Emissions from 4 Different Light Duty Vehicle Technologies Operating on Low Blend Ethanol Gasoline

Report B: Tailpipe Regulated & Unregulated Gaseous Emissions (CO, NO_X, THC, NMHC, NMOG, Ethanol, Carbonyls, VOC)

ERM REPORT # 04-27 B

ENVIRONMENTAL TECHNOLOGY CENTRE

EMISSIONS RESEARCH AND MEASUREMENT

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Executive Summary

The primary objective of this research program was to characterize the emissions of vehicles with various engine and emission control technologies when operated on low blend ethanol gasolines. This program was undertaken to help identify and quantify the emissions impact of ethanol blended fuels on the tailpipe and evaporative emissions.

This report discusses gaseous emissions of carbon monoxide (CO), oxides of nitrogen (NO_X), total hydrocarbon (THC), non-methane hydrocarbons (NMHC), non-methane organic gases (NMOG), ethanol, carbonyls (including formaldehyde and acetaldehyde), and volatile organic carbons (VOC). Specific reactivity and ozone forming potential are also discussed. Emission rates are presented on a weight per distance basis (g/mile). The Appendix to this report presents all emission rate data and the detailed results of the statistical analyses. Separate reports from this research program discuss tailpipe greenhouse gas emissions, evaporative emissions, and particulate matter emissions.

Testing was conducted using a 4-phase implementation of the Federal Test Procedure (FTP) and the US06 driving cycle. The FTP based driving cycle allowed examination of a cold engine start, a hot engine start, and stabilized transient operation typical of a non-demanding style of urban and suburban driving. The US06 driving cycle represented aggressive, high speed driving and incorporated rapid speed fluctuations. Emissions measurements were performed on three multi port fuel injection (MPFI) vehicles and one gasoline direct injection (GDI) vehicle. The test vehicles included:

- 1998 Ford Escort ZX2 (US EPA Tier 1 emission standard, available in North America)
- 2001 Nissan Sentra CA (California SULEV emission standard, available in North America)
- 2003 Dodge Caravan (US EPA LEV emission standard, available in North America)
- 2000 Mitsubishi Dion GDI (Japanese LEV emission standard, not currently available in North America)

The Escort and the Sentra were tested at both 20°C and -10°C. The Caravan and the Dion were tested at 20°C only. Tests were performed using four summer grade fuels (for tests at 20°C) and four winter grade fuels (for tests at -10°C). For each seasonal grade, the test fuels included a base fuel containing no ethanol, a 20% ethanol tailor blend, a 10% ethanol tailor blend, and a 10% ethanol splash blend. The splash blend fuels were made by simply "splash" blending a volume of ethanol with the base fuel, resulting in lower sulphur, higher octane, and higher vapour pressure than the base fuel. Since changes in these fuel qualities will have an impact on emissions, tailor blend fuels were custom designed to have similar sulphur, octane, and vapour pressure as the base fuel. Each base fuel was tested twice for each vehicle, once at the beginning and once at the end of the test program.

The major findings include:

- Observed differences in emission rates were primarily found on the driving cycle that involved cold engine start. The cycles that involved warm engine start and aggressive driving occasionally saw emissions differences. The stabilized portion of the LA4 driving cycle rarely had differences in emissions rates.

- Cold temperature operation mainly affected the emission rates from the driving cycle that involved cold engine start. Cold temperature operation rarely affected emission rates after the vehicles had warmed up to operating temperature.

- Increasing fuel ethanol content resulted in a decrease in CO emissions for all vehicle technologies during cold engine start and aggressive driving conditions. This decrease in CO occurred at both 20°C and -10°C operation, but was not always statistically significant

- Increasing fuel ethanol content resulted in an increase in NO_X emissions for all vehicle technologies, particularly during engine start (both cold and warm) and aggressive driving conditions. This effect was stronger at cold operating temperatures, but was not always statistically significant. An exception

to this trend was the NO_X emissions from the SULEV vehicle at 20°C operation, which did not appear to be affected by fuel ethanol content.

- Increasing fuel ethanol content reduced the THC emissions from the GDI vehicle. For the MPFI vehicles, E10 fuel caused an increase in THC emissions, while E20 fuel caused a decrease in THC emissions (over the base fuel). These patterns were also observed for the NMHC and NMOG emissions. The changes observed were not always statistically significant.

- Ethanol emissions increased with increasing fuel ethanol content for all vehicle technology. Ethanol emissions were highest for cold engine start; once the vehicles were running at operating temperature ethanol emissions were very low or undetectable. Operation at cold temperature resulted in higher ethanol emission rates as compared to operation at standard temperature.

- The presence of ethanol in the fuel increased the formaldehyde emissions for all vehicle technologies during cold engine start and aggressive driving conditions. These increases were not always statistically significant.

- The presence of ethanol in the fuel increased the acetaldehyde emissions for all vehicle technologies during cold engine start and aggressive driving conditions. These increases were statistically significant for the cold engine start driving cycles but not always statistically significant for the aggressive driving cycles.

- The VOC profiles were very similar among the four fuels for a given vehicle and were typical of a mixture of combustion gases and unburned fuel. The target compounds present were due to the gasoline content of the fuel and decreased with increasing fuel ethanol content.

- Fuel ethanol content did not affect the specific reactivity or ozone forming potential of the exhaust from the MPFI vehicles. For the GDI vehicle, increasing fuel ethanol content resulted in decreasing specific reactivity and ozone forming potential of the exhaust.

- Some differences in emission rates were observed between the tailor blended and splash blended E10 fuels; however relative to the standard deviations of the data, these differences were generally small.

- Relatively small ethanol emissions were present during some of the tests with E0 fuel, likely due to hang up of ethanol in the vehicle fuel system. These findings indicate that the canister conditioning and vehicle preparation procedures minimized but did not completely eliminate fuel carry-over

- The Caravan “flex fuel” operation during this testing program was found to be unreliable. Monitoring of the on board fuel ethanol sensor via the OBD II access port indicated that the sensor continually measured an ethanol content of zero; therefore it is possible that the engine did not realize any specially designed engine parameters for ethanol fuel operation

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1. Introduction

1.1 Program Objective

The primary objective of the overall research program was to characterize the emissions of vehicles with various engine and emission control technologies when operated on low level ethanol-gasoline blends. The overall study examined the exhaust and evaporative emissions in a manner that focused on identifying specific modes of operation where elevated emissions may occur. The results of this research may be used to evaluate technologies that could be used to mitigate any elevated emissions identified during the initial characterization phase. The information gathered may also be used in emission inventory development and as input to atmospheric chemistry models.

This research program studied a wide range of emission species, including:

- *Regulated emissions*, including carbon monoxide (CO), oxides of nitrogen (NO_X), total hydrocarbons (THC) non-methane hydrocarbons (NMHC), non-methane organic gases (NMOG), total particulate matter (TPM), and formaldehyde (HCHO)
- *Greenhouse gases*, including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O)
- *Other criteria air contaminants*, such as sulphur dioxide (SO_2), ammonia (NH_3)
- Particulate phase organic and elemental carbon (OC/EC)
- Particulate phase organic and inorganic ions, including sulphate
- Vapour phase organic acids
- Polycyclic aromatic hydrocarbons (PAHs) and nitrated polycyclic aromatic hydrocarbons (N-PAHs)
- Carbonyl compounds, including acetaldehyde
- Ethanol
- Particulate matter sizing (aerodynamic diameter)

1.2 Report Objective

This report outlines the *tailpipe regulated and unregulated gaseous* emissions from four test vehicles operated at two test temperatures (20°C and -10°C) on fuels of varying ethanol blends. Tailpipe emissions of carbon monoxide (CO), oxides of nitrogen (NO_X), total hydrocarbon (THC), non-methane hydrocarbons (NMHC), non-methane organic gases (NMOG), ethanol, carbonyls (including formaldehyde and acetaldehyde), and volatile organic carbons (VOC) are presented. Specific reactivity and ozone forming potential are also discussed. Results include data from tests performed on all four vehicles using four summer grade fuels (one base fuel, three ethanol blend fuels) and data from tests performed on two vehicles using four winter grade fuels (one base fuel, three ethanol blend fuels).

Other reports from this program discuss other pollutants of interest and evaporative emissions:

- Report 04-27–A : Tailpipe Greenhouse Gases
- Report 04-27–C: Particulate Matter Emissions
- Report 04-27–D: Evaporative Emissions

2. Background

The air quality concerns at the local and regional level that arise from gasoline-powered mobile-source emissions are ground level ozone (smog), toxic air pollutants, and carbon monoxide. The major ozone precursors come from emissions of volatile organic compounds (VOC), oxides of nitrogen (NO_X) and, to a lesser extent, carbon monoxide (CO). Because ozone formation is related to temperature and sunlight, ozone problems occur primarily in hot weather; however Toronto recently experienced its first winter smog event. Toxic air pollutants are a year-round problem, but are also more pronounced in hot weather. Carbon monoxide emissions from mobile sources are greater in cold weather, and elevated levels of CO are primarily a wintertime air quality problem.

There have been significant advances over the past decade in the development of clean fuels and vehicles to address the deterioration of our urban air quality. One of the most significant advances has been in the area of reformulated gasoline. These fuels typically contain oxygenates such as methyl or ethyl –tertiary butyl ether (MTBE or ETBE), or ethanol. The primary objective of the oxygenated fuels is to maintain vehicle performance while reducing the emissions of smog forming volatile organic compounds, as well as other toxics associated with motor vehicle exhaust. Given the recent environmental concerns that have emerged concerning the detection of MTBE in groundwater in the United States, there is growing potential for widespread replacement of MTBE by ethanol as the oxygenate of choice.

Compared with straight gasoline and gasoline containing MTBE, ethanol blended gasoline results in changes in some vehicle tailpipe emissions. Most toxic air pollutants and other pollutants (except acetaldehyde, formaldehyde, and Peroxyacetyl nitrate, or PAN) decrease when ethanol is added to gasoline.[I] This occurs primarily through dilution of the gasoline feedstock. Formaldehyde emissions are lower for ethanol blends than for MTBE blends. Atmospheric levels of formaldehyde and acetaldehyde are related to both primary emissions and atmospheric reactions. PAN is not directly emitted, but formed by atmospheric reaction.

Another consideration is the formation of organic sulphonic acids in the exhaust by reaction of aldehydes with sulphur dioxide. Ethanol may increase the emissions of acetaldehyde and, if the ethanol fuel is also a higher sulphur fuel, increased formation of these organic sulphonic acids could be observed.

At present Environment Canada and the US EPA require automobile manufacturers to certify their emission control systems on a prescribed set of fuels. Except for ethanol flexible fuelled vehicles, gasoline-powered motor vehicles are not required to certify their tailpipe emission control systems on ethanol fuels. Ethanol flexible fuelled vehicles are required to certify their tailpipe emission systems on pure gasoline and 85% ethanol blend gasoline.

Another motivation for producing ethanol blended gasoline is to potentially mitigate greenhouse gases that contribute to climate change. Although there is no reduction of CO_2 emissions at the tailpipe due to the use of ethanol blended fuels, the lifecycle greenhouse gas emissions from ethanol as a fuel may be lower than petroleum based fuels because ethanol is produced from renewable sources such as corn, which draws CO_2 from the atmosphere as it grows. Quantifying the lifecycle greenhouse gas reductions from the use of ethanol blended fuel depends on a number of factors, such as how the feedstock is harvested, how the ethanol is produced, and how the final product is transported. There are currently differing views in the scientific community about the impact of ethanol blended gasoline on climate change. More research is needed for a conclusion to be drawn.

