2929	0.9577	1.8863
Absolute Speed Change (m/s2)				
Target	204.88	340.90	204.87	545.78
Driven	206.64	345.33	205.12	551.11
Absolute Speed Change Rating (%)	0.8613	1.3001	0.1214	0.9770
Energy Rating	-0.6574	-0.5102	-0.4802	
Energy Economy Rating	-0.6574	-0.5102	-0.4802	-0.5532

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001836

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	76.33	73.58	78.62	68.00	86.00	Passed
Barometer	(inHg)	28.81	28.80	28.81	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.80	61.14	66.69	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.9					
Duration Phase 1	(s)	505.80					
Crank Time Phase1	(s)	0.90				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	544.10			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001836

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	75.70	73.22	78.26	68.00	86.00	Passed
Barometer	(inHg)	28.81	28.80	28.81	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.98	61.17	67.34	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.88					Passed
Sample Phase Time	(s)	869.9					
Duration Phase 2	(s)	869.80					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	544.10			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001836

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	75.73	73.94	78.08	68.00	86.00	Passed
Barometer	(inHg)	28.81	28.81	28.82	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.53	61.06	67.06	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.9					
Duration Phase 3	(s)	505.80					
Crank Time Phase3	(s)	0.90				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)	544.10			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/19/2021	**Time:**	21:06:29
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST		

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 5-27-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001838*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/19/2021*	CH_4 Response Factor	
Test Start	*21:06:29*	Odometer Position [mi]	*63798*
Start Time Cycle	*2021-05-19 21|18-43-(000)*	Delay Time Method	
Test End	*22:27:43*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A* ✓	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	ORVR_Prep	Operator	Joseph Bishop	Speed Table	Date:	
Test Number	ONT3_001838	Driver	Joseph Bishop	Shift Table Auto	Cold Start	

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		E10	Start Time	*21:06:29*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*22:27:43*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7453*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*63798*	Remark	E10 TEST				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	106.98	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.87	D.F.	
Span Read	*0.00*							RH[%]	*17.74*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*9.198*	Ph. End[s]	1489.8
Mass.	*0.000*							Dist.[mi]	*7.48*	Ph. Length[s]	1489.8
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9526*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	105.02	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	28.87	D.F.	
Span Value	*0.00*							RH[%]	*18.91*	Ph. Start[s]	1489.9
Sample	*0.00*							AH[g/kg]	*9.259*	Ph. End[s]	2811.8
Mass.	*0.000*							Dist.[mi]	*2.35*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9544*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	104.53	Volume[scf]	
Zero Value	*0*							Press.[inHg]	28.88	D.F.	
Span Value	*0.00*							RH[%]	*19.22*	Ph. Start[s]	2811.9
Sample	*0*							AH[g/kg]	*9.275*	Ph. End[s]	4300.8
Mass.	*0.000*							Dist.[mi]	*7.48*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9549*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.31*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 5-27-21

COMMENTS: Okay

Test Data: ORVR_Prep Operator: Joseph Bishop Date: 5/19/2021
Test Number: ONT3_001838 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001838

Test Cycle RL
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.76	11990.13	
Driven	12037.34	3781.83	12028.34	
Distance Rating (%)	0.3937	-0.2882	0.3187	
Cycle Energy (MJ)				
Target	5.94	2.43	5.94	
Driven	5.91	2.40	5.94	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3753	0.1585	0.3753	
Driven	0.3618	0.1495	0.3603	
Inertial Work (MJ)				
Target	3.71	2.04	3.71	5.76
Driven	3.77	2.04	3.80	5.83
Inertial Work Fraction				
Target	0.6247	0.8415	0.6247	
Driven	0.6382	0.8505	0.6397	
Inertial Work Rating	1.5976	-0.1174	2.3097	1.2508
Absolute Speed Change (m/s2)				
Target	545.78	469.44	545.78	1015.21
Driven	549.18	467.66	552.52	1018.74
Absolute Speed Change Rating (%)	0.6230	-0.3781	1.2350	0.3476
Energy Rating	-0.9459	-0.9047	-0.4094	
Energy Economy Rating	-0.9459	-0.9047	-0.4094	-0.7478

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001838

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	106.98	105.80	108.68	100.00	109.99	Passed
Barometer	(inHg)	28.87	28.86	28.87	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.39	63.67	65.20	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48					
Sample Phase Time	(s)	1489.8					
Duration Phase 1	(s)	1489.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001838

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	105.02	104.72	105.80	100.00	109.99	Passed
Barometer	(inHg)	28.87	28.87	28.88	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.82	64.21	65.26	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.35					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001838

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	104.53	103.28	105.62	100.00	109.99	Passed
Barometer	(inHg)	28.88	28.87	28.88	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.93	64.49	65.90	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3-001838

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Canister Capacity***	120g
Odometer	63813	***Vehicle Test Volume***	50 ft3
Test Start Date	Wednesday, May 19, 2021	***Profile***	CA
		Fuel	E10

0 – 1 Hour Diurnal / (3-Day Supplemental) **5/19/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	22:27:00	0:00:00	0:00:00	
Engine Key-off	22:30:00	0:03:00	0:03:00	
SHED Door Sealed	22:32:00	0:02:00	0:05:00	
Final Sample	23:32:00	1:00:00	1:05:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 4.122 ppm	Volume = 1804.1 ft3	Temp. = 102.6 °F	Baro. = 28.9 in/Hg	Mass HC=0.115 grams
Post Read Zero = 0 ppm	Post Read Span = 9.54 ppm			Mass EtOH= 0 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.33 ppm	Volume = 1801.8 ft3	Temp. = 105.2 °F	Baro. = 28.9 in/Hg	Mass HC =0.146 grams
Post Read Zero = -0.007 ppm	Post Read Span = 9.55 ppm			Mass EtOH = 0 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 103.1 °F	Minimum = 102 °F			
Max Ambient Temp = 107 °F	Maximum = 108 °F			
Min Interior Temp = 103.1 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.031±0.01 grams**
				Diurnal Mass EtOH = 0 grams
				Diurnal Total Mass HC plus EtOH = 0.031 grams

HOT SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, May 20, 2021	0:32:00	0:00:00	
End Cold Soak	Thursday, May 20, 2021	6:32:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 62.7 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.6 °F	Maximum = 68 °F			
Min. Internal Temp = 62.7 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Capacity***	120g
Odometer	63813	***Vehicle Test Volume***	50 ft3
Test Start Date	Wednesday, May 19, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Thursday, May 20, 2021	6:32:00	0:00:00	
Start Time Diurnal	Thursday, May 20, 2021	6:32:00	0:00:00	
End Time Diurnal	Friday, May 21, 2021	6:32:00	1064208:00:00	
24 Hour Sample	Friday, May 21, 2021	6:32:00	1064208:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.345 ppm	Volume = 1681.6 ft3	Temp. = 65.2 °F	Baro. = 28.88 in/Hg	Mass HC =0.168 grams
Post Read Zero = 0 ppm	Post Read Span = 9.51 ppm			Mass EtOH= 0.003 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 16.424 ppm	Volume = 1666.5 ft3	Temp. = 65 °F	Baro. = 28.96 in/Hg	Mass HC=0.449 grams
Post Read Zero = -0.016 ppm	Post Read Span = 93.314 ppm			Mass EtOH= 0.049 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.1 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.7 °F	± 2 °F			
Max. Δ Profile Sidewall = 1.1 °F	± 5 °F			
Min Water Temperature 64.77 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.281±0.01 grams**
				Diurnal Mass EtOH = 0.046 grams
				Diurnal Total Mass HC plus EtOH = 0.293 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	*VIN*	KNMAT2MT2GP597164
Model Year	2016	*Make/Model*	Nissan Rogue
Test Group	GNSXT02.525A	*Engine Size*	2.5L
Evaporative Family	GNSXR0120PBB	*Capacity*	120g
Odometer	63813	*Vehicle Test Volume*	50 ft3
Test Start Date	Wednesday, May 19, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Friday, May 21, 2021	6:32:00	1064208:00:00	
Start Time Diurnal	Friday, May 21, 2021	6:32:00	1064208:00:00	
End Time Diurnal	Saturday, May 22, 2021	6:32:00	1064232:00:00	
48 Hour Sample	Saturday, May 22, 2021	6:32:00	1064232:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 16.424 ppm	Volume = 1666.5 ft3	Temp. = 65 °F	Baro. = 28.96 in/Hg	Mass HC=0.449 grams
Post Read Zero = 0 ppm	Post Read Span = 93.314 ppm			Mass EtOH= 0.049 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 24.142 ppm	Volume = 1651.3 ft3	Temp. = 65 °F	Baro. = 29.03 in/Hg	Mass HC=0.657 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.305 ppm			Mass EtOH= 0.092 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.6 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.7 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.6 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.208±0.01 grams**
				Diurnal Mass EtOH = 0.043 grams
				Diurnal Total Mass HC plus EtOH = 0.219 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	Nissan Rogue
Test Group	GNSXT02.525A	***Engine Size***	2.5L
Evaporative Family	GNSXR0120PBB	***Capacity***	120g
Odometer	63813	***Vehicle Test Volume***	50 ft3
Test Start Date	Wednesday, May 19, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Saturday, May 22, 2021	6:32:00	1064232:00:00	
Start Time Diurnal	Saturday, May 22, 2021	6:32:00	1064232:00:00	
End Time Diurnal	Sunday, May 23, 2021	6:32:00	1064256:00:00	
72 Hour Sample	Sunday, May 23, 2021	6:32:00	1064256:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 24.142 ppm	Volume = 1651.3 ft3	Temp. = 65.03 °F	Baro. = 29.03 in/Hg	Mass HC=0.657 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.305 ppm			Mass EtOH= 0.092 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 31.066 ppm	Volume = 1637.7 ft3	Temp. = 65 °F	Baro. = 29.09 in/Hg	Mass HC=0.839 grams
Post Read Zero = -0.032 ppm	Post Read Span = 93.295 ppm			Mass EtOH= 0.131 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.7 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.9 °F	± 5 °F			
Min Water Temperature 64.6 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.182±0.01 grams**
				Diurnal Mass EtOH = 0.039 grams
				Diurnal Total Mass HC plus EtOH = 0.192 grams

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

3-Day Diurnal Standard **0.65**

Final Diurnal Total Mass HC plus EtOH emissions results: **0.324 grams** {hot soak + highest 24 hour mass}

VS Standard **50%**

QUALITY ASSURANCE

INSPECTED BY: J H.

DATE: 11/12/2021

COMMENTS: OK

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Nissan Rogue
Vehicle #:	3081-597164	**Engine Size**	2.5L
VIN:	KNMAT2MT2GP597164	**Model Year**	2016
Engine Family:	GNSXT02.525A	**Requested By:**	J. Link

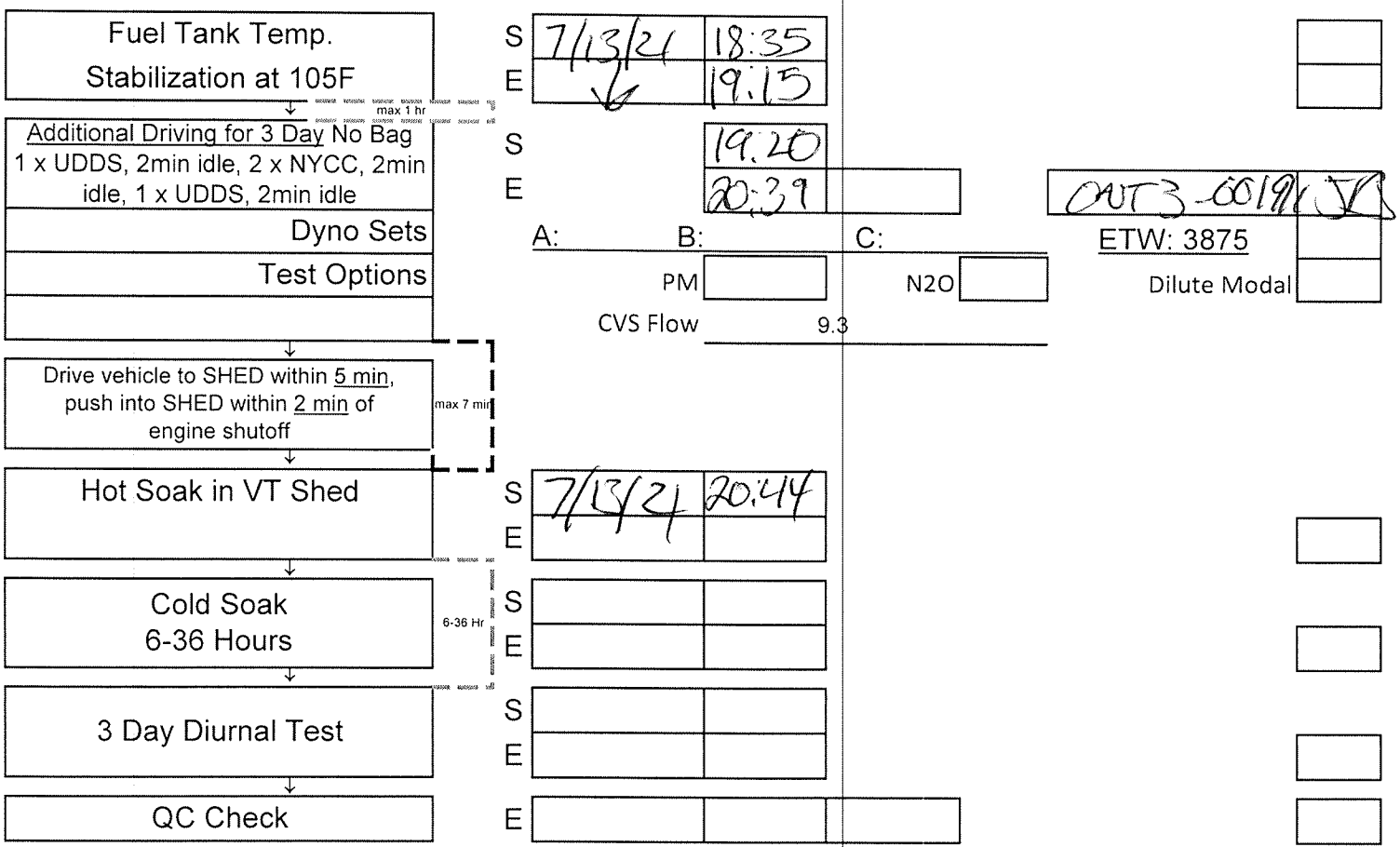
		Documentation						
		Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Canister Purge 1 Hour	E	2021-06-14	09:02					JC
Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S	2021-06-14	09:03			3		
	E	2021-06-14	09:15		Fuel Spec:		E15	JM
Idle 1 min								JM
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S	2021-06-14	09:17			5.8		
	E	2021-06-14	09:35		Fuel Spec:		<60F 58.4	JM
Heat Build 60F-105F in 1 Hour	S							
	E							JC
Precon FTP 72 (UDDS) 1	S	2012-06-14	12:43	63817 ~~63816~~				
	E	↓	13:12	63825			ONT3-0001861	JC
Dyno Sets			A: 17.795 B: -0.03154 C: 0.028				ETW: 3875	
Precon FTP 72 (UDDS) 2	S	2021-06-14	13:14	63825				
	E	↓	13:42	63852			ONT3-0001862	JB
Precon FTP 72 (UDDS) 3	S	2021-06-14	13:49	63832				
	E	↓	14:15	63840			ONT3_001864	VE
Precon FTP 72 (UDDS) 4	S	2021-06-14	14:40	63840				
	E	↓	15:06	63848			ONT3_001865	DC
Eng Off 5 min								JB
Idle 1 min								JB
Eng Off 1 min								JB
Idle 1 min								JB

Vehicle Soak 21 Days 68-86°F	S	6/19/21	15:20				
↓	E						
Set tire pressure 7psi over sticker	Front	40	Back	40			
↓							
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S			5.8			
↓	E			Fuel Spec:	E10		
Vehicle Soak 68-86°F (min 6 hr.)	S						
↓	E						
Set tire pressure to sticker	Front	33	Back	33			
↓							
Precon FTP 72 (UDDS)	S	7/12/21	18:49	63848			
↓	E	↓	19:17	63856	ONT3-001907	JS	
Dyno Sets	A:	B:	C:		ETW: 3875		
↓							
Vehicle Soak 68-86°F	S	7/12/21	19:20			JS	
↓	E	7/13/21	17:00			JS	
Canister Loading with Butane Type: 1.5x Load (12-36 hr)	S	7/12/21	~~08:0~~	19:32			
↓	E	7/13/21	08:05		2107501.SE3	JS	
Canister Loading Specs	Cap	120	Vol	2.4			
↓	Purge	300	Flow Rate	15	GNSXR0120PBB		
Set tire pressure to sticker	Front	33	Back	33		JS	
↓							
No Bag Cold Start FTP 75	S	7/13/21	17:38	63856			
↓	E	↓	18:29	63867	ONT3-001910	JS	
Dyno Sets	A:	B:	C:		ETW: 3875		
Test Options	PM		N2O		Dilute Modal		
	CVS Flow	P1:9.3 P2:9.3 P3:9.3					
Pre Test Comments	E15 Test						
↓							

T 75.02

B 28.82

H 87.50


Fuel Tank Temp.
Stabilization at 105F
max 1 hr
Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
Cold Soak
6-36 Hours
6-36 Hr
3 Day Diurnal Test
QC Check
S
E
7/13/21
18:35
19.15
19.20
20:39
OUT 3-00191
A:
B:
C:
ETW: 3875
PM
N2O
Dilute Modal
CVS Flow
9.3
7/13/21
20.47

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081	3081-597164		
VIN:	KNMAT2MT2GP597164			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Nissan	Rogue	FWD	2016
Test Group / Engine Size (L):	GNSXT02.525A	2.5L		
EVAP Family:	GNSXR0120PBB			
Standard Tire Size (front) / Pressure:	225/65-17	33		
Standard Tire Size (rear) / Pressure:	225/65-17	33		
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	35.59	-0.1577	0.028000	
Warmup Coefficients A / B / C:	17.80	-0.0315	0.028000	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E15 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	14.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	120
Canister volume (Liter)	2.4
Soak after drain / refills	Y
Test Fan Setup	Fixed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
5.8 of See Notes!
E15 Fuel
106.5" Wheelbase
Fixed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

~~Canister condition FTP:~~ ~~AS IS~~ ☐ ~~LOADED~~ ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

											Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐			1
~~Hwy:~~	~~Fuel~~		~~PM~~	☐	~~N2O~~	☐	~~Dilute Modal~~	☐			
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐			
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐			

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags	☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags	☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags	☐
Diurnal 24h	☐	Fuel type 24H Diurnal				
Diurnal 48h	☐	Fuel type 48h Diurnal				
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!			

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS CANISTER WORKSHEET

Station number 2

----PURGE ONLY----

VT#	3081-597164
Project	3081
Evap Family	NA
Ambient Temperature-Deg F	77
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	44.6 ✓
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0
Canister Volume-Liters	13.6
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	08:02:31
Start date	06-14-2021
Bed Purges/Cycle	100
Purge End/Load Start	09:02:40
Test Time Minutes	60 ✓
HC Loaded-Grams	0.0
Scale Reading-Grams	3.30
Butane Flow Actual-Gm/Hr	-0.0
Cycles Completed	1
Finish time	09:02:40
Finish date	06-14-2021
Disk File Name	21061401.ST2

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/14/2021	**Time:**	12:43:24
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	UDDS 1		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/12/2024

COMMENTS: Ok

General Data

Test Number	*ONT3_001861*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/14/2021*	CH_4 Response Factor	
Test Start	*12:43:24*	Odometer Position [mi]	*63817*
Start Time Cycle	*2021-06-14 12|51-47-(000)*	Delay Time Method	
Test End	*13:12:47*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*UDDS 1*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data *91_Pump_Gas* E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Domenic Coppola	Speed Table	Date:	
Test Number	ONT3_001861	Driver	Jennifer Chappell	Shift Table Auto	Cold Start	

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*12:43:24*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*13:12:47*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*63817*	Remark	UDDS 1				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.88	Volume [scf]	65535
Zero Read	*0.00*							Press. [inHg]	28.88	D.F.	
Span Read	*0.00*							RH [%]	*36.27*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*6.875*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8880*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.54	Volume [scf]	65535
Zero Value	*0.00*							Press. [inHg]	28.88	D.F.	
Span Value	*0.00*							RH [%]	*37.50*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*6.566*	Ph. End [s]	1375.7
Mass.	*0.000*							Dist. [mi]	*3.86*	Ph. Length [s]	870.2
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8800*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.46*

Test Data: FTP72 Operator: Domenic Coppola Date: 6/14/2021
Test Number: ONT3_001861 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001861

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5790.32	6209.08		
Distance Rating (%)	0.1932	-0.0318		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.11	2.86		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4431	0.2920		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.73	2.03		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5569	0.7080		
Inertial Work Rating	-1.3283	3.4261		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	203.24	348.05		
Absolute Speed Change Rating (%)	-0.7962	2.0958		
Energy Rating	-0.9286	1.7216		
Energy Economy Rating	-0.9286	1.7216		0.3519

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001861

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	74.88	72.50	77.18	68.00	86.00	Passed
Barometer	(inHg)	28.88	28.88	28.88	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	48.13	46.80	49.85	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No phase 3

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001861

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	72.54	71.60	74.30	68.00	86.00	Passed
Barometer	(inHg)	28.88	28.87	28.88	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	45.97	45.00	47.09	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	870.2					
Duration Phase 2	(s)	870.10					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Failed ok
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

End of test

J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/14/2021	**Time:**	13:14:00
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	UDDS 2		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001862*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/14/2021*	CH_4 Response Factor	
Test Start	*13:14:00*	Odometer Position [mi]	*63825*
Start Time Cycle	*2021-06-14 13|21-04-(000)*	Delay Time Method	
Test End	*13:42:43*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*UDDS 2*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*e15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001862	Driver	Joseph Bishop		Shift Table Auto	Cold Start	

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*13:14:00*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*13:42:43*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*63825*	Remark	UDDS 2				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.98	Volume [scf]	65535
Zero Read	*0.00*							Press. [inHg]	28.87	D.F.	
Span Read	*0.00*							RH [%]	*36.10*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*6.417*	Ph. End [s]	505.6
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8762*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	71.99	Volume [scf]	65535
Zero Value	*0.00*							Press. [inHg]	28.87	D.F.	
Span Value	*0.00*							RH [%]	*37.36*	Ph. Start [s]	505.7
Sample	*0.00*							AH [g/kg]	*6.423*	Ph. End [s]	1375.1
Mass.	*0.000*							Dist. [mi]	*3.86*	Ph. Length [s]	869.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8764*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.45*

Test Data: FTP72 Operator: Joseph Bishop Date: 6/14/2021
Test Number: ONT3_001862 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001862

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5771.25	6216.32		
Distance Rating (%)	-0.1367	0.0849		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.14	2.87		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4141	0.2908		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.84	2.03		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5859	0.7092		
Inertial Work Rating	4.9180	3.7623		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	210.87	350.18		
Absolute Speed Change Rating (%)	2.9264	2.7203		
Energy Rating	0.4683	1.7641		
Energy Economy Rating	0.4683	1.7641		1.0767

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001862

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	72.98	72.32	73.40	68.00	86.00	Passed
Barometer	(inHg)	28.87	28.87	28.87	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	44.92	44.29	45.43	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.6					
Duration Phase 1	(s)	505.50					
Crank Time Phase1	(s)	0.60				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001862

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	71.99	71.60	72.68	68.00	86.00	Passed
Barometer	(inHg)	28.87	28.86	28.87	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	44.96	44.36	46.46	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	869.5					
Duration Phase 2	(s)	869.40					
Crank Time Phase1	(s)	0.6000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/14/2021	**Time:**	13:49:13
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	UDDS 3		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001864*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/14/2021*	CH_4 Response Factor	
Test Start	*13:49:13*	Odometer Position [mi]	*63832*
Start Time Cycle	*2021-06-14 13|52-06-(000)*	Delay Time Method	
Test End	*14:15:42*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*UDDS 3*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001864	Driver	Victor Escudero		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		91_Pump_Gas	Start Time	*13:49:13*
		A [lbf]	*13.000*		Fuel type GASOLINE	End Time	*14:15:42*
Model	ROGUE	B [lbf/mph]	*0.06400*		Density *0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*63832*	Remark	UDDS 3				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.88	Volume [scf]	65535
Zero Read	*0.00*							Press. [inHg]	28.86	D.F.	
Span Read	*0.00*							RH [%]	*37.40*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*6.629*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8816*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.00	Volume [scf]	65535
Zero Value	*0.00*							Press. [inHg]	28.86	D.F.	
Span Value	*0.00*							RH [%]	*38.01*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*6.538*	Ph. End [s]	1375.2
Mass.	*0.000*							Dist. [mi]	*3.85*	Ph. Length [s]	869.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8793*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.44*

Test Data: FTP72 Operator: Joseph Bishop Date: 6/14/2021
Test Number: ONT3_001864 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001864

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.04		
Driven	5781.60	6197.34		
Distance Rating (%)	0.0424	-0.2207		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.13	2.81		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4424	0.2947		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.74	1.98		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5576	0.7053		
Inertial Work Rating	-0.5743	1.1882		
Absolute Speed Change (m/s2)				
Target	204.87	340.91		
Driven	204.31	345.34		
Absolute Speed Change Rating (%)	-0.2749	1.3008		
Energy Rating	-0.1349	0.1165		
Energy Economy Rating	-0.1349	0.1165		-0.0042

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001864

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	72.88	72.32	73.40	68.00	86.00	Passed
Barometer	(inHg)	28.86	28.86	28.87	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	46.40	45.90	46.98	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001864

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	72.00	71.78	72.32	68.00	86.00	Passed
Barometer	(inHg)	28.86	28.86	28.87	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	45.77	45.42	46.26	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.85					Passed
Sample Phase Time	(s)	869.7					
Duration Phase 2	(s)	869.60					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/14/2021	**Time:**	14:40:34
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	UDDS 4		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001868*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/14/2021*	CH_4 Response Factor	
Test Start	*14:40:34*	Odometer Position [mi]	*63840*
Start Time Cycle	*2021-06-14 14|43-48-(000)*	Delay Time Method	
Test End	*15:06:47*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Domenic Coppola*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*UDDS 4*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*e15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:
Test Number	ONT3_001868	Driver	Domenic Coppola	Shift Table Auto		Cold Start

Vehicle	KNMAT2MT2GP597164	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		91_Pump_Gas	Start Time	*14:40:34*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*15:06:47*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*63840*	Remark	UDDS 4				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.83	Volume [scf]	65535
Zero Read	*0.00*							Press. [inHg]	28.86	D.F.	
Span Read	*0.00*							RH [%]	*37.00*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*6.547*	Ph. End [s]	506.9
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	506.9
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8795*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.90*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.73	Volume [scf]	65535
Zero Value	*0.00*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*38.12*	Ph. Start [s]	507.0
Sample	*0.00*							AH [g/kg]	*6.726*	Ph. End [s]	1377.5
Mass.	*0.000*							Dist. [mi]	*3.87*	Ph. Length [s]	870.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8841*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.47*

Test Data: FTP72 Operator: Joseph Bishop Date: 6/14/2021
Test Number: ONT3_001868 Driver: Domenic Coppola

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001868

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5797.15	6221.85		
Distance Rating (%)	0.3115	0.1739		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.13	2.89		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4311	0.2911		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.78	2.05		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5689	0.7089		
Inertial Work Rating	1.6492	4.6425		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	206.57	350.76		
Absolute Speed Change Rating (%)	0.8253	2.8908		
Energy Rating	-0.1902	2.5384		
Energy Economy Rating	-0.1902	2.5384		1.1252

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001868

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	72.83	72.32	73.40	68.00	86.00	Passed
Barometer	(inHg)	28.86	28.85	28.86	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	45.83	45.04	46.48	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	506.9					
Duration Phase 1	(s)	506.80					
Crank Time Phase1	(s)	1.90				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

NO phase 3

J.H.

ATDS Emission Lab Test Report
Phase 2

Validation

Test Record #: ONT3_001868

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	72.73	72.14	73.58	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.85	28.86	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	47.08	45.98	48.38	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	870.6					
Duration Phase 2	(s)	870.50					
Crank Time Phase1	(s)	1.9000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Failed ok
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

End of test

J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/12/2021	**Time:**	18:47:29
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001907*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*7/12/2021*	CH_4 Response Factor	
Test Start	*18:47:29*	Odometer Position [mi]	*63848*
Start Time Cycle	*2021-07-12 18|55-21-(000)*	Delay Time Method	
Test End	*19:17:47*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*precon*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data ~~*91_Pump_Gas*~~ *E15* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table	Date:	
Test Number	ONT3_001907	Driver	Joseph Bishop	Shift Table Auto	Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*18:47:29*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*19:17:47*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*63848*	Remark	precon				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]	Temp. [°F]	74.49	Volume [scf]	
Range	*0*							Press. [inHg]	28.81	D.F.	
Zero Read	*0.00*							RH [%]	*59.66*	Ph. Start [s]	0.1
Span Read	*0.00*							AH [g/kg]	*11.263*	Ph. End [s]	505.4
Sample	*0.00*							Dist. [mi]	*3.60*	Ph. Length [s]	505.4
Mass.	*0.000*							NO_x Corr.	*1.0185*	Bag An. Delay [s]	
Mass per Dist.	*0.0000*							Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]	Temp. [°F]	74.05	Volume [scf]	
Range	*0*							Press. [inHg]	28.81	D.F.	
Zero Value	*0.00*							RH [%]	*56.53*	Ph. Start [s]	505.5
Span Value	*0.00*							AH [g/kg]	*10.506*	Ph. End [s]	1375.0
Sample	*0.00*							Dist. [mi]	*3.83*	Ph. Length [s]	869.6
Mass.	*0.000*							NO_x Corr.	*0.9933*	Bag An. Delay [s]	
Mass per Dist.	*0.0000*							Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.43*

Test Data: FTP72 Operator: Joseph Bishop Date: 7/12/2021
Test Number: ONT3_001907 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001907

Test Cycle FTP72
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5789.60	6164.75		
Distance Rating (%)	0.1809	-0.7454		
Cycle Energy (MJ)				
Target	3.13	2.81		
Driven	3.07	2.73		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3037		
Driven	0.4579	0.2989		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.67	1.91		
Inertial Work Fraction				
Target	0.5603	0.6963		
Driven	0.5421	0.7011		
Inertial Work Rating	-5.0676	-2.3514		
Absolute Speed Change (m/s2)				
Target	204.88	340.91		
Driven	198.30	337.43		
Absolute Speed Change Rating (%)	-3.2119	-1.0210		
Energy Rating	-2.1023	-2.3391		
Energy Economy Rating	-2.1023	-2.3391		-2.1712

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001907

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	74.49	73.22	75.92	68.00	86.00	Passed
Barometer	(inHg)	28.81	28.81	28.81	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	78.84	69.01	88.81	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							Passed
Phase Distance	(miles)	3.60					
Sample Phase Time	(s)	505.4					
Duration Phase 1	(s)	505.30				5	Passed
Crank Time Phase1	(s)	0.40				5	
Crank Time Phase3	(s)					1	Passed
Crank Counts		1				5	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3					540.00	660.00	
Hot Soak Time	(s)						
Test Hold Counts		0				60	Passed
Duration Test Hold	(s)	0.00					
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001907

Vehicle ID: KNMAT2MT2GP597164

Phase 2		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	74.05	73.22	75.56	68.00	86.00	Passed
Barometer	(inHg)	28.81	28.81	28.82	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	73.54	67.58	89.09	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.83					Passed
Sample Phase Time	(s)	869.6					
Duration Phase 2	(s)	869.50					
Crank Time Phase1	(s)	0.4000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-597164. ✓
Project	3081
Evap Family	GNSXR0120PBB ✓
Ambient Temperature-Deg F	75
Barometric Pressure-In/Hg	28.82
Humidity-Grains/Lb	67.5 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.4
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	19:32:26
Start date	07-12-2021
Bed Purges/Cycle	300
Purge End/Load Start	20:04:16
Test Time Minutes	753
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	0.34
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	08:05:00
Finish date	07-13-2021
Disk File Name	21071301.ST3

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/12/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/13/2021	**Time:**	17:38:30
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001910*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*7/13/2021*	CH_4 Response Factor	
Test Start	*17:38:30*	Odometer Position [mi]	*63856*
Start Time Cycle	*2021-07-13 17|48-46-(000)*	Delay Time Method	
Test End	*18:29:54*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*		Inertia [lb]	*3875.00* ✓	
	A [lbf]		B [lbf/mph]		C [lbf/mph2]
Street Load	*35.590* ✓		*-0.15770* ✓		*0.028000* ✓
Road Load	*13.000* ✓		*0.06400* ✓		*0.024200* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001910	Driver	Victor Escudero		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		91_Pump_Gas	Start Time	*17:38:30*
		A [lbf]	*13.000*		Fuel type GASOLINE	End Time	*18:29:54*
Model	ROGUE	B [lbf/mph]	*0.06400*		Density *0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*		NHV 18085	Soak Time	553.1
Displacement:					CWF *0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63856*	Remark	E15 TEST				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.34	Volume[scf]	2597
Zero Read	*0.00*							Press.[inHg]	28.85	D.F.	
Span Read	*0.00*							RH[%]	*61.75*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*11.593*	Ph. End[s]	505.6
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.6
Mass per Dist.	*0.0000*							NO_x Corr.	*1.0299*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.47	Volume[scf]	4443
Zero Value	*0.00*							Press.[inHg]	28.85	D.F.	
Span Value	*0.00*							RH[%]	*56.84*	Ph. Start[s]	505.7
Sample	*0.00*							AH[g/kg]	*10.343*	Ph. End[s]	1375.3
Mass.	*0.000*							Dist.[mi]	*3.86*	Ph. Length[s]	869.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9881*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.42	Volume[scf]	2584
Zero Value	*0*							Press.[inHg]	28.85	D.F.	
Span Value	*0.00*							RH[%]	*56.13*	Ph. Start[s]	1926.4
Sample	*0*							AH[g/kg]	*10.193*	Ph. End[s]	2432.2
Mass.	*0.000*							Dist.[mi]	*3.59*	Ph. Length[s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9833*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *11.06*

Test Data: FTP75 Operator: Joseph Bishop Date: 7/13/2021
Test Number: ONT3_001910 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001910

Test Cycle FTP75
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6210.96	5779.15	
Driven	5797.59	6215.81	5780.30	
Distance Rating (%)	0.3190	0.0781	0.0199	
Cycle Energy (MJ)				
Target	3.13	2.81	3.13	
Driven	3.11	2.79	3.09	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4397	0.3036	0.4397	
Driven	0.4373	0.2928	0.4371	
Inertial Work (MJ)				
Target	1.75	1.96	1.75	3.71
Driven	1.75	1.98	1.74	3.72
Inertial Work Fraction				
Target	0.5603	0.6964	0.5603	
Driven	0.5627	0.7072	0.5629	
Inertial Work Rating	-0.2166	0.8766	-0.8570	0.1877
Absolute Speed Change (m/s2)				
Target	204.88	340.91	204.88	545.78
Driven	203.58	342.52	203.88	546.27
Absolute Speed Change Rating (%)	-0.6304	0.4743	-0.4865	0.0904
Energy Rating	-0.9728	-0.7517	-1.3599	
Energy Economy Rating	-0.9728	-0.7517	-1.3599	-0.9805

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001910

Vehicle ID: KNMAT2MT2GP597164

Phase 1		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	74.34	73.22	75.38	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.85	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	81.15	72.62	93.60	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	95.24	92.03	98.33	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.6					
Duration Phase 1	(s)	505.50					
Crank Time Phase1	(s)	0.60				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	553.10			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001910

Vehicle ID: KNMAT2MT2GP597164

Phase 2		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	73.47	73.40	73.58	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.85	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	72.40	71.92	73.01	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	96.96	96.17	98.15	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					
Sample Phase Time	(s)	869.7					Passed
Duration Phase 2	(s)	869.60					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	553.10			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001910

Vehicle ID: KNMAT2MT2GP597164

Phase 3		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	73.42	73.22	73.58	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.85	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	71.35	70.75	71.97	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	96.99	95.63	99.05	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.9					
Duration Phase 3	(s)	505.80					
Crank Time Phase3	(s)	0.90				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)	553.10			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/13/2021	**Time:**	19:20:44
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001911*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*7/13/2021*	CH_4 Response Factor	
Test Start	*19:20:44*	Odometer Position [mi]	*63867*
Start Time Cycle	*2021-07-13 19|28-26-(000)*	Delay Time Method	
Test End	*20:39:41*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001911	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*19:20:44*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*20:39:41*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63867*	Remark	E15 TEST				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	105.25	Volume[scf]	7575
Zero Read	*0.00*							Press.[inHg]	28.88	D.F.	
Span Read	*0.00*							RH[%]	*25.33*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*12.553*	Ph. End[s]	1489.4
Mass.	*0.000*							Dist.[mi]	*7.46*	Ph. Length[s]	1489.4
Mass per Dist.	*0.0000*							NO_x Corr.	*1.0645*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	104.11	Volume[scf]	6719
Zero Value	*0.00*							Press.[inHg]	28.89	D.F.	
Span Value	*0.00*							RH[%]	*26.37*	Ph. Start[s]	1489.5
Sample	*0.00*							AH[g/kg]	*12.633*	Ph. End[s]	2811.4
Mass.	*0.000*							Dist.[mi]	*2.35*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*1.0675*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	103.87	Volume[scf]	7564
Zero Value	*0*							Press.[inHg]	28.90	D.F.	
Span Value	*0.00*							RH[%]	*26.78*	Ph. Start[s]	2811.5
Sample	*0*							AH[g/kg]	*12.734*	Ph. End[s]	4300.4
Mass.	*0.000*							Dist.[mi]	*7.47*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*1.0713*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.29*

Test Data: ORVR_Prep
Test Number: ONT3_001911

Operator: Joseph Bishop
Driver: Joseph Bishop

Date: 7/13/2021

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001911

Test Cycle RL
Test Legislation EPA

Vehicle ID KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*13.000*	*35.590*
B [lbf/mph]	*0.06400*	*-0.15770*
C [lbf/mph2]	*0.024200*	*0.028000*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.75	11990.13	
Driven	12008.51	3790.29	12017.56	
Distance Rating (%)	0.1533	-0.0648	0.2288	
Cycle Energy (MJ)				
Target	5.94	2.43	5.94	
Driven	5.88	2.35	5.91	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3753	0.1585	0.3753	
Driven	0.3682	0.1515	0.3669	
Inertial Work (MJ)				
Target	3.71	2.04	3.71	5.76
Driven	3.71	1.99	3.74	5.72
Inertial Work Fraction				
Target	0.6247	0.8415	0.6247	
Driven	0.6318	0.8485	0.6331	
Inertial Work Rating	-0.0012	-2.4805	0.8324	-0.5745
Absolute Speed Change (m/s2)				
Target	545.79	469.48	545.79	1015.27
Driven	545.81	457.93	548.84	1005.46
Absolute Speed Change Rating (%)	0.0039	-2.4607	0.5592	-0.9656
Energy Rating	-1.2904	-3.3281	-0.7419	
Energy Economy Rating	-1.2904	-3.3281	-0.7419	-1.6596

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001911

Vehicle ID: KNMAT2MT2GP597164

Phase 1		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	105.25	103.82	106.88	100.00	109.99	Passed
Barometer	(inHg)	28.88	28.87	28.89	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	87.87	87.05	88.83	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	104.05	99.59	105.89	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.46					
Sample Phase Time	(s)	1489.4					
Duration Phase 1	(s)	1489.30					
Crank Time Phase1	(s)	0.40				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No humidity Requirement

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001911

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	104.11	103.28	105.44	100.00	109.99	Passed
Barometer	(inHg)	28.89	28.88	28.90	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	88.43	87.48	89.30	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	104.06	103.19	106.43	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.35					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

no humidity requirement

J.H.

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001911

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	103.87	100.16	105.98	100.00	109.99	Passed
Barometer	(inHg)	28.90	28.90	28.91	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	89.14	83.85	92.96	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	105.05	103.19	108.05	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.47					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No humidity requirement

J.H.

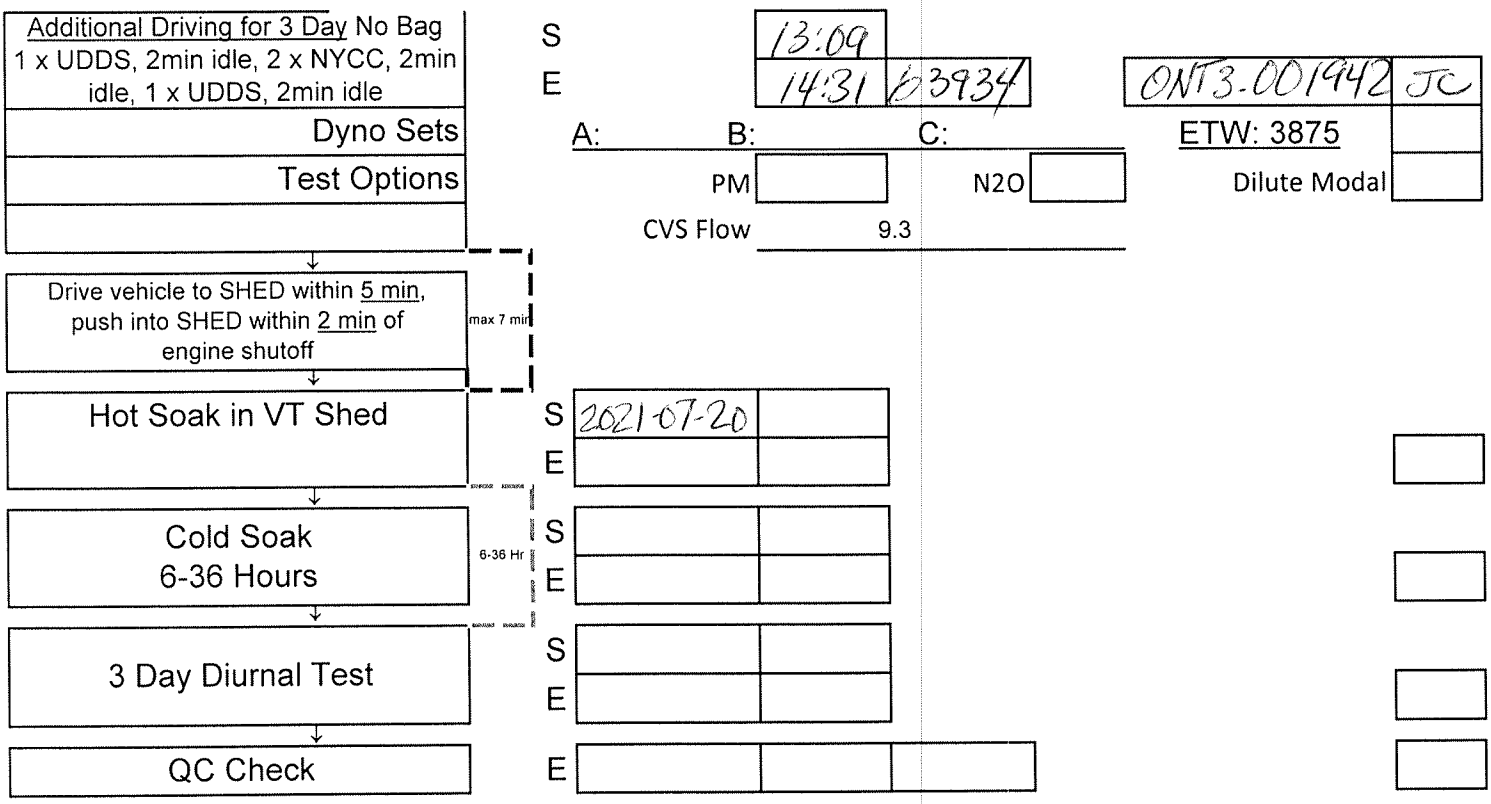
Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Nissan Rogue
Vehicle #:	3081-597164	**Engine Size**	2.5L
VIN:	KNMAT2MT2GP597164	**Model Year**	2016
Engine Family:	GNSXT02.525A	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Precon FTP 72 (UDDS)	min 6 hr	S 7/18/21	8:24	63885		DNT3-001926	VE
Dyno Sets		E ↓	8:44	63892		ETW: 3875	VE
		A: 13.0 B: 0.064 C: 0.0242					
Vehicle Soak 68-86°F		S 7/18/21	~~8:50~~ 11:19				VE
		E 2021-07-20	10:23				
Canister Loading with Butane Type: 1.5x Load	12-36 hr	S 2021-07-19	11:51			21071901.ST3	VE
		E ↓	23:52				
Canister Loading Specs		Cap	120	Vol	2.4		
		Purge	300	Flow Rate	15	GNSXR0120PBB	
Set tire pressure to sticker		Front	33	Back	33		
No Bag Cold Start FTP 75		S 2021-07-20	10:23	63905		DNT3001939	JC
Dyno Sets		E ↓	11:09	63916		ETW: 3875	JC
Test Options		A: 13.0 B: 0.064 C: 0.0242				Dilute Modal	
		PM		N2O			
Pre Test Comments		CVS Flow P1:9.3 P2:9.3 P3:9.3					
		E15 Test					
Fuel Tank Temp. Stabilization at 105F	max 1 hr	S 7/19/2021	11:57				
		E ↓	13:09				

75.0
28.9
52.5


Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
S
E
13:09
14:31
03934
ONT3-001942
JC
A:
B:
C:
ETW: 3875
PM
N2O
Dilute Modal
CVS Flow
9.3
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
2021-07-20
Cold Soak
6-36 Hours
6-36 Hr
3 Day Diurnal Test
QC Check

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081		3081-597164	
VIN:	KNMAT2MT2GP597164			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Nissan	Rogue	FWD	2016
Test Group / Engine Size (L):	GNSXT02.525A		2.5L	
EVAP Family:	GNSXR0120PBB			
Standard Tire Size (front) / Pressure:	225/65-17		33	
Standard Tire Size (rear) / Pressure:	225/65-17		33	
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	35.59	-0.1577	0.028000	
Warmup Coefficients A / B / C:	17.80	-0.0315	0.028000	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E15 Test			

Test Setup Information

		NOTES:
Dyno Coefficient Determination	Y	Cell 3 - FWD
Exhaust Leak Check	Y	5.8 of See Notes!
Fuel Drain and Refill	Y	E15 Fuel
Tank Volume (Gallons)	14.5	
Testing Fuel Level	40%	
Fuel Type	See Notes!	
Canister Load	1.5x Load	
Canister Working Capacity +/- 10g	120	
Canister volume (Liter)	2.4	106.5" Wheelbase
Soak after drain / refills	Y	Fixed Fan for testing
Test Fan Setup	Fixed	
Av. Rechr. Energy / SOC at Start of RLE		
Norminal Volt. (V) / Batt. Capacity (Ah)	/	

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

Emissions Test Data:

										Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐		1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/18/2021	**Time:**	8:14:31
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon		

General Data

Test Number	*ONT3_001926*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*7/18/2021*	CH_4 Response Factor	
Test Start	*8:14:31*	Odometer Position [mi]	*63885*
Start Time Cycle	*2021-07-18 08|21-45-(000)*	Delay Time Method	
Test End	*8:44:06*		
Operator	*Victor Escudero*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*precon*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data *91_Pump_Gas* e15

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*e15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Victor Escudero		Speed Table	Date:	
Test Number	ONT3_001926	Driver	Victor Escudero		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**	**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		91_Pump_Gas	Start Time	*8:14:31*
		A [lbf]	*13.000*		Fuel type GASOLINE	End Time	*8:44:06*
Model	ROGUE	B [lbf/mph]	*0.06400*		Density *0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*63885*	Remark	precon				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.12	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.99	D.F.	
Span Read	*0.00*							RH[%]	*53.12*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*10.175*	Ph. End[s]	505.5
Mass.	*0.000*							Dist.[mi]	*1.75*	Ph. Length[s]	505.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9827*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.33	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	28.99	D.F.	
Span Value	*0.00*							RH[%]	*55.13*	Ph. Start[s]	505.6
Sample	*0.00*							AH[g/kg]	*10.290*	Ph. End[s]	1375.0
Mass.	*0.000*							Dist.[mi]	*3.86*	Ph. Length[s]	869.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9864*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]			
Range	*0*							Temp.[°F]	Volume[scf]	
Zero Value	*0*							Press.[inHg]	D.F.	
Span Value	*0.00*							RH[%]	Ph. Start[s]	
Sample	*0*							AH[g/kg]	Ph. End[s]	
Mass.	*0.000*							Dist.[mi]	Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F	Bag An. Delay[s]	
								Dr. Viola.	Vio. Durat.[s]	
								Crank [s]	FE [mile/gal]	

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]		
Range	*0*							Temp.[°F]	Volume[scf]
Zero Value	*0*							Press.[inHg]	D.F.
Span Value	*0.00*							RH[%]	Ph. Start
Sample	*0*							AH[g/kg]	Ph. End
Mass.	*0.000*							Dist.[mi]	Ph. Length[s]
Mass per Dist.	*0.0000*							NO_X Corr. F	Bag An. Delay[s]
								Dr. Viola.	Vio. Durat.[s]
									FE [mile/gal]

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *5.61*

CVS Data			Environmental Data	
Dilution Factor (Bag)	Vio. Dur.[s]	0.0	Rel. Hum.[%]	*53.12*
Dilution Factor (Modal)	Number	0	Ab. Hum.[g/lbs]	*10.18*
CVS Volume[scf]	Act. Dist.[mi]	*1.75*	Pressure[inHg]	*28.99*
CVS Flow[scfm]			Temp.[°F]	*75.12*
CVS Inlet Pressure			Temp. Min.[°F]	*73.58*
CVS Inlet Temp.[°F]			Temp. Max.[°F]	*77.18*
CVS Inlet Temp. Min.[°F]			NO_X Corr. F	*0.9827*
CVS Inlet Temp. Max.[°F]				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_X[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_X[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*55.13*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*10.29*
CVS Volume[scf]		Act. Dist.[mi]	*3.86*	Pressure[inHg]	*28.99*
CVS Flow[scfm]				Temp.[°F]	*74.33*
CVS Inlet Pressure				Temp. Min.[°F]	*72.86*
CVS Inlet Temp.[°F]				Temp. Max.[°F]	*76.28*
CVS Inlet Temp. Min.[°F]				NO_X Corr. F	*0.9864*
CVS Inlet Temp. Max.[°F]					

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_X[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_X[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

Test Data: FTP72 Operator: Victor Escudero Date: 7/18/2021
Test Number: ONT3_001926 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *precon*

VIN KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [N]	*57.827*	*158.312*
B [N/km/h]	*0.17690*	*-0.43588*
C [N/km2/h2]	*0.041563*	*0.048089*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.20
Driven	5817.98	6205.57			12023.55
Distance Rating (%)	0.6718	-0.0882			0.2781
Cycle Energy (MJ)					
Target	3.13	2.81			
Driven	3.08	2.74			
Distance per Energy Cycle (m/MJ)					
Target	3.13	2.81			
Driven	3.08	2.74			
Road Load Work Fraction					
Target	0.4397	0.3037			
Driven	0.4614	0.3129			
Inertial Work (MJ)					
Target	1.75	1.96			
Driven	1.66	1.89			
Inertial Work Fraction					
Target	0.5603	0.6963			
Driven	0.5386	0.6871			
Inertial Work Rating (%)	-5.3998	-3.7500			
Absolute Speed Change (m/s)					
Target	204.88	340.90			
Driven	197.51	332.97			
Absolute Speed Change Rating (%)	-3.5958	-2.3277			
Energy Rating (%)	-1.5887	-2.4512			-1.9969
Energy Economy Rating (%)	-2.2970	-2.4224			-2.3214

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_001926

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.95	23.10	25.10	20.00	30.00	Passed
Barometer	(mbar)	981.60	981.60	981.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	0.00	0.00	0.00	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	71.23	65.26	77.09	38.50	87.50	Passed
CVS Inlet Temperature	(°C)				20.00	93.33	
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)				42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	n.a.			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62			3.52	3.66	Passed
Duration Phase 1	(s)	505.40					NA
Crank Time Phase1	(s)	0.50			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.52	22.70	24.60	20.00	30.00	Passed
Barometer	(mbar)	981.61	981.40	981.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	0.00	0.00	0.00	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	72.03	63.68	82.65	38.50	87.50	Passed
CVS Inlet Temperature	(°C)				20.00	93.33	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)				42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	n.a.			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86			3.78	3.94	Passed
Duration Phase 2	(s)	869.40					NA
Crank Time Phase1	(s)	0.5000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-597164
Project	3081
Evap Family	GNSXR0120PBB
Ambient Temperature-Deg F	75
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	52.5
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120
Canister Volume-Liters	2.4
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	11:19:35
Start date	07-19-2021
Bed Purges/Cycle	300
Purge End/Load Start	11:51:24
Test Time Minutes	753
HC Loaded-Grams	180.0
Scale Reading-Grams	-2.97
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	23:52:09
Finish date	07-19-2021
Disk File Name	21071901.ST3

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/20/2021	**Time:**	10:23:30
Test Legislation:	EPA1066		
Test Cycle:	FTP75		
Test Purpose:	Development		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 test		

General Data

Test Number	*ONT3_001939*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*7/20/2021*	CH_4 Response Factor	
Test Start	*10:23:30*	Odometer Position [mi]	*63905*
Start Time Cycle	*2021-07-20 10|29-34-(000)*	Delay Time Method	
Test End	*11:09:35*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E15 test*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data *91_Pump_Gas E15*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Domenic Coppola	Speed Table	Date:
Test Number	ONT3_001939	Driver	Jennifer Chappell	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*10:23:30*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*11:09:35*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	18085	Soak Time	542.8
Displacement:				CWF	*0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*63905*	Remark	E15 test				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.25	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	29.00	D.F.	
Span Read	*0.00*							RH[%]	*41.33*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*7.658*	Ph. End[s]	505.4
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.4
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9087*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.04	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	29.00	D.F.	
Span Value	*0.00*							RH[%]	*40.83*	Ph. Start[s]	505.5
Sample	*0.00*							AH[g/kg]	*7.512*	Ph. End[s]	1375.7
Mass.	*0.000*							Dist.[mi]	*3.86*	Ph. Length[s]	870.3
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9048*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.67	Volume[scf]	
Zero Value	*0*							Press.[inHg]	29.00	D.F.	
Span Value	*0.00*							RH[%]	*39.78*	Ph. Start[s]	1918.6
Sample	*0*							AH[g/kg]	*7.472*	Ph. End[s]	2424.2
Mass.	*0.000*							Dist.[mi]	*3.59*	Ph. Length[s]	505.7
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9037*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *11.04*

Test Data: FTP75
Test Number: ONT3_001939

Operator: Domenic Coppola
Driver: Jennifer Chappell

Date: 7/20/2021

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Development	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E15 test*

VIN KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [N]	*57.827*	*158.312*
B [N/km/h]	*0.17690*	*-0.43588*
C [N/km2/h2]	*0.041563*	*0.048089*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.14	6210.96	5779.15		17769.25
Driven	5787.33	6204.55	5779.26		17771.14
Distance Rating (%)	0.1416	-0.1031	0.0019		0.0106
Cycle Energy (MJ)					
Target	3.13	2.81	3.13		5.94
Driven	3.07	2.78	3.08		5.86
Distance per Energy Cycle (m/MJ)					
Target	3.13	2.81	3.13		2017.43
Driven	3.07	2.78	3.08		2046.24
Road Load Work Fraction					
Target	0.4397	0.3036	0.4397		0.3753
Driven	0.4328	0.2905	0.4311		0.3647
Inertial Work (MJ)					
Target	1.75	1.96	1.75		3.71
Driven	1.74	1.97	1.75		3.72
Inertial Work Fraction					
Target	0.5603	0.6964	0.5603		0.6247
Driven	0.5672	0.7095	0.5689		0.6353
Inertial Work Rating (%)	-0.6775	0.7158	-0.0020		0.2395
Absolute Speed Change (m/s)					
Target	204.88	340.90	204.88		545.78
Driven	202.78	343.64	204.57		547.44
Absolute Speed Change Rating (%)	-1.0260	0.8032	-0.1485		0.3043
Energy Rating (%)	-1.8892	-1.1567	-1.5183		-1.5341
Energy Economy Rating (%)	-2.0699	-1.0659	-1.5437		-1.4280

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Development	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_001939

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.47	22.40	25.20	20.00	30.00	Passed
Barometer	(mbar)	981.90	981.90	981.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.58	9.10	10.20	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	53.60	51.90	56.22	38.50	87.50	Passed
CVS Inlet Temperature	(°C)				20.00	93.33	
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)				42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	n.a.			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 1	(s)	505.30					NA
Crank Time Phase1	(s)	0.40			0	5	Passed
Crank Time Phase3	(s)	0.70			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	542.80			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Development	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.36	22.10	25.60	20.00	30.00	Passed
Barometer	(mbar)	981.89	981.80	981.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.28	8.40	10.10	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	52.58	49.37	55.78	38.50	87.50	Passed
CVS Inlet Temperature	(°C)				20.00	93.33	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)				42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	n.a.			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86			3.78	3.94	Passed
Duration Phase 2	(s)	870.20					NA
Crank Time Phase1	(s)	0.4000			0	5	Passed
Crank Time Phase3	(s)	0.70			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)	542.80			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Development	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

		Phase 3				Overall Status	Passed
		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.70	21.70	25.80	20.00	30.00	Passed
Barometer	(mbar)	981.90	981.90	981.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.19	8.50	9.80	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	52.31	49.59	54.38	38.50	87.50	Passed
CVS Inlet Temperature	(°C)				20.00	93.33	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)				42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	n.a.			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59			3.52	3.66	Passed
Duration Phase 3	(s)	505.60					NA
Crank Time Phase1	(s)	0.4000			0	5	Passed
Crank Time Phase3	(s)	0.70			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	542.80			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/20/2021	**Time:**	13:09:19
Test Legislation:	EPA1066		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 test		

General Data

Test Number	*ONT3_001942*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*7/20/2021*	CH_4 Response Factor	
Test Start	*13:09:19*	Odometer Position [mi]	*63916*
Start Time Cycle	*2021-07-20 13|18-53-(000)*	Delay Time Method	
Test End	*14:31:22*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Domenic Coppola*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 test*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data *91_Pump_Gas* e15

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*e15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	ORVR_Prep	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001942	Driver	Domenic Coppola	Shift Table Auto		Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*13:09:19*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*14:31:22*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63916*	Remark	E15 test				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	104.51	Volume[scf]	7577
Zero Read	*0.00*							Press.[inHg]	28.94	D.F.	
Span Read	*0.00*							RH[%]	*20.16*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*9.731*	Ph. End[s]	1490.5
Mass.	*0.000*							Dist.[mi]	*7.51*	Ph. Length[s]	1490.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9688*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	103.02	Volume[scf]	6715
Zero Value	*0.00*							Press.[inHg]	28.93	D.F.	
Span Value	*0.00*							RH[%]	*21.41*	Ph. Start[s]	1490.6
Sample	*0.00*							AH[g/kg]	*9.894*	Ph. End[s]	2812.5
Mass.	*0.000*							Dist.[mi]	*2.38*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9739*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	102.70	Volume[scf]	7550
Zero Value	*0*							Press.[inHg]	28.92	D.F.	
Span Value	*0.00*							RH[%]	*22.76*	Ph. Start[s]	2812.6
Sample	*0*							AH[g/kg]	*10.429*	Ph. End[s]	4301.5
Mass.	*0.000*							Dist.[mi]	*7.45*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9908*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.34*

Test Data: ORVR_Prep Operator: Joseph Bishop Date: 7/20/2021
Test Number: ONT3_001942 Driver: Domenic Coppola

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Certification	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E15 test*

VIN KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [N]	*57.827*	*158.312*
B [N/km/h]	*0.17690*	*-0.43588*
C [N/km2/h2]	*0.041563*	*0.048089*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	11990.13	3792.75	11990.13		27773.02
Driven	12091.20	3825.90	11992.36		27909.46
Distance Rating (%)	0.8429	0.8739	0.0185		0.4913
Cycle Energy (MJ)					
Target	5.94	2.43	5.94		8.37
Driven	5.90	2.38	5.84		8.25
Distance per Energy Cycle (m/MJ)					
Target	5.94	2.43	5.94		1885.52
Driven	5.90	2.38	5.84		1922.65
Road Load Work Fraction					
Target	0.3753	0.1585	0.3753		0.3124
Driven	0.3703	0.1465	0.3644		0.3033
Inertial Work (MJ)					
Target	3.71	2.04	3.71		5.76
Driven	3.72	2.03	3.71		5.75
Inertial Work Fraction					
Target	0.6247	0.8415	0.6247		0.6876
Driven	0.6297	0.8535	0.6356		0.6967
Inertial Work Rating (%)	0.0748	-0.3826	-0.0434		-0.1310
Absolute Speed Change (m/s)					
Target	545.78	469.46	545.78		1015.24
Driven	547.28	461.95	545.47		1008.19
Absolute Speed Change Rating (%)	0.2736	-1.6003	-0.0580		-0.6945
Energy Rating (%)	-0.7179	-1.7813	-1.7571		-1.3297
Energy Economy Rating (%)	-1.5722	-2.7033	-1.8074		-1.9689

Operator	Joseph Bishop	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Certification	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_001942

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	40.28	39.90	40.80	37.78	43.33	Passed
Barometer	(mbar)	980.00	979.80	980.20	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.12	12.90	13.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	68.12	67.28	69.24	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	40.96	39.85	41.85	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.83	48.65	49.05	42.00	52.00	
Filter Face Velocity	(cm/s)	1.06			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.51			7.30	7.60	Passed
Duration Phase 1	(s)	1490.40					NA
Crank Time Phase1	(s)	1.50			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Certification	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.45	38.30	40.70	37.78	43.33	Passed
Barometer	(mbar)	979.68	979.60	979.80	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.32	12.70	13.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	69.26	65.97	71.21	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	41.24	40.75	42.15	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.70	48.65	49.05	42.00	52.00	
Filter Face Velocity	(cm/s)	0.86			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.38			2.31	2.40	Passed
Duration Phase 2	(s)	1321.90					NA
Crank Time Phase1	(s)	1.5000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Certification	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.28	38.40	40.70	37.78	43.33	Passed
Barometer	(mbar)	979.34	979.00	979.60	800.00	1100.00	Passed
Dew Point Temperature	(°C)	14.12	13.50	14.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	73.00	69.70	75.94	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.18	40.85	43.55	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.87	48.65	49.05	42.00	52.00	
Filter Face Velocity	(cm/s)	0.49			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.45			7.30	7.60	Passed
Duration Phase 3	(s)	1488.90					NA
Crank Time Phase1	(s)	1.5000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001942

ATDS Vehicle ID	3081-597164	*VIN*	KNMAT2MT2GP597164
Model Year	2016	*Make/Model*	NISSAN ROGUE
Test Group	GNSXT02.525A	*Engine Size*	2.5
Evaporative Family	GNSXR0120PBB	*Canister Capacity*	120
Odometer	63934	*Vehicle Test Volume*	50 ft3
Test Start Date	Tuesday, July 20, 2021	*Profile*	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **7/20/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	14:31:00	0:00:00	0:00:00	
Engine Key-off	14:34:00	0:03:00	0:03:00	
SHED Door Sealed	14:35:00	0:01:00	0:04:00	
Final Sample	15:35:00	1:00:00	1:04:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 4.122 ppm	Volume = 1804.1 ft3	Temp. = 102.6 °F	Baro. = 28.9 in/Hg	Mass HC=0.12 grams
Post Read Zero = 0 ppm	Post Read Span = 9.53 ppm			Mass EtOH= 0 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.33 ppm	Volume = 1801.8 ft3	Temp. = 105.2 °F	Baro. = 28.9 in/Hg	Mass HC =0.218 grams
Post Read Zero = -0.007 ppm	Post Read Span = 9.55 ppm			Mass EtOH = 0.042 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 104.5 °F	Minimum = 102 °F			
Max Ambient Temp = 107.1 °F	Maximum = 108 °F			
Min Interior Temp = 104.5 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.098±0.01 grams**
				Diurnal Mass EtOH = 0.042 grams
				Diurnal Total Mass HC plus EtOH = 0.1085 grams

HOT SOAK TEST STATUS = COMPLETE

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P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Tuesday, July 20, 2021	16:35:00	0:00:00	
End Cold Soak	Tuesday, July 20, 2021	22:35:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 62.8 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.7 °F	Maximum = 68 °F			
Min. Internal Temp = 62.8 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	NISSAN ROGUE
Test Group	GNSXT02.525A	***Engine Size***	2.5
Evaporative Family	GNSXR0120PBB	***Capacity***	120
Odometer	63934	***Vehicle Test Volume***	50 ft3
Test Start Date	Tuesday, July 20, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Tuesday, July 20, 2021	22:35:00	0:00:00	
Start Time Diurnal	Tuesday, July 20, 2021	22:35:00	0:00:00	
End Time Diurnal	Wednesday, July 21, 2021	22:35:00	24:00:00	
24 Hour Sample	Wednesday, July 21, 2021	22:35:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.345 ppm	Volume = 1681.6 ft3	Temp. = 65.2 °F	Baro. = 28.88 in/Hg	Mass HC =0.245 grams
Post Read Zero = 0 ppm	Post Read Span = 9.751 ppm			Mass EtOH= 0.069 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 16.424 ppm	Volume = 1666.5 ft3	Temp. = 65 °F	Baro. = 28.96 in/Hg	Mass HC=0.85 grams
Post Read Zero = -0.016 ppm	Post Read Span = 93.314 ppm			Mass EtOH= 0.275 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.7 °F	± 5 °F			
Min Water Temperature 64.28 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.605±0.01 grams**
				Diurnal Mass EtOH = 0.206 grams
				Diurnal Total Mass HC plus EtOH = 0.657 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	NISSAN ROGUE
Test Group	GNSXT02.525A	***Engine Size***	2.5
Evaporative Family	GNSXR0120PBB	***Capacity***	120
Odometer	63934	***Vehicle Test Volume***	50 ft3
Test Start Date	Tuesday, July 20, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Wednesday, July 21, 2021	22:35:00	24:00:00	
Start Time Diurnal	Wednesday, July 21, 2021	22:35:00	24:00:00	
End Time Diurnal	Thursday, July 22, 2021	22:35:00	48:00:00	
48 Hour Sample	Thursday, July 22, 2021	22:35:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 16.424 ppm	Volume = 1666.5 ft3	Temp. = 65 °F	Baro. = 28.96 in/Hg	Mass HC=0.85 grams
Post Read Zero = 0 ppm	Post Read Span = 93.314 ppm			Mass EtOH= 0.275 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 24.142 ppm	Volume = 1651.3 ft3	Temp. = 65 °F	Baro. = 29.03 in/Hg	Mass HC=1.323 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.305 ppm			Mass EtOH= 0 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.7 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.473±0.01 grams**
				Diurnal Mass EtOH = 0.172 grams *
				Diurnal Total Mass HC plus EtOH = 0.516 grams *

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	NISSAN ROGUE
Test Group	GNSXT02.525A	***Engine Size***	2.5
Evaporative Family	GNSXR0120PBB	***Capacity***	120
Odometer	63934	***Vehicle Test Volume***	50 ft3
Test Start Date	Tuesday, July 20, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Thursday, July 22, 2021	22:35:00	48:00:00	
Start Time Diurnal	Thursday, July 22, 2021	22:35:00	48:00:00	
End Time Diurnal	Friday, July 23, 2021	22:35:00	72:00:00	
72 Hour Sample	Friday, July 23, 2021	22:35:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 24.142 ppm	Volume = 1651.3 ft3	Temp. = 65.03 °F	Baro. = 29.03 in/Hg	Mass HC=1.323 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.305 ppm			Mass EtOH= 0 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 31.066 ppm	Volume = 1637.7 ft3	Temp. = 65 °F	Baro. = 29.09 in/Hg	Mass HC=1.728 grams
Post Read Zero = -0.032 ppm	Post Read Span = 93.295 ppm			Mass EtOH= 0 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.6 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.405±0.01 grams**
				Diurnal Mass EtOH = 0.144 grams *
				Diurnal Total Mass HC plus EtOH = 0.441 grams *

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

3-Day Diurnal Standard **0.65**

Final Diurnal Total Mass HC plus EtOH emissions results: 0.766 grams {hot soak + highest 24 hour mass}

VS Standard **118%**

* EtOH multiplier obtained from the results of hot soak and day 1 diurnal were used to calculate EtOH results of day 2 and 3 diurnals. EtOH multiplier = 1.09.

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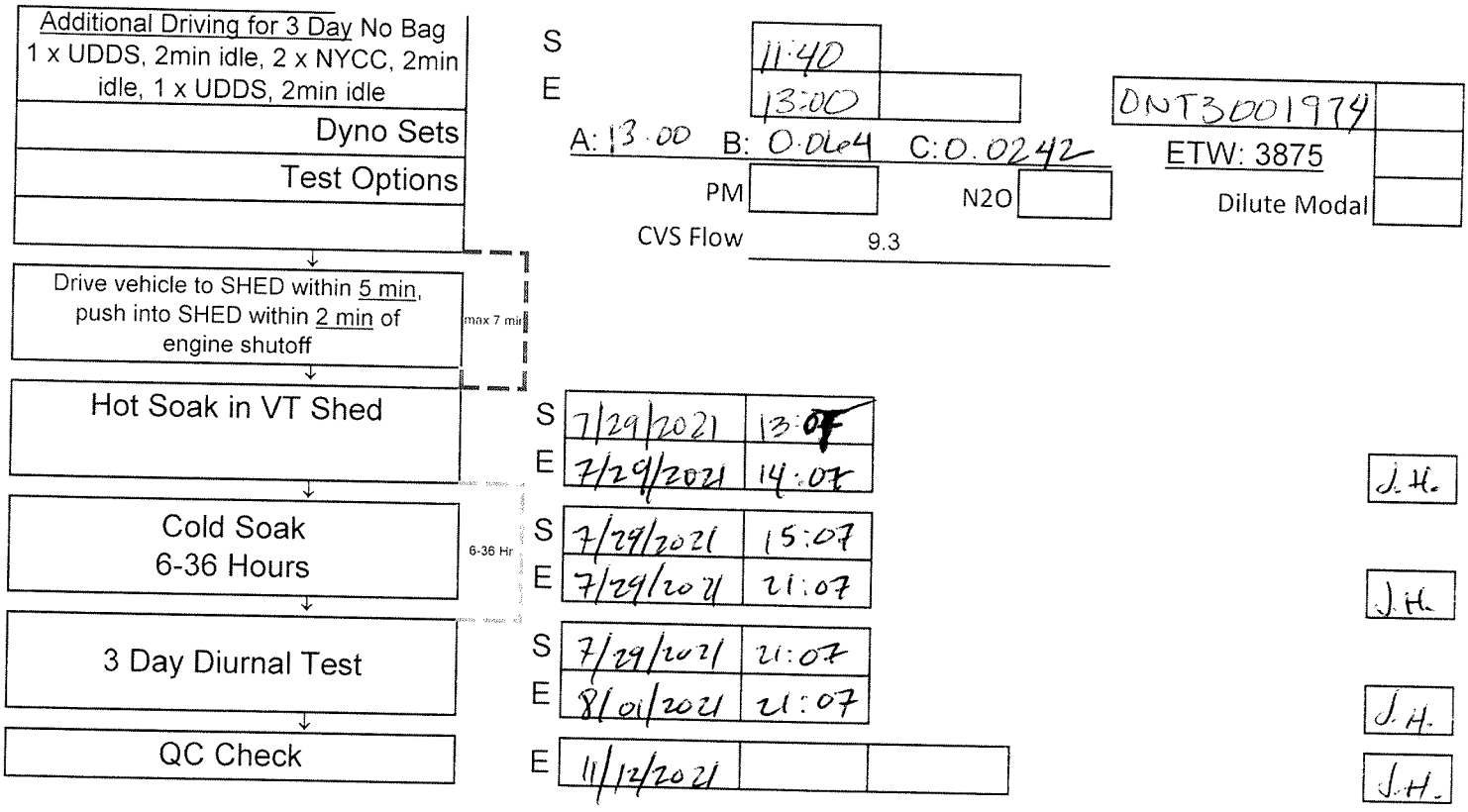
Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Nissan Rogue
Vehicle #:	3081-597164	**Engine Size**	2.5L
VIN:	KNMAT2MT2GP597164	**Model Year**	2016
Engine Family:	GNSXT02.525A	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Precon FTP 72 (UDDS)	S	7/28/21	17:41	63974			
	E		18:11	63941			
Dyno Sets	A:	B:	C:			ETW: 3875	
Vehicle Soak 68-86°F	S	✓	18:15				
	E	7/29/2021					
Canister Loading with Butane Type: 1.5x Load	S	7/28/2021	18:22				
	E	7/29/2021	06:47				
Canister Loading Specs	Cap	120	Vol	2.4			
	Purge	300	Flow Rate	15		GNSXR0120PBB	
Set tire pressure to sticker	Front	33	Back	33			JC
No Bag Cold Start FTP 75	S	7/29/2021	08:52	63941			
	E	↓	09:57	63953			
Dyno Sets	A: 13.00	B: 0.064	C: 0.0242			ETW: 3875	
Test Options	PM		N2O			Dilute Modal	
	CVS Flow	P1:9.3 P2:9.3 P3:9.3					
Pre Test Comments	E15 Test						
Fuel Tank Temp. Stabilization at 105F	S	7/29/2021	10:45				
	E	↓	11:45				

74.6
68.6
20.9


Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
S
E
11:40
13:00
A: 13.00 B: 0.064 C: 0.0242
PM
N2O
CVS Flow 9.3
DNT3001974
ETW: 3875
Dilute Modal
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
S 7/29/2021 13:07
E 7/29/2021 14:07
J.H.
Cold Soak
6-36 Hours
6-36 Hr
S 7/29/2021 15:07
E 7/29/2021 21:07
J.H.
3 Day Diurnal Test
S 7/29/2021 21:07
E 8/01/2021 21:07
J.H.
QC Check
E 11/12/2021
J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/28/2021	**Time:**	17:41:31
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	ONT3_001972		
Test Name	FTP72		
Test Cell	iGEM-V-TC1		
Test Type	FTP72 ✓		
Legislation	EPA1066		
Requirements (Bag)	SIMPLE		
Date	7/28/2021	CH_4 Response Factor	
Test Start	17:41:31	Odometer Position [mi]	63934
Start Time Cycle	2021-07-28 17|49-56-(000)	Delay Time Method	
Test End	18:11:11		
Operator	Victor Escudero	Air Condition	OFF
Driver	Victor Escudero	Particle Measurement	USUAL
Shifttable	Auto		
Flow Stream	PreCon		
Calibrated Ranges	autorange		
Remark	precon		

Vehicle Data — 3081-597164 ✓

Manufacturer	ROGUE	Displacement	
Vehicle Model	KNMAT2MT2GP597164 ✓	Engine Family	GNSXT02.525A ✓
Order Number	3081	Manufacturer	NISSAN
Test Group	3081-597164	Transmission	Automatic
Evaporative Family	GNSXR0120PBB	Engine Code	
Made Date	2016 ✓	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	1
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	0	Tank Volume [gal]	0
Engine Code	GNSXT02.525A	Tank Material	
Number of Cylinders	4		

Dyno Data — 3081

Dyno Type	SVOR	Inertia [lb]	3875.00 ✓		
	A [lbf]	B [lbf/mph]	C [lbf/mph2]		
Street Load	35.590 ✓	-0.15770 ✓	0.028000 ✓		
Road Load	13.000 ✓	0.06400 ✓	0.024200 ✓		

Fuel Data — ~~91_Pump_Gas~~ E15 ✓

Fuel Type	GASOLINE	Fuel Temperature [°C]	15.00
Fuel Analyze Date		Fuel Density [kg/l]	0.7380
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	18085
Fuel Tank Number		Carb. Weight Frac.	0.8527
Fuel Charge		HC Ratio	1.8742
Remarks:	E15 fuel ✓	OC Ratio	-1.0000

Weather Limit Data

Temp Min [deg F]	68.00	Dew Point Max [deg F]	100.00
Temp Max [deg F]	86.00	Pressure Min [mbar]	800.0
Dew Point Min [deg F]	15.01	Pressure Max [mbar]	1100.0

Fan Speed Data — FTP75

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Victor Escudero		Speed Table	Date:	
Test Number	ONT3_001972	Driver	Victor Escudero		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		91_Pump_Gas	Start Time	*17:41:31*
		A [lbf]	*13.000*		Fuel type GASOLINE	End Time	*18:11:11*
Model	ROGUE	B [lbf/mph]	*0.06400*		Density *0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63934*	Remark	precon				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.84	Volume[scf]	2593
Zero Read	*0.00*							Press.[inHg]	28.91	D.F.	
Span Read	*0.00*							RH[%]	*44.53*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.451*	Ph. End[s]	505.4
Mass.	*0.000*							Dist.[mi]	*3.62*	Ph. Length[s]	505.4
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9308*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.37	Volume[scf]	4444
Zero Value	*0.00*							Press.[inHg]	28.91	D.F.	
Span Value	*0.00*							RH[%]	*46.20*	Ph. Start[s]	505.5
Sample	*0.00*							AH[g/kg]	*8.635*	Ph. End[s]	1375.1
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	869.7
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9361*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start[s]	
Sample	*0*							AH[g/kg]		Ph. End[s]	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start	
Sample	*0*							AH[g/kg]		Ph. End	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_X$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.49*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*44.53*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*8.45*
CVS Volume[scf]	*2593.05*	Act. Dist.[mi]	*3.62*	Pressure[inHg]	*28.91*
CVS Flow[scfm]	*307.84*			Temp.[°F]	*74.84*
CVS Inlet Pressure	*28.83*			Temp. Min.[°F]	*72.32*
CVS Inlet Temp.[°F]	*97.44*			Temp. Max.[°F]	*78.08*
CVS Inlet Temp. Min.[°F]	*94.37*			NO_X Corr. F	*0.9308*
CVS Inlet Temp. Max.[°F]	*100.13*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*46.20*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*8.64*
CVS Volume[scf]	*4444.07*	Act. Dist.[mi]	*3.87*	Pressure[inHg]	*28.91*
CVS Flow[scfm]	*306.59*			Temp.[°F]	*74.37*
CVS Inlet Pressure	*28.83*			Temp. Min.[°F]	*72.14*
CVS Inlet Temp.[°F]	*98.86*			Temp. Max.[°F]	*77.90*
CVS Inlet Temp. Min.[°F]	*97.97*			NO_x Corr. F	*0.9361*
CVS Inlet Temp. Max.[°F]	*100.31*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

Test Data: FTP72 Operator: Victor Escudero Date: 7/28/2021
Test Number: ONT3_001972 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *precon*

VIN KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [N]	*57.827*	*158.312*
B [N/km/h]	*0.17690*	*-0.43588*
C [N/km2/h2]	*0.041563*	*0.048089*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.20
Driven	5819.90	6228.63			12048.53
Distance Rating (%)	0.7052	0.2830			0.4865
Cycle Energy (MJ)					
Target	3.13	2.81			
Driven	3.08	2.76			
Distance per Energy Cycle (m/MJ)					
Target	3.13	2.81			
Driven	3.08	2.76			
Road Load Work Fraction					
Target	0.4397	0.3037			
Driven	0.4552	0.3044			
Inertial Work (MJ)					
Target	1.75	1.96			
Driven	1.68	1.92			
Inertial Work Fraction					
Target	0.5603	0.6963			
Driven	0.5448	0.6956			
Inertial Work Rating (%)	-4.2484	-2.0519			
Absolute Speed Change (m/s)					
Target	204.88	340.91			
Driven	199.52	336.62			
Absolute Speed Change Rating (%)	-2.6162	-1.2586			
Energy Rating (%)	-1.5158	-1.9435			-1.7182
Energy Economy Rating (%)	-2.2551	-2.2706			-2.2432

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_001972

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.80	22.40	25.60	20.00	30.00	Passed
Barometer	(mbar)	979.03	979.00	979.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.00	10.00	12.50	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	59.15	55.00	65.38	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	36.36	34.65	37.85	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	54.74	53.65	55.55	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62			3.52	3.66	Passed
Duration Phase 1	(s)	505.30					NA
Crank Time Phase1	(s)	0.40			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.54	22.30	25.50	20.00	30.00	Passed
Barometer	(mbar)	978.97	978.90	979.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.30	9.60	13.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	60.45	53.88	69.83	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	37.14	36.65	37.95	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	54.74	53.65	55.55	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87			3.78	3.94	Passed
Duration Phase 2	(s)	869.60					NA
Crank Time Phase1	(s)	0.4000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS CANISTER WORKSHEET

Station number 2

--PURGE AND FILL--

VT#	3081-597164 ✓
Project	3081
Evap Family	GNSXT02.525A ✓
Ambient Temperature-Deg F	75
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	68.6
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.4
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	18:22:44
Start date	07-28-2021
Bed Purges/Cycle	300
Purge End/Load Start	18:55:17
Test Time Minutes	744
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	-1.01
Butane Flow Actual-Gm/Hr	15.2
Cycles Completed	1
Finish time	06:47:32
Finish date	07-29-2021
Disk File Name	21072901.ST2

QUALITY ASSURANCE

INSPECTED BY: J H.

DATE: 11/12/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/29/2021	**Time:**	8:52:04
Test Legislation:	EPA1066		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	e15 test		

AD QUALITY ASSURANCE

INSPECTED BY: S. H.

DATE: 11/12/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001973*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*7/29/2021*	CH_4 Response Factor	
Test Start	*8:52:04*	Odometer Position [mi]	*63941*
Start Time Cycle	*2021-07-29 09|17-11-(000)*	Delay Time Method	
Test End	*9:57:41*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*e15 test*		

Vehicle Data *3081-597164* ✓

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164* ✓	Engine Family	*GNSXT02.525A* ✓
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB* ✓	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*35.590* ✓	*-0.15770* ✓	*0.028000* ✓
Road Load	*13.000* ✓	*0.06400* ✓	*0.024200* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Domenic Coppola	Speed Table		Date:
Test Number	ONT3_001973	Driver	Jennifer Chappell	Shift Table Auto		Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*8:52:04*
		A [lbf]	*13.000*	Fuel type	GASOLINE	End Time	*9:57:41*
Model	ROGUE	B [lbf/mph]	*0.06400*	Density	*0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*	NHV	18085	Soak Time	547.3
Displacement:				CWF	*0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63941*	Remark	e15 test				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	78.03	Volume[scf]	2606
Zero Read	*0.00*							Press.[inHg]	28.92	D.F.	
Span Read	*0.00*							RH[%]	*38.63*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.144*	Ph. End[s]	505.9
Mass.	*0.000*							Dist.[mi]	*3.61*	Ph. Length[s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9222*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.33	Volume[scf]	4459
Zero Value	*0.00*							Press.[inHg]	28.92	D.F.	
Span Value	*0.00*							RH[%]	*42.18*	Ph. Start[s]	506.0
Sample	*0.00*							AH[g/kg]	*8.133*	Ph. End[s]	1375.7
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	869.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9218*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	77.44	Volume[scf]	2594
Zero Value	*0*							Press.[inHg]	28.91	D.F.	
Span Value	*0.00*							RH[%]	*40.77*	Ph. Start[s]	1921.0
Sample	*0*							AH[g/kg]	*8.434*	Ph. End[s]	2426.9
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	506.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9303*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.00*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *11.07*

Test Data: FTP75 Operator: Domenic Coppola Date: 7/29/2021
Test Number: ONT3_001973 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *e15 test*

VIN KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [N]	*57.827*	*158.312*
B [N/km/h]	*0.17690*	*-0.43588*
C [N/km2/h2]	*0.041563*	*0.048089*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6210.96	5779.15		17769.25
Driven	5804.53	6222.76	5787.57		17814.85
Distance Rating (%)	0.4393	0.1900	0.1457		0.2567
Cycle Energy (MJ)					
Target	3.13	2.81	3.13		5.94
Driven	3.09	2.76	3.09		5.85
Distance per Energy Cycle (m/MJ)					
Target	3.13	2.81	3.13		2017.35
Driven	3.09	2.76	3.09		2053.81
Road Load Work Fraction					
Target	0.4397	0.3037	0.4397		0.3753
Driven	0.4406	0.2943	0.4297		0.3683
Inertial Work (MJ)					
Target	1.75	1.96	1.75		3.71
Driven	1.73	1.95	1.76		3.70
Inertial Work Fraction					
Target	0.5603	0.6963	0.5603		0.6247
Driven	0.5594	0.7057	0.5703		0.6317
Inertial Work Rating (%)	-1.4596	-0.5601	0.5516		-0.4435
Absolute Speed Change (m/s)					
Target	204.88	340.92	204.87		545.79
Driven	202.40	340.50	204.42		544.05
Absolute Speed Change Rating (%)	-1.2112	-0.1214	-0.2206		-0.3186
Energy Rating (%)	-1.2939	-1.8821	-1.2190		-1.4504
Energy Economy Rating (%)	-1.7559	-2.1119	-1.3815		-1.8073

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_001973

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	25.57	23.40	26.50	20.00	30.00	Passed
Barometer	(mbar)	979.32	979.20	979.40	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.45	9.10	11.00	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	57.01	51.78	59.20	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	35.21	33.35	36.55	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	54.16	52.65	55.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61			3.52	3.66	Passed
Duration Phase 1	(s)	505.80					NA
Crank Time Phase1	(s)	0.90			0	5	Passed
Crank Time Phase3	(s)	1.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	547.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.07	22.70	26.20	20.00	30.00	Passed
Barometer	(mbar)	979.19	979.10	979.20	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.40	8.90	12.20	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	56.93	51.17	64.08	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	35.36	34.75	36.25	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	54.63	52.65	55.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87			3.78	3.94	Passed
Duration Phase 2	(s)	869.70					NA
Crank Time Phase1	(s)	0.9000			0	5	Passed
Crank Time Phase3	(s)	1.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)	547.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	25.24	24.10	26.50	20.00	30.00	Passed
Barometer	(mbar)	979.17	979.10	979.20	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.96	9.40	11.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	59.04	53.08	62.16	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	35.34	34.35	36.65	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	54.87	52.65	55.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 3	(s)	505.90					NA
Crank Time Phase1	(s)	0.9000			0	5	Passed
Crank Time Phase3	(s)	1.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	547.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/29/2021	**Time:**	11:40:57
Test Legislation:	EPA1066		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 test		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/12/2021

COMMENTS: ok

General Data

Test Number	*ONT3_001974*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*7/29/2021*	CH_4 Response Factor	
Test Start	*11:40:57*	Odometer Position [mi]	*63953*
Start Time Cycle	*2021-07-29 11|48-50-(000)*	Delay Time Method	
Test End	*13:00:45*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 test*		

Vehicle Data *3081-597164*

Manufacturer	*ROGUE*	Displacement	
Vehicle Model	*KNMAT2MT2GP597164*	Engine Family	*GNSXT02.525A*
Order Number	*3081*	Manufacturer	*NISSAN*
Test Group	*3081-597164*	Transmission	*Automatic*
Evaporative Family	*GNSXR0120PBB*	Engine Code	
Made Date	*2016*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*GNSXT02.525A*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
Street Load	*35.590*	*-0.15770*	*0.028000*
Road Load	*13.000*	*0.06400*	*0.024200*

Fuel Data ~~*91_Pump_Gas*~~ E15

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15 Test*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	ORVR_Prep	Operator	Domenic Coppola		Speed Table	Date:	
Test Number	ONT3_001974	Driver	Jennifer Chappell		Shift Table Auto	Cold Start	
Vehicle	KNMAT2MT2GP597164	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***KNMAT2MT2GP597164***	Inertia [lb]	*3875.00*		91_Pump_Gas	Start Time	*11:40:57*
		A [lbf]	*13.000*		Fuel type GASOLINE	End Time	*13:00:45*
Model	ROGUE	B [lbf/mph]	*0.06400*		Density *0.7380*		
Year	*2016*	C [lbf/mph2]	*0.024200*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	GNSXT02.525A						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*63953*	Remark	E15 test				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	105.13	Volume[scf]	7600
Zero Read	*0.00*							Press.[inHg]	28.89	D.F.	
Span Read	*0.00*							RH[%]	*18.84*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*9.275*	Ph. End[s]	1490.3
Mass.	*0.000*							Dist.[mi]	*7.49*	Ph. Length[s]	1490.3
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9549*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.30*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	104.17	Volume[scf]	6719
Zero Value	*0.00*							Press.[inHg]	28.88	D.F.	
Span Value	*0.00*							RH[%]	*19.67*	Ph. Start[s]	1490.4
Sample	*0.00*							AH[g/kg]	*9.415*	Ph. End[s]	2812.3
Mass.	*0.000*							Dist.[mi]	*2.38*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9591*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	104.69	Volume[scf]	7551
Zero Value	*0*							Press.[inHg]	28.88	D.F.	
Span Value	*0.00*							RH[%]	*19.35*	Ph. Start[s]	2812.4
Sample	*0*							AH[g/kg]	*9.407*	Ph. End[s]	4301.3
Mass.	*0.000*							Dist.[mi]	*7.48*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9589*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.35*

Test Data: ORVR_Prep Operator: Domenic Coppola Date: 7/29/2021
Test Number: ONT3_001974 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E15 test*

VIN KNMAT2MT2GP597164

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [N]	*57.827*	*158.312*
B [N/km/h]	*0.17690*	*-0.43588*
C [N/km2/h2]	*0.041563*	*0.048089*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	11990.13	3792.75	11990.13		27773.01
Driven	12060.29	3823.55	12028.55		27912.39
Distance Rating (%)	0.5851	0.8122	0.3204		0.5019
Cycle Energy (MJ)					
Target	5.94	2.43	5.94		8.37
Driven	5.93	2.38	5.88		8.28
Distance per Energy Cycle (m/MJ)					
Target	5.94	2.43	5.94		1885.47
Driven	5.93	2.38	5.88		1915.97
Road Load Work Fraction					
Target	0.3753	0.1584	0.3753		0.3124
Driven	0.3593	0.1467	0.3674		0.3015
Inertial Work (MJ)					
Target	3.71	2.04	3.71		5.76
Driven	3.80	2.03	3.72		5.78
Inertial Work Fraction					
Target	0.6247	0.8416	0.6247		0.6876
Driven	0.6407	0.8533	0.6326		0.6985
Inertial Work Rating (%)	2.2520	-0.6242	0.2487		0.4946
Absolute Speed Change (m/s)					
Target	545.80	469.54	545.80		1015.33
Driven	552.91	459.56	548.51		1009.96
Absolute Speed Change Rating (%)	1.3038	-2.1261	0.4969		-0.5296
Energy Rating (%)	-0.3012	-1.9853	-1.0065		-0.8796
Energy Economy Rating (%)	-0.8890	-2.8542	-1.3404		-1.6176

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_001974

Vehicle ID: KNMAT2MT2GP597164

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	40.63	39.80	41.90	37.78	43.33	Passed
Barometer	(mbar)	978.36	978.20	978.50	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.37	12.20	12.50	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	64.93	63.88	65.66	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	39.71	37.25	40.85	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.40	49.85	51.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.49			7.30	7.60	Passed
Duration Phase 1	(s)	1490.20					NA
Crank Time Phase1	(s)	1.30			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	40.10	39.80	40.50	37.78	43.33	Passed
Barometer	(mbar)	978.10	978.00	978.20	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.59	12.50	12.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	65.91	65.29	66.43	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	39.96	39.45	41.25	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.91	49.85	51.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.38			2.31	2.40	Passed
Duration Phase 2	(s)	1321.90					NA
Crank Time Phase1	(s)	1.3000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

		Phase 3					Overall Status	Passed
		Average	Min	Max	Low Limit	Upper Limit	Status	
General								
Cell Temperature	(°C)	40.38	37.80	42.30	37.78	43.33	Passed	
Barometer	(mbar)	977.85	977.70	978.00	800.00	1100.00	Passed	
Dew Point Temperature	(°C)	12.55	11.90	12.90	-9.44	37.78	Passed	
Specific Humidity Test Cell	(gr/lb)	65.85	62.64	67.55	38.50	87.50	Passed	
CVS Inlet Temperature	(°C)	41.08	39.75	42.95	20.00	93.33	Passed	
Dilution Factor	(-)				7.00	20.00		
Fuel Economy	(mpg)				10.00	50.00		
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed	
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed	
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed	
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed	
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed	
Ambient Concentrations								
HC	(ppm)				2.00	6.00		
NO_x	(ppm)				-0.10	0.10		
CO	(ppm)				0.20	0.99		
CO_2	(ppm)				300.00	600.00		
CH_4	(ppm)				1.30	3.00		
N2O	(ppm)				0.30	0.40		
Bag Analysis Time Ambient	(s)				0.00	NA		
Bag Analysis Time Exhaust	(s)				0.00	NA		
PM Filter Parameters								
Particulate Filter Temperature	(°C)	50.93	49.85	51.15	42.00	52.00		
Filter Face Velocity	(cm/s)				0.00	100.00		
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A	
Test-Cycle Specific Validations								
Phase Distance	(miles)	7.48			7.30	7.60	Passed	
Duration Phase 3	(s)	1488.90					NA	
Crank Time Phase1	(s)	1.3000			0	5	Passed	
Crank Time Phase3	(s)	0.00			0	5	Passed	
Crank Counts		1			0	1	Passed	
Shutdown Time Phase 1					0	5		
Shutdown Time Phase 3					0	5		
Hot Soak Time	(s)				540.00	660.00		
Test Hold Counts		0					Passed	
Duration Test Hold	(s)	0.00			0	60	Passed	

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001974

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	NISSAN ROGUE
Test Group	GNSXT02.525A	***Engine Size***	2.5
Evaporative Family	GNSXR0120PBB	***Canister Capacity***	120
Odometer	63970	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, July 29, 2021	***Profile***	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **7/29/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	13:00:00	0:00:00	0:00:00	
Engine Key-off	13:05:00	0:05:00	0:05:00	
SHED Door Sealed	13:07:00	0:02:00	0:07:00	
Final Sample	14:07:00	1:00:00	1:07:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 4.826 ppm	Volume = 1803.8 ft3	Temp. = 103.9 °F	Baro. = 28.88 in/Hg	Mass HC=0.133 grams
Post Read Zero = 0 ppm	Post Read Span = 9.55 ppm			Mass EtOH= 0.02 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 8.224 ppm	Volume = 1798.4 ft3	Temp. = 105 °F	Baro. = 28.85 in/Hg	Mass HC =0.225 grams
Post Read Zero = -0.015 ppm	Post Read Span = 9.54 ppm			Mass EtOH = 0.06 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 103.5 °F	Minimum = 102 °F			
Max Ambient Temp = 106.9 °F	Maximum = 108 °F			
Min Interior Temp = 103.5 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.092±0.01 grams**
				Diurnal Mass EtOH = 0.04 grams
				Diurnal Total Mass HC plus EtOH = 0.102 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, July 29, 2021	15:07:00	0:00:00	
End Cold Soak	Thursday, July 29, 2021	21:07:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 62.8 °F	Minimum = 62 °F			
Max. Ambient Temp = 67.9 °F	Maximum = 68 °F			
Min. Internal Temp = 62.8 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	NISSAN ROGUE
Test Group	GNSXT02.525A	***Engine Size***	2.5
Evaporative Family	GNSXR0120PBB	***Capacity***	120
Odometer	63970	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, July 29, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Thursday, July 29, 2021	21:07:00	0:00:00	
Start Time Diurnal	Thursday, July 29, 2021	21:07:00	0:00:00	
End Time Diurnal	Friday, July 30, 2021	21:07:00	24:00:00	
24 Hour Sample	Friday, July 30, 2021	21:07:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 8.44 ppm	Volume = 1677.2 ft3	Temp. = 65 °F	Baro. = 28.89 in/Hg	Mass HC =0.232 grams
Post Read Zero = 0 ppm	Post Read Span = 93.359 ppm			Mass EtOH= 0.075 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 23.691 ppm	Volume = 1667.8 ft3	Temp. = 65 °F	Baro. = 29 in/Hg	Mass HC=0.65 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.302 ppm			Mass EtOH= 0.263 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.8 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.9 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.52 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.418±0.01 grams**
				Diurnal Mass EtOH = 0.188 grams
				Diurnal Total Mass HC plus EtOH = 0.465 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	NISSAN ROGUE
Test Group	GNSXT02.525A	***Engine Size***	2.5
Evaporative Family	GNSXR0120PBB	***Capacity***	120
Odometer	63970	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, July 29, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Friday, July 30, 2021	21:07:00	24:00:00	
Start Time Diurnal	Friday, July 30, 2021	21:07:00	24:00:00	
End Time Diurnal	Saturday, July 31, 2021	21:07:00	48:00:00	
48 Hour Sample	Saturday, July 31, 2021	21:07:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 23.691 ppm	Volume = 1667.8 ft3	Temp. = 65 °F	Baro. = 29 in/Hg	Mass HC=0.65 grams
Post Read Zero = 0 ppm	Post Read Span = 93.302 ppm			Mass EtOH= 0.263 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 36.808 ppm	Volume = 1659.9 ft3	Temp. = 64.9 °F	Baro. = 29.01 in/Hg	Mass HC=1.005 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.292 ppm			Mass EtOH= 0.444 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = -0.2 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.9 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.3 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.355±0.01 grams**
				Diurnal Mass EtOH = 0.181 grams
				Diurnal Total Mass HC plus EtOH = 0.4 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-597164	***VIN***	KNMAT2MT2GP597164
Model Year	2016	***Make/Model***	NISSAN ROGUE
Test Group	GNSXT02.525A	***Engine Size***	2.5
Evaporative Family	GNSXR0120PBB	***Capacity***	120
Odometer	63970	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, July 29, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Saturday, July 31, 2021	21:07:00	48:00:00	
Start Time Diurnal	Saturday, July 31, 2021	21:07:00	48:00:00	
End Time Diurnal	Sunday, August 1, 2021	21:07:00	72:00:00	
72 Hour Sample	Sunday, August 1, 2021	21:07:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 36.808 ppm	Volume = 1659.9 ft3	Temp. = 64.93 °F	Baro. = 29.01 in/Hg	Mass HC=1.005 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.292 ppm			Mass EtOH= 0.444 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 48.826 ppm	Volume = 1653 ft3	Temp. = 65 °F	Baro. = 29.03 in/Hg	Mass HC=1.328 grams
Post Read Zero = -0.018 ppm	Post Read Span = 93.277 ppm			Mass EtOH= 0.61 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = -0.2 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.9 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.323±0.01 grams**
				Diurnal Mass EtOH = 0.166 grams
				Diurnal Total Mass HC plus EtOH = 0.365 grams

QUALITY ASSURANCE

INSPECTED BY: J H.

DATE: 11/12/2021

COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

3-Day Diurnal Standard **0.65**

Final Diurnal Total Mass HC plus EtOH emissions results: **0.567 grams {hot soak + highest 24 hour mass}**

VS Standard **87%**

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Automotive Testing and Development Services, Inc.

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Emissions
- *FTP Protocol*
- *SFTP Protocol*
- *Euro Protocols*
- *Asia Protocols*
- *Evaporative Emissions*
- *NMOG Determination*
- *Electric Vehicle Range*

Hydrocarbon Speciation
- *New Vehicle Certification*
- *In-Use Verification*
- *Gasoline*
- *Diesel*

Durability
- *Passenger Cars*
- *Light-Duty*
- *Medium-Duty*
- *Heavy-Duty*
- *Highway Motorcycles*
- *Non-road Motorcycles*
- *Non-road UTV/ATV*
- *Component*
- *On-road (Public Roads)*
- *Proving Grounds*
- *Temporary Test Sites*
- *OBD System Download*
- *Custom Data Logging*

Engineering
- *SAE Coast-Downs*
- *SAE Fuel Economy*
- *SAE OBD Compliance*
- *CFR Testing and Procedures*
- *CCR Testing and Procedures*
- *SAE J2807 Trailer Tow Rating*

Procurement
- *OEM In-Use*
- *Agency In-Use*
- *Component Collection*
- *Data Collection*
- *Usage Surveys*

Staffing
- *Drivers*
- *Mechanics*
- *Data Technicians*
- *Maintenance*
- *Administrative*
- *Lab Technicians*

January 28, 2022

Chris Bliley
Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

Kelly Davis
Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

Final Report on Evaporative Emissions Test Procedure Performed for Growth Energy and the Renewable Fuels Association.

Dear Chris Bliley and Kelly Davis,

Automotive Testing and Development Services, Inc. (ATDS) is pleased to provide this final report for the evaporative emissions testing conducted on vehicles for Renewable Fuels Association. This testing was conducted in strict accordance with 40 CFR 86 and California Title 13. ATDS' QA representatives have subjected all tests to a rigorous quality audit.

Sincerely,

Jose Haro
Test Engineer

Approved by:

Linwood E Farmer Jr.

Linwood Farmer
Vice President

Evaporative Emissions Testing

Project Number: 3081 - 009493

CONDUCTED FOR:

Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

&

Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

REPORT PREPARED BY:

Jose Haro, Test Engineer
Automotive Testing and Development Services, Inc.
400 South Etiwanda Avenue
Ontario, California 91761

Automotive Testing and Development Services, Inc. submitted this Report in fulfillment of Project 3081 - 009493 Evaporative Emissions Test Procedure. In ATDS' professional opinion this testing was conducted in a valid manner according to the listed methodology.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
PROJECT OVERVIEW 4
TEST VEHICLE INFORMATION 4
TEST SEQUENCE AND CHRONOLOGY 4
TEST PARAMETERS 6
E10 SHED TEST # 1 RESULTS 6
E10 SHED TEST # 2 RESULTS 6
E15 SHED TEST # 1 RESULTS 7
E15 SHED TEST # 2 RESULTS 7
RESULTS SUMMARY 8
DATA REVIEW AND CONCLUSION 9
APPENDIX 10

PROJECT OVERVIEW

This testing was conducted on behalf of Growth Energy and the Renewable Fuels Association. The project consisted of the 3-day evaporative emissions test sequence performed with two different fuels. Work commenced on February 24th, 2021 and was completed on June 7th, 2021.

TEST VEHICLE INFORMATION

The following vehicle was used for this project:

ATDS Vehicle ID:	3081-009493
VIN:	2T3H1RFV7KW009493
MY/Make/Model:	2019 Toyota Rav-4
Test Group:	KTYXT02.5N4H
Evaporative Family:	KTYXR0130P82
Tires:	225/65R/17 102H
Odometer:	37,510 miles

TEST SEQUENCE AND CHRONOLOGY

The following test sequence and chronology were used in this program:

2/24/2021
- Vehicle check in
- Flushed windshield washer fluid system and fluid bottle removed

2/25/2021
- Canister Purge
- Fuel changed to E10
- FTP-72 (X4)

2/25/2021 – 3/22/2021
- 21-day soak

3/23/2021
- Performed road load derivation (Test ID: ONT3_001663)
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001664)
- Canister loading (21032401.ST4)

3/24/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001665)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001666)

3/24/2021 – 3/27/2021
- 3-Day Diurnal evaporative emissions test run. E10 Test #1.

4/7/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001737)
- Canister loading (21040801.ST4)

4/8/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001739)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001740)

4/8/2021 – 4/11/2021
- 3-Day Diurnal evaporative emissions test run (E10 Test #2)

4/26/2021
- Canister Purge
- Fuel changed to E-15

4/28/2021
- FTP-74 (X4)

4/28/2021 – 5/25/2021
- 21-day soak

5/26/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001849)
- Canister loading (21052701.ST4)

5/27/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001851)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001852)

5/27/2021 – 5/31/2021
- 3-Day Diurnal evaporative emissions test run (E15 Test #1)

6/2/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001853)
- Canister loading (21060301.ST3)

6/3/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001854)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001855)

6/3/2021 – 6/7/2021
- 3-Day Diurnal evaporative emissions test run (E15 Test #2)

TEST PARAMETERS

ETW (lb)	A (ft-lb) track/set	B (ft-lb/mph) track/set	C (ft-lb/mph^2) track/set
3,875	32.725 / 15.600	0.20650 / 0.06700	0.024048 / 0.026200

E10 SHED TEST # 1 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.04	0.011	0.043
0-24 Hour Diurnal	0.122	0.059	0.137
24-48 Hour Diurnal	0.102	0.061	0.117
48-72 Hour Diurnal	0.093	0.024	0.099
		Final HC + EtOH Result:	0.18 grams

E10 SHED TEST # 2 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.045	0.006	0.0465
0-24 Hour Diurnal	0.163	0.065	0.179
24-48 Hour Diurnal	0.122	0.077	0.141
48-72 Hour Diurnal	0.109	0.067	0.126
		Final HC + EtOH Result:	0.226 grams

E15 SHED TEST # 1 RESULTS

	Diurnal Mass (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.041	0	0.041
0-24 Hour Diurnal	0.16	0.06	0.175
24-48 Hour Diurnal	0.118	0.053	0.131
48-72 Hour Diurnal	0.101	0.05	0.114
		Final HC + EtOH Result:	0.216 grams

E15 SHED TEST # 2 RESULTS

	Diurnal Mass (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.041	0	0.041
0-24 Hour Diurnal	0.177	0.066	0.194
24-48 Hour Diurnal	0.124	0.059	0.139
48-72 Hour Diurnal	0.106	0.053	0.119
		Final HC + EtOH Result:	0.235 grams

RESULTS SUMMARY

	E-10 Test 1	E-10 Test 2	E10 Average	E-15 Test 1	E-15 Test 2	E15 Average
Start	3/24/2021	4/8/2021		5/27/2021	6/3/2021	
End	3/27/2021	4/11/2021		5/31/2021	6/7/2021	
Hot Soak HC	0.040	0.045	0.0425	0.041	0.041	0.041
Hot Soak EtOH	0.011	0.006	0.0085	0.000	0.000	0.000
Day 1 HC	0.122	0.163	0.1425	0.160	0.177	0.169
Day 1 EtOH	0.059	0.065	0.062	0.060	0.066	0.063
Day 2 HC	0.102	0.122	0.112	0.118	0.124	0.121
Day 2 EtOH	0.061	0.077	0.069	0.053	0.059	0.056
Day 3 HC	0.093	0.109	0.101	0.101	0.106	0.104
Day 3 EtOH	0.024	0.067	0.0455	0.050	0.053	0.052
Final Total HC plus EtOH	0.180	0.226	0.203	0.216	0.235	0.226
EtOH Multiplier	1.11	1.09	1.10	1.07	1.08	1.075

Total test results are obtained by adding the hot soak result with the highest value from each of the three day diurnals.

All tests were conducted in strict accordance with the provisions of 40 CFR 86 and/or California Title 13 and have been reviewed by ATDS' in-house Quality Auditor. Detailed test results are in the Appendix attached to this report.

DATA REVIEW AND CONCLUSION

Based upon ATDS' review of the test data above, the vehicle tested (2019 Toyota Rav-4) has successfully completed emissions testing.

It has been a pleasure working with Growth Energy and the Renewable Fuels Association on this project and we look forward to future efforts.

Sincerely,

Jose Haro
Test Engineer

APPENDIX

Report for Growth Energy and the Renewable Fuels Association

Performed on a

2019 Toyota Rav-4 [3081-009493]

APPENDIX A
Vehicle Check In

APPENDIX B
Test Check Sheet

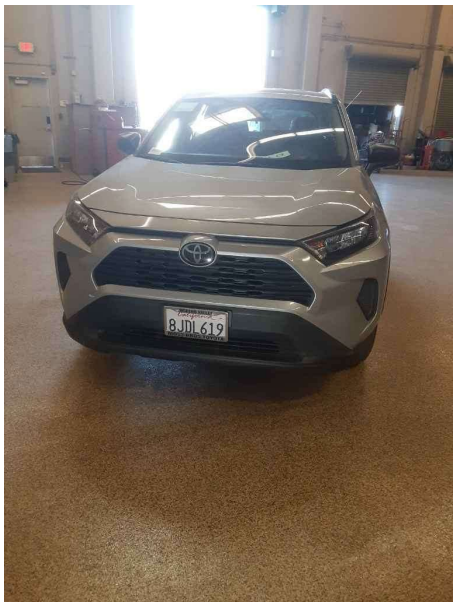
APPENDIX A

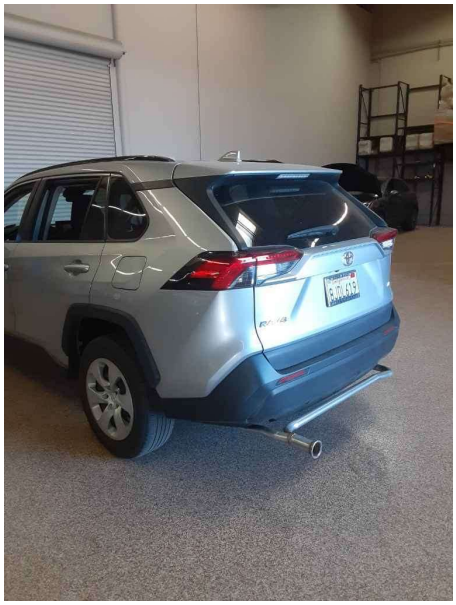
Vehicle Check In

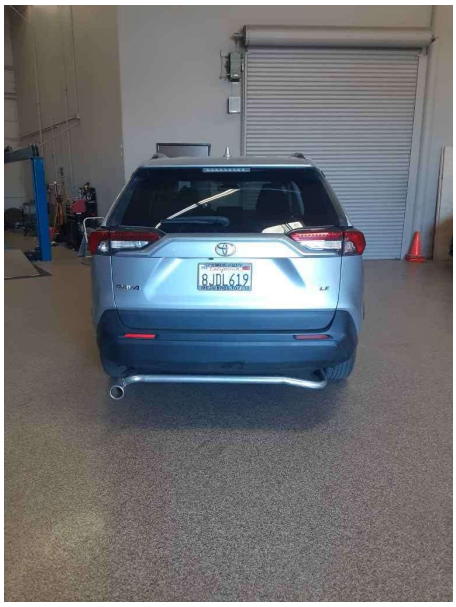
Project Information

Project ID	3081
ATDS Vehicle Number (-01, …)	3081-009493
Project Name	RFA Ethanol EVAP Testing
Date	02-24-2021
Vehicle Manufacturer	Toyota
Vehicle Model	RAV 4
Model Year	2019
Body Style (Sedan, SUV, Hatchback, etc..)	SUV
VIN	2T3H1RFV7KW009493
Odometer	37510
Engine Family	KTYXT02.5N4H
Evaporative Family	KTYXR0130P82
GVWR (Trucks/Leave Blank)	4610

Vehicle Body Photos

Front (Photo)	

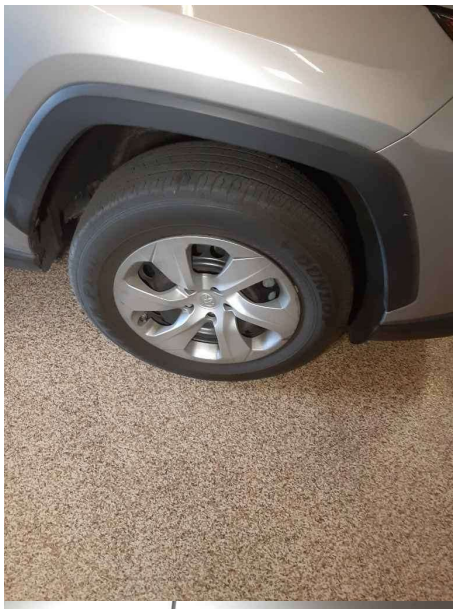
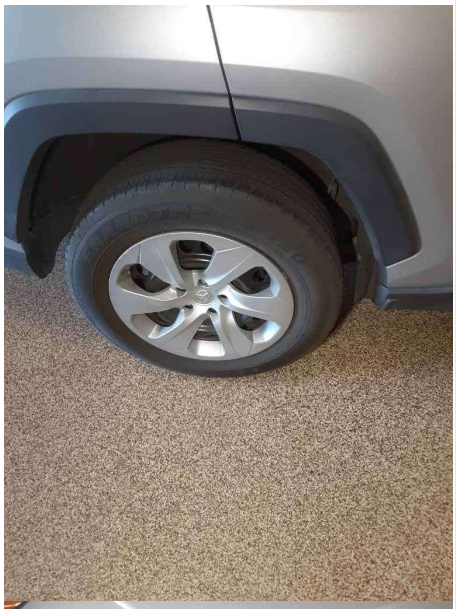
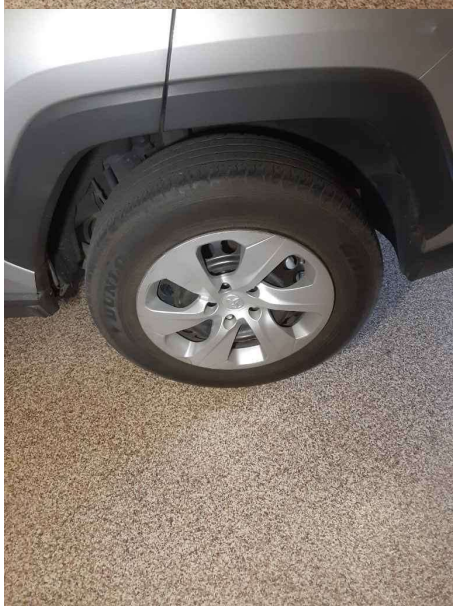
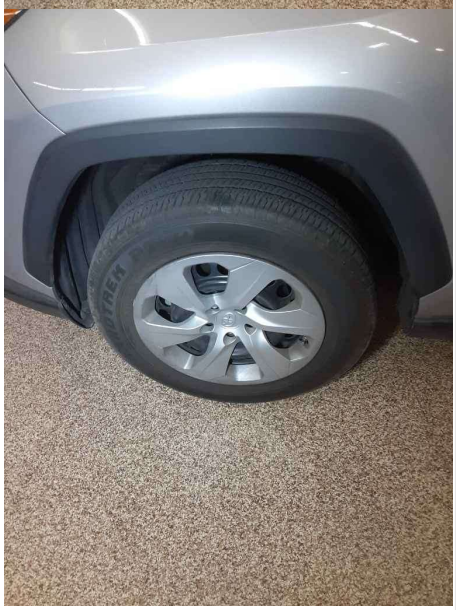
Driver Side Corner (Photo)	
Driver Side (Photo)	
Rear Side Corner -Driver Side (Photo)	

Rear (Photo)	
Rear Side Corner - Passenger Side (Photo)	
Passenger Side (Photo)	

Passenger Side Corner (Photo)	

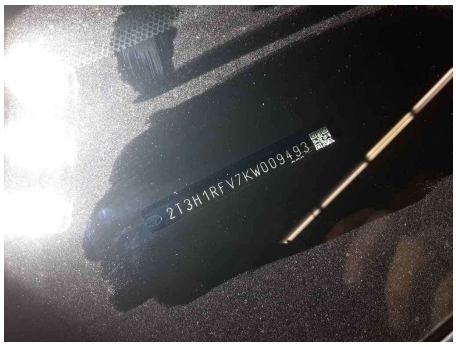
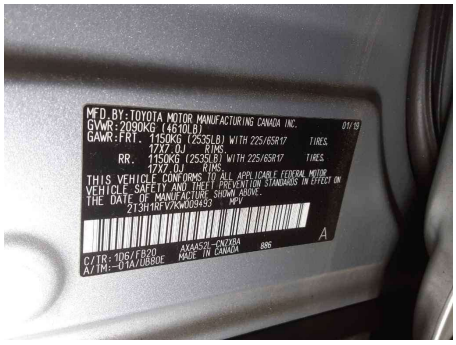
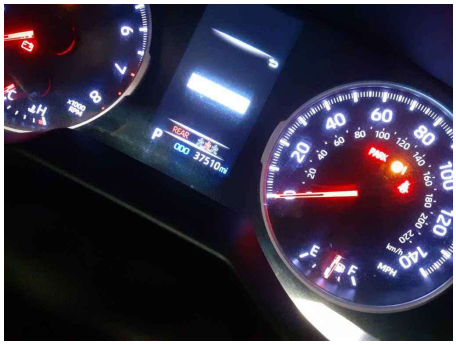
Tires and Wheels

Tire Label from Door (Photo)	
ACTUAL Tire Size	225/65R/17 102H

Tire Condition (Photos)	   
Tire Condition	Good
Drive Wheel	Front
Brakes?	>2mm (Usable)

Odometer and VIN

License Plate Number	8JDL619
VIN	2T3H1RFV7KW009493

VIN Plate from Windshield (Photo)	
Vehicle Information Sticker from Door (Photo)	
Odometer (Photo)	
Odometer	37510

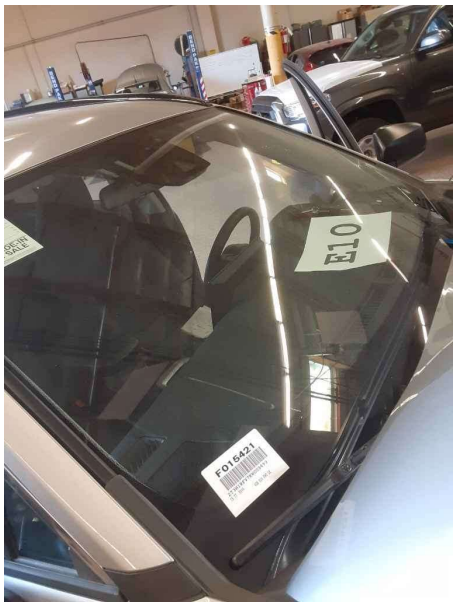
Engine and Emissions

VECI (Photo)	

Engine Bay (Photo)	
Engine Family	KTYXT02.5N4H
Evaporative Family	KTYXR0130P82
Engine Oil Level	Good
Coolant Level	Good
Transmission Fluid Level	No Dipstick
Transmission Type	Automatic
Belts and Hoses	Good
VECI Label Status	Both
Noise Leaks on Exhaust?	No
Visual Leaks on Exhaust?	No
Transmission Fluid Condition	No Dipstick

Windshield and Headlights

Windshield Wiper Fluid?	Yes
Do the windshield wipers work?	Yes
Any windshield cracks?	No

Windshield Photos	
Do the headlights work?	Yes
Are the headlights damaged?	No
Headlight Photos	
Do the tail lights work?	Yes
Are the tail lights damaged?	No
Tail Light Photos	

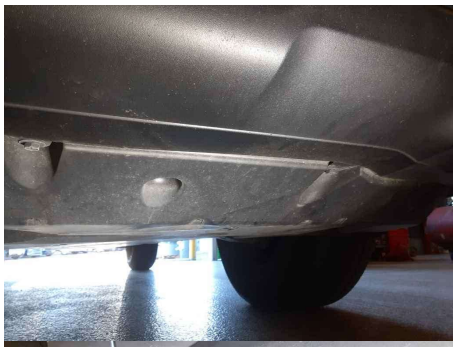
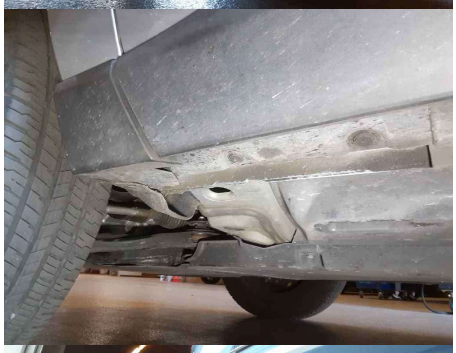
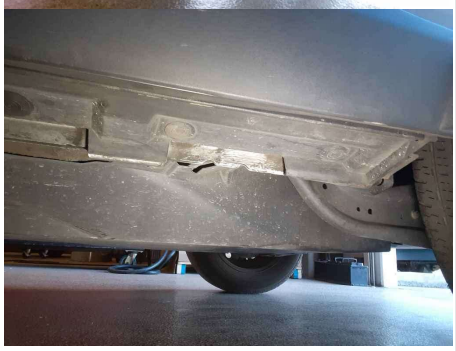
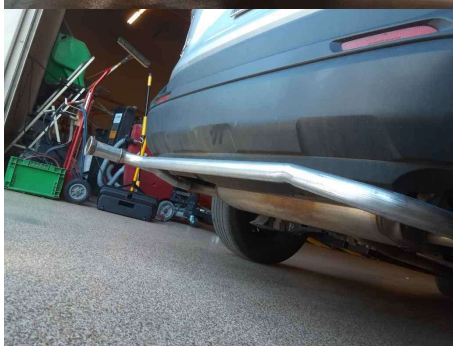
OBD

OBD Status Monitors Set	Yes
Mode 3 DTCs?	No
Mode 7 DTCs?	No

ABS/Traction Control

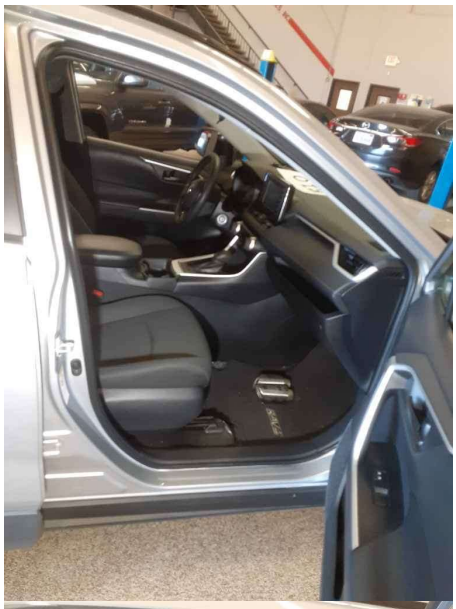
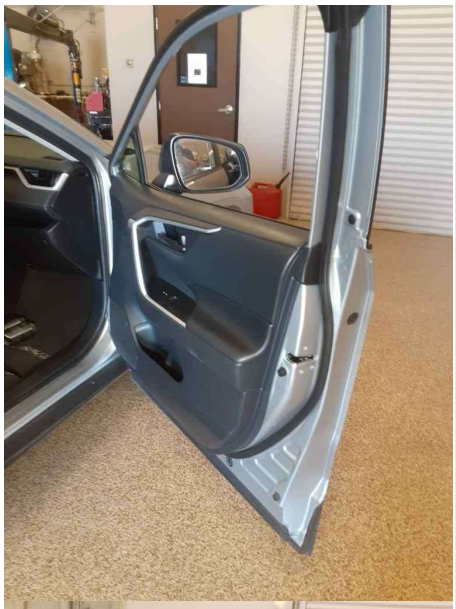
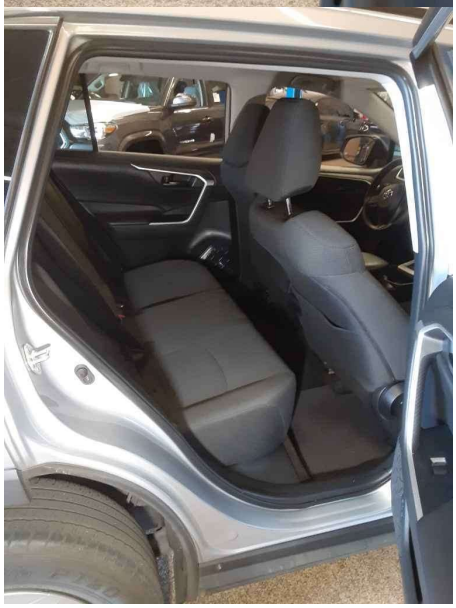
ABS?	Yes
Traction Control?	Yes

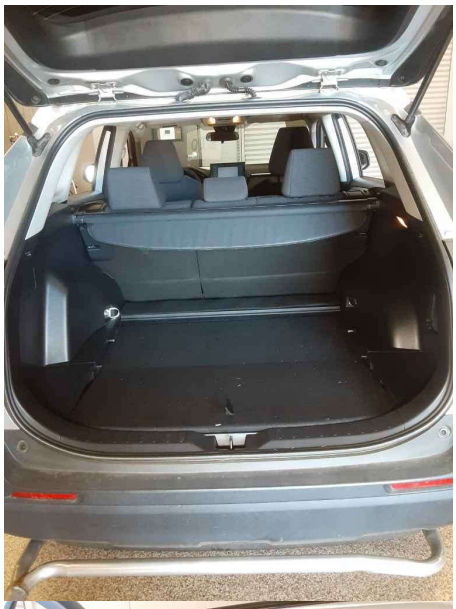
Underbody

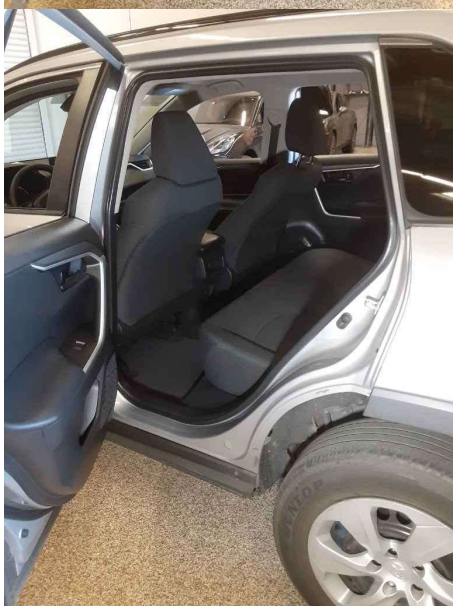
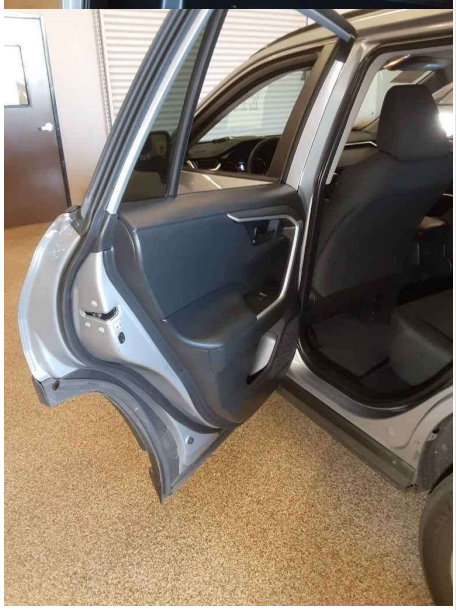
Underbody (Photos)	   

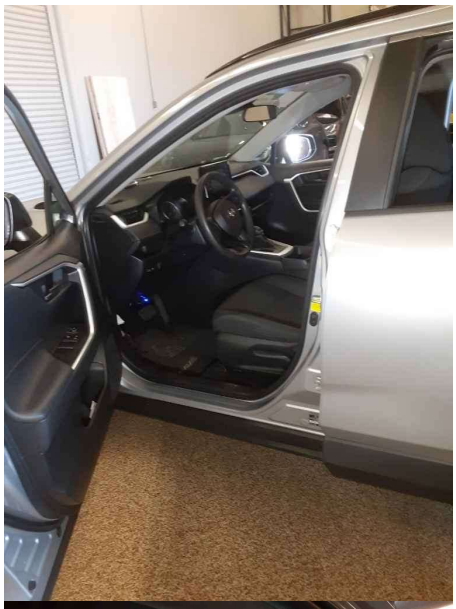
Interior

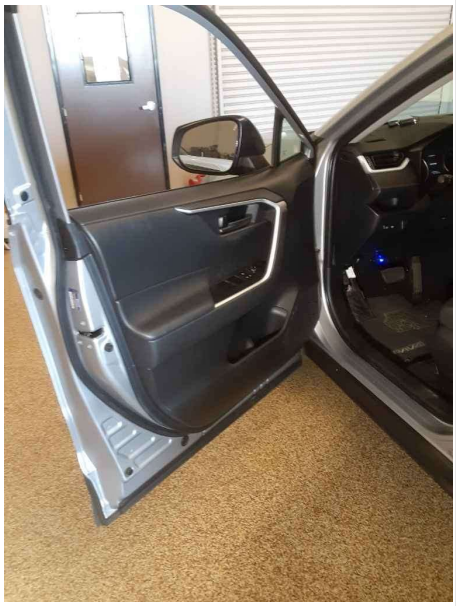
Interior (Photos)

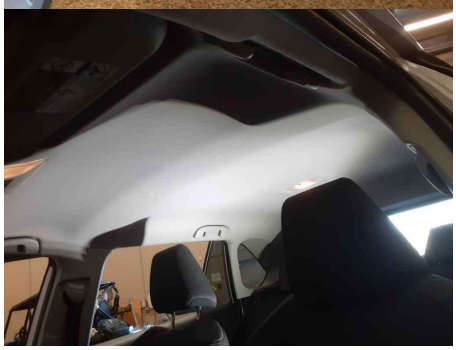








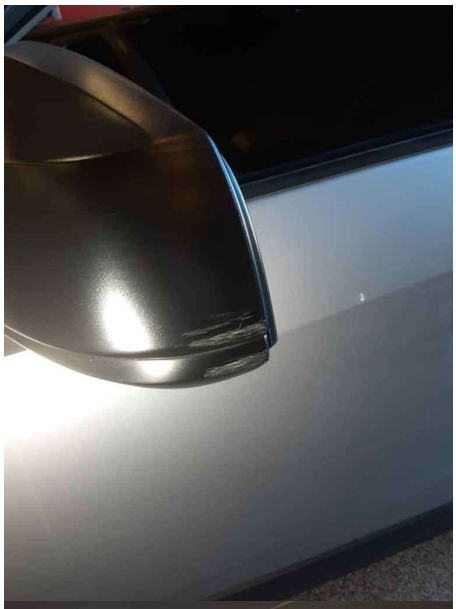
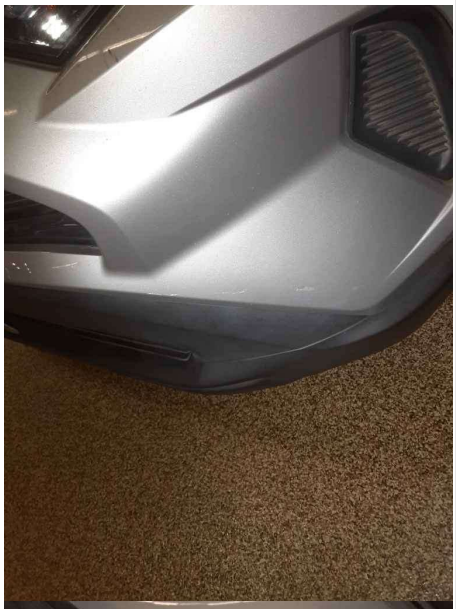
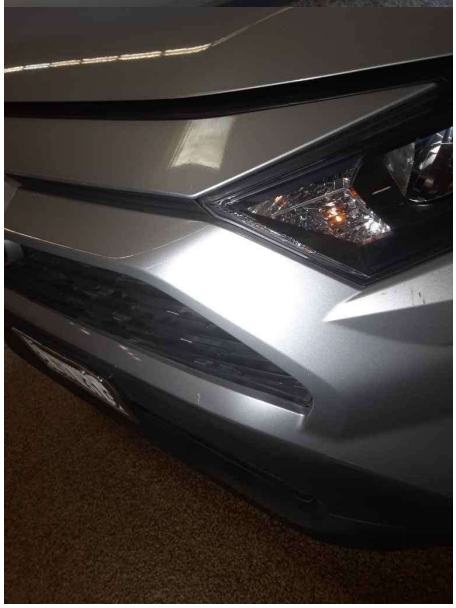
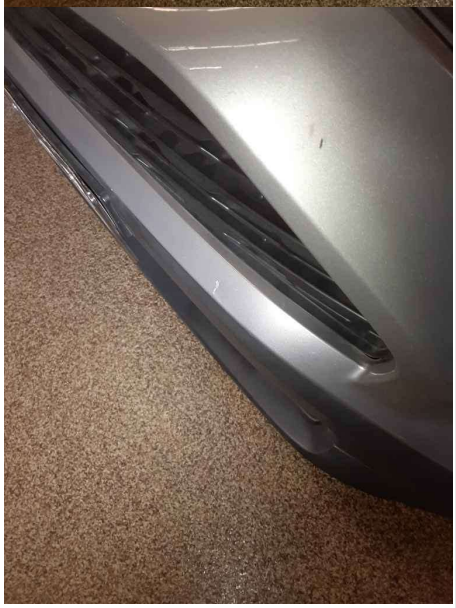


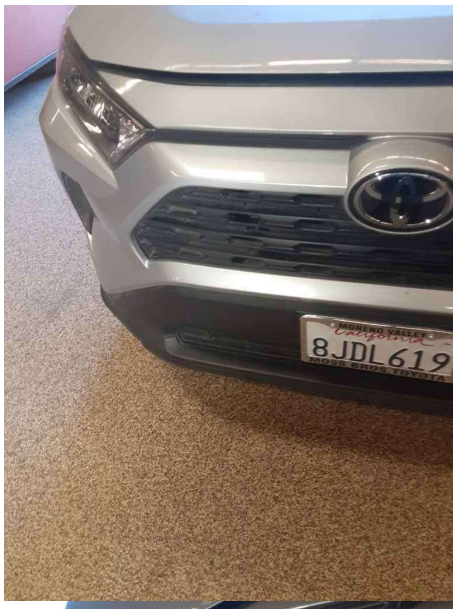


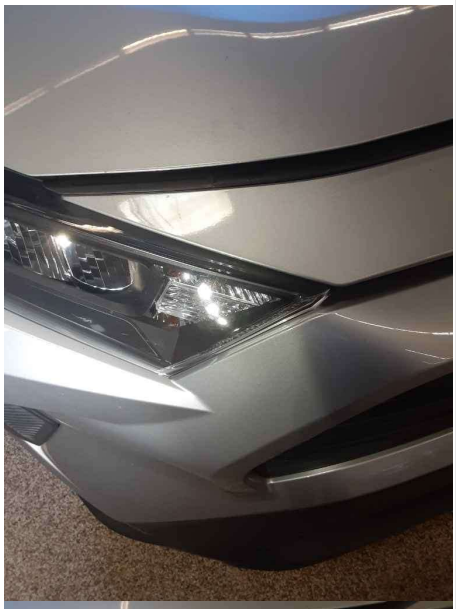
Damage Report

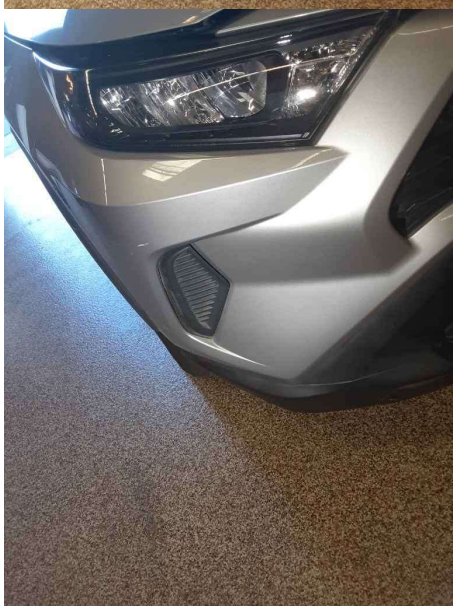
Any Damage (scratches/dents)?	Yes

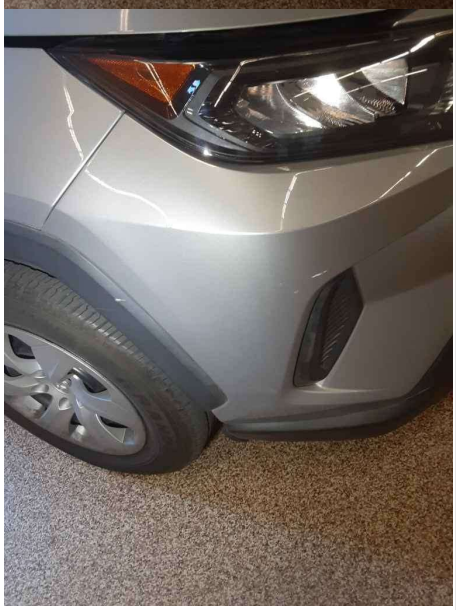
Damage Area	

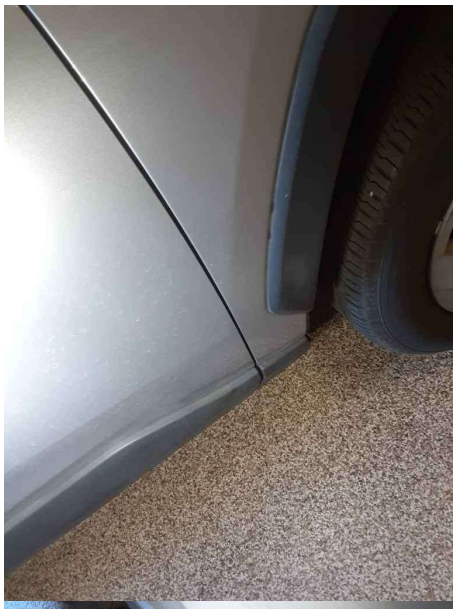





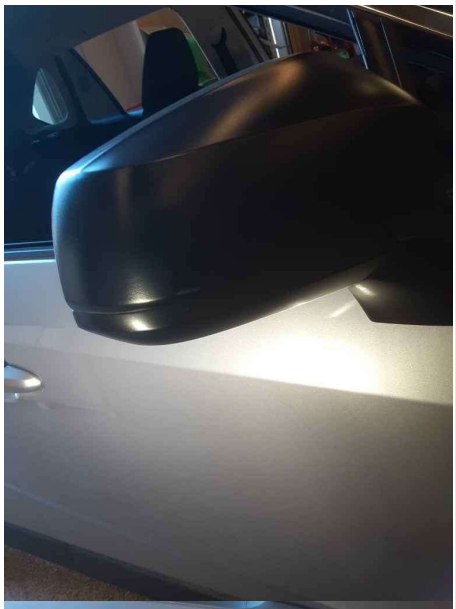

8JDL619

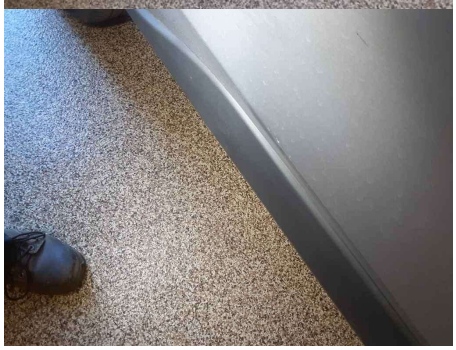


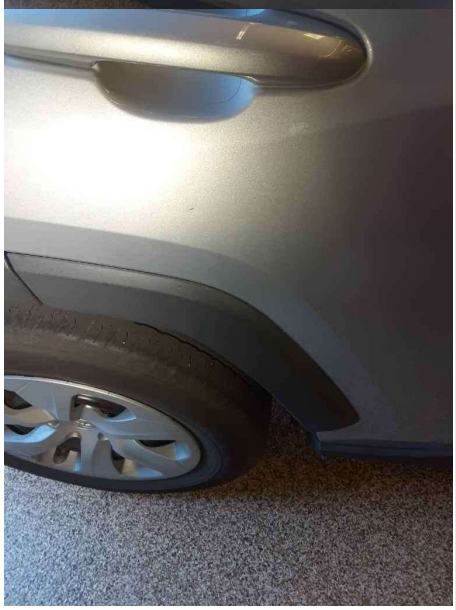


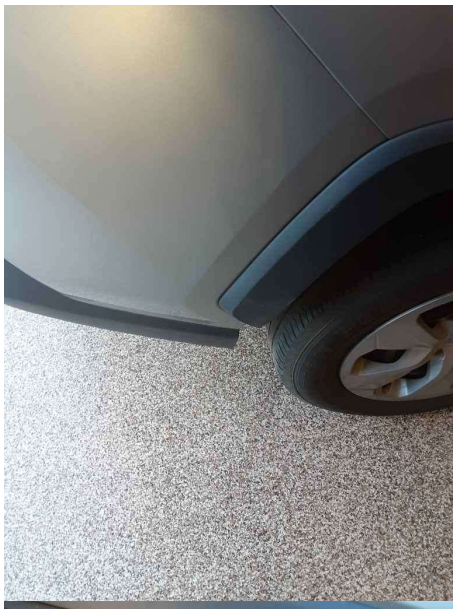


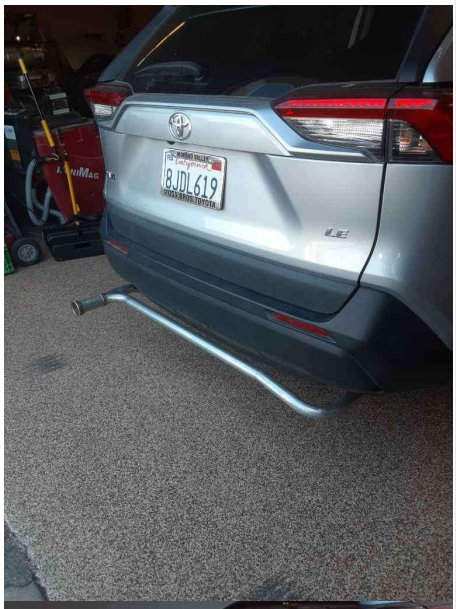


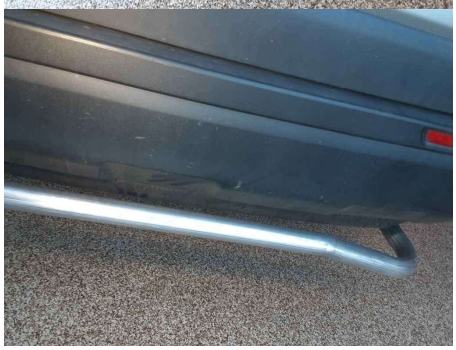


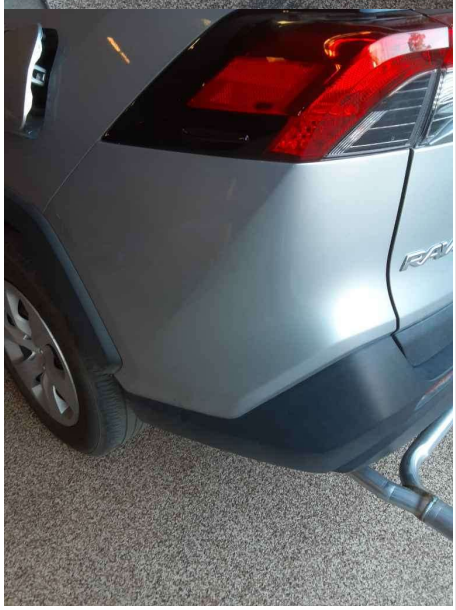


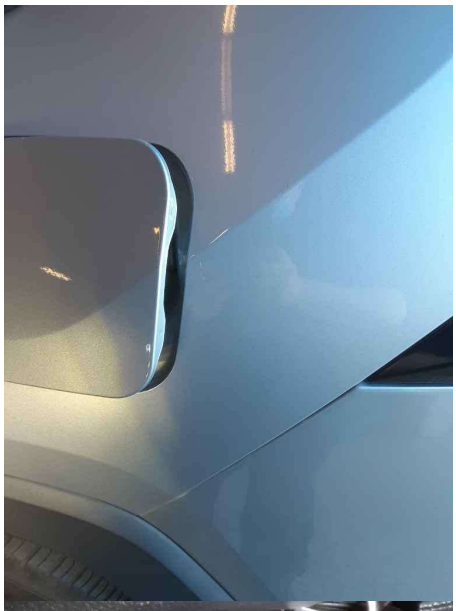


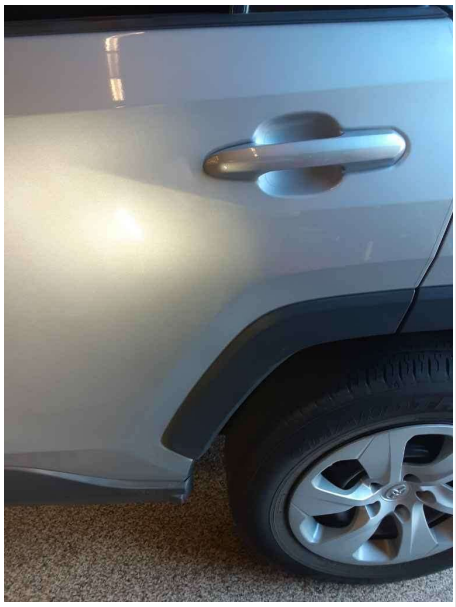


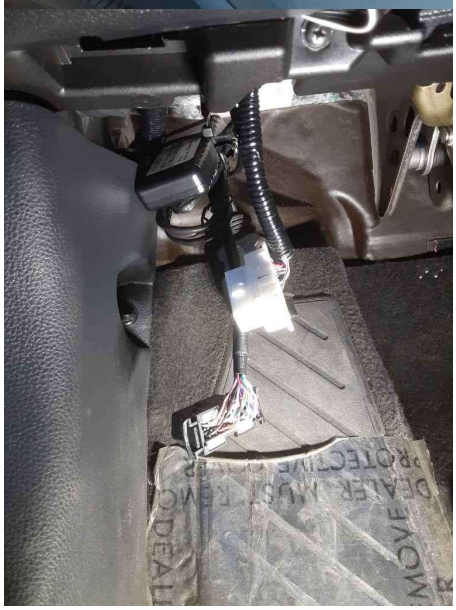






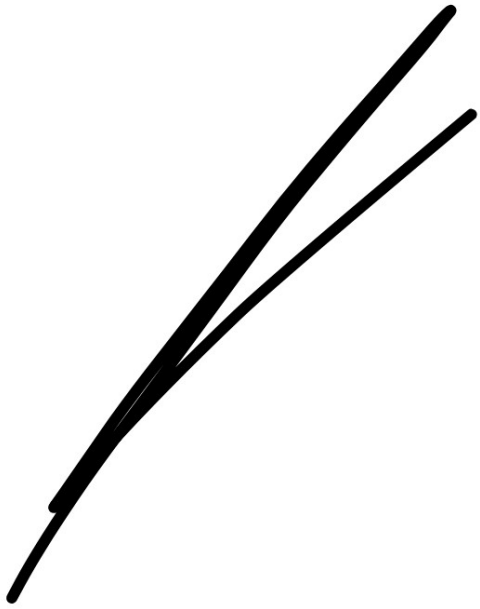






Confirmation

Start Form Timestamp	02-24-2021 01:47 PM
End Form Timestamp	02-24-2021 03:30 PM
Submission Id	5b232492-6b2c-4141-b39b-2d90d17cb2de
Name of Inspector	JMCKEOWN

Signature	
Comments	Disconnected dealer installed OBD Tracker which interfered with OBD communications.

Measurement values

Application:	Silver Scan-Tool Version 6.21.36.26940
Date/Time:	02/24/2021, 02:02:27 pm
Author:	Shop
Department:	Automotive Testing and Development Services Inc
Location:	400 Etiwanda Ave, Ontario CA 91761 United States
Comment:	ODO 37510

33: Scan-Tool

Communication	
Address word	33
Name	Scan-Tool
Protocol	ISO 15765-4 (CAN)
Baudrate	500 kbps
Interface	ATI Leaf Light HS v2, Ser.No 10217, Channel 1
Vehicle	
Vehicle	3081 009493 Renewable Fuel Ass
Description	2019 Toyota RAV4Project Manager Lin Farmer
Vehicle Identification Number	2T3H1RFV7KW009493

Contents

- Module E9 TCM-TransmisCtrl
- Module E8 ECM-EngineControl

Module E9: TCM-TransmisCtrl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

E9 TCM-TransmisCtrl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0100 0000 0000 0000 0000	Bit	Monitor status since DTCs cleared
PID 04	17.6	%	Calculated load value
PID 05	48	°C	Engine coolant temperature
PID 0C	2500	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 0F	23	°C	Intake air temperature
PID 11	19.2	%	Absolute throttle position
PID 1C	1		OBD requirements to which vehicle or engine is certified
PID 1F	22	s	Time since engine start
PID 21	0	km	Distance traveled while MIL is activated
PID 30	28	dec	Number of warm-ups since DTCs cleared
PID 31	505	km	Distance traveled since DTCs cleared
PID 41	0000 0000 0000 0100 0000 0000 0000 0000	Bit	Monitor status this driving cycle

Name	Measured value	Unit	Comment
PID 42	13.784	V	Control module voltage
PID 46	23	°C	Ambient air temperature
PID 4D	0	min	Engine run time while MIL is activated
PID 4E	949	min	Engine run time since DTCs cleared
PID 65	0000 0000	Bit	Auxiliary Inputs/Outputs Status

E9 TCM-TransmisCtrl: Mode 2 - Current freeze frame data

No data

E9 TCM-TransmisCtrl: Mode 3 - Emission-related diagnostic trouble codes

No data

E9 TCM-TransmisCtrl: Mode 6 - Monitoring test results for specific monitored systems

No data

E9 TCM-TransmisCtrl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

E9 TCM-TransmisCtrl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 04	896654280000	Calibration Identification (CALID)
InfoType 06	51 7E 38 C8	Calibration Verification Numbers (CVN)

Name	Measured value		Comment
InfoType 08	00 1B 00 6D 00 00 00

Name	Measured value		Comment
		7.995	- Calculated Ratio -
	SO2SCOMP1	0	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 1
	SO2SCOND1	0	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 1
		7.995	- Calculated Ratio -
	SO2SCOMP2	0	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 2
	SO2SCOND2	0	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
InfoType 0A	TCM-TransmisCtrl		ECU Name

E9 TCM-TransmisCtrl: Readiness - Readiness

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Misfire monitoring	no	yes	no	yes
Fuel system monitoring	no	yes	no	yes
Comprehensive component monitoring	yes	yes	yes	yes
Catalyst monitoring	no	yes	no	yes
Heated catalyst monitoring	no	yes	no	yes
Evaporative system monitoring	no	yes	no	yes
Secondary air system monitoring	no	yes	no	yes
Oxygen sensor monitoring	no	yes	no	yes
Oxygen sensor heater monitoring	no	yes	no	yes
EGR and/or VVT system monitoring	no	yes	no	yes

Module E8: ECM-EngineControl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

E8 ECM-EngineControl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0111 1010 0101 0000 0000	Bit	Monitor status since DTCs cleared
PID 03	0000 0010	Bit	Fuel system A status
PID 03	0000 0000	Bit	Fuel system B status
PID 04	17.3	%	Calculated load value
PID 05	48	°C	Engine coolant temperature
PID 06	-2.3	%	Short term fuel trim - Bank 1
PID 07	2.3	%	Long term fuel trim - Bank 1
PID 0C	2500	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 0E	28.0	°KW	Ignition timing advance for #1 cylinder
PID 0F	24	°C	Intake air temperature
PID 10	9.29	g/s	Air flow rate from mass air flow sensor
PID 11	19.2	%	Absolute throttle position
PID 13	0000 0011	Bit	Location of oxygen sensors
PID 1C	1		OBD requirements to which vehicle or engine is certified
PID 1F	22	s	Time since engine start

Name	Measured value	Unit	Comment
PID 21	0	km	Distance traveled while MIL is activated
PID 2E	0.0	%	Commanded evaporative purge
PID 2F	45.9	%	Fuel level input
PID 30	29	dec	Number of warm-ups since DTCs cleared
PID 31	505	km	Distance traveled since DTCs cleared
PID 33	98	kPa	Barometric pressure
PID 34	0.987	Lambda	Equivalence ratio
PID 34	-0.03	mA	Oxygen sensor current
PID 35	1.000	Lambda	Equivalence ratio
PID 35	-0.01	mA	Oxygen sensor current
PID 3C	235.7	°C	Catalyst temperature Bank 1 Sensor 1
PID 3E	84.1	°C	Catalyst temperature Bank 1 Sensor 2
PID 41	0000 0000 0010 0111 1010 0101 1010 0101	Bit	Monitor status this driving cycle
PID 42	13.779	V	Control module voltage
PID 43	14.5	%	Absolute load value
PID 44	1.001	Lambda	Fuel/Air commanded equivalence ratio
PID 45	0.0	%	Relative throttle position
PID 46	24	°C	Ambient air temperature
PID 47	51.8	%	Absolute throttle position B
PID 49	22.7	%	Accelerator pedal position D
PID 4A	38.8	%	Accelerator pedal position E
PID 4C	18.8	%	Commanded throttle actuator control
PID 4D	0	min	Engine run time while MIL is activated
PID 4E	949	min	Engine run time since DTCs cleared
PID 51	1		Type of fuel currently being utilized by the internal combustion engine
PID 53	97.850	kPa	Absolute Evap system vapor pressure

Name	Measured value	Unit	Comment
PID 55	0.0	%	Short term secondary O2 sensor fuel trim - Bank 1
PID 56	0.0	%	Long term secondary O2 sensor fuel trim - Bank 1
PID 5C	33	°C	Engine oil temperature
PID 62	9	%	Actual engine - percent torque
PID 63	288	Nm	Engine reference torque
PID 65	0000 0000	Bit	Auxiliary Inputs/Outputs Status
PID 69	0.0	%	Commanded EGR A Duty Cycle/Position
PID 6D	8000	kPa	Commanded Fuel Rail Pressure A
PID 6D	16800	kPa	Fuel Rail Pressure A
PID 6D	300	kPa	Commanded Fuel Rail Pressure B
PID 6D	300	kPa	Fuel Rail Pressure B
PID 87	23.34	kPa	Intake Manifold Absolute Pressure A
PID 8E	8	%	Engine Friction - Percent Torque
PID 9D	0.68	g/s	Engine fuel rate
PID 9D	0.68	g/s	Vehicle fuel rate
PID 9E	35.2	kg/h	Engine Exhaust Flow Rate

E8 ECM-EngineControl: Mode 2 - Current freeze frame data

No data

E8 ECM-EngineControl: Mode 3 - Emission-related diagnostic trouble codes

No data

E8 ECM-EngineControl: Mode 6 - Monitoring test results for specific monitored systems

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 01	91	8D	1.7773438	0.4492188	2.1953125	mA	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	95	90	0.032	0.000	0.343	s	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	96	90	0.016	0.000	0.343	s	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	97	84	0.054	-1.180	0.849		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	98	8D	0.0468750	0.0156250	127.9960938	mA	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	99	8D	-0.0664063	-128.0000000	-0.0195313	mA	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 02	91	8D	21.7148438	7.2734375	33.1250000	mA	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	92	8D	-0.2695313	-128.0000000	-0.2578125	mA	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	93	10	0.022	0.000	0.292	s	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 21	AF	04	4.675	1.000	65.535		Catalyst Monitor Bank 1
MID 31	BD	17	0.00	0.00	0.00	kPa	EGR Monitor Bank 1
MID 31	BE	17	0.00	0.00	0.00	kPa	EGR Monitor Bank 1
MID 31	C0	17	7.18	2.85	655.35	kPa	EGR Monitor Bank 1
MID 35	81	35	0.00	0.00	0.05	s	VVT Monitor Bank 1
MID 35	85	35	0.00	0.00	9.49	s	VVT Monitor Bank 1
MID 3D	C9	FD	0.902	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	CA	FD	3.146	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	CB	FD	1.452	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	CD	FD	1.452	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	CE	FD	2.112	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	CF	FD	2.288	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	D0	FD	2.332	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	D1	FD	1.452	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	D4	FD	3.388	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	D5	FD	3.146	0.000	32.767	kPa	Purge Flow Monitor
MID 3D	D7	FD	0.000	0.000	32.767	kPa	Purge Flow Monitor

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 3D	E1	FD	2.640	0.000	32.767	kPa	Purge Flow Monitor
MID 81	85	84	-0.012	-32.768	0.999		Fuel System Monitor Bank 1
MID 81	86	84	0.015	-32.768	0.999		Fuel System Monitor Bank 1
MID 81	87	84	-0.016	-32.768	0.999		Fuel System Monitor Bank 1
MID 81	88	84	0.009	-32.768	0.999		Fuel System Monitor Bank 1
MID 81	8D	84	-0.002	-32.768	0.999		Fuel System Monitor Bank 1
MID 81	8E	84	-0.008	-32.768	0.999		Fuel System Monitor Bank 1
MID 81	8F	84	0.005	-32.768	0.999		Fuel System Monitor Bank 1
MID 81	90	84	0.000	-32.768	0.999		Fuel System Monitor Bank 1
MID 81	95	84	0.000	0.000	0.999		Fuel System Monitor Bank 1
MID 81	96	84	0.000	0.000	0.999		Fuel System Monitor Bank 1
MID A1	0B	24	0	0	65535	counts	Misfire Monitor General Data
MID A1	0C	24	1	0	65535	counts	Misfire Monitor General Data
MID A2	0B	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A2	0C	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A3	0B	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A3	0C	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A4	0B	24	0	0	65535	counts	Misfire Cylinder 3 Data
MID A4	0C	24	1	0	65535	counts	Misfire Cylinder 3 Data
MID A5	0B	24	0	0	65535	counts	Misfire Cylinder 4 Data
MID A5	0C	24	0	0	65535	counts	Misfire Cylinder 4 Data

E8 ECM-EngineControl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

E8 ECM-EngineControl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 02	2T3H1RFV7KW009493	Vehicle Identification Number(VIN)
InfoType 04	8966342M8000	Calibration Identification (CALID)
InfoType 06	5A 11 29 41	Calibration Verification Numbers (CVN)
InfoType 08	00 1C 00 75 00 26 00 1A 00 00 00 00 00 27 00 1A 00 00 00 00 00 23 00 1A 00 00 00 00 00 0D 00 0E 00 2A 00 1A 00 00 00 00 00 2C 00 1C 00 00 00 00	In-use Performance Tracking

Values for InfoType 08

Name	Measured value	Comment
OBDCOND	28	General Denominator, OBD Monitoring Conditions Encountered Counts
IGNCNTR	117	Ignition Cycle Counter
CATCOMP1	38	Numerator, Catalyst Monitor Completion Counts Bank 1
CATCOND1	26	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 1
	1.462	- Calculated Ratio -
CATCOMP2	0	Numerator, Catalyst Monitor Completion Counts Bank 2
CATCOND2	0	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 2
	7.995	- Calculated Ratio -
O2SCOMP1	39	Numerator, O2 Sensor Monitor Completion Counts Bank 1
O2SCOND1	26	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 1
	1.500	- Calculated Ratio -
O2SCOMP2	0	Numerator, O2 Sensor Monitor Completion Counts Bank 2
O2SCOND2	0	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 2
	7.995	- Calculated Ratio -
EGRCOMP	35	Numerator, EGR/VVT Monitor Completion Condition Counts
EGRCOND	26	Denominator, EGR/VVT Monitor Conditions Encountered Counts
	1.346	- Calculated Ratio -
AIRCOMP	0	Numerator, Secondary Air Monitor Completion Condition Counts

Name	Measured value		Comment
	AIRCOND	0	Denominator, Secondary Air Monitor Conditions Encountered Counts
		7.995	- Calculated Ratio -
	EVAPCOMP	13	Numerator, EVAP Monitor Completion Condition Counts
	EVAPCOND	14	Denominator, EVAP Monitor Conditions Encountered Counts
		0.929	- Calculated Ratio -
	SO2SCOMP1	42	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 1
	SO2SCOND1	26	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 1
		1.615	- Calculated Ratio -
	SO2SCOMP2	0	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 2
	SO2SCOND2	0	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	AFRICOMP1	44	Numerator, Air Fuel Ratio Imbalance Monitor Completion Counts Bank 1
	AFRICOND1	28	Denominator, Air Fuel Ratio Imbalance Monitor Conditions Encountered Counts Bank 1
		1.571	- Calculated Ratio -
	AFRICOMP2	0	Numerator, Air Fuel Ratio Imbalance Monitor Completion Counts Bank 2
	AFRICOND2	0	Denominator, Air Fuel Ratio Imbalance Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
InfoType 0A	ECM-EngineControl		ECU Name
InfoType 13	4B 54 59 58 54 30 32 2E 35 4E 34 48		Hybrid/EV Battery DTCs and Location
InfoType 14	0		Distance Traveled Since Evap Monitoring Decision

E8 ECM-EngineControl: Readiness - Readiness

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Misfire monitoring	yes	yes	yes	yes
Fuel system monitoring	yes	yes	yes	no

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Comprehensive component monitoring	yes	yes	yes	yes
Catalyst monitoring	yes	yes	yes	no
Heated catalyst monitoring	no	yes	no	yes
Evaporative system monitoring	yes	yes	yes	no
Secondary air system monitoring	no	yes	no	yes
Oxygen sensor monitoring	yes	yes	yes	no
Oxygen sensor heater monitoring	no	yes	no	yes
EGR and/or VVT system monitoring	yes	yes	yes	no

APPENDIX B

Test Check Sheet

Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Toyta Rav4
Vehicle #:	3081-009493	**Engine Size**	2.5L
VIN:	2T3H1RFV7KW009493	**Model Year**	2019
Engine Family:	KTYXT02.5N4H	**Requested By:**	J. Link

		Documentation						
		Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Vehicle check in	E		2021-02-24	15:30	37510			JM
OBD download								JM
Prepare vehicle for Lab								JM
Canister Purge 1 Hour	E		2021-02-25	16:05	—			
Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S		2021-02-25	16:10		3		
	E		2021-02-25	16:15		Fuel Spec:	E10	
Idle 1 min								JB
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S		2021-02-25	16:20		5.8		
	E			17:15		Fuel Spec:	<60F 55.3 E10	JB
Heat Build 60F-105F in 1 Hour	S		2021-02-25	17:20	37510			
	E			18:20	37510		NA	~~JB~~
Precon FTP 72 (UDDS) 1	S		2021-02-25	8:26	37510			
	E			18:54	37518		ONT3-001500	JB
Dyno Sets		A: 16.3625 B: 0.0413 C: 0.024048					ETW: 3875	
Precon FTP 72 (UDDS) 2	S		2021-02-25	18:55	37518			
	E		↓	19:22	37526		ONT3-001501	VE
Precon FTP 72 (UDDS) 3	S		2021-02-25	19:33	37526			
	E		↓	20:00	37533		ONT3-001503	VE

Precon FTP 72 (UDDS) 4	S	2021-02-25	22:01	37533			
	E	√	20:28	37541	ONT3-001504	JB	
↓ Eng Off 5 min						VE	
↓ Idle 1 min						VE	
↓ Eng Off 1 min						VE	
↓ Idle 1 min						VE	
↓ Vehicle Soak 21 Days 68-86°F	S	2021/02/25	20:35				
	E	2021/03/22	18:15			LQ	
↓ Set tire pressure 7psi over sticker	Front	42	Back	42		LQ	
↓ Fuel Drain and 40% Fill, Fuel Type: See Notes!	S	2021/03/22	18:15	5.8			
	E	2021/03/22	15:05	Fuel Spec:	E10	LQ	
↓ Vehicle Soak 68-86°F (min 6 hr.)	S	2021/03/22	19:10				
	E	2021/03/22	16:00			JB	
↓ Set tire pressure to sticker	Front	35	Back	35		JB	
↓ 2x HFET warmup J2264 Dyno Coastdown	S	3/23/21	16:42	37541			
	E	↓	17:16	37562	ONT3-001663	JS	
Dyno Sets for Warmup HWY	A: 16.3625 B: 0.0413 C: 0.024048				ETW: 3875		
↓ Precon FTP 72 (UDDS)	S	3/23/21	17:42	37562			
	E	√	18:09	37569	ONT3-001664	VE	
Dyno Sets	A: 15.6 B: 0.0671 C: 0.0262				ETW: 3875	VE	
↓ Vehicle Soak 68-86°F	S	3/23/21	18:10			VE	
	E	2021-03-24					
↓ Canister Loading with Butane Type: 1.5x Load (12-36 hr)	S	2021-03-23	18:12				
	E	2021-03-24	07:48		21032401.ST4	VE	
↓ Canister Loading Specs	Cap	130	Vol	2.5			
	Purge	300	Flow Rate	15	KTYXR0130P82		

T 75.92
B 28.78
Δ 37.80

Set tire pressure to sticker

Front 35 Back 35

No Bag Cold Start FTP 75

S	2021-03-24	08:26	37569
E	↓	09:15	37580

ONT3_001665

Dyno Sets

A: B: C:

ETW: 3875

Test Options

PM N2O

Dilute Modal

CVS Flow P1:9.3 P2:9.3 P3:9.3

Pre Test Comments

E10 Test

Fuel Tank Temp. Stabilization at 105F

S	2021-03-24	10:00
E	↓	

max 1 hr

Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle

S		11:00	
E		12:18	37597

ONT3001666

Dyno Sets

A: B: C:

ETW: 3875

Test Options

PM N2O

Dilute Modal

CVS Flow 9.3

Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff

max 7 min

Hot Soak in VT Shed

S	2021-03-24	12:25
E	2021-03-24	13:25

Cold Soak 6-36 Hours

6-36 Hr

S	2021-03-24	14:25
E	2021-03-24	20:25

3 Day Diurnal Test

S	2021-03-24	20:25
E	2021-03-27	20:25

QC Check

E	2021-04-07	14:00

ATDS EMISSION TEST

Vehicle info / Test preparation

Project #/ Vehicle #	3081	3081-009493		
VIN:	2T3H1RFV7KW009493			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Toyta	Rav4	FWD	2019
Test Group / Engine Size (L):	KTYXT02.5N4H	2.5L		
EVAP Family:	KTYXR0130P82			
Standard Tire Size (front) / Pressure:	225/65-17	35		
Standard Tire Size (rear) / Pressure:	225/65-17	35		
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	32.73	0.2065	0.024048	
Warmup Coefficients A / B / C:	16.36	0.0413	0.024048	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E10 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	14.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	130
Canister volume (Liter)	2.465
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
5.8 of See Notes!
E10 Fuel
105.9" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

Emissions Test Data:

											Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐			1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐			
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐			
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐			

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS CANISTER WORKSHEET

Station number 2

----PURGE ONLY----

VT#	3081-009493
Project	3081
Evap Family	NA
Ambient Temperature-Deg F	74
Barometric Pressure-In/Hg	29.00
Humidity-Grains/Lb	32.1
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0
Canister Volume-Liters	14.2
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	15:02:57
Start date	02-25-2021
Bed Purges/Cycle	100
Purge End/Load Start	16:05:46
Test Time Minutes	63
HC Loaded-Grams	0.0
Scale Reading-Grams	3.73
Butane Flow Actual-Gm/Hr	-0.0
Cycles Completed	1
Finish time	16:05:46
Finish date	02-25-2021
Disk File Name	21022502.ST2

QUALITY ASSURANCE

INSPECTED BY: [signature]

DATE: 4/7/2021

COMMENTS: OK

Pre-Fuel System Conditioning

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	2/25/2021	**Time:**	18:26:52
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON #1		

QUALITY ASSURANCE

INSPECTED BY: ~

DATE: 4/7/2021

COMMENTS: OK

Pre Fuel / System Conditioning

General Data

Test Number	*ONT3_001500*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*2/25/2021*	CH_4 Response Factor	
Test Start	*18:26:52*	Odometer Position [mi]	*37510*
Start Time Cycle	*2021-02-25 18|31-30-(000)*	Delay Time Method	
Test End	*18:54:33*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON #1*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H* ✓
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82* ✓	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*16.362* ✓	*0.04130* ✓	*0.024048* ✓

Fuel Data *E10*

Fuel Type	*GASOLINE* ✓	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed* ✓

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop	Speed Table	Date:	
Test Number	ONT3_001500	Driver	Victor Escudero	Shift Table Auto	Cold Start	

Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		E10	Start Time	*18:26:52*
		A [lbf]	*16.362*	Fuel type	GASOLINE	End Time	*18:54:33*
Model	RAV4	B [lbf/mph]	*0.04130*	Density	*0.7453*		
Year	*2019*	C [lbf/mph2]	*0.024048*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*37510*	Remark	PRECON #1				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.79	Volume [scf]	2662
Zero Read	*0.00*							Press. [inHg]	29.02	D.F.	
Span Read	*0.00*							RH [%]	*7.69*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*1.434*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.62*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7662*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.79	Volume [scf]	4559
Zero Value	*0.00*							Press. [inHg]	29.02	D.F.	
Span Value	*0.00*							RH [%]	*7.26*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*1.447*	Ph. End [s]	1375.3
Mass.	*0.000*							Dist. [mi]	*3.84*	Ph. Length [s]	869.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7664*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.46*

Test Data: FTP72 Operator: Joseph Bishop Date: 2/25/2021
Test Number: ONT3_001500 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001500

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*16.362*	*32.725*
B [lbf/mph]	*0.04130*	*0.20650*
C [lbf/mph2]	*0.024048*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5830.34	6179.72		
Distance Rating (%)	0.8857	-0.5044		
Cycle Energy (MJ)				
Target	3.23	2.88		
Driven	3.23	2.84		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3202		
Driven	0.4563	0.3254		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.75	1.91		
Inertial Work Fraction				
Target	0.5436	0.6798		
Driven	0.5437	0.6746		
Inertial Work Rating	-0.0123	-2.2924		
Absolute Speed Change (m/s2)				
Target	204.88	340.91		
Driven	204.97	335.93		
Absolute Speed Change Rating (%)	0.0475	-1.4599		
Energy Rating	-0.9140	-1.0477		
Energy Economy Rating	-0.9140	-1.0477		-0.9118

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001500

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	74.79	73.22	77.90	68.00	86.00	Passed
Barometer	(inHg)	29.02	29.01	29.02	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	10.04	9.77	10.73	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	76.87	75.83	78.35	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No Humidity Requirements

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001500

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	76.79	73.04	79.34	68.00	86.00	Passed
Barometer	(inHg)	29.02	29.02	29.02	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	10.13	9.80	10.45	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	76.70	76.01	77.45	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.84					Passed
Sample Phase Time	(s)	869.8					
Duration Phase 2	(s)	869.70					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No Humidity Requirements

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	2/25/2021	**Time:**	18:55:02
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON #2		

QUALITY ASSURANCE

INSPECTED BY: [signature]

DATE: 4/7/2021

COMMENTS: OK

Pre-Fuel System Conditioning

General Data

Test Number	*ONT3_001501*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*2/25/2021*	CH_4 Response Factor	
Test Start	*18:55:02*	Odometer Position [mi]	*37518*
Start Time Cycle	*2021-02-25 18|59-50-(000)*	Delay Time Method	
Test End	*19:22:34*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON #2*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493*	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*16.362*	*0.04130*	*0.024048*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001501	Driver	Joseph Bishop	Shift Table Auto		Cold Start	

Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		E10	Start Time	*18:55:02*
		A [lbf]	*16.362*	Fuel type	GASOLINE	End Time	*19:22:34*
Model	RAV4	B [lbf/mph]	*0.04130*	Density	*0.7453*		
Year	*2019*	C [lbf/mph2]	*0.024048*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*37518*	Remark	PRECON #2				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.50	Volume[scf]	2663
Zero Read	*0.00*							Press.[inHg]	29.02	D.F.	
Span Read	*0.00*							RH[%]	*7.35*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*1.357*	Ph. End[s]	505.5
Mass.	*0.000*							Dist.[mi]	*3.58*	Ph. Length[s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7647*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	77.09	Volume[scf]	4560
Zero Value	*0.00*							Press.[inHg]	29.02	D.F.	
Span Value	*0.00*							RH[%]	*6.83*	Ph. Start[s]	505.6
Sample	*0.00*							AH[g/kg]	*1.375*	Ph. End[s]	1374.9
Mass.	*0.000*							Dist.[mi]	*3.86*	Ph. Length[s]	869.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7650*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.45*

Test Data: FTP72 Operator: Joseph Bishop Date: 2/25/2021
Test Number: ONT3_001501 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001501

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*16.362*	*32.725*
B [lbf/mph]	*0.04130*	*0.20650*
C [lbf/mph2]	*0.024048*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5769.06	6218.54		
Distance Rating (%)	-0.1747	0.1207		
Cycle Energy (MJ)				
Target	3.23	2.88		
Driven	3.19	2.88		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3202		
Driven	0.4676	0.3212		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.70	1.95		
Inertial Work Fraction				
Target	0.5436	0.6798		
Driven	0.5324	0.6788		
Inertial Work Rating	-3.1344	-0.3604		
Absolute Speed Change (m/s2)				
Target	204.88	340.91		
Driven	201.13	340.12		
Absolute Speed Change Rating (%)	-1.8288	-0.2314		
Energy Rating	-0.9259	-0.3291		
Energy Economy Rating	-0.9259	-0.3291		-0.6568

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001501

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	74.50	73.58	76.46	68.00	86.00	Passed
Barometer	(inHg)	29.02	29.02	29.02	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	9.50	9.31	9.68	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	76.10	74.57	77.63	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.58					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No Humidity Requirements

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001501

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	77.09	73.22	79.52	68.00	86.00	Passed
Barometer	(inHg)	29.02	29.02	29.03	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	9.63	9.34	9.91	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	76.26	75.47	77.09	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	869.4					
Duration Phase 2	(s)	869.30					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No Humidity Requirements

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	2/25/2021	**Time:**	19:33:30
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON #3		

QUALITY ASSURANCE

INSPECTED BY: [signature]

DATE: 4/7/2021

COMMENTS: OK

Pre-Fuel System Conditioning

General Data

Test Number	*ONT3_001503*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*2/25/2021*	CH_4 Response Factor	
Test Start	*19:33:30*	Odometer Position [mi]	*37528*
Start Time Cycle	*2021-02-25 19|37-32-(000)*	Delay Time Method	
Test End	*20:00:32*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON #3*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493*	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*16.362*	*0.04130*	*0.024048*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001503	Driver	Victor Escudero	Shift Table Auto		Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		E10	Start Time	*19:33:30*
		A [lbf]	*16.362*	Fuel type	GASOLINE	End Time	*20:00:32*
Model	RAV4	B [lbf/mph]	*0.04130*	Density	*0.7453*		
Year	*2019*	C [lbf/mph2]	*0.024048*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*37528*	Remark	PRECON #3				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	78.75	Volume[scf]	2667
Zero Read	*0.00*							Press.[in Hg]	29.02	D.F.	
Span Read	*0.00*							RH[%]	*6.33*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*1.345*	Ph. End[s]	505.6
Mass.	*0.000*							Dist.[mi]	*3.61*	Ph. Length[s]	505.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7645*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	76.22	Volume[scf]	4559
Zero Value	*0.00*							Press.[in Hg]	29.02	D.F.	
Span Value	*0.00*							RH[%]	*6.49*	Ph. Start[s]	505.7
Sample	*0.00*							AH[g/kg]	*1.268*	Ph. End[s]	1374.8
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	869.2
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7630*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.47*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*6.33*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*1.34*
CVS Volume[scf]	*2666.71*	Act. Dist.[mi]	*3.61*	Pressure[inHg]	*29.02*
CVS Flow[scfm]	*316.46*			Temp.[°F]	*78.75*
CVS Inlet Pressure	*28.85*			Temp. Min.[°F]	*77.36*
CVS Inlet Temp.[°F]	*75.81*			Temp. Max.[°F]	*79.70*
CVS Inlet Temp. Min.[°F]	*73.67*			NO_X Corr. F	*0.7645*
CVS Inlet Temp. Max.[°F]	*77.81*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*6.49*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*1.27*
CVS Volume[scf]	*4559.01*	Act. Dist.[mi]	*3.87*	Pressure[inHg]	*29.02*
CVS Flow[scfm]	*314.70*			Temp.[°F]	*76.22*
CVS Inlet Pressure	*28.84*			Temp. Min.[°F]	*73.22*
CVS Inlet Temp.[°F]	*76.16*			Temp. Max.[°F]	*79.88*
CVS Inlet Temp. Min.[°F]	*74.93*			NO_X Corr. F	*0.7630*
CVS Inlet Temp. Max.[°F]	*77.09*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

Test Data: FTP72 Operator: Joseph Bishop Date: 2/25/2021
Test Number: ONT3_001503 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001503

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*16.362*	*32.725*
B [lbf/mph]	*0.04130*	*0.20650*
C [lbf/mph2]	*0.024048*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.04		
Driven	5803.21	6224.20		
Distance Rating (%)	0.4163	0.2119		
Cycle Energy (MJ)				
Target	3.23	2.88		
Driven	3.24	2.91		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3202		
Driven	0.4740	0.3198		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.70	1.98		
Inertial Work Fraction				
Target	0.5436	0.6798		
Driven	0.5260	0.6802		
Inertial Work Rating	-2.9449	1.0480		
Absolute Speed Change (m/s2)				
Target	204.87	340.91		
Driven	201.77	342.21		
Absolute Speed Change Rating (%)	-1.5163	0.3800		
Energy Rating	-0.1204	0.7810		
Energy Economy Rating	-0.1204	0.7810		0.3158

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001503

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	78.75	77.36	79.70	68.00	86.00	Passed
Barometer	(inHg)	29.02	29.02	29.02	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	9.41	9.10	10.01	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	75.81	73.67	77.81	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61					Passed
Sample Phase Time	(s)	505.6					
Duration Phase 1	(s)	505.50					
Crank Time Phase1	(s)	0.60				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No Humidity Requirements

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001503

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	76.22	73.22	79.88	68.00	86.00	Passed
Barometer	(inHg)	29.02	29.02	29.02	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	8.88	8.53	9.32	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	76.16	74.93	77.09	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	869.2					
Duration Phase 2	(s)	869.10					
Crank Time Phase1	(s)	0.6000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No Humidity Requirements

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	2/25/2021	**Time:**	20:01:12
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON #4		

QUALITY ASSURANCE

INSPECTED BY: [signature]

DATE: 4/7/2021

COMMENTS: OK

Pre Fuel System Conditioning

General Data

Test Number	*ONT3_001504*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*2/25/2021*	CH_4 Response Factor	
Test Start	*20:01:12*	Odometer Position [mi]	*37533*
Start Time Cycle	*2021-02-25 20|05-06-(000)*	Delay Time Method	
Test End	*20:28:04*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON #4*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493*	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*16.362*	*0.04130*	*0.024048*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*77.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*21.20*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001504	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		E10	Start Time	*20:01:12*
		A [lbf]	*16.362*		Fuel type GASOLINE	End Time	*20:28:04*
Model	RAV4	B [lbf/mph]	*0.04130*		Density *0.7453*		
Year	*2019*	C [lbf/mph2]	*0.024048*		NHV 17916	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*37533*	Remark	PRECON #4				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.12	Volume[scf]	2664
Zero Read	*0.00*							Press.[inHg]	29.03	D.F.	
Span Read	*0.00*							RH[%]	*6.63*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*1.250*	Ph. End[s]	505.4
Mass.	*0.000*							Dist.[mi]	*3.58*	Ph. Length[s]	505.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7626*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	78.31	Volume[scf]	4565
Zero Value	*0.00*							Press.[inHg]	29.03	D.F.	
Span Value	*0.00*							RH[%]	*5.91*	Ph. Start[s]	505.5
Sample	*0.00*							AH[g/kg]	*1.237*	Ph. End[s]	1375.5
Mass.	*0.000*							Dist.[mi]	*3.84*	Ph. Length[s]	870.1
Mass per Dist.	*0.0000*							NO_x Corr.	*0.7624*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.42*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*6.63*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*1.25*
CVS Volume[scf]	*2663.75*	Act. Dist.[mi]	*3.58*	Pressure[inHg]	*29.03*
CVS Flow[scfm]	*316.24*			Temp.[°F]	*75.12*
CVS Inlet Pressure	*28.85*			Temp. Min.[°F]	*72.50*
CVS Inlet Temp.[°F]	*75.10*			Temp. Max.[°F]	*77.18*
CVS Inlet Temp. Min.[°F]	*73.13*			NO_X Corr. F	*0.7626*
CVS Inlet Temp. Max.[°F]	*77.27*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*5.91*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*1.24*
CVS Volume[scf]	*4564.57*	Act. Dist.[mi]	*3.84*	Pressure[inHg]	*29.03*
CVS Flow[scfm]	*314.76*			Temp.[°F]	*78.31*
CVS Inlet Pressure	*28.85*			Temp. Min.[°F]	*77.18*
CVS Inlet Temp.[°F]	*76.16*			Temp. Max.[°F]	*79.16*
CVS Inlet Temp. Min.[°F]	*75.47*			NO_X Corr. F	*0.7624*
CVS Inlet Temp. Max.[°F]	*77.09*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

Test Data: FTP72 Operator: Joseph Bishop Date: 2/25/2021
Test Number: ONT3_001504 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001504

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*16.362*	*32.725*
B [lbf/mph]	*0.04130*	*0.20650*
C [lbf/mph2]	*0.024048*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5761.97	6174.85		
Distance Rating (%)	-0.2974	-0.5828		
Cycle Energy (MJ)				
Target	3.23	2.88		
Driven	3.19	2.88		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201		
Driven	0.4663	0.3188		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.70	1.96		
Inertial Work Fraction				
Target	0.5436	0.6799		
Driven	0.5337	0.6812		
Inertial Work Rating	-3.0067	0.2393		
Absolute Speed Change (m/s2)				
Target	204.88	340.91		
Driven	200.71	342.04		
Absolute Speed Change Rating (%)	-2.0331	0.3339		
Energy Rating	-0.9204	0.6174		
Energy Economy Rating	-0.9204	0.6174		-0.1769

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001504

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	75.12	72.50	77.18	68.00	86.00	Passed
Barometer	(inHg)	29.03	29.02	29.03	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	8.75	8.36	9.15	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	75.10	73.13	77.27	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.58					Passed
Sample Phase Time	(s)	505.4					
Duration Phase 1	(s)	505.30					
Crank Time Phase1	(s)	0.40				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No Humidity Requirements

No Phase 3

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001504

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	78.31	77.18	79.16	68.00	86.00	Passed
Barometer	(inHg)	29.03	29.03	29.03	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	8.66	8.44	8.84	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	76.16	75.47	77.09	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.84					Passed
Sample Phase Time	(s)	870.1					
Duration Phase 2	(s)	870.00					
Crank Time Phase1	(s)	0.4000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Failed ok
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No Humidity Requirements
End of test

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/23/2021	**Time:**	16:42:55
Test Legislation:	EPA		
Test Cycle:	HWFET+HWFET		
Test Purpose:	Preconditioning		
Test Name:	HWFET_HWFET		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	ROADLOAD HWY		

QUALITY ASSURANCE

INSPECTED BY: L

DATE: 4/7/2021

COMMENTS: OK
Pre-Road Load

General Data

Test Number	*ONT3_001663*		
Test Name	*HWFET_HWFET*		
Test Cell	*iGEM-V-TC1*		
Test Type	*HWFET_HWFET*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/23/2021*	CH_4 Response Factor	
Test Start	*16:42:55*	Odometer Position [mi]	*37541*
Start Time Cycle	*2021-03-23 17|05-47-(000)*	Delay Time Method	
Test End	*17:16:58*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*ROADLOAD HWY*		

Vehicle Data — *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493*	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data — *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*16.362*	*0.04130*	*0.024048*

Fuel Data — *FirstLoad*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18093*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data — *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	HWFET_HWFET	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001663	Driver	Joseph Bishop	Shift Table Auto		Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		FirstLoad	Start Time	*16:42:55*
		A [lbf]	*16.362*	Fuel type	GASOLINE	End Time	*17:16:58*
Model	RAV4	B [lbf/mph]	*0.04130*	Density	*0.7453*		
Year	*2019*	C [lbf/mph2]	*0.024048*	NHV	18093	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*37541*	Remark	ROADLOAD HWY				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	77.11	Volume[scf]	3964
Zero Read	*0.00*							Press.[inHg]	28.75	D.F.	
Span Read	*0.00*							RH[%]	*28.09*	Ph. Start[s]	779.3
Sample	*0.00*							AH[g/kg]	*5.749*	Ph. End[s]	1544.2
Mass.	*0.000*							Dist.[mi]	*10.25*	Ph. Length[s	765.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.8597*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_X$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *10.25*

Test Data: HWFET_HWFET Operator: Joseph Bishop Date: 3/23/2021
Test Number: ONT3_001663 Driver: Joseph Bishop

Driver Violations

		P1	I1	Phase1
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001663

Test Cycle HWFET+HWFET
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*16.362*	*32.725*
B [lbf/mph]	*0.04130*	*0.20650*
C [lbf/mph2]	*0.024048*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	16506.54			
Driven	16492.43			
Distance Rating (%)	-0.0855			
Cycle Energy (MJ)				
Target	8.47			
Driven	8.46			
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.7558			
Driven	0.7501			
Inertial Work (MJ)				
Target	2.07			2.07
Driven	2.12			2.12
Inertial Work Fraction				
Target	0.2442			
Driven	0.2499			
Inertial Work Rating	2.3095			2.3095
Absolute Speed Change (m/s2)				
Target	130.69			130.69
Driven	132.91			132.91
Absolute Speed Change Rating (%)	1.6996			1.6996
Energy Rating	0.0366			
Energy Economy Rating	0.0366			0.0366

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001663

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	77.11	75.02	78.98	68.00	86.00	Passed
Barometer	(inHg)	28.75	28.75	28.75	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	40.24	39.00	41.28	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	82.32	77.27	86.63	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	10.25					Passed
Sample Phase Time	(s)	765.0					
Duration Phase 1	(s)	764.90					
Crank Time Phase1	(s)	0.00				5	Not App
Crank Counts		0				1	Passed
Shutdown Time Phase 1						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

QUALITY ASSURANCE

INSPECTED BY: ~

DATE: 4/7/2021

COMMENTS: OK

Data of automatic adaptation 03-23-2021

	Road	measured	act. set	
F0	32.7	33.3	15.6	lbs
F1	0.207	0.167	0.067	lbs/mph
F2	0.0240	0.0245	0.0262	lbs/(mph)²
Rw	3875.0			lbs

v max -	31.1	- 0.0	mph
Max. Devi.	1.06	0.62	lbs
Turn	3		

Close

Print

QUALITY ASSURANCE

INSPECTED BY: [signature]

DATE: 4/7/2021

COMMENTS: OK

Results Coastdown 03-23-2021

mph | Force deviation (lbs) | select

vu	vl	1	2	3	4	5	Average
70.0	60.0	1.16	1.13	1.06	0.00	0.00	1.12
60.0	50.0	-0.01	-0.09	-0.19	0.00	0.00	-0.10
50.0	40.0	-0.21	-0.29	-0.38	0.00	0.00	-0.30
40.0	30.0	0.85	0.73	0.73	0.00	0.00	0.77
30.0	20.0	0.82	0.73	0.62	0.00	0.00	0.72
20.0	10.0	-0.44	-0.48	-0.49	0.00	0.00	-0.47

GRAPHIC | Close

Save to File | Help

Break

Print

Get Data

Data Transfer running

							Set values	(mph)
F0	33.2	33.2	33.3	0.0	0.0	33.2	32.7	lbs
F1	0.179	0.170	0.167	0.000	0.000	0.172	0.207	lbs/mph
F2	0.0243	0.0244	0.0245	0.0000	0.0000	0.0244	0.0240	lbs/(mph)²
						Rw	3875.0	lbs

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/23/2021	**Time:**	17:42:17
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: [signature]

DATE: 4/7/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001664*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/23/2021*	CH_4 Response Factor	
Test Start	*17:42:17*	Odometer Position [mi]	*37562*
Start Time Cycle	*2021-03-23 17|46-11-(000)*	Delay Time Method	
Test End	*18:09:51*		
Operator	*Victor Escudero*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493*	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*15.600*	*0.06700*	*0.026200*

Fuel Data *E10*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Victor Escudero	Speed Table	Date:
Test Number	ONT3_001664	Driver	Victor Escudero	Shift Table Auto	Cold Start

Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		E10	Start Time	*17:42:17*
		A [lbf]	*15.600*	Fuel type	GASOLINE	End Time	*18:09:51*
Model	RAV4	B [lbf/mph]	*0.06700*	Density	*0.7453*		
Year	*2019*	C [lbf/mph2]	*0.026200*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*37562*	Remark	PRECON				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	$N2O$ [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	77.25	Volume [scf]	2645
Zero Read	*0.00*							Press. [inHg]	28.77	D.F.	
Span Read	*0.00*							RH [%]	*26.67*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*5.478*	Ph. End [s]	505.4
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8532*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	$N2O$ [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	77.04	Volume [scf]	4526
Zero Value	*0.00*							Press. [inHg]	28.77	D.F.	
Span Value	*0.00*							RH [%]	*26.80*	Ph. Start [s]	505.5
Sample	*0.00*							AH [g/kg]	*5.465*	Ph. End [s]	1374.8
Mass.	*0.000*							Dist. [mi]	*3.87*	Ph. Length [s]	869.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8528*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.46*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*26.67*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*5.48*
CVS Volume[scf]	*2645.20*	Act. Dist.[mi]	*3.60*	Pressure[inHg]	*28.77*
CVS Flow[scfm]	*314.03*			Temp.[°F]	*77.25*
CVS Inlet Pressure	*28.68*			Temp. Min.[°F]	*75.20*
CVS Inlet Temp.[°F]	*77.29*			Temp. Max.[°F]	*79.34*
CVS Inlet Temp. Min.[°F]	*75.29*			NO_x Corr. F	*0.8532*
CVS Inlet Temp. Max.[°F]	*80.15*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*26.80*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*5.47*
CVS Volume[scf]	*4525.99*	Act. Dist.[mi]	*3.87*	Pressure[inHg]	*28.77*
CVS Flow[scfm]	*312.35*			Temp.[°F]	*77.04*
CVS Inlet Pressure	*28.68*			Temp. Min.[°F]	*75.02*
CVS Inlet Temp.[°F]	*77.87*			Temp. Max.[°F]	*78.98*
CVS Inlet Temp. Min.[°F]	*77.09*			NO_X Corr. F	*0.8528*
CVS Inlet Temp. Max.[°F]	*78.89*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

Test Data: FTP72 Operator: Victor Escudero Date: 3/23/2021
Test Number: ONT3_001664 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001664

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.14	6211.05		
Driven	5787.98	6221.67		
Distance Rating (%)	0.1530	0.1711		
Cycle Energy (MJ)				
Target	3.23	2.88		
Driven	3.20	2.91		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201		
Driven	0.4599	0.3221		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.73	1.98		
Inertial Work Fraction				
Target	0.5436	0.6799		
Driven	0.5401	0.6779		
Inertial Work Rating	-1.3645	0.8509		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	202.17	342.40		
Absolute Speed Change Rating (%)	-1.3225	0.4382		
Energy Rating	-0.8879	0.9589		
Energy Economy Rating	-0.8879	0.9589		-0.0090

ATDS Emission Lab Test Report
Phase 1

Validation

Test Record #: ONT3_001664

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	77.25	75.20	79.34	68.00	86.00	Passed
Barometer	(inHg)	28.77	28.77	28.77	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	38.35	37.25	39.27	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	77.29	75.29	80.15	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.4					
Duration Phase 1	(s)	505.30					
Crank Time Phase1	(s)	0.40				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No Humidity Requirement

ATDS Emission Lab Test Report
Phase 2

Validation

Test Record #: ONT3_001664

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	77.04	75.02	78.98	68.00	86.00	Passed
Barometer	(inHg)	28.77	28.77	28.77	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	38.26	37.09	39.34	38.50	87.50	Review
CVS Inlet Temperature	(°F)	77.87	77.09	78.89	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	869.4					
Duration Phase 2	(s)	869.30					
Crank Time Phase1	(s)	0.4000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No Humidity Requirement

ATDS CANISTER WORKSHEET

Station number 4

--PURGE AND FILL--

VT#	3081-009493
Project	3081
Evap Family	KTYXR0130P82
Ambient Temperature-Deg F	76
Barometric Pressure-In/Hg	28.78
Humidity-Grains/Lb	37.8
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	130
Canister Volume-Liters	2.5
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	18:12:53
Start date	03-23-2021
Bed Purges/Cycle	300
Purge End/Load Start	18:46:03
Test Time Minutes	816
HC Loaded-Grams	195.0
Scale Reading-Grams	-3.59
Butane Flow Actual-Gm/Hr	14.9
Cycles Completed	1
Finish time	07:48:56
Finish date	03-24-2021
Disk File Name	21032401.ST4

QUALITY ASSURANCE
INSPECTED BY:
DATE: 4/7/2021
COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/24/2021	**Time:**	8:26:57
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 Test		

QUALITY ASSURANCE

INSPECTED BY: _____

DATE: 4/7/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001665*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/24/2021*	CH_4 Response Factor	
Test Start	*8:26:57*	Odometer Position [mi]	*37569*
Start Time Cycle	*2021-03-24 08|35-41-(000)*	Delay Time Method	
Test End	*9:15:43*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 Test*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*15.600* ✓	*0.06700* ✓	*0.026200* ✓

Fuel Data ~~*91_Pump_Gas*~~ E10 ✓

Fuel Type	*GASOLINE* ✓	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed* ✓

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Domenic Coppola	Speed Table	Date:		
Test Number	ONT3_001665	Driver	Jennifer Chappell	Shift Table Auto	Cold Start		
Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*8:26:57*
		A [lbf]	*15.600*	Fuel type	GASOLINE	End Time	*9:15:43*
Model	RAV4	B [lbf/mph]	*0.06700*	Density	*0.7380*		
Year	*2019*	C [lbf/mph2]	*0.026200*	NHV	18085	Soak Time	545.8
Displacement:				CWF	*0.8527*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*37569*	Remark	E10 Test				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	77.64	Volume [scf]	2674
Zero Read	*0.00*							Press. [inHg]	28.94	D.F.	
Span Read	*0.00*							RH [%]	*11.70*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*2.409*	Ph. End [s]	505.8
Mass.	*0.000*							Dist. [mi]	*3.61*	Ph. Length [s]	505.8
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7855*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.85	Volume [scf]	4565
Zero Value	*0.00*							Press. [inHg]	28.94	D.F.	
Span Value	*0.00*							RH [%]	*11.76*	Ph. Start [s]	505.9
Sample	*0.00*							AH [g/kg]	*2.358*	Ph. End [s]	1375.6
Mass.	*0.000*							Dist. [mi]	*3.88*	Ph. Length [s]	869.8
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7845*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.77	Volume [scf]	2655
Zero Value	*0*							Press. [inHg]	28.94	D.F.	
Span Value	*0.00*							RH [%]	*11.62*	Ph. Start [s]	1919.3
Sample	*0*							AH [g/kg]	*2.323*	Ph. End [s]	2425.3
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	506.1
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7837*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.10*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_x [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.09*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	11.70
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	2.41
CVS Volume[scf]	2673.93	Act. Dist.[mi]	3.61	Pressure[inHg]	28.94
CVS Flow[scfm]	317.19			Temp.[°F]	77.64
CVS Inlet Pressure	28.85			Temp. Min.[°F]	75.56
CVS Inlet Temp.[°F]	74.59			Temp. Max.[°F]	78.80
CVS Inlet Temp. Min.[°F]	72.23			NO_X Corr. F	0.7855
CVS Inlet Temp. Max.[°F]	77.27				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	0						
Sample	0.000						
Std. Dev.	0.000						
Ambient	0.000						
Std. Dev.	0.000						
Corrected	0.000						
Mass	THC[g]	CO[g]	CO_2[g]	NO_X[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	0.0000						
Corrected	0.0000						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_X[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	0.0000						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*11.76*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*2.36*
CVS Volume[scf]	*4565.39*	Act. Dist.[mi]	*3.88*	Pressure[inHg]	*28.94*
CVS Flow[scfm]	*314.93*			Temp.[°F]	*76.85*
CVS Inlet Pressure	*28.84*			Temp. Min.[°F]	*73.40*
CVS Inlet Temp.[°F]	*75.39*			Temp. Max.[°F]	*78.80*
CVS Inlet Temp. Min.[°F]	*74.75*			NO_X Corr. F	*0.7845*
CVS Inlet Temp. Max.[°F]	*76.37*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*11.62*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*2.32*
CVS Volume[scf]	*2654.67*	Act. Dist.[mi]	*3.60*	Pressure[inHg]	*28.94*
CVS Flow[scfm]	*314.72*			Temp.[°F]	*76.77*
CVS Inlet Pressure	*28.85*			Temp. Min.[°F]	*73.76*
CVS Inlet Temp.[°F]	*76.19*			Temp. Max.[°F]	*78.44*
CVS Inlet Temp. Min.[°F]	*74.93*			NO_X Corr. F	*0.7837*
CVS Inlet Temp. Max.[°F]	*77.99*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

Test Data: FTP75 Operator: Domenic Coppola Date: 3/24/2021
Test Number: ONT3_001665 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001665

Test Cycle FTP75
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6210.96	5779.15	
Driven	5811.56	6237.45	5791.85	
Distance Rating (%)	0.5609	0.4265	0.2198	
Cycle Energy (MJ)				
Target	3.23	2.88	3.23	
Driven	3.25	2.92	3.24	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201	0.4564	
Driven	0.4435	0.3201	0.4550	
Inertial Work (MJ)				
Target	1.75	1.96	1.75	3.71
Driven	1.81	1.98	1.77	3.77
Inertial Work Fraction				
Target	0.5436	0.6799	0.5436	
Driven	0.5565	0.6799	0.5450	
Inertial Work Rating	3.2288	1.2771	0.6449	1.5033
Absolute Speed Change (m/s2)				
Target	204.88	340.91	204.87	545.79
Driven	207.50	343.97	205.64	550.41
Absolute Speed Change Rating (%)	1.2766	0.8981	0.3738	0.8470
Energy Rating	0.2804	0.8295	0.1618	
Energy Economy Rating	0.2804	0.8295	0.1618	0.5021

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001665

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	77.64	75.56	78.80	68.00	86.00	Passed
Barometer	(inHg)	28.94	28.93	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	16.86	16.47	17.32	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	74.59	72.23	77.27	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61					Passed
Sample Phase Time	(s)	505.8					
Duration Phase 1	(s)	505.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	545.80			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

No Humidity Requirement

ATDS Emission Lab Test Report
Phase 2

Validation

Test Record #: ONT3_001665

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	76.85	73.40	78.80	68.00	86.00	Passed
Barometer	(inHg)	28.94	28.93	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	16.51	15.71	17.05	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	75.39	74.75	76.37	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.88					Passed
Sample Phase Time	(s)	869.8					
Duration Phase 2	(s)	869.70					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	545.80			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No Humidity Requirement

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001665

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	76.77	73.76	78.44	68.00	86.00	Passed
Barometer	(inHg)	28.94	28.93	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	16.26	15.63	16.76	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	76.19	74.93	77.99	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	506.1					
Duration Phase 3	(s)	506.00					
Crank Time Phase3	(s)	1.10				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)	545.80			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

No Humidity Requirement

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	3/24/2021	**Time:**	11:00:45
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 Test		

QUALITY ASSURANCE

INSPECTED BY: L

DATE: 4/7/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001666*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*3/24/2021*	CH_4 Response Factor	
Test Start	*11:00:45*	Odometer Position [mi]	*37580*
Start Time Cycle	*2021-03-24 11|07-34-(000)*	Delay Time Method	
Test End	*12:18:52*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 Test*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*15.600* ✓	*0.06700* ✓	*0.026200* ✓

Fuel Data ~~*91_Pump_Gas*~~ E10 ✓

Fuel Type	*GASOLINE* ✓	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed* ✓

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Domenic Coppola	Speed Table	Date:
Test Number	ONT3_001666	Driver	Jennifer Chappell	Shift Table Auto	Cold Start

Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*	91_Pump_Gas		Start Time	*11:00:45*
		A [lbf]	*15.600*	Fuel type	GASOLINE	End Time	*12:18:52*
Model	RAV4	B [lbf/mph]	*0.06700*	Density	*0.7380*		
Year	*2019*	C [lbf/mph2]	*0.026200*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*37580*	Remark	E10 Test				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	107.59	Volume[scf]	7758
Zero Read	*0.00*							Press.[inHg]	28.95	D.F.	
Span Read	*0.00*							RH[%]	*5.21*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*2.713*	Ph. End[s]	1490.4
Mass.	*0.000*							Dist.[mi]	*7.48*	Ph. Length[s]	1490.4
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7917*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.40*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	105.97	Volume[scf]	6852
Zero Value	*0.00*							Press.[inHg]	28.94	D.F.	
Span Value	*0.00*							RH[%]	*5.35*	Ph. Start[s]	1490.5
Sample	*0.00*							AH[g/kg]	*2.659*	Ph. End[s]	2812.4
Mass.	*0.000*							Dist.[mi]	*2.38*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7906*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	106.87	Volume[scf]	7699
Zero Value	*0*							Press.[inHg]	28.93	D.F.	
Span Value	*0.00*							RH[%]	*5.07*	Ph. Start[s]	2812.5
Sample	*0*							AH[g/kg]	*2.589*	Ph. End[s]	4301.4
Mass.	*0.000*							Dist.[mi]	*7.46*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.7892*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_X$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.32*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	5.21
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	2.71
CVS Volume[scf]	7757.99	Act. Dist.[mi]	7.48	Pressure[inHg]	28.95
CVS Flow[scfm]	312.32			Temp.[°F]	107.59
CVS Inlet Pressure	28.86			Temp. Min.[°F]	106.16
CVS Inlet Temp.[°F]	88.34			Temp. Max.[°F]	109.04
CVS Inlet Temp. Min.[°F]	83.75			NO_X Corr. F	0.7917
CVS Inlet Temp. Max.[°F]	90.77				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	0						
Sample	0.000						
Std. Dev.	0.000						
Ambient	0.000						
Std. Dev.	0.000						
Corrected	0.000						
Mass	THC[g]	CO[g]	CO_2[g]	NO_X[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	0.0000						
Corrected	0.0000						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_X[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	0.0000						

Fuel Consumption

Fuel Consumption[g]		Fuel Consumption[l/100km]	
Fuel Consumption[l]		**Fuel Economy**[mile/gal]	

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	5.35
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	2.66
CVS Volume[scf]	6852.31	Act. Dist.[mi]	2.38	Pressure[inHg]	28.94
CVS Flow[scfm]	311.00			Temp.[°F]	105.97
CVS Inlet Pressure	28.85			Temp. Min.[°F]	105.62
CVS Inlet Temp.[°F]	89.05			Temp. Max.[°F]	106.16
CVS Inlet Temp. Min.[°F]	87.89			NO_x Corr. F	0.7906
CVS Inlet Temp. Max.[°F]	92.21				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	0						
Sample	0.000						
Std. Dev.	0.000						
Ambient	0.000						
Std. Dev.	0.000						
Corrected	0.000						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	0.0000						
Corrected	0.0000						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	0.0000						

Fuel Consumption

Fuel Consumption[g]		Fuel Consumption[l/100km]	
Fuel Consumption[l]		**Fuel Economy[mile/gal]**	

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*5.07*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*2.59*
CVS Volume[scf]	*7699.32*	Act. Dist.[mi]	*7.46*	Pressure[inHg]	*28.93*
CVS Flow[scfm]	*310.25*			Temp.[°F]	*106.87*
CVS Inlet Pressure	*28.84*			Temp. Min.[°F]	*105.80*
CVS Inlet Temp.[°F]	*91.28*			Temp. Max.[°F]	*108.14*
CVS Inlet Temp. Min.[°F]	*88.43*			NO_x Corr. F	*0.7892*
CVS Inlet Temp. Max.[°F]	*94.73*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l/100km]

Fuel Consumption[l]

Fuel Economy[mile/gal]

Test Data: ORVR_Prep
Test Number: ONT3_001666

Operator: Domenic Coppola
Driver: Jennifer Chappell

Date: 3/24/2021

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001666

Test Cycle RL
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.77	11990.13	
Driven	12043.04	3830.75	12002.22	
Distance Rating (%)	0.4413	1.0014	0.1009	
Cycle Energy (MJ)				
Target	6.11	2.45	6.11	
Driven	6.14	2.32	6.13	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3921	0.1649	0.3921	
Driven	0.3921	0.1690	0.4031	
Inertial Work (MJ)				
Target	3.71	2.04	3.71	5.76
Driven	3.73	1.93	3.66	5.62
Inertial Work Fraction				
Target	0.6079	0.8351	0.6079	
Driven	0.6079	0.8310	0.5969	
Inertial Work Rating	0.5991	-5.6997	-1.5216	-2.4160
Absolute Speed Change (m/s2)				
Target	545.78	469.43	545.78	1015.21
Driven	546.98	444.70	540.52	987.99
Absolute Speed Change Rating (%)	0.2199	-5.2687	-0.9634	-2.6806
Energy Rating	0.1508	-6.5841	0.1873	
Energy Economy Rating	0.1508	-6.5841	0.1873	-1.6463

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001666

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	107.59	106.16	109.04	68.00	86.00	Review OK
Barometer	(inHg)	28.95	28.95	28.96	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.99	18.48	19.60	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	88.34	83.75	90.77	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48					Passed
Sample Phase Time	(s)	1490.4					
Duration Phase 1	(s)	1490.30					
Crank Time Phase1	(s)	1.40				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

Temp Set 105°F
No Humidity Requirement

ATDS Emission Lab Test Report
Phase 2

Validation

Test Record #: ONT3_001666

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	105.97	105.62	106.16	68.00	86.00	Review OK
Barometer	(inHg)	28.94	28.94	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.62	18.35	18.80	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	89.05	87.89	92.21	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.38					Passed
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

Temp Set 105°F
No Humidity Requirement

ATDS Emission Lab Test Report
Phase 3

Validation

Test Record #: ONT3_001666

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	106.87	105.80	108.14	68.00	86.00	Review OK
Barometer	(inHg)	28.93	28.92	28.94	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	18.12	17.77	18.88	38.50	87.50	Review OK
CVS Inlet Temperature	(°F)	91.28	88.43	94.73	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.46					Passed
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

Temp Set 105°F
No Humidity Requirement

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001665/ONT3_001666

ATDS Vehicle ID	3081-009493	*VIN*	2T3H1RFV7KW009493
Model Year	2019	*Make/Model*	Toyota Rav4
Test Group	KTYXT02.5N4H	*Engine Size*	2.5L
Evaporative Family	KTYXR0130P82	*Canister Capacity*	130g
Odometer	37597	*Vehicle Test Volume*	50 ft3
Test Start Date	Wednesday, March 24, 2021	*Profile*	CA
		Fuel	E10

0 – 1 Hour Diurnal / (3-Day Supplemental) 3/24/2021

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	12:18:52	0:00:00	0:00:00	
Engine Key-off	12:24:00	0:05:08	0:05:08	
SHED Door Sealed	12:25:00	0:01:00	0:06:08	
Final Sample	13:25:00	1:00:00	1:06:08	
Initial				
Zero = 0.000 ppm	Span = 9.550 ppm	Re-Zero = 0.000 ppm		
Read = 5.241 ppm	Volume = 1794.8 ft3	Temp. = 103.8 °F	Baro. = 28.97 in/Hg	Mass HC=0.145 grams
Post Read Zero = 0.000 ppm	Post Read Span = 9.539 ppm			Mass EtOH= 0.013 grams
Final				
Zero = 0.000 ppm	Span = 9.550 ppm	Re-Zero = 0.000 ppm		
Read = 6.765 ppm	Volume = 1799.9 ft3	Temp. = 105.3 °F	Baro. = 28.96 in/Hg	Mass HC =0.185 grams
Post Read Zero = -0.006 ppm	Post Read Span = 9.544 ppm			Mass EtOH = 0.024 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 103.9 °F	Minimum = 102 °F			
Max Ambient Temp = 106.5 °F	Maximum = 108 °F			
Min Interior Temp = 103.9 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.04±0.01 grams**
				Diurnal Mass EtOH = 0.011 grams
				Diurnal Total Mass HC plus EtOH = 0.043 grams

HOT SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Wednesday, March 24, 2021	14:25:00	0:00:00	
End Cold Soak	Wednesday, March 24, 2021	20:25:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63.2 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.7 °F	Maximum = 68 °F			
Min. Internal Temp = 63.2 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37597	***Vehicle Test Volume***	50 ft3
Test Start Date	Wednesday, March 24, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Wednesday, March 24, 2021	20:25:00	0:00:00	
Start Time Diurnal	Wednesday, March 24, 2021	20:25:00	0:00:00	
End Time Diurnal	Thursday, March 25, 2021	20:25:00	24:00:00	
24 Hour Sample	Thursday, March 25, 2021	20:25:00	24:00:00	
Initial				
Zero = 0.000 ppm	Span = 9.550 ppm	Re-Zero = 0.000 ppm		
Read = 6.620 ppm	Volume = 1680.8 ft3	Temp. = 64.8 °F	Baro. = 28.93 in/Hg	Mass HC =0.183 grams
Post Read Zero = 0.000 ppm	Post Read Span = 9.557 ppm			Mass EtOH= 0.023 grams
Final				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 11.257 ppm	Volume = 1655.7 ft3	Temp. = 65 °F	Baro. = 28.87 in/Hg	Mass HC=0.305 grams
Post Read Zero = -0.007 ppm	Post Read Span = 93.299 ppm			Mass EtOH= 0.082 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.9 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.9 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.91 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.122±0.01 grams**
				Diurnal Mass EtOH = 0.059 grams
				Diurnal Total Mass HC plus EtOH = 0.137 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37597	***Vehicle Test Volume***	50 ft3
Test Start Date	Wednesday, March 24, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Thursday, March 25, 2021	20:25:00	24:00:00	
Start Time Diurnal	Thursday, March 25, 2021	20:25:00	24:00:00	
End Time Diurnal	Friday, March 26, 2021	20:25:00	48:00:00	
48 Hour Sample	Friday, March 26, 2021	20:25:00	48:00:00	
Initial				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 11.257 ppm	Volume = 1655.7 ft3	Temp. = 65.03 °F	Baro. = 28.87 in/Hg	Mass HC=0.305 grams
Post Read Zero = 0.000 ppm	Post Read Span = 93.299 ppm			Mass EtOH= 0.082 grams
Final				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 15.300 ppm	Volume = 1612.5 ft3	Temp. = 65 °F	Baro. = 29.11 in/Hg	Mass HC=0.407 grams
Post Read Zero = -0.009 ppm	Post Read Span = 93.266 ppm			Mass EtOH= 0.143 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.7 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.8 °F	± 2 °F			
Max. Δ Profile Sidewall = 1.1 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.102±0.01 grams**
				Diurnal Mass EtOH = 0.061 grams
				Diurnal Total Mass HC plus EtOH = 0.117 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37597	***Vehicle Test Volume***	50 ft3
Test Start Date	Wednesday, March 24, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Friday, March 26, 2021	20:25:00	48:00:00	
Start Time Diurnal	Friday, March 26, 2021	20:25:00	48:00:00	
End Time Diurnal	Saturday, March 27, 2021	20:25:00	72:00:00	
72 Hour Sample	Saturday, March 27, 2021	20:25:00	72:00:00	
Initial				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 15.300 ppm	Volume = 1612.5 ft3	Temp. = 65.03 °F	Baro. = 29.11 in/Hg	Mass HC=0.407 grams
Post Read Zero = -0.009 ppm	Post Read Span = 93.266 ppm			Mass EtOH= 0.143 grams
Final				
Zero = 0.000 ppm	Span = 93.30 ppm	Re-Zero = 0.000 ppm		
Read = 18.801 ppm	Volume = 1606.1 ft3	Temp. = 64.9 °F	Baro. = 29.19 in/Hg	Mass HC= 0.500 grams
Post Read Zero = -0.012 ppm	Post Read Span = 93.299 ppm			Mass EtOH= 0.167 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.6 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.4 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.8 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.093±0.01 grams**
				Diurnal Mass EtOH = 0.024 grams
				Diurnal Total Mass HC plus EtOH = 0.099 grams

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal HC plus EtOH emissions results: 0.18 grams {hot soak + highest 24 hour mass}

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/17/2021

COMMENTS: OK

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

Emission Test Check Sheet
FTP with 3 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Toyta Rav4
Vehicle #:	3081-009493	**Engine Size**	2.5L
VIN:	2T3H1RFV7KW009493	**Model Year**	2019
Engine Family:	KTYXT02.5N4H	**Requested By:**	J. Link

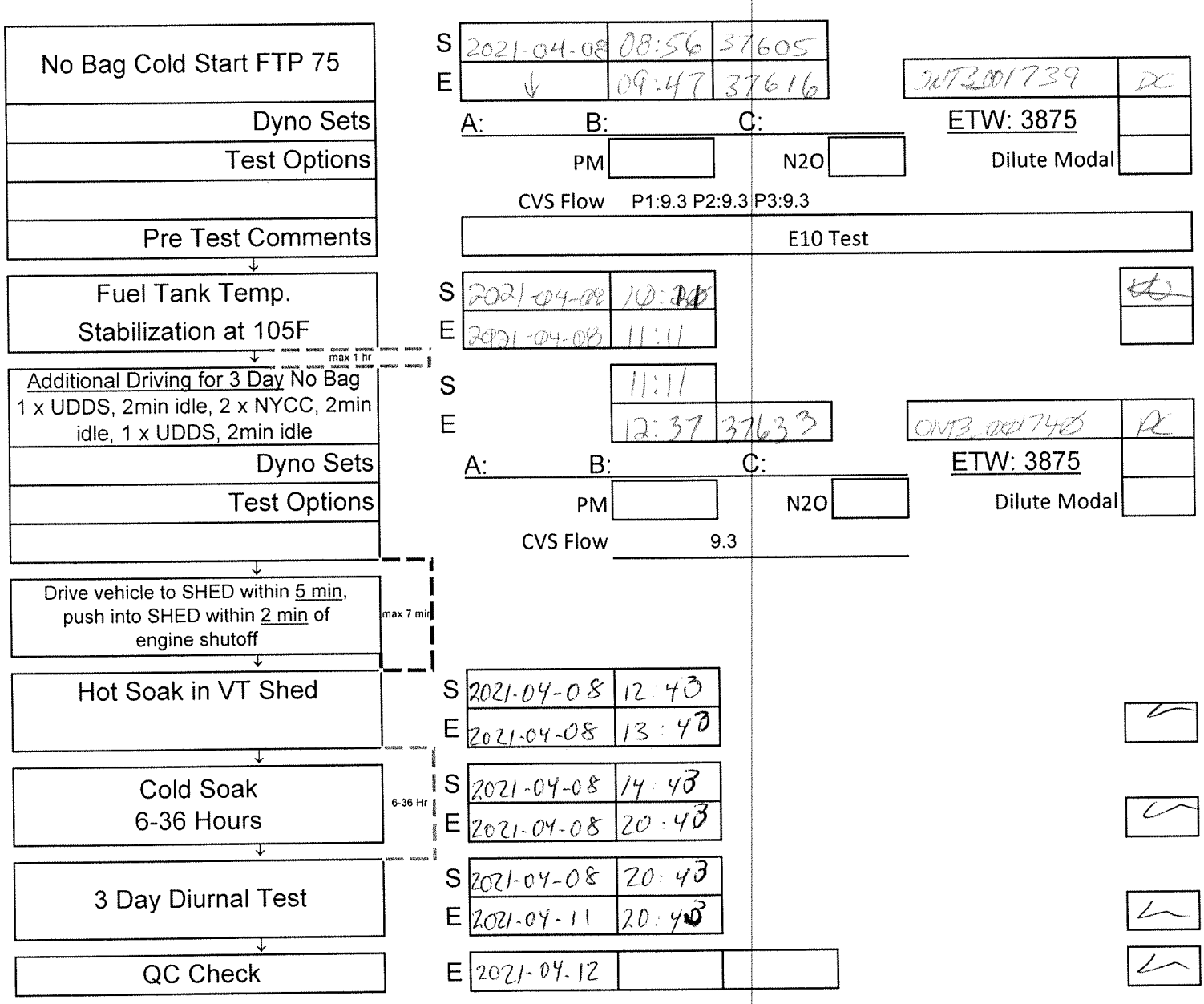
Documentation

		Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S		2021-04-06	14:21		5.8		
	E		2021-04-06	15:10		Fuel Spec:	E10	JM
↓								
Vehicle Soak 68-86°F	S		2021-04-06	15:15				
min 6 hr.	E							VE
↓								
Set tire pressure to sticker		Front		35	Back	35		VE
↓								
Precon FTP 72 (UDDS)	S		2021-04-07	14:29	37598			
	E		↓	14:57	37605		CWT2_00187	VE
Dyno Sets		A:	B:		C:		ETW: 3875	VE
↓								
Vehicle Soak 68-86°F	S		2021-04-07	15:05				VE
	E							
↓								
Canister Loading with Butane Type: 1.5x Load	S		4/7/2021	15:06				
12-36 hr	E		4/8/2021	04:42			21040801 ST4	JC
Canister Loading Specs		Cap		130	Vol	2.5		
		Purge		300	Flow Rate	15	KTYXR0130P82	
↓								
Set tire pressure to sticker		Front		35	Back	35		
↓								

T - 69.6

H - 43.4

B - 29.1


No Bag Cold Start FTP 75
Dyno Sets
Test Options
Pre Test Comments
S 2021-04-08 08:56 37605
E ↓ 09:47 37616
A: B: C:
PM N2O
CVS Flow P1:9.3 P2:9.3 P3:9.3
ETW: 3875
Dilute Modal
E10 Test
Fuel Tank Temp. Stabilization at 105F
S 2021-04-08 10:
E 2021-04-08 11:11
max 1 hr
Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
S 11:11
E 12:37 37633
A: B: C:
PM N2O
CVS Flow 9.3
ETW: 3875
Dilute Modal
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
S 2021-04-08 12:43
E 2021-04-08 13:43
Cold Soak 6-36 Hours
6-36 Hr
S 2021-04-08 14:43
E 2021-04-08 20:43
3 Day Diurnal Test
S 2021-04-08 20:43
E 2021-04-11 20:43
QC Check
E 2021-04-12

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project # / Vehicle #	3081	3081-009493		
VIN:	2T3H1RFV7KW009493			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Toyta	Rav4	FWD	2019
Test Group / Engine Size (L):	KTYXT02.5N4H	2.5L		
EVAP Family:	KTYXR0130P82			
Standard Tire Size (front) / Pressure:	225/65-17	35		
Standard Tire Size (rear) / Pressure:	225/65-17	35		
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	32.73	0.2065	0.024048	
Warmup Coefficients A / B / C:	16.36	0.0413	0.024048	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E10 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	14.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	130
Canister volume (Liter)	2.465
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
5.8 of See Notes!
E10 Fuel
105.9" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

Emissions Test Data:

FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐

Test Quantity: 1

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	4/7/2021	**Time:**	14:29:08
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon		

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 4-14-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001737*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*4/7/2021*	CH_4 Response Factor	
Test Start	*14:29:08*	Odometer Position [mi]	*37598*
Start Time Cycle	*2021-04-07 14|34-35-(000)*	Delay Time Method	
Test End	*14:57:01*		
Operator	*Victor Escudero*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*precon*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82* ✓	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H* ✓	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*		Inertia [lb]	*3875.00* ✓	
	A [lbf]		B [lbf/mph]		C [lbf/mph2]
Street Load	*32.725* ✓		*0.20650* ✓		*0.024048* ✓
Road Load	*15.600*		*0.06700*		*0.026200*

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Victor Escudero	Speed Table	Date:
Test Number	ONT3_001737	Driver	Victor Escudero	Shift Table Auto	Cold Start

Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		E10	Start Time	*14:29:08*
		A [lbf]	*15.600*	Fuel type	GASOLINE	End Time	*14:57:01*
Model	RAV4	B [lbf/mph]	*0.06700*	Density	*0.7453*		
Year	*2019*	C [lbf/mph2]	*0.026200*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*37598*	Remark	precon				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	71.29	Volume[scf]	2661
Zero Read	*0.00*							Press.[inHg]	28.99	D.F.	
Span Read	*0.00*							RH[%]	*40.13*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*6.713*	Ph. End[s]	505.5
Mass.	*0.000*							Dist.[mi]	*3.57*	Ph. Length[s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8838*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	70.92	Volume[scf]	4548
Zero Value	*0.00*							Press.[inHg]	28.99	D.F.	
Span Value	*0.00*							RH[%]	*40.98*	Ph. Start[s]	505.6
Sample	*0.00*							AH[g/kg]	*6.771*	Ph. End[s]	1375.0
Mass.	*0.000*							Dist.[mi]	*3.83*	Ph. Length[s]	869.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8853*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.40*

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 4-14-21

COMMENTS: Okay

Test Data: FTP72 Operator: Victor Escudero Date: 4/7/2021
Test Number: ONT3_001737 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001737

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5751.59	6167.17		
Distance Rating (%)	-0.4769	-0.7064		
Cycle Energy (MJ)				
Target	3.23	2.88		
Driven	3.19	2.87		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201		
Driven	0.4699	0.3286		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.69	1.93		
Inertial Work Fraction				
Target	0.5436	0.6799		
Driven	0.5301	0.6714		
Inertial Work Rating	-3.5205	-1.6972		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	200.69	337.38		
Absolute Speed Change Rating (%)	-2.0420	-1.0344		
Energy Rating	-0.5927	0.2408		
Energy Economy Rating	-0.5927	0.2408		-0.1875

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001737

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	71.29	69.44	74.30	68.00	86.00	Passed
Barometer	(inHg)	28.99	28.99	28.99	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	46.99	45.73	49.35	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	81.63	80.33	83.57	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.57					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001737

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	70.92	69.08	74.84	68.00	86.00	Passed
Barometer	(inHg)	28.99	28.98	28.99	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	47.39	45.68	50.04	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	82.30	81.23	83.75	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.83					Passed
Sample Phase Time	(s)	869.5					
Duration Phase 2	(s)	869.40					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS CANISTER WORKSHEET

Station number 4

--PURGE AND FILL--

VT#	3081-009493
Project	3081
Evap Family	KTYXR0130P82
Ambient Temperature-Deg F	70
Barometric Pressure-In/Hg	29.10
Humidity-Grains/Lb	43.4
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	130 ✓
Canister Volume-Liters	2.5 ✓
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	15:06:01
Start date	04-07-2021
Bed Purges/Cycle	300
Purge End/Load Start	15:39:11
Test Time Minutes	816
HC Loaded-Grams	195.0 ✓
Scale Reading-Grams	1.34 ✓
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	04:42:04
Finish date	04-08-2021
Disk File Name	21040801.ST4

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 4-14-21

COMMENTS: Okay

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	4/8/2021	**Time:**	8:56:55
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Certification		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST		

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 4-14-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001739*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*4/8/2021*	CH_4 Response Factor	
Test Start	*8:56:55*	Odometer Position [mi]	*37605*
Start Time Cycle	*2021-04-08 09|10-13-(000)*	Delay Time Method	
Test End	*9:47:30*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82* ✓	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H* ✓	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725* ✓	*0.20650* ✓	*0.024048* ✓
Road Load	*15.600* ✓	*0.06700* ✓	*0.026200* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Domenic Coppola	Speed Table	Date:		
Test Number	ONT3_001739	Driver	Jennifer Chappell	Shift Table Auto	Cold Start		

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		E10	Start Time	*8:56:55*
		A [lbf]	*15.600*	Fuel type	GASOLINE	End Time	*9:47:30*
Model	RAV4	B [lbf/mph]	*0.06700*	Density	*0.7453*		
Year	*2019*	C [lbf/mph2]	*0.026200*	NHV	17916	Soak Time	569.5
Displacement:				CWF	*0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*37605*	Remark	E10 TEST				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.40	Volume[scf]	2658
Zero Read	*0.00*							Press.[inHg]	29.00	D.F.	
Span Read	*0.00*							RH[%]	*38.69*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*7.189*	Ph. End[s]	505.8
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8962*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.13	Volume[scf]	4572
Zero Value	*0.00*							Press.[inHg]	29.00	D.F.	
Span Value	*0.00*							RH[%]	*39.03*	Ph. Start[s]	505.9
Sample	*0.00*							AH[g/kg]	*7.188*	Ph. End[s]	1375.8
Mass.	*0.000*							Dist.[mi]	*3.89*	Ph. Length[s]	870.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8962*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.85	Volume[scf]	2664
Zero Value	*0*							Press.[inHg]	29.00	D.F.	
Span Value	*0.00*							RH[%]	*38.95*	Ph. Start[s]	1942.0
Sample	*0*							AH[g/kg]	*7.104*	Ph. End[s]	2449.0
Mass.	*0.000*							Dist.[mi]	*3.61*	Ph. Length[s]	507.1
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8939*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*2.10*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *11.10*

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 4-14-21

COMMENTS: Okay

Test Data: FTP75 Operator: Domenic Coppola Date: 4/8/2021
Test Number: ONT3_001739 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001739

Test Cycle FTP75
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.14	6210.96	5779.15	
Driven	5794.53	6259.20	5811.10	
Distance Rating (%)	0.2662	0.7766	0.5529	
Cycle Energy (MJ)				
Target	3.23	2.88	3.23	
Driven	3.22	2.91	3.24	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201	0.4564	
Driven	0.4649	0.3284	0.4495	
Inertial Work (MJ)				
Target	1.75	1.96	1.75	3.71
Driven	1.72	1.95	1.78	3.71
Inertial Work Fraction				
Target	0.5436	0.6799	0.5436	
Driven	0.5351	0.6716	0.5505	
Inertial Work Rating	-1.7856	-0.3239	1.7698	-0.0571
Absolute Speed Change (m/s2)				
Target	204.88	340.92	204.87	545.79
Driven	203.11	339.80	207.20	545.24
Absolute Speed Change Rating (%)	-0.8625	-0.3277	1.1362	-0.1008
Energy Rating	-0.4886	0.1312	-0.0542	
Energy Economy Rating	-0.4886	0.1312	-0.0542	-0.0804

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001739

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	74.40	71.42	76.46	68.00	86.00	Passed
Barometer	(inHg)	29.00	29.00	29.00	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	50.32	47.73	52.09	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	77.57	76.19	79.79	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.8					
Duration Phase 1	(s)	505.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	569.50			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001739

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	74.13	71.60	76.28	68.00	86.00	Passed
Barometer	(inHg)	29.00	29.00	29.00	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	50.32	47.85	52.08	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	77.71	76.73	78.89	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.89					Passed
Sample Phase Time	(s)	870.0					
Duration Phase 2	(s)	869.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	569.50			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001739

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	73.85	71.78	76.10	68.00	86.00	Passed
Barometer	(inHg)	29.00	29.00	29.00	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	49.73	48.01	51.83	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	78.07	76.37	80.51	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61					Passed
Sample Phase Time	(s)	507.1					
Duration Phase 3	(s)	507.00					
Crank Time Phase3	(s)	2.10				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)	569.50			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	4/8/2021	**Time:**	11:11:31
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST		

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 4-14-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001740*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*4/8/2021*	CH_4 Response Factor	
Test Start	*11:11:31*	Odometer Position [mi]	*37616*
Start Time Cycle	*2021-04-08 11|30-30-(000)*	Delay Time Method	
Test End	*12:37:32*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82* ✓	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H* ✓	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725* ✓	*0.20650* ✓	*0.024048* ✓
Road Load	*15.600* ✓	*0.06700* ✓	*0.026200* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Domenic Coppola		Speed Table	Date:	
Test Number	ONT3_001740	Driver	Jennifer Chappell		Shift Table Auto	Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		E10	Start Time	*11:11:31*
		A [lbf]	*15.600*		Fuel type GASOLINE	End Time	*12:37:32*
Model	RAV4	B [lbf/mph]	*0.06700*		Density *0.7453*		
Year	*2019*	C [lbf/mph2]	*0.026200*		NHV 17916	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*37616*	Remark	E10 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	105.06	Volume [scf]	7696
Zero Read	*0.00*							Press. [inHg]	28.99	D.F.	
Span Read	*0.00*							RH [%]	*14.90*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*7.252*	Ph. End [s]	1489.8
Mass.	*0.000*							Dist. [mi]	*7.48*	Ph. Length [s]	1489.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8978*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	104.03	Volume [scf]	6829
Zero Value	*0.00*							Press. [inHg]	28.99	D.F.	
Span Value	*0.00*							RH [%]	*15.30*	Ph. Start [s]	1489.9
Sample	*0.00*							AH [g/kg]	*7.225*	Ph. End [s]	2811.8
Mass.	*0.000*							Dist. [mi]	*2.38*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8971*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	104.06	Volume [scf]	7675
Zero Value	*0*							Press. [inHg]	28.98	D.F.	
Span Value	*0.00*							RH [%]	*15.12*	Ph. Start [s]	2811.9
Sample	*0*							AH [g/kg]	*7.147*	Ph. End [s]	4300.8
Mass.	*0.000*							Dist. [mi]	*7.49*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.8951*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.35*

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 4-14-21

COMMENTS: Okay

Test Data: ORVR_Prep Operator: Domenic Coppola Date: 4/8/2021
Test Number: ONT3_001740 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001740

Test Cycle RL
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.76	11990.13	
Driven	12028.44	3833.72	12055.87	
Distance Rating (%)	0.3195	1.0800	0.5483	
Cycle Energy (MJ)				
Target	6.11	2.45	6.11	
Driven	6.10	2.34	6.21	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3921	0.1649	0.3921	
Driven	0.3936	0.1703	0.3834	
Inertial Work (MJ)				
Target	3.71	2.04	3.71	5.76
Driven	3.70	1.94	3.83	5.72
Inertial Work Fraction				
Target	0.6079	0.8351	0.6079	
Driven	0.6064	0.8297	0.6166	
Inertial Work Rating	-0.3507	-4.7691	3.1273	-0.6398
Absolute Speed Change (m/s2)				
Target	545.78	469.45	545.78	1015.23
Driven	541.27	445.56	555.39	994.88
Absolute Speed Change Rating (%)	-0.8269	-5.0884	1.7614	-2.0043
Energy Rating	-0.4194	-5.4589	1.0967	
Energy Economy Rating	-0.4194	-5.4589	1.0967	-1.1488

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001740

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	105.06	103.64	106.88	100.00	109.99	Passed
Barometer	(inHg)	28.99	28.99	29.00	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	50.76	50.03	51.48	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	96.25	94.19	99.41	68.00	200.00	Passed
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48					Passed
Sample Phase Time	(s)	1489.8					
Duration Phase 1	(s)	1489.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001740

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	104.03	103.64	104.54	100.00	109.99	Passed
Barometer	(inHg)	28.99	28.98	28.99	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	50.58	50.07	51.14	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	96.02	94.73	99.05	68.00	200.00	Passed
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.38					Passed
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001740

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	104.06	102.74	106.52	100.00	109.99	Passed
Barometer	(inHg)	28.98	28.97	28.98	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	50.03	49.01	50.89	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	98.25	95.63	101.93	68.00	200.00	Passed
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.49					Passed
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001740

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Canister Capacity***	130g
Odometer	37633	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, April 8, 2021	***Profile***	CA
		Fuel	E10

0 – 1 Hour Diurnal / (3-Day Supplemental) **4/8/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	12:37:32	0:00:00	0:00:00	
Engine Key-off	12:42:00	0:04:28	0:04:28	
SHED Door Sealed	12:43:00	0:01:00	0:05:28	
Final Sample	13:43:00	1:00:00	1:05:28	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 4.411 ppm	Volume = 1790.8 ft3	Temp. = 103.5 °F	Baro. = 29 in/Hg	Mass HC=0.121 grams
Post Read Zero = 0 ppm	Post Read Span = 9.538 ppm			Mass EtOH= 0 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 6.093 ppm	Volume = 1794.7 ft3	Temp. = 105.3 °F	Baro. = 29 in/Hg	Mass HC =0.166 grams
Post Read Zero = -0.007 ppm	Post Read Span = 9.536 ppm			Mass EtOH = 0.006 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 102.7 °F	Minimum = 102 °F			
Max Ambient Temp = 106.9 °F	Maximum = 108 °F			
Min Interior Temp = 102.7 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.045±0.01 grams**
				Diurnal Mass EtOH = 0.006 grams
				Diurnal Total Mass HC plus EtOH = 0.0465 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)		Total Soak Time	
Start Cold Soak	Thursday, April 8, 2021	14:43:00		0:00:00	
End Cold Soak	Thursday, April 8, 2021	20:43:00		6:00:00	
Test Temperatures	**Allowable Limit**				
Min. Ambient Temp = 63 °F	Minimum = 62 °F				
Max. Ambient Temp = 65.7 °F	Maximum = 68 °F				
Min. Internal Temp = 63 °F	Minimum = 40 °F				

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37633	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, April 8, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)		Total Soak Time	
End Cold Soak	Thursday, April 8, 2021	20:43:00		0:00:00	
Start Time Diurnal	Thursday, April 8, 2021	20:43:00		0:00:00	
End Time Diurnal	Friday, April 9, 2021	20:43:00		24:00:00	
24 Hour Sample	Friday, April 9, 2021	20:43:00		24:00:00	
Initial					
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm			
Read = 6.346 ppm	Volume = 1677 ft3	Temp. = 64.9 °F		Baro. = 28.98 in/Hg	Mass HC =0.175 grams
Post Read Zero = 0 ppm	Post Read Span = 9.534 ppm				Mass EtOH= 0.018 grams
Final					
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm			
Read = 12.335 ppm	Volume = 1669.4 ft3	Temp. = 64.9 °F		Baro. = 28.93 in/Hg	Mass HC=0.338 grams
Post Read Zero = -0.012 ppm	Post Read Span = 93.314 ppm				Mass EtOH= 0.083 grams
Temperatures	**Allowable Limit**				
Max. Δ Profile Underbody = 2.1 °F	± 3 °F				
Avg. Δ Profile Underbody = 0.9 °F	± 2 °F				
Max. Δ Profile Sidewall = 1.2 °F	± 5 °F				
Min Water Temperature 64.52 °F	Minimum = 40 °F				**Diurnal Mass HC= 0.163±0.01 grams**
					Diurnal Mass EtOH = 0.065 grams
					Diurnal Total Mass HC plus EtOH = 0.179 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37633	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, April 8, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)		Total Soak Time	
End 24 hour Diurnal	Friday, April 9, 2021	20:43:00		24:00:00	
Start Time Diurnal	Friday, April 9, 2021	20:43:00		24:00:00	
End Time Diurnal	Saturday, April 10, 2021	20:43:00		48:00:00	
48 Hour Sample	Saturday, April 10, 2021	20:43:00		48:00:00	
Initial					
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm			
Read = 12.335 ppm	Volume = 1669.4 ft3	Temp. = 64.9 °F		Baro. = 28.93 in/Hg	Mass HC=0.338 grams
Post Read Zero = 0 ppm	Post Read Span = 93.314 ppm				Mass EtOH= 0.083 grams
Final					
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm			
Read = 16.918 ppm	Volume = 1662.5 ft3	Temp. = 64.9 °F		Baro. = 28.84 in/Hg	Mass HC=0.46 grams
Post Read Zero = -0.01 ppm	Post Read Span = 93.334 ppm				Mass EtOH= 0.16 grams
Temperatures	**Allowable Limit**				
Max. Δ Profile Underbody = 2.1 °F	± 3 °F				
Avg. Δ Profile Underbody = 0.9 °F	± 2 °F				
Max. Δ Profile Sidewall = 1.1 °F	± 5 °F				
Min Water Temperature 64.8 °F	Minimum = 40 °F				**Diurnal Mass HC = 0.122±0.01 grams**
					Diurnal Mass EtOH = 0.077 grams
					Diurnal Total Mass HC plus EtOH = 0.141 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37633	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, April 8, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Saturday, April 10, 2021	20:43:00	48:00:00	
Start Time Diurnal	Saturday, April 10, 2021	20:43:00	48:00:00	
End Time Diurnal	Sunday, April 11, 2021	20:43:00	72:00:00	
72 Hour Sample	Sunday, April 11, 2021	20:43:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 16.918 ppm	Volume = 1662.5 ft3	Temp. = 64.93 °F	Baro. = 28.84 in/Hg	Mass HC=0.46 grams
Post Read Zero = -0.01 ppm	Post Read Span = 93.334 ppm			Mass EtOH= 0.16 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 21.155 ppm	Volume = 1656.1 ft3	Temp. = 65.1 °F	Baro. = 28.78 in/Hg	Mass HC=0.569 grams
Post Read Zero = -0.015 ppm	Post Read Span = 93.294 ppm			Mass EtOH= 0.227 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.8 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.5 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.7 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.109±0.01 grams**
				Diurnal Mass EtOH = 0.067 grams
				Diurnal Total Mass HC plus EtOH = 0.126 grams

QUALITY ASSURANCE

INSPECTED BY: [signature]

DATE: 11/17/2021

COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: 0.226 grams {hot soak + highest 24 hour mass}

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Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Toyota Rav4
Vehicle #:	3081-009493	**Engine Size**	2.5L
VIN:	2T3H1RFV7KW009493	**Model Year**	2019
Engine Family:	KTYXT02.5N4H	**Requested By:**	J. Link

		Documentation					
		Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Canister Purge 1 Hour	E		2021-04-26	15:58	37634			LC
Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S		2021 4 26	1605		3		
	E		2021 4 26	1625		Fuel Spec: E15		
Idle 1 min								
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S		2021 4 26	1630		5.8		
	E		2021 4 26	1655		Fuel Spec: <60F 58F		
Heat Build 60F-105F in 1 Hour	S			[illegible]				
	E							
Precon FTP 72 (UDDS) 1	S		2021-4-28	14:29	37634			
	E		↓	14:52	37641		ONT52259	
Dyno Sets	A: 16.3625 B: 0.0413 C: 0.024048					ETW: 3875		
Precon FTP 72 (UDDS) 2	S		2021-4-28	14:55	37641			
	E		↓	15:18	37649		ONT52259	JC
Precon FTP 72 (UDDS) 3	S		↓	15:25	37649			
	E		↓	15:48	37656		ONT52261	JB

105.9"

Precon FTP 72 (UDDS) 4

S	4/28/2021	15:50	37650
E	↓	16:13	37664

ONT52262 VE

↓

Eng Off 5 min — JB

↓

Idle 1 min — JB

↓

Eng Off 1 min — JB

↓

Idle 1 min — JB

↓

Vehicle Soak 21 Days
68-86°F

S	4/28/21	16:30
E	2021-05-25	15:30

JM

↓

Set tire pressure
7psi over sticker

Front 42 Back 42 — JM

↓

Fuel Drain and 40% Fill,
Fuel Type: See Notes!

S	2021-05-25	15:32
E	2021-05-25	16:10

5.8

Fuel Spec: E15 — JM

↓

Vehicle Soak
68-86°F
min 6 hr.

S	2021-05-25	16:15
E	2021-05-26	17:00

JB

↓

Set tire pressure to sticker

Front 35 Back 35 — JB

↓

2x HFET warmup
J2264 Dyno Coastdown
Dyno Sets for Warmup HWY

S
E

A: 16.3625 B: 0.0413 C: 0.024048

ETW: 3875

↓

Precon FTP 72 (UDDS)
Dyno Sets

S	2021-05-26	18:02	37664
E	↓	18:31	37671

ONT3_001840 JB

A: B: C:

ETW: 3875

↓

Vehicle Soak
68-86°F

S	2021-05-26	18:35
E	2021-05-27	17:30

T 81.68
D 29.95
H 59.30

JB JB

↓

Canister Loading with Butane
Type: 1.5x Load
12-36 hr

S	2021-05-26	18:56
E	2021-05-27	08:33

21052701.ST4 JB

Canister Loading Specs

Cap	130	Vol	2.5	
Purge	300	Flow Rate	15	KTYXR0130P82

↓

Set tire pressure to sticker — Front: 35 — Back: 35

No Bag Cold Start FTP 75

S	5/27/21	17:41	37664	ONT3-001851	JB
E	↓	18:28	37682		

Dyno Sets — A: B: C: — ETW: 3875

Test Options — PM: N2O: Dilute Modal:

CVS Flow P1:9.3 P2:9.3 P3:9.3

Pre Test Comments: E15 Test

Fuel Tank Temp. Stabilization at 105F

S	5/27/21	19:15	JB
E	↓	20:15	JB

max 1 hr

Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle

S	20:08			
E	21:27		ONT3-001852	JB

Dyno Sets — A: B: C: — ETW: 3875

Test Options — PM: N2O: Dilute Modal:

CVS Flow 9.3

Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff

max 7 min

Hot Soak in VT Shed

S	5/27/21	21:34	
E	5/27/21	22:34	J.H

Cold Soak 6-36 Hours

6-36 Hr

S	5/27/21	23:34	
E	5/28/21	05:34	J.H

3 Day Diurnal Test

S	5/28/21	5:34	
E	5/31/21	5:34	J.H.

QC Check

E	11/17/21			J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project # / Vehicle #	3081	3081-009493		
VIN:	2T3H1RFV7KW009493			
Test Cell:	Cell 2			
Make / Model / Wheel drive / MY:	Toyota	Rav4	FWD	2019
Test Group / Engine Size (L):	KTYXT02.5N4H	2.5L		
EVAP Family:	KTYXR0130P82			
Standard Tire Size (front) / Pressure:	225/65-17	35		
Standard Tire Size (rear) / Pressure:	225/65-17	35		
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	32.73	0.2065	0.024048	
Warmup Coefficients A / B / C:	16.36	0.0413	0.024048	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E15 Test			

Test Setup Information

		NOTES:
Dyno Coefficient Determination	Y	Cell 2 - FWD
Exhaust Leak Check	Y	5.8 of See Notes!
Fuel Drain and Refill	Y	E15 Fuel
Tank Volume (Gallons)	14.5	
Testing Fuel Level	40%	
Fuel Type	See Notes!	
Canister Load	1.5x Load	
Canister Working Capacity +/- 10g	130	
Canister volume (Liter)	2.465	105.9" Wheelbase
Soak after drain / refills	Y	Roadspeed Fan for testing
Test Fan Setup	Roadspeed	
Av. Rechr. Energy / SOC at Start of RLE		
Norminal Volt. (V) / Batt. Capacity (Ah)	/	

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐	Test Quantity:	1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS CANISTER WORKSHEET

Station number 1

----PURGE ONLY----

VT#	3081-009493 ✓
Project	3081
Evap Family	NA
Ambient Temperature-Deg F	75
Barometric Pressure-In/Hg	28.93
Humidity-Grains/Lb	52.3 ✓
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0 X ok
Canister Volume-Liters	14.2 x ok
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	14:56:04
Start date	04-26-2021
Bed Purges/Cycle	100
Purge End/Load Start	15:58:53
Test Time Minutes	63 ✓
HC Loaded-Grams	0.0
Scale Reading-Grams	2.17
Butane Flow Actual-Gm/Hr	0.3
Cycles Completed	1
Finish time	15:58:53
Finish date	04-26-2021
Disk File Name	21042601.ST1

Purge 60 mins.

Test = EPA 74

Options = Sec ShowTol

Test Init Start	= 28 April 2021 14:27:11	Test Start	= 28 April 2021 14:29:19
Posttest Completed At	= 28 April 2021 14:52:59	Test Finish	= 28 April 2021 14:52:12

Personnel Information::

Driver	= Domenic Coppola	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 2T3H1RFV7KW009493	Cert Tracking ID	= 3081-009493
Vehicle Model	= TOYOTA RAV4	Model Year	=
Engine Family	= KTYXT02.5N4H	Eng. Disp.	= 2.5L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7		

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 3875 (lb)	Road Load A	= 16.3625 (lbs)
Road Load B	= 0.0413	Road Load C	= 0.024048

Fuel Information:

Fuel	= GASOLINE - E15	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/Dev Calcs

Phase Information:

	Shift Tables
Phase 1	N/A

Response Factors:

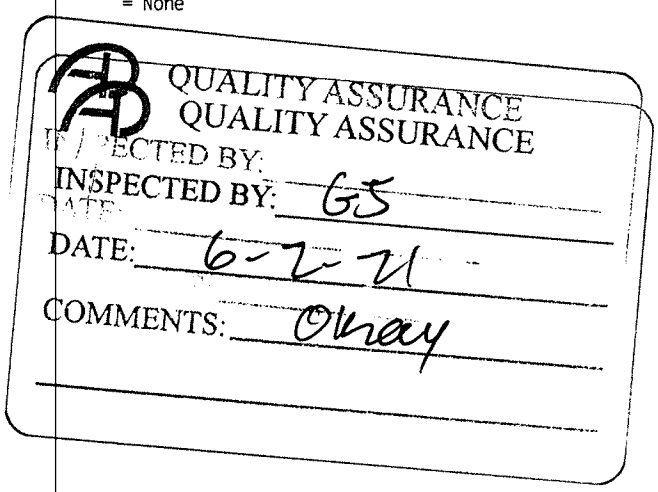
Bag Methane	= 1.05

Pre Test Remarks:
PREP 1

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 37634	Idle RPM	=
Test end Odometer	= 37641	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None



	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.99	Phase Start	= 14:29:19
	Temp	(F) =	75.2	Phase Finish	= 14:52:12
	Tdew	(F) =	48.6		
	Ahum	(gr/lb) =	52.2	Elapsed (sec) =	1372.8
				Drv Err (sec) =	0.0
	Dist	(mi) =	7.449	Crank Time =	0.8

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-2-21

COMMENTS: Okay

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Crank Time	VALID	5 (sec)
Restart Attempts	VALID	1
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = EPA 74

Options = Sec ShowTol

Test Init Start	= 28 April 2021 14:54:50	Test Start	= 28 April 2021 14:55:19
Posttest Completed At	= 28 April 2021 15:18:51	Test Finish	= 28 April 2021 15:18:11

Personnel Information::

Driver	= Jennifer Chappell	Operator	= Joe Bishop
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 2T3H1RFV7KW009493	Cert Tracking ID	= 3081-009493
Vehicle Model	= TOYOTA RAV4	Model Year	=
Engine Family	= KTYXT02.5N4H	Eng. Disp.	= 2.5L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 3875 (lb)	Road Load A	= 16.3625 (lbs)
Road Load B	= 0.0413	Road Load C	= 0.024048

Fuel Information:

Fuel	= GASOLINE - E15	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/Dev Calcs

Phase Information:

	Shift Tables
Phase 1	N/A

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 2

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 37641	Idle RPM	=
Test end Odometer	= 37649	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 6-2-21

COMMENTS: Okay

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.98	Phase Start	= 14:55:19
	Temp	(F) =	75.2	Phase Finish	= 15:18:11
	Tdew	(F) =	48.6		
	Ahum	(gr/lb) =	52.2	Elapsed (sec) =	1372.6
				Drv Err (sec) =	0.0
	Dist	(mi) =	7.459	Crank Time =	0.7

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-2-21

COMMENTS: Okay

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Crank Time	VALID	5 (sec)
Restart Attempts	VALID	1
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = EPA 74

Options = Sec ShowTol

Test Init Start	= 28 April 2021 15:24:13	Test Start	= 28 April 2021 15:25:28
Posttest Completed At	= 28 April 2021 15:49:01	Test Finish	= 28 April 2021 15:48:20

Personnel Information::

Driver	= Joe Bishop	Operator	= Joe Bishop
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 2T3H1RFV7KW009493	Cert Tracking ID	= 3081-009493
Vehicle Model	= TOYOTA RAV4	Model Year	=
Engine Family	= KTYXT02.5N4H	Eng. Disp.	= 2.5L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 3875 (lb)	Road Load A	= 16.3625 (lbs)
Road Load B	= 0.0413	Road Load C	= 0.024048

Fuel Information:

Fuel	= GASOLINE - E15	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/Dev Calcs

Phase Information:

	Shift Tables
Phase 1	N/A

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 3

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 37649	Idle RPM	=
Test end Odometer	= 37656	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

AD QUALITY ASSURANCE
INSPECTED BY: GJ
DATE: 6-2-21
COMMENTS: Okay

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.98	Phase Start	= 15:25:28
	Temp	(F) =	75.2	Phase Finish	= 15:48:20
	Tdew	(F) =	48.6		
	Ahum	(gr/lb) =	52.2	Elapsed (sec) =	1372.6
				Drv Err (sec) =	0.0
	Dist	(mi) =	7.466	Crank Time =	0.6

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 6-22-1

COMMENTS: O'Keefe

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Crank Time	VALID	5 (sec)
Restart Attempts	VALID	1
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = EPA 74

Options = Sec ShowTol

Test Init Start	= 28 April 2021 15:49:59	Test Start	= 28 April 2021 15:50:28
Posttest Completed At	= 28 April 2021 16:14:15	Test Finish	= 28 April 2021 16:13:20

Personnel Information::

Driver	= Joe Bishop	Operator	= Joe Bishop
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 2T3H1RFV7KW009493	Cert Tracking ID	= 3081-009493
Vehicle Model	= TOYOTA RAV4	Model Year	=
Engine Family	= KTYXT02.5N4H	Eng. Disp.	= 2.5L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 3875 (lb)	Road Load A	= 16.3625 (lbs)
Road Load B	= 0.0413	Road Load C	= 0.024048

Fuel Information:

Fuel	= GASOLINE - E15	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/Dev Calcs

Phase Information:

	Shift Tables
Phase 1	N/A

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 4

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 37656	Idle RPM	=
Test end Odometer	= 37664	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

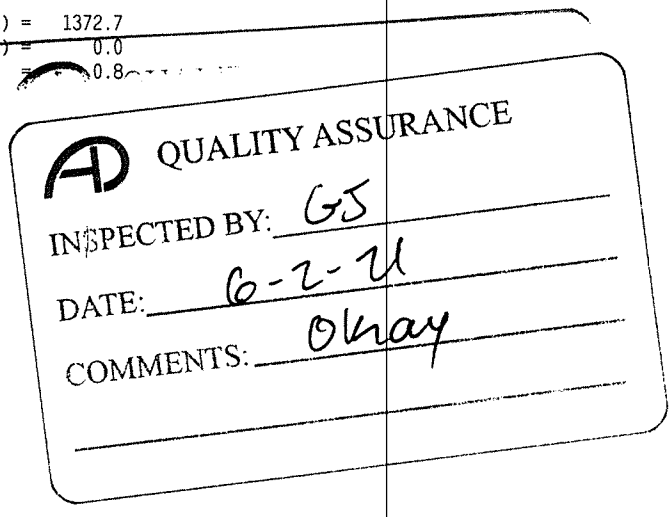
QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 6-2-21

COMMENTS: Okay

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.98	Phase Start	= 15:50:28
	Temp	(F) =	75.2	Phase Finish	= 16:13:20
	Tdew	(F) =	48.6		
	Ahum	(gr/lb) =	52.2	Elapsed (sec) =	1372.7
				Drv Err (sec) =	0.0
	Dist	(mi) =	7.400	Crank Time =	0.8



DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Crank Time	VALID	5 (sec)
Restart Attempts	VALID	1
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/26/2021	**Time:**	18:02:13
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-2-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001849*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/26/2021*	CH_4 Response Factor	
Test Start	*18:02:13*	Odometer Position [mi]	*37664*
Start Time Cycle	*2021-05-26 18|09-50-(000)*	Delay Time Method	
Test End	*18:31:10*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82* ✓	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H* ✓	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725* ✓	*0.20650* ✓	*0.024048* ✓
Road Load	*15.600* ✓	*0.06700* ✓	*0.026200* ✓

Fuel Data *FirstLoad* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18093*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001849	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		FirstLoad	Start Time	*18:02:13*
		A [lbf]	*15.600*		Fuel type GASOLINE	End Time	*18:31:10*
Model	RAV4	B [lbf/mph]	*0.06700*		Density *0.7453*		
Year	*2019*	C [lbf/mph2]	*0.026200*		NHV 18093	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*37664*	Remark	PRECON				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	80.31	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.95	D.F.	
Span Read	*0.00*							RH[%]	*35.83*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.120*	Ph. End[s]	505.8
Mass.	*0.000*							Dist.[mi]	*3.58*	Ph. Length[s]	505.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9215*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	82.43	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	28.95	D.F.	
Span Value	*0.00*							RH[%]	*33.54*	Ph. Start[s]	505.9
Sample	*0.00*							AH[g/kg]	*8.146*	Ph. End[s]	1381.4
Mass.	*0.000*							Dist.[mi]	*3.85*	Ph. Length[s]	875.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9222*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	HC+NO_x[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							*0.0000*	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.43*

QUALITY ASSURANCE
INSPECTED BY: GS
DATE: 6-2-21
COMMENTS: Okay

Test Data: FTP72 Operator: Joseph Bishop Date: 5/26/2021
Test Number: ONT3_001849 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001849

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5760.97	6188.33		
Distance Rating (%)	-0.3147	-0.3658		
Cycle Energy (MJ)				
Target	3.23	2.88		
Driven	3.22	2.89		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201		
Driven	0.4621	0.3272		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.73	1.94		
Inertial Work Fraction				
Target	0.5436	0.6799		
Driven	0.5379	0.6728		
Inertial Work Rating	-1.3985	-0.8011		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	203.62	338.57		
Absolute Speed Change Rating (%)	-0.6108	-0.6839		
Energy Rating	-0.0293	0.6059		
Energy Economy Rating	-0.0293	0.6059		0.2736

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001849

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	80.31	78.98	81.32	68.00	86.00	Passed
Barometer	(inHg)	28.95	28.95	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	56.84	56.34	57.23	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.58					Passed
Sample Phase Time	(s)	505.8					
Duration Phase 1	(s)	505.70					
Crank Time Phase1	(s)	0.80				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

NO phase 3

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001849

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	82.43	81.32	83.84	68.00	86.00	Passed
Barometer	(inHg)	28.95	28.95	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	57.02	56.69	57.34	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.85					Passed
Sample Phase Time	(s)	875.6					
Duration Phase 2	(s)	875.50					
Crank Time Phase1	(s)	0.8000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

End of test

ATDS CANISTER WORKSHEET

Station number 4

--PURGE AND FILL--

VT#	3081-009493
Project	3081
Evap Family	KTYXR0130P82
Ambient Temperature-Deg F	82
Barometric Pressure-In/Hg	28.95
Humidity-Grains/Lb	55.3
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	130 /
Canister Volume-Liters	2.5 /
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	18:56:18
Start date	05-26-2021
Bed Purges/Cycle	300
Purge End/Load Start	19:30:21
Test Time Minutes	816
HC Loaded-Grams	195.0 /
Scale Reading-Grams	-0.73
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	08:33:14
Finish date	05-27-2021
Disk File Name	21052701.ST4

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-2-21

COMMENTS: Okay

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/27/2021	**Time:**	17:41:57
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Certification		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST		

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-2-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001851*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/27/2021*	CH_4 Response Factor	
Test Start	*17:41:57*	Odometer Position [mi]	*37671*
Start Time Cycle	*2021-05-27 17|49-50-(000)*	Delay Time Method	
Test End	*18:28:56*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82* ✓	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H* ✓	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓		
	A [lbf]	B [lbf/mph]	C [lbf/mph2]		
Street Load	*32.725* ✓	*0.20650* ✓	*0.024048* ✓		
Road Load	*15.600* ✓	*0.06700* ✓	*0.026200* ✓		

Fuel Data *FirstLoad* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18093*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001851	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		FirstLoad	Start Time	*17:41:57*
		A [lbf]	*15.600*		Fuel type GASOLINE	End Time	*18:28:56*
Model	RAV4	B [lbf/mph]	*0.06700*		Density *0.7453*		
Year	*2019*	C [lbf/mph2]	*0.026200*		NHV 18093	Soak Time	546.0
Displacement:					CWF *0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*37671*	Remark	E15 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.01	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.95	D.F.	
Span Read	*0.00*							RH [%]	*38.58*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*7.582*	Ph. End [s]	505.9
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9067*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.80	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.95	D.F.	
Span Value	*0.00*							RH [%]	*38.48*	Ph. Start [s]	506.0
Sample	*0.00*							AH [g/kg]	*7.507*	Ph. End [s]	1375.4
Mass.	*0.000*							Dist. [mi]	*3.86*	Ph. Length [s]	869.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9047*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.94	Volume [scf]	
Zero Value	*0*							Press. [inHg]	28.95	D.F.	
Span Value	*0.00*							RH [%]	*39.42*	Ph. Start [s]	1921.5
Sample	*0*							AH [g/kg]	*7.475*	Ph. End [s]	2427.3
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9038*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_x [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***	
Mass per Dist.	*0.0000*							0.0000	mile/gal	
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi]	*11.04*

QUALITY ASSURANCE

INSPECTED BY: BS

DATE: 6-2-21

COMMENTS: Okay

Test Data: FTP75 Operator: Joseph Bishop Date: 5/27/2021
Test Number: ONT3_001851 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001851

Test Cycle FTP75
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6210.96	5779.15	
Driven	5778.02	6211.30	5779.21	
Distance Rating (%)	-0.0196	0.0054	0.0010	
Cycle Energy (MJ)				
Target	3.23	2.88	3.23	
Driven	3.23	2.91	3.23	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201	0.4564	
Driven	0.4566	0.3218	0.4554	
Inertial Work (MJ)				
Target	1.75	1.96	1.75	3.71
Driven	1.76	1.97	1.76	3.73
Inertial Work Fraction				
Target	0.5436	0.6799	0.5436	
Driven	0.5434	0.6782	0.5446	
Inertial Work Rating	0.2228	0.8180	0.3654	0.5752
Absolute Speed Change (m/s2)				
Target	204.88	340.90	204.88	545.78
Driven	205.48	342.49	205.36	547.90
Absolute Speed Change Rating (%)	0.2939	0.4656	0.2350	0.3886
Energy Rating	0.2795	1.0499	0.1811	
Energy Economy Rating	0.2795	1.0499	0.1811	0.6144

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001851

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	76.01	73.22	78.62	68.00	86.00	Passed
Barometer	(inHg)	28.95	28.95	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	53.07	51.48	54.61	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.9					
Duration Phase 1	(s)	505.80					
Crank Time Phase1	(s)	0.90				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	546.00			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001851

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	75.80	73.22	78.26	68.00	86.00	Passed
Barometer	(inHg)	28.95	28.95	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	52.55	50.34	54.61	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	869.5					
Duration Phase 2	(s)	869.40					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	546.00			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001851

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	74.94	72.32	77.90	68.00	86.00	Passed
Barometer	(inHg)	28.95	28.95	28.95	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	52.32	50.04	54.61	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.9					
Duration Phase 3	(s)	505.80					
Crank Time Phase3	(s)	0.90				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)	546.00			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	5/27/2021	**Time:**	20:08:12
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST		

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: ~~6-2-21~~ 6-2-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001852*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*5/27/2021*	CH_4 Response Factor	
Test Start	*20:08:12*	Odometer Position [mi]	*37682*
Start Time Cycle	*2021-05-27 20|19-19-(000)*	Delay Time Method	
Test End	*21:27:56*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST*		

Vehicle Data — *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82* ✓	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H* ✓	Tank Material	
Number of Cylinders	*4*		

Dyno Data — *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725* ✓	*0.20650* ✓	*0.024048* ✓
Road Load	*15.600* ✓	*0.06700* ✓	*0.026200* ✓

Fuel Data — *FirstLoad* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18093*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data — *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001852	Driver	Joseph Bishop	Shift Table Auto		Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		FirstLoad	Start Time	*20:08:12*
		A [lbf]	*15.600*	Fuel type	GASOLINE	End Time	*21:27:56*
Model	RAV4	B [lbf/mph]	*0.06700*	Density	*0.7453*		
Year	*2019*	C [lbf/mph2]	*0.026200*	NHV	18093	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*37682*	Remark	E15 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	105.76	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.97	D.F.	
Span Read	*0.00*							RH [%]	*15.83*	Ph. Start [s]	0.0
Sample	*0.00*							AH [g/kg]	*7.877*	Ph. End [s]	1489.7
Mass.	*0.000*							Dist. [mi]	*7.46*	Ph. Length [s]	1489.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9148*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	104.34	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.98	D.F.	
Span Value	*0.00*							RH [%]	*16.66*	Ph. Start [s]	1489.8
Sample	*0.00*							AH [g/kg]	*7.952*	Ph. End [s]	2811.6
Mass.	*0.000*							Dist. [mi]	*2.33*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9168*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	104.09	Volume [scf]	
Zero Value	*0*							Press. [inHg]	28.98	D.F.	
Span Value	*0.00*							RH [%]	*16.85*	Ph. Start [s]	2811.8
Sample	*0*							AH [g/kg]	*7.986*	Ph. End [s]	4300.6
Mass.	*0.000*							Dist. [mi]	*7.45*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9177*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.23*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-2-21

COMMENTS: Okay

Test Data: ORVR_Prep Operator: Joseph Bishop Date: 5/27/2021
Test Number: ONT3_001852 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001852

Test Cycle RL
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.74	11990.13	
Driven	11998.92	3751.54	11983.17	
Distance Rating (%)	0.0734	-1.0860	-0.0581	
Cycle Energy (MJ)				
Target	6.11	2.45	6.11	
Driven	6.14	2.33	6.14	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3921	0.1648	0.3921	
Driven	0.3941	0.1729	0.3952	
Inertial Work (MJ)				
Target	3.71	2.04	3.71	5.76
Driven	3.72	1.92	3.71	5.64
Inertial Work Fraction				
Target	0.6079	0.8352	0.6079	
Driven	0.6059	0.8271	0.6048	
Inertial Work Rating	0.2277	-5.8383	-0.0040	-2.0104
Absolute Speed Change (m/s2)				
Target	545.79	469.54	545.79	1015.33
Driven	546.15	446.62	546.68	993.07
Absolute Speed Change Rating (%)	0.0668	-4.8817	0.1635	-2.1920
Energy Rating	0.4779	-4.0312	0.5661	
Energy Economy Rating	0.4779	-4.0312	0.5661	-0.7743

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001852

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	105.76	105.26	106.70	100.00	109.99	Passed
Barometer	(inHg)	28.97	28.96	28.97	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	55.14	54.53	55.81	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.46					
Sample Phase Time	(s)	1489.7					
Duration Phase 1	(s)	1489.60					
Crank Time Phase1	(s)	0.70				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001852

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	104.34	103.28	105.80	100.00	109.99	Passed
Barometer	(inHg)	28.98	28.97	28.98	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	55.66	55.02	56.54	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.33					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001852

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	104.09	102.92	105.26	100.00	109.99	Passed
Barometer	(inHg)	28.98	28.98	28.99	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	55.90	55.40	56.70	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.45					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001852

ATDS Vehicle ID	3081-009493	*VIN*	2T3H1RFV7KW009493
Model Year	2019	*Make/Model*	Toyota Rav4
Test Group	KTYXT02.5N4H	*Engine Size*	2.5L
Evaporative Family	KTYXR0130P82	*Canister Capacity*	130g
Odometer	37699	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, May 27, 2021	*Profile*	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **5/27/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	21:27:56	0:00:00	0:00:00	
Engine Key-off	21:32:00	0:04:04	0:04:04	
SHED Door Sealed	21:34:00	0:02:00	0:06:04	
Final Sample	22:34:00	1:00:00	1:06:04	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 3.702 ppm	Volume = 1806.4 ft3	Temp. = 104.9 °F	Baro. = 29.01 in/Hg	Mass HC=0.102 grams
Post Read Zero = 0 ppm	Post Read Span = 9.55 ppm			Mass EtOH= 0 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.199 ppm	Volume = 1803.4 ft3	Temp. = 105.2 °F	Baro. = 29.03 in/Hg	Mass HC =0.143 grams
Post Read Zero = -0.009 ppm	Post Read Span = 9.55 ppm			Mass EtOH = 0 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 104.5 °F	Minimum = 102 °F			
Max Ambient Temp = 106.7 °F	Maximum = 108 °F			
Min Interior Temp = 104.5 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.041±0.01 grams**
				Diurnal Mass EtOH = 0 grams
				Diurnal Total Mass HC plus EtOH = 0.041 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, May 27, 2021	23:34:00	0:00:00	
End Cold Soak	Friday, May 28, 2021	5:34:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 62.9 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.7 °F	Maximum = 68 °F			
Min. Internal Temp = 62.9 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37699	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, May 27, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Friday, May 28, 2021	5:34:00	0:00:00	
Start Time Diurnal	Friday, May 28, 2021	5:34:00	0:00:00	
End Time Diurnal	Saturday, May 29, 2021	5:34:00	24:00:00	
24 Hour Sample	Saturday, May 29, 2021	5:34:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.549 ppm	Volume = 1687.1 ft3	Temp. = 65 °F	Baro. = 28.98 in/Hg	Mass HC =0.154 grams
Post Read Zero = 0 ppm	Post Read Span = 9.75 ppm			Mass EtOH= 0.001 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 11.397 ppm	Volume = 1682 ft3	Temp. = 65.1 °F	Baro. = 28.92 in/Hg	Mass HC=0.314 grams
Post Read Zero = -0.014 ppm	Post Read Span = 93.319 ppm			Mass EtOH= 0.061 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.2 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.5 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.84 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.16±0.01 grams**
				Diurnal Mass EtOH = 0.06 grams
				Diurnal Total Mass HC plus EtOH = 0.175 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	*VIN*	2T3H1RFV7KW009493
Model Year	2019	*Make/Model*	Toyota Rav4
Test Group	KTYXT02.5N4H	*Engine Size*	2.5L
Evaporative Family	KTYXR0130P82	*Capacity*	130g
Odometer	37699	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, May 27, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Saturday, May 29, 2021	5:34:00	24:00:00	
Start Time Diurnal	Saturday, May 29, 2021	5:34:00	24:00:00	
End Time Diurnal	Sunday, May 30, 2021	5:34:00	48:00:00	
48 Hour Sample	Sunday, May 30, 2021	5:34:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 11.397 ppm	Volume = 1682 ft3	Temp. = 65.1 °F	Baro. = 28.92 in/Hg	Mass HC=0.314 grams
Post Read Zero = 0 ppm	Post Read Span = 93.319 ppm			Mass EtOH= 0.061 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 15.726 ppm	Volume = 1674.4 ft3	Temp. = 64.9 °F	Baro. = 28.88 in/Hg	Mass HC=0.432 grams
Post Read Zero = -0.011 ppm	Post Read Span = 93.316 ppm			Mass EtOH= 0.114 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.2 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.5 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.6 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.118±0.01 grams**
				Diurnal Mass EtOH = 0.053 grams
				Diurnal Total Mass HC plus EtOH = 0.131 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	*VIN*	2T3H1RFV7KW009493
Model Year	2019	*Make/Model*	Toyota Rav4
Test Group	KTYXT02.5N4H	*Engine Size*	2.5L
Evaporative Family	KTYXR0130P82	*Capacity*	130g
Odometer	37699	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, May 27, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Sunday, May 30, 2021	5:34:00	48:00:00	
Start Time Diurnal	Sunday, May 30, 2021	5:34:00	48:00:00	
End Time Diurnal	Monday, May 31, 2021	5:34:00	72:00:00	
72 Hour Sample	Monday, May 31, 2021	5:34:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 15.726 ppm	Volume = 1674.4 ft3	Temp. = 64.93 °F	Baro. = 28.88 in/Hg	Mass HC=0.432 grams
Post Read Zero = -0.011 ppm	Post Read Span = 93.316 ppm			Mass EtOH= 0.114 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 19.585 ppm	Volume = 1661 ft3	Temp. = 65 °F	Baro. = 28.94 in/Hg	Mass HC=0.533 grams
Post Read Zero = -0.016 ppm	Post Read Span = 93.297 ppm			Mass EtOH= 0.164 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.2 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.5 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.101±0.01 grams**
				Diurnal Mass EtOH = 0.05 grams
				Diurnal Total Mass HC plus EtOH = 0.114 grams

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: 0.216 grams {hot soak + highest 24 hour mass}

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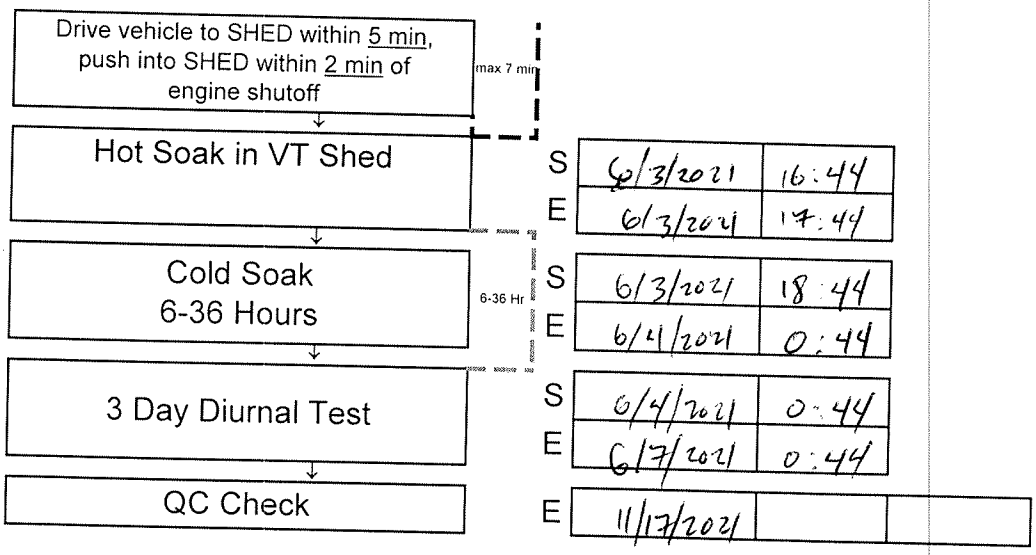
Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Toyota Rav4
Vehicle #:	3081-009493	**Engine Size**	2.5L
VIN:	2T3H1RFV7KW009493	**Model Year**	2019
Engine Family:	KTYXT02.5N4H	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Precon FTP 72 (UDDS)	S	2021-06-02	11:58	37700		DNT3001853	JC
Dyno Sets	E	↓	12:27	37707		ETW: 3875	JC
	A: 15.6 B: 0.0670 C: 0.0262						
Vehicle Soak 68-86°F	S	6/2/2021	12:30	T 80 B 28.8 H 66.5			JC
	E						
Canister Loading with Butane Type: 1.5x Load	S	6/2/2021	12:34			ST3	JC
12-36 hr	E	6/3/2021	02:10				
Canister Loading Specs	Cap	130	Vol	2.5			
	Purge	300	Flow Rate	15	KTYXR0130P82		
Set tire pressure to sticker	Front	35	Back	35			VE
No Bag Cold Start FTP 75	S	6/3/2021	12:21	37707			
Dyno Sets	E	↓	13:26	37718		DNT3	
Test Options	A: 15.6 B: 0.067 C: 0.0262					ETW: 3875	VE
	PM		N2O			Dilute Modal	
Pre Test Comments	CVS Flow P1:9.3 P2:9.3 P3:9.3						
	E15 Test						
Fuel Tank Temp. Stabilization at 105F	S	6/3/2021	14:25				
max 1 hr	E	↓	15:25				
Additional Driving for 3 Day No Bag 1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle	S		15:20				
Dyno Sets	E		16:38	37735		DNT3_001855	JS
Test Options	A: 15.6 B: 0.067 C: 0.0262					ETW: 3875	
	PM		N2O			Dilute Modal	
	CVS Flow 9.3						

1


Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
Cold Soak 6-36 Hours
6-36 Hr
3 Day Diurnal Test
QC Check
S
E
6/3/2021 16:44
6/3/2021 17:44
S
E
6/3/2021 18:44
6/4/2021 0:44
S
E
6/4/2021 0:44
6/7/2021 0:44
E
11/17/2021

J. H.

J. H.

J. H.

J. H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081	3081-009493		
VIN:	2T3H1RFV7KW009493			
Test Cell:	Cell 2			
Make / Model / Wheel drive / MY:	Toyota	Rav4	FWD	2019
Test Group / Engine Size (L):	KTYXT02.5N4H	2.5L		
EVAP Family:	KTYXR0130P82			
Standard Tire Size (front) / Pressure:	225/65-17	35		
Standard Tire Size (rear) / Pressure:	225/65-17	35		
Transmission / Shift File / Inertia Weight:	Auto	Auto	3875	
Target Coefficients A / B / C:	32.73	0.2065	0.024048	
Warmup Coefficients A / B / C:	16.36	0.0413	0.024048	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E15 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	14.5
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	130
Canister volume (Liter)	2.465
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 2 - FWD
5.8 of See Notes!
E15 Fuel
105.9" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐	Test Quantity:	1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/2/2021	**Time:**	11:58:17
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: G.S

DATE: 6-14-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001853*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/2/2021*	CH_4 Response Factor	
Test Start	*11:58:17*	Odometer Position [mi]	*37700*
Start Time Cycle	*2021-06-02 12|04-37-(000)*	Delay Time Method	
Test End	*12:27:25*		
Operator	*Jennifer Chappell*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493* ✓	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82* ✓	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H* ✓	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725* ✓	*0.20650* ✓	*0.024048* ✓
Road Load	*15.600* ✓	*0.06700* ✓	*0.026200* ✓

Fuel Data *91_Pump_Gas*

Fuel Type	*GASOLINE* ✓	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Jennifer Chappell		Speed Table	Date:	
Test Number	ONT3_001853	Driver	Jennifer Chappell		Shift Table Auto	Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		91_Pump_Gas	Start Time	*11:58:17*
		A [lbf]	*15.600*		Fuel type GASOLINE	End Time	*12:27:25*
Model	RAV4	B [lbf/mph]	*0.06700*		Density *0.7380*		
Year	*2019*	C [lbf/mph2]	*0.026200*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*37700*	Remark	PRECON				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	79.65	Volume [scf]	65535
Zero Read	*0.00*							Press. [inHg]	28.87	D.F.	
Span Read	*0.00*							RH [%]	*42.80*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.542*	Ph. End [s]	505.4
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9630*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	81.15	Volume [scf]	65535
Zero Value	*0.00*							Press. [inHg]	28.87	D.F.	
Span Value	*0.00*							RH [%]	*40.76*	Ph. Start [s]	505.5
Sample	*0.00*							AH [g/kg]	*9.542*	Ph. End [s]	1375.4
Mass.	*0.000*							Dist. [mi]	*3.87*	Ph. Length [s]	870.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9630*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	HC+NO_x [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	CFE [mi] *7.47*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-14-21

COMMENTS: Okay

Test Data: FTP72 Operator: Jennifer Chappell Date: 6/2/2021
Test Number: ONT3_001853 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001853

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5789.40	6231.42		
Distance Rating (%)	0.1774	0.3279		
Cycle Energy (MJ)				
Target	3.23	2.88		
Driven	3.24	2.91		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201		
Driven	0.4467	0.3279		
Inertial Work (MJ)				
Target	1.75	1.96		
Driven	1.79	1.96		
Inertial Work Fraction				
Target	0.5436	0.6799		
Driven	0.5533	0.6721		
Inertial Work Rating	2.2619	-0.0896		
Absolute Speed Change (m/s2)				
Target	204.88	340.91		
Driven	206.93	339.40		
Absolute Speed Change Rating (%)	1.0009	-0.4421		
Energy Rating	0.2872	0.7348		
Energy Economy Rating	0.2872	0.7348		0.4921

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001853

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	79.65	78.44	80.60	68.00	86.00	Passed
Barometer	(inHg)	28.87	28.87	28.87	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	66.79	66.42	67.17	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.4					
Duration Phase 1	(s)	505.30					
Crank Time Phase1	(s)	0.40				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001853

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	81.15	80.42	81.86	68.00	86.00	Passed
Barometer	(inHg)	28.87	28.87	28.87	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	66.79	66.39	67.12	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	870.0					
Duration Phase 2	(s)	869.90					
Crank Time Phase1	(s)	0.4000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-009493
Project	3081
Evap Family	KTYXR0130P82
Ambient Temperature-Deg F	80
Barometric Pressure-In/Hg	28.80
Humidity-Grains/Lb	66.5
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	130 /
Canister Volume-Liters	2.5 /
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	12:34:39
Start date	06-02-2021
Bed Purges/Cycle	300
Purge End/Load Start	13:07:49
Test Time Minutes	814
HC Loaded-Grams	195.0 /
Scale Reading-Grams	-0.77
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	02:10:05
Finish date	06-03-2021
Disk File Name	21060301.ST3

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-14-21

COMMENTS: Okay

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/3/2021	**Time:**	12:21:43
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST		

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 6-14-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001854*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/3/2021*	CH_4 Response Factor	
Test Start	*12:21:43*	Odometer Position [mi]	*37707*
Start Time Cycle	*2021-06-03 12|34-19-(000)*	Delay Time Method	
Test End	*13:26:59*		
Operator	*Victor Escudero*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST*		

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493*	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*15.600*	*0.06700*	*0.026200*

Fuel Data *91_Pump_Gas*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Victor Escudero		Speed Table	Date:	
Test Number	ONT3_001854	Driver	Victor Escudero		Shift Table Auto	Cold Start	

Vehicle	2T3H1RFV7KW009493	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		91_Pump_Gas	Start Time	*12:21:43*
		A [lbf]	*15.600*	Fuel type	GASOLINE	End Time	*13:26:59*
Model	RAV4	B [lbf/mph]	*0.06700*	Density	*0.7380*		
Year	*2019*	C [lbf/mph2]	*0.026200*	NHV	18085	Soak Time	1843.4
Displacement:				CWF	*0.8527*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*37707*	Remark	E15 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	79.94	Volume [scf]	65535
Zero Read	*0.00*							Press. [inHg]	28.84	D.F.	
Span Read	*0.00*							RH [%]	*40.96*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.224*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.58*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9534*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.36	Volume [scf]	65535
Zero Value	*0.00*							Press. [inHg]	28.84	D.F.	
Span Value	*0.00*							RH [%]	*46.97*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*8.788*	Ph. End [s]	1375.6
Mass.	*0.000*							Dist. [mi]	*3.86*	Ph. Length [s]	870.1
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9405*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	73.66	Volume [scf]	65535
Zero Value	*0*							Press. [inHg]	28.83	D.F.	
Span Value	*0.00*							RH [%]	*47.50*	Ph. Start [s]	2023.1
Sample	*0*							AH [g/kg]	*8.682*	Ph. End [s]	2528.6
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9374*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_x [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.05*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-14-21

COMMENTS: Okeey

Test Data: FTP75 Operator: Victor Escudero Date: 6/3/2021
Test Number: ONT3_001854 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001854

Test Cycle FTP75
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6210.96	5779.15	
Driven	5766.37	6213.99	5796.18	
Distance Rating (%)	-0.2212	0.0488	0.2948	
Cycle Energy (MJ)				
Target	3.23	2.88	3.23	
Driven	3.20	2.87	3.25	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4564	0.3201	0.4564	
Driven	0.4772	0.3276	0.4692	
Inertial Work (MJ)				
Target	1.75	1.96	1.75	3.71
Driven	1.67	1.93	1.73	3.63
Inertial Work Fraction				
Target	0.5436	0.6799	0.5436	
Driven	0.5228	0.6724	0.5308	
Inertial Work Rating	-4.6575	-1.3561	-1.6357	-2.1020
Absolute Speed Change (m/s2)				
Target	204.88	340.90	204.88	545.78
Driven	200.36	338.41	203.21	540.40
Absolute Speed Change Rating (%)	-2.2057	-0.7304	-0.8147	-0.9866
Energy Rating	-0.6375	-0.3178	0.4327	
Energy Economy Rating	-0.6375	-0.3178	0.4327	-0.1613

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001854

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	79.94	77.18	82.40	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.84	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	64.57	62.44	66.28	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.58					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Counts		1				1	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001854

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	74.36	73.76	77.36	68.00	86.00	Passed
Barometer	(inHg)	28.84	28.84	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	61.52	57.89	64.21	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	870.1					
Duration Phase 2	(s)	870.00					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	600.00			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001854

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	73.66	73.22	74.66	68.00	86.00	Passed
Barometer	(inHg)	28.83	28.83	28.83	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	60.77	57.95	62.51	38.50	87.50	Passed
CVS Inlet Temperature	(°F)	65535.00	65535.00	65535.00	68.00	200.00	Not App
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
PM Filter Parameters							
Particulate Filter Temperature	(°F)				32.0	125.6	
Filter Face Velocity	(cm/s)				0.00	100.00	
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.6					
Duration Phase 3	(s)	505.50					
Crank Time Phase3	(s)	0.60				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/3/2021	**Time:**	15:20:14
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:			

QUALITY ASSURANCE

INSPECTED BY: GJ

DATE: 6-14-21

COMMENTS: Okay

General Data

Test Number	*ONT3_001855*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/3/2021*	CH_4 Response Factor	
Test Start	*15:20:14*	Odometer Position [mi]	*37718*
Start Time Cycle	*2021-06-03 15|26-45-(000)*	Delay Time Method	
Test End	*16:38:07*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark			

Vehicle Data *3081-009493*

Manufacturer	*RAV4*	Displacement	
Vehicle Model	*2T3H1RFV7KW009493*	Engine Family	*KTYXT02.5N4H*
Order Number	*3081*	Manufacturer	*TOYOTA*
Test Group	*3081-009493*	Transmission	*Automatic*
Evaporative Family	*KTYXR0130P82*	Engine Code	
Made Date	*2019*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*KTYXT02.5N4H*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3875.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*32.725*	*0.20650*	*0.024048*
Road Load	*15.600*	*0.06700*	*0.026200*

Fuel Data *FirstLoad*

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18093*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E15*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001855	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	2T3H1RFV7KW009493	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***2T3H1RFV7KW009493***	Inertia [lb]	*3875.00*		FirstLoad	Start Time	*15:20:14*
		A [lbf]	*15.600*		Fuel type GASOLINE	End Time	*16:38:07*
Model	RAV4	B [lbf/mph]	*0.06700*		Density *0.7453*		
Year	*2019*	C [lbf/mph2]	*0.026200*		NHV 18093	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	KTYXT02.5N4H						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*37718*	Remark					

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	104.11	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.81	D.F.	
Span Read	*0.00*							RH[%]	*20.66*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*9.881*	Ph. End[s]	1490.5
Mass.	*0.000*							Dist.[mi]	*7.46*	Ph. Length[s]	1490.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9735*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	103.20	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	28.80	D.F.	
Span Value	*0.00*							RH[%]	*21.29*	Ph. Start[s]	1490.6
Sample	*0.00*							AH[g/kg]	*9.915*	Ph. End[s]	2812.5
Mass.	*0.000*							Dist.[mi]	*2.36*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9745*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	102.31	Volume[scf]	
Zero Value	*0*							Press.[inHg]	28.80	D.F.	
Span Value	*0.00*							RH[%]	*21.80*	Ph. Start[s]	2812.6
Sample	*0*							AH[g/kg]	*9.892*	Ph. End[s]	4301.5
Mass.	*0.000*							Dist.[mi]	*7.45*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9738*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.27*

QUALITY ASSURANCE

INSPECTED BY: GS

DATE: 6-14-21

COMMENTS: Okay

Test Data: ORVR_Prep Operator: Joseph Bishop Date: 6/3/2021
Test Number: ONT3_001855 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001855

Test Cycle RL
Test Legislation EPA

Vehicle ID 2T3H1RFV7KW009493

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3875.00*	
A [lbf]	*15.600*	*32.725*
B [lbf/mph]	*0.06700*	*0.20650*
C [lbf/mph2]	*0.026200*	*0.024048*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.75	11990.13	
Driven	12000.13	3798.48	11984.78	
Distance Rating (%)	0.0834	0.1513	-0.0447	
Cycle Energy (MJ)				
Target	6.11	2.45	6.11	
Driven	6.13	2.40	6.16	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3921	0.1648	0.3921	
Driven	0.4026	0.1685	0.3931	
Inertial Work (MJ)				
Target	3.71	2.04	3.71	5.76
Driven	3.67	1.99	3.74	5.70
Inertial Work Fraction				
Target	0.6079	0.8352	0.6079	
Driven	0.5974	0.8315	0.6069	
Inertial Work Rating	-1.2839	-2.4116	0.6380	-0.9774
Absolute Speed Change (m/s2)				
Target	545.79	469.52	545.79	1015.32
Driven	543.42	457.88	548.91	1004.43
Absolute Speed Change Rating (%)	-0.4343	-2.4791	0.5714	-1.0717
Energy Rating	0.3577	-2.1764	0.8352	
Energy Economy Rating	0.3577	-2.1764	0.8352	-0.1507

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001855

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	104.11	103.46	105.08	100.00	109.99	Passed
Barometer	(inHg)	28.81	28.80	28.81	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	69.17	68.64	69.58	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.46					
Sample Phase Time	(s)	1490.5					
Duration Phase 1	(s)	1490.40					
Crank Time Phase1	(s)	1.50				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001855

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	103.20	101.06	104.54	100.00	109.99	Passed
Barometer	(inHg)	28.80	28.80	28.81	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	69.41	65.35	72.00	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.36					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001855

Vehicle ID: 2T3H1RFV7KW009493

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 3							
Cell Temperature	(°F)	102.31	100.52	104.54	100.00	109.99	Passed
Barometer	(inHg)	28.80	28.79	28.80	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	69.24	65.52	71.44	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.45					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 3						5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001855

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Canister Capacity***	130g
Odometer	37735	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, June 3, 2021	***Profile***	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **6/3/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	16:38:07	0:00:00	0:00:00	
Engine Key-off	16:43:00	0:04:53	0:04:53	
SHED Door Sealed	16:44:00	0:01:00	0:05:53	
Final Sample	17:44:00	1:00:00	1:05:53	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 4.98 ppm	Volume = 1800.9 ft3	Temp. = 105 °F	Baro. = 28.8 in/Hg	Mass HC=0.136 grams
Post Read Zero = 0 ppm	Post Read Span = 9.48 ppm			Mass EtOH= 0 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 6.5 ppm	Volume = 1798 ft3	Temp. = 105.2 °F	Baro. = 28.79 in/Hg	Mass HC =0.177 grams
Post Read Zero = -0.019 ppm	Post Read Span = 9.52 ppm			Mass EtOH = 0 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 104.5 °F	Minimum = 102 °F			
Max Ambient Temp = 106.6 °F	Maximum = 108 °F			
Min Interior Temp = 104.5 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.041±0.01 grams**
				Diurnal Mass EtOH = 0 grams
				Diurnal Total Mass HC plus EtOH = 0.041 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, June 3, 2021	18:44:00	0:00:00	
End Cold Soak	Friday, June 4, 2021	0:44:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.7 °F	Maximum = 68 °F			
Min. Internal Temp = 63 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37735	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, June 3, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Friday, June 4, 2021	0:44:00	0:00:00	
Start Time Diurnal	Friday, June 4, 2021	0:44:00	0:00:00	
End Time Diurnal	Saturday, June 5, 2021	0:44:00	24:00:00	
24 Hour Sample	Saturday, June 5, 2021	0:44:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 6.956 ppm	Volume = 1674.3 ft3	Temp. = 64.9 °F	Baro. = 28.95 in/Hg	Mass HC =0.191 grams
Post Read Zero = 0 ppm	Post Read Span = 9.51 ppm			Mass EtOH= 0.004 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 13.395 ppm	Volume = 1671.6 ft3	Temp. = 65.1 °F	Baro. = 28.97 in/Hg	Mass HC=0.368 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.314 ppm			Mass EtOH= 0.07 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.2 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.5 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.45 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.177±0.01 grams**
				Diurnal Mass EtOH = 0.066 grams
				Diurnal Total Mass HC plus EtOH = 0.194 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37735	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, June 3, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Saturday, June 5, 2021	0:44:00	24:00:00	
Start Time Diurnal	Saturday, June 5, 2021	0:44:00	24:00:00	
End Time Diurnal	Sunday, June 6, 2021	0:44:00	48:00:00	
48 Hour Sample	Sunday, June 6, 2021	0:44:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 13.395 ppm	Volume = 1671.6 ft3	Temp. = 65.1 °F	Baro. = 28.97 in/Hg	Mass HC=0.368 grams
Post Read Zero = 0 ppm	Post Read Span = 93.314 ppm			Mass EtOH= 0.07 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 17.976 ppm	Volume = 1667.4 ft3	Temp. = 64.9 °F	Baro. = 28.9 in/Hg	Mass HC=0.492 grams
Post Read Zero = -0.015 ppm	Post Read Span = 93.322 ppm			Mass EtOH= 0.129 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.1 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.5 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.7 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.124±0.01 grams**
				Diurnal Mass EtOH = 0.059 grams
				Diurnal Total Mass HC plus EtOH = 0.139 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-009493	***VIN***	2T3H1RFV7KW009493
Model Year	2019	***Make/Model***	Toyota Rav4
Test Group	KTYXT02.5N4H	***Engine Size***	2.5L
Evaporative Family	KTYXR0130P82	***Capacity***	130g
Odometer	37735	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, June 3, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Sunday, June 6, 2021	0:44:00	48:00:00	
Start Time Diurnal	Sunday, June 6, 2021	0:44:00	48:00:00	
End Time Diurnal	Monday, June 7, 2021	0:44:00	72:00:00	
72 Hour Sample	Monday, June 7, 2021	0:44:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 17.976 ppm	Volume = 1667.4 ft3	Temp. = 64.93 °F	Baro. = 28.9 in/Hg	Mass HC=0.492 grams
Post Read Zero = -0.015 ppm	Post Read Span = 93.322 ppm			Mass EtOH= 0.129 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 21.984 ppm	Volume = 1660.4 ft3	Temp. = 65.1 °F	Baro. = 28.89 in/Hg	Mass HC=0.598 grams
Post Read Zero = -0.018 ppm	Post Read Span = 93.295 ppm			Mass EtOH= 0.182 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.3 °F	± 3 °F			
Avg. Δ Profile Underbody = -0.5 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.4 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.106±0.01 grams**
				Diurnal Mass EtOH = 0.053 grams
				Diurnal Total Mass HC plus EtOH = 0.119 grams

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

Final Diurnal Total Mass HC plus EtOH emissions results: 0.235 grams {hot soak + highest 24 hour mass}

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Automotive Testing and Development Services, Inc.

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Emissions
- *FTP Protocol*
- *SFTP Protocol*
- *Euro Protocols*
- *Asia Protocols*
- *Evaporative Emissions*
- *NMOG Determination*
- *Electric Vehicle Range*

Hydrocarbon Speciation
- *New Vehicle Certification*
- *In-Use Verification*
- *Gasoline*
- *Diesel*

Durability
- *Passenger Cars*
- *Light-Duty*
- *Medium-Duty*
- *Heavy-Duty*
- *Highway Motorcycles*
- *Non-road Motorcycles*
- *Non-road UTV/ATV*
- *Component*
- *On-road (Public Roads)*
- *Proving Grounds*
- *Temporary Test Sites*
- *OBD System Download*
- *Custom Data Logging*

Engineering
- *SAE Coast-Downs*
- *SAE Fuel Economy*
- *SAE OBD Compliance*
- *CFR Testing and Procedures*
- *CCR Testing and Procedures*
- *SAE J2807 Trailer Tow Rating*

Procurement
- *OEM In-Use*
- *Agency In-Use*
- *Component Collection*
- *Data Collection*
- *Usage Surveys*

Staffing
- *Drivers*
- *Mechanics*
- *Data Technicians*
- *Maintenance*
- *Administrative*
- *Lab Technicians*

January 28, 2022

Chris Bliley
Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

Kelly Davis
Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

Final Report on Evaporative Emissions Test Procedure Performed for Growth Energy and the Renewable Fuels Association.

Dear Chris Bliley and Kelly Davis,

Automotive Testing and Development Services, Inc. (ATDS) is pleased to provide this final report for the evaporative emissions testing conducted on vehicles for Renewable Fuels Association. This testing was conducted in strict accordance with 40 CFR 86 and California Title 13. ATDS' QA representatives have subjected all tests to a rigorous quality audit.

Sincerely,

Jose Haro
Test Engineer

Approved by:

Linwood E Farmer Jr.

Linwood Farmer
Vice President

Evaporative Emissions Testing

Project Number: 3081 - 139404

CONDUCTED FOR:

Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

&

Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

REPORT PREPARED BY:

Jose Haro, Test Engineer
Automotive Testing and Development Services, Inc.
400 South Etiwanda Avenue
Ontario, California 91761

Automotive Testing and Development Services, Inc. submitted this Report in fulfillment of Project 3081 - 139404 Evaporative Emissions Test Procedure. In ATDS' professional opinion this testing was conducted in a valid manner according to the listed methodology.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
PROJECT OVERVIEW 4
TEST VEHICLE INFORMATION 4
TEST SEQUENCE AND CHRONOLOGY 4
TEST PARAMETERS 6
E10 SHED TEST # 1 RESULTS 6
E10 SHED TEST # 2 RESULTS 6
E15 SHED TEST # 1 RESULTS 7
E15 SHED TEST # 2 RESULTS 7
RESULTS SUMMARY 8
DATA REVIEW AND CONCLUSION 9
APPENDIX 10

PROJECT OVERVIEW

This testing was conducted on behalf of Growth Energy and the Renewable Fuels Association. The project consisted of the 3-day evaporative emissions test sequence performed with two different fuels. Work commenced on June 21st, 2021 and was completed on September 26th, 2021.

TEST VEHICLE INFORMATION

The following vehicle was used for this project:

ATDS Vehicle ID:	3081-139404
VIN:	3KPC24A66ME139404
MY/Make/Model:	2021 Hyundai Accent
Test Group:	MHYXV01.6AB6
Evaporative Family:	MHYXR0120ABG
Tires:	185/65/15 88H
Odometer:	12,347 miles

TEST SEQUENCE AND CHRONOLOGY

The following test sequence and chronology were used in this program:

6/21/2021
- Vehicle check in
- Flushed windshield washer fluid system

6/28/2021
- Canister Purge
- Fuel changed to E15
- FTP-72 (X4)

6/28/2021 – 8/4/2021
- 21-day soak

8/4/2021
- Performed road load derivation (Test ID: ONT3_001989)
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001990)
- Canister loading (21080501.ST3)

8/5/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001996)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001997)

8/5/2021 – 8/9/2021
- 3-Day Diurnal evaporative emissions test run. E15 Test #1.

8/11/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_002007)
- Canister loading (21081201.ST1)

8/12/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_002017)

- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_002018)

8/12/2021 – 8/15/2021
- 3-Day Diurnal evaporative emissions test run (E15 Test #2)

8/24/2021
- Canister Purge
- Fuel changed to E-10
- FTP-74 (X4)

8/24/2021 – 9/15/2021
- 21-day soak

9/15/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_002190)
- Canister loading (21091502.ST2)

9/16/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_002195)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_002196)

9/216/2021 – 9/19/2021
- 3-Day Diurnal evaporative emissions test run (E10 Test #1)

9/22/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_002226)
- Canister loading (21092301.ST3)

9/23/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_002227)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_002228)

9/23/2021 – 9/26/2021
- 3-Day Diurnal evaporative emissions test run (E10 Test #2)

TEST PARAMETERS

ETW (lb)	A (ft-lb) track/set	B (ft-lb/mph) track/set	C (ft-lb/mph^2) track/set
3,000	37.791 / 13.300	-0.23049 / 0.10900	0.022439 / 0.018500

E10 SHED TEST # 1 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.002	0.018	0.0065
0-24 Hour Diurnal	0.19	0.138	0.225
24-48 Hour Diurnal	0.16	0.13	0.193
48-72 Hour Diurnal	0.068	0.128	0.1
		Final HC + EtOH Result:	0.232 grams

E10 SHED TEST # 2 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.008	0.021	0.01325
0-24 Hour Diurnal	0.183	0.137	0.217
24-48 Hour Diurnal	0.173	0.128	0.205
48-72 Hour Diurnal	0.159	0.126	0.191
		Final HC + EtOH Result:	0.23 grams

E15 SHED TEST # 1 RESULTS

	Diurnal Mass (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.067	0.016	0.071
0-24 Hour Diurnal	0.26	0.178	0.305
24-48 Hour Diurnal	0.116	0.165	0.157
48-72 Hour Diurnal	0.171	0.151	0.209
		Final HC + EtOH Result:	0.376 grams

E15 SHED TEST # 2 RESULTS

	Diurnal Mass (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.064	0.019	0.06875
0-24 Hour Diurnal	0.201	0.171	0.244
24-48 Hour Diurnal	0.176	0.152	0.214
48-72 Hour Diurnal	0.168	0.147	0.205
		Final HC + EtOH Result:	0.313 grams

RESULTS SUMMARY

	E-10 Test 1	E-10 Test 2	E10 Average	E-15 Test 1	E-15 Test 2	E15 Average
Start	9/16/2021	9/23/2021		8/5/2021	8/12/2021	
End	9/19/2021	9/26/2021		8/9/2021	8/15/2021	
Hot Soak HC	0.002	0.008	0.005	0.067	0.064	0.066
Hot Soak EtOH	0.018	0.021	0.020	0.016	0.019	0.018
Day 1 HC	0.19	0.183	0.187	0.26	0.201	0.231
Day 1 EtOH	0.138	0.137	0.138	0.178	0.171	0.175
Day 2 HC	0.16	0.173	0.167	0.116	0.176	0.146
Day 2 EtOH	0.13	0.128	0.129	0.165	0.152	0.159
Day 3 HC	0.068	0.159	0.114	0.171	0.168	0.170
Day 3 EtOH	0.128	0.126	0.127	0.151	0.147	0.149
Final Total HC plus EtOH	0.232	0.23	0.231	0.376	0.313	0.345
EtOH Multiplier	1.21	1.20	1.205	1.15	1.18	1.165

Total test results are obtained by adding the hot soak result with the highest value from each of the three day diurnals.

All tests were conducted in strict accordance with the provisions of 40 CFR 86 and/or California Title 13 and have been reviewed by ATDS' in-house Quality Auditor. Detailed test results are in the Appendix attached to this report.

DATA REVIEW AND CONCLUSION

Based upon ATDS' review of the test data above, the vehicle tested (2021 Hyundai Accent) has successfully completed emissions testing.

It has been a pleasure working with Growth Energy and the Renewable Fuels Association on this project and we look forward to future efforts.

Sincerely,

Jose Haro
Test Engineer

APPENDIX

Report for Growth Energy and the Renewable Fuels Association

Performed on a

2021 Hyundai Accent [3081-139404]

APPENDIX A
Vehicle Check In

APPENDIX B
Test Check Sheet

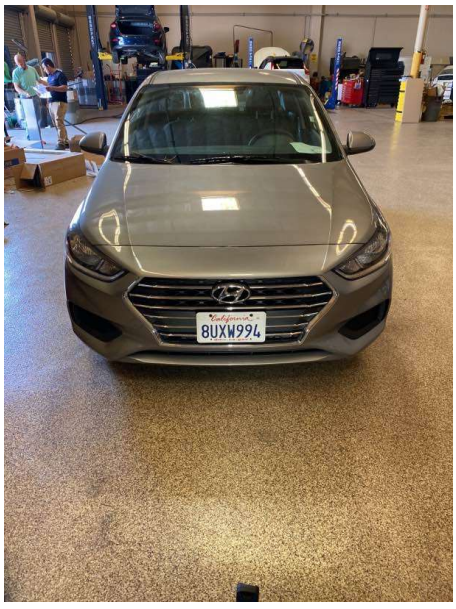
APPENDIX A

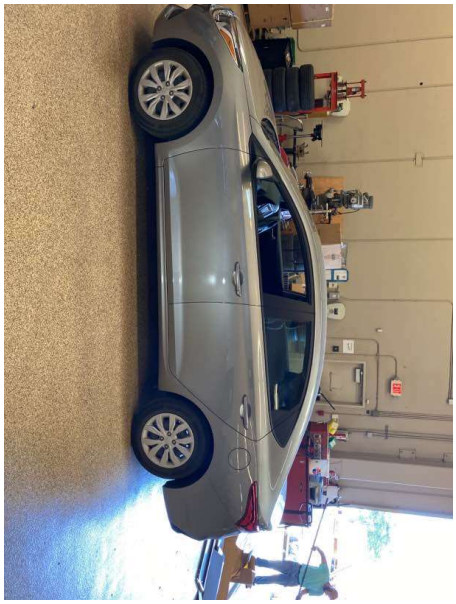
Vehicle Check In

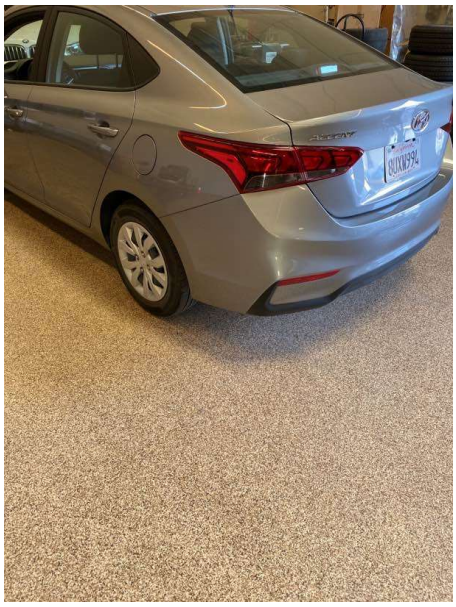
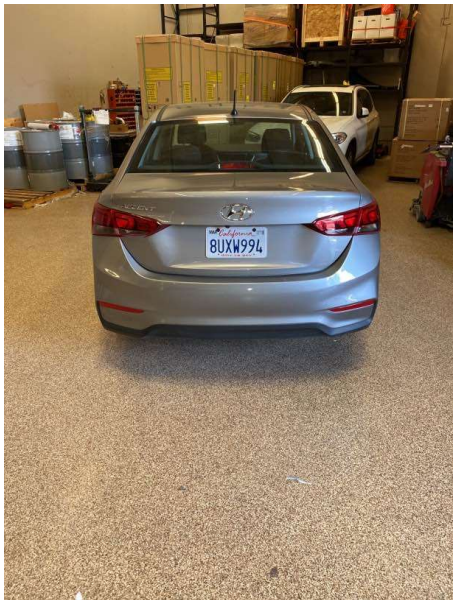
Project Information

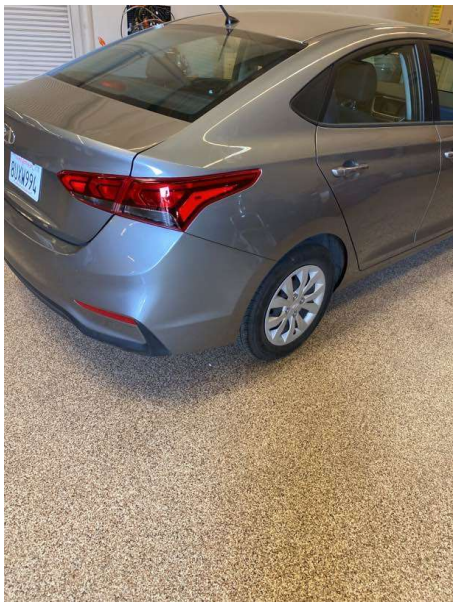
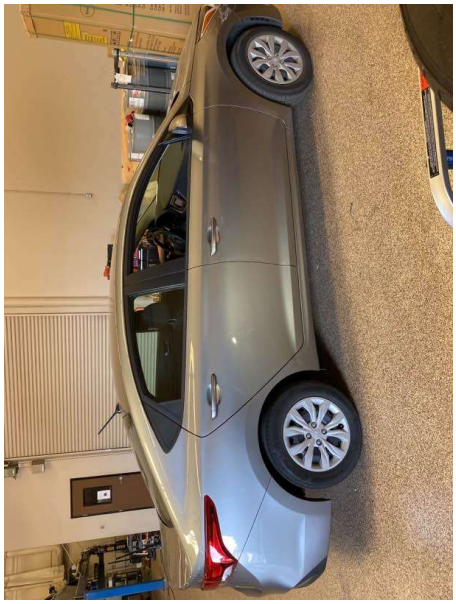
Project ID	3081
ATDS Vehicle Number (-01, …)	139404
Project Name	Renewable Fuel Ass Evaporative Testing
Date	06-21-2021
Vehicle Manufacturer	Kia of Mexico
Vehicle Model	Hyundai Accent
Model Year	2021
Body Style (Sedan, SUV, Hatchback, etc..)	Sedan
VIN	3KPC24A66ME139404
Odometer	12347
Engine Family	MHYXV01.6AB6
Evaporative Family	MHYXR0120ABG
GVWR (Trucks/Leave Blank)	3527

Vehicle Body Photos

Front (Photo)	

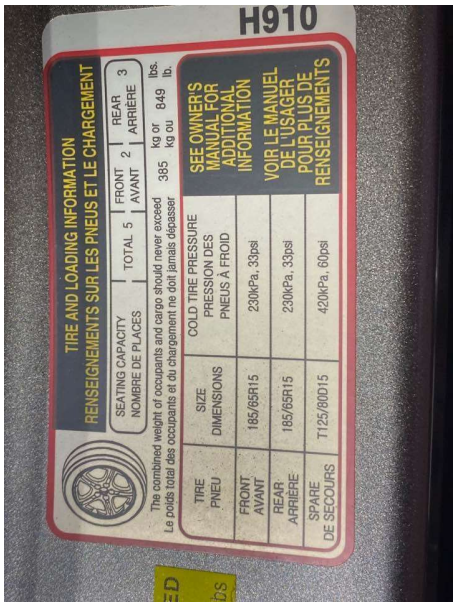
Driver Side Corner (Photo)	
Driver Side (Photo)	

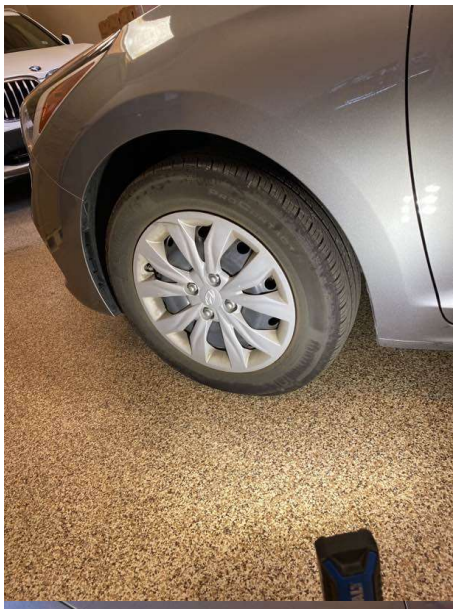
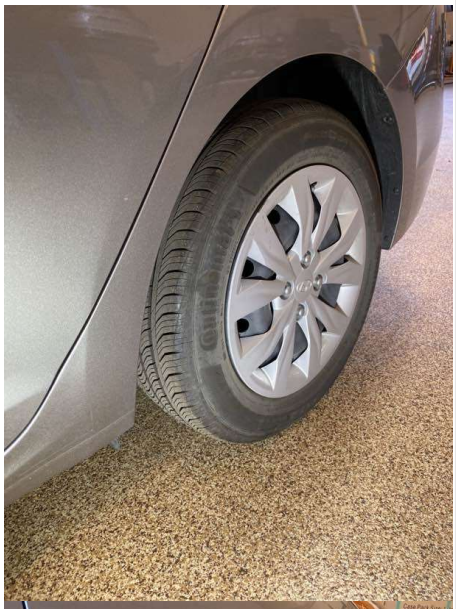
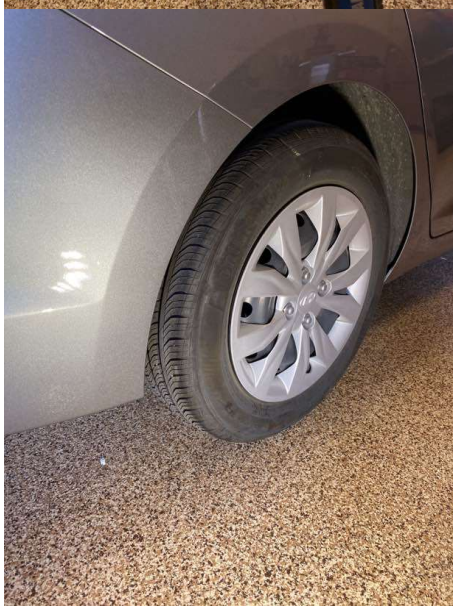
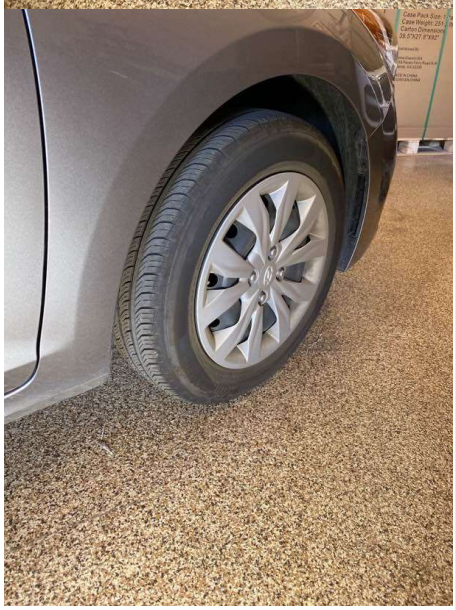
Rear Side Corner -Driver Side (Photo)	
Rear (Photo)	

Rear Side Corner - Passenger Side (Photo)	
Passenger Side (Photo)	

Passenger Side Corner (Photo)	

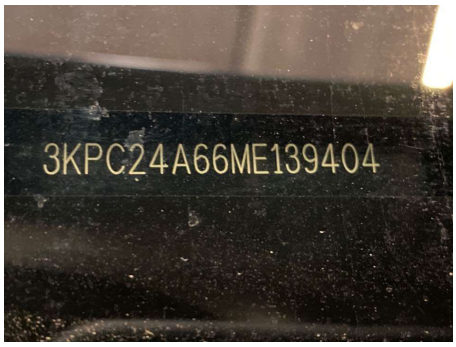
Tires and Wheels

Tire Label from Door (Photo)	
ACTUAL Tire Size	185/65/15 88H

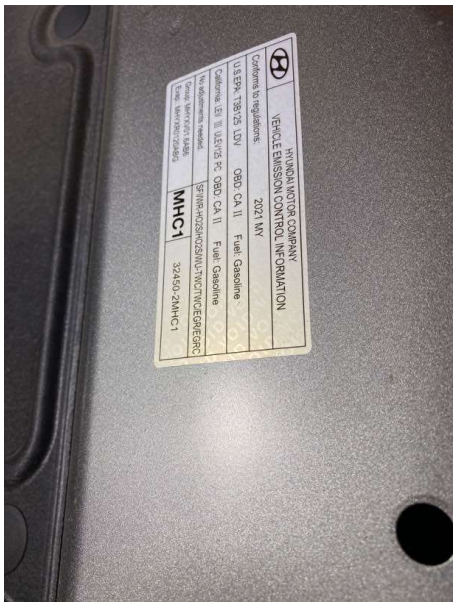
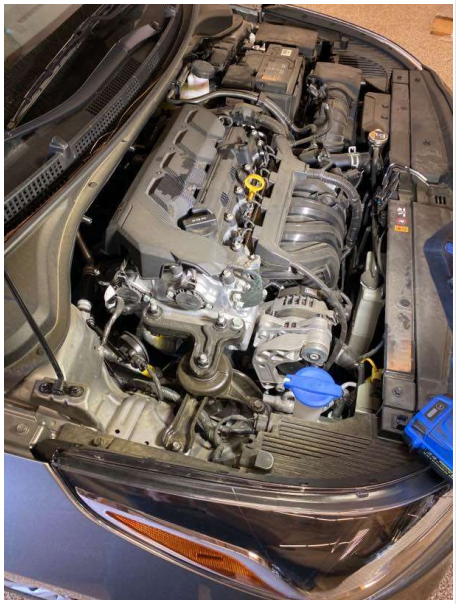
Tire Condition (Photos)	   
Tire Condition	Good
Drive Wheel	Front
Brakes?	>2mm (Usable)

Odometer and VIN

License Plate Number	8UXW994 CALIFORNIA
VIN	3KPC24A66ME139404

VIN Plate from Windshield (Photo)	
Vehicle Information Sticker from Door (Photo)	
Odometer (Photo)	
Odometer	12347

Engine and Emissions

VECI (Photo)	
Engine Bay (Photo)	
Engine Family	MHYXV01.6AB6
Evaporative Family	MHYXR0120ABG
Engine Oil Level	Good
Coolant Level	Good
Transmission Fluid Level	No Dipstick
Transmission Type	Automatic
Belts and Hoses	Good
VECI Label Status	Both

Noise Leaks on Exhaust?	No
Visual Leaks on Exhaust?	No
Transmission Fluid Condition	No Dipstick

Windshield and Headlights

Windshield Wiper Fluid?	No
Do the windshield wipers work?	Yes
Any windshield cracks?	No
Windshield Photos	
Do the headlights work?	Yes
Are the headlights damaged?	No
Headlight Photos	
Do the tail lights work?	Yes
Are the tail lights damaged?	No
Tail Light Photos	

OBD

OBD Status Monitors Set	Yes
Mode 3 DTCs?	No

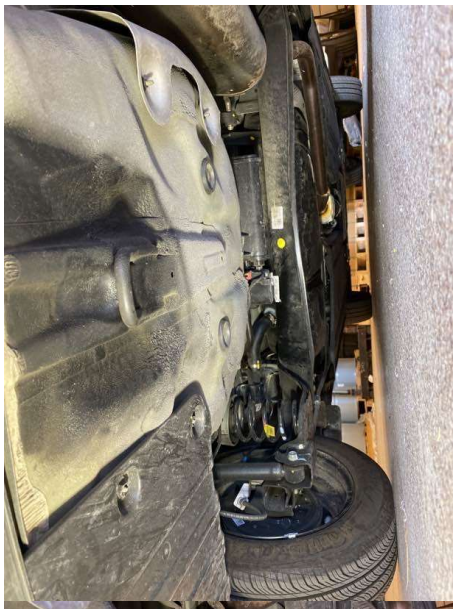
Mode 7 DTCs?	No

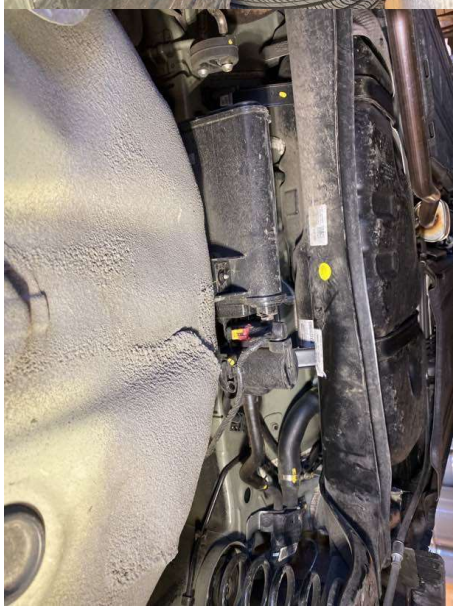
ABS/Traction Control

ABS?	Yes
Traction Control?	Yes

Underbody

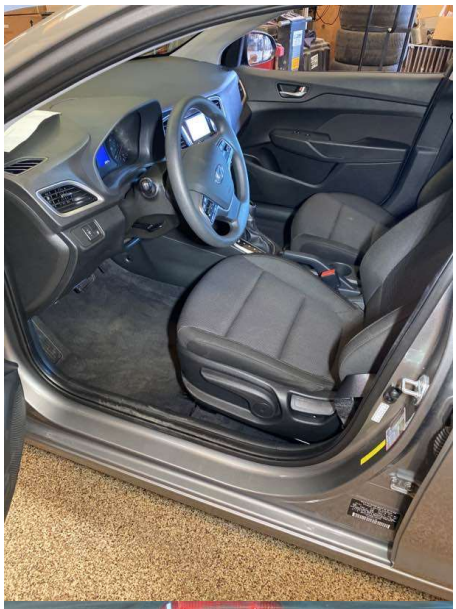
Underbody (Photos)	

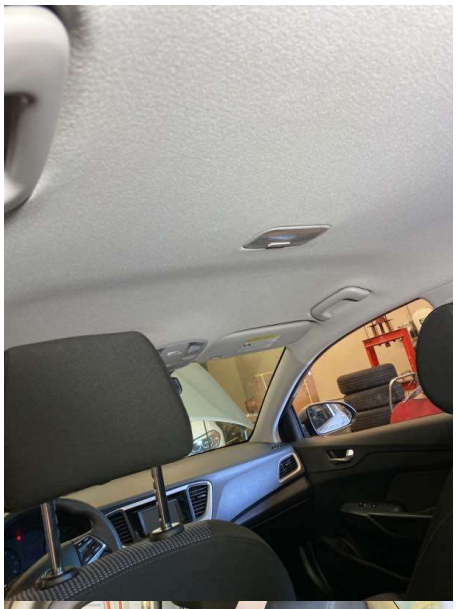


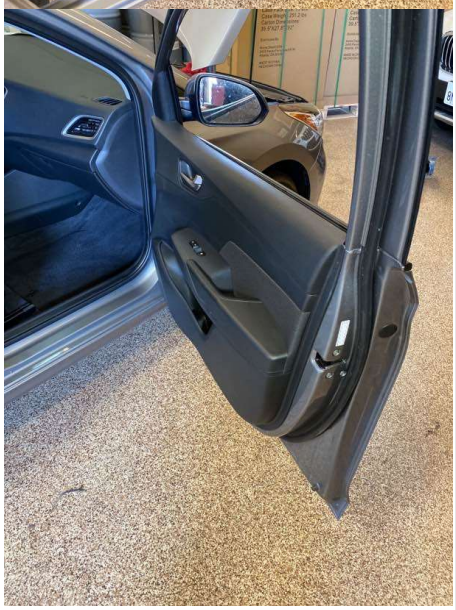


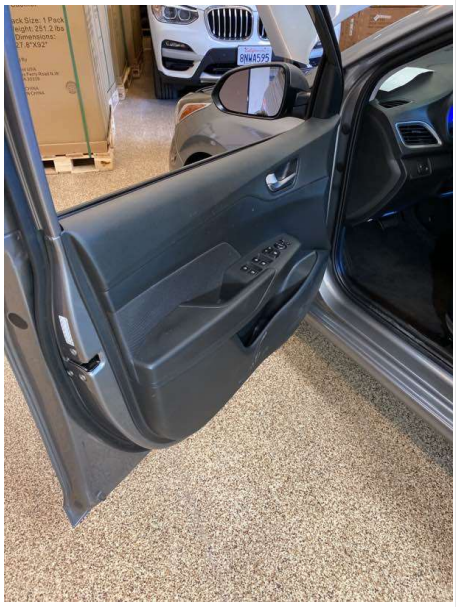
Interior

Interior (Photos)





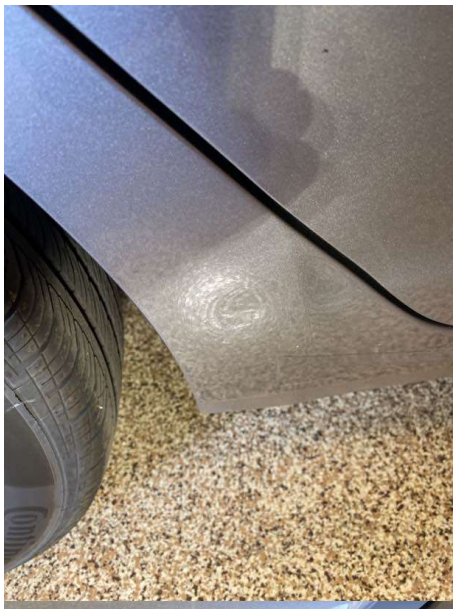


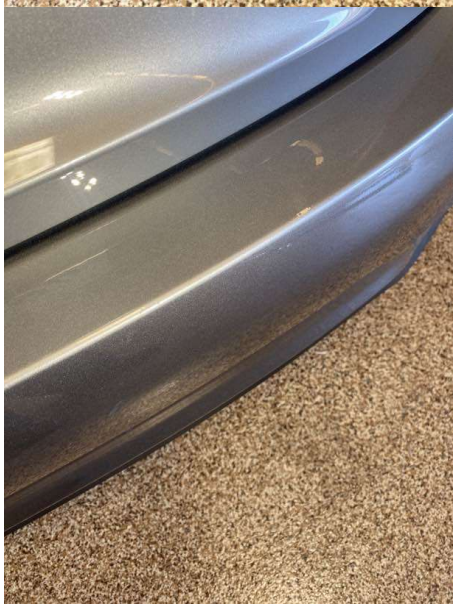
	

Damage Report

Any Damage (scratches/dents)?	Yes

Damage Area	





Confirmation

Start Form Timestamp	06-21-2021 09:24 AM
End Form Timestamp	06-21-2021 11:33 AM
Submission Id	503af50f-8078-49ef-a669-014350755fef
Name of Inspector	JMCKEOWN

Signature	
Comments	

Measurement values

Application:	Silver Scan-Tool Version 6.21.36.26940
Date/Time:	06/21/2021, 10:48:54 am
Author:	Shop
Department:	Automotive Testing and Development Services Inc
Location:	400 Etiwanda Ave, Ontario CA 91761 United States
Comment:	Check In ODO 12347

33: Scan-Tool

Communication	
Address word	33
Name	Scan-Tool
Protocol	ISO 15765-4 (CAN)
Baudrate	500 kbps
Interface	ATI Leaf Light HS v2, Ser.No 10217, Channel 1
Vehicle	
Vehicle	3081 139404 Renewable Fuel Ass
Description	2021 Hyundai AccentProject Manager Lin Farmer
Vehicle Identification Number	3KPC24A66ME139404

Contents

- Module E8 ECM-EngineControl
- Module E9 TCM-TransmisCtrl

Module E8: ECM-EngineControl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

E8 ECM-EngineControl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0111 1110 0101 0000 0000	Bit	Monitor status since DTCs cleared
PID 03	0000 0010	Bit	Fuel system A status
PID 03	0000 0000	Bit	Fuel system B status
PID 04	15.3	%	Calculated load value
PID 06	-6.3	%	Short term fuel trim - Bank 1
PID 07	-3.1	%	Long term fuel trim - Bank 1
PID 0B	27	kPa	Intake manifold absolute pressure
PID 0C	2808	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 0E	52.5	°KW	Ignition timing advance for #1 cylinder
PID 0F	26	°C	Intake air temperature
PID 10	8.19	g/s	Air flow rate from mass air flow sensor
PID 11	17.3	%	Absolute throttle position
PID 13	0000 0011	Bit	Location of oxygen sensors
PID 15	1.245	V	Oxygen sensor output voltage
PID 15	99.2	%	Short term fuel trim

Name	Measured value	Unit	Comment
PID 1C	3		OBD requirements to which vehicle or engine is certified
PID 1F	25	s	Time since engine start
PID 21	0	km	Distance traveled while MIL is activated
PID 2C	0.0	%	Commanded EGR
PID 2D	0.0	%	EGR error
PID 2E	0.0	%	Commanded evaporative purge
PID 2F	27.1	%	Fuel level input
PID 30	136	dec	Number of warm-ups since DTCs cleared
PID 31	19656	km	Distance traveled since DTCs cleared
PID 32	65.00	Pa	Evap system vapor pressure
PID 33	97	kPa	Barometric pressure
PID 34	1.000	Lambda	Equivalence ratio
PID 34	-0.02	mA	Oxygen sensor current
PID 3C	182.3	°C	Catalyst temperature Bank 1 Sensor 1
PID 41	0000 0000 0010 0111 1110 0101 1110 0101	Bit	Monitor status this driving cycle
PID 42	14.153	V	Control module voltage
PID 43	19.6	%	Absolute load value
PID 44	1.000	Lambda	Fuel/Air commanded equivalence ratio
PID 45	7.5	%	Relative throttle position
PID 46	25	°C	Ambient air temperature
PID 47	17.3	%	Absolute throttle position B
PID 49	22.0	%	Accelerator pedal position D
PID 4A	11.0	%	Accelerator pedal position E
PID 4C	9.8	%	Commanded throttle actuator control
PID 51	1		Type of fuel currently being utilized by the internal combustion engine
PID 55	0.0	%	Short term secondary O2 sensor fuel trim - Bank 1

Name	Measured value	Unit	Comment
PID 56	0.0	%	Long term secondary O2 sensor fuel trim - Bank 1
PID 62	16	%	Actual engine - percent torque
PID 63	220	Nm	Engine reference torque
PID 67	39	°C	Engine Coolant Temperature 1
PID 67	29	°C	Engine Coolant Temperature 2
PID 8E	9	%	Engine Friction - Percent Torque
PID 9D	0.52	g/s	Engine fuel rate
PID 9D	0.52	g/s	Vehicle fuel rate
PID 9E	31.0	kg/h	Engine Exhaust Flow Rate

E8 ECM-EngineControl: Mode 2 - Current freeze frame data

No data

E8 ECM-EngineControl: Mode 3 - Emission-related diagnostic trouble codes

No data

E8 ECM-EngineControl: Mode 6 - Monitoring test results for specific monitored systems

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 01	86	06	1.004620	0.299982	19.999316		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	87	06	1.110208	0.299982	19.999316		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	9B	0A	3.107902	0.000000	3.249992	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	9C	0A	2.498040	0.015137	7.999857	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 01	9D	85	0.0030517	-0.0700365	0.0700365		Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 02	05	10	0.080	0.000	0.700	s	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 02	06	10	0.270	0.000	2.000	s	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	85	3A	1.032	0.000	3.500	g	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	86	3A	1.428	0.000	4.000	g	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 21	8E	20	1.1015625	1.0000000	255.9960938		Catalyst Monitor Bank 1
MID 31	85	05	0.9999811	0.1000042	1.9999316		EGR Monitor Bank 1
MID 31	86	05	0.9999811	0.0000000	1.7999537		EGR Monitor Bank 1
MID 35	91	9C	-24.54	-24.54	-14.50	°	VVT Monitor Bank 1
MID 35	92	9C	-24.54	-24.54	-14.50	°	VVT Monitor Bank 1
MID 35	93	9C	34.07	23.31	43.31	°	VVT Monitor Bank 1
MID 35	94	9C	34.07	23.31	43.31	°	VVT Monitor Bank 1
MID 39	80	FE	-2526.50	-8192.00	-2500.00	Pa	EVAP Monitor (Cap Off, 0.150")
MID 3B	80	A9	16.00	-8192.00	60.00	Pa/s	EVAP Monitor (0.040")
MID 3C	82	A9	16.00	-8192.00	28.00	Pa/s	EVAP Monitor (0.020")
MID 3D	89	FE	64.25	-2169.25	8191.75	Pa	Purge Flow Monitor
MID 3D	88	FE	-2.25	-181.00	3999.75	Pa	Purge Flow Monitor
MID 3D	8A	FE	-59.25	-4000.00	-50.25	Pa	Purge Flow Monitor
MID 41	81	16	801.1	719.9	6513.5	°C	Exhaust Gas Sensor Heater Monitor Bank 1 - Sensor 1
MID 42	8C	0E	1.612	1.150	65.535	A	Exhaust Gas Sensor Heater Monitor Bank 1 - Sensor 2
MID 81	A1	1E	1.0005304	0.9304938	1.0705974	lambda	Fuel System Monitor Bank 1
MID 81	A3	1E	1.0005304	0.9304938	1.0705974	lambda	Fuel System Monitor Bank 1
MID 81	A5	1E	1.0005304	0.9304938	1.0705974	lambda	Fuel System Monitor Bank 1
MID 81	A7	1E	1.0005304	0.9304938	1.0705974	lambda	Fuel System Monitor Bank 1
MID A2	0B	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A2	0C	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A3	0B	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A3	0C	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A4	0B	24	0	0	65535	counts	Misfire Cylinder 3 Data

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID A4	0C	24	0	0	65535	counts	Misfire Cylinder 3 Data
MID A5	0B	24	0	0	65535	counts	Misfire Cylinder 4 Data
MID A5	0C	24	0	0	65535	counts	Misfire Cylinder 4 Data

E8 ECM-EngineControl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

E8 ECM-EngineControl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 02	3KPC24A66ME139404	Vehicle Identification Number(VIN)
InfoType 04	MHC-1NU06P000T03	Calibration Identification (CALID)
InfoType 06	F5 CE A2 3B	Calibration Verification Numbers (CVN)
InfoType 08	01 4C 03 DC 00 B9 01 4C 00 00 00 00 01 32 01 4C 00 00 00 00 01 F3 01 4C 00 00 00 00 00 4B 00 31 01 54 01 4C 00 00 00 00 00 B7 01 4C 00 00 00 00 00 00 00 00 00 00 00 00	In-use Performance Tracking
	Values for InfoType 08	

Name	Measured value	Comment
OBDCOND	332	General Denominator, OBD Monitoring Conditions Encountered Counts
IGNCNTR	988	Ignition Cycle Counter
CATCOMP1	185	Numerator, Catalyst Monitor Completion Counts Bank 1
CATCOND1	332	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 1
	0.557	- Calculated Ratio -
CATCOMP2	0	Numerator, Catalyst Monitor Completion Counts Bank 2

Name	Measured value		Comment
	CATCOND2	0	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	O2SCOMP1	306	Numerator, O2 Sensor Monitor Completion Counts Bank 1
	O2SCOND1	332	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 1
		0.922	- Calculated Ratio -
	O2SCOMP2	0	Numerator, O2 Sensor Monitor Completion Counts Bank 2
	O2SCOND2	0	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	EGRCOMP	499	Numerator, EGR/VVT Monitor Completion Condition Counts
	EGRCOND	332	Denominator, EGR/VVT Monitor Conditions Encountered Counts
		1.503	- Calculated Ratio -
	AIRCOMP	0	Numerator, Secondary Air Monitor Completion Condition Counts
	AIRCOND	0	Denominator, Secondary Air Monitor Conditions Encountered Counts
		7.995	- Calculated Ratio -
	EVAPCOMP	75	Numerator, EVAP Monitor Completion Condition Counts
	EVAPCOND	49	Denominator, EVAP Monitor Conditions Encountered Counts
		1.531	- Calculated Ratio -
	SO2SCOMP1	340	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 1
	SO2SCOND1	332	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 1
		1.024	- Calculated Ratio -
	SO2SCOMP2	0	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 2
	SO2SCOND2	0	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
	AFRICOMP1	183	Numerator, Air Fuel Ratio Imbalance Monitor Completion Counts Bank 1
	AFRICOND1	332	Denominator, Air Fuel Ratio Imbalance Monitor Conditions Encountered Counts Bank 1
		0.551	- Calculated Ratio -
	AFRICOMP2	0	Numerator, Air Fuel Ratio Imbalance Monitor Completion Counts Bank 2

Name	Measured value		Comment
	AFRICOND2	0	Denominator, Air Fuel Ratio Imbalance Monitor Conditions Encountered Counts Bank 2
		7.995	- Calculated Ratio -
InfoType 0A	ECM-EngineControl		ECU Name
InfoType 13	4D 48 59 58 56 30 31 2E 36 41 42 36		Hybrid/EV Battery DTCs and Location
InfoType 14	27		Distance Traveled Since Evap Monitoring Decision

E8 ECM-EngineControl: Readiness - Readiness

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Misfire monitoring	yes	yes	yes	yes
Fuel system monitoring	yes	yes	yes	no
Comprehensive component monitoring	yes	yes	yes	yes
Catalyst monitoring	yes	yes	yes	no
Heated catalyst monitoring	no	yes	no	yes
Evaporative system monitoring	yes	yes	yes	no
Secondary air system monitoring	no	yes	no	yes
Oxygen sensor monitoring	yes	yes	yes	no
Oxygen sensor heater monitoring	yes	yes	yes	no
EGR and/or VVT system monitoring	yes	yes	yes	no

Module E9: TCM-TransmisCtrl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
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Mode 9 - Vehicle information
Readiness - Readiness

E9 TCM-TransmisCtrl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0100 0000 0000 0000 0000	Bit	Monitor status since DTCs cleared
PID 0C	2829	1/min	Engine RPM
PID 30	9	dec	Number of warm-ups since DTCs cleared
PID 31	184	km	Distance traveled since DTCs cleared
PID 41	0000 0000 0000 0100 0000 0000 0000 0000	Bit	Monitor status this driving cycle

E9 TCM-TransmisCtrl: Mode 2 - Current freeze frame data

No data

E9 TCM-TransmisCtrl: Mode 3 - Emission-related diagnostic trouble codes

No data

E9 TCM-TransmisCtrl: Mode 6 - Monitoring test results for specific monitored systems

No data

E9 TCM-TransmisCtrl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

E9 TCM-TransmisCtrl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 04	CHC0M16NS1	Calibration Identification (CALID)
InfoType 06	61 5D 8E 40	Calibration Verification Numbers (CVN)
InfoType 0A	TCM-TransmisCtrl	ECU Name

E9 TCM-TransmisCtrl: Readiness - Readiness

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Misfire monitoring	no	yes	no	yes
Fuel system monitoring	no	yes	no	yes
Comprehensive component monitoring	yes	yes	yes	yes
Catalyst monitoring	no	yes	no	yes
Heated catalyst monitoring	no	yes	no	yes
Evaporative system monitoring	no	yes	no	yes
Secondary air system monitoring	no	yes	no	yes
Oxygen sensor monitoring	no	yes	no	yes
Oxygen sensor heater monitoring	no	yes	no	yes
EGR and/or VVT system monitoring	no	yes	no	yes

APPENDIX B

Test Check Sheet

Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Hyundai Accent
Vehicle #:	3081-139404	**Engine Size**	1.6L
VIN:	3KPC24A66ME139404	**Model Year**	2021
Engine Family:	MHYXV01.6AB6	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Vehicle check in	E	2021-06-21	11:33	12347			JM
OBD download							JM
Prepare vehicle for Lab							JM
Canister Purge 1 Hour	E	2021-06-28	09:03	12347			[illegible]
Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S	2021-06-28	09:05		3		
	E	2021-06-28	09:20		Fuel Spec:	E15	JM
Idle 1 min							[illegible]
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S	2021-06-28	09:28		4.76		
	E	2021-06-28	09:40		Fuel Spec:	<60F 53.9	[illegible]
Heat Build 60F-105F in 1 Hour	S	2021-06-28					
	E						[illegible]
Precon FTP 72 (UDDS) 1	S	2021-06-28	15:16	12347			
	E	↓	15:44	12354		ONTS-001875	JB
Dyno Sets	A: 18.8955 B: -0.046098 C: 0.022439				ETW: 3000		
Precon FTP 72 (UDDS) 2	S	2021-06-28	15:44	12354			
	E	↓	16:10	12362		ONTS-001876	JB
Precon FTP 72 (UDDS) 3	S	↓	16:11	12362			
	E	↓	16:38	12369		ONTS-001877	JB

Precon FTP 72 (UDDS) 4

↓

Eng Off 5 min

↓

Idle 1 min

↓

Eng Off 1 min

↓

Idle 1 min

↓

Vehicle Soak 21 Days
68-86°F

↓

Set tire pressure
7psi over sticker

↓

Fuel Drain and 40% Fill,
Fuel Type: See Notes!

↓

Vehicle Soak
68-86°F

min 6 hr.

↓

Set tire pressure to sticker

↓

2x HFET warmup
J2264 Dyno Coastdown
Dyno Sets for Warmup HWY

↓

Precon FTP 72 (UDDS)
Dyno Sets

↓

Vehicle Soak
68-86°F

↓

Canister Loading with Butane
Type: 1.5x Load

12-36 hr

Canister Loading Specs

↓

S	6/28/21	16:39	12369
E	↓	17:05	12377

ONT3-001878 VE

VE

VE

VE

VE

S	6/28/21	17:15	
E	8/4/21	13:00	

Front 40 Back 40

4.76

Fuel Spec:

S			
E			

S			
E			

Front 33 Back 33

S	8/4/21	15:18	12377
E		15:49	12404

ONT3-001959 VE

A: 18.8955 B: -0.046098 C: 0.022439 ETW: 3000

S		16:05	12404
E	↓	16:37	12412

ONT3-001990 JB

A: 13.3 B: 0.109 C: 0.0185 ETW: 3000 JB

S	8/4/21	16:40	JB
E	8/5/21	12:30	

S	8/4/21	16:43	
E	8/5/21	05:12	

21080501.SL3 JB

Cap	120	Vol	2.1	
Purge	300	Flow Rate	15	MHYZR0120ABG

T - 73.0
H - 44.6
B - 28.8

Set tire pressure to sticker

Front 33 Back 33 JB

No Bag Cold Start FTP 75

S 8/5/21 13:19 12412

E ↓ 14:09 12423

ONT3_001996 JB

Dyno Sets

A: B: C:

ETW: 3000

Test Options

PM N2O

Dilute Modal

Pre Test Comments

CVS Flow P1:9.3 P2:9.3 P3:9.3

E15 Test 1

Fuel Tank Temp. Stabilization at 105F

S 8/5/21 14:10

E 8/5/21 14:56

JS JB

max 1 hr

Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle

S 14:55

E 16:12

VE JB

Dyno Sets

A: B: C:

ETW: 3000

Test Options

PM N2O

Dilute Modal

CVS Flow 9.3

Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff

max 7 min

Hot Soak in VT Shed

S 8/5/2021 16:19

E 8/5/2021 17:19

J.H.

Cold Soak 6-36 Hours

6-36 Hr

S 8/5/2021 18:19

E 8/6/2021 0:19

J.H.

3 Day Diurnal Test

S 8/6/2021 0:19

E 8/9/2021 0:19

J.H.

QC Check

E 11/17/2021

J.H.

ATDS CANISTER WORKSHEET

Station number 4

----PURGE ONLY----

VT#	3081-139404 ✓
Project	3082
Evap Family	MHYXR0120ABG ✓ J.H.
Ambient Temperature-Deg F	76
Barometric Pressure-In/Hg	28.80
Humidity-Grains/Lb	72.5 ✓
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0
Canister Volume-Liters	13.6
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	08:03:30
Start date	06-28-2021
Bed Purges/Cycle	100
Purge End/Load Start	09:03:39
Test Time Minutes	60 ✓
HC Loaded-Grams	0.0
Scale Reading-Grams	4.17
Butane Flow Actual-Gm/Hr	0.0
Cycles Completed	1
Finish time	09:03:39
Finish date	06-28-2021
Disk File Name	21062801.ST4

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/28/2021	**Time:**	15:16:12
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON 1		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 4/17/2024

COMMENTS: OK

General Data

Test Number	*ONT3_001875*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/28/2021*	CH_4 Response Factor	
Test Start	*15:16:12*	Odometer Position [mi]	*12347*
Start Time Cycle	*2021-06-28 15|22-25-(000)*	Delay Time Method	
Test End	*15:44:08*		
Operator	*Victor Escudero*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*PRECON 1*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021* J.H.	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*18.896* ✓	*-0.04610* ✓	*0.022439* ✓

Fuel Data ~~*01_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Victor Escudero	Speed Table		Date:	
Test Number	ONT3_001875	Driver	Joseph Bishop	Shift Table Auto		Cold Start	

Vehicle	3KPC24A66ME139404	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*	91_Pump_Gas		Start Time	*15:16:12*
		A [lbf]	*18.896*	Fuel type	GASOLINE	End Time	*15:44:08*
Model	ACCENT	B [lbf/mph]	*-0.04610*	Density	*0.7380*		
Year	*2021*	C [lbf/mph2]	*0.022439*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*12347*	Remark	PRECON 1				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	72.78	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.64	D.F.	
Span Read	*0.00*							RH[%]	*59.91*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*10.735*	Ph. End[s]	505.7
Mass.	*0.000*							Dist.[mi]	*3.61*	Ph. Length[s]	505.7
Mass per Dist.	*0.0000*							NO_x Corr.	*1.0008*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.57	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	28.65	D.F.	
Span Value	*0.00*							RH[%]	*59.50*	Ph. Start[s]	505.8
Sample	*0.00*							AH[g/kg]	*10.951*	Ph. End[s]	1375.4
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	869.7
Mass per Dist.	*0.0000*							NO_x Corr.	*1.0080*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.48*

Test Data: FTP72 Operator: Victor Escudero Date: 6/28/2021
Test Number: ONT3_001875 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001875

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [lbf]	*18.896*	*37.791*
B [lbf/mph]	*-0.04610*	*-0.23049*
C [lbf/mph2]	*0.022439*	*0.022439*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5802.18	6226.25		
Distance Rating (%)	0.3985	0.2448		
Cycle Energy (MJ)				
Target	2.57	2.34		
Driven	2.59	2.37		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4716	0.3520		
Driven	0.4621	0.3491		
Inertial Work (MJ)				
Target	1.36	1.52		
Driven	1.40	1.54		
Inertial Work Fraction				
Target	0.5284	0.6480		
Driven	0.5379	0.6509		
Inertial Work Rating	2.7408	1.7579		
Absolute Speed Change (m/s2)				
Target	204.88	340.91		
Driven	209.28	345.05		
Absolute Speed Change Rating (%)	2.1520	1.2157		
Energy Rating	0.5210	1.0354		
Energy Economy Rating	0.5210	1.0354		0.7730

ATDS Emission Lab Test Report

Validation

Phase 1

Test Record #: ONT3_001875

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	72.78	72.32	73.22	68.00	86.00	Passed
Barometer	(inHg)	28.64	28.64	28.65	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	75.14	73.94	76.14	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61					Passed
Sample Phase Time	(s)	505.7					
Duration Phase 1	(s)	505.60					
Crank Time Phase1	(s)	0.70				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001875

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	73.57	73.22	73.94	68.00	86.00	Passed
Barometer	(inHg)	28.65	28.64	28.65	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	76.65	75.75	77.42	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	869.7					
Duration Phase 2	(s)	869.60					
Crank Time Phase1	(s)	0.7000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/28/2021	**Time:**	15:44:42
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON 2		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001876*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/28/2021*	CH_4 Response Factor	
Test Start	*15:44:42*	Odometer Position [mi]	*12354*
Start Time Cycle	*2021-06-28 15|47-21-(000)*	Delay Time Method	
Test End	*16:10:39*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*PRECON 2*		

Vehicle Data — *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data — *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*18.896* ✓	*-0.04610* ✓	*0.022439* ✓

Fuel Data — ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data — *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop	Speed Table		Date:	
Test Number	ONT3_001876	Driver	Victor Escudero	Shift Table Auto		Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*	91_Pump_Gas		Start Time	*15:44:42*
		A [lbf]	*18.896*	Fuel type	GASOLINE	End Time	*16:10:39*
Model	ACCENT	B [lbf/mph]	*-0.04610*	Density	*0.7380*		
Year	*2021*	C [lbf/mph2]	*0.022439*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*12354*	Remark	PRECON 2				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.05	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.65	D.F.	
Span Read	*0.00*							RH [%]	*58.37*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*10.916*	Ph. End [s]	505.6
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.6
Mass per Dist.	*0.0000*							NO_x Corr.	*1.0068*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	73.44	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.65	D.F.	
Span Value	*0.00*							RH [%]	*55.53*	Ph. Start [s]	505.7
Sample	*0.00*							AH [g/kg]	*10.162*	Ph. End [s]	1376.0
Mass.	*0.000*							Dist. [mi]	*3.86*	Ph. Length [s]	870.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9823*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.45*

Test Data: FTP72 Operator: Joseph Bishop Date: 6/28/2021
Test Number: ONT3_001876 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001876

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [lbf]	*18.896*	*37.791*
B [lbf/mph]	*-0.04610*	*-0.23049*
C [lbf/mph2]	*0.022439*	*0.022439*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5775.32	6205.96		
Distance Rating (%)	-0.0662	-0.0818		
Cycle Energy (MJ)				
Target	2.57	2.34		
Driven	2.56	2.38		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4716	0.3521		
Driven	0.4662	0.3385		
Inertial Work (MJ)				
Target	1.36	1.52		
Driven	1.37	1.57		
Inertial Work Fraction				
Target	0.5284	0.6479		
Driven	0.5338	0.6615		
Inertial Work Rating	0.5958	3.6051		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	205.35	348.30		
Absolute Speed Change Rating (%)	0.2313	2.1708		
Energy Rating	-0.3566	1.5462		
Energy Economy Rating	-0.3566	1.5462		0.5600

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001876

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	74.05	73.76	74.30	68.00	86.00	Passed
Barometer	(inHg)	28.65	28.65	28.65	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	76.41	72.27	78.32	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.6					
Duration Phase 1	(s)	505.50					
Crank Time Phase1	(s)	0.60				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Failed ok
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

no Phase 3

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001876

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	73.44	73.22	73.76	68.00	86.00	Passed
Barometer	(inHg)	28.65	28.65	28.65	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	71.13	70.44	72.41	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86					Passed
Sample Phase Time	(s)	870.4					
Duration Phase 2	(s)	870.30					
Crank Time Phase1	(s)	0.6000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

End of test

J.H.

6/28/2021 4:14 PM

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/28/2021	**Time:**	16:11:19
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON 3		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001877*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/28/2021*	CH_4 Response Factor	
Test Start	*16:11:19*	Odometer Position [mi]	*12362*
Start Time Cycle	*2021-06-28 16|15-12-(000)*	Delay Time Method	
Test End	*16:38:11*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*PRECON 3*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer	J.H.	Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*18.896* ✓	*-0.04610* ✓	*0.022439* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001877	Driver	Joseph Bishop		Shift Table Auto	Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*	91_Pump_Gas		Start Time	*16:11:19*
		A [lbf]	*18.896*	Fuel type	GASOLINE	End Time	*16:38:11*
Model	ACCENT	B [lbf/mph]	*-0.04610*	Density	*0.7380*		
Year	*2021*	C [lbf/mph2]	*0.022439*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*12362*	Remark	PRECON 3				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	73.07	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.65	D.F.	
Span Read	*0.00*							RH [%]	*55.72*	Ph. Start [s]	0.1
Sample	*0.00*							AH [gr/kg]	*10.068*	Ph. End [s]	505.4
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9793*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	73.36	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.65	D.F.	
Span Value	*0.00*							RH [%]	*55.43*	Ph. Start [s]	505.5
Sample	*0.00*							AH [gr/kg]	*10.115*	Ph. End [s]	1375.1
Mass.	*0.000*							Dist. [mi]	*3.87*	Ph. Length [s]	869.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9808*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.47*

Test Data: FTP72 Operator: Joseph Bishop Date: 6/28/2021
Test Number: ONT3_001877 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001877

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [lbf]	*18.896*	*37.791*
B [lbf/mph]	*-0.04610*	*-0.23049*
C [lbf/mph2]	*0.022439*	*0.022439*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.14	6211.05		
Driven	5792.81	6225.80		
Distance Rating (%)	0.2365	0.2375		
Cycle Energy (MJ)				
Target	2.57	2.34		
Driven	2.58	2.38		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4716	0.3520		
Driven	0.4584	0.3465		
Inertial Work (MJ)				
Target	1.36	1.52		
Driven	1.40	1.56		
Inertial Work Fraction				
Target	0.5284	0.6480		
Driven	0.5416	0.6535		
Inertial Work Rating	3.0900	2.7642		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	208.99	346.13		
Absolute Speed Change Rating (%)	2.0085	1.5334		
Energy Rating	0.3331	1.6214		
Energy Economy Rating	0.3331	1.6214		0.9513

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001877

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	73.07	72.86	73.22	68.00	86.00	Passed
Barometer	(inHg)	28.65	28.65	28.65	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	70.47	69.35	71.46	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60					Passed
Sample Phase Time	(s)	505.4					
Duration Phase 1	(s)	505.30					
Crank Time Phase1	(s)	0.40				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001877

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	73.36	73.22	73.40	68.00	86.00	Passed
Barometer	(inHg)	28.65	28.65	28.65	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	70.81	70.17	71.38	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87					Passed
Sample Phase Time	(s)	869.7					
Duration Phase 2	(s)	869.60					
Crank Time Phase1	(s)	0.4000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/28/2021	**Time:**	16:39:59
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON 4		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001878*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/28/2021*	CH_4 Response Factor	
Test Start	*16:39:59*	Odometer Position [mi]	*12369*
Start Time Cycle	*2021-06-28 16|42-17-(000)*	Delay Time Method	
Test End	*17:05:41*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*PRECON 4*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model	J.K.	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*18.896* ✓	*-0.04610* ✓	*0.022439* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001878	Driver	Victor Escudero		Shift Table Auto	Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**			**Fuel**	**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		91_Pump_Gas	Start Time	*16:39:59*
		A [lbf]	*18.896*		Fuel type GASOLINE	End Time	*17:05:41*
Model	ACCENT	B [lbf/mph]	*-0.04610*		Density *0.7380*		
Year	*2021*	C [lbf/mph2]	*0.022439*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*12369*	Remark	PRECON 4				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.92	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.65	D.F.	
Span Read	*0.00*							RH [%]	*54.85*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.857*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9727*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.89	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.66	D.F.	
Span Value	*0.00*							RH [%]	*54.87*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*9.851*	Ph. End [s]	1375.3
Mass.	*0.000*							Dist. [mi]	*3.85*	Ph. Length [s]	869.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9725*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.44*

Test Data: FTP72 Operator: Joseph Bishop Date: 6/28/2021
Test Number: ONT3_001878 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001878

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [lbf]	*18.896*	*37.791*
B [lbf/mph]	*-0.04610*	*-0.23049*
C [lbf/mph2]	*0.022439*	*0.022439*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6211.05		
Driven	5778.07	6188.97		
Distance Rating (%)	-0.0187	-0.3555		
Cycle Energy (MJ)				
Target	2.57	2.34		
Driven	2.56	2.36		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4716	0.3521		
Driven	0.4614	0.3425		
Inertial Work (MJ)				
Target	1.36	1.52		
Driven	1.38	1.55		
Inertial Work Fraction				
Target	0.5284	0.6479		
Driven	0.5386	0.6575		
Inertial Work Rating	1.5944	2.1803		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	206.91	344.90		
Absolute Speed Change Rating (%)	0.9951	1.1732		
Energy Rating	-0.3152	1.0449		
Energy Economy Rating	-0.3152	1.0449		0.3505

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001878

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	72.92	72.68	73.04	68.00	86.00	Passed
Barometer	(inHg)	28.65	28.65	28.66	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	69.00	68.54	69.73	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59					Passed
Sample Phase Time	(s)	505.5					
Duration Phase 1	(s)	505.40					
Crank Time Phase1	(s)	0.50				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001878

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	72.89	72.68	73.04	68.00	86.00	Passed
Barometer	(inHg)	28.66	28.65	28.66	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	68.96	68.40	69.73	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.85					Passed
Sample Phase Time	(s)	869.8					
Duration Phase 2	(s)	869.70					
Crank Time Phase1	(s)	0.5000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/4/2021	**Time:**	15:18:01
Test Legislation:	EPA1066		
Test Cycle:	HWFET+HWFET		
Test Purpose:	Certification		
Test Name:	HWFET_HWFET		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	ROADLOAD PREP		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001989*		
Test Name	*HWFET_HWFET*		
Test Cell	*iGEM-V-TC1*		
Test Type	*HWFET_HWFET*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/4/2021*	CH_4 Response Factor	
Test Start	*15:18:01*	Odometer Position [mi]	*12377*
Start Time Cycle	*2021-08-04 15|36-14-(000)*	Delay Time Method	
Test End	*15:49:38*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*ROADLOAD PREP*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021* ✓	License Plate	
Tire Manufacturer	X	Trim Level	
Tire Model	JH	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*18.896* ✓	*-0.04610* ✓	*0.022439* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	HWFET_HWFET	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001989	Driver	Victor Escudero		Shift Table Auto	Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		91_Pump_Gas	Start Time	*15:18:01*
		A [lbf]	*18.896*		Fuel type GASOLINE	End Time	*15:49:38*
Model	ACCENT	B [lbf/mph]	*-0.04610*		Density *0.7380*		
Year	*2021*	C [lbf/mph2]	*0.022439*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*12377*	Remark	ROADLOAD PREP				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	77.17	Volume [scf]	3867
Zero Read	*0.00*							Press. [inHg]	28.81	D.F.	
Span Read	*0.00*							RH [%]	*42.05*	Ph. Start [s]	779.3
Sample	*0.00*							AH [g/kg]	*8.658*	Ph. End [s]	1544.2
Mass.	*0.000*							Dist. [mi]	*10.27*	Ph. Length [s]	765.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9368*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *10.27*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*42.05*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*8.66*
CVS Volume[scf]	*3867.26*	Act. Dist.[mi]	*10.27*	Pressure[inHg]	*28.81*
CVS Flow[scfm]	*303.31*			Temp.[°F]	*77.17*
CVS Inlet Pressure	*28.74*			Temp. Min.[°F]	*75.38*
CVS Inlet Temp.[°F]	*107.59*			Temp. Max.[°F]	*78.44*
CVS Inlet Temp. Min.[°F]	*104.81*			NO_X Corr. F	*0.9368*
CVS Inlet Temp. Max.[°F]	*110.93*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy**[mile/gal]

Test Data: HWFET_HWFET Operator: Joseph Bishop Date: 8/4/2021
Test Number: ONT3_001989 Driver: Victor Escudero

Driver Violations

		P1	I1	Phase1
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Certification	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *ROADLOAD PREP*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*84.051*	*168.103*
B [N/km/h]	*-0.12742*	*-0.63707*
C [N/km2/h2]	*0.038538*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	16506.54				16506.54
Driven	16520.41				16520.41
Distance Rating (%)	0.0840				0.0840
Cycle Energy (MJ)					
Target	6.74				6.74
Driven	6.71				6.71
Distance per Energy Cycle (m/MJ)					
Target	6.74				2450.04
Driven	6.71				2463.28
Road Load Work Fraction					
Target	0.7624				0.7624
Driven	0.7622				0.7622
Inertial Work (MJ)					
Target	1.60				1.60
Driven	1.60				1.60
Inertial Work Fraction					
Target	0.2376				0.2376
Driven	0.2378				0.2378
Inertial Work Rating (%)	-0.3687				-0.3687
Absolute Speed Change (m/s)					
Target	130.69				130.69
Driven	130.45				130.45
Absolute Speed Change Rating (%)	-0.1842				-0.1842
Energy Rating (%)	-0.4538				-0.4538
Energy Economy Rating (%)	-0.5403				-0.5403

Operator Joseph Bishop | Driver Victor Escudero | Customer :

Test Purpose: Certification | Legislation *EPA1066* | Requirements (Bag)

Conditioning: | Emission Default

3081

SIMPLE

Overall Status Passed

Phase 1

Test Record #: ONT3_001989

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	25.10	24.10	25.80	20.00	30.00	Passed
Barometer	(mbar)	975.47	975.40	975.60	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.30	10.90	11.60	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	60.61	58.94	61.94	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.00	40.45	43.85	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.50	50.35	50.65	42.00	52.00	
Filter Face Velocity	(cm/s)	2.85			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	10.27			10.05	10.46	Passed
Duration Phase 1	(s)	764.90					NA
Crank Time Phase1	(s)	0.00			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		0			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

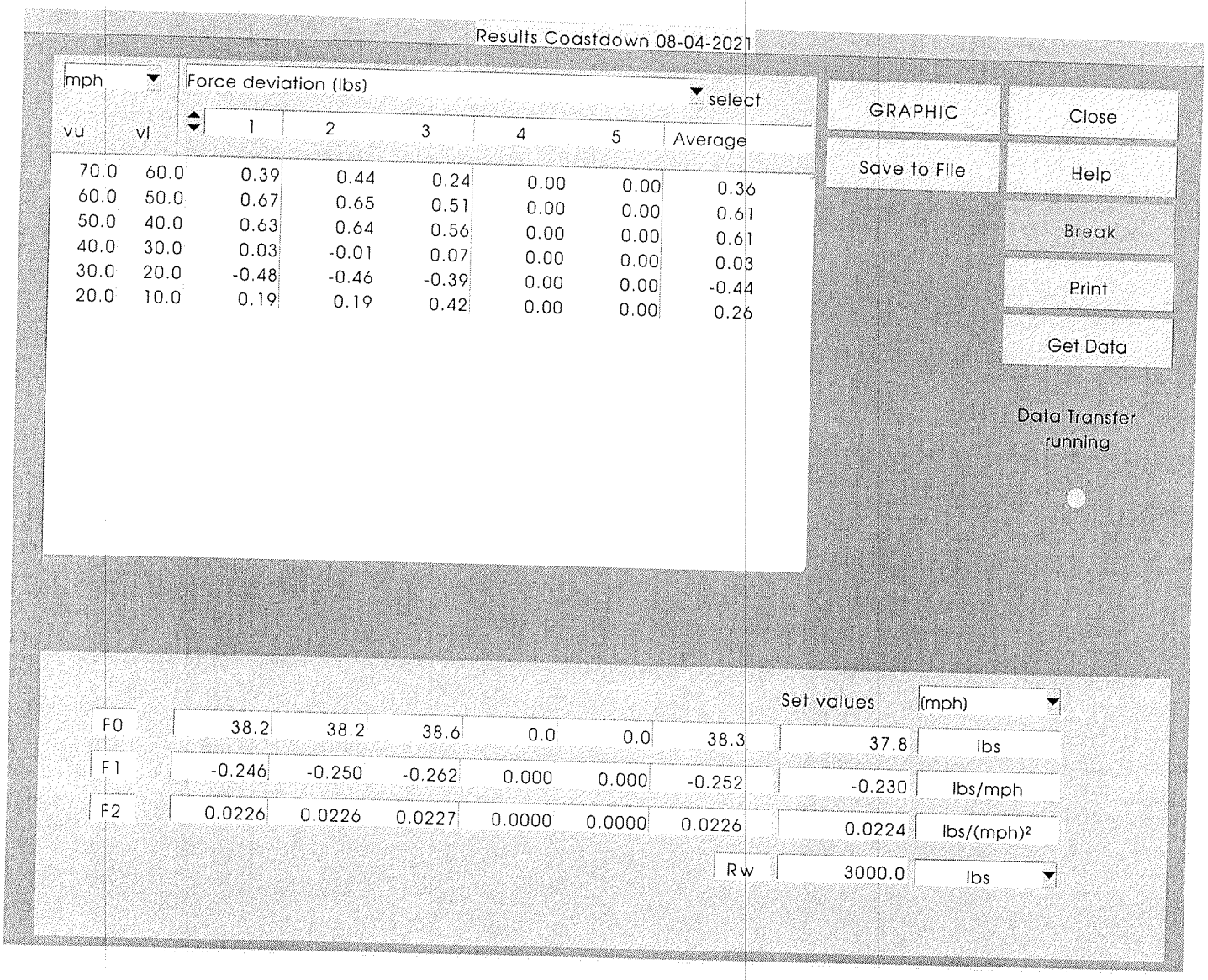
Data of automatic adaptation 08-04-2021

	Road	measured	act. set	
F0	37.8	38.6	13.3	lbs
F1	-0.230	-0.262	0.109	lbs/mph
F2	0.0224	0.0227	0.0185	lbs/(mph)²
Rw	3000.0			lbs

v max -	31.1	- 0.0	mph
Max. Devi.	0.56	0.42	lbs
Turn	3		

Close

Print


Results Coastdown 08-04-2021
mph
Force deviation (lbs)
select
GRAPHIC
Close
Save to File
Help
Break
Print
Get Data
Data Transfer running
vu vl 1 2 3 4 5 Average
70.0 60.0 0.39 0.44 0.24 0.00 0.00 0.36
60.0 50.0 0.67 0.65 0.51 0.00 0.00 0.61
50.0 40.0 0.63 0.64 0.56 0.00 0.00 0.61
40.0 30.0 0.03 -0.01 0.07 0.00 0.00 0.03
30.0 20.0 -0.48 -0.46 -0.39 0.00 0.00 -0.44
20.0 10.0 0.19 0.19 0.42 0.00 0.00 0.26
Set values
(mph)
F0 38.2 38.2 38.6 0.0 0.0 38.3 37.8 lbs
F1 -0.246 -0.250 -0.262 0.000 0.000 -0.252 -0.230 lbs/mph
F2 0.0226 0.0226 0.0227 0.0000 0.0000 0.0226 0.0224 lbs/(mph)²
Rw 3000.0 lbs

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/4/2021	**Time:**	16:05:07
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Certification		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001990*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/4/2021*	CH_4 Response Factor	
Test Start	*16:05:07*	Odometer Position [mi]	*12404*
Start Time Cycle	*2021-08-04 16|15-33-(000)*	Delay Time Method	
Test End	*16:37:08*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data — *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model	J.H.	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data — *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data — ~~*01_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data — *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001990	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		91_Pump_Gas	Start Time	*16:05:07*
		A [lbf]	*13.300*		Fuel type GASOLINE	End Time	*16:37:08*
Model	ACCENT	B [lbf/mph]	*0.10900*		Density *0.7380*		
Year	*2021*	C [lbf/mph2]	*0.018500*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12404*	Remark	PRECON				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.00	Volume[scf]	2571
Zero Read	*0.00*							Press.[inHg]	28.80	D.F.	
Span Read	*0.00*							RH[%]	*46.00*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.813*	Ph. End[s]	506.0
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	506.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9413*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.00*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.84	Volume[scf]	4415
Zero Value	*0.00*							Press.[inHg]	28.80	D.F.	
Span Value	*0.00*							RH[%]	*44.65*	Ph. Start[s]	506.1
Sample	*0.00*							AH[g/kg]	*8.223*	Ph. End[s]	1375.7
Mass.	*0.000*							Dist.[mi]	*3.86*	Ph. Length[s]	869.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9244*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]			
Range	*0*							Temp.[°F]	Volume[scf]	
Zero Value	*0*							Press.[inHg]	D.F.	
Span Value	*0.00*							RH[%]	Ph. Start[s]	
Sample	*0*							AH[g/kg]	Ph. End[s]	
Mass.	*0.000*							Dist.[mi]	Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_x Corr. F	Bag An. Delay[s]	
								Dr. Viola.	Vio. Durat.[s]	
								Crank [s]	FE [mile/gal]	

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]		
Range	*0*							Temp.[°F]	Volume[scf]
Zero Value	*0*							Press.[inHg]	D.F.
Span Value	*0.00*							RH[%]	Ph. Start
Sample	*0*							AH[g/kg]	Ph. End
Mass.	*0.000*							Dist.[mi]	Ph. Length[s]
Mass per Dist.	*0.0000*							NO_x Corr. F	Bag An. Delay[s]
								Dr. Viola.	Vio. Durat.[s]
									FE [mile/gal]

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.46*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*46.00*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*8.81*
CVS Volume[scf]	*2570.80*	Act. Dist.[mi]	*3.60*	Pressure[inHg]	*28.80*
CVS Flow[scfm]	*304.84*			Temp.[°F]	*75.00*
CVS Inlet Pressure	*28.73*			Temp. Min.[°F]	*71.96*
CVS Inlet Temp.[°F]	*101.43*			Temp. Max.[°F]	*77.54*
CVS Inlet Temp. Min.[°F]	*99.23*			NO_X Corr. F	*0.9413*
CVS Inlet Temp. Max.[°F]	*104.09*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*44.65*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*8.22*
CVS Volume[scf]	*4415.00*	Act. Dist.[mi]	*3.86*	Pressure[inHg]	*28.80*
CVS Flow[scfm]	*304.59*			Temp.[°F]	*73.84*
CVS Inlet Pressure	*28.73*			Temp. Min.[°F]	*73.04*
CVS Inlet Temp.[°F]	*102.37*			Temp. Max.[°F]	*75.20*
CVS Inlet Temp. Min.[°F]	*101.75*			NO_X Corr. F	*0.9244*
CVS Inlet Temp. Max.[°F]	*103.19*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

Test Data: FTP72
Test Number: ONT3_001990

Operator: Joseph Bishop
Driver: Joseph Bishop

Date: 8/4/2021

Driver Violations

	-	Phase1	Phase2
Number of Violations		0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Certification	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		
Test Intent:		*PRECON*			
VIN	3KPC24A66ME139404				

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.20
Driven	5788.89	6218.35			12007.24
Distance Rating (%)	0.1685	0.1175			0.1421
Cycle Energy (MJ)					
Target	2.57	2.34			
Driven	2.57	2.35			
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34			
Driven	2.57	2.35			
Road Load Work Fraction					
Target	0.4716	0.3520			
Driven	0.4584	0.3559			
Inertial Work (MJ)					
Target	1.36	1.52			
Driven	1.39	1.52			
Inertial Work Fraction					
Target	0.5284	0.6480			
Driven	0.5416	0.6441			
Inertial Work Rating (%)	2.6068	-0.0438			
Absolute Speed Change (m/s)					
Target	204.88	340.91			
Driven	207.96	340.76			
Absolute Speed Change Rating (%)	1.5047	-0.0443			
Energy Rating (%)	0.1102	0.5495			0.3196
Energy Economy Rating (%)	-0.0582	0.4296			0.1769

Operator Joseph Bishop | Driver Joseph Bishop | Customer : | 3081

Test Purpose: Certification | Legislation *EPA1066* | Requirements (Bag) | *SIMPLE*

Conditioning: | Emission Default

Overall Status: Passed

Phase 1

Test Record #: ONT3_001990

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.89	22.20	25.30	20.00	30.00	Passed
Barometer	(mbar)	975.38	975.20	975.50	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.54	9.50	13.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	61.69	53.46	69.79	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	38.57	37.35	40.05	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.73	50.65	50.85	42.00	52.00	
Filter Face Velocity	(cm/s)	3.05			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 1	(s)	505.90					NA
Crank Time Phase1	(s)	1.00			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	
Test Purpose:	Certification	Legislation	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.25	22.80	24.00	20.00	30.00	Passed
Barometer	(mbar)	975.44	975.30	975.60	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.54	10.10	11.20	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	57.56	55.81	60.20	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	39.09	38.75	39.55	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.65	50.65	50.85	42.00	52.00	
Filter Face Velocity	(cm/s)	3.06			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86			3.78	3.94	Passed
Duration Phase 2	(s)	869.60					NA
Crank Time Phase1	(s)	1.0000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-139404 ✓
Project	3081
Evap Family	MHYZR0120ABG ✓ J.H.
Ambient Temperature-Deg F	73
Barometric Pressure-In/Hg	28.80
Humidity-Grains/Lb	44.6 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.1
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	16:43:58
Start date	08-04-2021
Bed Purges/Cycle	300
Purge End/Load Start	17:11:48
Test Time Minutes	749
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	-2.19
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	05:12:33
Finish date	08-05-2021
Disk File Name	21080501.ST3

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/5/2021	**Time:**	13:19:58
Test Legislation:	EPA1066		
Test Cycle:	FTP75		
Test Purpose:	Certification		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST 1		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001996*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/5/2021*	CH_4 Response Factor	
Test Start	*13:19:58*	Odometer Position [mi]	*12412*
Start Time Cycle	*2021-08-05 13|28-35-(000)*	Delay Time Method	
Test End	*14:09:01*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST 1*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021* ✓	License Plate	
Tire Manufacturer	J.H.	Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001996	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*	91_Pump_Gas		Start Time	*13:19:58*
		A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*14:09:01*
Model	ACCENT	B [lbf/mph]	*0.10900*	Density	*0.7380*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	18085	Soak Time	547.3
Displacement:				CWF	*0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*12412*	Remark	E15 TEST 1				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	73.09	Volume [scf]	2581
Zero Read	*0.00*							Press. [inHg]	28.87	D.F.	
Span Read	*0.00*							RH [%]	*50.26*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.014*	Ph. End [s]	505.9
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9472*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	71.40	Volume [scf]	4439
Zero Value	*0.00*							Press. [inHg]	28.87	D.F.	
Span Value	*0.00*							RH [%]	*48.27*	Ph. Start [s]	506.0
Sample	*0.00*							AH [g/kg]	*8.167*	Ph. End [s]	1376.5
Mass.	*0.000*							Dist. [mi]	*3.88*	Ph. Length [s]	870.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9228*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	71.84	Volume [scf]	2581
Zero Value	*0*							Press. [inHg]	28.87	D.F.	
Span Value	*0.00*							RH [%]	*46.61*	Ph. Start [s]	1921.7
Sample	*0*							AH [g/kg]	*8.001*	Ph. End [s]	2427.5
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9182*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_x [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.07*

Test Data: FTP75
Test Number: ONT3_001996

Operator: Joseph Bishop
Driver: Joseph Bishop

Date: 8/5/2021

Driver Violations

	-	Phase1	Phase2	Phase3
Number of Violations		0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Certification	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		
Test Intent:		*E15 TEST 1*			
VIN	3KPC24A66ME139404				

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6210.95	5779.15		17769.25
Driven	5799.33	6241.48	5780.60		17821.41
Distance Rating (%)	0.3493	0.4915	0.0251		0.2935
Cycle Energy (MJ)					
Target	2.57	2.34	2.57		4.91
Driven	2.59	2.39	2.57		4.97
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34	2.57		2441.91
Driven	2.59	2.39	2.57		2421.69
Road Load Work Fraction					
Target	0.4716	0.3520	0.4716		0.4146
Driven	0.4671	0.3575	0.4678		0.4147
Inertial Work (MJ)					
Target	1.36	1.52	1.36		2.87
Driven	1.38	1.53	1.37		2.91
Inertial Work Fraction					
Target	0.5284	0.6480	0.5284		0.5854
Driven	0.5329	0.6425	0.5322		0.5853
Inertial Work Rating (%)	1.4998	1.1922	0.8507		1.1627
Absolute Speed Change (m/s)					
Target	204.87	340.91	204.88		545.79
Driven	205.92	342.08	205.26		547.63
Absolute Speed Change Rating (%)	0.5128	0.3443	0.1893		0.3383
Energy Rating (%)	0.6527	2.0599	0.1432		0.9180
Energy Economy Rating (%)	0.3014	1.5368	0.1179		0.8279

Operator Joseph Bishop | Driver Joseph Bishop | Customer : | 3081
Test Purpose: Certification | Legislatio *EPA1066* | Requirements (Bag) | *SIMPLE*
Conditioning: | Emission Default

Overall Status Passed

Phase 1

Test Record #: ONT3_001996

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.83	22.20	23.70	20.00	30.00	Passed
Barometer	(mbar)	977.67	977.60	977.80	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.93	11.00	14.10	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	63.10	58.92	73.09	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	37.40	36.45	38.65	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	51.12	51.05	51.15	42.00	52.00	
Filter Face Velocity	(cm/s)	3.25			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 1	(s)	505.80					NA
Crank Time Phase1	(s)	0.90			0	5	Passed
Crank Time Phase3	(s)	0.90			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	547.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	
Test Purpose:	Certification	Legislatio	*EPA 1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Overall Status: Passed

Phase 2

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	21.89	21.50	22.40	20.00	30.00	Passed
Barometer	(mbar)	977.63	977.60	977.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.47	10.10	11.10	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	57.17	55.49	59.66	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	37.83	37.55	38.25	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	51.01	51.05	51.15	42.00	52.00	
Filter Face Velocity	(cm/s)	3.15			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.88			3.78	3.94	Passed
Duration Phase 2	(s)	870.50					NA
Crank Time Phase1	(s)	0.9000			0	5	Passed
Crank Time Phase3	(s)	0.90			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)	547.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	
Test Purpose:	Certification	Legislation	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 3

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.13	21.30	23.30	20.00	30.00	Passed
Barometer	(mbar)	977.58	977.50	977.60	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.16	9.80	10.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	56.01	54.46	58.08	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	37.53	36.75	38.65	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.90	51.05	51.15	42.00	52.00	
Filter Face Velocity	(cm/s)	3.09			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59			3.52	3.66	Passed
Duration Phase 3	(s)	505.80					NA
Crank Time Phase1	(s)	0.9000			0	5	Passed
Crank Time Phase3	(s)	0.90			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	547.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/5/2021	**Time:**	14:55:13
Test Legislation:	EPA1066		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST 1		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001997*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/5/2021*	CH_4 Response Factor	
Test Start	*14:55:13*	Odometer Position [mi]	*12423*
Start Time Cycle	*2021-08-05 15|00-43-(000)*	Delay Time Method	
Test End	*16:12:45*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST 1*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYZR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_001997	Driver	Victor Escudero		Shift Table Auto	Cold Start	

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		91_Pump_Gas	Start Time	*14:55:13*
		A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*16:12:45*
Model	ACCENT	B [lbf/mph]	*0.10900*	Density	*0.7380*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*12423*	Remark	E15 TEST 1				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	105.00	Volume [scf]	7535
Zero Read	*0.00*							Press. [inHg]	28.86	D.F.	
Span Read	*0.00*							RH [%]	*22.66*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*11.152*	Ph. End [s]	1489.4
Mass.	*0.000*							Dist. [mi]	*7.49*	Ph. Length [s]	1489.4
Mass per Dist.	*0.0000*							NO_X Corr.	*1.0147*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.40*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	103.44	Volume [scf]	6671
Zero Value	*0.00*							Press. [inHg]	28.86	D.F.	
Span Value	*0.00*							RH [%]	*22.73*	Ph. Start [s]	1489.5
Sample	*0.00*							AH [g/kg]	*10.676*	Ph. End [s]	2811.4
Mass.	*0.000*							Dist. [mi]	*2.39*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9989*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	102.87	Volume [scf]	7497
Zero Value	*0*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*22.78*	Ph. Start [s]	2811.5
Sample	*0*							AH [g/kg]	*10.518*	Ph. End [s]	4300.4
Mass.	*0.000*							Dist. [mi]	*7.48*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9937*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.36*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*22.66*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*11.15*
CVS Volume[scf]	*7535.43*	Act. Dist.[mi]	*7.49*	Pressure[inHg]	*28.86*
CVS Flow[scfm]	*303.56*			Temp.[°F]	*105.00*
CVS Inlet Pressure	*28.79*			Temp. Min.[°F]	*101.84*
CVS Inlet Temp.[°F]	*108.38*			Temp. Max.[°F]	*107.78*
CVS Inlet Temp. Min.[°F]	*103.01*			NO_X Corr. F	*1.0147*
CVS Inlet Temp. Max.[°F]	*111.29*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*22.73*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*10.68*
CVS Volume[scf]	*6670.99*	Act. Dist.[mi]	*2.39*	Pressure[inHg]	*28.86*
CVS Flow[scfm]	*302.77*			Temp.[°F]	*103.44*
CVS Inlet Pressure	*28.78*			Temp. Min.[°F]	*102.20*
CVS Inlet Temp.[°F]	*111.13*			Temp. Max.[°F]	*105.08*
CVS Inlet Temp. Min.[°F]	*109.85*			NO_X Corr. F	*0.9989*
CVS Inlet Temp. Max.[°F]	*113.63*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*22.78*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*10.52*
CVS Volume[scf]	*7496.69*	Act. Dist.[mi]	*7.48*	Pressure[inHg]	*28.85*
CVS Flow[scfm]	*302.08*			Temp.[°F]	*102.87*
CVS Inlet Pressure	*28.78*			Temp. Min.[°F]	*96.62*
CVS Inlet Temp.[°F]	*113.56*			Temp. Max.[°F]	*104.36*
CVS Inlet Temp. Min.[°F]	*111.47*			NO_X Corr. F	*0.9937*
CVS Inlet Temp. Max.[°F]	*117.41*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

Test Data: ORVR_Prep
Test Number: ONT3_001997

Operator: Joseph Bishop
Driver: Victor Escudero

Date: 8/5/2021

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Certification	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		
Test Intent:		*E15 TEST 1*			
VIN	3KPC24A66ME139404				

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	11990.14	3792.75	11990.14		27773.02
Driven	12048.18	3851.80	12037.19		27937.17
Distance Rating (%)	0.4841	1.5568	0.3924		0.5910
Cycle Energy (MJ)					
Target	4.91	1.97	4.91		6.88
Driven	4.97	2.00	4.94		6.95
Distance per Energy Cycle (m/MJ)					
Target	4.91	1.97	4.91		2295.48
Driven	4.97	2.00	4.94		2286.20
Road Load Work Fraction					
Target	0.4146	0.1955	0.4146		0.3520
Driven	0.4176	0.1926	0.4163		0.3525
Inertial Work (MJ)					
Target	2.87	1.58	2.87		4.46
Driven	2.90	1.61	2.88		4.50
Inertial Work Fraction					
Target	0.5854	0.8045	0.5854		0.6480
Driven	0.5824	0.8074	0.5837		0.6475
Inertial Work Rating (%)	0.7892	1.9152	0.3633		1.0322
Absolute Speed Change (m/s)					
Target	545.78	469.45	545.78		1015.24
Driven	547.69	475.35	545.91		1022.03
Absolute Speed Change Rating (%)	0.3501	1.2557	0.0241		0.6689
Energy Rating (%)	1.3063	1.5515	0.6541		1.0755
Energy Economy Rating (%)	0.8116	-0.0053	0.2600		0.4042

Operator Joseph Bishop | Driver Victor Escudero | Customer : | 3081

Test Purpose: Certification | Legislatio *EPA1066* | Requirements (Bag) | *SIMPLE*

Conditioning: | Emission Default

Overall Status Passed

Phase 1

Test Record #: ONT3_001997

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	40.56	38.80	42.10	37.78	43.33	Passed
Barometer	(mbar)	977.41	977.30	977.50	800.00	1100.00	Passed
Dew Point Temperature	(°C)	15.13	14.60	15.60	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	78.06	75.22	80.50	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.43	39.45	44.05	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.11	49.85	50.75	42.00	52.00	
Filter Face Velocity	(cm/s)	2.84			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.49			7.30	7.60	Passed
Duration Phase 1	(s)	1489.30					NA
Crank Time Phase1	(s)	0.40			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	
Test Purpose:	Certification	Legislation	*EPA1066*	Requirements (Bag)	3081
Conditioning:		Emission	Default		*SIMPLE*

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.69	39.00	40.60	37.78	43.33	Passed
Barometer	(mbar)	977.22	977.10	977.40	800.00	1100.00	Passed
Dew Point Temperature	(°C)	14.47	14.20	14.60	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	74.73	73.42	75.60	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	43.96	43.25	45.35	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.66	49.85	50.75	42.00	52.00	
Filter Face Velocity	(cm/s)	2.48			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.39			2.31	2.40	Passed
Duration Phase 2	(s)	1321.90					NA
Crank Time Phase1	(s)	0.4000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	
Test Purpose:	Certification	Legislation	*EPA1066*	Requirements (Bag)	3081
Conditioning:		Emission	Default		*SIMPLE*

Phase 3

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.37	37.90	40.20	37.78	43.33	Passed
Barometer	(mbar)	977.01	976.90	977.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	14.23	13.60	14.60	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	73.62	70.46	75.25	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	45.31	44.15	47.45	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.51	49.85	50.75	42.00	52.00	
Filter Face Velocity	(cm/s)	2.52			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48			7.30	7.60	Passed
Duration Phase 3	(s)	1488.90					NA
Crank Time Phase1	(s)	0.4000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001997

ATDS Vehicle ID	3081-139404	*VIN*	3KPC24A66ME139404
Model Year	2021	*Make/Model*	Hyundai Accent
Test Group	MHYXV01.6AB6	*Engine Size*	1.6L
Evaporative Family	MHYZR0120ABG	*Canister Capacity*	120 g
Odometer	12441	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, August 5, 2021	*Profile*	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **8/5/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	16:12:45	0:00:00	0:00:00	
Engine Key-off	16:17:00	0:04:15	0:04:15	
SHED Door Sealed	16:19:00	0:02:00	0:06:15	
Final Sample	17:19:00	1:00:00	1:06:15	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 3.273 ppm	Volume = 1799.9 ft3	Temp. = 103.8 °F	Baro. = 28.86 in/Hg	Mass HC=0.087 grams
Post Read Zero = 0 ppm	Post Read Span = 9.531 ppm			Mass EtOH= -0.002 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.747 ppm	Volume = 1797.7 ft3	Temp. = 105.2 °F	Baro. = 28.86 in/Hg	Mass HC =0.154 grams
Post Read Zero = -0.023 ppm	Post Read Span = 9.544 ppm			Mass EtOH = 0.014 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 103.8 °F	Minimum = 102 °F			
Max Ambient Temp = 107 °F	Maximum = 108 °F			
Min Interior Temp = 103.8 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.067±0.01 grams**
				Diurnal Mass EtOH = 0.016 grams
				Diurnal Total Mass HC plus EtOH = 0.071 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, August 5, 2021	18:19:00	0:00:00	
End Cold Soak	Friday, August 6, 2021	0:19:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 62.7 °F	Minimum = 62 °F			
Max. Ambient Temp = 67.9 °F	Maximum = 68 °F			
Min. Internal Temp = 62.7 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	*VIN*	3KPC24A66ME139404
Model Year	2021	*Make/Model*	Hyundai Accent
Test Group	MHYXV01.6AB6	*Engine Size*	1.6L
Evaporative Family	MHYZR0120ABG	*Capacity*	120 g
Odometer	12441	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, August 5, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Friday, August 6, 2021	0:19:00	0:00:00	
Start Time Diurnal	Friday, August 6, 2021	0:19:00	0:00:00	
End Time Diurnal	Saturday, August 7, 2021	0:19:00	24:00:00	
24 Hour Sample	Saturday, August 7, 2021	0:19:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 6.003 ppm	Volume = 1676.3 ft3	Temp. = 65.2 °F	Baro. = 28.92 in/Hg	Mass HC =0.166 grams
Post Read Zero = 0 ppm	Post Read Span = 9.549 ppm			Mass EtOH= 0.042 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 13.323 ppm	Volume = 1670.4 ft3	Temp. = 64.9 °F	Baro. = 28.93 in/Hg	Mass HC=0.426 grams
Post Read Zero = -0.013 ppm	Post Read Span = 93.315 ppm			Mass EtOH= 0.22 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.38 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.26±0.01 grams**
				Diurnal Mass EtOH = 0.178 grams
				Diurnal Total Mass HC plus EtOH = 0.305 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12441	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, August 5, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Saturday, August 7, 2021	0:19:00	24:00:00	
Start Time Diurnal	Saturday, August 7, 2021	0:19:00	24:00:00	
End Time Diurnal	Sunday, August 8, 2021	0:19:00	48:00:00	
48 Hour Sample	Sunday, August 8, 2021	0:19:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 13.323 ppm	Volume = 1670.4 ft3	Temp. = 64.9 °F	Baro. = 28.93 in/Hg	Mass HC=0.426 grams
Post Read Zero = 0 ppm	Post Read Span = 93.315 ppm			Mass EtOH= 0.22 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 19.795 ppm	Volume = 1671.1 ft3	Temp. = 65 °F	Baro. = 28.92 in/Hg	Mass HC=0.542 grams
Post Read Zero = -0.014 ppm	Post Read Span = 93.313 ppm			Mass EtOH= 0.385 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.116±0.01 grams**
				Diurnal Mass EtOH = 0.165 grams
				Diurnal Total Mass HC plus EtOH = 0.157 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12441	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, August 5, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Sunday, August 8, 2021	0:19:00	48:00:00	
Start Time Diurnal	Sunday, August 8, 2021	0:19:00	48:00:00	
End Time Diurnal	Monday, August 9, 2021	0:19:00	72:00:00	
72 Hour Sample	Monday, August 9, 2021	0:19:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 19.795 ppm	Volume = 1671.1 ft3	Temp. = 65.03 °F	Baro. = 28.92 in/Hg	Mass HC=0.542 grams
Post Read Zero = -0.014 ppm	Post Read Span = 93.313 ppm			Mass EtOH= 0.385 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 26.073 ppm	Volume = 1665.6 ft3	Temp. = 64.8 °F	Baro. = 28.95 in/Hg	Mass HC=0.713 grams
Post Read Zero = -0.023 ppm	Post Read Span = 93.292 ppm			Mass EtOH= 0.536 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.3 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

Diurnal Mass HC= 0.171±0.01 grams

Diurnal Mass EtOH = 0.151 grams

Diurnal Total Mass HC plus EtOH = 0.209 grams

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: 0.376 grams {hot soak + highest 24 hour mass}

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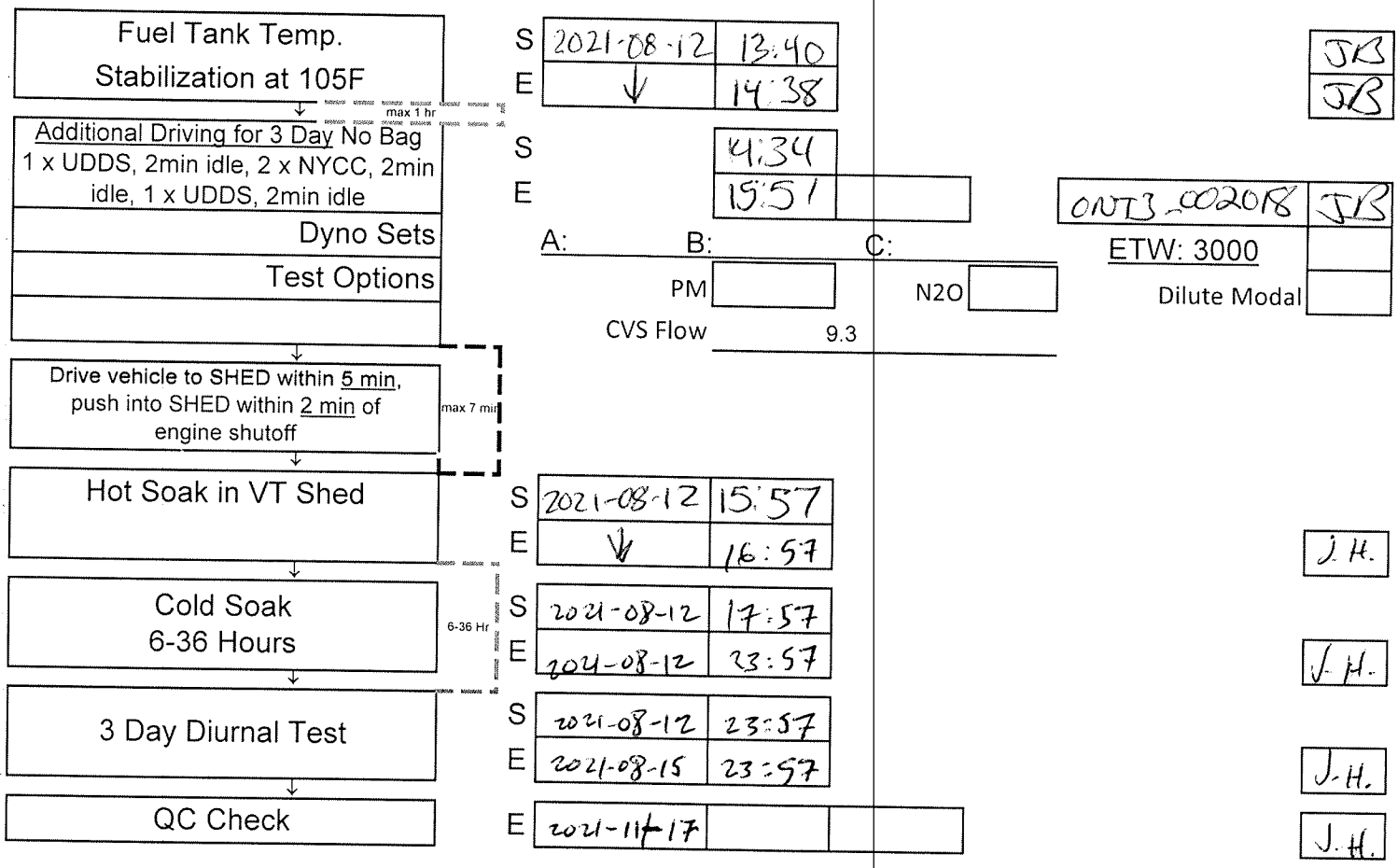
Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Hyundai Accent
Vehicle #:	3081-139404	**Engine Size**	1.6L
VIN:	3KPC24A66ME139404	**Model Year**	2021
Engine Family:	MHYXV01.6AB6	**Requested By:**	J. Link

Documentation

	Duration		Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Precon FTP 72 (UDDS)		S	8/11/2021	12:09	12441			
		E	↓	12:37	12448		DNT3 002007	JC
Dyno Sets		A: 13.3	B: 0.109	C: 0.0185			ETW: 3000	JC
Vehicle Soak 68-86°F		S	8/11/2021	12:45	T 75.2			JC
		E	8/12/2021	12:37	B 28.9			
Canister Loading with Butane Type: 1.5x Load	12-36 hr	S	8/11/2021	13:51	H 78.4			
		E	8/12/2021	02:06			ST2	JC
Canister Loading Specs		Cap		120	Vol	2.1		
		Purge		300	Flow Rate	15	MHYZR0120ABG	
Set tire pressure to sticker		Front		33	Back	33		JC
No Bag Cold Start FTP 75		S	8/12/2021	12:35	12448			
		E	↓	13:31	12459		DNT3 - 002017	JC
Dyno Sets		A: 13.3	B: 0.109	C: 0.0185			ETW: 3000	
Test Options		PM			N2O		Dilute Modal	
		CVS Flow	P1:9.3 P2:9.3 P3:9.3					
Pre Test Comments		E15 Test 2						


Fuel Tank Temp. Stabilization at 105F
max 1 hr
Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
Cold Soak 6-36 Hours
6-36 Hr
3 Day Diurnal Test
QC Check
S 2021-08-12 13:40
E ↓ 14:38
JB
JB
S 4:34
E 15:51
A: B: C:
PM
N2O
CVS Flow 9.3
ONT3_002018 JB
ETW: 3000
Dilute Modal
S 2021-08-12 15:57
E ↓ 16:57
J.H.
S 2021-08-12 17:57
E 2021-08-12 23:57
J.H.
S 2021-08-12 23:57
E 2021-08-15 23:57
J.H.
E 2021-11-17
J.H.