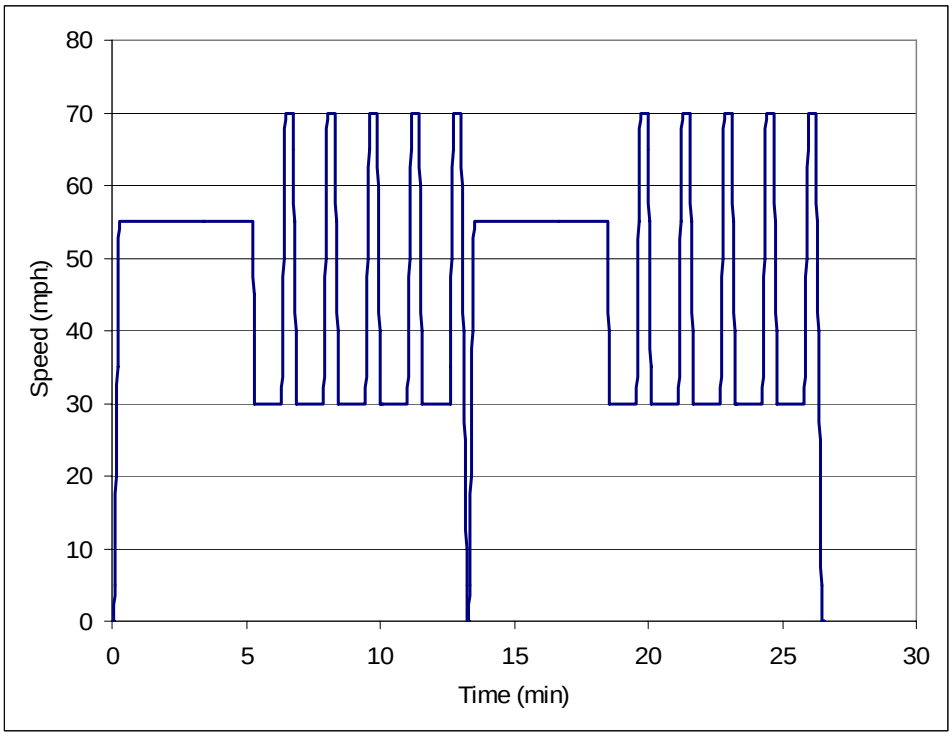
Research programs that investigate the emissions from vehicles running on ethanol blended gasoline, as well as research programs that study the lifecycle emission impact of ethanol blended gasoline are important for the development of policies that would determine support of the widespread introduction of ethanol as an oxygenate for Canadian gasoline.

3. Testing Details

3.1 Testing Procedure

To determine the effects of the low sulphur fuel used in this study, it was necessary to perform a conditioning sequence on each vehicle to remove residual sulphur from the catalyst. This sulphur removal procedure was developed by the University of California Riverside College of Engineering – Center for Environmental Research and Technology (CE-CERT).[2] The procedure involved running the vehicle at a rich air/fuel ratio and at a high catalyst temperature to facilitate the formation of hydrogen sulphide from the residual sulphur on the catalyst. The driving cycle is shown in Figure 1, and during each peak in the cycle it was necessary that the temperature of the exhaust going into the catalyst reached 700°C and that the air fuel ratio went rich. The sulphur removal procedure was complete after 10 peaks of high temperature and rich air/fuel ratio were completed.

Figure 1: Sulphur Removal Driving Cycle



A preparation procedure was conducted on each vehicle at the beginning of the testing program and whenever the test fuel was changed. This procedure is outlined in Table 1, and was done to minimize fuel carry over from test to test and to ensure that the vehicle condition was consistent for the beginning of each test.

Table 1: Vehicle Preparation Procedure

Step #	Action
1	Drain fuel
2	Fill vehicle with test fuel
3	Drive 2 LA4 driving cycles
4	Drain fuel
5	Fill vehicle with test fuel
6	Drive 2 LA4 driving cycles
7	Overnight soak at test temperature

The emissions testing procedure is outlined in Table 2. This procedure was conducted on each fuel until two sets of repeatable results were available for each phase of each driving cycle. Note that steps 3 and 9 were conducted on the testing done at 20°C only.

Table 2: Emissions Testing Procedure

Step #	Action
1	Drain fuel
2	Fill vehicle with chilled test fuel
3 *	SHED test (Heat build) for 1 hour
4	Cold start LA4
5	20 minute soak
6	Hot start LA4
7	20 minute soak
8	US06
9 *	SHED test (Hot soak) for 1 hour
10	Overnight soak at test temperature

** step done for 20°C tests only*

The charcoal canister of the vehicle collects evaporative hydrocarbon emissions during the SHED tests. The collected vapours are then purged into the engine during the driving cycles. These canisters are never fully purged during driving and always maintain a fixed amount of trapped vapour, which is called the canister "heel". This presented a problem because of the possibility of carry over of fuel from test to test.

To mitigate this problem, two new canisters were purchased for each vehicle at the beginning of the program and seasoned using the summer grade base testing fuel. The 20°C testing began using Canister #1, and the fuels were tested in ascending ethanol content starting with the base fuel. Before the repeat 20°C tests were performed, Canister #1 was replaced with a new seasoned canister, Canister #2. The repeat base fuel tests were therefore performed with identical canister conditions as the initial base fuel tests.

To prepare for the -10°C testing, Canister #1 was purged for approximately 4 weeks alternately with pressurized clean air and under vacuum to remove as much of the canister heel as possible. The -10°C testing began using Canister #2 (previously only used for summer grade base fuel) and the fuels were tested in ascending ethanol content starting with the base fuel. Before the repeat -10°C tests were performed, Canister #2 was replaced with Canister #1. Although Canister #1 had been exposed to ethanol fuels from the 20°C testing, it is believed that the purging process removed most of the ethanol contamination making the initial and repeat base fuel tests as similar as possible with regards to canister conditions.

The canister conditioning and vehicle preparation procedures minimized but did not completely eliminate fuel carry-over. The fuel lines and other components of the fuel system appeared to absorb ethanol from the fuel and continued to release small but measurable quantities of ethanol into the base fuel on the repeat tests. This situation is discussed in more detail in Section 7.5 of this report.

3.2 Test Vehicles

Four vehicles of differing technologies were tested in this program. A summary of these vehicles is as follows:

- 1998 Ford Escort ZX2 (US EPA Tier 1 emission standard, available in North America)
- 2001 Nissan Sentra CA (California SULEV emission standard, available in North America)
- 2003 Dodge Caravan (US EPA LEV emission standard, available in North America)
- 2000 Mitsubishi Dion (Japanese LEV emission standard, not currently available in North America)

1998 Ford Escort ZX2

The 1998 Ford Escort ZX2 test vehicle was a 2.0 L, 4 cylinder subcompact car with an automatic transmission, a 130 hP (at 5750 rpm) engine, and a curb weight of 2478 lb. The EnerGuide fuel economy for the Escort is 30 mpg in the city and 43 mpg on the highway (fuel consumption of 9.3 L/100 km city, 6.5 L/100km highway) when running on regular unleaded gasoline [3]. At the beginning of the testing program, the Escort odometer read approximately 80,000 km (approximately 50,000 mi).

This vehicle was manufactured under the United States Environmental Protection Agency (US EPA) Tier 1 Emission Standard for Passenger Cars, which is outlined in Table 3.[4] Note that because of the age and mileage of the vehicle, it falls into the "*100,000 miles / 10 years*" category. These standards apply to measurements made over the Federal Test Procedure (FTP) driving cycle. Of the three test vehicles available in North America, the Escort was the oldest and had the least stringent emission standard. It was therefore expected to have the highest emission rates out of the three North American vehicles.

Table 3: US EPA Tier 1 Emission Standard for Gasoline Passenger Cars (g/mile)

Driving Cycle	Time Frame	Total Hydrocarbon (THC)	Non-Methane Hydrocarbon (NMHC)	Carbon Monoxide (CO)	Oxides of Nitrogen (NO_X)	Particulate Matter (PM)
FTP	50,000 miles / 5 years	0.41	0.25	3.4	0.4	0.08
	100,000 miles / 10 years	-	0.31	4.2	0.6	0.10

2001 Nissan Sentra CA

The 2001 Nissan Sentra CA (Clean Air) test vehicle was a 1.8 L, 4 cylinder compact car with an automatic transmission, a 122 hP (at 6000 rpm) engine, and a curb weight of 2627 lb. The EnerGuide fuel economy for the Sentra is 31 mpg in the city and 43 mpg on the highway (fuel consumption of 9.0 L/100km city, 6.5 L/100km highway) when running on regular unleaded gasoline.[5] At the beginning of the testing program, the Sentra odometer read approximately 12,000 km (approximately 8,000 mi).

This vehicle was manufactured under the California Super Ultra Low Emission Vehicle (SULEV) Emission Standard for Passenger Cars, which is outlined in Table 4.[6] This standard applies to measurements made over the FTP driving cycle. Emissions regulations for the Supplemental Federal Test Procedure (SFTP), which includes the US06 driving cycle and the SC03 driving cycle, are also included in this standard. The SC03 driving cycle examines the effect of air conditioner use on emissions, and is not relevant to this study. Of the vehicles tested in this study, the Sentra is regulated under the most stringent emissions standard and was therefore expected to have the lowest emissions when compared to the other vehicles.

Table 4: California LEV II, SULEV Emission Standard for Passenger Cars (g/mile)

Driving Cycle	Time Frame	Non-Methane Organic Gases (NMOG)	Carbon Monoxide (CO)	Oxides of Nitrogen (NO_X)	Particulate Matter (PM)	Formaldehyde (HCHO)
FTP	120,000 miles / 11 years	0.010	1.0	0.02	0.01	0.004

2003 Dodge Caravan SE FFV

The 2003 Dodge Caravan SE FFV test vehicle was a 3.3 L, 6 cylinder minivan with an automatic transmission, a 180 hP (at 5200 rpm) engine, and a curb weight of 3869 lb. This vehicle was manufactured as a flex fuel vehicle and is capable of running on gasoline-ethanol blended fuels of up to 85% ethanol (E85). The EnerGuide fuel economy for the Caravan is 24 mpg in the city and 34 mpg on the highway (fuel consumption of 12.0 L/100km city, 8.2 L/100km highway) when running on regular unleaded gasoline. When running on E85, the EnerGuide fuel economy is 15 mpg in the city and 23 mpg on the highway (fuel consumption of 18.5 L/100km city, 12.5 L/100km highway).[7] At the beginning of the testing program, the Caravan odometer read approximately 25,000 km (approximately 15,000 mi).

The Caravan was manufactured under the US EPA Low Emission Vehicle (LEV) Emission Standard for Light Duty Trucks as part of the US EPA National Low Emission Vehicle (NLEV) Program. The NLEV program began in the north-eastern states with vehicle model year 1999, and became a US national program with vehicle model year 2001. This program was designed to harmonize the US Federal and the more stringent California vehicle emission standards. The details of the emission standard are outlined in Table 5.[8] Note that because of the age and mileage of the Caravan, it falls into the "*50,000 miles / 5 years*" category. This standard applies to measurements made over the FTP driving cycle. Emissions regulations for the Supplemental Federal Test Procedure (SFTP), which includes the US06 driving cycle and the SC03 driving cycle, are also included in this standard.

Table 5: US EPA LEV Emission Standard for Light Duty Trucks, Weight 3751 – 5750 lb (g/mile)

Driving Cycle	Time Frame	Non-Methane Organic Gases (NMOG)	Carbon Monoxide (CO)	Oxides of Nitrogen (NO_X)	Particulate Matter (PM)	Formaldehyde (HCHO)
FTP	50,000 miles / 5 years	0.100	4.4	0.4	n/a	0.018
	100,000 miles / 10 years	0.130	5.5	0.5	0.10	0.023

2000 Mitsubishi Dion Exceed

The 2000 Mitsubishi Dion Exceed test vehicle was a 2.0 L, 4 cylinder small utility wagon with an automatic transmission, a curb weight of 3115 lb and a 133 hP (at 5800 rpm) gasoline direct injection (GDI) engine. Mitsubishi has stated that, as compared to a conventional gasoline engine, their GDI engine delivers up to 20% less fuel consumption and lower NO_X, SO_X, CO, THC, and particulate emissions. EnerGuide fuel economy values are not available for this vehicle; however Mitsubishi has stated that the Dion has fuel consumption of 13.0 km/L during the Japan 10.15 Mode driving cycle[9] (equal to 37 mpg or 7.7 L/100km). This vehicle was manufactured under the Japanese Low Emission Vehicle (LEV) Emission Standard, which is outlined in Table 6.[10] At the beginning of the testing program, the Dion odometer read approximately 25,000 km (approximately 15,000 mi).

Table 6: Japanese LEV Emission Standard for Light Duty Vehicles, Weight > 1.7 t (g/mile)

Driving Cycle	Carbon Monoxide (CO)	Total Hydrocarbon (THC)	Oxides of Nitrogen (NO_X)
J-LEV	1.08	0.13	0.13

The Japanese emission standards and fuel economy ratings cannot be directly compared to the US EPA emission standards and EnerGuide fuel economy ratings. This is because the Japanese standards and fuel economy ratings are applicable to measurements made over the Japan 10.15 Mode driving cycle. This driving cycle is quiet different from the Federal Test Procedure, which is used for the US EPA emission standards and EnerGuide fuel economy ratings. In 2001 ERMD conducted emissions tests on the Dion using standard FTP testing conditions. The vehicle emission levels were found to comply with Tier 1 LDV emission standards, as outlined in Table 3. The fuel economy was found to be 32 mpg in the city and 45 mpg on the highway (fuel consumption of 8.8 L/100 km city and 6.3 L/100 km highway).

With a conventional multi point injection (MPI) fuel system, the fuel is injected into the engine intake ports, where it mixes with air before entering the cylinder. With a GDI fuel system, the fuel is injected directly into the cylinder, similar to a diesel engine fuel intake system. By eliminating the step of air/fuel mixing in the intake port and by incorporating a relatively high compression ratio, the GDI engine can more tightly control injection timing to meet vehicle load requirements. According to Mitsubishi, under most driving conditions and up to speeds of 120 km/h the GDI engine operates using an ultra lean air/fuel ratio (A/F ratio of 30 – 40), which is expected to result in a decrease in fuel consumption and fuel-enrichment related emissions. At higher speeds, or when operating at high loads, the GDI engine operates with a more rich air/fuel ratio (A/F ratio of 13 – 24), which sacrifices improved fuel consumption and lower emissions for enhanced performance.[11]

Although not currently sold in Canada, analysis of this technology is beneficial because as more stringent emissions standards are introduced, technology will change to meet these standards. If the reductions in fuel consumption and pollutant emission rates are valid, this technology may become available for sale in Canada. Canada is moving towards using ethanol blended fuels; The *Government of Canada Action Plan 2000 on Climate Change* (released in 2000) set a goal of 10% ethanol blended gasoline in 25% of the Canadian gasoline market[12], and The *Climate Change Plan for Canada* (released in 2002) increased this goal to reach 35% of the Canadian market[13]. With this in mind, the effect of ethanol blend fuels on GDI equipped vehicles must be well understood before this technology is embraced in Canada.

3.3 Test Fuels

The test fuel names, grades and descriptions are summarized in Table 7. Summer grade fuels were used for the testing conducted at 20°C, while winter grade fuels were used for the testing conducted at -10°C. The winter grade fuels were formulated to have higher RVP than the summer grade fuels, which is necessary to obtain proper fuel vaporization in the vehicle combustion chambers at cold temperatures.

One possible method of preparing ethanol blend fuels is to simply "splash" blend a volume of ethanol with a base fuel. This method results in an ethanol blend fuel that has lower sulphur, higher octane, and higher vapour pressure than the base fuel. Since changes in these fuel qualities will have an impact on emissions, tailor blend fuels were also examined in this study. The tailor blend fuels were designed to have similar sulphur, octane, and vapour pressure as the base fuel and to represent typical Canadian fuel properties. Selected fuel properties for the summer grade and the winter grade fuels are outlined in and Table 8 and Table 9 respectively. The complete fuel analysis data set is included in Appendix 1.

Table 7: Fuel Names and Descriptions

Fuel Grade	Fuel Name	Fuel Description
Summer	S-E0	Base Fuel, no ethanol
	S-E10	Tailor blend, 10% ethanol
	S-E10-Spl	Splash blend, 10% ethanol
	S-E20	Tailor blend, 20% ethanol
Winter	W-E0	Base Fuel, no ethanol
	W-E10	Tailor blend, 10% ethanol
	W-E10-Spl	Splash blend, 10% ethanol
	W-E20	Tailor blend, 20% ethanol

Table 8: Summer Grade Fuel Analysis Results

Fuel Property	Units	E0	E10	E10-Spl	E20
Specific Gravity	kg/L	0.705	0.725	0.717	0.734
Net Heating Value	BTU/lb_m	18927	18127	18182	17319
Energy Density	BTU/L	29358	28923	28674	27948
Fuel Fraction Carbon	Wt. Fraction	0.848	0.825	0.812	0.789
Fuel Fraction Oxygen	Wt. Fraction	0	0.036	0.036	0.073
Sulphur Content	ppm	34	34	31	35
Research Octane No.	n/a	88.6	90.0	96.0	92.0
Motor Octane No.	n/a	86.0	85.0	89.0	85.7
RVP	Psi	8.8	8.6	9.4	8.7

Table 9: Winter Grade Fuel Analysis Results

Fuel Property	Units	E0	E10	E10-Spl	E20
Specific Gravity	kg/L	0.693	0.726	0.705	0.714
Net Heating Value	BTU/lb_m	18975	18096	18200	17494
Energy Density	BTU/L	28927	28903	28216	27463
Fuel Fraction Carbon	Wt. Fraction	0.847	0.816	0.805	0.774
Fuel Fraction Oxygen	Wt. Fraction	0	0.036	0.037	0.073
Sulphur Content	ppm	33	33	26	27
Research Octane No.	n/a	88.2	90.0	94.0	100.0
Motor Octane No.	n/a	85.0	84.3	89.5	90.0
RVP	Psi	13.4	13.1	13.8	13.2

3.4 Driving Cycles & Test Temperatures

Testing was conducted at two temperatures: 20°C and -10°C. The testing at 20°C was conducted with the summer grade fuels. The testing at -10°C was performed with the winter grade fuels.

The vehicles were tested over two driving cycles to investigate the change in emissions from the vehicle technologies while operating on the various fuel compositions and under the different driving conditions.

LA4 Driving Cycle

The test cycle used to determine compliance with criteria emissions standards was based on the 3-phase Federal Test Procedure (FTP). In this study a 4-phase version was used to simplify particulate matter sample collection and still provide the desired information on cold and hot start effects.

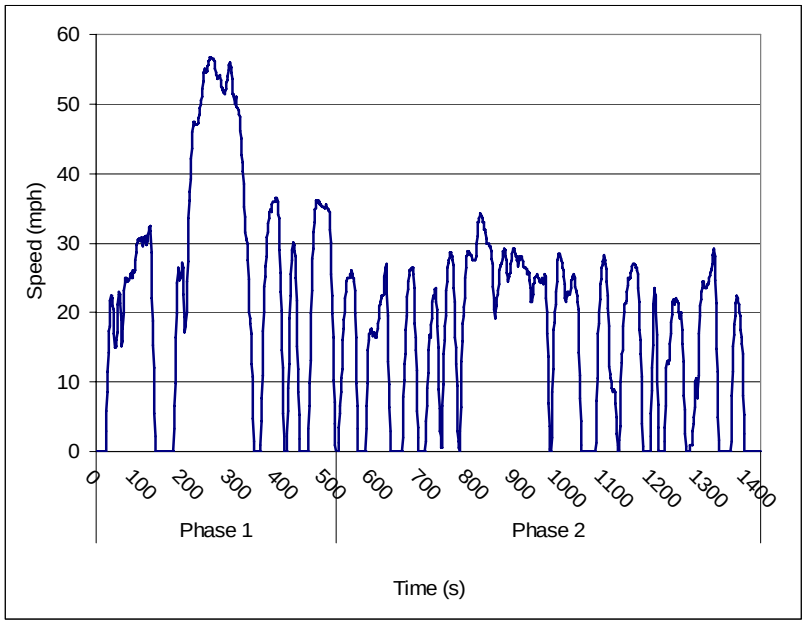
Phase 1 and 2 of the FTP driving cycle are collectively referred to as the LA4 cycle. Phase 1 allows examination of engine start-up conditions, while Phase 2 represents stabilized transient operation typical of a non-demanding style of urban and suburban driving as well as city fuel economy. Phases 1 is 505 seconds in length and covers a distance of 3.6 mi with an average speed of 25.6 mph and a maximum speed of 56.7 mph. Phase 2 of the LA4 follows immediately from Phase 1. This phase is 865 seconds in duration and covers a distance of 3.9 mi with an average speed of 16.1 mph and a maximum speed of 34.3 mph. For this study, the LA4 cycle was performed twice, with a 20 minutes soak period in between to facilitate filter changes for particulate matter sample collection.

The vehicle was allowed to soak overnight at the test temperature before the first LA4 cycle of each testing day. Because of the resulting cold engine conditions at start-up, this first LA4 cycle is referred to as a "Cold Start LA4" or "CSLA4". At the conclusion of the CSLA4, the vehicle and sampling systems were turned off for a twenty-minute soak period. After the soak, the vehicle and sampling systems were restarted and the LA4 cycle was repeated. Because the engine conditions were warm for the start-up of this second LA4 cycle, it is referred to as a "Hot Start LA4" or "HSLA4".

The differences in emissions between the Phase 1 CSLA4 and the Phase 1 HSLA4 were due primarily to the difference in engine start temperature and how long the emissions control technology took to reach operating temperature. During the Phase 2 CSLA4 and Phase 2 HSLA4 the emission control technology should have been functioning optimally and emissions from these two tests should be nearly identical.

Figure 2 illustrates the LA4 driving cycle. Note that while Phase 1 of the LA4 reaches higher speeds, Phase 2 of the LA4 contains more stop/start and acceleration/deceleration sequences.

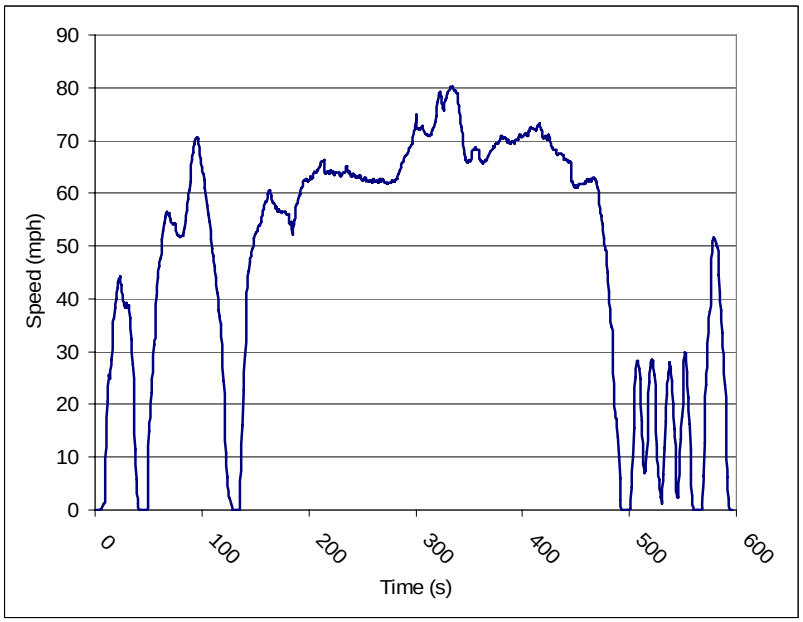
Figure 2: LA4 Driving Cycle



US06 Driving Cycle

The US06 driving cycle was developed to represent aggressive, high speed, hard acceleration/deceleration driving. It incorporates rapid speed fluctuations and better represents "real world" driving behaviour following start-up as compared to the LA4 driving cycle. This single-phase cycle is 600 seconds long and covers a distance of 8.1 mi with an average speed of 48.4 mph and a maximum speed of 80.3 mph. Figure 3 illustrates this driving cycle.

Figure 3: US06 Driving Cycle



4. Sample Collection & Analytical Methods

Test procedures used in this program comply with those specified in the Canadian Environmental Protection Act and are equivalent to those specified in the U.S. Code of Federal Regulations (US CFR) Title 40 Part 86, unless otherwise specified.

The total volume of exhaust produced by the vehicle was collected and diluted using a total exhaust dilution constant volume sampling (CVS) system. The total dilute exhaust volume flow rate was 330 scfm (9,345 L/min). The dilution air was taken from the test cell and was conditioned using a HEPA filter, which removed particulate matter with an efficiency of 99.9%. The organic composition of the dilution air was reduced and stabilized by passing it through a bed of activated carbon. Dilution was accomplished within 3 feet of the vehicle tailpipe to minimize particulate matter losses. The transfer line from the vehicle tailpipe to the dilution system was stainless steel to minimize contamination of the dilute exhaust.

Prior to the start of this test program, the dilution system was pressure washed to avoid contamination from previous experiments. During vehicle preconditioning, the inner surfaces of the tunnel were equilibrated with the exhaust of the vehicle before emissions samples were collected. The particulate matter levels in the dilution air were routinely monitored throughout the testing program.

Samples for determining emissions of CO, NO_X, and THC were collected on a per phase basis, resulting in two samples for each LA4 driving cycle and one sample for each US06 driving cycle. For each dilute exhaust sample collected, a corresponding dilution air sample was collected. Samples were collected at a constant rate through a venturied probe to fill large Tedlar™ bags. The bag samples were automatically analyzed at the end of each driving cycle using the automated instruments located in the test cell.

For carbonyl analysis, samples were collected from the CVS from all driving cycles on a per phase basis, resulting in two samples for each LA4 driving cycle and one sample for each US06 driving cycle. In addition, one dilution air sample was collected over each sampling day. The samples were drawn from the dilution tunnel through Sep-Pak silica cartridges coated with 2,4-Dinitrophenylhydrazine (2,4-DNPH), and analyzed at an on-site laboratory.

Dilute exhaust samples for determining speciated VOCs, methane and ethanol were collected from the CVS from all driving cycles on a per phase basis, resulting in two samples for each LA4 driving cycle and one sample for each US06 driving cycle. In addition, one dilution air sample was collected for each LA4 and US06 driving cycle. The samples were drawn from the dilution tunnel and collected in Tedlar™ bags. All samples underwent analysis within 8 hours of collection at an on-site laboratory.