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/11/2021	**Time:**	12:09:07
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	precon e15		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002007*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/11/2021*	CH_4 Response Factor	
Test Start	*12:09:07*	Odometer Position [mi]	*12441*
Start Time Cycle	*2021-08-11 12|14-25-(000)*	Delay Time Method	
Test End	*12:37:25*		
Operator	*Jennifer Chappell*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*precon e15*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021* ✓	License Plate	
Tire Manufacturer		Trim Level	
Tire Model	J.H.	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Jennifer Chappell	Speed Table	Date:		
Test Number	ONT3_002007	Driver	Victor Escudero	Shift Table Auto	Cold Start		

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*	91_Pump_Gas		Start Time	*12:09:07*
		A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*12:37:25*
Model	ACCENT	B [lbf/mph]	*0.10900*	Density	*0.7380*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12441*	Remark	precon e15				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.02	Volume[scf]	2555
Zero Read	*0.00*							Press.[inHg]	28.93	D.F.	
Span Read	*0.00*							RH[%]	*55.77*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*9.975*	Ph. End[s]	505.5
Mass.	*0.000*							Dist.[mi]	*3.59*	Ph. Length[s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9764*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	72.20	Volume[scf]	4373
Zero Value	*0.00*							Press.[inHg]	28.93	D.F.	
Span Value	*0.00*							RH[%]	*56.21*	Ph. Start[s]	505.6
Sample	*0.00*							AH[g/kg]	*9.775*	Ph. End[s]	1375.0
Mass.	*0.000*							Dist.[mi]	*3.85*	Ph. Length[s]	869.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9702*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start[s]	
Sample	*0*							AH[g/kg]		Ph. End[s]	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start	
Sample	*0*							AH[g/kg]		Ph. End	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.44*

Test Data: FTP72 Operator: Jennifer Chappell Date: 8/11/2021
Test Number: ONT3_002007 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Jennifer Chappell	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		
Test Intent:		*precon e15*			

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.20
Driven	5772.57	6203.61			11976.19
Distance Rating (%)	-0.1139	-0.1197			-0.1169
Cycle Energy (MJ)					
Target	2.57	2.34			
Driven	2.55	2.35			
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34			
Driven	2.55	2.35			
Road Load Work Fraction					
Target	0.4716	0.3521			
Driven	0.4766	0.3630			
Inertial Work (MJ)					
Target	1.36	1.52			
Driven	1.33	1.50			
Inertial Work Fraction					
Target	0.5284	0.6479			
Driven	0.5234	0.6370			
Inertial Work Rating (%)	-1.8615	-1.2836			
Absolute Speed Change (m/s)					
Target	204.88	340.91			
Driven	203.25	338.75			
Absolute Speed Change Rating (%)	-0.7950	-0.6313			
Energy Rating (%)	-0.9287	0.4153			-0.2880
Energy Economy Rating (%)	-0.8225	0.5328			-0.1717

Operator	Jennifer Chappell	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002007

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.79	21.80	24.00	20.00	30.00	Passed
Barometer	(mbar)	979.69	979.60	979.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.48	11.80	15.50	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	69.82	62.14	79.98	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	47.13	45.35	50.15	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.81	50.15	50.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59			3.52	3.66	Passed
Duration Phase 1	(s)	505.40					NA
Crank Time Phase1	(s)	0.50			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jennifer Chappell	Driver	Victor Escudero	Customer :	
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.33	21.10	23.40	20.00	30.00	Passed
Barometer	(mbar)	979.63	979.50	979.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.17	11.10	15.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	68.42	59.15	81.70	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	47.72	47.05	48.35	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.81	50.15	50.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.85			3.78	3.94	Passed
Duration Phase 2	(s)	869.40					NA
Crank Time Phase1	(s)	0.5000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS CANISTER WORKSHEET

Station number 1

--PURGE AND FILL--

VT#	3081-139404 ✓
Project	3081
Evap Family	MHYXR0120ABG ✓ J.H.
Ambient Temperature-Deg F	75
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	68.0 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.1
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	13:51:25
Start date	08-11-2021
Bed Purges/Cycle	300
Purge End/Load Start	14:19:15
Test Time Minutes	733
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	0.48
Butane Flow Actual-Gm/Hr	15.3
Cycles Completed	1
Finish time	02:06:33
Finish date	08-12-2021
Disk File Name	21081201.ST1

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/12/2021	**Time:**	12:35:21
Test Legislation:	EPA1066		
Test Cycle:	FTP75		
Test Purpose:	Certification		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002017*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/12/2021*	CH_4 Response Factor	
Test Start	*12:35:21*	Odometer Position [mi]	*12448*
Start Time Cycle	*2021-08-12 12|40-18-(000)*	Delay Time Method	
Test End	*13:21:58*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Domenic Coppola*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model	J.A.	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *FTP75*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
35	0	0

Test Data	FTP75	Operator	Domenic Coppola		Speed Table	Date:	
Test Number	ONT3_002017	Driver	Domenic Coppola		Shift Table Auto	Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**			**Fuel**	**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		91_Pump_Gas	Start Time	*12:35:21*
		A [lbf]	*13.300*		Fuel type GASOLINE	End Time	*13:21:58*
Model	ACCENT	B [lbf/mph]	*0.10900*		Density *0.7380*		
Year	*2021*	C [lbf/mph2]	*0.018500*		NHV 18085	Soak Time	584.8
Displacement:					CWF *0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*12448*	Remark	E15 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	73.81	Volume [scf]	2552
Zero Read	*0.00*							Press. [inHg]	28.96	D.F.	
Span Read	*0.00*							RH [%]	*40.32*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*7.365*	Ph. End [s]	506.2
Mass.	*0.000*							Dist. [mi]	*3.59*	Ph. Length [s]	506.2
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9009*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.20*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	73.25	Volume [scf]	4381
Zero Value	*0.00*							Press. [inHg]	28.96	D.F.	
Span Value	*0.00*							RH [%]	*41.89*	Ph. Start [s]	506.3
Sample	*0.00*							AH [g/kg]	*7.512*	Ph. End [s]	1376.6
Mass.	*0.000*							Dist. [mi]	*3.88*	Ph. Length [s]	870.4
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9048*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	72.59	Volume [scf]	2553
Zero Value	*0*							Press. [inHg]	28.96	D.F.	
Span Value	*0.00*							RH [%]	*43.94*	Ph. Start [s]	1958.6
Sample	*0*							AH [g/kg]	*7.710*	Ph. End [s]	2465.1
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	506.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9102*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.60*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_X [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.08*

Test Data: FTP75 Operator: Domenic Coppola Date: 8/12/2021
Test Number: ONT3_002017 Driver: Domenic Coppola

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Domenic Coppola	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Certification	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E15 TEST*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6210.96	5779.14		17769.24
Driven	5778.11	6250.75	5800.15		17829.01
Distance Rating (%)	-0.0179	0.6407	0.3635		0.3363
Cycle Energy (MJ)					
Target	2.57	2.34	2.57		4.91
Driven	2.57	2.39	2.58		4.97
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34	2.57		2441.88
Driven	2.57	2.39	2.58		2423.04
Road Load Work Fraction					
Target	0.4716	0.3520	0.4716		0.4146
Driven	0.4594	0.3438	0.4514		0.4014
Inertial Work (MJ)					
Target	1.36	1.52	1.36		2.87
Driven	1.39	1.57	1.42		2.97
Inertial Work Fraction					
Target	0.5284	0.6480	0.5284		0.5854
Driven	0.5406	0.6562	0.5486		0.5986
Inertial Work Rating (%)	2.2805	3.5091	4.3841		3.4951
Absolute Speed Change (m/s)					
Target	204.88	340.92	204.88		545.79
Driven	207.80	347.84	210.10		556.95
Absolute Speed Change Rating (%)	1.4244	2.0319	2.5499		2.0447
Energy Rating (%)	-0.0302	2.2147	0.5355		0.8666
Energy Economy Rating (%)	-0.0122	1.5399	0.1710		0.7712

Operator	Domenic Coppola	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Certification	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status Passed

Phase 1

Test Record #: ONT3_002017

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.23	21.30	23.90	20.00	30.00	Passed
Barometer	(mbar)	980.78	980.70	980.80	800.00	1100.00	Passed
Dew Point Temperature	(°C)	8.98	8.60	9.20	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	51.55	50.19	52.35	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	46.96	44.75	48.15	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.81	49.65	49.95	42.00	52.00	
Filter Face Velocity	(cm/s)	3.44			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.59			3.52	3.66	Passed
Duration Phase 1	(s)	506.10					NA
Crank Time Phase1	(s)	1.20			0	5	Passed
Crank Time Phase3	(s)	1.60			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	584.80			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Certification	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.91	21.40	24.00	20.00	30.00	Passed
Barometer	(mbar)	980.66	980.60	980.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.28	8.90	9.50	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	52.59	51.21	53.45	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	47.84	47.55	48.25	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.84	49.65	49.95	42.00	52.00	
Filter Face Velocity	(cm/s)	4.39			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.88			3.78	3.94	Passed
Duration Phase 2	(s)	870.30					NA
Crank Time Phase1	(s)	1.2000			0	5	Passed
Crank Time Phase3	(s)	1.60			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)	584.80			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Certification	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.55	21.30	23.80	20.00	30.00	Passed
Barometer	(mbar)	980.56	980.50	980.60	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.66	9.20	10.00	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	53.97	52.00	55.26	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	46.92	45.85	47.45	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.06	49.65	49.95	42.00	52.00	
Filter Face Velocity	(cm/s)	5.22			0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 3	(s)	506.50					NA
Crank Time Phase1	(s)	1.2000			0	5	Passed
Crank Time Phase3	(s)	1.60			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	584.80			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/12/2021	**Time:**	14:34:52
Test Legislation:	EPA1066		
Test Cycle:	RL		
Test Purpose:	Certification		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST 2		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002018*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/12/2021*	CH_4 Response Factor	
Test Start	*14:34:52*	Odometer Position [mi]	*12459*
Start Time Cycle	*2021-08-12 14|38-36-(000)*	Delay Time Method	
Test End	*15:51:50*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST 2*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021* ✓	License Plate	
Tire Manufacturer	J.H.	Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_002018	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		91_Pump_Gas	Start Time	*14:34:52*
		A [lbf]	*13.300*		Fuel type GASOLINE	End Time	*15:51:50*
Model	ACCENT	B [lbf/mph]	*0.10900*		Density *0.7380*		
Year	*2021*	C [lbf/mph2]	*0.018500*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12459*	Remark	E15 TEST 2				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	103.84	Volume[scf]	7448
Zero Read	*0.00*							Press.[inHg]	28.93	D.F.	
Span Read	*0.00*							RH[%]	*20.73*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*9.814*	Ph. End[s]	1494.1
Mass.	*0.000*							Dist.[mi]	*7.48*	Ph. Length[s]	1488.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9714*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	102.25	Volume[scf]	6612
Zero Value	*0.00*							Press.[inHg]	28.92	D.F.	
Span Value	*0.00*							RH[%]	*22.50*	Ph. Start[s]	1494.2
Sample	*0.00*							AH[g/kg]	*10.169*	Ph. End[s]	2816.1
Mass.	*0.000*							Dist.[mi]	*2.38*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9825*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	102.30	Volume[scf]	7443
Zero Value	*0*							Press.[inHg]	28.91	D.F.	
Span Value	*0.00*							RH[%]	*23.33*	Ph. Start[s]	2816.2
Sample	*0*							AH[g/kg]	*10.570*	Ph. End[s]	4305.1
Mass.	*0.000*							Dist.[mi]	*7.47*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9954*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.33*

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Certification	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E15 TEST 2*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	11990.13	3792.75	11990.13		27773.01
Driven	12028.42	3828.82	12022.05		27879.29
Distance Rating (%)	0.3193	0.9511	0.2662		0.3827
Cycle Energy (MJ)					
Target	4.91	1.97	4.91		6.88
Driven	5.00	1.91	4.97		6.89
Distance per Energy Cycle (m/MJ)					
Target	4.91	1.97	4.91		2295.45
Driven	5.00	1.91	4.97		2299.45
Road Load Work Fraction					
Target	0.4146	0.1955	0.4146		0.3520
Driven	0.4178	0.1892	0.4062		0.3497
Inertial Work (MJ)					
Target	2.87	1.58	2.87		4.46
Driven	2.91	1.55	2.95		4.48
Inertial Work Fraction					
Target	0.5854	0.8045	0.5854		0.6480
Driven	0.5822	0.8108	0.5938		0.6503
Inertial Work Rating (%)	1.2948	-2.1260	2.7627		0.6205
Absolute Speed Change (m/s)					
Target	545.78	469.48	545.78		1015.26
Driven	551.11	460.96	553.61		1013.50
Absolute Speed Change Rating (%)	0.9765	-1.8142	1.4340		-0.1738
Energy Rating (%)	1.8529	-2.8913	1.3041		0.8330
Energy Economy Rating (%)	1.5056	-3.9568	1.0245		-0.1745

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Certification	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002018

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.91	39.60	40.40	37.78	43.33	Passed
Barometer	(mbar)	979.57	979.50	979.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.24	12.90	13.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	68.70	66.80	69.55	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	50.99	50.15	51.65	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.15	49.05	49.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48			7.30	7.60	Passed
Duration Phase 1	(s)	1492.60					NA
Crank Time Phase1	(s)	0.50			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Certification	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.03	38.20	40.30	37.78	43.33	Passed
Barometer	(mbar)	979.36	979.20	979.50	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.73	13.00	14.50	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	71.18	67.64	74.65	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	51.06	50.65	51.65	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.94	49.05	49.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.38			2.31	2.40	Passed
Duration Phase 2	(s)	1321.90					NA
Crank Time Phase1	(s)	0.5000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Certification	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.06	38.00	40.80	37.78	43.33	Passed
Barometer	(mbar)	979.12	978.90	979.30	800.00	1100.00	Passed
Dew Point Temperature	(°C)	14.31	13.50	14.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	73.99	69.75	77.03	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	51.24	50.75	52.05	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)	0.00			2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	1800	
Bag Analysis Time Exhaust	(s)				0.00	1800	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.03	49.05	49.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.47			7.30	7.60	Passed
Duration Phase 3	(s)	1488.90					NA
Crank Time Phase1	(s)	0.5000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_002018

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Canister Capacity***	120 g
Odometer	12477	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, August 12, 2021	***Profile***	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **8/12/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	15:51:50	0:00:00	0:00:00	
Engine Key-off	15:55:00	0:03:10	0:03:10	
SHED Door Sealed	15:57:00	0:02:00	0:05:10	
Final Sample	16:57:00	1:00:00	1:05:10	
Initial				
Zero = 0.008 ppm	Span = 9.526 ppm	Re-Zero = 0.085 ppm		
Read = 4.062 ppm	Volume = 1802.3 ft3	Temp. = 102.8 °F	Baro. = 28.92 in/Hg	Mass HC=0.11 grams
Post Read Zero = 0.085 ppm	Post Read Span = 9.526 ppm			Mass EtOH= 0.009 grams
Final				
Zero = -0.014 ppm	Span = 9.537 ppm	Re-Zero = 0.085 ppm		
Read = 6.384 ppm	Volume = 1802.5 ft3	Temp. = 105 °F	Baro. = 28.9 in/Hg	Mass HC =0.174 grams
Post Read Zero = -0.014 ppm	Post Read Span = 9.537 ppm			Mass EtOH = 0.028 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 103.4 °F	Minimum = 102 °F			
Max Ambient Temp = 106.7 °F	Maximum = 108 °F			
Min Interior Temp = 103.4 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.064±0.01 grams**
				Diurnal Mass EtOH = 0.019 grams
				Diurnal Total Mass HC plus EtOH = 0.06875 grams

HOT SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)		Total Soak Time	
Start Cold Soak	Thursday, August 12, 2021	17:57:00		0:00:00	
End Cold Soak	Thursday, August 12, 2021	23:57:00		6:00:00	
Test Temperatures	**Allowable Limit**				
Min. Ambient Temp = 63.1 °F	Minimum = 62 °F				
Max. Ambient Temp = 67.9 °F	Maximum = 68 °F				
Min. Internal Temp = 63.1 °F	Minimum = 40 °F				

COLD SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12477	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, August 12, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Thursday, August 12, 2021	23:57:00	0:00:00	
Start Time Diurnal	Thursday, August 12, 2021	23:57:00	0:00:00	
End Time Diurnal	Friday, August 13, 2021	23:57:00	24:00:00	
24 Hour Sample	Friday, August 13, 2021	23:57:00	24:00:00	
Initial				
Zero = -0.006 ppm	Span = 9.55 ppm	Re-Zero = -0.062 ppm		
Read = 6.659 ppm	Volume = 1680 ft3	Temp. = 65.2 °F	Baro. = 29.01 in/Hg	Mass HC =0.185 grams
Post Read Zero = -0.062 ppm	Post Read Span = 9.537 ppm			Mass EtOH= 0.059 grams
Final				
Zero = -0.011 ppm	Span = 93.3 ppm	Re-Zero = -0.011 ppm		
Read = 14.008 ppm	Volume = 1672.1 ft3	Temp. = 64.9 °F	Baro. = 29.06 in/Hg	Mass HC=0.386 grams
Post Read Zero = -0.011 ppm	Post Read Span = 93.298 ppm			Mass EtOH= 0.23 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.1 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.59 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.201±0.01 grams**
				Diurnal Mass EtOH = 0.171 grams
				Diurnal Total Mass HC plus EtOH = 0.244 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12477	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, August 12, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Friday, August 13, 2021	23:57:00	24:00:00	
Start Time Diurnal	Friday, August 13, 2021	23:57:00	24:00:00	
End Time Diurnal	Saturday, August 14, 2021	23:57:00	48:00:00	
48 Hour Sample	Saturday, August 14, 2021	23:57:00	48:00:00	
Initial				
Zero = -0.011 ppm	Span = 93.3 ppm	Re-Zero = -0.011 ppm		
Read = 14.008 ppm	Volume = 1672.1 ft3	Temp. = 64.9 °F	Baro. = 29.06 in/Hg	Mass HC=0.386 grams
Post Read Zero = -0.011 ppm	Post Read Span = 93.298 ppm			Mass EtOH= 0.23 grams
Final				
Zero = -0.018 ppm	Span = 93.3 ppm	Re-Zero = -0.018 ppm		
Read = 20.419 ppm	Volume = 1672.1 ft3	Temp. = 65 °F	Baro. = 29.01 in/Hg	Mass HC=0.562 grams
Post Read Zero = -0.018 ppm	Post Read Span = 93.275 ppm			Mass EtOH= 0.382 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.7 °F	± 5 °F			
Min Water Temperature 64.7 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.176±0.01 grams**
				Diurnal Mass EtOH = 0.152 grams
				Diurnal Total Mass HC plus EtOH = 0.214 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12477	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, August 12, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Saturday, August 14, 2021	23:57:00	48:00:00	
Start Time Diurnal	Saturday, August 14, 2021	23:57:00	48:00:00	
End Time Diurnal	Sunday, August 15, 2021	23:57:00	72:00:00	
72 Hour Sample	Sunday, August 15, 2021	23:57:00	72:00:00	
Initial				
Zero = -0.018 ppm	Span = 93.3 ppm	Re-Zero = -0.018 ppm		
Read = 20.419 ppm	Volume = 1672.1 ft3	Temp. = 65.03 °F	Baro. = 29.01 in/Hg	Mass HC=0.562 grams
Post Read Zero = -0.018 ppm	Post Read Span = 93.275 ppm			Mass EtOH= 0.382 grams
Final				
Zero = -0.026 ppm	Span = 93.3 ppm	Re-Zero = -0.026 ppm		
Read = 26.607 ppm	Volume = 1676 ft3	Temp. = 64.9 °F	Baro. = 28.86 in/Hg	Mass HC=0.73 grams
Post Read Zero = -0.026 ppm	Post Read Span = 93.265 ppm			Mass EtOH= 0.529 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.9 °F	± 5 °F			
Min Water Temperature 64.7 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.168±0.01 grams**
				Diurnal Mass EtOH = 0.147 grams
				Diurnal Total Mass HC plus EtOH = 0.205 grams

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/17/2021

COMMENTS: OK

Final Diurnal Total Mass HC plus EtOH emissions results: 0.313 grams {hot soak + highest 24 hour mass}

400 S Etiwanda Avenue, Ontario, CA 91761
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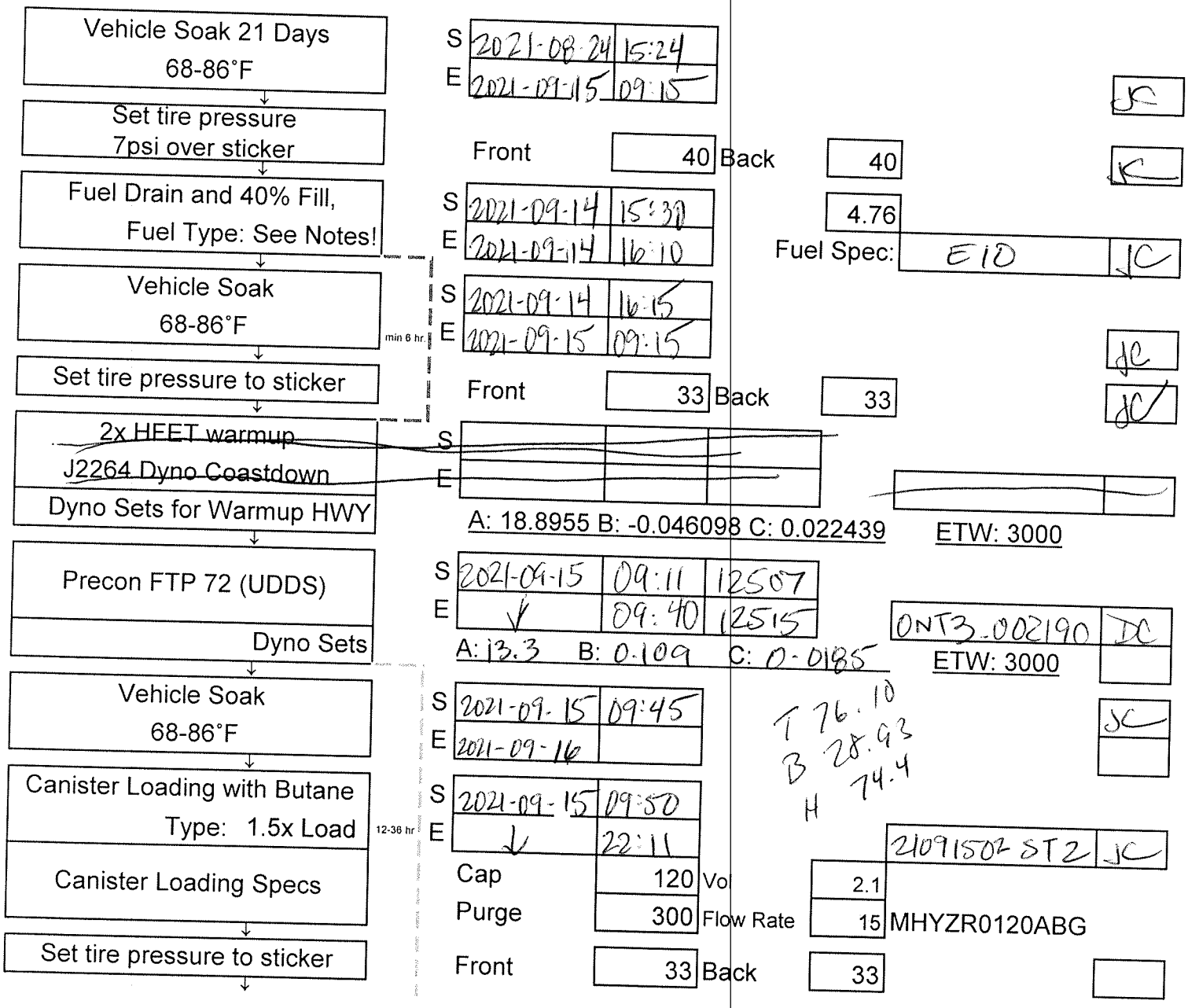
Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Hyundai Accent
Vehicle #:	3081-139404	**Engine Size**	1.6L
VIN:	3KPC24A66ME139404	**Model Year**	2021
Engine Family:	MHYXV01.6AB6	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Canister Purge 1 Hour	E	2021-08-24	11:36	12477			VC
↓							
Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S	2021-08-24	12:40		3		
↓	E	↓	12:50		Fuel Spec:		
Idle 1 min							
↓							
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S	2021-08-24	12:52		4.76		
↓	E	↓	13:25		Fuel Spec:	<60F	
Heat Build 60F-105F in 1 Hour	S		13:45	12477			
↓	E		14:45	12477			
Precon FTP 72 (UDDS) 1	S	2021-08-24	14:56	12477			
Dyno Sets	E	↓	15:24	12485		ONT3_002054	JB
	A: 18.8955 B: -0.046098 C: 0.022439					ETW: 3000	
Precon FTP 72 (UDDS) 2	S		15:25	12485			
↓	E		15:52	12492		ONT3_002055	JB
Precon FTP 72 (UDDS) 3	S		15:53	~~12500~~			
↓	E		16:19	12500		ONT3_002056	JB
Precon FTP 72 (UDDS) 4	S		16:20	12500			
↓	E	↓	16:48	12507		ONT3-002057	JB
Eng Off 5 min							JB
↓							
Idle 1 min							JB
↓							
Eng Off 1 min							JB
↓							
Idle 1 min							JB
↓							


Vehicle Soak 21 Days
68-86°F
Set tire pressure
7psi over sticker
Fuel Drain and 40% Fill,
Fuel Type: See Notes!
Vehicle Soak
68-86°F
min 6 hr.
Set tire pressure to sticker
2x HFET warmup
J2264 Dyno Coastdown
Dyno Sets for Warmup HWY
Precon FTP 72 (UDDS)
Dyno Sets
Vehicle Soak
68-86°F
Canister Loading with Butane
Type: 1.5x Load
12-36 hr
Canister Loading Specs
Set tire pressure to sticker
S 2021-08-24 15:24
E 2021-09-15 09:15
Front 40 Back 40
S 2021-09-14 15:30
E 2021-09-14 16:10
4.76
Fuel Spec: E10
S 2021-09-14 16:15
E 2021-09-15 09:15
Front 33 Back 33
S
E
A: 18.8955 B: -0.046098 C: 0.022439
ETW: 3000
S 2021-09-15 09:11 12507
E ↓ 09:40 12515
A: 13.3 B: 0.109 C: 0.0185
ONT3.002190
ETW: 3000
T 76.10
B 28.93
H 74.4
S 2021-09-15 09:45
E 2021-09-16
S 2021-09-15 09:50
E ↓ 22:11
Cap 120 Vol 2.1
Purge 300 Flow Rate 15
21091502 ST2
MHYZR0120ABG
Front 33 Back 33

No Bag Cold Start FTP 75

Dyno Sets

Test Options

Pre Test Comments

↓

Fuel Tank Temp. Stabilization at 105F

↓ max 1 hr

Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle

Dyno Sets

Test Options

↓

Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff

max 7 min

↓

Hot Soak in VT Shed

↓

Cold Soak 6-36 Hours

6-36 Hr

↓

3 Day Diurnal Test

↓

QC Check

S	2021-09-16	10:14	12515
E	↓	11:00	12526

A: 13.3 B: 0.109 C: 0.0185

PM [ ] N2O [ ]

CVS Flow P1:9.3 P2:9.3 P3:9.3

ONT3.002195 JC

ETW: 3000 X

Dilute Modal [ ]

E10 ~~Test 2~~ Test 1

S	2021-09-16	11:21	JC
E	2021-09-16	12:21	JC

S		12:06	
E		13:34	12544

A: 13.3 B: 0.109 C: 0.0185

PM [ ] N2O [ ]

CVS Flow 9.3

ONT3D02196 JC

ETW: 3000

Dilute Modal [ ]

S	2021-09-16	13:41	
E	2021-09-16	14:41	J.H.

S	2021-09-16	15:41	
E	2021-09-16	21:41	J.H.

S	2021-09-16	21:41	
E	2021-09-19	21:41	J.H.

E	2021-11-17			J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081		3081-139404	
VIN:	3KPC24A66ME139404			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Hyundai	Accent	FWD	2021
Test Group / Engine Size (L):	MHYXV01.6AB6		1.6L	
EVAP Family:	MHYZR0120ABG			
Standard Tire Size (front) / Pressure:	185/65R15		33	
Standard Tire Size (rear) / Pressure:	185/65R15		33	
Transmission / Shift File / Inertia Weight:	Auto	Auto	3000	
Target Coefficients A / B / C:	37.79	-0.2305	0.022439	
Warmup Coefficients A / B / C:	18.90	-0.0461	0.022439	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E15 Test 2			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	11.9
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	120
Canister volume (Liter)	2.1
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
4.76 of See Notes!
E10
101.6" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

									Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐	1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐	

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS CANISTER WORKSHEET

Station number 3

----PURGE ONLY----

VT#	3081-139404 ✓
Project	3081
Evap Family	MHYXR0120ABG ✓ J.H.
Ambient Temperature-Deg F	77
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	69.5 ✓
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0
Canister Volume-Liters	13.6
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	10:35:55
Start date	08-24-2021
Bed Purges/Cycle	100
Purge End/Load Start	11:36:54
Test Time Minutes	60 ✓
HC Loaded-Grams	0.0
Scale Reading-Grams	4.22
Butane Flow Actual-Gm/Hr	0.0
Cycles Completed	1
Finish time	11:36:54
Finish date	08-24-2021
Disk File Name	21082401.ST3

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: ok

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/24/2021	**Time:**	14:56:10
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:			

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: ok

General Data

Test Number	*ONT3_002054*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/24/2021*	CH_4 Response Factor	
Test Start	*14:56:10*	Odometer Position [mi]	*12477*
Start Time Cycle	*2021-08-24 15|01-54-(000)*	Delay Time Method	
Test End	*15:24:33*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark			

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model	J.H.	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00*
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_002054	Driver	Jennifer Chappell	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*14:56:10*
Model	ACCENT	A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*15:24:33*
		B [lbf/mph]	*0.10900*	Density	*0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12477*	Remark					

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.85	Volume[scf]	2571
Zero Read	*0.00*							Press.[inHg]	28.86	D.F.	
Span Read	*0.00*							RH[%]	*43.02*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*7.905*	Ph. End[s]	505.5
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.5
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9155*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	72.13	Volume[scf]	4402
Zero Value	*0.00*							Press.[inHg]	28.86	D.F.	
Span Value	*0.00*							RH[%]	*45.50*	Ph. Start[s]	505.6
Sample	*0.00*							AH[g/kg]	*7.890*	Ph. End[s]	1375.3
Mass.	*0.000*							Dist.[mi]	*3.85*	Ph. Length[s]	869.8
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9151*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start[s]	
Sample	*0*							AH[g/kg]		Ph. End[s]	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start	
Sample	*0*							AH[g/kg]		Ph. End	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.45*

Test Data: FTP72 Operator: Joseph Bishop Date: 8/24/2021
Test Number: ONT3_002054 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent:

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.19
Driven	5800.54	6194.46			11995.00
Distance Rating (%)	0.3702	-0.2671			0.0401
Cycle Energy (MJ)					
Target	2.57	2.34			
Driven	2.59	2.34			
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34			
Driven	2.59	2.34			
Road Load Work Fraction					
Target	0.4716	0.3520			
Driven	0.4639	0.3660			
Inertial Work (MJ)					
Target	1.36	1.52			
Driven	1.39	1.48			
Inertial Work Fraction					
Target	0.5284	0.6480			
Driven	0.5361	0.6340			
Inertial Work Rating (%)	2.1405	-2.2830			
Absolute Speed Change (m/s)					
Target	204.88	340.91			
Driven	208.15	336.75			
Absolute Speed Change Rating (%)	1.5935	-1.2205			
Energy Rating (%)	0.6748	-0.1273			0.2925
Energy Economy Rating (%)	0.3025	0.1400			0.2516

Operator Joseph Bishop | Driver Jennifer Chappell | Customer : | 3081
Test Purpose: Preconditioning | Legislatio EPA1066 | Requirements (Bag) | SIMPLE
Conditioning: | Emission Default

Overall Status Passed

Phase 1

Test Record #: ONT3_002054

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.25	21.40	24.70	20.00	30.00	Passed
Barometer	(mbar)	977.27	977.10	977.40	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.97	9.50	10.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	55.33	53.34	57.00	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	41.51	38.25	42.65	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.03	49.35	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 1	(s)	505.40					NA
Crank Time Phase1	(s)	0.50			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Jennifer Chappell	Customer :	
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.29	20.90	23.60	20.00	30.00	Passed
Barometer	(mbar)	977.20	977.20	977.20	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.94	9.50	10.20	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	55.23	53.24	56.41	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.22	41.95	42.65	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.98	49.35	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.85			3.78	3.94	Passed
Duration Phase 2	(s)	869.70					NA
Crank Time Phase1	(s)	0.5000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/24/2021	**Time:**	15:25:10
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON 2		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/19/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002055*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/24/2021*	CH_4 Response Factor	
Test Start	*15:25:10*	Odometer Position [mi]	*12485*
Start Time Cycle	*2021-08-24 15|29-12-(000)*	Delay Time Method	
Test End	*15:52:26*		
Operator	*Jennifer Chappell*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON 2*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Jennifer Chappell	Speed Table	Date:
Test Number	ONT3_002055	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*15:25:10*
Model	ACCENT	A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*15:52:26*
		B [lbf/mph]	*0.10900*	Density	*0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12485*	Remark	PRECON 2				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.12	Volume[scf]	2582
Zero Read	*0.00*							Press.[inHg]	*28.85*	D.F.	
Span Read	*0.00*							RH[%]	*47.75*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.573*	Ph. End[s]	506.4
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	506.4
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9343*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.40*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	71.23	Volume[scf]	4400
Zero Value	*0.00*							Press.[inHg]	*28.85*	D.F.	
Span Value	*0.00*							RH[%]	*47.43*	Ph. Start[s]	506.5
Sample	*0.00*							AH[g/kg]	*7.981*	Ph. End[s]	1376.1
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	869.7
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9176*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start[s]	
Sample	*0*							AH[g/kg]		Ph. End[s]	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start	
Sample	*0*							AH[g/kg]		Ph. End	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	HC+NO_X[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.47*

Test Data: FTP72 Operator: Jennifer Chappell Date: 8/24/2021
Test Number: ONT3_002055 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Jennifer Chappell	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		
Test Intent:		*PRECON 2*			
VIN	3KPC24A66ME139404				

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.20
Driven	5794.37	6229.56			12023.92
Distance Rating (%)	0.2632	0.2980			0.2812
Cycle Energy (MJ)					
Target	2.57	2.34			
Driven	2.57	2.37			
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34			
Driven	2.57	2.37			
Road Load Work Fraction					
Target	0.4716	0.3521			
Driven	0.4658	0.3555			
Inertial Work (MJ)					
Target	1.36	1.52			
Driven	1.37	1.52			
Inertial Work Fraction					
Target	0.5284	0.6479			
Driven	0.5342	0.6445			
Inertial Work Rating (%)	1.0450	0.5584			
Absolute Speed Change (m/s)					
Target	204.88	340.91			
Driven	206.27	342.19			
Absolute Speed Change Rating (%)	0.6812	0.3760			
Energy Rating (%)	-0.0560	1.0929			0.4916
Energy Economy Rating (%)	-0.3194	0.7863			0.2094

Operator Jennifer Chappell | Driver Joseph Bishop | Customer : 3081

Test Purpose: Preconditioning | Legislatio EPA 1066 | Requirements (Bag) SIMPLE

Conditioning: | Emission Default

Overall Status Passed

Phase 1

Test Record #: ONT3_002055

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.84	21.20	24.00	20.00	30.00	Passed
Barometer	(mbar)	977.08	977.00	977.20	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.17	9.90	12.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	60.01	54.96	66.80	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.44	39.05	43.55	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.90	49.15	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 1	(s)	506.30					NA
Crank Time Phase1	(s)	1.40			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jennifer Chappell	Driver	Joseph Bishop	Customer :	
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	21.80	20.70	23.30	20.00	30.00	Passed
Barometer	(mbar)	977.02	976.90	977.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.11	9.60	10.60	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	55.87	53.83	57.96	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.29	41.95	42.75	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)						
NO_x	(ppm)				2.00	6.00	
CO	(ppm)				-0.10	0.10	
CO_2	(ppm)				0.20	0.99	
CH_4	(ppm)				300.00	600.00	
N2O	(ppm)				1.30	3.00	
Bag Analysis Time Ambient	(s)				0.30	0.40	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters					0.00	NA	
Particulate Filter Temperature	(°C)	49.99	49.15	50.25			
Filter Face Velocity	(cm/s)				42.00	52.00	
Particulate Result Validation	(ug)	65535.00			0.00	100.00	
Test-Cycle Specific Validations					2.00	600.00	N/A
Phase Distance	(miles)	3.87					
Duration Phase 2	(s)	869.60			3.78	3.94	Passed
Crank Time Phase1	(s)	1.4000					NA
Crank Time Phase3	(s)				0	5	Passed
Crank Counts		1			0	5	
Shutdown Time Phase 1					0	1	Passed
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				0	5	
Test Hold Counts		0			540.00	660.00	
Duration Test Hold	(s)	0.00					Passed
					0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/24/2021	**Time:**	15:53:32
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON 3		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: ok

General Data

Test Number	*ONT3_002056*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/24/2021*	CH_4 Response Factor	
Test Start	*15:53:32*	Odometer Position [mi]	*12492*
Start Time Cycle	*2021-08-24 15|56-22-(000)*	Delay Time Method	
Test End	*16:19:48*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON 3*		

Vehicle Data — *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data — *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data — *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data — *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_002056	Driver	Victor Escudero	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*15:53:32*
Model	ACCENT	A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*16:19:48*
		B [lbf/mph]	*0.10900*	Density	*0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12492*	Remark	PRECON 3				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	72.79	Volume[scf]	2580
Zero Read	*0.00*							Press.[inHg]	28.85	D.F.	
Span Read	*0.00*							RH[%]	*44.63*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*7.918*	Ph. End[s]	506.3
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	506.3
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9159*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.30*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	71.10	Volume[scf]	4399
Zero Value	*0.00*							Press.[inHg]	28.85	D.F.	
Span Value	*0.00*							RH[%]	*47.82*	Ph. Start[s]	506.4
Sample	*0.00*							AH[g/kg]	*8.013*	Ph. End[s]	1375.8
Mass.	*0.000*							Dist.[mi]	*3.86*	Ph. Length[s]	869.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9185*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]			
Range	*0*							Temp.[°F]		Volume[scf]
Zero Value	*0*							Press.[inHg]		D.F.
Span Value	*0.00*							RH[%]		Ph. Start[s]
Sample	*0*							AH[g/kg]		Ph. End[s]
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay[s]
								Dr. Viola.		Vio. Durat.[s]
								Crank [s]		FE [mile/gal]

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]			
Range	*0*							Temp.[°F]		Volume[scf]
Zero Value	*0*							Press.[inHg]		D.F.
Span Value	*0.00*							RH[%]		Ph. Start
Sample	*0*							AH[g/kg]		Ph. End
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay[s]
								Dr. Viola.		Vio. Durat.[s]
										FE [mile/gal]

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.46*

Test Data: FTP72
Test Number: ONT3_002056

Operator: Joseph Bishop
Driver: Victor Escudero

Date: 8/24/2021

Driver Violations

	-	Phase1	Phase2
Number of Violations		0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *PRECON 3*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.04			11990.19
Driven	5790.19	6218.99			12009.18
Distance Rating (%)	0.1910	0.1280			0.1584
Cycle Energy (MJ)					
Target	2.57	2.34			
Driven	2.55	2.36			
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34			
Driven	2.55	2.36			
Road Load Work Fraction					
Target	0.4716	0.3520			
Driven	0.4819	0.3523			
Inertial Work (MJ)					
Target	1.36	1.52			
Driven	1.32	1.53			
Inertial Work Fraction					
Target	0.5284	0.6480			
Driven	0.5181	0.6477			
Inertial Work Rating (%)	-2.6863	0.6812			
Absolute Speed Change (m/s)					
Target	204.87	340.91			
Driven	200.55	341.47			
Absolute Speed Change Rating (%)	-2.1120	0.1651			
Energy Rating (%)	-0.7427	0.7152			-0.0478
Energy Economy Rating (%)	-0.9407	0.5830			-0.2063

Operator Joseph Bishop | Driver Victor Escudero | Customer : | 3081
Test Purpose: Preconditioning | Legislatio *EPA1066* | Requirements (Bag) | *SIMPLE*
Conditioning: | Emission Default

Overall Status Passed

Phase 1

Test Record #: ONT3_002056

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.66	20.90	24.10	20.00	30.00	Passed
Barometer	(mbar)	976.88	976.80	977.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.98	9.60	10.20	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	55.42	53.70	56.46	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.33	39.95	43.55	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.03	49.45	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 1	(s)	506.20					NA
Crank Time Phase1	(s)	1.30			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 2

Overall Status Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	21.72	20.60	23.10	20.00	30.00	Passed
Barometer	(mbar)	976.89	976.80	977.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.17	9.30	10.60	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	56.09	52.84	57.77	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.25	41.85	42.75	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.02	49.45	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86			3.78	3.94	Passed
Duration Phase 2	(s)	869.40					NA
Crank Time Phase1	(s)	1.3000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/24/2021	**Time:**	16:20:26
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON 4		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002057*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/24/2021*	CH_4 Response Factor	
Test Start	*16:20:26*	Odometer Position [mi]	*12500*
Start Time Cycle	*2021-08-24 16|25-28-(000)*	Delay Time Method	
Test End	*16:48:04*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON 4*		

Vehicle Data — *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data — *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data — *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data — *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_002057	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*16:20:26*
Model	ACCENT	A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*16:48:04*
		B [lbf/mph]	*0.10900*	Density	*0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*				
Displacement:				NHV	17916	Soak Time	
				CWF	*0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12500*	Remark	PRECON 4				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	72.38	Volume[scf]	2579
Zero Read	*0.00*							Press.[inHg]	28.84	D.F.	
Span Read	*0.00*							RH[%]	*50.14*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.784*	Ph. End[s]	506.3
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	506.3
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9404*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*1.30*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	71.18	Volume[scf]	4400
Zero Value	*0.00*							Press.[inHg]	28.84	D.F.	
Span Value	*0.00*							RH[%]	*48.62*	Ph. Start[s]	506.4
Sample	*0.00*							AH[g/kg]	*8.172*	Ph. End[s]	1376.1
Mass.	*0.000*							Dist.[mi]	*3.87*	Ph. Length[s]	869.8
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9229*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start[s]	
Sample	*0*							AH[g/kg]		Ph. End[s]	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start	
Sample	*0*							AH[g/kg]		Ph. End	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_X Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_X$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.47*

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*50.14*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*8.78*
CVS Volume[scf]	*2579.36*	Act. Dist.[mi]	*3.60*	Pressure[inHg]	*28.84*
CVS Flow[scfm]	*305.67*			Temp.[°F]	*72.38*
CVS Inlet Pressure	*28.77*			Temp. Min.[°F]	*69.44*
CVS Inlet Temp.[°F]	*108.33*			Temp. Max.[°F]	*75.02*
CVS Inlet Temp. Min.[°F]	*104.27*			NO_X Corr. F	*0.9404*
CVS Inlet Temp. Max.[°F]	*110.75*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	THC[g]	CO[g]	CO_2[g]	NO_x[g]	N_2O[g]	CH_4[g]	NMHC[g]
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N_2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

CVS Data		Cycle data		Environmental Data	
Dilution Factor (Bag)		Vio. Dur.[s]	0.0	Rel. Hum.[%]	*48.62*
Dilution Factor (Modal)		Number	0	Ab. Hum.[g/lbs]	*8.17*
CVS Volume[scf]	*4400.03*	Act. Dist.[mi]	*3.87*	Pressure[inHg]	*28.84*
CVS Flow[scfm]	*303.52*			Temp.[°F]	*71.18*
CVS Inlet Pressure	*28.77*			Temp. Min.[°F]	*68.54*
CVS Inlet Temp.[°F]	*108.08*			Temp. Max.[°F]	*73.58*
CVS Inlet Temp. Min.[°F]	*107.51*			NO_X Corr. F	*0.9229*
CVS Inlet Temp. Max.[°F]	*109.13*				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]

Fuel Consumption[l] Fuel Consumption[l/100km]

Fuel Economy[mile/gal]

Test Data: FTP72 Operator: Joseph Bishop Date: 8/24/2021
Test Number: ONT3_002057 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *PRECON 4*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.04			11990.19
Driven	5789.00	6225.36			12014.36
Distance Rating (%)	0.1705	0.2305			0.2016
Cycle Energy (MJ)					
Target	2.57	2.34			
Driven	2.57	2.36			
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34			
Driven	2.57	2.36			
Road Load Work Fraction					
Target	0.4716	0.3520			
Driven	0.4562	0.3628			
Inertial Work (MJ)					
Target	1.36	1.52			
Driven	1.40	1.50			
Inertial Work Fraction					
Target	0.5284	0.6480			
Driven	0.5438	0.6372			
Inertial Work Rating (%)	3.0718	-0.8899			
Absolute Speed Change (m/s)					
Target	204.87	340.91			
Driven	208.43	338.81			
Absolute Speed Change Rating (%)	1.7366	-0.6164			
Energy Rating (%)	0.1511	0.7908			0.4560
Energy Economy Rating (%)	-0.0193	0.5559			0.2533

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002057

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.43	20.80	23.90	20.00	30.00	Passed
Barometer	(mbar)	976.79	976.70	976.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.54	9.90	13.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	61.49	54.75	69.66	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.41	40.15	43.75	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.00	49.15	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 1	(s)	506.20					NA
Crank Time Phase1	(s)	1.30			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	21.77	20.30	23.10	20.00	30.00	Passed
Barometer	(mbar)	976.80	976.80	976.80	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.45	9.40	11.30	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	57.20	53.28	60.51	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	42.27	41.95	42.85	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.05	49.15	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87			3.78	3.94	Passed
Duration Phase 2	(s)	869.70					NA
Crank Time Phase1	(s)	1.3000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/15/2021	**Time:**	9:09:11
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002190*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/15/2021*	CH_4 Response Factor	
Test Start	*9:09:11*	Odometer Position [mi]	*12507*
Start Time Cycle	*2021-09-15 09|18-15-(000)*	Delay Time Method	
Test End	*9:40:47*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Domenic Coppola		Speed Table	Date:	
Test Number	ONT3_002190	Driver	Jennifer Chappell		Shift Table Auto	Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*9:09:11*
		A [lbf]	*13.300*		Fuel type GASOLINE	End Time	*9:40:47*
Model	ACCENT	B [lbf/mph]	*0.10900*		Density *0.7380*		
Year	*2021*	C [lbf/mph2]	*0.018500*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12507*	Remark	PRECON				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.94	Volume[scf]	2577
Zero Read	*0.00*							Press.[inHg]	28.93	D.F.	
Span Read	*0.00*							RH[%]	*48.72*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*9.604*	Ph. End[s]	505.9
Mass.	*0.000*							Dist.[mi]	*3.62*	Ph. Length[s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9649*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	75.26	Volume[scf]	4399
Zero Value	*0.00*							Press.[inHg]	28.93	D.F.	
Span Value	*0.00*							RH[%]	*50.61*	Ph. Start[s]	506.0
Sample	*0.00*							AH[g/kg]	*9.755*	Ph. End[s]	1376.0
Mass.	*0.000*							Dist.[mi]	*3.90*	Ph. Length[s]	870.1
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9695*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start[s]	
Sample	*0*							AH[g/kg]		Ph. End[s]	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]		Volume[scf]	
Zero Value	*0*							Press.[inHg]		D.F.	
Span Value	*0.00*							RH[%]		Ph. Start	
Sample	*0*							AH[g/kg]		Ph. End	
Mass.	*0.000*							Dist.[mi]		Ph. Length[s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay[s]	
								Dr. Viola.		Vio. Durat.[s]	
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.51*

Test Data: FTP72 Operator: Domenic Coppola Date: 9/15/2021
Test Number: ONT3_002190 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *PRECON*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.20
Driven	5820.85	6268.23			12089.09
Distance Rating (%)	0.7216	0.9206			0.8247
Cycle Energy (MJ)					
Target	2.57	2.34			
Driven	2.58	2.37			
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34			
Driven	2.58	2.37			
Road Load Work Fraction					
Target	0.4716	0.3521			
Driven	0.4700	0.3557			
Inertial Work (MJ)					
Target	1.36	1.52			
Driven	1.37	1.53			
Inertial Work Fraction					
Target	0.5284	0.6479			
Driven	0.5300	0.6443			
Inertial Work Rating (%)	0.6049	0.6431			
Absolute Speed Change (m/s)					
Target	204.88	340.90			
Driven	205.88	341.01			
Absolute Speed Change Rating (%)	0.4913	0.0325			
Energy Rating (%)	0.3036	1.2197			0.7402
Energy Economy Rating (%)	-0.4167	0.2954			-0.0838

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002190

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.41	23.00	25.60	20.00	30.00	Passed
Barometer	(mbar)	979.58	979.40	979.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.89	11.70	13.80	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	67.23	61.77	71.63	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	43.67	40.35	46.95	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.90	48.85	50.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62			3.52	3.66	Passed
Duration Phase 1	(s)	505.80					NA
Crank Time Phase1	(s)	0.90			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.04	22.80	25.50	20.00	30.00	Passed
Barometer	(mbar)	979.63	979.60	979.70	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.14	11.50	14.30	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	68.29	61.26	73.84	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	44.42	43.55	45.05	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.05	48.85	50.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.90			3.78	3.94	Passed
Duration Phase 2	(s)	870.00					NA
Crank Time Phase1	(s)	0.9000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS CANISTER WORKSHEET

Station number 2

--PURGE AND FILL--

VT#	3081-139404 ✓
Project	3081
Evap Family	MHYXR0120ABG ✓ J.H.
Ambient Temperature-Deg F	76
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	74.4 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.1
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	09:50:59
Start date	09-15-2021
Bed Purges/Cycle	300
Purge End/Load Start	10:18:49
Test Time Minutes	740
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	-0.90
Butane Flow Actual-Gm/Hr	15.2
Cycles Completed	1
Finish time	22:11:04
Finish date	09-15-2021
Disk File Name	21091502.ST2

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/16/2021	**Time:**	10:14:24
Test Legislation:	EPA1066		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST 1		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002195*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/16/2021*	CH_4 Response Factor	
Test Start	*10:14:24*	Odometer Position [mi]	*12515*
Start Time Cycle	*2021-09-16 10|19-15-(000)*	Delay Time Method	
Test End	*11:00:25*		
Operator	*Jennifer Chappell*	Air Condition	*OFF*
Driver	*Domenic Coppola*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST 1*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Jennifer Chappell	Speed Table	Date:
Test Number	ONT3_002195	Driver	Domenic Coppola	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*10:14:24*
		A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*11:00:25*
Model	ACCENT	B [lbf/mph]	*0.10900*	Density	*0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	17916	Soak Time	574.1
Displacement:				CWF	*0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*12515*	Remark	E10 TEST 1				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	77.06	Volume [scf]	2568
Zero Read	*0.00*							Press. [inHg]	28.88	D.F.	
Span Read	*0.00*							RH [%]	*48.54*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.952*	Ph. End [s]	505.8
Mass.	*0.000*							Dist. [mi]	*3.62*	Ph. Length [s]	505.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9757*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.85	Volume [scf]	4395
Zero Value	*0.00*							Press. [inHg]	28.88	D.F.	
Span Value	*0.00*							RH [%]	*43.55*	Ph. Start [s]	505.9
Sample	*0.00*							AH [g/kg]	*8.274*	Ph. End [s]	1376.4
Mass.	*0.000*							Dist. [mi]	*3.91*	Ph. Length [s]	870.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9258*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.26	Volume [scf]	2560
Zero Value	*0*							Press. [inHg]	28.88	D.F.	
Span Value	*0.00*							RH [%]	*43.91*	Ph. Start [s]	1947.3
Sample	*0*							AH [g/kg]	*8.751*	Ph. End [s]	2454.3
Mass.	*0.000*							Dist. [mi]	*3.61*	Ph. Length [s]	507.1
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9394*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*2.10*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_x [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.14*

Test Data: FTP75
Test Number: ONT3_002195

Operator: Jennifer Chappell
Driver: Domenic Coppola

Date: 9/16/2021

Driver Violations

	-	Phase1	Phase2	Phase3
Number of Violations		0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Jennifer Chappell	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E10 TEST 1*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6210.95	5779.15		17769.25
Driven	5826.63	6296.24	5808.67		17931.54
Distance Rating (%)	0.8217	1.3732	0.5107		0.9133
Cycle Energy (MJ)					
Target	2.57	2.34	2.57		4.91
Driven	2.58	2.39	2.58		4.97
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34	2.57		2441.91
Driven	2.58	2.39	2.58		2434.94
Road Load Work Fraction					
Target	0.4716	0.3520	0.4716		0.4146
Driven	0.4670	0.3577	0.4614		0.4128
Inertial Work (MJ)					
Target	1.36	1.52	1.36		2.87
Driven	1.38	1.54	1.39		2.92
Inertial Work Fraction					
Target	0.5284	0.6480	0.5284		0.5854
Driven	0.5330	0.6423	0.5386		0.5872
Inertial Work Rating (%)	1.3359	1.4050	2.2931		1.6301
Absolute Speed Change (m/s)					
Target	204.87	340.91	204.87		545.78
Driven	206.59	341.67	207.39		548.71
Absolute Speed Change Rating (%)	0.8369	0.2226	1.2272		0.5367
Energy Rating (%)	0.4599	2.3043	0.3660		1.0048
Energy Economy Rating (%)	-0.3602	0.9102	-0.1441		0.2854

Operator Jennifer Chappell | Driver Domenic Coppola | Customer :

Test Purpose: Preconditioning | Legislation *EPA1066* | Requirements (Bag)

Conditioning: | Emission Default

3081

SIMPLE

Overall Status Passed

Phase 1

Test Record #: ONT3_002195

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	25.03	24.30	25.50	20.00	30.00	Passed
Barometer	(mbar)	977.95	977.80	978.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.39	11.40	15.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	69.66	60.46	79.28	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	44.15	41.25	45.35	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.03	49.15	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62			3.52	3.66	Passed
Duration Phase 1	(s)	505.70					NA
Crank Time Phase1	(s)	0.80			0	5	Passed
Crank Time Phase3	(s)	2.10			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	574.10			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jennifer Chappell	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.81	23.50	24.40	20.00	30.00	Passed
Barometer	(mbar)	978.00	977.90	978.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.67	10.10	12.00	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	57.92	55.72	63.36	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	44.30	43.95	44.75	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.95	49.15	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.91			3.78	3.94	Passed
Duration Phase 2	(s)	870.50					NA
Crank Time Phase1	(s)	0.8000			0	5	Passed
Crank Time Phase3	(s)	2.10			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)	574.10			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jennifer Chappell	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.59	24.20	25.30	20.00	30.00	Passed
Barometer	(mbar)	977.88	977.70	978.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.49	10.50	13.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	61.25	57.05	72.08	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	44.26	42.35	45.15	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.16	49.15	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61			3.52	3.66	Passed
Duration Phase 3	(s)	507.00					NA
Crank Time Phase1	(s)	0.8000			0	5	Passed
Crank Time Phase3	(s)	2.10			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	574.10			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/16/2021	**Time:**	12:06:17
Test Legislation:	EPA1066		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST 1		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002196*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep*		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/16/2021*	CH_4 Response Factor	
Test Start	*12:06:17*	Odometer Position [mi]	*12526*
Start Time Cycle	*2021-09-16 12|33-31-(000)*	Delay Time Method	
Test End	*13:34:30*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST 1*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model	J.H.	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Domenic Coppola	Speed Table		Date:	
Test Number	ONT3_002196	Driver	Jennifer Chappell	Shift Table Auto		Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*12:06:17*
		A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*13:34:30*
Model	ACCENT	B [lbf/mph]	*0.10900*	Density	*0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*12526*	Remark	E10 TEST 1				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	$N2O$ [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	103.59	Volume [scf]	7494
Zero Read	*0.00*							Press. [inHg]	28.86	D.F.	
Span Read	*0.00*							RH [%]	*19.90*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.372*	Ph. End [s]	1490.0
Mass.	*0.000*							Dist. [mi]	*7.49*	Ph. Length [s]	1490.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9578*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.00*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	$N2O$ [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	102.04	Volume [scf]	6631
Zero Value	*0.00*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*20.31*	Ph. Start [s]	1490.1
Sample	*0.00*							AH [g/kg]	*9.129*	Ph. End [s]	2812.0
Mass.	*0.000*							Dist. [mi]	*2.40*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9506*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	$N2O$ [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	102.09	Volume [scf]	7453
Zero Value	*0*							Press. [inHg]	28.84	D.F.	
Span Value	*0.00*							RH [%]	*19.64*	Ph. Start [s]	2812.1
Sample	*0*							AH [g/kg]	*8.840*	Ph. End [s]	4301.0
Mass.	*0.000*							Dist. [mi]	*7.51*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9420*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.39*

Test Data: ORVR_Prep Operator: Domenic Coppola Date: 9/16/2021
Test Number: ONT3_002196 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :		3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*	
Conditioning:		Emission Standards	Default			

Test Intent: *E10 TEST 1*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	11990.13	3792.77	11990.13		27773.02
Driven	12050.49	3855.88	12082.63		27989.00
Distance Rating (%)	0.5034	1.6639	0.7715		0.7777
Cycle Energy (MJ)					
Target	4.91	1.97	4.91		6.88
Driven	4.98	1.94	4.99		6.93
Distance per Energy Cycle (m/MJ)					
Target	4.91	1.97	4.91		2295.49
Driven	4.98	1.94	4.99		2298.88
Road Load Work Fraction					
Target	0.4146	0.1956	0.4146		0.3520
Driven	0.4091	0.1941	0.4112		0.3497
Inertial Work (MJ)					
Target	2.87	1.58	2.87		4.46
Driven	2.94	1.57	2.94		4.50
Inertial Work Fraction					
Target	0.5854	0.8044	0.5854		0.6480
Driven	0.5909	0.8059	0.5888		0.6503
Inertial Work Rating (%)	2.2987	-1.0100	2.2546		1.1083
Absolute Speed Change (m/s)					
Target	545.78	469.43	545.78		1015.21
Driven	551.81	458.17	553.51		1010.95
Absolute Speed Change Rating (%)	1.1046	-2.3990	1.4174		-0.4196
Energy Rating (%)	1.3452	-1.1898	1.6618		1.0543
Energy Economy Rating (%)	0.8306	-2.8881	0.8758		-0.1479

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002196

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.77	39.00	40.70	37.78	43.33	Passed
Barometer	(mbar)	977.17	977.10	977.30	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.50	12.30	12.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	65.60	64.83	66.50	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	47.13	43.15	48.45	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.01	48.35	49.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.49			7.30	7.60	Passed
Duration Phase 1	(s)	1489.90					NA
Crank Time Phase1	(s)	1.00			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	38.91	38.80	39.00	37.78	43.33	Passed
Barometer	(mbar)	976.98	976.90	977.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.11	11.90	12.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	63.91	62.89	65.15	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	47.60	47.05	49.05	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.96	48.35	49.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.40			2.31	2.40	Passed
Duration Phase 2	(s)	1321.90					NA
Crank Time Phase1	(s)	1.0000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Domenic Coppola	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	38.94	38.60	40.10	37.78	43.33	Passed
Barometer	(mbar)	976.69	976.60	976.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.60	11.00	12.00	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	61.88	59.05	63.39	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	48.75	47.35	51.25	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.00	48.35	49.15	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.51			7.30	7.60	Passed
Duration Phase 3	(s)	1488.90					NA
Crank Time Phase1	(s)	1.0000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_002196

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Canister Capacity***	120 g
Odometer	12544	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 16, 2021	***Profile***	CA
		Fuel	E10

0 – 1 Hour Diurnal / (3-Day Supplemental) **9/16/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	13:34:30	0:00:00	0:00:00	
Engine Key-off	13:40:00	0:05:30	0:05:30	
SHED Door Sealed	13:41:00	0:01:00	0:06:30	
Final Sample	14:41:00	1:00:00	1:06:30	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 9.028 ppm	Volume = 1800.3 ft3	Temp. = 102.3 °F	Baro. = 28.84 in/Hg	Mass HC=0.288 grams
Post Read Zero = 0 ppm	Post Read Span = 93.283 ppm			Mass EtOH= 0.019 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 10.71 ppm	Volume = 1803.4 ft3	Temp. = 105 °F	Baro. = 28.86 in/Hg	Mass HC =0.29 grams
Post Read Zero = -0.016 ppm	Post Read Span = 93.236 ppm			Mass EtOH = 0.037 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 103.7 °F	Minimum = 102 °F			
Max Ambient Temp = 106.5 °F	Maximum = 108 °F			
Min Interior Temp = 103.7 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.002±0.01 grams**
				Diurnal Mass EtOH = 0.018 grams
				Diurnal Total Mass HC plus EtOH = 0.0065 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, September 16, 2021	15:41:00	0:00:00	
End Cold Soak	Thursday, September 16, 2021	21:41:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63.4 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.8 °F	Maximum = 68 °F			
Min. Internal Temp = 63.4 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12544	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 16, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Thursday, September 16, 2021	21:41:00	0:00:00	
Start Time Diurnal	Thursday, September 16, 2021	21:41:00	0:00:00	
End Time Diurnal	Friday, September 17, 2021	21:41:00	24:00:00	
24 Hour Sample	Friday, September 17, 2021	21:41:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 10.791 ppm	Volume = 1682.3 ft3	Temp. = 64.9 °F	Baro. = 28.89 in/Hg	Mass HC =0.295 grams
Post Read Zero = 0 ppm	Post Read Span = 93.248 ppm			Mass EtOH= 0.056 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 17.516 ppm	Volume = 1673.2 ft3	Temp. = 65 °F	Baro. = 29.04 in/Hg	Mass HC=0.485 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.257 ppm			Mass EtOH= 0.194 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.2 °F	± 3 °F			
Avg. Δ Profile Underbody = 0 °F	± 2 °F			
Max. Δ Profile Sidewall = 1.1 °F	± 5 °F			
Min Water Temperature 64.73 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.19±0.01 grams**
				Diurnal Mass EtOH = 0.138 grams
				Diurnal Total Mass HC plus EtOH = 0.225 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12544	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 16, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Friday, September 17, 2021	21:41:00	24:00:00	
Start Time Diurnal	Friday, September 17, 2021	21:41:00	24:00:00	
End Time Diurnal	Saturday, September 18, 2021	21:41:00	48:00:00	
48 Hour Sample	Saturday, September 18, 2021	21:41:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 17.516 ppm	Volume = 1673.2 ft3	Temp. = 65 °F	Baro. = 29.04 in/Hg	Mass HC=0.485 grams
Post Read Zero = 0 ppm	Post Read Span = 93.257 ppm			Mass EtOH= 0.194 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 23.432 ppm	Volume = 1674.4 ft3	Temp. = 65 °F	Baro. = 28.99 in/Hg	Mass HC=0.645 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.269 ppm			Mass EtOH= 0.324 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.2 °F	± 3 °F			
Avg. Δ Profile Underbody = 0 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 65 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.16±0.01 grams**
				Diurnal Mass EtOH = 0.13 grams
				Diurnal Total Mass HC plus EtOH = 0.193 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12544	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 16, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Saturday, September 18, 2021	21:41:00	48:00:00	
Start Time Diurnal	Saturday, September 18, 2021	21:41:00	48:00:00	
End Time Diurnal	Sunday, September 19, 2021	21:41:00	72:00:00	
72 Hour Sample	Sunday, September 19, 2021	21:41:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 23.432 ppm	Volume = 1674.4 ft3	Temp. = 65.03 °F	Baro. = 28.99 in/Hg	Mass HC=0.645 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.269 ppm			Mass EtOH= 0.324 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 29.092 ppm	Volume = 1675.3 ft3	Temp. = 64.8 °F	Baro. = 28.92 in/Hg	Mass HC=0.713 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.287 ppm			Mass EtOH= 0.452 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.1 °F	± 3 °F			
Avg. Δ Profile Underbody = 0 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.7 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.068±0.01 grams**
				Diurnal Mass EtOH = 0.128 grams
				Diurnal Total Mass HC plus EtOH = 0.1 grams

QUALITY ASSURANCE
INSPECTED BY: LH
DATE: 11/17/2021
COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: 0.232 grams {hot soak + highest 24 hour mass}

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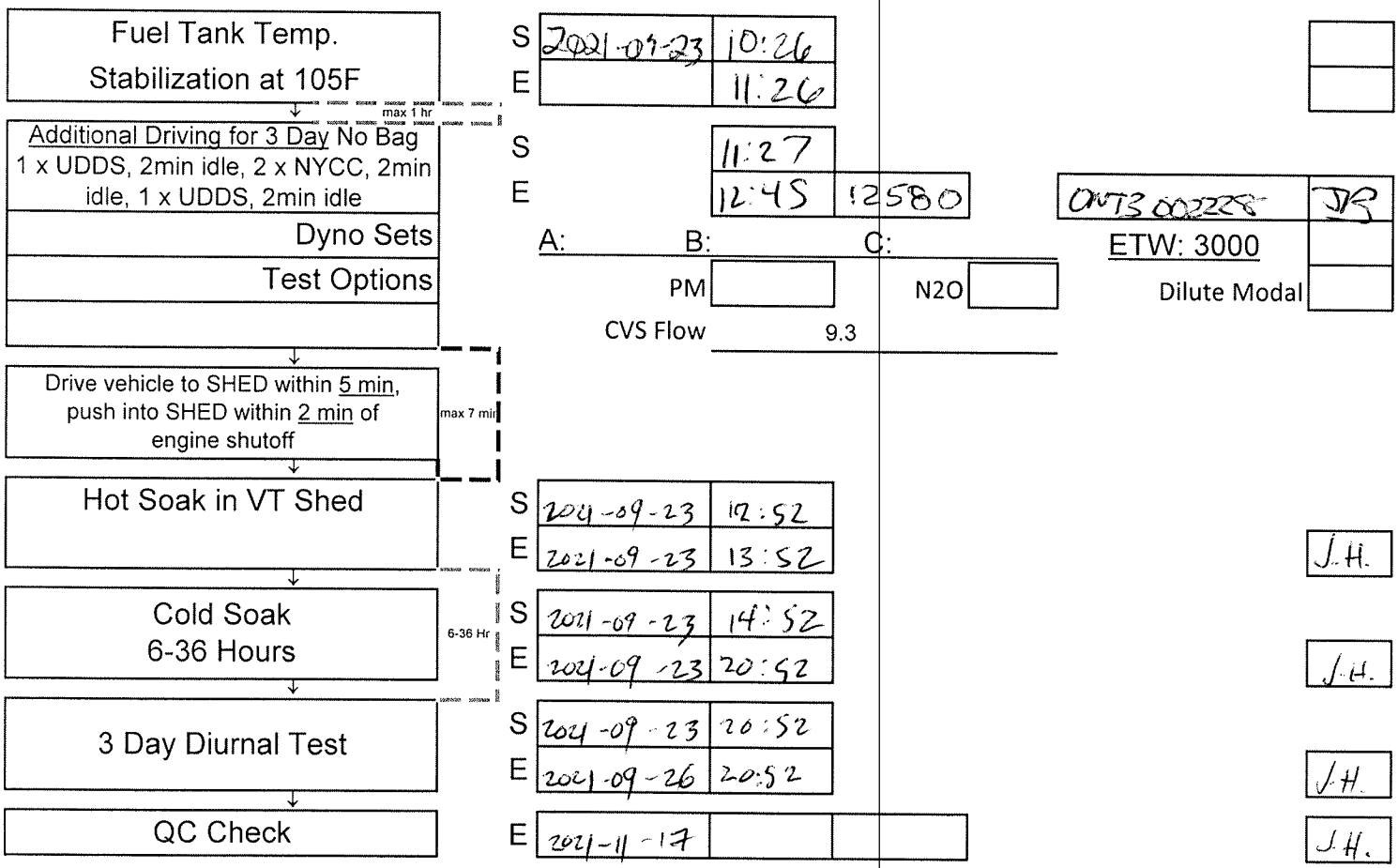
Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Hyundai Accent
Vehicle #:	3081-139404	**Engine Size**	1.6L
VIN:	3KPC24A66ME139404	**Model Year**	2021
Engine Family:	MHYXV01.6AB6	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Precon FTP 72 (UDDS)	S	9/22/21	19:34	12594			
	E	↓	20:02	12551		ONT3-202226	JK
Dyno Sets	A:	B:	C:			ETW: 3000	
Vehicle Soak 68-86°F	S	9/22/21	20:03		T 74.30		JB
	E	2021-09-23	09:03		B 28.95		AC
					H 55.30		
Canister Loading with Butane Type: 1.5x Load	S	2021-09-22	20:11				
12-36 hr	E	2021-09-23	08:39			21092301.SF3	AC
Canister Loading Specs	Cap	120	Vol	2.1			
	Purge	300	Flow Rate	15	MHYZR0120ABG		
Set tire pressure to sticker	Front	33	Back	33			AC
No Bag Cold Start FTP 75	S	2021-09-23	09:03	12551			
	E	↓	09:54	12562		ONT3-002227	JK
Dyno Sets	A: 13.3	B: 0.109	C: 0.0185			ETW: 3000	
Test Options	PM		N2O			Dilute Modal	
	CVS Flow	P1:9.3 P2:9.3 P3:9.3					
Pre Test Comments	E10 Test 2						


Fuel Tank Temp.
Stabilization at 105F
max 1 hr
Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
Cold Soak
6-36 Hours
6-36 Hr
3 Day Diurnal Test
QC Check
S 2021-09-23 10:26
E 11:26
S 11:27
E 12:45 12580
A: B: C:
PM
N2O
CVS Flow 9.3
ONT3 002226
JS
ETW: 3000
Dilute Modal
S 2021-09-23 12:52
E 2021-09-23 13:52
J.H.
S 2021-09-23 14:52
E 2021-09-23 20:52
J.H.
S 2021-09-23 20:52
E 2021-09-26 20:52
J.H.
E 2021-11-17
J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081	3081-139404		
VIN:	3KPC24A66ME139404			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Hyundai	Accent	FWD	2021
Test Group / Engine Size (L):	MHYXV01.6AB6	1.6L		
EVAP Family:	MHYZR0120ABG			
Standard Tire Size (front) / Pressure:	185/65R15	33		
Standard Tire Size (rear) / Pressure:	185/65R15	33		
Transmission / Shift File / Inertia Weight:	Auto	Auto	3000	
Target Coefficients A / B / C:	37.79	-0.2305	0.022439	
Warmup Coefficients A / B / C:	18.90	-0.0461	0.022439	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E10 Test 2			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	11.9
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	120
Canister volume (Liter)	2.1
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
4.76 of See Notes!
E10
101.6" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:

FTP-1	FTP-2	FTP-3	HWY	SC03	US06
9.3	9.3	9.3			

Emissions Test Data:

										Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐		1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/22/2021	**Time:**	19:34:12
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002226*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/22/2021*	CH_4 Response Factor	
Test Start	*19:34:12*	Odometer Position [mi]	*12544*
Start Time Cycle	*2021-09-22 19|40-25-(000)*	Delay Time Method	
Test End	*20:02:50*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYZR0120ABG* ✓	Engine Code	
Made Date	*2021*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Joseph Bishop		Speed Table	Date:	
Test Number	ONT3_002226	Driver	Joseph Bishop		Shift Table Auto	Cold Start	
Vehicle	3KPC24A66ME139404	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*19:34:12*
		A [lbf]	*13.300*		Fuel type GASOLINE	End Time	*20:02:50*
Model	ACCENT	B [lbf/mph]	*0.10900*		Density *0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*		NHV 17916	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*12544*	Remark	PRECON				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.45	Volume [scf]	2574
Zero Read	*0.00*							Press. [inHg]	28.93	D.F.	
Span Read	*0.00*							RH [%]	*39.06*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*7.807*	Ph. End [s]	505.9
Mass.	*0.000*							Dist. [mi]	*3.60*	Ph. Length [s]	505.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9128*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.90*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.04	Volume [scf]	4410
Zero Value	*0.00*							Press. [inHg]	28.94	D.F.	
Span Value	*0.00*							RH [%]	*40.45*	Ph. Start [s]	506.0
Sample	*0.00*							AH [g/kg]	*7.711*	Ph. End [s]	1377.3
Mass.	*0.000*							Dist. [mi]	*3.86*	Ph. Length [s]	871.4
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9102*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]		Volume [scf]	
Zero Value	*0*							Press. [inHg]		D.F.	
Span Value	*0.00*							RH [%]		Ph. Start [s]	
Sample	*0*							AH [g/kg]		Ph. End [s]	
Mass.	*0.000*							Dist. [mi]		Ph. Length [s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay [s]	
								Dr. Viola.		Vio. Durat. [s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]		Volume [scf]	
Zero Value	*0*							Press. [inHg]		D.F.	
Span Value	*0.00*							RH [%]		Ph. Start	
Sample	*0*							AH [g/kg]		Ph. End	
Mass.	*0.000*							Dist. [mi]		Ph. Length [s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay [s]	
								Dr. Viola.		Vio. Durat. [s]	
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.45*

Test Data: FTP72 Operator: Joseph Bishop Date: 9/22/2021
Test Number: ONT3_002226 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *PRECON*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.20
Driven	5788.41	6207.47			11995.88
Distance Rating (%)	0.1602	-0.0576			0.0474
Cycle Energy (MJ)					
Target	2.57	2.34			
Driven	2.58	2.35			
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34			
Driven	2.58	2.35			
Road Load Work Fraction					
Target	0.4716	0.3521			
Driven	0.4740	0.3587			
Inertial Work (MJ)					
Target	1.36	1.52			
Driven	1.36	1.51			
Inertial Work Fraction					
Target	0.5284	0.6479			
Driven	0.5260	0.6413			
Inertial Work Rating (%)	-0.0751	-0.6597			
Absolute Speed Change (m/s)					
Target	204.88	340.90			
Driven	204.86	338.93			
Absolute Speed Change Rating (%)	-0.0098	-0.5785			
Energy Rating (%)	0.3818	0.3645			0.3736
Energy Economy Rating (%)	0.2207	0.4206			0.3250

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002226

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.70	23.40	26.30	20.00	30.00	Passed
Barometer	(mbar)	979.79	979.60	979.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.82	9.50	10.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	54.65	53.09	56.80	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	43.91	42.05	45.45	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.66	48.85	49.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 1	(s)	505.80					NA
Crank Time Phase1	(s)	0.90			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.91	22.90	26.00	20.00	30.00	Passed
Barometer	(mbar)	979.93	979.80	980.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.64	9.10	10.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	53.98	52.01	56.58	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	43.99	43.75	44.35	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.69	48.85	49.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.86			3.78	3.94	Passed
Duration Phase 2	(s)	871.30					NA
Crank Time Phase1	(s)	0.9000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081_139404 ✓
Project	3081
Evap Family	MHYZR0120ABG ✓ J.H.
Ambient Temperature-Deg F	74
Barometric Pressure-In/Hg	28.95
Humidity-Grains/Lb	55.3 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	120 ✓
Canister Volume-Liters	2.1
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	20:11:20
Start date	09-22-2021
Bed Purges/Cycle	300
Purge End/Load Start	20:39:09
Test Time Minutes	749
HC Loaded-Grams	180.0 ✓
Scale Reading-Grams	-2.20
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	08:39:44
Finish date	09-23-2021
Disk File Name	21092301.ST3

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/23/2021	**Time:**	9:03:18
Test Legislation:	EPA1066		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST #2		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002227*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/23/2021*	CH_4 Response Factor	
Test Start	*9:03:18*	Odometer Position [mi]	*12551*
Start Time Cycle	*2021-09-23 09|16-04-(000)*	Delay Time Method	
Test End	*9:54:10*		
Operator	*Jason Link*	Air Condition	*OFF*
Driver	*Domenic Coppola*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST #2*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021* ✓	License Plate	
Tire Manufacturer		Trim Level	
Tire Model	J.H.	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓		
	A [lbf]	B [lbf/mph]	C [lbf/mph2]		
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓		
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓		

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Jason Link	Speed Table		Date:	
Test Number	ONT3_002227	Driver	Domenic Coppola	Shift Table Auto		Cold Start	

Vehicle	3KPC24A66ME139404	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*9:03:18*
		A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*9:54:10*
Model	ACCENT	B [lbf/mph]	*0.10900*	Density	*0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	17916	Soak Time	572.5
Displacement:				CWF	*0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*12551*	Remark	E10 TEST #2				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	77.28	Volume [scf]	2569
Zero Read	*0.00*							Press. [inHg]	28.91	D.F.	
Span Read	*0.00*							RH [%]	*37.03*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*7.612*	Ph. End [s]	505.6
Mass.	*0.000*							Dist. [mi]	*3.62*	Ph. Length [s]	505.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9075*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.30	Volume [scf]	4403
Zero Value	*0.00*							Press. [inHg]	28.91	D.F.	
Span Value	*0.00*							RH [%]	*38.26*	Ph. Start [s]	505.7
Sample	*0.00*							AH [g/kg]	*7.611*	Ph. End [s]	1375.9
Mass.	*0.000*							Dist. [mi]	*3.92*	Ph. Length [s]	870.3
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9075*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_X [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.72	Volume [scf]	2561
Zero Value	*0*							Press. [inHg]	28.91	D.F.	
Span Value	*0.00*							RH [%]	*39.04*	Ph. Start [s]	1946.1
Sample	*0*							AH [g/kg]	*7.621*	Ph. End [s]	2452.0
Mass.	*0.000*							Dist. [mi]	*3.62*	Ph. Length [s]	506.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9077*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.00*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_X [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.16*

Test Data: FTP75 Operator: Jason Link Date: 9/23/2021
Test Number: ONT3_002227 Driver: Domenic Coppola

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Jason Link	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E10 TEST #2*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.14	6210.96	5779.15		17769.25
Driven	5826.61	6311.51	5817.76		17955.88
Distance Rating (%)	0.8213	1.6189	0.6681		1.0503
Cycle Energy (MJ)					
Target	2.57	2.34	2.57		4.91
Driven	2.58	2.38	2.57		4.95
Distance per Energy Cycle (m/MJ)					
Target	2.57	2.34	2.57		2441.88
Driven	2.58	2.38	2.57		2449.30
Road Load Work Fraction					
Target	0.4716	0.3520	0.4716		0.4146
Driven	0.4702	0.3628	0.4702		0.4185
Inertial Work (MJ)					
Target	1.36	1.52	1.36		2.87
Driven	1.37	1.52	1.36		2.88
Inertial Work Fraction					
Target	0.5284	0.6480	0.5284		0.5854
Driven	0.5298	0.6372	0.5298		0.5815
Inertial Work Rating (%)	0.5390	0.1155	0.1344		0.2066
Absolute Speed Change (m/s)					
Target	204.88	340.92	204.87		545.79
Driven	205.60	340.12	204.96		545.35
Absolute Speed Change Rating (%)	0.3488	-0.2340	0.0410		-0.0811
Energy Rating (%)	0.2741	1.8088	-0.1274		0.6164
Energy Economy Rating (%)	-0.5458	0.1865	-0.7965		-0.3039

Operator	Jason Link	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002227

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	25.16	23.70	26.30	20.00	30.00	Passed
Barometer	(mbar)	979.05	978.90	979.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.45	9.10	9.80	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	53.28	51.75	54.81	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	43.69	39.55	51.25	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.47	48.55	49.75	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62			3.52	3.66	Passed
Duration Phase 1	(s)	505.50					NA
Crank Time Phase1	(s)	0.60			0	5	Passed
Crank Time Phase3	(s)	1.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	572.50			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jason Link	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.61	23.50	25.90	20.00	30.00	Passed
Barometer	(mbar)	979.06	979.00	979.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.44	9.00	9.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	53.28	51.54	54.95	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	43.69	41.75	45.65	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.67	48.55	49.75	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.92			3.78	3.94	Passed
Duration Phase 2	(s)	870.20					NA
Crank Time Phase1	(s)	0.6000			0	5	Passed
Crank Time Phase3	(s)	1.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)	572.50			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jason Link	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.29	23.20	25.60	20.00	30.00	Passed
Barometer	(mbar)	979.02	978.90	979.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.47	9.00	10.10	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	53.35	51.54	55.69	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	43.51	41.45	44.35	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.74	48.55	49.75	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62			3.52	3.66	Passed
Duration Phase 3	(s)	505.90					NA
Crank Time Phase1	(s)	0.6000			0	5	Passed
Crank Time Phase3	(s)	1.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	572.50			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/23/2021	**Time:**	11:27:43
Test Legislation:	EPA1066		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST #2		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/17/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002228*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/23/2021*	CH_4 Response Factor	
Test Start	*11:27:43*	Odometer Position [mi]	*12562*
Start Time Cycle	*2021-09-23 11|33-39-(000)*	Delay Time Method	
Test End	*12:45:00*		
Operator	*Jason Link*	Air Condition	*OFF*
Driver	*Domenic Coppola*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST #2*		

Vehicle Data *3081-139404* ✓

Manufacturer	*ACCENT*	Displacement	
Vehicle Model	*3KPC24A66ME139404* ✓	Engine Family	*MHYXV01.6AB6* ✓
Order Number	*3081*	Manufacturer	*HYUNDAI*
Test Group	*3081-139404*	Transmission	*Automatic*
Evaporative Family	*MHYXR0120ABG* ✓	Engine Code	
Made Date	*2021* ✓	License Plate	
Tire Manufacturer	X	Trim Level	
Tire Model	J.H.	Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*MHYXV01.6AB6*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*3000.00* ✓
Street Load	*37.791* ✓	*-0.23049* ✓	*0.022439* ✓
Road Load	*13.300* ✓	*0.10900* ✓	*0.018500* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Jason Link	Speed Table	Date:
Test Number	ONT3_002228	Driver	Domenic Coppola	Shift Table Auto	Cold Start

Vehicle		**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***3KPC24A66ME139404***	Inertia [lb]	*3000.00*		E10	Start Time	*11:27:43*
		A [lbf]	*13.300*	Fuel type	GASOLINE	End Time	*12:45:00*
Model	ACCENT	B [lbf/mph]	*0.10900*	Density	*0.7453*		
Year	*2021*	C [lbf/mph2]	*0.018500*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	MHYXV01.6AB6						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*12562*	Remark	E10 TEST #2				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	102.96	Volume[scf]	7512
Zero Read	*0.00*							Press.[inHg]	28.89	D.F.	
Span Read	*0.00*							RH[%]	*17.91*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.249*	Ph. End[s]	1489.6
Mass.	*0.000*							Dist.[mi]	*7.55*	Ph. Length[s]	1489.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9251*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	102.89	Volume[scf]	6647
Zero Value	*0.00*							Press.[inHg]	28.89	D.F.	
Span Value	*0.00*							RH[%]	*17.62*	Ph. Start[s]	1489.7
Sample	*0.00*							AH[g/kg]	*8.102*	Ph. End[s]	2811.6
Mass.	*0.000*							Dist.[mi]	*2.39*	Ph. Length[s]	1322.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9210*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	100.98	Volume[scf]	7473
Zero Value	*0*							Press.[inHg]	28.88	D.F.	
Span Value	*0.00*							RH[%]	*18.16*	Ph. Start[s]	2811.7
Sample	*0*							AH[g/kg]	*7.885*	Ph. End[s]	4300.6
Mass.	*0.000*							Dist.[mi]	*7.45*	Ph. Length[s]	1489.0
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9149*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *17.39*

Test Data: ORVR_Prep Operator: Jason Link Date: 9/23/2021
Test Number: ONT3_002228 Driver: Domenic Coppola

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Jason Link	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E10 TEST #2*

VIN 3KPC24A66ME139404

DYNO Data

	Road Load	Street Load
Inertia [lb]	*3000.00*	
A [N]	*59.161*	*168.103*
B [N/km/h]	*0.30128*	*-0.63707*
C [N/km2/h2]	*0.031773*	*0.038538*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	11990.13	3792.75	11990.13		27773.01
Driven	12146.08	3850.39	11982.01		27978.48
Distance Rating (%)	1.3006	1.5199	-0.0677		0.7398
Cycle Energy (MJ)					
Target	4.91	1.97	4.91		6.88
Driven	5.02	1.93	4.93		6.90
Distance per Energy Cycle (m/MJ)					
Target	4.91	1.97	4.91		2295.34
Driven	5.02	1.93	4.93		2305.05
Road Load Work Fraction					
Target	0.4146	0.1955	0.4146		0.3520
Driven	0.4170	0.1973	0.4098		0.3527
Inertial Work (MJ)					
Target	2.87	1.58	2.87		4.46
Driven	2.93	1.55	2.91		4.47
Inertial Work Fraction					
Target	0.5854	0.8045	0.5854		0.6480
Driven	0.5830	0.8027	0.5902		0.6473
Inertial Work Rating (%)	1.8348	-2.1157	1.2831		0.2299
Absolute Speed Change (m/s)					
Target	545.80	469.54	545.80		1015.33
Driven	550.30	454.52	548.81		1003.97
Absolute Speed Change Rating (%)	0.8258	-3.1984	0.5519		-1.1191
Energy Rating (%)	2.2495	-1.8954	0.4617		0.8134
Energy Economy Rating (%)	0.9280	-3.4813	0.5270		-0.4232

Operator	Jason Link	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002228

Vehicle ID: 3KPC24A66ME139404

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.42	37.90	40.40	37.78	43.33	Passed
Barometer	(mbar)	978.42	978.20	978.50	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.61	9.90	10.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	57.74	54.89	58.98	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	46.26	43.35	48.15	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.77	48.55	48.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.55			7.30	7.60	Passed
Duration Phase 1	(s)	1489.50					NA
Crank Time Phase1	(s)	0.60			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jason Link	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.38	37.80	40.20	37.78	43.33	Passed
Barometer	(mbar)	978.26	978.20	978.30	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.33	9.70	10.80	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	56.71	53.95	58.35	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	46.96	46.25	48.75	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.72	48.55	48.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.39			2.31	2.40	Passed
Duration Phase 2	(s)	1321.90					NA
Crank Time Phase1	(s)	0.6000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jason Link	Driver	Domenic Coppola	Customer :	3081
Test Purpose:	Preconditioning	Legislatior	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	38.32	37.80	40.00	37.78	43.33	Passed
Barometer	(mbar)	978.06	977.80	978.20	800.00	1100.00	Passed
Dew Point Temperature	(°C)	9.93	9.30	10.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	55.19	52.78	56.79	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	48.06	46.85	50.95	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.66	48.55	48.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.45			7.30	7.60	Passed
Duration Phase 3	(s)	1488.90					NA
Crank Time Phase1	(s)	0.6000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_002228

ATDS Vehicle ID	3081-139404	*VIN*	3KPC24A66ME139404
Model Year	2021	*Make/Model*	Hyundai Accent
Test Group	MHYXV01.6AB6	*Engine Size*	1.6L
Evaporative Family	MHYZR0120ABG	*Canister Capacity*	120 g
Odometer	12580	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, September 23, 2021	*Profile*	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **9/23/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	12:45:00	0:00:00	0:00:00	
Engine Key-off	12:51:00	0:06:00	0:06:00	
SHED Door Sealed	12:52:00	0:01:00	0:07:00	
Final Sample	13:52:00	1:00:00	1:07:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 3.717 ppm	Volume = 1798.5 ft3	Temp. = 102.6 °F	Baro. = 28.9 in/Hg	Mass HC=0.137 grams
Post Read Zero = 0 ppm	Post Read Span = 9.267 ppm			Mass EtOH= 0.001 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.558 ppm	Volume = 1799.8 ft3	Temp. = 104.9 °F	Baro. = 28.87 in/Hg	Mass HC =0.145 grams
Post Read Zero = 0.007 ppm	Post Read Span = 9.539 ppm			Mass EtOH = 0.022 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 103 °F	Minimum = 102 °F			
Max Ambient Temp = 106.7 °F	Maximum = 108 °F			
Min Interior Temp = 103 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.008±0.01 grams**
				Diurnal Mass EtOH = 0.021 grams
				Diurnal Total Mass HC plus EtOH = 0.01325 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)		Total Soak Time	
Start Cold Soak	Thursday, September 23, 2021	14:52:00		0:00:00	
End Cold Soak	Thursday, September 23, 2021	20:52:00		6:00:00	
Test Temperatures	**Allowable Limit**				
Min. Ambient Temp = 63.3 °F	Minimum = 62 °F				
Max. Ambient Temp = 65.5 °F	Maximum = 68 °F				
Min. Internal Temp = 63.3 °F	Minimum = 40 °F				

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12580	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 23, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Thursday, September 23, 2021	20:52:00	0:00:00	
Start Time Diurnal	Thursday, September 23, 2021	20:52:00	0:00:00	
End Time Diurnal	Friday, September 24, 2021	20:52:00	24:00:00	
24 Hour Sample	Friday, September 24, 2021	20:52:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 5.886 ppm	Volume = 1683.4 ft3	Temp. = 65.1 °F	Baro. = 28.93 in/Hg	Mass HC =0.162 grams
Post Read Zero = 0 ppm	Post Read Span = 9.547 ppm			Mass EtOH= 0.031 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 12.769 ppm	Volume = 1681.2 ft3	Temp. = 64.9 °F	Baro. = 28.93 in/Hg	Mass HC=0.345 grams
Post Read Zero = -0.014 ppm	Post Read Span = 93.29 ppm			Mass EtOH= 0.168 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.6 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.2 °F	± 2 °F			
Max. Δ Profile Sidewall = 1.1 °F	± 5 °F			
Min Water Temperature 64.66 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.183±0.01 grams**
				Diurnal Mass EtOH = 0.137 grams
				Diurnal Total Mass HC plus EtOH = 0.217 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12580	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 23, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)		Total Soak Time	
End 24 hour Diurnal	Friday, September 24, 2021	20:52:00		24:00:00	
Start Time Diurnal	Friday, September 24, 2021	20:52:00		24:00:00	
End Time Diurnal	Saturday, September 25, 2021	20:52:00		48:00:00	
48 Hour Sample	Saturday, September 25, 2021	20:52:00		48:00:00	
Initial					
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm			
Read = 12.769 ppm	Volume = 1681.2 ft3	Temp. = 64.9 °F		Baro. = 28.93 in/Hg	Mass HC=0.345 grams
Post Read Zero = 0 ppm	Post Read Span = 93.29 ppm				Mass EtOH= 0.168 grams
Final					
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm			
Read = 18.772 ppm	Volume = 1679.2 ft3	Temp. = 65 °F		Baro. = 28.96 in/Hg	Mass HC=0.518 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.284 ppm				Mass EtOH= 0.296 grams
Temperatures	**Allowable Limit**				
Max. Δ Profile Underbody = 2.2 °F	± 3 °F				
Avg. Δ Profile Underbody = 1.2 °F	± 2 °F				
Max. Δ Profile Sidewall = 0.7 °F	± 5 °F				
Min Water Temperature 64.7 °F	Minimum = 40 °F				**Diurnal Mass HC = 0.173±0.01 grams**
					Diurnal Mass EtOH = 0.128 grams
					Diurnal Total Mass HC plus EtOH = 0.205 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-139404	***VIN***	3KPC24A66ME139404
Model Year	2021	***Make/Model***	Hyundai Accent
Test Group	MHYXV01.6AB6	***Engine Size***	1.6L
Evaporative Family	MHYZR0120ABG	***Capacity***	120 g
Odometer	12580	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 23, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Saturday, September 25, 2021	20:52:00	48:00:00	
Start Time Diurnal	Saturday, September 25, 2021	20:52:00	48:00:00	
End Time Diurnal	Sunday, September 26, 2021	20:52:00	72:00:00	
72 Hour Sample	Sunday, September 26, 2021	20:52:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 18.772 ppm	Volume = 1679.2 ft3	Temp. = 65.03 °F	Baro. = 28.96 in/Hg	Mass HC=0.518 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.284 ppm			Mass EtOH= 0.296 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 24.472 ppm	Volume = 1678.1 ft3	Temp. = 64.9 °F	Baro. = 29.04 in/Hg	Mass HC=0.677 grams
Post Read Zero = -0.017 ppm	Post Read Span = 93.282 ppm			Mass EtOH= 0.422 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.2 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.2 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.9 °F	± 5 °F			
Min Water Temperature 64.7 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.159±0.01 grams**
				Diurnal Mass EtOH = 0.126 grams
				Diurnal Total Mass HC plus EtOH = 0.191 grams

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/17/2021

COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: 0.23 grams {hot soak + highest 24 hour mass}

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Automotive Testing and Development Services, Inc.

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Emissions
- *FTP Protocol*
- *SFTP Protocol*
- *Euro Protocols*
- *Asia Protocols*
- *Evaporative Emissions*
- *NMOG Determination*
- *Electric Vehicle Range*

Hydrocarbon Speciation
- *New Vehicle Certification*
- *In-Use Verification*
- *Gasoline*
- *Diesel*

Durability
- *Passenger Cars*
- *Light-Duty*
- *Medium-Duty*
- *Heavy-Duty*
- *Highway Motorcycles*
- *Non-road Motorcycles*
- *Non-road UTV/ATV*
- *Component*
- *On-road (Public Roads)*
- *Proving Grounds*
- *Temporary Test Sites*
- *OBD System Download*
- *Custom Data Logging*

Engineering
- *SAE Coast-Downs*
- *SAE Fuel Economy*
- *SAE OBD Compliance*
- *CFR Testing and Procedures*
- *CCR Testing and Procedures*
- *SAE J2807 Trailer Tow Rating*

Procurement
- *OEM In-Use*
- *Agency In-Use*
- *Component Collection*
- *Data Collection*
- *Usage Surveys*

Staffing
- *Drivers*
- *Mechanics*
- *Data Technicians*
- *Maintenance*
- *Administrative*
- *Lab Technicians*

January 28, 2022

Chris Bliley
Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

Kelly Davis
Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

Final Report on Evaporative Emissions Test Procedure Performed for Growth Energy and the Renewable Fuels Association.

Dear Chris Bliley and Kelly Davis,

Automotive Testing and Development Services, Inc. (ATDS) is pleased to provide this final report for the evaporative emissions testing conducted on vehicles for Renewable Fuels Association. This testing was conducted in strict accordance with 40 CFR 86 and California Title 13. ATDS' QA representatives have subjected all tests to a rigorous quality audit.

Sincerely,

Jose Haro
Test Engineer

Approved by:

Linwood E Farmer Jr.

Linwood Farmer
Vice President

Evaporative Emissions Testing

Project Number: 3081 - 265672

CONDUCTED FOR:

Growth Energy
701 8th Street NW, Suite 450
Washington, DC 20001

&

Renewable Fuels Association
6024 Manchester Rd. Suite 101
Ellisville, MO 63011

REPORT PREPARED BY:

Jose Haro, Test Engineer
Automotive Testing and Development Services, Inc.
400 South Etiwanda Avenue
Ontario, California 91761

Automotive Testing and Development Services, Inc. submitted this Report in fulfillment of Project 3081 - 265672 Evaporative Emissions Test Procedure. In ATDS' professional opinion this testing was conducted in a valid manner according to the listed methodology.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
PROJECT OVERVIEW 4
TEST VEHICLE INFORMATION 4
TEST SEQUENCE AND CHRONOLOGY 4
TEST PARAMETERS 6
E10 SHED TEST # 1 RESULTS 6
E10 SHED TEST # 2 RESULTS 6
E15 SHED TEST # 1 RESULTS 7
E15 SHED TEST # 2 RESULTS 7
RESULTS SUMMARY 8
DATA REVIEW AND CONCLUSION 9
APPENDIX 10

PROJECT OVERVIEW

This testing was conducted on behalf of Growth Energy and the Renewable Fuels Association. The project consisted of the 3-day evaporative emissions test sequence performed with two different fuels. Work commenced on April 30th, 2021 and was completed on September 6th, 2021.

TEST VEHICLE INFORMATION

The following vehicle was used for this project:

ATDS Vehicle ID:	3081-265672
VIN:	1C4RJEBG3LC265672
MY/Make/Model:	2020 Jeep Grand Cherokee
Test Group:	LCRXT03.65P5
Evaporative Family:	LCRXR0204RP0
Tires:	265/60R18
Odometer:	23,419 miles

TEST SEQUENCE AND CHRONOLOGY

The following test sequence and chronology were used in this program:

4/30/2021
- Vehicle check in

5/1/2021
- Flushed windshield washer fluid system and fluid bottle removed
- Leak test of fuel and EVAP system

5/1/2021
- AC refrigerant drained by dealer

6/2/2021
- Canister Purge
- Fuel changed to E15
- FTP-72 (X4)

6/2/2021 – 6/25/2021
- 21-day soak

6/30/2021
- Tire rotation completed

6/30/2021
- Performed road load derivation (Test ID: ONT52677)
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_001884)
- Canister loading (21070101.ST3)

7/1/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_001886)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_001887)

7/1/2021 – 7/4/2021

- 3-Day Diurnal evaporative emissions test run. E15 Test #1.

7/8/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT52735)
- Canister loading (21070901.ST3)

7/9/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT52738)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT52739)

7/9/2021 – 7/12/2021
- 3-Day Diurnal evaporative emissions test run (E15 Test #2)

7/16/2021
- Canister Purge
- Fuel changed to E-10

7/18/2021
- FTP-74 (X4)

7/18/2021 – 8/17/2021
- 21-day soak

8/18/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_002030)
- Canister loading (21081901.ST2)

8/19/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_002040)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_002041)

8/19/2021 – 8/22/2021
- 3-Day Diurnal evaporative emissions test run (E10 Test #1)

9/1/2021
- Performed FTP-72 preconditioning cycle (Test ID: ONT3_002100)
- Canister loading (21090201.ST3)

9/2/2021
- Conducted FTP-75 shed test preconditioning (Test ID: ONT3_002105)
- ORVR preconditioning cycle for 3-day shed test (Test ID: ONT3_002106)

9/2/2021 – 9/6/2021
- 3-Day Diurnal evaporative emissions test run (E10 Test #2)

TEST PARAMETERS

ETW (lb)	A (ft-lb) track/set	B (ft-lb/mph) track/set	C (ft-lb/mph^2) track/set
5,250	59.300 / 35.110	-0.26750 / -0.26370	0.035140 / 0.033800

E10 SHED TEST # 1 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.066	0.023	0.07175
0-24 Hour Diurnal	0.612	0.184	0.658
24-48 Hour Diurnal	0.547	0.142	0.583
48-72 Hour Diurnal	0.563	0.124	0.594
		Final HC + EtOH Result:	0.73 grams

E10 SHED TEST # 2 RESULTS

	Diurnal Mass HC (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.078	0.015	0.08175
0-24 Hour Diurnal	0.761	0.197	0.81
24-48 Hour Diurnal	0.503	0.156	0.542
48-72 Hour Diurnal	0.51	0.126	0.542
		Final HC + EtOH Result:	0.892 grams

E15 SHED TEST # 1 RESULTS

	Diurnal Mass (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.055	0.021	0.06025
0-24 Hour Diurnal	0.472	0.174	0.516
24-48 Hour Diurnal	0.409	0.131	0.442
48-72 Hour Diurnal	0.453	0.061	0.468
		Final HC + EtOH Result:	0.576 grams

E15 SHED TEST # 2 RESULTS

	Diurnal Mass (g)	Diurnal Mass EtOH (g)	Diurnal Total Mass HC + EtOH (g)
0-1 Hour Hot Soak	0.078	0.023	0.08375
0-24 Hour Diurnal	0.516	0.173	0.559
24-48 Hour Diurnal	0.46	0.133	0.493
48-72 Hour Diurnal	0.506	0.127	0.538
		Final HC + EtOH Result:	0.643 grams

RESULTS SUMMARY

	E-10 Test 1	E-10 Test 2	E10 Average	E-15 Test 1	E-15 Test 2	E15 Average
Start	8/19/2021	9/2/2021		7/1/2021	7/9/2021	
End	8/22/2021	9/6/2021		7/4/2021	7/12/2021	
Hot Soak HC	0.07	0.08	0.072	0.055	0.078	0.0665
Hot Soak EtOH	0.023	0.015	0.019	0.021	0.023	0.022
Day 1 HC	0.612	0.761	0.687	0.472	0.516	0.494
Day 1 EtOH	0.184	0.197	0.191	0.174	0.173	0.1735
Day 2 HC	0.547	0.503	0.525	0.409	0.46	0.4345
Day 2 EtOH	0.142	0.156	0.149	0.131	0.133	0.132
Day 3 HC	0.563	0.51	0.537	0.453	0.506	0.4795
Day 3 EtOH	0.124	0.126	0.125	0.061	0.127	0.094
Final Total HC plus EtOH	0.730	0.892	0.811	0.576	0.643	0.6095
EtOH Multiplier	1.08	1.06	1.07	1.09	1.08	1.085

Total test results are obtained by adding the hot soak result with the highest value from each of the three day diurnals.

All tests were conducted in strict accordance with the provisions of 40 CFR 86 and/or California Title 13 and have been reviewed by ATDS' in-house Quality Auditor. Detailed test results are in the Appendix attached to this report.

DATA REVIEW AND CONCLUSION

Based upon ATDS' review of the test data above, the vehicle tested (2020 Jeep Grand Cherokee) has successfully completed emissions testing.

It has been a pleasure working with Growth Energy and the Renewable Fuels Association on this project and we look forward to future efforts.

Sincerely,

Jose Haro
Test Engineer

APPENDIX

Report for Growth Energy and the Renewable Fuels Association

Performed on a

2020 Jeep Grand Cherokee [3081-265672]

APPENDIX A
Vehicle Check In

APPENDIX B
Test Check Sheet

APPENDIX A

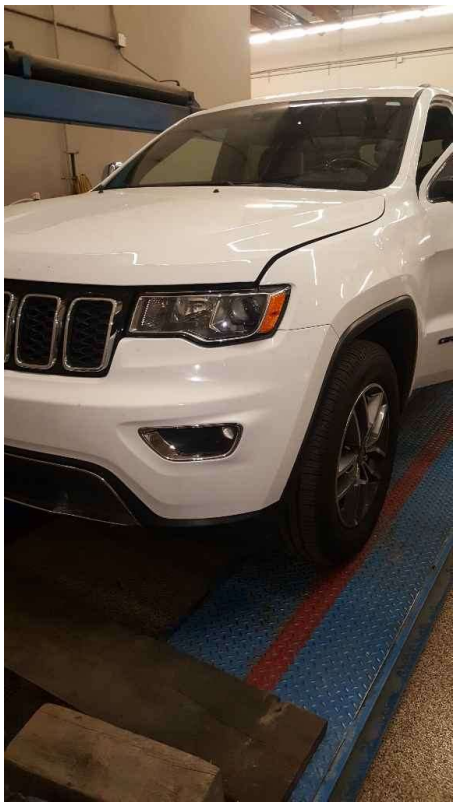
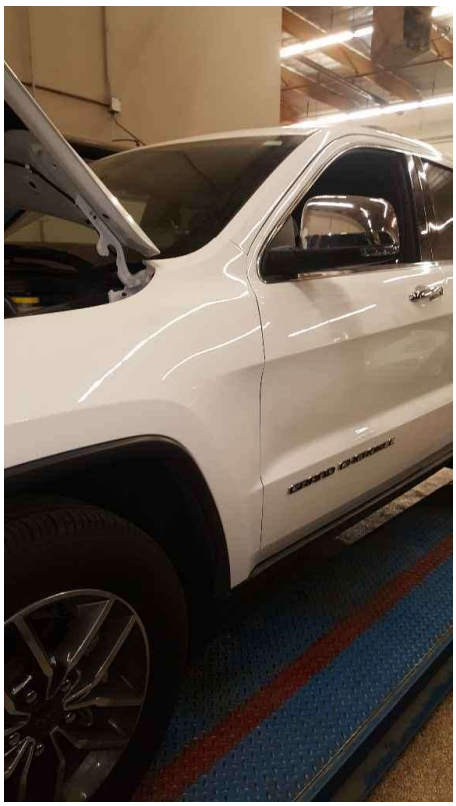
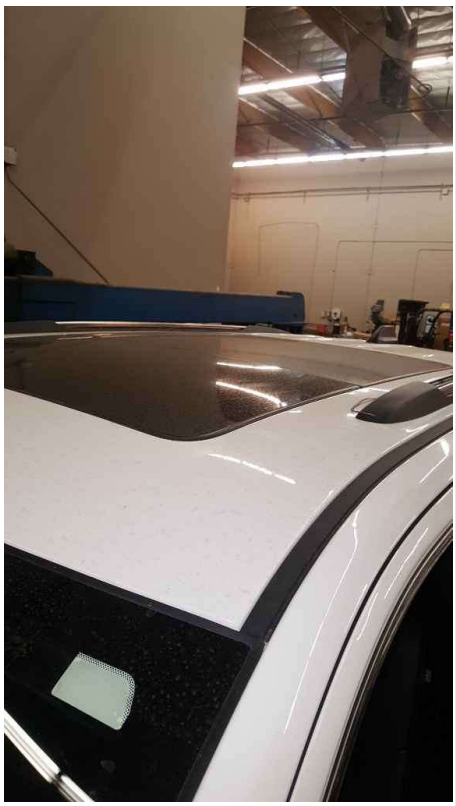
Vehicle Check In

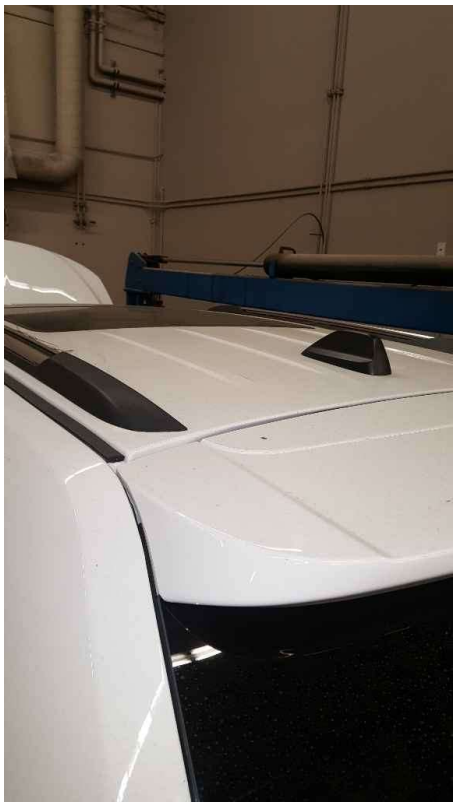
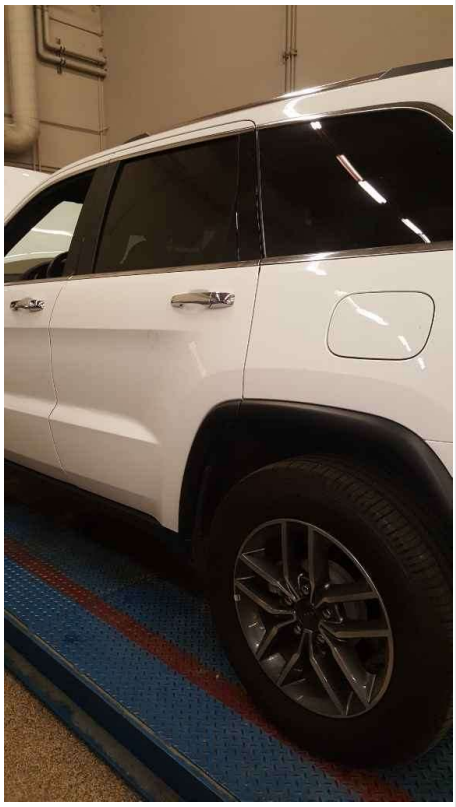
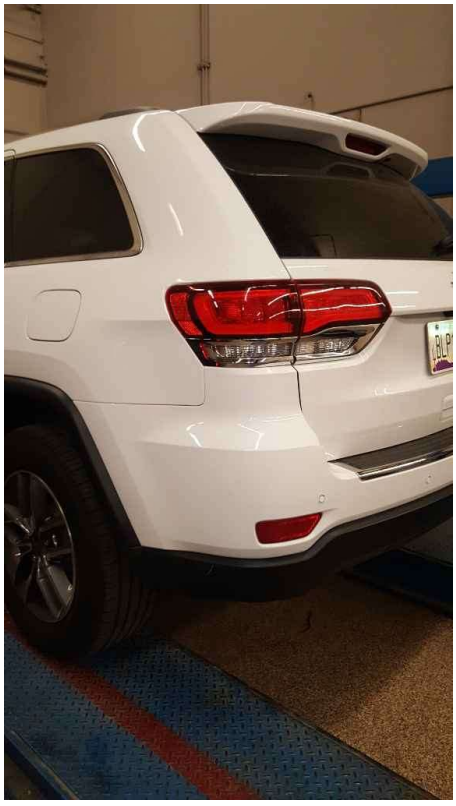
Project Information

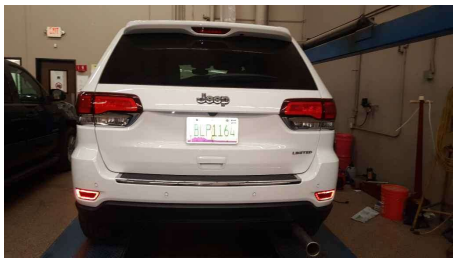
Project ID	3081
ATDS Vehicle Number (-01, …)	265672
Project Name	RFA E15 Evap Testing
Date	04-28-2021
Vehicle Manufacturer	Jeep
Vehicle Model	Grand Cherokee
Model Year	2020
Body Style (Sedan, SUV, Hatchback, etc..)	SUV
VIN	1C4RJEBG3LC265672
Odometer	23419
Engine Family	LCRXT03.65P5
Evaporative Family	LCRXR0204RP0
GVWR (Trucks/Leave Blank)	6500

Vehicle Body Photos

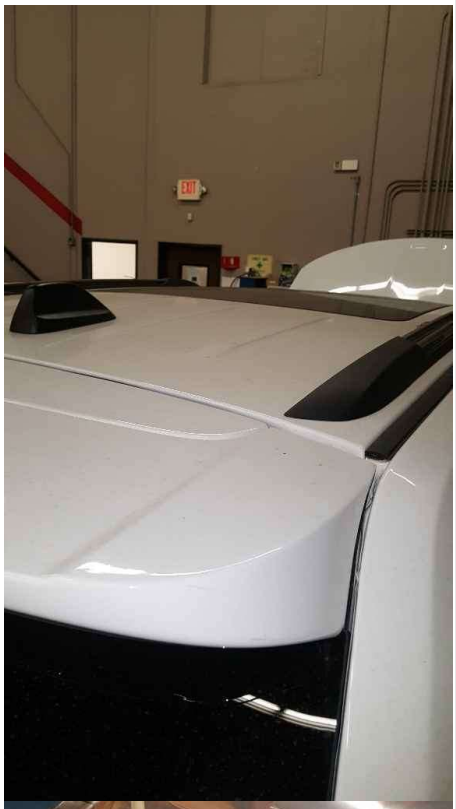
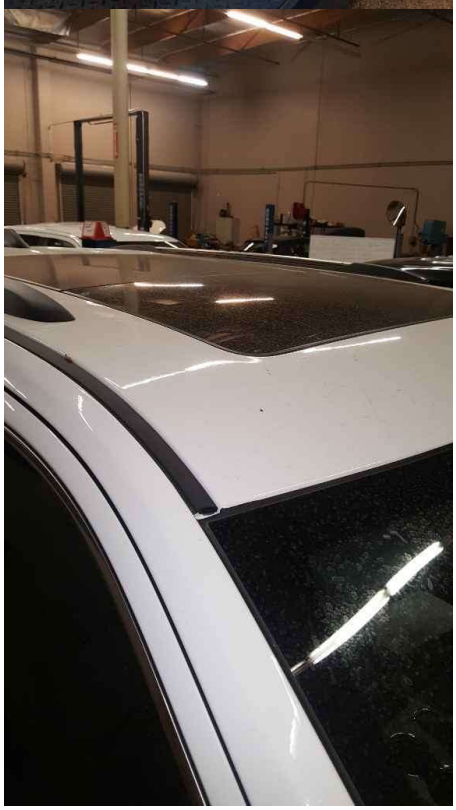
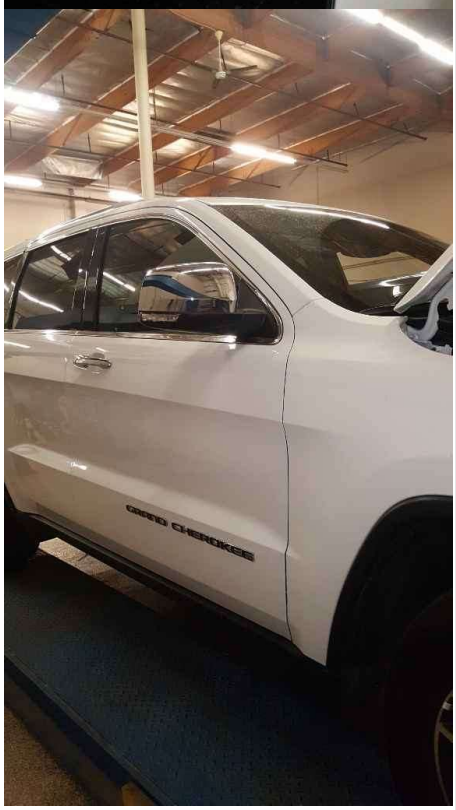
Front (Photo)	

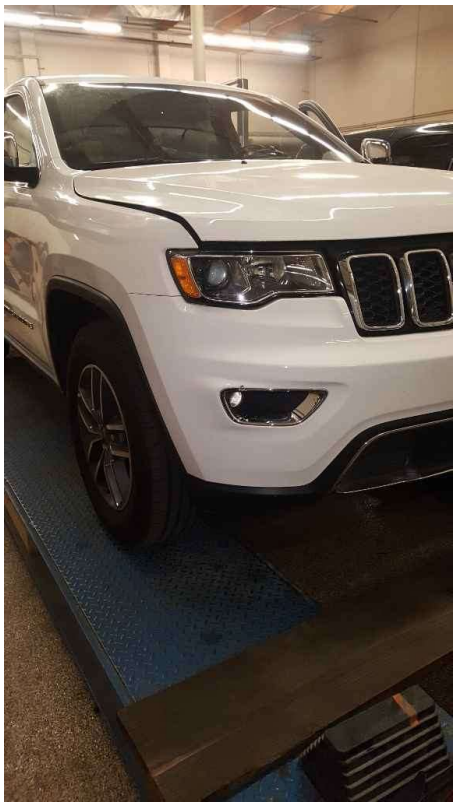
Driver Side Corner (Photo)	
Driver Side (Photo)	 

	 
Rear Side Corner -Driver Side (Photo)	

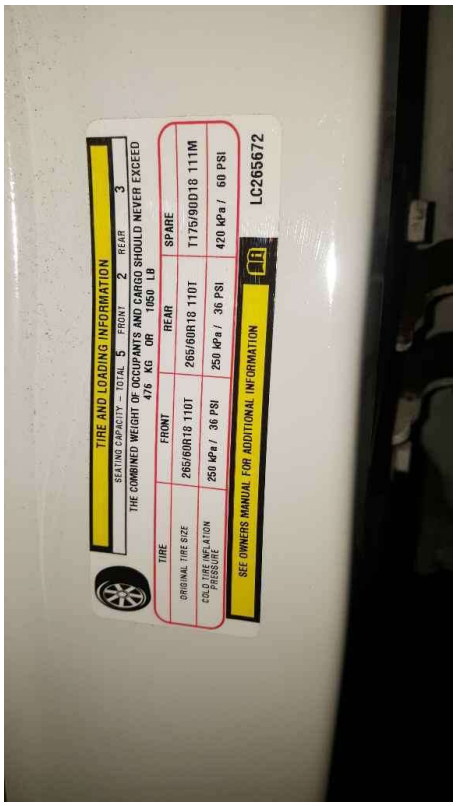
Rear (Photo)	
Rear Side Corner - Passenger Side (Photo)	

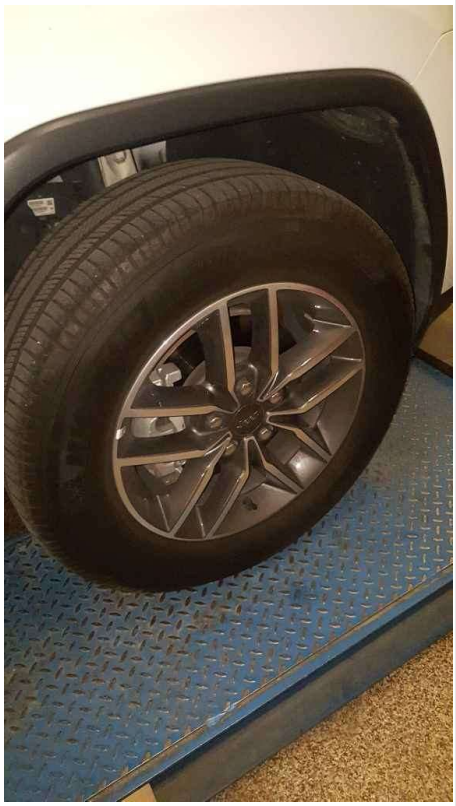
Passenger Side (Photo)

Passenger Side Corner (Photo)	

Tires and Wheels

Tire Label from Door (Photo)	
ACTUAL Tire Size	265/60R18
Tire Condition (Photos)	

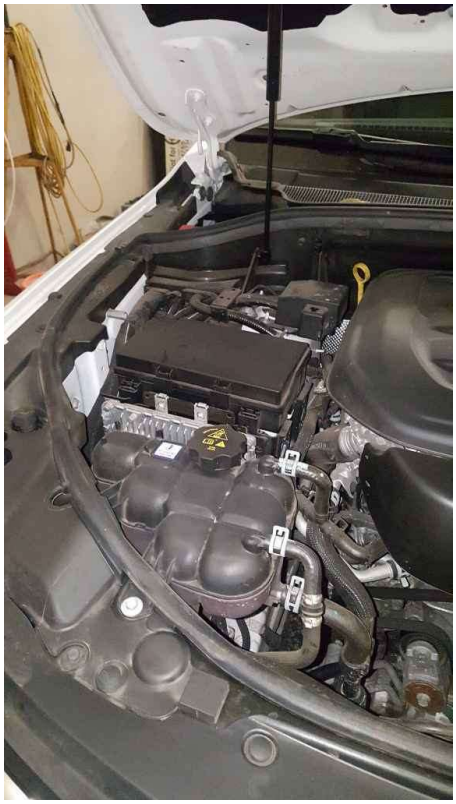
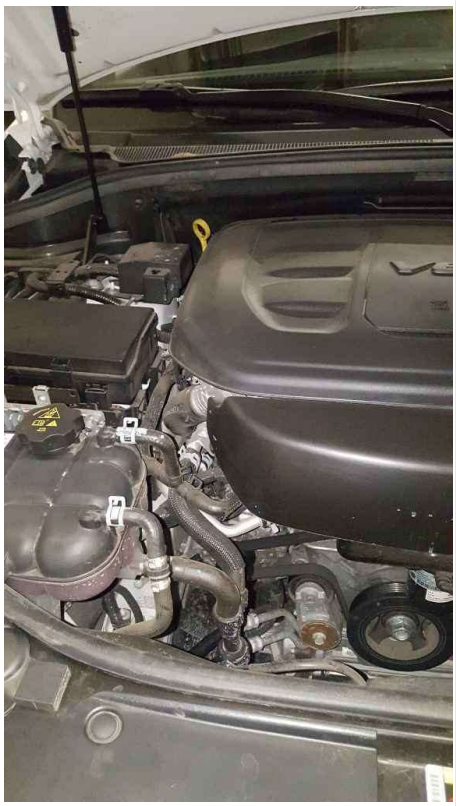
	
Tire Condition	Good
Drive Wheel	Rear
Brakes?	>2mm (Usable)

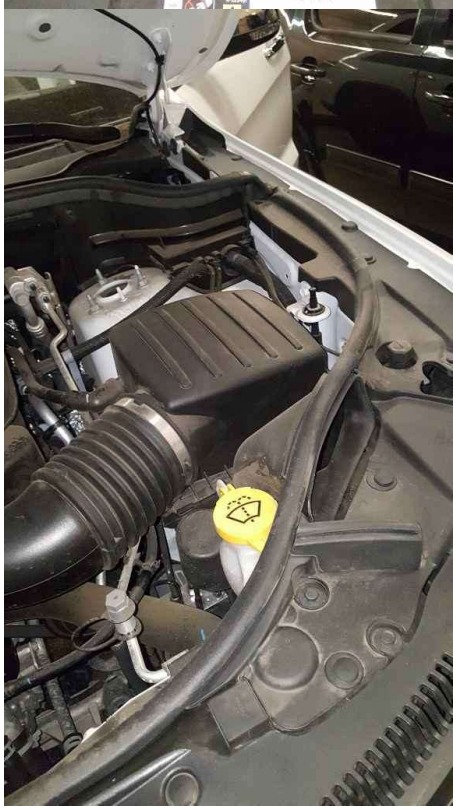
Odometer and VIN

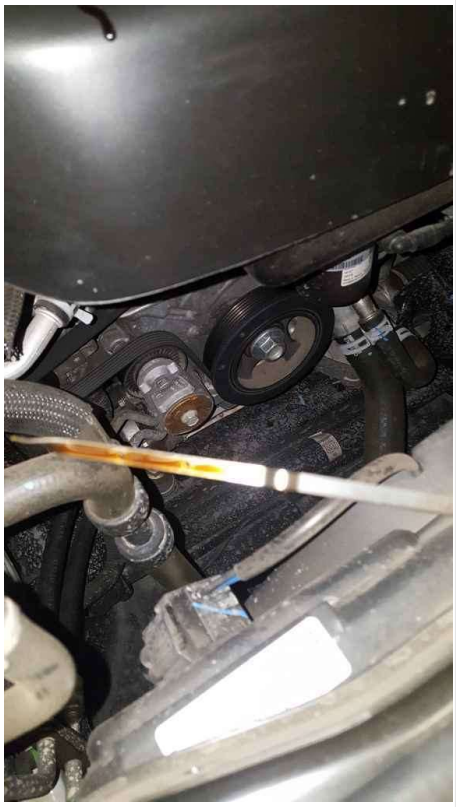
License Plate Number	BLP1164
VIN	1C4RJEBG3LC265672
VIN Plate from Windshield (Photo)	

Vehicle Information Sticker from Door (Photo)	
Odometer (Photo)	
Odometer	23419

Engine and Emissions

VECI (Photo)	
Engine Bay (Photo)	 

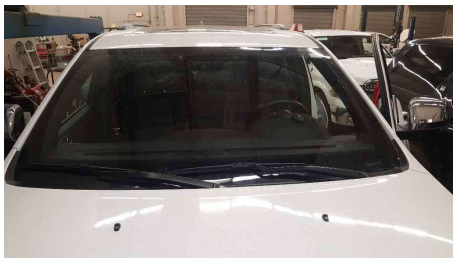
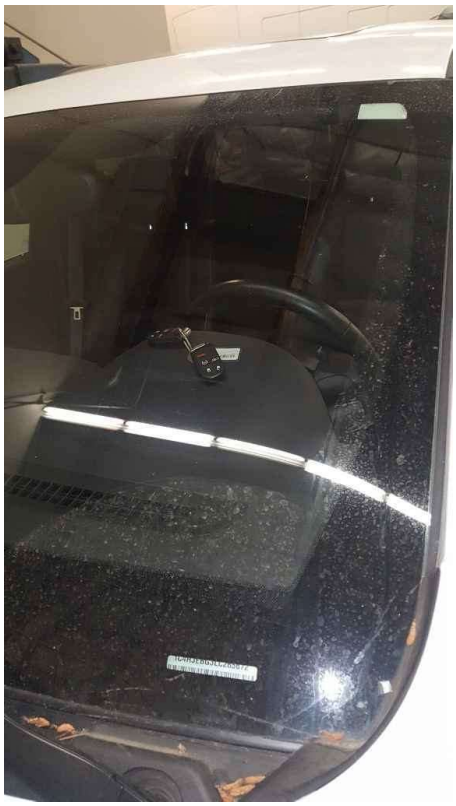


	
Engine Family	LCRXT03.65P5

Evaporative Family	LCRXR0204RP0
Engine Oil Level	Good
Coolant Level	Good
Transmission Fluid Level	No Dipstick
Transmission Type	Automatic
Belts and Hoses	Good
VECI Label Status	Both
Noise Leaks on Exhaust?	No
Visual Leaks on Exhaust?	No
Transmission Fluid Condition	No Dipstick

Windshield and Headlights

Windshield Wiper Fluid?	Yes
Do the windshield wipers work?	Yes
Any windshield cracks?	No

Windshield Photos	 
Do the headlights work?	Yes

Are the headlights damaged?	No
Headlight Photos	
Do the tail lights work?	Yes
Are the tail lights damaged?	No
Tail Light Photos	

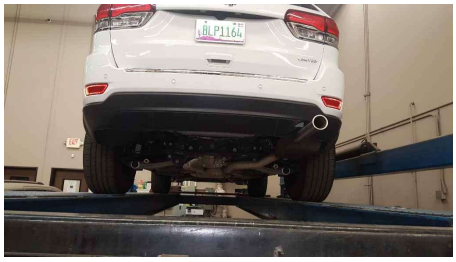
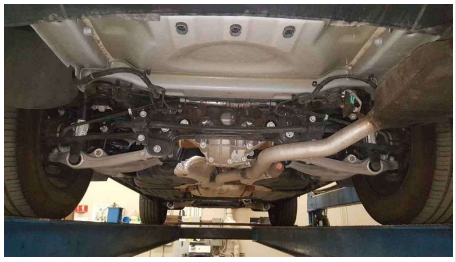
OBD

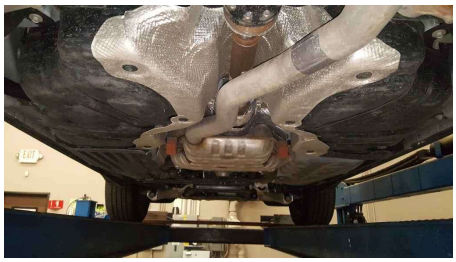
OBD Status Monitors Set	Yes
Mode 3 DTCs?	No
Mode 7 DTCs?	No

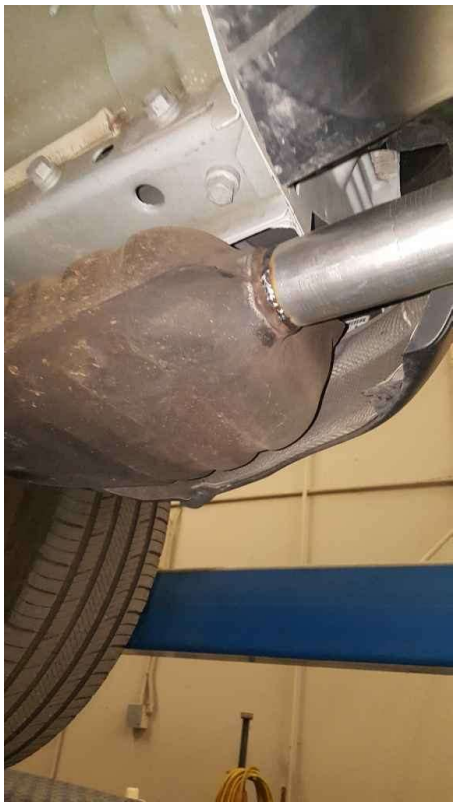
ABS/Traction Control

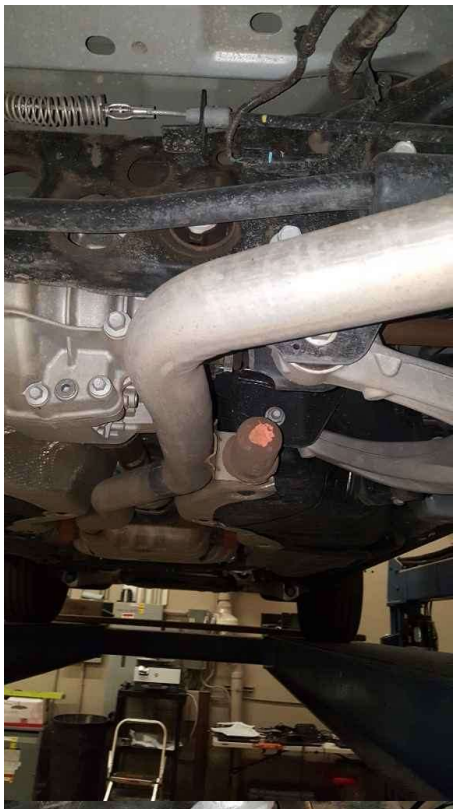
ABS?	Yes
Traction Control?	Yes

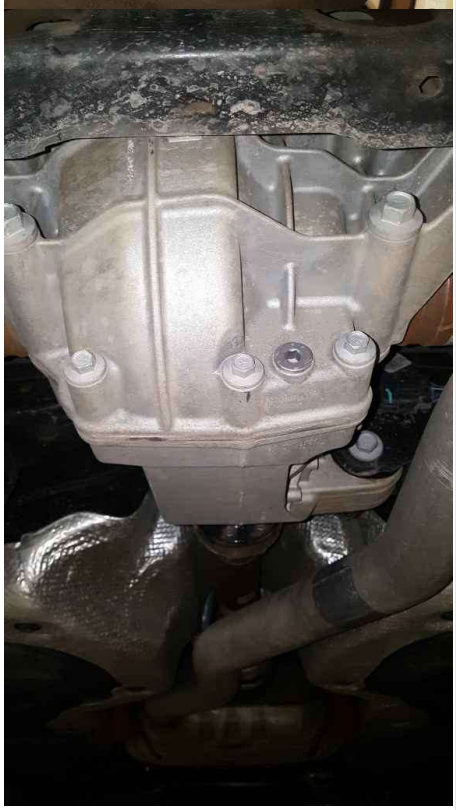
Underbody

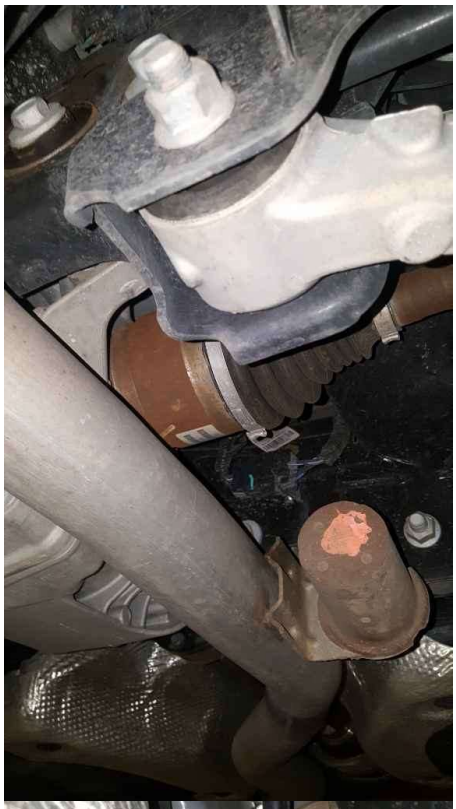
Underbody (Photos)	 

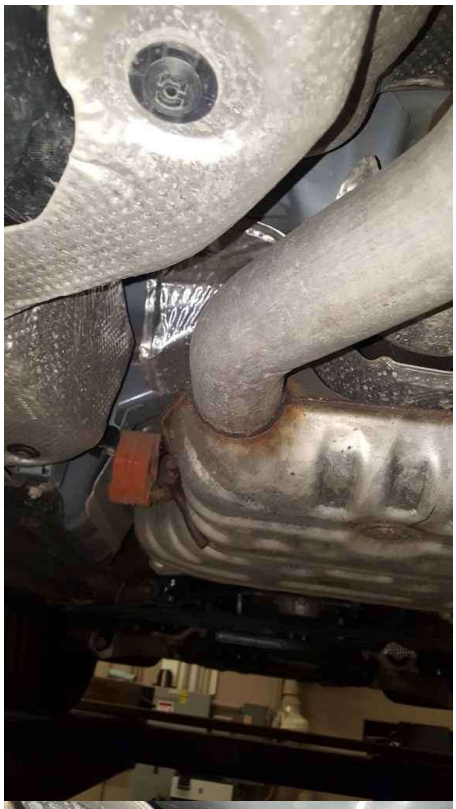


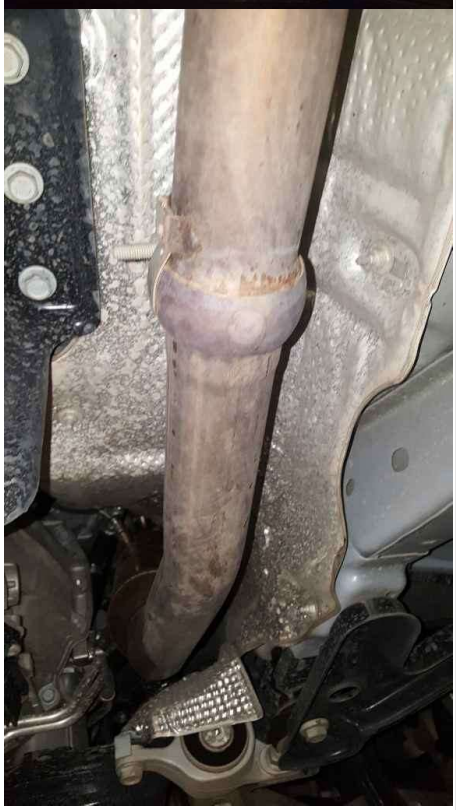


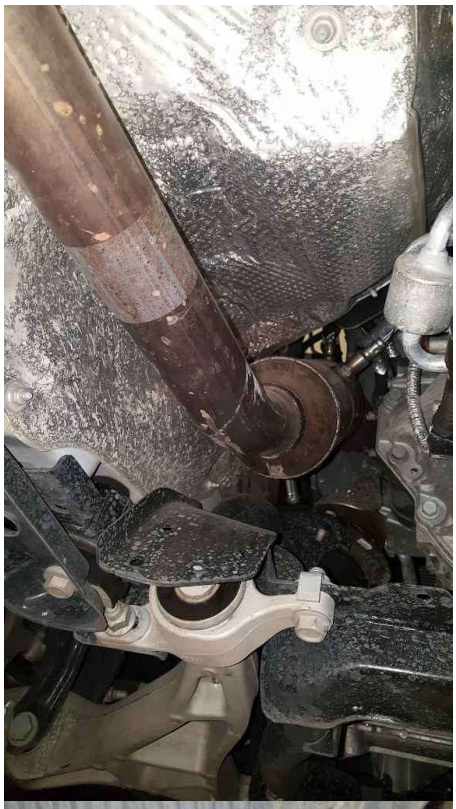


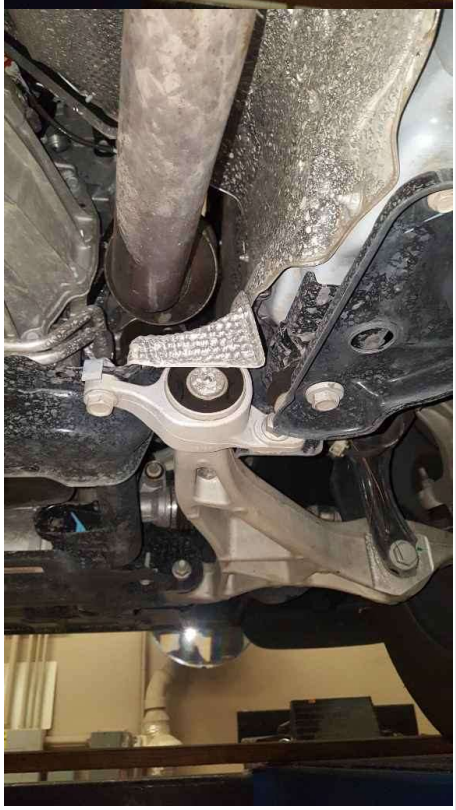


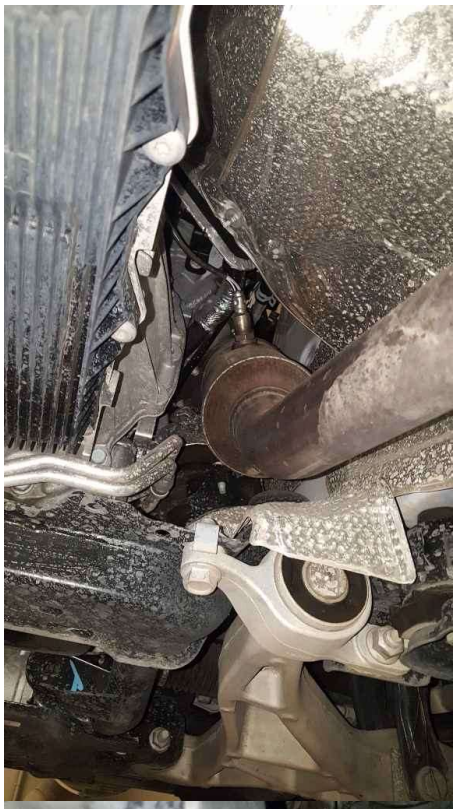


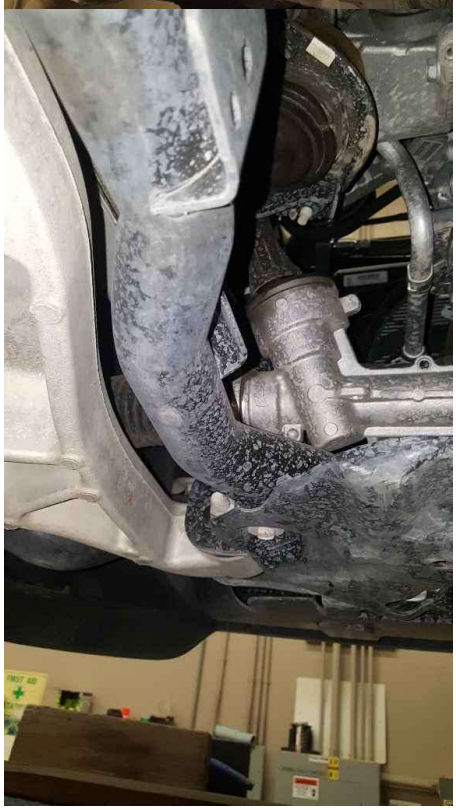


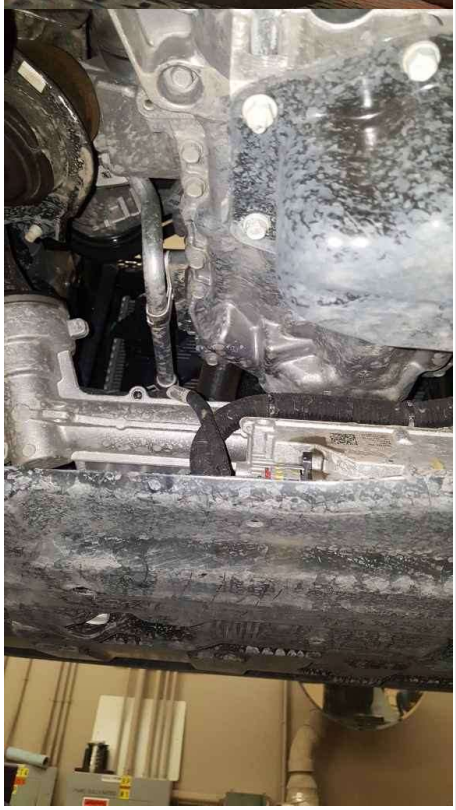


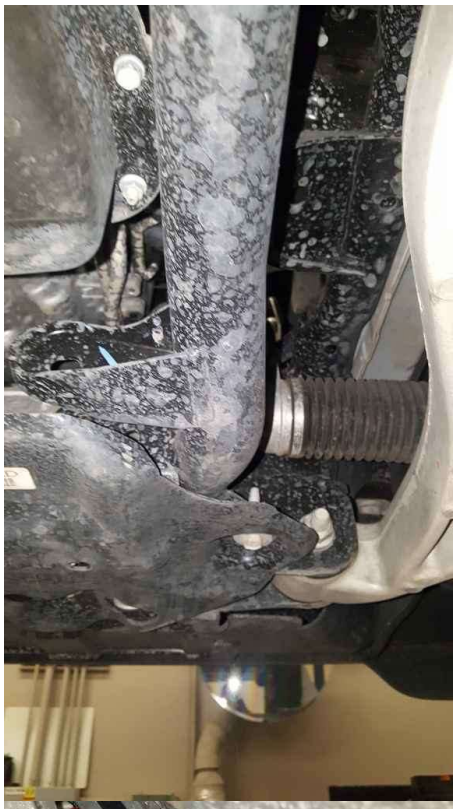






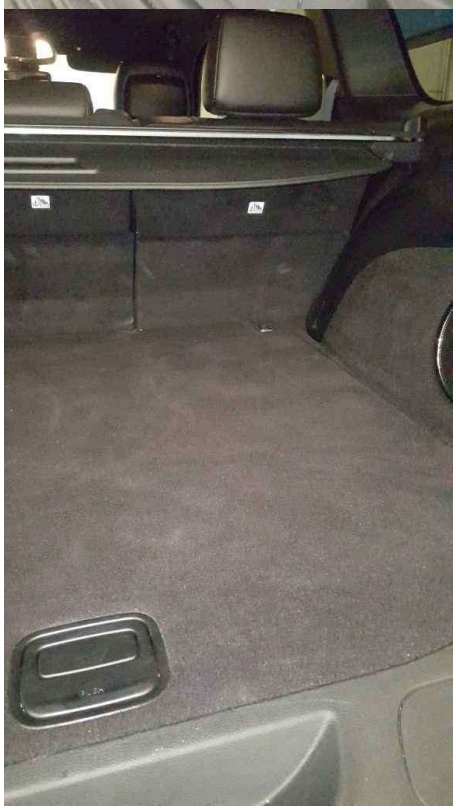






Interior

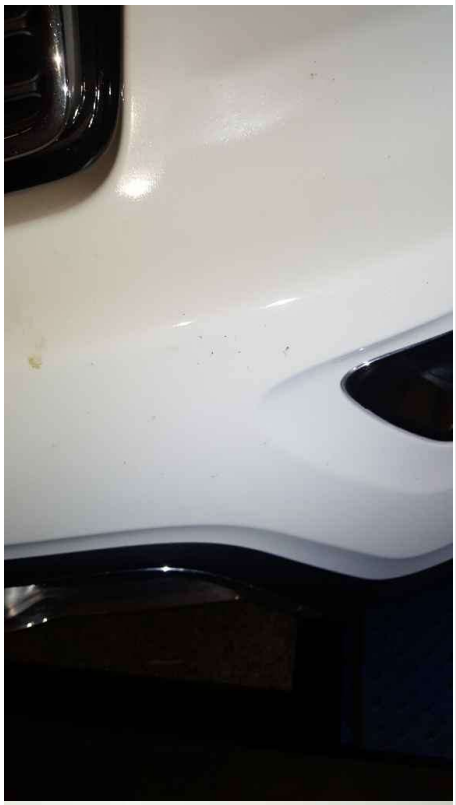
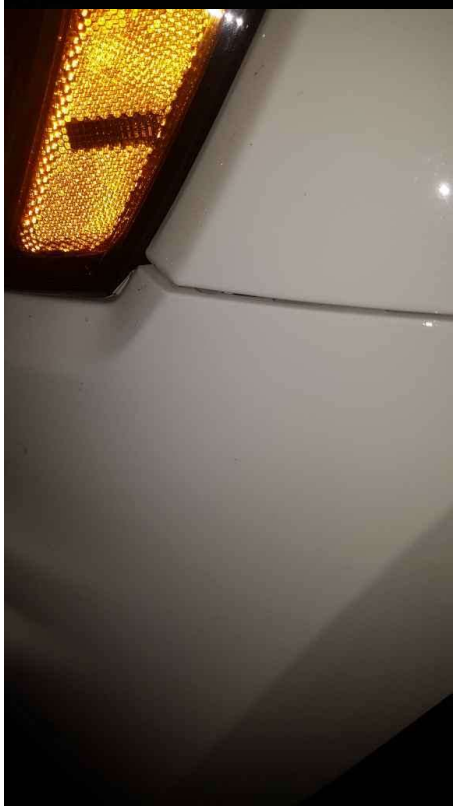
Interior (Photos)	

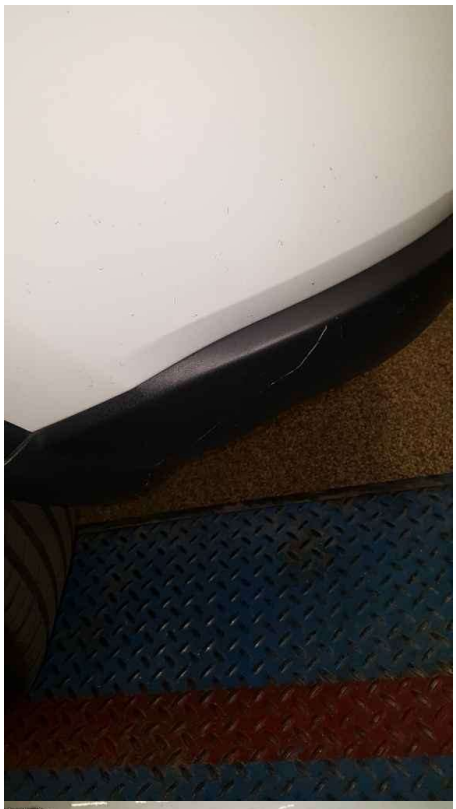


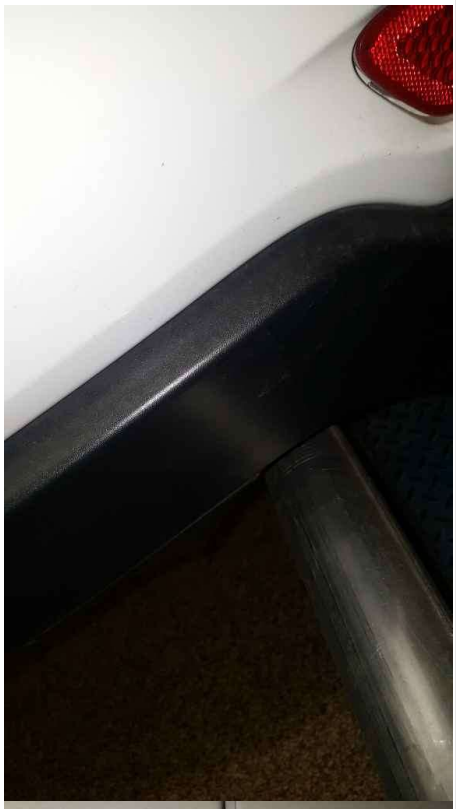
Damage Report

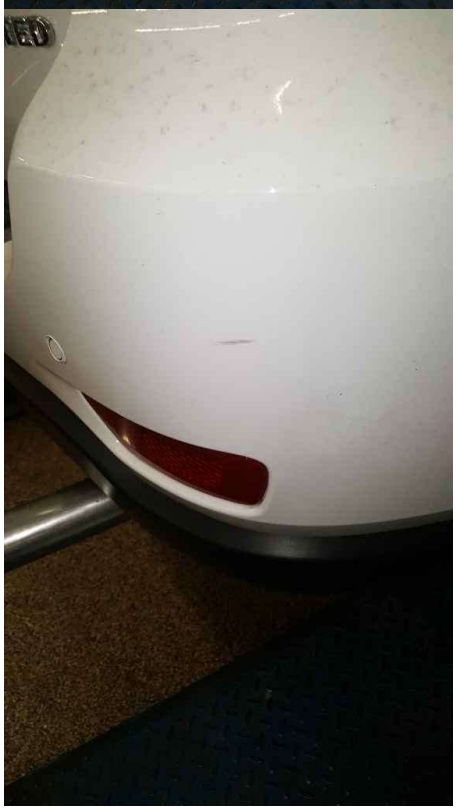
Any Damage (scratches/dents)?	Yes

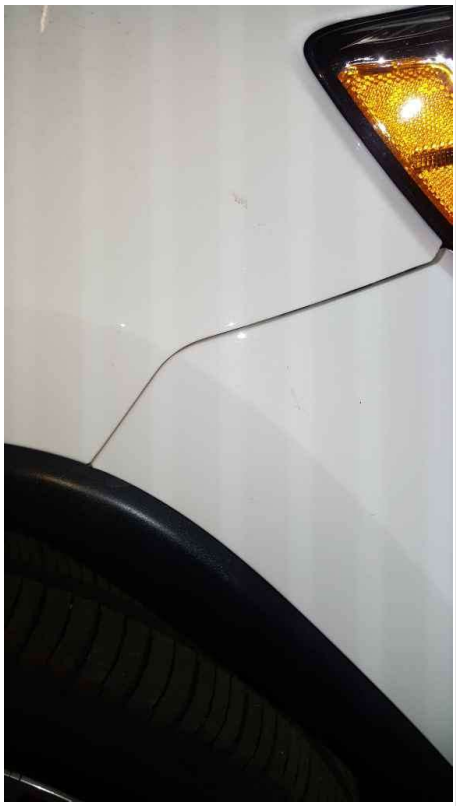
Damage Area







Confirmation

Start Form Timestamp	04-28-2021 10:40 PM
End Form Timestamp	04-30-2021 10:33 PM
Submission Id	4a618204-2266-49f6-b781-ea781e8962a6
Name of Inspector	Lee
Signature	
Comments	

Measurement values

Application:	Silver Scan-Tool Version 6.21.36.26940
Date/Time:	04/30/2021, 09:10:28 pm
Author:	Shop
Department:	Automotive Testing and Development Services Inc
Location:	400 Etiwanda Ave, Ontario CA 91761 United States
Comment:	Check In 04/30/2021 - ODO 23419

33: Scan-Tool

Communication	
Address word	33
Name	Scan-Tool
Protocol	ISO 15765-4 (CAN)
Baudrate	500 kbps
Interface	ATI Leaf Light HS v2, Ser.No 10217, Channel 1
Vehicle	
Vehicle	3081-265672_RFA_Jeep_CheckIn
Description	Renewable Fuel Association2020 Jeep Grand Cherokee 3.6L V6E15 Evap Testing
Vehicle Identification Number	1C4RJEBG3LC265672

Contents

- Module E8 ECM-EngineControl
- Module E9 TCM-TransmisCtrl

Module E8: ECM-EngineControl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

E8 ECM-EngineControl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0111 1110 0101 0000 0000	Bit	Monitor status since DTCs cleared
PID 03	0000 0010	Bit	Fuel system A status
PID 03	0000 0000	Bit	Fuel system B status
PID 04	27.1	%	Calculated load value
PID 05	43	°C	Engine coolant temperature
PID 06	-3.1	%	Short term fuel trim - Bank 1
PID 07	0.0	%	Long term fuel trim - Bank 1
PID 08	-4.7	%	Short term fuel trim - Bank 2
PID 09	0.0	%	Long term fuel trim - Bank 2
PID 0B	40	kPa	Intake manifold absolute pressure
PID 0C	3067	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 0E	27.5	°KW	Ignition timing advance for #1 cylinder
PID 0F	29	°C	Intake air temperature
PID 11	18.4	%	Absolute throttle position
PID 13	0011 0011	Bit	Location of oxygen sensors

Name	Measured value	Unit	Comment
PID 14	0.685	V	Oxygen sensor output voltage
PID 14	-2.3	%	Short term fuel trim
PID 15	0.665	V	Oxygen sensor output voltage
PID 15	99.2	%	Short term fuel trim
PID 18	0.800	V	Oxygen sensor output voltage
PID 18	-4.7	%	Short term fuel trim
PID 19	0.310	V	Oxygen sensor output voltage
PID 19	99.2	%	Short term fuel trim
PID 1C	1		OBD requirements to which vehicle or engine is certified
PID 1F	45	s	Time since engine start
PID 21	0	km	Distance traveled while MIL is activated
PID 2C	0.0	%	Commanded EGR
PID 2D	0.0	%	EGR error
PID 2E	0.0	%	Commanded evaporative purge
PID 2F	27.8	%	Fuel level input
PID 30	255	dec	Number of warm-ups since DTCs cleared
PID 31	37612	km	Distance traveled since DTCs cleared
PID 32	-138.00	Pa	Evap system vapor pressure
PID 33	97	kPa	Barometric pressure
PID 3C	270.0	°C	Catalyst temperature Bank 1 Sensor 1
PID 3D	270.0	°C	Catalyst temperature Bank 2 Sensor 1
PID 41	0000 0000 0000 0100 1110 0001 1110 0101	Bit	Monitor status this driving cycle
PID 42	14.051	V	Control module voltage
PID 43	17.6	%	Absolute load value
PID 44	1.000	Lambda	Fuel/Air commanded equivalence ratio
PID 45	6.3	%	Relative throttle position

Name	Measured value	Unit	Comment
PID 46	28	°C	Ambient air temperature
PID 47	16.9	%	Absolute throttle position B
PID 49	22.4	%	Accelerator pedal position D
PID 4A	11.4	%	Accelerator pedal position E
PID 4C	6.7	%	Commanded throttle actuator control
PID 51	1		Type of fuel currently being utilized by the internal combustion engine
PID 62	18	%	Actual engine - percent torque
PID 63	350	Nm	Engine reference torque
PID 6B	36	°C	Exhaust Gas Recirculation Temp Sensor C (Bank 1 Sensor 2)
PID 8E	21	%	Engine Friction - Percent Torque
PID 9D	1.30	g/s	Engine fuel rate
PID 9D	1.30	g/s	Vehicle fuel rate
PID 9E	229.2	kg/h	Engine Exhaust Flow Rate

E8 ECM-EngineControl: Mode 2 - Current freeze frame data

No data

E8 ECM-EngineControl: Mode 3 - Emission-related diagnostic trouble codes

No data

E8 ECM-EngineControl: Mode 6 - Monitoring test results for specific monitored systems

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 01	91	2F	328.36	130.00	655.35	%	Exhaust Gas Sensor Monitor Bank 1 - Sensor 1
MID 02	07	0B	0.647	0.000	0.647	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 02	08	0B	0.745	0.705	65.535	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	81	04	2.707	0.500	65.535		Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	82	01	60	0	400		Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 02	83	8A	0.156860	0.000000	0.196166	V	Exhaust Gas Sensor Monitor Bank 1 - Sensor 2
MID 05	91	2F	291.74	130.00	655.35	%	Exhaust Gas Sensor Monitor Bank 2 - Sensor 1
MID 06	07	0B	0.647	0.000	0.647	V	Exhaust Gas Sensor Monitor Bank 2 - Sensor 2
MID 06	08	0B	0.725	0.705	65.535	V	Exhaust Gas Sensor Monitor Bank 2 - Sensor 2
MID 06	81	04	3.061	0.500	65.535		Exhaust Gas Sensor Monitor Bank 2 - Sensor 2
MID 06	82	01	51	0	400		Exhaust Gas Sensor Monitor Bank 2 - Sensor 2
MID 06	83	8A	0.176513	0.000000	0.196166	V	Exhaust Gas Sensor Monitor Bank 2 - Sensor 2
MID 21	92	2F	0.00	0.00	0.29	%	Catalyst Monitor Bank 1
MID 22	92	2F	0.00	0.00	0.29	%	Catalyst Monitor Bank 2
MID 31	93	24	0	0	50	counts	EGR Monitor Bank 1
MID 31	95	39	-0.51	-100.00	10.00	%	EGR Monitor Bank 1
MID 31	96	39	-1.83	-100.00	10.00	%	EGR Monitor Bank 1
MID 31	97	2E	1	1	1	Bit	EGR Monitor Bank 1
MID 35	81	1C	1.30	0.00	6.00	°	VVT Monitor Bank 1
MID 35	82	1C	0.90	0.00	6.00	°	VVT Monitor Bank 1
MID 35	97	05	0.0001831	0.0000000	0.0360406		VVT Monitor Bank 1
MID 35	98	05	0.0000305	0.0000000	0.0267329		VVT Monitor Bank 1
MID 36	81	1C	1.20	0.00	6.00	°	VVT Monitor Bank 2
MID 36	82	1C	1.30	0.00	6.00	°	VVT Monitor Bank 2
MID 39	87	35	0.00	0.00	0.00	s	EVAP Monitor (Cap Off, 0.150")
MID 3A	87	35	0.00	0.00	655.35	s	EVAP Monitor (0.090")
MID 3C	85	34	0	0	0	min	EVAP Monitor (0.020")
MID 3C	86	34	0	0	0	min	EVAP Monitor (0.020")
MID 3C	90	34	86	8	4300	min	EVAP Monitor (0.020")

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID 3D	89	35	0.00	0.00	655.35	s	Purge Flow Monitor
MID 3D	90	81	0	0	0		Purge Flow Monitor
MID 3D	91	81	0	0	0		Purge Flow Monitor
MID 3D	92	81	0	0	0		Purge Flow Monitor
MID 3D	93	81	0	0	0		Purge Flow Monitor
MID 3D	94	81	1710	100	32767		Purge Flow Monitor
MID 41	97	16	30.0	-40.0	150.0	°C	Exhaust Gas Sensor Heater Monitor Bank 1 - Sensor 1
MID 42	97	16	30.0	-40.0	150.0	°C	Exhaust Gas Sensor Heater Monitor Bank 1 - Sensor 2
MID 45	97	16	25.0	-40.0	150.0	°C	Exhaust Gas Sensor Heater Monitor Bank 2 - Sensor 1
MID 46	97	16	25.0	-40.0	150.0	°C	Exhaust Gas Sensor Heater Monitor Bank 2 - Sensor 2
MID 81	90	05	1.0135611	0.0000000	1.0998937		Fuel System Monitor Bank 1
MID 81	91	05	0.9905208	0.9000989	1.9999316		Fuel System Monitor Bank 1
MID 81	92	05	0.0000000	0.0000000	0.0000000		Fuel System Monitor Bank 1
MID 82	90	05	1.0012323	0.0000000	1.0998937		Fuel System Monitor Bank 2
MID 82	91	05	0.9993707	0.9000989	1.9999316		Fuel System Monitor Bank 2
MID 82	92	05	0.0000000	0.0000000	0.0000000		Fuel System Monitor Bank 2
MID A2	0B	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A2	0C	24	0	0	65535	counts	Misfire Cylinder 1 Data
MID A3	0B	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A3	0C	24	0	0	65535	counts	Misfire Cylinder 2 Data
MID A4	0B	24	0	0	65535	counts	Misfire Cylinder 3 Data
MID A4	0C	24	1	0	65535	counts	Misfire Cylinder 3 Data
MID A5	0B	24	1	0	65535	counts	Misfire Cylinder 4 Data
MID A5	0C	24	0	0	65535	counts	Misfire Cylinder 4 Data
MID A6	0B	24	0	0	65535	counts	Misfire Cylinder 5 Data
MID A6	0C	24	0	0	65535	counts	Misfire Cylinder 5 Data
MID A7	0B	24	0	0	65535	counts	Misfire Cylinder 6 Data

Name	CID (hex)	UID (hex)	Test value	min. limit	max. limit	Unit	Comment
MID A7	0C	24	0	0	65535	counts	Misfire Cylinder 6 Data

E8 ECM-EngineControl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

E8 ECM-EngineControl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 02	1C4RJEBG3LC265672	Vehicle Identification Number(VIN)
InfoType 04	68496222AA	Calibration Identification (CALID)
InfoType 06	2F 02 DE 0F	Calibration Verification Numbers (CVN)
InfoType 08	03 3F 08 05 02 F7 03 32 02 F7 03 32 03 04 03 3F 03 04 03 3F 01 9E 03 3F 00 00 00 00 00 38 00 93 03 3B 03 3F 03 3A 03 3F 03 02 03 3F 03 02 03 3F 00 00 00 00 00 00 00 00	In-use Performance Tracking

Values for InfoType 08

Name	Measured value	Comment
OBDCOND	831	General Denominator, OBD Monitoring Conditions Encountered Counts
IGNCNTR	2053	Ignition Cycle Counter
CATCOMP1	759	Numerator, Catalyst Monitor Completion Counts Bank 1
CATCOND1	818	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 1
	0.928	- Calculated Ratio -
CATCOMP2	759	Numerator, Catalyst Monitor Completion Counts Bank 2
CATCOND2	818	Denominator, Catalyst Monitor Conditions Encountered Counts Bank 2
	0.928	- Calculated Ratio -

Name	Measured value		Comment
	O2SCOMP1	772	Numerator, O2 Sensor Monitor Completion Counts Bank 1
	O2SCOND1	831	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 1
		0.929	- Calculated Ratio -
	O2SCOMP2	772	Numerator, O2 Sensor Monitor Completion Counts Bank 2
	O2SCOND2	831	Denominator, O2 Sensor Monitor Conditions Encountered Counts Bank 2
		0.929	- Calculated Ratio -
	EGRCOMP	414	Numerator, EGR/VVT Monitor Completion Condition Counts
	EGRCOND	831	Denominator, EGR/VVT Monitor Conditions Encountered Counts
		0.498	- Calculated Ratio -
	AIRCOMP	0	Numerator, Secondary Air Monitor Completion Condition Counts
	AIRCOND	0	Denominator, Secondary Air Monitor Conditions Encountered Counts
		7.995	- Calculated Ratio -
	EVAPCOMP	56	Numerator, EVAP Monitor Completion Condition Counts
	EVAPCOND	147	Denominator, EVAP Monitor Conditions Encountered Counts
		0.381	- Calculated Ratio -
	SO2SCOMP1	827	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 1
	SO2SCOND1	831	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 1
		0.995	- Calculated Ratio -
	SO2SCOMP2	826	Numerator, Secondary O2 Sensor Monitor Completion Counts Bank 2
	SO2SCOND2	831	Denominator, Secondary O2 Sensor Monitor Conditions Encountered Counts Bank 2
		0.994	- Calculated Ratio -
	AFRICOMP1	770	Numerator, Air Fuel Ratio Imbalance Monitor Completion Counts Bank 1
	AFRICOND1	831	Denominator, Air Fuel Ratio Imbalance Monitor Conditions Encountered Counts Bank 1
		0.927	- Calculated Ratio -
	AFRICOMP2	770	Numerator, Air Fuel Ratio Imbalance Monitor Completion Counts Bank 2
	AFRICOND2	831	Denominator, Air Fuel Ratio Imbalance Monitor Conditions Encountered Counts Bank 2
		0.927	- Calculated Ratio -

Name	Measured value	Comment
InfoType 0A	ECM-EngineControl	ECU Name
InfoType 13	4C 43 52 58 54 30 33 2E 36 35 50 35	Hybrid/EV Battery DTCs and Location
InfoType 14	0	Distance Traveled Since Evap Monitoring Decision

E8 ECM-EngineControl: Readiness - Readiness

Monitor	PID 01		PID 41	
	supported	complete	enabled	complete
Misfire monitoring	yes	yes	no	yes
Fuel system monitoring	yes	yes	no	yes
Comprehensive component monitoring	yes	yes	yes	yes
Catalyst monitoring	yes	yes	yes	no
Heated catalyst monitoring	no	yes	no	yes
Evaporative system monitoring	yes	yes	no	no
Secondary air system monitoring	no	yes	no	yes
Oxygen sensor monitoring	yes	yes	yes	no
Oxygen sensor heater monitoring	yes	yes	yes	no
EGR and/or VVT system monitoring	yes	yes	yes	no

Module E9: TCM-TransmisCtrl

Mode 1 - Current powertrain diagnostic data
Mode 2 - Current freeze frame data
Mode 3 - Emission-related diagnostic trouble codes
Mode 6 - Monitoring test results for specific monitored systems
Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle
Mode 9 - Vehicle information
Readiness - Readiness

E9 TCM-TransmisCtrl: Mode 1 - Current powertrain diagnostic data

Name	Measured value	Unit	Comment
PID 01	0000 0000 0000 0100 0000 0000 0000 0000	Bit	Monitor status since DTCs cleared
PID 04	27.1	%	Calculated load value
PID 05	42	°C	Engine coolant temperature
PID 0C	3067	1/min	Engine RPM
PID 0D	0	km/h	Vehicle speed sensor
PID 21	0	km	Distance traveled while MIL is activated
PID 30	255	dec	Number of warm-ups since DTCs cleared
PID 31	36868	km	Distance traveled since DTCs cleared
PID 42	13.876	V	Control module voltage
PID 49	22.4	%	Accelerator pedal position D

E9 TCM-TransmisCtrl: Mode 2 - Current freeze frame data

No data

E9 TCM-TransmisCtrl: Mode 3 - Emission-related diagnostic trouble codes

No data

E9 TCM-TransmisCtrl: Mode 6 - Monitoring test results for specific monitored systems

No data

E9 TCM-TransmisCtrl: Mode 7 - Emission-related diagnostic trouble codes detected during current or last completed driving cycle

No data

E9 TCM-TransmisCtrl: Mode 9 - Vehicle information

Name	Measured value	Comment
InfoType 04	68495810AA	Calibration Identification (CALID)
InfoType 06	3D AC B3 42	Calibration Verification Numbers (CVN)
InfoType 0A	TCM-TransmisCtrl	ECU Name

E9 TCM-TransmisCtrl: Readiness - Readiness

Monitor	PID 01	
	supported	complete
Misfire monitoring	no	yes
Fuel system monitoring	no	yes
Comprehensive component monitoring	yes	yes
Catalyst monitoring	no	yes
Heated catalyst monitoring	no	yes
Evaporative system monitoring	no	yes

Monitor	PID 01	
	supported	complete
Secondary air system monitoring	no	yes
Oxygen sensor monitoring	no	yes
Oxygen sensor heater monitoring	no	yes
EGR and/or VVT system monitoring	no	yes

APPENDIX B

Test Check Sheet

Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Jeep Cherokee
Vehicle #:	3081-265672	**Engine Size**	3.6L
VIN:	1C4RJEBG3LC265672	**Model Year**	2020
Engine Family:	LCRXT03.65P5	**Requested By:**	J. Link

Documentation

		Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Vehicle check in	E		2021-04-30	22:33	23419			LQ
↓ OBD download								LQ
↓ Prepare vehicle for Lab								LQ
↓ Canister Purge 1 Hour	E		2021-06-02	10:36	23423			JL
↓ Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S		2021-06-02	10:38		3		
	E		2021-06-02	11:09		Fuel Spec:	E5	JM
↓ Idle 1 min								
↓ Fuel Drain and 40% Fill, Fuel Type: See Notes!	S		2021-06-02	11:10		9.84		
	E		2021-06-02	11:35		Fuel Spec:	<60F 58.7	
↓ Heat Build 60F-105F in 1 Hour	S		2021-06-02		23423			
	E		2021-06-02		23423			
↓ Precon FTP 72 (UDDS) 1	S		2021-06-02	17:47	23423			
	E		↓	18:09	23432		ONT52523	
Dyno Sets			A: 29.65 B: -0.0535 C: 0.03514				ETW: 5250	
↓ Precon FTP 72 (UDDS) 2	S		2021-06-02	18:13	23432			
	E		↓	18:36	23439		ONT52529	
↓ Precon FTP 72 (UDDS) 3	S		↓	18:39	23439			
	E		↓	19:02	23447		ONT52531	
↓								

Precon FTP 72 (UDDS) 4	S	6/2/21	19:05	23447		
	E	↓	19:28	23454	ONT52532	JC
↓ Eng Off 5 min						JR
↓ Idle 1 min						JB
↓ Eng Off 1 min						JB
↓ Idle 1 min						JB
↓ Vehicle Soak 21 Days 68-86°F	S	6/2/21	19:39			
	E	2021-06-25	18:00			JC
↓ Set tire pressure 7psi over sticker	Front	43	Back	43		JC
↓ Fuel Drain and 40% Fill, Fuel Type: See Notes!	S	2021-06-25	18:20	9.84		
	E	2021-06-25	19:04	Fuel Spec:	E15	JC
↓ Vehicle Soak 68-86°F (min 6 hr.)	S	2021-06-25	19:10			
	E	2021-06-28				
↓ Set tire pressure to sticker	Front	36	Back	36		
↓ 2x HFET warmup J2264 Dyno Coastdown	S	2021-06-28	13:11	23454		
	E	↓	13:48	23475	ONT3_001874	JC
Dyno Sets for Warmup HWY	A: 29.65 B: -0.0535 C: 0.03514				ETW: 5250	
↓ Precon FTP 72 (UDDS)	S	2021-06-29	1409	23709		
	E	↓	1437	23717	ONT3_001884	DC
Dyno Sets	A:	B:	C:		ETW: 5250	
↓ Vehicle Soak 68-86°F	S	2021-06-29	1438			
	E					
↓ Canister Loading with Butane Type: 1.5x Load (12-36 hr)	S					
	E					
Canister Loading Specs	Cap	204	Vol	3.1		
	Purge	300	Flow Rate	15	LCRXR0204RP0	

T 70.70

B ~~68.80~~ 28.84

T 68.60

23584
~~23640~~ 23652
23673

Set tire pressure to sticker

Front 36 Back 36

No Bag Cold Start FTP 75

S 7/1/21 11:04 23717

E 12:51 23728 ONT3_00188 VE

Dyno Sets

A: B: C: ETW: 5250

Test Options

PM N2O Dilute Modal

CVS Flow P1:9.3 P2:9.3 P3:9.3

Pre Test Comments

E15 Test

Fuel Tank Temp. Stabilization at 105F

S 7/1/21 1:11 JB

E 2:11 JB

max 1 hr

Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle

S 14:05

E 15:22 ONT3_00187 JB

Dyno Sets

A: B: C: ETW: 5250

Test Options

PM N2O Dilute Modal

CVS Flow 9.3

Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff

max 7 min

Hot Soak in VT Shed

S 7/1/21 15:28

E 7/1/2021 16:28 J.H.

Cold Soak 6-36 Hours

6-36 Hr

S 7/1/2021 17:28

E 7/1/2021 23:28 J.H.

3 Day Diurnal Test

S 7/1/2021 23:28

E 7/4/2021 23:28 J.H.

QC Check

E 11/15/2021 J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081	3081-265672		
VIN:	1C4RJEBG3LC265672			
Test Cell:	Cell 3			
Make / Model / Wheel drive / MY:	Jeep	Cherokee	FWD	2020
Test Group / Engine Size (L):	LCRXT03.65P5	3.6L		
EVAP Family:	LCRXR0204RP0			
Standard Tire Size (front) / Pressure:	265/60-18	36		
Standard Tire Size (rear) / Pressure:	265/60-18	36		
Transmission / Shift File / Inertia Weight:	Auto	Auto	5250	
Target Coefficients A / B / C:	59.30	-0.2675	0.035140	
Warmup Coefficients A / B / C:	29.65	-0.0535	0.035140	
Set Coefficients A / B / C:				
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E15 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	24.6
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	204
Canister volume (Liter)	3.1
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 3 - FWD
9.84 of See Notes!
E15 Fuel
105.9" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

										Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐		1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags	☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags	☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags	☐
Diurnal 24h	☐	Fuel type 24H Diurnal				
Diurnal 48h	☐	Fuel type 48h Diurnal				
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!			

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS CANISTER WORKSHEET

Station number 2

----PURGE ONLY----

VT#	3081-265672
Project	3081
Evap Family	NA
Ambient Temperature-Deg F	76
Barometric Pressure-In/Hg	28.94
Humidity-Grains/Lb	64.2
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0
Canister Volume-Liters	13.6
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	09:36:10
Start date	06-02-2021
Bed Purges/Cycle	100
Purge End/Load Start	10:36:19
Test Time Minutes	60
HC Loaded-Grams	0.0
Scale Reading-Grams	2.32
Butane Flow Actual-Gm/Hr	-0.0
Cycles Completed	1
Finish time	10:36:19
Finish date	06-02-2021
Disk File Name	21060201.ST2

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

Test = EPA 74

Options = Sec ShowTol

Test Init Start	= 02 June 2021 17:43:18	Test Start	= 02 June 2021 17:47:04
Posttest Completed At	= 02 June 2021 18:10:57	Test Finish	= 02 June 2021 18:09:56

Personnel Information::

Driver	= Joe Bishop	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb)	Road Load A	= 29.65 (lbs)
Road Load B	= -0.0535	Road Load C	= 0.03514

Fuel Information:

Fuel	= GASOLINE - E15	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/Dev Calcs

Phase Information:

	Shift Tables
Phase 1	N/A

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 1

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23423	Idle RPM	=
Test end Odometer	= 23432	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.81	Phase Start	= 17:47:04
	Temp	(F) =	80.2	Phase Finish	= 18:09:56
	Tdew	(F) =	54.8		
	Ahum	(gr/lb) =	66.3	Elapsed (sec)	= 1372.2
				Drv Err (sec)	= 0.0
	Dist	(mi) =	7.453	Crank Time	= 0.3

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Crank Time	VALID	5 (sec)
Restart Attempts	VALID	1
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = EPA 74

Options = Sec ShowTol

Test Init Start	= 02 June 2021 18:11:35	Test Start	= 02 June 2021 18:13:25
Posttest Completed At	= 02 June 2021 18:36:49	Test Finish	= 02 June 2021 18:36:18

Personnel Information::

Driver	= Joe Bishop	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 29.65 (lbs) ✓
Road Load B	= -0.0535 ✓	Road Load C	= 0.03514 ✓

Fuel Information:

Fuel	= GASOLINE - E15 ✓	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/Dev Calcs

Phase Information:

	Shift Tables
Phase 1	N/A

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 2

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23432	Idle RPM	=
Test end Odometer	= 23439	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE
INSPECTED BY: J. H.
DATE: 11/15/2021
COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.81	Phase Start	= 18:13:25
	Temp	(F) =	80.8	Phase Finish	= 18:36:18
	Tdew	(F) =	55.1		
	Ahum	(gr/lb) =	67.0	Elapsed (sec) =	1373.5
				Drv Err (sec) =	0.0
	Dist	(mi) =	7.507	Crank Time =	1.5

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Crank Time	VALID	5 (sec)
Restart Attempts	VALID	1
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = Precon 1

Options = Sec ShowTol

Test Init Start	= 02 June 2021 18:38:14	Test Start	= 02 June 2021 18:39:04
Posttest Completed At	= 02 June 2021 19:02:48	Test Finish	= 02 June 2021 19:02:00

Personnel Information::

Driver	= Joe Bishop	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 29.65 (lbs) ✓
Road Load B	= -0.0535 ✓	Road Load C	= 0.03514 ✓

Fuel Information:

Fuel	= GASOLINE - E15 ✓	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	Con't

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 3

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23439	Idle RPM	=
Test end Odometer	= 23447	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.81	Phase Start	= 18:39:04
	Temp	(F) =	81.0	Phase Finish	= 18:47:30
	Tdew	(F) =	55.2		
	Ahum	(gr/lb) =	67.2	Elapsed (sec) =	506.3
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.594		
Phase 2:	Baro	(inHg) =	28.81	Phase Start	= 18:47:30
	Temp	(F) =	81.2	Phase Finish	= 19:02:00
	Tdew	(F) =	55.3		
	Ahum	(gr/lb) =	67.5	Elapsed (sec) =	869.4
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.893		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Shutdown Time	VALID	5 (sec)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = Precon 1

Options = Sec ShowTol

Test Init Start	= 02 June 2021 19:04:31	Test Start	= 02 June 2021 19:05:42
Posttest Completed At	= 02 June 2021 19:29:18	Test Finish	= 02 June 2021 19:28:37

Personnel Information::

Driver	= Joe Bishop	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 29.65 (lbs) ✓
Road Load B	= -0.0535 ✓	Road Load C	= 0.03514 ✓

Fuel Information:

Fuel	= GASOLINE - E15 ✓	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	Con't

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 4

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23447	Idle RPM	=
Test end Odometer	= 23454	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.82	Phase Start	= 19:05:42
	Temp	(F) =	81.0	Phase Finish	= 19:14:07
	Tdew	(F) =	55.8		
	Ahum	(gr/lb) =	68.8	Elapsed (sec) =	505.0
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.602		
Phase 2:	Baro	(inHg) =	28.83	Phase Start	= 19:14:07
	Temp	(F) =	81.5	Phase Finish	= 19:28:37
	Tdew	(F) =	55.3		
	Ahum	(gr/lb) =	67.6	Elapsed (sec) =	869.6
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.875		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Shutdown Time	VALID	5 (sec)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = HWFET with Warmup

Options = Sec ShowTol

Test Init Start	= 30 June 2021 13:07:16	Test Start	= 30 June 2021 13:09:46
Posttest Completed At	= 30 June 2021 13:36:21	Test Finish	= 30 June 2021 13:35:31

Personnel Information::

Driver	= Victor Escudero	Operator	= Domenic Coppola
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 29.65 (lbs) ✓
Road Load B	= -0.0535 ✓	Road Load C	= 0.03514 ✓

Fuel Information:

Fuel	= GASOLINE - E15 ✓	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	N/A

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
ROAD LOAD

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23681	Idle RPM	=
Test end Odometer	= 23702	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.87	Phase Start	= 13:09:46
	Temp	(F) =	76.1	Phase Finish	= 13:22:46
	Tdew	(F) =	59.9		
	Ahum	(gr/lb) =	79.8	Elapsed (sec) =	780.0
				Drv Err (sec) =	0.0
	Dist	(mi) =	10.254		
Phase 2:	Baro	(inHg) =	28.87	Phase Start	= 13:22:46
	Temp	(F) =	78.0	Phase Finish	= 13:35:31
	Tdew	(F) =	60.5		
	Ahum	(gr/lb) =	81.5	Elapsed (sec) =	765.0
				Drv Err (sec) =	0.0
	Dist	(mi) =	10.276		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

AVL/REALTIME DYNO-ABC DERIVATION

JUN 30-21 Printing 13:58:19

RECORD #182

	DYNO-SET	TRACK	TIRE LOSSES	
A:	35.11	59.30	25.91	lbs
B:	-0.2637	-0.2675	-0.0867	lbs/mph
C:	0.03380	0.03514	0.00226	lbs/mph2

CD RUN	DYNO-SET A lbs	DYNO-SET B lbs/mph	DYNO-SET C lbs/mph2	MEASURED A lbs	MEASURED B lbs/mph	MEASURED C lbs/mph2	MAXIMUM DIFFERENCE lbs
1	29.65	-0.0535	0.03514	53.84	-0.0573	0.03648	15.8
2	35.11	-0.2637	0.03380	61.13	-0.3658	0.03636	1.0
3	35.11	-0.2637	0.03380	60.89	-0.3365	0.03584	1.0
4	35.11	-0.2637	0.03380	61.02	-0.3491	0.03598	1.0

QUALITY ASSURANCE

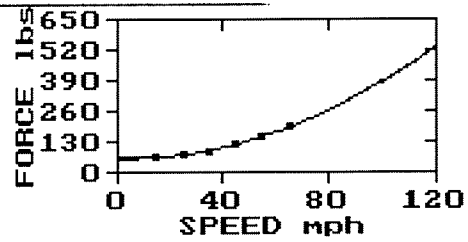
INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

VEHICLE 1C4RJEBG3LC265672
BRAKE OFF
CRADLE DOWN
PL REC 3
SITE ATDS
REMARKS REMOTE CONTROL

INERTIA	5250	lbs
TRACK INERTIA	5329	lbs
DIFF LIMIT	2.00	lbs
HIGHEST SPEED	70	mph
LOWEST SPEED	10	mph
SPEED INTERVA	6	
CONFIRM RUNS	2	



Esc Exit PgUp Previous PgDn Next ALT-P Print ALT-F File F2 Edit Remarks

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	6/30/2021	**Time:**	14:09:44
Test Legislation:	EPA		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 7/15/2021

COMMENTS: ok

General Data

Test Number	*ONT3_001884*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*6/30/2021*	CH_4 Response Factor	
Test Start	*14:09:44*	Odometer Position [mi]	*23709*
Start Time Cycle	*2021-06-30 14|15-48-(000)*	Delay Time Method	
Test End	*14:37:40*		
Operator	*Domenic Coppola*	Air Condition	*OFF*
Driver	*Domenic Coppola*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370* ✓	*0.033800* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Domenic Coppola		Speed Table	Date:	
Test Number	ONT3_001884	Driver	Domenic Coppola		Shift Table Auto	Cold Start	
Vehicle	1C4RJEBG3LC265672	**Dyno**			**Fuel**	**Test Timing**	
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*		91_Pump_Gas	Start Time	*14:09:44*
		A [lbf]	*35.110*		Fuel type GASOLINE	End Time	*14:37:40*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*		Density *0.7380*		
Year	*2020*	C [lbf/mph2]	*0.033800*		NHV 18085	Soak Time	
Displacement:					CWF *0.8527*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*23709*	Remark	PRECON				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.71	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.85	D.F.	
Span Read	*0.00*							RH[%]	*55.62*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*10.554*	Ph. End[s]	505.7
Mass.	*0.000*							Dist.[mi]	*3.62*	Ph. Length[s]	505.7
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9949*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.14	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	28.85	D.F.	
Span Value	*0.00*							RH[%]	*53.29*	Ph. Start[s]	505.8
Sample	*0.00*							AH[g/kg]	*9.580*	Ph. End[s]	1376.1
Mass.	*0.000*							Dist.[mi]	*3.92*	Ph. Length[s]	870.4
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9641*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_X$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *7.54*

CVS Data			Cycle data		Environmental Data	
Dilution Factor (Bag)			Vio. Dur.[s]	0.0	Rel. Hum.[%]	*55.62*
Dilution Factor (Modal)			Number	0	Ab. Hum.[g/lbs]	*10.55*
CVS Volume[scf]			Act. Dist.[mi]	*3.62*	Pressure[inHg]	*28.85*
CVS Flow[scfm]					Temp.[°F]	*74.71*
CVS Inlet Pressure					Temp. Min.[°F]	*73.94*
CVS Inlet Temp.[°F]					Temp. Max.[°F]	*75.74*
CVS Inlet Temp. Min.[°F]					NO_X Corr. F	*0.9949*
CVS Inlet Temp. Max.[°F]						

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_X[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_X[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_X[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]		Fuel Consumption[l/100km]	
Fuel Consumption[l]		**Fuel Economy[mile/gal]**	

CVS Data	Cycle data		Environmental Data	
Dilution Factor (Bag)	Vio. Dur.[s]	0.0	Rel. Hum.[%]	*53.29*
Dilution Factor (Modal)	Number	0	Ab. Hum.[g/lbs]	*9.58*
CVS Volume[scf]	Act. Dist.[mi]	*3.92*	Pressure[inHg]	*28.85*
CVS Flow[scfm]			Temp.[°F]	*73.14*
CVS Inlet Pressure			Temp. Min.[°F]	*70.52*
CVS Inlet Temp.[°F]			Temp. Max.[°F]	*74.48*
CVS Inlet Temp. Min.[°F]			NO_x Corr. F	*0.9641*
CVS Inlet Temp. Max.[°F]				

Bag

Concentrations	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N_2O[ppm]	CH_4[ppm]	NMHC[ppm]
Range	*0*						
Sample	*0.000*						
Std. Dev.	*0.000*						
Ambient	*0.000*						
Std. Dev.	*0.000*						
Corrected	*0.000*						
Mass	**THC[g]**	**CO[g]**	**CO_2[g]**	**NO_x[g]**	**N_2O[g]**	**CH_4[g]**	**NMHC[g]**
Uncorrected	*0.0000*						
Corrected	*0.0000*						
Mass per distance	**THC[g/mile]**	**CO[g/mile]**	**CO_2[g/mile]**	**NO_x[g/mile]**	**N_2O[g/mile]**	**CH_4[g/mile]**	**NMHC[g/mile]**
Corrected for Lost Sample Mass	*0.0000*						

Fuel Consumption

Fuel Consumption[g]	Fuel Consumption[l/100km]
Fuel Consumption[l]	**Fuel Economy[mile/gal]**

Test Data: FTP72 Operator: Domenic Coppola Date: 6/30/2021
Test Number: ONT3_001884 Driver: Domenic Coppola

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001884

Test Cycle FTP72
Test Legislation EPA

Vehicle ID 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [lbf]	*35.110*	*59.300*
B [lbf/mph]	*-0.26370*	*-0.26750*
C [lbf/mph2]	*0.033800*	*0.035140*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.14	6211.05		
Driven	5826.98	6305.54		
Distance Rating (%)	0.8278	1.5213		
Cycle Energy (MJ)				
Target	4.32	3.97		
Driven	4.33	4.06		
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4497	0.3320		
Driven	0.4300	0.3153		
Inertial Work (MJ)				
Target	2.38	2.65		
Driven	2.47	2.78		
Inertial Work Fraction				
Target	0.5503	0.6680		
Driven	0.5700	0.6847		
Inertial Work Rating	3.8725	4.7944		
Absolute Speed Change (m/s2)				
Target	204.88	340.90		
Driven	208.95	350.66		
Absolute Speed Change Rating (%)	1.9897	2.8622		
Energy Rating	-0.5485	0.7016		
Energy Economy Rating	-0.5485	0.7016		0.0299

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001884

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(F)	74.71	73.94	75.74	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.84	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	73.88	70.07	76.44	38.50	87.50	Passed
CVS Inlet Temperature	(F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62					Passed
Sample Phase Time	(s)	505.7					
Duration Phase 1	(s)	505.60					
Crank Time Phase1	(s)	0.70				5	Passed
Crank Time Phase3	(s)					5	
Crank Counts		1				1	Passed
Shutdown Time Phase 1						5	Passed
Shutdown Time Phase 3						5	Failed OK
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

NO Phase 3

J.H.

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001884

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	73.14	70.52	74.48	68.00	86.00	Passed
Barometer	(inHg)	28.85	28.84	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	67.06	61.09	70.47	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.92					Passed
Sample Phase Time	(s)	870.4					
Duration Phase 2	(s)	870.30					
Crank Time Phase1	(s)	0.7000				5	Passed
Crank Counts		1				1	Passed
Shutdown Time Phase 2						5	Failed ok
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

End of test

J.H.

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-265672
Project	3081
Evap Family	LCRXR0204RP0
Ambient Temperature-Deg F	71
Barometric Pressure-In/Hg	28.84
Humidity-Grains/Lb	68.6
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	204
Canister Volume-Liters	3.1
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	14:36:37
Start date	06-30-2021
Bed Purges/Cycle	300
Purge End/Load Start	15:17:46
Test Time Minutes	1266
HC Loaded-Grams	306.0
Scale Reading-Grams	-0.43
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	11:44:45
Finish date	07-01-2021
Disk File Name	21070101.ST3

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/1/2021	**Time:**	11:04:39
Test Legislation:	EPA		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001886*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*7/1/2021*	CH_4 Response Factor	
Test Start	*11:04:39*	Odometer Position [mi]	*23717*
Start Time Cycle	*2021-07-01 12|41-11-(000)*	Delay Time Method	
Test End	*12:51:06*		
Operator	*Victor Escudero*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370*	*0.033800* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Victor Escudero	Speed Table		Date:	
Test Number	ONT3_001886	Driver	Victor Escudero	Shift Table Auto		Cold Start	

Vehicle	1C4RJEBG3LC265672	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*	91_Pump_Gas		Start Time	*11:04:39*
		A [lbf]	*35.110*	Fuel type	GASOLINE	End Time	*12:51:06*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.033800*	NHV	18085	Soak Time	553.5
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer[mile]	*23717*	Remark	E15 TEST				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.10	Volume[scf]	
Zero Read	*0.00*							Press.[inHg]	28.89	D.F.	
Span Read	*0.00*							RH[%]	*55.96*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*10.388*	Ph. End[s]	505.6
Mass.	*0.000*							Dist.[mi]	*3.61*	Ph. Length[s]	505.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9895*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	73.41	Volume[scf]	
Zero Value	*0.00*							Press.[inHg]	28.88	D.F.	
Span Value	*0.00*							RH[%]	*53.99*	Ph. Start[s]	505.7
Sample	*0.00*							AH[g/kg]	*9.784*	Ph. End[s]	1375.0
Mass.	*0.000*							Dist.[mi]	*3.88*	Ph. Length[s]	869.4
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9704*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.11	Volume[scf]	
Zero Value	*0*							Press.[inHg]	28.88	D.F.	
Span Value	*0.00*							RH[%]	*52.91*	Ph. Start[s]	1928.6
Sample	*0*							AH[g/kg]	*9.820*	Ph. End[s]	2434.1
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.6
Mass per Dist.	*0.0000*							NO_X Corr.	*0.9716*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	0.0000							0.0000	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***	
Mass per Dist.	*0.0000*							0.0000	mile/gal	
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi]	*11.09*

Test Data: FTP75 Operator: Victor Escudero Date: 7/1/2021
Test Number: ONT3_001886 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001886

Test Cycle FTP75
Test Legislation EPA

Vehicle ID 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [lbf]	*35.110*	*59.300*
B [lbf/mph]	*-0.26370*	*-0.26750*
C [lbf/mph2]	*0.033800*	*0.035140*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	5779.15	6210.96	5779.15	
Driven	5815.55	6239.53	5797.94	
Distance Rating (%)	0.6298	0.4600	0.3251	
Cycle Energy (MJ)				
Target	4.32	3.97	4.32	
Driven	4.28	4.00	4.32	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.4497	0.3320	0.4497	
Driven	0.4537	0.3226	0.4517	
Inertial Work (MJ)				
Target	2.38	2.65	2.38	5.03
Driven	2.34	2.71	2.37	5.06
Inertial Work Fraction				
Target	0.5503	0.6680	0.5503	
Driven	0.5463	0.6774	0.5483	
Inertial Work Rating	-1.5183	2.0176	-0.3332	0.6663
Absolute Speed Change (m/s2)				
Target	204.88	340.90	204.88	545.78
Driven	202.68	344.64	203.88	548.00
Absolute Speed Change Rating (%)	-1.0724	1.0976	-0.4875	0.4082
Energy Rating	-1.4362	0.1436	-0.2998	
Energy Economy Rating	-1.4362	0.1436	-0.2998	-0.3384

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001886

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	74.10	73.58	75.38	68.00	86.00	Passed
Barometer	(inHg)	28.89	28.88	28.89	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	72.72	69.80	84.19	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61					Passed
Sample Phase Time	(s)	505.6					
Duration Phase 1	(s)	505.50					
Crank Time Phase1	(s)	0.60				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)	553.50			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001886

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	73.41	73.04	73.76	68.00	86.00	Passed
Barometer	(inHg)	28.88	28.88	28.89	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	68.48	67.42	69.93	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.88					Passed
Sample Phase Time	(s)	869.4					
Duration Phase 2	(s)	869.30					
Crank Counts		1				1	Passed
Hot Soak Time	(s)	553.50			540.00	660.00	Passed
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001886

Vehicle ID: 1C4RJEBG3LC265672

Phase 3		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	74.11	73.58	75.02	68.00	86.00	Passed
Barometer	(inHg)	28.88	28.87	28.88	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	68.74	64.52	74.96	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							Passed
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60				5	Passed
Sample Phase Time	(s)	505.6				1	Passed
Duration Phase 3	(s)	505.50				5	Passed
Crank Time Phase3	(s)	0.60			540.00	660.00	Passed
Crank Counts		1				60	Passed
Shutdown Time Phase 3							
Hot Soak Time	(s)	553.50					
Test Hold Counts		0					
Duration Test Hold	(s)	0.00					

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	7/1/2021	**Time:**	14:05:57
Test Legislation:	EPA		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E15 TEST		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

General Data

Test Number	*ONT3_001887*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA*		
Requirements (Bag)	*SIMPLE*		
Date	*7/1/2021*	CH_4 Response Factor	
Test Start	*14:05:57*	Odometer Position [mi]	*23728*
Start Time Cycle	*2021-07-01 14|10-15-(000)*	Delay Time Method	
Test End	*15:22:29*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	OFF
Shifttable	*Auto*		
Flow Stream	*PreCon_noCVS*		
Calibrated Ranges	*autorange*		
Remark	*E15 TEST*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370* ✓	*0.033800* ✓

Fuel Data ~~*91_Pump_Gas*~~ E15 ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7380*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*18085*
Fuel Tank Number		Carb. Weight Frac.	*0.8527*
Fuel Charge		HC Ratio	*1.8742*
Remarks:	*E15* ✓	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_001887	Driver	Victor Escudero	Shift Table Auto	Cold Start

Vehicle	1C4RJEBG3LC265672	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*	91_Pump_Gas		Start Time	*14:05:57*
		A [lbf]	*35.110*	Fuel type	GASOLINE	End Time	*15:22:29*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*	Density	*0.7380*		
Year	*2020*	C [lbf/mph2]	*0.033800*	NHV	18085	Soak Time	
Displacement:				CWF	*0.8527*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon_noCVS				
Odometer [mile]	*23728*	Remark	E15 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	104.18	Volume [scf]	
Zero Read	*0.00*							Press. [inHg]	28.84	D.F.	
Span Read	*0.00*							RH [%]	*21.59*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*10.346*	Ph. End [s]	1489.6
Mass.	*0.000*							Dist. [mi]	*7.47*	Ph. Length [s]	1489.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9882*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.60*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	101.81	Volume [scf]	
Zero Value	*0.00*							Press. [inHg]	28.83	D.F.	
Span Value	*0.00*							RH [%]	*22.84*	Ph. Start [s]	1489.7
Sample	*0.00*							AH [g/kg]	*10.204*	Ph. End [s]	2811.6
Mass.	*0.000*							Dist. [mi]	*2.37*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9836*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	101.18	Volume [scf]	
Zero Value	*0*							Press. [inHg]	28.83	D.F.	
Span Value	*0.00*							RH [%]	*22.82*	Ph. Start [s]	2811.7
Sample	*0*							AH [g/kg]	*10.003*	Ph. End [s]	4300.6
Mass.	*0.000*							Dist. [mi]	*7.46*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9773*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.30*

Test Data: ORVR_Prep Operator: Joseph Bishop Date: 7/1/2021
Test Number: ONT3_001887 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

ATDS Emission Lab Test Report

Drive Cycle Energy Summary

Test Record #: ONT3_001887

Test Cycle RL
Test Legislation EPA

Vehicle ID 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [lbf]	*35.110*	*59.300*
B [lbf/mph]	*-0.26370*	*-0.26750*
C [lbf/mph2]	*0.033800*	*0.035140*

	Phase1	Phase2	Phase3	Weighted
Distance				
Target	11990.13	3792.74	11990.13	
Driven	12016.74	3818.47	12008.91	
Distance Rating (%)	0.2220	0.6786	0.1567	
Cycle Energy (MJ)				
Target	8.29	3.38	8.29	
Driven	8.37	3.28	8.41	
Distance per Energy Cycle (m/MJ)				
Target				
Driven				
Road Load Work Fraction				
Target	0.3933	0.1814	0.3933	
Driven	0.3952	0.1816	0.3794	
Inertial Work (MJ)				
Target	5.03	2.77	5.03	7.80
Driven	5.06	2.69	5.22	7.84
Inertial Work Fraction				
Target	0.6067	0.8186	0.6067	
Driven	0.6048	0.8184	0.6206	
Inertial Work Rating	0.5821	-2.9427	3.7798	0.5069
Absolute Speed Change (m/s2)				
Target	545.79	469.54	545.79	1015.33
Driven	546.83	453.99	558.33	1007.37
Absolute Speed Change Rating (%)	0.1900	-3.3132	2.2976	-0.7843
Energy Rating	0.6632	-3.7068	1.2784	
Energy Economy Rating	0.6632	-3.7068	1.2784	-0.2884

ATDS Emission Lab Test Report

Phase 1

Validation

Test Record #: ONT3_001887

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 1							
Cell Temperature	(°F)	104.18	101.32	106.16	100.00	109.99	Passed
Barometer	(inHg)	28.84	28.83	28.85	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	72.42	67.84	75.16	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 1							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.47					
Sample Phase Time	(s)	1489.6					
Duration Phase 1	(s)	1489.50					
Crank Time Phase1	(s)	0.60				5	Passed
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed
CVS Choke Flow Conditions							

ATDS Emission Lab Test Report

Phase 2

Validation

Test Record #: ONT3_001887

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
Phase 2							
Cell Temperature	(°F)	101.81	100.24	105.26	100.00	109.99	Passed
Barometer	(inHg)	28.83	28.83	28.84	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	71.43	67.51	74.62	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 2							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.37					
Sample Phase Time	(s)	1322.0					
Duration Phase 2	(s)	1321.90					
Crank Counts		1				1	Passed
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					
Duration Test Hold	(s)	0.00				60	Passed

ATDS Emission Lab Test Report

Phase 3

Validation

Test Record #: ONT3_001887

Vehicle ID: 1C4RJEBG3LC265672

Phase 3		Average	Min	Max	Low Limit	Upper Limit	Status
Cell Temperature	(°F)	101.18	100.34	106.16	100.00	109.99	Passed
Barometer	(inHg)	28.83	28.82	28.83	23.62	32.48	Passed
Specific Humidity Test Cell	(gr/lb)	70.02	66.55	72.03	38.50	87.50	Passed
CVS Inlet Temperature	(°F)				68.00	200.00	
Phase 3							
Dilution Air Concentrations							
HC	(ppm)	0.00			0.00	9.00	
NO_x	(ppm)				0	1.50	
CO	(ppm)				0	12.20	
CO_2	(%)				0.00	0.09	
CH_4	(ppm)				0.00	12.20	
Bag Analysis Time Ambient	(s)					1200	
Bag Analysis Time Exhaust	(s)					1200	
Bag Sample Proportionality Check							
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.46					
Sample Phase Time	(s)	1489.0					
Duration Phase 3	(s)	1488.90					
Crank Time Phase3	(s)	0.00					
Crank Counts		1				5	Passed
Shutdown Time Phase 3						1	Passed
Hot Soak Time	(s)					5	
Test Hold Counts		0			540.00	660.00	
Duration Test Hold	(s)	0.00					
						60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_001887

ATDS Vehicle ID	3081-265672	***VIN***	1C4RJEBG3LC265672
Model Year	2020	***Make/Model***	Jeep Cherokee
Test Group	LCRXT03.65P5	***Engine Size***	3.6L
Evaporative Family	LCRXR0204RP0	***Canister Capacity***	204 g
Odometer	23745	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, July 1, 2021	***Profile***	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **7/1/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	15:22:29	0:00:00	0:00:00	
Engine Key-off	15:27:00	0:04:31	0:04:31	
SHED Door Sealed	15:28:00	0:01:00	0:05:31	
Final Sample	16:28:00	1:00:00	1:05:31	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 3.829 ppm	Volume = 1796.7 ft3	Temp. = 107.1 °F	Baro. = 28.83 in/Hg	Mass HC=0.111 grams
Post Read Zero = 0 ppm	Post Read Span = 9.545 ppm			Mass EtOH= -0.02 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 6.052 ppm	Volume = 1792.7 ft3	Temp. = 104.9 °F	Baro. = 28.8 in/Hg	Mass HC =0.166 grams
Post Read Zero = -0.031 ppm	Post Read Span = 9.518 ppm			Mass EtOH = 0.001 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 102.1 °F	Minimum = 102 °F			
Max Ambient Temp = 107.2 °F	Maximum = 108 °F			
Min Interior Temp = 102.1 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.055±0.01 grams**
				Diurnal Mass EtOH = 0.021 grams
				Diurnal Total Mass HC plus EtOH = 0.06025 grams

HOT SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, July 1, 2021	17:28:00	0:00:00	
End Cold Soak	Thursday, July 1, 2021	23:28:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63.1 °F	Minimum = 62 °F			
Max. Ambient Temp = 65.5 °F	Maximum = 68 °F			
Min. Internal Temp = 63.1 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Capacity*	204 g
Odometer	23745	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, July 1, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Thursday, July 1, 2021	23:28:00	0:00:00	
Start Time Diurnal	Thursday, July 1, 2021	23:28:00	0:00:00	
End Time Diurnal	Friday, July 2, 2021	23:28:00	24:00:00	
24 Hour Sample	Friday, July 2, 2021	23:28:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 6.81 ppm	Volume = 1668.8 ft3	Temp. = 64.9 °F	Baro. = 28.9 in/Hg	Mass HC =0.189 grams
Post Read Zero = 0 ppm	Post Read Span = 9.533 ppm			Mass EtOH= 0.027 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 24.24 ppm	Volume = 1657.2 ft3	Temp. = 65 °F	Baro. = 28.94 in/Hg	Mass HC=0.661 grams
Post Read Zero = -0.016 ppm	Post Read Span = 93.324 ppm			Mass EtOH= 0.201 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.6 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.3 °F	± 2 °F			
Max. Δ Profile Sidewall = 1.2 °F	± 5 °F			
Min Water Temperature 64.35 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.472±0.01 grams**
				Diurnal Mass EtOH = 0.174 grams
				Diurnal Total Mass HC plus EtOH = 0.516 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	***VIN***	1C4RJEBG3LC265672
Model Year	2020	***Make/Model***	Jeep Cherokee
Test Group	LCRXT03.65P5	***Engine Size***	3.6L
Evaporative Family	LCRXR0204RP0	***Capacity***	204 g
Odometer	23745	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, July 1, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Friday, July 2, 2021	23:28:00	24:00:00	
Start Time Diurnal	Friday, July 2, 2021	23:28:00	24:00:00	
End Time Diurnal	Saturday, July 3, 2021	23:28:00	48:00:00	
48 Hour Sample	Saturday, July 3, 2021	23:28:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 24.24 ppm	Volume = 1657.2 ft3	Temp. = 65 °F	Baro. = 28.94 in/Hg	Mass HC=0.661 grams
Post Read Zero = 0 ppm	Post Read Span = 93.324 ppm			Mass EtOH= 0.201 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 39.634 ppm	Volume = 1646.3 ft3	Temp. = 64.9 °F	Baro. = 28.95 in/Hg	Mass HC=1.07 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.306 ppm			Mass EtOH= 0.332 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.4 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.2 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.9 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.409±0.01 grams**
				Diurnal Mass EtOH = 0.131 grams
				Diurnal Total Mass HC plus EtOH = 0.442 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	***VIN***	1C4RJEBG3LC265672
Model Year	2020	***Make/Model***	Jeep Cherokee
Test Group	LCRXT03.65P5	***Engine Size***	3.6L
Evaporative Family	LCRXR0204RP0	***Capacity***	204 g
Odometer	23745	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, July 1, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Saturday, July 3, 2021	23:28:00	48:00:00	
Start Time Diurnal	Saturday, July 3, 2021	23:28:00	48:00:00	
End Time Diurnal	Sunday, July 4, 2021	23:28:00	72:00:00	
72 Hour Sample	Sunday, July 4, 2021	23:28:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 39.634 ppm	Volume = 1646.3 ft3	Temp. = 64.93 °F	Baro. = 28.95 in/Hg	Mass HC=1.07 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.306 ppm			Mass EtOH= 0.332 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 56.623 ppm	Volume = 1637.1 ft3	Temp. = 65 °F	Baro. = 28.94 in/Hg	Mass HC=1.523 grams
Post Read Zero = -0.032 ppm	Post Read Span = 93.301 ppm			Mass EtOH= 0.393 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 2.4 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.2 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.2 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.453±0.01 grams**
				Diurnal Mass EtOH = 0.061 grams
				Diurnal Total Mass HC plus EtOH = 0.468 grams

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: 0.576 grams {hot soak + highest 24 hour mass}

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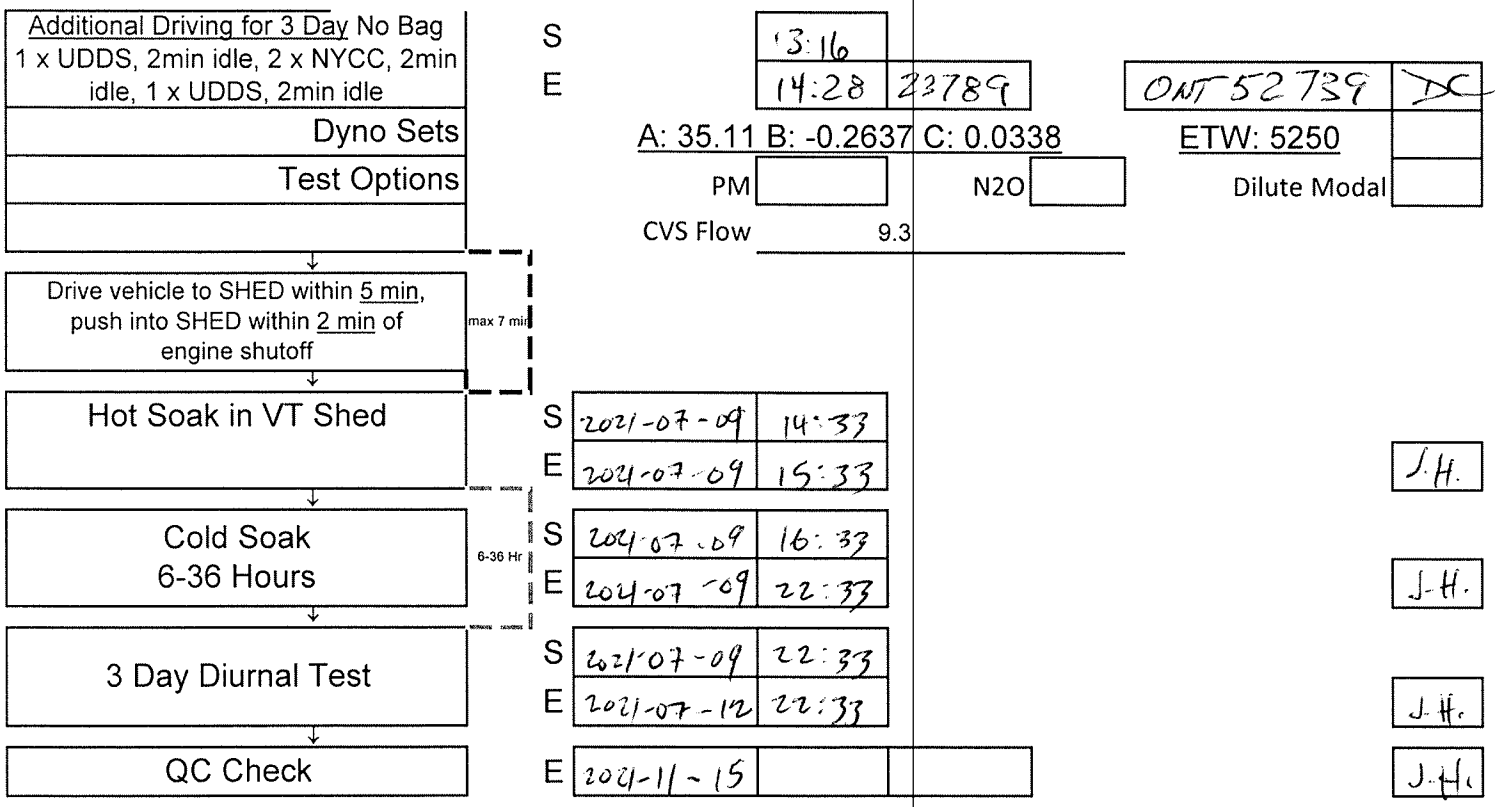
Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Jeep Cherokee
Vehicle #:	3081-265672	**Engine Size**	3.6L
VIN:	1C4RJEBG3LC265672	**Model Year**	2020
Engine Family:	LCRXT03.65P5	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Precon FTP 72 (UDDS)	S	7/8/21	15:28	23745		ONT 52735	JB
	E	↓	15:51	23753			
Dyno Sets		A: 35.11 B: -0.2637 C: 0.0338		23760		ETW: 5250	VE
Vehicle Soak 68-86°F	S	7/8/21	16:00				JB
	E	2021-07-09	10:54				JC
Canister Loading with Butane Type: 1.5x Load (12-36 hr)	S	2021-07-08	16:33				
	E	2021-07-09	07:09			21070901.ST3	JB
Canister Loading Specs	Cap	204	Vol	3.1			
	Purge	300	Flow Rate	15		LCRXR0204RP0	
Set tire pressure to sticker	Front	36	Back	36			
No Bag Cold Start FTP 75	S	2021-07-09	10:54	23760			
	E	↓	11:35	23772		ONT 52738	JC
Dyno Sets		A: 35.11 B: -0.2637 C: 0.0338				ETW: 5250	
Test Options	PM		N2O			Dilute Modal	
	CVS Flow	P1:9.3 P2:9.3 P3:9.3					
Pre Test Comments	E15 Test						
Fuel Tank Temp. Stabilization at 105F (max 1 hr)	S	2021-07-09	12:05				
	E	↓	12:14				

T ~~81.36~~ 83.00
B 28.76 25.78
T 75.48 79.95


Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
S
E
13:16
14:28
23789
ONT 52 739
DC
Dyno Sets
A: 35.11 B: -0.2637 C: 0.0338
ETW: 5250
Test Options
PM
N2O
Dilute Modal
CVS Flow
9.3
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
S
E
2021-07-09
14:33
2021-07-09
15:33
J.H.
Cold Soak
6-36 Hours
6-36 Hr
S
E
2021-07-09
16:33
2021-07-09
22:33
J.H.
3 Day Diurnal Test
S
E
2021-07-09
22:33
2021-07-12
22:33
J.H.
QC Check
E
2021-11-15
J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081	3081-265672		
VIN:	1C4RJEBG3LC265672			
Test Cell:	Cell 2			
Make / Model / Wheel drive / MY:	Jeep	Cherokee	RWD	2020
Test Group / Engine Size (L):	LCRXT03.65P5	3.6L		
EVAP Family:	LCRXR0204RP0			
Standard Tire Size (front) / Pressure:	265/60-18	36		
Standard Tire Size (rear) / Pressure:	265/60-18	36		
Transmission / Shift File / Inertia Weight:	Auto	Auto	5250	
Target Coefficients A / B / C:	59.30	-0.2675	0.035140	
Warmup Coefficients A / B / C:	29.65	-0.0535	0.035140	
Set Coefficients A / B / C:	35.11	-0.2637	0.0338	
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E15 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	24.6
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	204
Canister volume (Liter)	3.1
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 2 - RWD
9.84 of See Notes!
E15 Fuel
105.9" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐	Test Quantity:	1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

Test = Precon 1

Options = Sec ShowTol

Test Init Start	= 08 July 2021 15:24:45	Test Start	= 08 July 2021 15:28:47
Posttest Completed At	= 08 July 2021 15:52:32	Test Finish	= 08 July 2021 15:51:42

Personnel Information::

Driver	= Victor Escudero	Operator	= Joe Bishop
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 35.11 (lbs) ✓
Road Load B	= -0.2637 ✓	Road Load C	= 0.0338 ✓

Fuel Information:

Fuel	= GASOLINE - E15 ✓	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	Con't

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23753	Idle RPM	=
Test end Odometer	= 23760	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.79	Phase Start	= 15:28:47
	Temp	(F) =	83.3	Phase Finish	= 15:37:12
	Tdew	(F) =	60.9		
	Ahum	(gr/lb) =	83.0	Elapsed (sec) =	505.0
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.610		
Phase 2:	Baro	(inHg) =	28.79	Phase Start	= 15:37:12
	Temp	(F) =	83.1	Phase Finish	= 15:51:42
	Tdew	(F) =	60.2		
	Ahum	(gr/lb) =	81.0	Elapsed (sec) =	869.5
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.861		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Shutdown Time	VALID	5 (sec)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-265672 ✓
Project	3081
Evap Family	LCRXR0204RP0 ✓
Ambient Temperature-Deg F	83
Barometric Pressure-In/Hg	28.78
Humidity-Grains/Lb	70.0 ✓
Butane Flow Command-Gm/Hr	19.0
Canister HC Capacity-Grams	204 ✓
Canister Volume-Liters	3.1
Overfill/Cycle	1.5 ✓
Test Cycles	1 of 1
Start time	16:33:10
Start date	07-08-2021
Bed Purges/Cycle	300
Purge End/Load Start	17:14:19
Test Time Minutes	1008
HC Loaded-Grams	306.0 ✓
Scale Reading-Grams	0.23
Butane Flow Actual-Gm/Hr	19.0
Cycles Completed	1
Finish time	09:21:20
Finish date	07-09-2021
Disk File Name	21070901.ST3

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

Test = EPA 75

Options = Sec ShowTol

Test Init Start	= 09 July 2021 10:53:29	Test Start	= 09 July 2021 10:54:57
Posttest Completed At	= 09 July 2021 11:36:19	Test Finish	= 09 July 2021 11:35:31
Hot Soak Start Time	= 08 July 2021 16:00:00		

Personnel Information::

Driver	= Jennifer Chappell	Operator	= Domenic Coppola
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Soak Start Time:	= JULY 8, 2021 16:00	Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 35.11 (lbs) ✓
Road Load B	= -0.2637 ✓	Road Load C	= 0.0338 ✓

Fuel Information:

Fuel	= GASOLINE - E15 ✓	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	AUTO
Phase 2	Con't
Phase 3	AUTO

Response Factors:

Bag Methane = 1.05

Pre Test Remarks:

E15 TEST

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23760	Idle RPM	=
Test end Odometer	= 23772	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

AD QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: ok

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.91	Phase Start	= 10:54:57
	Temp	(F) =	76.6	Phase Finish	= 11:03:23
	Tdew	(F) =	57.6		
	Ahum	(gr/lb) =	73.2	Elapsed (sec) =	505.7
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.613	Crank Time =	0.8
Phase 2:	Baro	(inHg) =	28.92	Phase Start	= 11:03:23
	Temp	(F) =	76.8	Phase Finish	= 11:17:53
	Tdew	(F) =	57.3		
	Ahum	(gr/lb) =	72.4	Elapsed (sec) =	869.5
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.874		
Phase 3:	Baro	(inHg) =	28.91	Phase Start	= 11:27:05
	Temp	(F) =	77.6	Phase Finish	= 11:35:31
	Tdew	(F) =	57.5		
	Ahum	(gr/lb) =	73.0	Elapsed (sec) =	505.6
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.591	Crank Time =	0.7

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Crank Time	VALID	5 (sec)
Restart Attempts	VALID	1
Shutdown Time	VALID	5 (sec)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Hot Soak Length	VALID	540 - 660 (sec)
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = EPA / Carb Running Loss

Options = Sec ShowTol

Test Init Start	= 07/09/2021 13:10:50	Test Start	= 07/09/2021 13:16:44
Posttest Completed At	= 07/09/2021 14:32:03	Test Finish	= 07/09/2021 14:28:24
Hot Soak Start Time	= 07/08/16:00:00		

Personnel Information::

Driver	= Jennifer Chappell	Operator	= Domenic Coppola
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Soak Start Time:	= JULY 8, 2021 16:00	Ambient Limit Type	= OPEN

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 35.11 (lbs) ✓
Road Load B	= -0.2637 ✓	Road Load C	= 0.0338 ✓

Fuel Information:

Fuel	= GASOLINE - E15 ✓	Specific gravity	= 0.7420
NHV	= 18476.00	Fuel R-Factor	= 0.60
CWF	= 0.8652	OWF	= 0.0000
HWF	= 0.1339	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	N/A
Phase 3	N/A

Response Factors:
Bag Methane = 1.05

Pre Test Remarks:
E15 TEST

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23772	Idle RPM	=
Test end Odometer	= 23789	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: S. H.

DATE: 11/5/2021

COMMENTS: OK

		Test Info		Times Info	
Phase 1:	Baro	(inHg) =	28.90	Phase Start	= 13:16:44
	Temp	(F) =	104.1	Phase Finish	= 13:41:36
	Tdew	(F) =	59.1		
	Ahum	(gr/lb) =	77.3	Elapsed (sec) =	1492.5
				Drv Err (sec) =	0.0
	Dist	(mi) =	7.552	Crank Time =	0.5
Phase 2:	Baro	(inHg) =	28.89	Phase Start	= 13:41:36
	Temp	(F) =	101.8	Phase Finish	= 14:03:32
	Tdew	(F) =	59.8		
	Ahum	(gr/lb) =	79.5	Elapsed (sec) =	1316.0
				Drv Err (sec) =	0.0
	Dist	(mi) =	2.404		
Phase 3:	Baro	(inHg) =	28.89	Phase Start	= 14:03:32
	Temp	(F) =	104.8	Phase Finish	= 14:28:24
	Tdew	(F) =	60.8		
	Ahum	(gr/lb) =	82.3	Elapsed (sec) =	1492.0
				Drv Err (sec) =	0.0
	Dist	(mi) =	7.450		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	-200 - 200 (degF)
Barometer	VALID	-200 - 200 (inHg)
Dew Point	VALID	-200 - 200 (degF)
Absolute Humidity	VALID	-200 - 200 ()
Crank Time	VALID	5 (sec)
Restart Attempts	VALID	1
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT52739

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Canister Capacity*	204 g
Odometer	23789	*Vehicle Test Volume*	50 ft3
Test Start Date	Friday, July 9, 2021	*Profile*	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) 7/9/2021

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	14:28:24	0:00:00	0:00:00	
Engine Key-off	14:32:00	0:03:36	0:03:36	
SHED Door Sealed	14:33:00	0:01:00	0:04:36	
Final Sample	15:33:00	1:00:00	1:04:36	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 4.083 ppm	Volume = 1793 ft3	Temp. = 105.4 °F	Baro. = 28.92 in/Hg	Mass HC=0.123 grams
Post Read Zero = 0 ppm	Post Read Span = 9.54 ppm			Mass EtOH= -0.033 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 7.157 ppm	Volume = 1789.4 ft3	Temp. = 105.1 °F	Baro. = 28.89 in/Hg	Mass HC =0.201 grams
Post Read Zero = -0.01 ppm	Post Read Span = 9.55 ppm			Mass EtOH = -0.01 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 104.2 °F	Minimum = 102 °F			
Max Ambient Temp = 107.1 °F	Maximum = 108 °F			
Min Interior Temp = 104.2 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.078±0.01 grams**
				Diurnal Mass EtOH = 0.023 grams
				Diurnal Total Mass HC plus EtOH = 0.08375 grams

HOT SOAK TEST STATUS = COMPLETE

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Friday, July 9, 2021	16:33:00	0:00:00	
End Cold Soak	Friday, July 9, 2021	22:33:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 62.7 °F	Minimum = 62 °F			

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3-Day Diurnal Test Report Shed 1

Max. Ambient Temp = 65.5 °F	Maximum = 68 °F			
Min. Internal Temp = 62.7 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Capacity*	204 g
Odometer	23789	*Vehicle Test Volume*	50 ft3
Test Start Date	Friday, July 9, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Friday, July 9, 2021	22:33:00	0:00:00	
Start Time Diurnal	Friday, July 9, 2021	22:33:00	0:00:00	
End Time Diurnal	Saturday, July 10, 2021	22:33:00	24:00:00	
24 Hour Sample	Saturday, July 10, 2021	22:33:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 7.728 ppm	Volume = 1665.4 ft3	Temp. = 65 °F	Baro. = 28.93 in/Hg	Mass HC =0.211 grams
Post Read Zero = 0 ppm	Post Read Span = 9.55 ppm			Mass EtOH= 0.014 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 26.695 ppm	Volume = 1661.3 ft3	Temp. = 65.1 °F	Baro. = 28.95 in/Hg	Mass HC=0.727 grams
Post Read Zero = -0.019 ppm	Post Read Span = 93.339 ppm			Mass EtOH= 0.187 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.8 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.8 °F	± 5 °F			
Min Water Temperature 64.35 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.516±0.01 grams**
				Diurnal Mass EtOH = 0.173 grams
				Diurnal Total Mass HC plus EtOH = 0.559 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	***VIN***	1C4RJEBG3LC265672
Model Year	2020	***Make/Model***	Jeep Cherokee
Test Group	LCRXT03.65P5	***Engine Size***	3.6L
Evaporative Family	LCRXR0204RP0	***Capacity***	204 g
Odometer	23789	***Vehicle Test Volume***	50 ft3
Test Start Date	Friday, July 9, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Saturday, July 10, 2021	22:33:00	24:00:00	
Start Time Diurnal	Saturday, July 10, 2021	22:33:00	24:00:00	
End Time Diurnal	Sunday, July 11, 2021	22:33:00	48:00:00	
48 Hour Sample	Sunday, July 11, 2021	22:33:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 26.695 ppm	Volume = 1661.3 ft3	Temp. = 65.1 °F	Baro. = 28.95 in/Hg	Mass HC=0.727 grams
Post Read Zero = 0 ppm	Post Read Span = 93.339 ppm			Mass EtOH= 0.187 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 43.758 ppm	Volume = 1655.2 ft3	Temp. = 64.8 °F	Baro. = 28.9 in/Hg	Mass HC=1.187 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.306 ppm			Mass EtOH= 0.32 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.9 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.1 °F	± 2 °F			
Max. Δ Profile Sidewall = 0.9 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.46±0.01 grams**
				Diurnal Mass EtOH = 0.133 grams
				Diurnal Total Mass HC plus EtOH = 0.493 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	***VIN***	1C4RJEBG3LC265672
Model Year	2020	***Make/Model***	Jeep Cherokee
Test Group	LCRXT03.65P5	***Engine Size***	3.6L
Evaporative Family	LCRXR0204RP0	***Capacity***	204 g
Odometer	23789	***Vehicle Test Volume***	50 ft3
Test Start Date	Friday, July 9, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Sunday, July 11, 2021	22:33:00	48:00:00	
Start Time Diurnal	Sunday, July 11, 2021	22:33:00	48:00:00	
End Time Diurnal	Monday, July 12, 2021	22:33:00	72:00:00	
72 Hour Sample	Monday, July 12, 2021	22:33:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 43.758 ppm	Volume = 1655.2 ft3	Temp. = 64.83 °F	Baro. = 28.9 in/Hg	Mass HC=1.187 grams
Post Read Zero = -0.021 ppm	Post Read Span = 93.306 ppm			Mass EtOH= 0.32 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 62.751 ppm	Volume = 1647.2 ft3	Temp. = 65 °F	Baro. = 28.89 in/Hg	Mass HC=1.693 grams
Post Read Zero = -0.025 ppm	Post Read Span = 93.321 ppm			Mass EtOH= 0.447 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1 °F	± 3 °F			
Avg. Δ Profile Underbody = 0.1 °F	± 2 °F			
Max. Δ Profile Sidewall = 1 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.506±0.01 grams**
				Diurnal Mass EtOH = 0.127 grams
				Diurnal Total Mass HC plus EtOH = 0.538 grams

QUALITY ASSURANCE
INSPECTED BY: J.H.
DATE: 11/15/2021
COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: ~~0.643 grams~~ {hot soak + highest 24 hour mass}

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Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Jeep Cherokee
Vehicle #:	3081-265672	**Engine Size**	3.6L
VIN:	1C4RJEBG3LC265672	**Model Year**	2020
Engine Family:	LCRXT03.65P5	**Requested By:**	J. Link

Documentation

	Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Canister Purge 1 Hour	E	2021-07-16	09:06	23789			JL
Fuel Drain and 3 gal Fill, Fuel Type: See Notes!	S	2021-07-16	09:15		3		
	E	2021-07-16	09:30			Fuel Spec: E10	JM
Idle 1 min							LG
Fuel Drain and 40% Fill, Fuel Type: See Notes!	S	2021-07-16	09:45		9.84		
	E	2021-07-16	10:15			Fuel Spec: <60F 53.2F	LG
Heat Build 60F-105F in 1 Hour	S	2021-07-16	11:20	23789			
	E	2021-07-16	12:20	23789			LG
Precon FTP 72 (UDDS) 1	S	2021-07-18	6:06	23789			
	E		6:29	23797		ONT52765	VE
Dyno Sets		A: 29.65 B: -0.0535 C: 0.03514				ETW: 5250	
Precon FTP 72 (UDDS) 2	S		6:33	23797			
	E		6:56	23804		ONT52766	VE
Precon FTP 72 (UDDS) 3	S		6:59	23804			
	E		7:22	23812		ONT52767	VE
Precon FTP 72 (UDDS) 4	S		7:27	23812			
	E	✓	7:50	23819		ONT52768	VE
Eng Off 5 min							VE
Idle 1 min							VE
Eng Off 1 min							VE
Idle 1 min							VE
Vehicle Soak 21 Days	S	2021-07-18	7:58				

68-86°F

E

↓

Set tire pressure
7psi over sticker

Front 43 Back 43

↓

Fuel Drain and 40% Fill,
Fuel Type: See Notes!

S

E

9.84

Fuel Spec:

↓

Vehicle Soak
68-86°F

min 6 hr.

S

E

↓

Set tire pressure to sticker

Front 36 Back 36 JB

↓

2x HFET warmup
J2264 Dyno Coastdown
Dyno Sets for Warmup HWY

S	8/17/21	18:53	23819
E	↓	19:25	23840

ONT3-002018 JB

A: 29.65 B: -0.0535 C: 0.03514

ETW: 5250

↓

Precon FTP 72 (UDDS)
Dyno Sets

S	8/18/2021	07:24	23849
E		08:03	23856

ONT3002030 JC

A: 35.11 B: -0.2637 C: 0.0338

ETW: 5250 JC

↓

Vehicle Soak
68-86°F

S

E

T 76.8
B 28.9
H 69.4

↓

Canister Loading with Butane
Type: 1.5x Load

12-36 hr

S 8/18/2021

E

Canister Loading Specs

Cap 204 Vol 3.1

Purge 300 Flow Rate 15 LCRXR0204RP0

↓

Set tire pressure to sticker

Front 36 Back 36

↓

No Bag Cold Start FTP 75
Dyno Sets
Test Options

S	8/18/21	13:04	23856
E	↓	13:49	23867

ONT3 002040 JB

A: 35.11 B: -0.2637 C: 0.0338

ETW: 5250

PM N2O Dilute Modal

CVS Flow P1:9.3 P2:9.3 P3:9.3

E10 Test

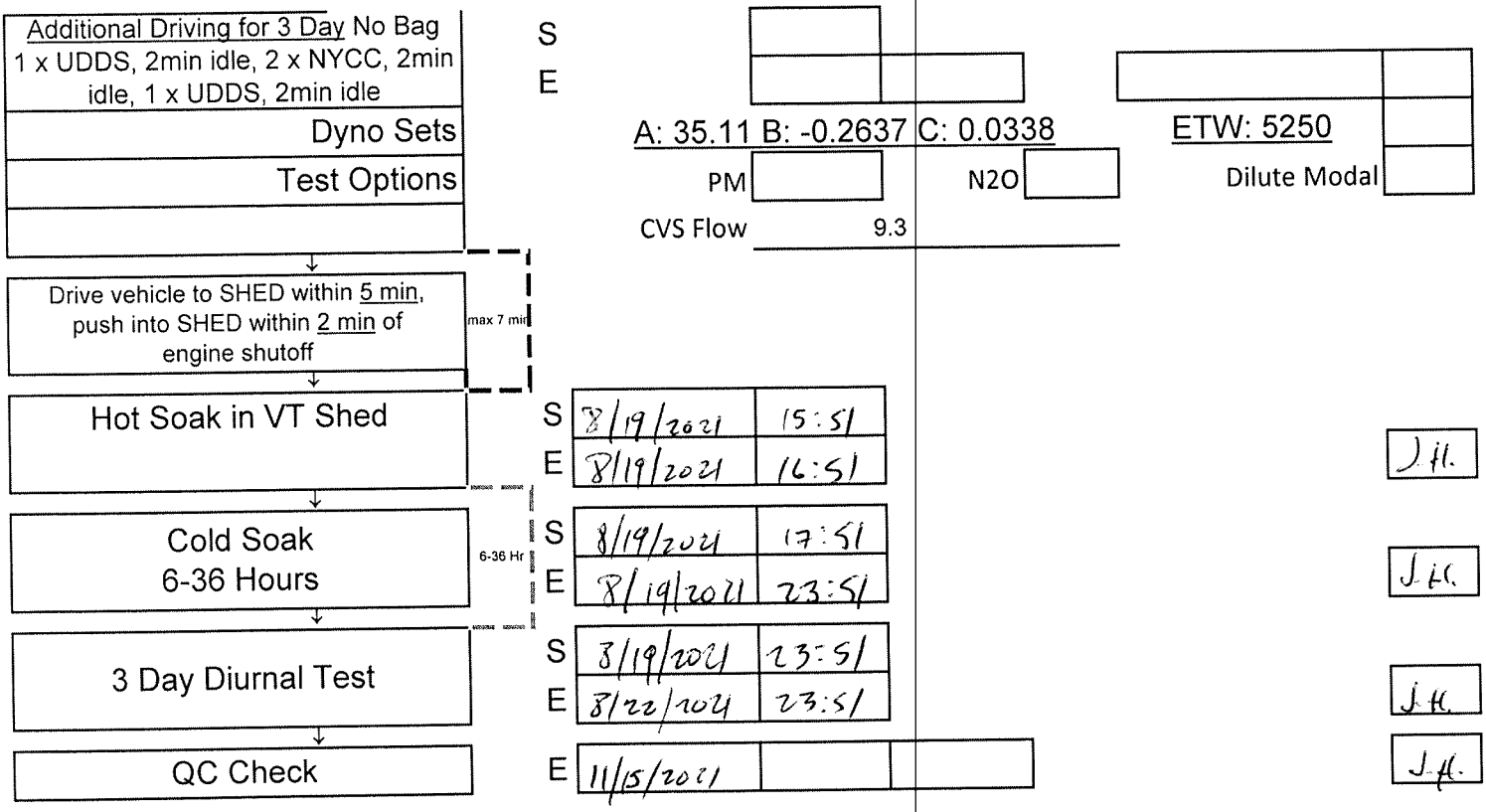
Pre Test Comments

↓

Fuel Tank Temp.
Stabilization at 105F

max 1 hr

S	8/18/21	13:50	JB
E	↓	14.25	JB


Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
S
E
A: 35.11 B: -0.2637 C: 0.0338
PM
N2O
CVS Flow 9.3
ETW: 5250
Dilute Modal
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
S 8/19/2021 15:51
E 8/19/2021 16:51
J.H.
Cold Soak
6-36 Hours
6-36 Hr
S 8/19/2021 17:51
E 8/19/2021 23:51
J.H.
3 Day Diurnal Test
S 8/19/2021 23:51
E 8/22/2021 23:51
J.H.
QC Check
E 11/15/2021
J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081		3081-265672	
VIN:	1C4RJEBG3LC265672			
Test Cell:	Cell 2			
Make / Model / Wheel drive / MY:	Jeep	Cherokee	RWD	2020
Test Group / Engine Size (L):	LCRXT03.65P5		3.6L	
EVAP Family:	LCRXR0204RP0			
Standard Tire Size (front) / Pressure:	265/60-18		36	
Standard Tire Size (rear) / Pressure:	265/60-18		36	
Transmission / Shift File / Inertia Weight:	Auto	Auto	5250	
Target Coefficients A / B / C:	59.30	-0.2675	0.035140	
Warmup Coefficients A / B / C:	29.65	-0.0535	0.035140	
Set Coefficients A / B / C:	35.11	-0.2637	0.0338	
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E10 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	24.6
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	204
Canister volume (Liter)	3.1
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 2 - RWD
9.84 of See Notes!
~~E0 Fuel~~ E10
105.9" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Emissions Test Data:

FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐	Test Quantity:	1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options		Mini Bags	☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp ☐	Mini Bags	☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp ☑	Mini Bags	☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS CANISTER WORKSHEET

Station number 3

----PURGE ONLY----

VT#	3081-265672 ✓
Project	3081
Evap Family	~~LCRXT03.65P5~~ LCRXR0204RPO ✓
Ambient Temperature-Deg F	75
Barometric Pressure-In/Hg	28.82
Humidity-Grains/Lb	67.5 ✓
Butane Flow Command-Gm/Hr	0.0
Canister HC Capacity-Grams	0
Canister Volume-Liters	13.6
Overfill/Cycle	1.0
Test Cycles	1 of 1
Start time	08:06:00
Start date	07-16-2021
Bed Purges/Cycle	100
Purge End/Load Start	09:06:09
Test Time Minutes	60 ✓
HC Loaded-Grams	0.0
Scale Reading-Grams	0.23
Butane Flow Actual-Gm/Hr	0.0
Cycles Completed	1
Finish time	09:06:09
Finish date	07-16-2021
Disk File Name	21071601.ST3

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

Test = Precon 1

Options = Sec ShowTol

Test Init Start	= 18 July 2021 06:03:32	Test Start	= 18 July 2021 06:06:37
Posttest Completed At	= 18 July 2021 06:29:55	Test Finish	= 18 July 2021 06:29:32

Personnel Information::

Driver	= Victor Escudero	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 29.65 (lbs) ✓
Road Load B	= -0.0535 ✓	Road Load C	= 0.03514 ✓

Fuel Information:

Fuel	= GASOLINE E10 ✓	Specific gravity	= 0.7600
NHV	= 18012.00	Fuel R-Factor	= 0.60
CWF	= 0.8810	OWF	= 0.0000
HWF	= 0.1190	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	Con't

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 1
E10 GASOLINE

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23789	Idle RPM	=
Test end Odometer	= 23797	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: J.H

DATE: 11/15/2024

COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.96	Phase Start	= 06:06:37
	Temp	(F) =	76.1	Phase Finish	= 06:15:02
	Tdew	(F) =	57.4		
	Ahum	(gr/lb) =	72.4	Elapsed (sec) =	505.0
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.604		
Phase 2:	Baro	(inHg) =	28.97	Phase Start	= 06:15:02
	Temp	(F) =	76.3	Phase Finish	= 06:29:32
	Tdew	(F) =	57.7		
	Ahum	(gr/lb) =	73.4	Elapsed (sec) =	869.8
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.885		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Shutdown Time	VALID	5 (sec)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = Precon 1

Options = Sec ShowTol

Test Init Start	= 18 July 2021 06:30:19	Test Start	= 18 July 2021 06:33:54
Posttest Completed At	= 18 July 2021 06:57:10	Test Finish	= 18 July 2021 06:56:48

Personnel Information::

Driver	= Victor Escudero	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7		

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 29.65 (lbs) ✓
Road Load B	= -0.0535 ✓	Road Load C	= 0.03514 ✓

Fuel Information:

Fuel	= GASOLINE E10 ✓	Specific gravity	= 0.7600
NHV	= 18012.00	Fuel R-Factor	= 0.60
CWF	= 0.8810	OWF	= 0.0000
HWF	= 0.1190	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	Con't

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 2

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23797	Idle RPM	=
Test end Odometer	= 23804	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE
INSPECTED BY: J.H.
DATE: 11/15/2021
COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.97	Phase Start	= 06:33:54
	Temp	(F) =	76.5	Phase Finish	= 06:42:19
	Tdew	(F) =	57.8		
	Ahum	(gr/lb) =	73.5	Elapsed (sec) =	504.9
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.584		
Phase 2:	Baro	(inHg) =	28.97	Phase Start	= 06:42:19
	Temp	(F) =	76.9	Phase Finish	= 06:56:48
	Tdew	(F) =	57.6		
	Ahum	(gr/lb) =	73.2	Elapsed (sec) =	869.3
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.867		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Shutdown Time	VALID	5 (sec)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = Precon 1

Options = Sec ShowTol

Test Init Start	= 18 July 2021 06:57:42	Test Start	= 18 July 2021 06:59:09
Posttest Completed At	= 18 July 2021 07:22:33	Test Finish	= 18 July 2021 07:22:04

Personnel Information::

Driver	= Victor Escudero	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 29.65 (lbs) ✓
Road Load B	= -0.0535 ✓	Road Load C	= 0.03514 ✓

Fuel Information:

Fuel	= GASOLINE E10 ✓	Specific gravity	= 0.7600
NHV	= 18012.00	Fuel R-Factor	= 0.60
CWF	= 0.8810	OWF	= 0.0000
HWF	= 0.1190	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	Con't

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 3

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23804	Idle RPM	=
Test end Odometer	= 23812	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

AD QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: ok

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.97	Phase Start	= 06:59:09
	Temp	(F) =	77.1	Phase Finish	= 07:07:34
	Tdew	(F) =	57.7		
	Ahum	(gr/lb) =	73.2	Elapsed (sec) =	505.0
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.561		
Phase 2:	Baro	(inHg) =	28.98	Phase Start	= 07:07:34
	Temp	(F) =	77.3	Phase Finish	= 07:22:04
	Tdew	(F) =	57.5		
	Ahum	(gr/lb) =	72.8	Elapsed (sec) =	869.3
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.841		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Shutdown Time	VALID	5 (sec)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

Test = Precon 1

Options = Sec ShowTol

Test Init Start	= 18 July 2021 07:23:22	Test Start	= 18 July 2021 07:27:42
Posttest Completed At	= 18 July 2021 07:51:10	Test Finish	= 18 July 2021 07:50:37

Personnel Information::

Driver	= Victor Escudero	Operator	= Victor Escudero
Requestor	= J. Link	Supervisor	= Link, Jason

Vehicle Information:

VIN	= 1C4RJEBG3LC265672 ✓	Cert Tracking ID	= 3081-265672
Vehicle Model	= JEEP CHEROKEE	Model Year	= 2020
Engine Family	= LCRXT03.65P5 ✓	Eng. Disp.	= 3.6L
Ignition Status	= No	Transmission	=
Automatic	= 1	Idle RPM	=
Sample Delay	=		

Vehicle Conditions:

Ambient Limit Type	= OTHER7

Test Specifications:

TO-Number	= W0110	CVS BulkStream Flow :	= 2) 350 scfm
TestNet Number	= 3081		

Dynamometer:

Inertia	= 5250 (lb) ✓	Road Load A	= 29.65 (lbs) ✓
Road Load B	= -0.0535 ✓	Road Load C	= 0.03514 ✓

Fuel Information:

Fuel	= GASOLINE E10 ✓	Specific gravity	= 0.7600
NHV	= 18012.00	Fuel R-Factor	= 0.60
CWF	= 0.8810	OWF	= 0.0000
HWF	= 0.1190	Fuel Calculation Type	= Gasoline/EPA Calcs

Phase Information:

	Shift Tables
Phase 1	N/A
Phase 2	Con't

Response Factors:

Bag Methane	= 1.05

Pre Test Remarks:
PRECON 4

Post Test Remarks:

Non-Critical Information:

Begin Odo	= 23812	Idle RPM	=
Test end Odometer	= 23819	Driveability	= Good
Engine performance	= No Problem	Brakes	= No Problem
Transmission	= No Problem	Vehicle stalls	= None

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

	Test Info			Times Info	
Phase 1:	Baro	(inHg) =	28.97	Phase Start	= 07:27:42
	Temp	(F) =	77.4	Phase Finish	= 07:36:07
	Tdew	(F) =	57.7		
	Ahum	(gr/lb) =	73.2	Elapsed (sec) =	504.9
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.574		
Phase 2:	Baro	(inHg) =	28.97	Phase Start	= 07:36:07
	Temp	(F) =	77.2	Phase Finish	= 07:50:37
	Tdew	(F) =	57.6		
	Ahum	(gr/lb) =	73.0	Elapsed (sec) =	869.4
				Drv Err (sec) =	0.0
	Dist	(mi) =	3.850		

DATA VALIDATION

PARAMETER DESCRIPTION	VALUE OF PARAMETER	LIMIT OF PARAMETER
Temperature	VALID	68 - 86 (degF)
Barometer	VALID	26.99 - 33.0001 (inHg)
Dew Point	VALID	-20 - 200 (degF)
Absolute Humidity	VALID	0 - 150 (gr/lb)
Shutdown Time	VALID	5 (sec)
Phase Length	VALID	2 (%)
Distance	VALID	2 (%)
Test Hold Conditions	VALID	60 (sec)
Leak Check	VALID	1
Venturi Inlet Temperature	VALID	32 - 300 (degF)

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/18/2021	**Time:**	7:24:54
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	PRECON		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2024

COMMENTS: OK

General Data

Test Number	*ONT3_002030*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/18/2021*	CH_4 Response Factor	
Test Start	*7:24:54*	Odometer Position [mi]	*23849*
Start Time Cycle	*2021-08-18 07|40-17-(000)*	Delay Time Method	
Test End	*8:03:04*		
Operator	*Jennifer Chappell*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*PRECON*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370* ✓	*0.033800* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Jennifer Chappell		Speed Table	Date:	
Test Number	ONT3_002030	Driver	Jennifer Chappell		Shift Table Auto	Cold Start	
Vehicle	1C4RJEBG3LC265672	**Dyno**			**Fuel**		**Test Timing**
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*		E10	Start Time	*7:24:54*
		A [lbf]	*35.110*		Fuel type GASOLINE	End Time	*8:03:04*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*		Density *0.7453*		
Year	*2020*	C [lbf/mph2]	*0.033800*		NHV 17916	Soak Time	
Displacement:					CWF *0.8312*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*23849*	Remark	PRECON				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.93	Volume [scf]	2554
Zero Read	*0.00*							Press. [inHg]	28.89	D.F.	
Span Read	*0.00*							RH [%]	*54.43*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*11.127*	Ph. End [s]	505.7
Mass.	*0.000*							Dist. [mi]	*3.61*	Ph. Length [s]	505.7
Mass per Dist.	*0.0000*							NO_x Corr.	*1.0139*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	76.35	Volume [scf]	4365
Zero Value	*0.00*							Press. [inHg]	28.90	D.F.	
Span Value	*0.00*							RH [%]	*47.03*	Ph. Start [s]	505.8
Sample	*0.00*							AH [g/kg]	*9.402*	Ph. End [s]	1375.4
Mass.	*0.000*							Dist. [mi]	*3.87*	Ph. Length [s]	869.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9587*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]		Volume [scf]	
Zero Value	*0*							Press. [inHg]		D.F.	
Span Value	*0.00*							RH [%]		Ph. Start [s]	
Sample	*0*							AH [g/kg]		Ph. End [s]	
Mass.	*0.000*							Dist. [mi]		Ph. Length [s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay [s]	
								Dr. Viola.		Vio. Durat. [s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]		Volume [scf]	
Zero Value	*0*							Press. [inHg]		D.F.	
Span Value	*0.00*							RH [%]		Ph. Start	
Sample	*0*							AH [g/kg]		Ph. End	
Mass.	*0.000*							Dist. [mi]		Ph. Length [s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay [s]	
								Dr. Viola.		Vio. Durat. [s]	
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.47*

Test Data: FTP72 Operator: Jennifer Chappell Date: 8/18/2021
Test Number: ONT3_002030 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Jennifer Chappell	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *PRECON*

VIN 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [N]	*156.177*	*263.780*
B [N/km/h]	*-0.72887*	*-0.73937*
C [N/km2/h2]	*0.058050*	*0.060352*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.19
Driven	5800.69	6224.37			12025.06
Distance Rating (%)	0.3729	0.2145			0.2908
Cycle Energy (MJ)					
Target	4.32	3.97			
Driven	4.36	4.00			
Distance per Energy Cycle (m/MJ)					
Target	4.32	3.97			
Driven	4.36	4.00			
Road Load Work Fraction					
Target	0.4497	0.3320			
Driven	0.4488	0.3202			
Inertial Work (MJ)					
Target	2.38	2.65			
Driven	2.40	2.72			
Inertial Work Fraction					
Target	0.5503	0.6680			
Driven	0.5512	0.6798			
Inertial Work Rating (%)	1.0747	2.5538			
Absolute Speed Change (m/s)					
Target	204.88	340.91			
Driven	206.05	345.77			
Absolute Speed Change Rating (%)	0.5720	1.4245			
Energy Rating (%)	0.9051	0.7679			0.8394
Energy Economy Rating (%)	0.5274	0.5492			0.5440

Operator Jennifer Chappell | Driver Jennifer Chappell | Customer : | 3081
Test Purpose: Preconditioning | Legislation *EPA1066* | Requirements (Bag) | *SIMPLE*
Conditioning: | Emission Default

Overall Status Review

Phase 1

Test Record #: ONT3_002030 | Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.96	24.60	25.40	20.00	30.00	Passed
Barometer	(mbar)	978.46	978.40	978.60	800.00	1100.00	Passed
Dew Point Temperature	(°C)	15.10	13.30	16.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	77.89	69.03	87.51	38.50	87.50	Review OK
CVS Inlet Temperature	(°C)	47.78	45.55	50.75	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.11	49.75	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61			3.52	3.66	Passed
Duration Phase 1	(s)	505.60					NA
Crank Time Phase1	(s)	0.70			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

No humidity requirement

J.H.

Operator	Jennifer Chappell	Driver	Jennifer Chappell	Customer :	
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.64	24.50	24.90	20.00	30.00	Passed
Barometer	(mbar)	978.56	978.50	978.60	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.59	12.00	13.30	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	65.81	63.43	69.03	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	48.34	47.45	49.55	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	50.15	49.75	50.25	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.87			3.78	3.94	Passed
Duration Phase 2	(s)	869.60					NA
Crank Time Phase1	(s)	0.7000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS CANISTER WORKSHEET

Station number 2

--PURGE AND FILL--

VT#	3081-265672 ✓
Project	3081
Evap Family	LCRXR0204RP0 ✓
Ambient Temperature-Deg F	77
Barometric Pressure-In/Hg	28.90
Humidity-Grains/Lb	64.4 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	204 ✓
Canister Volume-Liters	3.1
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	08:28:53
Start date	08-18-2021
Bed Purges/Cycle	300
Purge End/Load Start	09:10:02
Test Time Minutes	1252
HC Loaded-Grams	306.0 ✓
Scale Reading-Grams	0.40
Butane Flow Actual-Gm/Hr	15.2
Cycles Completed	1
Finish time	05:24:40
Finish date	08-19-2021
Disk File Name	21081901.ST2

QUALITY ASSURANCE

INSPECTED BY: J.H

DATE: 11/15/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/19/2021	**Time:**	13:04:43
Test Legislation:	EPA1066		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002040*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/19/2021*	CH_4 Response Factor	
Test Start	*13:04:43*	Odometer Position [mi]	*23856*
Start Time Cycle	*2021-08-19 13|08-34-(000)*	Delay Time Method	
Test End	*13:49:41*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370* ✓	*0.033800* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_002040	Driver	Jennifer Chappell	Shift Table Auto	Cold Start

Vehicle	1C4RJEBG3LC265672	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*		E10	Start Time	*13:04:43*
		A [lbf]	*35.110*	Fuel type	GASOLINE	End Time	*13:49:41*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*	Density	*0.7453*		
Year	*2020*	C [lbf/mph2]	*0.033800*	NHV	17916	Soak Time	553.3
Displacement:				CWF	*0.8312*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*23856*	Remark	E10 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.40	Volume [scf]	2524
Zero Read	*0.00*							Press. [inHg]	28.88	D.F.	
Span Read	*0.00*							RH [%]	*47.02*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.110*	Ph. End [s]	505.5
Mass.	*0.000*							Dist. [mi]	*3.62*	Ph. Length [s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9500*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.83	Volume [scf]	4301
Zero Value	*0.00*							Press. [inHg]	28.88	D.F.	
Span Value	*0.00*							RH [%]	*46.61*	Ph. Start [s]	505.6
Sample	*0.00*							AH [g/kg]	*9.161*	Ph. End [s]	1375.7
Mass.	*0.000*							Dist. [mi]	*3.89*	Ph. Length [s]	870.2
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9515*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	75.34	Volume [scf]	2510
Zero Value	*0*							Press. [inHg]	28.87	D.F.	
Span Value	*0.00*							RH [%]	*49.22*	Ph. Start [s]	1927.2
Sample	*0*							AH [g/kg]	*9.525*	Ph. End [s]	2432.9
Mass.	*0.000*							Dist. [mi]	*3.61*	Ph. Length [s]	505.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9625*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NO_x [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *11.11*

Test Data: FTP75 Operator: Joseph Bishop Date: 8/19/2021
Test Number: ONT3_002040 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E10 TEST*

VIN 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [N]	*156.177*	*263.780*
B [N/km/h]	*-0.72887*	*-0.73937*
C [N/km2/h2]	*0.058050*	*0.060352*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6210.96	5779.15		17769.27
Driven	5818.82	6255.74	5805.83		17880.40
Distance Rating (%)	0.6864	0.7210	0.4616		0.6254
Cycle Energy (MJ)					
Target	4.32	3.97	4.32		8.29
Driven	4.31	4.04	4.34		8.37
Distance per Energy Cycle (m/MJ)					
Target	4.32	3.97	4.32		1446.15
Driven	4.31	4.04	4.34		1442.13
Road Load Work Fraction					
Target	0.4497	0.3320	0.4497		0.3933
Driven	0.4517	0.3268	0.4462		0.3898
Inertial Work (MJ)					
Target	2.38	2.65	2.38		5.03
Driven	2.36	2.72	2.41		5.11
Inertial Work Fraction					
Target	0.5503	0.6680	0.5503		0.6067
Driven	0.5483	0.6732	0.5538		0.6102
Inertial Work Rating (%)	-0.5983	2.4530	1.2592		1.5117
Absolute Speed Change (m/s)					
Target	204.88	340.90	204.88		545.78
Driven	203.89	346.82	205.93		551.87
Absolute Speed Change Rating (%)	-0.4820	1.7365	0.5135		1.1167
Energy Rating (%)	-0.2382	1.6587	0.6109		0.6503
Energy Economy Rating (%)	-0.9268	0.9224	0.1484		0.2778

Operator	Joseph Bishop	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002040

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.11	23.40	24.90	20.00	30.00	Passed
Barometer	(mbar)	977.99	977.90	978.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.10	11.70	12.50	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	63.77	61.94	65.32	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	54.21	48.45	57.85	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	51.71	50.95	52.35	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.62			3.52	3.66	Passed
Duration Phase 1	(s)	505.40					NA
Crank Time Phase1	(s)	0.50			0	5	Passed
Crank Time Phase3	(s)	0.80			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	553.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.35	23.70	24.60	20.00	30.00	Passed
Barometer	(mbar)	977.97	977.90	978.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.18	11.60	12.40	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	64.13	61.37	65.30	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	57.95	57.05	58.65	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	52.92	50.95	52.35	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.89			3.78	3.94	Passed
Duration Phase 2	(s)	870.10					NA
Crank Time Phase1	(s)	0.5000			0	5	Passed
Crank Time Phase3	(s)	0.80			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)	553.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislatior	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 — Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	24.08	22.40	25.20	20.00	30.00	Passed
Barometer	(mbar)	977.76	977.70	977.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.75	11.50	14.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	66.68	60.89	75.80	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	55.31	49.15	57.55	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	52.72	50.95	52.35	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61			3.52	3.66	Passed
Duration Phase 3	(s)	505.70					NA
Crank Time Phase1	(s)	0.5000			0	5	Passed
Crank Time Phase3	(s)	0.80			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	553.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	8/19/2021	**Time:**	14:26:22
Test Legislation:	EPA1066		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002041*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*8/19/2021*	CH_4 Response Factor	
Test Start	*14:26:22*	Odometer Position [mi]	*23867*
Start Time Cycle	*2021-08-19 14|33-05-(000)*	Delay Time Method	
Test End	*15:44:25*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Joseph Bishop*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370* ✓	*0.033800* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_002041	Driver	Joseph Bishop	Shift Table Auto	Cold Start

Vehicle	1C4RJEBG3LC265672	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*		E10	Start Time	*14:26:22*
		A [lbf]	*35.110*	Fuel type	GASOLINE	End Time	*15:44:25*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*	Density	*0.7453*		
Year	*2020*	C [lbf/mph2]	*0.033800*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*23867*	Remark	E10 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	104.22	Volume [scf]	7354
Zero Read	*0.00*							Press. [inHg]	28.86	D.F.	
Span Read	*0.00*							RH [%]	*23.15*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*11.134*	Ph. End [s]	1490.0
Mass.	*0.000*							Dist. [mi]	*7.45*	Ph. Length [s]	1490.0
Mass per Dist.	*0.0000*							NO_X Corr.	*1.0141*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.00*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	102.24	Volume [scf]	6513
Zero Value	*0.00*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*24.04*	Ph. Start [s]	1490.1
Sample	*0.00*							AH [g/kg]	*10.900*	Ph. End [s]	2812.0
Mass.	*0.000*							Dist. [mi]	*2.38*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_X Corr.	*1.0063*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	101.92	Volume [scf]	7323
Zero Value	*0*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*24.05*	Ph. Start [s]	2812.1
Sample	*0*							AH [g/kg]	*10.801*	Ph. End [s]	4301.0
Mass.	*0.000*							Dist. [mi]	*7.47*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_X Corr.	*1.0030*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO_2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH_4 [g/mile]	NMHC [g/mile]	$HC+NO_X$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.30*

Test Data: ORVR_Prep Operator: Joseph Bishop Date: 8/19/2021
Test Number: ONT3_002041 Driver: Joseph Bishop

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E10 TEST*

VIN 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [N]	*156.177*	*263.780*
B [N/km/h]	*-0.72887*	*-0.73937*
C [N/km2/h2]	*0.058050*	*0.060352*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	11990.13	3792.75	11990.13		27773.02
Driven	11986.28	3822.75	12026.21		27835.24
Distance Rating (%)	-0.0321	0.7908	0.3009		0.2240
Cycle Energy (MJ)					
Target	8.29	3.38	8.29		11.67
Driven	8.35	3.30	8.30		11.62
Distance per Energy Cycle (m/MJ)					
Target	8.29	3.38	8.29		1352.21
Driven	8.35	3.30	8.30		1362.41
Road Load Work Fraction					
Target	0.3933	0.1815	0.3933		0.3320
Driven	0.3844	0.1837	0.3892		0.3293
Inertial Work (MJ)					
Target	5.03	2.77	5.03		7.80
Driven	5.14	2.70	5.07		7.79
Inertial Work Fraction					
Target	0.6067	0.8185	0.6067		0.6680
Driven	0.6156	0.8163	0.6108		0.6707
Inertial Work Rating (%)	2.1590	-2.5800	0.7334		-0.0470
Absolute Speed Change (m/s)					
Target	545.78	469.46	545.78		1015.24
Driven	553.19	454.45	548.51		1004.98
Absolute Speed Change Rating (%)	1.3579	-3.1972	0.5004		-1.0112
Energy Rating (%)	0.6837	-2.3126	0.0478		-0.0878
Energy Economy Rating (%)	0.7110	-3.1769	-0.2530		-0.7544

Operator Joseph Bishop | Driver Joseph Bishop | Customer : | 3081
Test Purpose: Preconditioning | Legislation *EPA1066* | Requirements (Bag) | *SIMPLE*
Conditioning: | Emission Default

Overall Status: Passed

Phase 1

Test Record #: ONT3_002041

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	40.12	38.90	41.00	37.78	43.33	Passed
Barometer	(mbar)	977.25	977.00	977.40	800.00	1100.00	Passed
Dew Point Temperature	(°C)	15.11	14.80	15.30	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	77.94	75.99	79.05	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	59.72	50.65	62.75	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	53.05	51.05	53.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.45			7.30	7.60	Passed
Duration Phase 1	(s)	1489.90					NA
Crank Time Phase1	(s)	1.00			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.02	38.00	40.20	37.78	43.33	Passed
Barometer	(mbar)	977.03	976.90	977.20	800.00	1100.00	Passed
Dew Point Temperature	(°C)	14.78	14.10	15.10	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	76.30	72.64	78.14	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	59.47	58.75	61.05	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	53.82	51.05	53.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.38			2.31	2.40	Passed
Duration Phase 2	(s)	1321.90					NA
Crank Time Phase1	(s)	1.0000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Joseph Bishop	Customer :	
Test Purpose:	Preconditioning	Legislatior	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 3

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	38.85	37.90	40.60	37.78	43.33	Passed
Barometer	(mbar)	976.87	976.70	977.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	14.62	14.00	15.10	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	75.61	72.23	78.05	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	60.51	58.65	62.15	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	54.21	51.05	53.95	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.47			7.30	7.60	Passed
Duration Phase 3	(s)	1488.90					NA
Crank Time Phase1	(s)	1.0000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_002041

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Canister Capacity*	204 g
Odometer	23893	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, August 19, 2021	*Profile*	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) 8/19/2021

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	15:44:25	0:00:00	0:00:00	
Engine Key-off	15:50:00	0:05:35	0:05:35	
SHED Door Sealed	15:51:00	0:01:00	0:06:35	
Final Sample	16:51:00	1:00:00	1:06:35	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 3.968 ppm	Volume = 1793.6 ft3	Temp. = 106.4 °F	Baro. = 28.86 in/Hg	Mass HC=0.112 grams
Post Read Zero = 0 ppm	Post Read Span = 9.564 ppm			Mass EtOH= 0 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 7.326 ppm	Volume = 1788.2 ft3	Temp. = 105.2 °F	Baro. = 28.83 in/Hg	Mass HC =0.178 grams
Post Read Zero = 0.012 ppm	Post Read Span = 9.524 ppm			Mass EtOH = 0.023 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 102.2 °F	Minimum = 102 °F			
Max Ambient Temp = 106.9 °F	Maximum = 108 °F			
Min Interior Temp = 102.2 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.066±0.01 grams**
				Diurnal Mass EtOH = 0.023 grams
				Diurnal Total Mass HC plus EtOH = 0.07175 grams

HOT SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, August 19, 2021	17:51:00	0:00:00	
End Cold Soak	Thursday, August 19, 2021	23:51:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63.2 °F	Minimum = 62 °F			
Max. Ambient Temp = 67.9 °F	Maximum = 68 °F			
Min. Internal Temp = 63.2 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Capacity*	204 g
Odometer	23893	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, August 19, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Thursday, August 19, 2021	23:51:00	0:00:00	
Start Time Diurnal	Thursday, August 19, 2021	23:51:00	0:00:00	
End Time Diurnal	Friday, August 20, 2021	23:51:00	24:00:00	
24 Hour Sample	Friday, August 20, 2021	23:51:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 7.692 ppm	Volume = 1667.9 ft3	Temp. = 64.9 °F	Baro. = 28.88 in/Hg	Mass HC =0.19 grams
Post Read Zero = 0 ppm	Post Read Span = 9.566 ppm			Mass EtOH= 0.049 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 30.421 ppm	Volume = 1663.8 ft3	Temp. = 65.1 °F	Baro. = 28.81 in/Hg	Mass HC=0.802 grams
Post Read Zero = -0.02 ppm	Post Read Span = 93.344 ppm			Mass EtOH= 0.233 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.1 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 3.3 °F	± 5 °F			
Min Water Temperature 64.56 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.612±0.01 grams**
				Diurnal Mass EtOH = 0.184 grams
				Diurnal Total Mass HC plus EtOH = 0.658 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Capacity*	204 g
Odometer	23893	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, August 19, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Friday, August 20, 2021	23:51:00	24:00:00	
Start Time Diurnal	Friday, August 20, 2021	23:51:00	24:00:00	
End Time Diurnal	Saturday, August 21, 2021	23:51:00	48:00:00	
48 Hour Sample	Saturday, August 21, 2021	23:51:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 30.421 ppm	Volume = 1663.8 ft3	Temp. = 65.1 °F	Baro. = 28.81 in/Hg	Mass HC=0.802 grams
Post Read Zero = 0 ppm	Post Read Span = 93.344 ppm			Mass EtOH= 0.233 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 49.886 ppm	Volume = 1654.3 ft3	Temp. = 64.9 °F	Baro. = 28.83 in/Hg	Mass HC=1.349 grams
Post Read Zero = -0.009 ppm	Post Read Span = 93.328 ppm			Mass EtOH= 0.375 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.9 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 3.2 °F	± 5 °F			
Min Water Temperature 64.6 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.547±0.01 grams**
				Diurnal Mass EtOH = 0.142 grams
				Diurnal Total Mass HC plus EtOH = 0.583 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Capacity*	204 g
Odometer	23893	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, August 19, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Saturday, August 21, 2021	23:51:00	48:00:00	
Start Time Diurnal	Saturday, August 21, 2021	23:51:00	48:00:00	
End Time Diurnal	Sunday, August 22, 2021	23:51:00	72:00:00	
72 Hour Sample	Sunday, August 22, 2021	23:51:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 49.886 ppm	Volume = 1654.3 ft3	Temp. = 64.93 °F	Baro. = 28.83 in/Hg	Mass HC=1.349 grams
Post Read Zero = -0.009 ppm	Post Read Span = 93.328 ppm			Mass EtOH= 0.375 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 71.105 ppm	Volume = 1645.1 ft3	Temp. = 64.9 °F	Baro. = 28.84 in/Hg	Mass HC=1.912 grams
Post Read Zero = -0.034 ppm	Post Read Span = 93.36 ppm			Mass EtOH= 0.499 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 0.7 °F	± 3 °F			
Avg. Δ Profile Underbody = 1 °F	± 2 °F			
Max. Δ Profile Sidewall = 3.1 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.563±0.01 grams**
				Diurnal Mass EtOH = 0.124 grams
				Diurnal Total Mass HC plus EtOH = 0.594 grams

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: 0.73 grams {hot soak + highest 24 hour mass}

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS:

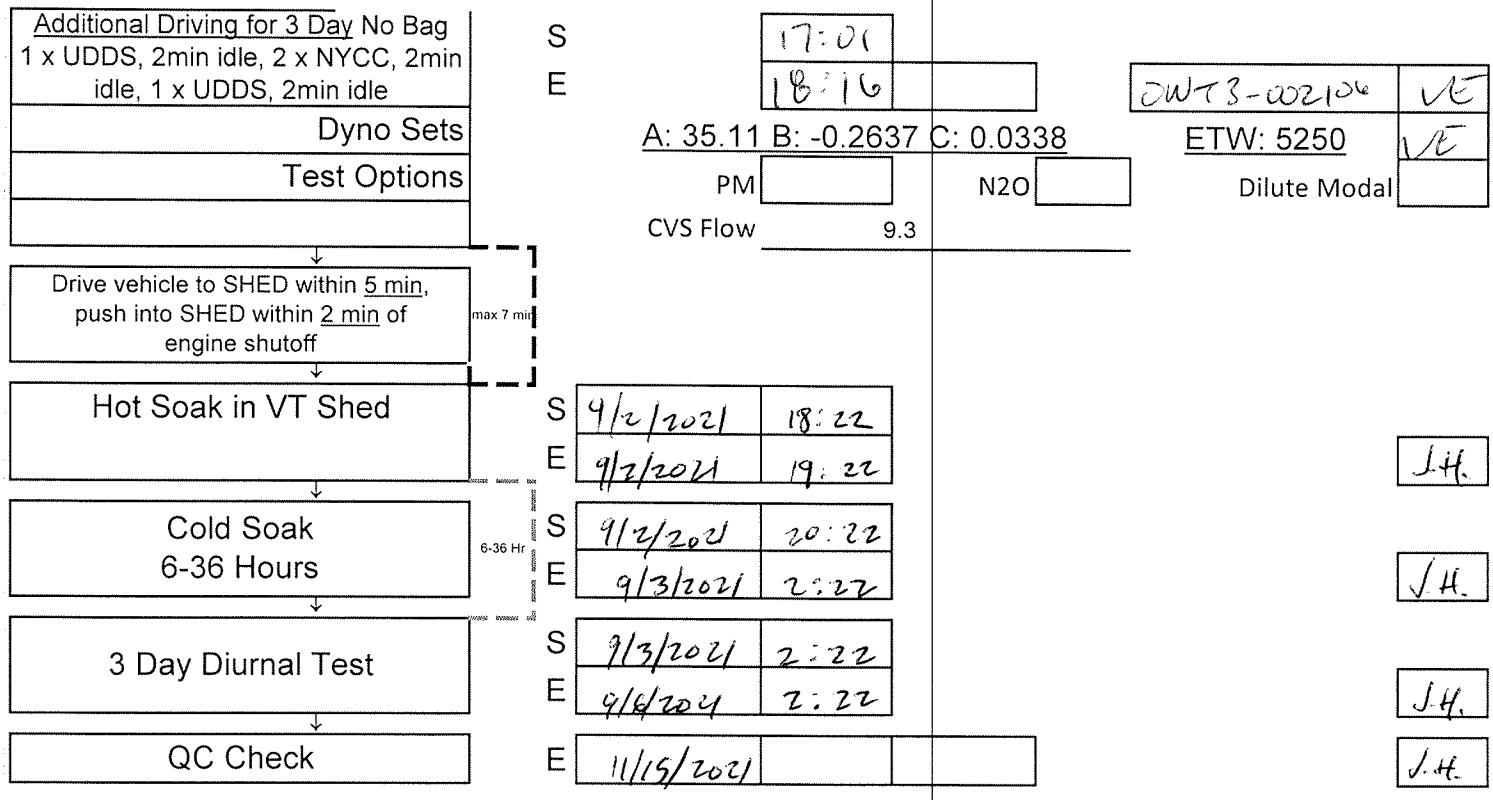
OK

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

Emission Test Check Sheet
FTP with 2 Day SHED Procedure

Project #:	3081	**Vehicle Name:**	Jeep Cherokee
Vehicle #:	3081-265672	**Engine Size**	3.6L
VIN:	1C4RJEBG3LC265672	**Model Year**	2020
Engine Family:	LCRXT03.65P5	**Requested By:**	J. Link

		Duration	Date	Time	Odometer	Fuel Amt.	Test ID Number (attach hardcopy)	Initials
Precon FTP 72 (UDDS)	S		9/1/2021	11:12	23893			
	E		↓	11:40	23900		DNT3_002100	JB
Dyno Sets			A: 35.11 B: -0.2637 C: 0.0338				ETW: 5250	
Vehicle Soak 68-86°F	S		9/1/2021	11:45			T: 73.9 B: 28.8 H: 60.9	JB
	E		9/2/21	15:00				JB
Canister Loading with Butane Type: 1.5x Load	S		9/1/21	11:49				
	E	12-36 hr	9/2/21	08:55			21090201.STB	JB
Canister Loading Specs	Cap			204	Vol	3.1		
	Purge			300	Flow Rate	15	LCRXR0204RP0	
Set tire pressure to sticker	Front			36	Back	36		
No Bag Cold Start FTP 75	S		9/2/21	15:46	23908			
	E		↓	16:31	23911		DNT3_02105	
Dyno Sets			A: 35.11 B: -0.2637 C: 0.0338				ETW: 5250	
Test Options			PM		N2O		Dilute Modal	
			CVS Flow P1:9.3 P2:9.3 P3:9.3					
Pre Test Comments			E10 Test					
Fuel Tank Temp. Stabilization at 105F	S		9/2/21	16:32				
	E	max 1 hr						


Additional Driving for 3 Day No Bag
1 x UDDS, 2min idle, 2 x NYCC, 2min idle, 1 x UDDS, 2min idle
Dyno Sets
Test Options
Drive vehicle to SHED within 5 min, push into SHED within 2 min of engine shutoff
max 7 min
Hot Soak in VT Shed
Cold Soak 6-36 Hours
6-36 Hr
3 Day Diurnal Test
QC Check
S
E
17:01
18:16
A: 35.11 B: -0.2637 C: 0.0338
PM
N2O
CVS Flow
9.3
DWT3-002106
VE
ETW: 5250
VE
Dilute Modal
9/2/2021 18:22
9/2/2021 19:22
J.H.
9/2/2021 20:22
9/3/2021 2:22
J.H.
9/3/2021 2:22
9/6/2021 2:22
J.H.
11/15/2021
J.H.

ATDS EMISSION TEST

Vehicle Info / Test preparation

Project #/ Vehicle #	3081	3081-265672		
VIN:	1C4RJEBG3LC265672			
Test Cell:	Cell 2			
Make / Model / Wheel drive / MY:	Jeep	Cherokee	RWD	2020
Test Group / Engine Size (L):	LCRXT03.65P5	3.6L		
EVAP Family:	LCRXR0204RP0			
Standard Tire Size (front) / Pressure:	265/60-18	36		
Standard Tire Size (rear) / Pressure:	265/60-18	36		
Transmission / Shift File / Inertia Weight:	Auto	Auto	5250	
Target Coefficients A / B / C:	59.30	-0.2675	0.035140	
Warmup Coefficients A / B / C:	29.65	-0.0535	0.035140	
Set Coefficients A / B / C:	35.11	-0.2637	0.0338	
Coefficient Unit:	lbs	lbs/(mph)	lbs/(mph)^2	
Test Remarks	E10 Test			

Test Setup Information

Dyno Coefficient Determination	Y
Exhaust Leak Check	Y
Fuel Drain and Refill	Y
Tank Volume (Gallons)	24.6
Testing Fuel Level	40%
Fuel Type	See Notes!
Canister Load	1.5x Load
Canister Working Capacity +/- 10g	204
Canister volume (Liter)	3.1
Soak after drain / refills	Y
Test Fan Setup	Roadspeed
Av. Rechr. Energy / SOC at Start of RLE	
Norminal Volt. (V) / Batt. Capacity (Ah)	/

NOTES:

Cell 2 - RWD
9.84 of See Notes!
E10 Fuel
105.9" Wheelbase
Roadspeed Fan for testing

Exhaust Tests

Precondition (FTP72): Double ☐ Single ☑

Canister condition FTP: AS IS ☐ LOADED ☑

Emissions Test Data:

										Test Quantity:
FTP:	Fuel	See Notes!	PM	☐	N2O	☐	Dilute Modal	☐		1
Hwy:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
US06:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		
SC03:	Fuel		PM	☐	N2O	☐	Dilute Modal	☐		

CVS Flow:	FTP-1	FTP-2	FTP-3	HWY	SC03	US06
	9.3	9.3	9.3			

Charge Depleting Tests

Charge Depleting test: UDDS ☐ HWY: ☐ Mct UDDS/Hwy: ☐ Load Canister ☐ Top fuel to 85% ☐

Evaporative Tests

Refueling (ORVR)	☐	ORVR Options	Alcohol Samp	☐	Mini Bags ☐
EPA Supplemental	☐	EPA Supplemental Options	Alcohol Samp	☐	Mini Bags ☐
Carb Supplemental	☑	CARB Supplemental Options	Alcohol Samp	☑	Mini Bags ☐
Diurnal 24h	☐	Fuel type 24H Diurnal			
Diurnal 48h	☐	Fuel type 48h Diurnal			
Diurnal 72h	☑	Fuel type 72h Diurnal	See Notes!		

Remarks on test sheet

Additional notes

Vehicle Dyno Mode Instructions

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/1/2021	**Time:**	11:12:33
Test Legislation:	EPA1066		
Test Cycle:	FTP72		
Test Purpose:	Preconditioning		
Test Name:	FTP72		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	Precon		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 4/15/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002100*		
Test Name	*FTP72*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP72* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/1/2021*	CH_4 Response Factor	
Test Start	*11:12:33*	Odometer Position [mi]	*23893*
Start Time Cycle	*2021-09-01 11|17-27-(000)*	Delay Time Method	
Test End	*11:40:58*		
Operator	*Jennifer Chappell*	Air Condition	*OFF*
Driver	*Jennifer Chappell*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*Precon*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370* ✓	*0.033800* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP72	Operator	Jennifer Chappell	Speed Table	Date:	
Test Number	ONT3_002100	Driver	Jennifer Chappell	Shift Table Auto	Cold Start	

Vehicle	1C4RJEBG3LC265672	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*		E10	Start Time	*11:12:33*
		A [lbf]	*35.110*	Fuel type	GASOLINE	End Time	*11:40:58*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*	Density	*0.7453*		
Year	*2020*	C [lbf/mph2]	*0.033800*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*23893*	Remark	Precon				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	74.09	Volume [scf]	2561
Zero Read	*0.00*							Press. [inHg]	28.87	D.F.	
Span Read	*0.00*							RH [%]	*48.86*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*9.064*	Ph. End [s]	505.7
Mass.	*0.000*							Dist. [mi]	*3.61*	Ph. Length [s]	505.7
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9486*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.70*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	73.72	Volume [scf]	4379
Zero Value	*0.00*							Press. [inHg]	28.87	D.F.	
Span Value	*0.00*							RH [%]	*48.07*	Ph. Start [s]	505.8
Sample	*0.00*							AH [g/kg]	*8.802*	Ph. End [s]	1375.6
Mass.	*0.000*							Dist. [mi]	*3.88*	Ph. Length [s]	869.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9409*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]		Volume [scf]	
Zero Value	*0*							Press. [inHg]		D.F.	
Span Value	*0.00*							RH [%]		Ph. Start [s]	
Sample	*0*							AH [g/kg]		Ph. End [s]	
Mass.	*0.000*							Dist. [mi]		Ph. Length [s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay [s]	
								Dr. Viola.		Vio. Durat. [s]	
								Crank [s]		FE [mile/gal]	

PHASE 4	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]		Volume [scf]	
Zero Value	*0*							Press. [inHg]		D.F.	
Span Value	*0.00*							RH [%]		Ph. Start	
Sample	*0*							AH [g/kg]		Ph. End	
Mass.	*0.000*							Dist. [mi]		Ph. Length [s]	
Mass per Dist.	*0.0000*							NO_x Corr. F		Bag An. Delay [s]	
								Dr. Viola.		Vio. Durat. [s]	
										FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *7.49*

Test Data: FTP72 Operator: Jennifer Chappell Date: 9/1/2021
Test Number: ONT3_002100 Driver: Jennifer Chappell

Driver Violations

		Phase1	Phase2
Number of Violations	-	0	0
Duration of Violations	(s)	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Jennifer Chappell	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *Precon*

VIN 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [N]	*156.177*	*263.780*
B [N/km/h]	*-0.72887*	*-0.73937*
C [N/km2/h2]	*0.058050*	*0.060352*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6211.05			11990.20
Driven	5809.54	6243.16			12052.70
Distance Rating (%)	0.5258	0.5170			0.5212
Cycle Energy (MJ)					
Target	4.32	3.97			
Driven	4.34	4.01			
Distance per Energy Cycle (m/MJ)					
Target	4.32	3.97			
Driven	4.34	4.01			
Road Load Work Fraction					
Target	0.4497	0.3320			
Driven	0.4529	0.3262			
Inertial Work (MJ)					
Target	2.38	2.65			
Driven	2.38	2.70			
Inertial Work Fraction					
Target	0.5503	0.6680			
Driven	0.5471	0.6738			
Inertial Work Rating (%)	-0.0409	1.8943			
Absolute Speed Change (m/s)					
Target	204.87	340.91			
Driven	204.17	344.34			
Absolute Speed Change Rating (%)	-0.3434	1.0058			
Energy Rating (%)	0.5359	1.0144			0.7652
Energy Economy Rating (%)	0.0100	0.4924			0.2421

Operator	Jennifer Chappell	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002100

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.39	23.00	23.90	20.00	30.00	Passed
Barometer	(mbar)	977.76	977.70	977.80	800.00	1100.00	Passed
Dew Point Temperature	(°C)	12.03	11.60	12.60	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	63.45	61.37	65.53	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	44.96	41.15	47.15	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.74	48.45	48.85	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61			3.52	3.66	Passed
Duration Phase 1	(s)	505.60					NA
Crank Time Phase1	(s)	0.70			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Jennifer Chappell	Driver	Jennifer Chappell	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.18	23.00	23.30	20.00	30.00	Passed
Barometer	(mbar)	977.75	977.70	977.80	800.00	1100.00	Passed
Dew Point Temperature	(°C)	11.59	11.30	11.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	61.62	60.58	62.78	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	45.94	45.35	46.75	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	48.56	48.45	48.85	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.88			3.78	3.94	Passed
Duration Phase 2	(s)	869.80					NA
Crank Time Phase1	(s)	0.7000			0	5	Passed
Crank Time Phase3	(s)				0	5	
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS CANISTER WORKSHEET

Station number 3

--PURGE AND FILL--

VT#	3081-265672 ✓
Project	3081
Evap Family	LCRXR0204RP0 ✓
Ambient Temperature-Deg F	74
Barometric Pressure-In/Hg	28.78
Humidity-Grains/Lb	60.9 ✓
Butane Flow Command-Gm/Hr	15.0
Canister HC Capacity-Grams	204 ✓
Canister Volume-Liters	3.1
Overfill/Cycle	1.5
Test Cycles	1 of 1
Start time	11:49:04
Start date	09-01-2021
Bed Purges/Cycle	300
Purge End/Load Start	12:30:13
Test Time Minutes	1267
HC Loaded-Grams	306.0 ✓
Scale Reading-Grams	-3.18
Butane Flow Actual-Gm/Hr	15.0
Cycles Completed	1
Finish time	08:55:38
Finish date	09-02-2021
Disk File Name	21090201.ST3

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 11/15/2021

COMMENTS: OK

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/2/2021	**Time:**	15:46:52
Test Legislation:	EPA1066		
Test Cycle:	FTP75		
Test Purpose:	Preconditioning		
Test Name:	FTP75		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST		

QUALITY ASSURANCE

INSPECTED BY: J. H.

DATE: 11/15/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002105*		
Test Name	*FTP75*		
Test Cell	*iGEM-V-TC1*		
Test Type	*FTP75* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/2/2021*	CH_4 Response Factor	
Test Start	*15:46:52*	Odometer Position [mi]	*23900*
Start Time Cycle	*2021-09-02 15|50-46-(000)*	Delay Time Method	
Test End	*16:31:52*		
Operator	*Joseph Bishop*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370* ✓	*0.033800* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*68.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*86.00*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	FTP75	Operator	Joseph Bishop	Speed Table	Date:
Test Number	ONT3_002105	Driver	Victor Escudero	Shift Table Auto	Cold Start

Vehicle	1C4RJEBG3LC265672	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*		E10	Start Time	*15:46:52*
		A [lbf]	*35.110*	Fuel type	GASOLINE	End Time	*16:31:52*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*	Density	*0.7453*		
Year	*2020*	C [lbf/mph2]	*0.033800*	NHV	17916	Soak Time	551.3
Displacement:				CWF	*0.8312*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer[mile]	*23900*	Remark	E10 TEST				

Bag Analysis

PHASE 1	THC[ppmC]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	74.74	Volume[scf]	2565
Zero Read	*0.00*							Press.[inHg]	28.85	D.F.	
Span Read	*0.00*							RH[%]	*44.61*	Ph. Start[s]	0.1
Sample	*0.00*							AH[g/kg]	*8.455*	Ph. End[s]	505.8
Mass.	*0.000*							Dist.[mi]	*3.61*	Ph. Length[s]	505.8
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9309*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.80*	FE [mile/gal]	

PHASE 2	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	72.08	Volume[scf]	4377
Zero Value	*0.00*							Press.[inHg]	28.85	D.F.	
Span Value	*0.00*							RH[%]	*48.40*	Ph. Start[s]	505.9
Sample	*0.00*							AH[g/kg]	*8.388*	Ph. End[s]	1375.4
Mass.	*0.000*							Dist.[mi]	*3.89*	Ph. Length[s]	869.6
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9290*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
										FE [mile/gal]	

PHASE 3	THC[ppmC1]	CO[ppm]	CO_2[%]	NO_x[ppm]	N2O[ppm]	CH_4[ppm]	NMHC[ppm]				
Range	*0*							Temp.[°F]	71.97	Volume[scf]	2544
Zero Value	*0*							Press.[inHg]	28.85	D.F.	
Span Value	*0.00*							RH[%]	*47.30*	Ph. Start[s]	1925.3
Sample	*0*							AH[g/kg]	*8.166*	Ph. End[s]	2430.7
Mass.	*0.000*							Dist.[mi]	*3.60*	Ph. Length[s]	505.5
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9228*	Bag An. Delay[s]	
								Dr. Viola.	*0*	Vio. Durat.[s]	0.0
								Crank [s]	*0.50*	FE [mile/gal]	

Total Result (weighted)

Weighted	THC[g/mile]	CO[g/mile]	CO_2[g/mile]	NO_x[g/mile]	N2O[g/mile]	CH_4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.00000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	

Total Result

actual	THC[g/mile]	CO[g/mile]	CO2[g/mile]	NOX[g/mile]	N2O[g/mile]	CH4[g/mile]	NMHC[g/mile]	$HC+NO_x$[g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist.[mi] *11.10*

Test Data: FTP75 Operator: Joseph Bishop Date: 9/2/2021
Test Number: ONT3_002105 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E10 TEST*

VIN 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [N]	*156.177*	*263.780*
B [N/km/h]	*-0.72887*	*-0.73937*
C [N/km2/h2]	*0.058050*	*0.060352*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	5779.15	6210.95	5779.15		17769.25
Driven	5814.73	6254.54	5796.14		17865.40
Distance Rating (%)	0.6157	0.7017	0.2939		0.5411
Cycle Energy (MJ)					
Target	4.32	3.97	4.32		8.29
Driven	4.28	3.99	4.24		8.24
Distance per Energy Cycle (m/MJ)					
Target	4.32	3.97	4.32		1446.11
Driven	4.28	3.99	4.24		1462.79
Road Load Work Fraction					
Target	0.4497	0.3320	0.4497		0.3933
Driven	0.4599	0.3240	0.4604		0.3944
Inertial Work (MJ)					
Target	2.38	2.65	2.38		5.03
Driven	2.31	2.69	2.29		4.99
Inertial Work Fraction					
Target	0.5503	0.6680	0.5503		0.6067
Driven	0.5401	0.6760	0.5396		0.6056
Inertial Work Rating (%)	-2.7812	1.5219	-3.6476		-0.7442
Absolute Speed Change (m/s)					
Target	204.87	340.91	204.88		545.79
Driven	200.25	344.14	198.75		543.53
Absolute Speed Change Rating (%)	-2.2593	0.9465	-2.9907		-0.4134
Energy Rating (%)	-0.9564	0.3239	-1.7363		-0.8201
Energy Economy Rating (%)	-1.5873	-0.3766	-2.0661		-1.1530

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002105

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	23.75	22.30	24.70	20.00	30.00	Passed
Barometer	(mbar)	977.02	976.90	977.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.97	10.10	11.50	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	59.18	55.45	61.22	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	43.95	40.55	46.45	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.96	49.75	50.35	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.61			3.52	3.66	Passed
Duration Phase 1	(s)	505.70					NA
Crank Time Phase1	(s)	0.80			0	5	Passed
Crank Time Phase3	(s)	0.50			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	551.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislatio	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.27	21.20	23.40	20.00	30.00	Passed
Barometer	(mbar)	977.03	977.00	977.10	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.85	10.00	11.30	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	58.72	55.50	60.77	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	45.40	44.65	46.25	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.17	49.75	50.35	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.89			3.78	3.94	Passed
Duration Phase 2	(s)	869.50					NA
Crank Time Phase1	(s)	0.8000			0	5	Passed
Crank Time Phase3	(s)	0.50			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)	551.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Joseph Bishop	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislatior	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3 Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	22.21	20.80	23.90	20.00	30.00	Passed
Barometer	(mbar)	976.95	976.80	977.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	10.45	9.90	11.10	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	57.16	54.96	59.47	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	45.50	43.15	47.15	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.16	49.75	50.35	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	3.60			3.52	3.66	Passed
Duration Phase 3	(s)	505.40					NA
Crank Time Phase1	(s)	0.8000			0	5	Passed
Crank Time Phase3	(s)	0.50			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)	551.30			540.00	660.00	Passed
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

ATDS Emission Lab Test Report

for Exhaust Emission Test Procedures according

Date:	9/2/2021	**Time:**	17:01:18
Test Legislation:	EPA1066		
Test Cycle:	RL		
Test Purpose:	Preconditioning		
Test Name:	ORVR_Prep		
Test Cell:	iGEM-V-TC1		
Order Number:	3081		
Remark:	E10 TEST		

QUALITY ASSURANCE

INSPECTED BY: J.H.

DATE: 9/15/2021

COMMENTS: OK

General Data

Test Number	*ONT3_002106*		
Test Name	*ORVR_Prep*		
Test Cell	*iGEM-V-TC1*		
Test Type	*ORVR_Prep* ✓		
Legislation	*EPA1066*		
Requirements (Bag)	*SIMPLE*		
Date	*9/2/2021*	CH_4 Response Factor	
Test Start	*17:01:18*	Odometer Position [mi]	*23911*
Start Time Cycle	*2021-09-02 17|04-33-(000)*	Delay Time Method	
Test End	*18:16:53*		
Operator	*Victor Escudero*	Air Condition	*OFF*
Driver	*Victor Escudero*	Particle Measurement	USUAL
Shifttable	*Auto*		
Flow Stream	*PreCon*		
Calibrated Ranges	*autorange*		
Remark	*E10 TEST*		

Vehicle Data *3081-265672* ✓

Manufacturer	*CHEROKEE*	Displacement	
Vehicle Model	*1C4RJEBG3LC265672* ✓	Engine Family	*LCRXT03.65P5* ✓
Order Number	*3081*	Manufacturer	*JEEP*
Test Group	*3081-265672*	Transmission	*Automatic*
Evaporative Family	*LCRXR0204RP0* ✓	Engine Code	
Made Date	*2020*	License Plate	
Tire Manufacturer		Trim Level	
Tire Model		Axle Ratio	*1*
Tire Size		Drive Axle Weight [lbs]	
Tire Pressure [psi]	*0*	Tank Volume [gal]	*0*
Engine Code	*LCRXT03.65P5*	Tank Material	
Number of Cylinders	*4*		

Dyno Data *3081*

Dyno Type	*SVOR*	Inertia [lb]	*5250.00* ✓
	A [lbf]	B [lbf/mph]	C [lbf/mph2]
Street Load	*59.300* ✓	*-0.26750* ✓	*0.035140* ✓
Road Load	*35.110* ✓	*-0.26370* ✓	*0.033800* ✓

Fuel Data *E10* ✓

Fuel Type	*GASOLINE*	Fuel Temperature [°C]	*15.00*
Fuel Analyze Date		Fuel Density [kg/l]	*0.7453*
Fuel Manufacturer		Net Heat. Val. [BTU/lb]	*17916*
Fuel Tank Number		Carb. Weight Frac.	*0.8312*
Fuel Charge		HC Ratio	*1.8400*
Remarks:	*E10*	OC Ratio	*-1.0000*

Weather Limit Data

Temp Min [deg F]	*100.00*	Dew Point Max [deg F]	*100.00*
Temp Max [deg F]	*109.99*	Pressure Min [mbar]	*800.0*
Dew Point Min [deg F]	*15.01*	Pressure Max [mbar]	*1100.0*

Fan Speed Data *RoadSpeed*

F1 [%]	F2 [%/mph]	F3 [%/mph2]
5	0.745999992	0.0031

Test Data	ORVR_Prep	Operator	Victor Escudero	Speed Table	Date:
Test Number	ONT3_002106	Driver	Victor Escudero	Shift Table Auto	Cold Start

Vehicle	1C4RJEBG3LC265672	**Dyno**		**Fuel**		**Test Timing**	
Vehicle #	***1C4RJEBG3LC265672***	Inertia [lb]	*5250.00*		E10	Start Time	*17:01:18*
		A [lbf]	*35.110*	Fuel type	GASOLINE	End Time	*18:16:53*
Model	CHEROKEE	B [lbf/mph]	*-0.26370*	Density	*0.7453*		
Year	*2020*	C [lbf/mph2]	*0.033800*	NHV	17916	Soak Time	
Displacement:				CWF	*0.8312*		
Engine Family	LCRXT03.65P5						
Trans	*Automatic*	Flow Stream	PreCon				
Odometer [mile]	*23911*	Remark	E10 TEST				

Bag Analysis

PHASE 1	THC [ppmC]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	104.69	Volume [scf]	7494
Zero Read	*0.00*							Press. [inHg]	28.85	D.F.	
Span Read	*0.00*							RH [%]	*21.19*	Ph. Start [s]	0.1
Sample	*0.00*							AH [g/kg]	*10.326*	Ph. End [s]	1490.9
Mass.	*0.000*							Dist. [mi]	*7.48*	Ph. Length [s]	1490.9
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9875*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*1.90*	FE [mile/gal]	

PHASE 2	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	102.50	Volume [scf]	6616
Zero Value	*0.00*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*22.15*	Ph. Start [s]	1491.0
Sample	*0.00*							AH [g/kg]	*10.111*	Ph. End [s]	2812.9
Mass.	*0.000*							Dist. [mi]	*2.36*	Ph. Length [s]	1322.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9807*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
										FE [mile/gal]	

PHASE 3	THC [ppmC1]	CO [ppm]	CO_2 [%]	NO_x [ppm]	N2O [ppm]	CH_4 [ppm]	NMHC [ppm]				
Range	*0*							Temp. [°F]	101.88	Volume [scf]	7435
Zero Value	*0*							Press. [inHg]	28.85	D.F.	
Span Value	*0.00*							RH [%]	*23.12*	Ph. Start [s]	2813.0
Sample	*0*							AH [g/kg]	*10.366*	Ph. End [s]	4301.9
Mass.	*0.000*							Dist. [mi]	*7.48*	Ph. Length [s]	1489.0
Mass per Dist.	*0.0000*							NO_x Corr.	*0.9888*	Bag An. Delay [s]	
								Dr. Viola.	*0*	Vio. Durat. [s]	0.0
								Crank [s]	*0.00*	FE [mile/gal]	

Total Result

actual	THC [g/mile]	CO [g/mile]	CO2 [g/mile]	NOX [g/mile]	N2O [g/mile]	CH4 [g/mile]	NMHC [g/mile]	$HC+NO_x$ [g/mile]	***Fuel Economy***
Mass per Dist.	*0.0000*							0.0000	mile/gal
Mass per Dist. (rounded)	*0.0000*							0.0000	Dist. [mi] *17.32*

Test Data: ORVR_Prep Operator: Victor Escudero Date: 9/2/2021
Test Number: ONT3_002106 Driver: Victor Escudero

Driver Violations

		Phase1	Phase2	Phase3
Number of Violations	-	0	0	0
Duration of Violations	(s)	0.0	0.0	0.0

Number	Phase	Violation Begin (s)	Violation End (s)	Violation Duration (s)	Scheduled Speed (mph)	Max Speed Deviation (mph)
No Violations In This Test				0.0		

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation:	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission Standards	Default		

Test Intent: *E10 TEST*

VIN 1C4RJEBG3LC265672

DYNO Data

	Road Load	Street Load
Inertia [lb]	*5250.00*	
A [N]	*156.177*	*263.780*
B [N/km/h]	*-0.72887*	*-0.73937*
C [N/km2/h2]	*0.058050*	*0.060352*

	Phase1	Phase2	Phase3	Phase4	Weighted
Distance (m)					
Target	11990.13	3792.77	11990.13		27773.04
Driven	12038.31	3805.40	12030.60		27874.30
Distance Rating (%)	0.4018	0.3328	0.3375		0.3646
Cycle Energy (MJ)					
Target	8.29	3.38	8.29		11.67
Driven	8.25	3.25	8.31		11.53
Distance per Energy Cycle (m/MJ)					
Target	8.29	3.38	8.29		1352.22
Driven	8.25	3.25	8.31		1373.84
Road Load Work Fraction					
Target	0.3933	0.1815	0.3933		0.3320
Driven	0.4015	0.1797	0.3913		0.3349
Inertial Work (MJ)					
Target	5.03	2.77	5.03		7.80
Driven	4.94	2.66	5.06		7.67
Inertial Work Fraction					
Target	0.6067	0.8185	0.6067		0.6680
Driven	0.5985	0.8203	0.6087		0.6651
Inertial Work Rating (%)	-1.8417	-3.7405	0.5128		-1.6497
Absolute Speed Change (m/s)					
Target	545.78	469.43	545.78		1015.20
Driven	540.34	444.61	548.15		989.40
Absolute Speed Change Rating (%)	-0.9961	-5.2874	0.4350		-2.5418
Energy Rating (%)	-0.4948	-3.9528	0.1823		-0.7992
Energy Economy Rating (%)	-0.9011	-4.4619	-0.1549		-1.5991

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Overall Status: Passed

Phase 1

Test Record #: ONT3_002106

Vehicle ID: 1C4RJEBG3LC265672

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	40.38	39.70	41.30	37.78	43.33	Passed
Barometer	(mbar)	976.94	976.90	977.00	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.96	13.70	14.30	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	72.28	70.69	74.12	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	48.24	44.85	50.05	20.00	93.33	Passed
Weighted Test Dilution Factor	(-)				7.00	20.00	
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.25	48.95	49.45	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			1.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48			7.30	7.60	Passed
Duration Phase 1	(s)	1490.80					NA
Crank Time Phase1	(s)	1.90			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	
Test Purpose:	Preconditioning	Legislation	*EPA1066*	Requirements (Bag)	
Conditioning:		Emission	Default		

3081
SIMPLE

Phase 2

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	39.16	38.70	39.80	37.78	43.33	Passed
Barometer	(mbar)	976.89	976.80	976.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.65	13.50	13.70	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	70.77	70.10	71.27	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	48.94	48.15	50.95	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.			-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.07	48.95	49.45	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	2.36			2.31	2.40	Passed
Duration Phase 2	(s)	1321.90					NA
Crank Time Phase1	(s)	1.9000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 2					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

Operator	Victor Escudero	Driver	Victor Escudero	Customer :	3081
Test Purpose:	Preconditioning	Legislatior	*EPA1066*	Requirements (Bag)	*SIMPLE*
Conditioning:		Emission	Default		

Phase 3

Overall Status: Passed

		Average	Min	Max	Low Limit	Upper Limit	Status
General							
Cell Temperature	(°C)	38.82	37.80	40.70	37.78	43.33	Passed
Barometer	(mbar)	976.84	976.80	976.90	800.00	1100.00	Passed
Dew Point Temperature	(°C)	13.99	13.10	14.90	-9.44	37.78	Passed
Specific Humidity Test Cell	(gr/lb)	72.56	68.02	76.96	38.50	87.50	Passed
CVS Inlet Temperature	(°C)	50.37	48.35	52.75	20.00	93.33	Passed
Dilution Factor	(-)				7.00	20.00	
Fuel Economy	(mpg)				10.00	50.00	
Zero Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Offset	(%)	-	0.00	0.00	-2.00	2.00	Passed
Zero Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Span Check Drift	(%)	-	0.00	0.00	-2.00	2.00	Passed
Bag vs. Modal Validation (CO2)	(%)	n.a.	-	-	-10.00	10.00	Passed
Ambient Concentrations							
HC	(ppm)				2.00	6.00	
NO_x	(ppm)				-0.10	0.10	
CO	(ppm)				0.20	0.99	
CO_2	(ppm)				300.00	600.00	
CH_4	(ppm)				1.30	3.00	
N2O	(ppm)				0.30	0.40	
Bag Analysis Time Ambient	(s)				0.00	NA	
Bag Analysis Time Exhaust	(s)				0.00	NA	
PM Filter Parameters							
Particulate Filter Temperature	(°C)	49.41	48.95	49.45	42.00	52.00	
Filter Face Velocity	(cm/s)				0.00	100.00	
Particulate Result Validation	(ug)	65535.00			2.00	600.00	N/A
Test-Cycle Specific Validations							
Phase Distance	(miles)	7.48			7.30	7.60	Passed
Duration Phase 3	(s)	1488.90					NA
Crank Time Phase1	(s)	1.9000			0	5	Passed
Crank Time Phase3	(s)	0.00			0	5	Passed
Crank Counts		1			0	1	Passed
Shutdown Time Phase 1					0	5	
Shutdown Time Phase 3					0	5	
Hot Soak Time	(s)				540.00	660.00	
Test Hold Counts		0					Passed
Duration Test Hold	(s)	0.00			0	60	Passed

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

TEST ID VETS: ONT3_002106

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Canister Capacity*	204 g
Odometer	23928	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, September 2, 2021	*Profile*	CA
		Fuel	E15

0 – 1 Hour Diurnal / (3-Day Supplemental) **9/2/2021**

	Test Control Clock (PDT)	By Event Duration	By Sequence Duration	
End CVS Test	18:16:53	0:00:00	0:00:00	
Engine Key-off	18:21:00	0:04:07	0:04:07	
SHED Door Sealed	18:22:00	0:01:00	0:05:07	
Final Sample	19:22:00	1:00:00	1:05:07	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 3.802 ppm	Volume = 1792.5 ft3	Temp. = 106.3 °F	Baro. = 28.86 in/Hg	Mass HC=0.096 grams
Post Read Zero = 0 ppm	Post Read Span = 9.548 ppm			Mass EtOH= 0.003 grams
Final				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 6.519 ppm	Volume = 1789.3 ft3	Temp. = 105 °F	Baro. = 28.88 in/Hg	Mass HC =0.174 grams
Post Read Zero = 0.009 ppm	Post Read Span = 9.554 ppm			Mass EtOH = 0.018 grams
Test Temperatures	Allowable Limit			
Min Ambient Temp = 102.9 °F	Minimum = 102 °F			
Max Ambient Temp = 107.4 °F	Maximum = 108 °F			
Min Interior Temp = 102.9 °F	Minimum = 68 °F			**Diurnal Mass HC = 0.078±0.01 grams**
				Diurnal Mass EtOH = 0.015 grams
				Diurnal Total Mass HC plus EtOH = 0.08175 grams

HOT SOAK TEST STATUS = COMPLETE

400 S Etiwanda Avenue, Ontario, CA 91761
P: (909) 390-1100 F: (909) 390-9056 E: info@automotivetesting.com

AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

6 Hour Cold Soak / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
Start Cold Soak	Thursday, September 2, 2021	20:22:00	0:00:00	
End Cold Soak	Friday, September 3, 2021	2:22:00	6:00:00	
Test Temperatures	**Allowable Limit**			
Min. Ambient Temp = 63 °F	Minimum = 62 °F			
Max. Ambient Temp = 66.3 °F	Maximum = 68 °F			
Min. Internal Temp = 63 °F	Minimum = 40 °F			

COLD SOAK TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	***VIN***	1C4RJEBG3LC265672
Model Year	2020	***Make/Model***	Jeep Cherokee
Test Group	LCRXT03.65P5	***Engine Size***	3.6L
Evaporative Family	LCRXR0204RP0	***Capacity***	204 g
Odometer	23928	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 2, 2021		

0 – 24 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End Cold Soak	Friday, September 3, 2021	2:22:00	0:00:00	
Start Time Diurnal	Friday, September 3, 2021	2:22:00	0:00:00	
End Time Diurnal	Saturday, September 4, 2021	2:22:00	24:00:00	
24 Hour Sample	Saturday, September 4, 2021	2:22:00	24:00:00	
Initial				
Zero = 0 ppm	Span = 9.55 ppm	Re-Zero = 0 ppm		
Read = 7.497 ppm	Volume = 1667.4 ft3	Temp. = 65.1 °F	Baro. = 28.94 in/Hg	Mass HC =0.206 grams
Post Read Zero = 0 ppm	Post Read Span = 9.563 ppm			Mass EtOH= 0.05 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 34.394 ppm	Volume = 1658.4 ft3	Temp. = 65 °F	Baro. = 28.89 in/Hg	Mass HC=0.967 grams
Post Read Zero = -0.015 ppm	Post Read Span = 93.308 ppm			Mass EtOH= 0.247 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.1 °F	± 2 °F			
Max. Δ Profile Sidewall = 3.3 °F	± 5 °F			
Min Water Temperature 64.28 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.761±0.01 grams**
				Diurnal Mass EtOH = 0.197 grams
				Diurnal Total Mass HC plus EtOH = 0.81 grams

0 – 24 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	*VIN*	1C4RJEBG3LC265672
Model Year	2020	*Make/Model*	Jeep Cherokee
Test Group	LCRXT03.65P5	*Engine Size*	3.6L
Evaporative Family	LCRXR0204RP0	*Capacity*	204 g
Odometer	23928	*Vehicle Test Volume*	50 ft3
Test Start Date	Thursday, September 2, 2021		

24 – 48 Hour Diurnal / (3-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 24 hour Diurnal	Saturday, September 4, 2021	2:22:00	24:00:00	
Start Time Diurnal	Saturday, September 4, 2021	2:22:00	24:00:00	
End Time Diurnal	Sunday, September 5, 2021	2:22:00	48:00:00	
48 Hour Sample	Sunday, September 5, 2021	2:22:00	48:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 34.394 ppm	Volume = 1658.4 ft3	Temp. = 65 °F	Baro. = 28.89 in/Hg	Mass HC=0.967 grams
Post Read Zero = 0 ppm	Post Read Span = 93.308 ppm			Mass EtOH= 0.247 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 54.522 ppm	Volume = 1647 ft3	Temp. = 64.9 °F	Baro. = 28.88 in/Hg	Mass HC=1.47 grams
Post Read Zero = -0.026 ppm	Post Read Span = 93.325 ppm			Mass EtOH= 0.403 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1.1 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.1 °F	± 2 °F			
Max. Δ Profile Sidewall = 3.5 °F	± 5 °F			
Min Water Temperature 64.4 °F	Minimum = 40 °F			**Diurnal Mass HC = 0.503±0.01 grams**
				Diurnal Mass EtOH = 0.156 grams
				Diurnal Total Mass HC plus EtOH = 0.542 grams

24 – 48 HOUR DIURNAL TEST STATUS = COMPLETE

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AUTOMOTIVE TESTING DEVELOPMENT SERVICES, INC.

3-Day Diurnal Test Report Shed 1

ATDS Vehicle ID	3081-265672	***VIN***	1C4RJEBG3LC265672
Model Year	2020	***Make/Model***	Jeep Cherokee
Test Group	LCRXT03.65P5	***Engine Size***	3.6L
Evaporative Family	LCRXR0204RP0	***Capacity***	204 g
Odometer	23928	***Vehicle Test Volume***	50 ft3
Test Start Date	Thursday, September 2, 2021		

48 – 72 Hour Diurnal / (2-Day Supplemental)

	Test Control Date	Test Control Clock (PDT)	Total Soak Time	
End 48 hour Diurnal	Sunday, September 5, 2021	2:22:00	48:00:00	
Start Time Diurnal	Sunday, September 5, 2021	2:22:00	48:00:00	
End Time Diurnal	Monday, September 6, 2021	2:22:00	72:00:00	
72 Hour Sample	Monday, September 6, 2021	2:22:00	72:00:00	
Initial				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 54.522 ppm	Volume = 1647 ft3	Temp. = 64.93 °F	Baro. = 28.88 in/Hg	Mass HC=1.47 grams
Post Read Zero = -0.026 ppm	Post Read Span = 93.325 ppm			Mass EtOH= 0.403 grams
Final				
Zero = 0 ppm	Span = 93.3 ppm	Re-Zero = 0 ppm		
Read = 73.854 ppm	Volume = 1632.3 ft3	Temp. = 65 °F	Baro. = 28.92 in/Hg	Mass HC=1.98 grams
Post Read Zero = -0.015 ppm	Post Read Span = 93.284 ppm			Mass EtOH= 0.529 grams
Temperatures	**Allowable Limit**			
Max. Δ Profile Underbody = 1 °F	± 3 °F			
Avg. Δ Profile Underbody = 1.1 °F	± 2 °F			
Max. Δ Profile Sidewall = 3.4 °F	± 5 °F			
Min Water Temperature 64.5 °F	Minimum = 40 °F			**Diurnal Mass HC= 0.51±0.01 grams**
				Diurnal Mass EtOH = 0.126 grams
				Diurnal Total Mass HC plus EtOH = 0.542 grams

QUALITY ASSURANCE
INSPECTED BY: J.H.
DATE: 11/15/2021
COMMENTS: OK

48 - 72 HOUR DIURNAL TEST STATUS = COMPLETE

Final Diurnal Total Mass HC plus EtOH emissions results: 0.892 grams {hot soak + highest 24 hour mass}

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CE-CERT

College of Engineering: Center for Environmental Research and Technology

Emissions and Fuels Research
University of California, Riverside
Chain of Custody For Fuel Samples

Project: Ethanol Study	Date Sample Collected: 10/20/2020 Initials: DG/TT	Send Results: Tianbo Tang
Sample Description: Gasoline Fuel Samples	Date Delivered: 10/20/2020 Initials: DG/TT	Send Results: ttang052@ucr.edu
Quote#: 08-PPRD-Q06827	# of Samples Submitted: 6	(cell: 571-776-9657)

Sample ID	Analysis Method	Analysis Description	Comments
FS20011	D5191	D5191: Vapor Pressure of Petroleum Products (RVP)	E-10 Drum 2
	D5453	D-5453: Sulfur content by Antek	
	D5580	D-5580: Benzene and Aromatics	
	D6550	D6550 Olefin Content of Gasolines by SFC	
	D86	D-86: Distillation	
	D4815	D-4815: Oxygenates and Oxygen (Gasoline)	
	D2699Mdp	RON by D2699 Falling Level	
	D2700Mdp	MON by D2700 Falling Level	
	D4052	D-4052: API Gravity @ 60F	
	D6730	D6730: DHA with precolumn	
	D5291 CH	D-5291: Determination of Carbon, Hydrogen	
	D4809 Net	D4809: Heat of Combustion (Net) Intermediates	
FS20012	D5191	D5191: Vapor Pressure of Petroleum Products (RVP)	E-10 Drum 3
	D5453	D-5453: Sulfur content by Antek	
	D5580	D-5580: Benzene and Aromatics	
	D6550	D6550 Olefin Content of Gasolines by SFC	
	D86	D-86: Distillation	
	D4815	D-4815: Oxygenates and Oxygen (Gasoline)	
	D2699Mdp	RON by D2699 Falling Level	
	D2700Mdp	MON by D2700 Falling Level	
	D4052	D-4052: API Gravity @ 60F	
	D6730	D6730: DHA with precolumn	
	D5291 CH	D-5291: Determination of Carbon, Hydrogen	
	D4809 Net	D4809: Heat of Combustion (Net) Intermediates	
FS20013	D5191	D5191: Vapor Pressure of Petroleum Products (RVP)	E-10 Drum 4
	D5453	D-5453: Sulfur content by Antek	
	D5580	D-5580: Benzene and Aromatics	
	D6550	D6550 Olefin Content of Gasolines by SFC	
	D86	D-86: Distillation	
	D4815	D-4815: Oxygenates and Oxygen (Gasoline)	
	D2699Mdp	RON by D2699 Falling Level	
	D2700Mdp	MON by D2700 Falling Level	
	D4052	D-4052: API Gravity @ 60F	
	D6730	D6730: DHA with precolumn	
	D5291 CH	D-5291: Determination of Carbon, Hydrogen	
	D4809 Net	D4809: Heat of Combustion (Net) Intermediates	
FS20014	D5191	D5191: Vapor Pressure of Petroleum Products (RVP)	E-15 Drum 1
	D5453	D-5453: Sulfur content by Antek	
	D5580	D-5580: Benzene and Aromatics	
	D6550	D6550 Olefin Content of Gasolines by SFC	
	D86	D-86: Distillation	
	D4815	D-4815: Oxygenates and Oxygen (Gasoline)	
	D2699Mdp	RON by D2699 Falling Level	
	D2700Mdp	MON by D2700 Falling Level	
	D4052	D-4052: API Gravity @ 60F	
	D6730	D6730: DHA with precolumn	
	D5291 CH	D-5291: Determination of Carbon, Hydrogen	
	D4809 Net	D4809: Heat of Combustion (Net) Intermediates	
FS20015	D5191	D5191: Vapor Pressure of Petroleum Products (RVP)	E-15 Drum 2
	D5453	D-5453: Sulfur content by Antek	
	D5580	D-5580: Benzene and Aromatics	
	D6550	D6550 Olefin Content of Gasolines by SFC	
	D86	D-86: Distillation	
	D4815	D-4815: Oxygenates and Oxygen (Gasoline)	
	D2699Mdp	RON by D2699 Falling Level	
	D2700Mdp	MON by D2700 Falling Level	
	D4052	D-4052: API Gravity @ 60F	
	D6730	D6730: DHA with precolumn	
	D5291 CH	D-5291: Determination of Carbon, Hydrogen	
	D4809 Net	D4809: Heat of Combustion (Net) Intermediates	
FS20016	D5191	D5191: Vapor Pressure of Petroleum Products (RVP)	E-15 Drum 3
	D5453	D-5453: Sulfur content by Antek	
	D5580	D-5580: Benzene and Aromatics	
	D6550	D6550 Olefin Content of Gasolines by SFC	
	D86	D-86: Distillation	
	D4815	D-4815: Oxygenates and Oxygen (Gasoline)	
	D2699Mdp	RON by D2699 Falling Level	
	D2700Mdp	MON by D2700 Falling Level	
	D4052	D-4052: API Gravity @ 60F	
	D6730	D6730: DHA with precolumn	
	D5291 CH	D-5291: Determination of Carbon, Hydrogen	
	D4809 Net	D4809: Heat of Combustion (Net) Intermediates	

CE-CERT

College of Engineering: Center for Environmental Research and Technology

Emissions and Fuels Research
University of California, Riverside
Chain of Custody For Fuel Samples

Project: Ethanol Study	**Date Sample Collected: 10/8/2020 Initials: DG**	**Send Results:** Tianbo Tang
Sample Description: Gasoline Fuel Samples	**Date Delivered: 10/8/2020 Initials: DG**	**Send Results:** ttang052@ucr.edu
Quote#: 08-PPRD-Q06827	**# of Samples Submitted: 2**	(cell: 571-776-9657)

FS20009	D5501 Fuels	Ethanol Content - Denatured Fuel Fuels Lab	Denatured Ethanol (glass)
	D381	Existent Gum Content - Fuels	
	E1064	Water Content - Organic Liquids (Coulometric)	
	D1688M	Copper in Water (D4806 Modification)	
	D1613	Acidity in Solvents and Chemical Intermediates	
	D6423	D6423: pHe of EtOH, Denatured Fuel EtOH and Fuel EtOH	
	D4176	D-4176: Distillate Fuel Haze Rating,Free Water and Sedimen	
	D5453	D-5453: Sulfur content by Antek	
	D7576	D 7576: Benzene and Aromatics in EtOH by GC	
FS20010	D5501 Fuels	Ethanol Content - Denatured Fuel Fuels Lab	Denatured Ethanol (glass)
	D381	Existent Gum Content - Fuels	
	E1064	Water Content - Organic Liquids (Coulometric)	
	D1688M	Copper in Water (D4806 Modification)	
	D1613	Acidity in Solvents and Chemical Intermediates	
	D6423	D6423: pHe of EtOH, Denatured Fuel EtOH and Fuel EtOH	
	D4176	D-4176: Distillate Fuel Haze Rating,Free Water and Sedimen	
	D5453	D-5453: Sulfur content by Antek	
	D7576	D 7576: Benzene and Aromatics in EtOH by GC	

SOUTHWEST RESEARCH INSTITUTE®

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FUELS AND LUBRICANTS RESEARCH DIVISION

May 14, 2021

Mr. George Karavalakis
University of California, Riverside
1084 Columbia Avenue
Riverside, CA 92507
Phone: (951) 827-3305
Email: gkaraval@cert.ucr.edu

Subject: Test Summary Report, Revision 4
SwRI WO # 84199

Dear Mr. Karavalakis:

The sample received on November 13, 2020, has been analyzed, as requested. The sample was received in 2 quart glass containers and in good condition. Included in the report is the data for ASTM D7319 that was requested on December 3, 2020 by email. An additional analysis, ASTM D7347 was completed per your request and added to this report. Sample identification and the results of the analyses are shown in the attached table.

Test aliquots were taken in accordance with the test procedure. Analyses were performed in accordance with the test procedures used with no deviations or modifications. Precision should be consistent with that stated in the test procedure. The analyses pertain only to the sample received by Southwest Research Institute and represent only a sampling of a batch. This report shall not be reproduced except in full without the express written permission of Southwest Research Institute.

If you have any questions or need any further information, please call me at (210)-522-6920. We appreciate the opportunity to be of service to your firm.

Sincerely,

Melissa T. Legg
Principal Scientist
Fuels Research Laboratory
Petroleum Products Research Department
Office of Automotive Engineering

SwRI Benefiting government, industry and the public through innovative science and technology

	Project Name		ODDB
	Lab Number		55089
	Sample Code		FS20009
			Denatured Ethanol
D1613	**Acidity**	**mgKOH/g**	0.0353
	Acidity as Acetic Acid	**wt%**	0.0038
D1688 M	**Copper**	**mg/L**	<0.05
D381	**Unwashed Gum**	**mg/100 mL**	0.50
	Washed Gum	**mg/100 mL**	<0.5
D4176	**Clear and Bright**		Pass
	Particulate		Pass
	Free Water		Pass
	Haze Rating		1
	Temperature of Sample	**°C**	6.0
D5453	**Sulfur**	**ppm**	0.75
D5501	**Ethanol**	**Vol%**	97.49
	Methanol	**Vol%**	0.02
D6423	**pHe**		8.55
D7319	**Total Chloride**	**ppm**	<0.5
	Total Sulfate	**ppm**	<0.5
	Potential Sulfate	**ppm**	<1.0
D7347	**Olefin Content**	**mass%**	<0.1
D7576	**Benzene**	**Vol%**	0.01
	Toluene	**Vol%**	<0.01
	Ethylbenzene	**Vol%**	<0.01
	p,m-Xylene	**Vol%**	<0.01
	o-Xylene	**Vol%**	<0.01
	C9 plus Aromatics	**Vol%**	<0.01
	Total Aromatics	**Vol%**	<0.29
E1064	**Water**	**Wt%**	0.6913

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FUELS AND LUBRICANTS RESEARCH DIVISION

November 10, 2020

Mr. George Karavalakis
University of California, Riverside
1084 Columbia Avenue
Riverside, CA 92507
Phone: (951) 827-3305
Email: gkaraval@cert.ucr.edu

Subject: Test Summary Report
SwRI WO # 84133

Dear Mr. Karavalakis:

The samples received on October 28, 2020, have been analyzed, as requested. The samples were received in gallon containers and in good condition. Sample identification and the results of the analyses are shown in the attached table.

Test aliquots were taken in accordance with the test procedure. Analyses were performed in accordance with the test procedures used with no deviations or modifications. Precision should be consistent with that stated in the test procedure. The analyses pertain only to the samples received by Southwest Research Institute and represent only a sampling of a batch. This report shall not be reproduced except in full without the express written permission of Southwest Research Institute.

If you have any questions or need any further information, please call me at (210)-522-6920. We appreciate the opportunity to be of service to your firm.

Sincerely,

Melissa T. Legg
Principal Scientist
Fuels Research Laboratory
Petroleum Products Research Department
Office of Automotive Engineering

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	Project Name		ODDB	ODDB	ODDB	ODDB	ODDB	ODDB
	Lab Number		54925	54926	54927	54928	54929	54930
	Sample Code		FS20011	FS20012	FS20013	FS20014	FS20015	FS20016
			E10 Drum#2	E10 Drum#3	E10 Drum#4	E15 Drum#1	E15 Drum#2	E15 Drum#3
D5191	RVP (EPA Equation)	psi	7.43	7.44	7.41	7.33	7.35	7.36
	DVPE (ASTM Equation)	psi	7.31	7.32	7.28	7.20	7.22	7.23
	CARVP (California Equation)	psi	7.20	7.21	7.17	7.09	7.11	7.12
D2699Mdp	Research Octane Number	ON	91.1	91.2	91.1	94.1	93.4	93.4
D2700Mdp	Motor Octane Number	ON	83.6	83.5	83.5	85.1	85.1	85.0
D4052	API Gravity		59.15	59.15	59.15	58.48	58.48	58.48
	Specific Gravity		0.7422	0.7422	0.7422	0.7448	0.7448	0.7448
	Density at 15C	g/ml	0.7420	0.7419	0.7420	0.7446	0.7445	0.7445
D4809	Heat of Combustion , Gross	BTU/lb	19255	19264	19274	18883	18862	18887
		MJ/kg	44.787	44.809	44.831	43.922	43.873	43.931
		cal/g	10697.2	10702.5	10707.8	10490.6	10478.9	10492.8
	Heat of Combustion , Net	BTU/lb	17970	17980	17996	17609	17592	17615
		MJ/kg	41.799	41.823	41.860	40.959	40.919	40.972
		cal/g	9983.6	9989.2	9998.1	9782.8	9773.3	9786.1
D4815	Methanol	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethanol	Vol%	9.61	9.70	9.68	14.54	14.59	14.21
	Isopropanol	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	tert-Butanol	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	n-Propanol	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Methyl tert-butyl ether	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	sec-Butanol	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Diisopropylether	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Isobutanol	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Ethyl tert-butylether	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	tert-Pentanol	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	n-Butanol	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	tert-amyl methyl ether	Vol%	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	Total Oxygen	Wt%	3.57	3.60	3.59	5.38	5.40	5.26
D5291 CH	Carbon	wt%	82.80	82.76	82.85	81.08	80.71	80.93
	Hydrogen	wt%	14.08	14.08	14.00	13.96	13.92	13.94
D5453	Sulfur	ppm	6.23	5.79	6.74	4.47	4.62	4.33
D5580	Benzene	Vol%	0.59	0.60	0.60	0.56	0.56	0.56
	Toluene	Vol%	4.03	4.04	4.04	3.81	3.81	3.81
	Ethylbenzene	Vol%	0.94	0.94	0.94	0.89	0.89	0.89
	p,m-Xylene	Vol%	3.85	3.85	3.85	3.65	3.65	3.64
	o-Xylene	Vol%	1.36	1.36	1.37	1.29	1.29	1.29
	C9 plus Aromatics	Vol%	8.73	8.74	8.74	8.27	8.27	8.25
	Total Aromatics	Vol%	19.52	19.53	19.53	18.47	18.47	18.45
D6550	Olefin	Mass %	5.0	5.0	5.1	4.6	4.7	4.6
D6730	DHA		File Attached	File Attached	File Attached	File Attached	File Attached	File Attached
D86	Distillation							
	IBP	deg F	100.8	101.9	102.2	101.9	102.9	102.0
	5%	degF	129.2	130.0	129.4	130.7	128.5	128.7
	10%	degF	134.8	135.8	135.4	136.8	135.8	135.4
	15%	degF	138.6	139.3	139.3	140.7	139.8	139.4
	20%	degF	142.3	143.1	142.7	144.3	143.4	143.1
	30%	degF	148.8	149.7	149.1	150.8	150.5	149.8
	40%	degF	156.4	157.7	157.7	156.4	156.3	155.5
	50%	degF	204.1	205.3	204.1	162.0	161.8	159.6
	60%	degF	227.5	228.5	228.2	219.4	219.1	218.4
	70%	degF	248.1	249.4	248.6	244.7	244.8	242.5
	80%	degF	274.8	275.7	275.1	272.6	271.5	269.8
	90%	degF	313.7	314.2	313.0	310.5	310.9	310.1
	95%	degF	341.8	342.6	341.8	340.6	339.3	338.8
	Final Boiling Point	degF	392.6	397.0	392.6	394.8	394.2	392.8
	Recovered	mL	99.0	99.2	99.0	98.8	97.9	98.5
	Residue	mL	0.7	0.7	0.7	0.7	0.7	0.7
	Loss	mL	0.3	0.1	0.3	0.5	1.4	0.8

Detailed Hydrocarbon Analysis Summary Report -

Report Date: 11/2/2020 8:41:20 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Location: GC 12 D6730
Normalized to 100.000%

SUMMARY REPORT

Group Type	Total(Mass%)	Total(Vol%)	Total(Mol%)
Paraffins:	7.892	8.847	8.108
I-Paraffins:	39.668	43.130	35.978
Olefins:	4.191	4.507	4.542
Naphthenes:	12.216	11.784	10.854
Aromatics:	23.326	19.661	18.791
Total C14+:	0.325	0.313	0.144
Total Unknowns:	1.756	1.846	1.289

Oxygenates:

Total:	10.625(Mass%)	9.912(Vol%)
Total Oxygen Content:	3.690(Mass%)	

Multisubstituted Aromatics: 14.821(Mass%) 12.526(Vol%)

Average Molecular Weight: 87.989

Relative Density: 0.736

Vapor Pressure :

Calculated Octane Number: 85.9

Motor Octane Number (Jenkins Calculation): 78.1

	IBP	T10	T50	T90	FBP
BP by Mass (Deg F)	31.10	173.30	210.63	334.04	449.60
BP by Vol (Deg F)	31.10	173.30	210.63	334.04	423.50

Percent Carbon: 83.879
Percent Hydrogen: 12.431
Bromine Number (Calc): 7.861
Particulate Matter Index: 1.145

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 8:42:17 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Oxygenates

Compound	Mass%	Mass% Oxygen	Vol%
ethanol : X2	10.625	3.690	9.912

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 8:42:17 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Totals by Group Type & Carbon Number (in Mass Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.511	0.106	0.048	0.000	0.000	0.000	0.666
C5	2.499	7.035	1.802	0.341	0.000	0.001	11.678
C6	1.895	7.933	1.199	3.285	0.724	0.045	15.082
C7	1.389	8.657	0.758	3.943	4.742	0.007	19.496
C8	0.835	9.936	0.073	2.873	7.622	0.209	21.548
C9	0.391	3.401	0.203	1.390	5.871	0.191	11.447
C10	0.207	1.784	0.073	0.315	3.587	0.304	6.269
C11	0.108	0.542	0.021	0.065	0.392	0.361	1.489
C12	0.046	0.265	0.006	0.005	0.388	0.326	1.037
C13	0.010	0.008	0.007	0.000	0.000	0.311	0.336
Total:	7.892	39.668	4.191	12.216	23.326	1.756	87.294

Oxygenates 10.625
Total C14+: 0.325
Total Unknowns: 1.756
Grand Total: 100.000

Totals by Group Type & Carbon Number (in Volume Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.003	0.000	0.000	0.000	0.000	0.000	0.003
C4	0.650	0.141	0.058	0.000	0.000	0.000	0.849
C5	2.938	8.357	2.012	0.337	0.000	0.001	13.645
C6	2.115	8.879	1.255	3.199	0.607	0.048	16.103
C7	1.495	9.302	0.787	3.841	4.026	0.007	19.458
C8	0.874	10.378	0.074	2.744	6.467	0.220	20.757
C9	0.401	3.481	0.215	1.310	4.961	0.200	10.568
C10	0.209	1.787	0.073	0.289	2.971	0.320	5.647
C11	0.107	0.537	0.021	0.059	0.309	0.380	1.413
C12	0.045	0.259	0.006	0.004	0.321	0.343	0.979
C13	0.009	0.008	0.007	0.000	0.000	0.327	0.352
Total:	8.847	43.130	4.507	11.784	19.661	1.846	87.928

Oxygenates 9.912
Total C14+: 0.313
Total Unknowns: 1.846
Grand Total: 100.000

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 8:42:17 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Totals by Group Type & Carbon Number (in Mol Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.001	0.000	0.000	0.000	0.000	0.000	0.001
C3	0.003	0.000	0.000	0.000	0.000	0.000	0.004
C4	0.773	0.161	0.076	0.000	0.000	0.001	1.011
C5	3.048	8.579	2.265	0.428	0.000	0.001	14.321
C6	1.935	8.100	1.259	3.434	0.816	0.121	15.666
C7	1.219	7.602	0.678	3.534	4.528	0.008	17.569
C8	0.643	7.653	0.057	2.253	6.317	0.166	17.089
C9	0.268	2.333	0.142	0.969	4.298	0.170	8.180
C10	0.128	1.103	0.046	0.197	2.386	0.219	4.079
C11	0.061	0.305	0.012	0.037	0.235	0.242	0.893
C12	0.024	0.137	0.003	0.002	0.210	0.192	0.569
C13	0.005	0.004	0.004	0.000	0.000	0.169	0.181
Total:	8.108	35.978	4.542	10.854	18.791	1.289	78.274

Oxygenates 20.293
Total C14+: 0.144
Total Unknowns: 1.289
Grand Total: 100.000

Detailed Hydrocarbon Analysis - Dienes (Di-Olefins) Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Diene Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %
13.031	481.390	O5	1,4-pentadiene	0.001	0.001	0.001
14.848	506.110	O5	2-methylbutadiene-1,3	0.007	0.008	0.010
16.186	527.940	O5	1t,3-pentadiene	0.008	0.008	0.010
16.885	538.200	O5	cyclopentadiene	0.005	0.006	0.007
20.390	581.020	O6	1,5-hexadiene	0.000	0.000	0.000
21.989	597.090	O6	1c/t,4-hexadiene	0.000	0.000	0.000
25.273	632.930	O7	cyclic diolefin or triolefin-[1]	0.002	0.003	0.003
25.835	638.570	O7	cyclic diolefin or triolefin-[2]	0.007	0.007	0.007
28.352	661.940	O6	diolefin (hexadiene)	0.003	0.003	0.003
30.166	677.180	O7	1,6-heptadiene	0.000	0.000	0.000
36.537	720.920	N8	1,1,3-trimethylcyclopentane	0.179	0.176	0.141

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
6.434	100.000	P1	methane	0.000	0.000	0.000	-258.700	-161.500
6.620	200.000	P2	ethane	0.000	0.000	0.001	-127.480	-88.600
7.114	293.470	O3	propylene	0.000	0.000	0.000	-53.896	-47.720
7.176	300.000	P3	propane	0.002	0.003	0.003	-43.672	-42.040
8.191	366.090	I4	i-butane	0.106	0.141	0.161	10.904	-11.720
8.342	372.490	--	unknown	0.000	0.000	0.001	32.000	0.000
8.848	390.710	O4	butene-1	0.002	0.003	0.004	20.750	-6.250
8.879	391.700	O4	isobutylene	0.003	0.004	0.005	20.750	-6.250
9.154	400.000	P4	n-butane	0.511	0.650	0.773	31.100	-0.500
9.544	412.290	O4	t-butene-2	0.018	0.022	0.029	33.584	0.880
9.642	415.120	I5	2,2-dimethylpropane	0.003	0.004	0.004	49.100	9.500
9.873	421.510	--	unknown	0.001	0.001	0.001	32.000	0.000
10.130	428.120	O4	c-butene-2	0.025	0.029	0.038	38.696	3.720
11.668	460.090	X2	ethanol	10.625	9.912	20.293	173.300	78.500
11.710	460.820	O5	3-methylbutene-1	0.058	0.068	0.073	68.090	20.050
12.774	477.730	I5	i-pentane	7.032	8.353	8.575	82.112	27.840
13.031	481.390	O5	1,4-pentadiene	0.001	0.001	0.001	78.728	25.960
13.746	490.870	O5	pentene-1	0.124	0.142	0.155	85.928	29.960
14.222	496.680	O5	2-methylbutene-1	0.287	0.324	0.360	88.070	31.150
14.507	500.000	P5	n-pentane	2.499	2.938	3.048	96.908	36.060
14.848	506.110	O5	2-methylbutadiene-1,3	0.007	0.008	0.010	93.308	34.060
15.095	510.400	O5	t-pentene-2	0.374	0.424	0.469	97.412	36.340
15.466	516.590	O5	3,3-dimethylbutene-1	0.005	0.006	0.006	106.232	41.240
15.636	519.350	O5	c-pentene-2	0.207	0.233	0.260	98.474	36.930
15.794	521.870	--	unknown	0.000	0.000	0.001	32.000	0.000
15.974	524.690	O5	2-methylbutene-2	0.624	0.694	0.783	101.408	38.560
16.186	527.940	O5	1t,3-pentadiene	0.008	0.008	0.010	107.636	42.020
16.306	529.750	--	unknown	0.001	0.001	0.001	32.000	0.000
16.885	538.200	O5	cyclopentadiene	0.005	0.006	0.007	32.000	0.000
17.014	540.010	I6	2,2-dimethylbutane	0.447	0.507	0.457	121.514	49.730
18.312	557.140	O5	cyclopentene	0.102	0.097	0.131	111.614	44.230

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF Acquired: 10/30/20 23:25:35
Sample: ODDB:54925 Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 7**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
18.678	561.640	O6	4-methylpentene-1	0.024	0.026	0.025	128.948	53.860
18.747	562.470	O6	3-methylpentene-1	0.035	0.039	0.037	129.506	54.170
18.837	563.550	--	unknown	0.002	0.002	0.002	32.000	0.000
19.105	566.710	N5	cyclopentane	0.341	0.337	0.428	120.650	49.250
19.291	568.870	I6	2,3-dimethylbutane	1.360	1.513	1.389	136.364	57.980
19.447	570.660	--	unknown	0.043	0.045	0.118	32.000	0.000
19.562	571.960	O6	2,3-dimethylbutene-1	0.014	0.015	0.015	132.098	55.610
19.706	573.570	I6	2-methylpentane	3.777	4.257	3.856	140.468	60.260
19.836	575.010	O6	4-methyl-t-pentene-2	0.069	0.075	0.072	137.480	58.600
20.390	581.020	O6	1,5-hexadiene	0.000	0.000	0.000	139.010	59.450
20.811	585.420	I6	3-methylpentane	2.349	2.602	2.398	145.886	63.270
21.261	589.980	O6	2-methylpentene-1	0.114	0.123	0.120	143.780	62.100
21.351	590.880	O6	hexene-1	0.049	0.053	0.051	146.246	63.470
21.989	597.090	O6	1c/t,4-hexadiene	0.000	0.000	0.000	149.000	65.000
22.297	600.000	P6	n-hexane	1.895	2.115	1.935	155.714	68.730
22.521	602.680	O6	t-hexene-3	0.074	0.080	0.078	152.744	67.080
22.587	603.460	O6	c-hexene-3	0.025	0.026	0.026	151.592	66.440
22.739	605.260	O6	t-hexene-2	0.146	0.158	0.153	154.184	67.880
22.943	607.630	O6	2-methylpentene-2	0.186	0.198	0.194	153.140	67.300
23.022	608.550	O6	4-methylcyclopentene	0.050	0.048	0.054	148.820	64.900
23.184	610.410	O6	3-methyl-c-pentene-2	0.113	0.119	0.118	153.842	67.690
23.307	611.810	O6	3-methylcyclopentene	0.027	0.026	0.029	149.000	65.000
23.416	613.040	O6	O6-[1]	0.000	0.000	0.000	32.000	0.000
23.547	614.520	O6	c-hexene-2	0.079	0.084	0.083	155.984	68.880
23.784	617.160	O6	O6-[2]	0.001	0.001	0.001	32.000	0.000
24.112	620.750	O7	3,3-dimethylpentene-1	0.174	0.183	0.156	171.446	77.470
24.268	622.430	--	unknown	0.001	0.001	0.003	32.000	0.000
24.408	623.920	I7	2,2-dimethylpentane	0.105	0.114	0.092	174.542	79.190
24.625	626.230	N6	methylcyclopentane	2.455	2.414	2.567	161.240	71.800
25.037	630.510	I7	2,4-dimethylpentane	1.539	1.683	1.351	176.882	80.490
25.273	632.930	O7	cyclic diolefin or triolefin-[1]	0.002	0.003	0.003	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

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Sample: ODDB:54925 Analyzed: 11/2/2020 8:40:44 PM
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Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
25.456	634.780	I7	2,2,3-trimethylbutane	0.049	0.052	0.043	177.584	80.880
25.622	636.450	--	unknown	0.002	0.002	0.002	32.000	0.000
25.835	638.570	O7	cyclic diolefin or triolefin-[2]	0.007	0.007	0.007	32.000	0.000
26.173	641.870	O7	O7-[1]	0.002	0.002	0.002	32.000	0.000
26.285	642.950	O7	3,4-dimethylpentene-1	0.006	0.006	0.005	177.422	80.790
26.656	646.500	O7	4,4-dimethyl-c-pentene-2	0.008	0.009	0.007	176.756	80.420
26.802	647.880	O7	2,4-dimethylpentene-1	0.008	0.009	0.007	178.880	81.600
26.903	648.840	O6	1-methylcyclopentene	0.188	0.178	0.202	167.864	75.480
27.104	650.700	A6	benzene	0.724	0.607	0.816	176.162	80.090
27.286	652.380	O7	2-methyl-c-hexene-3	0.004	0.005	0.004	186.800	86.000
27.501	654.350	I7	3,3-dimethylpentane	0.098	0.104	0.086	186.908	86.060
27.602	655.270	O7	5-methylhexene-1	0.010	0.011	0.009	185.558	85.310
27.794	657.000	--	unknown	0.004	0.004	0.003	32.000	0.000
27.928	658.200	N6	cyclohexane	0.830	0.785	0.868	177.296	80.720
28.223	660.810	O7	2-methyl-t-hexene-3	0.017	0.018	0.015	186.620	85.900
28.352	661.940	O6	diolefin (hexadiene)	0.003	0.003	0.003	158.000	70.000
28.444	662.750	O7	2-ethyl-3-methylbutene-1	0.006	0.007	0.006	187.448	86.360
28.571	663.850	O7	4-methylhexene-1	0.014	0.015	0.013	188.114	86.730
28.867	666.400	O7	4-methyl-t/c-hexene-2	0.020	0.021	0.018	187.358	86.310
29.043	667.890	I7	2-methylhexane	2.024	2.196	1.777	194.090	90.050
29.206	669.270	I7	2,3-dimethylpentane	2.599	2.752	2.282	193.604	89.780
29.488	671.630	N7	1,1-dimethylcyclopentane	0.076	0.074	0.068	189.464	87.480
29.808	674.270	O7	5-methyl-t-hexene-2	0.023	0.025	0.021	190.598	88.110
30.024	676.040	I7	3-methylhexane	2.053	2.199	1.803	197.330	91.850
30.166	677.180	O7	1,6-heptadiene	0.000	0.000	0.000	205.106	96.170
30.452	679.480	O7	3,4-dimethyl-c-pentene-2	0.013	0.013	0.012	192.650	89.250
30.759	681.910	N7	1c,3-dimethylcyclopentane	0.699	0.691	0.626	195.386	90.770
31.112	684.680	N7	1t,3-dimethylcyclopentane	0.621	0.611	0.557	197.096	91.720
31.290	686.050	I7	3-ethylpentane	0.191	0.201	0.168	200.246	93.470
31.480	687.510	N7	1t,2-dimethylcyclopentane	0.609	0.596	0.546	197.366	91.870
31.662	688.900	I8	2,2,4-trimethylpentane	2.857	3.039	2.200	210.632	99.240

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

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Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
32.211	693.030	O7	O7-[2]	0.001	0.001	0.001	32.000	0.000
32.450	694.800	O7	3-methyl-c-hexene-3	0.022	0.022	0.020	203.720	95.400
32.722	696.790	--	unknown	0.000	0.000	0.000	32.000	0.000
32.986	698.710	O7	t-heptene-3	0.079	0.083	0.071	204.206	95.670
33.165	700.000	P7	n-heptane	1.389	1.495	1.219	209.156	98.420
33.461	701.940	O7	2-methyl-2-hexene	0.082	0.085	0.074	203.738	95.410
33.616	702.940	O7	3-methyl-t-hexene-3	0.032	0.034	0.029	200.372	93.540
33.861	704.520	O7	t-heptene-2	0.031	0.032	0.028	208.310	97.950
34.090	705.980	O7	3-ethylpentene-2	0.021	0.021	0.019	204.818	96.010
34.220	706.810	--	unknown	0.000	0.000	0.000	32.000	0.000
34.580	709.080	O7	c-heptene-2	0.078	0.081	0.070	209.138	98.410
34.766	710.240	O7	3-methyl-t-hexene-2	0.001	0.001	0.001	203.324	95.180
35.096	712.280	O7	2,3-dimethylpentene-2	0.033	0.034	0.030	207.320	97.400
35.324	713.680	O7	3-ethylcyclopentene	0.004	0.004	0.004	207.986	97.770
35.435	714.350	--	unknown	0.000	0.000	0.000	32.000	0.000
35.719	716.070	O7	O7-[3]	0.006	0.007	0.006	32.000	0.000
35.986	717.670	N7	1c,2-dimethylcyclopentane	0.278	0.279	0.249	211.154	99.530
36.113	718.420	N7	methylcyclohexane	1.310	1.253	1.174	213.674	100.930
36.427	720.280	I8	2,2-dimethylhexane	0.041	0.043	0.031	224.312	106.840
36.537	720.920	N8	1,1,3-trimethylcyclopentane	0.179	0.176	0.141	220.802	104.890
36.876	722.890	O7	O7-[4]	0.004	0.005	0.004	32.000	0.000
36.955	723.350	--	unknown	0.002	0.002	0.002	32.000	0.000
37.147	724.460	O7	O7-[5]	0.005	0.005	0.004	32.000	0.000
37.259	725.100	--	unknown	0.001	0.001	0.001	32.000	0.000
37.508	726.510	O7	O7-[6]	0.006	0.006	0.006	32.000	0.000
38.003	729.300	N7	ethylcyclopentane	0.350	0.336	0.313	218.246	103.470
38.130	730.000	I8	2,5-dimethylhexane	0.578	0.614	0.445	228.398	109.110
38.318	731.050	I8	2,2,3-trimethylpentane	0.115	0.118	0.088	229.730	109.850
38.468	731.870	I8	2,4-dimethylhexane	0.672	0.706	0.517	228.974	109.430
38.603	732.610	--	unknown	0.010	0.011	0.008	32.000	0.000
38.822	733.810	--	unknown	0.002	0.002	0.001	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

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Hold

Components Listed in Chromatographic Order **Page: 10**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
38.921	734.340	O7	O7-[7]	0.002	0.002	0.002	32.000	0.000
39.162	735.650	O7	O7-[8]	0.002	0.002	0.001	32.000	0.000
39.476	737.330	N8	1c,2t,4-trimethylcyclopentane	0.294	0.283	0.230	242.132	116.740
39.691	738.470	I8	3,3-dimethylhexane	0.058	0.060	0.045	233.546	111.970
40.176	741.020	O7	O7-[9]	0.003	0.003	0.003	32.000	0.000
40.484	742.620	O7	O7-[10]	0.002	0.002	0.002	32.000	0.000
40.644	743.450	O7	O7-[11]	0.005	0.005	0.005	32.000	0.000
40.841	744.460	N8	1t,2c,3-trimethylcyclopentane	0.213	0.204	0.167	230.738	110.410
41.380	747.200	I8	2,3,4-trimethylpentane	1.257	1.287	0.968	236.246	113.470
41.597	748.290	I8	I8-[1]	0.080	0.082	0.061	236.246	113.470
41.893	749.770	O7	O7-[12]	0.021	0.021	0.016	32.000	0.000
42.202	751.300	I8	2,3,3-trimethylpentane	1.191	1.207	0.917	238.586	114.770
42.635	753.420	A7	toluene	4.742	4.026	4.528	231.134	110.630
42.744	753.940	O8	O8-[1]	0.005	0.005	0.004	32.000	0.000
43.084	755.590	O8	O8-[2]	0.007	0.007	0.006	32.000	0.000
43.616	758.130	I8	2,3-dimethylhexane	0.560	0.579	0.431	240.098	115.610
43.795	758.970	I8	2-methyl-3-ethylpentane	0.069	0.071	0.053	240.098	115.610
44.089	760.360	N8	1,1,2-trimethylcyclopentane	0.011	0.010	0.008	236.714	113.730
44.534	762.420	O8	O8-[3]	0.029	0.029	0.023	32.000	0.000
44.941	764.300	I8	2-methylheptane	0.936	0.987	0.721	243.770	117.650
45.253	765.720	I8	4-methylheptane	0.357	0.373	0.275	243.878	117.710
45.509	766.880	I8	3-methyl-3-ethylpentane	0.077	0.080	0.060	240.098	115.610
45.625	767.400	I8	3,4-dimethylhexane	0.085	0.087	0.066	243.914	117.730
46.248	770.180	N8	1c,3-dimethylcyclohexane	0.114	0.110	0.089	246.848	119.360
46.658	771.980	I8	3-methylheptane	0.895	0.934	0.690	246.074	118.930
46.922	773.140	--	unknown	0.181	0.190	0.139	32.000	0.000
47.014	773.530	N8	1c,2t,3-trimethylcyclopentane	0.428	0.409	0.336	243.500	117.500
47.176	774.230	I8	3-ethylhexane	0.109	0.112	0.084	245.372	118.540
47.448	775.410	N8	1t,4-dimethylcyclohexane	0.197	0.190	0.154	246.848	119.360
47.889	777.290	--	unknown	0.002	0.002	0.006	32.000	0.000
48.281	778.950	--	unknown	0.001	0.001	0.002	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

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Hold

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Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
48.425	779.560	O8	O8-[4]	0.001	0.001	0.001	32.000	0.000
48.773	781.010	N8	1,1-dimethylcyclohexane	0.035	0.033	0.027	247.190	119.550
49.236	782.930	I9	2,2,5-trimethylhexane	0.635	0.661	0.436	255.362	124.090
49.667	784.690	N8	3c-ethylmethylcyclopentane	0.215	0.206	0.169	249.980	121.100
49.877	785.550	O9	2,6-dimethylheptene-1	0.003	0.003	0.002	32.000	0.000
50.210	786.890	N8	3t-ethylmethylcyclopentane	0.183	0.175	0.143	249.980	121.100
50.542	788.220	N8	2t-ethylmethylcyclopentane	0.166	0.159	0.130	250.160	121.200
50.999	790.040	O8	O8-[5]	0.007	0.007	0.005	32.000	0.000
51.128	790.550	N8	1,1-methylethylcyclopentane	0.022	0.021	0.017	250.754	121.530
51.816	793.240	N8	1t,2-dimethylcyclohexane	0.192	0.183	0.151	254.174	123.430
52.015	794.010	O8	t-octene-4	0.009	0.009	0.007	252.068	122.260
52.422	795.580	O9	3,5,5-trimethylhexene-1	0.001	0.001	0.001	32.000	0.000
52.794	797.000	--	unknown	0.010	0.011	0.007	32.000	0.000
52.886	797.350	N8	1c,2c,3-trimethylcyclopentane	0.022	0.021	0.017	253.400	123.000
53.589	800.000	P8	n-octane	0.835	0.874	0.643	258.224	125.680
53.867	801.040	N8	1c,4-dimethylcyclohexane	0.270	0.254	0.212	255.794	124.330
54.737	804.260	O8	t-octene-2	0.008	0.009	0.007	32.000	0.000
54.960	805.080	--	unknown	0.005	0.005	0.014	32.000	0.000
55.334	806.450	I9	I9-[1]	0.039	0.040	0.027	32.000	0.000
55.435	806.810	--	unknown	0.017	0.018	0.012	32.000	0.000
55.831	808.240	N8	i-propylcyclopentane	0.085	0.081	0.067	259.574	126.430
56.489	810.590	--	unknown	0.004	0.004	0.010	32.000	0.000
57.017	812.460	--	unknown	0.009	0.010	0.025	32.000	0.000
57.125	812.840	O8	c-octene-2	0.004	0.004	0.003	32.000	0.000
57.331	813.560	--	unknown	0.001	0.001	0.001	32.000	0.000
57.696	814.830	N8	N8-[1]	0.014	0.014	0.011	32.000	0.000
58.064	816.100	O8	O8-[6]	0.002	0.002	0.002	32.000	0.000
58.446	817.400	I9	2,2,3,4-tetramethylpentane	0.127	0.127	0.087	271.454	133.030
59.086	819.580	I9	2,3,4-trimethylhexane	0.072	0.071	0.049	282.308	139.060
59.385	820.580	N8	N8-[2]	0.003	0.003	0.002	32.000	0.000
59.645	821.450	O9	O9-[1]	0.031	0.032	0.022	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

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Sample: ODDB:54925 Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
60.051	822.800	N8	N8-[3]	0.001	0.001	0.001	32.000	0.000
60.499	824.280	O9	O9-[2]	0.006	0.006	0.004	32.000	0.000
61.041	826.050	N8	1c,2-dimethylcyclohexane	0.190	0.176	0.149	265.532	129.740
61.235	826.680	--	unknown	0.023	0.024	0.018	32.000	0.000
61.631	827.960	I9	2,3,5-trimethylhexane	0.007	0.007	0.005	268.430	131.350
61.943	828.960	I9	2,2-dimethylheptane	0.013	0.014	0.009	270.860	132.700
62.836	831.790	N9	1,1,4-trimethylcyclohexane	0.341	0.325	0.237	275.000	135.000
63.400	833.560	I9	2,2,3-trimethylhexane	0.161	0.166	0.110	271.220	132.900
63.985	835.380	I9	2,4-dimethylheptane	0.034	0.035	0.024	271.220	132.900
64.726	837.650	I9	4,4-dimethylheptane	0.196	0.202	0.135	271.220	132.900
65.027	838.560	N8	ethylcyclohexane	0.001	0.001	0.001	269.222	131.790
65.627	840.370	N8	n-propylcyclopentane	0.033	0.031	0.026	267.728	130.960
65.832	840.990	I9	2,5-dimethylheptane	0.266	0.273	0.182	276.800	136.000
66.295	842.370	I9	3,3-&3,5-dimethylheptane	0.062	0.063	0.042	278.636	137.020
66.702	843.570	I9	3,5-dimethylheptane	0.042	0.043	0.029	276.800	136.000
67.179	844.970	I9	2,6-dimethylheptane	0.073	0.075	0.050	275.396	135.220
67.806	846.800	N9	1,1,3-trimethylcyclohexane	0.049	0.046	0.034	295.862	146.590
68.300	848.220	O9	2,4-dimethylheptene-1	0.002	0.002	0.001	32.000	0.000
68.846	849.780	N8	N8-[4]	0.001	0.001	0.001	32.000	0.000
69.092	850.480	N8	N8-[5]	0.003	0.003	0.003	32.000	0.000
69.408	851.370	N9	1c,2t,4t-trimethylcyclohexane	0.020	0.019	0.014	32.000	0.000
70.264	853.770	A8	ethylbenzene	1.243	1.055	1.030	277.160	136.200
70.637	854.800	N9	1c,3c,5c-trimethylcyclohexane	0.129	0.122	0.090	32.000	0.000
71.461	857.070	O9	2-methyloctene-1	0.020	0.022	0.014	32.000	0.000
71.896	858.250	I9	I9-[2]	0.004	0.004	0.003	32.000	0.000
72.360	859.510	O9	2-methyloctene-2	0.030	0.033	0.021	32.000	0.000
74.123	864.200	A8	1,3-dimethylbenzene	3.352	2.855	2.778	282.416	139.120
74.448	865.050	A8	1,4-dimethylbenzene	1.355	1.158	1.123	281.048	138.360
75.059	866.640	I9	3,4-dimethylheptane	0.034	0.034	0.023	285.080	140.600
75.384	867.470	I9	3,4 -dimethylheptane	0.064	0.064	0.044	285.080	140.600
75.918	868.840	N9	N9-[1]	0.030	0.028	0.021	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
76.367	869.990	I9	I9-[3]	0.079	0.079	0.054	32.000	0.000
77.262	872.250	I9	4-ethylheptane	0.003	0.003	0.002	288.392	142.440
77.569	873.020	I9	4-methyloctane	0.276	0.282	0.189	288.392	142.440
77.965	874.000	I9	2-methyloctane	0.339	0.349	0.232	289.904	143.280
78.568	875.490	N9	N9-[2]	0.038	0.036	0.026	32.000	0.000
79.424	877.590	N9	1c,2t,3c-trimethylcyclohexane	0.041	0.040	0.028	304.160	151.200
79.736	878.350	I9	3-ethylheptane	0.079	0.080	0.054	289.400	143.000
80.250	879.590	I9	3-methyloctane	0.436	0.445	0.299	291.614	144.230
80.568	880.350	I9	3,3-diethylpentane	0.021	0.021	0.015	270.842	132.690
81.010	881.410	--	unknown	0.067	0.070	0.046	32.000	0.000
81.299	882.090	N9	1c,2t,4c-trimethylcyclohexane	0.018	0.017	0.013	275.000	135.000
81.666	882.960	N9	1,1,2-trimethylcyclohexane	0.031	0.028	0.021	293.360	145.200
82.032	883.820	A8	1,2-dimethylbenzene	1.672	1.398	1.386	291.974	144.430
82.558	885.060	I9	I9-[4]	0.028	0.029	0.019	32.000	0.000
82.921	885.900	I9	I9-[5]	0.106	0.107	0.073	32.000	0.000
83.657	887.600	N9	N9-[3]	0.090	0.085	0.063	32.000	0.000
83.922	888.210	N9	N9-[4]	0.113	0.107	0.079	32.000	0.000
84.051	888.510	--	unknown	0.040	0.042	0.028	32.000	0.000
84.424	889.360	O9	nonene-1	0.006	0.005	0.004	274.100	134.500
84.609	889.780	I9	I9-[6]	0.062	0.062	0.042	32.000	0.000
85.014	890.700	N9	N9-[5]	0.160	0.151	0.111	32.000	0.000
85.555	891.910	I9	I9-[7]	0.017	0.017	0.011	32.000	0.000
86.009	892.930	N9	i-butylcyclopentane	0.033	0.031	0.023	298.346	147.970
86.219	893.400	N9	N9-[6]	0.022	0.021	0.016	32.000	0.000
87.066	895.280	--	unknown	0.001	0.001	0.001	32.000	0.000
87.435	896.090	N9	N9-[7]	0.015	0.014	0.011	32.000	0.000
87.738	896.750	N9	N9-[8]	0.009	0.008	0.006	32.000	0.000
88.031	897.390	O9	t-nonene-2	0.007	0.008	0.005	32.000	0.000
88.250	897.870	O9	t-nonene-3	0.021	0.022	0.015	32.000	0.000
88.667	898.770	I9	I9-[8]	0.128	0.129	0.088	32.000	0.000
88.823	899.110	--	unknown	0.024	0.026	0.017	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF Acquired: 10/30/20 23:25:35
Sample: ODDB:54925 Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
89.237	900.000	P9	n-nonane	0.391	0.401	0.268	303.476	150.820
89.598	901.750	N9	1,1-methylethylcyclohexane	0.094	0.086	0.065	305.924	152.180
90.170	904.510	N9	N9-[9]	0.010	0.009	0.007	32.000	0.000
90.421	905.710	N9	N9-[10]	0.027	0.025	0.019	32.000	0.000
90.690	907.000	O10	t-2,2,5,5-tetramethylhexene-3	0.004	0.005	0.003	32.000	0.000
90.801	907.530	--	unknown	0.003	0.003	0.002	32.000	0.000
91.585	911.260	N9	N9-[11]	0.006	0.006	0.004	32.000	0.000
92.009	913.250	A9	i-propylbenzene	0.066	0.056	0.048	306.338	152.410
92.371	914.950	O9	c-nonene-3	0.075	0.081	0.052	32.000	0.000
92.516	915.630	--	unknown	0.020	0.021	0.014	32.000	0.000
92.931	917.570	I10	I10-[1]	0.012	0.013	0.008	32.000	0.000
93.033	918.040	N9	i-propylcyclohexane	0.022	0.021	0.016	310.622	154.790
93.178	918.710	--	unknown	0.006	0.007	0.004	32.000	0.000
93.771	921.460	I10	I10-[2]	0.114	0.114	0.070	32.000	0.000
94.167	923.280	I10	2,2-dimethyloctane	0.037	0.037	0.023	314.420	156.900
94.443	924.540	I10	2,4-dimethyloctane	0.055	0.055	0.034	312.620	155.900
94.875	926.520	N9	N9-[12]	0.007	0.007	0.005	32.000	0.000
95.307	928.480	N9	N9-[13]	0.023	0.022	0.016	32.000	0.000
95.916	931.230	I10	2,6-dimethyloctane	0.092	0.093	0.057	320.738	160.410
96.274	932.830	I10	2,5-dimethyloctane	0.083	0.084	0.051	317.300	158.500
96.528	933.970	--	unknown	0.003	0.003	0.002	32.000	0.000
97.127	936.640	N9	n-butylcyclopentane	0.062	0.058	0.043	313.916	156.620
97.342	937.590	I10	I10-[3]	0.033	0.034	0.021	32.000	0.000
97.491	938.250	N10	N10-[1]	0.038	0.035	0.024	32.000	0.000
97.755	939.420	--	unknown	0.006	0.006	0.004	32.000	0.000
98.004	940.520	I10	I10-[4]	0.022	0.022	0.014	32.000	0.000
98.460	942.510	I10	3,3-dimethyloctane	0.147	0.146	0.091	322.160	161.200
98.772	943.880	N10	N10-[2]	0.025	0.023	0.016	32.000	0.000
98.985	944.800	--	unknown	0.020	0.021	0.012	32.000	0.000
99.156	945.550	--	unknown	0.026	0.027	0.016	32.000	0.000
99.548	947.250	A9	n-propylbenzene	0.371	0.317	0.272	318.632	159.240

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
99.844	948.520	I10	3,6-dimethyloctane	0.028	0.028	0.017	321.440	160.800
100.102	949.630	I10	3-methyl-5-ethylheptane	0.049	0.049	0.030	316.760	158.200
100.251	950.270	--	unknown	0.006	0.007	0.004	32.000	0.000
100.566	951.630	N10	N10-[3]	0.029	0.027	0.018	32.000	0.000
101.194	954.300	--	unknown	0.026	0.028	0.017	32.000	0.000
101.502	955.610	A9	1,3-methylethylbenzene	1.312	1.117	0.961	322.394	161.330
101.888	957.240	A9	1,4-methylethylbenzene	0.563	0.481	0.412	323.618	162.010
102.197	958.540	N10	N10-[4]	0.032	0.029	0.020	32.000	0.000
102.370	959.270	--	unknown	0.003	0.003	0.002	32.000	0.000
102.742	960.830	--	unknown	0.002	0.002	0.001	32.000	0.000
102.946	961.680	--	unknown	0.011	0.012	0.031	32.000	0.000
103.232	962.870	A9	1,3,5-trimethylbenzene	0.700	0.595	0.512	328.532	164.740
103.497	963.970	I10	I10-[5]	0.044	0.044	0.027	32.000	0.000
103.764	965.080	N10	N10-[5]	0.019	0.017	0.012	32.000	0.000
103.956	965.870	--	unknown	0.006	0.007	0.004	32.000	0.000
104.193	966.850	I10	I10-[6]	0.003	0.003	0.002	32.000	0.000
104.509	968.150	I10	5-methylnonane	0.054	0.055	0.034	329.180	165.100
104.915	969.810	I10	4-methylnonane	0.447	0.445	0.277	32.000	0.000
105.258	971.210	A9	1,2-methylethylbenzene	0.417	0.349	0.305	329.324	165.180
105.444	971.970	I10	2-methylnonane	0.128	0.130	0.079	332.654	167.030
105.574	972.500	--	unknown	0.013	0.014	0.008	32.000	0.000
105.865	973.680	--	unknown	0.012	0.013	0.007	32.000	0.000
106.099	974.620	I10	3-ethyloctane	0.028	0.028	0.017	331.700	166.500
106.180	974.950	--	unknown	0.015	0.015	0.009	32.000	0.000
106.469	976.110	N10	N10-[6]	0.025	0.023	0.015	32.000	0.000
106.803	977.450	I10	3-methylnonane	0.157	0.157	0.097	334.040	167.800
107.004	978.260	--	unknown	0.007	0.008	0.004	32.000	0.000
107.359	979.680	N10	N10-[7]	0.003	0.003	0.002	32.000	0.000
107.542	980.410	I10	I10-[7]	0.100	0.100	0.062	32.000	0.000
107.816	981.500	I10	I10-[8]	0.008	0.008	0.005	32.000	0.000
108.103	982.640	--	unknown	0.011	0.012	0.007	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF Acquired: 10/30/20 23:25:35
Sample: ODDB:54925 Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
108.564	984.460	A9	1,2,4-trimethylbenzene	2.041	1.715	1.494	336.884	169.380
108.795	985.370	--	unknown	0.008	0.009	0.006	32.000	0.000
108.961	986.020	I10	I10-[9]	0.009	0.009	0.006	32.000	0.000
109.078	986.480	N10	i-butylcyclohexane	0.038	0.035	0.024	340.340	171.300
109.271	987.240	--	unknown	0.030	0.032	0.019	32.000	0.000
109.386	987.690	I10	I10-[10]	0.046	0.046	0.028	32.000	0.000
109.668	988.790	I10	I10-[11]	0.020	0.019	0.012	32.000	0.000
109.809	989.340	I10	I10-[12]	0.013	0.013	0.008	32.000	0.000
110.162	990.710	N10	N10-[8]	0.024	0.022	0.015	32.000	0.000
110.376	991.540	--	unknown	0.002	0.003	0.002	32.000	0.000
110.766	993.050	O10	decene-1	0.002	0.002	0.002	339.080	170.600
110.926	993.660	N10	1t-methyl-2-n-propylcyclohexane	0.012	0.011	0.007	339.800	171.000
111.051	994.150	O10	2,3-dimethyloctene-2	0.066	0.066	0.041	32.000	0.000
111.168	994.600	I10	I10-[13]	0.016	0.016	0.010	32.000	0.000
111.461	995.720	A10	i-butylbenzene	0.004	0.003	0.002	343.022	172.790
111.606	996.280	--	unknown	0.058	0.061	0.038	32.000	0.000
111.842	997.180	I10	I10-[14]	0.040	0.040	0.025	32.000	0.000
112.119	998.240	A10	sec-butylbenzene	0.038	0.032	0.025	344.012	173.340
112.368	999.180	--	unknown	0.009	0.009	0.006	32.000	0.000
112.582	1000.000	P10	n-decane	0.207	0.209	0.128	345.470	174.150
112.824	1001.520	I11	I11-[1]	0.029	0.029	0.016	32.000	0.000
113.182	1003.780	N10	N10-[9]	0.018	0.017	0.011	32.000	0.000
113.581	1006.290	--	unknown	0.005	0.006	0.003	32.000	0.000
113.825	1007.820	A9	1,2,3-trimethylbenzene	0.400	0.329	0.293	349.016	176.120
113.987	1008.830	--	unknown	0.009	0.009	0.006	32.000	0.000
114.271	1010.610	A10	1,3-methyl-i-propylbenzene	0.044	0.038	0.029	347.144	175.080
114.716	1013.370	--	unknown	0.010	0.011	0.028	32.000	0.000
114.832	1014.090	A10	1,4-methyl-i-propylbenzene	0.026	0.022	0.017	350.834	177.130
114.995	1015.100	--	unknown	0.003	0.003	0.002	32.000	0.000
115.299	1016.980	I11	I11-[2]	0.028	0.028	0.016	32.000	0.000
115.570	1018.650	I11	I11-[3]	0.013	0.013	0.007	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
115.863	1020.460	A10	2-3-dihydroindene	0.278	0.212	0.207	352.130	177.850
116.229	1022.700	--	unknown	0.020	0.021	0.015	32.000	0.000
116.475	1024.210	N10	sec-butylcyclohexane	0.043	0.039	0.027	354.812	179.340
116.710	1025.640	I11	I11-[4]	0.009	0.009	0.005	32.000	0.000
117.056	1027.740	A10	1,2-methyl-i-propylbenzene	0.075	0.063	0.049	352.724	178.180
117.232	1028.820	I11	3-ethylnonane	0.006	0.006	0.003	32.000	0.000
117.334	1029.430	--	unknown	0.003	0.004	0.002	32.000	0.000
117.628	1031.210	--	unknown	0.068	0.072	0.038	32.000	0.000
117.851	1032.560	N11	N11-[1]	0.047	0.044	0.027	32.000	0.000
118.092	1034.010	I11	I11-[5]	0.017	0.017	0.010	32.000	0.000
118.243	1034.920	--	unknown	0.003	0.003	0.002	32.000	0.000
118.602	1037.070	I11	I11-[6]	0.032	0.029	0.018	32.000	0.000
118.768	1038.070	--	unknown	0.034	0.036	0.020	32.000	0.000
119.211	1040.710	A10	1,3-diethylbenzene	0.141	0.121	0.093	358.052	181.140
119.411	1041.900	--	unknown	0.065	0.069	0.043	32.000	0.000
119.659	1043.380	A10	1,3-methyl-n-propylbenzene	0.288	0.246	0.189	359.618	182.010
119.834	1044.410	I11	I11-[7]	0.024	0.024	0.014	32.000	0.000
120.116	1046.080	A10	1,4-diethylbenzene	0.012	0.010	0.008	362.822	183.790
120.297	1047.150	A10	1,4-methyl-n-propylbenzene	0.179	0.154	0.118	362.156	183.420
120.470	1048.170	A10	n-butylbenzene	0.086	0.074	0.057	361.940	183.300
120.880	1050.590	A10	1,3-dimethyl-5-ethylbenzene	0.302	0.252	0.198	362.516	183.620
121.202	1052.470	A10	1,2-diethylbenzene	0.032	0.027	0.021	362.228	183.460
121.345	1053.310	I11	I11-[8]	0.018	0.018	0.010	32.000	0.000
121.574	1054.650	N10	t-decahydronaphthalene	0.009	0.009	0.005	368.960	187.200
121.824	1056.110	N11	N11-[2]	0.017	0.016	0.010	32.000	0.000
122.104	1057.740	--	unknown	0.014	0.014	0.008	32.000	0.000
122.245	1058.560	A10	1,2-methyl-n-propylbenzene	0.099	0.083	0.065	364.946	184.970
122.636	1060.820	I11	I11-[9]	0.012	0.012	0.007	32.000	0.000
122.755	1061.510	I11	I11-[10]	0.072	0.071	0.040	32.000	0.000
122.961	1062.700	I11	I11-[11]	0.049	0.048	0.027	32.000	0.000
123.311	1064.710	--	unknown	0.004	0.004	0.002	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
123.473	1065.640	I11	I11-[12]	0.048	0.048	0.027	32.000	0.000
123.730	1067.120	--	unknown	0.009	0.010	0.005	32.000	0.000
124.018	1068.770	A10	1,4,dimethyl-2-ethylbenzene	0.219	0.184	0.143	368.366	186.870
124.291	1070.330	A10	1,3-dimethyl-4-ethylbenzene	0.274	0.235	0.180	370.832	188.240
124.562	1071.870	I11	I11-[13]	0.003	0.003	0.002	32.000	0.000
124.863	1073.580	--	unknown	0.008	0.009	0.005	32.000	0.000
125.122	1075.050	I11	I11-[14]	0.151	0.150	0.085	32.000	0.000
125.289	1075.990	A10	1,2-dimethyl-4-ethylbenzene	0.301	0.253	0.197	373.136	189.520
125.602	1077.760	--	unknown	0.009	0.010	0.006	32.000	0.000
125.890	1079.380	--	unknown	0.014	0.014	0.009	32.000	0.000
125.978	1079.880	I11	I11-[15]	0.005	0.004	0.003	32.000	0.000
126.264	1081.480	A10	1,3-dimethyl-2-ethylbenzene	0.051	0.042	0.033	374.090	190.050
126.418	1082.350	I11	I11-[16]	0.018	0.018	0.010	32.000	0.000
126.747	1084.190	--	unknown	0.018	0.019	0.010	32.000	0.000
126.946	1085.300	I11	I11-[17]	0.009	0.009	0.005	32.000	0.000
127.175	1086.580	--	unknown	0.016	0.017	0.009	32.000	0.000
127.509	1088.430	--	unknown	0.009	0.009	0.005	32.000	0.000
127.584	1088.850	--	unknown	0.012	0.013	0.007	32.000	0.000
127.858	1090.360	O11	undecene-1	0.021	0.021	0.012	378.860	192.700
128.193	1092.220	A11	1,4-methyl-t-butylbenzene	0.038	0.033	0.022	32.000	0.000
128.469	1093.740	A10	1,2-dimethyl-3-ethylbenzene	0.084	0.069	0.055	381.110	193.950
128.811	1095.620	--	unknown	0.007	0.007	0.005	32.000	0.000
129.084	1097.120	--	unknown	0.014	0.015	0.009	32.000	0.000
129.165	1097.560	A11	1,2-ethyl-i-propylbenzene	0.009	0.008	0.005	32.000	0.000
129.334	1098.490	--	unknown	0.007	0.007	0.004	32.000	0.000
129.610	1100.000	P11	n-undecane	0.108	0.107	0.061	384.620	195.900
129.737	1100.950	--	unknown	0.010	0.011	0.006	32.000	0.000
129.915	1102.280	A11	1,4-ethyl-i-propylbenzene	0.003	0.002	0.002	32.000	0.000
130.344	1105.480	A10	1,2,4,5-tetramethylbenzene	0.176	0.146	0.115	386.312	196.840
130.732	1108.380	--	unknown	0.008	0.009	0.005	32.000	0.000
130.886	1109.520	A10	1,2,3,5-tetramethylbenzene	0.233	0.193	0.153	388.472	198.040

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF Acquired: 10/30/20 23:25:35
Sample: ODDB:54925 Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
131.041	1110.670	--	unknown	0.006	0.006	0.004	32.000	0.000
131.377	1113.160	--	unknown	0.012	0.013	0.008	32.000	0.000
131.571	1114.590	--	unknown	0.008	0.008	0.005	32.000	0.000
131.875	1116.830	--	unknown	0.022	0.023	0.015	32.000	0.000
132.320	1120.110	--	unknown	0.015	0.016	0.010	32.000	0.000
132.477	1121.260	--	unknown	0.016	0.017	0.010	32.000	0.000
132.962	1124.810	A11	1,2-methyl-t-butylbenzene	0.007	0.005	0.004	32.000	0.000
133.117	1125.940	--	unknown	0.013	0.013	0.008	32.000	0.000
133.429	1128.220	A10	5-methylindan	0.207	0.171	0.138	32.000	0.000
133.774	1130.720	I12	I12-[1]	0.050	0.049	0.026	421.340	216.300
134.179	1133.660	--	unknown	0.008	0.008	0.004	32.000	0.000
134.295	1134.500	A10	4-methylindan	0.051	0.042	0.034	32.000	0.000
134.562	1136.430	--	unknown	0.011	0.012	0.008	32.000	0.000
134.675	1137.240	A11	1,2-ethyl-n-propylbenzene	0.060	0.049	0.035	32.000	0.000
134.928	1139.060	A10	2-methylindan	0.198	0.161	0.132	368.600	187.000
135.139	1140.570	A11	1,3-methyl-n-butylbenzene	0.010	0.008	0.006	390.200	199.000
135.389	1142.370	--	unknown	0.006	0.006	0.003	32.000	0.000
135.543	1143.470	A12	1,3-di-i-propylbenzene	0.067	0.055	0.036	397.760	203.200
135.756	1145.000	A11	s-pentylbenzene	0.061	0.051	0.036	401.000	205.000
135.929	1146.230	--	unknown	0.002	0.002	0.001	32.000	0.000
136.341	1149.170	--	unknown	0.019	0.020	0.011	32.000	0.000
136.439	1149.860	A11	n-pentylbenzene	0.051	0.042	0.030	401.720	205.400
136.519	1150.430	--	unknown	0.023	0.024	0.014	32.000	0.000
136.798	1152.420	N12	1t-M-2-(4-MP)cyclopentane	0.005	0.004	0.002	32.000	0.000
136.995	1153.810	A12	1,2-di-i-propylbenzene	0.029	0.024	0.016	399.200	204.000
137.142	1154.850	--	unknown	0.028	0.029	0.015	32.000	0.000
137.627	1158.270	--	unknown	0.041	0.043	0.022	32.000	0.000
137.871	1159.990	A12	1,4-di-i-propylbenzene	0.051	0.042	0.027	410.540	210.300
138.176	1162.130	--	unknown	0.007	0.007	0.004	32.000	0.000
138.348	1163.340	A10	tetrahydronaphthalene	0.018	0.014	0.012	405.716	207.620
138.495	1164.360	--	unknown	0.008	0.008	0.005	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
138.741	1166.080	--	unknown	0.004	0.005	0.003	32.000	0.000
138.883	1167.080	I12	I12-[2]	0.055	0.054	0.028	421.340	216.300
139.183	1169.170	A10	naphthalene	0.170	0.122	0.117	424.382	217.990
139.507	1171.420	A12	1-t-butyl-3,5-dimethylbenzene	0.004	0.003	0.002	32.000	0.000
139.849	1173.790	A12	1,4-ethyl-t-butylbenzene	0.077	0.064	0.042	32.000	0.000
140.252	1176.580	--	unknown	0.028	0.029	0.015	32.000	0.000
140.543	1178.590	I12	I12-[3]	0.057	0.056	0.030	421.340	216.300
140.773	1180.180	I12	I12-[4]	0.033	0.032	0.017	421.340	216.300
141.116	1182.530	--	unknown	0.007	0.007	0.004	32.000	0.000
141.353	1184.160	I12	I12-[5]	0.034	0.034	0.018	421.340	216.300
141.603	1185.870	--	unknown	0.012	0.013	0.006	32.000	0.000
141.897	1187.870	I12	I12-[6]	0.035	0.034	0.018	421.340	216.300
142.095	1189.230	A12	1,3-di-n-propylbenzene	0.041	0.034	0.022	32.000	0.000
142.337	1190.870	A12	A12-[1]	0.025	0.021	0.014	32.000	0.000
142.554	1192.340	O12	dodecene-1	0.006	0.006	0.003	416.120	213.400
142.914	1194.780	--	unknown	0.007	0.008	0.004	32.000	0.000
143.254	1197.080	--	unknown	0.005	0.005	0.003	32.000	0.000
143.556	1199.130	A12	A12-[2]	0.021	0.017	0.011	32.000	0.000
143.685	1200.000	P12	n-dodecane	0.046	0.045	0.024	421.340	216.300
143.948	1202.210	--	unknown	0.003	0.004	0.002	32.000	0.000
144.225	1204.540	--	unknown	0.013	0.014	0.007	32.000	0.000
144.318	1205.320	--	unknown	0.004	0.005	0.002	32.000	0.000
144.762	1209.040	--	unknown	0.012	0.013	0.006	32.000	0.000
144.988	1210.930	--	unknown	0.006	0.006	0.003	32.000	0.000
145.187	1212.590	A12	1,3,5-triethylbenzene	0.003	0.003	0.002	420.800	216.000
145.373	1214.140	--	unknown	0.008	0.008	0.004	32.000	0.000
145.717	1217.000	--	unknown	0.022	0.024	0.012	32.000	0.000
145.891	1218.450	--	unknown	0.013	0.014	0.007	32.000	0.000
146.207	1221.070	--	unknown	0.003	0.003	0.002	32.000	0.000
146.498	1223.470	--	unknown	0.018	0.019	0.010	32.000	0.000
146.737	1225.450	--	unknown	0.017	0.018	0.009	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF Acquired: 10/30/20 23:25:35
Sample: ODDB:54925 Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
146.811	1226.060	--	unknown	0.008	0.008	0.004	32.000	0.000
147.121	1228.610	--	unknown	0.005	0.005	0.003	32.000	0.000
147.205	1229.300	--	unknown	0.013	0.013	0.007	32.000	0.000
147.509	1231.800	A12	1,2,4-triethylbenzene	0.013	0.011	0.007	423.500	217.500
147.729	1233.610	--	unknown	0.005	0.005	0.003	32.000	0.000
148.092	1236.580	--	unknown	0.004	0.004	0.002	32.000	0.000
148.233	1237.730	--	unknown	0.012	0.013	0.007	32.000	0.000
148.465	1239.620	--	unknown	0.002	0.002	0.001	32.000	0.000
148.803	1242.370	A12	1,4-methyl-n-pentylbenzene	0.036	0.030	0.020	32.000	0.000
149.086	1244.670	--	unknown	0.010	0.010	0.005	32.000	0.000
149.242	1245.940	--	unknown	0.004	0.004	0.002	32.000	0.000
149.380	1247.050	--	unknown	0.003	0.003	0.002	32.000	0.000
149.668	1249.380	--	unknown	0.004	0.005	0.002	32.000	0.000
149.952	1251.680	--	unknown	0.006	0.007	0.003	32.000	0.000
150.149	1253.260	--	unknown	0.008	0.009	0.004	32.000	0.000
150.536	1256.380	A12	n-hexylbenzene	0.020	0.016	0.011	32.000	0.000
150.626	1257.100	--	unknown	0.021	0.022	0.011	32.000	0.000
150.997	1260.070	--	unknown	0.011	0.012	0.006	32.000	0.000
151.256	1262.140	--	unknown	0.005	0.005	0.003	32.000	0.000
151.501	1264.100	--	unknown	0.005	0.005	0.003	32.000	0.000
151.660	1265.370	--	unknown	0.003	0.004	0.002	32.000	0.000
151.869	1267.030	--	unknown	0.006	0.007	0.003	32.000	0.000
151.921	1267.450	--	unknown	0.009	0.010	0.005	32.000	0.000
152.209	1269.740	--	unknown	0.011	0.011	0.006	32.000	0.000
152.638	1273.140	I13	I13-[1]	0.008	0.008	0.004	455.720	235.400
152.827	1274.630	A11	1,2,3,4,5-pentamethylbenzene	0.024	0.017	0.014	449.600	232.000
153.058	1276.460	--	unknown	0.009	0.010	0.006	32.000	0.000
153.571	1280.500	--	unknown	0.006	0.006	0.004	32.000	0.000
153.925	1283.280	A11	2-methylnaphthalene	0.093	0.067	0.057	465.890	241.050
154.414	1287.110	--	unknown	0.010	0.010	0.006	32.000	0.000
154.564	1288.290	--	unknown	0.002	0.002	0.001	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 8:42:18 PM

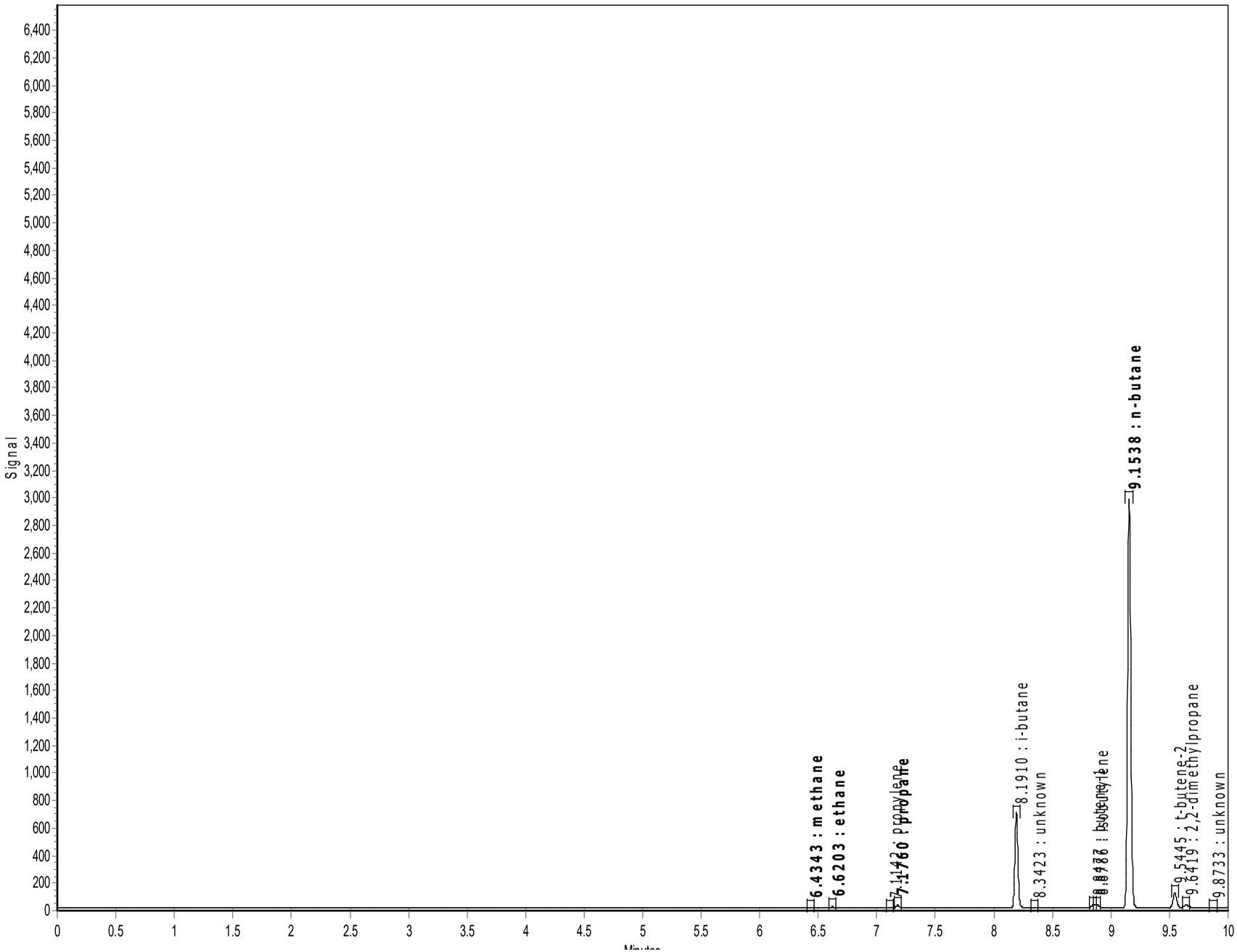
RawFile: D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF
Acquired: 10/30/20 23:25:35
Sample: ODDB:54925
Analyzed: 11/2/2020 8:40:44 PM
Processed 630 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

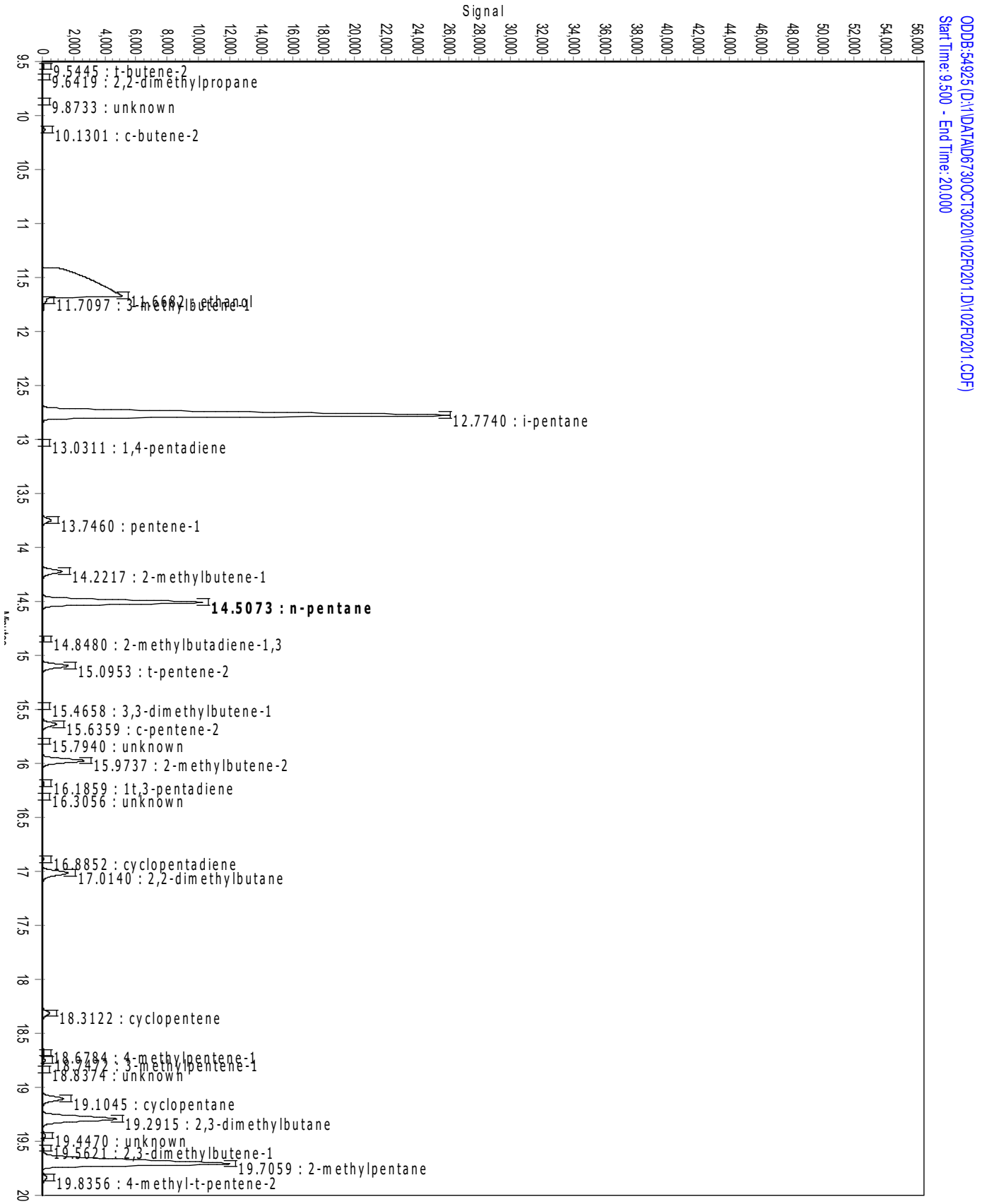
Hold

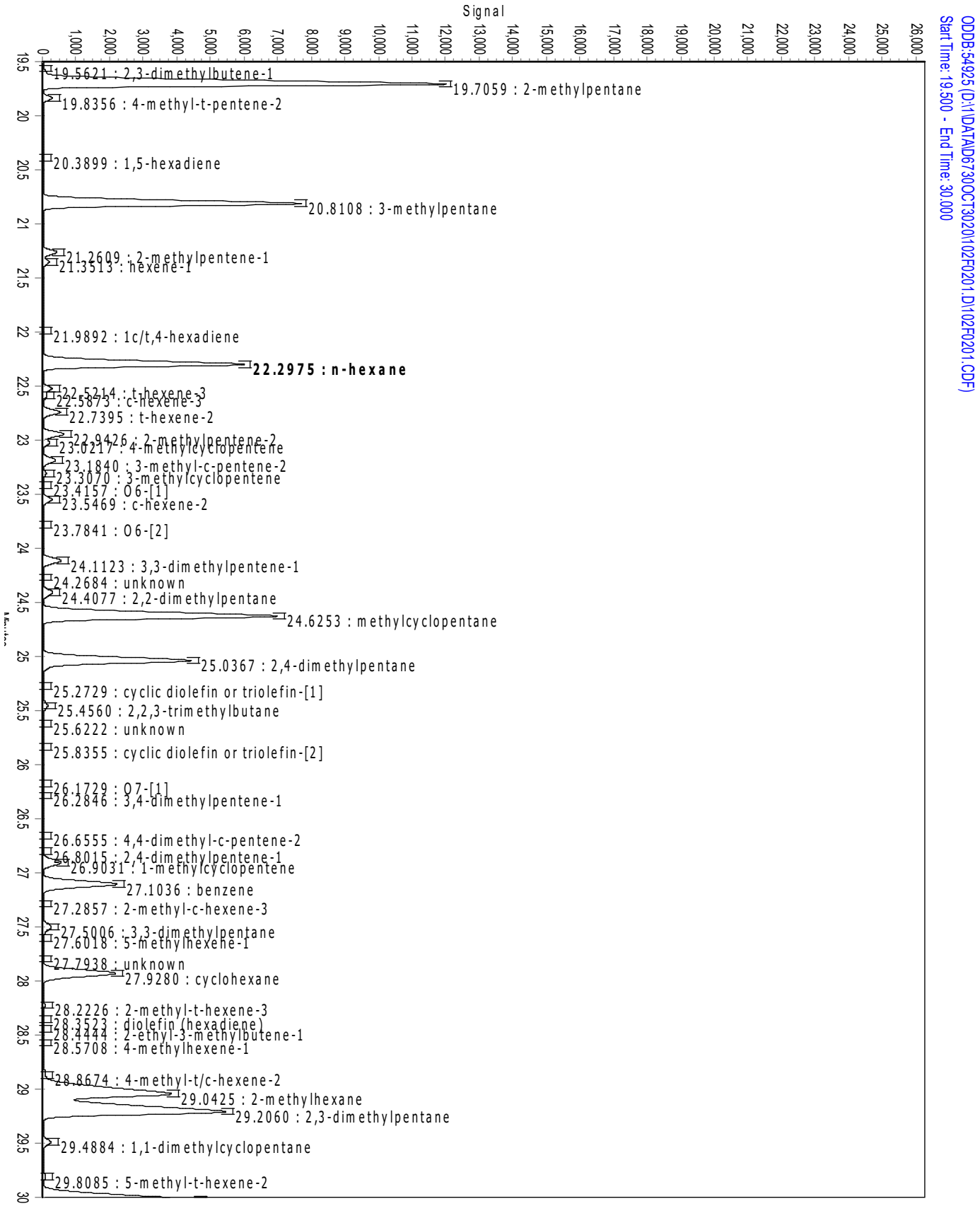
Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
154.703	1289.370	--	unknown	0.003	0.003	0.002	32.000	0.000
154.907	1290.960	O13	tridecene-1	0.007	0.007	0.004	451.040	232.800
155.340	1294.340	--	unknown	0.002	0.002	0.001	32.000	0.000
155.495	1295.540	--	unknown	0.003	0.003	0.001	32.000	0.000
155.565	1296.080	--	unknown	0.002	0.002	0.001	32.000	0.000
155.878	1298.510	A11	1-methylnaphthalene	0.037	0.027	0.023	472.352	244.640
156.070	1300.000	P13	n-tridecane	0.010	0.009	0.005	455.720	235.400
156.190	1301.080	+	C14+ (Summarized)	0.325	0.313	0.144	455.720	235.400

ODDB:54925 (D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 0.000 - End Time: 10.000