4.1 Carbon Monoxide (CO)

Dilute exhaust and dilution air concentrations of CO were determined using a Horiba Non-Dispersive Infra-Red (NDIR) instrument (Model AIA 23). This is a dedicated analyzer, specifically used for vehicle emissions testing. The lower detection limit of the CO analyzer is 0.6ppm. The corresponding distance based detection limits for each driving cycle are outlined in Table 10.

Table 10: Detection Limit Ranges for CO Analysis

	Lower D.L.	
Concentration	0.6	ppm
Phase 1 LA4	0.02	g/mile
Phase 2 LA4	0.02	g/mile
US06	0.008	g/mile

4.2 Oxides of Nitrogen (NO_X)

Dilute exhaust and dilution air concentrations of NO_X were determined using a Horiba Chemiluminescence instrument (Model CLA-22A). This is a dedicated analyzer, specifically used for vehicle emissions testing. The lower detection limit of the NO_X analyzer is 0.6ppm. The corresponding distance based detection limits for each driving cycle are outlined in Table 11.

Table 11: Detection Limit Ranges for NO_X Analysis

	Lower D.L.	
Concentration	0.6	ppm
Phase 1 LA4	0.02	g/mile
Phase 2 LA4	0.03	g/mile
US06	0.01	g/mile

4.3 Total Hydrocarbon (THC)

Dilute exhaust and dilution air concentrations of THC were determined using a Horiba Flame Ionization instrument (Model FIA-23A). This is a dedicated analyzer, specifically used for vehicle emissions testing. The lower detection limit of the THC analyzer is 0.6ppm. The corresponding distance based detection limits for each driving cycle are outlined in Table 12.

Table 12: Detection Limit Ranges for THC Analysis

	Lower D.L.	
Concentration	0.6	ppm
Phase 1 LA4	0.008	g/mile
Phase 2 LA4	0.01	g/mile
US06	0.004	g/mile

4.4 Ethanol

Dilute exhaust and dilution air concentrations of ethanol were made using an Innova Model 1312 Photoacoustic Multi-Gas Analyzer following ERMD Standard Method #4.9. The detection limit for ethanol on this analyser is 0.3 ppm. Distance-based limits of detection can be found in Table 13.

Table 13: Detection Limit Ranges for Ethanol Analysis

	Lower D.L.	
Concentration	0.3	ppm
Phase 1 & 3	1.3	mg/mile
Phase 2 & 4	2.0	mg/mile
US06	6.7	mg/mile

4.5 Carbonyls

Dilute exhaust and dilution air samples were collected on Sep-Pak silica cartridges coated with 2,4-Dinitrophenylhydrazine (2,4-DNPH). Carbonyl compounds selectively reacted with the 2,4-DNPH to form hydrazones, which remained retained by the cartridge. The hydrazones were dissolved and removed from the cartridge by elution with acetonitrile. The eluate was then analyzed by reverse phase High Performance

Liquid Chromatography (HPLC) with ultraviolet (UV) detection. The list of target compounds is given in Table 14.

Table 14: HPLC Target Compounds for Carbonyl Analysis

ID#	Compound Name
1	formaldehyde
2	acetaldehyde
3	acrolein
4	acetone
5	propionaldehyde
6	crotonaldehyde
7	methacrolein
8	2-butanone
9	iso&butyraldehyde
10	benzaldehyde
11	isovaleraldehyde
12	valeraldehyde
13	o-tolualdehyde
14	m&p-tolualdehyde
15	hexanaldehyde
16	2-5 dimethylbenzaldehyde

Carbonyls were determined using an Agilent 1100 Series Liquid Chromatograph with an Ultraviolet-Visible (UV-Vis) light diode array detector equipped with a deuterium lamp. Component identification was made by analysis of certified standards with retention time comparison. Table 15 lists the analytical conditions, including detection limits.

Table 15: HPLC Parameters for Carbonyl Compound Analysis

Instrument	Agilent 1100 Series Liquid Chromatograph
Detector	Ultraviolet-Visible (UV-Vis) light diode array equipped with a deuterium lamp
Column	Two Zorbax® Eclipse XBD-C18 narrow-bore columns 2.1 × 150mm, 3.5µm packing
Guard Column	Eclipse XBD-C8 narrow-bore guard column 2.1 × 12.5mm, 5µm packing
Sample size	5µL
Detection Limit	Concentration: 0.0011 µg/mL in liquid extract Phase 1 LA4: 0.003 mg/mile Phase 2 LA4: 0.003 mg/mile US06: 0.001 mg/mile

4.6 Speciated Volatile Organic Carbon (VOC) Analysis

Approximately 160 non-methane hydrocarbons were determined using a Hewlett Packard 5890 Series II gas chromatograph with a flame ionization detector. An Entech M7000 cryogenic concentrator was used for sample concentration and introduction. The analytical conditions are summarized in Table 16. The analytical method was calibrated using external standards on a per component basis. The hydrocarbon gas phase standards used were prepared in-house using a permeation tube gas standard generator.

Table 16: Analytical Conditions for Non-Methane Hydrocarbon Analysis

Column	HP1 50m x 0.32 mm x 1 μm film Column head pressure 80 kPa
Oven Program	-50°C hold 5 min, 10°C/min to 50°C, 5°C /min to 200 °C, hold 2 min.
Detector	FID, 300 °C
Sample Concentration	50 mL on glass bead/Tenax trap microscale purge and trap mode.

The preconcentrator system does not allow for the determination of methane and sometimes the C_2 hydrocarbons are not well retained on the trap. Methane was determined and confirmation of the C_2 and C_3 hydrocarbons was accomplished by simple gas loop injection onto a capillary column. The sample loop was flushed with sample, the pressure inside the loop was allowed to equilibrate to ambient conditions and the contents of the loop were injected directly onto the capillary column. A Hewlett Packard 5890 Series II Gas Chromatograph equipped with a gas sampling valve and a Flame Ionization Detector (FID) was used for the analysis. The analytical conditions are summarized in Table 17.

Table 17. Analytical Conditions for Light Hydrocarbon Analysis

Column	GS-Q 30 m x 0.53 mm column head pressure 9 psig
Oven Program	40°C hold 1.1 min, 25 °C/min 130 °C hold 7.3 min
Detector	FID, 180 °C
Sample	0.25 mL sample loop, sample valve at 100 °C

The detection limits are summarized in Table 18. The list of target analytes for the complete analysis is given in Appendix 11. Note that the analyte list for the Escort and Sentra tests at 20°C varies slightly from the analyte list for the Escort and Sentra tests at -10°C and the Caravan and Dion tests at 20°C.

Table 18. Detection Limits for Hydrocarbon Speciation Analysis

	Detection Limits	
Methane (C_1)	Concentration:	4.4 ng/L
	Phase 1 LA4:	0.10 mg/mile
	Phase 2 LA4:	0.15 mg/mile
	US06:	0.05 mg/mile
C_2 and higher compounds	Concentration:	0.1 – 0.2 ng/L
	Phase 1 LA4:	0.002 – 0.004 mg/mile
	Phase 2 LA4:	0.003 – 0.007 mg/mile
	US06:	0.001 – 0.002 mg/mile

5. Calculations and Data Analysis

5.1 Oxygen-Corrected THC

Total hydrocarbon (THC) emissions are due to unburned or partially burned fuel. The instrumentation used to determine THC responds differently to unburned ethanol as compared to unburned gasoline, and this effect must be corrected for. To obtain the oxygen-corrected THC values the proportion of the analyzer signal due to unburned ethanol is subtracted from the measured dilute exhaust concentration of THC. The oxygen-corrected THC emission rate is then calculated in the usual manner. As the ethanol content in the fuel increases, the oxygen-corrected THC content can be expected to decrease proportionally. The calculation for oxygen-corrected THC is as follows:

$$Oxygen - Corrected\ THC_{ppmC} = THC_{ppmC} - \left(R_{EtOH} * Ethanol_{ppmC}\right)$$

Where: R_{EtOH} = analyzer response factor to Ethanol (unitless)

5.2 Non-Methane Hydrocarbon (NMHC)

The Tier 1 emission standard under which the Escort was manufactured specifies a regulated emission rate for non-methane hydrocarbons (NMHC). NMHC is not directly measured, but rather is calculated from the measured dilute exhaust concentrations of total hydrocarbon (THC), oxygenates (ethanol for this study) and methane (CH_4). The analyzer response factors to methane and ethanol were determined empirically at the beginning of this study. The NMHC concentrations are then used to calculate emission rates in the normal manner. The calculation for NMHC is as follows:

$$NMHC_{ppmC} = THC_{ppmC} - \left(R_{EtOH} * Ethanol_{ppmC}\right) - \left(R_{CH4} * CH_{4\ ppmC}\right)$$

Where: R_{EtOH} = analyzer response factor to Ethanol (unitless)
R_{CH4} = analyzer response factor to Methane (unitless)

5.3 Non-Methane Organic Gases (NMOG)

The California LEV II SULEV and US EPA LEV emission standards under which the Sentra and Caravan were respectively manufactured specify a regulated emission rate for non-methane organic gases (NMOG). NMOG is not directly measured, but rather is calculated from the calculated emission rate of NMHC, the measured emission rates of oxygenates (ethanol for this study), and a group of 16 carbonyl compounds. The calculation for NMOG is as follows:

$$NMOG_{mg/mile} = NMHC_{mg/mile} + Ethanol_{mg/mile} + Carbonyls_{mg/mile}$$

5.4 Composite Emission Rate

To facilitate the comparison of the data, the Phase 1 CSLA4, Phase 2 CSLA4, Phase 1 HSLA4 and Phase 2 HSLA4 can be combined to calculate a single composite LA4 emission rate reflective of a weighted average of these four driving cycles. The calculation for the composite emission rate is as follows:

$$Composite\,(g/mile) = 0.43 \times \left(\frac{ER_{P1CSLA4} + ER_{P2CSLA4}}{D_{P1CSLA4} + D_{P2CSLA4}} \right) + 0.57 \times \left(\frac{ER_{P1HSLA4} + ER_{P2HSLA4}}{D_{P1HSLA4} + D_{P2HSLA4}} \right)$$

Where: ER_X = emission rate for Phase *x* (g/phase)
D_X = distance travelled in Phase *x* (miles)

5.5 Average & Standard Deviation

Each driving cycle was repeated 2 to 6 times for each fuel. The number of repeats conducted was determined by the consistency of the emission rate results. The averages of these tests are presented in this report along with the corresponding standard deviations. Outlying data, as determined by the Grubbs' Outlier Test using a 95% confidence interval, have been removed from these results. The Grubbs' test is outlined below[14]. Note that the "critical value" is chosen from the Grubbs' critical value table based on the number of data points. Less than 0.5% of the data were found to be outliers.

$$G_1 = \frac{\left|\bar{x} - x_i\right|}{s} \qquad where: \bar{x} = sample\ set\ mean, \quad x_i = suspected\ single\ outlier, \quad s = standard\ deviation\ for\ sample\ set$$

$$if\ G_1 > critical\ value \Rightarrow then\ x_i = outlier$$

5.6 Statistical Analysis (ANOVA Test)

The potential difference between the emissions from the E0 fuel as compared to the ethanol blend fuels were evaluated using analysis of variance (ANOVA) tests. The Microsoft Excel "Single Factor ANOVA" tool was used. The P-value given by this tool can be interpreted as the probability that the observed difference between the two fuels being compared is not greater than the differences within the repeat tests on the fuels. In other words, the P-value can bee seen as the probability that the differences between the two fuels is not statistically significant but due to random error. The P-value is a number between 0 and 1, where 1 equals 100% probability that the differences are due to random error.

In this report, two types of comparisons were made using the ANOVA test. First, the CO_2 emission rates from the initial tests on the E0 (base) fuel were compared to the CO_2 emission rates from the repeat tests on the E0 fuel. This comparison was done to determine if the vehicle operation had shifted during the testing program. The second type of comparison compared the emission rates from the ethanol blend fuels to the emission rates from the E0 fuel. This comparison was made to evaluate the effect of ethanol on the emission rates.

For this study a 95% confidence interval was used, meaning that P-values less than 0.05 indicate a statistically significant difference. When using a P-value less than 0.05, there is less than 1 chance in 20 that any statistically significant differences observed were actually due to random error.

The P-values for these comparisons are summarized for each emission type in the Appendices. For those comparisons that showed a statistically significant difference, the change is indicated in the table. NSD indicates no statistically significant difference. For those comparisons that showed a statistically significant difference, the percent difference between the fuels was also determined, using the following calculation:

$$\%\ Difference = \frac{Emission\ Rate\ of\ Ethanol\ Blend\ Fuel - Emission\ Rate\ of\ E0\ Fuel}{Emission\ Rate\ of\ E0\ Fuel}$$

$$Positive\ \%\ Difference = Emission\ Rate\ of\ Ethanol\ Blend\ Fuel > Emission\ Rate\ of\ E0\ Fuel$$

$$Negative\ \%\ Difference = Emission\ Rate\ of\ E0\ Fuel > Emission\ Rate\ of\ Ethanol\ Blend\ Fuel$$

5.7 Regression Analysis

To investigate the changes in emission rates with increasing ethanol content, regression analyses were performed on the test results. Results presented include the regression line slope, as well as the upper and lower limits of the slope using a 95% confidence interval.

The regression line slope can indicate two things. The sign of the value is indicative of the direction of the trend; negative slope indicates a decrease in emission rate with increasing ethanol content and positive slope indicates an increase. The magnitude of the slope is related to the magnitude of the increase/decrease (if significantly different from zero).

Test results that have upper and lower limits that span zero (i.e. upper limit is positive and lower limit is negative) are no different than zero within a 95% confidence interval and do not indicate a trend. Test results that have upper and lower limits with the same sign (i.e. both positive or both negative) indicate a statistically significant trend with a 95% confidence.

6. Results and Discussion - Repeatability of E0 Fuel Tests

Each vehicle was tested twice on the E0 fuel – once before the ethanol blend fuels were tested and once following the ethanol blend fuel tests. This was done to enable the detection of vehicle shift over the testing program. CO_2 emission rates are indicative of repeatability because CO_2 emissions are largely associated with fuel consumption and do not greatly vary from test to test (when using the same vehicle and fuel). This section presents only the final results of the repeatability analysis. Details on the statistical analysis of the repeatability data, as well as detailed results of CO_2 emission rates from all driving cycles, are discussed in ERMD Report 04-27 A: Tailpipe Greenhouse Gases.

6.1 20°C Testing

The CO_2 results reveal that for the majority of the tests on the Escort and the Sentra, the initial E0 fuel CO_2 emission rates were statistically different than those from the repeat E0 fuel tests. These statistical differences are believed to have been caused by a faulty muffler on the Escort, which invalidated the initial set of test results for both the Escort and the Sentra. For the Escort, any holes in the muffler may have allowed exhaust to escape and/or additional dilution air to enter. For both the Escort and the Sentra, the muffler material that became lodged in the sampling system may have changed the flow rate through the system by interfering with the critical flow venturi. For these reasons, the initial E0 fuel results from both the Escort and the Sentra were considered void and were not used in further analyses in this report. All future references to E0 fuel results from the Escort and the Sentra during 20ºC testing refer only to the repeat E0 fuel tests results.

The CO_2 results from the Caravan and the Dion reveal that there was generally no statistically significant difference between the initial E0 fuel CO_2 emission rates and those from the repeat E0 fuel; therefore the data sets were combined. All future references to E0 fuel results from the Caravan and the Dion during 20ºC testing refer the combined results from the initial and repeat E0 fuel.

6.2 -10°C Testing

The CO_2 results from the initial E0 fuel testing were not statistically different than those from the repeat E0 fuel testing; therefore the data sets were combined. All future references to E0 fuel results from the Escort and Sentra during -10ºC testing refer the combined results from the initial and repeat E0 fuel tests.

7. Results and Discussion – Fuel Comparison

7.1 Carbon Monoxide (CO)

Figure 4 and Figure 5 illustrate the carbon monoxide (CO) emission rates from the four vehicles over the LA4 and US06 driving cycles at the two test temperatures (20°C and -10°C respectively). These figures use units of grams of CO per mile travelled. Numerical emission rates can be found in Appendix 2a.

For all vehicles at 20°C, CO emissions were highest during cold engine start (Phase 1 of the CSLA4) and under aggressive driving conditions (US06). For the two vehicles that were tested at -10°C, cold temperature operation dramatically increased CO emissions from cold engine start, but had little effect on LA4 emissions once the vehicle was at normal operating temperature. For the Escort, cold temperature operation also caused an increase in CO emissions during US06 driving cycle.

Visually, the ethanol blend fuels generally resulted in a decrease in CO emission rates. To obtain a more objective analysis of the trends, linear regression analyses were performed on the emission rates as a function of ethanol content. The regression analysis results are presented Appendix 2b.

The majority of the regression analysis results indicate a negative slope, or decreasing CO emission rate, with increasing ethanol content of the fuel. Cold engine start (Phase 1 CSLA4), hot engine start (Phase 1 HSLA4) and aggressive driving conditions (US06) had larger CO emission rate decreases, while little effect on CO emissions was seen after the vehicle had reached normal operating temperatures (Phase 2 CSLA4 and Phase 2 HS LA4). Also note that only a handful of the regression trends were statistically significant, including the Dion over nearly all of the driving cycles, the Caravan over the Phase 1 HSLA4, the Sentra over the US06 cycle at 20°C, and the Escort over the Phase 1 CSLA4 at -10°C.

For the Escort, ethanol caused a much larger reduction in cold engine start CO emissions at -10°C as compared to 20°C, while the effect of ethanol under aggressive driving was weaker at -10°C as compared to 20°C. The CO reductions versus ethanol trends observed with the Sentra were similar between both temperatures.

The results of the ANOVA are similar to the trend analysis results above, and are presented in Appendix 2c. For the Escort, statistically significant decreases in CO emissions due to ethanol use were observed under aggressive driving conditions at 20°C operation and under cold engine start at -10°C operation. No effect was observed when the vehicle reached normal operating conditions under non-aggressive driving conditions. For the Sentra and the Caravan, the presence of ethanol in the fuel generally had no statistically significant effect. For the Dion, statistically significant decreases in CO emissions due to ethanol use were observed at engine start and under aggressive driving conditions. Generally no effect was observed when the vehicle reached normal operating conditions under non-aggressive driving conditions.

Visually comparing the E10 fuel to the E10-Spl fuel, the -10°C CO emissions from the E10-Spl fuel were higher than those from the E10 fuel for both the Escort and the Sentra. At 20°C the CO emissions from the E10-Spl fuel were sometimes higher (Escort US06, Dion LA4), sometimes lower (US06 for Sentra, Dion and Caravan), and sometimes similar (LA4 for Escort, Sentra and Caravan) to those from the E10 fuel. Compared to the standard deviations associated with these data, the differences between the E10 and E10-Spl at 20°C were small.

The ANOVA results comparing the E10 fuel to the E10-Spl fuel indicate that the E10-Spl fuel had statistically higher CO emissions than the E10 fuel for both the Escort and Sentra during the -10°C Phase 1 CSLA4. The ANOVA results generally show no statistically significant difference between the CO emissions from the E10 and E10-Spl fuels for the remainder of the -10°C tests for all vehicles during the 20°C testing.

Overall Conclusions

- For the Multi-Port Fuel Injection (MPFI) vehicles:
  - CO emissions were highest for cold engine start and aggressive driving cycles. The exception to this was the Sentra at -10ºC, which did not have increased CO emissions during aggressive driving.
  - Cold engine start at -10ºC had increased CO emissions as compared to cold engine start at 20ºC. Although increases in CO were also seen for other driving cycles at -10°C, this effect was smaller once the vehicle had reached operating temperature.
  - The presence of ethanol in the fuel appeared to decrease the CO emissions during engine start and aggressive driving conditions; however these decreases were not always statistically significant. Decreases ranged from 15-73% during engine start and from 8-92% during aggressive driving conditions.
  - The splash blended E10 fuel resulted in 35-50% higher CO emissions during engine start at cold temperature operation, as compared to the tailor blended E10 fuel. At 20°C there was no statistical difference in CO emissions between the two fuels.

- For the Gasoline Direct Injection (GDI) vehicle:
  - Cold engine start resulted in a slight increase in CO emissions over warm engine start. This increase is relatively small as compared to the increases experienced by the MPFI vehicles.
  - CO emissions decreased as the ethanol content of the fuel increases. This was particularly evident during cold engine start and aggressive driving, which had decreases ranging from 3-55% and 20-45% respectively.
  - There was no difference in CO emissions between the E10 and E10-Spl fuels.

Figure 4: CO Emission Rates (g/mile) from 20°C Tests

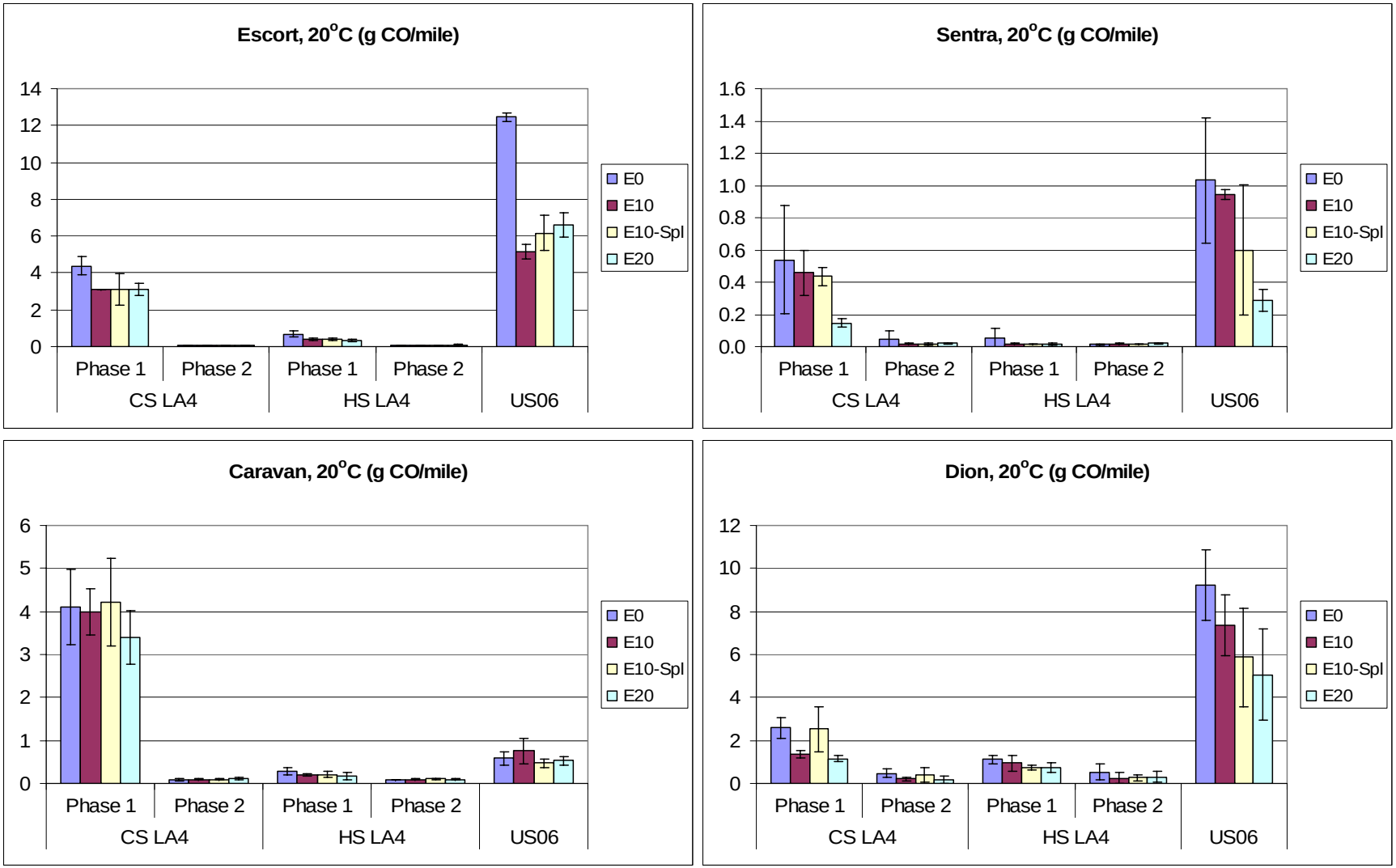
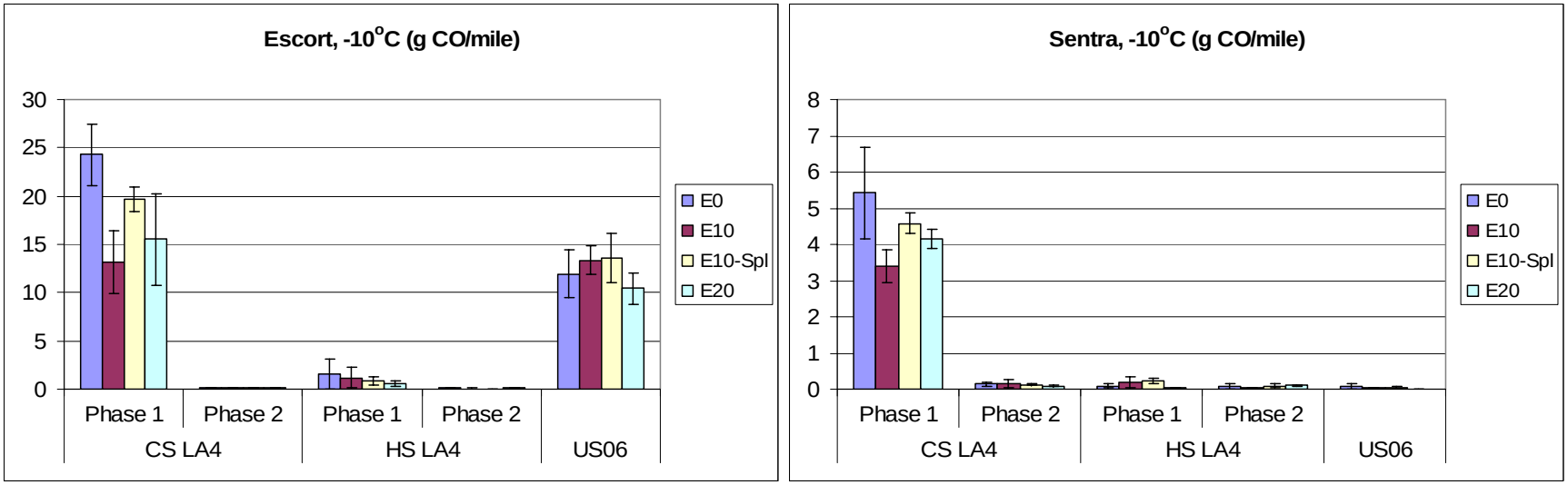


Figure 5: CO Emission Rates (g/mile) from -10°C Tests



7.2 Oxides of Nitrogen (NO_X)

Figure 6 and Figure 7 illustrate the oxides of nitrogen (NO_X) emission rates from the four vehicles over the LA4 and US06 driving cycles at the two test temperatures (20°C and -10°C respectively). These figures use units of grams of NO_X per mile travelled. Numerical emission rates can be found in Appendix 3a.