Signal
ODDB:54925 (D:\1DATA\D6730OCT30201102F0201.D\102F0201.CDF)
Start Time: 9.500 - End Time: 20.000
9.5445 : t-butene-2
9.6419 : 2,2-dimethylpropane
9.8733 : unknown
10.1301 : c-butene-2
11.6682 : ethanol
11.7097 : 3-methylbutene-1
12.7740 : i-pentane
13.0311 : 1,4-pentadiene
13.7460 : pentene-1
14.2217 : 2-methylbutene-1
14.5073 : n-pentane
14.8480 : 2-methylbutadiene-1,3
15.0953 : t-pentene-2
15.4658 : 3,3-dimethylbutene-1
15.6359 : c-pentene-2
15.7940 : unknown
15.9737 : 2-methylbutene-2
16.1859 : 1t,3-pentadiene
16.3056 : unknown
16.8852 : cyclopentadiene
17.0140 : 2,2-dimethylbutane
18.3122 : cyclopentene
18.6784 : 4-methylpentene-1
18.7472 : 3-methylpentene-1
18.8374 : unknown
19.1045 : cyclopentane
19.2915 : 2,3-dimethylbutane
19.4470 : unknown
19.5621 : 2,3-dimethylbutene-1
19.7059 : 2-methylpentane
19.8356 : 4-methyl-t-pentene-2


Signal
ODDB:54925 (D:\1DATA\D6730OCT30201102F0201.D\102F0201.CDF)
Start Time: 19.500 - End Time: 30.000
19.5621 : 2,3-dimethylbutene-1
19.7059 : 2-methylpentane
19.8356 : 4-methyl-t-pentene-2
20.3899 : 1,5-hexadiene
20.8108 : 3-methylpentane
21.2609 : 2-methylpentene-1
21.3513 : hexene-1
21.9892 : 1c/t,4-hexadiene
22.2975 : n-hexane
22.5214 : t-hexene-3
22.5873 : c-hexene-3
22.7395 : t-hexene-2
22.9426 : 2-methylpentene-2
23.0217 : 4-methylcyclopentene
23.1840 : 3-methyl-c-pentene-2
23.3070 : 3-methylcyclopentene
23.4157 : O6-[1]
23.5469 : c-hexene-2
23.7841 : O6-[2]
24.1123 : 3,3-dimethylpentene-1
24.2684 : unknown
24.4077 : 2,2-dimethylpentane
24.6253 : methylcyclopentane
25.0367 : 2,4-dimethylpentane
25.2729 : cyclic diolefin or triolefin-[1]
25.4560 : 2,2,3-trimethylbutane
25.6222 : unknown
25.8355 : cyclic diolefin or triolefin-[2]
26.1729 : O7-[1]
26.2846 : 3,4-dimethylpentene-1
26.6555 : 4,4-dimethyl-c-pentene-2
26.8015 : 2,4-dimethylpentene-1
26.9031 : 1-methylcyclopentene
27.1036 : benzene
27.2857 : 2-methyl-c-hexene-3
27.5006 : 3,3-dimethylpentane
27.6018 : 5-methylhexene-1
27.7938 : unknown
27.9280 : cyclohexane
28.2226 : 2-methyl-t-hexene-3
28.3523 : diolefin (hexadiene)
28.4444 : 2-ethyl-3-methylbutene-1
28.5708 : 4-methylhexene-1
28.8674 : 4-methyl-t/c-hexene-2
29.0425 : 2-methylhexane
29.2060 : 2,3-dimethylpentane
29.4884 : 1,1-dimethylcyclopentane
29.8085 : 5-methyl-t-hexene-2

Signal
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
8,000
8,500
9,000
9,500
10,000
10,500
11,000
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12,000
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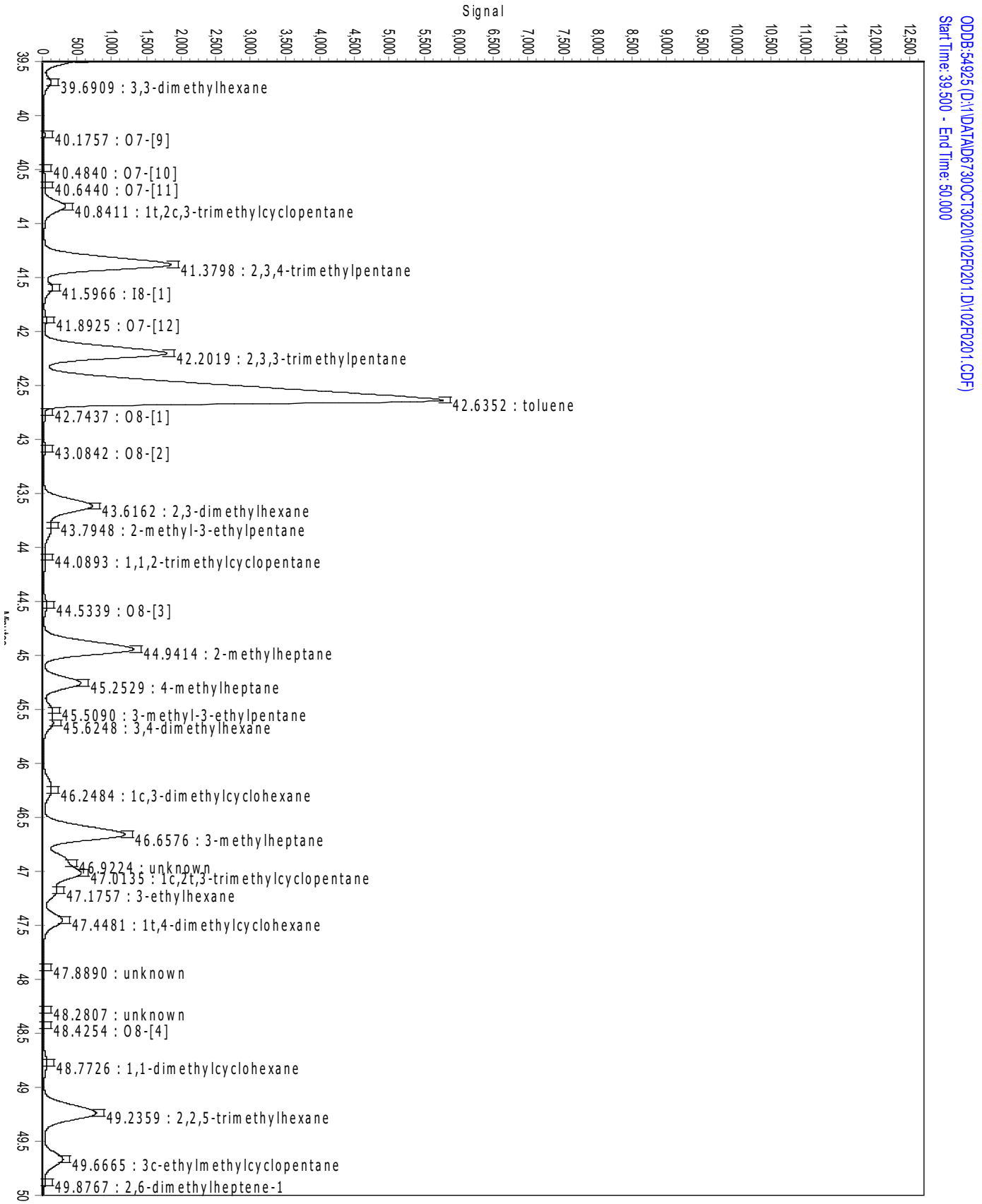
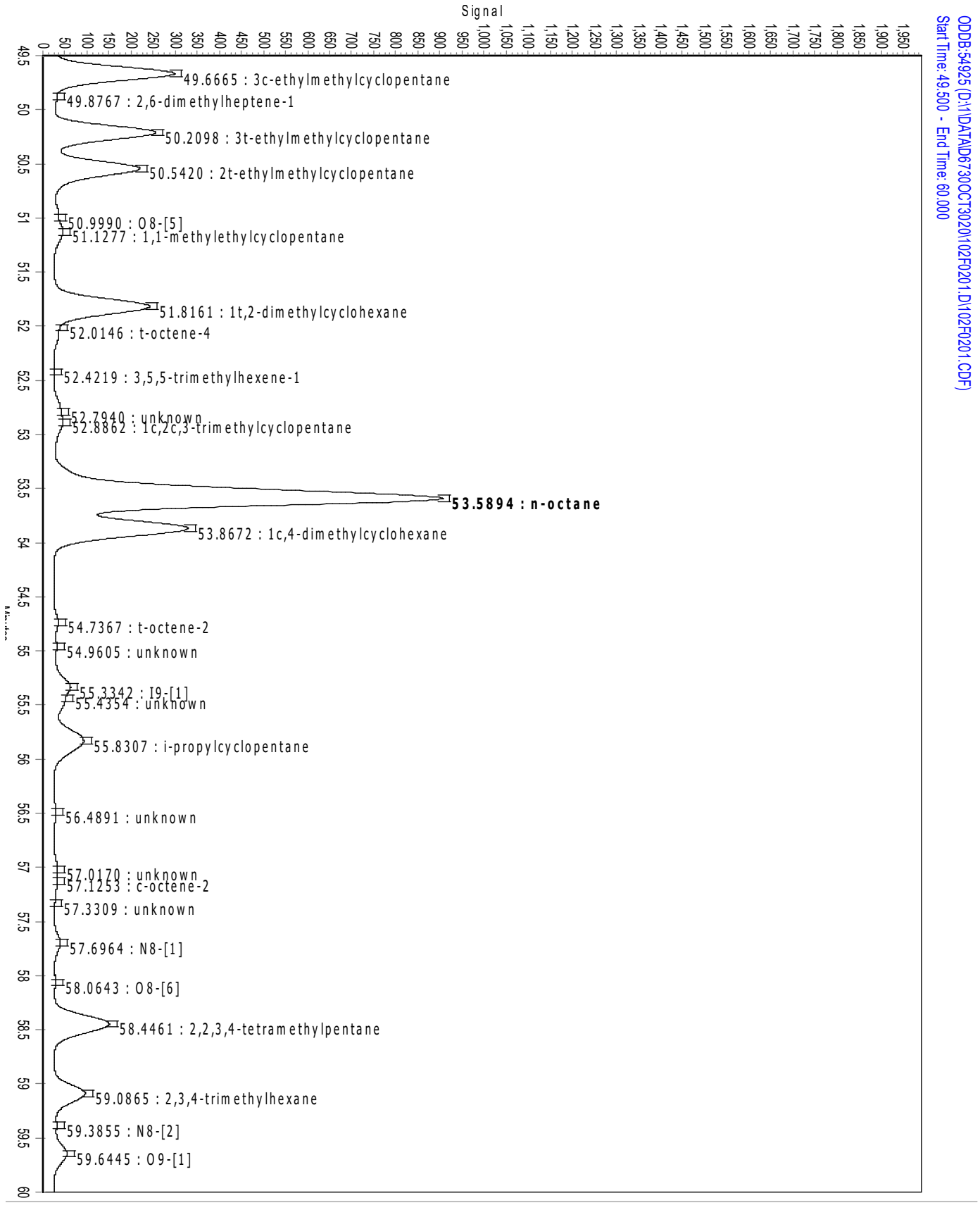
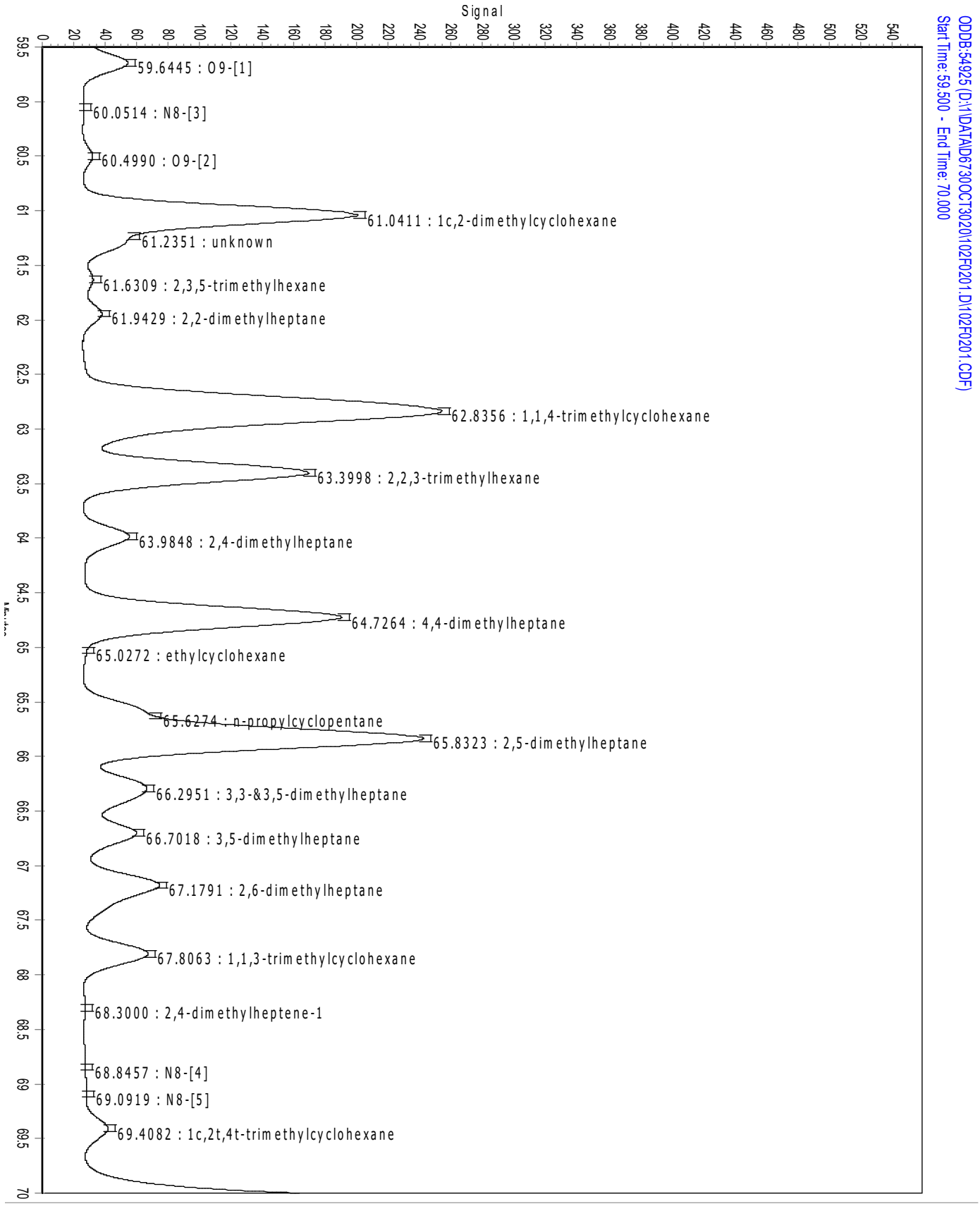
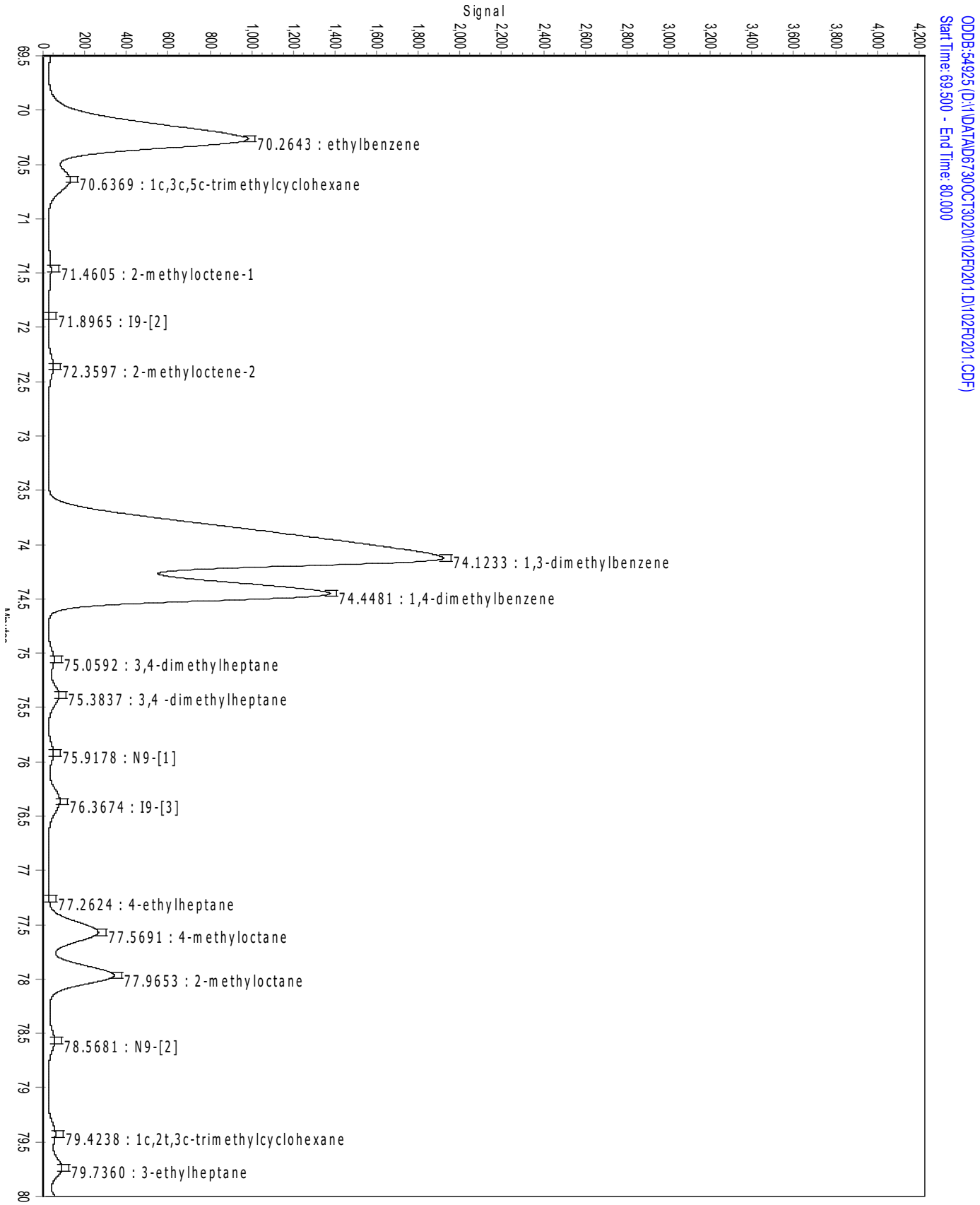
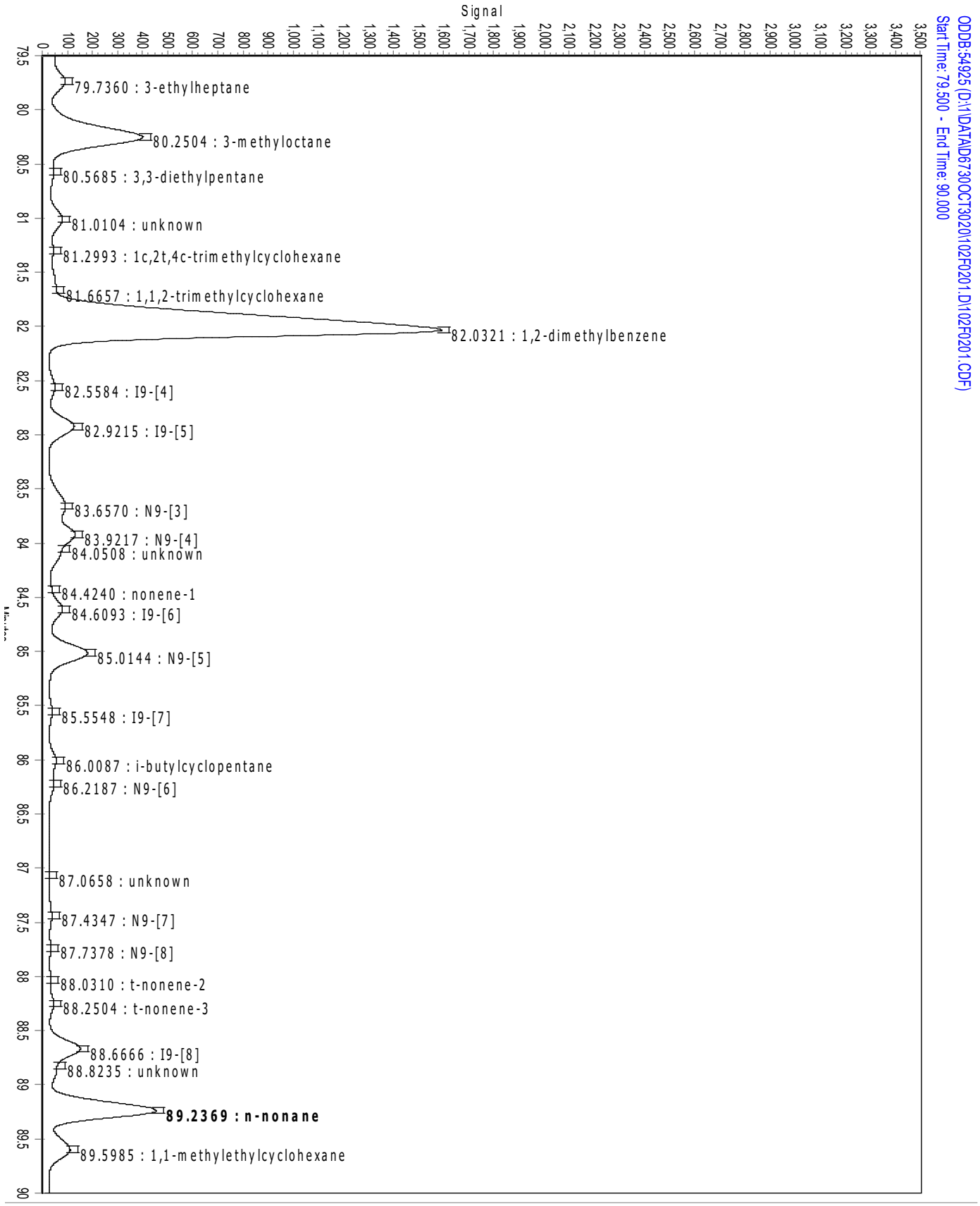
32
32.5
33
33.5
34
34.5
35
35.5
36
36.5
37
37.5
38
38.5
39
39.5
40
29.8085 : 5-methyl-t-hexene-2
30.0243 : 3-methylhexane
30.1657 : 1,6-heptadiene
30.4515 : 3,4-dimethyl-c-pentene-2
30.7589 : 1c,3-dimethylcyclopentane
31.1120 : 1t,3-dimethylcyclopentane
31.2901 : 3-ethylpentane
31.4799 : 1t,2-dimethylcyclopentane
31.6623 : 2,2,4-trimethylpentane
32.2108 : O7-[2]
32.4502 : 3-methyl-c-hexene-3
32.7222 : unknown
32.9865 : t-heptene-3
33.1651 : n-heptane
33.4612 : 2-methyl-2-hexene
33.6158 : 3-methyl-t-hexene-3
33.8605 : t-heptene-2
34.0896 : 3-ethylpentene-2
34.2198 : unknown
34.5799 : c-heptene-2
34.7662 : 3-methyl-t-hexene-2
35.0955 : 2,3-dimethylpentene-2
35.3241 : 3-ethylcyclopentene
35.4347 : unknown
35.7189 : O7-[3]
35.9863 : 1c,2-dimethylcyclopentane
36.1134 : methylcyclohexane
36.4274 : 2,2-dimethylhexane
36.5374 : 1,1,3-trimethylcyclopentane
36.8756 : O7-[4]
36.9548 : unknown
37.1474 : O7-[5]
37.2593 : unknown
37.5078 : O7-[6]
38.0033 : ethylcyclopentane
38.1301 : 2,5-dimethylhexane
38.3179 : 2,2,3-trimethylpentane
38.4682 : 2,4-dimethylhexane
38.6025 : unknown
38.8216 : unknown
38.9207 : O7-[7]
39.1621 : O7-[8]
39.4756 : 1c,2t,4-trimethylcyclopentane
39.6909 : 3,3-dimethylhexane
ODDB:54925 (D:\1DATA\D6730OCT30201102F0201.D\102F0201.CDF)
Start Time: 29.500 - End Time: 40.000

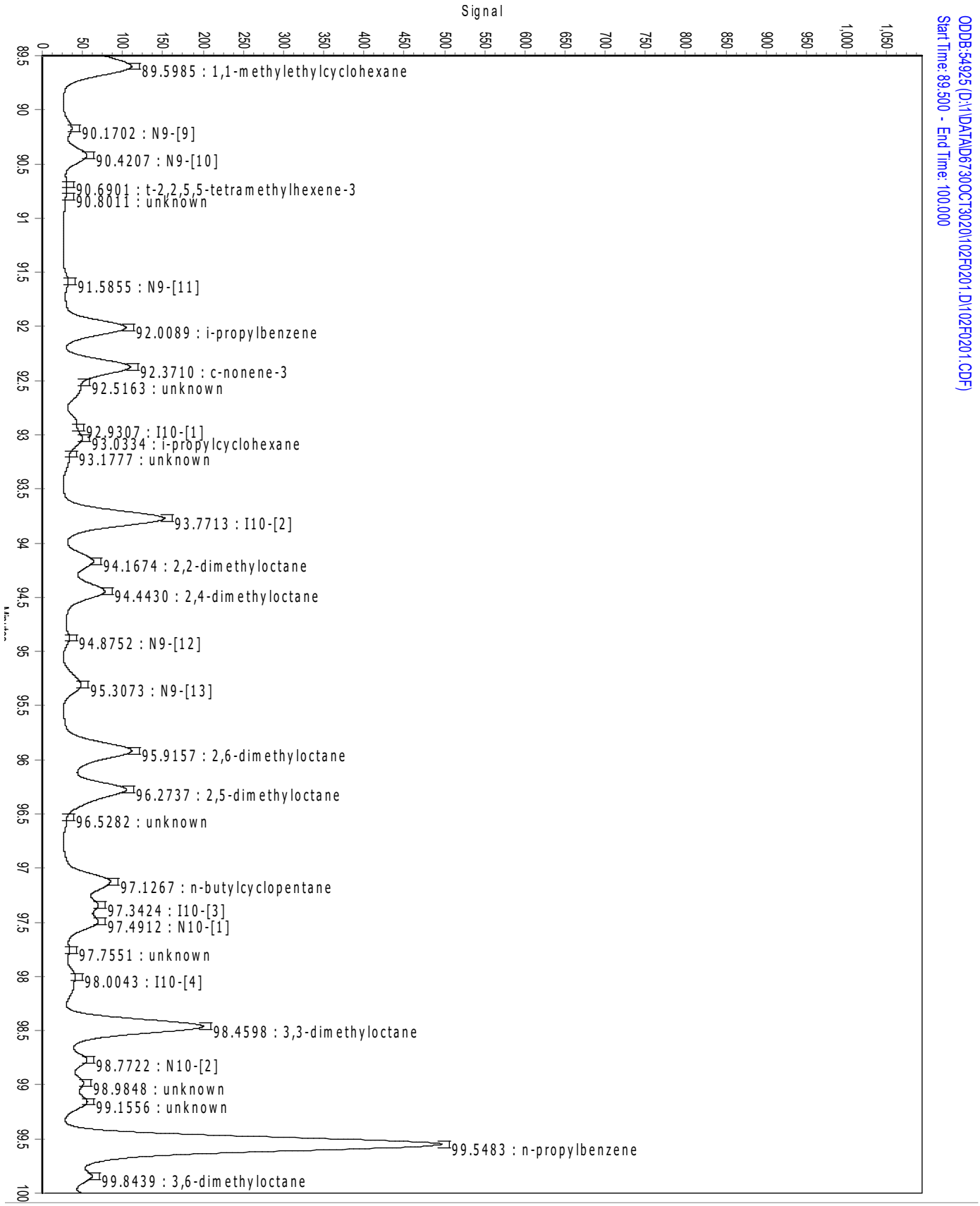

Signal
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
8,000
8,500
9,000
9,500
10,000
10,500
11,000
11,500
12,000
12,500
39.5
40
40.5
41
41.5
42
42.5
43
43.5
44
44.5
45
45.5
46
46.5
47
47.5
48
48.5
49
49.5
50
39.6909 : 3,3-dimethylhexane
40.1757 : O7-[9]
40.4840 : O7-[10]
40.6440 : O7-[11]
40.8411 : 1t,2c,3-trimethylcyclopentane
41.3798 : 2,3,4-trimethylpentane
41.5966 : I8-[1]
41.8925 : O7-[12]
42.2019 : 2,3,3-trimethylpentane
42.6352 : toluene
42.7437 : O8-[1]
43.0842 : O8-[2]
43.6162 : 2,3-dimethylhexane
43.7948 : 2-methyl-3-ethylpentane
44.0893 : 1,1,2-trimethylcyclopentane
44.5339 : O8-[3]
44.9414 : 2-methylheptane
45.2529 : 4-methylheptane
45.5090 : 3-methyl-3-ethylpentane
45.6248 : 3,4-dimethylhexane
46.2484 : 1c,3-dimethylcyclohexane
46.6576 : 3-methylheptane
46.9224 : unknown
47.0135 : 1c,2t,3-trimethylcyclopentane
47.1757 : 3-ethylhexane
47.4481 : 1t,4-dimethylcyclohexane
47.8890 : unknown
48.2807 : unknown
48.4254 : O8-[4]
48.7726 : 1,1-dimethylcyclohexane
49.2359 : 2,2,5-trimethylhexane
49.6665 : 3c-ethylmethylcyclopentane
49.8767 : 2,6-dimethylheptene-1
ODDB:54925 (D:\1DATA\D6730OCT30201\02F0201.D\102F0201.CDF)
Start Time: 39.500 - End Time: 50.000


Signal
ODDB:54925 (D:\1DATAD6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 49.500 - End Time: 60.000
49.6665 : 3c-ethylmethylcyclopentane
49.8767 : 2,6-dimethylheptene-1
50.2098 : 3t-ethylmethylcyclopentane
50.5420 : 2t-ethylmethylcyclopentane
50.9990 : O8-[5]
51.1277 : 1,1-methylethylcyclopentane
51.8161 : 1t,2-dimethylcyclohexane
52.0146 : t-octene-4
52.4219 : 3,5,5-trimethylhexene-1
52.7940 : unknown
52.8862 : 1c,2c,3-trimethylcyclopentane
53.5894 : n-octane
53.8672 : 1c,4-dimethylcyclohexane
54.7367 : t-octene-2
54.9605 : unknown
55.3342 : I9-[1]
55.4354 : unknown
55.8307 : i-propylcyclopentane
56.4891 : unknown
57.0170 : unknown
57.1253 : c-octene-2
57.3309 : unknown
57.6964 : N8-[1]
58.0643 : O8-[6]
58.4461 : 2,2,3,4-tetramethylpentane
59.0865 : 2,3,4-trimethylhexane
59.3855 : N8-[2]
59.6445 : O9-[1]

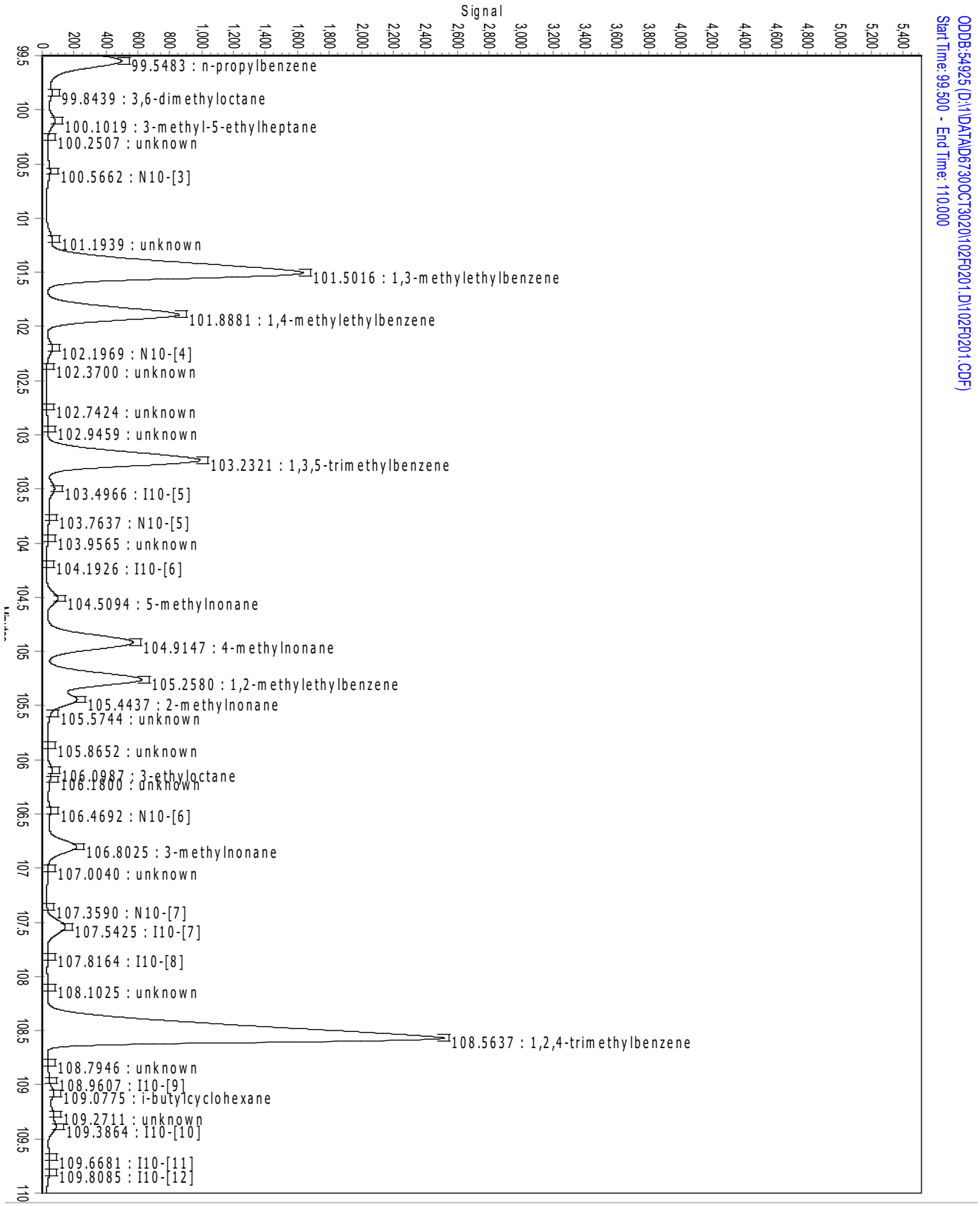

Signal
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
59.5
60
60.5
61
61.5
62
62.5
63
63.5
64
64.5
65
65.5
66
66.5
67
67.5
68
68.5
69
69.5
70
59.6445 : O9-[1]
60.0514 : N8-[3]
60.4990 : O9-[2]
61.0411 : 1c,2-dimethylcyclohexane
61.2351 : unknown
61.6309 : 2,3,5-trimethylhexane
61.9429 : 2,2-dimethylheptane
62.8356 : 1,1,4-trimethylcyclohexane
63.3998 : 2,2,3-trimethylhexane
63.9848 : 2,4-dimethylheptane
64.7264 : 4,4-dimethylheptane
65.0272 : ethylcyclohexane
65.6274 : n-propylcyclopentane
65.8323 : 2,5-dimethylheptane
66.2951 : 3,3-&3,5-dimethylheptane
66.7018 : 3,5-dimethylheptane
67.1791 : 2,6-dimethylheptane
67.8063 : 1,1,3-trimethylcyclohexane
68.3000 : 2,4-dimethylheptene-1
68.8457 : N8-[4]
69.0919 : N8-[5]
69.4082 : 1c,2t,4t-trimethylcyclohexane
ODDB:54925 (D:\1DATA\D6730OCT30201\02F0201.D\102F0201.CDF)
Start Time: 59.500 - End Time: 70.000


Signal
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
4,200
69.5
70
70.5
71
71.5
72
72.5
73
73.5
74
74.5
75
75.5
76
76.5
77
77.5
78
78.5
79
79.5
80
70.2643 : ethylbenzene
70.6369 : 1c,3c,5c-trimethylcyclohexane
71.4605 : 2-methyloctene-1
71.8965 : I9-[2]
72.3597 : 2-methyloctene-2
74.1233 : 1,3-dimethylbenzene
74.4481 : 1,4-dimethylbenzene
75.0592 : 3,4-dimethylheptane
75.3837 : 3,4 -dimethylheptane
75.9178 : N9-[1]
76.3674 : I9-[3]
77.2624 : 4-ethylheptane
77.5691 : 4-methyloctane
77.9653 : 2-methyloctane
78.5681 : N9-[2]
79.4238 : 1c,2t,3c-trimethylcyclohexane
79.7360 : 3-ethylheptane
ODDB:54925 (D:\1DATA\D6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 69.500 - End Time: 80.000

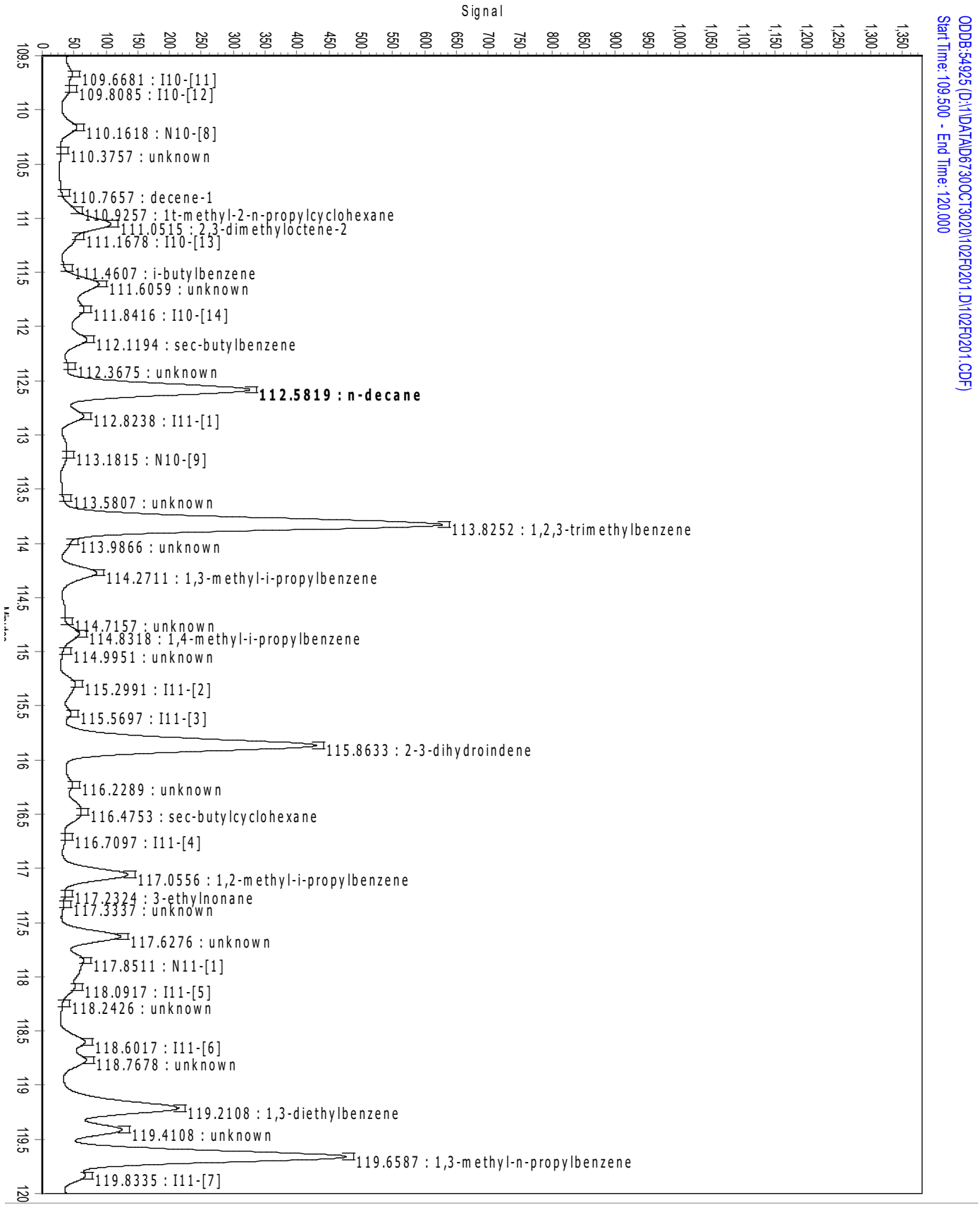

Signal
ODDB:54925 (D:\1DATAD6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 79.500 - End Time: 90.000
79.7360 : 3-ethylheptane
80.2504 : 3-methyloctane
80.5685 : 3,3-diethylpentane
81.0104 : unknown
81.2993 : 1c,2t,4c-trimethylcyclohexane
81.6657 : 1,1,2-trimethylcyclohexane
82.0321 : 1,2-dimethylbenzene
82.5584 : I9-[4]
82.9215 : I9-[5]
83.6570 : N9-[3]
83.9217 : N9-[4]
84.0508 : unknown
84.4240 : nonene-1
84.6093 : I9-[6]
85.0144 : N9-[5]
85.5548 : I9-[7]
86.0087 : i-butylcyclopentane
86.2187 : N9-[6]
87.0658 : unknown
87.4347 : N9-[7]
87.7378 : N9-[8]
88.0310 : t-nonene-2
88.2504 : t-nonene-3
88.6666 : I9-[8]
88.8235 : unknown
89.2369 : n-nonane
89.5985 : 1,1-methylethylcyclohexane



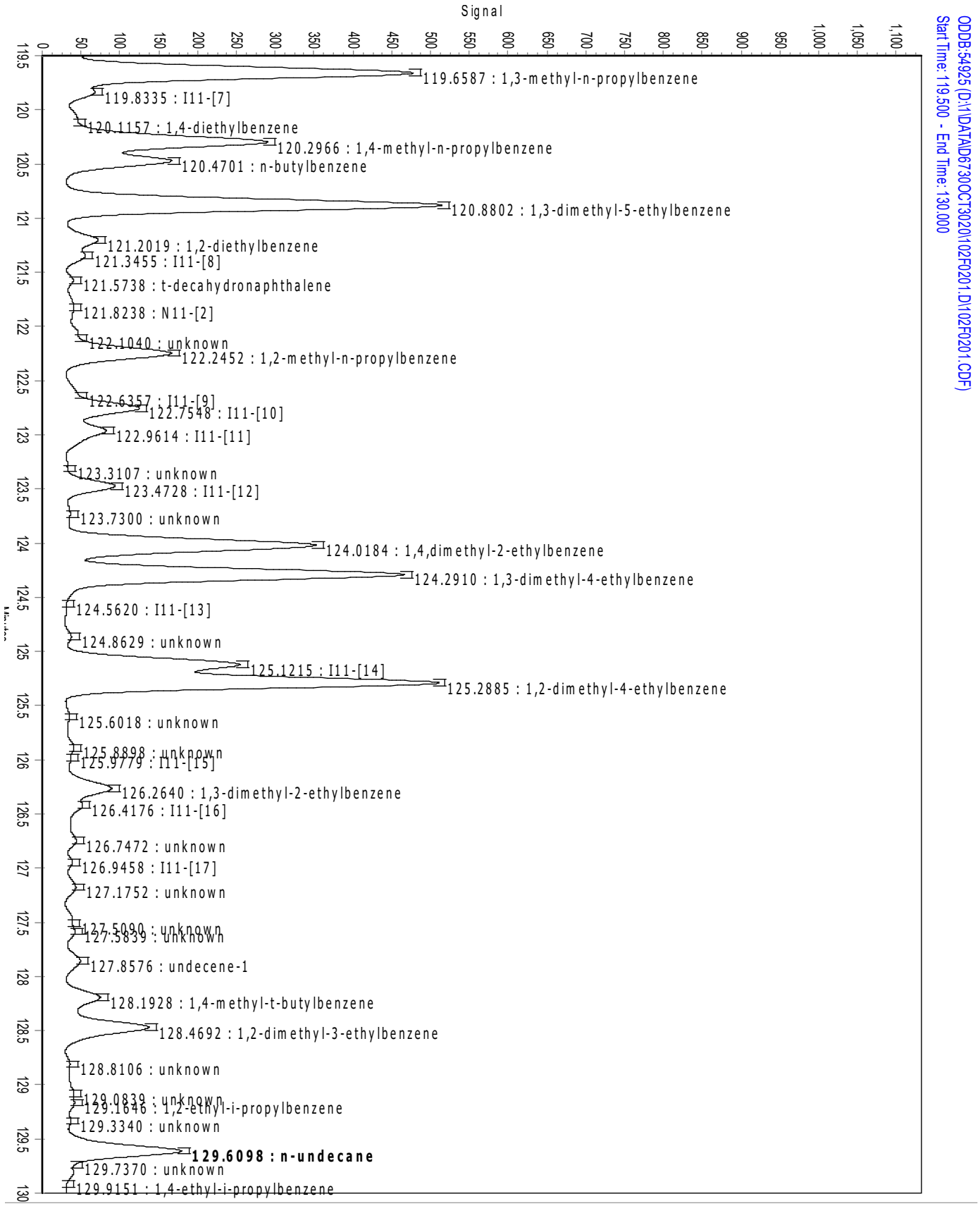
ODDB:54925 (D:\1DATA\D6730OCT30201102F0201.D\102F0201.CDF)
Start Time: 89.500 - End Time: 100.000



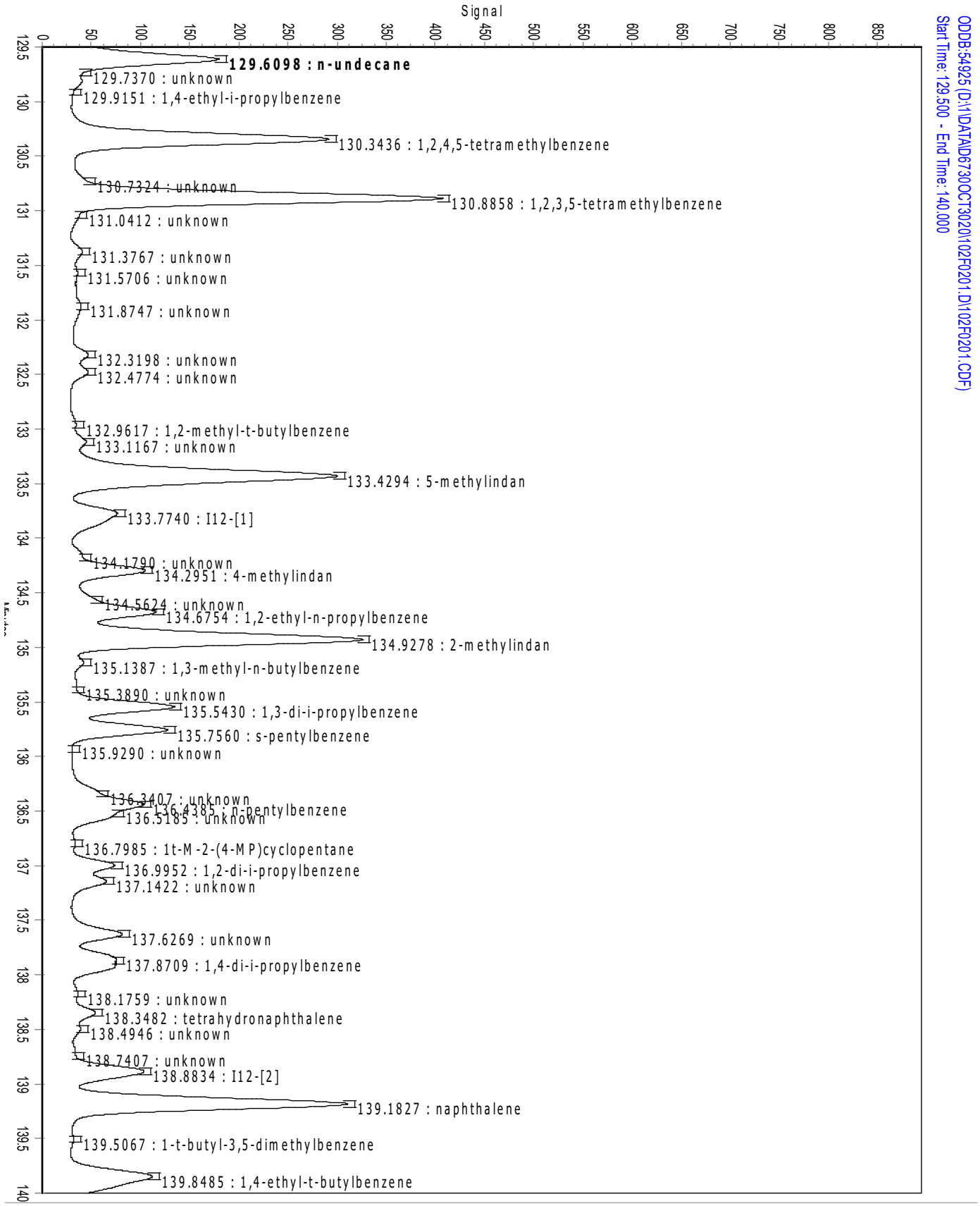
ODDB:54925 (D:\1DATA\D6730OCT30201102F0201.D\102F0201.CDF)
Start Time: 99.500 - End Time: 110.000

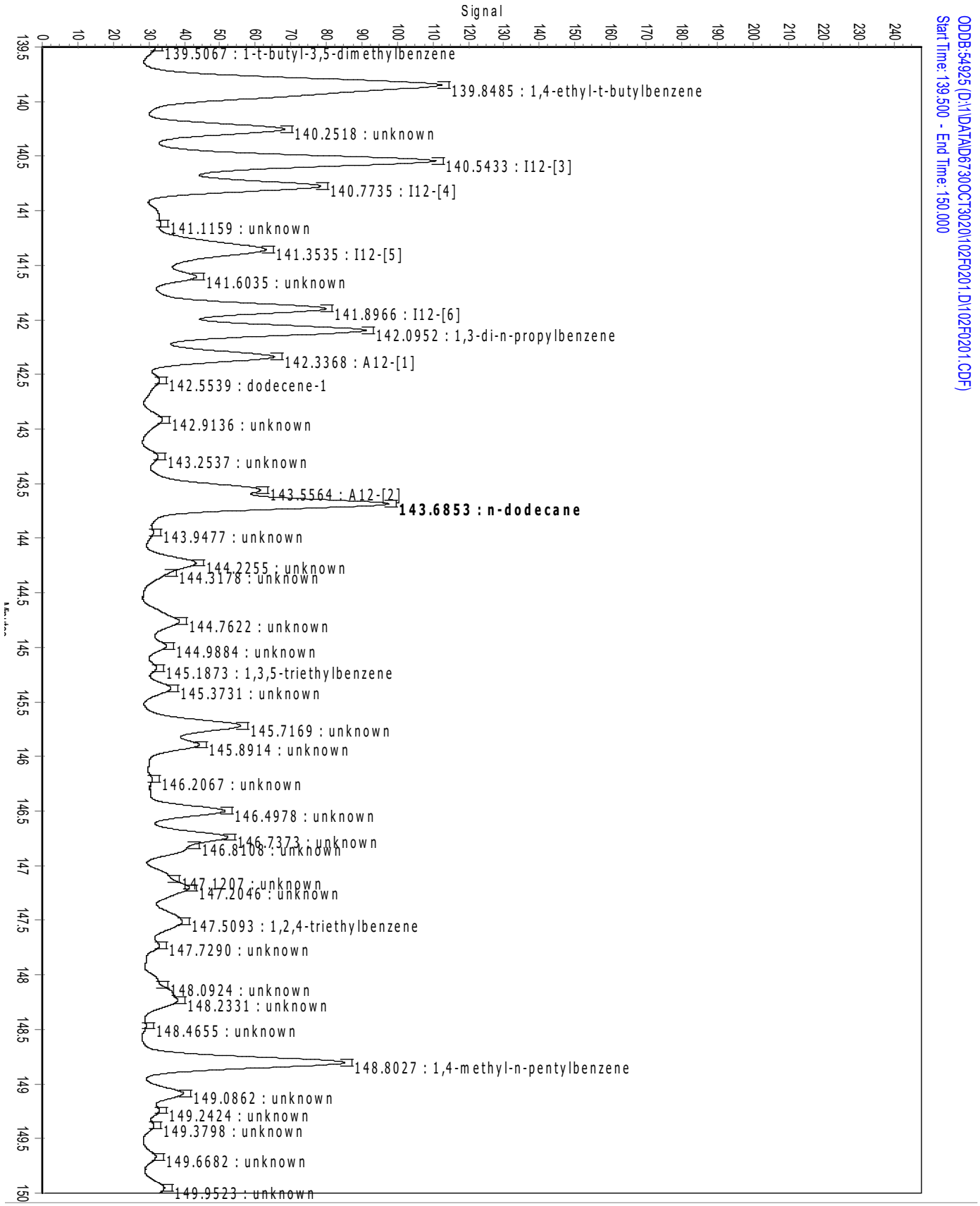


ODDB:54925 (D:\1DATA\D6730OCT30201\02F0201.D\102F0201.CDF)
Start Time: 109.500 - End Time: 120.000

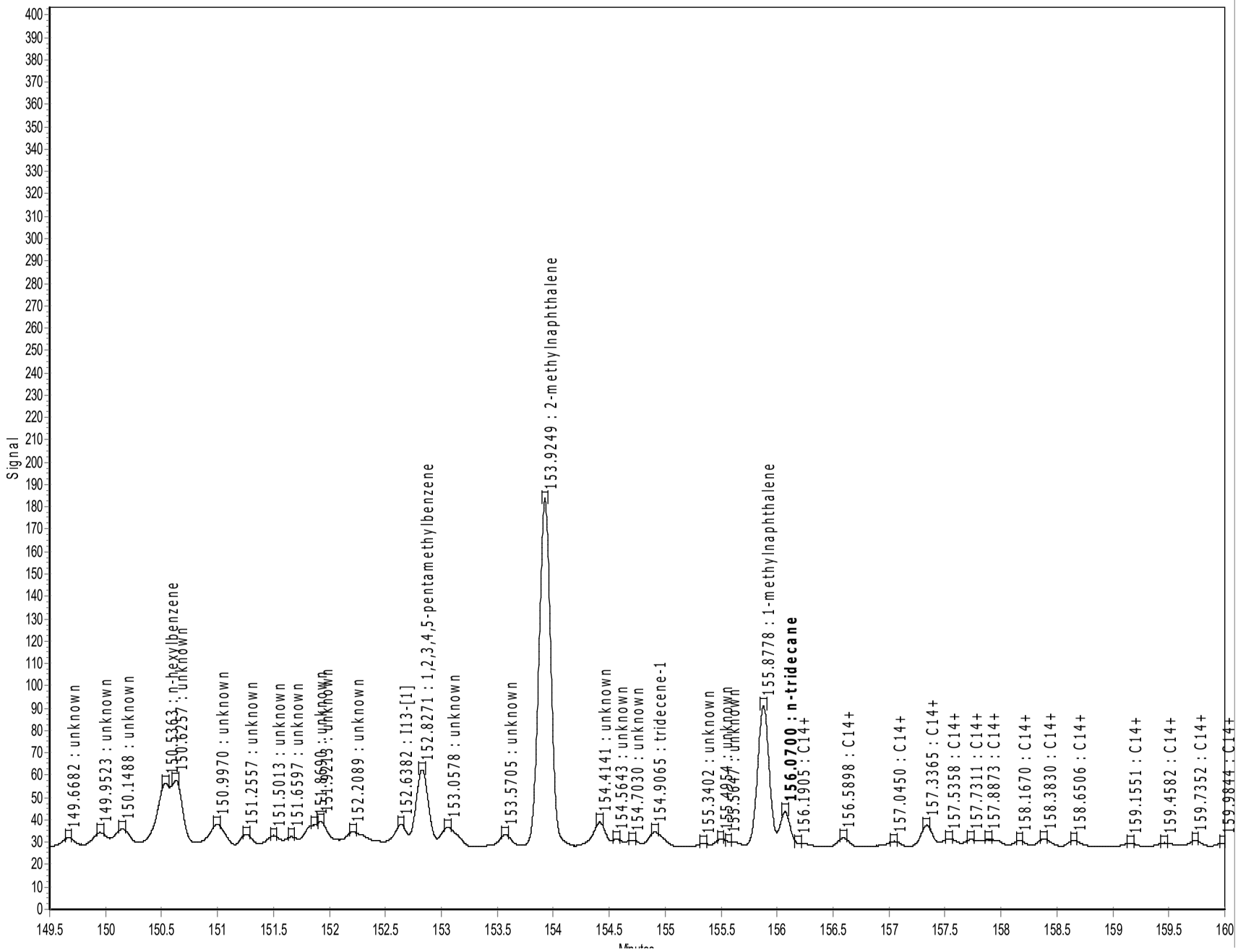


ODDB:54925 (D:\1DATA\D6730OCT30201102F0201.D\102F0201.CDF)
Start Time: 119.500 - End Time: 130.000

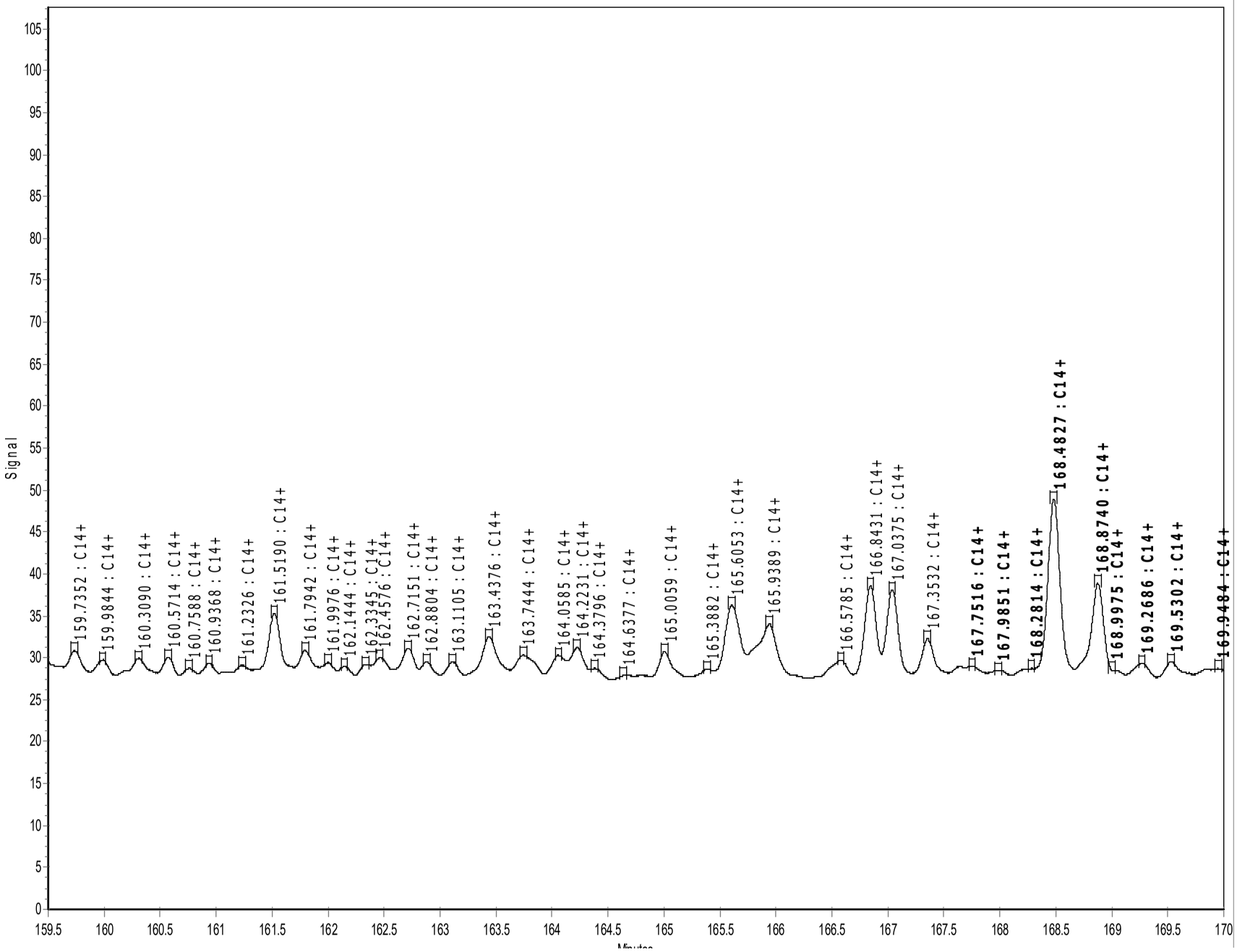

Signal
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
129.5
130
130.5
131
131.5
132
132.5
133
133.5
134
134.5
135
135.5
136
136.5
137
137.5
138
138.5
139
139.5
140
129.6098 : n-undecane
129.7370 : unknown
129.9151 : 1,4-ethyl-i-propylbenzene
130.3436 : 1,2,4,5-tetramethylbenzene
130.7324 : unknown
130.8858 : 1,2,3,5-tetramethylbenzene
131.0412 : unknown
131.3767 : unknown
131.5706 : unknown
131.8747 : unknown
132.3198 : unknown
132.4774 : unknown
132.9617 : 1,2-methyl-t-butylbenzene
133.1167 : unknown
133.4294 : 5-methylindan
133.7740 : I12-[1]
134.1790 : unknown
134.2951 : 4-methylindan
134.5624 : unknown
134.6754 : 1,2-ethyl-n-propylbenzene
134.9278 : 2-methylindan
135.1387 : 1,3-methyl-n-butylbenzene
135.3890 : unknown
135.5430 : 1,3-di-i-propylbenzene
135.7560 : s-pentylbenzene
135.9290 : unknown
136.3407 : unknown
136.4385 : n-pentylbenzene
136.5185 : unknown
136.7985 : 1t-M-2-(4-MP)cyclopentane
136.9952 : 1,2-di-i-propylbenzene
137.1422 : unknown
137.6269 : unknown
137.8709 : 1,4-di-i-propylbenzene
138.1759 : unknown
138.3482 : tetrahydronaphthalene
138.4946 : unknown
138.7407 : unknown
138.8834 : I12-[2]
139.1827 : naphthalene
139.5067 : 1-t-butyl-3,5-dimethylbenzene
139.8485 : 1,4-ethyl-t-butylbenzene
ODDB:54925 (D:\1DATA\D6730OCT30201102F0201.D\102F0201.CDF)
Start Time: 129.500 - End Time: 140.000


Signal
ODDB:54925 (D:\1DATA\D6730OCT30201102F0201.D\102F0201.CDF)
Start Time: 139.500 - End Time: 150.000
139.5067 : 1-t-butyl-3,5-dimethylbenzene
139.8485 : 1,4-ethyl-t-butylbenzene
140.2518 : unknown
140.5433 : I12-[3]
140.7735 : I12-[4]
141.1159 : unknown
141.3535 : I12-[5]
141.6035 : unknown
141.8966 : I12-[6]
142.0952 : 1,3-di-n-propylbenzene
142.3368 : A12-[1]
142.5539 : dodecene-1
142.9136 : unknown
143.2537 : unknown
143.5564 : A12-[2]
143.6853 : n-dodecane
143.9477 : unknown
144.2255 : unknown
144.3178 : unknown
144.7622 : unknown
144.9884 : unknown
145.1873 : 1,3,5-triethylbenzene
145.3731 : unknown
145.7169 : unknown
145.8914 : unknown
146.2067 : unknown
146.4978 : unknown
146.7373 : unknown
146.8108 : unknown
147.1207 : unknown
147.2046 : unknown
147.5093 : 1,2,4-triethylbenzene
147.7290 : unknown
148.0924 : unknown
148.2331 : unknown
148.4655 : unknown
148.8027 : 1,4-methyl-n-pentylbenzene
149.0862 : unknown
149.2424 : unknown
149.3798 : unknown
149.6682 : unknown
149.9523 : unknown

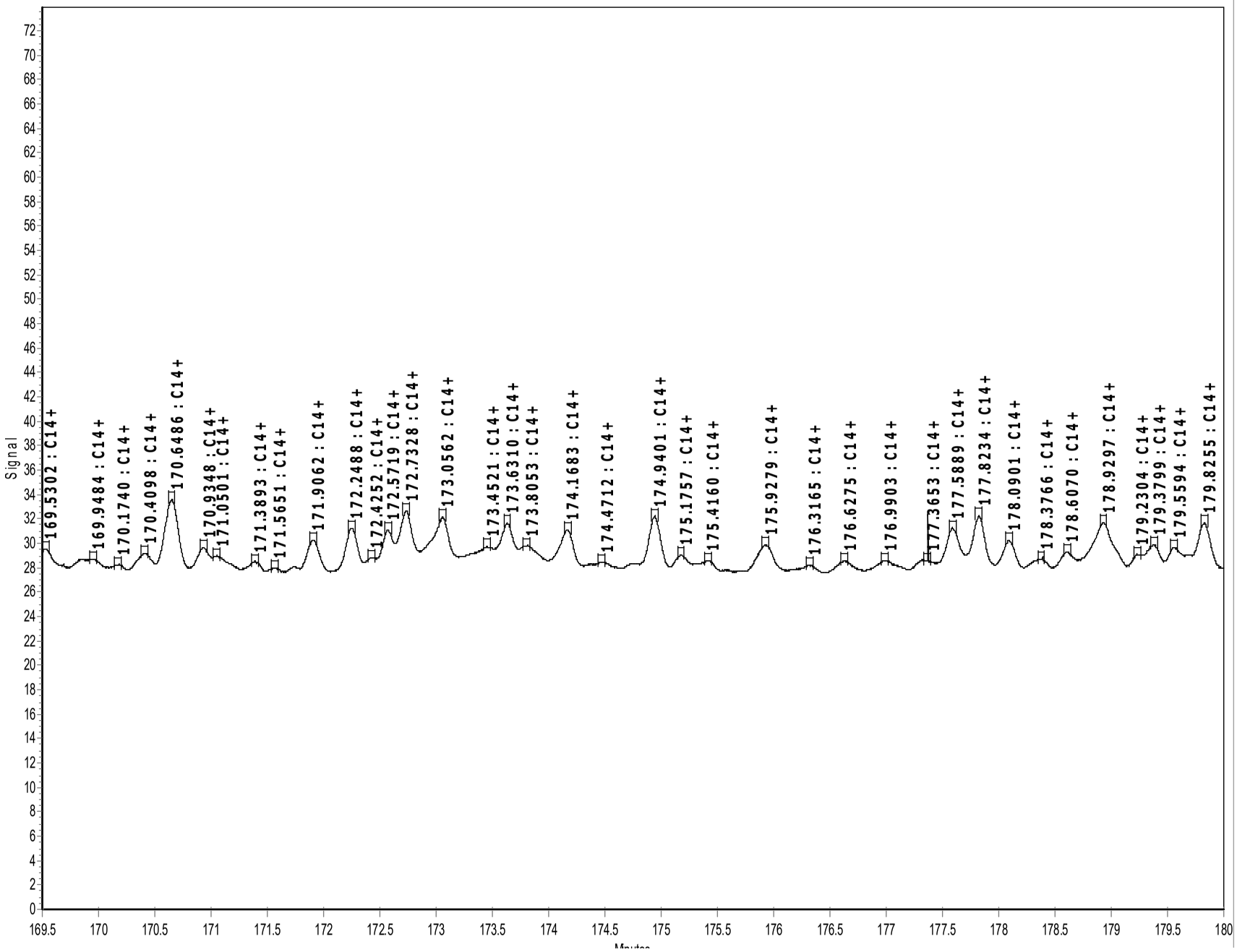
ODDB:54925 (D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 149.500 - End Time: 160.000



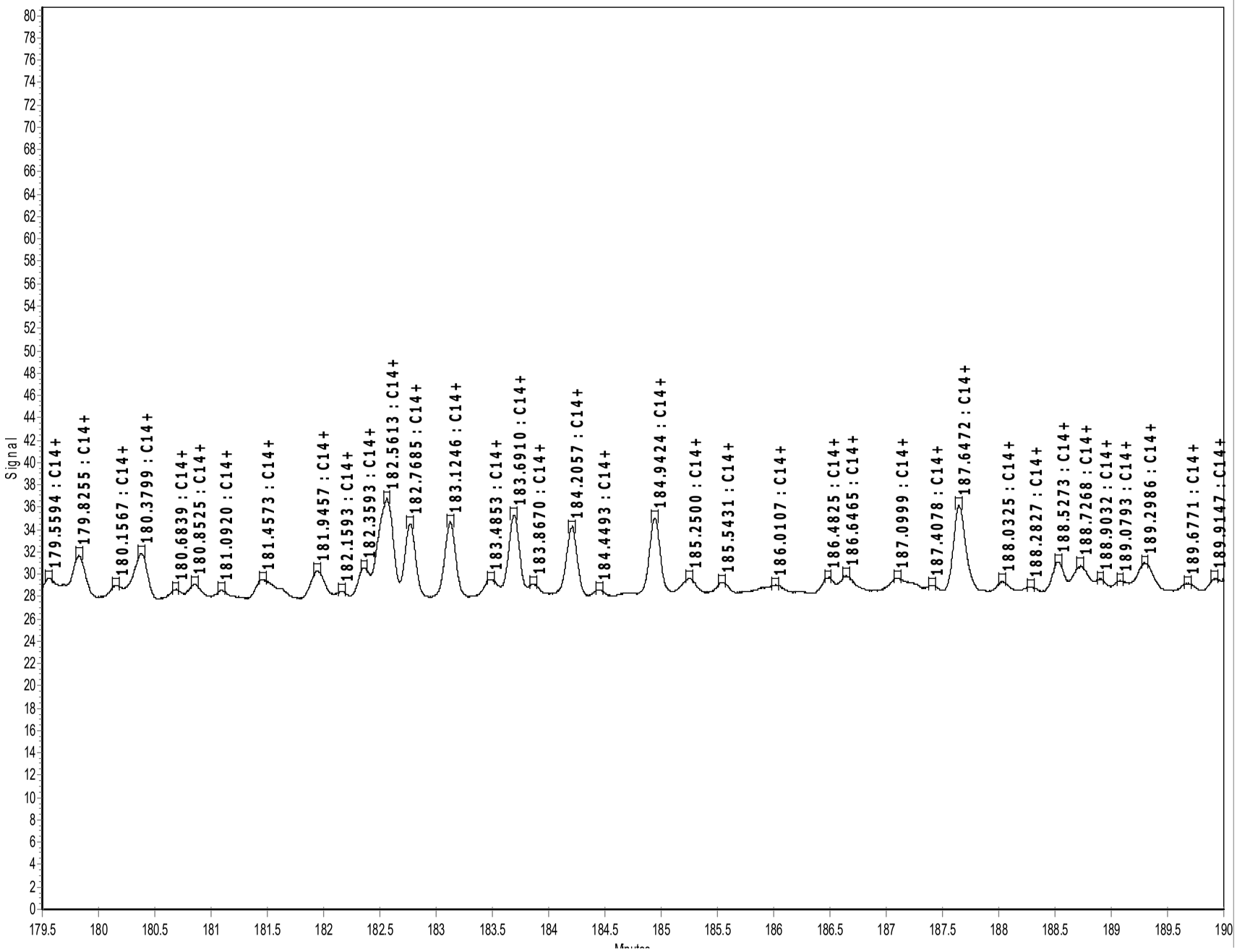
ODDB:54925 (D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 159.500 - End Time: 170.000



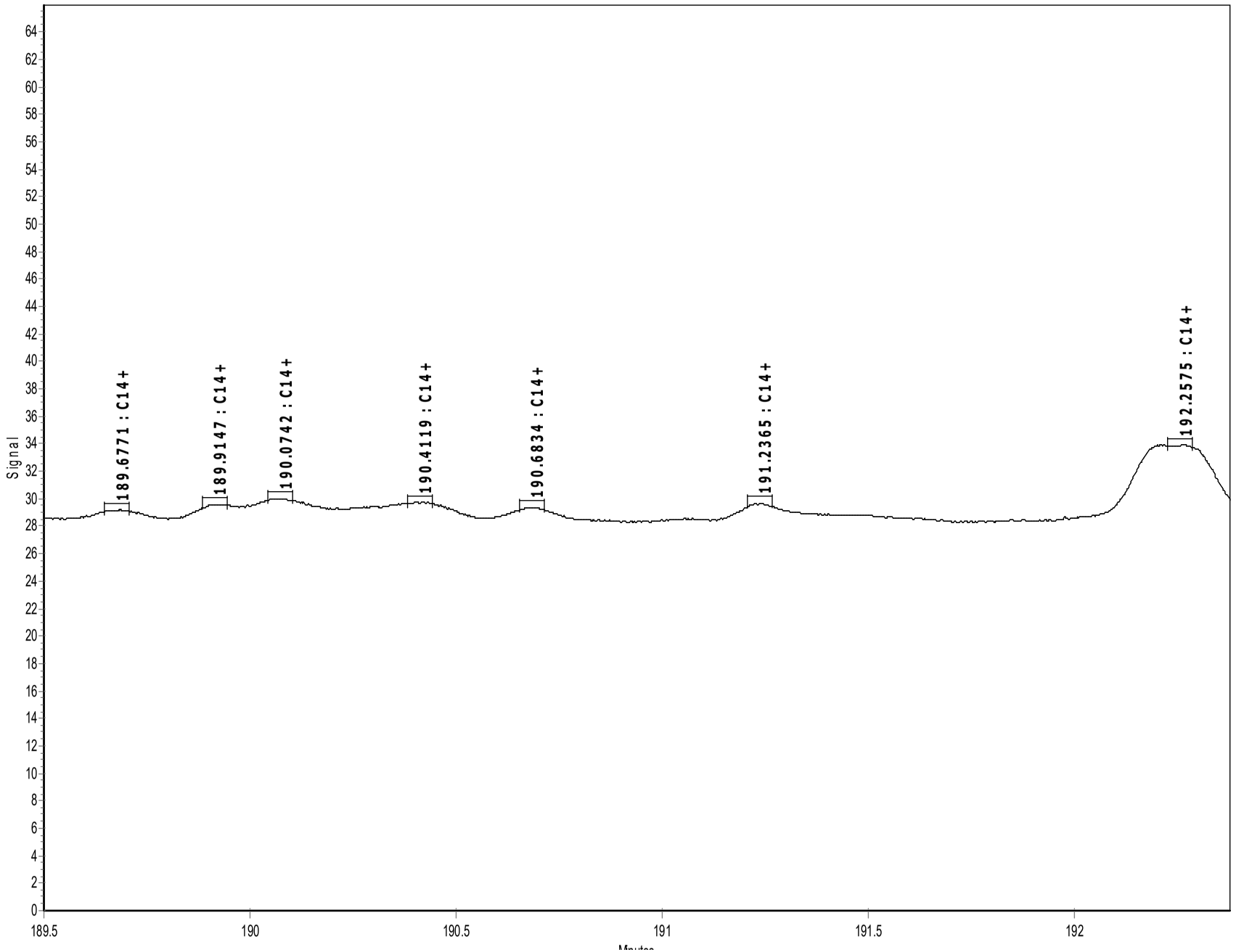
ODDB:54925 (D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 169.500 - End Time: 180.000



ODDB:54925 (D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 179.500 - End Time: 190.000



ODDB:54925 (D:\1\DATA\D6730OCT3020\102F0201.D\102F0201.CDF)
Start Time: 189.500 - End Time: 192.378



Detailed Hydrocarbon Analysis Summary Report -

Report Date: 11/2/2020 9:02:09 PM

RawFile: D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF
Acquired: 10/31/20 02:46:24
Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Location: GC 12 D6730
Normalized to 100.000%

SUMMARY REPORT

Group Type	Total(Mass%)	Total(Vol%)	Total(Mol%)
Paraffins:	7.877	8.829	8.094
I-Paraffins:	39.610	43.071	35.943
Olefins:	4.171	4.486	4.526
Naphthenes:	12.182	11.755	10.839
Aromatics:	23.377	19.708	18.847
Total C14+:	0.400	0.386	0.178
Total Unknowns:	1.761	1.852	1.259

Oxygenates:

Total:	10.624(Mass%)	9.913(Vol%)
Total Oxygen Content:	3.689(Mass%)	

Multisubstituted Aromatics: 14.865(Mass%) 12.567(Vol%)

Average Molecular Weight: 88.091

Relative Density: 0.736

Vapor Pressure :

Calculated Octane Number: 85.9

Motor Octane Number (Jenkins Calculation): 78.1

	IBP	T10	T50	T90	FBP
BP by Mass (Deg F)	31.10	173.30	210.63	336.88	465.89
BP by Vol (Deg F)	31.10	173.30	210.63	336.88	465.89

Percent Carbon: 83.881
Percent Hydrogen: 12.429
Bromine Number (Calc): 7.831
Particulate Matter Index: 1.158

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

RawFile: D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF
Acquired: 10/31/20 02:46:24
Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Oxygenates

Compound	Mass%	Mass% Oxygen	Vol%
ethanol : X2	10.624	3.689	9.913

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 9:02:16 PM

RawFile: D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF
Acquired: 10/31/20 02:46:24
Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Totals by Group Type & Carbon Number (in Mass Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.505	0.105	0.048	0.000	0.000	0.000	0.659
C5	2.488	6.997	1.788	0.340	0.000	0.001	11.614
C6	1.891	7.911	1.197	3.278	0.723	0.046	15.046
C7	1.387	8.635	0.764	3.933	4.743	0.008	19.469
C8	0.834	9.929	0.070	2.872	7.625	0.205	21.536
C9	0.392	3.399	0.198	1.394	5.889	0.185	11.457
C10	0.207	1.815	0.073	0.316	3.607	0.279	6.296
C11	0.111	0.544	0.022	0.043	0.400	0.387	1.506
C12	0.048	0.267	0.005	0.005	0.391	0.327	1.043
C13	0.010	0.009	0.007	0.000	0.000	0.323	0.349
Total:	7.877	39.610	4.171	12.182	23.377	1.761	87.216

Oxygenates 10.624
Total C14+: 0.400
Total Unknowns: 1.761
Grand Total: 100.000

Totals by Group Type & Carbon Number (in Volume Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.003
C4	0.643	0.139	0.058	0.000	0.000	0.000	0.840
C5	2.926	8.315	1.996	0.336	0.000	0.001	13.573
C6	2.112	8.857	1.253	3.193	0.606	0.048	16.068
C7	1.493	9.280	0.794	3.833	4.028	0.008	19.436
C8	0.875	10.374	0.071	2.743	6.471	0.216	20.750
C9	0.402	3.480	0.209	1.315	4.977	0.195	10.578
C10	0.209	1.818	0.072	0.290	2.987	0.293	5.671
C11	0.110	0.538	0.021	0.040	0.316	0.407	1.432
C12	0.047	0.261	0.004	0.004	0.324	0.344	0.985
C13	0.010	0.008	0.007	0.000	0.000	0.340	0.365
Total:	8.829	43.071	4.486	11.755	19.708	1.852	87.849

Oxygenates 9.913
Total C14+: 0.386
Total Unknowns: 1.852
Grand Total: 100.000

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 9:02:16 PM

RawFile: D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF
Acquired: 10/31/20 02:46:24
Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Totals by Group Type & Carbon Number (in Mol Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.001	0.000	0.000	0.000	0.000	0.000	0.001
C3	0.003	0.000	0.000	0.000	0.000	0.000	0.004
C4	0.766	0.159	0.075	0.000	0.000	0.001	1.001
C5	3.038	8.543	2.250	0.427	0.000	0.001	14.260
C6	1.933	8.086	1.259	3.431	0.816	0.121	15.647
C7	1.219	7.591	0.685	3.528	4.534	0.009	17.566
C8	0.643	7.657	0.055	2.254	6.326	0.164	17.100
C9	0.269	2.334	0.138	0.973	4.316	0.140	8.171
C10	0.128	1.124	0.046	0.198	2.402	0.201	4.099
C11	0.063	0.307	0.012	0.025	0.240	0.254	0.901
C12	0.025	0.138	0.002	0.002	0.212	0.193	0.573
C13	0.005	0.004	0.003	0.000	0.000	0.176	0.188
Total:	8.094	35.943	4.526	10.839	18.847	1.259	78.250

Oxygenates	20.314	Total C14+:	0.178
Total Unknowns:	1.259	Grand Total:	100.000

Detailed Hydrocarbon Analysis - Dienes (Di-Olefins) Detail Report - Report Date: 11/2/2020 9:02:16 PM

RawFile: D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF
Acquired: 10/31/20 02:46:24
Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Diene Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %
13.030	481.390	O5	1,4-pentadiene	0.001	0.001	0.001
14.847	506.110	O5	2-methylbutadiene-1,3	0.007	0.008	0.009
16.185	527.950	O5	1t,3-pentadiene	0.008	0.008	0.010
16.885	538.190	O5	cyclopentadiene	0.005	0.006	0.007
20.390	581.030	O6	1,5-hexadiene	0.000	0.000	0.000
21.989	597.090	O6	1c/t,4-hexadiene	0.000	0.000	0.000
25.273	632.940	O7	cyclic diolefin or triolefin-[1]	0.003	0.003	0.003
25.835	638.580	O7	cyclic diolefin or triolefin-[2]	0.007	0.007	0.007
28.353	661.960	O6	diolefin (hexadiene)	0.003	0.003	0.003
30.171	677.230	O7	1,6-heptadiene	0.000	0.000	0.000
36.538	720.930	N8	1,1,3-trimethylcyclopentane	0.174	0.171	0.136

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

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Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 6**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
6.435	100.000	P1	methane	0.000	0.000	0.000	-258.700	-161.500
6.620	200.000	P2	ethane	0.000	0.000	0.001	-127.480	-88.600
7.114	293.490	O3	propylene	0.000	0.000	0.000	-53.896	-47.720
7.176	300.000	P3	propane	0.002	0.002	0.003	-43.672	-42.040
8.191	366.100	I4	i-butane	0.105	0.139	0.159	10.904	-11.720
8.341	372.460	--	unknown	0.000	0.000	0.001	32.000	0.000
8.847	390.700	O4	butene-1	0.002	0.003	0.004	20.750	-6.250
8.878	391.710	O4	isobutylene	0.003	0.004	0.005	20.750	-6.250
9.154	400.000	P4	n-butane	0.505	0.643	0.766	31.100	-0.500
9.544	412.290	O4	t-butene-2	0.018	0.022	0.029	33.584	0.880
9.642	415.120	I5	2,2-dimethylpropane	0.003	0.004	0.004	49.100	9.500
9.875	421.560	--	unknown	0.001	0.001	0.001	32.000	0.000
10.130	428.120	O4	c-butene-2	0.024	0.029	0.038	38.696	3.720
11.669	460.120	X2	ethanol	10.624	9.913	20.314	173.300	78.500
11.715	460.920	O5	3-methylbutene-1	0.051	0.060	0.064	68.090	20.050
12.773	477.730	I5	i-pentane	6.994	8.311	8.539	82.112	27.840
13.030	481.390	O5	1,4-pentadiene	0.001	0.001	0.001	78.728	25.960
13.746	490.870	O5	pentene-1	0.123	0.142	0.155	85.928	29.960
14.221	496.680	O5	2-methylbutene-1	0.285	0.323	0.358	88.070	31.150
14.507	500.000	P5	n-pentane	2.488	2.926	3.038	96.908	36.060
14.847	506.110	O5	2-methylbutadiene-1,3	0.007	0.008	0.009	93.308	34.060
15.095	510.390	O5	t-pentene-2	0.372	0.423	0.467	97.412	36.340
15.466	516.600	O5	3,3-dimethylbutene-1	0.005	0.006	0.006	106.232	41.240
15.635	519.350	O5	c-pentene-2	0.207	0.232	0.259	98.474	36.930
15.794	521.880	--	unknown	0.000	0.000	0.001	32.000	0.000
15.973	524.680	O5	2-methylbutene-2	0.622	0.691	0.781	101.408	38.560
16.185	527.950	O5	1t,3-pentadiene	0.008	0.008	0.010	107.636	42.020
16.305	529.750	--	unknown	0.001	0.001	0.001	32.000	0.000
16.885	538.190	O5	cyclopentadiene	0.005	0.006	0.007	32.000	0.000
17.014	540.010	I6	2,2-dimethylbutane	0.446	0.506	0.456	121.514	49.730
18.312	557.140	O5	cyclopentene	0.101	0.097	0.131	111.614	44.230

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

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Sample: ODDB:54926 Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
18.678	561.640	O6	4-methylpentene-1	0.024	0.026	0.025	128.948	53.860
18.747	562.470	O6	3-methylpentene-1	0.035	0.039	0.037	129.506	54.170
18.831	563.480	--	unknown	0.001	0.002	0.002	32.000	0.000
19.104	566.710	N5	cyclopentane	0.340	0.336	0.427	120.650	49.250
19.291	568.880	I6	2,3-dimethylbutane	1.357	1.510	1.387	136.364	57.980
19.447	570.660	--	unknown	0.043	0.045	0.118	32.000	0.000
19.563	571.980	O6	2,3-dimethylbutene-1	0.016	0.017	0.017	132.098	55.610
19.706	573.580	I6	2-methylpentane	3.766	4.245	3.849	140.468	60.260
19.835	575.020	O6	4-methyl-t-pentene-2	0.069	0.075	0.072	137.480	58.600
20.390	581.030	O6	1,5-hexadiene	0.000	0.000	0.000	139.010	59.450
20.811	585.430	I6	3-methylpentane	2.343	2.597	2.395	145.886	63.270
20.962	586.980	--	unknown	0.000	0.000	0.000	32.000	0.000
21.261	589.990	O6	2-methylpentene-1	0.113	0.122	0.119	143.780	62.100
21.351	590.880	O6	hexene-1	0.049	0.053	0.051	146.246	63.470
21.989	597.090	O6	1c/t,4-hexadiene	0.000	0.000	0.000	149.000	65.000
22.297	600.000	P6	n-hexane	1.891	2.112	1.933	155.714	68.730
22.521	602.680	O6	t-hexene-3	0.074	0.080	0.078	152.744	67.080
22.587	603.470	O6	c-hexene-3	0.024	0.026	0.026	151.592	66.440
22.739	605.260	O6	t-hexene-2	0.146	0.157	0.152	154.184	67.880
22.828	606.300	--	unknown	0.000	0.001	0.001	32.000	0.000
22.942	607.630	O6	2-methylpentene-2	0.185	0.197	0.194	153.140	67.300
23.021	608.550	O6	4-methylcyclopentene	0.050	0.048	0.054	148.820	64.900
23.184	610.410	O6	3-methyl-c-pentene-2	0.112	0.119	0.118	153.842	67.690
23.307	611.820	O6	3-methylcyclopentene	0.027	0.026	0.029	149.000	65.000
23.416	613.060	O6	O6-[1]	0.000	0.000	0.000	32.000	0.000
23.547	614.520	O6	c-hexene-2	0.079	0.084	0.083	155.984	68.880
23.783	617.160	O6	O6-[2]	0.001	0.001	0.001	32.000	0.000
24.112	620.750	O7	3,3-dimethylpentene-1	0.174	0.182	0.156	171.446	77.470
24.254	622.280	--	unknown	0.001	0.001	0.003	32.000	0.000
24.407	623.920	I7	2,2-dimethylpentane	0.104	0.114	0.092	174.542	79.190
24.625	626.230	N6	methylcyclopentane	2.450	2.409	2.564	161.240	71.800

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

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Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
25.036	630.520	I7	2,4-dimethylpentane	1.536	1.681	1.350	176.882	80.490
25.273	632.940	O7	cyclic diolefin or triolefin-[1]	0.003	0.003	0.003	32.000	0.000
25.455	634.790	I7	2,2,3-trimethylbutane	0.049	0.052	0.043	177.584	80.880
25.622	636.460	--	unknown	0.002	0.002	0.002	32.000	0.000
25.835	638.580	O7	cyclic diolefin or triolefin-[2]	0.007	0.007	0.007	32.000	0.000
26.172	641.870	O7	O7-[1]	0.002	0.002	0.002	32.000	0.000
26.284	642.950	O7	3,4-dimethylpentene-1	0.006	0.006	0.005	177.422	80.790
26.655	646.510	O7	4,4-dimethyl-c-pentene-2	0.008	0.009	0.007	176.756	80.420
26.801	647.880	O7	2,4-dimethylpentene-1	0.008	0.009	0.007	178.880	81.600
26.903	648.840	O6	1-methylcyclopentene	0.188	0.177	0.201	167.864	75.480
27.103	650.700	A6	benzene	0.723	0.606	0.816	176.162	80.090
27.286	652.390	O7	2-methyl-c-hexene-3	0.004	0.005	0.004	186.800	86.000
27.500	654.350	I7	3,3-dimethylpentane	0.098	0.104	0.086	186.908	86.060
27.601	655.270	O7	5-methylhexene-1	0.010	0.011	0.009	185.558	85.310
27.793	657.000	--	unknown	0.004	0.004	0.003	32.000	0.000
27.928	658.200	N6	cyclohexane	0.828	0.783	0.867	177.296	80.720
28.222	660.810	O7	2-methyl-t-hexene-3	0.017	0.018	0.015	186.620	85.900
28.353	661.960	O6	diolefin (hexadiene)	0.003	0.003	0.003	158.000	70.000
28.444	662.760	O7	2-ethyl-3-methylbutene-1	0.006	0.007	0.006	187.448	86.360
28.571	663.850	O7	4-methylhexene-1	0.014	0.015	0.013	188.114	86.730
28.887	666.570	O7	4-methyl-t/c-hexene-2	0.028	0.029	0.025	187.358	86.310
29.042	667.890	I7	2-methylhexane	2.012	2.182	1.768	194.090	90.050
29.205	669.270	I7	2,3-dimethylpentane	2.596	2.750	2.282	193.604	89.780
29.488	671.630	N7	1,1-dimethylcyclopentane	0.076	0.074	0.068	189.464	87.480
29.808	674.280	O7	5-methyl-t-hexene-2	0.024	0.025	0.021	190.598	88.110
30.024	676.040	I7	3-methylhexane	2.049	2.196	1.802	197.330	91.850
30.171	677.230	O7	1,6-heptadiene	0.000	0.000	0.000	205.106	96.170
30.451	679.480	O7	3,4-dimethyl-c-pentene-2	0.013	0.013	0.011	192.650	89.250
30.759	681.920	N7	1c,3-dimethylcyclopentane	0.698	0.690	0.626	195.386	90.770
31.112	684.680	N7	1t,3-dimethylcyclopentane	0.620	0.610	0.557	197.096	91.720
31.289	686.050	I7	3-ethylpentane	0.190	0.201	0.167	200.246	93.470

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

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Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
31.480	687.520	N7	1t,2-dimethylcyclopentane	0.607	0.595	0.545	197.366	91.870
31.662	688.900	I8	2,2,4-trimethylpentane	2.855	3.038	2.202	210.632	99.240
32.214	693.050	O7	O7-[2]	0.001	0.001	0.001	32.000	0.000
32.450	694.810	O7	3-methyl-c-hexene-3	0.022	0.022	0.020	203.720	95.400
32.700	696.640	--	unknown	0.000	0.000	0.000	32.000	0.000
32.986	698.710	O7	t-heptene-3	0.079	0.083	0.071	204.206	95.670
33.164	700.000	P7	n-heptane	1.387	1.493	1.219	209.156	98.420
33.461	701.940	O7	2-methyl-2-hexene	0.083	0.085	0.074	203.738	95.410
33.616	702.940	O7	3-methyl-t-hexene-3	0.031	0.033	0.028	200.372	93.540
33.861	704.520	O7	t-heptene-2	0.031	0.032	0.028	208.310	97.950
34.089	705.980	O7	3-ethylpentene-2	0.021	0.021	0.019	204.818	96.010
34.214	706.770	--	unknown	0.000	0.000	0.000	32.000	0.000
34.578	709.070	O7	c-heptene-2	0.078	0.081	0.070	209.138	98.410
34.766	710.240	O7	3-methyl-t-hexene-2	0.001	0.001	0.001	203.324	95.180
35.096	712.280	O7	2,3-dimethylpentene-2	0.033	0.034	0.030	207.320	97.400
35.327	713.690	O7	3-ethylcyclopentene	0.004	0.004	0.003	207.986	97.770
35.420	714.260	--	unknown	0.001	0.001	0.000	32.000	0.000
35.720	716.070	O7	O7-[3]	0.006	0.007	0.006	32.000	0.000
35.991	717.700	N7	1c,2-dimethylcyclopentane	0.298	0.299	0.267	211.154	99.530
36.114	718.430	N7	methylcyclohexane	1.289	1.233	1.156	213.674	100.930
36.427	720.280	I8	2,2-dimethylhexane	0.046	0.049	0.036	224.312	106.840
36.538	720.930	N8	1,1,3-trimethylcyclopentane	0.174	0.171	0.136	220.802	104.890
36.870	722.860	O7	O7-[4]	0.005	0.005	0.004	32.000	0.000
36.954	723.340	O7	O7-[5]	0.002	0.002	0.002	32.000	0.000
37.145	724.450	O7	O7-[6]	0.005	0.005	0.004	32.000	0.000
37.289	725.270	--	unknown	0.001	0.001	0.001	32.000	0.000
37.505	726.490	O7	O7-[7]	0.006	0.006	0.005	32.000	0.000
37.621	727.150	--	unknown	0.001	0.001	0.001	32.000	0.000
38.005	729.310	N7	ethylcyclopentane	0.345	0.332	0.310	218.246	103.470
38.130	730.010	I8	2,5-dimethylhexane	0.583	0.619	0.449	228.398	109.110
38.319	731.050	I8	2,2,3-trimethylpentane	0.120	0.123	0.093	229.730	109.850

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Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 10**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
38.468	731.870	I8	2,4-dimethylhexane	0.664	0.698	0.512	228.974	109.430
38.593	732.560	--	unknown	0.012	0.013	0.009	32.000	0.000
38.811	733.750	--	unknown	0.001	0.002	0.001	32.000	0.000
38.925	734.370	O7	O7-[8]	0.002	0.002	0.002	32.000	0.000
39.161	735.650	O7	O7-[9]	0.002	0.002	0.001	32.000	0.000
39.475	737.320	N8	1c,2t,4-trimethylcyclopentane	0.294	0.283	0.231	242.132	116.740
39.691	738.480	I8	3,3-dimethylhexane	0.058	0.060	0.045	233.546	111.970
40.178	741.030	O7	O7-[10]	0.003	0.003	0.003	32.000	0.000
40.466	742.530	O7	O7-[11]	0.001	0.001	0.001	32.000	0.000
40.624	743.350	O7	O7-[12]	0.005	0.005	0.004	32.000	0.000
40.838	744.450	N8	1t,2c,3-trimethylcyclopentane	0.214	0.204	0.168	230.738	110.410
41.378	747.190	I8	2,3,4-trimethylpentane	1.257	1.288	0.970	236.246	113.470
41.596	748.280	I8	I8-[1]	0.077	0.079	0.060	236.246	113.470
41.893	749.770	O7	O7-[13]	0.021	0.021	0.016	32.000	0.000
42.200	751.290	I8	2,3,3-trimethylpentane	1.186	1.202	0.915	238.586	114.770
42.634	753.410	A7	toluene	4.743	4.028	4.534	231.134	110.630
42.762	754.030	O8	O8-[1]	0.004	0.004	0.003	32.000	0.000
42.935	754.870	O8	O8-[2]	0.001	0.001	0.001	32.000	0.000
43.086	755.590	O8	O8-[3]	0.006	0.006	0.005	32.000	0.000
43.195	756.120	--	unknown	0.001	0.001	0.001	32.000	0.000
43.613	758.110	I8	2,3-dimethylhexane	0.535	0.553	0.412	240.098	115.610
43.752	758.770	I8	2-methyl-3-ethylpentane	0.092	0.095	0.071	240.098	115.610
44.090	760.360	N8	1,1,2-trimethylcyclopentane	0.010	0.010	0.008	236.714	113.730
44.534	762.420	O8	O8-[4]	0.028	0.028	0.022	32.000	0.000
44.942	764.300	I8	2-methylheptane	0.935	0.986	0.721	243.770	117.650
45.254	765.720	I8	4-methylheptane	0.356	0.372	0.275	243.878	117.710
45.516	766.900	I8	3-methyl-3-ethylpentane	0.072	0.074	0.055	240.098	115.610
45.622	767.380	I8	3,4-dimethylhexane	0.090	0.092	0.069	243.914	117.730
46.243	770.150	N8	1c,3-dimethylcyclohexane	0.112	0.108	0.088	246.848	119.360
46.656	771.970	I8	3-methylheptane	0.893	0.931	0.689	246.074	118.930
46.927	773.150	--	unknown	0.186	0.196	0.143	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

RawFile: D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF Acquired: 10/31/20 02:46:24
Sample: ODDB:54926 Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
47.010	773.510	N8	1c,2t,3-trimethylcyclopentane	0.422	0.403	0.331	243.500	117.500
47.177	774.240	I8	3-ethylhexane	0.111	0.115	0.086	245.372	118.540
47.452	775.420	N8	1t,4-dimethylcyclohexane	0.196	0.189	0.154	246.848	119.360
47.893	777.300	--	unknown	0.002	0.002	0.006	32.000	0.000
48.274	778.920	--	unknown	0.001	0.001	0.002	32.000	0.000
48.425	779.550	O8	O8-[5]	0.001	0.001	0.001	32.000	0.000
48.776	781.020	N8	1,1-dimethylcyclohexane	0.035	0.033	0.027	247.190	119.550
49.238	782.930	I9	2,2,5-trimethylhexane	0.635	0.661	0.436	255.362	124.090
49.663	784.670	N8	3c-ethylmethylcyclopentane	0.215	0.206	0.168	249.980	121.100
49.866	785.500	O9	2,6-dimethylheptene-1	0.003	0.003	0.002	32.000	0.000
50.209	786.880	N8	3t-ethylmethylcyclopentane	0.182	0.175	0.143	249.980	121.100
50.542	788.220	N8	2t-ethylmethylcyclopentane	0.166	0.159	0.130	250.160	121.200
50.986	789.980	O8	O8-[6]	0.006	0.006	0.005	32.000	0.000
51.124	790.530	N8	1,1-methylethylcyclopentane	0.023	0.021	0.018	250.754	121.530
51.820	793.250	N8	1t,2-dimethylcyclohexane	0.192	0.182	0.150	254.174	123.430
52.002	793.950	O8	t-octene-4	0.010	0.010	0.008	252.068	122.260
52.424	795.580	O9	3,5,5-trimethylhexene-1	0.001	0.001	0.001	32.000	0.000
52.884	797.330	N8	1c,2c,3-trimethylcyclopentane	0.032	0.030	0.025	253.400	123.000
53.591	800.000	P8	n-octane	0.834	0.875	0.643	258.224	125.680
53.868	801.040	N8	1c,4-dimethylcyclohexane	0.270	0.254	0.212	255.794	124.330
54.738	804.260	O8	t-octene-2	0.008	0.009	0.007	32.000	0.000
54.959	805.070	--	unknown	0.005	0.005	0.014	32.000	0.000
55.333	806.440	I9	I9-[1]	0.038	0.039	0.026	32.000	0.000
55.432	806.790	--	unknown	0.017	0.018	0.012	32.000	0.000
55.827	808.220	N8	i-propylcyclopentane	0.085	0.081	0.067	259.574	126.430
56.490	810.590	--	unknown	0.004	0.004	0.003	32.000	0.000
56.764	811.560	O9	O9-[1]	0.001	0.001	0.001	32.000	0.000
57.027	812.480	--	unknown	0.009	0.009	0.006	32.000	0.000
57.151	812.920	O8	c-octene-2	0.004	0.004	0.003	32.000	0.000
57.393	813.770	--	unknown	0.001	0.001	0.001	32.000	0.000
57.698	814.830	N8	N8-[1]	0.014	0.013	0.011	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

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Sample: ODDB:54926 Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
58.063	816.090	O8	O8-[1]	0.002	0.002	0.002	32.000	0.000
58.448	817.400	I9	2,2,3,4-tetramethylpentane	0.127	0.126	0.087	271.454	133.030
59.089	819.580	I9	2,3,4-trimethylhexane	0.072	0.071	0.049	282.308	139.060
59.385	820.580	N8	N8-[2]	0.003	0.003	0.002	32.000	0.000
59.645	821.450	O9	O9-[1]	0.031	0.032	0.022	32.000	0.000
60.061	822.830	N8	N8-[3]	0.001	0.001	0.001	32.000	0.000
60.499	824.270	O9	O9-[2]	0.006	0.006	0.004	32.000	0.000
61.041	826.050	N8	1c,2-dimethylcyclohexane	0.191	0.177	0.150	265.532	129.740
61.242	826.700	--	unknown	0.022	0.023	0.018	32.000	0.000
61.629	827.950	I9	2,3,5-trimethylhexane	0.007	0.007	0.005	268.430	131.350
61.946	828.960	I9	2,2-dimethylheptane	0.013	0.014	0.009	270.860	132.700
62.835	831.790	N9	1,1,4-trimethylcyclohexane	0.341	0.325	0.238	275.000	135.000
63.401	833.560	I9	2,2,3-trimethylhexane	0.161	0.166	0.111	271.220	132.900
63.982	835.360	I9	2,4-dimethylheptane	0.034	0.035	0.024	271.220	132.900
64.717	837.620	I9	4,4-dimethylheptane	0.196	0.202	0.135	271.220	132.900
65.032	838.570	N8	ethylcyclohexane	0.001	0.001	0.001	269.222	131.790
65.641	840.410	N8	n-propylcyclopentane	0.036	0.034	0.028	267.728	130.960
65.842	841.010	I9	2,5-dimethylheptane	0.263	0.270	0.180	276.800	136.000
66.297	842.370	I9	3,3-&3,5-dimethylheptane	0.062	0.063	0.042	278.636	137.020
66.704	843.570	I9	3,5-dimethylheptane	0.042	0.043	0.029	276.800	136.000
67.179	844.970	I9	2,6-dimethylheptane	0.073	0.075	0.050	275.396	135.220
67.805	846.790	N9	1,1,3-trimethylcyclohexane	0.049	0.046	0.034	295.862	146.590
68.302	848.220	O9	2,4-dimethylheptene-1	0.002	0.002	0.001	32.000	0.000
68.843	849.770	N8	N8-[4]	0.001	0.001	0.001	32.000	0.000
69.083	850.450	N8	N8-[5]	0.003	0.003	0.003	32.000	0.000
69.408	851.370	N9	1c,2t,4t-trimethylcyclohexane	0.020	0.019	0.014	32.000	0.000
70.265	853.770	A8	ethylbenzene	1.244	1.056	1.032	277.160	136.200
70.640	854.810	N9	1c,3c,5c-trimethylcyclohexane	0.130	0.123	0.091	32.000	0.000
71.467	857.080	O9	2-methyloctene-1	0.020	0.022	0.014	32.000	0.000
71.907	858.280	I9	I9-[2]	0.003	0.003	0.002	32.000	0.000
72.357	859.500	O9	2-methyloctene-2	0.029	0.031	0.020	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

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Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
72.761	860.580	N9	N9-[1]	0.000	0.000	0.000	32.000	0.000
74.118	864.180	A8	1,3-dimethylbenzene	3.353	2.857	2.782	282.416	139.120
74.449	865.050	A8	1,4-dimethylbenzene	1.354	1.158	1.123	281.048	138.360
75.059	866.630	I9	3,4-dimethylheptane	0.031	0.031	0.021	285.080	140.600
75.385	867.470	I9	3,4 -dimethylheptane	0.063	0.063	0.043	285.080	140.600
75.920	868.850	N9	N9-[2]	0.027	0.026	0.019	32.000	0.000
76.362	869.970	I9	I9-[3]	0.077	0.078	0.053	32.000	0.000
77.226	872.150	I9	4-ethylheptane	0.002	0.002	0.001	288.392	142.440
77.572	873.020	I9	4-methyloctane	0.276	0.282	0.190	288.392	142.440
77.966	874.000	I9	2-methyloctane	0.339	0.350	0.233	289.904	143.280
78.572	875.500	N9	N9-[3]	0.038	0.036	0.026	32.000	0.000
79.424	877.590	N9	1c,2t,3c-trimethylcyclohexane	0.041	0.040	0.029	304.160	151.200
79.737	878.350	I9	3-ethylheptane	0.079	0.080	0.054	289.400	143.000
80.250	879.590	I9	3-methyloctane	0.436	0.446	0.300	291.614	144.230
80.572	880.360	I9	3,3-diethylpentane	0.022	0.021	0.015	270.842	132.690
81.011	881.410	--	unknown	0.067	0.070	0.046	32.000	0.000
81.299	882.090	N9	1c,2t,4c-trimethylcyclohexane	0.018	0.017	0.013	275.000	135.000
81.666	882.960	N9	1,1,2-trimethylcyclohexane	0.031	0.028	0.021	293.360	145.200
82.028	883.810	A8	1,2-dimethylbenzene	1.675	1.401	1.389	291.974	144.430
82.560	885.060	I9	I9-[4]	0.028	0.029	0.019	32.000	0.000
82.923	885.900	I9	I9-[5]	0.106	0.107	0.073	32.000	0.000
83.657	887.600	N9	N9-[4]	0.090	0.085	0.063	32.000	0.000
83.921	888.210	N9	N9-[5]	0.118	0.111	0.082	32.000	0.000
84.067	888.540	--	unknown	0.035	0.037	0.025	32.000	0.000
84.610	889.780	I9	I9-[6]	0.068	0.068	0.047	32.000	0.000
85.014	890.690	N9	N9-[6]	0.160	0.151	0.111	32.000	0.000
85.556	891.920	I9	I9-[7]	0.017	0.017	0.012	32.000	0.000
86.009	892.930	N9	i-butylcyclopentane	0.033	0.031	0.023	298.346	147.970
86.218	893.400	N9	N9-[7]	0.022	0.021	0.016	32.000	0.000
87.072	895.290	--	unknown	0.001	0.001	0.001	32.000	0.000
87.451	896.120	N9	N9-[8]	0.015	0.014	0.011	32.000	0.000

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Comments:
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Hold

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Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
87.738	896.750	N9	N9-[9]	0.009	0.008	0.006	32.000	0.000
88.032	897.390	O9	t-nonene-2	0.007	0.008	0.005	32.000	0.000
88.251	897.870	O9	t-nonene-3	0.021	0.022	0.015	32.000	0.000
88.667	898.770	I9	I9-[8]	0.128	0.129	0.088	32.000	0.000
88.826	899.110	--	unknown	0.024	0.025	0.016	32.000	0.000
89.237	900.000	P9	n-nonane	0.392	0.402	0.269	303.476	150.820
89.598	901.740	N9	1,1-methylethylcyclohexane	0.094	0.086	0.066	305.924	152.180
90.171	904.510	N9	N9-[10]	0.010	0.009	0.007	32.000	0.000
90.421	905.710	N9	N9-[11]	0.027	0.025	0.019	32.000	0.000
90.703	907.060	O10	t-2,2,5,5-tetramethylhexene-3	0.005	0.005	0.003	32.000	0.000
90.812	907.580	--	unknown	0.002	0.002	0.001	32.000	0.000
91.178	909.320	--	unknown	0.000	0.000	0.000	32.000	0.000
91.585	911.250	N9	N9-[12]	0.006	0.006	0.004	32.000	0.000
92.008	913.250	A9	i-propylbenzene	0.066	0.056	0.048	306.338	152.410
92.372	914.960	O9	c-nonene-3	0.075	0.081	0.052	32.000	0.000
92.519	915.650	--	unknown	0.019	0.020	0.013	32.000	0.000
92.931	917.570	I10	I10-[1]	0.012	0.012	0.008	32.000	0.000
93.036	918.050	N9	i-propylcyclohexane	0.023	0.021	0.016	310.622	154.790
93.192	918.780	--	unknown	0.006	0.006	0.004	32.000	0.000
93.771	921.460	I10	I10-[2]	0.114	0.115	0.070	32.000	0.000
94.167	923.280	I10	2,2-dimethyloctane	0.037	0.037	0.023	314.420	156.900
94.442	924.540	I10	2,4-dimethyloctane	0.055	0.056	0.034	312.620	155.900
94.875	926.510	N9	N9-[13]	0.007	0.007	0.005	32.000	0.000
95.309	928.480	N9	N9-[14]	0.024	0.022	0.016	32.000	0.000
95.917	931.230	I10	2,6-dimethyloctane	0.092	0.093	0.057	320.738	160.410
96.276	932.840	I10	2,5-dimethyloctane	0.083	0.084	0.052	317.300	158.500
96.532	933.990	--	unknown	0.003	0.003	0.002	32.000	0.000
97.131	936.660	N9	n-butylcyclopentane	0.062	0.058	0.043	313.916	156.620
97.342	937.590	I10	I10-[3]	0.033	0.034	0.021	32.000	0.000
97.492	938.260	N10	N10-[1]	0.038	0.035	0.024	32.000	0.000
97.756	939.420	--	unknown	0.006	0.006	0.004	32.000	0.000

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Hold

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98.004	940.510	I10	I10-[4]	0.022	0.023	0.014	32.000	0.000
98.461	942.520	I10	3,3-dimethyloctane	0.147	0.146	0.091	322.160	161.200
98.773	943.880	N10	N10-[2]	0.025	0.023	0.016	32.000	0.000
98.985	944.800	--	unknown	0.020	0.021	0.012	32.000	0.000
99.156	945.550	--	unknown	0.026	0.027	0.016	32.000	0.000
99.549	947.250	A9	n-propylbenzene	0.372	0.318	0.273	318.632	159.240
99.845	948.530	I10	3,6-dimethyloctane	0.028	0.028	0.017	321.440	160.800
100.101	949.630	I10	3-methyl-5-ethylheptane	0.048	0.049	0.030	316.760	158.200
100.244	950.240	--	unknown	0.007	0.007	0.004	32.000	0.000
100.566	951.630	N10	N10-[3]	0.029	0.027	0.018	32.000	0.000
101.193	954.300	--	unknown	0.026	0.028	0.017	32.000	0.000
101.502	955.610	A9	1,3-methylethylbenzene	1.316	1.121	0.965	322.394	161.330
101.890	957.250	A9	1,4-methylethylbenzene	0.564	0.482	0.414	323.618	162.010
102.197	958.540	N10	N10-[4]	0.032	0.029	0.020	32.000	0.000
102.377	959.300	--	unknown	0.003	0.003	0.002	32.000	0.000
102.746	960.840	--	unknown	0.002	0.002	0.001	32.000	0.000
102.944	961.670	--	unknown	0.011	0.012	0.031	32.000	0.000
103.233	962.870	A9	1,3,5-trimethylbenzene	0.702	0.597	0.514	328.532	164.740
103.497	963.970	I10	I10-[5]	0.044	0.044	0.027	32.000	0.000
103.765	965.080	N10	N10-[5]	0.019	0.018	0.012	32.000	0.000
103.955	965.870	--	unknown	0.006	0.007	0.004	32.000	0.000
104.194	966.850	I10	I10-[6]	0.003	0.003	0.002	32.000	0.000
104.510	968.150	I10	5-methylnonane	0.055	0.055	0.034	329.180	165.100
104.915	969.810	I10	4-methylnonane	0.449	0.447	0.278	32.000	0.000
105.258	971.210	A9	1,2-methylethylbenzene	0.419	0.350	0.307	329.324	165.180
105.444	971.970	I10	2-methylnonane	0.131	0.133	0.081	332.654	167.030
105.595	972.580	--	unknown	0.010	0.011	0.006	32.000	0.000
105.866	973.680	--	unknown	0.012	0.013	0.008	32.000	0.000
106.103	974.640	I10	3-ethyloctane	0.028	0.028	0.017	331.700	166.500
106.183	974.960	--	unknown	0.014	0.015	0.009	32.000	0.000
106.470	976.120	N10	N10-[6]	0.025	0.023	0.016	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

RawFile: D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF
Acquired: 10/31/20 02:46:24
Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 16**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
106.803	977.460	I10	3-methylnonane	0.158	0.159	0.098	334.040	167.800
107.022	978.330	--	unknown	0.006	0.007	0.004	32.000	0.000
107.372	979.730	N10	N10-[7]	0.003	0.003	0.002	32.000	0.000
107.543	980.410	I10	I10-[7]	0.100	0.100	0.062	32.000	0.000
107.816	981.500	I10	I10-[8]	0.009	0.009	0.005	32.000	0.000
108.103	982.640	--	unknown	0.011	0.012	0.007	32.000	0.000
108.564	984.460	A9	1,2,4-trimethylbenzene	2.048	1.721	1.501	336.884	169.380
108.797	985.380	--	unknown	0.007	0.008	0.005	32.000	0.000
108.972	986.070	I10	I10-[9]	0.011	0.011	0.007	32.000	0.000
109.078	986.480	N10	i-butylcyclohexane	0.037	0.034	0.023	340.340	171.300
109.269	987.230	--	unknown	0.028	0.029	0.018	32.000	0.000
109.387	987.690	I10	I10-[10]	0.048	0.048	0.030	32.000	0.000
109.669	988.790	I10	I10-[11]	0.020	0.020	0.012	32.000	0.000
109.809	989.340	I10	I10-[12]	0.013	0.013	0.008	32.000	0.000
110.160	990.700	N10	N10-[8]	0.024	0.022	0.015	32.000	0.000
110.369	991.510	--	unknown	0.003	0.003	0.002	32.000	0.000
110.777	993.090	O10	decene-1	0.003	0.003	0.002	339.080	170.600
110.936	993.700	N10	1t-methyl-2-n-propylcyclohexane	0.012	0.011	0.008	339.800	171.000
111.055	994.160	O10	2,3-dimethyloctene-2	0.065	0.065	0.041	32.000	0.000
111.164	994.580	I10	I10-[13]	0.017	0.016	0.010	32.000	0.000
111.461	995.720	A10	i-butylbenzene	0.004	0.003	0.002	343.022	172.790
111.607	996.280	I10	I10-[14]	0.058	0.058	0.036	32.000	0.000
111.840	997.170	--	unknown	0.040	0.042	0.025	32.000	0.000
112.121	998.240	A10	sec-butylbenzene	0.038	0.033	0.025	344.012	173.340
112.368	999.180	--	unknown	0.009	0.010	0.006	32.000	0.000
112.581	1000.000	P10	n-decane	0.207	0.209	0.128	345.470	174.150
112.824	1001.530	I11	I11-[1]	0.029	0.029	0.017	32.000	0.000
113.180	1003.780	N10	N10-[9]	0.018	0.017	0.012	32.000	0.000
113.510	1005.850	--	unknown	0.004	0.004	0.003	32.000	0.000
113.826	1007.830	A9	1,2,3-trimethylbenzene	0.402	0.331	0.294	349.016	176.120
113.975	1008.760	--	unknown	0.010	0.010	0.007	32.000	0.000

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Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
114.271	1010.610	A10	1,3-methyl-i-propylbenzene	0.044	0.038	0.029	347.144	175.080
114.682	1013.170	--	unknown	0.009	0.009	0.024	32.000	0.000
114.832	1014.090	A10	1,4-methyl-i-propylbenzene	0.027	0.023	0.018	350.834	177.130
114.993	1015.090	--	unknown	0.003	0.003	0.002	32.000	0.000
115.300	1016.990	I11	I11-[2]	0.028	0.028	0.016	32.000	0.000
115.570	1018.650	I11	I11-[3]	0.013	0.013	0.007	32.000	0.000
115.864	1020.460	A10	2-3-dihydroindene	0.279	0.213	0.208	352.130	177.850
116.229	1022.700	--	unknown	0.020	0.021	0.015	32.000	0.000
116.478	1024.220	N10	sec-butylcyclohexane	0.043	0.039	0.027	354.812	179.340
116.706	1025.620	I11	I11-[4]	0.009	0.009	0.005	32.000	0.000
117.055	1027.740	A10	1,2-methyl-i-propylbenzene	0.075	0.063	0.049	352.724	178.180
117.226	1028.780	I11	3-ethylnonane	0.005	0.005	0.003	32.000	0.000
117.320	1029.340	--	unknown	0.004	0.004	0.002	32.000	0.000
117.628	1031.210	--	unknown	0.068	0.072	0.038	32.000	0.000
117.854	1032.570	N11	N11-[1]	0.026	0.024	0.015	32.000	0.000
117.905	1032.880	--	unknown	0.022	0.023	0.012	32.000	0.000
118.087	1033.980	I11	I11-[5]	0.017	0.017	0.009	32.000	0.000
118.232	1034.850	--	unknown	0.003	0.003	0.002	32.000	0.000
118.602	1037.070	I11	I11-[6]	0.032	0.029	0.018	32.000	0.000
118.769	1038.070	--	unknown	0.035	0.037	0.020	32.000	0.000
119.210	1040.700	A10	1,3-diethylbenzene	0.142	0.121	0.093	358.052	181.140
119.411	1041.900	--	unknown	0.065	0.069	0.043	32.000	0.000
119.662	1043.390	A10	1,3-methyl-n-propylbenzene	0.289	0.247	0.190	359.618	182.010
119.837	1044.430	I11	I11-[7]	0.024	0.024	0.014	32.000	0.000
120.122	1046.120	A10	1,4-diethylbenzene	0.013	0.011	0.009	362.822	183.790
120.295	1047.140	A10	1,4-methyl-n-propylbenzene	0.179	0.154	0.118	362.156	183.420
120.471	1048.180	A10	n-butylbenzene	0.087	0.074	0.057	361.940	183.300
120.880	1050.580	A10	1,3-dimethyl-5-ethylbenzene	0.303	0.254	0.199	362.516	183.620
121.203	1052.480	A10	1,2-diethylbenzene	0.032	0.027	0.021	362.228	183.460
121.345	1053.310	I11	I11-[8]	0.019	0.018	0.010	32.000	0.000
121.574	1054.640	N10	t-decahydronaphthalene	0.009	0.009	0.005	368.960	187.200

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Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
121.824	1056.100	N11	N11-[2]	0.017	0.016	0.010	32.000	0.000
122.111	1057.770	--	unknown	0.015	0.015	0.008	32.000	0.000
122.248	1058.570	A10	1,2-methyl-n-propylbenzene	0.098	0.083	0.064	364.946	184.970
122.649	1060.890	I11	I11-[9]	0.014	0.014	0.008	32.000	0.000
122.753	1061.490	I11	I11-[10]	0.071	0.070	0.040	32.000	0.000
122.963	1062.710	I11	I11-[11]	0.049	0.049	0.027	32.000	0.000
123.266	1064.450	--	unknown	0.003	0.003	0.002	32.000	0.000
123.473	1065.640	I11	I11-[12]	0.049	0.049	0.028	32.000	0.000
123.732	1067.120	--	unknown	0.010	0.010	0.005	32.000	0.000
124.019	1068.770	A10	1,4,dimethyl-2-ethylbenzene	0.220	0.185	0.144	368.366	186.870
124.290	1070.310	A10	1,3-dimethyl-4-ethylbenzene	0.276	0.236	0.181	370.832	188.240
124.564	1071.870	I11	I11-[13]	0.003	0.003	0.002	32.000	0.000
124.863	1073.570	--	unknown	0.009	0.009	0.005	32.000	0.000
125.122	1075.040	I11	I11-[14]	0.150	0.149	0.084	32.000	0.000
125.288	1075.980	A10	1,2-dimethyl-4-ethylbenzene	0.303	0.255	0.199	373.136	189.520
125.600	1077.740	--	unknown	0.009	0.010	0.006	32.000	0.000
125.883	1079.340	--	unknown	0.014	0.015	0.009	32.000	0.000
125.993	1079.950	I11	I11-[15]	0.004	0.004	0.002	32.000	0.000
126.263	1081.470	A10	1,3-dimethyl-2-ethylbenzene	0.051	0.042	0.034	374.090	190.050
126.416	1082.330	I11	I11-[16]	0.019	0.019	0.011	32.000	0.000
126.746	1084.170	--	unknown	0.018	0.019	0.010	32.000	0.000
126.946	1085.290	I11	I11-[17]	0.009	0.009	0.005	32.000	0.000
127.174	1086.560	--	unknown	0.016	0.017	0.009	32.000	0.000
127.516	1088.460	--	unknown	0.009	0.009	0.005	32.000	0.000
127.585	1088.850	--	unknown	0.012	0.013	0.007	32.000	0.000
127.857	1090.360	O11	undecene-1	0.022	0.021	0.012	378.860	192.700
128.194	1092.210	A11	1,4-methyl-t-butylbenzene	0.038	0.033	0.023	32.000	0.000
128.469	1093.730	A10	1,2-dimethyl-3-ethylbenzene	0.084	0.070	0.055	381.110	193.950
128.812	1095.620	--	unknown	0.007	0.008	0.005	32.000	0.000
129.079	1097.080	--	unknown	0.015	0.016	0.010	32.000	0.000
129.171	1097.580	A11	1,2-ethyl-i-propylbenzene	0.008	0.007	0.005	32.000	0.000

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Hold

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Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
129.333	1098.470	--	unknown	0.007	0.007	0.004	32.000	0.000
129.612	1100.000	P11	n-undecane	0.111	0.110	0.063	384.620	195.900
129.808	1101.470	--	unknown	0.008	0.009	0.005	32.000	0.000
129.918	1102.290	A11	1,4-ethyl-i-propylbenzene	0.003	0.002	0.002	32.000	0.000
130.344	1105.480	A10	1,2,4,5-tetramethylbenzene	0.177	0.147	0.116	386.312	196.840
130.716	1108.250	A11	1,2-methyl-n-butylbenzene	0.007	0.006	0.004	390.200	199.000
130.885	1109.500	A10	1,2,3,5-tetramethylbenzene	0.236	0.195	0.155	388.472	198.040
131.033	1110.600	--	unknown	0.007	0.007	0.004	32.000	0.000
131.375	1113.140	--	unknown	0.013	0.013	0.008	32.000	0.000
131.569	1114.570	--	unknown	0.008	0.008	0.005	32.000	0.000
131.875	1116.830	--	unknown	0.023	0.024	0.015	32.000	0.000
132.319	1120.090	--	unknown	0.015	0.016	0.010	32.000	0.000
132.477	1121.250	--	unknown	0.016	0.017	0.010	32.000	0.000
132.953	1124.740	A11	1,2-methyl-t-butylbenzene	0.007	0.005	0.004	32.000	0.000
133.116	1125.930	--	unknown	0.013	0.013	0.008	32.000	0.000
133.429	1128.210	A10	5-methylindan	0.208	0.172	0.138	32.000	0.000
133.774	1130.720	I12	I12-[1]	0.051	0.050	0.026	421.340	216.300
134.179	1133.650	--	unknown	0.008	0.008	0.004	32.000	0.000
134.296	1134.500	A10	4-methylindan	0.052	0.043	0.034	32.000	0.000
134.562	1136.420	--	unknown	0.012	0.012	0.008	32.000	0.000
134.675	1137.240	A11	1,2-ethyl-n-propylbenzene	0.060	0.050	0.036	32.000	0.000
134.927	1139.050	A10	2-methylindan	0.199	0.162	0.132	368.600	187.000
135.138	1140.570	A11	1,3-methyl-n-butylbenzene	0.010	0.008	0.006	390.200	199.000
135.389	1142.370	--	unknown	0.006	0.006	0.004	32.000	0.000
135.546	1143.500	A12	1,3-di-i-propylbenzene	0.067	0.056	0.036	397.760	203.200
135.754	1144.980	A11	s-pentylbenzene	0.061	0.051	0.036	401.000	205.000
135.908	1146.080	--	unknown	0.002	0.003	0.001	32.000	0.000
136.341	1149.170	--	unknown	0.019	0.020	0.011	32.000	0.000
136.438	1149.860	A11	n-pentylbenzene	0.048	0.039	0.028	401.720	205.400
136.503	1150.320	--	unknown	0.027	0.028	0.016	32.000	0.000
136.798	1152.420	N12	1t-M-2-(4-MP)cyclopentane	0.005	0.004	0.002	32.000	0.000

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136.995	1153.810	A12	1,2-di-i-propylbenzene	0.029	0.024	0.016	399.200	204.000
137.141	1154.840	--	unknown	0.028	0.030	0.015	32.000	0.000
137.626	1158.270	--	unknown	0.042	0.044	0.023	32.000	0.000
137.897	1160.180	A12	1,4-di-i-propylbenzene	0.052	0.043	0.028	410.540	210.300
138.175	1162.130	--	unknown	0.008	0.008	0.004	32.000	0.000
138.350	1163.360	A10	tetrahydronaphthalene	0.018	0.014	0.012	405.716	207.620
138.492	1164.350	--	unknown	0.009	0.010	0.006	32.000	0.000
138.725	1165.980	--	unknown	0.004	0.004	0.003	32.000	0.000
138.886	1167.110	I12	I12-[2]	0.056	0.055	0.029	421.340	216.300
139.182	1169.170	A10	naphthalene	0.172	0.123	0.118	424.382	217.990
139.508	1171.430	A12	1-t-butyl-3,5-dimethylbenzene	0.004	0.003	0.002	32.000	0.000
139.848	1173.800	A12	1,4-ethyl-t-butylbenzene	0.078	0.064	0.042	32.000	0.000
140.252	1176.590	--	unknown	0.028	0.029	0.015	32.000	0.000
140.543	1178.590	I12	I12-[3]	0.058	0.057	0.030	421.340	216.300
140.774	1180.190	I12	I12-[4]	0.033	0.032	0.017	421.340	216.300
141.123	1182.590	--	unknown	0.007	0.007	0.004	32.000	0.000
141.350	1184.150	I12	I12-[5]	0.034	0.034	0.018	421.340	216.300
141.603	1185.880	--	unknown	0.012	0.013	0.006	32.000	0.000
141.896	1187.880	I12	I12-[6]	0.035	0.035	0.018	421.340	216.300
142.096	1189.240	A12	1,3-di-n-propylbenzene	0.041	0.034	0.022	32.000	0.000
142.335	1190.870	A12	A12-[1]	0.025	0.021	0.014	32.000	0.000
142.553	1192.350	O12	dodecene-1	0.005	0.004	0.002	416.120	213.400
142.636	1192.910	--	unknown	0.002	0.002	0.001	32.000	0.000
142.913	1194.790	--	unknown	0.008	0.008	0.004	32.000	0.000
143.254	1197.100	--	unknown	0.005	0.005	0.003	32.000	0.000
143.557	1199.140	A12	A12-[2]	0.020	0.017	0.011	32.000	0.000
143.683	1200.000	P12	n-dodecane	0.048	0.047	0.025	421.340	216.300
143.945	1202.200	--	unknown	0.003	0.004	0.002	32.000	0.000
144.228	1204.580	--	unknown	0.018	0.019	0.009	32.000	0.000
144.763	1209.070	--	unknown	0.012	0.013	0.006	32.000	0.000
144.988	1210.940	--	unknown	0.006	0.007	0.003	32.000	0.000

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Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
145.186	1212.600	A12	1,3,5-triethylbenzene	0.003	0.003	0.002	420.800	216.000
145.373	1214.150	--	unknown	0.008	0.008	0.004	32.000	0.000
145.717	1217.020	--	unknown	0.023	0.024	0.012	32.000	0.000
145.890	1218.450	--	unknown	0.014	0.014	0.007	32.000	0.000
146.206	1221.080	--	unknown	0.003	0.003	0.002	32.000	0.000
146.497	1223.490	--	unknown	0.018	0.019	0.010	32.000	0.000
146.738	1225.470	--	unknown	0.019	0.020	0.010	32.000	0.000
146.829	1226.220	--	unknown	0.006	0.007	0.004	32.000	0.000
147.121	1228.630	--	unknown	0.005	0.005	0.003	32.000	0.000
147.201	1229.280	--	unknown	0.013	0.014	0.007	32.000	0.000
147.506	1231.790	A12	1,2,4-triethylbenzene	0.014	0.012	0.008	423.500	217.500
147.727	1233.600	--	unknown	0.004	0.005	0.002	32.000	0.000
147.833	1234.470	--	unknown	0.001	0.001	0.001	32.000	0.000
148.079	1236.480	--	unknown	0.004	0.004	0.002	32.000	0.000
148.191	1237.400	--	unknown	0.005	0.005	0.003	32.000	0.000
148.237	1237.770	--	unknown	0.008	0.008	0.004	32.000	0.000
148.466	1239.640	--	unknown	0.002	0.002	0.001	32.000	0.000
148.802	1242.380	A12	1,4-methyl-n-pentylbenzene	0.037	0.031	0.020	32.000	0.000
149.087	1244.690	--	unknown	0.010	0.010	0.005	32.000	0.000
149.242	1245.950	--	unknown	0.004	0.004	0.002	32.000	0.000
149.380	1247.060	--	unknown	0.003	0.004	0.002	32.000	0.000
149.669	1249.400	--	unknown	0.005	0.005	0.003	32.000	0.000
149.952	1251.690	--	unknown	0.007	0.007	0.004	32.000	0.000
150.150	1253.280	--	unknown	0.008	0.009	0.004	32.000	0.000
150.531	1256.350	A12	n-hexylbenzene	0.020	0.017	0.011	32.000	0.000
150.627	1257.120	--	unknown	0.021	0.022	0.012	32.000	0.000
150.997	1260.090	--	unknown	0.012	0.013	0.007	32.000	0.000
151.253	1262.130	--	unknown	0.005	0.005	0.003	32.000	0.000
151.500	1264.100	--	unknown	0.005	0.005	0.003	32.000	0.000
151.659	1265.370	--	unknown	0.004	0.004	0.002	32.000	0.000
151.844	1266.840	--	unknown	0.006	0.006	0.003	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:02:16 PM

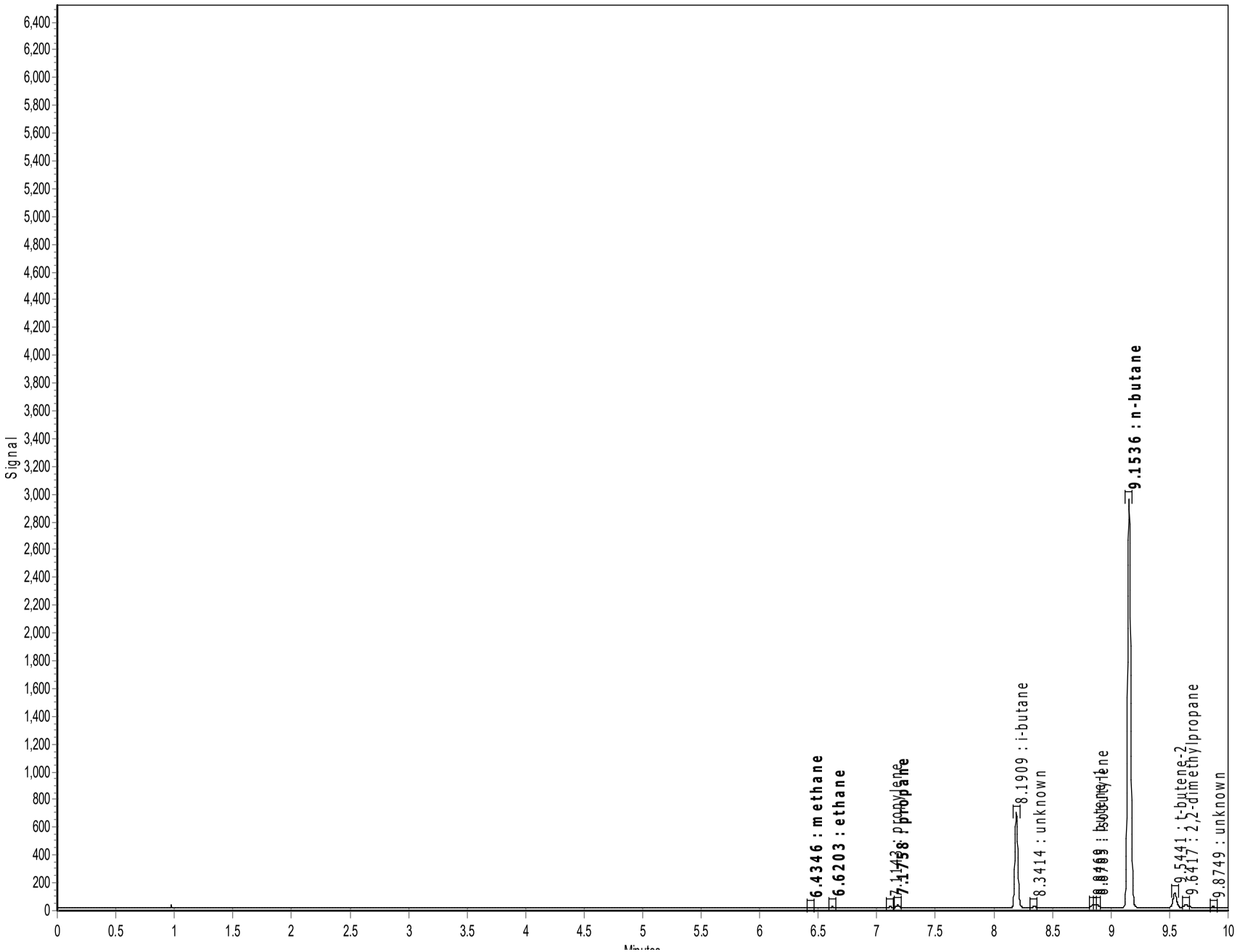
RawFile: D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF
Acquired: 10/31/20 02:46:24
Sample: ODDB:54926
Analyzed: 11/2/2020 8:59:33 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

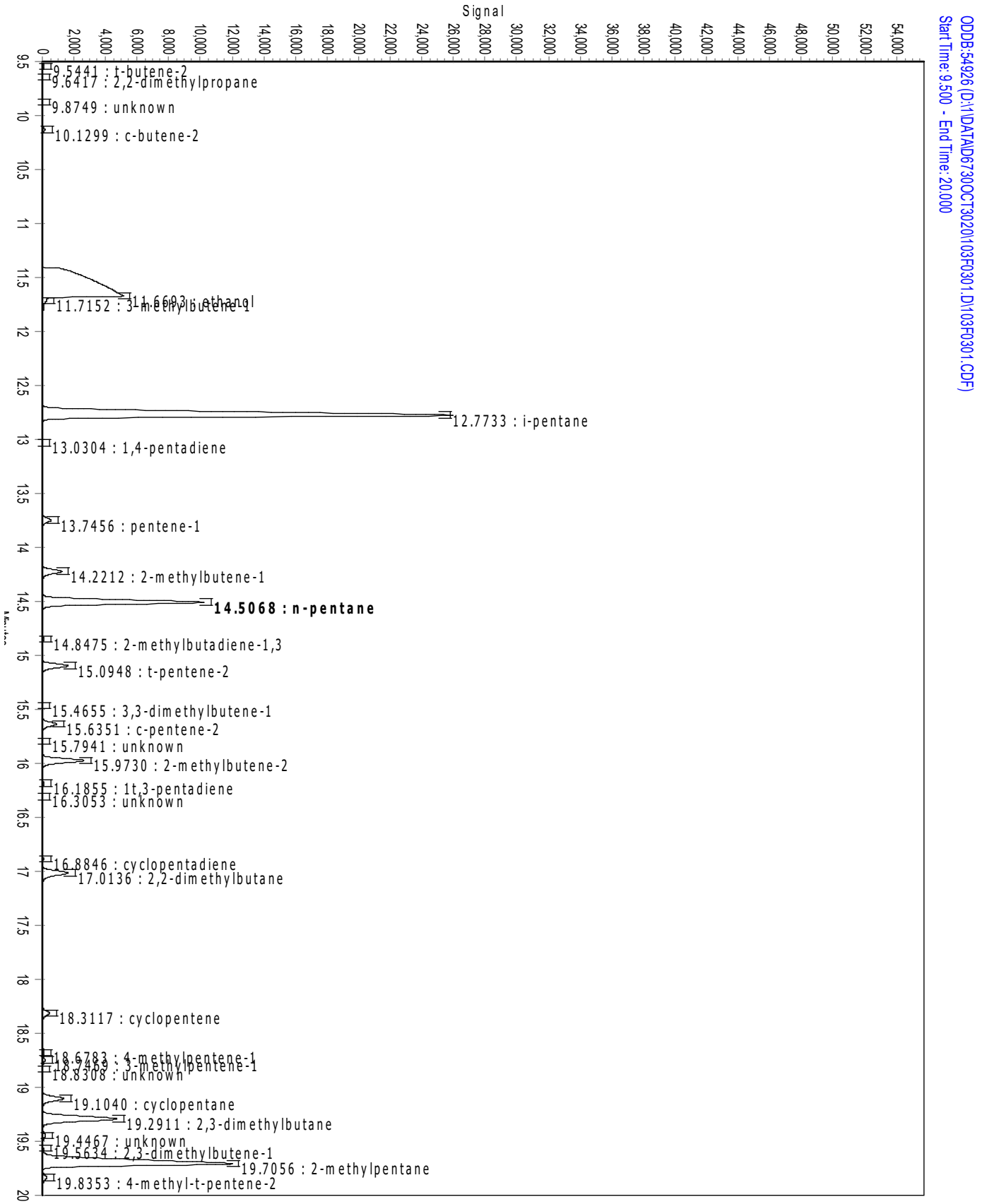
Hold

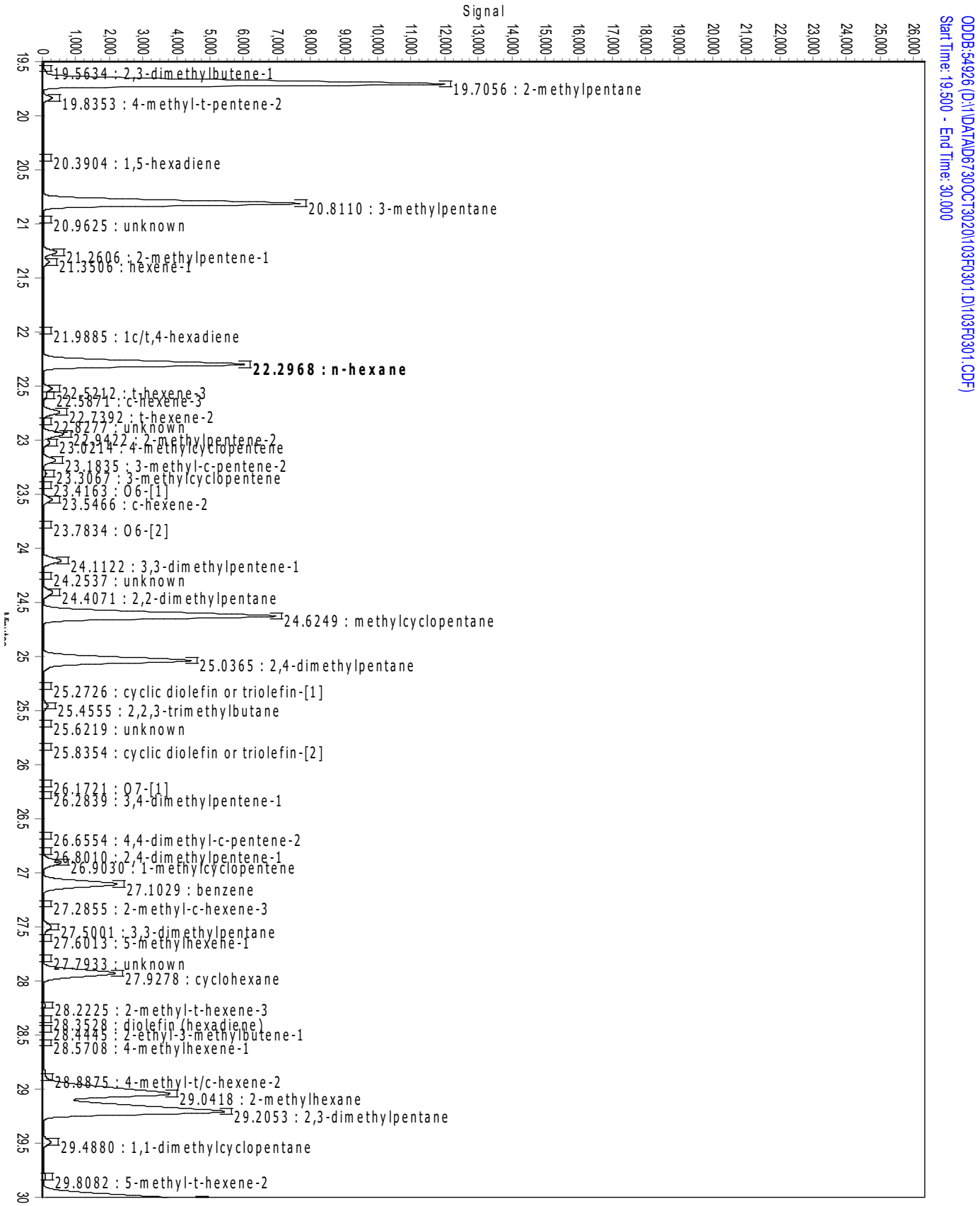
Components Listed in Chromatographic Order **Page: 22**

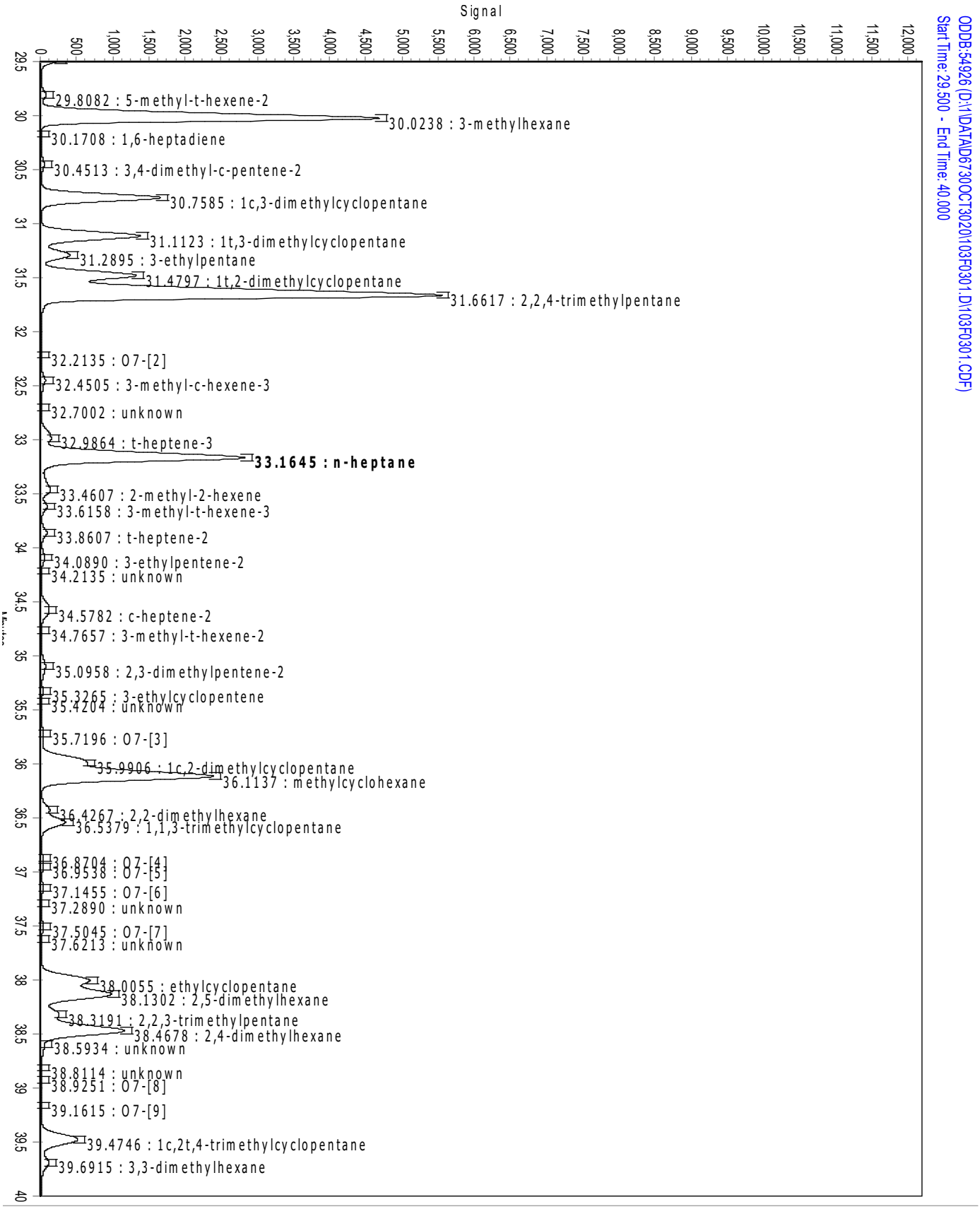
Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
151.920	1267.450	--	unknown	0.010	0.010	0.005	32.000	0.000
152.216	1269.800	--	unknown	0.009	0.010	0.005	32.000	0.000
152.363	1270.970	--	unknown	0.002	0.003	0.001	32.000	0.000
152.637	1273.140	I13	I13-[1]	0.009	0.008	0.004	455.720	235.400
152.827	1274.640	A11	1,2,3,4,5-pentamethylbenzene	0.024	0.018	0.014	449.600	232.000
153.056	1276.450	--	unknown	0.010	0.010	0.006	32.000	0.000
153.571	1280.510	--	unknown	0.007	0.007	0.004	32.000	0.000
153.924	1283.290	A11	2-methylnaphthalene	0.096	0.069	0.059	465.890	241.050
154.413	1287.120	--	unknown	0.011	0.011	0.006	32.000	0.000
154.565	1288.300	--	unknown	0.002	0.003	0.002	32.000	0.000
154.704	1289.390	--	unknown	0.003	0.003	0.002	32.000	0.000
154.903	1290.940	O13	tridecene-1	0.007	0.007	0.003	451.040	232.800
155.161	1292.950	--	unknown	0.001	0.001	0.000	32.000	0.000
155.342	1294.360	--	unknown	0.002	0.002	0.001	32.000	0.000
155.502	1295.610	--	unknown	0.004	0.004	0.002	32.000	0.000
155.593	1296.310	--	unknown	0.002	0.002	0.001	32.000	0.000
155.879	1298.530	A11	1-methylnaphthalene	0.038	0.028	0.024	472.352	244.640
156.069	1300.000	P13	n-tridecane	0.010	0.010	0.005	455.720	235.400
156.179	1300.990	+	C14+ (Summarized)	0.400	0.386	0.178	455.720	235.400

ODDB:54926 (D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 0.000 - End Time: 10.000



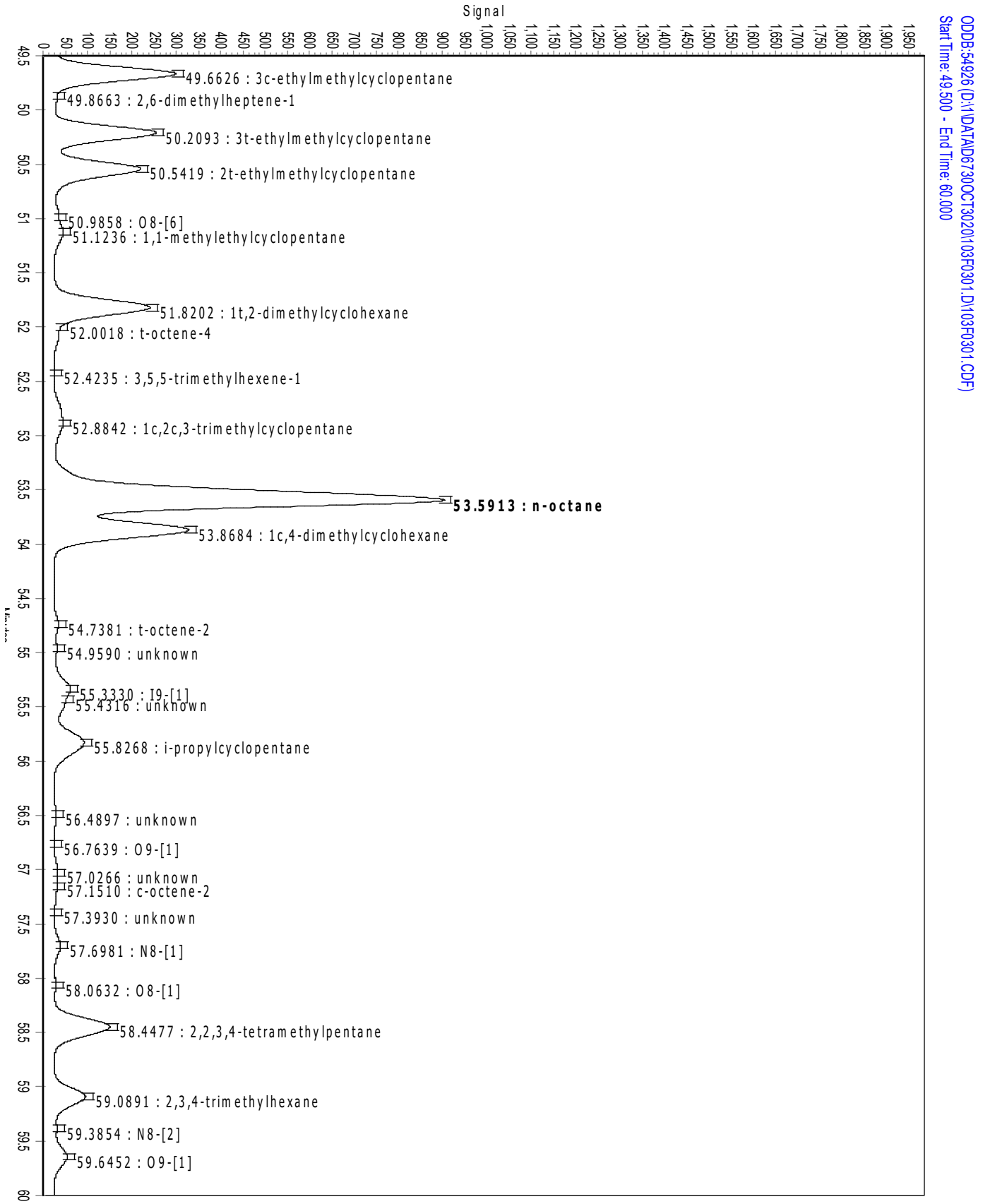

Signal
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
16,000
18,000
20,000
22,000
24,000
26,000
28,000
30,000
32,000
34,000
36,000
38,000
40,000
42,000
44,000
46,000
48,000
50,000
52,000
54,000
9.5
10
10.5
11
11.5
12
12.5
13
13.5
14
14.5
15
15.5
16
16.5
17
17.5
18
18.5
19
19.5
20
9.5441 : t-butene-2
9.6417 : 2,2-dimethylpropane
9.8749 : unknown
10.1299 : c-butene-2
11.6603 : ethanol
11.7152 : 3-methylbutene-1
12.7733 : i-pentane
13.0304 : 1,4-pentadiene
13.7456 : pentene-1
14.2212 : 2-methylbutene-1
14.5068 : n-pentane
14.8475 : 2-methylbutadiene-1,3
15.0948 : t-pentene-2
15.4655 : 3,3-dimethylbutene-1
15.6351 : c-pentene-2
15.7941 : unknown
15.9730 : 2-methylbutene-2
16.1855 : 1t,3-pentadiene
16.3053 : unknown
16.8846 : cyclopentadiene
17.0136 : 2,2-dimethylbutane
18.3117 : cyclopentene
18.6783 : 4-methylpentene-1
18.7483 : 3-methylpentene-1
18.8308 : unknown
19.1040 : cyclopentane
19.2911 : 2,3-dimethylbutane
19.4467 : unknown
19.5634 : 2,3-dimethylbutene-1
19.7056 : 2-methylpentane
19.8353 : 4-methyl-t-pentene-2
ODDB:54926 (D:\1DATA\D6730OCT30201103F0301.D\1103F0301.CDF)
Start Time: 9.500 - End Time: 20.000

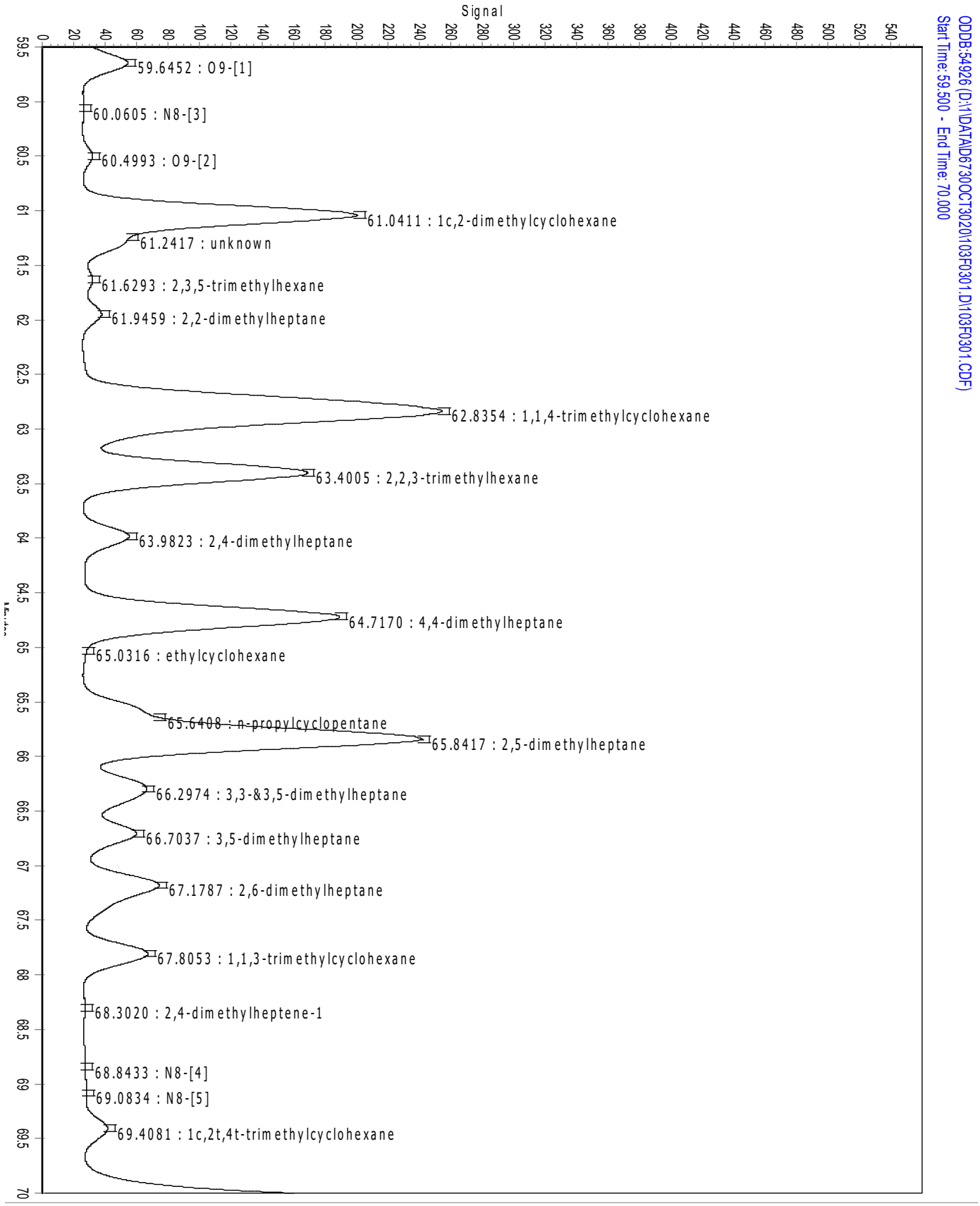

Signal
ODDB:54926 (D:\1DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 19.500 - End Time: 30.000
19.5634 : 2,3-dimethylbutene-1
19.7056 : 2-methylpentane
19.8353 : 4-methyl-t-pentene-2
20.3904 : 1,5-hexadiene
20.8110 : 3-methylpentane
20.9625 : unknown
21.2606 : 2-methylpentene-1
21.3506 : hexene-1
21.9885 : 1c/t,4-hexadiene
22.2968 : n-hexane
22.5212 : t-hexene-3
22.5871 : c-hexene-3
22.7392 : t-hexene-2
22.8277 : unknown
22.9422 : 2-methylpentene-2
23.0214 : 4-methylcyclopentene
23.1835 : 3-methyl-c-pentene-2
23.3067 : 3-methylcyclopentene
23.4163 : O6-[1]
23.5466 : c-hexene-2
23.7834 : O6-[2]
24.1122 : 3,3-dimethylpentene-1
24.2537 : unknown
24.4071 : 2,2-dimethylpentane
24.6249 : methylcyclopentane
25.0365 : 2,4-dimethylpentane
25.2726 : cyclic diolefin or triolefin-[1]
25.4555 : 2,2,3-trimethylbutane
25.6219 : unknown
25.8354 : cyclic diolefin or triolefin-[2]
26.1721 : O7-[1]
26.2839 : 3,4-dimethylpentene-1
26.6554 : 4,4-dimethyl-c-pentene-2
26.8010 : 2,4-dimethylpentene-1
26.9030 : 1-methylcyclopentene
27.1029 : benzene
27.2855 : 2-methyl-c-hexene-3
27.5001 : 3,3-dimethylpentane
27.6013 : 5-methylhexene-1
27.7933 : unknown
27.9278 : cyclohexane
28.2225 : 2-methyl-t-hexene-3
28.3528 : diolefin (hexadiene)
28.4445 : 2-ethyl-3-methylbutene-1
28.5708 : 4-methylhexene-1
28.8875 : 4-methyl-t/c-hexene-2
29.0418 : 2-methylhexane
29.2053 : 2,3-dimethylpentane
29.4880 : 1,1-dimethylcyclopentane
29.8082 : 5-methyl-t-hexene-2

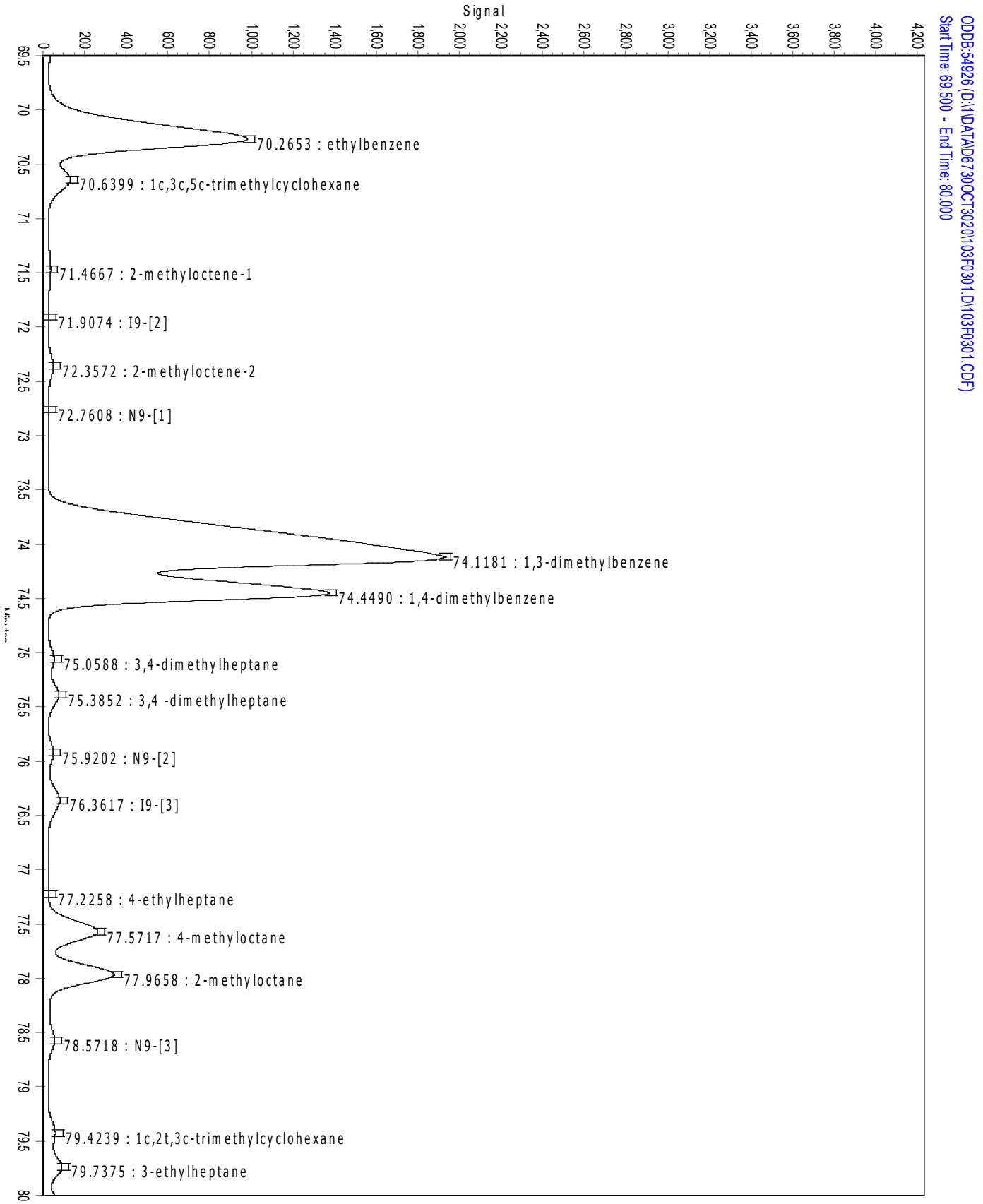


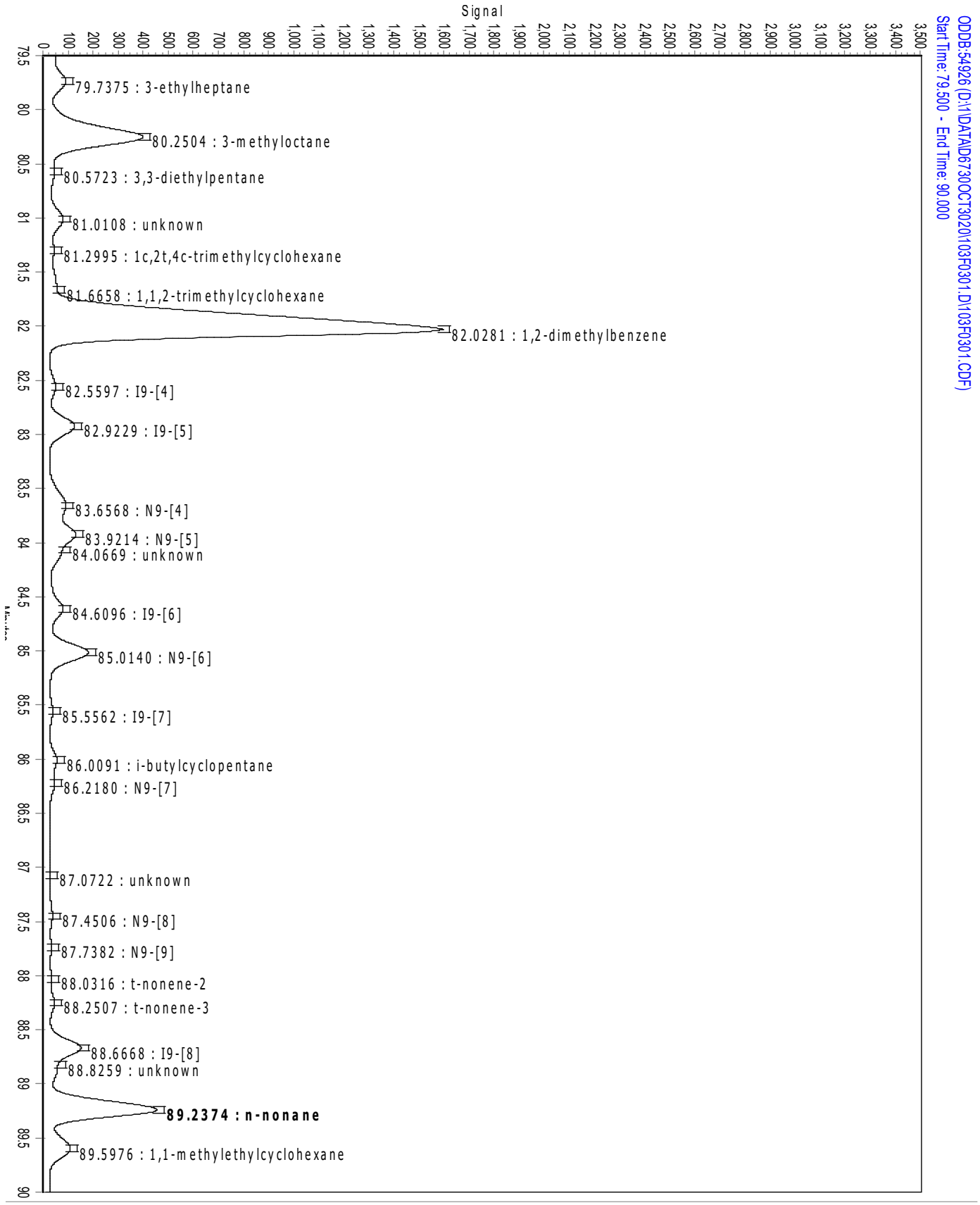
ODDB:54926 (D:\1DATA\D6730OCT30201103F0301.D\1103F0301.CDF)
Start Time: 29.500 - End Time: 40.000

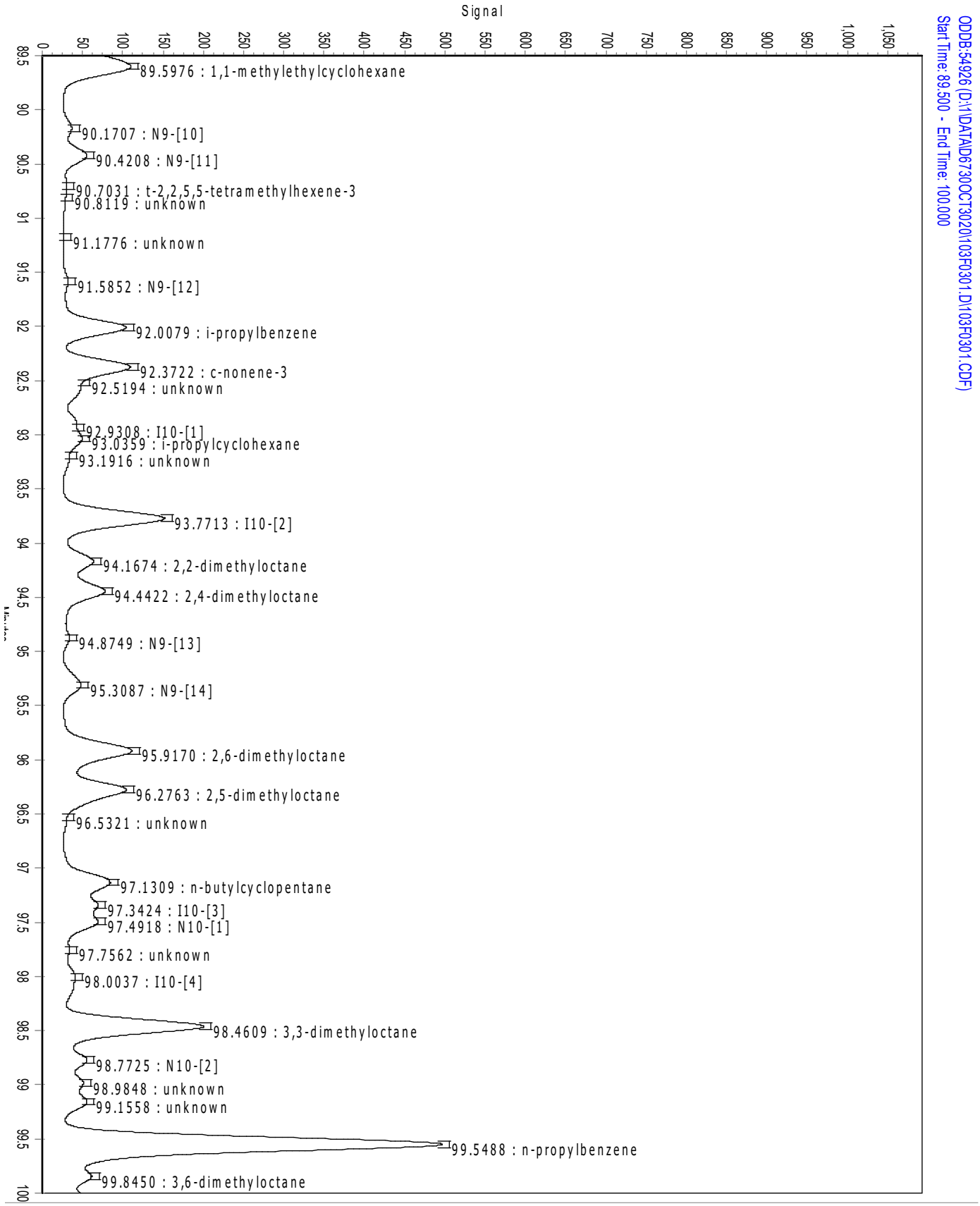
Signal
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
8,000
8,500
9,000
9,500
10,000
10,500
11,000
11,500
12,000
12,500
39.5
40
40.5
41
41.5
42
42.5
43
43.5
44
44.5
45
45.5
46
46.5
47
47.5
48
48.5
49
49.5
50
39.6915 : 3,3-dimethylhexane
40.1781 : O7-[10]
40.4658 : O7-[11]
40.6242 : O7-[12]
40.8384 : 1t,2c,3-trimethylcyclopentane
41.3781 : 2,3,4-trimethylpentane
41.5958 : I8-[1]
41.8934 : O7-[13]
42.2001 : 2,3,3-trimethylpentane
42.6344 : toluene
42.7617 : O8-[1]
42.9346 : O8-[2]
43.0856 : O8-[3]
43.1955 : unknown
43.6126 : 2,3-dimethylhexane
43.7516 : 2-methyl-3-ethylpentane
44.0898 : 1,1,2-trimethylcyclopentane
44.5338 : O8-[4]
44.9415 : 2-methylheptane
45.2544 : 4-methylheptane
45.5155 : 3-methyl-3-ethylpentane
45.6221 : 3,4-dimethylhexane
46.2428 : 1c,3-dimethylcyclohexane
46.6557 : 3-methylheptane
46.9275 : unknown
47.0096 : 1c,2t,3-trimethylcyclopentane
47.1773 : 3-ethylhexane
47.4516 : 1t,4-dimethylcyclohexane
47.8927 : unknown
48.2743 : unknown
48.4251 : O8-[5]
48.7758 : 1,1-dimethylcyclohexane
49.2385 : 2,2,5-trimethylhexane
49.6626 : 3c-ethylmethylcyclopentane
49.8663 : 2,6-dimethylheptene-1
ODDB:54926 (D:\1DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 39.500 - End Time: 50.000

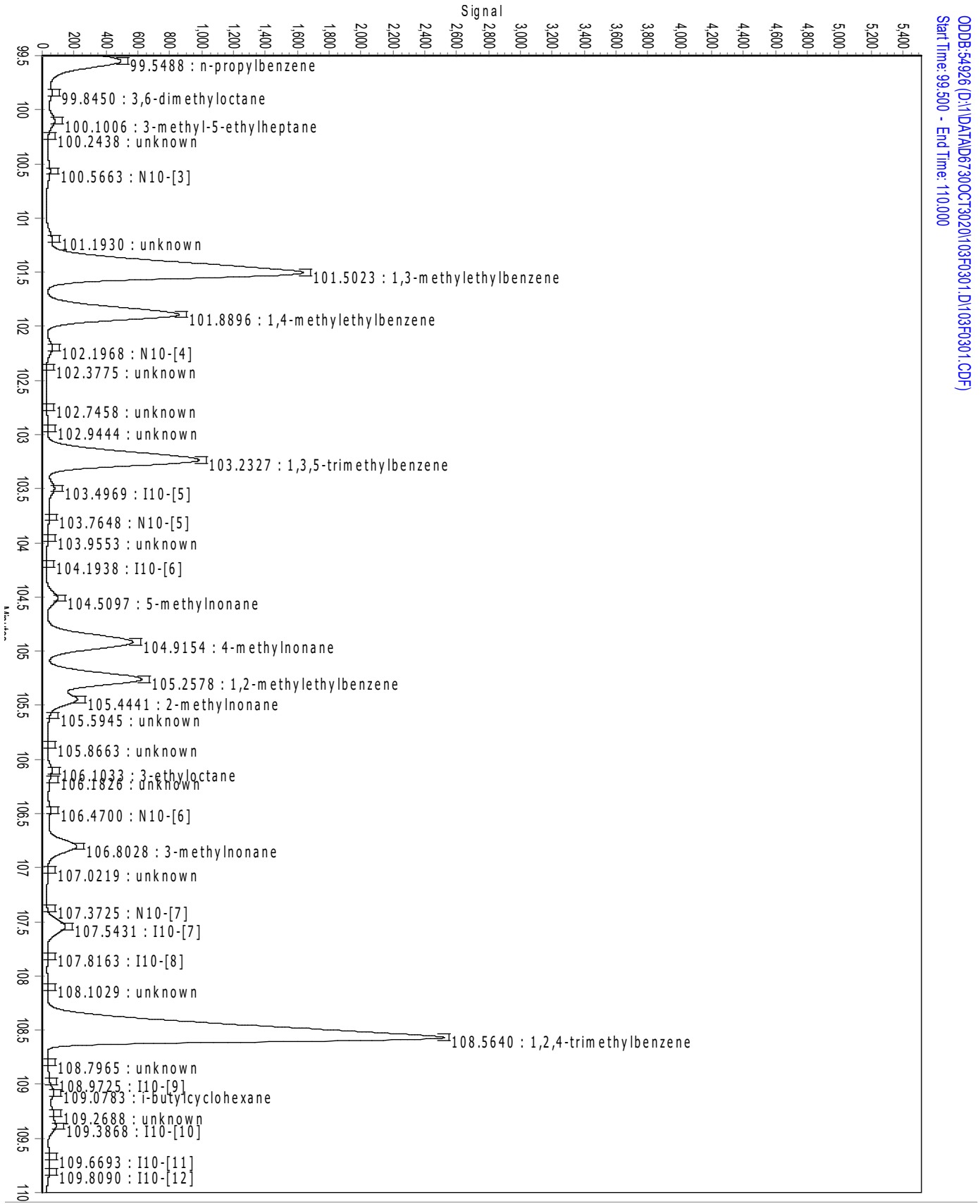

Signal
ODDB:54926 (D:\1DATAD6730OCT30201103F0301.D\103F0301.CDF)
Start Time: 49.500 - End Time: 60.000
49.6626 : 3c-ethylmethylcyclopentane
49.8663 : 2,6-dimethylheptene-1
50.2093 : 3t-ethylmethylcyclopentane
50.5419 : 2t-ethylmethylcyclopentane
50.9858 : O8-[6]
51.1236 : 1,1-methylethylcyclopentane
51.8202 : 1t,2-dimethylcyclohexane
52.0018 : t-octene-4
52.4235 : 3,5,5-trimethylhexene-1
52.8842 : 1c,2c,3-trimethylcyclopentane
53.5913 : n-octane
53.8684 : 1c,4-dimethylcyclohexane
54.7381 : t-octene-2
54.9590 : unknown
55.3330 : I9-[1]
55.4316 : unknown
55.8268 : i-propylcyclopentane
56.4897 : unknown
56.7639 : O9-[1]
57.0266 : unknown
57.1510 : c-octene-2
57.3930 : unknown
57.6981 : N8-[1]
58.0632 : O8-[1]
58.4477 : 2,2,3,4-tetramethylpentane
59.0891 : 2,3,4-trimethylhexane
59.3854 : N8-[2]
59.6452 : O9-[1]

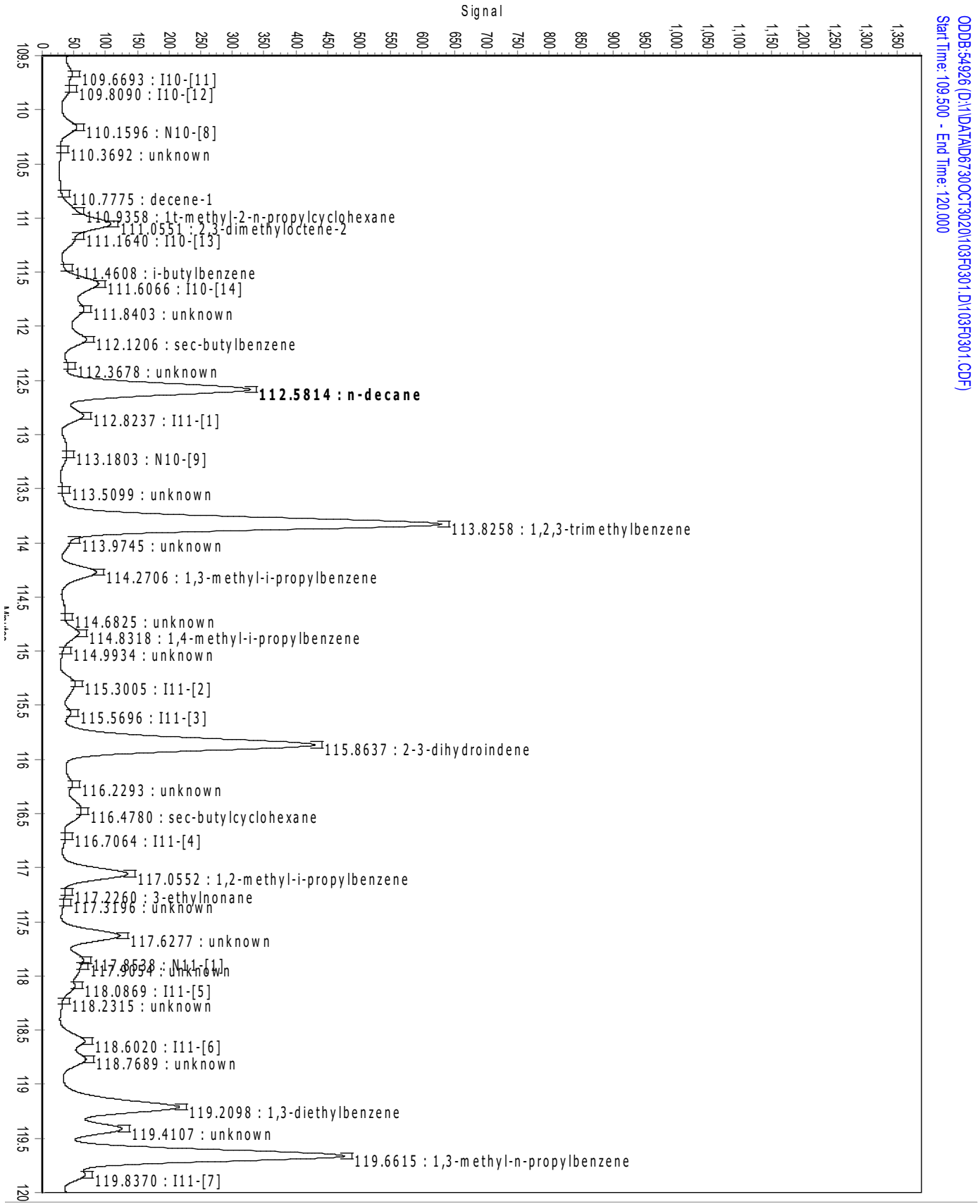

Signal
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
59.5
60
60.5
61
61.5
62
62.5
63
63.5
64
64.5
65
65.5
66
66.5
67
67.5
68
68.5
69
69.5
70
59.6452 : O9-[1]
60.0605 : N8-[3]
60.4993 : O9-[2]
61.0411 : 1c,2-dimethylcyclohexane
61.2417 : unknown
61.6293 : 2,3,5-trimethylhexane
61.9459 : 2,2-dimethylheptane
62.8354 : 1,1,4-trimethylcyclohexane
63.4005 : 2,2,3-trimethylhexane
63.9823 : 2,4-dimethylheptane
64.7170 : 4,4-dimethylheptane
65.0316 : ethylcyclohexane
65.6408 : n-propylcyclopentane
65.8417 : 2,5-dimethylheptane
66.2974 : 3,3-&3,5-dimethylheptane
66.7037 : 3,5-dimethylheptane
67.1787 : 2,6-dimethylheptane
67.8053 : 1,1,3-trimethylcyclohexane
68.3020 : 2,4-dimethylheptene-1
68.8433 : N8-[4]
69.0834 : N8-[5]
69.4081 : 1c,2t,4t-trimethylcyclohexane
ODDB:54926 (D:\1DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 59.500 - End Time: 70.000


Signal
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
4,200
ODDB:54926 (D:\1DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 69.500 - End Time: 80.000
69.5
70
70.5
71
71.5
72
72.5
73
73.5
74
74.5
75
75.5
76
76.5
77
77.5
78
78.5
79
79.5
80
70.2653 : ethylbenzene
70.6399 : 1c,3c,5c-trimethylcyclohexane
71.4667 : 2-methyloctene-1
71.9074 : I9-[2]
72.3572 : 2-methyloctene-2
72.7608 : N9-[1]
74.1181 : 1,3-dimethylbenzene
74.4490 : 1,4-dimethylbenzene
75.0588 : 3,4-dimethylheptane
75.3852 : 3,4 -dimethylheptane
75.9202 : N9-[2]
76.3617 : I9-[3]
77.2258 : 4-ethylheptane
77.5717 : 4-methyloctane
77.9658 : 2-methyloctane
78.5718 : N9-[3]
79.4239 : 1c,2t,3c-trimethylcyclohexane
79.7375 : 3-ethylheptane

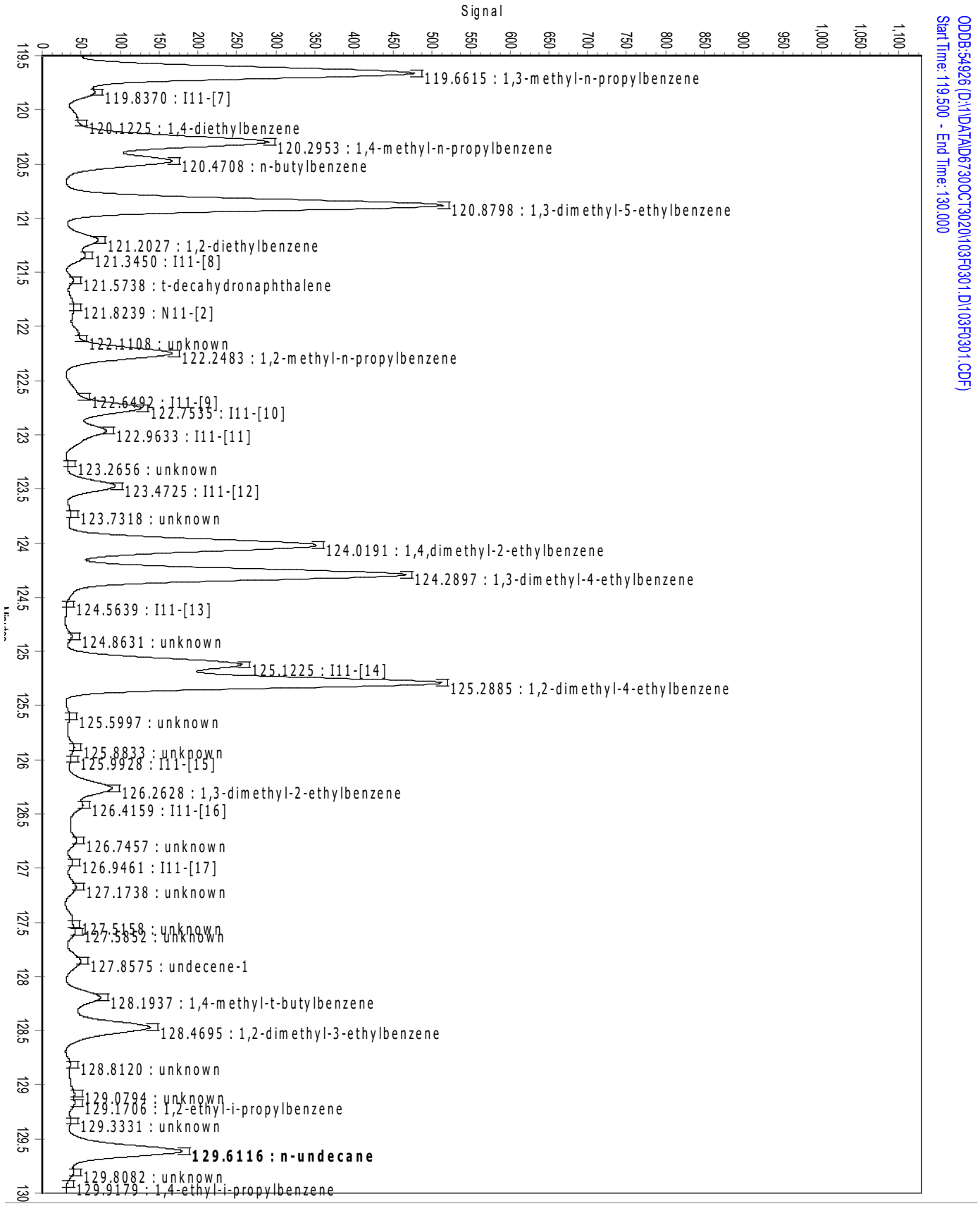

Signal
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
1,400
1,500
1,600
1,700
1,800
1,900
2,000
2,100
2,200
2,300
2,400
2,500
2,600
2,700
2,800
2,900
3,000
3,100
3,200
3,300
3,400
3,500
ODDB:54926 (D:\1DATAD6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 79.500 - End Time: 90.000
79.5
80
80.5
81
81.5
82
82.5
83
83.5
84
84.5
85
85.5
86
86.5
87
87.5
88
88.5
89
89.5
90
79.7375 : 3-ethylheptane
80.2504 : 3-methyloctane
80.5723 : 3,3-diethylpentane
81.0108 : unknown
81.2995 : 1c,2t,4c-trimethylcyclohexane
81.6658 : 1,1,2-trimethylcyclohexane
82.0281 : 1,2-dimethylbenzene
82.5597 : I9-[4]
82.9229 : I9-[5]
83.6568 : N9-[4]
83.9214 : N9-[5]
84.0669 : unknown
84.6096 : I9-[6]
85.0140 : N9-[6]
85.5562 : I9-[7]
86.0091 : i-butylcyclopentane
86.2180 : N9-[7]
87.0722 : unknown
87.4506 : N9-[8]
87.7382 : N9-[9]
88.0316 : t-nonene-2
88.2507 : t-nonene-3
88.6668 : I9-[8]
88.8259 : unknown
89.2374 : n-nonane
89.5976 : 1,1-methylethylcyclohexane


Signal
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1,000
1,050
89.5
90
90.5
91
91.5
92
92.5
93
93.5
94
94.5
95
95.5
96
96.5
97
97.5
98
98.5
99
99.5
100
89.5976 : 1,1-methylethylcyclohexane
90.1707 : N9-[10]
90.4208 : N9-[11]
90.7031 : t-2,2,5,5-tetramethylhexene-3
90.8119 : unknown
91.1776 : unknown
91.5852 : N9-[12]
92.0079 : i-propylbenzene
92.3722 : c-nonene-3
92.5194 : unknown
92.9308 : I10-[1]
93.0359 : i-propylcyclohexane
93.1916 : unknown
93.7713 : I10-[2]
94.1674 : 2,2-dimethyloctane
94.4422 : 2,4-dimethyloctane
94.8749 : N9-[13]
95.3087 : N9-[14]
95.9170 : 2,6-dimethyloctane
96.2763 : 2,5-dimethyloctane
96.5321 : unknown
97.1309 : n-butylcyclopentane
97.3424 : I10-[3]
97.4918 : N10-[1]
97.7562 : unknown
98.0037 : I10-[4]
98.4609 : 3,3-dimethyloctane
98.7725 : N10-[2]
98.9848 : unknown
99.1558 : unknown
99.5488 : n-propylbenzene
99.8450 : 3,6-dimethyloctane
ODDB:54926 (D:\1DATA\D6730OCT30201103F0301.D\1103F0301.CDF)
Start Time: 89.500 - End Time: 100.000

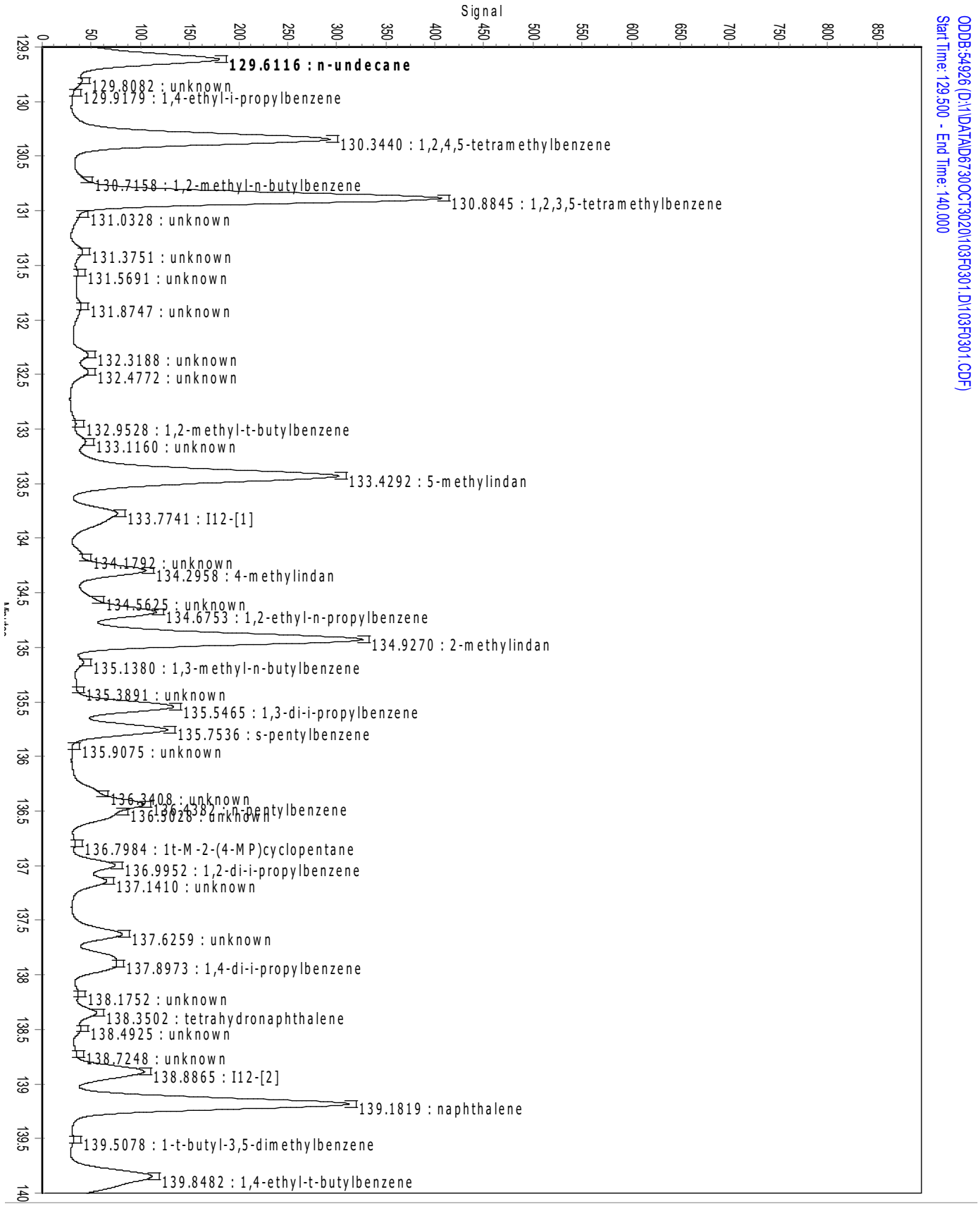

Signal
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
4,200
4,400
4,600
4,800
5,000
5,200
5,400
ODDB:54926 (D:\1DATAD6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 99.500 - End Time: 110.000
99.5
100
100.5
101
101.5
102
102.5
103
103.5
104
104.5
105
105.5
106
106.5
107
107.5
108
108.5
109
109.5
110
99.5488 : n-propylbenzene
99.8450 : 3,6-dimethyloctane
100.1006 : 3-methyl-5-ethylheptane
100.2438 : unknown
100.5663 : N10-[3]
101.1930 : unknown
101.5023 : 1,3-methylethylbenzene
101.8896 : 1,4-methylethylbenzene
102.1968 : N10-[4]
102.3775 : unknown
102.7458 : unknown
102.9444 : unknown
103.2327 : 1,3,5-trimethylbenzene
103.4969 : I10-[5]
103.7648 : N10-[5]
103.9553 : unknown
104.1938 : I10-[6]
104.5097 : 5-methylnonane
104.9154 : 4-methylnonane
105.2578 : 1,2-methylethylbenzene
105.4441 : 2-methylnonane
105.5945 : unknown
105.8663 : unknown
106.1033 : 3-ethyloctane
106.1826 : unknown
106.4700 : N10-[6]
106.8028 : 3-methylnonane
107.0219 : unknown
107.3725 : N10-[7]
107.5431 : I10-[7]
107.8163 : I10-[8]
108.1029 : unknown
108.5640 : 1,2,4-trimethylbenzene
108.7965 : unknown
108.9725 : I10-[9]
109.0783 : i-butylcyclohexane
109.2688 : unknown
109.3868 : I10-[10]
109.6693 : I10-[11]
109.8090 : I10-[12]

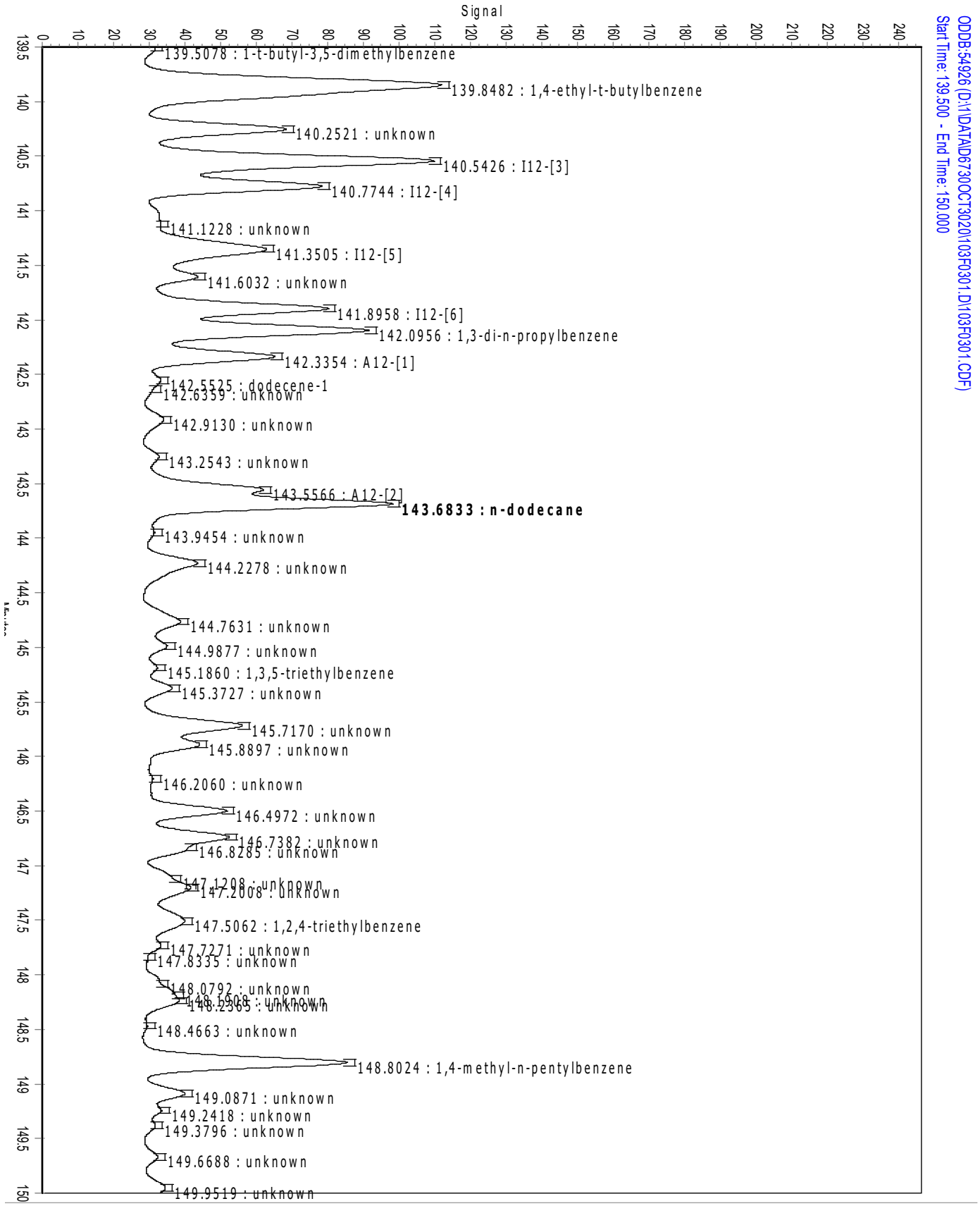


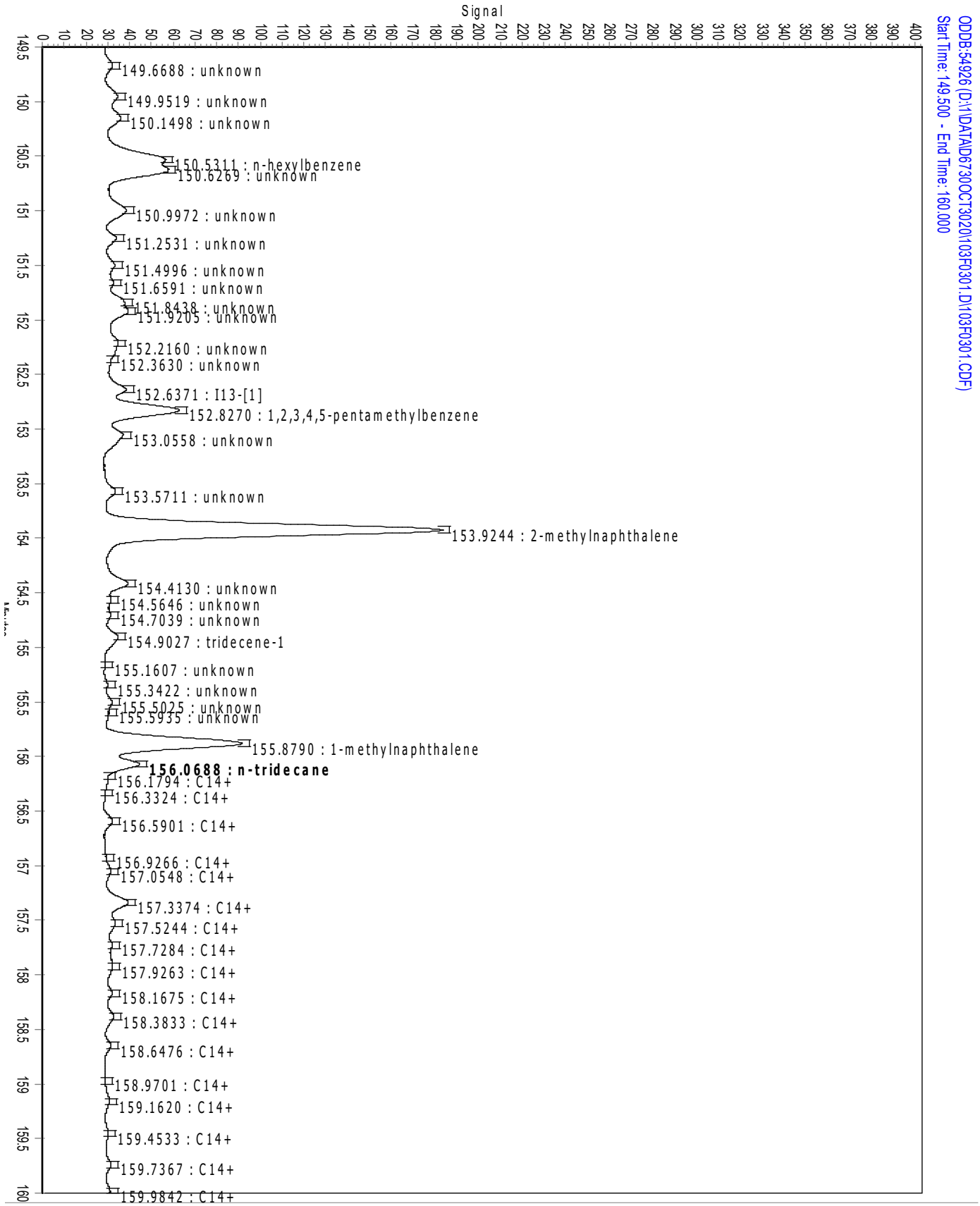
ODDB:54926 (D:\1DATA\D6730OCT30201103F0301.D\1103F0301.CDF)
Start Time: 109.500 - End Time: 120.000



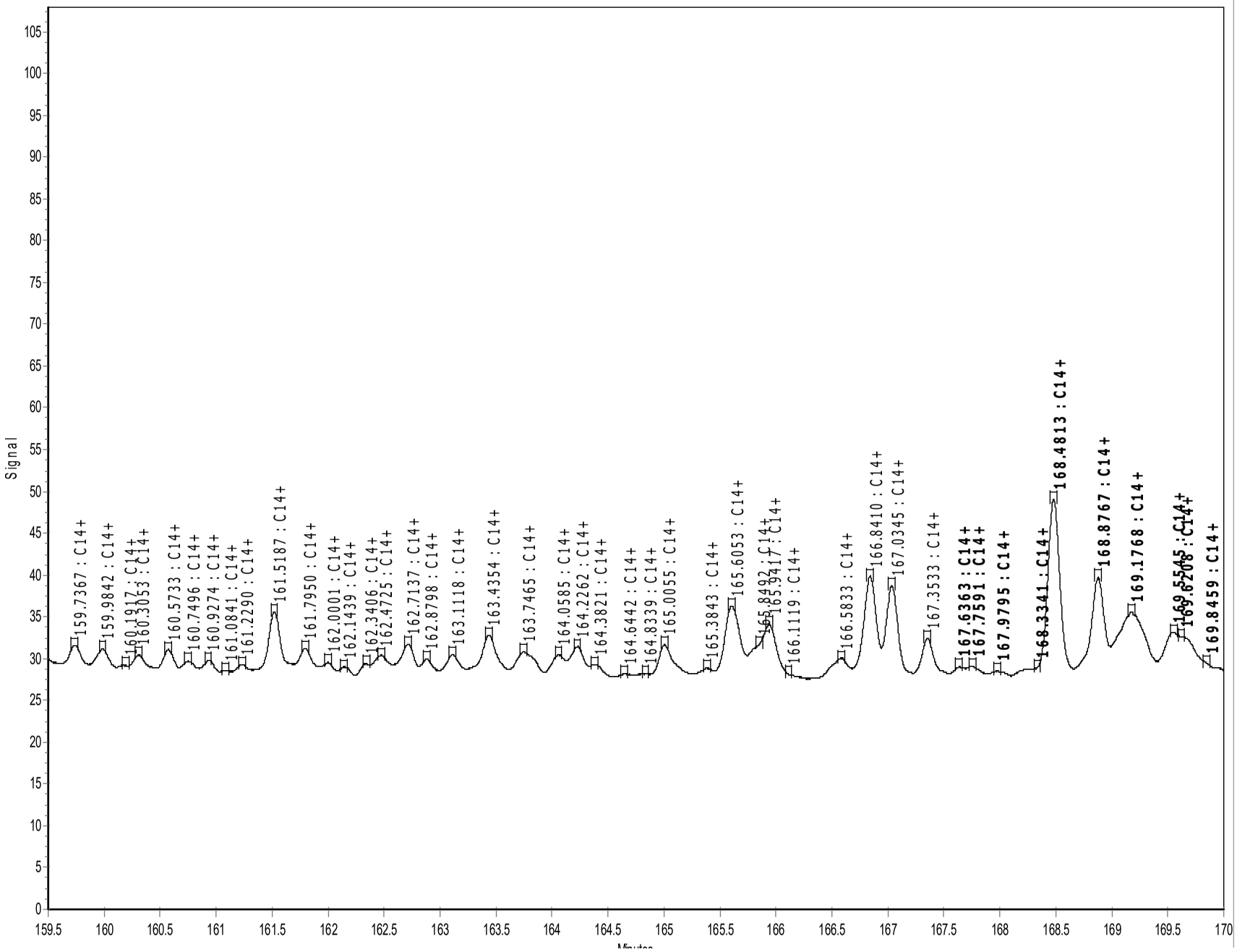
ODDB:54926 (D:\1DATA\D6730OCT30201103F0301.D\1103F0301.CDF)
Start Time: 119.500 - End Time: 130.000


Signal
ODDB:54926 (D:\1DATA\D6730OCT30201103F0301.D\103F0301.CDF)
Start Time: 129.500 - End Time: 140.000
129.6116 : n-undecane
129.8082 : unknown
129.9179 : 1,4-ethyl-i-propylbenzene
130.3440 : 1,2,4,5-tetramethylbenzene
130.7158 : 1,2-methyl-n-butylbenzene
130.8845 : 1,2,3,5-tetramethylbenzene
131.0328 : unknown
131.3751 : unknown
131.5691 : unknown
131.8747 : unknown
132.3188 : unknown
132.4772 : unknown
132.9528 : 1,2-methyl-t-butylbenzene
133.1160 : unknown
133.4292 : 5-methylindan
133.7741 : I12-[1]
134.1792 : unknown
134.2958 : 4-methylindan
134.5625 : unknown
134.6753 : 1,2-ethyl-n-propylbenzene
134.9270 : 2-methylindan
135.1380 : 1,3-methyl-n-butylbenzene
135.3891 : unknown
135.5465 : 1,3-di-i-propylbenzene
135.7536 : s-pentylbenzene
135.9075 : unknown
136.3408 : unknown
136.4382 : n-pentylbenzene
136.5028 : unknown
136.7984 : 1t-M-2-(4-MP)cyclopentane
136.9952 : 1,2-di-i-propylbenzene
137.1410 : unknown
137.6259 : unknown
137.8973 : 1,4-di-i-propylbenzene
138.1752 : unknown
138.3502 : tetrahydronaphthalene
138.4925 : unknown
138.7248 : unknown
138.8865 : I12-[2]
139.1819 : naphthalene
139.5078 : 1-t-butyl-3,5-dimethylbenzene
139.8482 : 1,4-ethyl-t-butylbenzene

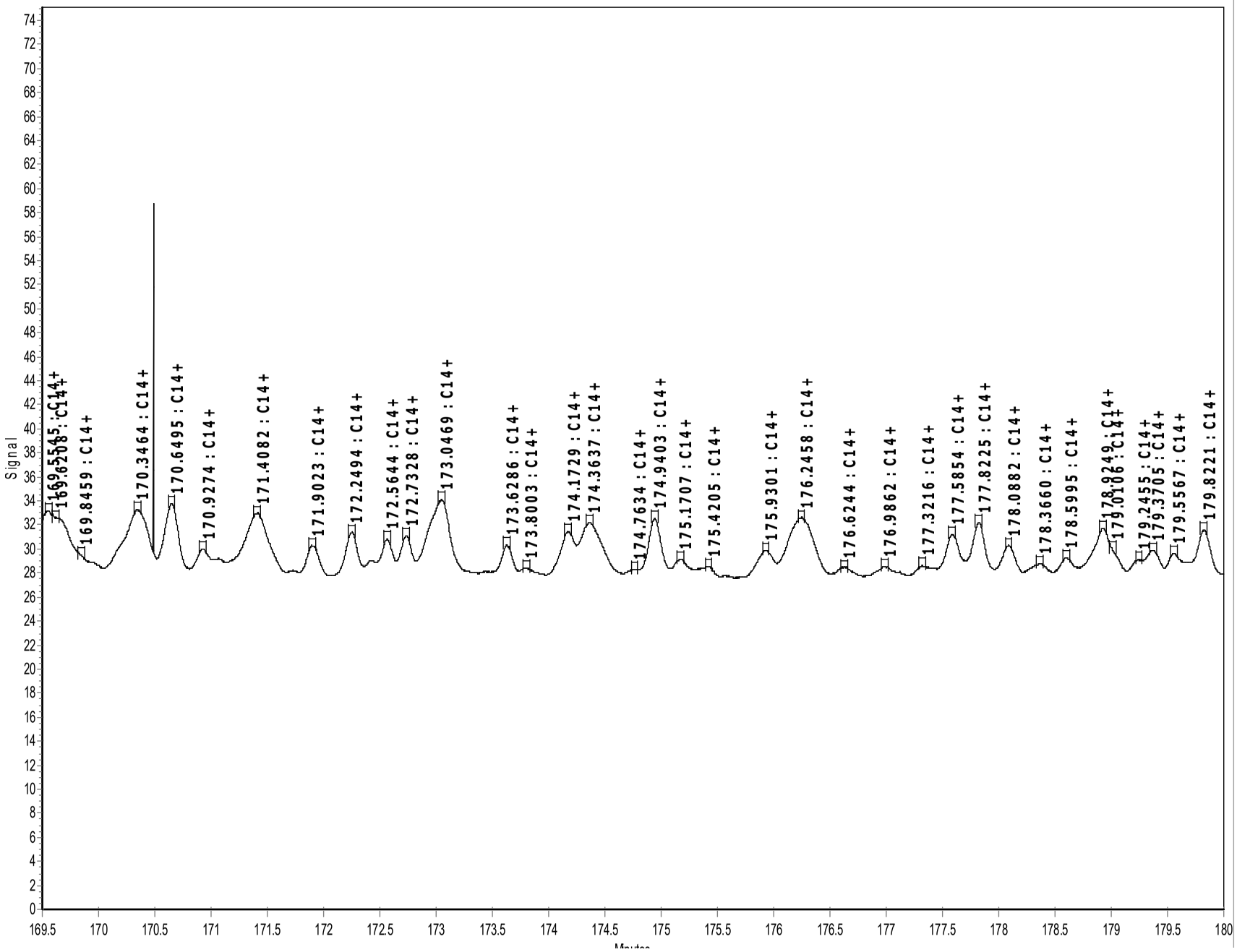

Signal
ODDB:54926 (D:\1DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 139.500 - End Time: 150.000
139.5078 : 1-t-butyl-3,5-dimethylbenzene
139.8482 : 1,4-ethyl-t-butylbenzene
140.2521 : unknown
140.5426 : I12-[3]
140.7744 : I12-[4]
141.1228 : unknown
141.3505 : I12-[5]
141.6032 : unknown
141.8958 : I12-[6]
142.0956 : 1,3-di-n-propylbenzene
142.3354 : A12-[1]
142.5525 : dodecene-1
142.6359 : unknown
142.9130 : unknown
143.2543 : unknown
143.5566 : A12-[2]
143.6833 : n-dodecane
143.9454 : unknown
144.2278 : unknown
144.7631 : unknown
144.9877 : unknown
145.1860 : 1,3,5-triethylbenzene
145.3727 : unknown
145.7170 : unknown
145.8897 : unknown
146.2060 : unknown
146.4972 : unknown
146.7382 : unknown
146.8285 : unknown
147.1208 : unknown
147.2008 : unknown
147.5062 : 1,2,4-triethylbenzene
147.7271 : unknown
147.8335 : unknown
148.0792 : unknown
148.1908 : unknown
148.2365 : unknown
148.4663 : unknown
148.8024 : 1,4-methyl-n-pentylbenzene
149.0871 : unknown
149.2418 : unknown
149.3796 : unknown
149.6688 : unknown
149.9519 : unknown


Signal
ODDB:54926 (D:\1DATA\D6730OCT30201103F0301.D\103F0301.CDF)
Start Time: 149.500 - End Time: 160.000
149.6688 : unknown
149.9519 : unknown
150.1498 : unknown
150.5311 : n-hexylbenzene
150.6269 : unknown
150.9972 : unknown
151.2531 : unknown
151.4996 : unknown
151.6591 : unknown
151.8438 : unknown
151.9205 : unknown
152.2160 : unknown
152.3630 : unknown
152.6371 : I13-[1]
152.8270 : 1,2,3,4,5-pentamethylbenzene
153.0558 : unknown
153.5711 : unknown
153.9244 : 2-methylnaphthalene
154.4130 : unknown
154.5646 : unknown
154.7039 : unknown
154.9027 : tridecene-1
155.1607 : unknown
155.3422 : unknown
155.5025 : unknown
155.5935 : unknown
155.8790 : 1-methylnaphthalene
156.0688 : n-tridecane
156.1794 : C14+
156.3324 : C14+
156.5901 : C14+
156.9266 : C14+
157.0548 : C14+
157.3374 : C14+
157.5244 : C14+
157.7284 : C14+
157.9263 : C14+
158.1675 : C14+
158.3833 : C14+
158.6476 : C14+
158.9701 : C14+
159.1620 : C14+
159.4533 : C14+
159.7367 : C14+
159.9842 : C14+

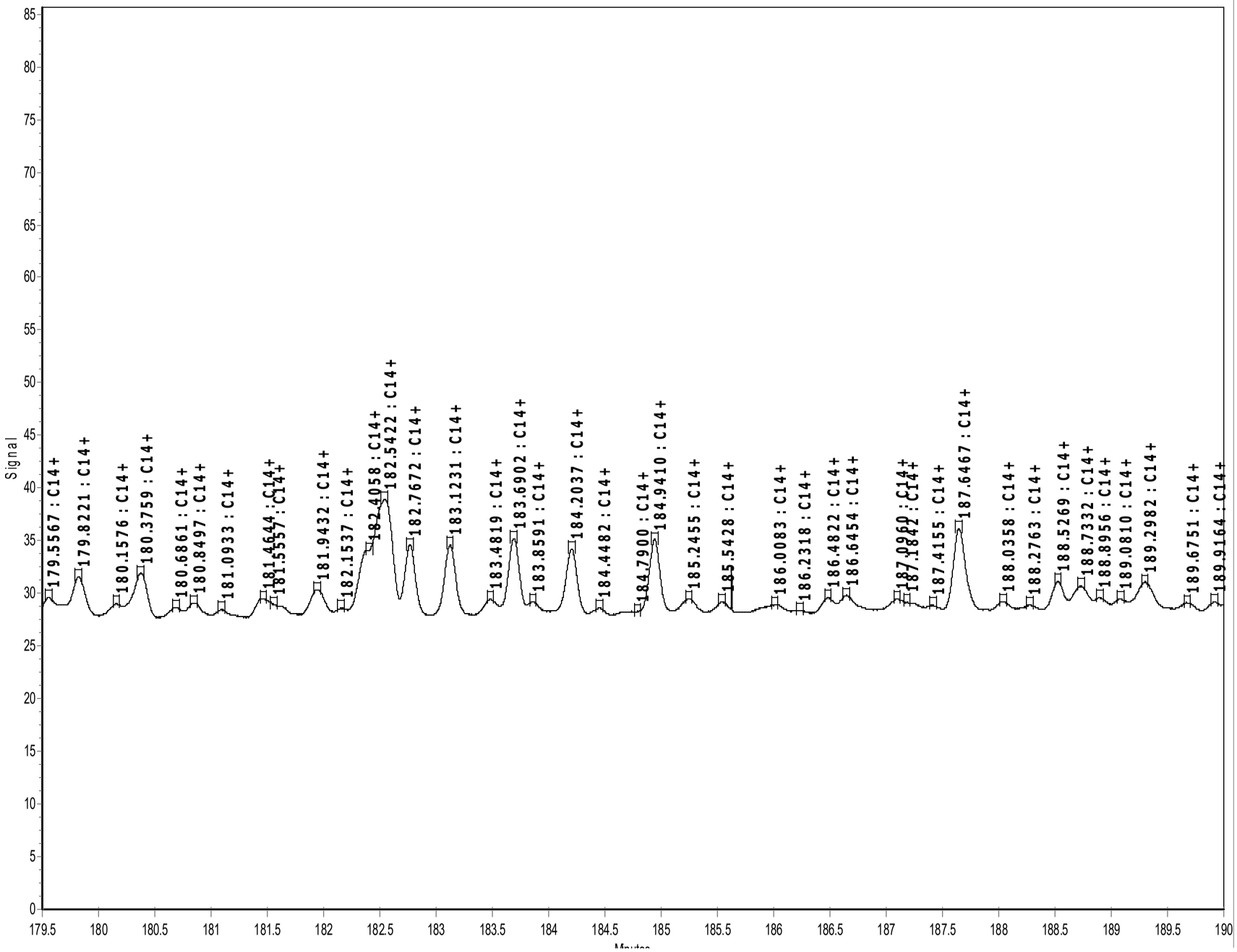
ODDB:54926 (D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 159.500 - End Time: 170.000



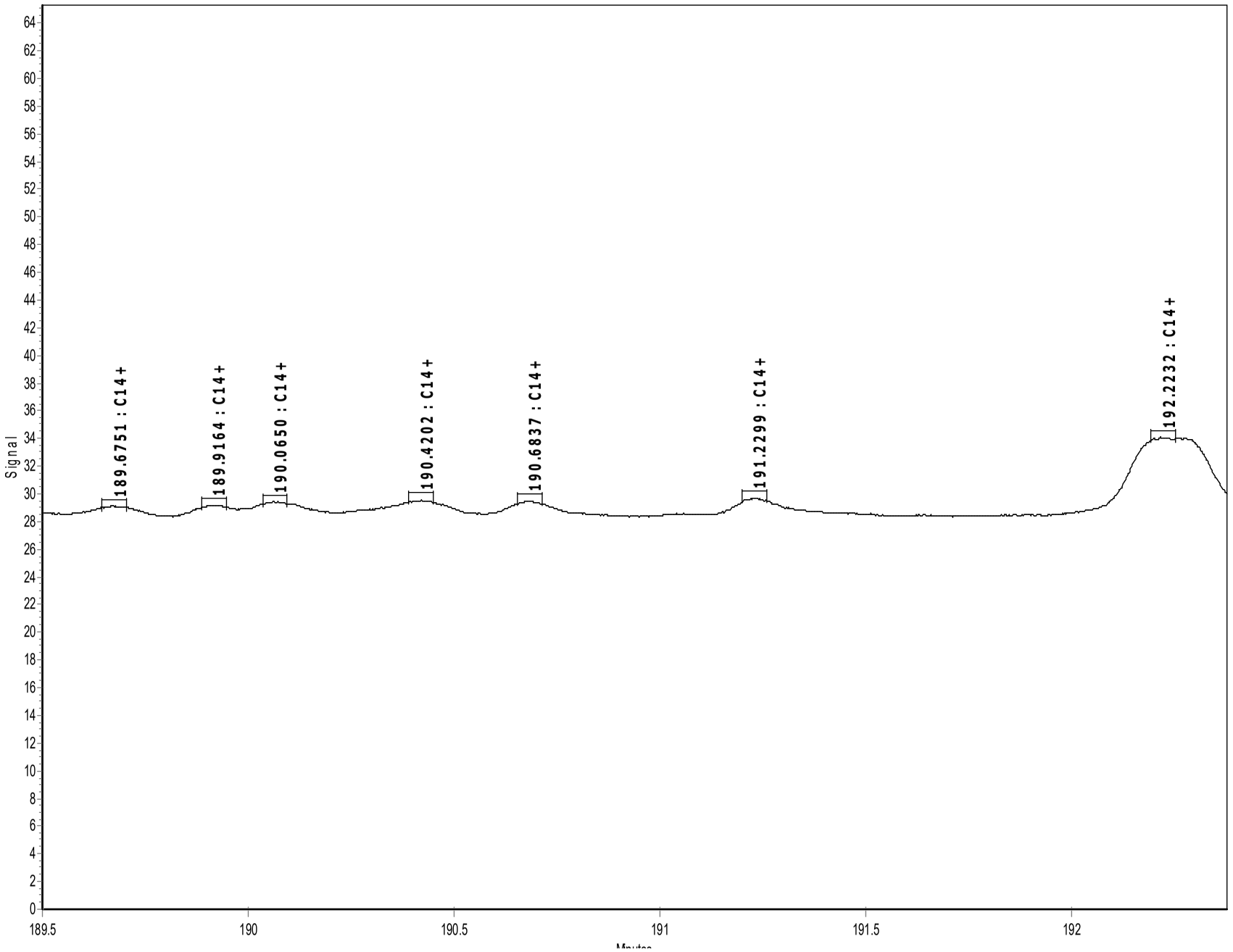
ODDB:54926 (D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 169.500 - End Time: 180.000



ODDB:54926 (D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 179.500 - End Time: 190.000



ODDB:54926 (D:\1\DATA\D6730OCT3020\103F0301.D\103F0301.CDF)
Start Time: 189.500 - End Time: 192.378



Detailed Hydrocarbon Analysis Summary Report -

Report Date: 11/2/2020 9:17:46 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Location: GC 12 D6730
Normalized to 100.000%

SUMMARY REPORT

Group Type	Total(Mass%)	Total(Vol%)	Total(Mol%)
Paraffins:	7.879	8.832	8.093
I-Paraffins:	39.619	43.084	35.942
Olefins:	4.191	4.509	4.543
Naphthenes:	12.190	11.763	10.841
Aromatics:	23.391	19.721	18.843
Total C14+:	0.390	0.376	0.173
Total Unknowns:	1.692	1.779	1.218

Oxygenates:

Total:	10.648(Mass%)	9.936(Vol%)
Total Oxygen Content:	3.698(Mass%)	

Multisubstituted Aromatics: 14.827(Mass%) 12.534(Vol%)

Average Molecular Weight: 88.030

Relative Density: 0.736

Vapor Pressure :

Calculated Octane Number: 86.0

Motor Octane Number (Jenkins Calculation): 78.1

	IBP	T10	T50	T90	FBP
BP by Mass (Deg F)	31.10	173.30	210.63	334.04	465.89
BP by Vol (Deg F)	31.10	173.30	210.63	334.04	465.89

Percent Carbon: 83.877
Percent Hydrogen: 12.425
Bromine Number (Calc): 7.851
Particulate Matter Index: 1.156

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Oxygenates

Compound	Mass%	Mass% Oxygen	Vol%
ethanol : X2	10.648	3.698	9.936

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Totals by Group Type & Carbon Number (in Mass Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.505	0.105	0.048	0.000	0.000	0.000	0.658
C5	2.490	7.000	1.810	0.341	0.000	0.001	11.641
C6	1.894	7.939	1.182	3.284	0.725	0.045	15.070
C7	1.389	8.651	0.763	3.940	4.747	0.008	19.497
C8	0.834	9.933	0.070	2.870	7.619	0.208	21.533
C9	0.391	3.395	0.207	1.393	5.870	0.187	11.443
C10	0.207	1.790	0.076	0.311	3.638	0.242	6.264
C11	0.110	0.534	0.021	0.047	0.407	0.385	1.504
C12	0.047	0.265	0.006	0.005	0.386	0.309	1.018
C13	0.009	0.008	0.007	0.000	0.000	0.306	0.331
Total:	7.879	39.619	4.191	12.190	23.391	1.692	87.270

Oxygenates 10.648
Total C14+: 0.390
Total Unknowns: 1.692
Grand Total: 100.000

Totals by Group Type & Carbon Number (in Volume Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.003
C4	0.643	0.139	0.058	0.000	0.000	0.000	0.839
C5	2.928	8.317	2.022	0.336	0.000	0.001	13.604
C6	2.115	8.888	1.238	3.198	0.607	0.048	16.094
C7	1.496	9.297	0.792	3.839	4.031	0.008	19.464
C8	0.874	10.378	0.071	2.742	6.465	0.218	20.749
C9	0.401	3.476	0.219	1.314	4.961	0.197	10.566
C10	0.208	1.794	0.076	0.285	3.015	0.255	5.634
C11	0.109	0.528	0.021	0.044	0.322	0.405	1.429
C12	0.046	0.259	0.006	0.004	0.319	0.325	0.960
C13	0.009	0.008	0.007	0.000	0.000	0.322	0.346
Total:	8.832	43.084	4.509	11.763	19.721	1.779	87.908

Oxygenates 9.936
Total C14+: 0.376
Total Unknowns: 1.779
Grand Total: 100.000

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Totals by Group Type & Carbon Number (in Mol Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.001	0.000	0.000	0.000	0.000	0.000	0.001
C3	0.003	0.000	0.000	0.000	0.000	0.000	0.004
C4	0.765	0.159	0.075	0.000	0.000	0.001	1.000
C5	3.038	8.540	2.276	0.427	0.000	0.001	14.283
C6	1.935	8.110	1.243	3.435	0.817	0.121	15.660
C7	1.220	7.600	0.683	3.532	4.535	0.009	17.579
C8	0.643	7.655	0.054	2.251	6.317	0.166	17.086
C9	0.268	2.330	0.144	0.972	4.299	0.142	8.155
C10	0.128	1.108	0.048	0.194	2.421	0.177	4.076
C11	0.062	0.301	0.012	0.027	0.244	0.255	0.901
C12	0.024	0.137	0.003	0.002	0.209	0.181	0.557
C13	0.005	0.004	0.003	0.000	0.000	0.167	0.178
Total:	8.093	35.942	4.543	10.841	18.843	1.218	78.262

Oxygenates 20.347
Total C14+: 0.173
Total Unknowns: 1.218
Grand Total: 100.000

Detailed Hydrocarbon Analysis - Dienes (Di-Olefins) Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Diene Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %
13.032	481.390	O5	1,4-pentadiene	0.001	0.001	0.001
14.849	506.110	O5	2-methylbutadiene-1,3	0.007	0.008	0.009
16.187	527.950	O5	1t,3-pentadiene	0.008	0.008	0.010
16.886	538.200	O5	cyclopentadiene	0.005	0.006	0.007
20.387	580.980	O6	1,5-hexadiene	0.000	0.000	0.000
21.990	597.090	O6	1c/t,4-hexadiene	0.000	0.000	0.000
25.274	632.930	O7	cyclic diolefin or triolefin-[1]	0.002	0.003	0.003
25.836	638.570	O7	cyclic diolefin or triolefin-[2]	0.007	0.007	0.007
28.353	661.940	O6	diolefin (hexadiene)	0.003	0.003	0.003
36.538	720.920	N8	1,1,3-trimethylcyclopentane	0.180	0.177	0.141

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 6**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
6.436	100.000	P1	methane	0.000	0.000	0.000	-258.700	-161.500
6.621	200.000	P2	ethane	0.000	0.000	0.001	-127.480	-88.600
7.115	293.470	O3	propylene	0.000	0.000	0.000	-53.896	-47.720
7.177	300.000	P3	propane	0.002	0.002	0.003	-43.672	-42.040
8.192	366.110	I4	i-butane	0.105	0.139	0.159	10.904	-11.720
8.343	372.490	--	unknown	0.000	0.000	0.001	32.000	0.000
8.849	390.700	O4	butene-1	0.002	0.003	0.004	20.750	-6.250
8.880	391.700	O4	isobutylene	0.003	0.004	0.005	20.750	-6.250
9.155	400.000	P4	n-butane	0.505	0.643	0.765	31.100	-0.500
9.546	412.290	O4	t-butene-2	0.018	0.022	0.028	33.584	0.880
9.643	415.120	I5	2,2-dimethylpropane	0.003	0.004	0.004	49.100	9.500
9.876	421.560	--	unknown	0.001	0.001	0.001	32.000	0.000
10.131	428.120	O4	c-butene-2	0.024	0.029	0.038	38.696	3.720
11.667	460.050	X2	ethanol	10.648	9.936	20.347	173.300	78.500
11.713	460.850	O5	3-methylbutene-1	0.071	0.084	0.090	68.090	20.050
12.774	477.720	I5	i-pentane	6.996	8.313	8.536	82.112	27.840
13.032	481.390	O5	1,4-pentadiene	0.001	0.001	0.001	78.728	25.960
13.747	490.870	O5	pentene-1	0.123	0.142	0.155	85.928	29.960
14.223	496.680	O5	2-methylbutene-1	0.286	0.323	0.358	88.070	31.150
14.508	500.000	P5	n-pentane	2.490	2.928	3.038	96.908	36.060
14.849	506.110	O5	2-methylbutadiene-1,3	0.007	0.008	0.009	93.308	34.060
15.096	510.400	O5	t-pentene-2	0.372	0.423	0.467	97.412	36.340
15.467	516.600	O5	3,3-dimethylbutene-1	0.005	0.006	0.006	106.232	41.240
15.637	519.360	O5	c-pentene-2	0.207	0.232	0.260	98.474	36.930
15.796	521.900	--	unknown	0.000	0.000	0.001	32.000	0.000
15.974	524.690	O5	2-methylbutene-2	0.622	0.692	0.781	101.408	38.560
16.187	527.950	O5	1t,3-pentadiene	0.008	0.008	0.010	107.636	42.020
16.307	529.760	--	unknown	0.001	0.001	0.001	32.000	0.000
16.886	538.200	O5	cyclopentadiene	0.005	0.006	0.007	32.000	0.000
17.015	540.010	I6	2,2-dimethylbutane	0.446	0.506	0.456	121.514	49.730
18.313	557.150	O5	cyclopentene	0.102	0.097	0.131	111.614	44.230

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 7**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
18.680	561.650	O6	4-methylpentene-1	0.024	0.026	0.025	128.948	53.860
18.748	562.480	O6	3-methylpentene-1	0.035	0.039	0.037	129.506	54.170
18.831	563.470	--	unknown	0.002	0.002	0.002	32.000	0.000
19.105	566.710	N5	cyclopentane	0.341	0.336	0.427	120.650	49.250
19.292	568.880	I6	2,3-dimethylbutane	1.359	1.512	1.388	136.364	57.980
19.448	570.660	--	unknown	0.043	0.045	0.118	32.000	0.000
19.706	573.560	I6	2-methylpentane	3.788	4.270	3.869	140.468	60.260
19.836	575.010	O6	4-methyl-t-pentene-2	0.069	0.075	0.072	137.480	58.600
20.387	580.980	O6	1,5-hexadiene	0.000	0.000	0.000	139.010	59.450
20.811	585.420	I6	3-methylpentane	2.346	2.600	2.397	145.886	63.270
21.262	589.990	O6	2-methylpentene-1	0.114	0.122	0.119	143.780	62.100
21.352	590.880	O6	hexene-1	0.049	0.053	0.051	146.246	63.470
21.990	597.090	O6	1c/t,4-hexadiene	0.000	0.000	0.000	149.000	65.000
22.298	600.000	P6	n-hexane	1.894	2.115	1.935	155.714	68.730
22.522	602.680	O6	t-hexene-3	0.074	0.080	0.078	152.744	67.080
22.588	603.470	O6	c-hexene-3	0.025	0.026	0.026	151.592	66.440
22.740	605.260	O6	t-hexene-2	0.146	0.157	0.152	154.184	67.880
22.821	606.210	--	unknown	0.001	0.001	0.001	32.000	0.000
22.943	607.630	O6	2-methylpentene-2	0.185	0.198	0.194	153.140	67.300
23.022	608.550	O6	4-methylcyclopentene	0.050	0.048	0.054	148.820	64.900
23.185	610.410	O6	3-methyl-c-pentene-2	0.113	0.119	0.118	153.842	67.690
23.308	611.820	O6	3-methylcyclopentene	0.027	0.026	0.029	149.000	65.000
23.416	613.040	O6	O6-[1]	0.000	0.000	0.000	32.000	0.000
23.548	614.520	O6	c-hexene-2	0.079	0.084	0.083	155.984	68.880
23.784	617.150	O6	O6-[2]	0.001	0.001	0.001	32.000	0.000
24.113	620.750	O7	3,3-dimethylpentene-1	0.174	0.183	0.156	171.446	77.470
24.253	622.260	--	unknown	0.001	0.001	0.003	32.000	0.000
24.307	622.840	O7	4,4-dimethyl-t-pentene-2	0.001	0.001	0.001	170.114	76.730
24.408	623.920	I7	2,2-dimethylpentane	0.104	0.113	0.091	174.542	79.190
24.626	626.230	N6	methylcyclopentane	2.454	2.413	2.567	161.240	71.800
25.037	630.510	I7	2,4-dimethylpentane	1.538	1.684	1.352	176.882	80.490

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
25.274	632.930	O7	cyclic diolefin or triolefin-[1]	0.002	0.003	0.003	32.000	0.000
25.457	634.780	I7	2,2,3-trimethylbutane	0.049	0.052	0.043	177.584	80.880
25.623	636.450	--	unknown	0.002	0.002	0.002	32.000	0.000
25.836	638.570	O7	cyclic diolefin or triolefin-[2]	0.007	0.007	0.007	32.000	0.000
26.173	641.870	O7	O7-[1]	0.002	0.002	0.002	32.000	0.000
26.285	642.950	O7	3,4-dimethylpentene-1	0.006	0.006	0.005	177.422	80.790
26.656	646.500	O7	4,4-dimethyl-c-pentene-2	0.008	0.009	0.007	176.756	80.420
26.802	647.880	O7	2,4-dimethylpentene-1	0.008	0.009	0.007	178.880	81.600
26.905	648.840	O6	1-methylcyclopentene	0.188	0.178	0.202	167.864	75.480
27.104	650.700	A6	benzene	0.725	0.607	0.817	176.162	80.090
27.286	652.380	O7	2-methyl-c-hexene-3	0.004	0.005	0.004	186.800	86.000
27.501	654.350	I7	3,3-dimethylpentane	0.098	0.104	0.086	186.908	86.060
27.602	655.270	O7	5-methylhexene-1	0.010	0.011	0.009	185.558	85.310
27.794	656.990	--	unknown	0.004	0.004	0.003	32.000	0.000
27.928	658.200	N6	cyclohexane	0.830	0.785	0.868	177.296	80.720
28.224	660.810	O7	2-methyl-t-hexene-3	0.017	0.018	0.015	186.620	85.900
28.353	661.940	O6	diolefin (hexadiene)	0.003	0.003	0.003	158.000	70.000
28.445	662.750	O7	2-ethyl-3-methylbutene-1	0.006	0.007	0.006	187.448	86.360
28.572	663.850	O7	4-methylhexene-1	0.014	0.015	0.013	188.114	86.730
28.878	666.480	O7	4-methyl-t/c-hexene-2	0.024	0.025	0.022	187.358	86.310
29.042	667.880	I7	2-methylhexane	2.018	2.189	1.772	194.090	90.050
29.206	669.260	I7	2,3-dimethylpentane	2.601	2.755	2.285	193.604	89.780
29.488	671.620	N7	1,1-dimethylcyclopentane	0.076	0.074	0.068	189.464	87.480
29.810	674.280	O7	5-methyl-t-hexene-2	0.023	0.024	0.021	190.598	88.110
30.024	676.030	I7	3-methylhexane	2.052	2.199	1.803	197.330	91.850
30.452	679.470	O7	3,4-dimethyl-c-pentene-2	0.013	0.013	0.011	192.650	89.250
30.760	681.910	N7	1c,3-dimethylcyclopentane	0.699	0.691	0.626	195.386	90.770
31.113	684.670	N7	1t,3-dimethylcyclopentane	0.621	0.611	0.557	197.096	91.720
31.291	686.050	I7	3-ethylpentane	0.191	0.201	0.168	200.246	93.470
31.480	687.510	N7	1t,2-dimethylcyclopentane	0.608	0.596	0.545	197.366	91.870
31.662	688.890	I8	2,2,4-trimethylpentane	2.863	3.047	2.206	210.632	99.240

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF Acquired: 10/31/20 06:07:04
Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
32.212	693.030	O7	O7-[2]	0.001	0.001	0.001	32.000	0.000
32.451	694.800	O7	3-methyl-c-hexene-3	0.022	0.022	0.020	203.720	95.400
32.987	698.710	O7	t-heptene-3	0.079	0.083	0.071	204.206	95.670
33.166	700.000	P7	n-heptane	1.389	1.496	1.220	209.156	98.420
33.463	701.940	O7	2-methyl-2-hexene	0.083	0.085	0.074	203.738	95.410
33.617	702.940	O7	3-methyl-t-hexene-3	0.031	0.033	0.028	200.372	93.540
33.862	704.520	O7	t-heptene-2	0.031	0.032	0.028	208.310	97.950
34.091	705.990	O7	3-ethylpentene-2	0.021	0.021	0.019	204.818	96.010
34.579	709.070	O7	c-heptene-2	0.078	0.081	0.070	209.138	98.410
34.768	710.250	O7	3-methyl-t-hexene-2	0.001	0.001	0.001	203.324	95.180
35.095	712.270	O7	2,3-dimethylpentene-2	0.033	0.034	0.030	207.320	97.400
35.326	713.680	O7	3-ethylcyclopentene	0.004	0.004	0.003	207.986	97.770
35.414	714.220	--	unknown	0.001	0.001	0.001	32.000	0.000
35.720	716.070	O7	O7-[3]	0.006	0.007	0.006	32.000	0.000
35.986	717.660	N7	1c,2-dimethylcyclopentane	0.292	0.294	0.262	211.154	99.530
36.114	718.420	N7	methylcyclohexane	1.296	1.240	1.161	213.674	100.930
36.429	720.280	I8	2,2-dimethylhexane	0.040	0.042	0.031	224.312	106.840
36.538	720.920	N8	1,1,3-trimethylcyclopentane	0.180	0.177	0.141	220.802	104.890
36.868	722.840	O7	O7-[4]	0.005	0.005	0.004	32.000	0.000
36.956	723.350	O7	O7-[5]	0.002	0.002	0.002	32.000	0.000
37.147	724.450	O7	O7-[6]	0.005	0.005	0.004	32.000	0.000
37.265	725.120	--	unknown	0.001	0.001	0.001	32.000	0.000
37.506	726.490	O7	O7-[7]	0.006	0.006	0.006	32.000	0.000
38.007	729.310	N7	ethylcyclopentane	0.348	0.334	0.312	218.246	103.470
38.131	730.000	I8	2,5-dimethylhexane	0.580	0.616	0.447	228.398	109.110
38.321	731.050	I8	2,2,3-trimethylpentane	0.114	0.118	0.088	229.730	109.850
38.470	731.880	I8	2,4-dimethylhexane	0.670	0.705	0.517	228.974	109.430
38.596	732.570	--	unknown	0.012	0.013	0.009	32.000	0.000
38.813	733.760	--	unknown	0.002	0.002	0.001	32.000	0.000
38.927	734.370	O7	O7-[8]	0.002	0.002	0.002	32.000	0.000
39.161	735.640	O7	O7-[9]	0.002	0.002	0.001	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

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Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
39.475	737.320	N8	1c,2t,4-trimethylcyclopentane	0.294	0.283	0.230	242.132	116.740
39.693	738.480	I8	3,3-dimethylhexane	0.058	0.060	0.045	233.546	111.970
40.179	741.040	O7	O7-[10]	0.003	0.003	0.003	32.000	0.000
40.481	742.600	O7	O7-[11]	0.002	0.002	0.002	32.000	0.000
40.634	743.400	O7	O7-[12]	0.005	0.005	0.004	32.000	0.000
40.839	744.450	N8	1t,2c,3-trimethylcyclopentane	0.213	0.204	0.167	230.738	110.410
41.380	747.200	I8	2,3,4-trimethylpentane	1.258	1.288	0.969	236.246	113.470
41.597	748.280	I8	I8-[1]	0.078	0.080	0.060	236.246	113.470
41.895	749.780	O7	O7-[13]	0.021	0.021	0.016	32.000	0.000
42.201	751.290	I8	2,3,3-trimethylpentane	1.186	1.203	0.914	238.586	114.770
42.632	753.400	A7	toluene	4.747	4.031	4.535	231.134	110.630
42.760	754.020	O8	O8-[1]	0.004	0.004	0.003	32.000	0.000
42.937	754.880	O8	O8-[2]	0.001	0.001	0.001	32.000	0.000
43.080	755.570	O8	O8-[3]	0.006	0.006	0.005	32.000	0.000
43.193	756.110	--	unknown	0.001	0.001	0.001	32.000	0.000
43.617	758.130	I8	2,3-dimethylhexane	0.556	0.575	0.428	240.098	115.610
43.791	758.950	I8	2-methyl-3-ethylpentane	0.071	0.073	0.055	240.098	115.610
44.088	760.350	N8	1,1,2-trimethylcyclopentane	0.010	0.010	0.008	236.714	113.730
44.533	762.420	O8	O8-[4]	0.028	0.028	0.022	32.000	0.000
44.944	764.310	I8	2-methylheptane	0.935	0.986	0.720	243.770	117.650
45.254	765.720	I8	4-methylheptane	0.356	0.372	0.275	243.878	117.710
45.512	766.890	I8	3-methyl-3-ethylpentane	0.072	0.075	0.056	240.098	115.610
45.624	767.390	I8	3,4-dimethylhexane	0.089	0.091	0.069	243.914	117.730
46.244	770.160	N8	1c,2c,4-trimethylcyclopentane	0.112	0.108	0.088	242.168	116.760
46.656	771.970	I8	3-methylheptane	0.892	0.931	0.688	246.074	118.930
46.928	773.160	--	unknown	0.189	0.199	0.146	32.000	0.000
47.010	773.510	N8	1c,2t,3-trimethylcyclopentane	0.417	0.398	0.327	243.500	117.500
47.179	774.250	I8	3-ethylhexane	0.114	0.117	0.087	245.372	118.540
47.452	775.430	N8	1t,4-dimethylcyclohexane	0.196	0.189	0.154	246.848	119.360
47.894	777.310	--	unknown	0.002	0.002	0.006	32.000	0.000
48.271	778.910	--	unknown	0.001	0.001	0.002	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
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Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
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Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
48.426	779.560	O8	O8-[5]	0.001	0.001	0.001	32.000	0.000
48.774	781.010	N8	1,1-dimethylcyclohexane	0.035	0.033	0.027	247.190	119.550
49.238	782.930	I9	2,2,5-trimethylhexane	0.635	0.661	0.436	255.362	124.090
49.661	784.660	N8	3c-ethylmethylcyclopentane	0.215	0.206	0.169	249.980	121.100
49.884	785.570	O9	2,6-dimethylheptene-1	0.003	0.003	0.002	32.000	0.000
50.211	786.900	N8	3t-ethylmethylcyclopentane	0.182	0.175	0.143	249.980	121.100
50.544	788.230	N8	2t-ethylmethylcyclopentane	0.166	0.159	0.130	250.160	121.200
51.006	790.070	O8	O8-[6]	0.007	0.007	0.006	32.000	0.000
51.122	790.520	N8	1,1-methylethylcyclopentane	0.022	0.020	0.017	250.754	121.530
51.817	793.240	N8	1t,2-dimethylcyclohexane	0.194	0.184	0.152	254.174	123.430
52.063	794.190	O8	t-octene-4	0.007	0.008	0.006	252.068	122.260
52.424	795.580	O9	3,5,5-trimethylhexene-1	0.001	0.001	0.001	32.000	0.000
52.885	797.340	N8	1c,2c,3-trimethylcyclopentane	0.032	0.030	0.025	253.400	123.000
53.590	800.000	P8	n-octane	0.834	0.874	0.643	258.224	125.680
53.869	801.040	N8	1c,4-dimethylcyclohexane	0.270	0.254	0.212	255.794	124.330
54.739	804.270	O8	t-octene-2	0.008	0.009	0.007	32.000	0.000
54.963	805.090	--	unknown	0.005	0.005	0.014	32.000	0.000
55.331	806.440	I9	I9-[1]	0.037	0.038	0.026	32.000	0.000
55.423	806.770	--	unknown	0.019	0.020	0.013	32.000	0.000
55.829	808.240	N8	i-propylcyclopentane	0.085	0.081	0.067	259.574	126.430
56.491	810.600	--	unknown	0.004	0.004	0.003	32.000	0.000
56.760	811.550	O9	O9-[1]	0.001	0.001	0.001	32.000	0.000
57.033	812.510	--	unknown	0.008	0.009	0.006	32.000	0.000
57.132	812.860	O8	c-octene-2	0.004	0.004	0.003	32.000	0.000
57.398	813.790	--	unknown	0.001	0.001	0.001	32.000	0.000
57.700	814.840	N8	N8-[1]	0.014	0.014	0.011	32.000	0.000
58.065	816.100	O8	O8-[1]	0.002	0.002	0.002	32.000	0.000
58.448	817.410	I9	2,2,3,4-tetramethylpentane	0.127	0.126	0.087	271.454	133.030
59.087	819.580	I9	2,3,4-trimethylhexane	0.072	0.071	0.049	282.308	139.060
59.390	820.600	N8	N8-[2]	0.003	0.003	0.002	32.000	0.000
59.646	821.460	O9	O9-[1]	0.031	0.032	0.022	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

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Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
60.061	822.830	N8	N8-[3]	0.001	0.001	0.001	32.000	0.000
60.501	824.290	O9	O9-[2]	0.006	0.006	0.004	32.000	0.000
61.041	826.050	N8	1c,2-dimethylcyclohexane	0.191	0.176	0.150	265.532	129.740
61.241	826.700	--	unknown	0.022	0.024	0.018	32.000	0.000
61.629	827.950	I9	2,3,5-trimethylhexane	0.007	0.007	0.005	268.430	131.350
61.944	828.970	I9	2,2-dimethylheptane	0.013	0.014	0.009	270.860	132.700
62.456	830.590	--	unknown	0.001	0.001	0.001	32.000	0.000
62.829	831.770	N9	1,1,4-trimethylcyclohexane	0.340	0.324	0.237	275.000	135.000
63.398	833.560	I9	2,2,3-trimethylhexane	0.161	0.166	0.110	271.220	132.900
63.981	835.370	I9	2,4-dimethylheptane	0.034	0.035	0.023	271.220	132.900
64.727	837.650	I9	4,4-dimethylheptane	0.196	0.202	0.135	271.220	132.900
65.049	838.630	N8	ethylcyclohexane	0.001	0.001	0.001	269.222	131.790
65.629	840.380	N8	n-propylcyclopentane	0.032	0.030	0.025	267.728	130.960
65.837	841.000	I9	2,5-dimethylheptane	0.266	0.274	0.183	276.800	136.000
66.295	842.370	I9	3,3-&3,5-dimethylheptane	0.062	0.063	0.042	278.636	137.020
66.703	843.570	I9	3,5-dimethylheptane	0.042	0.043	0.029	276.800	136.000
67.182	844.980	I9	2,6-dimethylheptane	0.072	0.075	0.050	275.396	135.220
67.805	846.790	N9	1,1,3-trimethylcyclohexane	0.049	0.046	0.034	295.862	146.590
68.304	848.230	O9	2,4-dimethylheptene-1	0.002	0.002	0.001	32.000	0.000
68.834	849.750	N8	N8-[4]	0.001	0.001	0.001	32.000	0.000
69.080	850.450	N8	N8-[5]	0.003	0.003	0.003	32.000	0.000
69.406	851.370	N9	1c,2t,4t-trimethylcyclohexane	0.020	0.019	0.014	32.000	0.000
70.260	853.760	A8	ethylbenzene	1.243	1.056	1.031	277.160	136.200
70.639	854.810	N9	1c,3c,5c-trimethylcyclohexane	0.130	0.123	0.091	32.000	0.000
71.486	857.140	O9	2-methyloctene-1	0.021	0.022	0.014	32.000	0.000
71.892	858.240	I9	I9-[2]	0.004	0.004	0.003	32.000	0.000
72.361	859.510	O9	2-methyloctene-2	0.030	0.033	0.021	32.000	0.000
72.773	860.620	N9	N9-[1]	0.002	0.002	0.001	32.000	0.000
73.172	861.680	N9	N9-[2]	0.001	0.001	0.001	32.000	0.000
74.115	864.180	A8	1,3-dimethylbenzene	3.345	2.850	2.773	282.416	139.120
74.446	865.040	A8	1,4-dimethylbenzene	1.358	1.161	1.126	281.048	138.360

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF Acquired: 10/31/20 06:07:04
Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
75.058	866.630	I9	3,4-dimethylheptane	0.031	0.031	0.021	285.080	140.600
75.383	867.470	I9	3,4 -dimethylheptane	0.063	0.063	0.043	285.080	140.600
75.919	868.850	N9	N9-[3]	0.027	0.026	0.019	32.000	0.000
76.359	869.970	I9	I9-[3]	0.078	0.078	0.053	32.000	0.000
77.241	872.200	I9	4-ethylheptane	0.002	0.002	0.002	288.392	142.440
77.571	873.020	I9	4-methyloctane	0.276	0.282	0.189	288.392	142.440
77.963	874.000	I9	2-methyloctane	0.339	0.349	0.232	289.904	143.280
78.569	875.500	N9	N9-[4]	0.038	0.036	0.026	32.000	0.000
79.143	876.900	--	unknown	0.001	0.001	0.000	32.000	0.000
79.422	877.590	N9	1c,2t,3c-trimethylcyclohexane	0.041	0.039	0.028	304.160	151.200
79.737	878.350	I9	3-ethylheptane	0.079	0.080	0.054	289.400	143.000
80.250	879.590	I9	3-methyloctane	0.436	0.445	0.299	291.614	144.230
80.573	880.360	I9	3,3-diethylpentane	0.021	0.021	0.015	270.842	132.690
81.011	881.410	--	unknown	0.066	0.070	0.046	32.000	0.000
81.299	882.100	N9	1c,2t,4c-trimethylcyclohexane	0.018	0.017	0.013	275.000	135.000
81.666	882.960	N9	1,1,2-trimethylcyclohexane	0.030	0.028	0.021	293.360	145.200
82.030	883.820	A8	1,2-dimethylbenzene	1.673	1.399	1.387	291.974	144.430
82.560	885.060	I9	I9-[4]	0.028	0.029	0.019	32.000	0.000
82.922	885.910	I9	I9-[5]	0.106	0.107	0.073	32.000	0.000
83.656	887.600	N9	N9-[5]	0.090	0.085	0.063	32.000	0.000
83.922	888.210	N9	N9-[6]	0.116	0.110	0.081	32.000	0.000
84.062	888.530	--	unknown	0.036	0.038	0.025	32.000	0.000
84.438	889.390	O9	nonene-1	0.007	0.006	0.005	274.100	134.500
84.609	889.780	I9	I9-[6]	0.061	0.061	0.042	32.000	0.000
85.014	890.700	N9	N9-[7]	0.159	0.151	0.111	32.000	0.000
85.554	891.910	I9	I9-[7]	0.017	0.017	0.011	32.000	0.000
86.008	892.930	N9	i-butylcyclopentane	0.033	0.031	0.023	298.346	147.970
86.220	893.400	N9	N9-[8]	0.023	0.021	0.016	32.000	0.000
87.064	895.270	--	unknown	0.001	0.001	0.001	32.000	0.000
87.439	896.100	N9	N9-[9]	0.015	0.014	0.011	32.000	0.000
87.738	896.750	N9	N9-[10]	0.009	0.008	0.006	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF Acquired: 10/31/20 06:07:04
Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
88.032	897.390	O9	t-nonene-2	0.007	0.008	0.005	32.000	0.000
88.251	897.870	O9	t-nonene-3	0.021	0.022	0.015	32.000	0.000
88.663	898.760	I9	I9-[8]	0.130	0.131	0.089	32.000	0.000
88.835	899.130	--	unknown	0.022	0.024	0.015	32.000	0.000
89.236	900.000	P9	n-nonane	0.391	0.401	0.268	303.476	150.820
89.596	901.740	N9	1,1-methylethylcyclohexane	0.094	0.086	0.065	305.924	152.180
90.170	904.510	N9	N9-[11]	0.010	0.009	0.007	32.000	0.000
90.421	905.720	N9	N9-[12]	0.027	0.025	0.019	32.000	0.000
90.709	907.090	O10	t-2,2,5,5-tetramethylhexene-3	0.005	0.005	0.003	32.000	0.000
90.811	907.580	--	unknown	0.002	0.002	0.001	32.000	0.000
91.172	909.300	--	unknown	0.000	0.000	0.000	32.000	0.000
91.585	911.260	N9	N9-[13]	0.006	0.006	0.004	32.000	0.000
92.010	913.260	A9	i-propylbenzene	0.066	0.056	0.048	306.338	152.410
92.371	914.960	O9	c-nonene-3	0.076	0.082	0.053	32.000	0.000
92.531	915.700	--	unknown	0.018	0.019	0.012	32.000	0.000
92.931	917.570	I10	I10-[1]	0.012	0.012	0.008	32.000	0.000
93.029	918.030	N9	i-propylcyclohexane	0.023	0.022	0.016	310.622	154.790
93.198	918.810	--	unknown	0.005	0.006	0.004	32.000	0.000
93.772	921.470	I10	I10-[2]	0.114	0.115	0.070	32.000	0.000
94.169	923.290	I10	2,2-dimethyloctane	0.036	0.037	0.023	314.420	156.900
94.443	924.550	I10	2,4-dimethyloctane	0.055	0.055	0.034	312.620	155.900
94.876	926.520	N9	N9-[14]	0.007	0.007	0.005	32.000	0.000
95.310	928.500	N9	N9-[15]	0.023	0.022	0.016	32.000	0.000
95.916	931.230	I10	2,6-dimethyloctane	0.092	0.093	0.057	320.738	160.410
96.272	932.830	I10	2,5-dimethyloctane	0.083	0.084	0.051	317.300	158.500
96.531	933.990	--	unknown	0.003	0.003	0.002	32.000	0.000
97.129	936.650	N9	n-butylcyclopentane	0.062	0.058	0.043	313.916	156.620
97.343	937.600	I10	I10-[3]	0.033	0.034	0.021	32.000	0.000
97.493	938.260	N10	N10-[1]	0.038	0.035	0.024	32.000	0.000
97.758	939.430	--	unknown	0.006	0.006	0.004	32.000	0.000
98.008	940.530	I10	I10-[4]	0.022	0.023	0.014	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 15**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
98.462	942.520	I10	3,3-dimethyloctane	0.146	0.146	0.091	322.160	161.200
98.774	943.890	N10	N10-[2]	0.025	0.023	0.016	32.000	0.000
98.985	944.810	--	unknown	0.020	0.021	0.012	32.000	0.000
99.158	945.560	--	unknown	0.026	0.027	0.016	32.000	0.000
99.549	947.250	A9	n-propylbenzene	0.371	0.317	0.272	318.632	159.240
99.845	948.530	I10	3,6-dimethyloctane	0.028	0.028	0.017	321.440	160.800
100.102	949.640	I10	3-methyl-5-ethylheptane	0.048	0.049	0.030	316.760	158.200
100.238	950.220	--	unknown	0.007	0.008	0.005	32.000	0.000
100.568	951.630	N10	N10-[3]	0.029	0.027	0.018	32.000	0.000
101.239	954.490	--	unknown	0.027	0.028	0.017	32.000	0.000
101.505	955.620	A9	1,3-methylethylbenzene	1.312	1.117	0.961	322.394	161.330
101.888	957.240	A9	1,4-methylethylbenzene	0.563	0.481	0.412	323.618	162.010
102.197	958.540	N10	N10-[4]	0.031	0.029	0.020	32.000	0.000
102.356	959.210	--	unknown	0.003	0.004	0.002	32.000	0.000
102.761	960.910	--	unknown	0.002	0.002	0.001	32.000	0.000
102.945	961.670	--	unknown	0.011	0.012	0.030	32.000	0.000
103.232	962.870	A9	1,3,5-trimethylbenzene	0.700	0.595	0.512	328.532	164.740
103.497	963.970	I10	I10-[5]	0.044	0.043	0.027	32.000	0.000
103.764	965.080	N10	N10-[5]	0.019	0.018	0.012	32.000	0.000
103.956	965.870	--	unknown	0.006	0.007	0.004	32.000	0.000
104.194	966.850	I10	I10-[6]	0.003	0.003	0.002	32.000	0.000
104.510	968.150	I10	5-methylnonane	0.054	0.055	0.034	329.180	165.100
104.915	969.810	I10	4-methylnonane	0.448	0.445	0.277	32.000	0.000
105.259	971.210	A9	1,2-methylethylbenzene	0.417	0.349	0.306	329.324	165.180
105.445	971.970	I10	2-methylnonane	0.129	0.131	0.080	332.654	167.030
105.582	972.530	--	unknown	0.012	0.012	0.007	32.000	0.000
105.867	973.680	--	unknown	0.012	0.013	0.007	32.000	0.000
106.098	974.620	I10	3-ethyloctane	0.029	0.028	0.018	331.700	166.500
106.188	974.980	--	unknown	0.014	0.014	0.008	32.000	0.000
106.470	976.120	N10	N10-[6]	0.025	0.023	0.015	32.000	0.000
106.801	977.450	I10	3-methylnonane	0.158	0.158	0.097	334.040	167.800

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF Acquired: 10/31/20 06:07:04
Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
107.023	978.340	--	unknown	0.006	0.007	0.004	32.000	0.000
107.366	979.710	N10	N10-[7]	0.003	0.003	0.002	32.000	0.000
107.544	980.420	I10	I10-[7]	0.100	0.100	0.062	32.000	0.000
107.816	981.500	I10	I10-[8]	0.009	0.008	0.005	32.000	0.000
108.102	982.630	--	unknown	0.011	0.012	0.007	32.000	0.000
108.563	984.450	A9	1,2,4-trimethylbenzene	2.041	1.716	1.495	336.884	169.380
108.797	985.370	--	unknown	0.007	0.008	0.005	32.000	0.000
108.981	986.100	I10	I10-[9]	0.012	0.012	0.008	32.000	0.000
109.080	986.480	N10	i-butylcyclohexane	0.036	0.033	0.022	340.340	171.300
109.268	987.220	--	unknown	0.027	0.029	0.017	32.000	0.000
109.385	987.680	I10	I10-[10]	0.049	0.048	0.030	32.000	0.000
109.669	988.790	I10	I10-[11]	0.020	0.020	0.012	32.000	0.000
109.809	989.340	I10	I10-[12]	0.013	0.013	0.008	32.000	0.000
110.163	990.710	N10	N10-[8]	0.024	0.022	0.015	32.000	0.000
110.409	991.670	--	unknown	0.003	0.003	0.002	32.000	0.000
110.794	993.150	O10	decene-1	0.003	0.003	0.002	339.080	170.600
110.923	993.650	N10	1t-methyl-2-n-propylcyclohexane	0.010	0.009	0.006	339.800	171.000
111.051	994.140	O10	2,3-dimethyloctene-2	0.069	0.068	0.043	32.000	0.000
111.178	994.630	I10	I10-[13]	0.015	0.014	0.009	32.000	0.000
111.468	995.740	--	unknown	0.004	0.004	0.002	32.000	0.000
111.603	996.260	A10	i-butylbenzene	0.054	0.047	0.036	343.022	172.790
111.842	997.180	I10	I10-[14]	0.040	0.040	0.025	32.000	0.000
112.120	998.240	A10	sec-butylbenzene	0.038	0.032	0.025	344.012	173.340
112.367	999.180	--	unknown	0.009	0.009	0.006	32.000	0.000
112.583	1000.000	P10	n-decane	0.207	0.208	0.128	345.470	174.150
112.824	1001.530	I11	I11-[1]	0.029	0.029	0.016	32.000	0.000
113.176	1003.740	N10	N10-[9]	0.018	0.017	0.011	32.000	0.000
113.588	1006.330	--	unknown	0.006	0.006	0.004	32.000	0.000
113.827	1007.830	A9	1,2,3-trimethylbenzene	0.400	0.329	0.293	349.016	176.120
113.987	1008.830	--	unknown	0.008	0.009	0.006	32.000	0.000
114.272	1010.610	A10	1,3-methyl-i-propylbenzene	0.044	0.038	0.029	347.144	175.080

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF Acquired: 10/31/20 06:07:04
Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
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Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
114.709	1013.330	--	unknown	0.010	0.010	0.027	32.000	0.000
114.831	1014.090	A10	1,4-methyl-i-propylbenzene	0.026	0.022	0.017	350.834	177.130
114.992	1015.080	--	unknown	0.003	0.003	0.002	32.000	0.000
115.302	1017.000	I11	I11-[2]	0.028	0.028	0.016	32.000	0.000
115.570	1018.650	I11	I11-[3]	0.013	0.013	0.007	32.000	0.000
115.864	1020.460	A10	2-3-dihydroindene	0.278	0.213	0.207	352.130	177.850
116.229	1022.700	--	unknown	0.020	0.021	0.015	32.000	0.000
116.475	1024.200	N10	sec-butylcyclohexane	0.043	0.039	0.027	354.812	179.340
116.709	1025.630	I11	I11-[4]	0.009	0.009	0.005	32.000	0.000
117.057	1027.750	A10	1,2-methyl-i-propylbenzene	0.075	0.063	0.049	352.724	178.180
117.202	1028.630	I11	3-ethylnonane	0.005	0.005	0.003	32.000	0.000
117.317	1029.320	--	unknown	0.004	0.004	0.002	32.000	0.000
117.629	1031.210	--	unknown	0.068	0.071	0.038	32.000	0.000
117.853	1032.560	N11	N11-[1]	0.030	0.028	0.017	32.000	0.000
117.931	1033.040	--	unknown	0.017	0.018	0.010	32.000	0.000
118.090	1033.990	I11	I11-[5]	0.016	0.016	0.009	32.000	0.000
118.227	1034.820	--	unknown	0.003	0.003	0.002	32.000	0.000
118.603	1037.070	I11	I11-[6]	0.032	0.029	0.018	32.000	0.000
118.769	1038.070	--	unknown	0.035	0.036	0.020	32.000	0.000
119.210	1040.700	A10	1,3-diethylbenzene	0.141	0.120	0.093	358.052	181.140
119.411	1041.900	--	unknown	0.065	0.068	0.043	32.000	0.000
119.659	1043.370	A10	1,3-methyl-n-propylbenzene	0.286	0.244	0.188	359.618	182.010
119.832	1044.400	I11	I11-[7]	0.026	0.026	0.015	32.000	0.000
120.116	1046.080	A10	1,4-diethylbenzene	0.012	0.010	0.008	362.822	183.790
120.297	1047.150	A10	1,4-methyl-n-propylbenzene	0.179	0.154	0.118	362.156	183.420
120.471	1048.170	A10	n-butylbenzene	0.086	0.074	0.057	361.940	183.300
120.880	1050.580	A10	1,3-dimethyl-5-ethylbenzene	0.302	0.253	0.198	362.516	183.620
121.204	1052.480	A10	1,2-diethylbenzene	0.032	0.027	0.021	362.228	183.460
121.347	1053.320	I11	I11-[8]	0.018	0.018	0.010	32.000	0.000
121.574	1054.650	N10	t-decahydronaphthalene	0.009	0.009	0.005	368.960	187.200
121.823	1056.100	N11	N11-[2]	0.017	0.016	0.010	32.000	0.000

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Comments:
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Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
122.084	1057.620	--	unknown	0.012	0.012	0.007	32.000	0.000
122.246	1058.560	A10	1,2-methyl-n-propylbenzene	0.100	0.085	0.066	364.946	184.970
122.623	1060.740	I11	I11-[9]	0.011	0.011	0.006	32.000	0.000
122.753	1061.490	I11	I11-[10]	0.073	0.073	0.041	32.000	0.000
122.965	1062.710	I11	I11-[11]	0.039	0.038	0.022	32.000	0.000
123.049	1063.200	--	unknown	0.010	0.010	0.006	32.000	0.000
123.269	1064.470	--	unknown	0.003	0.003	0.002	32.000	0.000
123.471	1065.630	I11	I11-[12]	0.049	0.048	0.027	32.000	0.000
123.730	1067.110	--	unknown	0.009	0.010	0.005	32.000	0.000
124.019	1068.770	A10	1,4,dimethyl-2-ethylbenzene	0.219	0.184	0.144	368.366	186.870
124.290	1070.320	A10	1,3-dimethyl-4-ethylbenzene	0.274	0.235	0.180	370.832	188.240
124.555	1071.820	I11	I11-[13]	0.004	0.004	0.002	32.000	0.000
124.862	1073.570	--	unknown	0.008	0.009	0.005	32.000	0.000
125.122	1075.040	I11	I11-[14]	0.150	0.149	0.084	32.000	0.000
125.289	1075.990	A10	1,2-dimethyl-4-ethylbenzene	0.301	0.254	0.198	373.136	189.520
125.600	1077.740	--	unknown	0.009	0.010	0.006	32.000	0.000
125.886	1079.360	--	unknown	0.012	0.013	0.008	32.000	0.000
125.959	1079.770	I11	I11-[15]	0.005	0.005	0.003	32.000	0.000
126.262	1081.470	A10	1,3-dimethyl-2-ethylbenzene	0.051	0.042	0.033	374.090	190.050
126.417	1082.340	I11	I11-[16]	0.018	0.018	0.010	32.000	0.000
126.745	1084.170	--	unknown	0.018	0.019	0.010	32.000	0.000
126.946	1085.290	I11	I11-[17]	0.009	0.009	0.005	32.000	0.000
127.176	1086.580	--	unknown	0.016	0.017	0.009	32.000	0.000
127.489	1088.320	--	unknown	0.007	0.008	0.004	32.000	0.000
127.585	1088.850	--	unknown	0.013	0.014	0.007	32.000	0.000
127.857	1090.360	O11	undecene-1	0.021	0.021	0.012	378.860	192.700
128.195	1092.220	A11	1,4-methyl-t-butylbenzene	0.038	0.033	0.022	32.000	0.000
128.469	1093.740	A10	1,2-dimethyl-3-ethylbenzene	0.084	0.069	0.055	381.110	193.950
128.811	1095.620	--	unknown	0.007	0.007	0.005	32.000	0.000
129.088	1097.140	--	unknown	0.014	0.015	0.009	32.000	0.000
129.165	1097.560	A11	1,2-ethyl-i-propylbenzene	0.009	0.007	0.005	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF Acquired: 10/31/20 06:07:04
Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
129.334	1098.480	--	unknown	0.007	0.007	0.004	32.000	0.000
129.611	1100.000	P11	n-undecane	0.110	0.109	0.062	384.620	195.900
129.808	1101.470	--	unknown	0.009	0.009	0.005	32.000	0.000
129.918	1102.300	A11	1,4-ethyl-i-propylbenzene	0.003	0.002	0.002	32.000	0.000
130.345	1105.490	A10	1,2,4,5-tetramethylbenzene	0.174	0.144	0.114	386.312	196.840
130.521	1106.800	A11	1,2-methyl-n-butylbenzene	0.003	0.002	0.002	390.200	199.000
130.716	1108.250	--	unknown	0.007	0.007	0.004	32.000	0.000
130.886	1109.520	A10	1,2,3,5-tetramethylbenzene	0.235	0.195	0.154	388.472	198.040
131.043	1110.680	--	unknown	0.006	0.006	0.004	32.000	0.000
131.375	1113.140	--	unknown	0.012	0.013	0.008	32.000	0.000
131.569	1114.570	--	unknown	0.008	0.008	0.005	32.000	0.000
131.876	1116.840	--	unknown	0.022	0.023	0.015	32.000	0.000
132.319	1120.100	--	unknown	0.015	0.016	0.010	32.000	0.000
132.477	1121.260	--	unknown	0.016	0.016	0.010	32.000	0.000
133.021	1125.240	A11	1,2-methyl-t-butylbenzene	0.007	0.006	0.004	32.000	0.000
133.117	1125.940	--	unknown	0.012	0.013	0.007	32.000	0.000
133.428	1128.210	A10	5-methylindan	0.206	0.171	0.137	32.000	0.000
133.774	1130.720	I12	I12-[1]	0.050	0.049	0.026	421.340	216.300
134.166	1133.560	--	unknown	0.007	0.007	0.004	32.000	0.000
134.297	1134.510	A10	4-methylindan	0.052	0.043	0.035	32.000	0.000
134.675	1137.240	A11	1,2-ethyl-n-propylbenzene	0.070	0.058	0.042	32.000	0.000
134.927	1139.050	A10	2-methylindan	0.198	0.161	0.132	368.600	187.000
135.138	1140.570	A11	1,3-methyl-n-butylbenzene	0.009	0.008	0.006	390.200	199.000
135.394	1142.410	--	unknown	0.006	0.007	0.004	32.000	0.000
135.541	1143.460	A12	1,3-di-i-propylbenzene	0.066	0.055	0.036	397.760	203.200
135.753	1144.980	A11	s-pentylbenzene	0.063	0.052	0.038	401.000	205.000
136.181	1148.030	--	unknown	0.003	0.003	0.002	32.000	0.000
136.328	1149.070	--	unknown	0.015	0.015	0.009	32.000	0.000
136.438	1149.860	A11	n-pentylbenzene	0.050	0.041	0.030	401.720	205.400
136.510	1150.370	--	unknown	0.025	0.026	0.015	32.000	0.000
136.798	1152.420	N12	1t-M-2-(4-MP)cyclopentane	0.005	0.004	0.002	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF Acquired: 10/31/20 06:07:04
Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
136.996	1153.810	A12	1,2-di-i-propylbenzene	0.029	0.024	0.016	399.200	204.000
137.141	1154.850	--	unknown	0.028	0.029	0.015	32.000	0.000
137.625	1158.260	--	unknown	0.041	0.043	0.022	32.000	0.000
137.887	1160.100	A12	1,4-di-i-propylbenzene	0.051	0.042	0.028	410.540	210.300
138.172	1162.110	--	unknown	0.007	0.008	0.004	32.000	0.000
138.348	1163.340	A10	tetrahydronaphthalene	0.019	0.014	0.013	405.716	207.620
138.493	1164.360	--	unknown	0.008	0.008	0.005	32.000	0.000
138.711	1165.880	--	unknown	0.004	0.004	0.003	32.000	0.000
138.885	1167.100	I12	I12-[2]	0.056	0.054	0.029	421.340	216.300
139.182	1169.170	A10	naphthalene	0.170	0.122	0.117	424.382	217.990
139.506	1171.420	A12	1-t-butyl-3,5-dimethylbenzene	0.004	0.003	0.002	32.000	0.000
139.848	1173.790	A12	1,4-ethyl-t-butylbenzene	0.077	0.064	0.042	32.000	0.000
140.252	1176.590	--	unknown	0.027	0.029	0.015	32.000	0.000
140.542	1178.590	I12	I12-[3]	0.057	0.056	0.030	421.340	216.300
140.774	1180.180	I12	I12-[4]	0.033	0.032	0.017	421.340	216.300
141.110	1182.500	--	unknown	0.007	0.007	0.004	32.000	0.000
141.357	1184.190	I12	I12-[5]	0.034	0.033	0.017	421.340	216.300
141.603	1185.870	--	unknown	0.012	0.012	0.006	32.000	0.000
141.896	1187.880	I12	I12-[6]	0.035	0.034	0.018	421.340	216.300
142.096	1189.230	A12	1,3-di-n-propylbenzene	0.041	0.034	0.022	32.000	0.000
142.336	1190.870	A12	A12-[1]	0.025	0.021	0.014	32.000	0.000
142.553	1192.350	O12	dodecene-1	0.006	0.006	0.003	416.120	213.400
142.913	1194.790	--	unknown	0.007	0.008	0.004	32.000	0.000
143.255	1197.100	--	unknown	0.005	0.005	0.002	32.000	0.000
143.558	1199.140	A12	A12-[2]	0.020	0.016	0.011	32.000	0.000
143.684	1200.000	P12	n-dodecane	0.047	0.046	0.024	421.340	216.300
143.947	1202.210	--	unknown	0.003	0.003	0.002	32.000	0.000
144.227	1204.560	--	unknown	0.013	0.013	0.007	32.000	0.000
144.313	1205.290	--	unknown	0.005	0.005	0.002	32.000	0.000
144.763	1209.060	--	unknown	0.012	0.013	0.006	32.000	0.000
144.987	1210.930	--	unknown	0.006	0.006	0.003	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF Acquired: 10/31/20 06:07:04
Sample: ODDB:54927 Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
145.186	1212.590	A12	1,3,5-triethylbenzene	0.003	0.003	0.002	420.800	216.000
145.372	1214.140	--	unknown	0.007	0.008	0.004	32.000	0.000
145.716	1217.010	--	unknown	0.022	0.023	0.012	32.000	0.000
145.890	1218.450	--	unknown	0.013	0.014	0.007	32.000	0.000
146.207	1221.080	--	unknown	0.003	0.003	0.002	32.000	0.000
146.498	1223.480	--	unknown	0.018	0.019	0.010	32.000	0.000
146.736	1225.450	--	unknown	0.017	0.018	0.009	32.000	0.000
146.808	1226.050	--	unknown	0.008	0.008	0.004	32.000	0.000
147.108	1228.510	--	unknown	0.004	0.005	0.002	32.000	0.000
147.205	1229.310	--	unknown	0.013	0.014	0.007	32.000	0.000
147.507	1231.790	A12	1,2,4-triethylbenzene	0.014	0.011	0.007	423.500	217.500
147.728	1233.610	--	unknown	0.005	0.005	0.003	32.000	0.000
148.088	1236.540	--	unknown	0.004	0.004	0.002	32.000	0.000
148.189	1237.370	--	unknown	0.005	0.005	0.002	32.000	0.000
148.231	1237.720	--	unknown	0.008	0.008	0.004	32.000	0.000
148.467	1239.640	--	unknown	0.001	0.002	0.001	32.000	0.000
148.803	1242.370	A12	1,4-methyl-n-pentylbenzene	0.036	0.030	0.020	32.000	0.000
149.087	1244.680	--	unknown	0.009	0.010	0.005	32.000	0.000
149.242	1245.940	--	unknown	0.004	0.004	0.002	32.000	0.000
149.379	1247.050	--	unknown	0.003	0.003	0.002	32.000	0.000
149.669	1249.390	--	unknown	0.004	0.005	0.002	32.000	0.000
149.951	1251.670	--	unknown	0.006	0.006	0.003	32.000	0.000
150.150	1253.270	--	unknown	0.008	0.008	0.004	32.000	0.000
150.534	1256.360	A12	n-hexylbenzene	0.020	0.017	0.011	32.000	0.000
150.626	1257.100	--	unknown	0.020	0.021	0.011	32.000	0.000
150.997	1260.070	--	unknown	0.011	0.012	0.006	32.000	0.000
151.255	1262.140	--	unknown	0.005	0.005	0.003	32.000	0.000
151.501	1264.100	--	unknown	0.005	0.005	0.003	32.000	0.000
151.660	1265.370	--	unknown	0.003	0.003	0.002	32.000	0.000
151.849	1266.870	--	unknown	0.006	0.006	0.003	32.000	0.000
151.917	1267.420	--	unknown	0.009	0.009	0.005	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:18:01 PM

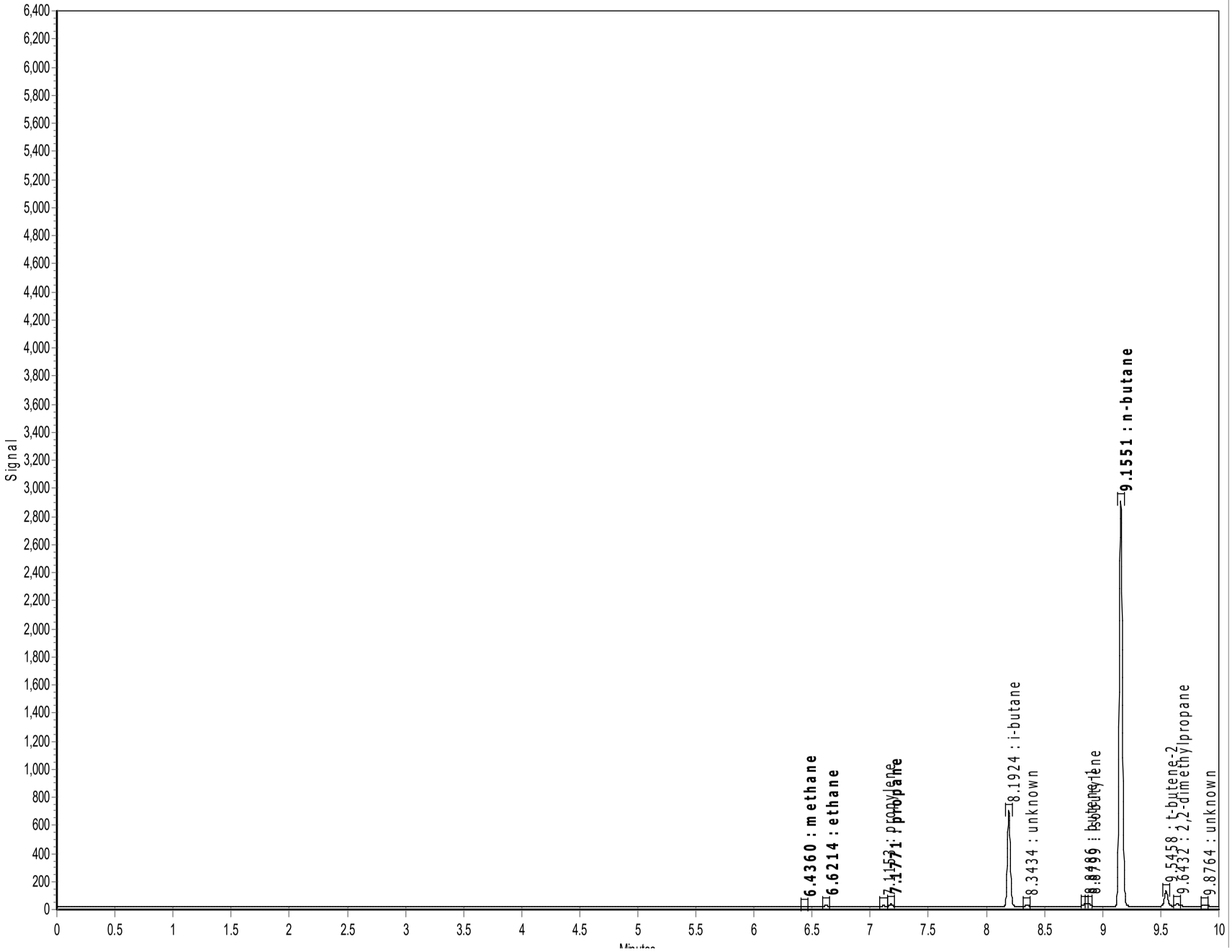
RawFile: D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF
Acquired: 10/31/20 06:07:04
Sample: ODDB:54927
Analyzed: 11/2/2020 9:17:20 PM
Processed 627 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

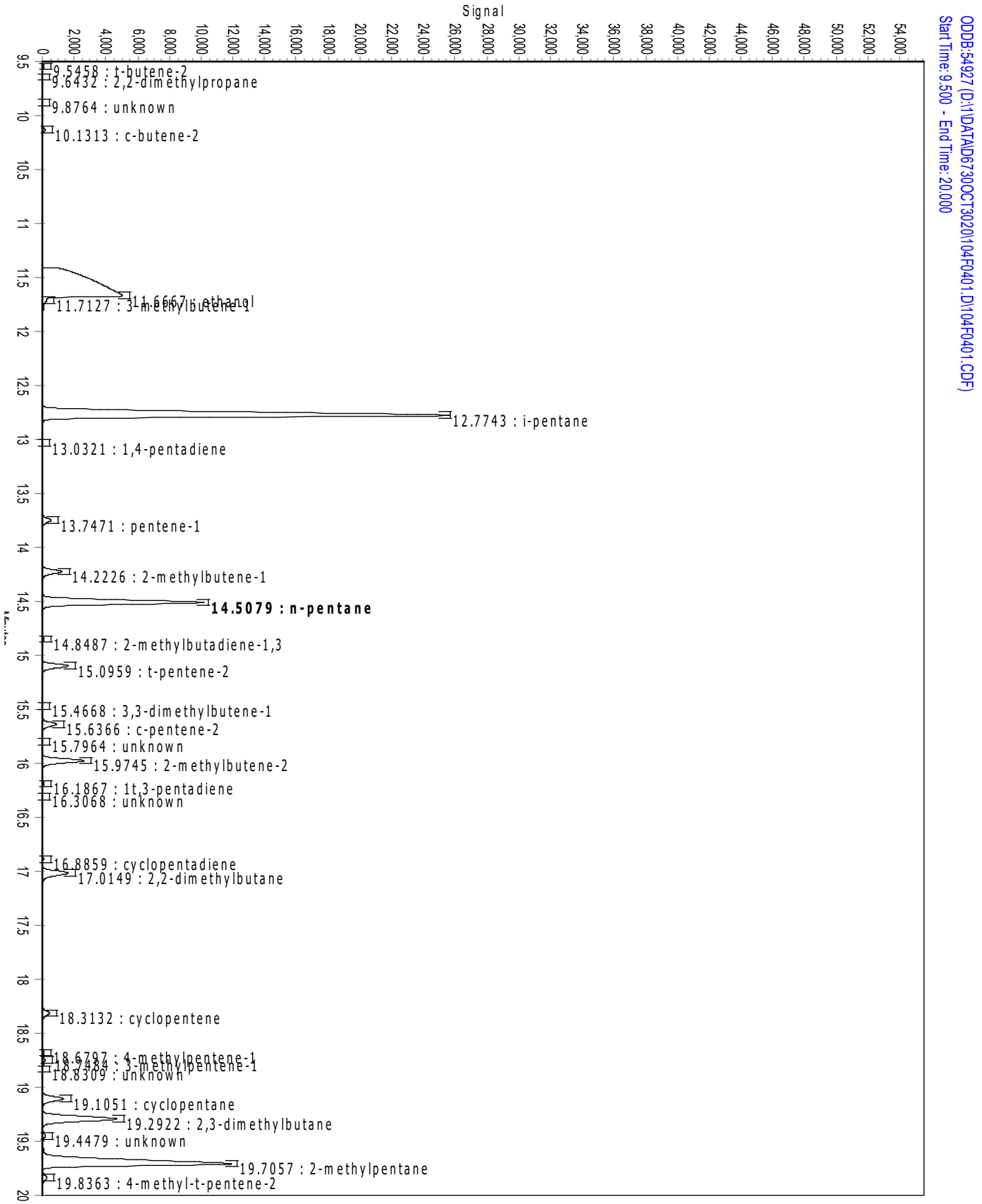
Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
152.209	1269.740	--	unknown	0.011	0.011	0.006	32.000	0.000
152.638	1273.140	I13	I13-[1]	0.008	0.008	0.004	455.720	235.400
152.827	1274.640	A11	1,2,3,4,5-pentamethylbenzene	0.024	0.017	0.014	449.600	232.000
153.057	1276.450	--	unknown	0.009	0.009	0.005	32.000	0.000
153.571	1280.500	--	unknown	0.006	0.006	0.003	32.000	0.000
153.924	1283.270	A11	2-methylnaphthalene	0.095	0.068	0.058	465.890	241.050
154.413	1287.110	--	unknown	0.010	0.010	0.006	32.000	0.000
154.562	1288.270	--	unknown	0.002	0.002	0.001	32.000	0.000
154.704	1289.380	--	unknown	0.003	0.003	0.002	32.000	0.000
154.909	1290.970	O13	tridecene-1	0.007	0.007	0.003	451.040	232.800
155.340	1294.330	--	unknown	0.001	0.002	0.001	32.000	0.000
155.505	1295.610	--	unknown	0.003	0.003	0.001	32.000	0.000
155.576	1296.170	--	unknown	0.002	0.002	0.001	32.000	0.000
155.877	1298.500	A11	1-methylnaphthalene	0.037	0.027	0.023	472.352	244.640
156.070	1300.000	P13	n-tridecane	0.009	0.009	0.005	455.720	235.400
156.182	1301.000	+	C14+ (Summarized)	0.390	0.376	0.173	455.720	235.400

ODDB:54927 (D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 0.000 - End Time: 10.000




Signal
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6,000
8,000
10,000
12,000
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18,000
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30,000
32,000
34,000
36,000
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44,000
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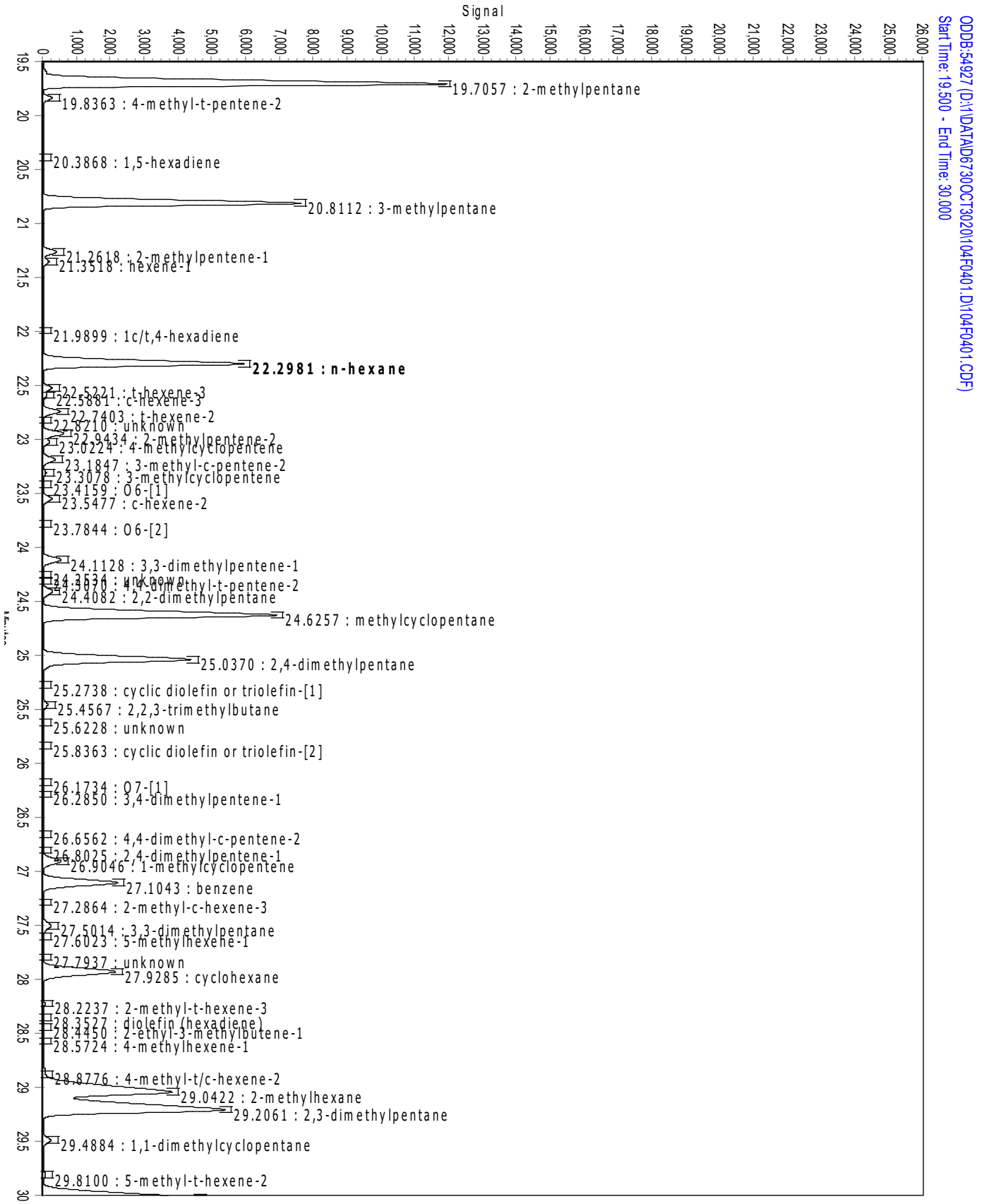
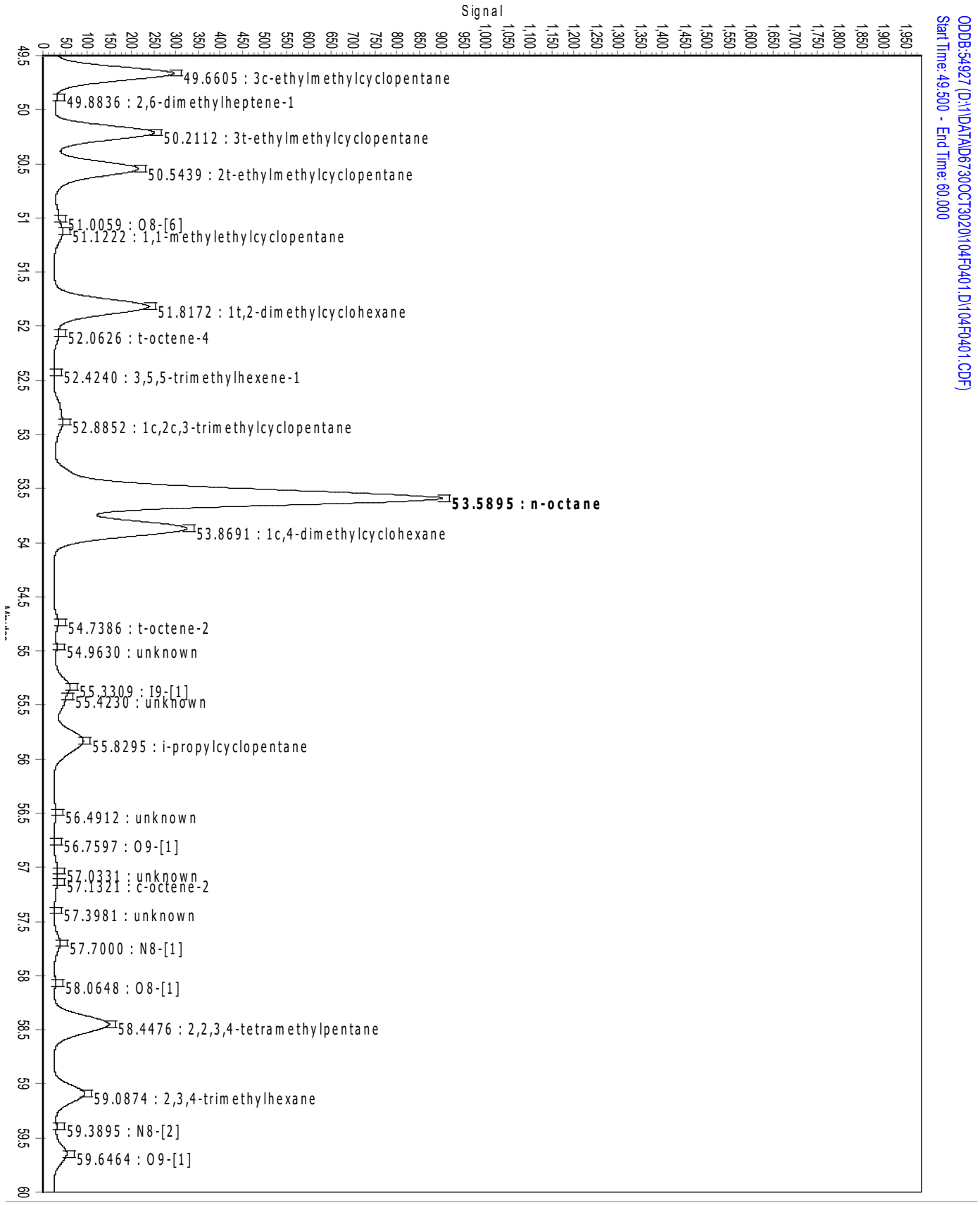
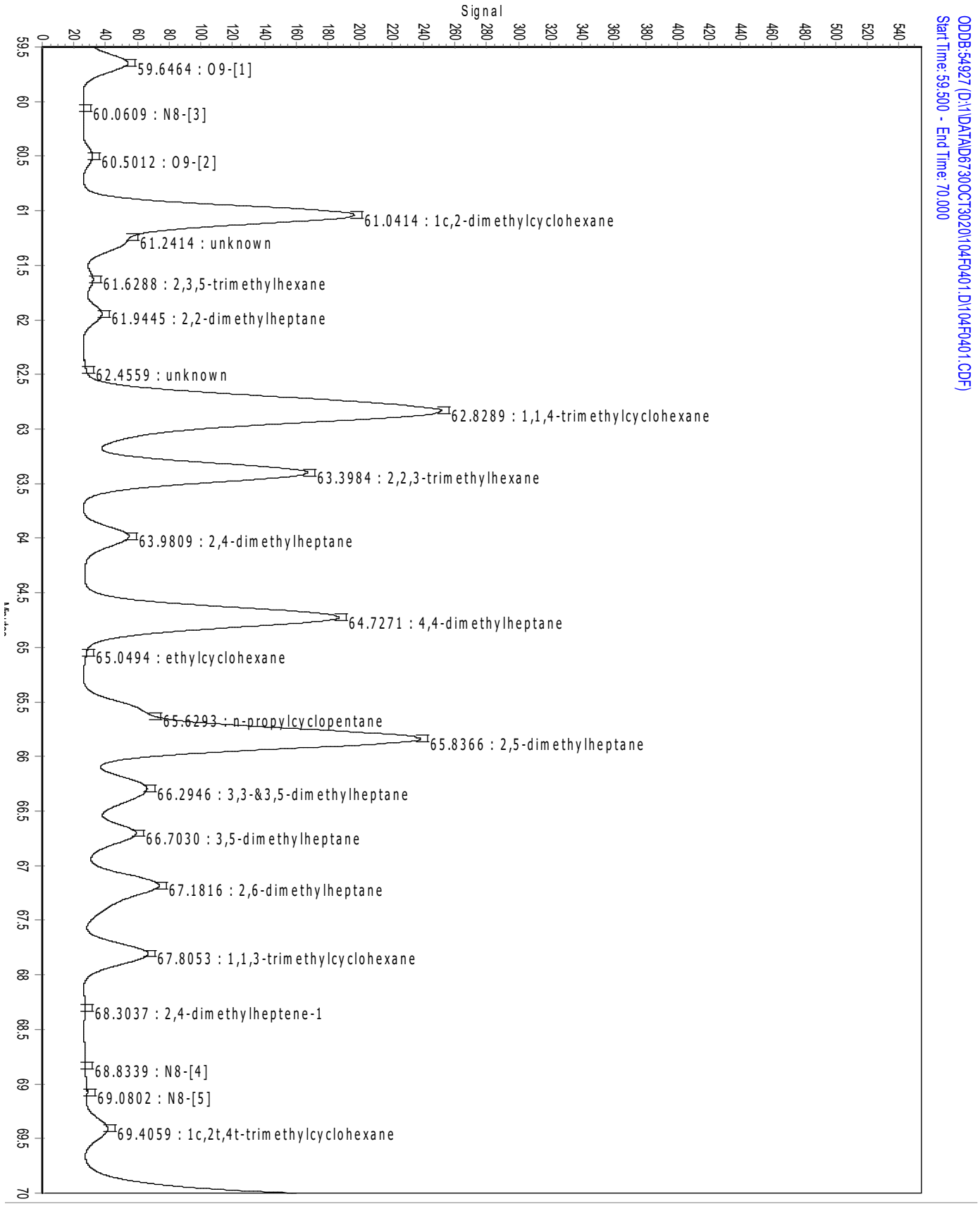
52,000
54,000
9.5
10
10.5
11
11.5
12
12.5
13
13.5
14
14.5
15
15.5
16
16.5
17
17.5
18
18.5
19
19.5
20
9.5458 : t-butene-2
9.6432 : 2,2-dimethylpropane
9.8764 : unknown
10.1313 : c-butene-2
11.6667 : ethanol
11.7127 : 3-methylbutene-1
12.7743 : i-pentane
13.0321 : 1,4-pentadiene
13.7471 : pentene-1
14.2226 : 2-methylbutene-1
14.5079 : n-pentane
14.8487 : 2-methylbutadiene-1,3
15.0959 : t-pentene-2
15.4668 : 3,3-dimethylbutene-1
15.6366 : c-pentene-2
15.7964 : unknown
15.9745 : 2-methylbutene-2
16.1867 : 1t,3-pentadiene
16.3068 : unknown
16.8859 : cyclopentadiene
17.0149 : 2,2-dimethylbutane
18.3132 : cyclopentene
18.6797 : 4-methylpentene-1
18.7434 : 3-methylpentene-1
18.8309 : unknown
19.1051 : cyclopentane
19.2922 : 2,3-dimethylbutane
19.4479 : unknown
19.7057 : 2-methylpentane
19.8363 : 4-methyl-t-pentene-2
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 9.500 - End Time: 20.000


Signal
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 19.500 - End Time: 30.000
19.7057 : 2-methylpentane
19.8363 : 4-methyl-t-pentene-2
20.3868 : 1,5-hexadiene
20.8112 : 3-methylpentane
21.2618 : 2-methylpentene-1
21.3518 : hexene-1
21.9899 : 1c/t,4-hexadiene
22.2981 : n-hexane
22.5221 : t-hexene-3
22.5881 : c-hexene-3
22.7403 : t-hexene-2
22.8210 : unknown
22.9434 : 2-methylpentene-2
23.0224 : 4-methylcyclopentene
23.1847 : 3-methyl-c-pentene-2
23.3078 : 3-methylcyclopentene
23.4159 : O6-[1]
23.5477 : c-hexene-2
23.7844 : O6-[2]
24.1128 : 3,3-dimethylpentene-1
24.3534 : unknown
24.3970 : 4,4-dimethyl-t-pentene-2
24.4082 : 2,2-dimethylpentane
24.6257 : methylcyclopentane
25.0370 : 2,4-dimethylpentane
25.2738 : cyclic diolefin or triolefin-[1]
25.4567 : 2,2,3-trimethylbutane
25.6228 : unknown
25.8363 : cyclic diolefin or triolefin-[2]
26.1734 : O7-[1]
26.2850 : 3,4-dimethylpentene-1
26.6562 : 4,4-dimethyl-c-pentene-2
26.8025 : 2,4-dimethylpentene-1
26.9046 : 1-methylcyclopentene
27.1043 : benzene
27.2864 : 2-methyl-c-hexene-3
27.5014 : 3,3-dimethylpentane
27.6023 : 5-methylhexene-1
27.7937 : unknown
27.9285 : cyclohexane
28.2237 : 2-methyl-t-hexene-3
28.3527 : diolefin (hexadiene)
28.4450 : 2-ethyl-3-methylbutene-1
28.5724 : 4-methylhexene-1
28.8776 : 4-methyl-t/c-hexene-2
29.0422 : 2-methylhexane
29.2061 : 2,3-dimethylpentane
29.4884 : 1,1-dimethylcyclopentane
29.8100 : 5-methyl-t-hexene-2

ODB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 29.500 - End Time: 40.000

ODDB:54927 (D:\1DATAD6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 39.500 - End Time: 50.000


Signal
ODDB:54927 (D:\1DATA\D6730OCT30201104F0401.D\104F0401.CDF)
Start Time: 49.500 - End Time: 60.000
49.6605 : 3c-ethylmethylcyclopentane
49.8836 : 2,6-dimethylheptene-1
50.2112 : 3t-ethylmethylcyclopentane
50.5439 : 2t-ethylmethylcyclopentane
51.0059 : O8-[6]
51.1222 : 1,1-methylethylcyclopentane
51.8172 : 1t,2-dimethylcyclohexane
52.0626 : t-octene-4
52.4240 : 3,5,5-trimethylhexene-1
52.8852 : 1c,2c,3-trimethylcyclopentane
53.5895 : n-octane
53.8691 : 1c,4-dimethylcyclohexane
54.7386 : t-octene-2
54.9630 : unknown
55.3309 : I9-[1]
55.4230 : unknown
55.8295 : i-propylcyclopentane
56.4912 : unknown
56.7597 : O9-[1]
57.0331 : unknown
57.1321 : c-octene-2
57.3981 : unknown
57.7000 : N8-[1]
58.0648 : O8-[1]
58.4476 : 2,2,3,4-tetramethylpentane
59.0874 : 2,3,4-trimethylhexane
59.3895 : N8-[2]
59.6464 : O9-[1]


Signal
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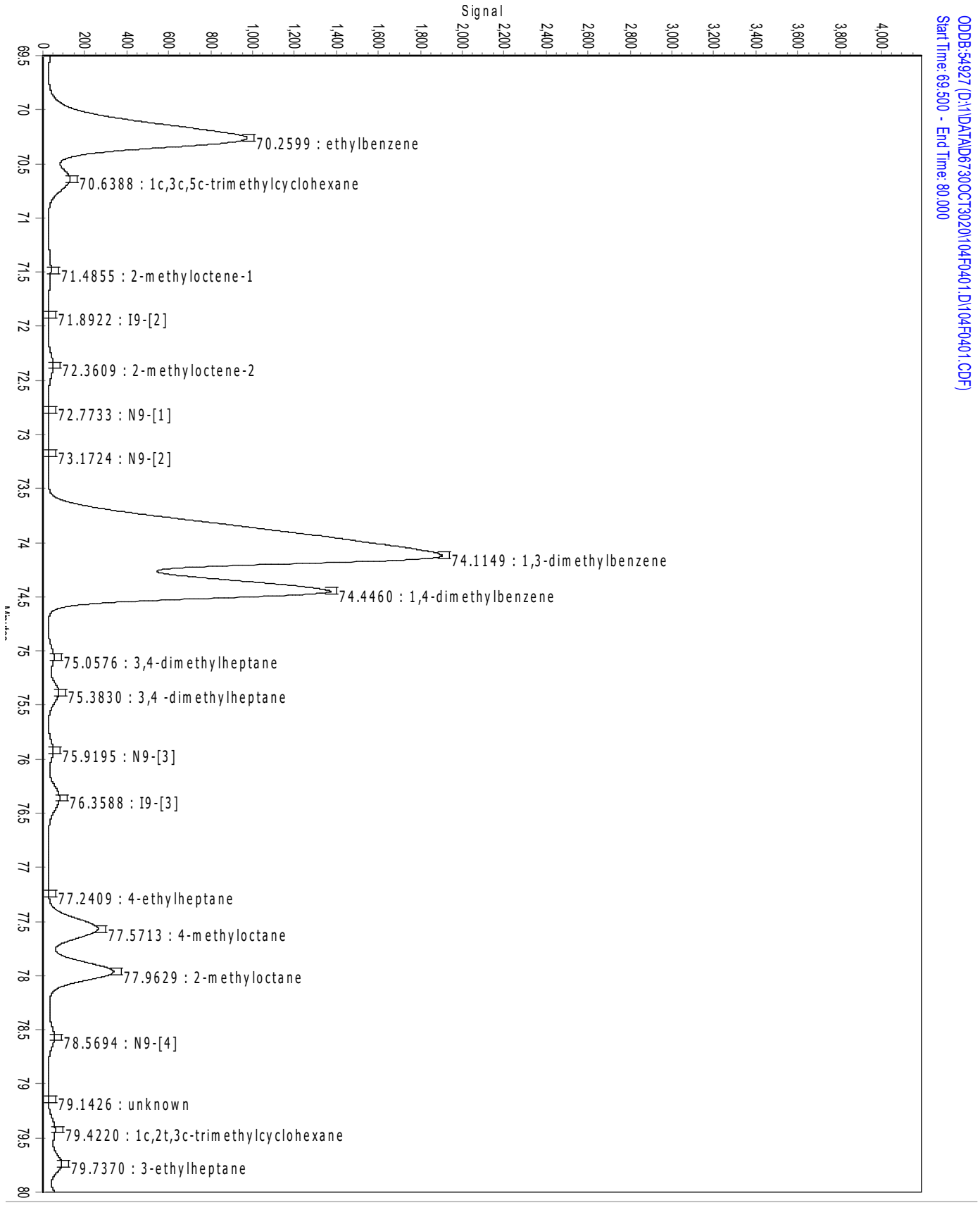
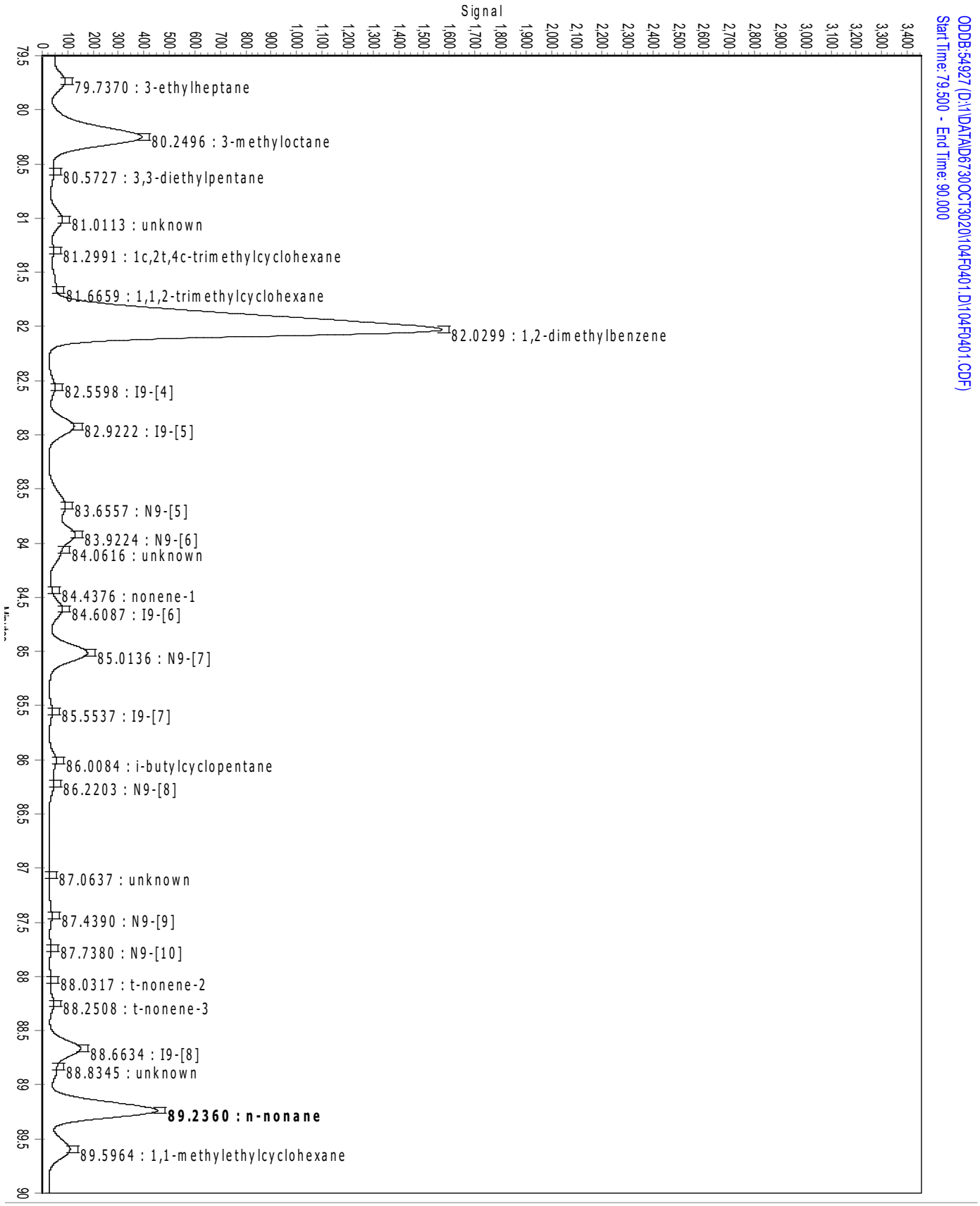
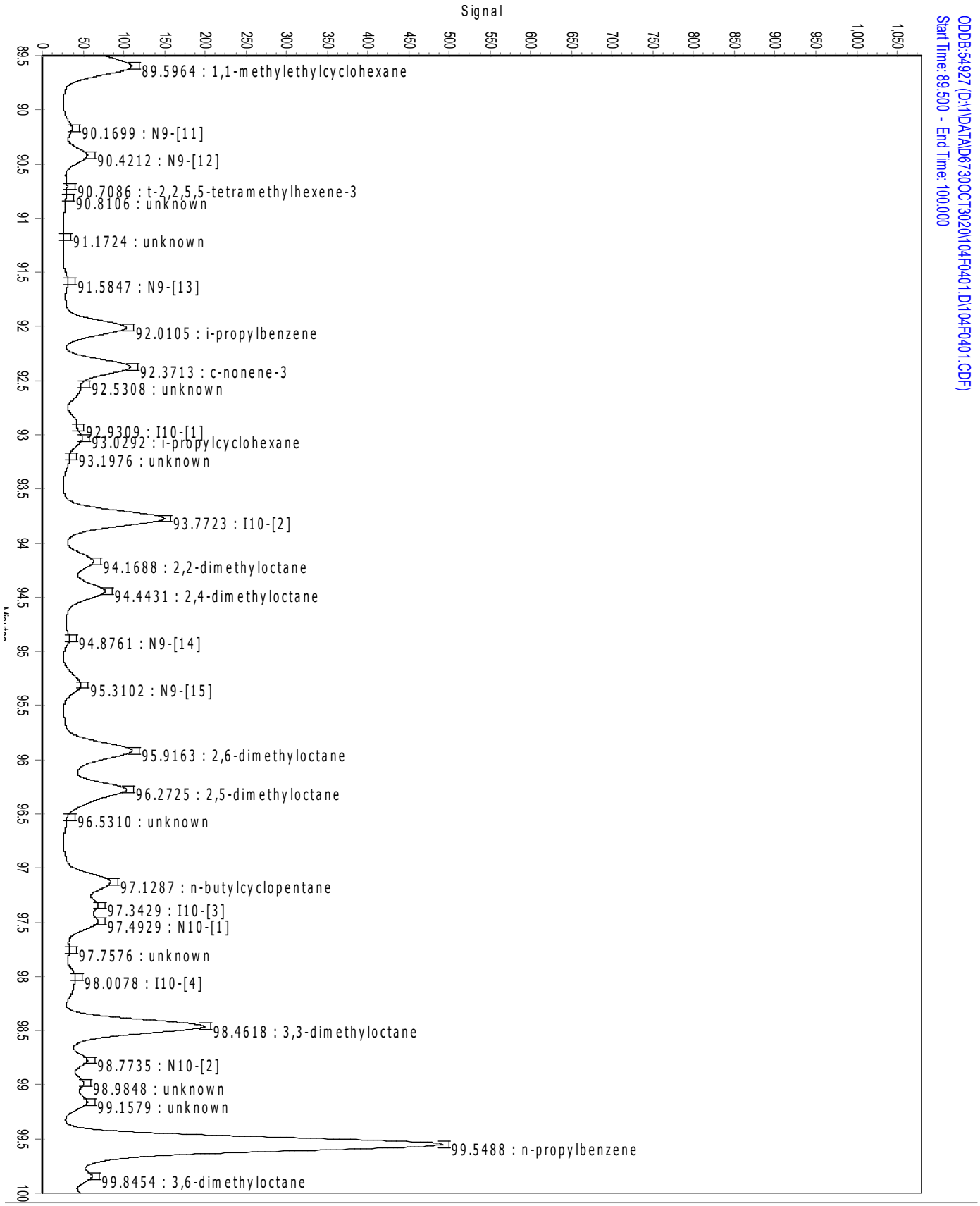
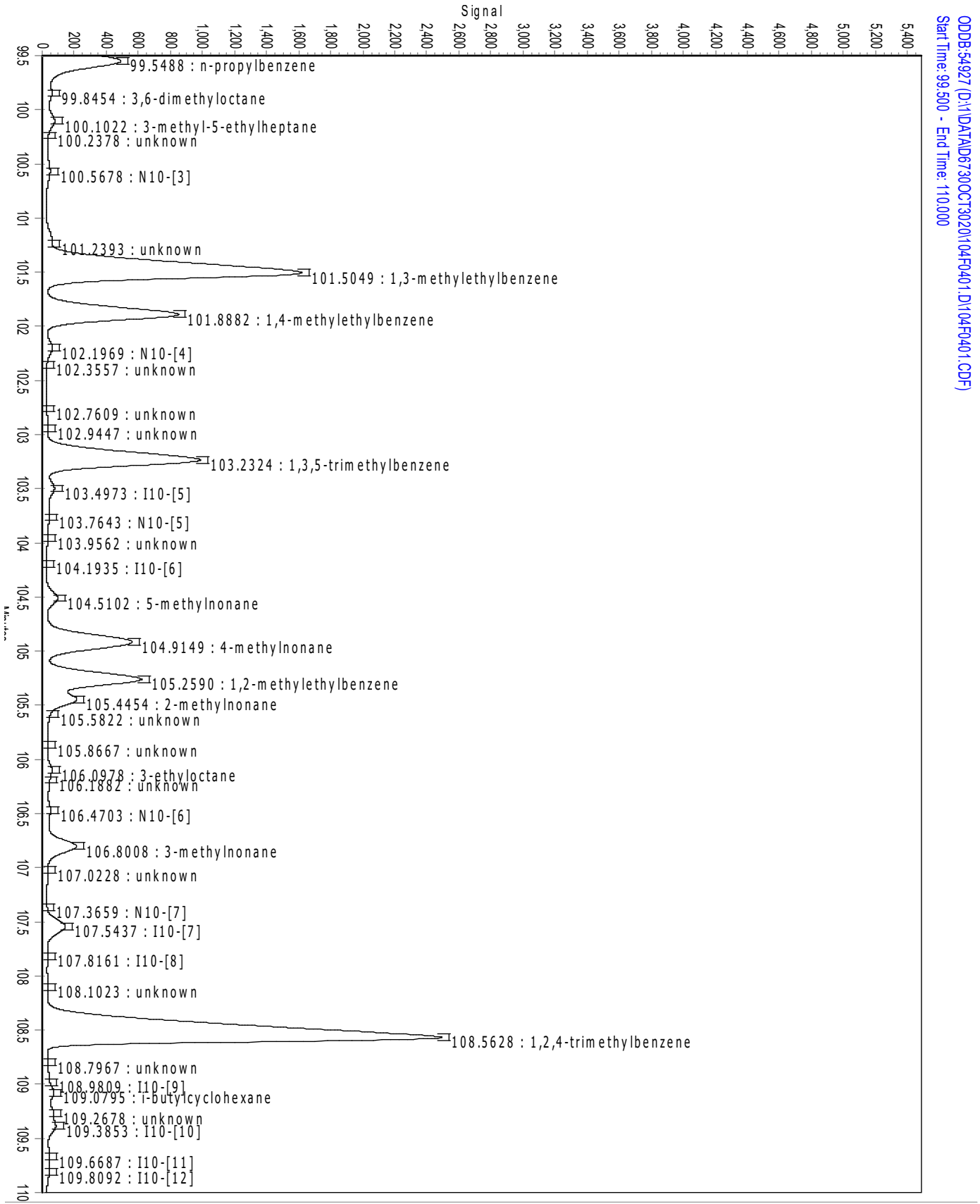
63
63.5
64
64.5
65
65.5
66
66.5
67
67.5
68
68.5
69
69.5
70
59.6464 : O9-[1]
60.0609 : N8-[3]
60.5012 : O9-[2]
61.0414 : 1c,2-dimethylcyclohexane
61.2414 : unknown
61.6288 : 2,3,5-trimethylhexane
61.9445 : 2,2-dimethylheptane
62.4559 : unknown
62.8289 : 1,1,4-trimethylcyclohexane
63.3984 : 2,2,3-trimethylhexane
63.9809 : 2,4-dimethylheptane
64.7271 : 4,4-dimethylheptane
65.0494 : ethylcyclohexane
65.6293 : n-propylcyclopentane
65.8366 : 2,5-dimethylheptane
66.2946 : 3,3-&3,5-dimethylheptane
66.7030 : 3,5-dimethylheptane
67.1816 : 2,6-dimethylheptane
67.8053 : 1,1,3-trimethylcyclohexane
68.3037 : 2,4-dimethylheptene-1
68.8339 : N8-[4]
69.0802 : N8-[5]
69.4059 : 1c,2t,4t-trimethylcyclohexane
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 59.500 - End Time: 70.000

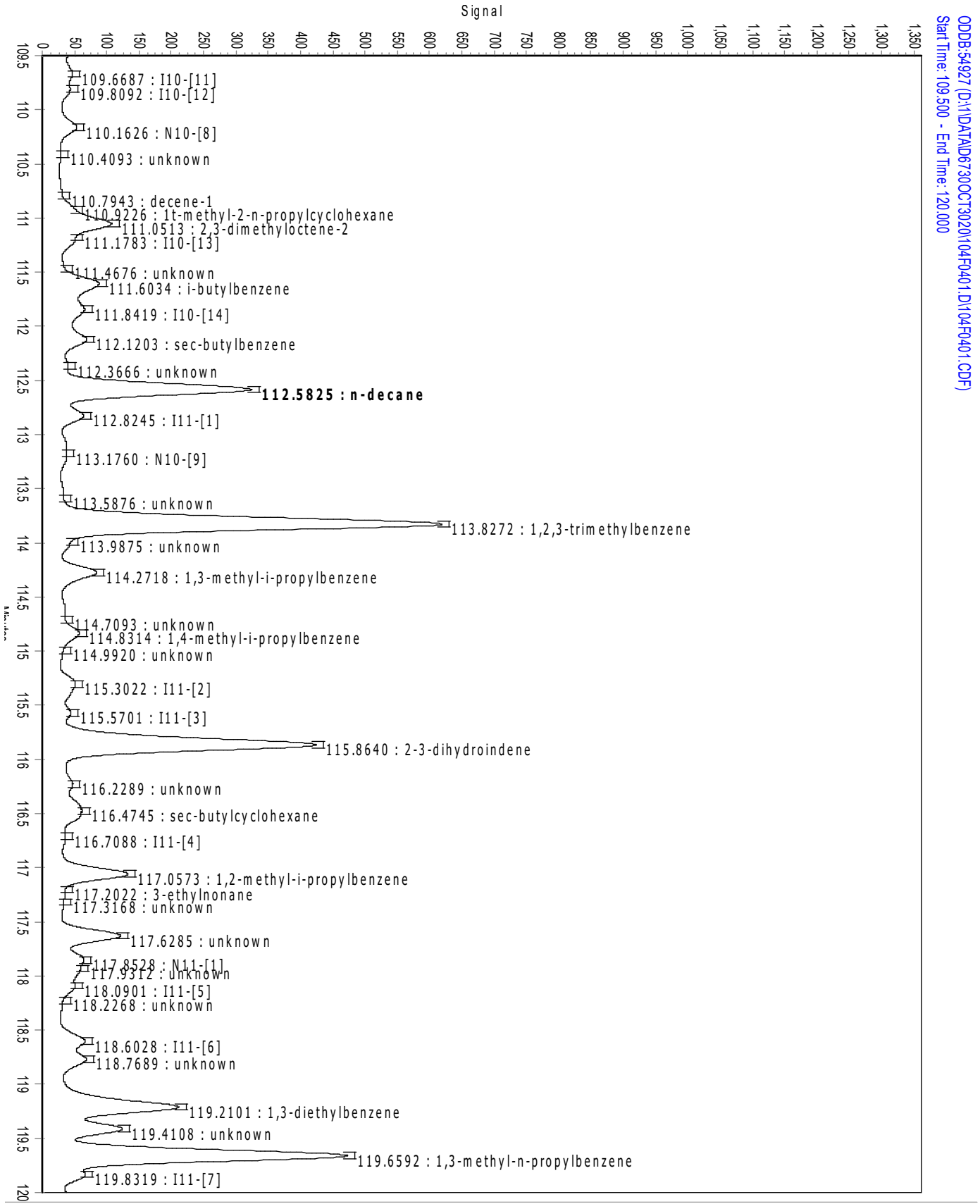

Signal
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
69.5
70
70.5
71
71.5
72
72.5
73
73.5
74
74.5
75
75.5
76
76.5
77
77.5
78
78.5
79
79.5
80
70.2599 : ethylbenzene
70.6388 : 1c,3c,5c-trimethylcyclohexane
71.4855 : 2-methyloctene-1
71.8922 : I9-[2]
72.3609 : 2-methyloctene-2
72.7733 : N9-[1]
73.1724 : N9-[2]
74.1149 : 1,3-dimethylbenzene
74.4460 : 1,4-dimethylbenzene
75.0576 : 3,4-dimethylheptane
75.3830 : 3,4 -dimethylheptane
75.9195 : N9-[3]
76.3588 : I9-[3]
77.2409 : 4-ethylheptane
77.5713 : 4-methyloctane
77.9629 : 2-methyloctane
78.5694 : N9-[4]
79.1426 : unknown
79.4220 : 1c,2t,3c-trimethylcyclohexane
79.7370 : 3-ethylheptane
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 69.500 - End Time: 80.000


Signal
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 79.500 - End Time: 90.000
79.7370 : 3-ethylheptane
80.2496 : 3-methyloctane
80.5727 : 3,3-diethylpentane
81.0113 : unknown
81.2991 : 1c,2t,4c-trimethylcyclohexane
81.6659 : 1,1,2-trimethylcyclohexane
82.0299 : 1,2-dimethylbenzene
82.5598 : I9-[4]
82.9222 : I9-[5]
83.6557 : N9-[5]
83.9224 : N9-[6]
84.0616 : unknown
84.4376 : nonene-1
84.6087 : I9-[6]
85.0136 : N9-[7]
85.5537 : I9-[7]
86.0084 : i-butylcyclopentane
86.2203 : N9-[8]
87.0637 : unknown
87.4390 : N9-[9]
87.7380 : N9-[10]
88.0317 : t-nonene-2
88.2508 : t-nonene-3
88.6634 : I9-[8]
88.8345 : unknown
89.2360 : n-nonane
89.5964 : 1,1-methylethylcyclohexane

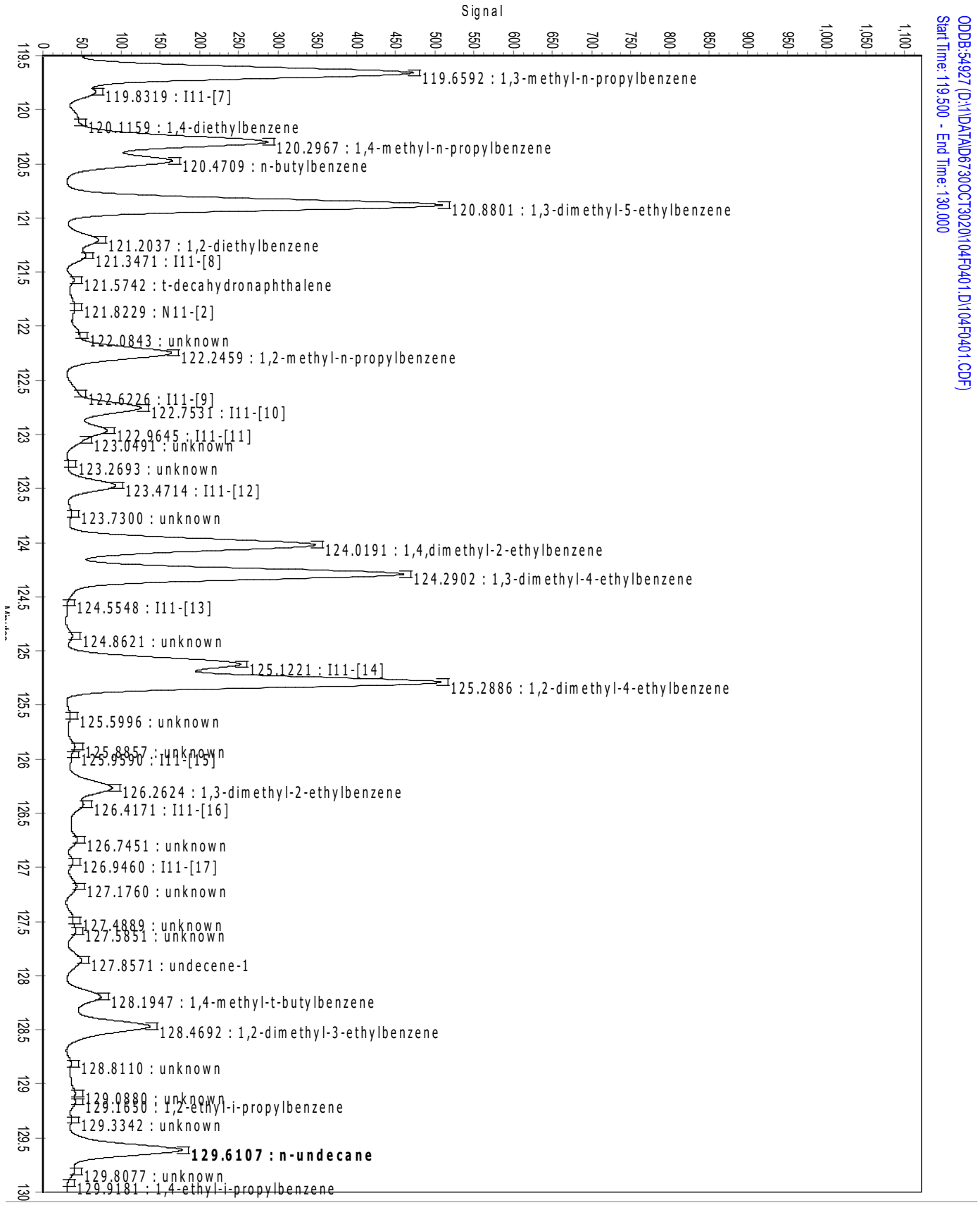


ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 89.500 - End Time: 100.000


Signal
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
4,200
4,400
4,600
4,800
5,000
5,200
5,400
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 99.500 - End Time: 110.000
99.5
100
100.5
101
101.5
102
102.5
103
103.5
104
104.5
105
105.5
106
106.5
107
107.5
108
108.5
109
109.5
110
99.5488 : n-propylbenzene
99.8454 : 3,6-dimethyloctane
100.1022 : 3-methyl-5-ethylheptane
100.2378 : unknown
100.5678 : N10-[3]
101.2393 : unknown
101.5049 : 1,3-methylethylbenzene
101.8882 : 1,4-methylethylbenzene
102.1969 : N10-[4]
102.3557 : unknown
102.7609 : unknown
102.9447 : unknown
103.2324 : 1,3,5-trimethylbenzene
103.4973 : I10-[5]
103.7643 : N10-[5]
103.9562 : unknown
104.1935 : I10-[6]
104.5102 : 5-methylnonane
104.9149 : 4-methylnonane
105.2590 : 1,2-methylethylbenzene
105.4454 : 2-methylnonane
105.5822 : unknown
105.8667 : unknown
106.0978 : 3-ethyloctane
106.1882 : unknown
106.4703 : N10-[6]
106.8008 : 3-methylnonane
107.0228 : unknown
107.3659 : N10-[7]
107.5437 : I10-[7]
107.8161 : I10-[8]
108.1023 : unknown
108.5628 : 1,2,4-trimethylbenzene
108.7967 : unknown
108.9809 : I10-[9]
109.0795 : i-butylcyclohexane
109.2678 : unknown
109.3853 : I10-[10]
109.6687 : I10-[11]
109.8092 : I10-[12]

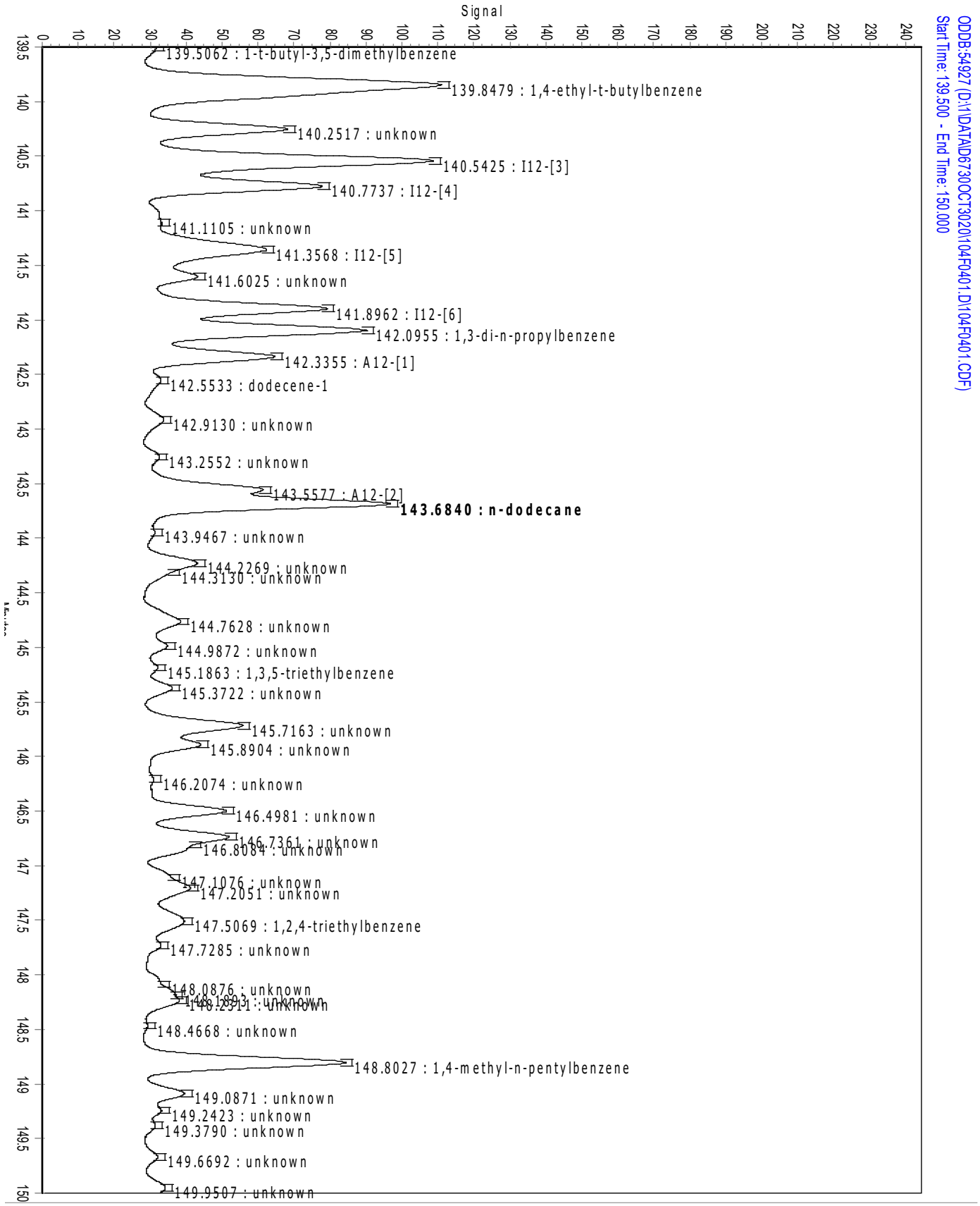


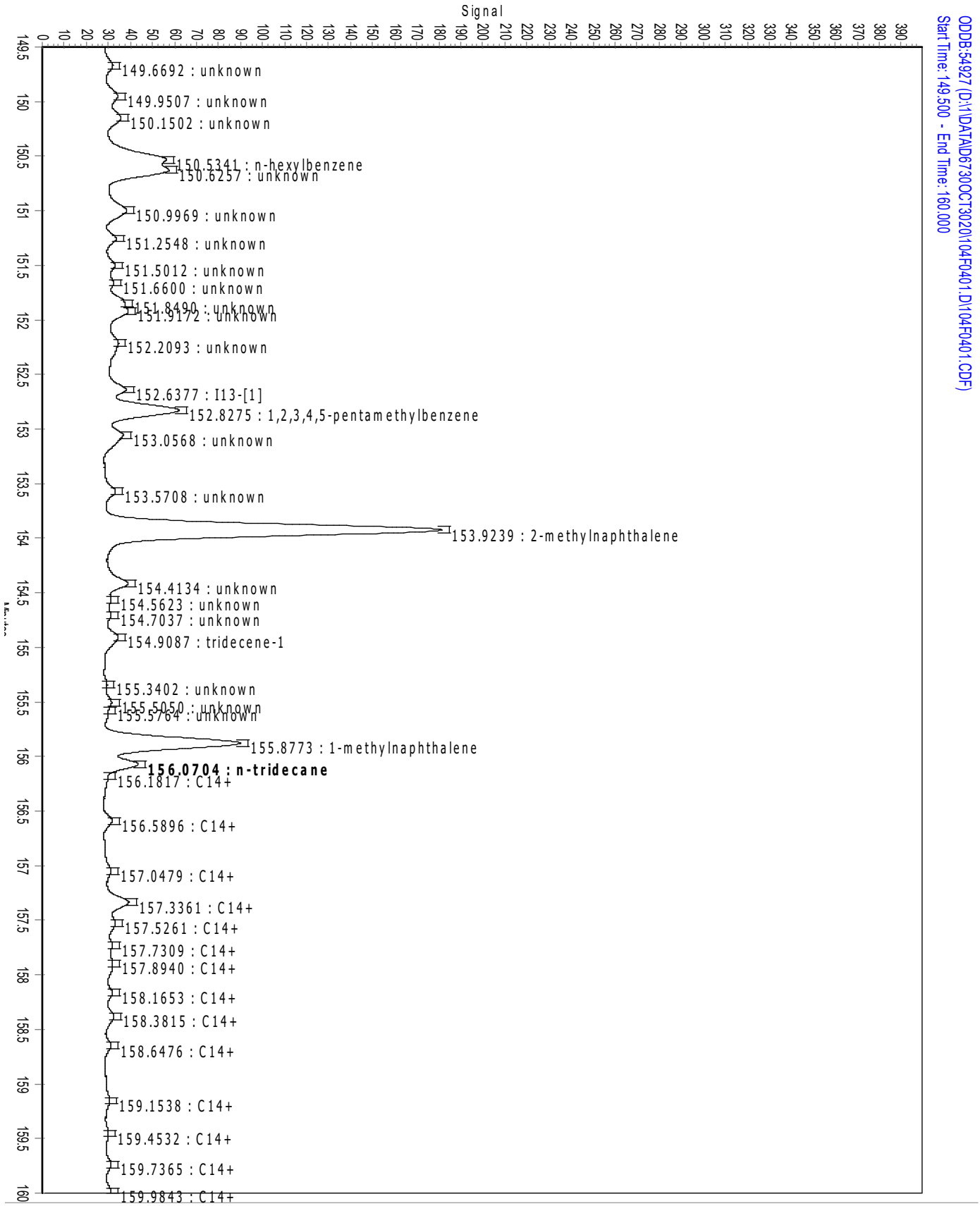
ODDB:54927 (D:\1DATA\D6730OCT30201\04F0401.D\104F0401.CDF)
Start Time: 109.500 - End Time: 120.000

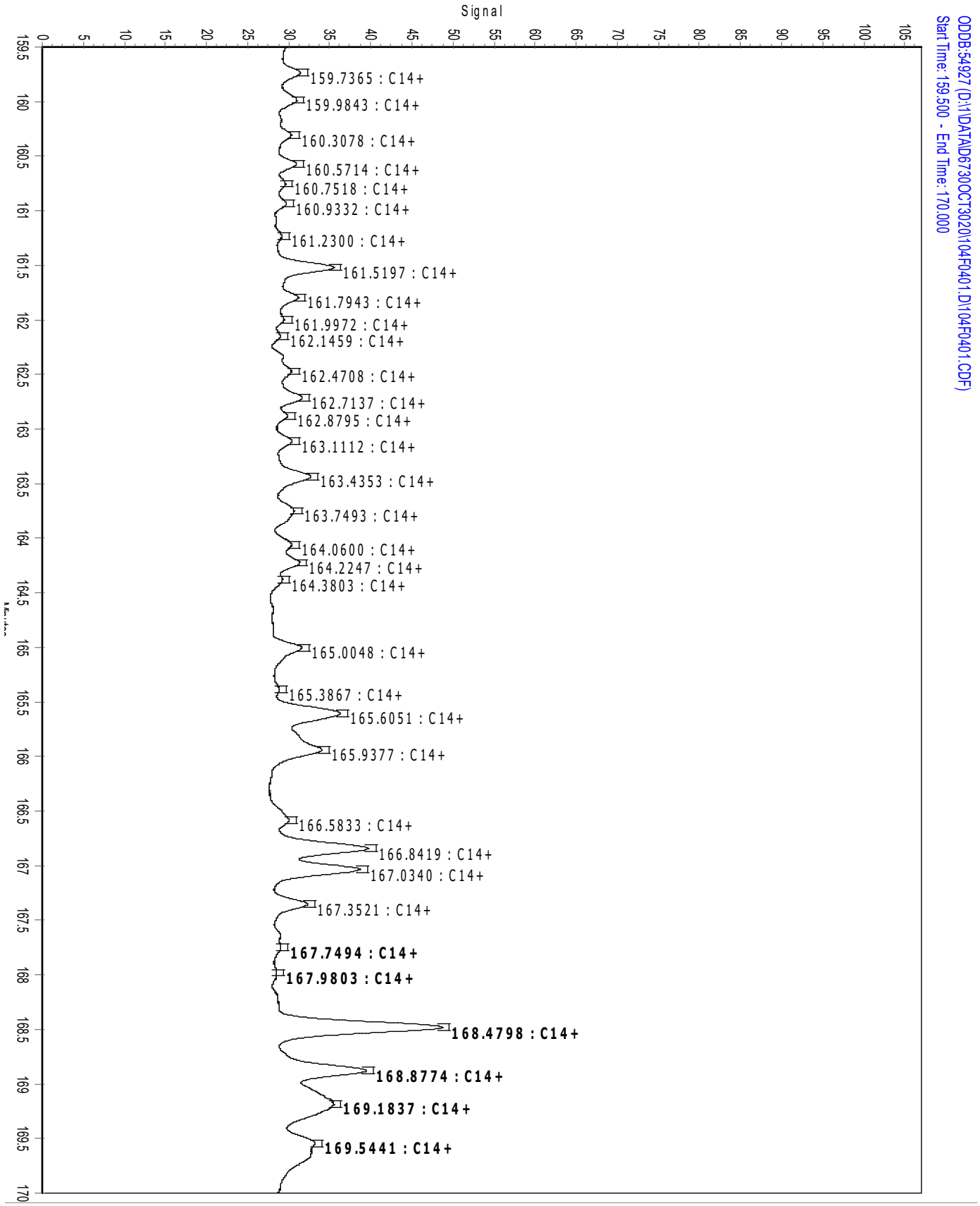


ODB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 119.500 - End Time: 130.000

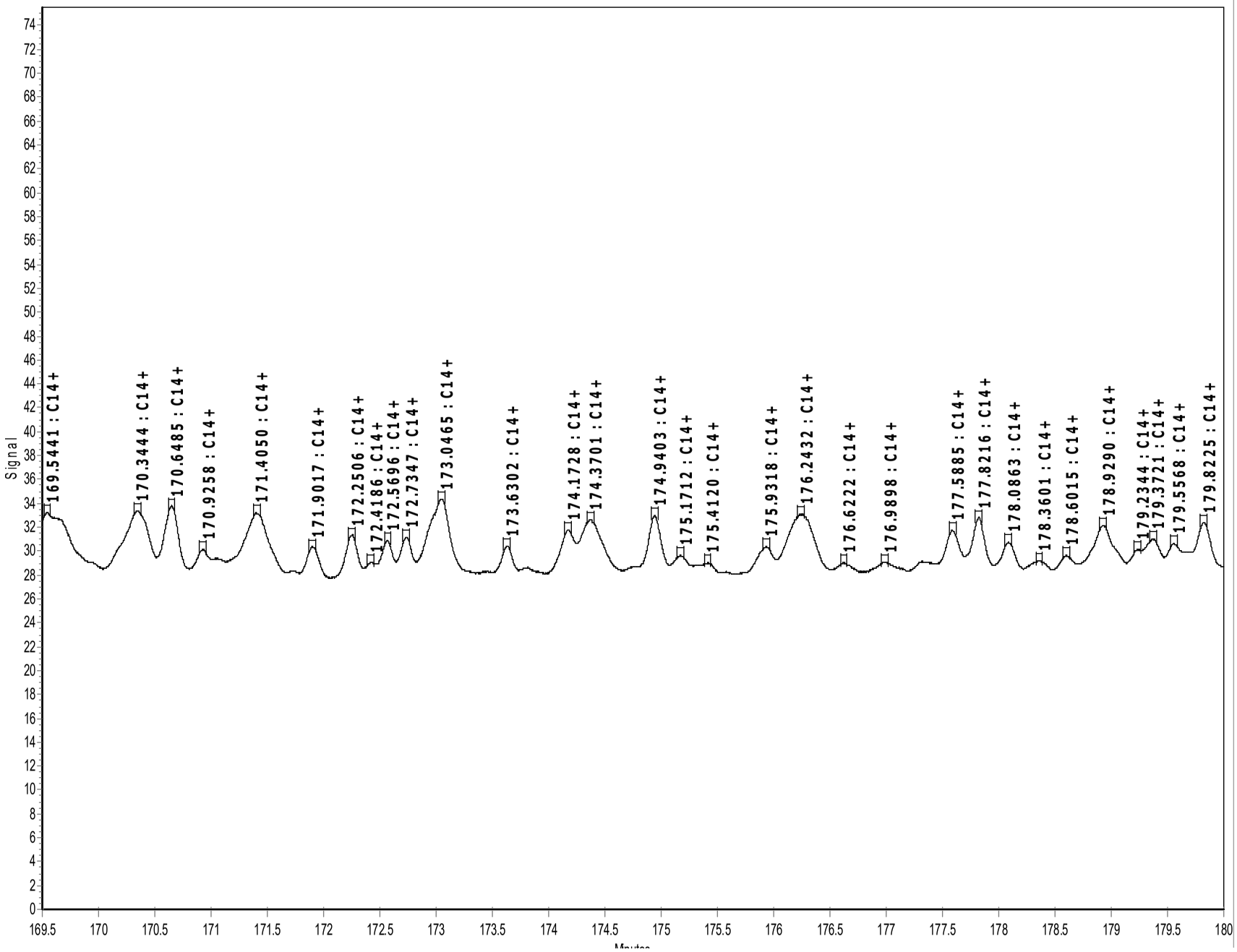
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 129.500 - End Time: 140.000


Signal
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 139.500 - End Time: 150.000
139.5062 : 1-t-butyl-3,5-dimethylbenzene
139.8479 : 1,4-ethyl-t-butylbenzene
140.2517 : unknown
140.5425 : I12-[3]
140.7737 : I12-[4]
141.1105 : unknown
141.3568 : I12-[5]
141.6025 : unknown
141.8962 : I12-[6]
142.0955 : 1,3-di-n-propylbenzene
142.3355 : A12-[1]
142.5533 : dodecene-1
142.9130 : unknown
143.2552 : unknown
143.5577 : A12-[2]
143.6840 : n-dodecane
143.9467 : unknown
144.2269 : unknown
144.3130 : unknown
144.7628 : unknown
144.9872 : unknown
145.1863 : 1,3,5-triethylbenzene
145.3722 : unknown
145.7163 : unknown
145.8904 : unknown
146.2074 : unknown
146.4981 : unknown
146.7361 : unknown
146.8084 : unknown
147.1076 : unknown
147.2051 : unknown
147.5069 : 1,2,4-triethylbenzene
147.7285 : unknown
148.0876 : unknown
148.1893 : unknown
148.2331 : unknown
148.4668 : unknown
148.8027 : 1,4-methyl-n-pentylbenzene
149.0871 : unknown
149.2423 : unknown
149.3790 : unknown
149.6692 : unknown
149.9507 : unknown

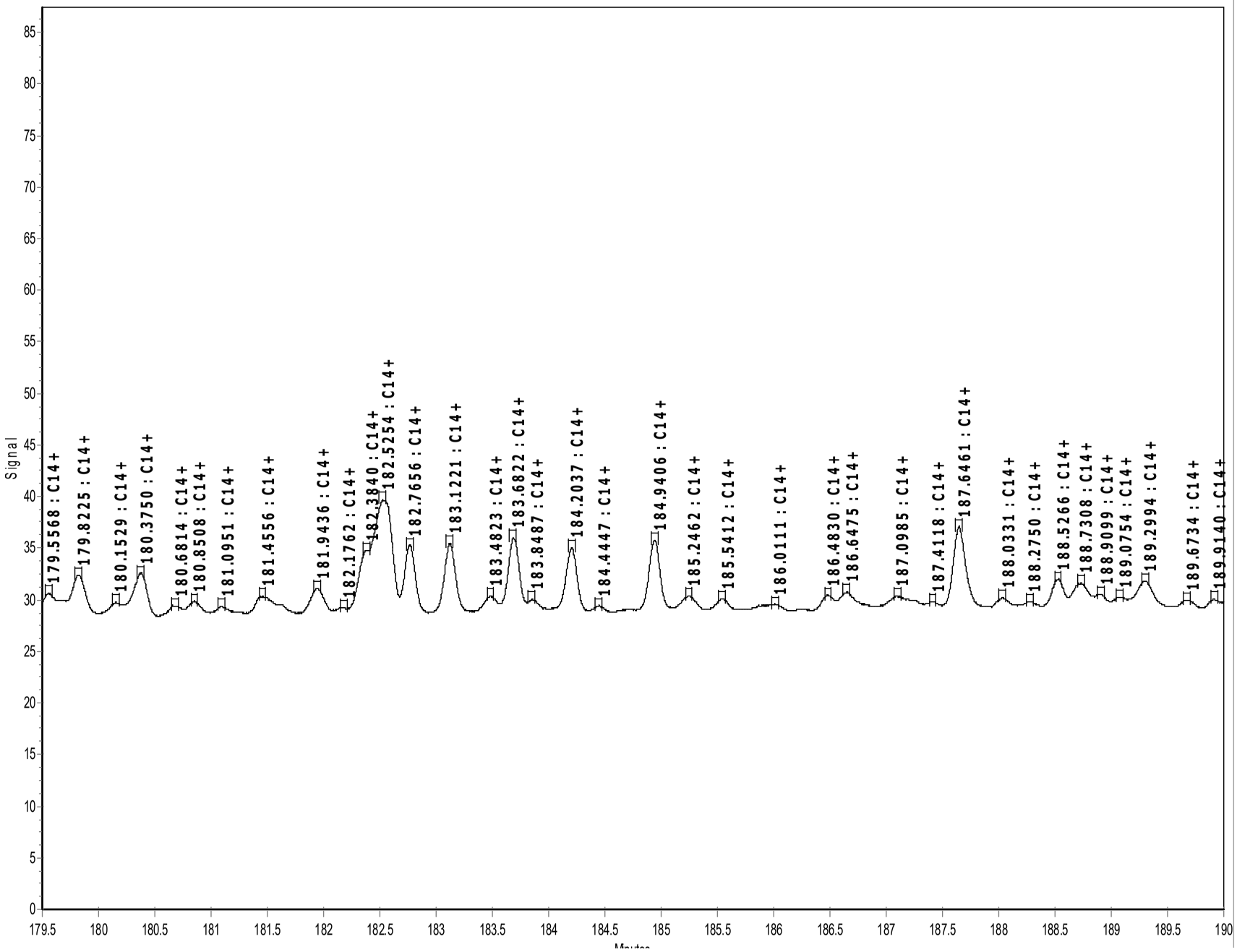

Signal
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 149.500 - End Time: 160.000
149.6692 : unknown
149.9507 : unknown
150.1502 : unknown
150.5341 : n-hexylbenzene
150.6257 : unknown
150.9969 : unknown
151.2548 : unknown
151.5012 : unknown
151.6600 : unknown
151.8490 : unknown
151.9172 : unknown
152.2093 : unknown
152.6377 : I13-[1]
152.8275 : 1,2,3,4,5-pentamethylbenzene
153.0568 : unknown
153.5708 : unknown
153.9239 : 2-methylnaphthalene
154.4134 : unknown
154.5623 : unknown
154.7037 : unknown
154.9087 : tridecene-1
155.3402 : unknown
155.5050 : unknown
155.5764 : unknown
155.8773 : 1-methylnaphthalene
156.0704 : n-tridecane
156.1817 : C14+
156.5896 : C14+
157.0479 : C14+
157.3361 : C14+
157.5261 : C14+
157.7309 : C14+
157.8940 : C14+
158.1653 : C14+
158.3815 : C14+
158.6476 : C14+
159.1538 : C14+
159.4532 : C14+
159.7365 : C14+
159.9843 : C14+


Signal
ODDB:54927 (D:\1DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 159.500 - End Time: 170.000
159.7365 : C14+
159.9843 : C14+
160.3078 : C14+
160.5714 : C14+
160.7518 : C14+
160.9332 : C14+
161.2300 : C14+
161.5197 : C14+
161.7943 : C14+
161.9972 : C14+
162.1459 : C14+
162.4708 : C14+
162.7137 : C14+
162.8795 : C14+
163.1112 : C14+
163.4353 : C14+
163.7493 : C14+
164.0600 : C14+
164.2247 : C14+
164.3803 : C14+
165.0048 : C14+
165.3867 : C14+
165.6051 : C14+
165.9377 : C14+
166.5833 : C14+
166.8419 : C14+
167.0340 : C14+
167.3521 : C14+
167.7494 : C14+
167.9803 : C14+
168.4798 : C14+
168.8774 : C14+
169.1837 : C14+
169.5441 : C14+

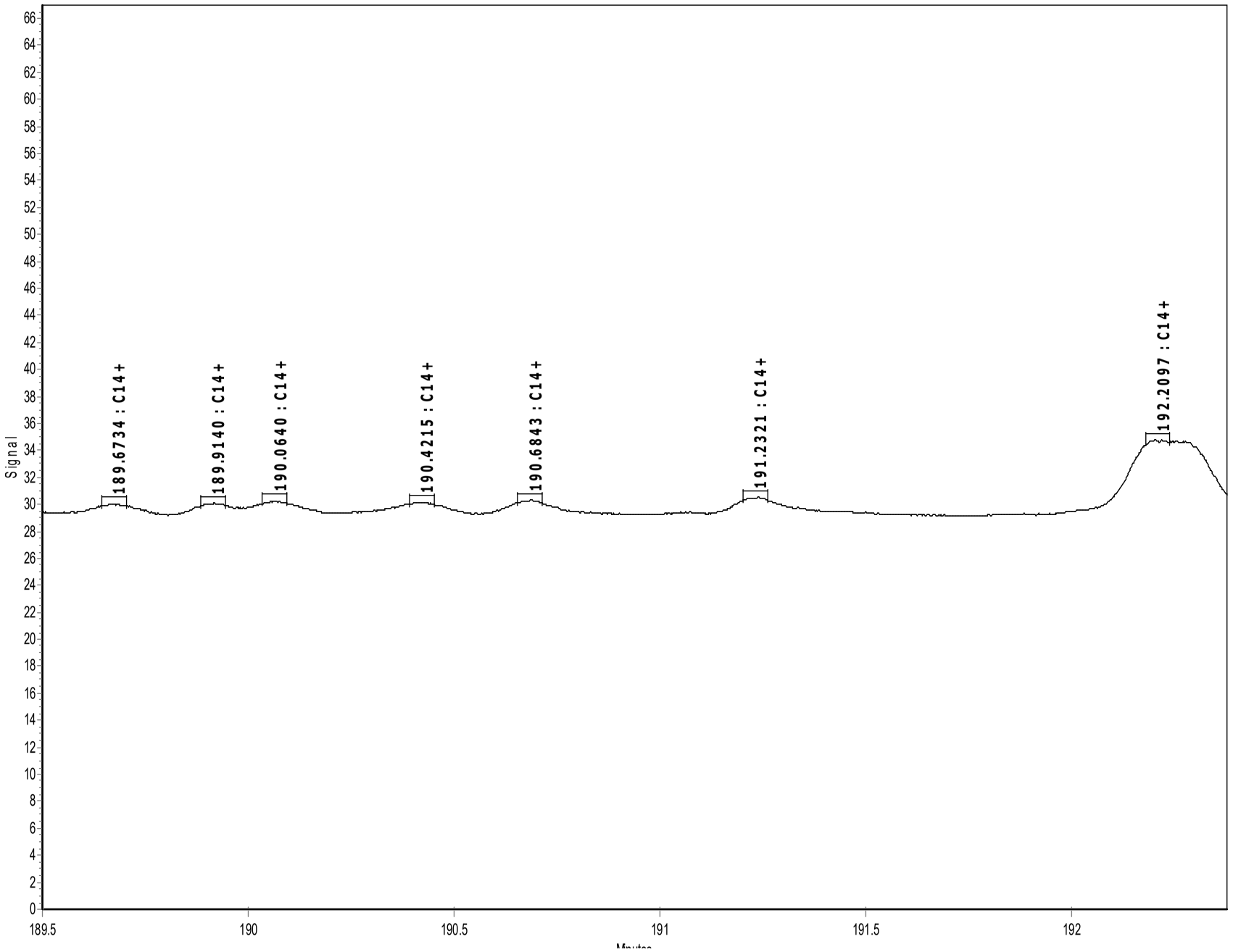
ODDB:54927 (D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 169.500 - End Time: 180.000



ODDB:54927 (D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 179.500 - End Time: 190.000



ODDB:54927 (D:\1\DATA\D6730OCT3020\104F0401.D\104F0401.CDF)
Start Time: 189.500 - End Time: 192.378



Detailed Hydrocarbon Analysis Summary Report -

Report Date: 11/2/2020 9:31:33 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Location: GC 12 D6730
Normalized to 100.000%

SUMMARY REPORT

Group Type	Total(Mass%)	Total(Vol%)	Total(Mol%)
Paraffins:	7.424	8.357	7.222
I-Paraffins:	37.199	40.616	31.946
Olefins:	3.891	4.198	3.984
Naphthenes:	11.435	11.078	9.630
Aromatics:	21.894	18.533	16.710
Total C14+:	0.355	0.344	0.149
Total Unknowns:	1.645	1.738	1.142

Oxygenates:

Total:	16.156(Mass%)	15.136(Vol%)
Total Oxygen Content:	5.611(Mass%)	

Multisubstituted Aromatics: 13.900(Mass%) 11.798(Vol%)

Average Molecular Weight: 83.316

Relative Density: 0.739

Vapor Pressure :

Calculated Octane Number: 86.8

Motor Octane Number (Jenkins Calculation): 78.7

	IBP	T10	T50	T90	FBP
BP by Mass (Deg F)	31.10	173.30	197.33	329.32	465.89
BP by Vol (Deg F)	31.10	173.30	197.33	329.32	449.60

Percent Carbon: 82.918
Percent Hydrogen: 11.471
Bromine Number (Calc): 7.285
Particulate Matter Index: 1.074

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Oxygenates

Compound	Mass%	Mass% Oxygen	Vol%
ethanol : X2	16.156	5.611	15.136

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Totals by Group Type & Carbon Number (in Mass Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.472	0.097	0.045	0.000	0.000	0.001	0.615
C5	2.364	6.598	1.633	0.323	0.000	0.001	10.919
C6	1.781	7.437	1.133	3.087	0.681	0.041	14.160
C7	1.303	8.108	0.727	3.698	4.466	0.006	18.309
C8	0.787	9.331	0.068	2.685	7.182	0.211	20.264
C9	0.368	3.193	0.186	1.306	5.506	0.192	10.752
C10	0.193	1.696	0.067	0.293	3.332	0.264	5.844
C11	0.102	0.488	0.019	0.039	0.369	0.356	1.374
C12	0.043	0.244	0.005	0.004	0.358	0.288	0.941
C13	0.009	0.008	0.007	0.000	0.000	0.285	0.309
Total:	7.424	37.199	3.891	11.435	21.894	1.645	81.844

Oxygenates 16.156
Total C14+: 0.355
Total Unknowns: 1.645
Grand Total: 100.000

Totals by Group Type & Carbon Number (in Volume Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.603	0.129	0.054	0.000	0.000	0.001	0.787
C5	2.791	7.872	1.828	0.320	0.000	0.001	12.812
C6	1.997	8.359	1.192	3.018	0.573	0.044	15.182
C7	1.409	8.749	0.759	3.617	3.808	0.007	18.348
C8	0.828	9.788	0.069	2.576	6.119	0.223	19.602
C9	0.379	3.282	0.198	1.236	4.673	0.203	9.971
C10	0.195	1.706	0.067	0.270	2.771	0.278	5.287
C11	0.102	0.485	0.019	0.036	0.293	0.376	1.311
C12	0.042	0.239	0.005	0.004	0.297	0.304	0.891
C13	0.009	0.007	0.007	0.000	0.000	0.301	0.324
Total:	8.357	40.616	4.198	11.078	18.533	1.738	82.783

Oxygenates 15.136
Total C14+: 0.344
Total Unknowns: 1.738
Grand Total: 100.000

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Totals by Group Type & Carbon Number (in Mol Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.001	0.000	0.000	0.000	0.000	0.000	0.001
C2	0.001	0.000	0.000	0.000	0.000	0.000	0.001
C3	0.003	0.000	0.000	0.000	0.000	0.000	0.003
C4	0.677	0.140	0.067	0.000	0.000	0.001	0.884
C5	2.730	7.619	1.944	0.384	0.000	0.001	12.678
C6	1.722	7.190	1.128	3.056	0.726	0.106	13.928
C7	1.084	6.742	0.616	3.138	4.038	0.006	15.624
C8	0.574	6.806	0.050	1.994	5.636	0.159	15.218
C9	0.239	2.074	0.123	0.862	3.817	0.160	7.275
C10	0.113	0.993	0.040	0.174	2.099	0.179	3.597
C11	0.055	0.260	0.010	0.021	0.210	0.222	0.779
C12	0.021	0.119	0.003	0.002	0.184	0.160	0.488
C13	0.004	0.003	0.003	0.000	0.000	0.147	0.158
Total:	7.222	31.946	3.984	9.630	16.710	1.142	69.491

Oxygenates	29.218	Total C14+:	0.149
Total Unknowns:	1.142	Grand Total:	100.000

Detailed Hydrocarbon Analysis - Dienes (Di-Olefins) Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Diene Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %
8.989	395.150	O4	1,3-butadiene	0.000	0.000	0.000
13.018	481.230	O5	1,4-pentadiene	0.001	0.001	0.001
14.847	506.130	O5	2-methylbutadiene-1,3	0.007	0.007	0.008
16.185	527.960	O5	1t,3-pentadiene	0.007	0.008	0.009
16.884	538.210	O5	cyclopentadiene	0.005	0.006	0.006
20.389	581.030	O6	1,5-hexadiene	0.000	0.000	0.000
21.988	597.090	O6	1c/t,4-hexadiene	0.000	0.000	0.000
25.273	632.950	O7	cyclic diolefin or triolefin-[1]	0.002	0.002	0.002
25.835	638.590	O7	cyclic diolefin or triolefin-[2]	0.006	0.007	0.007
28.352	661.960	O6	diolefin (hexadiene)	0.003	0.003	0.003
36.536	720.930	N8	1,1,3-trimethylcyclopentane	0.162	0.160	0.120

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 6**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
6.434	100.000	P1	methane	0.000	0.000	0.001	-258.700	-161.500
6.620	200.000	P2	ethane	0.000	0.000	0.001	-127.480	-88.600
7.114	293.500	O3	propylene	0.000	0.000	0.000	-53.896	-47.720
7.175	300.000	P3	propane	0.002	0.002	0.003	-43.672	-42.040
8.190	366.110	I4	i-butane	0.097	0.129	0.140	10.904	-11.720
8.341	372.460	--	unknown	0.000	0.000	0.001	32.000	0.000
8.700	385.850	--	unknown	0.000	0.000	0.000	32.000	0.000
8.827	390.070	O4	butene-1	0.002	0.003	0.003	20.750	-6.250
8.878	391.710	O4	isobutylene	0.003	0.004	0.004	20.750	-6.250
8.989	395.150	O4	1,3-butadiene	0.000	0.000	0.000	24.062	-4.410
9.153	400.000	P4	n-butane	0.472	0.603	0.677	31.100	-0.500
9.544	412.290	O4	t-butene-2	0.017	0.021	0.025	33.584	0.880
9.641	415.130	I5	2,2-dimethylpropane	0.003	0.004	0.004	49.100	9.500
9.863	421.260	--	unknown	0.001	0.001	0.001	32.000	0.000
10.129	428.120	O4	c-butene-2	0.023	0.027	0.034	38.696	3.720
11.757	461.660	X2	ethanol	16.156	15.136	29.218	173.300	78.500
12.772	477.720	I5	i-pentane	6.595	7.868	7.616	82.112	27.840
13.018	481.230	O5	1,4-pentadiene	0.001	0.001	0.001	78.728	25.960
13.745	490.880	O5	pentene-1	0.116	0.134	0.138	85.928	29.960
14.221	496.690	O5	2-methylbutene-1	0.268	0.305	0.319	88.070	31.150
14.505	500.000	P5	n-pentane	2.364	2.791	2.730	96.908	36.060
14.847	506.130	O5	2-methylbutadiene-1,3	0.007	0.007	0.008	93.308	34.060
15.094	510.410	O5	t-pentene-2	0.350	0.399	0.416	97.412	36.340
15.465	516.610	O5	3,3-dimethylbutene-1	0.005	0.005	0.006	106.232	41.240
15.635	519.360	O5	c-pentene-2	0.194	0.219	0.231	98.474	36.930
15.794	521.910	--	unknown	0.000	0.000	0.001	32.000	0.000
15.972	524.700	O5	2-methylbutene-2	0.585	0.652	0.694	101.408	38.560
16.185	527.960	O5	1t,3-pentadiene	0.007	0.008	0.009	107.636	42.020
16.305	529.780	--	unknown	0.001	0.001	0.001	32.000	0.000
16.884	538.210	O5	cyclopentadiene	0.005	0.006	0.006	32.000	0.000
17.013	540.020	I6	2,2-dimethylbutane	0.419	0.477	0.405	121.514	49.730

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

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Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
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Comments:
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Hold

Components Listed in Chromatographic Order **Page: 7**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
18.312	557.160	O5	cyclopentene	0.095	0.091	0.117	111.614	44.230
18.678	561.660	O6	4-methylpentene-1	0.022	0.025	0.022	128.948	53.860
18.747	562.490	O6	3-methylpentene-1	0.037	0.041	0.036	129.506	54.170
19.103	566.710	N5	cyclopentane	0.323	0.320	0.384	120.650	49.250
19.290	568.880	I6	2,3-dimethylbutane	1.275	1.425	1.233	136.364	57.980
19.446	570.670	--	unknown	0.040	0.043	0.105	32.000	0.000
19.566	572.030	O6	2,3-dimethylbutene-1	0.019	0.021	0.019	132.098	55.610
19.703	573.570	I6	2-methylpentane	3.538	4.005	3.421	140.468	60.260
19.834	575.020	O6	4-methyl-t-pentene-2	0.065	0.071	0.064	137.480	58.600
20.389	581.030	O6	1,5-hexadiene	0.000	0.000	0.000	139.010	59.450
20.808	585.420	I6	3-methylpentane	2.204	2.452	2.131	145.886	63.270
21.260	590.000	O6	2-methylpentene-1	0.107	0.115	0.106	143.780	62.100
21.350	590.900	O6	hexene-1	0.046	0.050	0.045	146.246	63.470
21.988	597.090	O6	1c/t,4-hexadiene	0.000	0.000	0.000	149.000	65.000
22.295	600.000	P6	n-hexane	1.781	1.997	1.722	155.714	68.730
22.520	602.700	O6	t-hexene-3	0.070	0.076	0.069	152.744	67.080
22.587	603.480	O6	c-hexene-3	0.023	0.025	0.023	151.592	66.440
22.739	605.280	O6	t-hexene-2	0.137	0.149	0.136	154.184	67.880
22.942	607.650	O6	2-methylpentene-2	0.174	0.187	0.173	153.140	67.300
23.021	608.570	O6	4-methylcyclopentene	0.047	0.045	0.048	148.820	64.900
23.183	610.430	O6	3-methyl-c-pentene-2	0.106	0.112	0.105	153.842	67.690
23.306	611.830	O6	3-methylcyclopentene	0.025	0.024	0.026	149.000	65.000
23.415	613.070	O6	O6-[1]	0.000	0.000	0.000	32.000	0.000
23.546	614.540	O6	c-hexene-2	0.074	0.079	0.074	155.984	68.880
23.783	617.170	O6	O6-[2]	0.001	0.001	0.001	32.000	0.000
24.112	620.760	O7	3,3-dimethylpentene-1	0.163	0.172	0.139	171.446	77.470
24.244	622.190	--	unknown	0.001	0.001	0.002	32.000	0.000
24.304	622.840	O7	4,4-dimethyl-t-pentene-2	0.002	0.002	0.002	170.114	76.730
24.407	623.940	I7	2,2-dimethylpentane	0.098	0.107	0.081	174.542	79.190
24.623	626.230	N6	methylcyclopentane	2.307	2.278	2.284	161.240	71.800
25.034	630.510	I7	2,4-dimethylpentane	1.442	1.585	1.199	176.882	80.490

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

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Hold

Components Listed in Chromatographic Order **Page: 8**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
25.273	632.950	O7	cyclic diolefin or triolefin-[1]	0.002	0.002	0.002	32.000	0.000
25.455	634.800	I7	2,2,3-trimethylbutane	0.046	0.049	0.038	177.584	80.880
25.622	636.470	--	unknown	0.002	0.002	0.002	32.000	0.000
25.835	638.590	O7	cyclic diolefin or triolefin-[2]	0.006	0.007	0.007	32.000	0.000
26.173	641.890	O7	O7-[1]	0.002	0.002	0.002	32.000	0.000
26.283	642.960	O7	3,4-dimethylpentene-1	0.006	0.006	0.005	177.422	80.790
26.655	646.520	O7	4,4-dimethyl-c-pentene-2	0.008	0.008	0.007	176.756	80.420
26.801	647.900	O7	2,4-dimethylpentene-1	0.008	0.008	0.007	178.880	81.600
26.903	648.850	O6	1-methylcyclopentene	0.177	0.167	0.179	167.864	75.480
27.103	650.710	A6	benzene	0.681	0.573	0.726	176.162	80.090
27.285	652.400	O7	2-methyl-c-hexene-3	0.004	0.004	0.003	186.800	86.000
27.500	654.360	I7	3,3-dimethylpentane	0.092	0.098	0.076	186.908	86.060
27.600	655.270	O7	5-methylhexene-1	0.009	0.010	0.008	185.558	85.310
27.793	657.010	--	unknown	0.003	0.004	0.003	32.000	0.000
27.927	658.210	N6	cyclohexane	0.780	0.740	0.772	177.296	80.720
28.222	660.820	O7	2-methyl-t-hexene-3	0.016	0.017	0.014	186.620	85.900
28.352	661.960	O6	diolefin (hexadiene)	0.003	0.003	0.003	158.000	70.000
28.444	662.760	O7	2-ethyl-3-methylbutene-1	0.006	0.006	0.005	187.448	86.360
28.571	663.870	O7	4-methylhexene-1	0.013	0.014	0.011	188.114	86.730
28.884	666.550	O7	4-methyl-t/c-hexene-2	0.027	0.028	0.023	187.358	86.310
29.040	667.880	I7	2-methylhexane	1.883	2.051	1.566	194.090	90.050
29.203	669.260	I7	2,3-dimethylpentane	2.443	2.598	2.031	193.604	89.780
29.486	671.630	N7	1,1-dimethylcyclopentane	0.072	0.070	0.061	189.464	87.480
29.808	674.290	O7	5-methyl-t-hexene-2	0.022	0.023	0.018	190.598	88.110
30.021	676.020	I7	3-methylhexane	1.925	2.071	1.600	197.330	91.850
30.450	679.480	O7	3,4-dimethyl-c-pentene-2	0.012	0.012	0.010	192.650	89.250
30.758	681.920	N7	1c,3-dimethylcyclopentane	0.656	0.651	0.557	195.386	90.770
31.111	684.690	N7	1t,3-dimethylcyclopentane	0.583	0.576	0.495	197.096	91.720
31.287	686.050	I7	3-ethylpentane	0.179	0.190	0.149	200.246	93.470
31.477	687.510	N7	1t,2-dimethylcyclopentane	0.571	0.562	0.485	197.366	91.870
31.659	688.890	I8	2,2,4-trimethylpentane	2.672	2.855	1.949	210.632	99.240

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

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Processed 631 Peaks
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Hold

Components Listed in Chromatographic Order **Page: 9**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
31.751	689.590	O7	2-ethylpentene-1	0.008	0.008	0.007	200.552	93.640
32.211	693.040	O7	O7-[2]	0.001	0.001	0.001	32.000	0.000
32.450	694.810	O7	3-methyl-c-hexene-3	0.020	0.021	0.017	203.720	95.400
32.987	698.720	O7	t-heptene-3	0.074	0.078	0.063	204.206	95.670
33.163	700.000	P7	n-heptane	1.303	1.409	1.084	209.156	98.420
33.461	701.950	O7	2-methyl-2-hexene	0.078	0.081	0.066	203.738	95.410
33.616	702.950	O7	3-methyl-t-hexene-3	0.029	0.031	0.025	200.372	93.540
33.860	704.530	O7	t-heptene-2	0.029	0.030	0.025	208.310	97.950
34.089	705.990	O7	3-ethylpentene-2	0.020	0.020	0.017	204.818	96.010
34.574	709.050	O7	c-heptene-2	0.074	0.076	0.062	209.138	98.410
34.767	710.260	O7	3-methyl-t-hexene-2	0.001	0.001	0.001	203.324	95.180
35.095	712.280	O7	2,3-dimethylpentene-2	0.031	0.032	0.027	207.320	97.400
35.326	713.700	O7	3-ethylcyclopentene	0.004	0.003	0.003	207.986	97.770
35.420	714.270	--	unknown	0.000	0.001	0.000	32.000	0.000
35.719	716.080	O7	O7-[3]	0.006	0.006	0.005	32.000	0.000
35.981	717.650	N7	1c,2-dimethylcyclopentane	0.257	0.259	0.218	211.154	99.530
36.112	718.420	N7	methylcyclohexane	1.235	1.187	1.048	213.674	100.930
36.424	720.270	I8	2,2-dimethylhexane	0.045	0.048	0.033	224.312	106.840
36.536	720.930	N8	1,1,3-trimethylcyclopentane	0.162	0.160	0.120	220.802	104.890
36.847	722.740	--	unknown	0.009	0.009	0.006	32.000	0.000
36.948	723.320	O7	O7-[4]	0.003	0.003	0.002	32.000	0.000
37.145	724.450	O7	O7-[5]	0.004	0.005	0.004	32.000	0.000
37.287	725.260	--	unknown	0.001	0.001	0.001	32.000	0.000
37.503	726.490	O7	O7-[6]	0.007	0.007	0.006	32.000	0.000
38.005	729.320	N7	ethylcyclopentane	0.324	0.313	0.275	218.246	103.470
38.129	730.010	I8	2,5-dimethylhexane	0.548	0.584	0.400	228.398	109.110
38.317	731.050	I8	2,2,3-trimethylpentane	0.105	0.109	0.077	229.730	109.850
38.466	731.870	I8	2,4-dimethylhexane	0.633	0.669	0.462	228.974	109.430
38.603	732.620	--	unknown	0.010	0.010	0.007	32.000	0.000
38.816	733.790	--	unknown	0.002	0.002	0.001	32.000	0.000
38.922	734.360	O7	O7-[7]	0.002	0.002	0.001	32.000	0.000

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Hold

Components Listed in Chromatographic Order

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39.161	735.650	O7	O7-[8]	0.002	0.002	0.001	32.000	0.000
39.474	737.330	N8	1c,2t,4-trimethylcyclopentane	0.276	0.268	0.205	242.132	116.740
39.691	738.480	I8	3,3-dimethylhexane	0.054	0.057	0.040	233.546	111.970
40.177	741.040	O7	O7-[9]	0.003	0.003	0.003	32.000	0.000
40.480	742.610	O7	O7-[10]	0.002	0.002	0.001	32.000	0.000
40.654	743.510	O7	O7-[11]	0.006	0.006	0.005	32.000	0.000
40.837	744.450	N8	1t,2c,3-trimethylcyclopentane	0.200	0.192	0.148	230.738	110.410
41.376	747.190	I8	2,3,4-trimethylpentane	1.183	1.216	0.863	236.246	113.470
41.594	748.290	I8	I8-[1]	0.073	0.075	0.053	236.246	113.470
41.892	749.770	O7	O7-[12]	0.019	0.020	0.014	32.000	0.000
42.198	751.280	I8	2,3,3-trimethylpentane	1.116	1.135	0.814	238.586	114.770
42.628	753.390	A7	toluene	4.466	3.808	4.038	231.134	110.630
42.749	753.980	O8	O8-[1]	0.004	0.004	0.003	32.000	0.000
42.938	754.890	O8	O8-[2]	0.001	0.001	0.001	32.000	0.000
43.079	755.570	O8	O8-[3]	0.005	0.006	0.004	32.000	0.000
43.191	756.110	--	unknown	0.001	0.001	0.001	32.000	0.000
43.610	758.100	I8	2,3-dimethylhexane	0.509	0.528	0.371	240.098	115.610
43.760	758.810	I8	2-methyl-3-ethylpentane	0.081	0.084	0.059	240.098	115.610
44.088	760.360	N8	1,1,2-trimethylcyclopentane	0.010	0.009	0.007	236.714	113.730
44.532	762.420	O8	O8-[4]	0.026	0.027	0.020	32.000	0.000
44.937	764.290	I8	2-methylheptane	0.880	0.932	0.642	243.770	117.650
45.253	765.720	I8	4-methylheptane	0.335	0.352	0.245	243.878	117.710
45.514	766.910	I8	3-methyl-3-ethylpentane	0.067	0.069	0.049	240.098	115.610
45.619	767.380	I8	3,4-dimethylhexane	0.085	0.087	0.062	243.914	117.730
46.239	770.140	N8	1c,2c,4-trimethylcyclopentane	0.105	0.102	0.078	242.168	116.760
46.653	771.970	I8	3-methylheptane	0.841	0.881	0.613	246.074	118.930
46.932	773.190	--	unknown	0.187	0.197	0.136	32.000	0.000
47.013	773.540	N8	1c,2t,3-trimethylcyclopentane	0.386	0.371	0.287	243.500	117.500
47.175	774.240	I8	3-ethylhexane	0.104	0.108	0.076	245.372	118.540
47.449	775.420	N8	1t,4-dimethylcyclohexane	0.185	0.179	0.137	246.848	119.360
47.893	777.320	--	unknown	0.002	0.002	0.005	32.000	0.000

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Hold

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48.280	778.960	--	unknown	0.001	0.001	0.002	32.000	0.000
48.428	779.580	O8	O8-[5]	0.001	0.001	0.001	32.000	0.000
48.774	781.020	N8	1,1-dimethylcyclohexane	0.033	0.031	0.024	247.190	119.550
49.235	782.930	I9	2,2,5-trimethylhexane	0.598	0.625	0.389	255.362	124.090
49.664	784.690	N8	3c-ethylmethylcyclopentane	0.202	0.194	0.150	249.980	121.100
49.848	785.430	O9	2,6-dimethylheptene-1	0.004	0.004	0.002	32.000	0.000
50.210	786.900	N8	3t-ethylmethylcyclopentane	0.172	0.166	0.128	249.980	121.100
50.543	788.230	N8	2t-ethylmethylcyclopentane	0.157	0.151	0.116	250.160	121.200
51.019	790.120	O8	O8-[6]	0.007	0.007	0.005	32.000	0.000
51.125	790.540	N8	1,1-methylethylcyclopentane	0.020	0.019	0.015	250.754	121.530
51.816	793.250	N8	1t,2-dimethylcyclohexane	0.181	0.173	0.135	254.174	123.430
52.014	794.010	O8	t-octene-4	0.008	0.009	0.006	252.068	122.260
52.422	795.590	O9	3,5,5-trimethylhexene-1	0.001	0.001	0.001	32.000	0.000
52.884	797.340	N8	1c,2c,3-trimethylcyclopentane	0.030	0.029	0.023	253.400	123.000
53.588	800.000	P8	n-octane	0.787	0.828	0.574	258.224	125.680
53.867	801.040	N8	1c,4-dimethylcyclohexane	0.255	0.240	0.189	255.794	124.330
54.738	804.280	O8	t-octene-2	0.008	0.008	0.006	32.000	0.000
54.961	805.090	--	unknown	0.005	0.005	0.012	32.000	0.000
55.335	806.460	I9	I9-[1]	0.035	0.036	0.023	32.000	0.000
55.422	806.770	--	unknown	0.018	0.019	0.011	32.000	0.000
55.829	808.240	N8	i-propylcyclopentane	0.080	0.077	0.060	259.574	126.430
56.490	810.600	--	unknown	0.003	0.004	0.009	32.000	0.000
57.026	812.490	--	unknown	0.008	0.009	0.022	32.000	0.000
57.120	812.820	O8	c-octene-2	0.004	0.004	0.003	32.000	0.000
57.323	813.530	--	unknown	0.001	0.001	0.001	32.000	0.000
57.698	814.840	N8	N8-[1]	0.013	0.013	0.010	32.000	0.000
58.061	816.090	O8	O8-[7]	0.002	0.002	0.002	32.000	0.000
58.446	817.410	I9	2,2,3,4-tetramethylpentane	0.120	0.120	0.078	271.454	133.030
59.088	819.590	I9	2,3,4-trimethylhexane	0.067	0.067	0.044	282.308	139.060
59.384	820.580	N8	N8-[2]	0.003	0.003	0.002	32.000	0.000
59.646	821.460	O9	O9-[1]	0.029	0.030	0.019	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF Acquired: 10/31/20 09:28:00
Sample: ODDB:54928 Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
60.073	822.880	N8	N8-[3]	0.001	0.001	0.001	32.000	0.000
60.499	824.290	O9	O9-[2]	0.006	0.006	0.004	32.000	0.000
61.040	826.050	N8	1c,2-dimethylcyclohexane	0.178	0.165	0.132	265.532	129.740
61.226	826.660	--	unknown	0.023	0.025	0.017	32.000	0.000
61.630	827.960	I9	2,3,5-trimethylhexane	0.006	0.006	0.004	268.430	131.350
61.943	828.970	I9	2,2-dimethylheptane	0.013	0.013	0.008	270.860	132.700
62.837	831.800	N9	1,1,4-trimethylcyclohexane	0.321	0.307	0.212	275.000	135.000
63.396	833.560	I9	2,2,3-trimethylhexane	0.152	0.157	0.099	271.220	132.900
63.984	835.380	I9	2,4-dimethylheptane	0.032	0.033	0.021	271.220	132.900
64.724	837.650	I9	4,4-dimethylheptane	0.185	0.192	0.120	271.220	132.900
65.059	838.670	N8	ethylcyclohexane	0.001	0.001	0.001	269.222	131.790
65.634	840.400	N8	n-propylcyclopentane	0.031	0.030	0.023	267.728	130.960
65.833	841.000	I9	2,5-dimethylheptane	0.250	0.258	0.163	276.800	136.000
66.292	842.360	I9	3,3-&3,5-dimethylheptane	0.058	0.059	0.038	278.636	137.020
66.705	843.580	I9	3,5-dimethylheptane	0.040	0.041	0.026	276.800	136.000
67.186	845.000	I9	2,6-dimethylheptane	0.057	0.060	0.037	275.396	135.220
67.338	845.440	--	unknown	0.011	0.012	0.007	32.000	0.000
67.808	846.810	N9	1,1,3-trimethylcyclohexane	0.046	0.043	0.030	295.862	146.590
68.310	848.250	O9	2,4-dimethylheptene-1	0.002	0.002	0.001	32.000	0.000
68.834	849.750	N8	N8-[4]	0.001	0.001	0.001	32.000	0.000
69.094	850.490	N8	N8-[5]	0.003	0.003	0.002	32.000	0.000
69.410	851.380	N9	1c,2t,4t-trimethylcyclohexane	0.019	0.018	0.012	32.000	0.000
70.260	853.760	A8	ethylbenzene	1.172	0.999	0.920	277.160	136.200
70.637	854.810	N9	1c,3c,5c-trimethylcyclohexane	0.123	0.116	0.081	32.000	0.000
71.467	857.090	O9	2-methyloctene-1	0.019	0.021	0.013	32.000	0.000
71.902	858.280	I9	I9-[2]	0.003	0.003	0.002	32.000	0.000
72.359	859.510	O9	2-methyloctene-2	0.028	0.030	0.018	32.000	0.000
74.105	864.150	A8	1,3-dimethylbenzene	3.147	2.692	2.470	282.416	139.120
74.436	865.020	A8	1,4-dimethylbenzene	1.286	1.104	1.010	281.048	138.360
75.054	866.630	I9	3,4-dimethylheptane	0.029	0.030	0.019	285.080	140.600
75.382	867.470	I9	3,4 -dimethylheptane	0.059	0.059	0.038	285.080	140.600