For all of the vehicles at both 20°C and -10°C the NO_X emissions were highest for driving cycles involving engine start (Phase 1 CSLA4, Phase 1 HSLA4, and US06), likely because the vehicle catalyst was cold. Once the catalyst had warmed up to operating temperature (Phase 2 CSLA4 and Phase 2 HSLA4), NO_X emissions decreased.

The 20°C NO_X emission rates from the Sentra were low and often below the detection limit, making it difficult to conclude on definite emission trends for this vehicle. This is due to the relatively high measurement uncertainty of low emission rates. At -10°C the Sentra NO_X emissions with the E20 fuel are unexpectedly high as compared to the other test cycles and vehicles. These elevated NO_X values were repeatable on both of the two test days, possibly indicating a reaction of the Sentra to the level of fuel ethanol content. A recent Environment Canada, ERM study has shown that operation on E85 can cause elevated NO_X emission rates [15]. There is also the possibility that these unexpected results may have been due to a problem during testing,

Visually, the ethanol blend fuels generally resulted in an increase in NO_X emission rates. To obtain a more objective analysis of the trends, linear regression analyses were performed on the emission rates as a function of ethanol content. The regression analysis results are presented in Appendix 3b.

For the Escort and the Caravan at 20°C, increasing ethanol content resulted in an increasing trend in NO_X emissions under cold engine start (Phase 1 CSLA4), hot engine start (Phase 1 HSLA4) and aggressive driving conditions (US06) while it had little effect on emissions after the vehicle had reached normal operating temperatures (Phase 2 CSLA4 and Phase 2 HS LA4). Increasing ethanol content resulted in an increasing trend in NO_X for the Dion over all driving cycles, and had essentially no effect on the NO_X emissions from the Sentra. Note that only 5 of the trends at 20°C were statistically significant.

For the two vehicles that were tested under cold temperature conditions (-10°C), increasing fuel ethanol content resulted in a statistically significant increasing trend in NO_X emissions for the LA4 driving cycles. With the US06 cycle, increasing ethanol content of the fuel resulted in a statistically significant increasing trend in NO_X emissions for the Sentra and a slight decreasing trend (not statistically significant) in NO_X emissions for the Escort. With these results it is important to consider the validity of the relatively high NO_X emissions from the Sentra with E20 fuel; these high emission rates greatly affected the trend analysis results. For all tests except the Escort during the US06 cycle, the effect of ethanol was stronger at -10°C as compared to at 20°C.

The results of the ANOVA are similar to the trend analysis results above and are presented in Appendix 3c. For the Escort, statistically significant increases in NO_X emissions due to ethanol use were observed for the Phase 1 CSLA4 at 20°C. At -10°C statistically significant increases in Escort NO_X emissions occurred for the E20 fuel over all LA4 driving cycles. For the Sentra during 20°C operation the ethanol fuel blends did not cause a statistically significant change in NO_X emissions. At -10°C operation the E20 fuel resulted in statistically significant increases in Sentra NO_X for all driving cycles but the Phase 2 HSLA4. The Caravan experienced statistically significant increases in NO_X emissions over the US06 cycle with E10-Spl and over the Phase 1 CSLA4 and Phase 1 HSLA4 with E20. The Dion experienced statistically significant increases in NO_X emissions over the Phase 1 CSLA4 with E10 and over the Phase 2 CSLA4 and Phase 2 HSLA4 with E20.

A visual comparison of the NO_X emissions from the Dion indicates that the emissions from the E10-Spl fuel were higher than those from the E10 fuel for all driving cycles. For the other 3 vehicles, a consistent trend regarding the NO_X emissions from the E10 fuel and E10-Spl fuel is not apparent; the E10-Spl NO_X emissions from these vehicles were sometimes higher, sometimes lower, and sometimes similar to those

from the E10 fuel. Note that many of the visual differences between the E10 and E10-Spl were small compared to the large standard deviations associated with these data.

The ANOVA results comparing the E10 fuel to the E10-Spl fuel indicate that for the majority of the tests there was no statistically significant difference between the E10 and E10-Spl fuels. The exceptions to this are the Caravan during the US06 and the Escort during the Phase 1 CSLA4 at -10°C. For both of these tests the E10-Spl fuel had statistically lower NO_X emissions as compared to the E10 fuel.

Overall Conclusions

- For the MPFI vehicles:
  - NO_X emissions were highest for cycles involving engine start (Phase 1 CSLA4, Phase 1 HSLA4 and US06).
  - The 20°C NO_X emission rates from the Sentra were low, making it difficult to conclude on definite emission trends for this vehicle; however the NO_X emission rates from this vehicle did not appear to be affected by fuel ethanol content.
  - For the Escort and Caravan at 20°C operation, increasing fuel ethanol content resulted in an increase in NO_X emissions over driving cycles involving engine start (Phase 1 CSLA4, Phase 1 HSLA4 and US06). Increases ranged from 14-91% during cold engine start, from 6-41% during warm engine start and from 1-30% during aggressive driving conditions
  - At -10°C operation with the Escort, increasing fuel ethanol content caused a 16-161% increase in NO_X emissions over the LA4 cycles and did not have a significant affect over the US06 cycle.
  - At -10°C operation with the Sentra, increasing fuel ethanol content caused an increase in NO_X emissions over all driving cycles. The relatively high NO_X emissions from the Sentra with E20 fuel are questionable.
  - For all tests except the Escort during the US06 cycle, the effect of ethanol was stronger at -10°C as compared to at 20°C.
  - There was no difference in NO_X emissions between the E10 and E10-Spl fuels.

- For the GDI vehicle:
  - NO_X emissions were highest for cycles involving engine start (Phase 1 CSLA4, Phase 1 HSLA4 and US06).
  - NO_X emissions once the vehicle had reached operating temperature (Phase 2 CSLA4 and Phase 2 HSLA4) were higher for the Dion as compared to the MPFI vehicles.
  - At 20°C operation, increasing fuel ethanol content resulted in increasing NO_X emissions over all driving cycles.
  - As compared to the tailor blended E10 fuel, the splash blended E10 fuel resulted in a 2-34% increase in NO_X emissions during all driving cycles; however the differences between the two fuels were not statistically significant.

Figure 6: NO_X Emission Rates (g/mile) from 20°C Tests

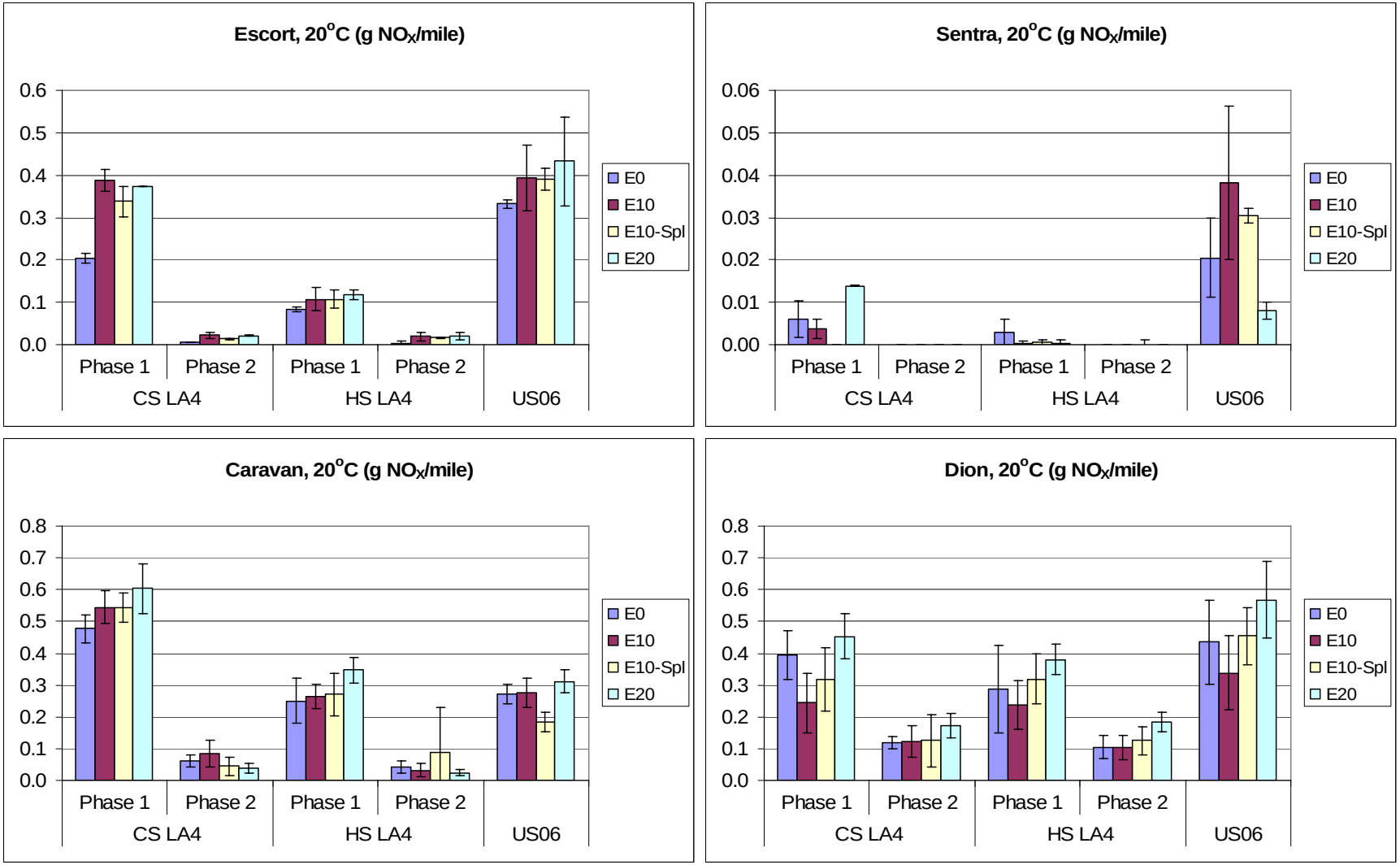
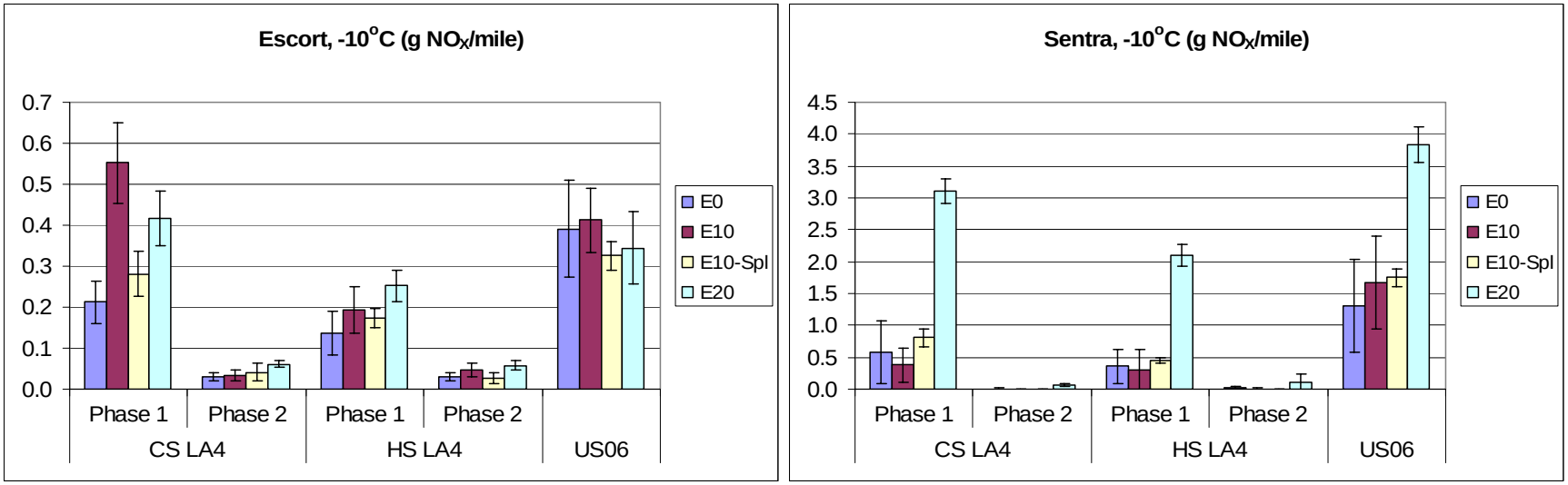