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
75.917	868.850	N9	N9-[1]	0.026	0.024	0.017	32.000	0.000
76.356	869.970	I9	I9-[3]	0.073	0.074	0.047	32.000	0.000
77.252	872.230	I9	4-ethylheptane	0.002	0.002	0.001	288.392	142.440
77.562	873.000	I9	4-methyloctane	0.260	0.267	0.169	288.392	142.440
77.960	873.990	I9	2-methyloctane	0.319	0.331	0.207	289.904	143.280
78.567	875.490	N9	N9-[2]	0.035	0.034	0.023	32.000	0.000
79.422	877.590	N9	1c,2t,3c-trimethylcyclohexane	0.039	0.038	0.026	304.160	151.200
79.736	878.350	I9	3-ethylheptane	0.074	0.076	0.048	289.400	143.000
80.248	879.590	I9	3-methyloctane	0.411	0.421	0.267	291.614	144.230
80.571	880.360	I9	3,3-diethylpentane	0.020	0.020	0.013	270.842	132.690
81.010	881.410	--	unknown	0.063	0.066	0.041	32.000	0.000
81.297	882.090	N9	1c,2t,4c-trimethylcyclohexane	0.017	0.016	0.011	275.000	135.000
81.665	882.960	N9	1,1,2-trimethylcyclohexane	0.028	0.026	0.019	293.360	145.200
82.022	883.810	A8	1,2-dimethylbenzene	1.577	1.324	1.237	291.974	144.430
82.558	885.060	I9	I9-[4]	0.027	0.027	0.017	32.000	0.000
82.922	885.910	I9	I9-[5]	0.100	0.101	0.065	32.000	0.000
83.654	887.600	N9	N9-[3]	0.085	0.081	0.056	32.000	0.000
83.922	888.210	N9	N9-[4]	0.106	0.100	0.070	32.000	0.000
84.048	888.500	--	unknown	0.038	0.040	0.025	32.000	0.000
84.607	889.780	I9	I9-[6]	0.064	0.065	0.041	32.000	0.000
85.012	890.700	N9	N9-[5]	0.150	0.142	0.099	32.000	0.000
85.552	891.910	I9	I9-[7]	0.016	0.016	0.010	32.000	0.000
86.005	892.930	N9	i-butylcyclopentane	0.031	0.030	0.021	298.346	147.970
86.217	893.400	N9	N9-[6]	0.021	0.020	0.014	32.000	0.000
87.053	895.250	--	unknown	0.001	0.001	0.001	32.000	0.000
87.443	896.110	N9	N9-[7]	0.014	0.014	0.010	32.000	0.000
87.736	896.750	N9	N9-[8]	0.008	0.008	0.005	32.000	0.000
88.031	897.390	O9	t-nonene-2	0.007	0.008	0.005	32.000	0.000
88.250	897.870	O9	t-nonene-3	0.020	0.020	0.013	32.000	0.000
88.666	898.770	I9	I9-[8]	0.122	0.124	0.079	32.000	0.000
88.834	899.130	--	unknown	0.021	0.022	0.014	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
89.235	900.000	P9	n-nonane	0.368	0.379	0.239	303.476	150.820
89.596	901.740	N9	1,1-methylethylcyclohexane	0.088	0.081	0.058	305.924	152.180
90.170	904.510	N9	N9-[9]	0.009	0.009	0.006	32.000	0.000
90.420	905.720	N9	N9-[10]	0.026	0.024	0.017	32.000	0.000
90.704	907.070	O10	t-2,2,5,5-tetramethylhexene-3	0.004	0.005	0.003	32.000	0.000
90.815	907.610	--	unknown	0.002	0.002	0.001	32.000	0.000
91.153	909.210	--	unknown	0.000	0.000	0.000	32.000	0.000
91.584	911.260	N9	N9-[11]	0.006	0.006	0.004	32.000	0.000
92.007	913.250	A9	i-propylbenzene	0.062	0.053	0.043	306.338	152.410
92.375	914.980	O9	c-nonene-3	0.071	0.077	0.047	32.000	0.000
92.520	915.660	--	unknown	0.018	0.019	0.012	32.000	0.000
92.950	917.670	I10	I10-[1]	0.014	0.014	0.008	32.000	0.000
93.034	918.050	N9	i-propylcyclohexane	0.019	0.018	0.013	310.622	154.790
93.174	918.710	--	unknown	0.006	0.006	0.004	32.000	0.000
93.770	921.460	I10	I10-[2]	0.107	0.108	0.063	32.000	0.000
94.167	923.290	I10	2,2-dimethyloctane	0.034	0.035	0.020	314.420	156.900
94.442	924.550	I10	2,4-dimethyloctane	0.051	0.052	0.030	312.620	155.900
94.875	926.530	N9	N9-[12]	0.007	0.006	0.004	32.000	0.000
95.307	928.490	N9	N9-[13]	0.022	0.021	0.015	32.000	0.000
95.915	931.230	I10	2,6-dimethyloctane	0.086	0.088	0.050	320.738	160.410
96.272	932.840	I10	2,5-dimethyloctane	0.078	0.079	0.046	317.300	158.500
96.535	934.010	--	unknown	0.003	0.003	0.002	32.000	0.000
97.128	936.650	N9	n-butylcyclopentane	0.058	0.055	0.038	313.916	156.620
97.341	937.600	I10	I10-[3]	0.031	0.031	0.018	32.000	0.000
97.490	938.260	N10	N10-[1]	0.036	0.033	0.021	32.000	0.000
97.755	939.430	--	unknown	0.005	0.006	0.003	32.000	0.000
98.001	940.510	I10	I10-[4]	0.021	0.021	0.012	32.000	0.000
98.459	942.520	I10	3,3-dimethyloctane	0.138	0.138	0.081	322.160	161.200
98.772	943.890	N10	N10-[2]	0.023	0.022	0.014	32.000	0.000
98.984	944.810	--	unknown	0.019	0.020	0.011	32.000	0.000
99.154	945.550	--	unknown	0.024	0.026	0.014	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF Acquired: 10/31/20 09:28:00
Sample: ODDB:54928 Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
99.548	947.250	A9	n-propylbenzene	0.349	0.299	0.242	318.632	159.240
99.844	948.530	I10	3,6-dimethyloctane	0.026	0.026	0.015	321.440	160.800
100.098	949.630	I10	3-methyl-5-ethylheptane	0.047	0.047	0.027	316.760	158.200
100.261	950.330	--	unknown	0.005	0.006	0.003	32.000	0.000
100.566	951.630	N10	N10-[3]	0.028	0.025	0.016	32.000	0.000
101.192	954.300	--	unknown	0.024	0.025	0.014	32.000	0.000
101.493	955.580	A9	1,3-methylethylbenzene	1.234	1.055	0.855	322.394	161.330
101.885	957.240	A9	1,4-methylethylbenzene	0.529	0.454	0.367	323.618	162.010
102.195	958.540	N10	N10-[4]	0.030	0.027	0.018	32.000	0.000
102.358	959.230	--	unknown	0.003	0.003	0.002	32.000	0.000
102.765	960.930	--	unknown	0.002	0.002	0.001	32.000	0.000
102.947	961.690	--	unknown	0.010	0.011	0.027	32.000	0.000
103.229	962.870	A9	1,3,5-trimethylbenzene	0.657	0.561	0.455	328.532	164.740
103.494	963.970	I10	I10-[5]	0.041	0.041	0.024	32.000	0.000
103.763	965.080	N10	N10-[5]	0.018	0.017	0.011	32.000	0.000
103.954	965.870	--	unknown	0.006	0.006	0.003	32.000	0.000
104.191	966.850	I10	I10-[6]	0.003	0.003	0.002	32.000	0.000
104.507	968.150	I10	5-methylnonane	0.051	0.052	0.030	329.180	165.100
104.912	969.810	I10	4-methylnonane	0.420	0.420	0.246	32.000	0.000
105.256	971.210	A9	1,2-methylethylbenzene	0.392	0.329	0.271	329.324	165.180
105.442	971.970	I10	2-methylnonane	0.120	0.122	0.070	332.654	167.030
105.569	972.480	--	unknown	0.013	0.013	0.007	32.000	0.000
105.864	973.680	--	unknown	0.011	0.012	0.007	32.000	0.000
106.096	974.620	I10	3-ethyloctane	0.026	0.025	0.015	331.700	166.500
106.175	974.940	--	unknown	0.014	0.015	0.008	32.000	0.000
106.467	976.120	N10	N10-[6]	0.023	0.021	0.014	32.000	0.000
106.799	977.450	I10	3-methylnonane	0.146	0.147	0.085	334.040	167.800
106.975	978.160	--	unknown	0.008	0.009	0.005	32.000	0.000
107.357	979.680	N10	N10-[7]	0.003	0.002	0.002	32.000	0.000
107.540	980.410	I10	I10-[7]	0.094	0.094	0.055	32.000	0.000
107.814	981.500	I10	I10-[8]	0.008	0.008	0.005	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
108.101	982.640	--	unknown	0.010	0.011	0.006	32.000	0.000
108.556	984.440	A9	1,2,4-trimethylbenzene	1.912	1.614	1.326	336.884	169.380
108.794	985.380	--	unknown	0.007	0.007	0.005	32.000	0.000
108.962	986.040	I10	I10-[9]	0.010	0.010	0.006	32.000	0.000
109.077	986.490	N10	i-butylcyclohexane	0.035	0.032	0.021	340.340	171.300
109.270	987.240	--	unknown	0.025	0.026	0.015	32.000	0.000
109.385	987.700	I10	I10-[10]	0.046	0.046	0.027	32.000	0.000
109.665	988.790	I10	I10-[11]	0.018	0.018	0.011	32.000	0.000
109.806	989.340	I10	I10-[12]	0.012	0.012	0.007	32.000	0.000
110.154	990.690	N10	N10-[8]	0.022	0.020	0.013	32.000	0.000
110.289	991.210	--	unknown	0.003	0.003	0.002	32.000	0.000
110.777	993.100	O10	decene-1	0.002	0.002	0.001	339.080	170.600
110.930	993.690	N10	1t-methyl-2-n-propylcyclohexane	0.012	0.011	0.007	339.800	171.000
111.054	994.170	O10	2,3-dimethyloctene-2	0.060	0.060	0.036	32.000	0.000
111.162	994.580	I10	I10-[13]	0.015	0.015	0.009	32.000	0.000
111.464	995.740	A10	i-butylbenzene	0.003	0.003	0.002	343.022	172.790
111.604	996.280	I10	I10-[14]	0.054	0.054	0.031	32.000	0.000
111.839	997.180	--	unknown	0.037	0.039	0.022	32.000	0.000
112.118	998.240	A10	sec-butylbenzene	0.035	0.030	0.022	344.012	173.340
112.366	999.190	--	unknown	0.008	0.009	0.005	32.000	0.000
112.579	1000.000	P10	n-decane	0.193	0.195	0.113	345.470	174.150
112.821	1001.530	I11	I11-[1]	0.027	0.027	0.014	32.000	0.000
113.178	1003.780	N10	N10-[9]	0.016	0.015	0.010	32.000	0.000
113.619	1006.550	--	unknown	0.006	0.006	0.004	32.000	0.000
113.822	1007.820	A9	1,2,3-trimethylbenzene	0.371	0.307	0.257	349.016	176.120
113.976	1008.780	--	unknown	0.009	0.009	0.006	32.000	0.000
114.269	1010.610	A10	1,3-methyl-i-propylbenzene	0.041	0.035	0.025	347.144	175.080
114.700	1013.290	--	unknown	0.009	0.009	0.023	32.000	0.000
114.830	1014.100	A10	1,4-methyl-i-propylbenzene	0.024	0.021	0.015	350.834	177.130
114.982	1015.040	--	unknown	0.003	0.003	0.002	32.000	0.000
115.298	1016.990	I11	I11-[2]	0.025	0.025	0.014	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
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Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 17**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
115.567	1018.650	I11	I11-[3]	0.012	0.012	0.006	32.000	0.000
115.861	1020.460	A10	2-3-dihydroindene	0.259	0.199	0.183	352.130	177.850
116.228	1022.710	--	unknown	0.018	0.019	0.013	32.000	0.000
116.472	1024.200	N10	sec-butylcyclohexane	0.040	0.036	0.024	354.812	179.340
116.706	1025.630	I11	I11-[4]	0.008	0.008	0.004	32.000	0.000
117.055	1027.750	A10	1,2-methyl-i-propylbenzene	0.068	0.058	0.042	352.724	178.180
117.181	1028.520	I11	3-ethylnonane	0.006	0.006	0.003	32.000	0.000
117.322	1029.370	--	unknown	0.003	0.003	0.002	32.000	0.000
117.624	1031.200	--	unknown	0.063	0.066	0.034	32.000	0.000
117.850	1032.560	N11	N11-[1]	0.024	0.022	0.013	32.000	0.000
117.904	1032.890	--	unknown	0.020	0.021	0.011	32.000	0.000
118.089	1034.000	I11	I11-[5]	0.016	0.016	0.008	32.000	0.000
118.244	1034.930	--	unknown	0.002	0.002	0.001	32.000	0.000
118.599	1037.070	I11	I11-[6]	0.029	0.027	0.016	32.000	0.000
118.767	1038.070	--	unknown	0.032	0.034	0.017	32.000	0.000
119.208	1040.700	A10	1,3-diethylbenzene	0.131	0.112	0.081	358.052	181.140
119.409	1041.900	--	unknown	0.060	0.064	0.038	32.000	0.000
119.657	1043.370	A10	1,3-methyl-n-propylbenzene	0.270	0.232	0.167	359.618	182.010
119.830	1044.400	I11	I11-[7]	0.020	0.020	0.011	32.000	0.000
120.120	1046.120	A10	1,4-diethylbenzene	0.011	0.010	0.007	362.822	183.790
120.294	1047.140	A10	1,4-methyl-n-propylbenzene	0.166	0.143	0.103	362.156	183.420
120.468	1048.170	A10	n-butylbenzene	0.080	0.069	0.050	361.940	183.300
120.878	1050.580	A10	1,3-dimethyl-5-ethylbenzene	0.281	0.236	0.174	362.516	183.620
121.201	1052.480	A10	1,2-diethylbenzene	0.030	0.025	0.018	362.228	183.460
121.344	1053.310	I11	I11-[8]	0.017	0.017	0.009	32.000	0.000
121.572	1054.640	N10	t-decahydronaphthalene	0.008	0.008	0.004	368.960	187.200
121.823	1056.110	N11	N11-[2]	0.016	0.014	0.008	32.000	0.000
122.074	1057.570	--	unknown	0.011	0.012	0.006	32.000	0.000
122.246	1058.560	A10	1,2-methyl-n-propylbenzene	0.092	0.078	0.057	364.946	184.970
122.634	1060.810	I11	I11-[9]	0.011	0.011	0.006	32.000	0.000
122.750	1061.480	I11	I11-[10]	0.067	0.067	0.036	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 18**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
122.959	1062.690	I11	I11-[11]	0.036	0.036	0.019	32.000	0.000
123.051	1063.220	--	unknown	0.008	0.009	0.004	32.000	0.000
123.251	1064.370	--	unknown	0.003	0.003	0.002	32.000	0.000
123.473	1065.650	I11	I11-[12]	0.044	0.044	0.024	32.000	0.000
123.726	1067.100	--	unknown	0.008	0.009	0.004	32.000	0.000
124.016	1068.760	A10	1,4,dimethyl-2-ethylbenzene	0.204	0.171	0.126	368.366	186.870
124.288	1070.310	A10	1,3-dimethyl-4-ethylbenzene	0.255	0.219	0.158	370.832	188.240
124.558	1071.850	I11	I11-[13]	0.003	0.003	0.002	32.000	0.000
124.861	1073.570	--	unknown	0.007	0.008	0.004	32.000	0.000
125.119	1075.030	I11	I11-[14]	0.138	0.138	0.074	32.000	0.000
125.286	1075.980	A10	1,2-dimethyl-4-ethylbenzene	0.281	0.237	0.174	373.136	189.520
125.599	1077.750	--	unknown	0.008	0.008	0.005	32.000	0.000
125.886	1079.360	--	unknown	0.012	0.012	0.007	32.000	0.000
125.978	1079.880	I11	I11-[15]	0.004	0.004	0.002	32.000	0.000
126.261	1081.470	A10	1,3-dimethyl-2-ethylbenzene	0.046	0.039	0.029	374.090	190.050
126.413	1082.320	I11	I11-[16]	0.017	0.017	0.009	32.000	0.000
126.744	1084.170	--	unknown	0.016	0.017	0.009	32.000	0.000
126.943	1085.280	I11	I11-[17]	0.008	0.008	0.004	32.000	0.000
127.173	1086.560	--	unknown	0.014	0.015	0.008	32.000	0.000
127.515	1088.470	--	unknown	0.008	0.008	0.004	32.000	0.000
127.583	1088.840	--	unknown	0.011	0.011	0.006	32.000	0.000
127.856	1090.360	O11	undecene-1	0.019	0.019	0.010	378.860	192.700
128.192	1092.210	A11	1,4-methyl-t-butylbenzene	0.035	0.030	0.020	32.000	0.000
128.467	1093.720	A10	1,2-dimethyl-3-ethylbenzene	0.077	0.064	0.048	381.110	193.950
128.811	1095.620	--	unknown	0.006	0.007	0.004	32.000	0.000
129.087	1097.130	--	unknown	0.013	0.013	0.008	32.000	0.000
129.164	1097.550	A11	1,2-ethyl-i-propylbenzene	0.008	0.007	0.005	32.000	0.000
129.332	1098.480	--	unknown	0.006	0.006	0.003	32.000	0.000
129.611	1100.000	P11	n-undecane	0.102	0.102	0.055	384.620	195.900
129.808	1101.470	--	unknown	0.007	0.007	0.004	32.000	0.000
129.922	1102.330	A11	1,4-ethyl-i-propylbenzene	0.002	0.002	0.001	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to 100.000%

Hold

Components Listed in Chromatographic Order **Page: 19**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
130.342	1105.470	A10	1,2,4,5-tetramethylbenzene	0.162	0.135	0.100	386.312	196.840
130.705	1108.170	A11	1,2-methyl-n-butylbenzene	0.007	0.006	0.004	390.200	199.000
130.882	1109.490	A10	1,2,3,5-tetramethylbenzene	0.219	0.181	0.136	388.472	198.040
131.030	1110.590	--	unknown	0.006	0.006	0.004	32.000	0.000
131.374	1113.140	--	unknown	0.011	0.012	0.007	32.000	0.000
131.568	1114.570	--	unknown	0.007	0.007	0.004	32.000	0.000
131.876	1116.850	--	unknown	0.020	0.021	0.012	32.000	0.000
132.318	1120.090	--	unknown	0.013	0.014	0.008	32.000	0.000
132.475	1121.250	--	unknown	0.014	0.015	0.009	32.000	0.000
132.957	1124.780	A11	1,2-methyl-t-butylbenzene	0.005	0.004	0.003	32.000	0.000
133.115	1125.930	--	unknown	0.012	0.012	0.007	32.000	0.000
133.427	1128.210	A10	5-methylindan	0.192	0.159	0.121	32.000	0.000
133.772	1130.710	I12	I12-[1]	0.046	0.045	0.023	421.340	216.300
134.177	1133.650	--	unknown	0.007	0.007	0.003	32.000	0.000
134.295	1134.500	A10	4-methylindan	0.047	0.039	0.030	32.000	0.000
134.567	1136.470	--	unknown	0.012	0.012	0.007	32.000	0.000
134.673	1137.230	A11	1,2-ethyl-n-propylbenzene	0.054	0.045	0.030	32.000	0.000
134.925	1139.040	A10	2-methylindan	0.184	0.150	0.116	368.600	187.000
135.135	1140.560	A11	1,3-methyl-n-butylbenzene	0.009	0.007	0.005	390.200	199.000
135.392	1142.400	--	unknown	0.006	0.006	0.003	32.000	0.000
135.542	1143.470	A12	1,3-di-i-propylbenzene	0.062	0.051	0.032	397.760	203.200
135.752	1144.980	A11	s-pentylbenzene	0.058	0.048	0.033	401.000	205.000
136.342	1149.190	--	unknown	0.018	0.019	0.010	32.000	0.000
136.439	1149.870	A11	n-pentylbenzene	0.046	0.038	0.026	401.720	205.400
136.518	1150.440	--	unknown	0.021	0.022	0.012	32.000	0.000
136.795	1152.410	N12	1t-M-2-(4-MP)cyclopentane	0.004	0.004	0.002	32.000	0.000
136.994	1153.820	A12	1,2-di-i-propylbenzene	0.027	0.022	0.014	399.200	204.000
137.141	1154.860	--	unknown	0.026	0.027	0.013	32.000	0.000
137.625	1158.270	--	unknown	0.038	0.040	0.020	32.000	0.000
137.899	1160.200	A12	1,4-di-i-propylbenzene	0.047	0.039	0.024	410.540	210.300
138.176	1162.150	--	unknown	0.007	0.007	0.003	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

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Acquired: 10/31/20 09:28:00
Sample: ODDB:54928
Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
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Hold

Components Listed in Chromatographic Order **Page: 20**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
138.347	1163.350	A10	tetrahydronaphthalene	0.017	0.013	0.011	405.716	207.620
138.492	1164.360	--	unknown	0.007	0.007	0.004	32.000	0.000
138.740	1166.100	--	unknown	0.004	0.004	0.003	32.000	0.000
138.886	1167.110	I12	I12-[2]	0.051	0.050	0.025	421.340	216.300
139.180	1169.170	A10	naphthalene	0.158	0.114	0.103	424.382	217.990
139.505	1171.430	A12	1-t-butyl-3,5-dimethylbenzene	0.003	0.003	0.002	32.000	0.000
139.846	1173.800	A12	1,4-ethyl-t-butylbenzene	0.071	0.059	0.037	32.000	0.000
140.250	1176.590	--	unknown	0.025	0.027	0.013	32.000	0.000
140.541	1178.600	I12	I12-[3]	0.053	0.052	0.026	421.340	216.300
140.773	1180.190	I12	I12-[4]	0.030	0.030	0.015	421.340	216.300
141.121	1182.590	--	unknown	0.006	0.006	0.003	32.000	0.000
141.349	1184.150	I12	I12-[5]	0.031	0.030	0.015	421.340	216.300
141.602	1185.880	--	unknown	0.011	0.011	0.005	32.000	0.000
141.895	1187.890	I12	I12-[6]	0.032	0.032	0.016	421.340	216.300
142.094	1189.240	A12	1,3-di-n-propylbenzene	0.038	0.031	0.019	32.000	0.000
142.333	1190.870	A12	A12-[1]	0.023	0.019	0.012	32.000	0.000
142.552	1192.360	O12	dodecene-1	0.005	0.005	0.003	416.120	213.400
142.912	1194.800	--	unknown	0.006	0.007	0.003	32.000	0.000
143.253	1197.110	--	unknown	0.004	0.004	0.002	32.000	0.000
143.553	1199.140	A12	A12-[2]	0.019	0.016	0.010	32.000	0.000
143.681	1200.000	P12	n-dodecane	0.043	0.042	0.021	421.340	216.300
143.945	1202.220	--	unknown	0.003	0.003	0.001	32.000	0.000
144.227	1204.590	--	unknown	0.011	0.012	0.005	32.000	0.000
144.303	1205.230	--	unknown	0.004	0.005	0.002	32.000	0.000
144.762	1209.070	--	unknown	0.011	0.011	0.005	32.000	0.000
144.986	1210.950	--	unknown	0.005	0.006	0.003	32.000	0.000
145.185	1212.610	A12	1,3,5-triethylbenzene	0.003	0.002	0.002	420.800	216.000
145.373	1214.170	--	unknown	0.007	0.007	0.003	32.000	0.000
145.715	1217.020	--	unknown	0.021	0.022	0.011	32.000	0.000
145.888	1218.450	--	unknown	0.012	0.013	0.006	32.000	0.000
146.206	1221.090	--	unknown	0.003	0.003	0.001	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF Acquired: 10/31/20 09:28:00
Sample: ODDB:54928 Analyzed: 11/2/2020 9:31:07 PM
Processed 631 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments: Normalized to 100.000%

Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
146.496	1223.490	--	unknown	0.017	0.018	0.009	32.000	0.000
146.738	1225.490	--	unknown	0.016	0.017	0.008	32.000	0.000
146.814	1226.120	--	unknown	0.007	0.007	0.003	32.000	0.000
147.120	1228.630	--	unknown	0.004	0.005	0.002	32.000	0.000
147.195	1229.250	--	unknown	0.012	0.012	0.006	32.000	0.000
147.506	1231.800	A12	1,2,4-triethylbenzene	0.013	0.011	0.006	423.500	217.500
147.727	1233.620	--	unknown	0.005	0.005	0.002	32.000	0.000
148.079	1236.490	--	unknown	0.003	0.003	0.002	32.000	0.000
148.235	1237.770	--	unknown	0.011	0.012	0.006	32.000	0.000
148.464	1239.640	--	unknown	0.001	0.001	0.001	32.000	0.000
148.801	1242.370	A12	1,4-methyl-n-pentylbenzene	0.034	0.028	0.017	32.000	0.000
149.085	1244.690	--	unknown	0.009	0.009	0.004	32.000	0.000
149.239	1245.930	--	unknown	0.003	0.004	0.002	32.000	0.000
149.378	1247.060	--	unknown	0.003	0.003	0.001	32.000	0.000
149.666	1249.390	--	unknown	0.004	0.004	0.002	32.000	0.000
149.950	1251.680	--	unknown	0.006	0.006	0.003	32.000	0.000
150.147	1253.270	--	unknown	0.007	0.008	0.004	32.000	0.000
150.532	1256.360	A12	n-hexylbenzene	0.019	0.015	0.010	32.000	0.000
150.622	1257.080	--	unknown	0.019	0.020	0.010	32.000	0.000
150.995	1260.070	--	unknown	0.011	0.011	0.005	32.000	0.000
151.253	1262.140	--	unknown	0.004	0.005	0.002	32.000	0.000
151.499	1264.100	--	unknown	0.004	0.005	0.002	32.000	0.000
151.658	1265.370	--	unknown	0.003	0.003	0.002	32.000	0.000
151.875	1267.100	--	unknown	0.006	0.006	0.003	32.000	0.000
151.917	1267.430	--	unknown	0.008	0.008	0.004	32.000	0.000
152.207	1269.730	--	unknown	0.010	0.011	0.005	32.000	0.000
152.636	1273.140	I13	I13-[1]	0.008	0.007	0.003	455.720	235.400
152.825	1274.630	A11	1,2,3,4,5-pentamethylbenzene	0.022	0.016	0.012	449.600	232.000
153.056	1276.450	--	unknown	0.008	0.009	0.005	32.000	0.000
153.570	1280.500	--	unknown	0.006	0.006	0.003	32.000	0.000
153.923	1283.270	A11	2-methylnaphthalene	0.088	0.064	0.051	465.890	241.050

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:32:01 PM

RawFile: D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF
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Comments:
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Hold

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
154.411	1287.100	--	unknown	0.009	0.010	0.005	32.000	0.000
154.561	1288.270	--	unknown	0.002	0.002	0.001	32.000	0.000
154.701	1289.360	--	unknown	0.003	0.003	0.001	32.000	0.000
154.905	1290.960	O13	tridecene-1	0.007	0.007	0.003	451.040	232.800
155.340	1294.340	--	unknown	0.001	0.002	0.001	32.000	0.000
155.502	1295.590	--	unknown	0.003	0.003	0.001	32.000	0.000
155.590	1296.280	--	unknown	0.001	0.001	0.001	32.000	0.000
155.874	1298.480	A11	1-methylnaphthalene	0.035	0.025	0.020	472.352	244.640
156.070	1300.000	P13	n-tridecane	0.009	0.009	0.004	455.720	235.400
156.188	1301.060	+	C14+ (Summarized)	0.355	0.344	0.149	455.720	235.400

ODDB:54928 (D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
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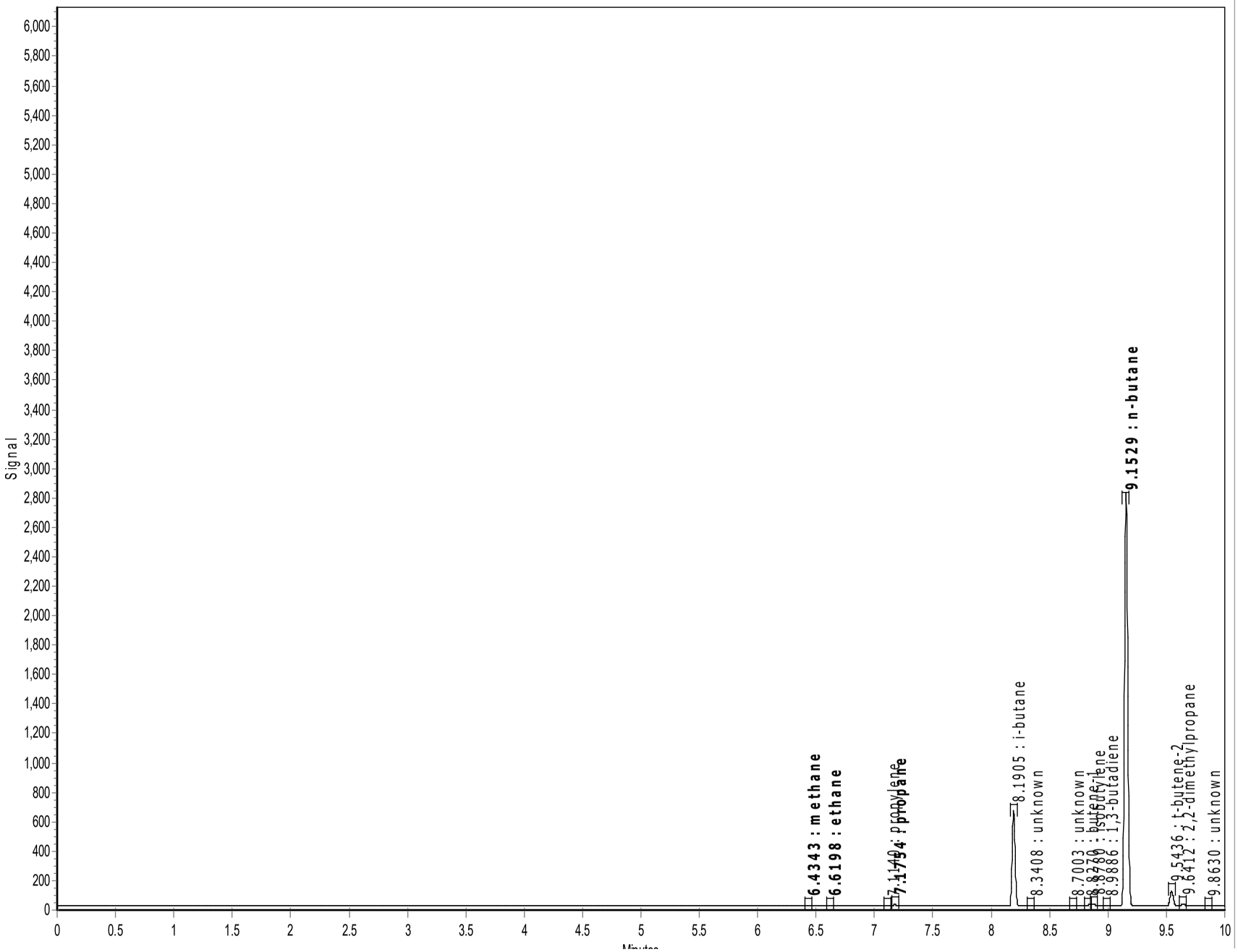

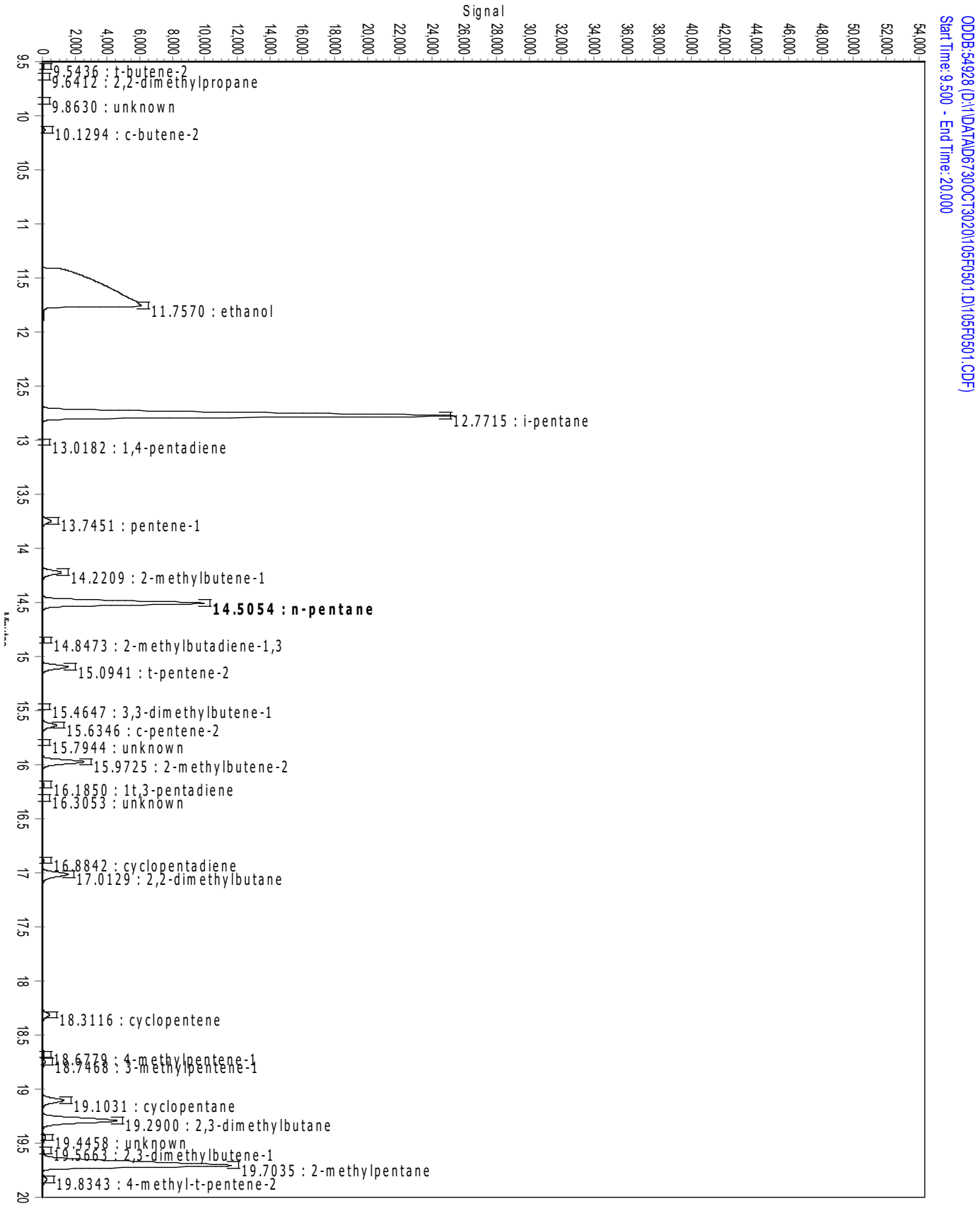
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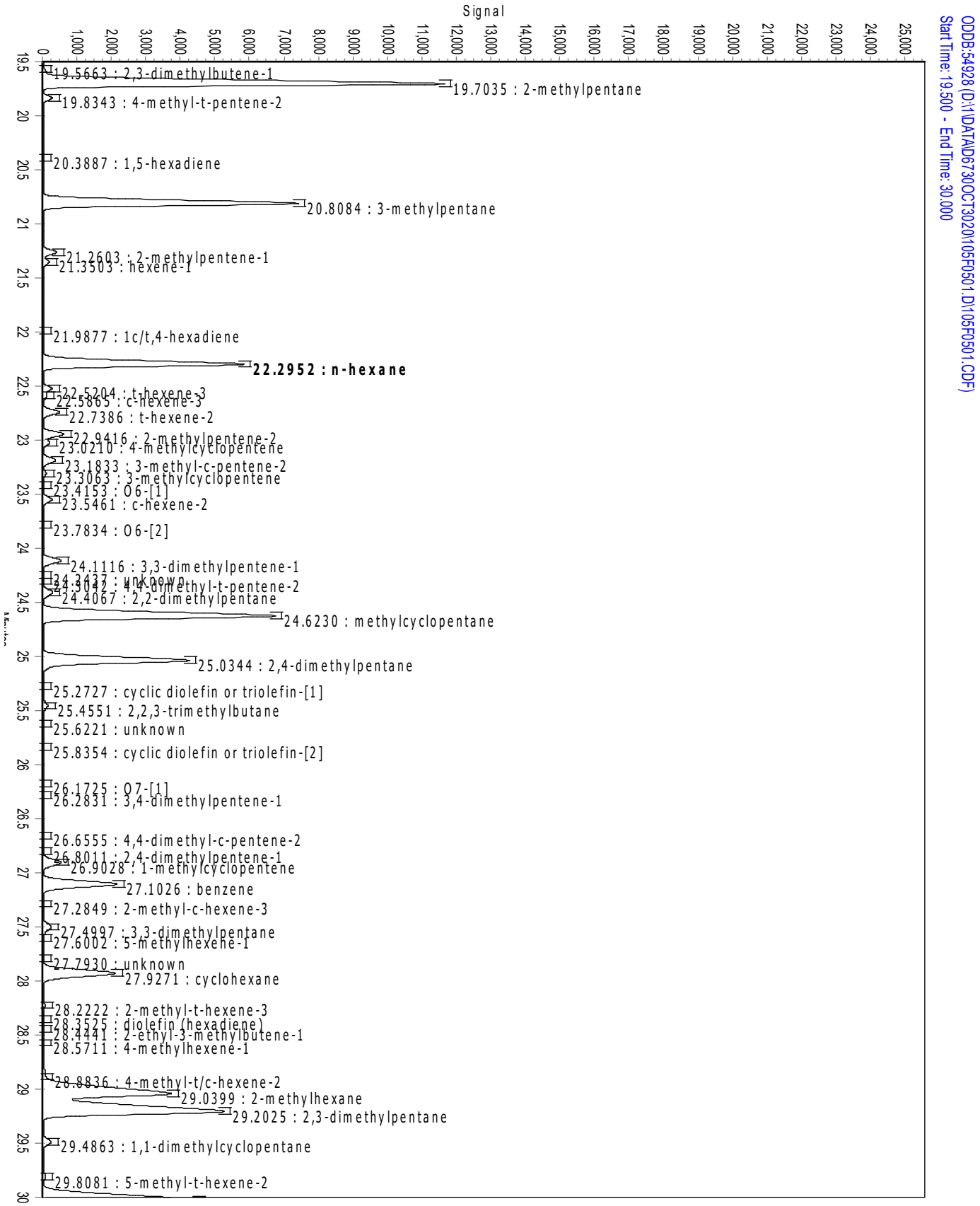
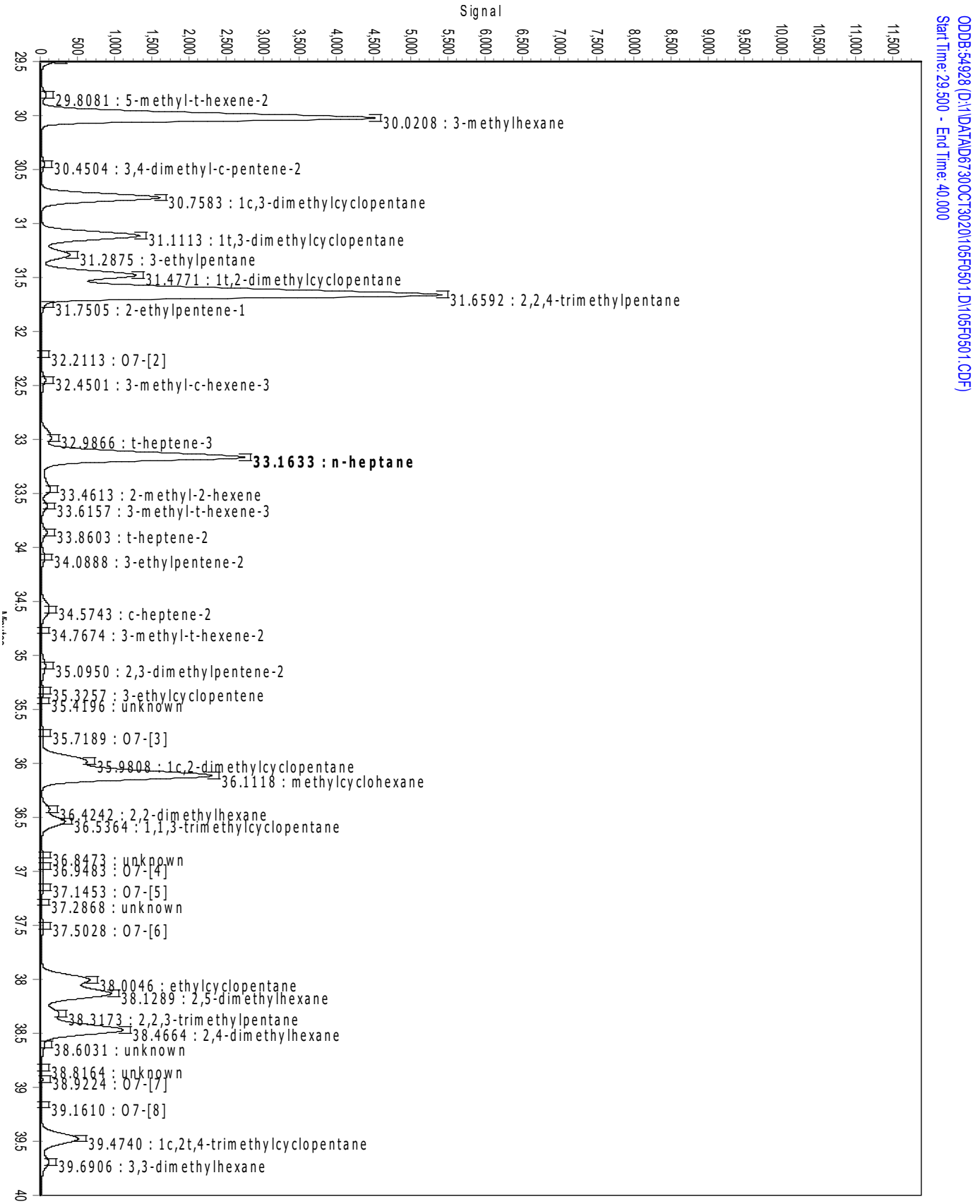
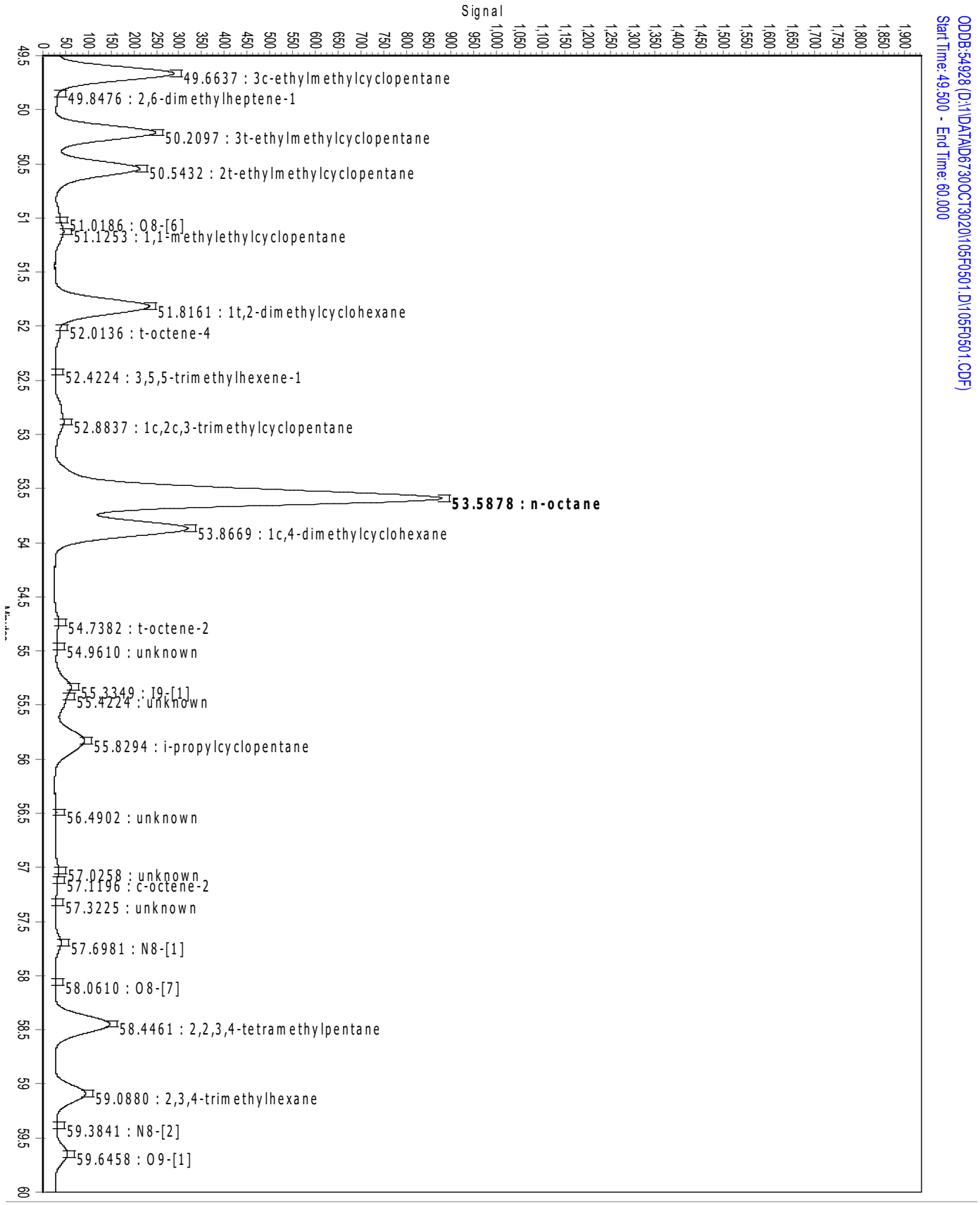
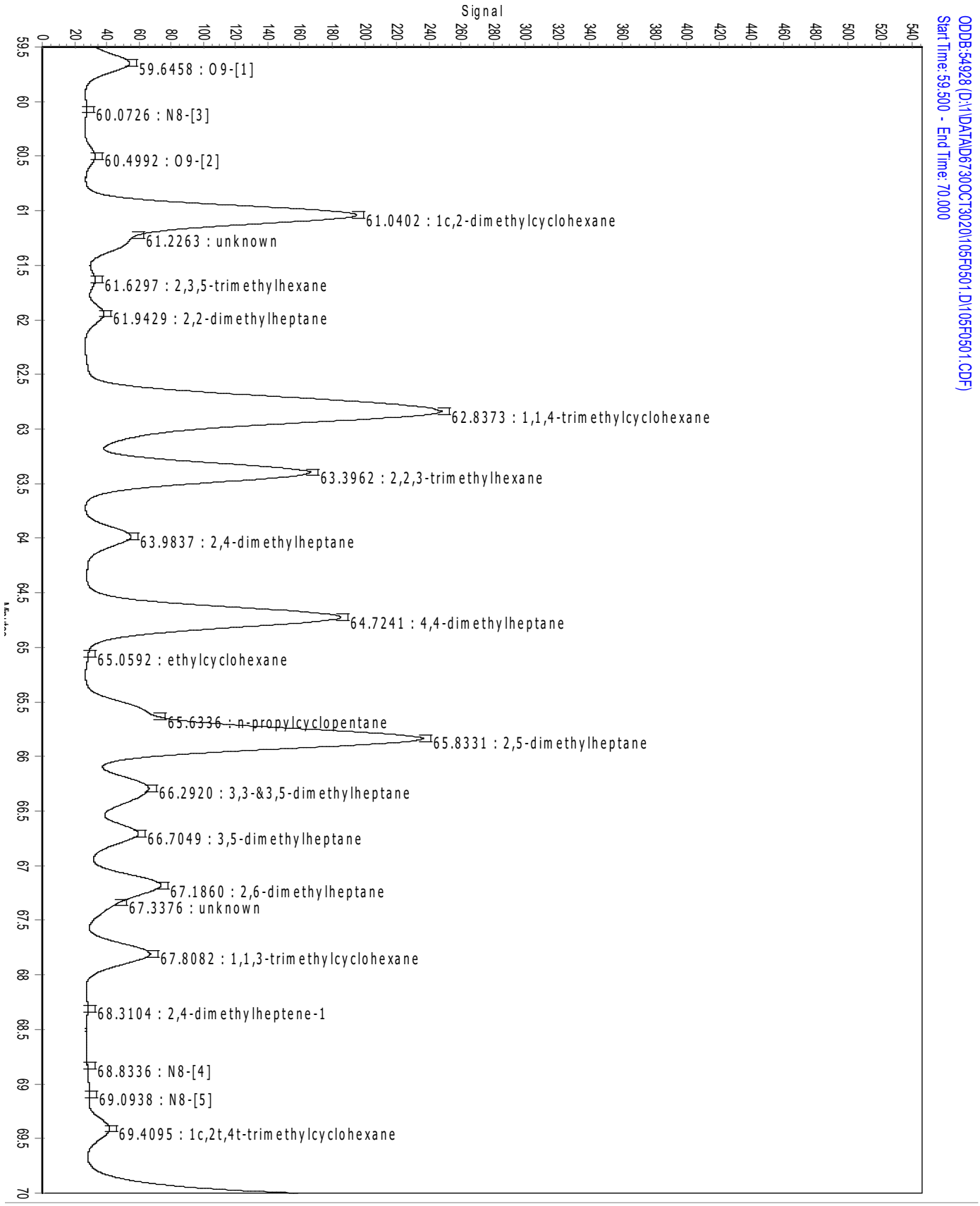
ODDB:54928 (D:\1DATA\D6730OCT30201105F0501.D\105F0501.CDF)
Start Time: 9.500 - End Time: 20.000
9.5436 : t-butene-2
9.6412 : 2,2-dimethylpropane
9.8630 : unknown
10.1294 : c-butene-2
11.7570 : ethanol
12.7715 : i-pentane
13.0182 : 1,4-pentadiene
13.7451 : pentene-1
14.2209 : 2-methylbutene-1
14.5054 : n-pentane
14.8473 : 2-methylbutadiene-1,3
15.0941 : t-pentene-2
15.4647 : 3,3-dimethylbutene-1
15.6346 : c-pentene-2
15.7944 : unknown
15.9725 : 2-methylbutene-2
16.1850 : 1t,3-pentadiene
16.3053 : unknown
16.8842 : cyclopentadiene
17.0129 : 2,2-dimethylbutane
18.3116 : cyclopentene
18.6779 : 4-methylpentene-1
18.7468 : 3-methylpentene-1
19.1031 : cyclopentane
19.2900 : 2,3-dimethylbutane
19.4458 : unknown
19.5663 : 2,3-dimethylbutene-1
19.7035 : 2-methylpentane
19.8343 : 4-methyl-t-pentene-2

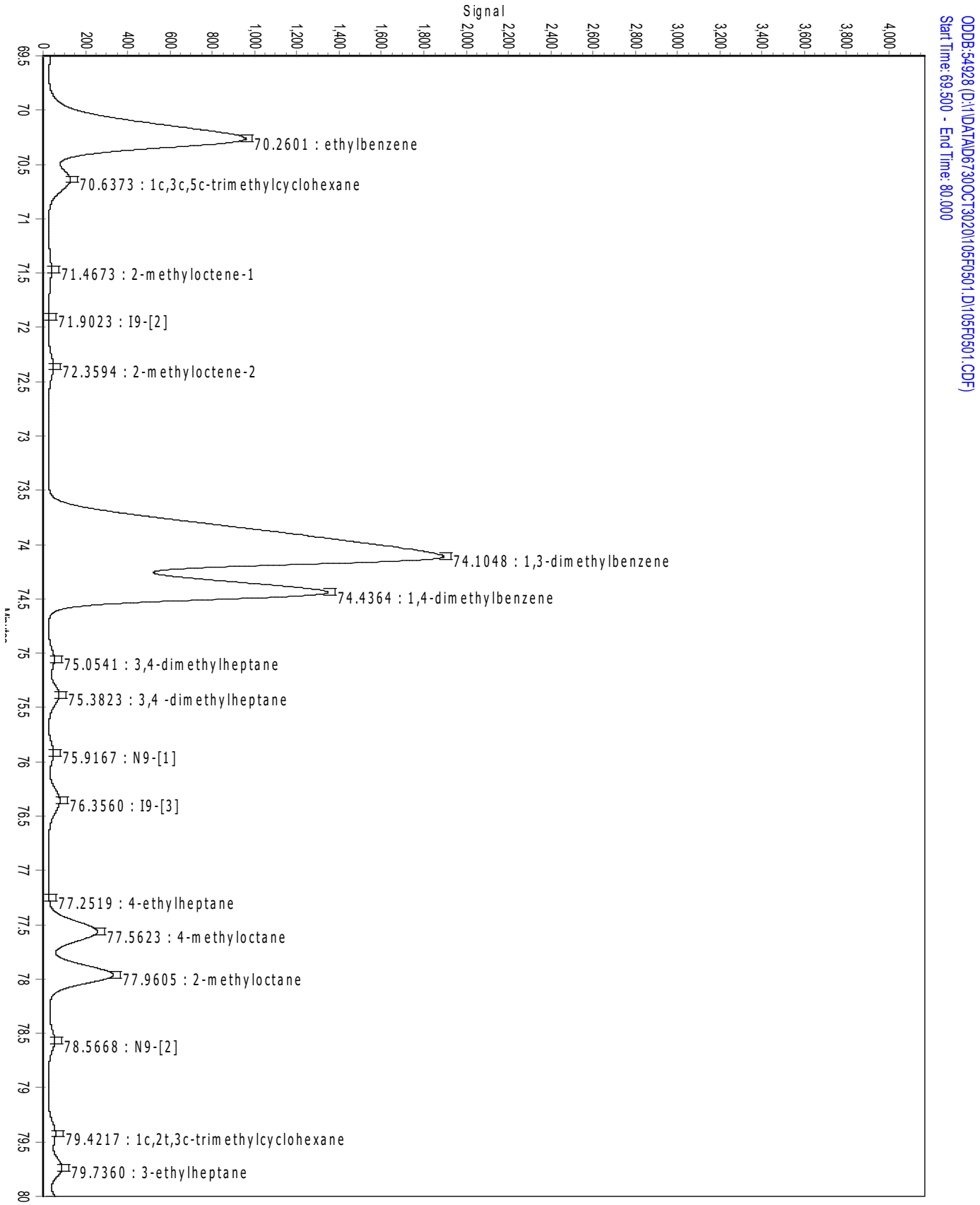

Signal
ODDB:54928 (D:\1DATA\D6730OCT30220\105F0501.D\105F0501.CDF)
Start Time: 19.500 - End Time: 30.000
19.5663 : 2,3-dimethylbutene-1
19.7035 : 2-methylpentane
19.8343 : 4-methyl-t-pentene-2
20.3887 : 1,5-hexadiene
20.8084 : 3-methylpentane
21.2603 : 2-methylpentene-1
21.3503 : hexene-1
21.9877 : 1c/t,4-hexadiene
22.2952 : n-hexane
22.5204 : t-hexene-3
22.5865 : c-hexene-3
22.7386 : t-hexene-2
22.9416 : 2-methylpentene-2
23.0210 : 4-methylcyclopentene
23.1833 : 3-methyl-c-pentene-2
23.3063 : 3-methylcyclopentene
23.4153 : O6-[1]
23.5461 : c-hexene-2
23.7834 : O6-[2]
24.1116 : 3,3-dimethylpentene-1
24.3437 : unknown
24.3942 : 4,4-dimethyl-t-pentene-2
24.4067 : 2,2-dimethylpentane
24.6230 : methylcyclopentane
25.0344 : 2,4-dimethylpentane
25.2727 : cyclic diolefin or triolefin-[1]
25.4551 : 2,2,3-trimethylbutane
25.6221 : unknown
25.8354 : cyclic diolefin or triolefin-[2]
26.1725 : O7-[1]
26.2831 : 3,4-dimethylpentene-1
26.6555 : 4,4-dimethyl-c-pentene-2
26.8011 : 2,4-dimethylpentene-1
26.9028 : 1-methylcyclopentene
27.1026 : benzene
27.2849 : 2-methyl-c-hexene-3
27.4997 : 3,3-dimethylpentane
27.6002 : 5-methylhexene-1
27.7930 : unknown
27.9271 : cyclohexane
28.2222 : 2-methyl-t-hexene-3
28.3525 : diolefin (hexadiene)
28.4441 : 2-ethyl-3-methylbutene-1
28.5711 : 4-methylhexene-1
28.8836 : 4-methyl-t/c-hexene-2
29.0399 : 2-methylhexane
29.2025 : 2,3-dimethylpentane
29.4863 : 1,1-dimethylcyclopentane
29.8081 : 5-methyl-t-hexene-2

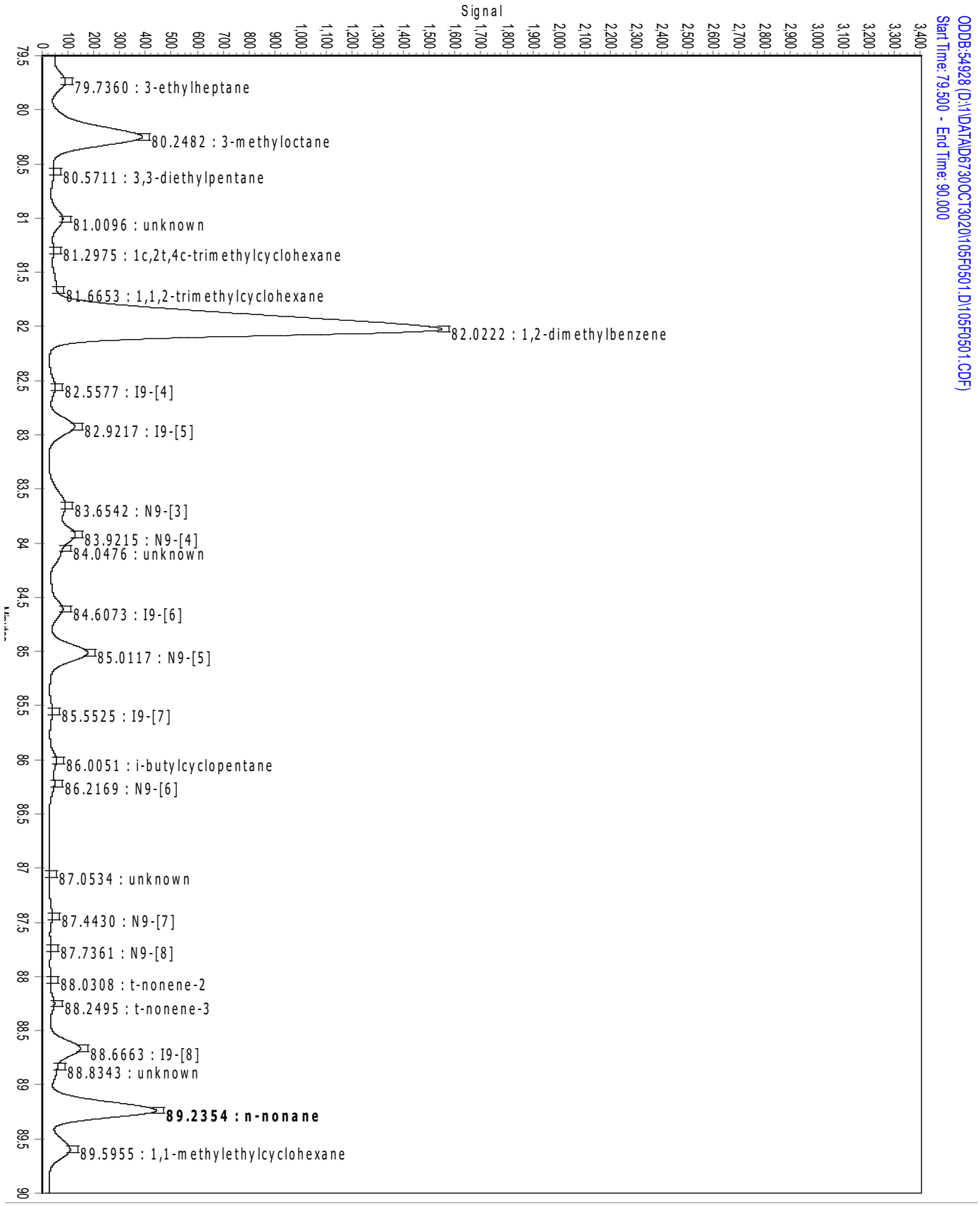

Signal
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
8,000
8,500
9,000
9,500
10,000
10,500
11,000
11,500
ODB:54928 (D:\1DATA\D6730OCT30201105F0501.D\105F0501.CDF)
Start Time: 29.500 - End Time: 40.000
29.5
30
30.5
31
31.5
32
32.5
33
33.5
34
34.5
35
35.5
36
36.5
37
37.5
38
38.5
39
39.5
40
29.8081 : 5-methyl-t-hexene-2
30.0208 : 3-methylhexane
30.4504 : 3,4-dimethyl-c-pentene-2
30.7583 : 1c,3-dimethylcyclopentane
31.1113 : 1t,3-dimethylcyclopentane
31.2875 : 3-ethylpentane
31.4771 : 1t,2-dimethylcyclopentane
31.6592 : 2,2,4-trimethylpentane
31.7505 : 2-ethylpentene-1
32.2113 : O7-[2]
32.4501 : 3-methyl-c-hexene-3
32.9866 : t-heptene-3
33.1633 : n-heptane
33.4613 : 2-methyl-2-hexene
33.6157 : 3-methyl-t-hexene-3
33.8603 : t-heptene-2
34.0888 : 3-ethylpentene-2
34.5743 : c-heptene-2
34.7674 : 3-methyl-t-hexene-2
35.0950 : 2,3-dimethylpentene-2
35.3257 : 3-ethylcyclopentene
35.4196 : unknown
35.7189 : O7-[3]
35.9808 : 1c,2-dimethylcyclopentane
36.1118 : methylcyclohexane
36.4242 : 2,2-dimethylhexane
36.5364 : 1,1,3-trimethylcyclopentane
36.8473 : unknown
36.9483 : O7-[4]
37.1453 : O7-[5]
37.2868 : unknown
37.5028 : O7-[6]
38.0046 : ethylcyclopentane
38.1289 : 2,5-dimethylhexane
38.3173 : 2,2,3-trimethylpentane
38.4664 : 2,4-dimethylhexane
38.6031 : unknown
38.8164 : unknown
38.9224 : O7-[7]
39.1610 : O7-[8]
39.4740 : 1c,2t,4-trimethylcyclopentane
39.6906 : 3,3-dimethylhexane

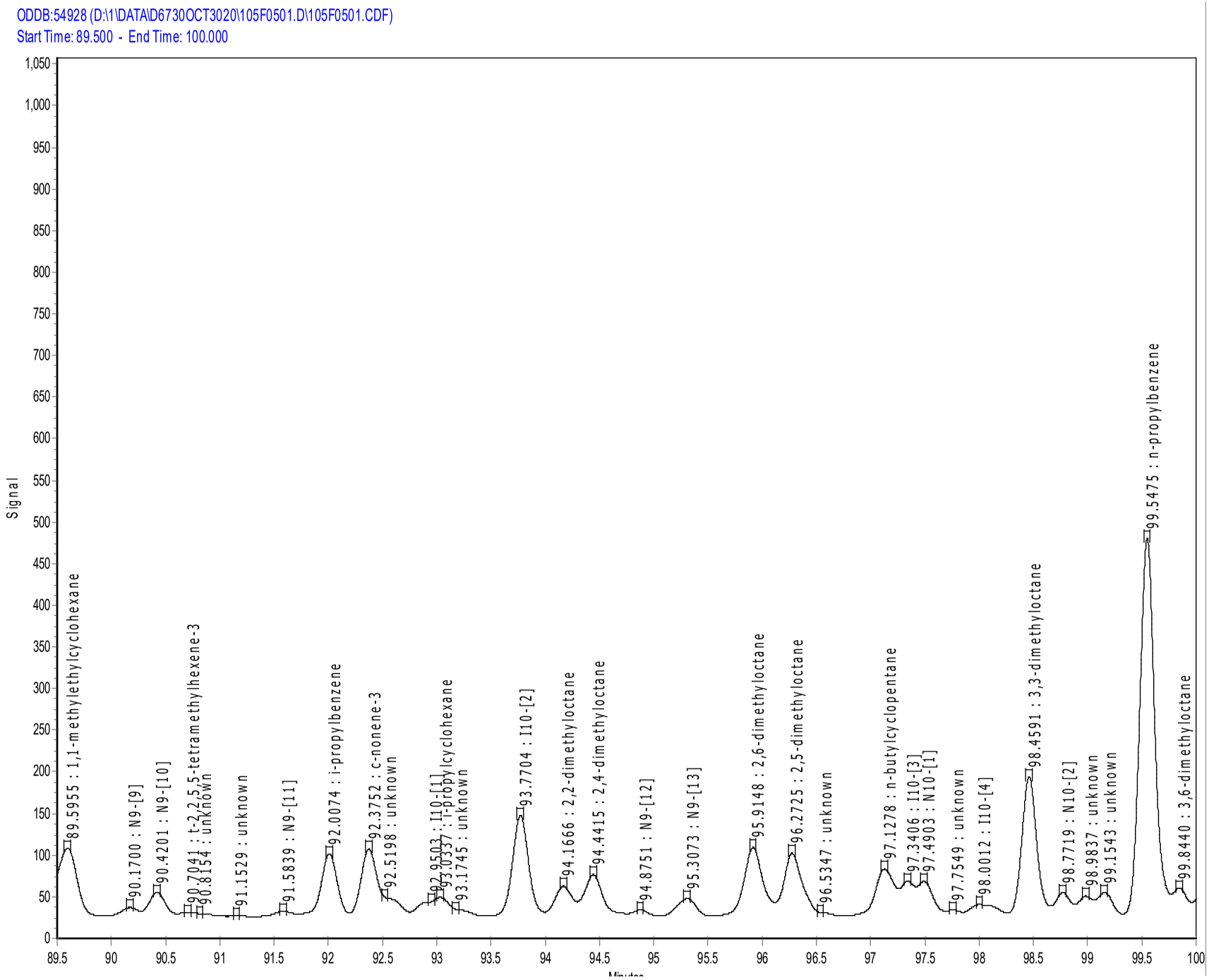
Signal
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
8,000
8,500
9,000
9,500
10,000
10,500
11,000
11,500
12,000
12,500
39.5
40
40.5
41
41.5
42
42.5
43
43.5
44
44.5
45
45.5
46
46.5
47
47.5
48
48.5
49
49.5
50
39.6906 : 3,3-dimethylhexane
40.1769 : O7-[9]
40.4803 : O7-[10]
40.6536 : O7-[11]
40.8373 : 1t,2c,3-trimethylcyclopentane
41.3762 : 2,3,4-trimethylpentane
41.5945 : I8-[1]
41.8922 : O7-[12]
42.1976 : 2,3,3-trimethylpentane
42.6281 : toluene
42.7493 : O8-[1]
42.9380 : O8-[2]
43.0791 : O8-[3]
43.1907 : unknown
43.6095 : 2,3-dimethylhexane
43.7595 : 2-methyl-3-ethylpentane
44.0877 : 1,1,2-trimethylcyclopentane
44.5324 : O8-[4]
44.9373 : 2-methylheptane
45.2528 : 4-methylheptane
45.5141 : 3-methyl-3-ethylpentane
45.6195 : 3,4-dimethylhexane
46.2388 : 1c,2c,4-trimethylcyclopentane
46.6527 : 3-methylheptane
46.9319 : unknown
47.0130 : 1c,2t,3-trimethylcyclopentane
47.1755 : 3-ethylhexane
47.4495 : 1t,4-dimethylcyclohexane
47.8928 : unknown
48.2802 : unknown
48.4281 : O8-[5]
48.7736 : 1,1-dimethylcyclohexane
49.2345 : 2,2,5-trimethylhexane
49.6637 : 3c-ethylmethylcyclopentane
49.8476 : 2,6-dimethylheptene-1
ODB:54928 (D:\1DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 39.500 - End Time: 50.000

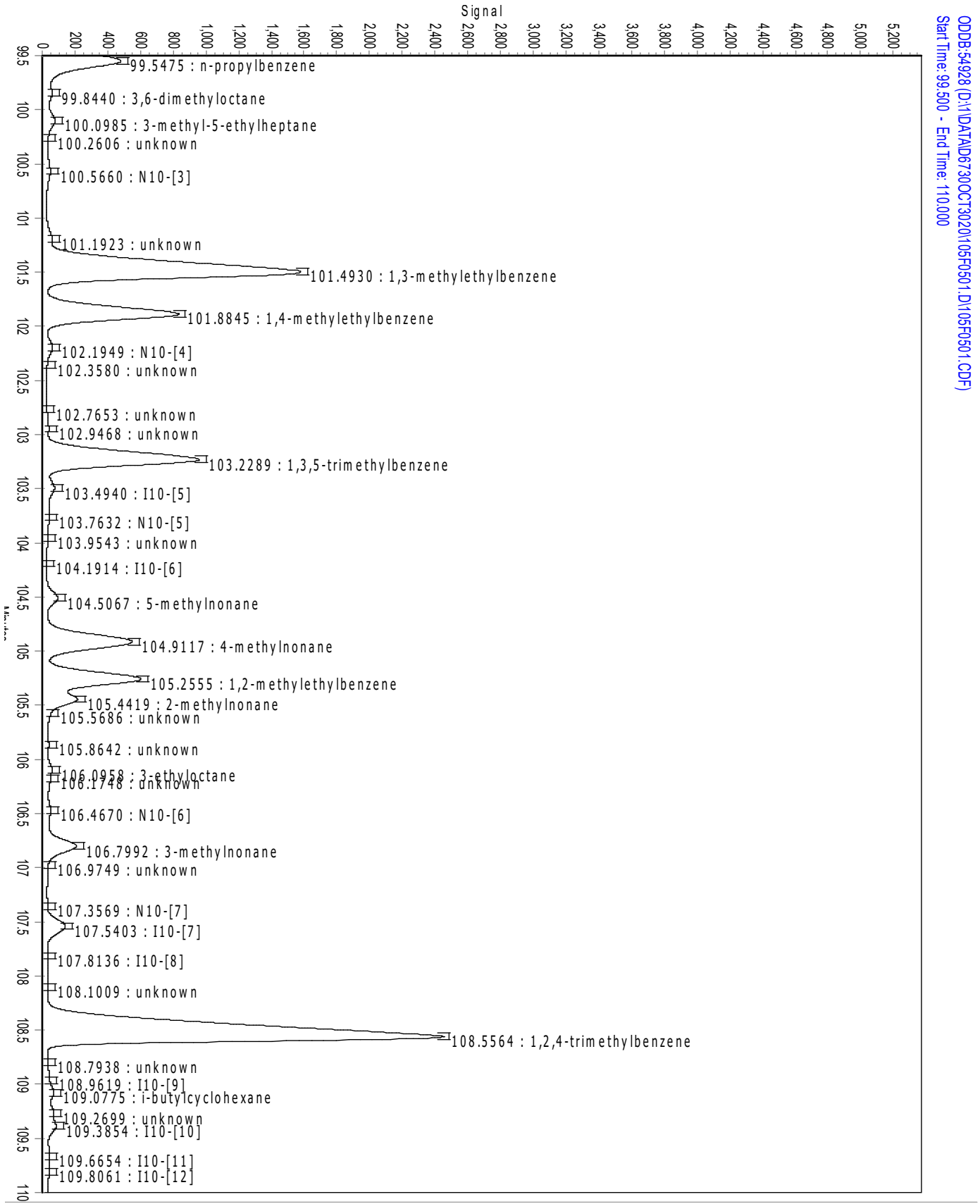

Signal
ODDB:54928 (D:\1DATAD6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 49.500 - End Time: 60.000
49.6637 : 3c-ethylmethylcyclopentane
49.8476 : 2,6-dimethylheptene-1
50.2097 : 3t-ethylmethylcyclopentane
50.5432 : 2t-ethylmethylcyclopentane
51.0186 : O8-[6]
51.1253 : 1,1-methylethylcyclopentane
51.8161 : 1t,2-dimethylcyclohexane
52.0136 : t-octene-4
52.4224 : 3,5,5-trimethylhexene-1
52.8837 : 1c,2c,3-trimethylcyclopentane
53.5878 : n-octane
53.8669 : 1c,4-dimethylcyclohexane
54.7382 : t-octene-2
54.9610 : unknown
55.3349 : I9-[1]
55.4224 : unknown
55.8294 : i-propylcyclopentane
56.4902 : unknown
57.0258 : unknown
57.1196 : c-octene-2
57.3225 : unknown
57.6981 : N8-[1]
58.0610 : O8-[7]
58.4461 : 2,2,3,4-tetramethylpentane
59.0880 : 2,3,4-trimethylhexane
59.3841 : N8-[2]
59.6458 : O9-[1]

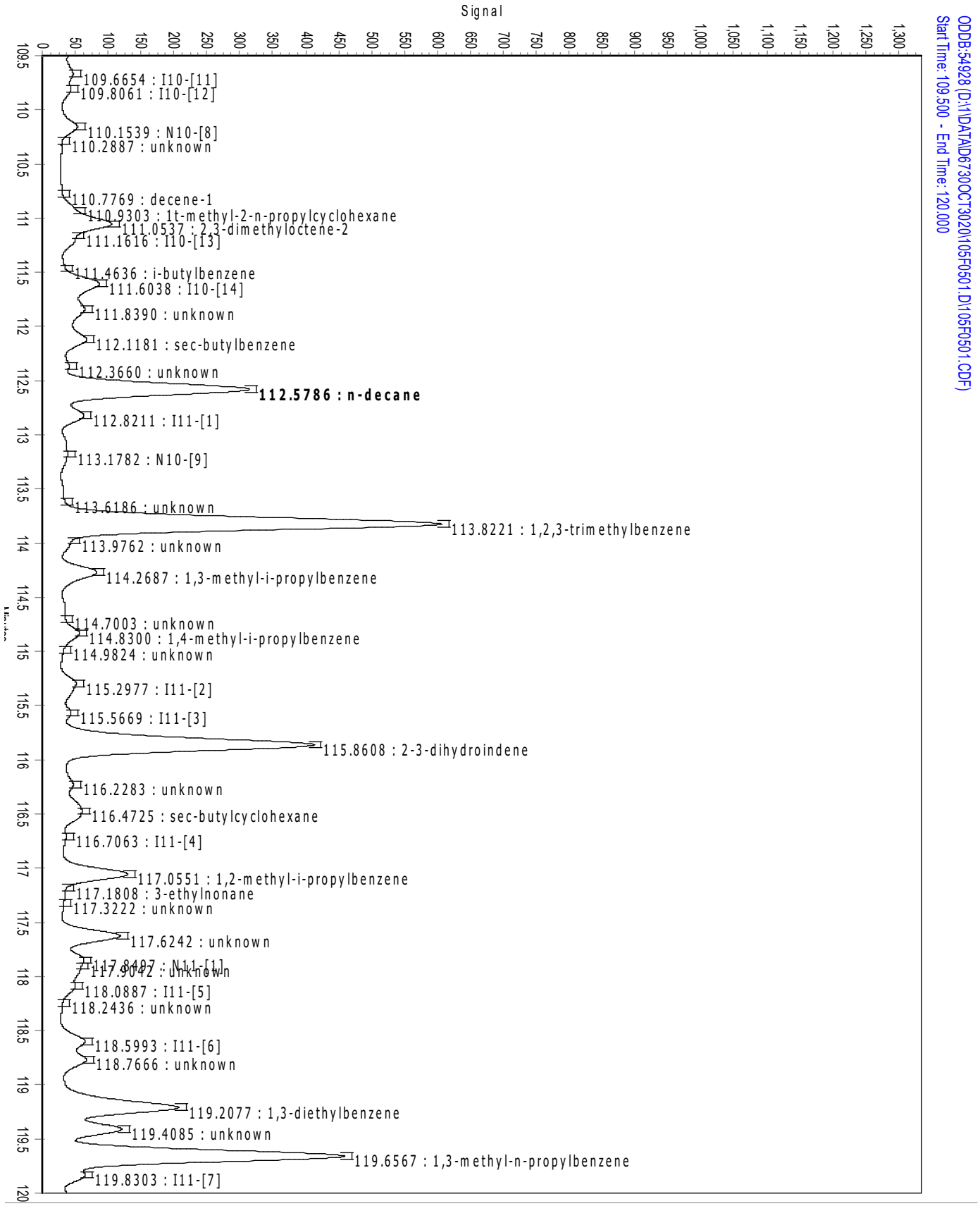

Signal
ODDB:54928 (D:\1DATA\D6730OCT30201105F0501.D\105F0501.CDF)
Start Time: 59.500 - End Time: 70.000
59.6458 : O9-[1]
60.0726 : N8-[3]
60.4992 : O9-[2]
61.0402 : 1c,2-dimethylcyclohexane
61.2263 : unknown
61.6297 : 2,3,5-trimethylhexane
61.9429 : 2,2-dimethylheptane
62.8373 : 1,1,4-trimethylcyclohexane
63.3962 : 2,2,3-trimethylhexane
63.9837 : 2,4-dimethylheptane
64.7241 : 4,4-dimethylheptane
65.0592 : ethylcyclohexane
65.6336 : n-propylcyclopentane
65.8331 : 2,5-dimethylheptane
66.2920 : 3,3-&3,5-dimethylheptane
66.7049 : 3,5-dimethylheptane
67.1860 : 2,6-dimethylheptane
67.3376 : unknown
67.8082 : 1,1,3-trimethylcyclohexane
68.3104 : 2,4-dimethylheptene-1
68.8336 : N8-[4]
69.0938 : N8-[5]
69.4095 : 1c,2t,4t-trimethylcyclohexane


Signal
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
69.5
70
70.5
71
71.5
72
72.5
73
73.5
74
74.5
75
75.5
76
76.5
77
77.5
78
78.5
79
79.5
80
70.2601 : ethylbenzene
70.6373 : 1c,3c,5c-trimethylcyclohexane
71.4673 : 2-methyloctene-1
71.9023 : I9-[2]
72.3594 : 2-methyloctene-2
74.1048 : 1,3-dimethylbenzene
74.4364 : 1,4-dimethylbenzene
75.0541 : 3,4-dimethylheptane
75.3823 : 3,4 -dimethylheptane
75.9167 : N9-[1]
76.3560 : I9-[3]
77.2519 : 4-ethylheptane
77.5623 : 4-methyloctane
77.9605 : 2-methyloctane
78.5668 : N9-[2]
79.4217 : 1c,2t,3c-trimethylcyclohexane
79.7360 : 3-ethylheptane
ODDB:54928 (D:\1DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 69.500 - End Time: 80.000

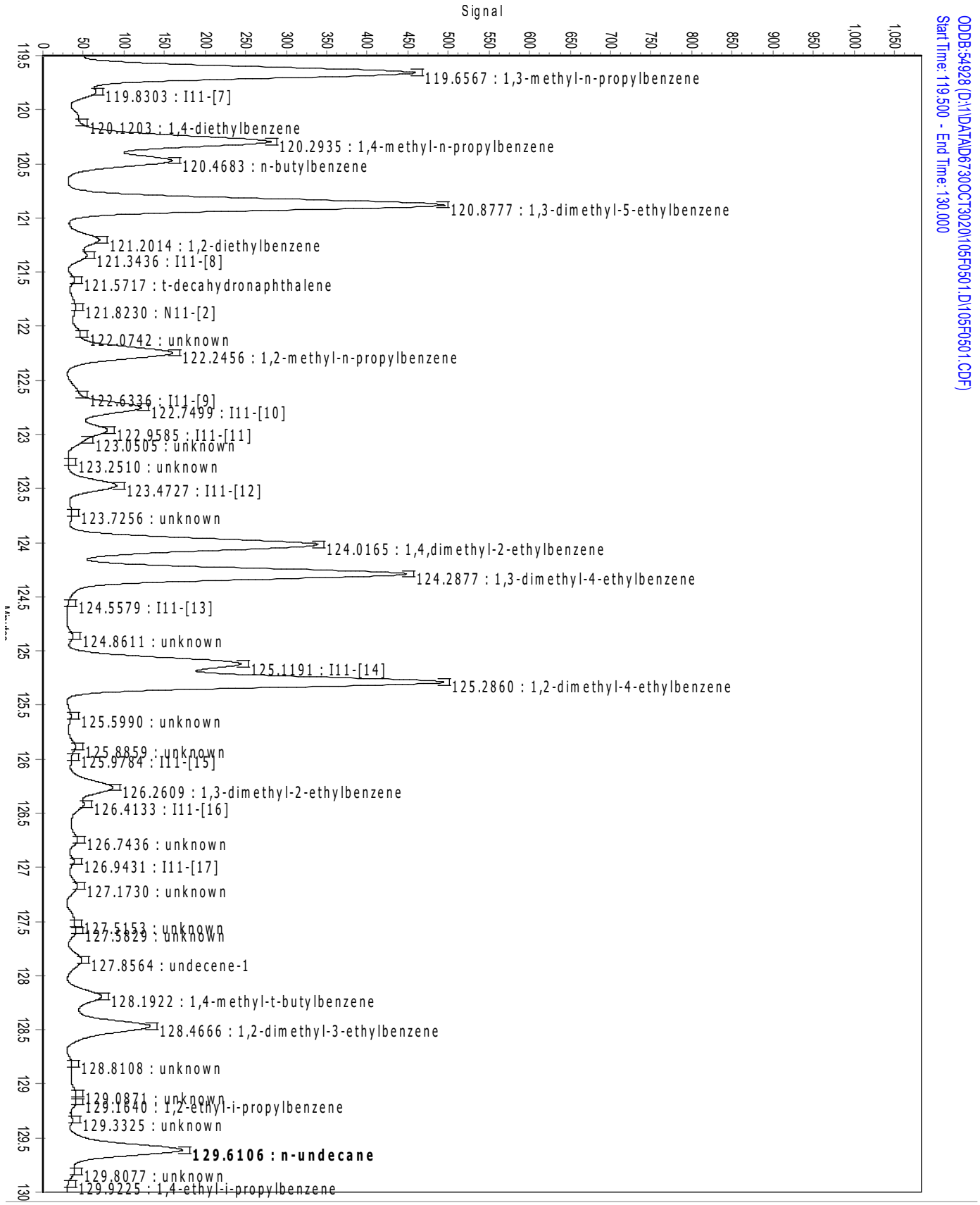

Signal
ODDB:54928 (D:\1DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 79.500 - End Time: 90.000
79.7360 : 3-ethylheptane
80.2482 : 3-methyloctane
80.5711 : 3,3-diethylpentane
81.0096 : unknown
81.2975 : 1c,2t,4c-trimethylcyclohexane
81.6653 : 1,1,2-trimethylcyclohexane
82.0222 : 1,2-dimethylbenzene
82.5577 : I9-[4]
82.9217 : I9-[5]
83.6542 : N9-[3]
83.9215 : N9-[4]
84.0476 : unknown
84.6073 : I9-[6]
85.0117 : N9-[5]
85.5525 : I9-[7]
86.0051 : i-butylcyclopentane
86.2169 : N9-[6]
87.0534 : unknown
87.4430 : N9-[7]
87.7361 : N9-[8]
88.0308 : t-nonene-2
88.2495 : t-nonene-3
88.6663 : I9-[8]
88.8343 : unknown
89.2354 : n-nonane
89.5955 : 1,1-methylethylcyclohexane


ODDB:54928 (D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 89.500 - End Time: 100.000
Signal
Minutes
89.5955 : 1,1-methylethylcyclohexane
90.1700 : N9-[9]
90.4201 : N9-[10]
90.7041 : t-2,2,5,5-tetramethylhexene-3
90.8154 : unknown
91.1529 : unknown
91.5839 : N9-[11]
92.0074 : i-propylbenzene
92.3752 : c-nonene-3
92.5198 : unknown
92.9503 : I10-[1]
93.0337 : i-propylcyclohexane
93.1745 : unknown
93.7704 : I10-[2]
94.1666 : 2,2-dimethyloctane
94.4415 : 2,4-dimethyloctane
94.8751 : N9-[12]
95.3073 : N9-[13]
95.9148 : 2,6-dimethyloctane
96.2725 : 2,5-dimethyloctane
96.5347 : unknown
97.1278 : n-butylcyclopentane
97.3406 : I10-[3]
97.4903 : N10-[1]
97.7549 : unknown
98.0012 : I10-[4]
98.4591 : 3,3-dimethyloctane
98.7719 : N10-[2]
98.9837 : unknown
99.1543 : unknown
99.5475 : n-propylbenzene
99.8440 : 3,6-dimethyloctane

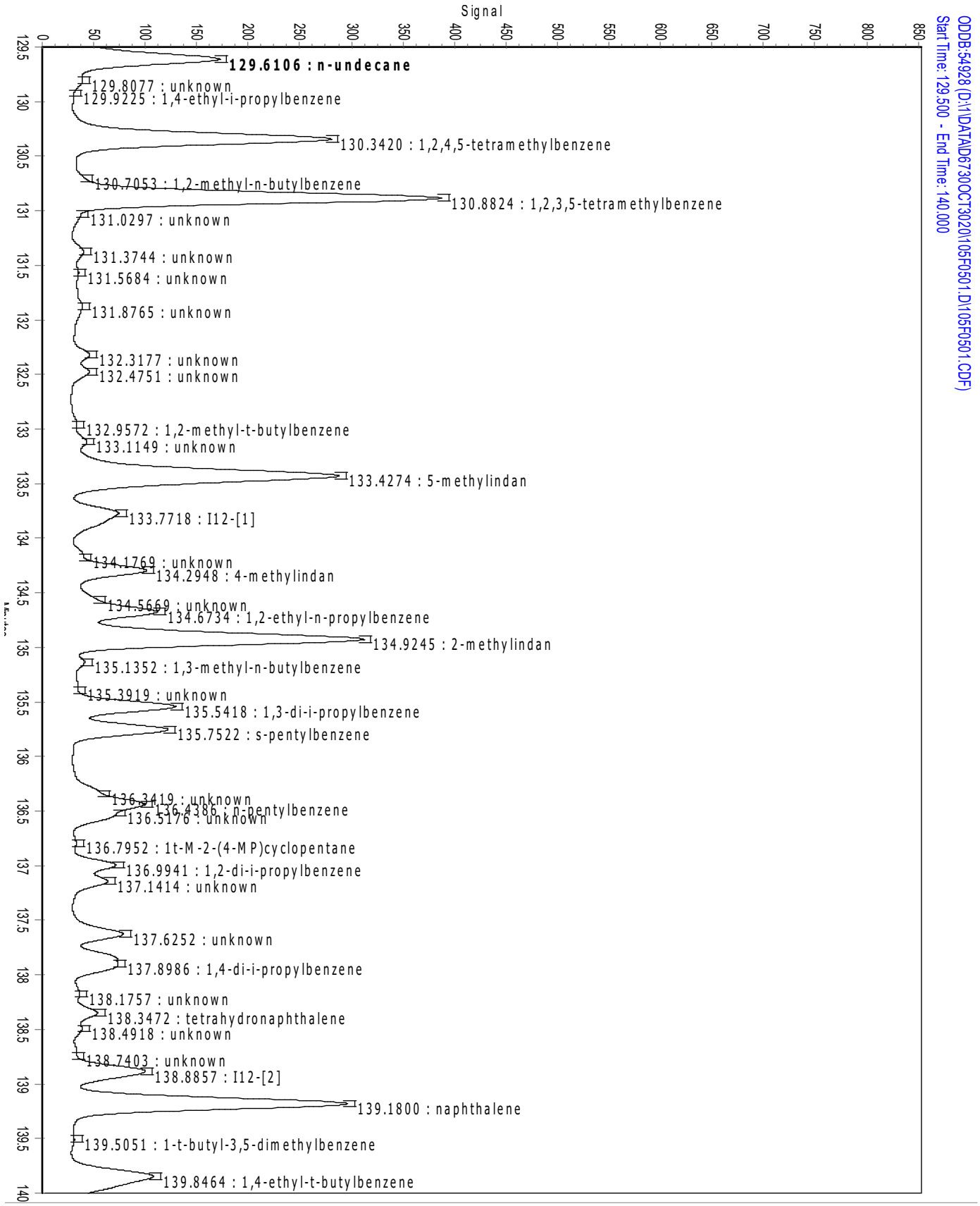

Signal
ODDB:54928 (D:\1DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 99.500 - End Time: 110.000
99.5475 : n-propylbenzene
99.8440 : 3,6-dimethyloctane
100.0985 : 3-methyl-5-ethylheptane
100.2606 : unknown
100.5660 : N10-[3]
101.1923 : unknown
101.4930 : 1,3-methylethylbenzene
101.8845 : 1,4-methylethylbenzene
102.1949 : N10-[4]
102.3580 : unknown
102.7653 : unknown
102.9468 : unknown
103.2289 : 1,3,5-trimethylbenzene
103.4940 : I10-[5]
103.7632 : N10-[5]
103.9543 : unknown
104.1914 : I10-[6]
104.5067 : 5-methylnonane
104.9117 : 4-methylnonane
105.2555 : 1,2-methylethylbenzene
105.4419 : 2-methylnonane
105.5686 : unknown
105.8642 : unknown
106.0958 : 3-ethyloctane
106.1748 : unknown
106.4670 : N10-[6]
106.7992 : 3-methylnonane
106.9749 : unknown
107.3569 : N10-[7]
107.5403 : I10-[7]
107.8136 : I10-[8]
108.1009 : unknown
108.5564 : 1,2,4-trimethylbenzene
108.7938 : unknown
108.9619 : I10-[9]
109.0775 : i-butylcyclohexane
109.2699 : unknown
109.3854 : I10-[10]
109.6654 : I10-[11]
109.8061 : I10-[12]



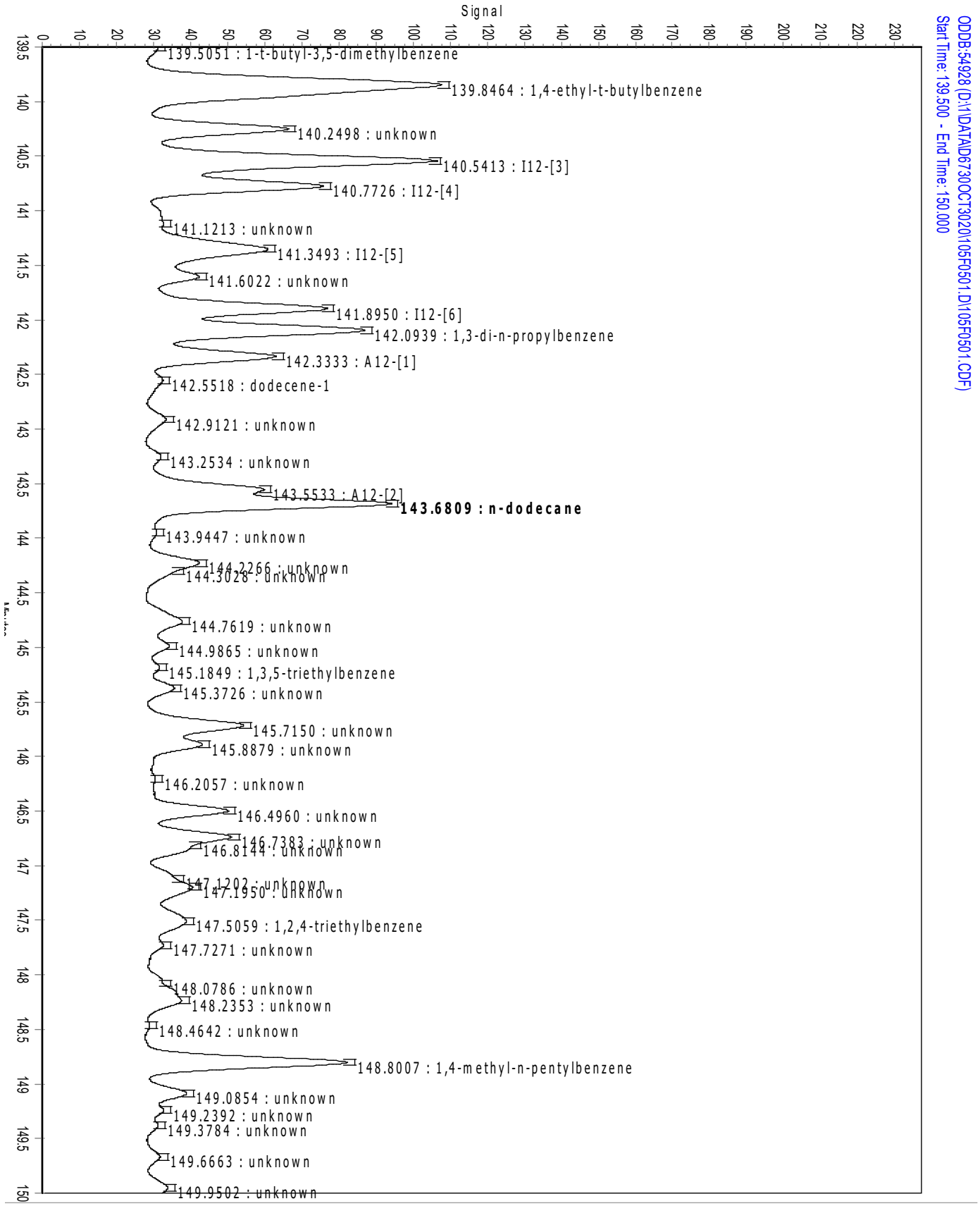
ODDB:54928 (D:\1DATA\D6730OCT30201105F0501.D\105F0501.CDF)
Start Time: 109.500 - End Time: 120.000

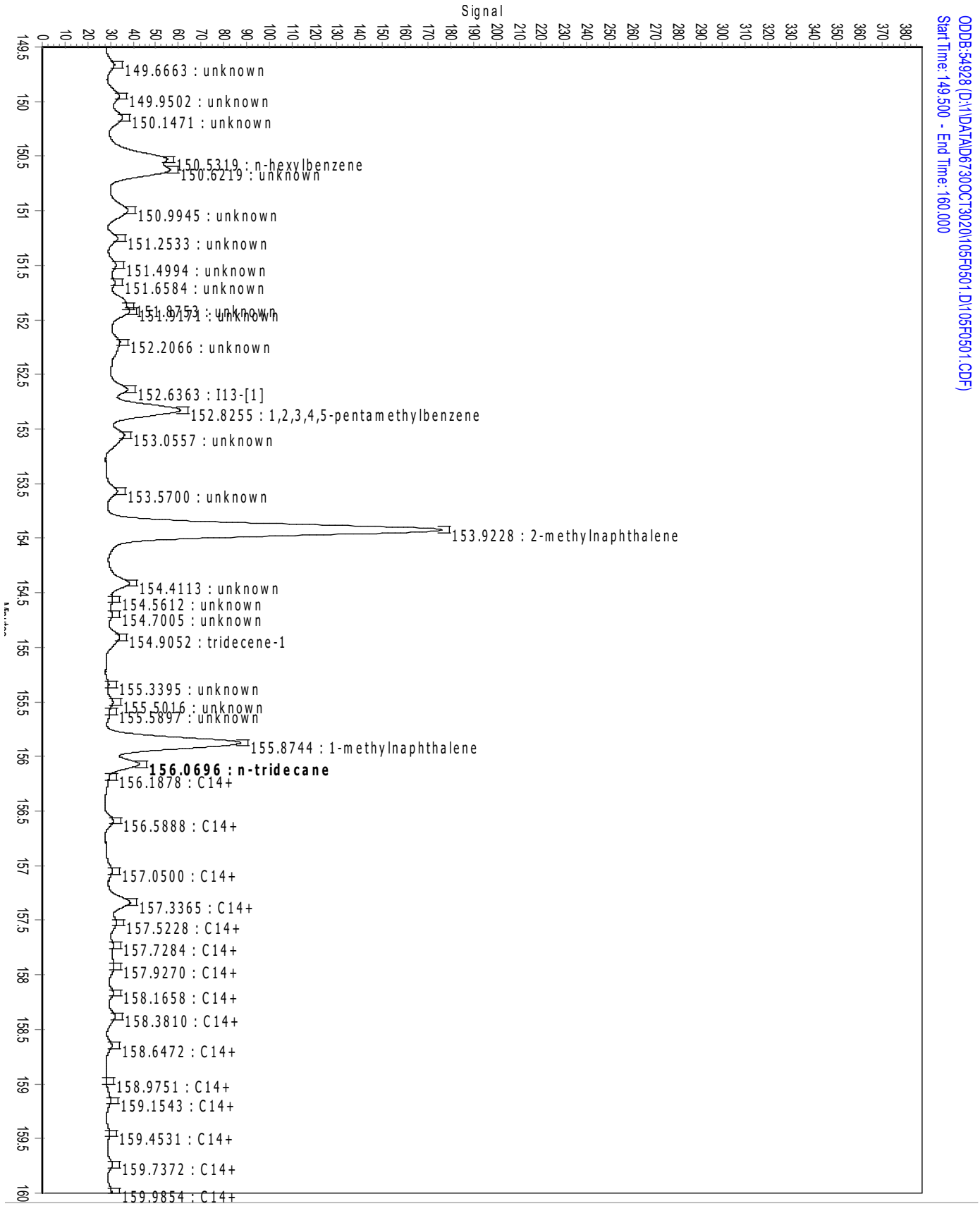


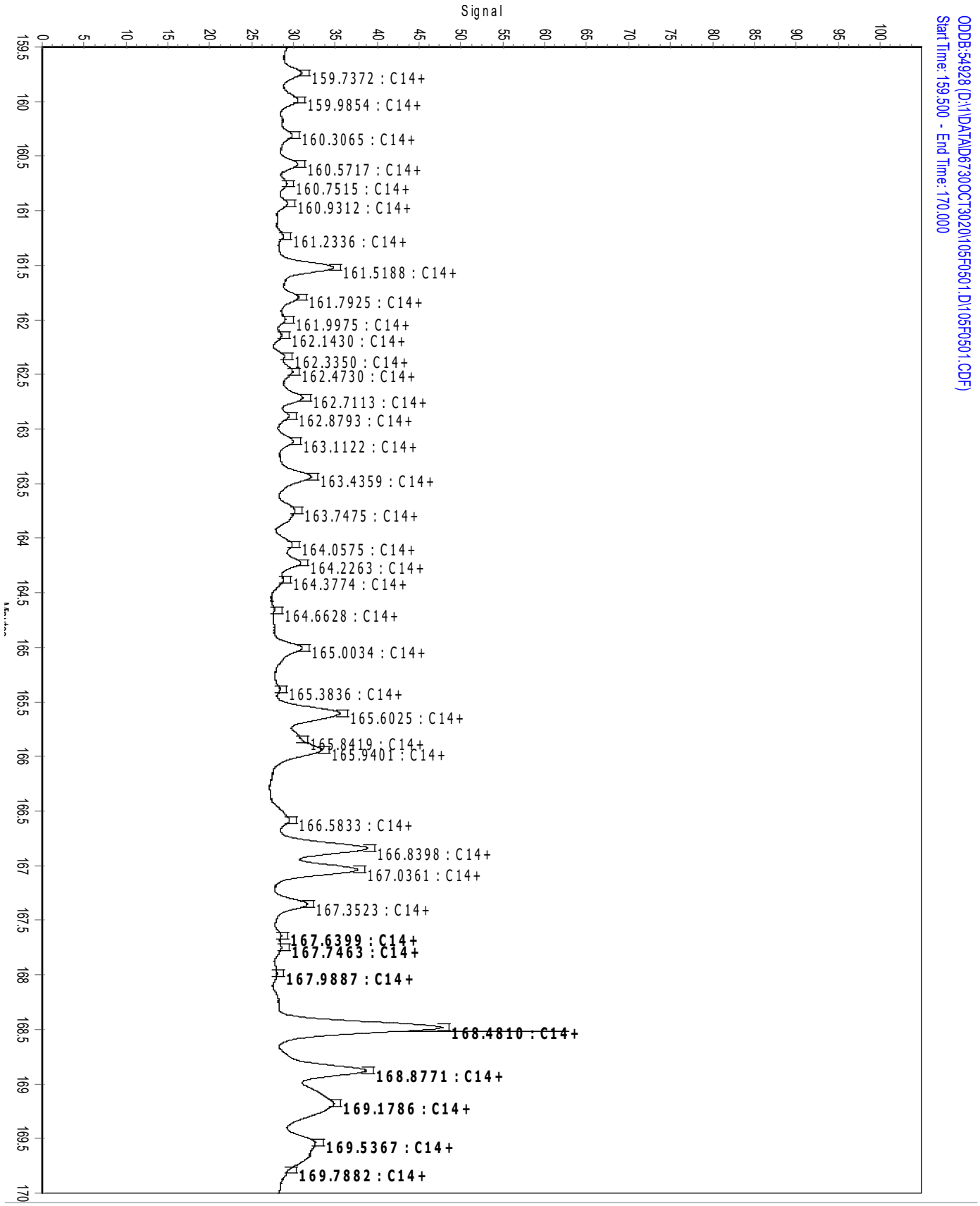
ODDB:54928 (D:\1DATA\D6730OCT30201105F0501.D\105F0501.CDF)
Start Time: 119.500 - End Time: 130.000



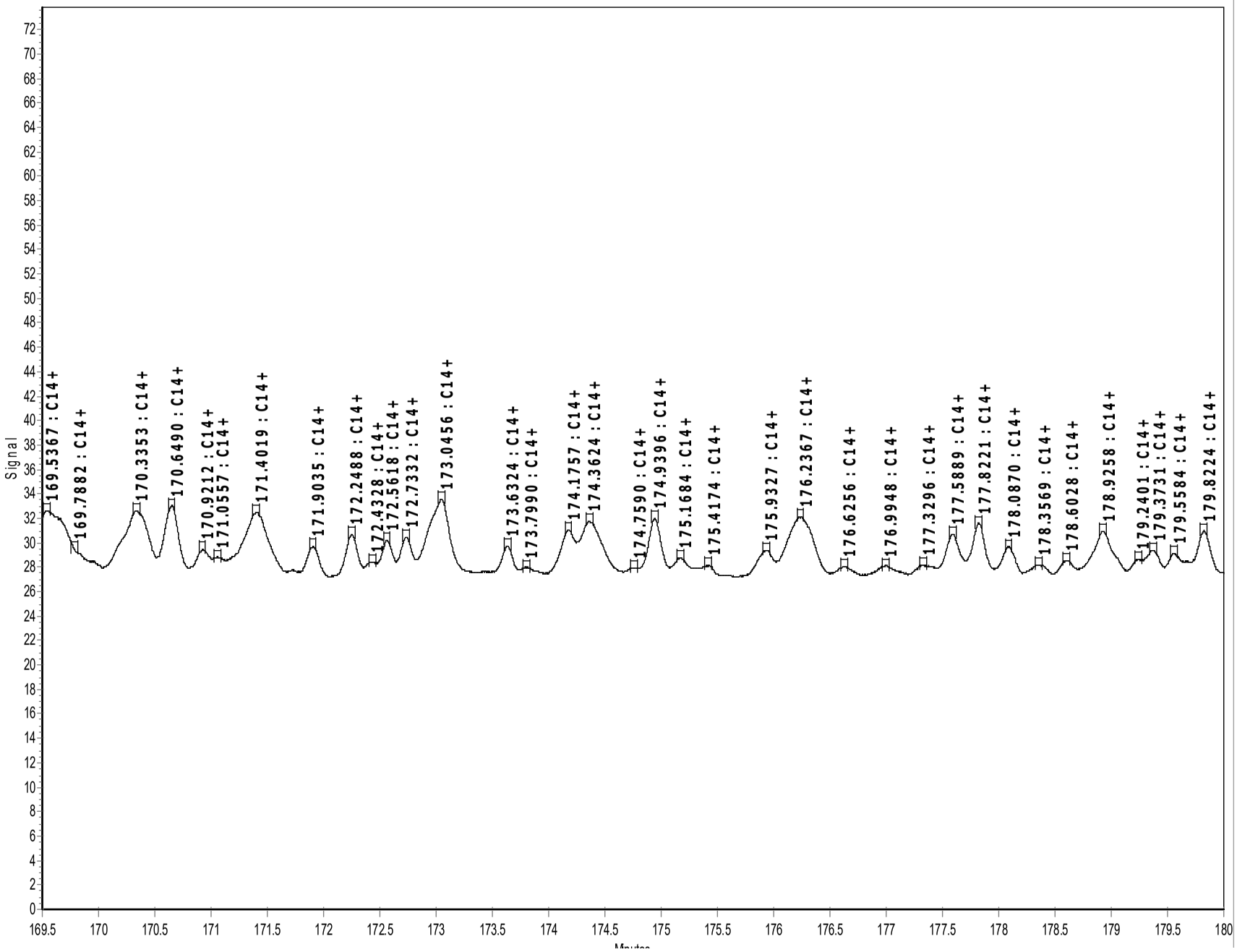
ODDB:54928 (D:\1DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 129.500 - End Time: 140.000


Signal
ODDB:54928 (D:\1DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 139.500 - End Time: 150.000
139.5051 : 1-t-butyl-3,5-dimethylbenzene
139.8464 : 1,4-ethyl-t-butylbenzene
140.2498 : unknown
140.5413 : I12-[3]
140.7726 : I12-[4]
141.1213 : unknown
141.3493 : I12-[5]
141.6022 : unknown
141.8950 : I12-[6]
142.0939 : 1,3-di-n-propylbenzene
142.3333 : A12-[1]
142.5518 : dodecene-1
142.9121 : unknown
143.2534 : unknown
143.5533 : A12-[2]
143.6809 : n-dodecane
143.9447 : unknown
144.2266 : unknown
144.3028 : unknown
144.7619 : unknown
144.9865 : unknown
145.1849 : 1,3,5-triethylbenzene
145.3726 : unknown
145.7150 : unknown
145.8879 : unknown
146.2057 : unknown
146.4960 : unknown
146.7383 : unknown
146.8144 : unknown
147.1202 : unknown
147.1950 : unknown
147.5059 : 1,2,4-triethylbenzene
147.7271 : unknown
148.0786 : unknown
148.2353 : unknown
148.4642 : unknown
148.8007 : 1,4-methyl-n-pentylbenzene
149.0854 : unknown
149.2392 : unknown
149.3784 : unknown
149.6663 : unknown
149.9502 : unknown


Signal
ODDB:54928 (D:\1DATA\D6730OCT30201105F0501.D\105F0501.CDF)
Start Time: 149.500 - End Time: 160.000
149.6663 : unknown
149.9502 : unknown
150.1471 : unknown
150.5319 : n-hexylbenzene
150.6219 : unknown
150.9945 : unknown
151.2533 : unknown
151.4994 : unknown
151.6584 : unknown
151.8753 : unknown
151.9171 : unknown
152.2066 : unknown
152.6363 : I13-[1]
152.8255 : 1,2,3,4,5-pentamethylbenzene
153.0557 : unknown
153.5700 : unknown
153.9228 : 2-methylnaphthalene
154.4113 : unknown
154.5612 : unknown
154.7005 : unknown
154.9052 : tridecene-1
155.3395 : unknown
155.5016 : unknown
155.5897 : unknown
155.8744 : 1-methylnaphthalene
156.0696 : n-tridecane
156.1878 : C14+
156.5888 : C14+
157.0500 : C14+
157.3365 : C14+
157.5228 : C14+
157.7284 : C14+
157.9270 : C14+
158.1658 : C14+
158.3810 : C14+
158.6472 : C14+
158.9751 : C14+
159.1543 : C14+
159.4531 : C14+
159.7372 : C14+
159.9854 : C14+


Signal
ODDB:54928 (D:\1DATA\D6730OCT30201105F0501.D\105F0501.CDF)
Start Time: 159.500 - End Time: 170.000
159.7372 : C14+
159.9854 : C14+
160.3065 : C14+
160.5717 : C14+
160.7515 : C14+
160.9312 : C14+
161.2336 : C14+
161.5188 : C14+
161.7925 : C14+
161.9975 : C14+
162.1430 : C14+
162.3350 : C14+
162.4730 : C14+
162.7113 : C14+
162.8793 : C14+
163.1122 : C14+
163.4359 : C14+
163.7475 : C14+
164.0575 : C14+
164.2263 : C14+
164.3774 : C14+
164.6628 : C14+
165.0034 : C14+
165.3836 : C14+
165.6025 : C14+
165.8419 : C14+
165.9401 : C14+
166.5833 : C14+
166.8398 : C14+
167.0361 : C14+
167.3523 : C14+
167.6399 : C14+
167.7463 : C14+
167.9887 : C14+
168.4810 : C14+
168.8771 : C14+
169.1786 : C14+
169.5367 : C14+
169.7882 : C14+

ODDB:54928 (D:\1\DATA\D6730OCT3020\105F0501.D\105F0501.CDF)
Start Time: 169.500 - End Time: 180.000



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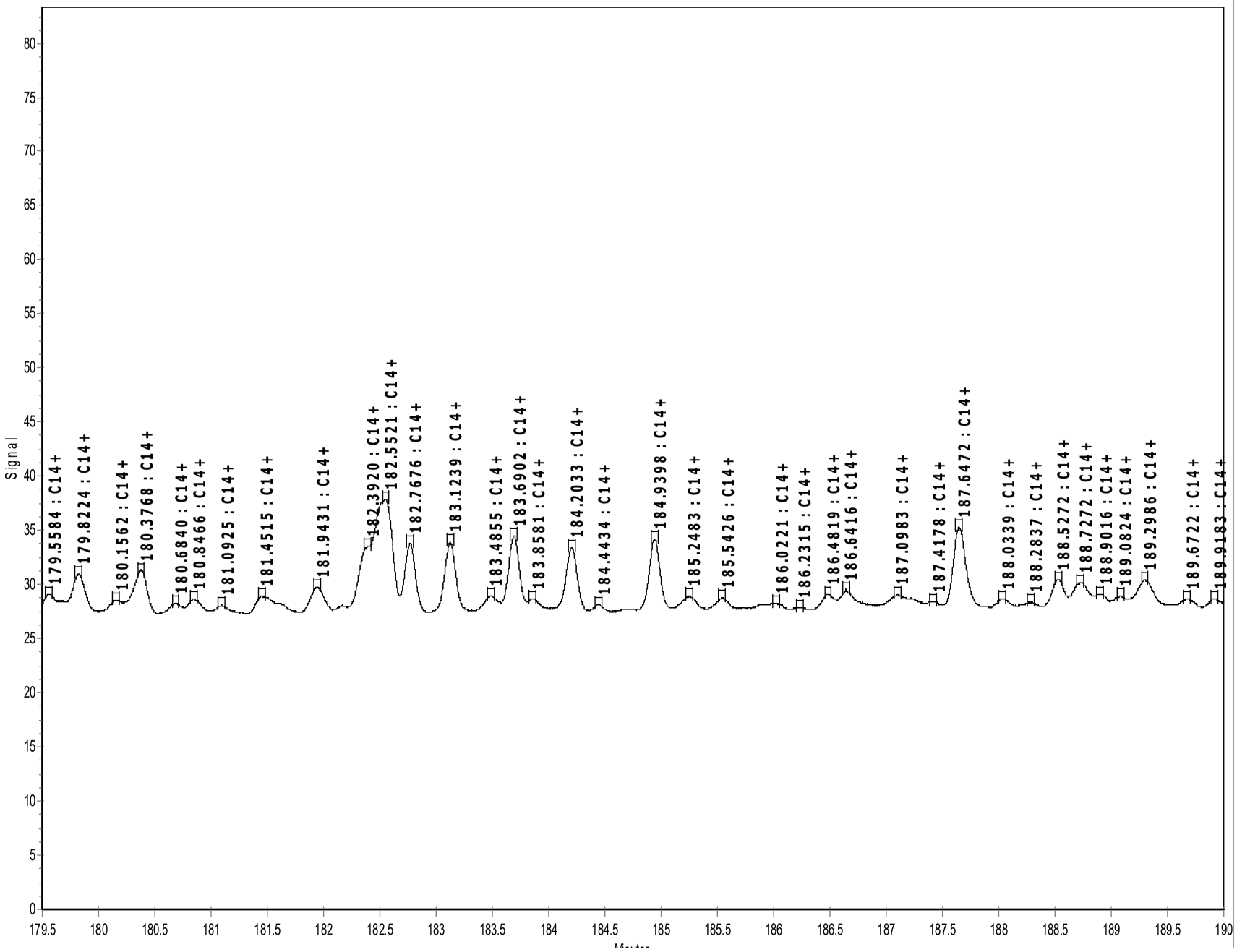
Start Time: 179.500 - End Time: 190.000



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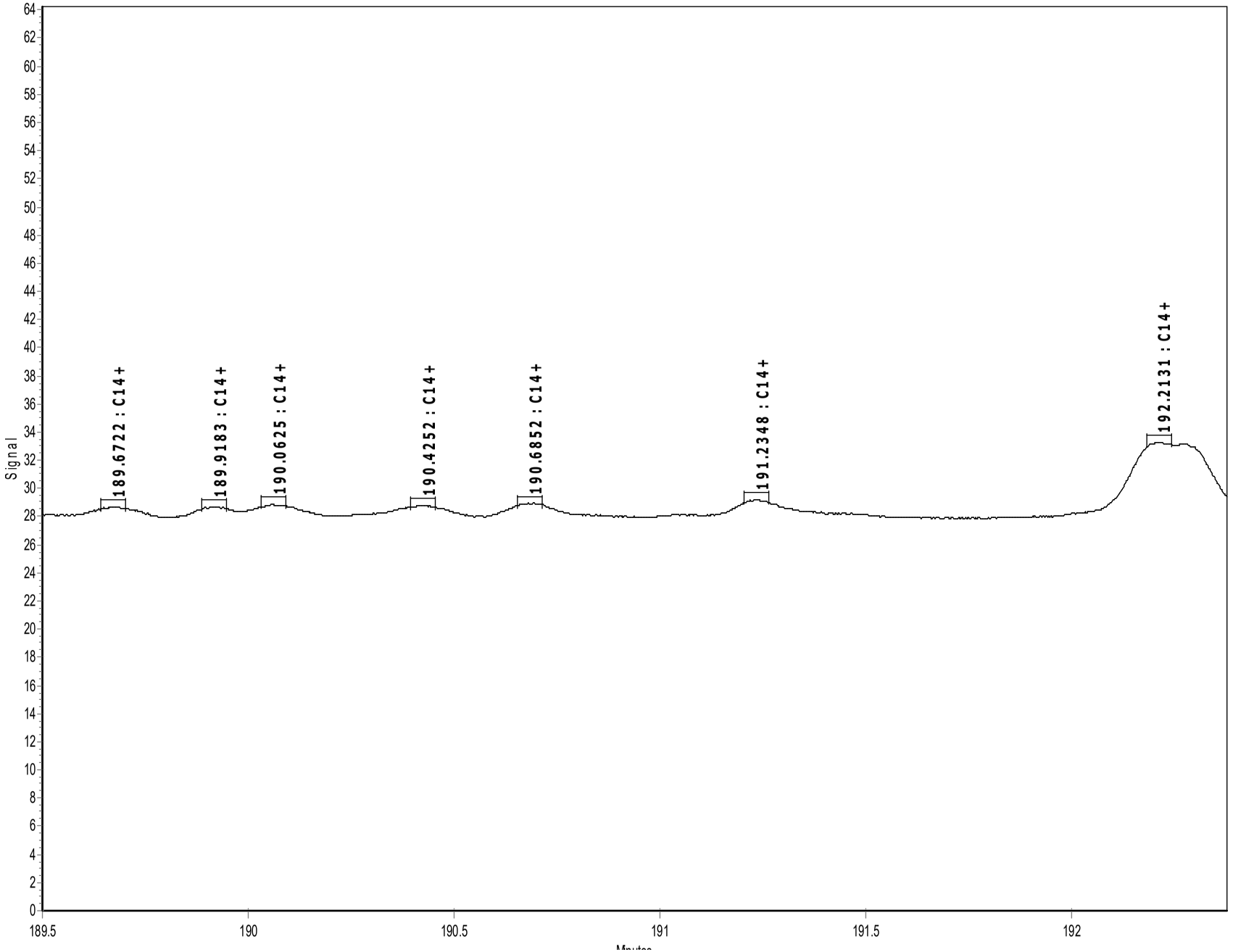
Start Time: 189.500 - End Time: 192.378



Detailed Hydrocarbon Analysis Summary Report -

Report Date: 11/2/2020 9:50:28 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Location: GC 12 D6730
Normalized to 100.000%

SUMMARY REPORT

Group Type	Total(Mass%)	Total(Vol%)	Total(Mol%)
Paraffins:	7.413	8.344	7.211
I-Paraffins:	37.157	40.572	31.921
Olefins:	3.894	4.201	3.985
Naphthenes:	11.454	11.097	9.648
Aromatics:	21.911	18.549	16.725
Total C14+:	0.365	0.354	0.153
Total Unknowns:	1.671	1.765	1.154

Oxygenates:

Total:	16.136(Mass%)	15.119(Vol%)
Total Oxygen Content:	5.604(Mass%)	

Multisubstituted Aromatics: 13.921(Mass%) 11.817(Vol%)

Average Molecular Weight: 83.376

Relative Density: 0.739

Vapor Pressure :

Calculated Octane Number: 86.7

Motor Octane Number (Jenkins Calculation): 78.7

	IBP	T10	T50	T90	FBP
BP by Mass (Deg F)	31.10	173.30	197.33	329.32	465.89
BP by Vol (Deg F)	31.10	173.30	197.33	329.32	449.60

Percent Carbon: 82.922
Percent Hydrogen: 11.474
Bromine Number (Calc): 7.275
Particulate Matter Index: 1.113

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Normalized to xxx%
Int Std: NONE
Int Std Amt: 0.000
Sample Wt: 1.000 Sample Den: 1.000

Oxygenates

Compound	Mass%	Mass% Oxygen	Vol%
ethanol : X2	16.136	5.604	15.119

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.0000
Sample Wt: 1.0000 Sample Den: 1.000

Totals by Group Type & Carbon Number (in Mass Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.001	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.468	0.096	0.044	0.000	0.000	0.001	0.610
C5	2.357	6.569	1.628	0.322	0.000	0.001	10.877
C6	1.781	7.433	1.132	3.087	0.681	0.041	14.155
C7	1.303	8.110	0.732	3.696	4.455	0.007	18.303
C8	0.783	9.310	0.068	2.696	7.154	0.191	20.201
C9	0.367	3.187	0.192	1.305	5.517	0.182	10.750
C10	0.194	1.697	0.066	0.300	3.374	0.262	5.894
C11	0.104	0.498	0.020	0.043	0.365	0.371	1.401
C12	0.045	0.249	0.006	0.004	0.365	0.315	0.984
C13	0.009	0.008	0.006	0.000	0.000	0.300	0.323
Total:	7.413	37.157	3.894	11.454	21.911	1.671	81.828

Oxygenates 16.136
Total C14+: 0.365
Total Unknowns: 1.671
Grand Total: 100.000

Totals by Group Type & Carbon Number (in Volume Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.001
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.598	0.128	0.054	0.000	0.000	0.001	0.780
C5	2.782	7.838	1.822	0.320	0.000	0.001	12.763
C6	1.997	8.357	1.190	3.019	0.573	0.044	15.179
C7	1.409	8.752	0.763	3.616	3.799	0.007	18.346
C8	0.824	9.767	0.069	2.586	6.096	0.202	19.544
C9	0.378	3.276	0.204	1.236	4.682	0.193	9.968
C10	0.197	1.707	0.067	0.277	2.806	0.277	5.331
C11	0.103	0.495	0.020	0.040	0.289	0.392	1.339
C12	0.044	0.244	0.006	0.004	0.303	0.332	0.934
C13	0.009	0.008	0.006	0.000	0.000	0.316	0.339
Total:	8.344	40.572	4.201	11.097	18.549	1.765	82.762

Oxygenates 15.119
Total C14+: 0.354
Total Unknowns: 1.765
Grand Total: 100.000

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.0000
Sample Wt: 1.0000 Sample Den: 1.000

Totals by Group Type & Carbon Number (in Mol Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.001	0.000	0.000	0.000	0.000	0.000	0.001
C3	0.003	0.000	0.000	0.000	0.000	0.000	0.003
C4	0.671	0.138	0.066	0.000	0.000	0.001	0.877
C5	2.723	7.591	1.939	0.383	0.000	0.001	12.638
C6	1.723	7.192	1.127	3.058	0.727	0.107	13.933
C7	1.084	6.748	0.620	3.139	4.031	0.007	15.629
C8	0.571	6.795	0.050	2.003	5.618	0.144	15.182
C9	0.239	2.072	0.127	0.862	3.827	0.154	7.279
C10	0.114	0.994	0.040	0.178	2.127	0.179	3.632
C11	0.055	0.266	0.011	0.023	0.208	0.232	0.795
C12	0.022	0.122	0.003	0.002	0.188	0.176	0.512
C13	0.004	0.004	0.003	0.000	0.000	0.154	0.165
Total:	7.211	31.921	3.985	9.648	16.725	1.154	69.491

Oxygenates 29.202
Total C14+: 0.153
Total Unknowns: 1.154
Grand Total: 100.000

Detailed Hydrocarbon Analysis - Dienes (Di-Olefins) Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000
Sample Den: 1.000

Diene Components Listed in Chromatographic Order **Page: 5**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %
8.985	394.970	O4	1,3-butadiene	0.000	0.000	0.000
13.021	481.250	O5	1,4-pentadiene	0.001	0.001	0.001
14.850	506.140	O5	2-methylbutadiene-1,3	0.007	0.007	0.008
16.188	527.980	O5	1t,3-pentadiene	0.007	0.008	0.009
16.887	538.230	O5	cyclopentadiene	0.005	0.006	0.006
20.389	581.020	O6	1,5-hexadiene	0.000	0.000	0.000
21.990	597.110	O6	1c/t,4-hexadiene	0.000	0.000	0.000
25.276	632.970	O7	cyclic diolefin or triolefin-[1]	0.002	0.002	0.002
25.838	638.610	O7	cyclic diolefin or triolefin-[2]	0.006	0.007	0.007
28.355	661.980	O6	diolefin (hexadiene)	0.003	0.003	0.003
30.175	677.270	O7	1,6-heptadiene	0.000	0.000	0.000
36.539	720.940	N8	1,1,3-trimethylcyclopentane	0.169	0.167	0.126

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order **Page: 6**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
6.436	100.000	P1	methane	0.000	0.000	0.000	-258.700	-161.500
6.550	180.040	O2	ethylene	0.000	0.000	0.000	-154.624	-103.680
6.622	200.000	P2	ethane	0.000	0.000	0.001	-127.480	-88.600
7.116	293.470	O3	propylene	0.000	0.000	0.000	-53.896	-47.720
7.178	300.000	P3	propane	0.001	0.002	0.003	-43.672	-42.040
8.193	366.110	I4	i-butane	0.096	0.128	0.138	10.904	-11.720
8.344	372.510	--	unknown	0.000	0.000	0.001	32.000	0.000
8.710	386.090	--	unknown	0.000	0.000	0.000	32.000	0.000
8.828	390.030	O4	butene-1	0.002	0.002	0.003	20.750	-6.250
8.880	391.700	O4	isobutylene	0.003	0.004	0.005	20.750	-6.250
8.985	394.970	O4	1,3-butadiene	0.000	0.000	0.000	24.062	-4.410
9.155	400.000	P4	n-butane	0.468	0.598	0.671	31.100	-0.500
9.546	412.300	O4	t-butene-2	0.017	0.021	0.025	33.584	0.880
9.643	415.120	I5	2,2-dimethylpropane	0.003	0.004	0.004	49.100	9.500
9.863	421.210	--	unknown	0.001	0.001	0.001	32.000	0.000
10.132	428.130	O4	c-butene-2	0.023	0.027	0.034	38.696	3.720
11.744	461.400	X2	ethanol	16.136	15.119	29.202	173.300	78.500
12.772	477.700	I5	i-pentane	6.566	7.834	7.587	82.112	27.840
13.021	481.250	O5	1,4-pentadiene	0.001	0.001	0.001	78.728	25.960
13.748	490.890	O5	pentene-1	0.115	0.133	0.137	85.928	29.960
14.223	496.700	O5	2-methylbutene-1	0.267	0.304	0.318	88.070	31.150
14.507	500.000	P5	n-pentane	2.357	2.782	2.723	96.908	36.060
14.850	506.140	O5	2-methylbutadiene-1,3	0.007	0.007	0.008	93.308	34.060
15.097	510.430	O5	t-pentene-2	0.349	0.398	0.414	97.412	36.340
15.468	516.630	O5	3,3-dimethylbutene-1	0.005	0.005	0.006	106.232	41.240
15.637	519.380	O5	c-pentene-2	0.194	0.218	0.230	98.474	36.930
15.795	521.900	--	unknown	0.000	0.000	0.001	32.000	0.000
15.975	524.710	O5	2-methylbutene-2	0.583	0.651	0.693	101.408	38.560
16.188	527.980	O5	1t,3-pentadiene	0.007	0.008	0.009	107.636	42.020
16.308	529.790	--	unknown	0.001	0.001	0.001	32.000	0.000
16.887	538.230	O5	cyclopentadiene	0.005	0.006	0.006	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
17.015	540.040	I6	2,2-dimethylbutane	0.418	0.477	0.405	121.514	49.730
18.314	557.180	O5	cyclopentene	0.095	0.091	0.117	111.614	44.230
18.681	561.680	O6	4-methylpentene-1	0.022	0.025	0.022	128.948	53.860
18.749	562.500	O6	3-methylpentene-1	0.037	0.041	0.036	129.506	54.170
19.106	566.730	N5	cyclopentane	0.322	0.320	0.383	120.650	49.250
19.292	568.890	I6	2,3-dimethylbutane	1.274	1.424	1.233	136.364	57.980
19.448	570.680	--	unknown	0.040	0.043	0.105	32.000	0.000
19.567	572.030	O6	2,3-dimethylbutene-1	0.018	0.020	0.018	132.098	55.610
19.704	573.560	I6	2-methylpentane	3.537	4.004	3.422	140.468	60.260
19.837	575.040	O6	4-methyl-t-pentene-2	0.064	0.071	0.064	137.480	58.600
19.915	575.900	--	unknown	0.000	0.000	0.000	32.000	0.000
20.389	581.020	O6	1,5-hexadiene	0.000	0.000	0.000	139.010	59.450
20.810	585.410	I6	3-methylpentane	2.204	2.452	2.132	145.886	63.270
21.263	590.010	O6	2-methylpentene-1	0.107	0.116	0.106	143.780	62.100
21.353	590.910	O6	hexene-1	0.046	0.050	0.045	146.246	63.470
21.990	597.110	O6	1c/t,4-hexadiene	0.000	0.000	0.000	149.000	65.000
22.297	600.000	P6	n-hexane	1.781	1.997	1.723	155.714	68.730
22.523	602.710	O6	t-hexene-3	0.070	0.076	0.069	152.744	67.080
22.589	603.500	O6	c-hexene-3	0.023	0.025	0.023	151.592	66.440
22.741	605.290	O6	t-hexene-2	0.137	0.148	0.135	154.184	67.880
22.826	606.280	--	unknown	0.001	0.001	0.001	32.000	0.000
22.945	607.660	O6	2-methylpentene-2	0.174	0.186	0.173	153.140	67.300
23.024	608.580	O6	4-methylcyclopentene	0.047	0.046	0.048	148.820	64.900
23.186	610.440	O6	3-methyl-c-pentene-2	0.106	0.112	0.105	153.842	67.690
23.309	611.850	O6	3-methylcyclopentene	0.025	0.025	0.026	149.000	65.000
23.418	613.080	O6	O6-[1]	0.000	0.000	0.000	32.000	0.000
23.549	614.550	O6	c-hexene-2	0.074	0.079	0.074	155.984	68.880
23.786	617.180	O6	O6-[2]	0.001	0.001	0.001	32.000	0.000
24.114	620.780	O7	3,3-dimethylpentene-1	0.163	0.172	0.139	171.446	77.470
24.247	622.210	--	unknown	0.001	0.001	0.002	32.000	0.000
24.310	622.880	O7	4,4-dimethyl-t-pentene-2	0.002	0.002	0.002	170.114	76.730

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

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Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order **Page: 8**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
24.409	623.950	I7	2,2-dimethylpentane	0.097	0.107	0.081	174.542	79.190
24.624	626.230	N6	methylcyclopentane	2.307	2.278	2.285	161.240	71.800
25.036	630.510	I7	2,4-dimethylpentane	1.443	1.586	1.201	176.882	80.490
25.276	632.970	O7	cyclic diolefin or triolefin-[1]	0.002	0.002	0.002	32.000	0.000
25.458	634.810	I7	2,2,3-trimethylbutane	0.046	0.049	0.038	177.584	80.880
25.625	636.490	--	unknown	0.002	0.002	0.002	32.000	0.000
25.838	638.610	O7	cyclic diolefin or triolefin-[2]	0.006	0.007	0.007	32.000	0.000
26.175	641.910	O7	O7-[1]	0.002	0.002	0.002	32.000	0.000
26.287	642.990	O7	3,4-dimethylpentene-1	0.006	0.006	0.005	177.422	80.790
26.659	646.540	O7	4,4-dimethyl-c-pentene-2	0.008	0.008	0.007	176.756	80.420
26.804	647.920	O7	2,4-dimethylpentene-1	0.008	0.008	0.007	178.880	81.600
26.906	648.870	O6	1-methylcyclopentene	0.177	0.167	0.179	167.864	75.480
27.105	650.730	A6	benzene	0.681	0.573	0.727	176.162	80.090
27.288	652.420	O7	2-methyl-c-hexene-3	0.004	0.004	0.003	186.800	86.000
27.503	654.390	I7	3,3-dimethylpentane	0.092	0.098	0.076	186.908	86.060
27.604	655.300	O7	5-methylhexene-1	0.010	0.010	0.008	185.558	85.310
27.796	657.030	--	unknown	0.004	0.004	0.003	32.000	0.000
27.930	658.220	N6	cyclohexane	0.780	0.741	0.773	177.296	80.720
28.225	660.840	O7	2-methyl-t-hexene-3	0.016	0.017	0.014	186.620	85.900
28.355	661.980	O6	diolefin (hexadiene)	0.003	0.003	0.003	158.000	70.000
28.447	662.780	O7	2-ethyl-3-methylbutene-1	0.006	0.006	0.005	187.448	86.360
28.573	663.880	O7	4-methylhexene-1	0.013	0.014	0.011	188.114	86.730
28.887	666.570	O7	4-methyl-t/c-hexene-2	0.027	0.029	0.023	187.358	86.310
29.038	667.860	I7	2-methylhexane	1.879	2.047	1.563	194.090	90.050
29.202	669.250	I7	2,3-dimethylpentane	2.449	2.604	2.037	193.604	89.780
29.487	671.630	N7	1,1-dimethylcyclopentane	0.072	0.070	0.061	189.464	87.480
29.811	674.300	O7	5-methyl-t-hexene-2	0.022	0.023	0.019	190.598	88.110
30.022	676.030	I7	3-methylhexane	1.926	2.072	1.602	197.330	91.850
30.175	677.270	O7	1,6-heptadiene	0.000	0.000	0.000	205.106	96.170
30.454	679.500	O7	3,4-dimethyl-c-pentene-2	0.012	0.012	0.010	192.650	89.250
30.760	681.930	N7	1c,3-dimethylcyclopentane	0.656	0.651	0.557	195.386	90.770

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
31.113	684.700	N7	1t,3-dimethylcyclopentane	0.583	0.576	0.495	197.096	91.720
31.288	686.050	I7	3-ethylpentane	0.179	0.190	0.149	200.246	93.470
31.478	687.510	N7	1t,2-dimethylcyclopentane	0.570	0.561	0.484	197.366	91.870
31.658	688.880	I8	2,2,4-trimethylpentane	2.672	2.855	1.950	210.632	99.240
31.758	689.640	O7	2-ethylpentene-1	0.007	0.007	0.006	200.552	93.640
32.215	693.070	O7	O7-[2]	0.001	0.001	0.001	32.000	0.000
32.453	694.830	O7	3-methyl-c-hexene-3	0.021	0.021	0.017	203.720	95.400
32.989	698.740	O7	t-heptene-3	0.074	0.078	0.063	204.206	95.670
33.164	700.000	P7	n-heptane	1.303	1.409	1.084	209.156	98.420
33.349	701.210	O7	c-heptene-3	0.015	0.016	0.013	204.350	95.750
33.465	701.970	O7	2-methyl-2-hexene	0.063	0.065	0.053	203.738	95.410
33.619	702.970	O7	3-methyl-t-hexene-3	0.029	0.031	0.025	200.372	93.540
33.863	704.550	O7	t-heptene-2	0.029	0.030	0.025	208.310	97.950
34.093	706.010	O7	3-ethylpentene-2	0.020	0.020	0.017	204.818	96.010
34.582	709.100	O7	c-heptene-2	0.073	0.076	0.062	209.138	98.410
34.769	710.270	O7	3-methyl-t-hexene-2	0.001	0.001	0.001	203.324	95.180
35.095	712.280	O7	2,3-dimethylpentene-2	0.031	0.031	0.026	207.320	97.400
35.329	713.710	O7	3-ethylcyclopentene	0.004	0.003	0.003	207.986	97.770
35.422	714.280	--	unknown	0.000	0.000	0.000	32.000	0.000
35.721	716.090	O7	O7-[3]	0.006	0.006	0.005	32.000	0.000
35.982	717.650	N7	1c,2-dimethylcyclopentane	0.254	0.256	0.215	211.154	99.530
36.112	718.420	N7	methylcyclohexane	1.237	1.188	1.050	213.674	100.930
36.431	720.310	I8	2,2-dimethylhexane	0.037	0.040	0.027	224.312	106.840
36.539	720.940	N8	1,1,3-trimethylcyclopentane	0.169	0.167	0.126	220.802	104.890
36.852	722.760	O7	O7-[4]	0.009	0.009	0.007	32.000	0.000
36.965	723.420	--	unknown	0.002	0.002	0.002	32.000	0.000
37.148	724.460	O7	O7-[5]	0.004	0.004	0.004	32.000	0.000
37.252	725.060	--	unknown	0.001	0.001	0.001	32.000	0.000
37.505	726.500	O7	O7-[6]	0.006	0.006	0.005	32.000	0.000
37.624	727.170	--	unknown	0.001	0.001	0.001	32.000	0.000
38.007	729.320	N7	ethylcyclopentane	0.324	0.313	0.276	218.246	103.470

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
38.131	730.020	I8	2,5-dimethylhexane	0.546	0.582	0.399	228.398	109.110
38.321	731.070	I8	2,2,3-trimethylpentane	0.105	0.109	0.077	229.730	109.850
38.468	731.880	I8	2,4-dimethylhexane	0.630	0.665	0.460	228.974	109.430
38.594	732.570	--	unknown	0.012	0.012	0.009	32.000	0.000
38.819	733.800	--	unknown	0.001	0.002	0.001	32.000	0.000
38.928	734.390	O7	O7-[7]	0.002	0.002	0.002	32.000	0.000
39.166	735.680	O7	O7-[8]	0.002	0.002	0.001	32.000	0.000
39.477	737.340	N8	1c,2t,4-trimethylcyclopentane	0.276	0.267	0.205	242.132	116.740
39.694	738.500	I8	3,3-dimethylhexane	0.054	0.057	0.040	233.546	111.970
40.180	741.050	O7	O7-[9]	0.003	0.003	0.003	32.000	0.000
40.488	742.650	O7	O7-[10]	0.002	0.002	0.001	32.000	0.000
40.623	743.350	O7	O7-[11]	0.004	0.004	0.003	32.000	0.000
40.842	744.470	N8	1t,2c,3-trimethylcyclopentane	0.201	0.193	0.149	230.738	110.410
41.378	747.190	I8	2,3,4-trimethylpentane	1.180	1.213	0.861	236.246	113.470
41.598	748.300	I8	I8-[1]	0.073	0.075	0.053	236.246	113.470
41.895	749.780	O7	O7-[12]	0.019	0.020	0.014	32.000	0.000
42.199	751.290	I8	2,3,3-trimethylpentane	1.113	1.133	0.812	238.586	114.770
42.624	753.370	A7	toluene	4.455	3.799	4.031	231.134	110.630
42.746	753.960	O8	O8-[1]	0.004	0.004	0.003	32.000	0.000
43.082	755.580	O8	O8-[2]	0.008	0.008	0.006	32.000	0.000
43.613	758.120	I8	2,3-dimethylhexane	0.497	0.516	0.363	240.098	115.610
43.742	758.730	I8	2-methyl-3-ethylpentane	0.091	0.095	0.066	240.098	115.610
44.092	760.370	N8	1,1,2-trimethylcyclopentane	0.010	0.009	0.007	236.714	113.730
44.535	762.430	O8	O8-[3]	0.026	0.027	0.020	32.000	0.000
44.938	764.290	I8	2-methylheptane	0.877	0.929	0.640	243.770	117.650
45.254	765.730	I8	4-methylheptane	0.334	0.351	0.244	243.878	117.710
45.515	766.910	I8	3-methyl-3-ethylpentane	0.068	0.070	0.049	240.098	115.610
45.624	767.400	I8	3,4-dimethylhexane	0.084	0.086	0.061	243.914	117.730
46.254	770.200	N8	1c,2c,4-trimethylcyclopentane	0.105	0.102	0.078	242.168	116.760
46.655	771.970	I8	3-methylheptane	0.838	0.878	0.612	246.074	118.930
46.927	773.160	--	unknown	0.172	0.181	0.125	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
47.012	773.530	N8	1c,2t,3-trimethylcyclopentane	0.394	0.378	0.293	243.500	117.500
47.179	774.250	I8	3-ethylhexane	0.109	0.113	0.080	245.372	118.540
47.450	775.420	N8	1t,4-dimethylcyclohexane	0.184	0.178	0.137	246.848	119.360
47.893	777.310	--	unknown	0.002	0.002	0.005	32.000	0.000
48.270	778.910	--	unknown	0.001	0.001	0.002	32.000	0.000
48.431	779.590	O8	O8-[4]	0.001	0.001	0.000	32.000	0.000
48.779	781.040	N8	1,1-dimethylcyclohexane	0.033	0.031	0.024	247.190	119.550
49.237	782.930	I9	2,2,5-trimethylhexane	0.596	0.623	0.387	255.362	124.090
49.666	784.690	N8	3c-ethylmethylcyclopentane	0.202	0.195	0.150	249.980	121.100
49.894	785.620	O9	2,6-dimethylheptene-1	0.002	0.002	0.002	32.000	0.000
50.214	786.910	N8	3t-ethylmethylcyclopentane	0.171	0.165	0.127	249.980	121.100
50.545	788.240	N8	2t-ethylmethylcyclopentane	0.156	0.150	0.116	250.160	121.200
50.997	790.030	O8	O8-[5]	0.006	0.006	0.005	32.000	0.000
51.130	790.560	N8	1,1-methylethylcyclopentane	0.021	0.020	0.015	250.754	121.530
51.819	793.250	N8	1t,2-dimethylcyclohexane	0.182	0.173	0.135	254.174	123.430
52.039	794.110	O8	t-octene-4	0.007	0.007	0.005	252.068	122.260
52.428	795.600	O9	3,5,5-trimethylhexene-1	0.001	0.001	0.001	32.000	0.000
52.887	797.350	N8	1c,2c,3-trimethylcyclopentane	0.030	0.029	0.022	253.400	123.000
53.589	800.000	P8	n-octane	0.783	0.824	0.571	258.224	125.680
53.870	801.050	N8	1c,4-dimethylcyclohexane	0.254	0.240	0.188	255.794	124.330
54.742	804.280	O8	t-octene-2	0.008	0.008	0.006	32.000	0.000
54.965	805.100	--	unknown	0.005	0.005	0.012	32.000	0.000
55.341	806.470	I9	I9-[1]	0.037	0.037	0.024	32.000	0.000
55.439	806.830	--	unknown	0.016	0.017	0.010	32.000	0.000
55.831	808.240	N8	i-propylcyclopentane	0.080	0.076	0.060	259.574	126.430
56.495	810.620	--	unknown	0.003	0.004	0.009	32.000	0.000
57.029	812.500	--	unknown	0.008	0.009	0.022	32.000	0.000
57.130	812.850	O8	c-octene-2	0.005	0.005	0.003	32.000	0.000
57.705	814.850	N8	N8-[1]	0.013	0.013	0.010	32.000	0.000
58.071	816.120	O8	O8-[6]	0.002	0.002	0.002	32.000	0.000
58.453	817.430	I9	2,2,3,4-tetramethylpentane	0.119	0.119	0.077	271.454	133.030

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
59.093	819.600	I9	2,3,4-trimethylhexane	0.067	0.067	0.044	282.308	139.060
59.393	820.610	N8	N8-[2]	0.003	0.003	0.002	32.000	0.000
59.650	821.470	O9	O9-[1]	0.029	0.030	0.019	32.000	0.000
60.061	822.840	N8	N8-[3]	0.001	0.001	0.000	32.000	0.000
60.506	824.300	O9	O9-[2]	0.006	0.006	0.004	32.000	0.000
61.043	826.060	N8	1c,2-dimethylcyclohexane	0.178	0.165	0.132	265.532	129.740
61.238	826.690	--	unknown	0.022	0.024	0.017	32.000	0.000
61.637	827.980	I9	2,3,5-trimethylhexane	0.006	0.007	0.004	268.430	131.350
61.950	828.980	I9	2,2-dimethylheptane	0.013	0.013	0.008	270.860	132.700
62.840	831.810	N9	1,1,4-trimethylcyclohexane	0.320	0.306	0.211	275.000	135.000
63.404	833.570	I9	2,2,3-trimethylhexane	0.151	0.156	0.098	271.220	132.900
63.988	835.390	I9	2,4-dimethylheptane	0.032	0.033	0.021	271.220	132.900
64.729	837.660	I9	4,4-dimethylheptane	0.186	0.192	0.121	271.220	132.900
65.630	840.380	N8	n-propylcyclopentane	0.029	0.027	0.021	267.728	130.960
65.839	841.010	I9	2,5-dimethylheptane	0.251	0.259	0.163	276.800	136.000
66.302	842.390	I9	3,3-&3,5-dimethylheptane	0.058	0.059	0.038	278.636	137.020
66.710	843.590	I9	3,5-dimethylheptane	0.040	0.041	0.026	276.800	136.000
67.183	844.980	I9	2,6-dimethylheptane	0.068	0.071	0.044	275.396	135.220
67.814	846.820	N9	1,1,3-trimethylcyclohexane	0.046	0.043	0.030	295.862	146.590
68.311	848.250	O9	2,4-dimethylheptene-1	0.002	0.002	0.001	32.000	0.000
69.088	850.460	N8	N8-[4]	0.004	0.004	0.003	32.000	0.000
69.416	851.390	N9	1c,2t,4t-trimethylcyclohexane	0.019	0.018	0.012	32.000	0.000
70.259	853.750	A8	ethylbenzene	1.167	0.995	0.916	277.160	136.200
70.644	854.820	N9	1c,3c,5c-trimethylcyclohexane	0.123	0.116	0.081	32.000	0.000
71.474	857.100	O9	2-methyloctene-1	0.019	0.021	0.013	32.000	0.000
71.914	858.300	I9	I9-[2]	0.003	0.003	0.002	32.000	0.000
72.366	859.520	O9	2-methyloctene-2	0.027	0.030	0.018	32.000	0.000
74.096	864.120	A8	1,3-dimethylbenzene	3.126	2.674	2.455	282.416	139.120
74.430	865.000	A8	1,4-dimethylbenzene	1.290	1.108	1.013	281.048	138.360
75.057	866.630	I9	3,4-dimethylheptane	0.029	0.030	0.019	285.080	140.600
75.385	867.480	I9	3,4 -dimethylheptane	0.059	0.059	0.038	285.080	140.600

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
75.922	868.850	N9	N9-[1]	0.026	0.024	0.017	32.000	0.000
76.359	869.970	I9	I9-[3]	0.073	0.074	0.047	32.000	0.000
77.238	872.190	I9	4-ethylheptane	0.002	0.002	0.001	288.392	142.440
77.563	873.000	I9	4-methyloctane	0.259	0.266	0.168	288.392	142.440
77.960	873.990	I9	2-methyloctane	0.318	0.330	0.207	289.904	143.280
78.570	875.490	N9	N9-[2]	0.035	0.034	0.023	32.000	0.000
79.425	877.590	N9	1c,2t,3c-trimethylcyclohexane	0.039	0.038	0.026	304.160	151.200
79.740	878.350	I9	3-ethylheptane	0.074	0.075	0.048	289.400	143.000
80.254	879.590	I9	3-methyloctane	0.410	0.420	0.266	291.614	144.230
80.575	880.360	I9	3,3-diethylpentane	0.020	0.020	0.013	270.842	132.690
81.013	881.410	--	unknown	0.062	0.066	0.041	32.000	0.000
81.302	882.100	N9	1c,2t,4c-trimethylcyclohexane	0.017	0.016	0.011	275.000	135.000
81.677	882.980	N9	1,1,2-trimethylcyclohexane	0.029	0.027	0.019	293.360	145.200
82.020	883.790	A8	1,2-dimethylbenzene	1.571	1.319	1.234	291.974	144.430
82.563	885.060	I9	I9-[4]	0.027	0.027	0.017	32.000	0.000
82.925	885.910	I9	I9-[5]	0.099	0.101	0.065	32.000	0.000
83.660	887.600	N9	N9-[3]	0.085	0.080	0.056	32.000	0.000
83.926	888.220	N9	N9-[4]	0.105	0.100	0.070	32.000	0.000
84.052	888.500	--	unknown	0.038	0.040	0.025	32.000	0.000
84.435	889.380	O9	nonene-1	0.006	0.006	0.004	274.100	134.500
84.610	889.780	I9	I9-[6]	0.058	0.059	0.038	32.000	0.000
85.016	890.700	N9	N9-[5]	0.150	0.142	0.099	32.000	0.000
85.558	891.920	I9	I9-[7]	0.016	0.016	0.010	32.000	0.000
86.011	892.930	N9	i-butylcyclopentane	0.031	0.030	0.021	298.346	147.970
86.223	893.400	N9	N9-[6]	0.021	0.020	0.014	32.000	0.000
87.061	895.260	--	unknown	0.001	0.001	0.001	32.000	0.000
87.443	896.100	N9	N9-[7]	0.014	0.014	0.009	32.000	0.000
87.743	896.760	N9	N9-[8]	0.008	0.008	0.005	32.000	0.000
88.036	897.400	O9	t-nonene-2	0.007	0.008	0.005	32.000	0.000
88.255	897.870	O9	t-nonene-3	0.020	0.020	0.013	32.000	0.000
88.670	898.770	I9	I9-[8]	0.117	0.118	0.076	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
88.810	899.070	--	unknown	0.026	0.028	0.017	32.000	0.000
89.239	900.000	P9	n-nonane	0.367	0.378	0.239	303.476	150.820
89.601	901.750	N9	1,1-methylethylcyclohexane	0.088	0.081	0.058	305.924	152.180
90.176	904.530	N9	N9-[9]	0.009	0.009	0.006	32.000	0.000
90.428	905.730	N9	N9-[10]	0.026	0.024	0.017	32.000	0.000
90.712	907.090	O10	t-2,2,5,5-tetramethylhexene-3	0.007	0.007	0.004	32.000	0.000
91.590	911.260	N9	N9-[11]	0.006	0.006	0.004	32.000	0.000
92.015	913.270	A9	i-propylbenzene	0.062	0.053	0.043	306.338	152.410
92.378	914.970	O9	c-nonene-3	0.073	0.079	0.048	32.000	0.000
92.544	915.750	--	unknown	0.016	0.017	0.010	32.000	0.000
92.943	917.610	I10	I10-[1]	0.012	0.012	0.007	32.000	0.000
93.038	918.050	N9	i-propylcyclohexane	0.021	0.019	0.014	310.622	154.790
93.196	918.790	--	unknown	0.005	0.006	0.004	32.000	0.000
93.777	921.470	I10	I10-[2]	0.107	0.108	0.063	32.000	0.000
94.174	923.300	I10	2,2-dimethyloctane	0.034	0.035	0.020	314.420	156.900
94.449	924.560	I10	2,4-dimethyloctane	0.051	0.052	0.030	312.620	155.900
94.881	926.530	N9	N9-[12]	0.007	0.006	0.004	32.000	0.000
95.316	928.510	N9	N9-[13]	0.022	0.021	0.015	32.000	0.000
95.922	931.240	I10	2,6-dimethyloctane	0.086	0.087	0.050	320.738	160.410
96.279	932.850	I10	2,5-dimethyloctane	0.078	0.079	0.046	317.300	158.500
96.546	934.040	--	unknown	0.002	0.003	0.001	32.000	0.000
97.135	936.660	N9	n-butylcyclopentane	0.058	0.055	0.038	313.916	156.620
97.347	937.600	I10	I10-[3]	0.031	0.032	0.018	32.000	0.000
97.498	938.270	N10	N10-[1]	0.036	0.033	0.021	32.000	0.000
97.762	939.430	--	unknown	0.005	0.006	0.003	32.000	0.000
98.010	940.530	I10	I10-[4]	0.021	0.021	0.012	32.000	0.000
98.465	942.520	I10	3,3-dimethyloctane	0.138	0.138	0.081	322.160	161.200
98.778	943.890	N10	N10-[2]	0.023	0.022	0.014	32.000	0.000
98.992	944.820	--	unknown	0.019	0.020	0.011	32.000	0.000
99.161	945.560	--	unknown	0.024	0.026	0.014	32.000	0.000
99.554	947.260	A9	n-propylbenzene	0.349	0.299	0.242	318.632	159.240

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
99.850	948.540	I10	3,6-dimethyloctane	0.026	0.026	0.015	321.440	160.800
100.107	949.640	I10	3-methyl-5-ethylheptane	0.046	0.047	0.027	316.760	158.200
100.259	950.290	--	unknown	0.006	0.006	0.003	32.000	0.000
100.572	951.640	N10	N10-[3]	0.028	0.025	0.016	32.000	0.000
101.243	954.500	--	unknown	0.025	0.026	0.015	32.000	0.000
101.501	955.590	A9	1,3-methylethylbenzene	1.233	1.054	0.855	322.394	161.330
101.888	957.230	A9	1,4-methylethylbenzene	0.529	0.454	0.367	323.618	162.010
102.202	958.550	N10	N10-[4]	0.030	0.028	0.018	32.000	0.000
102.379	959.290	--	unknown	0.003	0.003	0.002	32.000	0.000
102.738	960.800	--	unknown	0.002	0.002	0.001	32.000	0.000
102.947	961.670	--	unknown	0.011	0.011	0.028	32.000	0.000
103.233	962.860	A9	1,3,5-trimethylbenzene	0.658	0.562	0.456	328.532	164.740
103.499	963.970	I10	I10-[5]	0.041	0.041	0.024	32.000	0.000
103.769	965.080	N10	N10-[5]	0.018	0.017	0.011	32.000	0.000
103.960	965.870	--	unknown	0.006	0.006	0.004	32.000	0.000
104.196	966.850	I10	I10-[6]	0.003	0.003	0.002	32.000	0.000
104.512	968.140	I10	5-methylnonane	0.051	0.052	0.030	329.180	165.100
104.917	969.800	I10	4-methylnonane	0.421	0.420	0.246	32.000	0.000
105.261	971.210	A9	1,2-methylethylbenzene	0.392	0.329	0.272	329.324	165.180
105.451	971.980	I10	2-methylnonane	0.120	0.122	0.070	332.654	167.030
105.571	972.470	--	unknown	0.013	0.014	0.008	32.000	0.000
105.871	973.690	--	unknown	0.011	0.012	0.007	32.000	0.000
106.106	974.630	I10	3-ethyloctane	0.025	0.025	0.015	331.700	166.500
106.179	974.930	--	unknown	0.014	0.015	0.008	32.000	0.000
106.475	976.120	N10	N10-[6]	0.023	0.021	0.014	32.000	0.000
106.805	977.450	I10	3-methylnonane	0.148	0.149	0.087	334.040	167.800
107.020	978.310	--	unknown	0.006	0.007	0.004	32.000	0.000
107.372	979.710	N10	N10-[7]	0.003	0.003	0.002	32.000	0.000
107.549	980.420	I10	I10-[7]	0.094	0.094	0.055	32.000	0.000
107.822	981.510	I10	I10-[8]	0.008	0.008	0.005	32.000	0.000
108.105	982.630	--	unknown	0.011	0.011	0.006	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
108.558	984.420	A9	1,2,4-trimethylbenzene	1.918	1.619	1.330	336.884	169.380
108.802	985.380	--	unknown	0.007	0.007	0.005	32.000	0.000
108.963	986.010	I10	I10-[9]	0.010	0.010	0.006	32.000	0.000
109.084	986.490	N10	i-butylcyclohexane	0.035	0.033	0.021	340.340	171.300
109.280	987.250	--	unknown	0.027	0.028	0.016	32.000	0.000
109.390	987.690	I10	I10-[10]	0.045	0.045	0.026	32.000	0.000
109.673	988.790	I10	I10-[11]	0.019	0.019	0.011	32.000	0.000
109.814	989.340	I10	I10-[12]	0.012	0.012	0.007	32.000	0.000
110.163	990.700	N10	N10-[8]	0.023	0.021	0.013	32.000	0.000
110.392	991.580	--	unknown	0.003	0.003	0.002	32.000	0.000
110.797	993.150	O10	decene-1	0.003	0.003	0.002	339.080	170.600
110.957	993.770	N10	1t-methyl-2-n-propylcyclohexane	0.015	0.014	0.009	339.800	171.000
111.057	994.150	O10	2,3-dimethyloctene-2	0.057	0.057	0.034	32.000	0.000
111.167	994.570	I10	I10-[13]	0.016	0.016	0.009	32.000	0.000
111.472	995.740	A10	i-butylbenzene	0.004	0.003	0.002	343.022	172.790
111.612	996.280	I10	I10-[14]	0.054	0.054	0.032	32.000	0.000
111.845	997.170	--	unknown	0.038	0.040	0.022	32.000	0.000
112.127	998.250	A10	sec-butylbenzene	0.036	0.031	0.022	344.012	173.340
112.373	999.190	--	unknown	0.008	0.009	0.005	32.000	0.000
112.586	1000.000	P10	n-decane	0.194	0.197	0.114	345.470	174.150
112.829	1001.530	I11	I11-[1]	0.028	0.028	0.015	32.000	0.000
113.185	1003.780	N10	N10-[9]	0.017	0.016	0.010	32.000	0.000
113.519	1005.880	--	unknown	0.004	0.004	0.002	32.000	0.000
113.832	1007.840	A9	1,2,3-trimethylbenzene	0.376	0.311	0.261	349.016	176.120
113.982	1008.770	--	unknown	0.009	0.010	0.006	32.000	0.000
114.277	1010.610	A10	1,3-methyl-i-propylbenzene	0.041	0.036	0.026	347.144	175.080
114.702	1013.260	--	unknown	0.009	0.009	0.023	32.000	0.000
114.838	1014.100	A10	1,4-methyl-i-propylbenzene	0.025	0.022	0.016	350.834	177.130
115.003	1015.120	--	unknown	0.003	0.003	0.002	32.000	0.000
115.306	1017.000	I11	I11-[2]	0.026	0.026	0.014	32.000	0.000
115.575	1018.660	I11	I11-[3]	0.012	0.012	0.006	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

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Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
115.869	1020.470	A10	2-3-dihydroindene	0.262	0.201	0.185	352.130	177.850
116.235	1022.710	--	unknown	0.019	0.020	0.013	32.000	0.000
116.482	1024.220	N10	sec-butylcyclohexane	0.041	0.037	0.024	354.812	179.340
116.716	1025.640	I11	I11-[4]	0.008	0.008	0.004	32.000	0.000
117.063	1027.760	A10	1,2-methyl-i-propylbenzene	0.070	0.059	0.044	352.724	178.180
117.207	1028.630	--	unknown	0.005	0.006	0.003	32.000	0.000
117.328	1029.370	I11	3-ethylnonane	0.004	0.004	0.002	32.000	0.000
117.633	1031.210	--	unknown	0.064	0.068	0.034	32.000	0.000
117.855	1032.550	N11	N11-[1]	0.027	0.025	0.014	32.000	0.000
117.926	1032.980	--	unknown	0.018	0.019	0.010	32.000	0.000
118.095	1034.000	I11	I11-[5]	0.016	0.015	0.008	32.000	0.000
118.233	1034.830	--	unknown	0.003	0.003	0.002	32.000	0.000
118.609	1037.090	I11	I11-[6]	0.030	0.028	0.016	32.000	0.000
118.774	1038.080	--	unknown	0.033	0.035	0.018	32.000	0.000
119.216	1040.710	A10	1,3-diethylbenzene	0.133	0.114	0.083	358.052	181.140
119.417	1041.910	--	unknown	0.061	0.065	0.038	32.000	0.000
119.665	1043.390	A10	1,3-methyl-n-propylbenzene	0.270	0.232	0.168	359.618	182.010
119.841	1044.430	I11	I11-[7]	0.023	0.023	0.012	32.000	0.000
120.117	1046.060	A10	1,4-diethylbenzene	0.011	0.009	0.007	362.822	183.790
120.299	1047.140	A10	1,4-methyl-n-propylbenzene	0.169	0.145	0.105	362.156	183.420
120.477	1048.190	A10	n-butylbenzene	0.081	0.070	0.051	361.940	183.300
120.885	1050.580	A10	1,3-dimethyl-5-ethylbenzene	0.284	0.239	0.176	362.516	183.620
121.209	1052.480	A10	1,2-diethylbenzene	0.030	0.025	0.019	362.228	183.460
121.352	1053.320	I11	I11-[8]	0.017	0.017	0.009	32.000	0.000
121.580	1054.650	N10	t-decahydronaphthalene	0.009	0.008	0.005	368.960	187.200
121.830	1056.110	N11	N11-[2]	0.016	0.015	0.009	32.000	0.000
122.110	1057.740	--	unknown	0.013	0.014	0.007	32.000	0.000
122.253	1058.570	A10	1,2-methyl-n-propylbenzene	0.093	0.078	0.057	364.946	184.970
122.657	1060.910	I11	I11-[9]	0.013	0.013	0.007	32.000	0.000
122.758	1061.500	I11	I11-[10]	0.066	0.066	0.035	32.000	0.000
122.966	1062.700	I11	I11-[11]	0.036	0.036	0.019	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
123.053	1063.200	--	unknown	0.010	0.010	0.005	32.000	0.000
123.318	1064.730	--	unknown	0.003	0.004	0.002	32.000	0.000
123.478	1065.640	I11	I11-[12]	0.045	0.045	0.024	32.000	0.000
123.735	1067.120	--	unknown	0.009	0.009	0.005	32.000	0.000
124.024	1068.770	A10	1,4,dimethyl-2-ethylbenzene	0.206	0.174	0.128	368.366	186.870
124.296	1070.320	A10	1,3-dimethyl-4-ethylbenzene	0.258	0.222	0.160	370.832	188.240
124.575	1071.910	I11	I11-[13]	0.003	0.003	0.002	32.000	0.000
124.869	1073.580	--	unknown	0.008	0.008	0.004	32.000	0.000
125.127	1075.050	I11	I11-[14]	0.141	0.141	0.075	32.000	0.000
125.294	1075.990	A10	1,2-dimethyl-4-ethylbenzene	0.283	0.240	0.176	373.136	189.520
125.608	1077.770	--	unknown	0.009	0.009	0.005	32.000	0.000
125.891	1079.360	--	unknown	0.013	0.013	0.008	32.000	0.000
125.981	1079.870	I11	I11-[15]	0.004	0.004	0.002	32.000	0.000
126.269	1081.480	A10	1,3-dimethyl-2-ethylbenzene	0.048	0.040	0.030	374.090	190.050
126.422	1082.340	I11	I11-[16]	0.017	0.017	0.009	32.000	0.000
126.753	1084.190	--	unknown	0.017	0.018	0.009	32.000	0.000
126.952	1085.300	I11	I11-[17]	0.008	0.008	0.004	32.000	0.000
127.183	1086.590	--	unknown	0.015	0.016	0.008	32.000	0.000
127.517	1088.440	--	unknown	0.008	0.009	0.004	32.000	0.000
127.595	1088.880	--	unknown	0.011	0.012	0.006	32.000	0.000
127.863	1090.360	O11	undecene-1	0.020	0.020	0.011	378.860	192.700
128.200	1092.230	A11	1,4-methyl-t-butylbenzene	0.036	0.031	0.020	32.000	0.000
128.476	1093.750	A10	1,2-dimethyl-3-ethylbenzene	0.079	0.065	0.049	381.110	193.950
128.819	1095.630	--	unknown	0.007	0.007	0.004	32.000	0.000
129.096	1097.150	--	unknown	0.014	0.015	0.009	32.000	0.000
129.166	1097.540	A11	1,2-ethyl-i-propylbenzene	0.008	0.007	0.005	32.000	0.000
129.341	1098.490	--	unknown	0.006	0.007	0.004	32.000	0.000
129.616	1100.000	P11	n-undecane	0.104	0.103	0.055	384.620	195.900
129.816	1101.500	--	unknown	0.008	0.008	0.004	32.000	0.000
129.937	1102.400	A11	1,4-ethyl-i-propylbenzene	0.002	0.002	0.001	32.000	0.000
130.350	1105.490	A10	1,2,4,5-tetramethylbenzene	0.164	0.137	0.102	386.312	196.840

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
130.592	1107.290	A11	1,2-methyl-n-butylbenzene	0.003	0.002	0.002	390.200	199.000
130.682	1107.960	--	unknown	0.006	0.006	0.003	32.000	0.000
130.890	1109.510	A10	1,2,3,5-tetramethylbenzene	0.220	0.183	0.137	388.472	198.040
131.033	1110.570	--	unknown	0.007	0.007	0.004	32.000	0.000
131.382	1113.160	--	unknown	0.012	0.012	0.007	32.000	0.000
131.577	1114.600	--	unknown	0.008	0.008	0.005	32.000	0.000
131.724	1115.680	--	unknown	0.003	0.004	0.002	32.000	0.000
131.884	1116.860	--	unknown	0.018	0.018	0.011	32.000	0.000
132.325	1120.110	--	unknown	0.014	0.015	0.009	32.000	0.000
132.483	1121.260	--	unknown	0.015	0.016	0.009	32.000	0.000
132.965	1124.790	A11	1,2-methyl-t-butylbenzene	0.006	0.005	0.003	32.000	0.000
133.121	1125.930	--	unknown	0.012	0.013	0.007	32.000	0.000
133.435	1128.220	A10	5-methylindan	0.194	0.161	0.123	32.000	0.000
133.781	1130.730	I12	I12-[1]	0.047	0.047	0.023	421.340	216.300
134.185	1133.660	--	unknown	0.007	0.008	0.003	32.000	0.000
134.303	1134.510	A10	4-methylindan	0.048	0.040	0.031	32.000	0.000
134.582	1136.530	--	unknown	0.014	0.014	0.009	32.000	0.000
134.682	1137.250	A11	1,2-ethyl-n-propylbenzene	0.054	0.044	0.030	32.000	0.000
134.933	1139.060	A10	2-methylindan	0.186	0.152	0.117	368.600	187.000
135.145	1140.580	A11	1,3-methyl-n-butylbenzene	0.009	0.007	0.005	390.200	199.000
135.403	1142.430	--	unknown	0.006	0.006	0.003	32.000	0.000
135.550	1143.490	A12	1,3-di-i-propylbenzene	0.063	0.052	0.032	397.760	203.200
135.763	1145.010	A11	s-pentylbenzene	0.057	0.048	0.032	401.000	205.000
135.916	1146.100	--	unknown	0.002	0.002	0.001	32.000	0.000
136.202	1148.140	--	unknown	0.004	0.004	0.002	32.000	0.000
136.348	1149.180	--	unknown	0.015	0.016	0.009	32.000	0.000
136.442	1149.850	A11	n-pentylbenzene	0.043	0.036	0.024	401.720	205.400
136.509	1150.320	--	unknown	0.026	0.027	0.014	32.000	0.000
136.806	1152.430	N12	1t-M-2-(4-MP)cyclopentane	0.004	0.004	0.002	32.000	0.000
137.003	1153.830	A12	1,2-di-i-propylbenzene	0.027	0.023	0.014	399.200	204.000
137.149	1154.860	--	unknown	0.026	0.028	0.014	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
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Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
137.633	1158.280	--	unknown	0.039	0.041	0.020	32.000	0.000
137.900	1160.150	A12	1,4-di-i-propylbenzene	0.048	0.040	0.025	410.540	210.300
138.182	1162.140	--	unknown	0.007	0.007	0.004	32.000	0.000
138.355	1163.350	A10	tetrahydronaphthalene	0.018	0.014	0.011	405.716	207.620
138.501	1164.370	--	unknown	0.008	0.008	0.005	32.000	0.000
138.755	1166.150	--	unknown	0.004	0.005	0.003	32.000	0.000
138.892	1167.100	I12	I12-[2]	0.052	0.051	0.025	421.340	216.300
139.187	1169.160	A10	naphthalene	0.160	0.116	0.104	424.382	217.990
139.513	1171.430	A12	1-t-butyl-3,5-dimethylbenzene	0.004	0.003	0.002	32.000	0.000
139.854	1173.790	A12	1,4-ethyl-t-butylbenzene	0.073	0.060	0.037	32.000	0.000
140.259	1176.590	--	unknown	0.026	0.027	0.013	32.000	0.000
140.551	1178.610	I12	I12-[3]	0.054	0.053	0.026	421.340	216.300
140.780	1180.190	I12	I12-[4]	0.031	0.030	0.015	421.340	216.300
141.121	1182.530	--	unknown	0.007	0.007	0.003	32.000	0.000
141.359	1184.160	I12	I12-[5]	0.032	0.031	0.016	421.340	216.300
141.610	1185.880	--	unknown	0.011	0.012	0.005	32.000	0.000
141.904	1187.890	I12	I12-[6]	0.033	0.032	0.016	421.340	216.300
142.103	1189.240	A12	1,3-di-n-propylbenzene	0.038	0.032	0.020	32.000	0.000
142.344	1190.880	A12	A12-[1]	0.024	0.020	0.012	32.000	0.000
142.563	1192.370	O12	dodecene-1	0.006	0.006	0.003	416.120	213.400
142.919	1194.790	--	unknown	0.007	0.007	0.003	32.000	0.000
143.261	1197.100	--	unknown	0.005	0.005	0.002	32.000	0.000
143.564	1199.150	A12	A12-[2]	0.019	0.016	0.010	32.000	0.000
143.690	1200.000	P12	n-dodecane	0.045	0.044	0.022	421.340	216.300
143.954	1202.220	--	unknown	0.003	0.003	0.002	32.000	0.000
144.232	1204.550	--	unknown	0.012	0.013	0.006	32.000	0.000
144.323	1205.320	--	unknown	0.004	0.004	0.002	32.000	0.000
144.771	1209.070	--	unknown	0.011	0.012	0.006	32.000	0.000
144.995	1210.950	--	unknown	0.006	0.006	0.003	32.000	0.000
145.195	1212.610	A12	1,3,5-triethylbenzene	0.003	0.003	0.002	420.800	216.000
145.382	1214.170	--	unknown	0.007	0.008	0.004	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
145.724	1217.020	--	unknown	0.021	0.022	0.011	32.000	0.000
145.898	1218.470	--	unknown	0.011	0.012	0.006	32.000	0.000
146.057	1219.780	--	unknown	0.001	0.001	0.001	32.000	0.000
146.215	1221.090	--	unknown	0.003	0.003	0.001	32.000	0.000
146.506	1223.500	--	unknown	0.017	0.018	0.009	32.000	0.000
146.747	1225.490	--	unknown	0.017	0.018	0.009	32.000	0.000
146.831	1226.190	--	unknown	0.006	0.007	0.003	32.000	0.000
147.128	1228.630	--	unknown	0.005	0.005	0.002	32.000	0.000
147.209	1229.290	--	unknown	0.012	0.013	0.006	32.000	0.000
147.512	1231.780	A12	1,2,4-triethylbenzene	0.013	0.011	0.007	423.500	217.500
147.735	1233.610	--	unknown	0.005	0.005	0.003	32.000	0.000
148.062	1236.280	--	unknown	0.003	0.003	0.001	32.000	0.000
148.188	1237.320	--	unknown	0.005	0.005	0.003	32.000	0.000
148.238	1237.730	--	unknown	0.008	0.008	0.004	32.000	0.000
148.473	1239.640	--	unknown	0.001	0.002	0.001	32.000	0.000
148.811	1242.390	A12	1,4-methyl-n-pentylbenzene	0.035	0.029	0.018	32.000	0.000
149.096	1244.710	--	unknown	0.009	0.010	0.005	32.000	0.000
149.249	1245.950	--	unknown	0.004	0.004	0.002	32.000	0.000
149.389	1247.080	--	unknown	0.003	0.003	0.002	32.000	0.000
149.676	1249.400	--	unknown	0.005	0.005	0.002	32.000	0.000
149.959	1251.690	--	unknown	0.006	0.006	0.003	32.000	0.000
150.156	1253.280	--	unknown	0.008	0.008	0.004	32.000	0.000
150.544	1256.400	A12	n-hexylbenzene	0.019	0.016	0.010	32.000	0.000
150.632	1257.110	--	unknown	0.020	0.021	0.010	32.000	0.000
151.004	1260.090	--	unknown	0.011	0.012	0.006	32.000	0.000
151.261	1262.140	--	unknown	0.005	0.005	0.002	32.000	0.000
151.508	1264.110	--	unknown	0.005	0.005	0.002	32.000	0.000
151.669	1265.390	--	unknown	0.003	0.004	0.002	32.000	0.000
151.872	1267.010	--	unknown	0.006	0.006	0.003	32.000	0.000
151.922	1267.410	--	unknown	0.009	0.009	0.004	32.000	0.000
152.218	1269.770	--	unknown	0.006	0.006	0.003	32.000	0.000

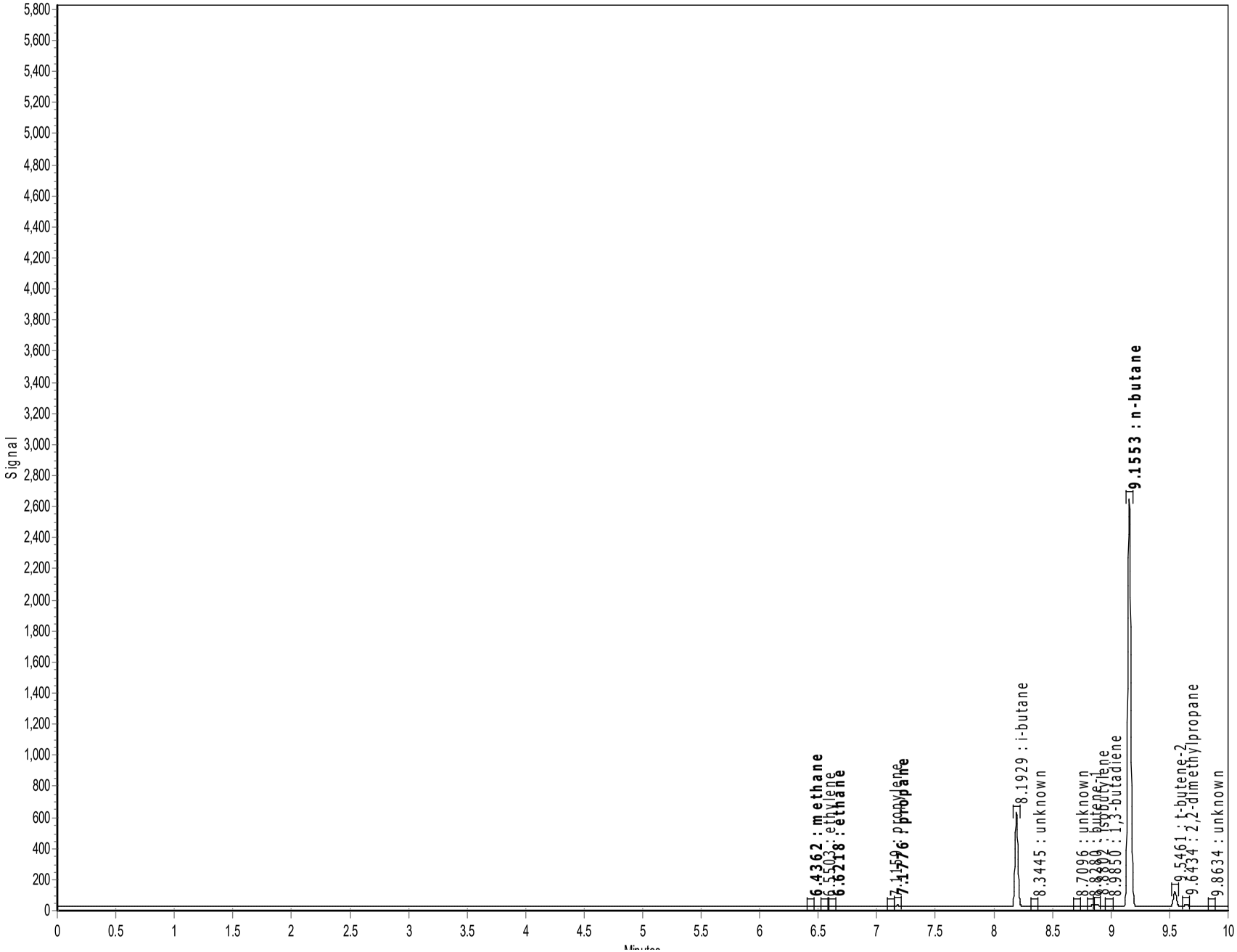
Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 9:50:37 PM

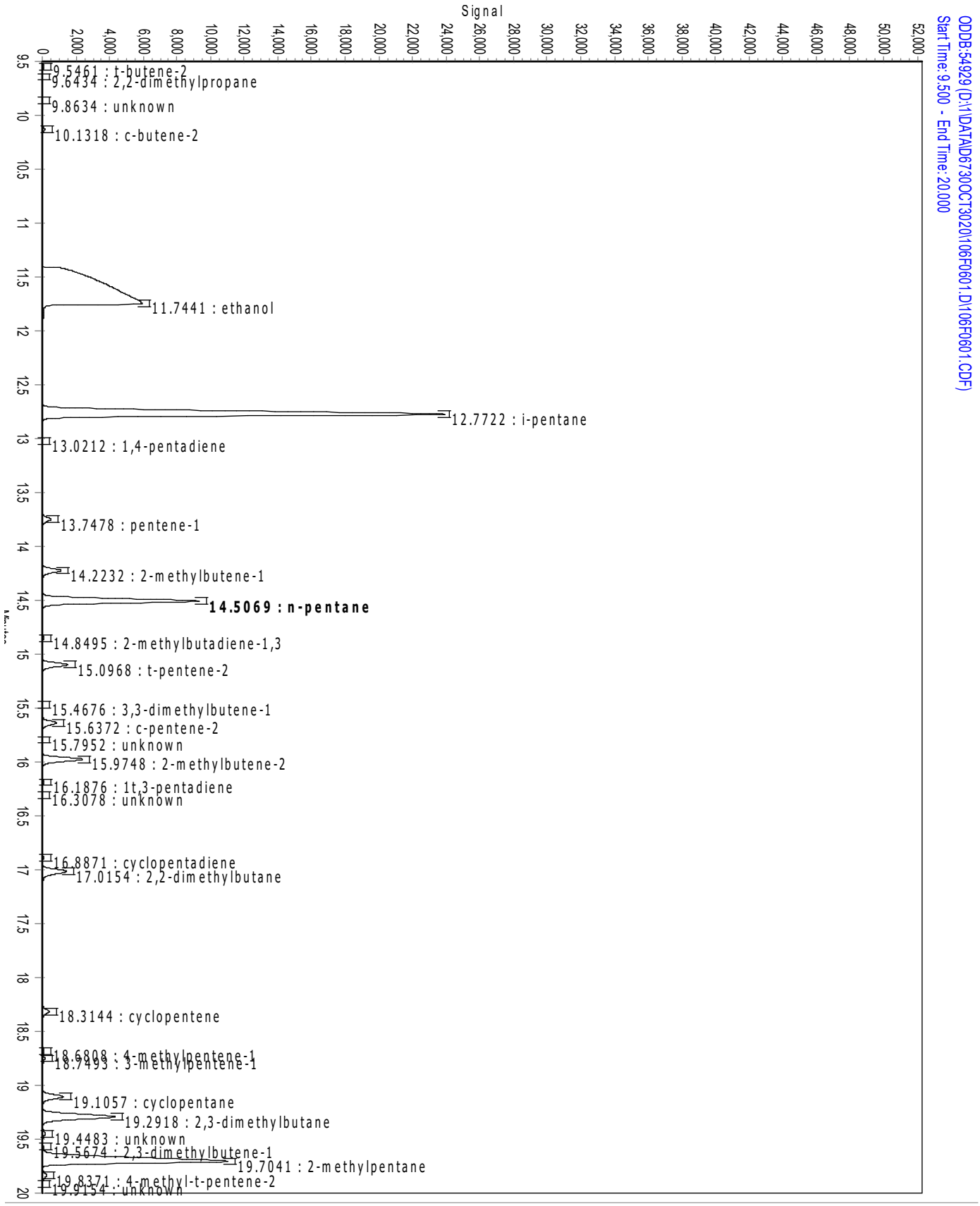
RawFile: D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF
Acquired: 10/31/20 12:48:52
Sample: ODDB:54929
Analyzed: 11/2/2020 9:49:30 PM
Processed 637 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

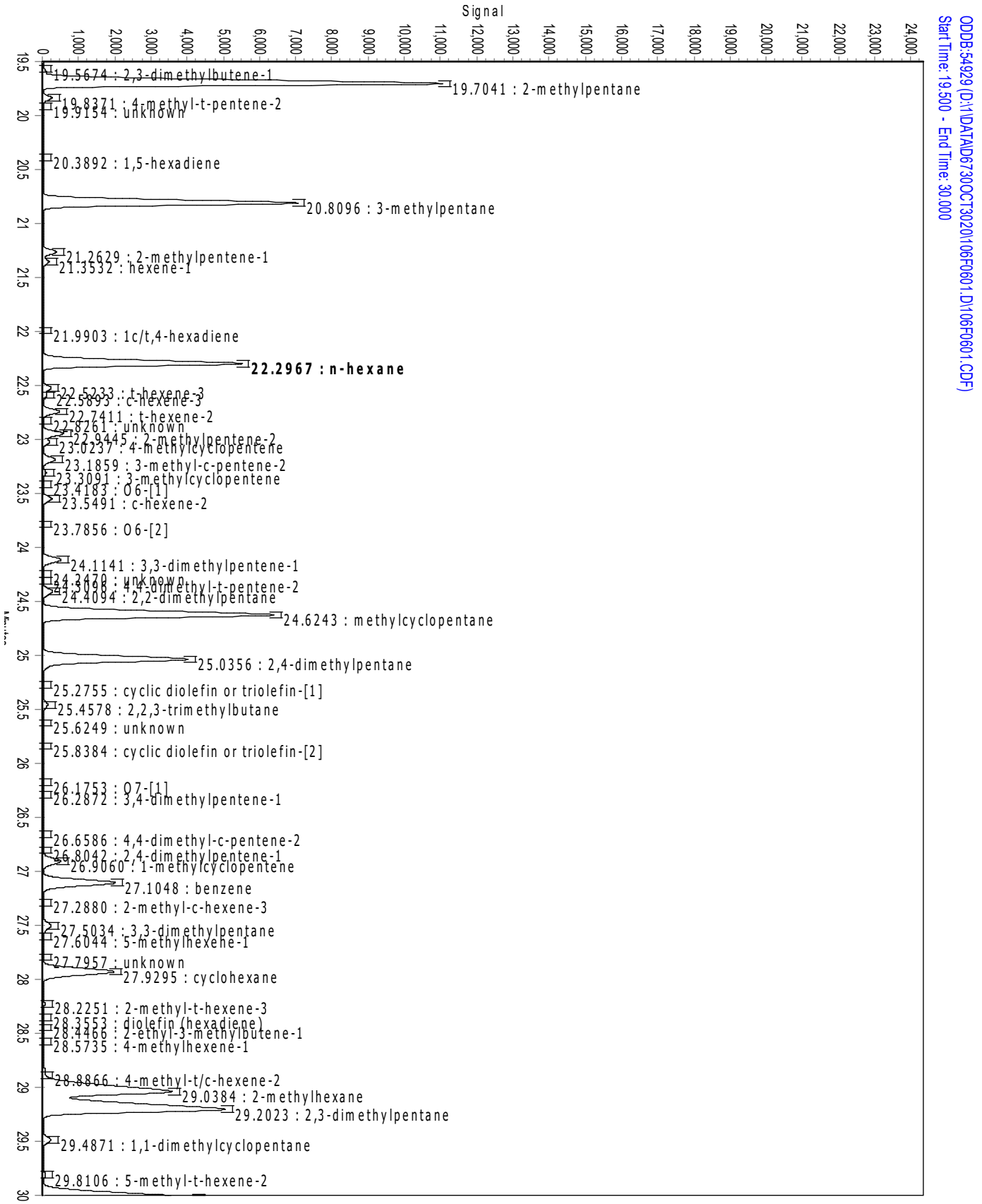
Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
152.274	1270.210	--	unknown	0.005	0.005	0.003	32.000	0.000
152.645	1273.150	I13	I13-[1]	0.008	0.008	0.004	455.720	235.400
152.835	1274.650	A11	1,2,3,4,5-pentamethylbenzene	0.023	0.017	0.013	449.600	232.000
153.066	1276.480	--	unknown	0.006	0.006	0.003	32.000	0.000
153.117	1276.880	--	unknown	0.003	0.003	0.002	32.000	0.000
153.580	1280.530	--	unknown	0.006	0.006	0.003	32.000	0.000
153.932	1283.290	A11	2-methylnaphthalene	0.090	0.065	0.052	465.890	241.050
154.421	1287.120	--	unknown	0.010	0.010	0.006	32.000	0.000
154.571	1288.300	--	unknown	0.002	0.002	0.001	32.000	0.000
154.712	1289.400	--	unknown	0.003	0.003	0.002	32.000	0.000
154.918	1291.010	O13	tridecene-1	0.006	0.006	0.003	451.040	232.800
155.160	1292.890	--	unknown	0.001	0.001	0.000	32.000	0.000
155.349	1294.360	--	unknown	0.002	0.002	0.001	32.000	0.000
155.512	1295.630	--	unknown	0.003	0.003	0.001	32.000	0.000
155.582	1296.170	--	unknown	0.002	0.002	0.001	32.000	0.000
155.885	1298.520	A11	1-methylnaphthalene	0.035	0.026	0.021	472.352	244.640
156.076	1300.000	P13	n-tridecane	0.009	0.009	0.004	455.720	235.400
156.191	1301.040	+	C14+ (Summarized)	0.365	0.354	0.153	455.720	235.400

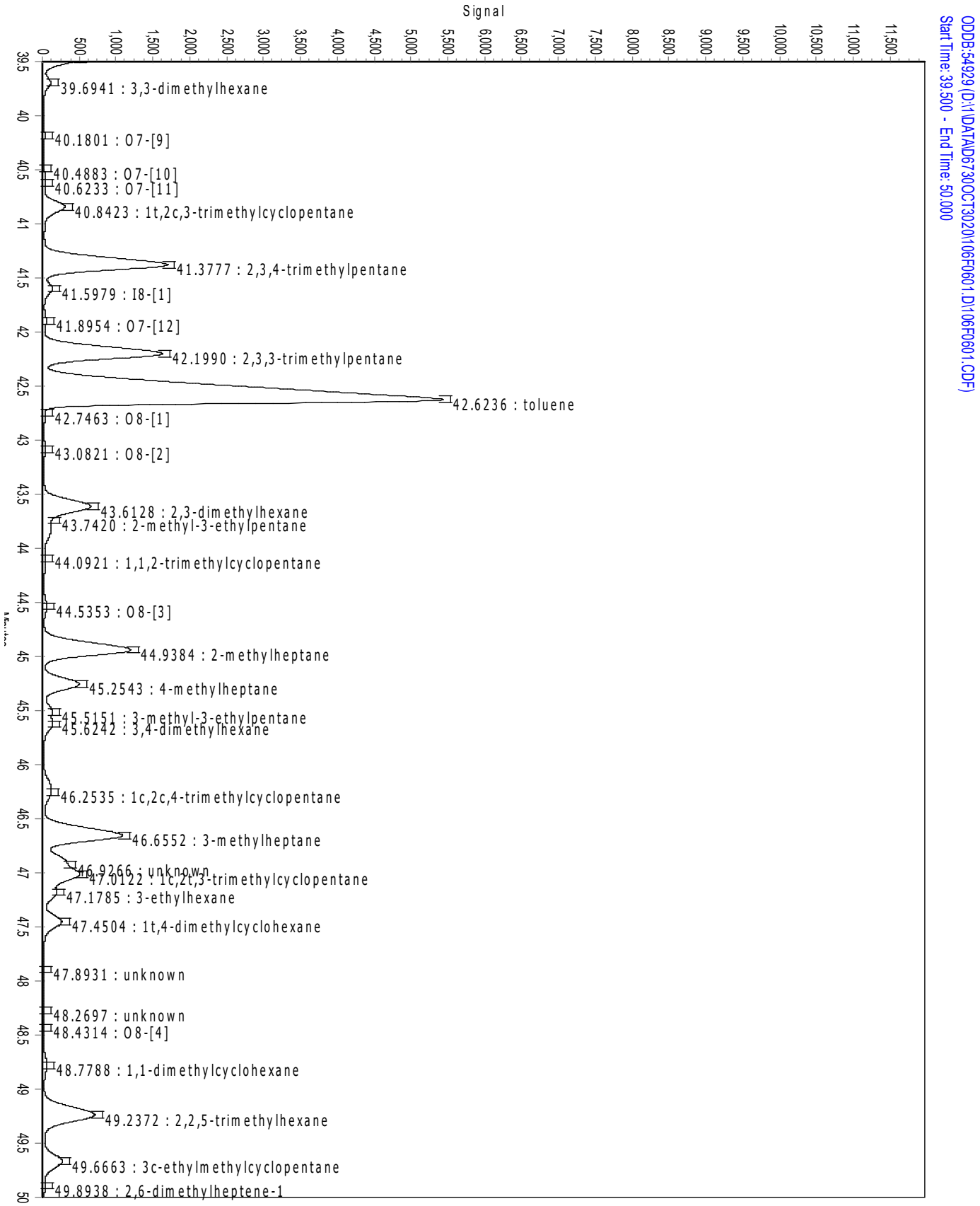
ODDB:54929 (D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 0.000 - End Time: 10.000

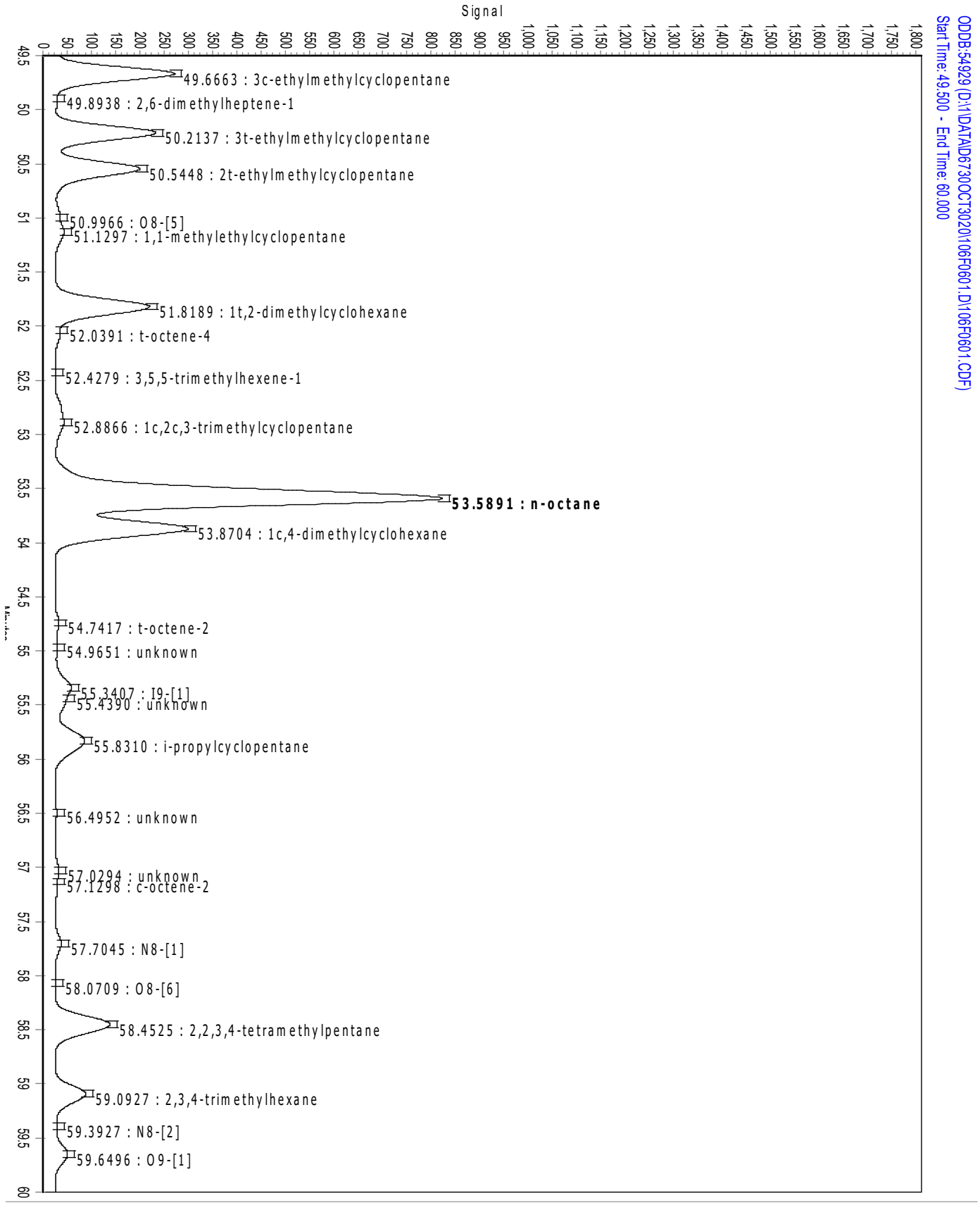


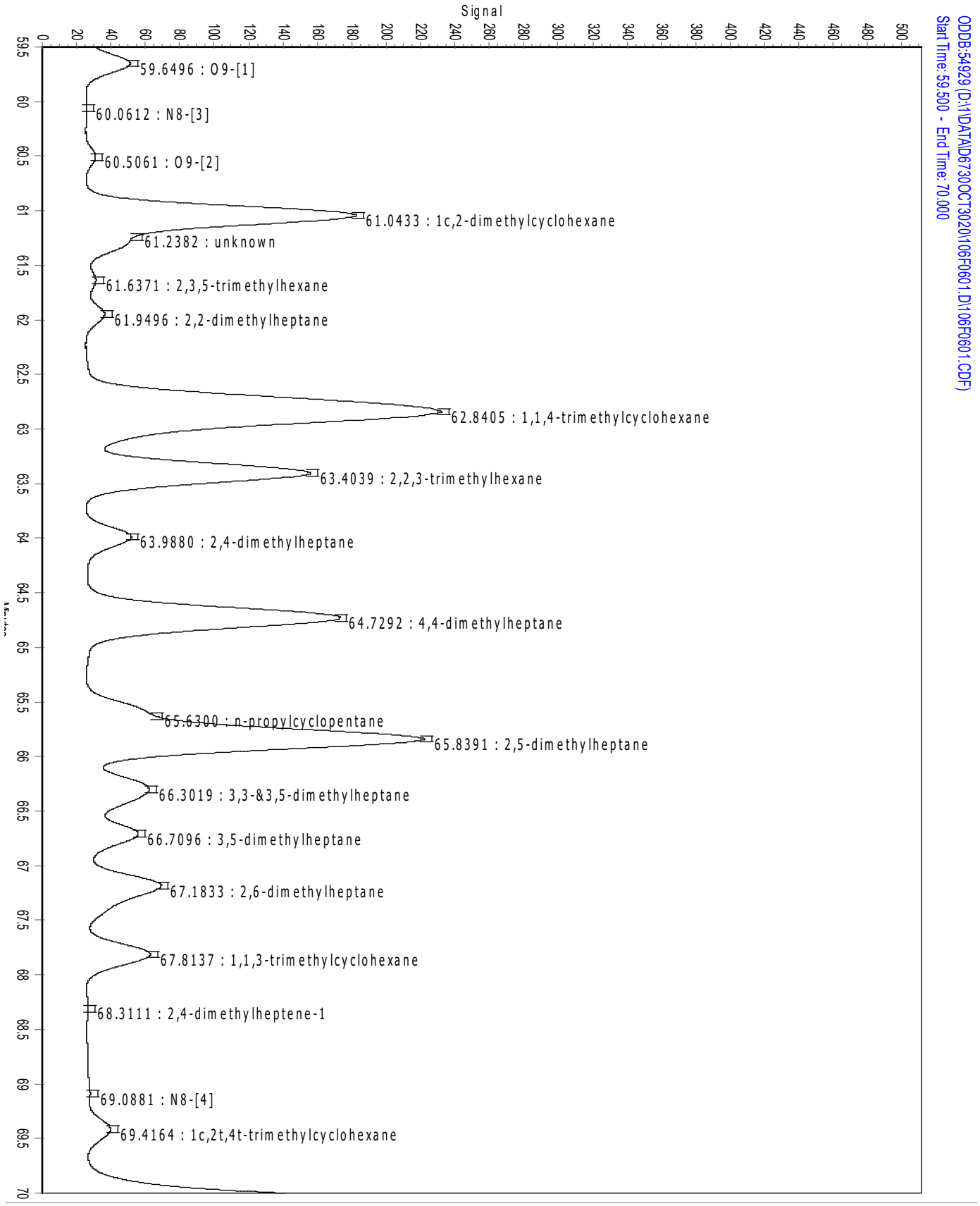

Signal
ODDB:54929 (D:\1DATAD6730OCT3020\106F0601.D\106F0601.CDF)
Start Time:9.500 - End Time:20.000
9.5461 : t-butene-2
9.6434 : 2,2-dimethylpropane
9.8634 : unknown
10.1318 : c-butene-2
11.7441 : ethanol
12.7722 : i-pentane
13.0212 : 1,4-pentadiene
13.7478 : pentene-1
14.2232 : 2-methylbutene-1
14.5069 : n-pentane
14.8495 : 2-methylbutadiene-1,3
15.0968 : t-pentene-2
15.4676 : 3,3-dimethylbutene-1
15.6372 : c-pentene-2
15.7952 : unknown
15.9748 : 2-methylbutene-2
16.1876 : 1t,3-pentadiene
16.3078 : unknown
16.8871 : cyclopentadiene
17.0154 : 2,2-dimethylbutane
18.3144 : cyclopentene
18.6808 : 4-methylpentene-1
18.7493 : 3-methylpentene-1
19.1057 : cyclopentane
19.2918 : 2,3-dimethylbutane
19.4483 : unknown
19.5674 : 2,3-dimethylbutene-1
19.7041 : 2-methylpentane
19.8371 : 4-methyl-t-pentene-2
19.9154 : unknown

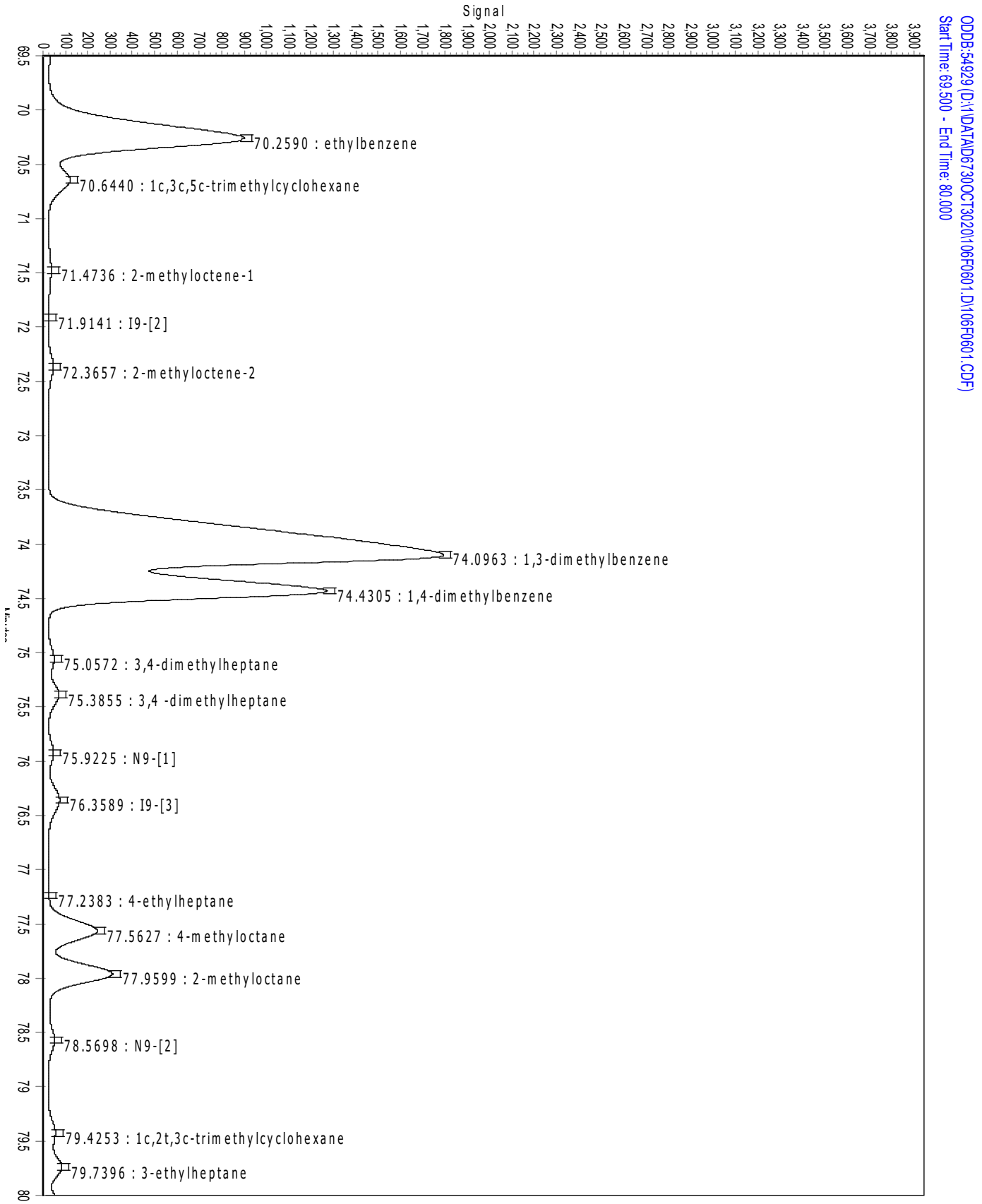

Signal
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 19.500 - End Time: 30.000
19.5674 : 2,3-dimethylbutene-1
19.7041 : 2-methylpentane
19.8371 : 4-methyl-t-pentene-2
19.9154 : unknown
20.3892 : 1,5-hexadiene
20.8096 : 3-methylpentane
21.2629 : 2-methylpentene-1
21.3532 : hexene-1
21.9903 : 1c/t,4-hexadiene
22.2967 : n-hexane
22.5233 : t-hexene-3
22.5693 : c-hexene-3
22.7411 : t-hexene-2
22.8261 : unknown
22.9445 : 2-methylpentene-2
23.0237 : 4-methylcyclopentene
23.1859 : 3-methyl-c-pentene-2
23.3091 : 3-methylcyclopentene
23.4183 : O6-[1]
23.5491 : c-hexene-2
23.7856 : O6-[2]
24.1141 : 3,3-dimethylpentene-1
24.3470 : unknown
24.3698 : 4,4-dimethyl-t-pentene-2
24.4094 : 2,2-dimethylpentane
24.6243 : methylcyclopentane
25.0356 : 2,4-dimethylpentane
25.2755 : cyclic diolefin or triolefin-[1]
25.4578 : 2,2,3-trimethylbutane
25.6249 : unknown
25.8384 : cyclic diolefin or triolefin-[2]
26.1753 : O7-[1]
26.2872 : 3,4-dimethylpentene-1
26.6586 : 4,4-dimethyl-c-pentene-2
26.8042 : 2,4-dimethylpentene-1
26.9060 : 1-methylcyclopentene
27.1048 : benzene
27.2880 : 2-methyl-c-hexene-3
27.5034 : 3,3-dimethylpentane
27.6044 : 5-methylhexene-1
27.7957 : unknown
27.9295 : cyclohexane
28.2251 : 2-methyl-t-hexene-3
28.3553 : diolefin (hexadiene)
28.4466 : 2-ethyl-3-methylbutene-1
28.5735 : 4-methylhexene-1
28.8866 : 4-methyl-t/c-hexene-2
29.0384 : 2-methylhexane
29.2023 : 2,3-dimethylpentane
29.4871 : 1,1-dimethylcyclopentane
29.8106 : 5-methyl-t-hexene-2

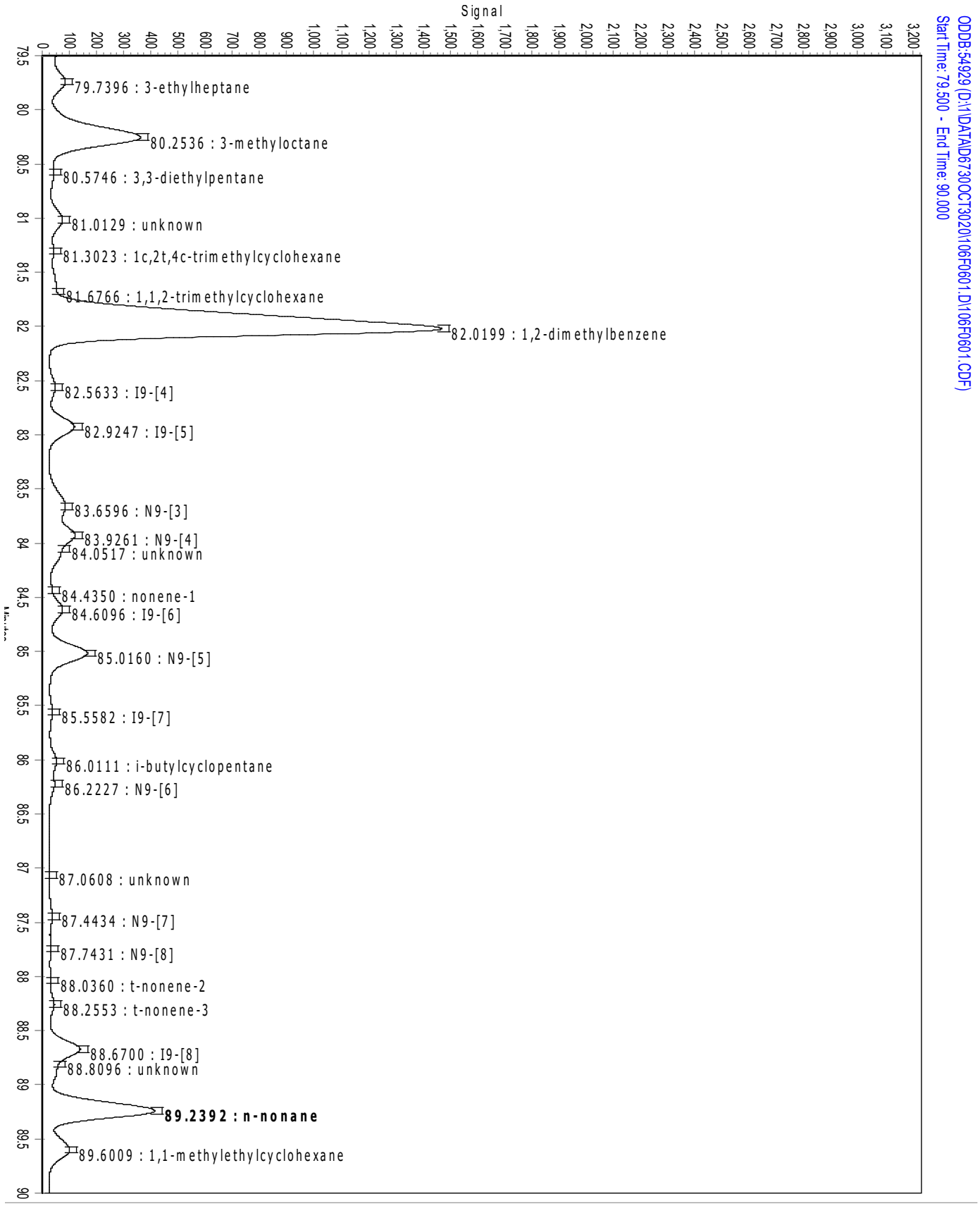
ODDB:54929 (D:\1DATA\D6730OCT30201106F0601.D\106F0601.CDF)
Start Time: 29.500 - End Time: 40.000

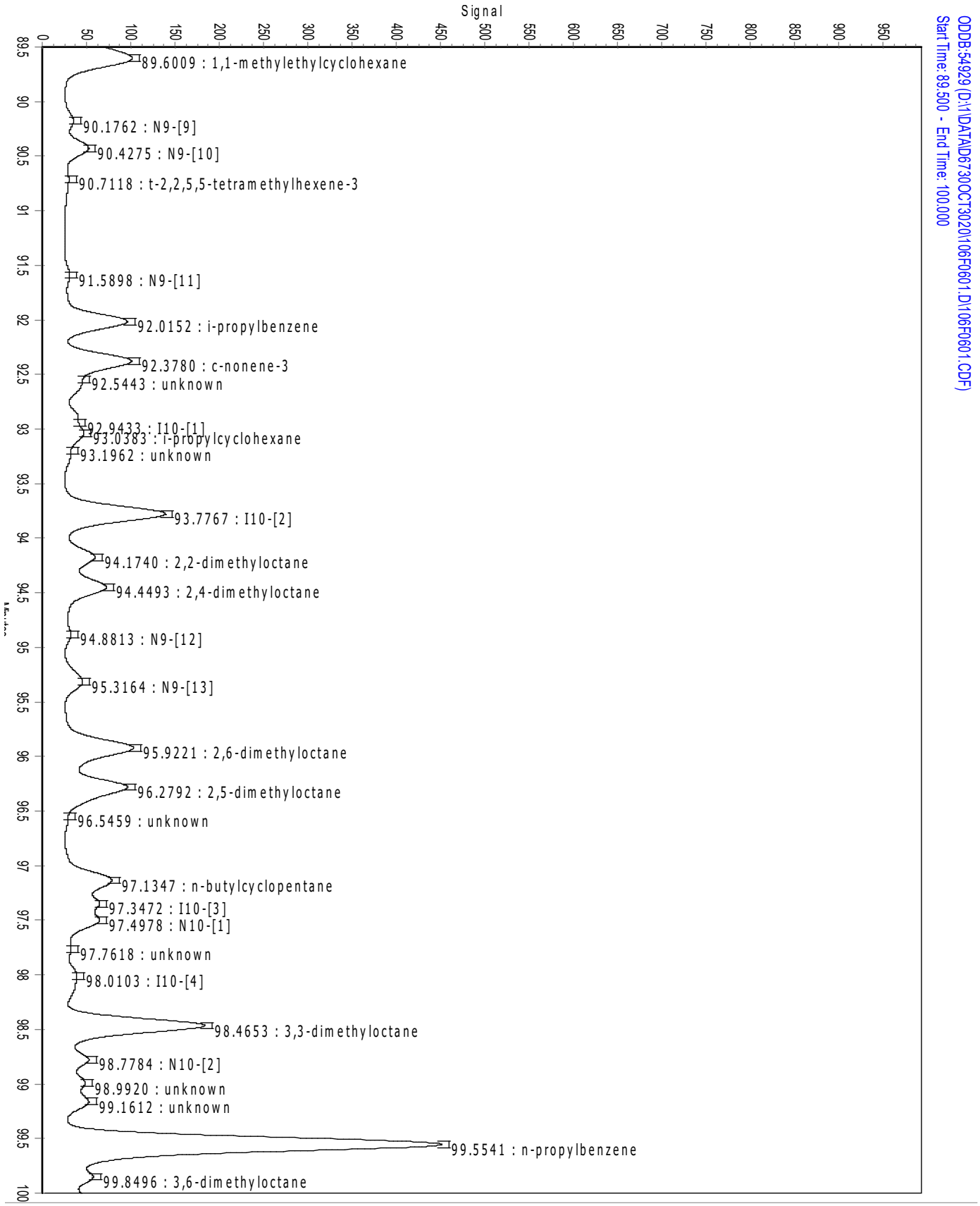

Signal
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
7,000
7,500
8,000
8,500
9,000
9,500
10,000
10,500
11,000
11,500
39.5
40
40.5
41
41.5
42
42.5
43
43.5
44
44.5
45
45.5
46
46.5
47
47.5
48
48.5
49
49.5
50
39.6941 : 3,3-dimethylhexane
40.1801 : O7-[9]
40.4883 : O7-[10]
40.6233 : O7-[11]
40.8423 : 1t,2c,3-trimethylcyclopentane
41.3777 : 2,3,4-trimethylpentane
41.5979 : I8-[1]
41.8954 : O7-[12]
42.1990 : 2,3,3-trimethylpentane
42.6236 : toluene
42.7463 : O8-[1]
43.0821 : O8-[2]
43.6128 : 2,3-dimethylhexane
43.7420 : 2-methyl-3-ethylpentane
44.0921 : 1,1,2-trimethylcyclopentane
44.5353 : O8-[3]
44.9384 : 2-methylheptane
45.2543 : 4-methylheptane
45.5151 : 3-methyl-3-ethylpentane
45.6242 : 3,4-dimethylhexane
46.2535 : 1c,2c,4-trimethylcyclopentane
46.6552 : 3-methylheptane
46.9266 : unknown
47.0122 : 1c,2t,3-trimethylcyclopentane
47.1785 : 3-ethylhexane
47.4504 : 1t,4-dimethylcyclohexane
47.8931 : unknown
48.2697 : unknown
48.4314 : O8-[4]
48.7788 : 1,1-dimethylcyclohexane
49.2372 : 2,2,5-trimethylhexane
49.6663 : 3c-ethylmethylcyclopentane
49.8938 : 2,6-dimethylheptene-1
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 39.500 - End Time: 50.000


Signal
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 49.500 - End Time: 60.000
49.6663 : 3c-ethylmethylcyclopentane
49.8938 : 2,6-dimethylheptene-1
50.2137 : 3t-ethylmethylcyclopentane
50.5448 : 2t-ethylmethylcyclopentane
50.9966 : O8-[5]
51.1297 : 1,1-methylethylcyclopentane
51.8189 : 1t,2-dimethylcyclohexane
52.0391 : t-octene-4
52.4279 : 3,5,5-trimethylhexene-1
52.8866 : 1c,2c,3-trimethylcyclopentane
53.5891 : n-octane
53.8704 : 1c,4-dimethylcyclohexane
54.7417 : t-octene-2
54.9651 : unknown
55.3407 : I9-[1]
55.4390 : unknown
55.8310 : i-propylcyclopentane
56.4952 : unknown
57.0294 : unknown
57.1298 : c-octene-2
57.7045 : N8-[1]
58.0709 : O8-[6]
58.4525 : 2,2,3,4-tetramethylpentane
59.0927 : 2,3,4-trimethylhexane
59.3927 : N8-[2]
59.6496 : O9-[1]

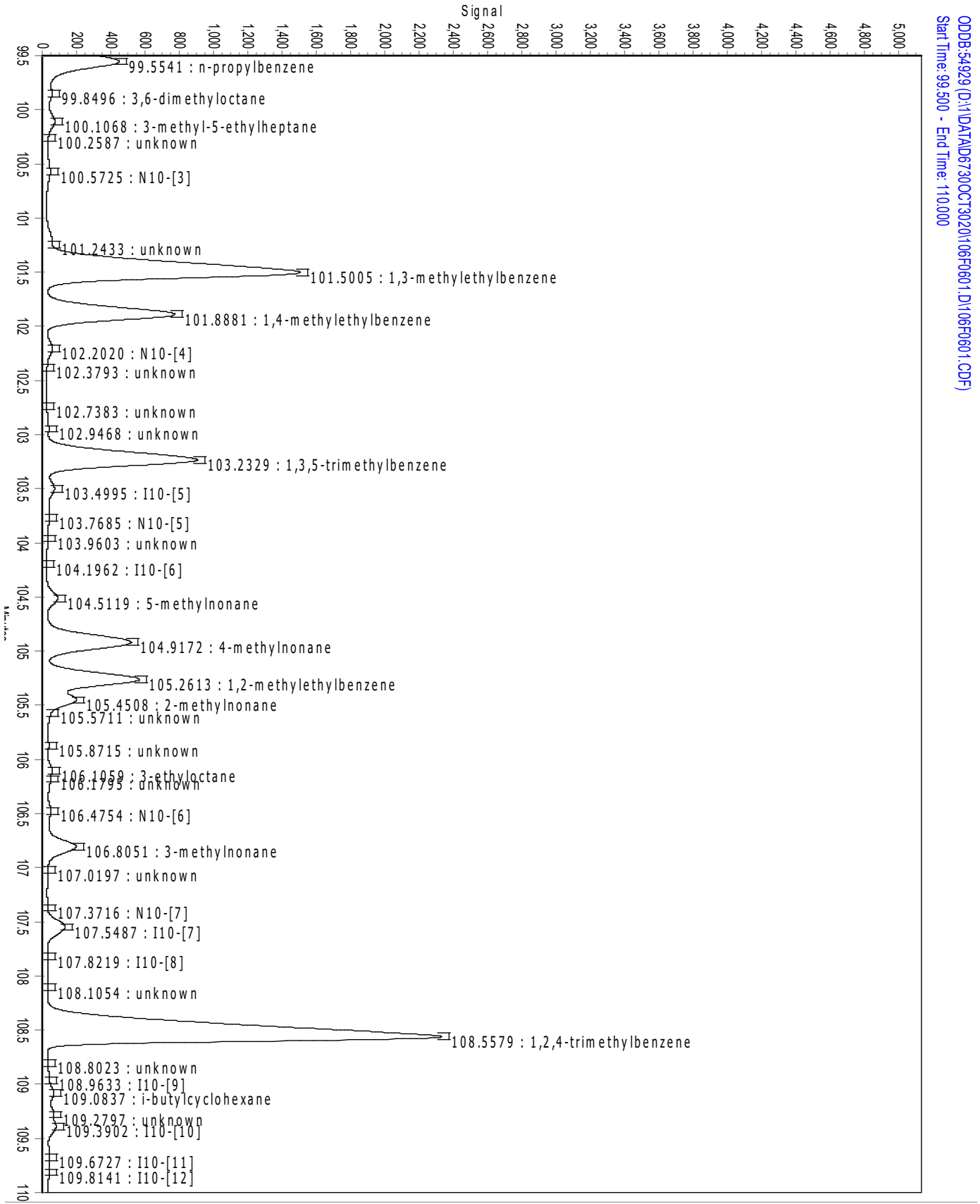

Signal
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
59.5
60
60.5
61
61.5
62
62.5
63
63.5
64
64.5
65
65.5
66
66.5
67
67.5
68
68.5
69
69.5
70
59.6496 : O9-[1]
60.0612 : N8-[3]
60.5061 : O9-[2]
61.0433 : 1c,2-dimethylcyclohexane
61.2382 : unknown
61.6371 : 2,3,5-trimethylhexane
61.9496 : 2,2-dimethylheptane
62.8405 : 1,1,4-trimethylcyclohexane
63.4039 : 2,2,3-trimethylhexane
63.9880 : 2,4-dimethylheptane
64.7292 : 4,4-dimethylheptane
65.6300 : n-propylcyclopentane
65.8391 : 2,5-dimethylheptane
66.3019 : 3,3-&3,5-dimethylheptane
66.7096 : 3,5-dimethylheptane
67.1833 : 2,6-dimethylheptane
67.8137 : 1,1,3-trimethylcyclohexane
68.3111 : 2,4-dimethylheptene-1
69.0881 : N8-[4]
69.4164 : 1c,2t,4t-trimethylcyclohexane
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 59.500 - End Time: 70.000


Signal
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 69.500 - End Time: 80.000
70.2590 : ethylbenzene
70.6440 : 1c,3c,5c-trimethylcyclohexane
71.4736 : 2-methyloctene-1
71.9141 : I9-[2]
72.3657 : 2-methyloctene-2
74.0963 : 1,3-dimethylbenzene
74.4305 : 1,4-dimethylbenzene
75.0572 : 3,4-dimethylheptane
75.3855 : 3,4 -dimethylheptane
75.9225 : N9-[1]
76.3589 : I9-[3]
77.2383 : 4-ethylheptane
77.5627 : 4-methyloctane
77.9599 : 2-methyloctane
78.5698 : N9-[2]
79.4253 : 1c,2t,3c-trimethylcyclohexane
79.7396 : 3-ethylheptane

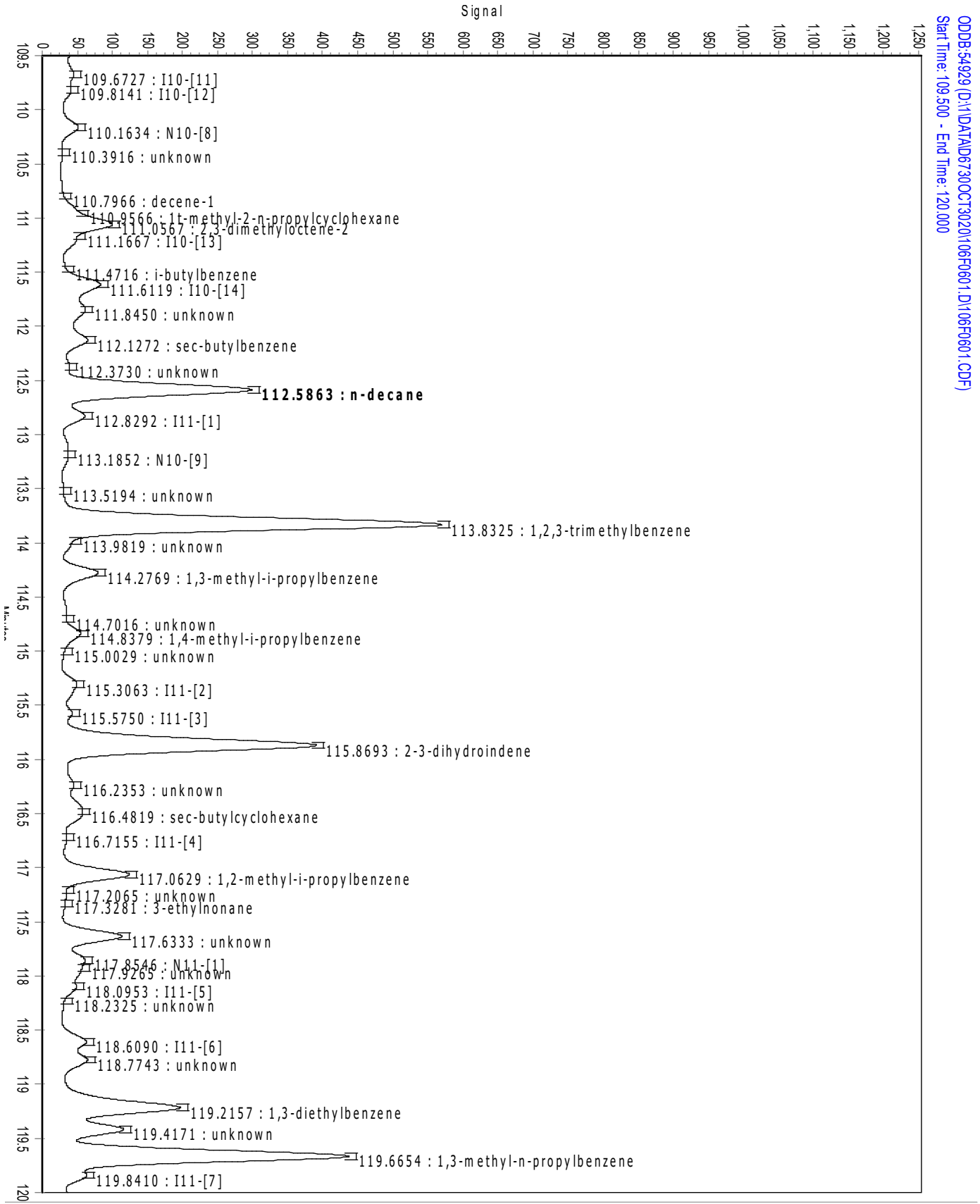

Signal
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 79.500 - End Time: 90.000
79.7396 : 3-ethylheptane
80.2536 : 3-methyloctane
80.5746 : 3,3-diethylpentane
81.0129 : unknown
81.3023 : 1c,2t,4c-trimethylcyclohexane
81.6766 : 1,1,2-trimethylcyclohexane
82.0199 : 1,2-dimethylbenzene
82.5633 : I9-[4]
82.9247 : I9-[5]
83.6596 : N9-[3]
83.9261 : N9-[4]
84.0517 : unknown
84.4350 : nonene-1
84.6096 : I9-[6]
85.0160 : N9-[5]
85.5582 : I9-[7]
86.0111 : i-butylcyclopentane
86.2227 : N9-[6]
87.0608 : unknown
87.4434 : N9-[7]
87.7431 : N9-[8]
88.0360 : t-nonene-2
88.2553 : t-nonene-3
88.6700 : I9-[8]
88.8096 : unknown
89.2392 : n-nonane
89.6009 : 1,1-methylethylcyclohexane

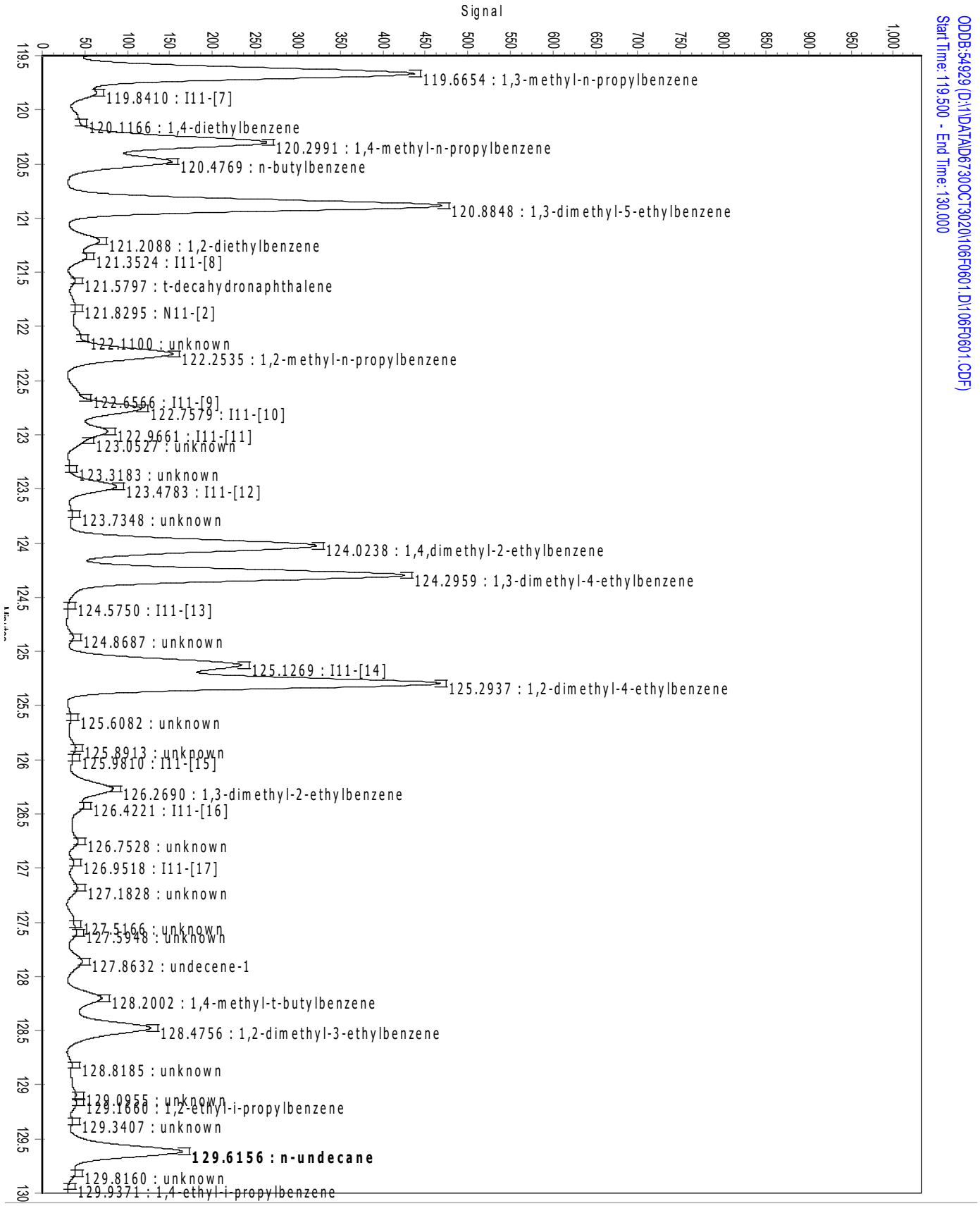


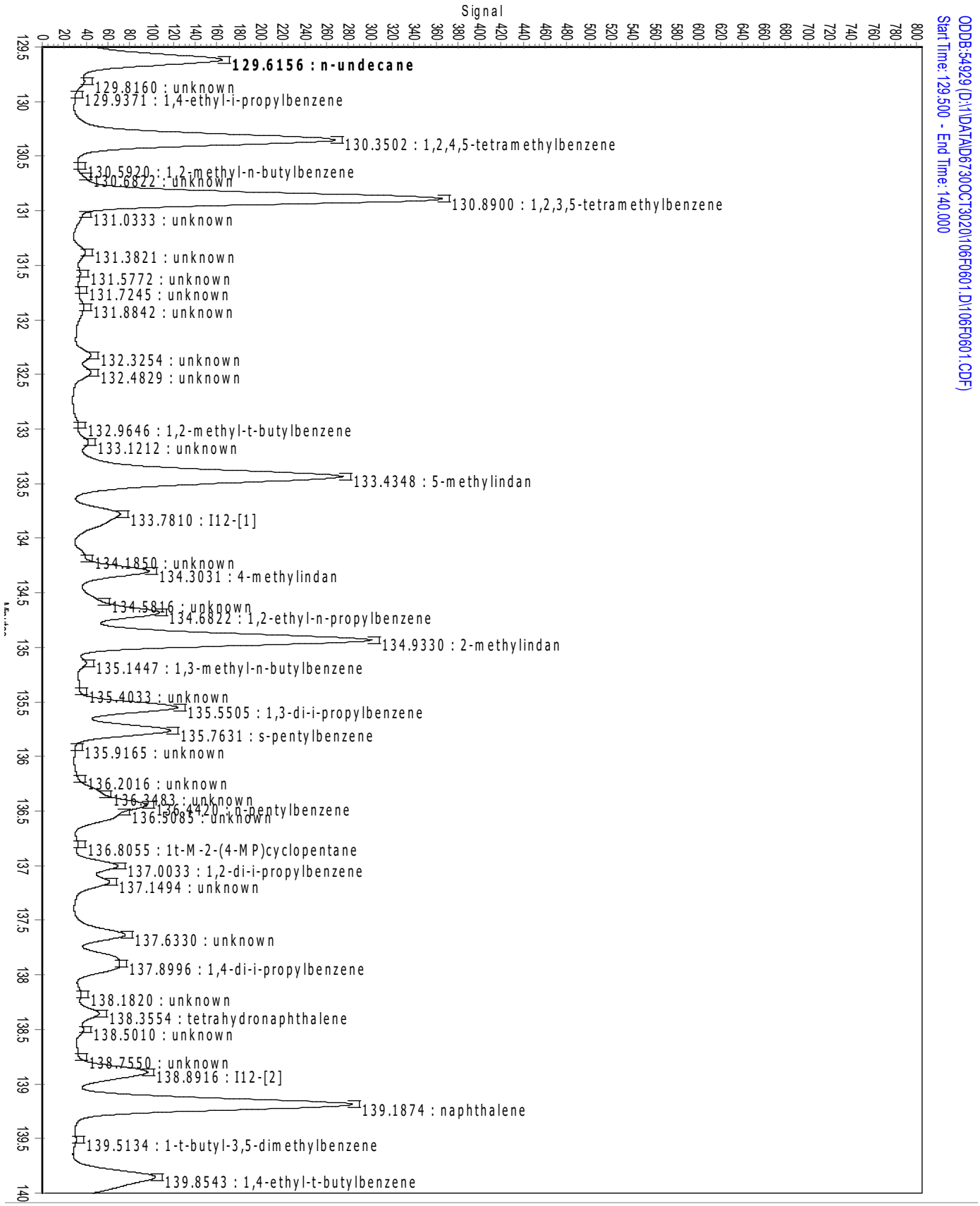
ODDB:54929 (D:\1DATAD6730OCT30201106F0601.D\106F0601.CDF)
Start Time: 89.500 - End Time: 100.000

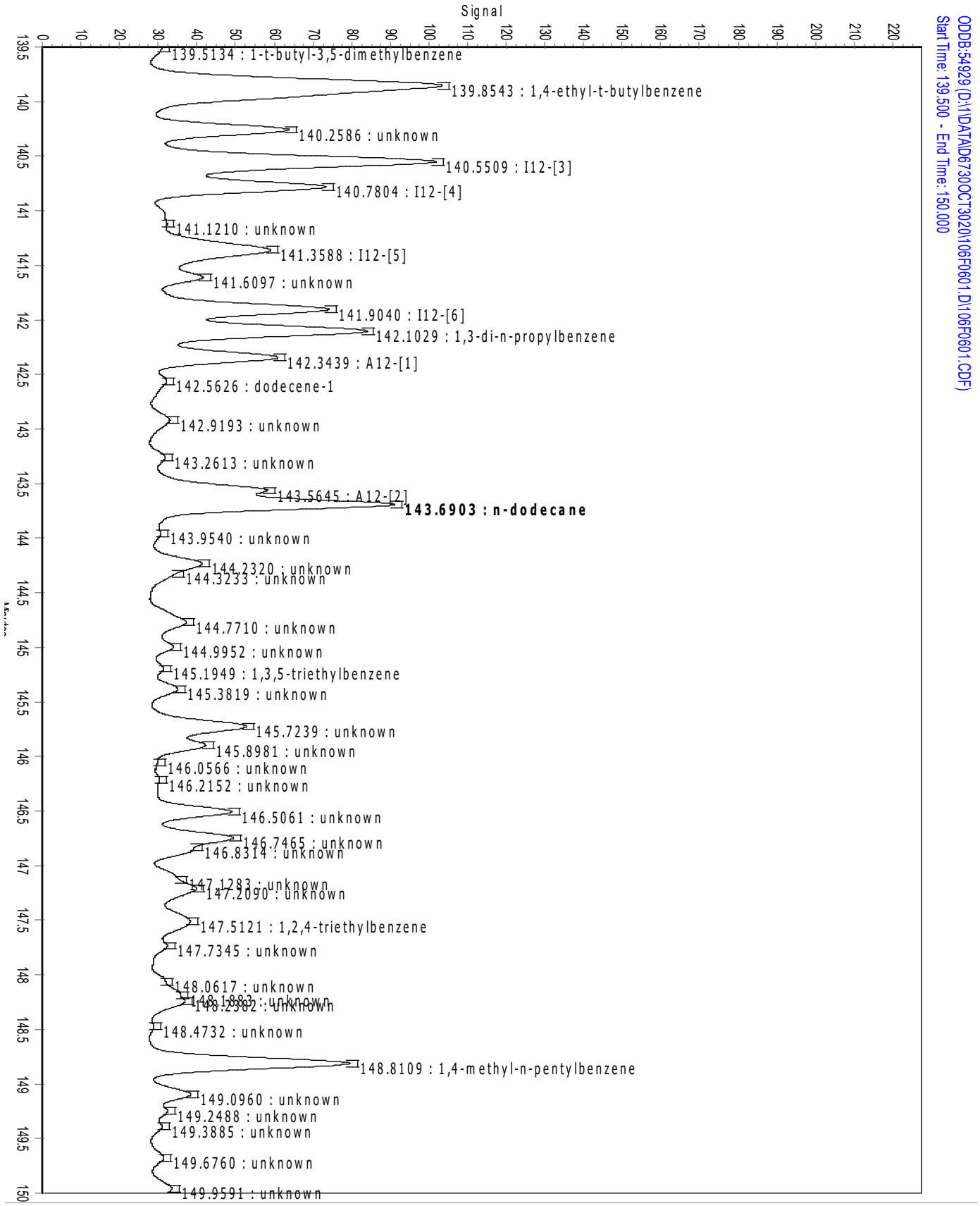


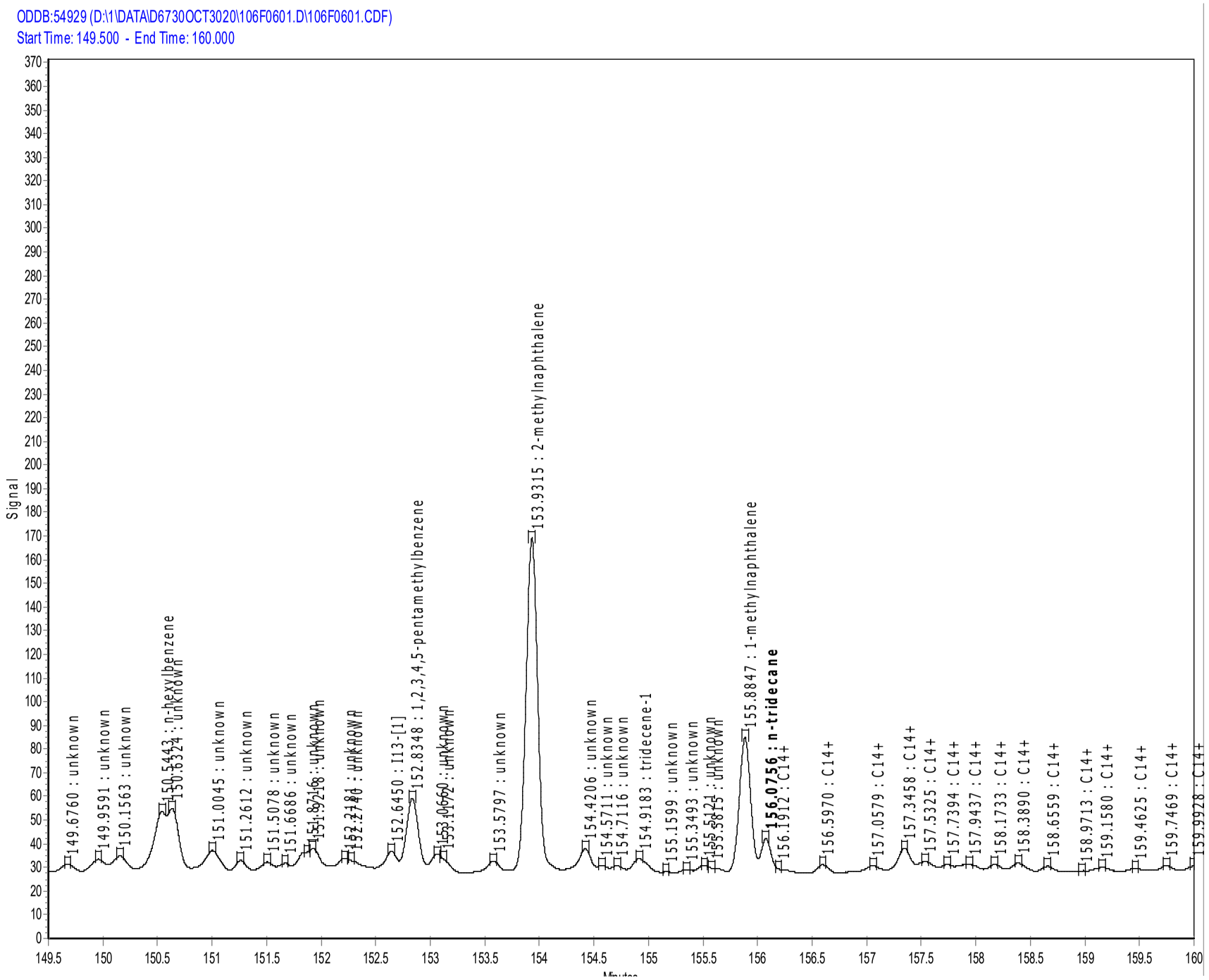
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 99.500 - End Time: 110.000


Signal
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1,000
1,050
1,100
1,150
1,200
1,250
109.5
110
110.5
111
111.5
112
112.5
113
113.5
114
114.5
115
115.5
116
116.5
117
117.5
118
118.5
119
119.5
120
ODB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 109.500 - End Time: 120.000
109.6727 : I10-[11]
109.8141 : I10-[12]
110.1634 : N10-[8]
110.3916 : unknown
110.7966 : decene-1
110.9566 : 1t-methyl-2-n-propylcyclohexane
111.0567 : 2,3-dimethyloctene-2
111.1667 : I10-[13]
111.4716 : i-butylbenzene
111.6119 : I10-[14]
111.8450 : unknown
112.1272 : sec-butylbenzene
112.3730 : unknown
112.5863 : n-decane
112.8292 : I11-[1]
113.1852 : N10-[9]
113.5194 : unknown
113.8325 : 1,2,3-trimethylbenzene
113.9819 : unknown
114.2769 : 1,3-methyl-i-propylbenzene
114.7016 : unknown
114.8379 : 1,4-methyl-i-propylbenzene
115.0029 : unknown
115.3063 : I11-[2]
115.5750 : I11-[3]
115.8693 : 2-3-dihydroindene
116.2353 : unknown
116.4819 : sec-butylcyclohexane
116.7155 : I11-[4]
117.0629 : 1,2-methyl-i-propylbenzene
117.2065 : unknown
117.3281 : 3-ethylnonane
117.6333 : unknown
117.8546 : N11-[1]
117.9265 : unknown
118.0953 : I11-[5]
118.2325 : unknown
118.6090 : I11-[6]
118.7743 : unknown
119.2157 : 1,3-diethylbenzene
119.4171 : unknown
119.6654 : 1,3-methyl-n-propylbenzene
119.8410 : I11-[7]

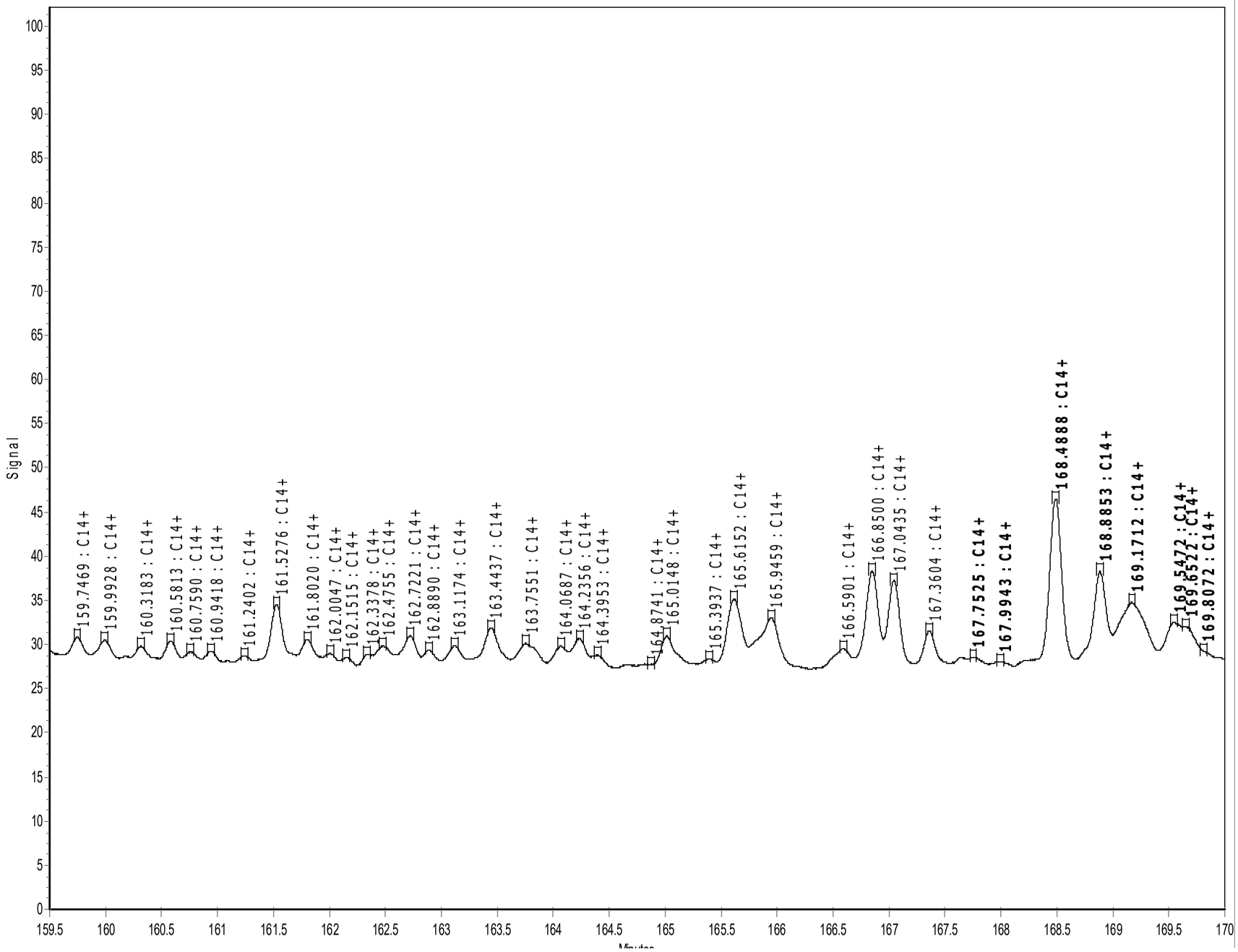

Signal
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1,000
119.5
120
120.5
121
121.5
122
122.5
123
123.5
124
124.5
125
125.5
126
126.5
127
127.5
128
128.5
129
129.5
130
119.6654 : 1,3-methyl-n-propylbenzene
119.8410 : I11-[7]
120.1166 : 1,4-diethylbenzene
120.2991 : 1,4-methyl-n-propylbenzene
120.4769 : n-butylbenzene
120.8848 : 1,3-dimethyl-5-ethylbenzene
121.2088 : 1,2-diethylbenzene
121.3524 : I11-[8]
121.5797 : t-decahydronaphthalene
121.8295 : N11-[2]
122.1100 : unknown
122.2535 : 1,2-methyl-n-propylbenzene
122.6566 : I11-[9]
122.7579 : I11-[10]
122.9661 : I11-[11]
123.0527 : unknown
123.3183 : unknown
123.4783 : I11-[12]
123.7348 : unknown
124.0238 : 1,4,dimethyl-2-ethylbenzene
124.2959 : 1,3-dimethyl-4-ethylbenzene
124.5750 : I11-[13]
124.8687 : unknown
125.1269 : I11-[14]
125.2937 : 1,2-dimethyl-4-ethylbenzene
125.6082 : unknown
125.8913 : unknown
125.9810 : I11-[15]
126.2690 : 1,3-dimethyl-2-ethylbenzene
126.4221 : I11-[16]
126.7528 : unknown
126.9518 : I11-[17]
127.1828 : unknown
127.5166 : unknown
127.5948 : unknown
127.8632 : undecene-1
128.2002 : 1,4-methyl-t-butylbenzene
128.4756 : 1,2-dimethyl-3-ethylbenzene
128.8185 : unknown
129.0955 : unknown
129.1660 : 1,2-ethyl-i-propylbenzene
129.3407 : unknown
129.6156 : n-undecane
129.8160 : unknown
129.9371 : 1,4-ethyl-i-propylbenzene
ODDB:54929 (D:\1DATA\D6730OCT30201106F0601.D\106F0601.CDF)
Start Time: 119.500 - End Time: 130.000


Signal
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 129.500 - End Time: 140.000
129.6156 : n-undecane
129.8160 : unknown
129.9371 : 1,4-ethyl-i-propylbenzene
130.3502 : 1,2,4,5-tetramethylbenzene
130.5920 : 1,2-methyl-n-butylbenzene
130.6822 : unknown
130.8900 : 1,2,3,5-tetramethylbenzene
131.0333 : unknown
131.3821 : unknown
131.5772 : unknown
131.7245 : unknown
131.8842 : unknown
132.3254 : unknown
132.4829 : unknown
132.9646 : 1,2-methyl-t-butylbenzene
133.1212 : unknown
133.4348 : 5-methylindan
133.7810 : I12-[1]
134.1850 : unknown
134.3031 : 4-methylindan
134.5816 : unknown
134.6822 : 1,2-ethyl-n-propylbenzene
134.9330 : 2-methylindan
135.1447 : 1,3-methyl-n-butylbenzene
135.4033 : unknown
135.5505 : 1,3-di-i-propylbenzene
135.7631 : s-pentylbenzene
135.9165 : unknown
136.2016 : unknown
136.3483 : unknown
136.4420 : n-pentylbenzene
136.5085 : unknown
136.8055 : 1t-M-2-(4-MP)cyclopentane
137.0033 : 1,2-di-i-propylbenzene
137.1494 : unknown
137.6330 : unknown
137.8996 : 1,4-di-i-propylbenzene
138.1820 : unknown
138.3554 : tetrahydronaphthalene
138.5010 : unknown
138.7550 : unknown
138.8916 : I12-[2]
139.1874 : naphthalene
139.5134 : 1-t-butyl-3,5-dimethylbenzene
139.8543 : 1,4-ethyl-t-butylbenzene

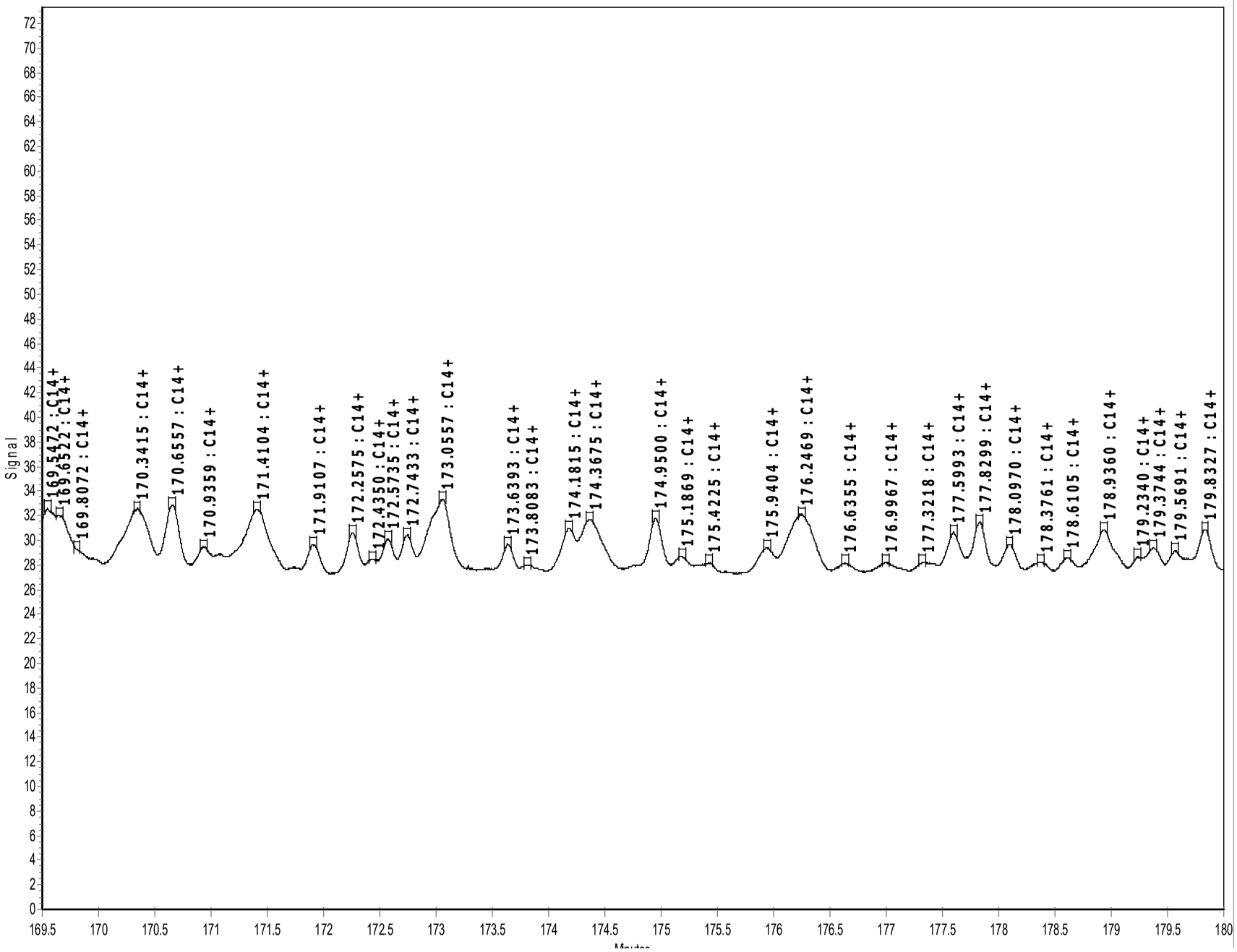

Signal
ODDB:54929 (D:\1DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 139.500 - End Time: 150.000
139.5134 : 1-t-butyl-3,5-dimethylbenzene
139.8543 : 1,4-ethyl-t-butylbenzene
140.2586 : unknown
140.5509 : I12-[3]
140.7804 : I12-[4]
141.1210 : unknown
141.3588 : I12-[5]
141.6097 : unknown
141.9040 : I12-[6]
142.1029 : 1,3-di-n-propylbenzene
142.3439 : A12-[1]
142.5626 : dodecene-1
142.9193 : unknown
143.2613 : unknown
143.5645 : A12-[2]
143.6903 : n-dodecane
143.9540 : unknown
144.2320 : unknown
144.3233 : unknown
144.7710 : unknown
144.9952 : unknown
145.1949 : 1,3,5-triethylbenzene
145.3819 : unknown
145.7239 : unknown
145.8981 : unknown
146.0566 : unknown
146.2152 : unknown
146.5061 : unknown
146.7465 : unknown
146.8314 : unknown
147.1283 : unknown
147.2090 : unknown
147.5121 : 1,2,4-triethylbenzene
147.7345 : unknown
148.0617 : unknown
148.1883 : unknown
148.2382 : unknown
148.4732 : unknown
148.8109 : 1,4-methyl-n-pentylbenzene
149.0960 : unknown
149.2488 : unknown
149.3885 : unknown
149.6760 : unknown
149.9591 : unknown


ODDB:54929 (D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 149.500 - End Time: 160.000
Signal
Minutes
149.6760 : unknown
149.9591 : unknown
150.1563 : unknown
150.5443 : n-hexylbenzene
150.8324 : unknown
151.0045 : unknown
151.2612 : unknown
151.5078 : unknown
151.6686 : unknown
152.6450 : 113-[1]
152.8348 : 1,2,3,4,5-pentamethylbenzene
153.5797 : unknown
153.9315 : 2-methylnaphthalene
154.4206 : unknown
154.5711 : unknown
154.7116 : unknown
154.9183 : tridecene-1
155.1599 : unknown
155.3493 : unknown
155.8847 : 1-methylnaphthalene
156.0756 : n-tridecane
156.1912 : C14+
156.5970 : C14+
157.0579 : C14+
157.3458 : C14+
157.5325 : C14+
157.7394 : C14+
157.9437 : C14+
158.1733 : C14+
158.3890 : C14+
158.6559 : C14+
158.9713 : C14+
159.1580 : C14+
159.4625 : C14+
159.7469 : C14+
159.9928 : C14+

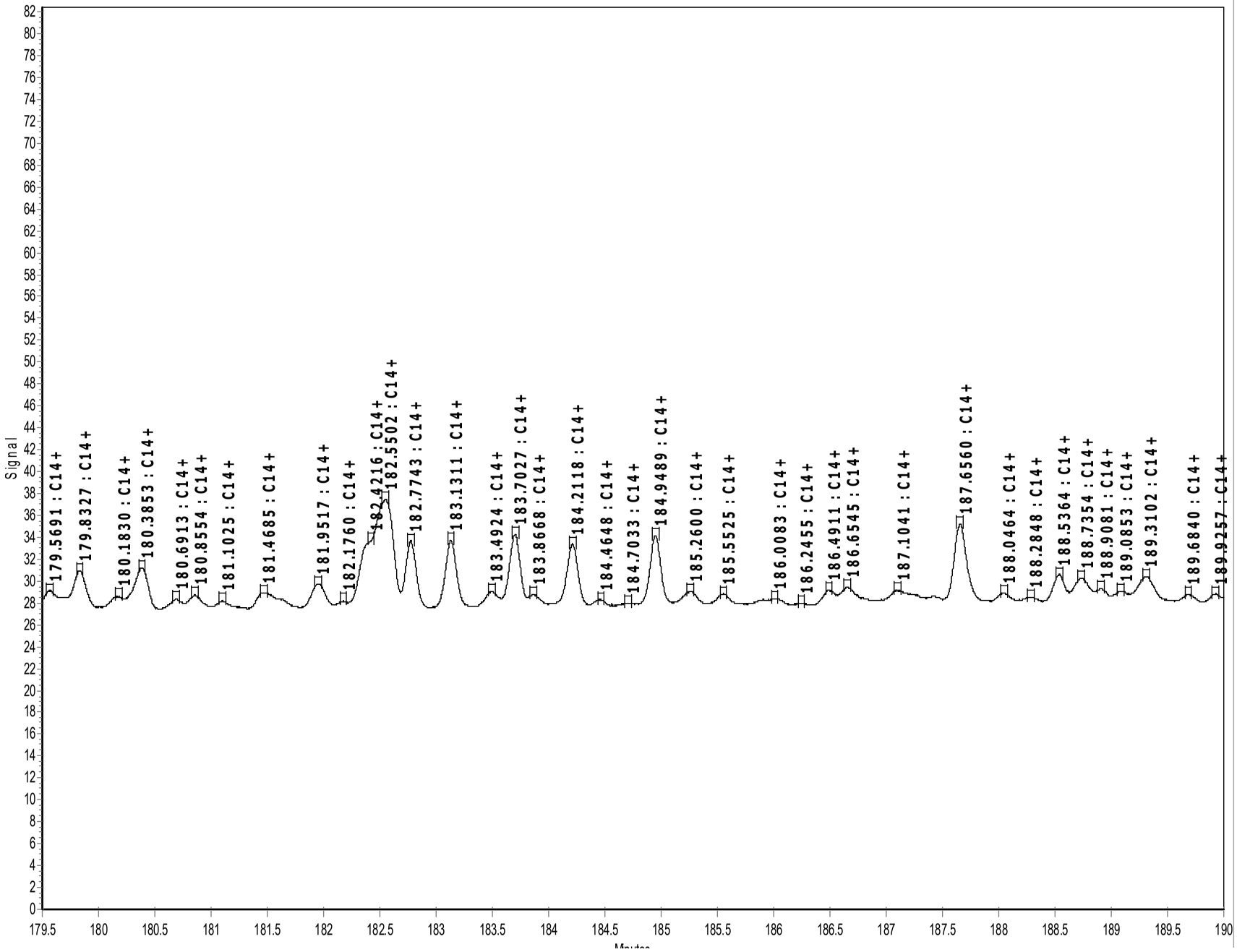
ODDB:54929 (D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 159.500 - End Time: 170.000



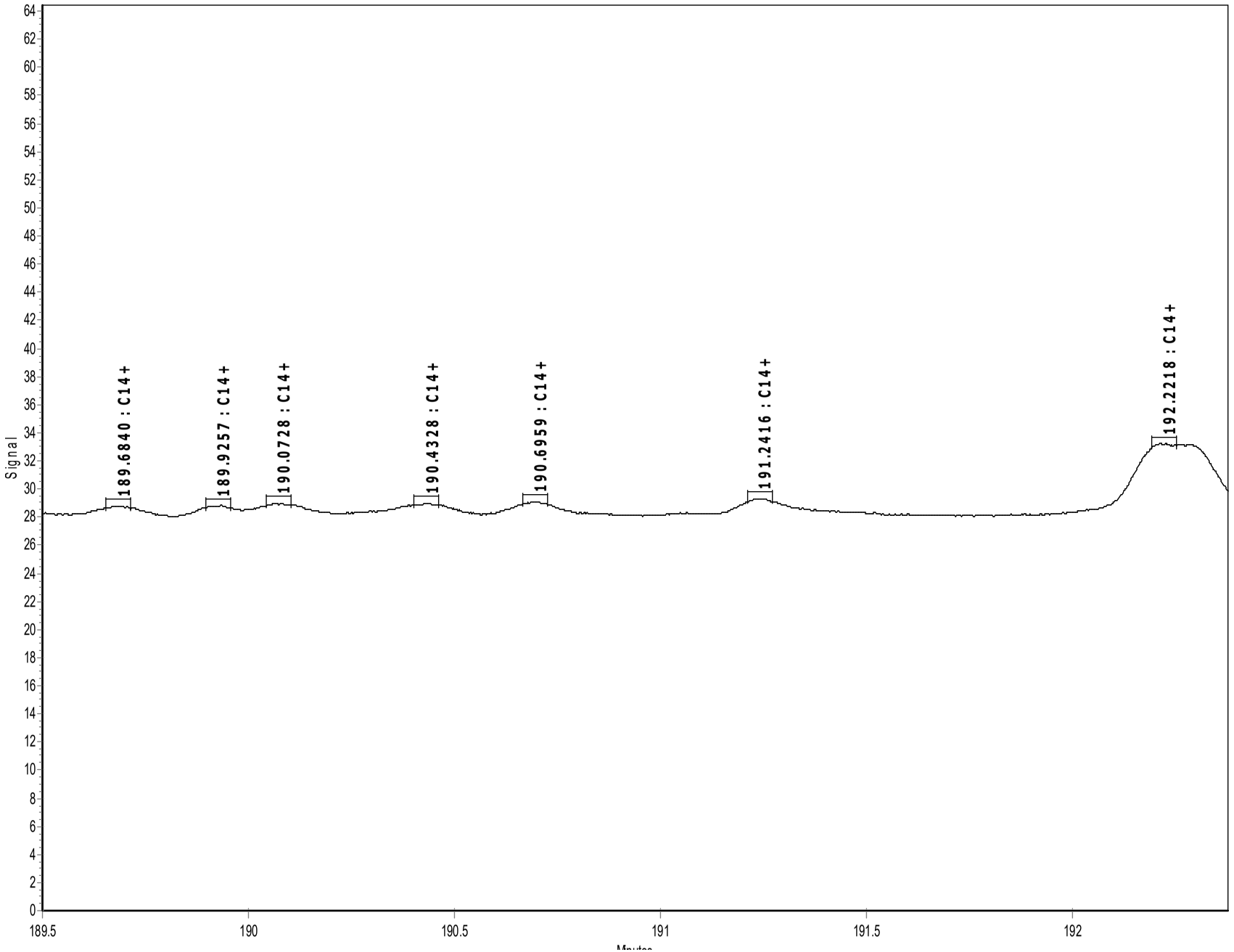
ODDB:54929 (D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 169.500 - End Time: 180.000



ODDB:54929 (D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 179.500 - End Time: 190.000



ODDB:54929 (D:\1\DATA\D6730OCT3020\106F0601.D\106F0601.CDF)
Start Time: 189.500 - End Time: 192.378



Detailed Hydrocarbon Analysis Summary Report -

Report Date: 11/2/2020 10:38:17 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Location: GC 12 D6730
Normalized to 100.000%

SUMMARY REPORT

Group Type	Total(Mass%)	Total(Vol%)	Total(Mol%)
Paraffins:	7.411	8.343	7.211
I-Paraffins:	37.151	40.567	31.918
Olefins:	3.897	4.203	3.986
Naphthenes:	11.428	11.071	9.623
Aromatics:	21.877	18.518	16.692
Total C14+:	0.356	0.345	0.150
Total Unknowns:	1.713	1.808	1.182

Oxygenates:

Total:	16.167(Mass%)	15.146(Vol%)
Total Oxygen Content:	5.615(Mass%)	

Multisubstituted Aromatics: 13.848(Mass%) 11.754(Vol%)

Average Molecular Weight: 83.311

Relative Density: 0.739

Vapor Pressure :

Calculated Octane Number: 86.7

Motor Octane Number (Jenkins Calculation): 78.7

	IBP	T10	T50	T90	FBP
BP by Mass (Deg F)	31.10	173.30	197.33	329.32	465.89
BP by Vol (Deg F)	31.10	173.30	197.33	329.32	449.60

Percent Carbon: 82.916
Percent Hydrogen: 11.470
Bromine Number (Calc): 7.284
Particulate Matter Index: 1.102

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 10:38:28 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Sample: ODDB:54930
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:

Acquired: 10/31/20 16:09:43
Analyzed: 11/2/2020 10:37:26 PM

Normalized to xxx%
Int Std: NONE
Int Std Amt: 0.000
Sample Wt: 1.000 Sample Den: 1.000

Oxygenates

Compound	Mass%	Mass% Oxygen	Vol%
ethanol : X2	16.167	5.615	15.146

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 10:38:28 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.0000
Sample Wt: 1.0000 Sample Den: 1.000

Totals by Group Type & Carbon Number (in Mass Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.472	0.097	0.045	0.000	0.000	0.001	0.615
C5	2.365	6.599	1.633	0.323	0.000	0.001	10.921
C6	1.782	7.446	1.130	3.088	0.681	0.042	14.170
C7	1.302	8.110	0.732	3.693	4.450	0.009	18.297
C8	0.770	9.310	0.066	2.687	7.143	0.201	20.176
C9	0.366	3.188	0.191	1.295	5.504	0.179	10.723
C10	0.194	1.677	0.069	0.295	3.413	0.229	5.876
C11	0.104	0.496	0.020	0.042	0.373	0.370	1.404
C12	0.044	0.221	0.004	0.004	0.312	0.385	0.971
C13	0.009	0.008	0.006	0.000	0.000	0.298	0.321
Total:	7.411	37.151	3.897	11.428	21.877	1.713	81.764

Oxygenates 16.167
Total C14+: 0.356
Total Unknowns: 1.713
Grand Total: 100.000

Totals by Group Type & Carbon Number (in Volume Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C3	0.002	0.000	0.000	0.000	0.000	0.000	0.002
C4	0.603	0.129	0.054	0.000	0.000	0.001	0.787
C5	2.792	7.872	1.828	0.320	0.000	0.001	12.813
C6	1.998	8.369	1.188	3.020	0.573	0.044	15.192
C7	1.408	8.750	0.763	3.613	3.794	0.009	18.338
C8	0.810	9.765	0.067	2.577	6.086	0.212	19.517
C9	0.377	3.276	0.202	1.226	4.670	0.189	9.942
C10	0.196	1.687	0.070	0.272	2.840	0.241	5.306
C11	0.103	0.493	0.020	0.039	0.296	0.390	1.340
C12	0.044	0.217	0.004	0.004	0.259	0.406	0.934
C13	0.009	0.008	0.006	0.000	0.000	0.315	0.337
Total:	8.343	40.567	4.203	11.071	18.518	1.808	82.701

Oxygenates 15.146
Total C14+: 0.345
Total Unknowns: 1.808
Grand Total: 100.000

Detailed Hydrocarbon Analysis Detail Report -

Report Date: 11/2/2020 10:38:28 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha

Comments:

Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.0000
Sample Wt: 1.0000 Sample Den: 1.000

Totals by Group Type & Carbon Number (in Mol Percent)

	Paraffins	I-Paraffins	Olefins	Naphthenes	Aromatics	Unknowns	Total
C1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
C2	0.001	0.000	0.000	0.000	0.000	0.000	0.001
C3	0.003	0.000	0.000	0.000	0.000	0.000	0.003
C4	0.677	0.140	0.067	0.000	0.000	0.001	0.884
C5	2.731	7.619	1.944	0.384	0.000	0.001	12.679
C6	1.723	7.199	1.124	3.057	0.727	0.107	13.936
C7	1.083	6.743	0.620	3.134	4.024	0.012	15.615
C8	0.562	6.790	0.048	1.995	5.605	0.152	15.151
C9	0.238	2.071	0.126	0.855	3.815	0.151	7.256
C10	0.114	0.982	0.041	0.175	2.149	0.159	3.620
C11	0.055	0.264	0.011	0.023	0.212	0.232	0.797
C12	0.022	0.108	0.002	0.002	0.160	0.214	0.508
C13	0.004	0.004	0.003	0.000	0.000	0.154	0.164
Total:	7.211	31.918	3.986	9.623	16.692	1.182	69.432

Oxygenates 29.236
Total Unknowns: 1.182
Total C14+: 0.150
Grand Total: 100.000

Detailed Hydrocarbon Analysis - Dienes (Di-Olefins) Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000
Sample Den: 1.000

Diene Components Listed in Chromatographic Order **Page: 5**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %
8.987	395.090	O4	1,3-butadiene	0.000	0.000	0.000
13.019	481.240	O5	1,4-pentadiene	0.001	0.001	0.001
14.848	506.130	O5	2-methylbutadiene-1,3	0.007	0.007	0.008
16.186	527.970	O5	1t,3-pentadiene	0.007	0.008	0.009
16.886	538.220	O5	cyclopentadiene	0.005	0.006	0.006
20.391	581.040	O6	1,5-hexadiene	0.000	0.000	0.000
21.990	597.110	O6	1c/t,4-hexadiene	0.000	0.000	0.000
25.274	632.960	O7	cyclic diolefin or triolefin-[1]	0.002	0.002	0.002
25.837	638.600	O7	cyclic diolefin or triolefin-[2]	0.006	0.007	0.007
28.354	661.970	O6	diolefin (hexadiene)	0.003	0.003	0.003
30.187	677.370	O7	1,6-heptadiene	0.000	0.000	0.000
36.537	720.930	N8	1,1,3-trimethylcyclopentane	0.160	0.158	0.119

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order **Page: 6**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
6.434	100.000	P1	methane	0.000	0.000	0.000	-258.700	-161.500
6.620	200.000	P2	ethane	0.000	0.000	0.001	-127.480	-88.600
7.114	293.490	O3	propylene	0.000	0.000	0.000	-53.896	-47.720
7.176	300.000	P3	propane	0.002	0.002	0.003	-43.672	-42.040
8.191	366.110	I4	i-butane	0.097	0.129	0.140	10.904	-11.720
8.342	372.500	--	unknown	0.000	0.000	0.000	32.000	0.000
8.705	386.000	--	unknown	0.000	0.000	0.000	32.000	0.000
8.826	390.030	O4	butene-1	0.002	0.003	0.003	20.750	-6.250
8.879	391.710	O4	isobutylene	0.003	0.004	0.004	20.750	-6.250
8.987	395.090	O4	1,3-butadiene	0.000	0.000	0.000	24.062	-4.410
9.154	400.000	P4	n-butane	0.472	0.603	0.677	31.100	-0.500
9.545	412.300	O4	t-butene-2	0.017	0.021	0.025	33.584	0.880
9.642	415.130	I5	2,2-dimethylpropane	0.003	0.004	0.004	49.100	9.500
9.867	421.360	--	unknown	0.001	0.001	0.001	32.000	0.000
10.130	428.130	O4	c-butene-2	0.023	0.027	0.034	38.696	3.720
11.754	461.600	X2	ethanol	16.167	15.146	29.236	173.300	78.500
12.772	477.720	I5	i-pentane	6.596	7.868	7.616	82.112	27.840
13.019	481.240	O5	1,4-pentadiene	0.001	0.001	0.001	78.728	25.960
13.746	490.880	O5	pentene-1	0.116	0.134	0.138	85.928	29.960
14.222	496.690	O5	2-methylbutene-1	0.268	0.305	0.319	88.070	31.150
14.506	500.000	P5	n-pentane	2.365	2.792	2.731	96.908	36.060
14.848	506.130	O5	2-methylbutadiene-1,3	0.007	0.007	0.008	93.308	34.060
15.095	510.410	O5	t-pentene-2	0.350	0.399	0.416	97.412	36.340
15.466	516.610	O5	3,3-dimethylbutene-1	0.005	0.005	0.006	106.232	41.240
15.636	519.370	O5	c-pentene-2	0.194	0.219	0.231	98.474	36.930
15.795	521.910	--	unknown	0.000	0.000	0.001	32.000	0.000
15.974	524.700	O5	2-methylbutene-2	0.585	0.653	0.695	101.408	38.560
16.186	527.970	O5	1t,3-pentadiene	0.007	0.008	0.009	107.636	42.020
16.307	529.790	--	unknown	0.001	0.001	0.001	32.000	0.000
16.886	538.220	O5	cyclopentadiene	0.005	0.006	0.006	32.000	0.000
17.014	540.030	I6	2,2-dimethylbutane	0.419	0.477	0.405	121.514	49.730

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

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Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
18.313	557.170	O5	cyclopentene	0.095	0.091	0.117	111.614	44.230
18.680	561.670	O6	4-methylpentene-1	0.022	0.025	0.022	128.948	53.860
18.748	562.490	O6	3-methylpentene-1	0.037	0.041	0.036	129.506	54.170
19.105	566.720	N5	cyclopentane	0.323	0.320	0.384	120.650	49.250
19.291	568.880	I6	2,3-dimethylbutane	1.276	1.426	1.234	136.364	57.980
19.447	570.670	--	unknown	0.040	0.043	0.105	32.000	0.000
19.564	572.000	O6	2,3-dimethylbutene-1	0.016	0.017	0.016	132.098	55.610
19.704	573.570	I6	2-methylpentane	3.545	4.012	3.427	140.468	60.260
19.836	575.030	O6	4-methyl-t-pentene-2	0.064	0.071	0.064	137.480	58.600
19.909	575.840	--	unknown	0.000	0.000	0.000	32.000	0.000
20.391	581.040	O6	1,5-hexadiene	0.000	0.000	0.000	139.010	59.450
20.810	585.420	I6	3-methylpentane	2.206	2.454	2.133	145.886	63.270
21.262	590.010	O6	2-methylpentene-1	0.107	0.115	0.106	143.780	62.100
21.352	590.900	O6	hexene-1	0.046	0.050	0.045	146.246	63.470
21.990	597.110	O6	1c/t,4-hexadiene	0.000	0.000	0.000	149.000	65.000
22.296	600.000	P6	n-hexane	1.782	1.998	1.723	155.714	68.730
22.522	602.700	O6	t-hexene-3	0.070	0.076	0.069	152.744	67.080
22.589	603.490	O6	c-hexene-3	0.023	0.025	0.023	151.592	66.440
22.740	605.280	O6	t-hexene-2	0.137	0.148	0.135	154.184	67.880
22.828	606.320	--	unknown	0.000	0.000	0.000	32.000	0.000
22.943	607.660	O6	2-methylpentene-2	0.174	0.187	0.173	153.140	67.300
23.023	608.570	O6	4-methylcyclopentene	0.047	0.046	0.048	148.820	64.900
23.185	610.440	O6	3-methyl-c-pentene-2	0.106	0.112	0.105	153.842	67.690
23.308	611.840	O6	3-methylcyclopentene	0.025	0.025	0.026	149.000	65.000
23.417	613.080	O6	O6-[1]	0.000	0.000	0.000	32.000	0.000
23.548	614.550	O6	c-hexene-2	0.074	0.079	0.074	155.984	68.880
23.786	617.190	O6	O6-[2]	0.001	0.001	0.001	32.000	0.000
24.113	620.770	O7	3,3-dimethylpentene-1	0.163	0.172	0.139	171.446	77.470
24.245	622.200	--	unknown	0.001	0.001	0.002	32.000	0.000
24.299	622.780	--	unknown	0.002	0.002	0.005	32.000	0.000
24.408	623.940	I7	2,2-dimethylpentane	0.098	0.107	0.081	174.542	79.190

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
24.624	626.230	N6	methylcyclopentane	2.308	2.279	2.285	161.240	71.800
25.036	630.520	I7	2,4-dimethylpentane	1.443	1.586	1.200	176.882	80.490
25.274	632.960	O7	cyclic diolefin or triolefin-[1]	0.002	0.002	0.002	32.000	0.000
25.457	634.800	I7	2,2,3-trimethylbutane	0.046	0.049	0.038	177.584	80.880
25.624	636.480	--	unknown	0.002	0.002	0.002	32.000	0.000
25.837	638.600	O7	cyclic diolefin or triolefin-[2]	0.006	0.007	0.007	32.000	0.000
26.174	641.900	O7	O7-[1]	0.002	0.002	0.002	32.000	0.000
26.286	642.980	O7	3,4-dimethylpentene-1	0.006	0.006	0.005	177.422	80.790
26.657	646.530	O7	4,4-dimethyl-c-pentene-2	0.008	0.008	0.007	176.756	80.420
26.803	647.910	O7	2,4-dimethylpentene-1	0.008	0.008	0.007	178.880	81.600
26.905	648.860	O6	1-methylcyclopentene	0.177	0.167	0.179	167.864	75.480
27.104	650.720	A6	benzene	0.681	0.573	0.727	176.162	80.090
27.287	652.400	O7	2-methyl-c-hexene-3	0.004	0.004	0.003	186.800	86.000
27.502	654.370	I7	3,3-dimethylpentane	0.090	0.096	0.075	186.908	86.060
27.606	655.320	O7	5-methylhexene-1	0.011	0.012	0.009	185.558	85.310
27.795	657.020	--	unknown	0.004	0.004	0.003	32.000	0.000
27.928	658.210	N6	cyclohexane	0.780	0.741	0.772	177.296	80.720
28.224	660.830	O7	2-methyl-t-hexene-3	0.016	0.017	0.014	186.620	85.900
28.354	661.970	O6	diolefin (hexadiene)	0.003	0.003	0.003	158.000	70.000
28.445	662.770	O7	2-ethyl-3-methylbutene-1	0.006	0.006	0.005	187.448	86.360
28.573	663.880	O7	4-methylhexene-1	0.013	0.014	0.011	188.114	86.730
28.886	666.570	O7	4-methyl-t/c-hexene-2	0.025	0.027	0.021	187.358	86.310
29.039	667.870	I7	2-methylhexane	1.883	2.051	1.566	194.090	90.050
29.202	669.250	I7	2,3-dimethylpentane	2.445	2.600	2.033	193.604	89.780
29.487	671.630	N7	1,1-dimethylcyclopentane	0.072	0.070	0.061	189.464	87.480
29.810	674.300	O7	5-methyl-t-hexene-2	0.022	0.023	0.019	190.598	88.110
30.022	676.030	I7	3-methylhexane	1.925	2.071	1.601	197.330	91.850
30.187	677.370	O7	1,6-heptadiene	0.000	0.000	0.000	205.106	96.170
30.452	679.490	O7	3,4-dimethyl-c-pentene-2	0.012	0.012	0.010	192.650	89.250
30.759	681.930	N7	1c,3-dimethylcyclopentane	0.656	0.651	0.557	195.386	90.770
31.112	684.690	N7	1t,3-dimethylcyclopentane	0.583	0.576	0.495	197.096	91.720

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order **Page: 9**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
31.289	686.050	I7	3-ethylpentane	0.179	0.189	0.149	200.246	93.470
31.479	687.510	N7	1t,2-dimethylcyclopentane	0.571	0.561	0.484	197.366	91.870
31.659	688.890	I8	2,2,4-trimethylpentane	2.672	2.854	1.948	210.632	99.240
31.752	689.590	O7	2-ethylpentene-1	0.008	0.008	0.007	200.552	93.640
32.213	693.050	O7	O7-[2]	0.001	0.001	0.001	32.000	0.000
32.452	694.820	O7	3-methyl-c-hexene-3	0.021	0.021	0.017	203.720	95.400
32.987	698.720	O7	t-heptene-3	0.074	0.078	0.063	204.206	95.670
33.164	700.000	P7	n-heptane	1.302	1.408	1.083	209.156	98.420
33.463	701.960	O7	2-methyl-2-hexene	0.078	0.080	0.066	203.738	95.410
33.617	702.960	O7	3-methyl-t-hexene-3	0.029	0.031	0.025	200.372	93.540
33.862	704.540	O7	t-heptene-2	0.029	0.030	0.025	208.310	97.950
34.091	706.000	O7	3-ethylpentene-2	0.019	0.020	0.016	204.818	96.010
34.224	706.850	--	unknown	0.000	0.000	0.000	32.000	0.000
34.575	709.060	O7	c-heptene-2	0.073	0.076	0.062	209.138	98.410
34.767	710.260	O7	3-methyl-t-hexene-2	0.001	0.001	0.001	203.324	95.180
35.096	712.290	O7	2,3-dimethylpentene-2	0.031	0.032	0.027	207.320	97.400
35.327	713.700	O7	3-ethylcyclopentene	0.004	0.003	0.003	207.986	97.770
35.433	714.350	--	unknown	0.000	0.000	0.000	32.000	0.000
35.720	716.080	O7	O7-[3]	0.006	0.006	0.005	32.000	0.000
35.981	717.650	N7	1c,2-dimethylcyclopentane	0.271	0.274	0.230	211.154	99.530
36.113	718.430	N7	methylcyclohexane	1.218	1.170	1.034	213.674	100.930
36.462	720.490	I8	2,2-dimethylhexane	0.046	0.049	0.034	224.312	106.840
36.537	720.930	N8	1,1,3-trimethylcyclopentane	0.160	0.158	0.119	220.802	104.890
36.849	722.750	O7	O7-[4]	0.009	0.009	0.007	32.000	0.000
36.960	723.380	O7	O7-[5]	0.002	0.002	0.002	32.000	0.000
37.148	724.460	O7	O7-[6]	0.005	0.005	0.004	32.000	0.000
37.296	725.310	--	unknown	0.001	0.001	0.001	32.000	0.000
37.504	726.490	O7	O7-[7]	0.006	0.006	0.005	32.000	0.000
37.621	727.160	--	unknown	0.001	0.001	0.001	32.000	0.000
38.007	729.320	N7	ethylcyclopentane	0.322	0.311	0.273	218.246	103.470
38.130	730.010	I8	2,5-dimethylhexane	0.548	0.584	0.400	228.398	109.110

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
38.322	731.070	I8	2,2,3-trimethylpentane	0.103	0.106	0.075	229.730	109.850
38.468	731.880	I8	2,4-dimethylhexane	0.633	0.669	0.462	228.974	109.430
38.603	732.620	--	unknown	0.010	0.011	0.007	32.000	0.000
38.819	733.800	--	unknown	0.002	0.002	0.001	32.000	0.000
38.931	734.400	O7	O7-[8]	0.002	0.002	0.001	32.000	0.000
39.163	735.660	O7	O7-[9]	0.002	0.002	0.001	32.000	0.000
39.475	737.330	N8	1c,2t,4-trimethylcyclopentane	0.276	0.267	0.205	242.132	116.740
39.692	738.480	I8	3,3-dimethylhexane	0.054	0.056	0.040	233.546	111.970
40.178	741.040	O7	O7-[10]	0.003	0.003	0.003	32.000	0.000
40.482	742.620	O7	O7-[11]	0.002	0.002	0.001	32.000	0.000
40.624	743.350	O7	O7-[12]	0.004	0.004	0.004	32.000	0.000
40.839	744.450	N8	1t,2c,3-trimethylcyclopentane	0.200	0.192	0.149	230.738	110.410
41.377	747.190	I8	2,3,4-trimethylpentane	1.179	1.212	0.860	236.246	113.470
41.596	748.290	I8	I8-[1]	0.073	0.075	0.053	236.246	113.470
41.894	749.770	O7	O7-[13]	0.019	0.019	0.014	32.000	0.000
42.199	751.280	I8	2,3,3-trimethylpentane	1.112	1.132	0.811	238.586	114.770
42.627	753.380	A7	toluene	4.450	3.794	4.024	231.134	110.630
42.754	753.990	O8	O8-[1]	0.004	0.004	0.003	32.000	0.000
42.937	754.880	O8	O8-[2]	0.001	0.001	0.001	32.000	0.000
43.082	755.580	O8	O8-[3]	0.006	0.006	0.004	32.000	0.000
43.190	756.100	--	unknown	0.001	0.001	0.001	32.000	0.000
43.611	758.100	I8	2,3-dimethylhexane	0.517	0.536	0.377	240.098	115.610
43.781	758.910	I8	2-methyl-3-ethylpentane	0.071	0.074	0.052	240.098	115.610
44.085	760.340	--	unknown	0.006	0.006	0.004	32.000	0.000
44.135	760.570	N8	1,1,2-trimethylcyclopentane	0.004	0.004	0.003	236.714	113.730
44.534	762.420	O8	O8-[4]	0.026	0.027	0.020	32.000	0.000
44.938	764.280	I8	2-methylheptane	0.876	0.928	0.639	243.770	117.650
45.254	765.720	I8	4-methylheptane	0.334	0.350	0.244	243.878	117.710
45.513	766.890	I8	3-methyl-3-ethylpentane	0.067	0.070	0.049	240.098	115.610
45.621	767.380	I8	3,4-dimethylhexane	0.084	0.086	0.061	243.914	117.730
46.245	770.160	N8	1c,2c,4-trimethylcyclopentane	0.105	0.102	0.078	242.168	116.760

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
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Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
46.653	771.960	I8	3-methylheptane	0.837	0.877	0.610	246.074	118.930
46.927	773.160	--	unknown	0.179	0.188	0.130	32.000	0.000
47.012	773.520	N8	1c,2t,3-trimethylcyclopentane	0.391	0.375	0.291	243.500	117.500
47.178	774.240	I8	3-ethylhexane	0.104	0.108	0.076	245.372	118.540
47.451	775.420	N8	1t,4-dimethylcyclohexane	0.184	0.178	0.136	246.848	119.360
47.894	777.310	--	unknown	0.002	0.002	0.005	32.000	0.000
48.275	778.920	--	unknown	0.001	0.001	0.002	32.000	0.000
48.427	779.560	O8	O8-[5]	0.001	0.001	0.000	32.000	0.000
48.775	781.020	N8	1,1-dimethylcyclohexane	0.033	0.031	0.024	247.190	119.550
49.237	782.930	I9	2,2,5-trimethylhexane	0.595	0.622	0.387	255.362	124.090
49.668	784.690	N8	3c-ethylmethylcyclopentane	0.202	0.194	0.150	249.980	121.100
49.877	785.540	O9	2,6-dimethylheptene-1	0.003	0.003	0.002	32.000	0.000
50.212	786.890	N8	3t-ethylmethylcyclopentane	0.171	0.165	0.127	249.980	121.100
50.544	788.220	N8	2t-ethylmethylcyclopentane	0.156	0.150	0.116	250.160	121.200
50.996	790.020	O8	O8-[6]	0.006	0.006	0.004	32.000	0.000
51.118	790.500	N8	1,1-methylethylcyclopentane	0.021	0.020	0.016	250.754	121.530
51.821	793.250	N8	1t,2-dimethylcyclohexane	0.181	0.173	0.135	254.174	123.430
52.033	794.080	O8	t-octene-4	0.007	0.008	0.005	252.068	122.260
52.422	795.570	O9	3,5,5-trimethylhexene-1	0.001	0.001	0.001	32.000	0.000
52.883	797.330	N8	1c,2c,3-trimethylcyclopentane	0.030	0.029	0.022	253.400	123.000
53.346	799.080	N8	1t,3-dimethylcyclohexane	0.012	0.012	0.009	254.174	123.430
53.591	800.000	P8	n-octane	0.770	0.810	0.562	258.224	125.680
53.869	801.040	N8	1c,4-dimethylcyclohexane	0.253	0.239	0.188	255.794	124.330
54.740	804.270	O8	t-octene-2	0.008	0.008	0.006	32.000	0.000
54.963	805.090	--	unknown	0.005	0.005	0.012	32.000	0.000
55.339	806.460	I9	I9-[1]	0.037	0.038	0.024	32.000	0.000
55.442	806.830	--	unknown	0.015	0.016	0.010	32.000	0.000
55.829	808.230	N8	i-propylcyclopentane	0.080	0.076	0.059	259.574	126.430
56.496	810.610	--	unknown	0.004	0.004	0.009	32.000	0.000
57.029	812.490	--	unknown	0.008	0.009	0.022	32.000	0.000
57.128	812.840	O8	c-octene-2	0.004	0.004	0.003	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
57.402	813.800	--	unknown	0.001	0.001	0.001	32.000	0.000
57.701	814.840	N8	N8-[1]	0.013	0.013	0.010	32.000	0.000
58.060	816.080	O8	O8-[7]	0.002	0.002	0.002	32.000	0.000
58.451	817.420	I9	2,2,3,4-tetramethylpentane	0.119	0.119	0.077	271.454	133.030
59.091	819.590	I9	2,3,4-trimethylhexane	0.067	0.067	0.044	282.308	139.060
59.392	820.600	N8	N8-[2]	0.003	0.003	0.002	32.000	0.000
59.647	821.450	O9	O9-[1]	0.029	0.030	0.019	32.000	0.000
60.056	822.810	N8	N8-[3]	0.001	0.001	0.001	32.000	0.000
60.503	824.290	O9	O9-[2]	0.006	0.006	0.004	32.000	0.000
61.039	826.040	N8	1c,2-dimethylcyclohexane	0.180	0.167	0.134	265.532	129.740
61.253	826.740	--	unknown	0.020	0.021	0.015	32.000	0.000
61.636	827.970	I9	2,3,5-trimethylhexane	0.006	0.006	0.004	268.430	131.350
61.946	828.970	I9	2,2-dimethylheptane	0.012	0.013	0.008	270.860	132.700
62.837	831.790	N9	1,1,4-trimethylcyclohexane	0.319	0.306	0.211	275.000	135.000
63.401	833.560	I9	2,2,3-trimethylhexane	0.151	0.156	0.098	271.220	132.900
63.985	835.370	I9	2,4-dimethylheptane	0.032	0.033	0.021	271.220	132.900
64.729	837.660	I9	4,4-dimethylheptane	0.184	0.190	0.119	271.220	132.900
65.026	838.560	N8	ethylcyclohexane	0.001	0.001	0.001	269.222	131.790
65.611	840.320	N8	n-propylcyclopentane	0.025	0.024	0.019	267.728	130.960
65.838	841.000	I9	2,5-dimethylheptane	0.255	0.263	0.165	276.800	136.000
66.297	842.370	I9	3,3-&3,5-dimethylheptane	0.058	0.059	0.038	278.636	137.020
66.708	843.590	I9	3,5-dimethylheptane	0.040	0.040	0.026	276.800	136.000
67.185	844.980	I9	2,6-dimethylheptane	0.068	0.071	0.044	275.396	135.220
67.811	846.800	N9	1,1,3-trimethylcyclohexane	0.046	0.043	0.030	295.862	146.590
68.307	848.240	O9	2,4-dimethylheptene-1	0.002	0.002	0.001	32.000	0.000
68.882	849.880	--	unknown	0.002	0.002	0.001	32.000	0.000
69.088	850.460	N8	N8-[4]	0.003	0.003	0.002	32.000	0.000
69.413	851.380	N9	1c,2t,4t-trimethylcyclohexane	0.019	0.018	0.012	32.000	0.000
70.264	853.770	A8	ethylbenzene	1.165	0.993	0.914	277.160	136.200
70.641	854.810	N9	1c,3c,5c-trimethylcyclohexane	0.122	0.116	0.081	32.000	0.000
71.473	857.100	O9	2-methyloctene-1	0.019	0.021	0.013	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
71.908	858.280	I9	I9-[2]	0.003	0.003	0.002	32.000	0.000
72.363	859.510	O9	2-methyloctene-2	0.027	0.030	0.018	32.000	0.000
74.102	864.140	A8	1,3-dimethylbenzene	3.126	2.673	2.453	282.416	139.120
74.437	865.020	A8	1,4-dimethylbenzene	1.282	1.101	1.006	281.048	138.360
75.057	866.630	I9	3,4-dimethylheptane	0.029	0.030	0.019	285.080	140.600
75.385	867.470	I9	3,4 -dimethylheptane	0.059	0.059	0.038	285.080	140.600
75.920	868.850	N9	N9-[1]	0.026	0.024	0.017	32.000	0.000
76.357	869.960	I9	I9-[3]	0.073	0.074	0.047	32.000	0.000
77.201	872.090	I9	4-ethylheptane	0.002	0.002	0.001	288.392	142.440
77.565	873.000	I9	4-methyloctane	0.259	0.266	0.168	288.392	142.440
77.962	873.990	I9	2-methyloctane	0.317	0.329	0.206	289.904	143.280
78.571	875.500	N9	N9-[2]	0.035	0.034	0.023	32.000	0.000
79.425	877.590	N9	1c,2t,3c-trimethylcyclohexane	0.038	0.037	0.025	304.160	151.200
79.737	878.350	I9	3-ethylheptane	0.074	0.075	0.048	289.400	143.000
80.248	879.580	I9	3-methyloctane	0.409	0.419	0.265	291.614	144.230
80.574	880.370	I9	3,3-diethylpentane	0.020	0.020	0.013	270.842	132.690
81.012	881.410	--	unknown	0.062	0.066	0.041	32.000	0.000
81.300	882.100	N9	1c,2t,4c-trimethylcyclohexane	0.017	0.016	0.011	275.000	135.000
81.647	882.920	N9	1,1,2-trimethylcyclohexane	0.025	0.023	0.017	293.360	145.200
82.025	883.810	A8	1,2-dimethylbenzene	1.571	1.319	1.233	291.974	144.430
82.561	885.060	I9	I9-[4]	0.027	0.027	0.017	32.000	0.000
82.924	885.910	I9	I9-[5]	0.099	0.100	0.064	32.000	0.000
83.656	887.600	N9	N9-[3]	0.085	0.080	0.056	32.000	0.000
83.923	888.210	N9	N9-[4]	0.105	0.100	0.069	32.000	0.000
84.050	888.500	--	unknown	0.038	0.040	0.025	32.000	0.000
84.419	889.350	O9	nonene-1	0.005	0.005	0.003	274.100	134.500
84.612	889.790	I9	I9-[6]	0.058	0.059	0.038	32.000	0.000
85.014	890.700	N9	N9-[5]	0.150	0.142	0.099	32.000	0.000
85.557	891.920	I9	I9-[7]	0.016	0.016	0.010	32.000	0.000
86.008	892.930	N9	i-butylcyclopentane	0.031	0.029	0.021	298.346	147.970
86.220	893.400	N9	N9-[6]	0.021	0.020	0.014	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

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Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
87.085	895.320	--	unknown	0.001	0.001	0.001	32.000	0.000
87.447	896.110	N9	N9-[7]	0.014	0.014	0.009	32.000	0.000
87.739	896.750	N9	N9-[8]	0.008	0.008	0.005	32.000	0.000
88.032	897.390	O9	t-nonene-2	0.007	0.008	0.005	32.000	0.000
88.253	897.870	O9	t-nonene-3	0.020	0.020	0.013	32.000	0.000
88.667	898.770	I9	I9-[8]	0.119	0.120	0.077	32.000	0.000
88.821	899.100	--	unknown	0.024	0.025	0.015	32.000	0.000
89.236	900.000	P9	n-nonane	0.366	0.377	0.238	303.476	150.820
89.599	901.750	N9	1,1-methylethylcyclohexane	0.088	0.081	0.058	305.924	152.180
90.172	904.520	N9	N9-[9]	0.009	0.009	0.006	32.000	0.000
90.423	905.720	N9	N9-[10]	0.025	0.024	0.017	32.000	0.000
90.704	907.070	O10	t-2,2,5,5-tetramethylhexene-3	0.004	0.005	0.003	32.000	0.000
90.819	907.620	--	unknown	0.002	0.002	0.001	32.000	0.000
91.587	911.270	N9	N9-[11]	0.006	0.005	0.004	32.000	0.000
92.011	913.270	A9	i-propylbenzene	0.062	0.053	0.043	306.338	152.410
92.375	914.970	O9	c-nonene-3	0.072	0.077	0.047	32.000	0.000
92.533	915.710	--	unknown	0.017	0.018	0.011	32.000	0.000
92.941	917.620	I10	I10-[1]	0.012	0.012	0.007	32.000	0.000
93.038	918.070	N9	i-propylcyclohexane	0.021	0.019	0.014	310.622	154.790
93.182	918.740	--	unknown	0.006	0.006	0.004	32.000	0.000
93.773	921.470	I10	I10-[2]	0.106	0.108	0.062	32.000	0.000
94.171	923.300	I10	2,2-dimethyloctane	0.034	0.035	0.020	314.420	156.900
94.445	924.560	I10	2,4-dimethyloctane	0.051	0.052	0.030	312.620	155.900
94.879	926.540	N9	N9-[12]	0.007	0.006	0.004	32.000	0.000
95.312	928.500	N9	N9-[13]	0.022	0.021	0.014	32.000	0.000
95.918	931.240	I10	2,6-dimethyloctane	0.086	0.087	0.050	320.738	160.410
96.277	932.850	I10	2,5-dimethyloctane	0.078	0.079	0.045	317.300	158.500
96.526	933.960	--	unknown	0.003	0.003	0.002	32.000	0.000
96.951	935.860	--	unknown	0.002	0.002	0.001	32.000	0.000
97.131	936.660	N9	n-butylcyclopentane	0.056	0.053	0.037	313.916	156.620
97.344	937.600	I10	I10-[3]	0.031	0.032	0.018	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
97.494	938.270	N10	N10-[1]	0.035	0.033	0.021	32.000	0.000
97.758	939.430	--	unknown	0.005	0.006	0.003	32.000	0.000
98.007	940.530	I10	I10-[4]	0.021	0.021	0.012	32.000	0.000
98.461	942.520	I10	3,3-dimethyloctane	0.137	0.137	0.080	322.160	161.200
98.775	943.890	N10	N10-[2]	0.023	0.021	0.014	32.000	0.000
98.987	944.810	--	unknown	0.019	0.020	0.011	32.000	0.000
99.159	945.560	--	unknown	0.024	0.026	0.014	32.000	0.000
99.551	947.260	A9	n-propylbenzene	0.348	0.298	0.241	318.632	159.240
99.847	948.540	I10	3,6-dimethyloctane	0.026	0.026	0.015	321.440	160.800
100.103	949.640	I10	3-methyl-5-ethylheptane	0.045	0.046	0.027	316.760	158.200
100.247	950.260	--	unknown	0.006	0.007	0.004	32.000	0.000
100.568	951.630	N10	N10-[3]	0.027	0.025	0.016	32.000	0.000
101.193	954.300	--	unknown	0.023	0.024	0.014	32.000	0.000
101.500	955.600	A9	1,3-methylethylbenzene	1.232	1.053	0.854	322.394	161.330
101.886	957.230	A9	1,4-methylethylbenzene	0.528	0.453	0.366	323.618	162.010
102.198	958.550	N10	N10-[4]	0.029	0.027	0.018	32.000	0.000
102.359	959.220	--	unknown	0.003	0.003	0.002	32.000	0.000
102.731	960.780	--	unknown	0.002	0.002	0.001	32.000	0.000
102.940	961.650	--	unknown	0.011	0.011	0.028	32.000	0.000
103.230	962.860	A9	1,3,5-trimethylbenzene	0.656	0.561	0.455	328.532	164.740
103.496	963.970	I10	I10-[5]	0.041	0.041	0.024	32.000	0.000
103.763	965.070	N10	N10-[5]	0.018	0.017	0.011	32.000	0.000
103.959	965.880	--	unknown	0.006	0.006	0.003	32.000	0.000
104.192	966.840	I10	I10-[6]	0.003	0.003	0.002	32.000	0.000
104.511	968.150	I10	5-methylnonane	0.051	0.051	0.030	329.180	165.100
104.914	969.800	I10	4-methylnonane	0.420	0.419	0.246	32.000	0.000
105.259	971.210	A9	1,2-methylethylbenzene	0.391	0.328	0.271	329.324	165.180
105.445	971.970	I10	2-methylnonane	0.124	0.126	0.072	332.654	167.030
105.596	972.580	--	unknown	0.009	0.010	0.006	32.000	0.000
105.867	973.680	--	unknown	0.011	0.012	0.007	32.000	0.000
106.099	974.620	I10	3-ethyloctane	0.026	0.026	0.015	331.700	166.500

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
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Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
106.183	974.960	--	unknown	0.013	0.014	0.008	32.000	0.000
106.471	976.120	N10	N10-[6]	0.023	0.021	0.014	32.000	0.000
106.803	977.450	I10	3-methylnonane	0.147	0.148	0.086	334.040	167.800
107.008	978.280	--	unknown	0.007	0.007	0.004	32.000	0.000
107.374	979.740	N10	N10-[7]	0.003	0.003	0.002	32.000	0.000
107.545	980.420	I10	I10-[7]	0.094	0.094	0.055	32.000	0.000
107.817	981.500	I10	I10-[8]	0.008	0.008	0.005	32.000	0.000
108.102	982.630	--	unknown	0.011	0.011	0.006	32.000	0.000
108.558	984.430	A9	1,2,4-trimethylbenzene	1.914	1.615	1.326	336.884	169.380
108.799	985.380	--	unknown	0.007	0.007	0.005	32.000	0.000
108.972	986.060	I10	I10-[9]	0.011	0.011	0.006	32.000	0.000
109.077	986.480	N10	i-butylcyclohexane	0.034	0.032	0.020	340.340	171.300
109.267	987.220	--	unknown	0.027	0.029	0.016	32.000	0.000
109.386	987.690	I10	I10-[10]	0.044	0.044	0.026	32.000	0.000
109.669	988.790	I10	I10-[11]	0.019	0.019	0.011	32.000	0.000
109.812	989.350	I10	I10-[12]	0.012	0.012	0.007	32.000	0.000
110.161	990.700	N10	N10-[8]	0.022	0.021	0.013	32.000	0.000
110.302	991.250	--	unknown	0.003	0.003	0.002	32.000	0.000
110.777	993.090	O10	decene-1	0.003	0.003	0.002	339.080	170.600
110.934	993.690	N10	1t-methyl-2-n-propylcyclohexane	0.012	0.011	0.007	339.800	171.000
111.054	994.160	O10	2,3-dimethyloctene-2	0.063	0.063	0.037	32.000	0.000
111.180	994.640	I10	I10-[13]	0.013	0.013	0.008	32.000	0.000
111.462	995.720	--	unknown	0.004	0.004	0.002	32.000	0.000
111.606	996.270	A10	i-butylbenzene	0.051	0.044	0.032	343.022	172.790
111.842	997.180	I10	I10-[14]	0.037	0.037	0.022	32.000	0.000
112.122	998.240	A10	sec-butylbenzene	0.035	0.030	0.022	344.012	173.340
112.369	999.180	--	unknown	0.008	0.009	0.005	32.000	0.000
112.583	1000.000	P10	n-decane	0.194	0.196	0.114	345.470	174.150
112.825	1001.530	I11	I11-[1]	0.027	0.027	0.015	32.000	0.000
113.184	1003.790	N10	N10-[9]	0.017	0.016	0.010	32.000	0.000
113.582	1006.290	--	unknown	0.005	0.005	0.003	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
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Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
113.827	1007.820	A9	1,2,3-trimethylbenzene	0.374	0.309	0.259	349.016	176.120
113.973	1008.740	--	unknown	0.009	0.010	0.007	32.000	0.000
114.273	1010.620	A10	1,3-methyl-i-propylbenzene	0.041	0.035	0.026	347.144	175.080
114.711	1013.330	--	unknown	0.010	0.010	0.025	32.000	0.000
114.833	1014.090	A10	1,4-methyl-i-propylbenzene	0.024	0.021	0.015	350.834	177.130
114.982	1015.020	--	unknown	0.003	0.003	0.002	32.000	0.000
115.302	1017.000	I11	I11-[2]	0.026	0.026	0.014	32.000	0.000
115.571	1018.650	I11	I11-[3]	0.012	0.012	0.006	32.000	0.000
115.865	1020.460	A10	2-3-dihydroindene	0.261	0.200	0.184	352.130	177.850
116.230	1022.700	--	unknown	0.018	0.020	0.013	32.000	0.000
116.476	1024.200	N10	sec-butylcyclohexane	0.041	0.037	0.024	354.812	179.340
116.709	1025.630	I11	I11-[4]	0.008	0.008	0.004	32.000	0.000
117.060	1027.760	A10	1,2-methyl-i-propylbenzene	0.070	0.059	0.044	352.724	178.180
117.238	1028.840	I11	3-ethylnonane	0.005	0.005	0.002	32.000	0.000
117.316	1029.320	--	unknown	0.004	0.004	0.002	32.000	0.000
117.629	1031.210	--	unknown	0.064	0.067	0.034	32.000	0.000
117.852	1032.550	N11	N11-[1]	0.026	0.024	0.014	32.000	0.000
117.916	1032.940	--	unknown	0.019	0.020	0.010	32.000	0.000
118.094	1034.010	I11	I11-[5]	0.016	0.016	0.008	32.000	0.000
118.228	1034.820	--	unknown	0.003	0.003	0.002	32.000	0.000
118.604	1037.080	I11	I11-[6]	0.030	0.028	0.016	32.000	0.000
118.770	1038.070	--	unknown	0.033	0.034	0.018	32.000	0.000
119.212	1040.710	A10	1,3-diethylbenzene	0.132	0.113	0.082	358.052	181.140
119.412	1041.900	--	unknown	0.061	0.065	0.038	32.000	0.000
119.661	1043.380	A10	1,3-methyl-n-propylbenzene	0.271	0.233	0.168	359.618	182.010
119.834	1044.400	I11	I11-[7]	0.021	0.021	0.011	32.000	0.000
120.111	1046.040	A10	1,4-diethylbenzene	0.011	0.009	0.007	362.822	183.790
120.297	1047.150	A10	1,4-methyl-n-propylbenzene	0.169	0.145	0.105	362.156	183.420
120.472	1048.180	A10	n-butylbenzene	0.081	0.070	0.050	361.940	183.300
120.880	1050.580	A10	1,3-dimethyl-5-ethylbenzene	0.283	0.238	0.176	362.516	183.620
121.204	1052.480	A10	1,2-diethylbenzene	0.030	0.025	0.019	362.228	183.460

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
121.347	1053.320	I11	I11-[8]	0.017	0.017	0.009	32.000	0.000
121.575	1054.640	N10	t-decahydronaphthalene	0.009	0.008	0.005	368.960	187.200
121.824	1056.100	N11	N11-[2]	0.016	0.015	0.009	32.000	0.000
122.092	1057.660	--	unknown	0.012	0.012	0.006	32.000	0.000
122.248	1058.560	A10	1,2-methyl-n-propylbenzene	0.093	0.079	0.058	364.946	184.970
122.617	1060.700	I11	I11-[9]	0.009	0.009	0.005	32.000	0.000
122.752	1061.480	I11	I11-[10]	0.069	0.069	0.037	32.000	0.000
122.964	1062.710	I11	I11-[11]	0.034	0.034	0.018	32.000	0.000
123.037	1063.130	--	unknown	0.011	0.012	0.006	32.000	0.000
123.319	1064.750	--	unknown	0.004	0.004	0.002	32.000	0.000
123.471	1065.630	I11	I11-[12]	0.045	0.045	0.024	32.000	0.000
123.731	1067.120	--	unknown	0.009	0.009	0.005	32.000	0.000
124.020	1068.770	A10	1,4,dimethyl-2-ethylbenzene	0.205	0.173	0.128	368.366	186.870
124.291	1070.310	A10	1,3-dimethyl-4-ethylbenzene	0.257	0.221	0.160	370.832	188.240
124.540	1071.730	I11	I11-[13]	0.004	0.004	0.002	32.000	0.000
124.865	1073.580	--	unknown	0.008	0.008	0.004	32.000	0.000
125.123	1075.040	I11	I11-[14]	0.141	0.140	0.075	32.000	0.000
125.290	1075.990	A10	1,2-dimethyl-4-ethylbenzene	0.283	0.239	0.175	373.136	189.520
125.602	1077.750	--	unknown	0.009	0.009	0.005	32.000	0.000
125.889	1079.370	--	unknown	0.012	0.013	0.007	32.000	0.000
125.965	1079.790	I11	I11-[15]	0.005	0.005	0.003	32.000	0.000
126.267	1081.490	A10	1,3-dimethyl-2-ethylbenzene	0.047	0.039	0.029	374.090	190.050
126.416	1082.330	I11	I11-[16]	0.018	0.018	0.010	32.000	0.000
126.747	1084.180	--	unknown	0.016	0.017	0.009	32.000	0.000
126.947	1085.300	I11	I11-[17]	0.008	0.008	0.004	32.000	0.000
127.178	1086.580	--	unknown	0.015	0.016	0.008	32.000	0.000
127.517	1088.470	--	unknown	0.008	0.009	0.004	32.000	0.000
127.589	1088.870	--	unknown	0.011	0.012	0.006	32.000	0.000
127.859	1090.360	O11	undecene-1	0.020	0.020	0.011	378.860	192.700
128.195	1092.220	A11	1,4-methyl-t-butylbenzene	0.036	0.031	0.020	32.000	0.000
128.471	1093.740	A10	1,2-dimethyl-3-ethylbenzene	0.079	0.065	0.049	381.110	193.950

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
128.814	1095.630	--	unknown	0.007	0.007	0.004	32.000	0.000
129.087	1097.120	--	unknown	0.013	0.014	0.008	32.000	0.000
129.172	1097.590	A11	1,2-ethyl-i-propylbenzene	0.008	0.007	0.005	32.000	0.000
129.335	1098.490	--	unknown	0.006	0.007	0.004	32.000	0.000
129.612	1100.000	P11	n-undecane	0.104	0.103	0.055	384.620	195.900
129.812	1101.490	--	unknown	0.007	0.008	0.004	32.000	0.000
129.920	1102.310	A11	1,4-ethyl-i-propylbenzene	0.002	0.002	0.001	32.000	0.000
130.345	1105.480	A10	1,2,4,5-tetramethylbenzene	0.164	0.136	0.102	386.312	196.840
130.731	1108.350	A11	1,2-methyl-n-butylbenzene	0.009	0.008	0.005	390.200	199.000
130.885	1109.500	A10	1,2,3,5-tetramethylbenzene	0.219	0.182	0.136	388.472	198.040
131.039	1110.640	--	unknown	0.006	0.006	0.004	32.000	0.000
131.377	1113.150	--	unknown	0.012	0.012	0.007	32.000	0.000
131.572	1114.590	--	unknown	0.007	0.008	0.005	32.000	0.000
131.876	1116.830	--	unknown	0.021	0.022	0.013	32.000	0.000
132.321	1120.110	--	unknown	0.014	0.015	0.009	32.000	0.000
132.478	1121.260	--	unknown	0.015	0.015	0.009	32.000	0.000
132.958	1124.770	A11	1,2-methyl-t-butylbenzene	0.006	0.005	0.003	32.000	0.000
133.117	1125.930	--	unknown	0.012	0.013	0.007	32.000	0.000
133.430	1128.210	A10	5-methylindan	0.194	0.161	0.122	32.000	0.000
133.772	1130.700	--	unknown	0.028	0.030	0.018	32.000	0.000
133.823	1131.070	I12	I12-[1]	0.019	0.019	0.009	421.340	216.300
134.181	1133.660	--	unknown	0.007	0.008	0.003	32.000	0.000
134.296	1134.500	A10	4-methylindan	0.048	0.040	0.030	32.000	0.000
134.584	1136.580	--	unknown	0.015	0.015	0.009	32.000	0.000
134.678	1137.260	A11	1,2-ethyl-n-propylbenzene	0.052	0.044	0.029	32.000	0.000
134.928	1139.060	A10	2-methylindan	0.186	0.152	0.117	368.600	187.000
135.139	1140.570	A11	1,3-methyl-n-butylbenzene	0.009	0.007	0.005	390.200	199.000
135.411	1142.520	--	unknown	0.006	0.007	0.004	32.000	0.000
135.545	1143.480	A12	1,3-di-i-propylbenzene	0.062	0.051	0.032	397.760	203.200
135.756	1144.990	A11	s-pentylbenzene	0.057	0.048	0.032	401.000	205.000
135.913	1146.110	--	unknown	0.002	0.002	0.001	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order **Page: 20**

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
136.342	1149.170	--	unknown	0.018	0.019	0.010	32.000	0.000
136.439	1149.860	A11	n-pentylbenzene	0.048	0.040	0.027	401.720	205.400
136.519	1150.430	--	unknown	0.022	0.023	0.012	32.000	0.000
136.799	1152.420	N12	1t-M-2-(4-MP)cyclopentane	0.004	0.004	0.002	32.000	0.000
136.998	1153.830	A12	1,2-di-i-propylbenzene	0.027	0.023	0.014	399.200	204.000
137.143	1154.860	--	unknown	0.026	0.028	0.013	32.000	0.000
137.628	1158.280	--	unknown	0.039	0.041	0.020	32.000	0.000
137.901	1160.200	A12	1,4-di-i-propylbenzene	0.048	0.040	0.025	410.540	210.300
138.178	1162.140	--	unknown	0.007	0.007	0.004	32.000	0.000
138.351	1163.350	A10	tetrahydronaphthalene	0.018	0.014	0.011	405.716	207.620
138.495	1164.370	--	unknown	0.007	0.008	0.005	32.000	0.000
138.737	1166.060	--	unknown	0.004	0.004	0.003	32.000	0.000
138.887	1167.100	I12	I12-[2]	0.052	0.051	0.025	421.340	216.300
139.184	1169.170	A10	naphthalene	0.160	0.115	0.104	424.382	217.990
139.510	1171.440	A12	1-t-butyl-3,5-dimethylbenzene	0.004	0.003	0.002	32.000	0.000
139.850	1173.800	--	unknown	0.054	0.057	0.028	32.000	0.000
139.906	1174.190	A12	1,4-ethyl-t-butylbenzene	0.022	0.018	0.011	32.000	0.000
140.253	1176.590	--	unknown	0.026	0.027	0.013	32.000	0.000
140.545	1178.600	I12	I12-[3]	0.054	0.053	0.026	421.340	216.300
140.775	1180.190	I12	I12-[4]	0.031	0.030	0.015	421.340	216.300
141.114	1182.520	--	unknown	0.006	0.007	0.003	32.000	0.000
141.354	1184.170	I12	I12-[5]	0.032	0.031	0.016	421.340	216.300
141.605	1185.890	--	unknown	0.011	0.012	0.005	32.000	0.000
141.898	1187.880	I12	I12-[6]	0.033	0.032	0.016	421.340	216.300
142.097	1189.240	A12	1,3-di-n-propylbenzene	0.038	0.032	0.020	32.000	0.000
142.336	1190.870	A12	A12-[1]	0.023	0.019	0.012	32.000	0.000
142.555	1192.350	O12	dodecene-1	0.004	0.004	0.002	416.120	213.400
142.651	1193.010	--	unknown	0.001	0.002	0.001	32.000	0.000
142.914	1194.790	--	unknown	0.007	0.007	0.003	32.000	0.000
143.255	1197.100	--	unknown	0.004	0.005	0.002	32.000	0.000
143.559	1199.150	A12	A12-[2]	0.019	0.016	0.010	32.000	0.000

Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
143.684	1200.000	P12	n-dodecane	0.044	0.044	0.022	421.340	216.300
143.948	1202.220	--	unknown	0.003	0.003	0.002	32.000	0.000
144.230	1204.590	--	unknown	0.013	0.013	0.006	32.000	0.000
144.332	1205.440	--	unknown	0.004	0.004	0.002	32.000	0.000
144.764	1209.060	--	unknown	0.011	0.012	0.006	32.000	0.000
144.990	1210.950	--	unknown	0.006	0.006	0.003	32.000	0.000
145.189	1212.610	A12	1,3,5-triethylbenzene	0.003	0.003	0.002	420.800	216.000
145.375	1214.160	--	unknown	0.007	0.007	0.004	32.000	0.000
145.718	1217.010	--	unknown	0.021	0.022	0.011	32.000	0.000
145.896	1218.500	--	unknown	0.011	0.012	0.006	32.000	0.000
146.022	1219.540	--	unknown	0.002	0.002	0.001	32.000	0.000
146.209	1221.090	--	unknown	0.003	0.003	0.001	32.000	0.000
146.499	1223.490	--	unknown	0.017	0.018	0.009	32.000	0.000
146.739	1225.470	--	unknown	0.016	0.017	0.008	32.000	0.000
146.812	1226.070	--	unknown	0.007	0.008	0.004	32.000	0.000
147.116	1228.570	--	unknown	0.004	0.005	0.002	32.000	0.000
147.203	1229.290	--	unknown	0.012	0.013	0.006	32.000	0.000
147.508	1231.800	A12	1,2,4-triethylbenzene	0.013	0.011	0.007	423.500	217.500
147.732	1233.630	--	unknown	0.004	0.004	0.002	32.000	0.000
147.841	1234.520	--	unknown	0.001	0.001	0.001	32.000	0.000
148.094	1236.590	--	unknown	0.004	0.004	0.002	32.000	0.000
148.146	1237.020	--	unknown	0.004	0.005	0.002	32.000	0.000
148.234	1237.740	--	unknown	0.007	0.007	0.004	32.000	0.000
148.466	1239.630	--	unknown	0.001	0.002	0.001	32.000	0.000
148.804	1242.380	A12	1,4-methyl-n-pentylbenzene	0.034	0.029	0.018	32.000	0.000
149.090	1244.700	--	unknown	0.009	0.009	0.005	32.000	0.000
149.243	1245.940	--	unknown	0.003	0.004	0.002	32.000	0.000
149.382	1247.070	--	unknown	0.003	0.003	0.002	32.000	0.000
149.671	1249.400	--	unknown	0.004	0.005	0.002	32.000	0.000
149.954	1251.690	--	unknown	0.006	0.006	0.003	32.000	0.000
150.150	1253.270	--	unknown	0.007	0.008	0.004	32.000	0.000

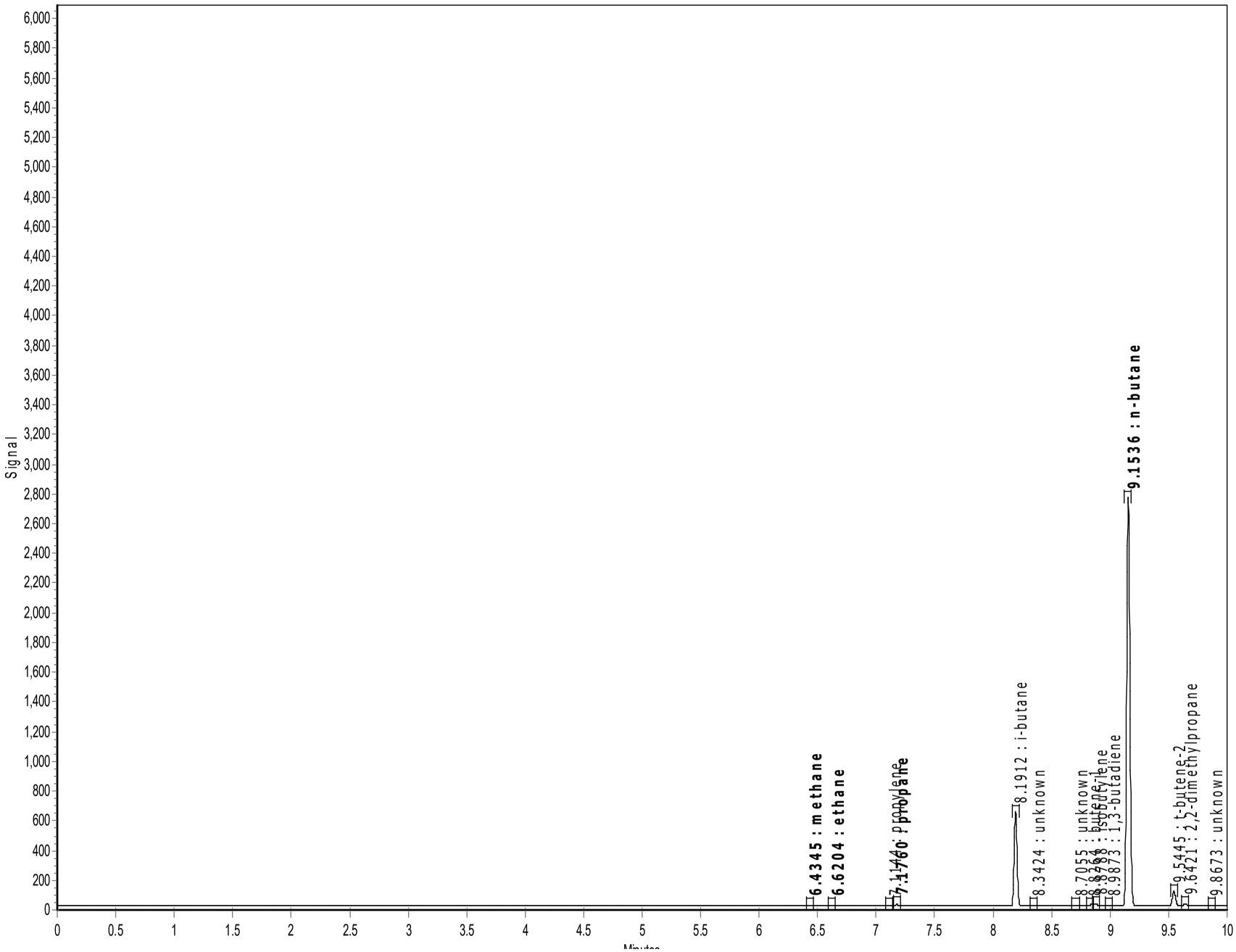
Detailed Hydrocarbon Analysis Detail Report - Report Date: 11/2/2020 10:38:29 PM

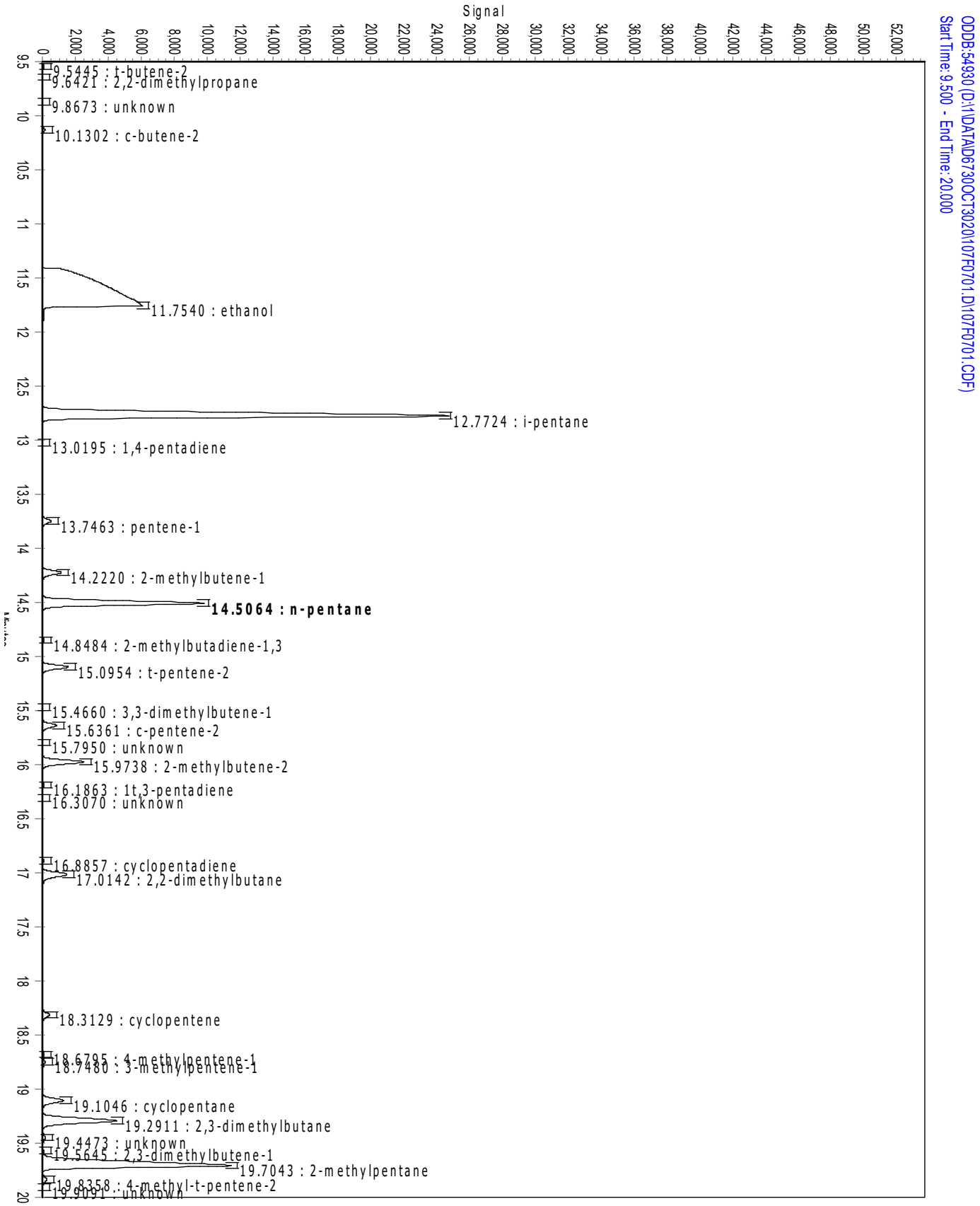
RawFile: D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF
Acquired: 10/31/20 16:09:43
Sample: ODDB:54930
Analyzed: 11/2/2020 10:37:26 PM
Processed 651 Peaks
Reference File: C:\Dragon Software\Dragon DHA\References\PONAVI_SwRI_07182018_1108.dha
Comments:
Yield: 100.000%
Int Std: NONE
Int Std Amt: 0.000
Hold
Sample Wt: 1.000 Sample Den: 1.000

Components Listed in Chromatographic Order

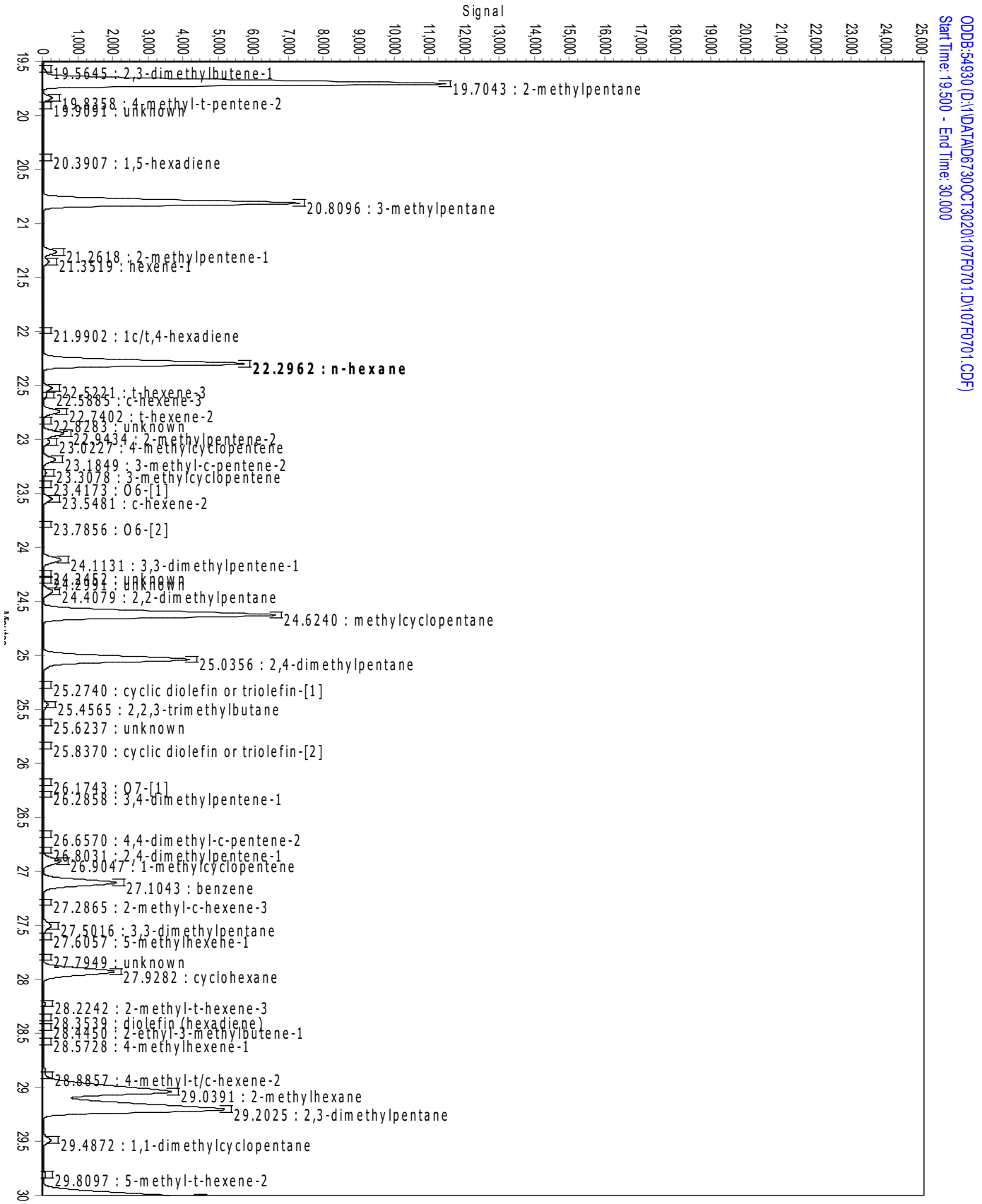
Minutes	Index	Group	Component	Mass %	Volume %	Mol %	BP(F)	BP(C)
150.535	1256.370	A12	n-hexylbenzene	0.019	0.016	0.010	32.000	0.000
150.627	1257.100	--	unknown	0.020	0.021	0.010	32.000	0.000
150.998	1260.080	--	unknown	0.011	0.012	0.006	32.000	0.000
151.255	1262.130	--	unknown	0.005	0.005	0.002	32.000	0.000
151.501	1264.090	--	unknown	0.005	0.005	0.002	32.000	0.000
151.660	1265.360	--	unknown	0.003	0.003	0.002	32.000	0.000
151.846	1266.850	--	unknown	0.005	0.005	0.003	32.000	0.000
151.922	1267.450	--	unknown	0.009	0.010	0.005	32.000	0.000
152.208	1269.720	--	unknown	0.008	0.009	0.004	32.000	0.000
152.370	1271.010	--	unknown	0.002	0.002	0.001	32.000	0.000
152.638	1273.140	I13	I13-[1]	0.008	0.008	0.004	455.720	235.400
152.829	1274.640	A11	1,2,3,4,5-pentamethylbenzene	0.022	0.017	0.013	449.600	232.000
153.056	1276.440	--	unknown	0.009	0.009	0.005	32.000	0.000
153.572	1280.500	--	unknown	0.006	0.006	0.003	32.000	0.000
153.928	1283.300	A11	2-methylnaphthalene	0.087	0.063	0.051	465.890	241.050
154.078	1284.470	--	unknown	0.002	0.002	0.001	32.000	0.000
154.414	1287.100	--	unknown	0.010	0.010	0.006	32.000	0.000
154.564	1288.280	--	unknown	0.002	0.002	0.001	32.000	0.000
154.705	1289.380	--	unknown	0.003	0.003	0.002	32.000	0.000
154.908	1290.960	O13	tridecene-1	0.006	0.006	0.003	451.040	232.800
155.142	1292.780	--	unknown	0.001	0.001	0.000	32.000	0.000
155.344	1294.350	--	unknown	0.002	0.002	0.001	32.000	0.000
155.504	1295.600	--	unknown	0.003	0.003	0.001	32.000	0.000
155.582	1296.200	--	unknown	0.002	0.002	0.001	32.000	0.000
155.878	1298.500	A11	1-methylnaphthalene	0.035	0.025	0.020	472.352	244.640
156.071	1300.000	P13	n-tridecane	0.009	0.009	0.004	455.720	235.400
156.182	1300.990	+	C14+ (Summarized)	0.356	0.345	0.150	455.720	235.400

ODDB:54930 (D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 0.000 - End Time: 10.000



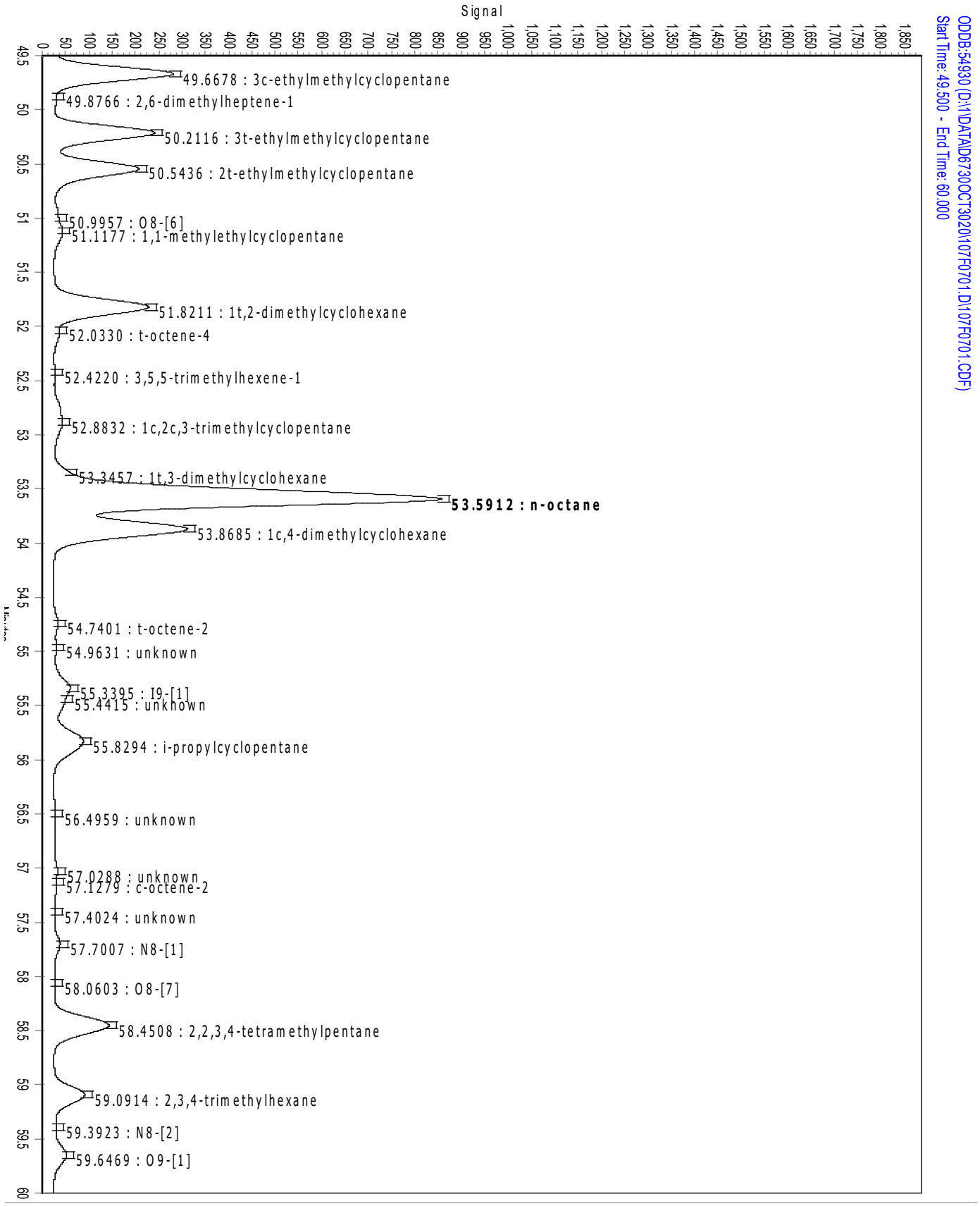


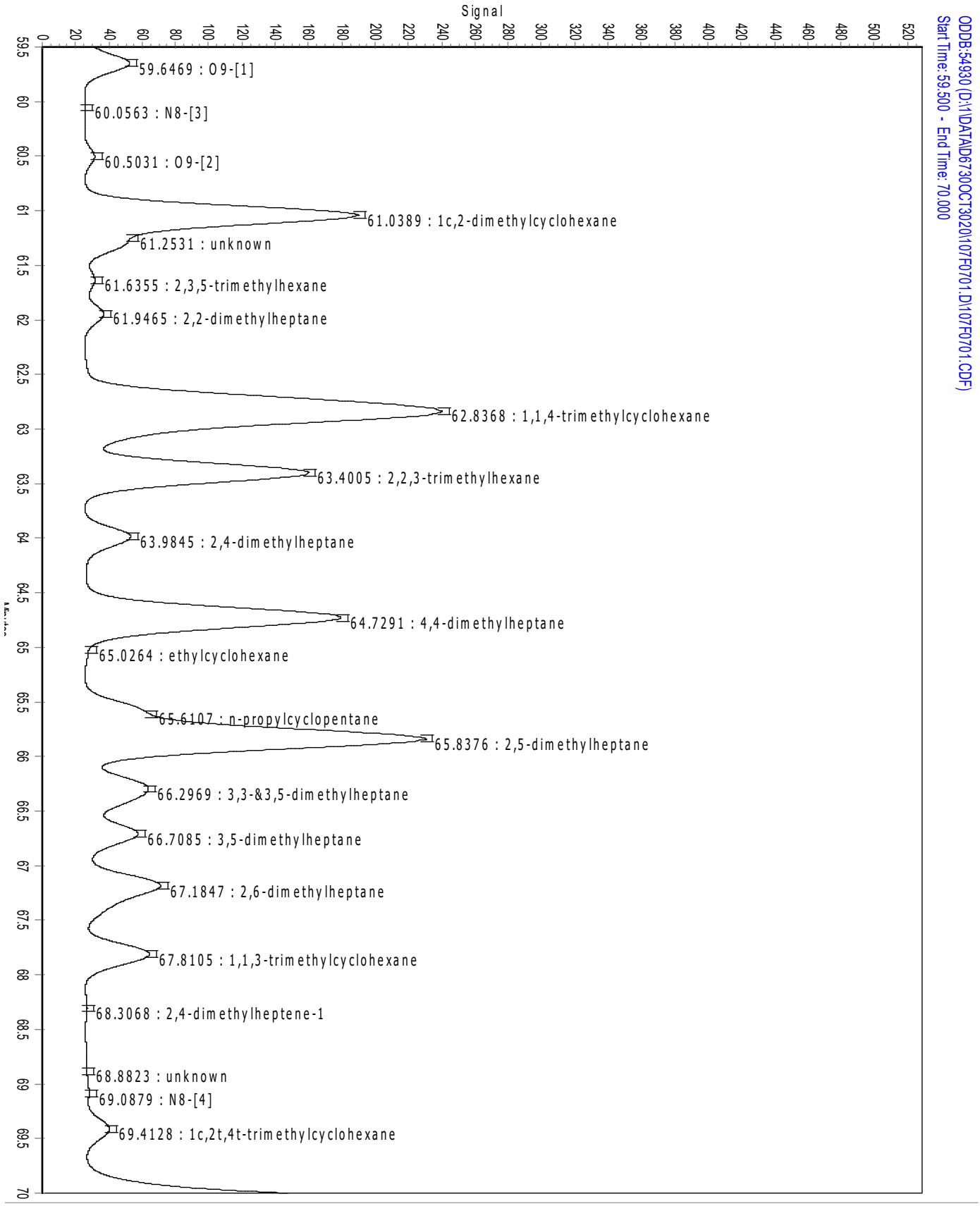
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 9.500 - End Time: 20.000

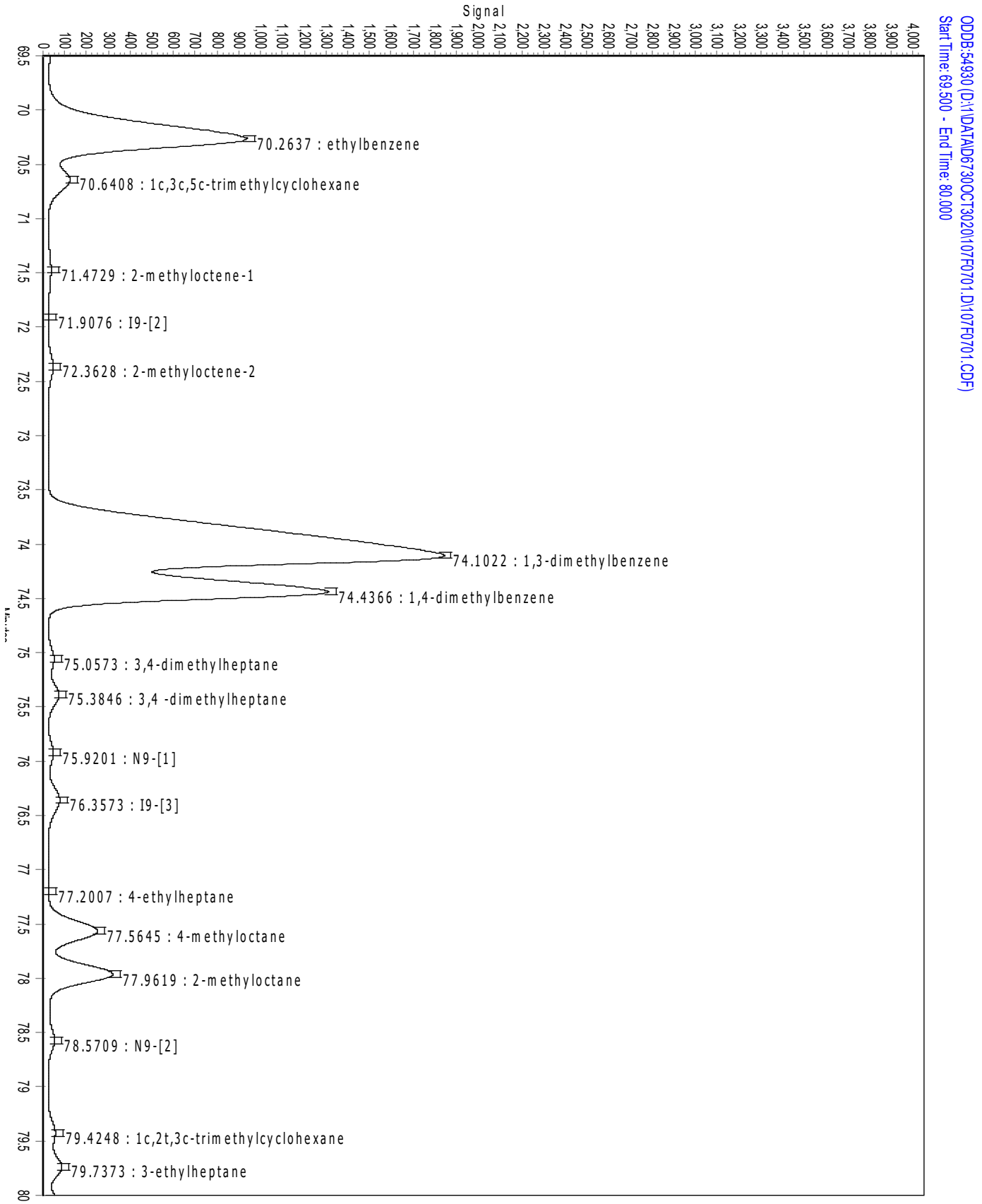

Signal
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 19.500 - End Time: 30.000
19.5645 : 2,3-dimethylbutene-1
19.7043 : 2-methylpentane
19.8358 : 4-methyl-t-pentene-2
19.9091 : unknown
20.3907 : 1,5-hexadiene
20.8096 : 3-methylpentane
21.2618 : 2-methylpentene-1
21.3519 : hexene-1
21.9902 : 1c/t,4-hexadiene
22.2962 : n-hexane
22.5221 : t-hexene-3
22.5885 : c-hexene-3
22.7402 : t-hexene-2
22.8283 : unknown
22.9434 : 2-methylpentene-2
23.0227 : 4-methylcyclopentene
23.1849 : 3-methyl-c-pentene-2
23.3078 : 3-methylcyclopentene
23.4173 : O6-[1]
23.5481 : c-hexene-2
23.7856 : O6-[2]
24.1131 : 3,3-dimethylpentene-1
24.2994 : unknown
24.4079 : 2,2-dimethylpentane
24.6240 : methylcyclopentane
25.0356 : 2,4-dimethylpentane
25.2740 : cyclic diolefin or triolefin-[1]
25.4565 : 2,2,3-trimethylbutane
25.6237 : unknown
25.8370 : cyclic diolefin or triolefin-[2]
26.1743 : O7-[1]
26.2858 : 3,4-dimethylpentene-1
26.6570 : 4,4-dimethyl-c-pentene-2
26.8031 : 2,4-dimethylpentene-1
26.9047 : 1-methylcyclopentene
27.1043 : benzene
27.2865 : 2-methyl-c-hexene-3
27.5016 : 3,3-dimethylpentane
27.6057 : 5-methylhexene-1
27.7949 : unknown
27.9282 : cyclohexane
28.2242 : 2-methyl-t-hexene-3
28.3539 : diolefin (hexadiene)
28.4450 : 2-ethyl-3-methylbutene-1
28.5728 : 4-methylhexene-1
28.8857 : 4-methyl-t/c-hexene-2
29.0391 : 2-methylhexane
29.2025 : 2,3-dimethylpentane
29.4872 : 1,1-dimethylcyclopentane
29.8097 : 5-methyl-t-hexene-2

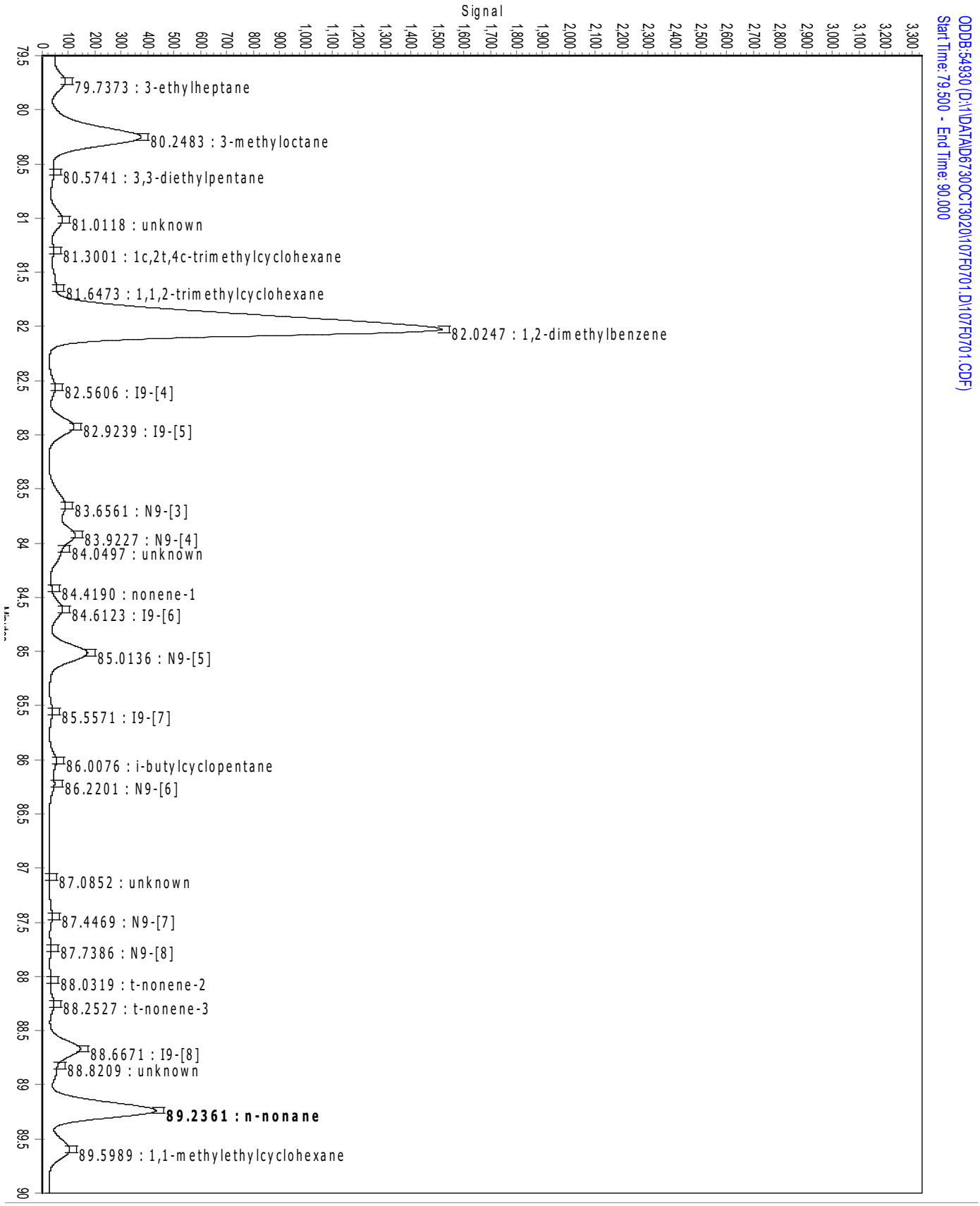
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 29.500 - End Time: 40.000

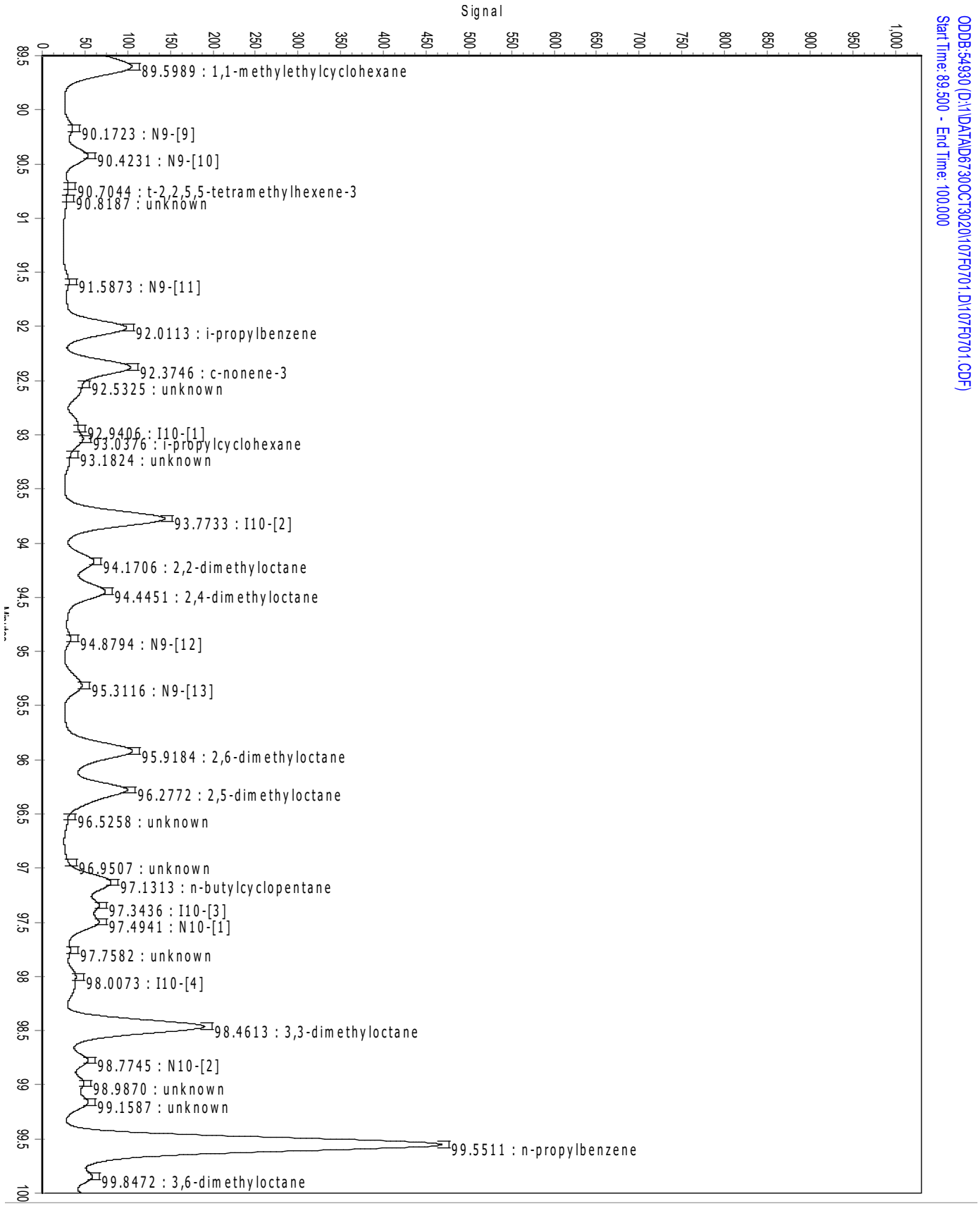
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 39.500 - End Time: 50.000


Signal
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 49.500 - End Time: 60.000
49.6678 : 3c-ethylmethylcyclopentane
49.8766 : 2,6-dimethylheptene-1
50.2116 : 3t-ethylmethylcyclopentane
50.5436 : 2t-ethylmethylcyclopentane
50.9957 : O8-[6]
51.1177 : 1,1-methylethylcyclopentane
51.8211 : 1t,2-dimethylcyclohexane
52.0330 : t-octene-4
52.4220 : 3,5,5-trimethylhexene-1
52.8832 : 1c,2c,3-trimethylcyclopentane
53.3457 : 1t,3-dimethylcyclohexane
53.5912 : n-octane
53.8685 : 1c,4-dimethylcyclohexane
54.7401 : t-octene-2
54.9631 : unknown
55.3395 : I9-[1]
55.4415 : unknown
55.8294 : i-propylcyclopentane
56.4959 : unknown
57.0288 : unknown
57.1279 : c-octene-2
57.4024 : unknown
57.7007 : N8-[1]
58.0603 : O8-[7]
58.4508 : 2,2,3,4-tetramethylpentane
59.0914 : 2,3,4-trimethylhexane
59.3923 : N8-[2]
59.6469 : O9-[1]

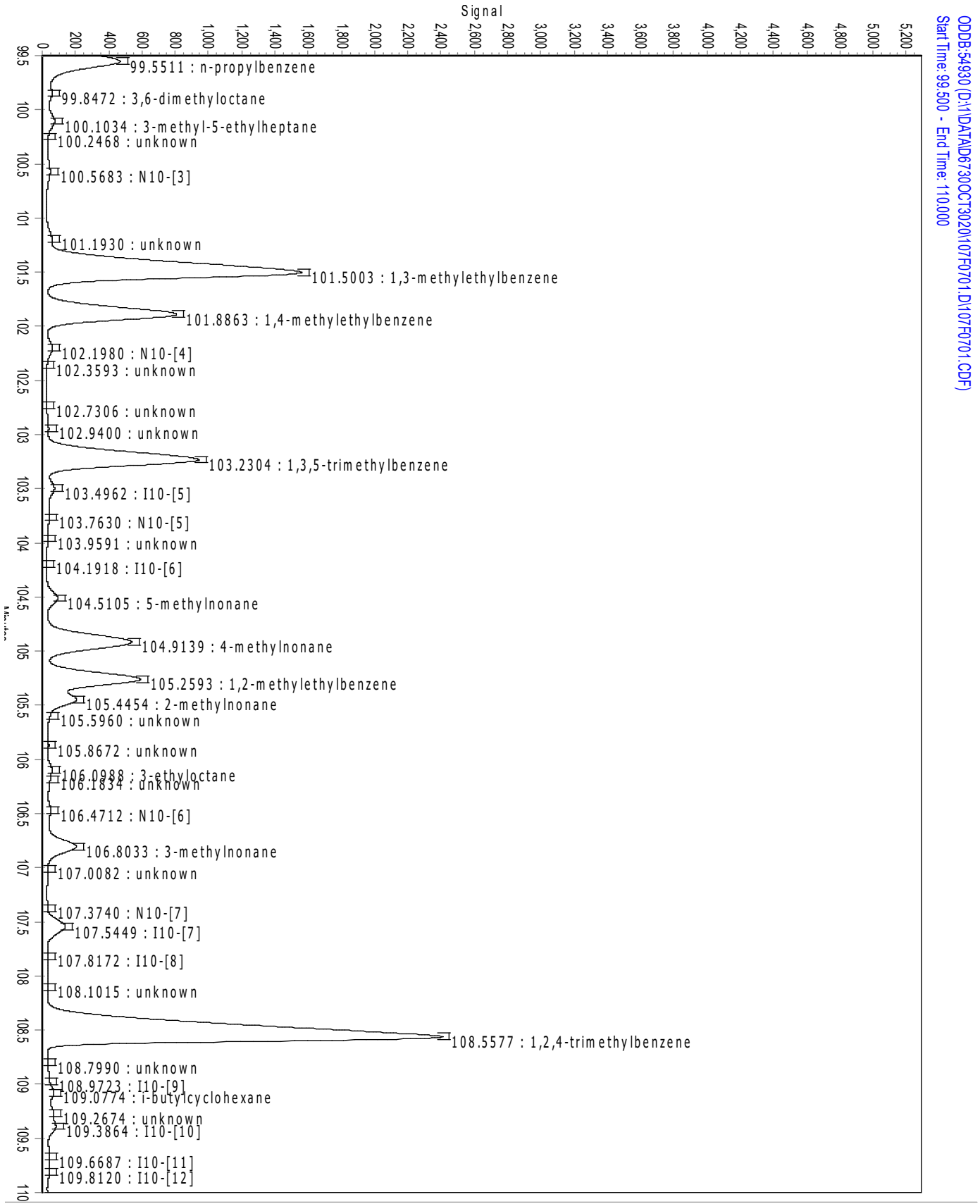

Signal
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 59.500 - End Time: 70.000
59.6469 : O9-[1]
60.0563 : N8-[3]
60.5031 : O9-[2]
61.0389 : 1c,2-dimethylcyclohexane
61.2531 : unknown
61.6355 : 2,3,5-trimethylhexane
61.9465 : 2,2-dimethylheptane
62.8368 : 1,1,4-trimethylcyclohexane
63.4005 : 2,2,3-trimethylhexane
63.9845 : 2,4-dimethylheptane
64.7291 : 4,4-dimethylheptane
65.0264 : ethylcyclohexane
65.6107 : n-propylcyclopentane
65.8376 : 2,5-dimethylheptane
66.2969 : 3,3-&3,5-dimethylheptane
66.7085 : 3,5-dimethylheptane
67.1847 : 2,6-dimethylheptane
67.8105 : 1,1,3-trimethylcyclohexane
68.3068 : 2,4-dimethylheptene-1
68.8823 : unknown
69.0879 : N8-[4]
69.4128 : 1c,2t,4t-trimethylcyclohexane

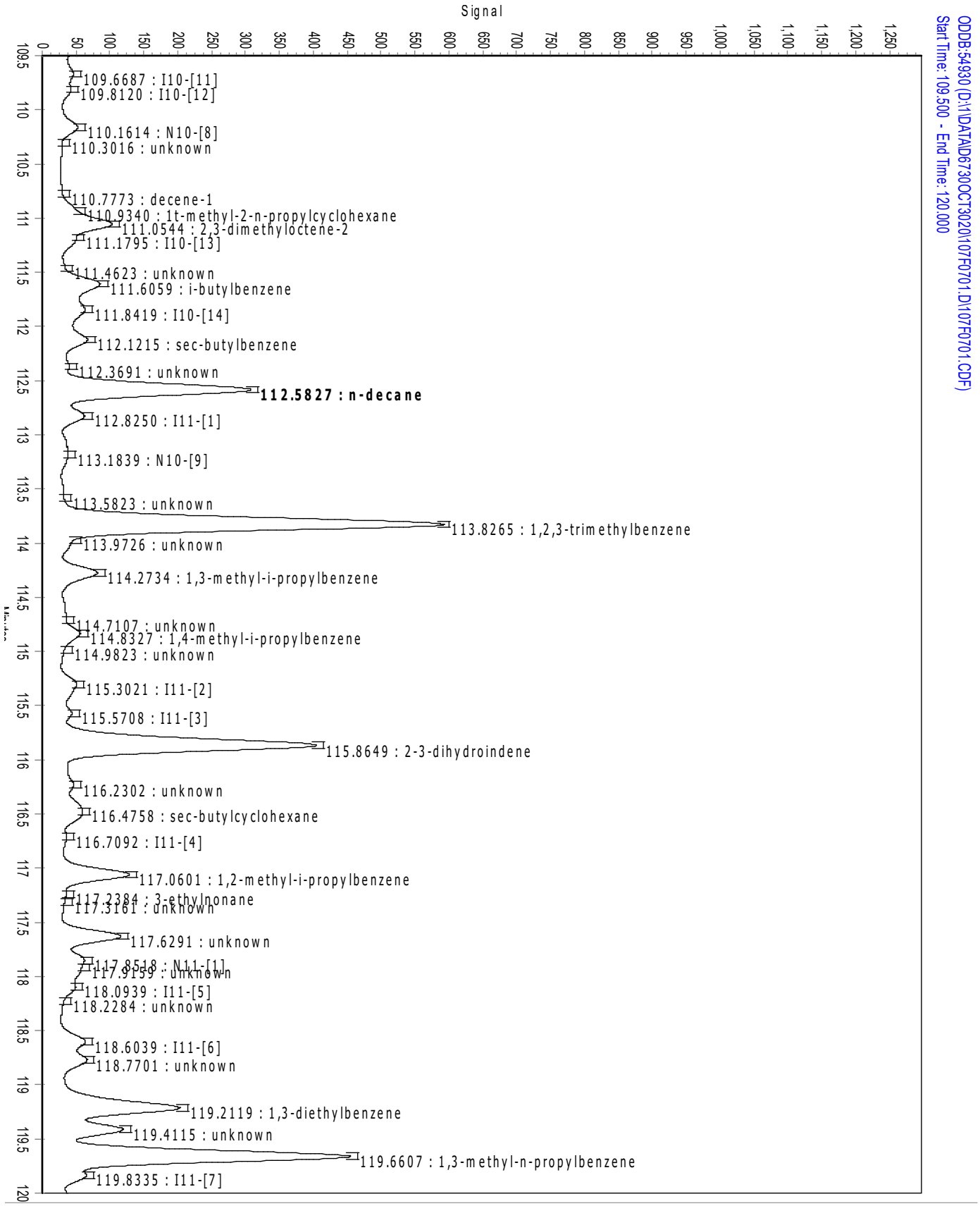

Signal
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 69.500 - End Time: 80.000
70.2637 : ethylbenzene
70.6408 : 1c,3c,5c-trimethylcyclohexane
71.4729 : 2-methyloctene-1
71.9076 : I9-[2]
72.3628 : 2-methyloctene-2
74.1022 : 1,3-dimethylbenzene
74.4366 : 1,4-dimethylbenzene
75.0573 : 3,4-dimethylheptane
75.3846 : 3,4 -dimethylheptane
75.9201 : N9-[1]
76.3573 : I9-[3]
77.2007 : 4-ethylheptane
77.5645 : 4-methyloctane
77.9619 : 2-methyloctane
78.5709 : N9-[2]
79.4248 : 1c,2t,3c-trimethylcyclohexane
79.7373 : 3-ethylheptane


Signal
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 79.500 - End Time: 90.000
79.7373 : 3-ethylheptane
80.2483 : 3-methyloctane
80.5741 : 3,3-diethylpentane
81.0118 : unknown
81.3001 : 1c,2t,4c-trimethylcyclohexane
81.6473 : 1,1,2-trimethylcyclohexane
82.0247 : 1,2-dimethylbenzene
82.5606 : I9-[4]
82.9239 : I9-[5]
83.6561 : N9-[3]
83.9227 : N9-[4]
84.0497 : unknown
84.4190 : nonene-1
84.6123 : I9-[6]
85.0136 : N9-[5]
85.5571 : I9-[7]
86.0076 : i-butylcyclopentane
86.2201 : N9-[6]
87.0852 : unknown
87.4469 : N9-[7]
87.7386 : N9-[8]
88.0319 : t-nonene-2
88.2527 : t-nonene-3
88.6671 : I9-[8]
88.8209 : unknown
89.2361 : n-nonane
89.5989 : 1,1-methylethylcyclohexane

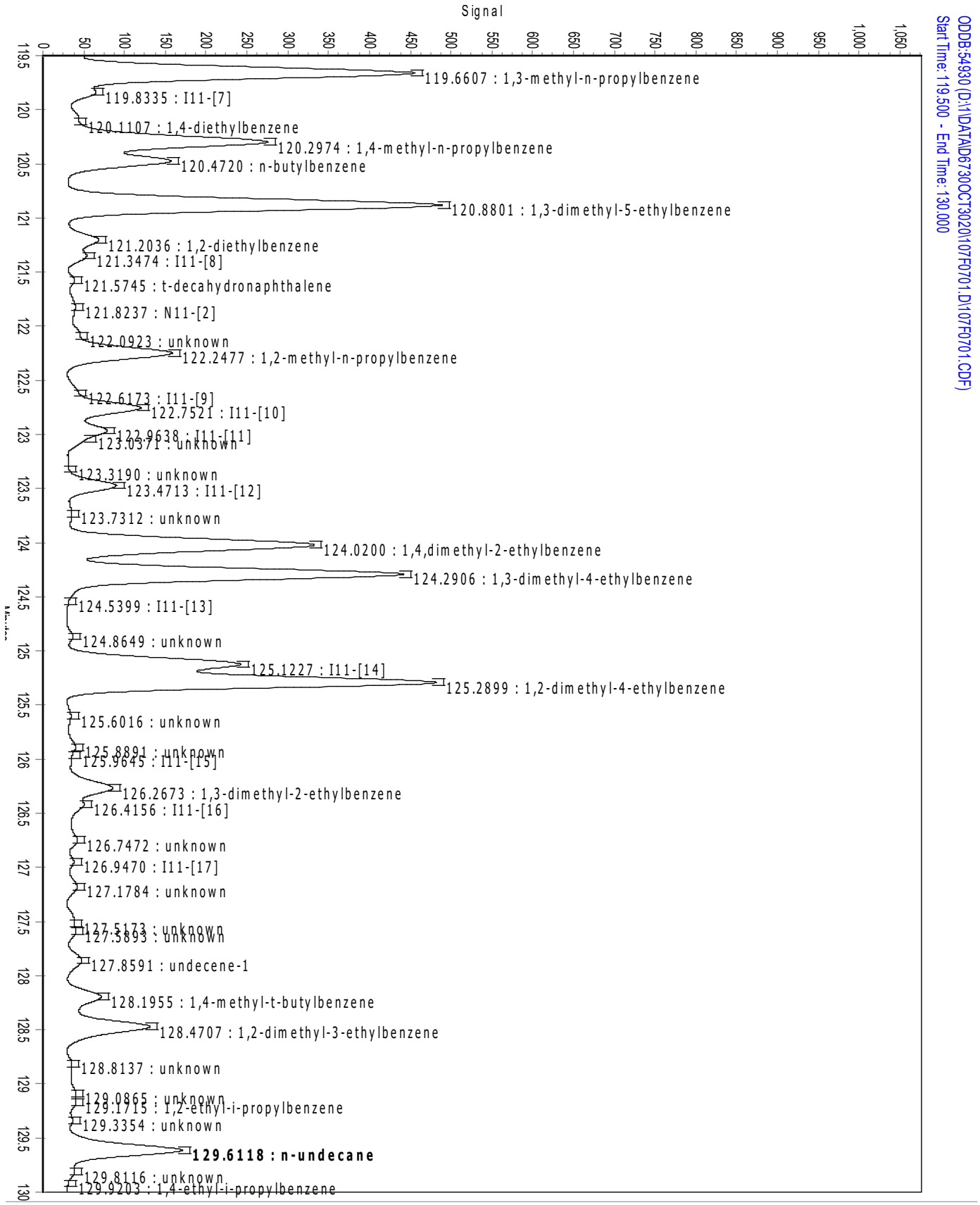


ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 89.500 - End Time: 100.000

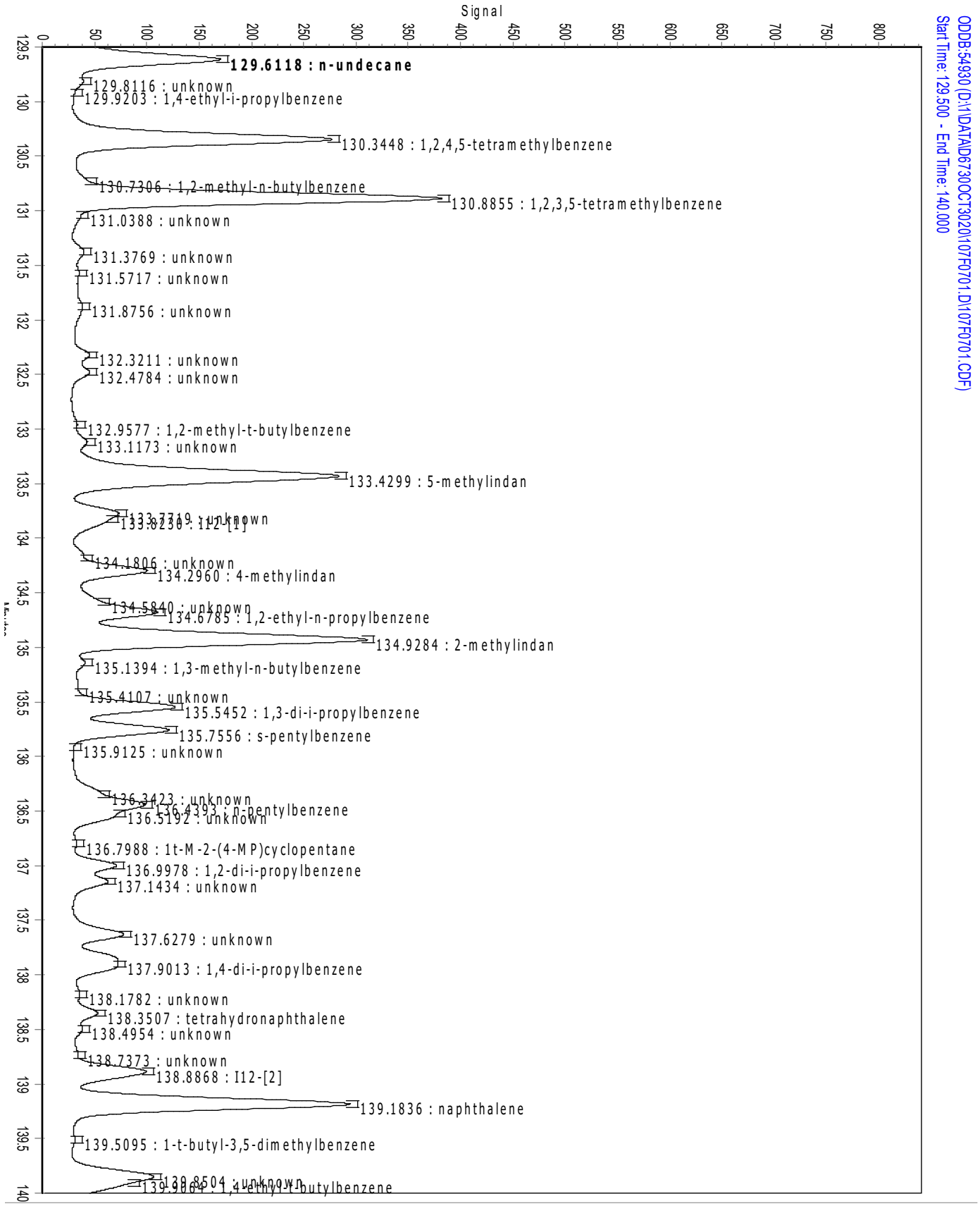

Signal
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
4,200
4,400
4,600
4,800
5,000
5,200
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 99.500 - End Time: 110.000
99.5
100
100.5
101
101.5
102
102.5
103
103.5
104
104.5
105
105.5
106
106.5
107
107.5
108
108.5
109
109.5
110
99.5511 : n-propylbenzene
99.8472 : 3,6-dimethyloctane
100.1034 : 3-methyl-5-ethylheptane
100.2468 : unknown
100.5683 : N10-[3]
101.1930 : unknown
101.5003 : 1,3-methylethylbenzene
101.8863 : 1,4-methylethylbenzene
102.1980 : N10-[4]
102.3593 : unknown
102.7306 : unknown
102.9400 : unknown
103.2304 : 1,3,5-trimethylbenzene
103.4962 : I10-[5]
103.7630 : N10-[5]
103.9591 : unknown
104.1918 : I10-[6]
104.5105 : 5-methylnonane
104.9139 : 4-methylnonane
105.2593 : 1,2-methylethylbenzene
105.4454 : 2-methylnonane
105.5960 : unknown
105.8672 : unknown
106.0988 : 3-ethyloctane
106.1834 : unknown
106.4712 : N10-[6]
106.8033 : 3-methylnonane
107.0082 : unknown
107.3740 : N10-[7]
107.5449 : I10-[7]
107.8172 : I10-[8]
108.1015 : unknown
108.5577 : 1,2,4-trimethylbenzene
108.7990 : unknown
108.9723 : I10-[9]
109.0774 : i-butylcyclohexane
109.2674 : unknown
109.3864 : I10-[10]
109.6687 : I10-[11]
109.8120 : I10-[12]



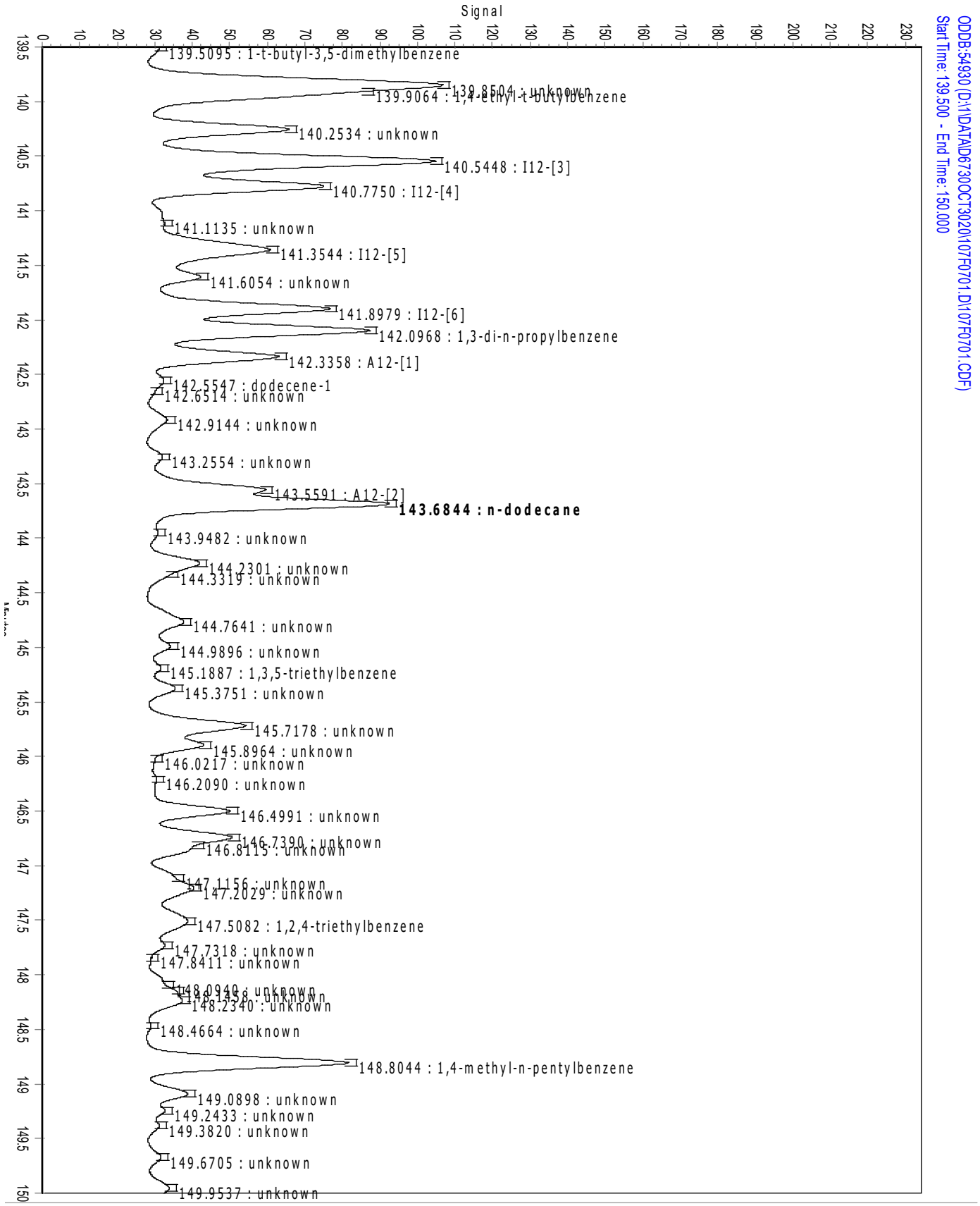
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 109.500 - End Time: 120.000

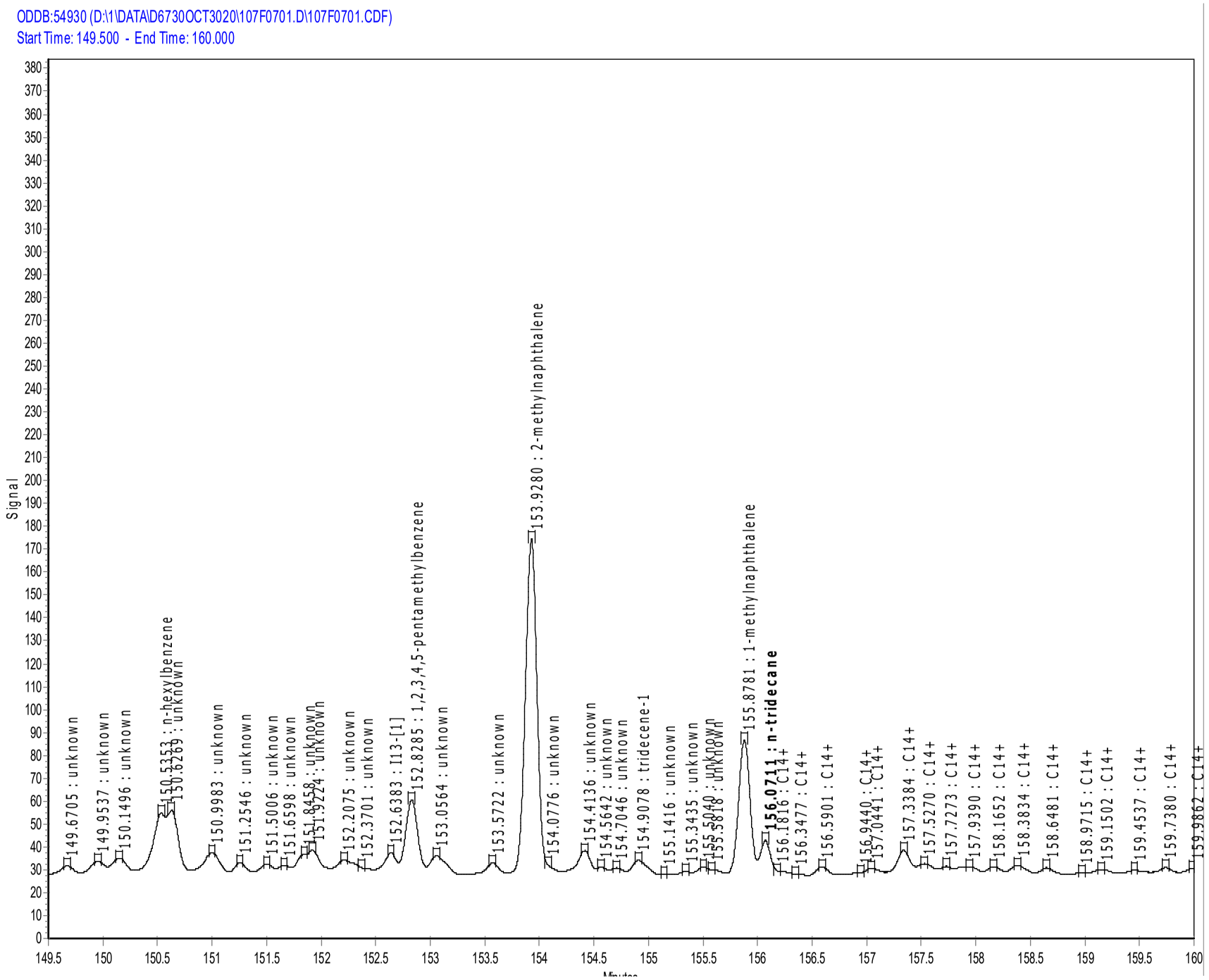


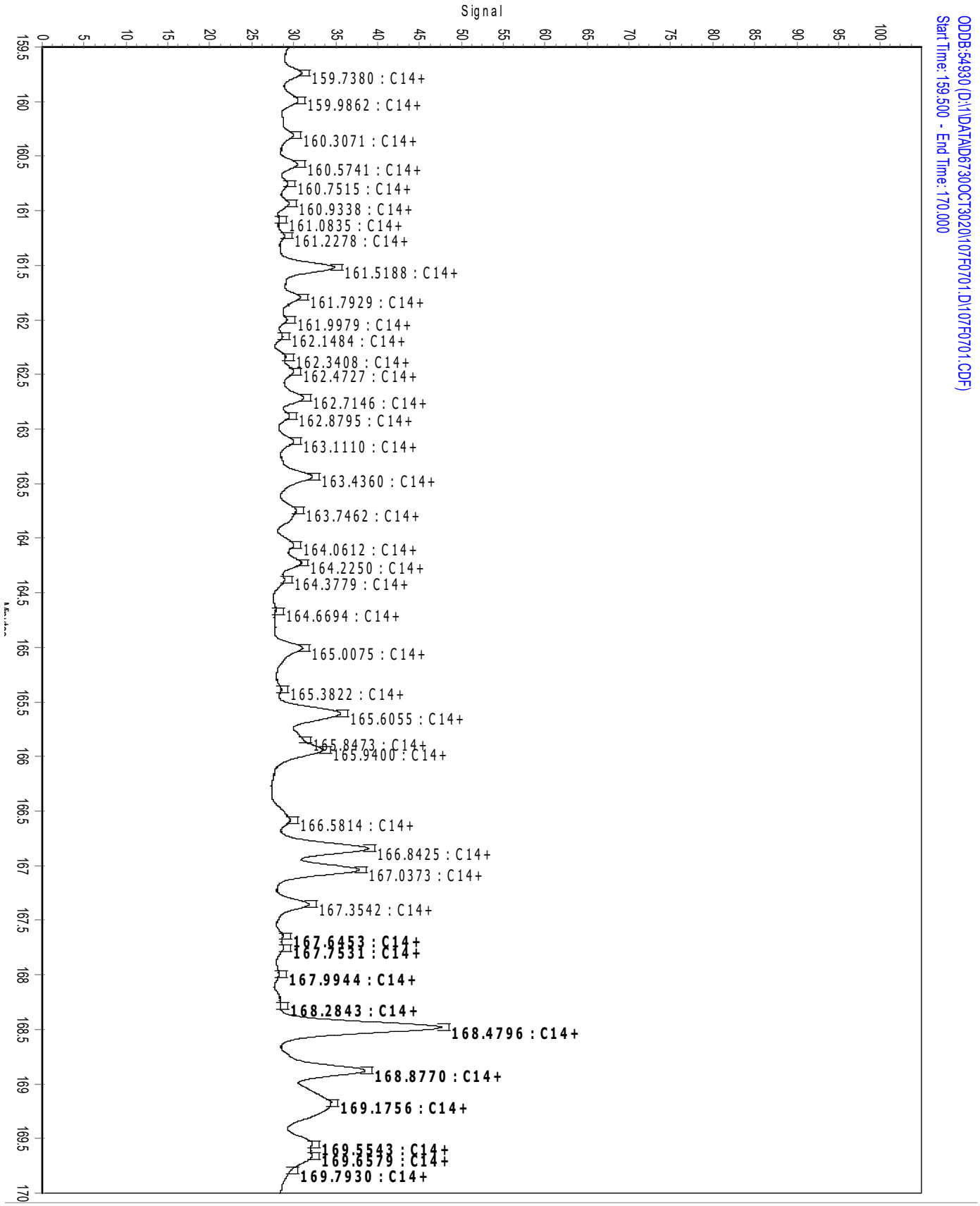
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 119.500 - End Time: 130.000



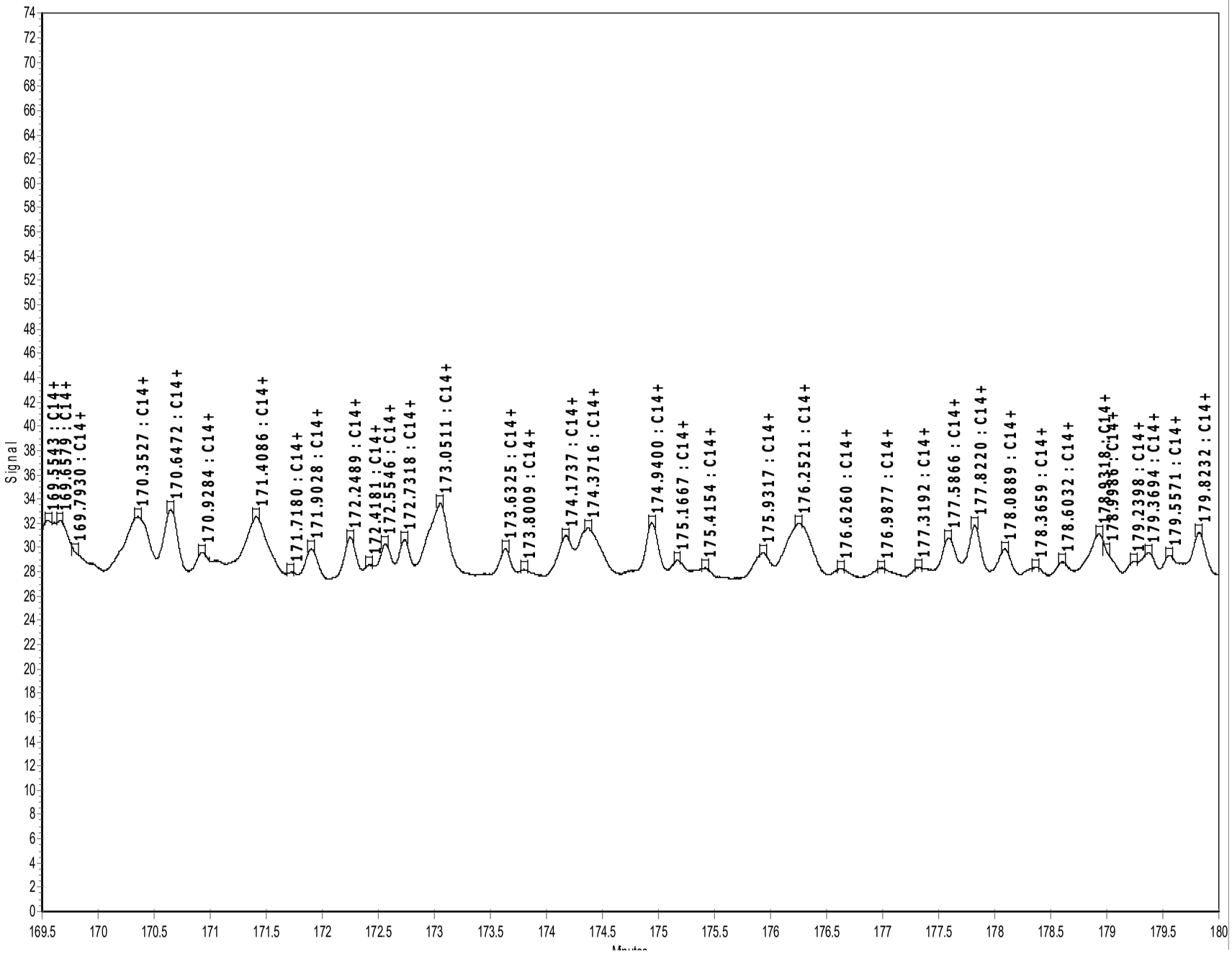
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 129.500 - End Time: 140.000


Signal
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 139.500 - End Time: 150.000
139.5095 : 1-t-butyl-3,5-dimethylbenzene
139.8504 : unknown
139.9064 : 1,4-ethyl-t-butylbenzene
140.2534 : unknown
140.5448 : I12-[3]
140.7750 : I12-[4]
141.1135 : unknown
141.3544 : I12-[5]
141.6054 : unknown
141.8979 : I12-[6]
142.0968 : 1,3-di-n-propylbenzene
142.3358 : A12-[1]
142.5547 : dodecene-1
142.6514 : unknown
142.9144 : unknown
143.2554 : unknown
143.5591 : A12-[2]
143.6844 : n-dodecane
143.9482 : unknown
144.2301 : unknown
144.3319 : unknown
144.7641 : unknown
144.9896 : unknown
145.1887 : 1,3,5-triethylbenzene
145.3751 : unknown
145.7178 : unknown
145.8964 : unknown
146.0217 : unknown
146.2090 : unknown
146.4991 : unknown
146.7390 : unknown
146.8115 : unknown
147.1156 : unknown
147.2029 : unknown
147.5082 : 1,2,4-triethylbenzene
147.7318 : unknown
147.8411 : unknown
148.0940 : unknown
148.1458 : unknown
148.2340 : unknown
148.4664 : unknown
148.8044 : 1,4-methyl-n-pentylbenzene
149.0898 : unknown
149.2433 : unknown
149.3820 : unknown
149.6705 : unknown
149.9537 : unknown

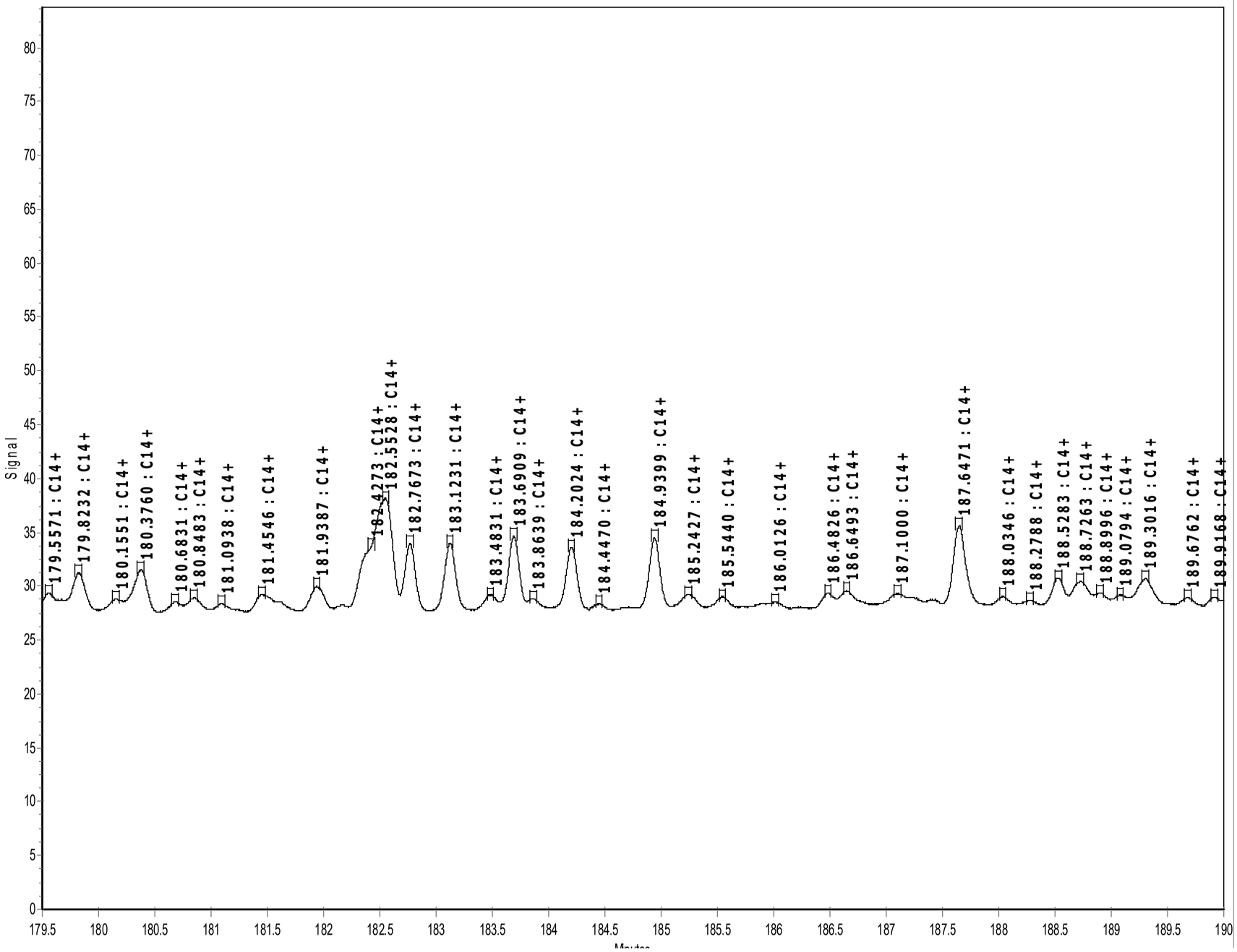

ODDB:54930 (D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 149.500 - End Time: 160.000
Signal
Minutes
149.6705 : unknown
149.9537 : unknown
150.1496 : unknown
150.5353 : n-hexylbenzene
150.8269 : unknown
150.9983 : unknown
151.2546 : unknown
151.5006 : unknown
151.6598 : unknown
151.8458 : unknown
151.9224 : unknown
152.2075 : unknown
152.3701 : unknown
152.6383 : I13-[1]
152.8285 : 1,2,3,4,5-pentamethylbenzene
153.0564 : unknown
153.5722 : unknown
153.9280 : 2-methylnaphthalene
154.0776 : unknown
154.4136 : unknown
154.5642 : unknown
154.7046 : unknown
154.9078 : tridecene-1
155.1416 : unknown
155.3435 : unknown
155.5040 : unknown
155.5818 : unknown
155.8781 : 1-methylnaphthalene
156.0711 : n-tridecane
156.1816 : C14+
156.3477 : C14+
156.5901 : C14+
156.9440 : C14+
157.0441 : C14+
157.3384 : C14+
157.5270 : C14+
157.7273 : C14+
157.9390 : C14+
158.1652 : C14+
158.3834 : C14+
158.6481 : C14+
158.9715 : C14+
159.1502 : C14+
159.4537 : C14+
159.7380 : C14+
159.9862 : C14+


Signal
ODDB:54930 (D:\1DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 159.500 - End Time: 170.000
159.7380 : C14+
159.9862 : C14+
160.3071 : C14+
160.5741 : C14+
160.7515 : C14+
160.9338 : C14+
161.0835 : C14+
161.2278 : C14+
161.5188 : C14+
161.7929 : C14+
161.9979 : C14+
162.1484 : C14+
162.3408 : C14+
162.4727 : C14+
162.7146 : C14+
162.8795 : C14+
163.1110 : C14+
163.4360 : C14+
163.7462 : C14+
164.0612 : C14+
164.2250 : C14+
164.3779 : C14+
164.6694 : C14+
165.0075 : C14+
165.3822 : C14+
165.6055 : C14+
165.8473 : C14+
165.9400 : C14+
166.5814 : C14+
166.8425 : C14+
167.0373 : C14+
167.3542 : C14+
167.6453 : C14+
167.7531 : C14+
167.9944 : C14+
168.2843 : C14+
168.4796 : C14+
168.8770 : C14+
169.1756 : C14+
169.5543 : C14+
169.6579 : C14+
169.7930 : C14+

ODDB:54930 (D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 169.500 - End Time: 180.000



ODDB:54930 (D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 179.500 - End Time: 190.000



ODDB:54930 (D:\1\DATA\D6730OCT3020\107F0701.D\107F0701.CDF)
Start Time: 189.500 - End Time: 192.378