Figure 7: NO_X Emission Rates (g/mile) from -10°C Tests



7.3 Total Hydrocarbons (THC)

Figure 8 and Figure 9 illustrate the oxygen-corrected total hydrocarbon (THC) emission rates from the four vehicles over the LA4 and US06 driving cycles at the two test temperatures (20°C and -10°C respectively). These figures use units of grams of THC per mile travelled. Numerical emission rates can be found in Appendix 4a.

For all vehicles at both 20°C and -10°C, THC emissions were highest during cold engine start (Phase 1 of the CSLA4). For the two vehicles that were tested at -10°C, cold temperature operation dramatically increased THC emissions from cold engine start, but had little effect on emissions from the other cycles.

Visually, the THC emissions from the Escort and Sentra appear to have increased from E0 to E10 and then decrease with E20. Because of the high standard deviations associated with the Caravan THC results, a trend is difficult to identify; however the THC emissions from the E0, E10 and E20 fuels appear to be similar for this vehicle. The THC emission rates from the Dion appear to have decreased slightly with increasing fuel ethanol content. To obtain a more objective analysis of the trends, linear regression analyses were performed on the emission rates as a function of ethanol content. The regression analysis results are presented in Appendix 4b.

The majority of the regression analysis results indicate small slopes values as compared to the slope values seen with the CO and NO_X regression analysis. This supports the theory that fuel ethanol content did not greatly affect the THC emissions. The exception is the Dion during the Phase 1 CSLA4, in which a statistically significant decreasing trend was seen.

The results of the ANOVA analysis are presented in Appendix 4c. The majority of the ANOVA results from the Escort, Sentra and Caravan do not indicate a statistically significant difference between the E0 fuel and the ethanol blend fuels. The few ANOVA results from these vehicles that do show a statistically significant difference generally involve the E10 and E10-Spl fuels and the Phase 1 CSLA4 and US06 driving cycles; however these results do not show any particular trend concerning vehicle response or fuel effect. The ANOVA results from the Dion indicate a statistically significant decrease in THC during the Phase 1 CSLA4 driving cycle with the E10 and E20 fuels.

A visual comparison of the THC emissions from the E10 and E10-Spl fuel suggests that, as compared to the E10 fuel, the E10-Spl fuel had lower LA4 THC emissions for the Escort and the Sentra at both test temperatures and higher LA4 THC emissions for the Caravan and Dion. For all vehicles and test temperatures the US06 THC emissions were similar between the E10 and E10-Spl fuels. Note that for the Escort (at 20°C), the Caravan and the Dion the differences between the E10 and E10-Spl were small compared to the large standard deviations associated with these data.

The ANOVA results comparing the 20°C THC emissions from the E10 fuel to those from the E10-Spl fuel indicate that for the majority of the tests there was no statistically significant difference between the two fuels. The one exception to this is the Sentra Phase 1 CSLA4, in which the E10-Spl fuel had statistically lower THC emissions than the E10 fuel. At -10°C the ANOVA results indicate a statistically lower THC emission rate from the E10-Spl fuel for both the Escort and Sentra during the Phase 1 CSLA4.

Overall Conclusions

- For the MPFI vehicles:
  - THC emissions were highest for the driving cycle involving cold engine start.
  - Cold engine start at -10ºC increased THC emissions over cold engine start at 20ºC.
  - For the Escort and Sentra, the E10 fuel resulted in increased THC emissions over the E0 fuel, while the E20 fuel resulted in decreased THC emissions over the E0 fuel. For the cold engine start cycle this increase ranged from 13-31% at 20°C and from 47-66% at -10°C.
  - The THC emissions from the Caravan were similar for the E0, E10 and E20 fuels.

- As compared to the tailor blended E10 fuel, the splash blended E10 fuel resulted in 28-41% lower THC emissions during engine start at cold temperature operation. At standard temperature operation there was no difference in THC emissions between the two fuels.

- For the GDI vehicle:
  - THC emissions were highest for the driving cycle involving cold engine start.
  - THC emissions during cold engine start were reduced as fuel ethanol content increased. During the cold engine start cycle the THC emissions from the ethanol blends were 13-22% lower than the base fuel.
  - There was no difference in THC emissions between the E10 and E10-Spl fuels

Figure 8: Oxygen-Corrected THC Emission Rates (g/mile) from 20°C Tests

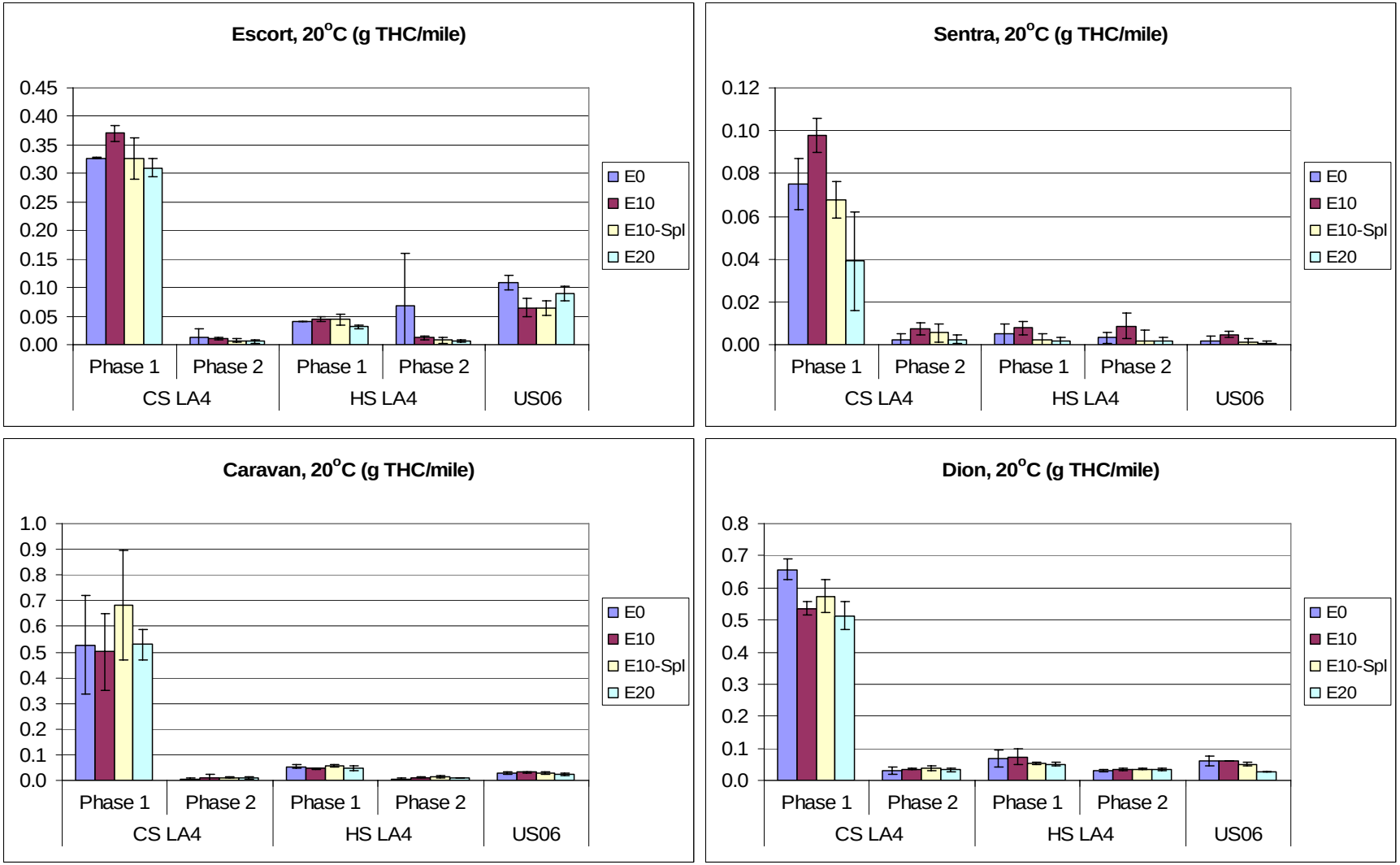
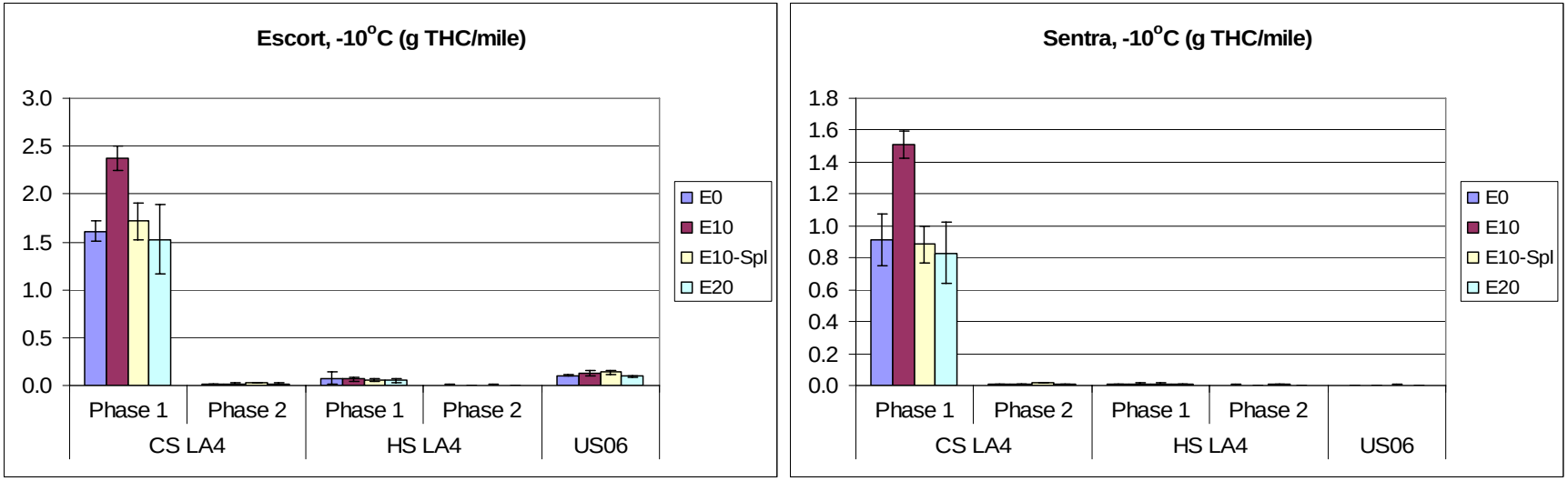


Figure 9: Oxygen-Corrected THC Emission Rates (g/mile) from -10°C Tests



7.4 Non-Methane Hydrocarbons (NMHC) & Non-Methane Organic Gases (NMOG)

Figure 10 and Figure 11 illustrate emissions of non-methane hydrocarbon (NMHC) and non-methane organic gases (NMOG) from the four vehicles over the 4-Phase Composite and US06 driving cycles at the two test temperatures (20°C and -10°C respectively). These figures use units of grams of NMHC or NMOG per mile travelled. Note that the data sets on the graphs that do not have error bars are from single test results, therefore standards deviations for these data sets could not be calculated. Numerical emission rates for NMHC and NMOG can be found in Appendix 5 and Appendix 6 respectively. To simplify the discussion, the 4-phase composite emission rate is used in this section. Per phase trends were similar to those observed with the oxygen corrected THC emission rates.

As can be seen from the figures, the NMHC and NMOG results followed similar patterns. This is because the NMHC and NMOG calculations are dominated by the total hydrocarbon emission rate, which was relatively large compared to the methane, carbonyl and ethanol emission rates. The bulk of the 4-Phase Composite emission rates came from the cold engine start, or the Phase 1 CSLA4 driving cycle.

For the Escort and the Sentra, the E10 fuel increased NMHC and NMOG emissions over the E0 fuel; however as the fuel ethanol content increased to E20 the NMHC and NMOG emissions decreased. This pattern was true for all driving cycles and vehicles with the exception of the Escort US06 at 20°C. Note the standard deviations for the Escort US06 at 20°C are very high and make pattern determination difficult. NMOG and NMHC emissions were higher at -10°C as compared to at 20°C. The pattern of emissions with respect to the fuel ethanol content generally did not change between the two test temperatures

The NMHC and NMOG emissions from the Caravan during the 4-Phase Composite were similar for the E0, E10 and E20 fuels, and increased for the E10-Spl fuel. During the US06 driving cycles the ethanol blends showed a slight decrease in emissions over the base fuel.

All driving cycles with the Dion saw reduced NMHC and NMOG emissions with the ethanol blends over the base fuel. The emissions from the 4-Phase Composite were similar between the ethanol blends, while the emissions from the US06 were lower for the E20 as compared to the E10 fuel.

The E10 and E10-Spl fuels had similar NMHC and NMOG emissions for the Escort, Sentra and Dion for all driving cycles at 20°C. The E10-Spl fuel appears to have resulted in higher NMHC and NMOG emissions for the Caravan during the LA4 cycle; however the lack of repeat data for this measurement makes it difficult to conclude upon a definite trend. During the -10°C US06 driving cycle the NMHC and NMOG emissions were similar between the E10 and E10-Spl fuels for both vehicles. During the -10°C LA4 driving cycle the E10-Spl fuel resulted in lower NMHC and NMOG emissions than the E10 fuel.

Overall Conclusions

- For the MPFI vehicles:
  - NMHC and NMOG emissions were highest for the driving cycle involving cold engine start.
  - As compared to the E0 fuel, the Escort and Sentra had increased NMHC and NMOG emission rates with the E10 fuel and decreased emission rates with the E20 fuel. For the 4-Phase Composite cycle, the E10 fuel increased NMHC by 20-66% and NMOG by 21-56%; the E20 fuel decreased NMHC by 6-52% and NMOG by 1-27%.
  - The Caravan emissions rates of NMHC and NMOG were similar between the base fuel and the ethanol blend fuels for the 4-Phase Composite. With aggressive driving the Caravan NMHC and NMOG emission rates decreased by 3-33% with increasing fuel ethanol content.
  - Operation at -10ºC had increased NMHC and NMOG emissions as compared to operation at 20ºC, however the pattern of emissions with respect to fuel ethanol content remained the same.
  - As compared to the E10 fuel, the E10-Spl fuel resulted in 22-41% lower NMHC and NMOG emissions during the 4-Phase Composite at cold temperature operation. There was no

difference in NMHC or NMOG emissions between the two fuels during the aggressive driving at -10°C or during any of the 20°C tests.

- For the GDI vehicle:
  - NMHC and NMOG emissions were highest for the driving cycle involving cold engine start.
  - NMHC and NMOG emissions were lower for the ethanol blends fuels as compared to the base fuel. During the 4-Phase Composite cycle, NMHC was lowered by 13-26% and NMOG by 10-19%.
  - During aggressive driving, the higher ethanol blend fuel (E20) had lower NMHC and NMOG emissions than the lower ethanol blend fuel (E10).
  - There was no difference in NMHC or NMOG emissions between the E10 and E10-Spl fuels.

Figure 10: NMHC and NMOG Emission Rates (g/mile) from 20°C Tests

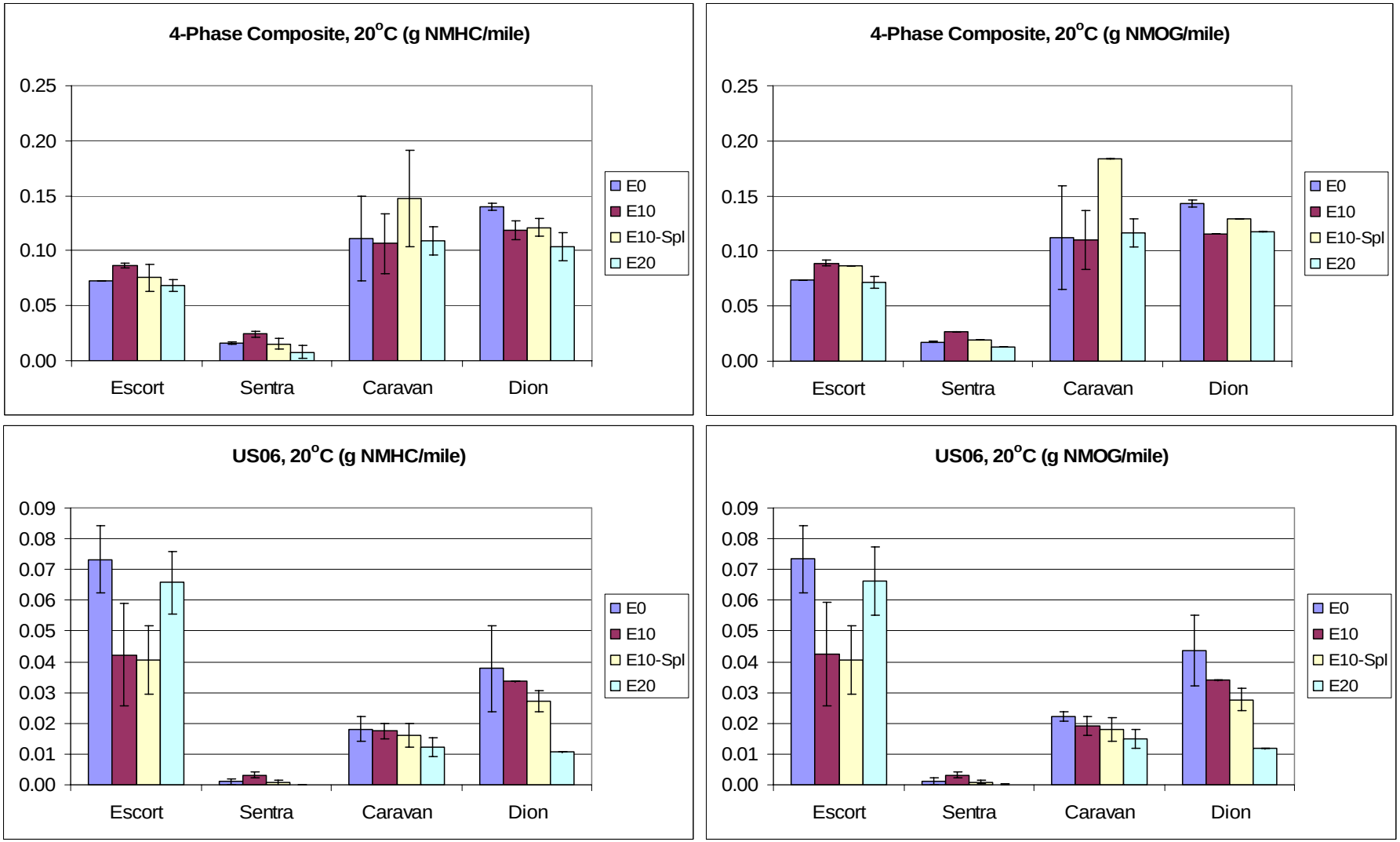
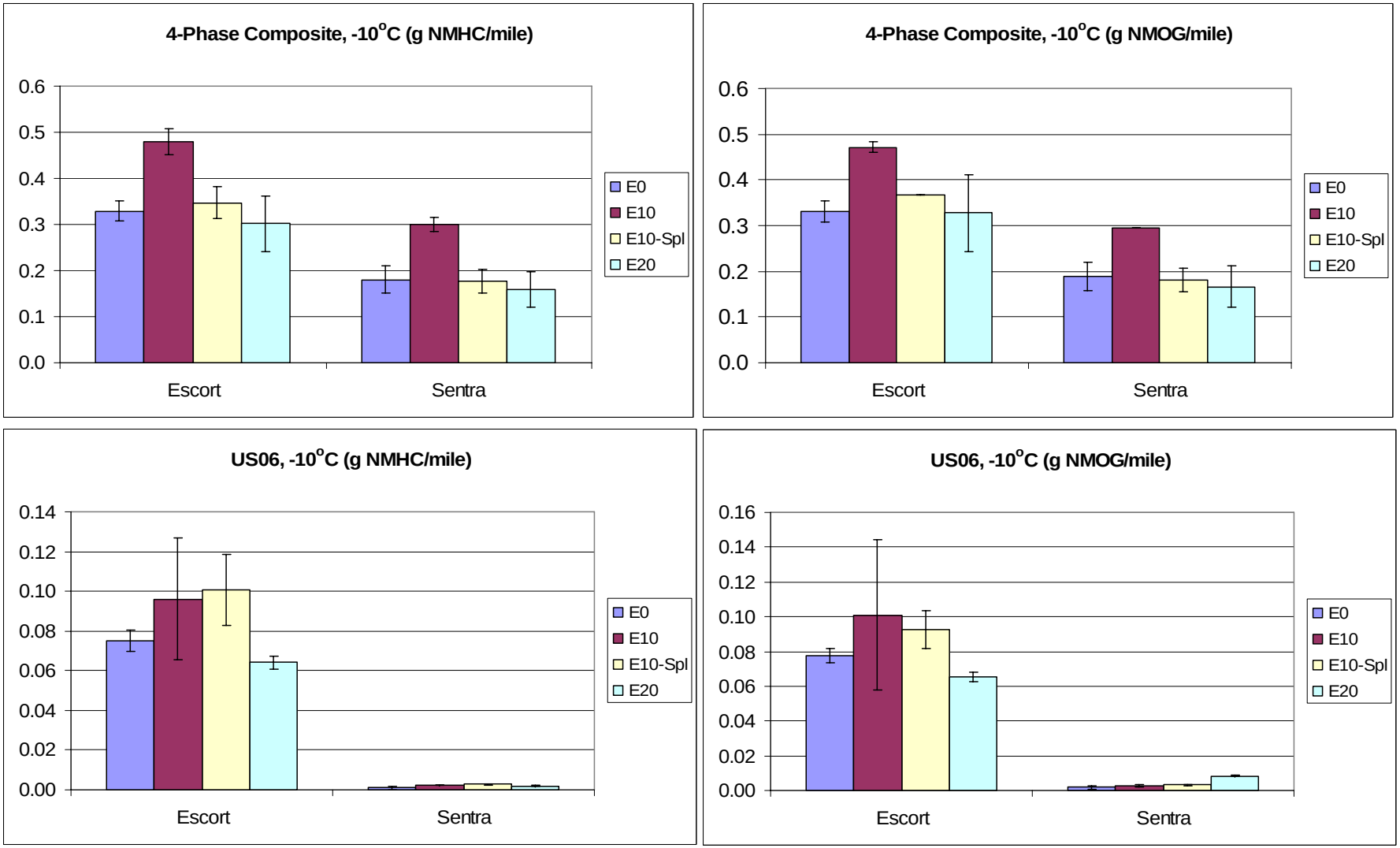


Figure 11: NMHC and NMOG Emission Rates (g/mile) from -10°C Tests



7.5 Ethanol

Figure 12 and Figure 13 illustrate the ethanol emission rates from the four vehicles over the LA4 and US06 driving cycles at the two test temperatures (20°C and -10°C respectively). These figures use units of milligrams of ethanol per mile travelled. Numerical emission rates can be found in Appendix 7.

As expected, the ethanol emissions increased with increasing fuel ethanol content. Ethanol emissions were generally only found in the Phase 1 CSLA4 cycle as a result of cold engine start. Once the vehicles were running at operating temperature ethanol emissions were very low or undetectable. The US06 driving cycle had slightly elevated ethanol emissions as well.

Of the four vehicles tested at 20°C, the Caravan had the highest ethanol emissions rates. The Caravan was also the only vehicle to have consistent ethanol emissions during the US06 driving cycle.

For the two vehicles tested at -10°C, operation at cold temperature resulted in higher ethanol emission rates as compared to operation at standard temperature. The cold temperature mainly affected the Phase 1 CSLA4 cycle, while the cycles where the vehicles ran at operating temperature continued to have low or undetectable ethanol emission rates.

When running on E20 at -10°C the Sentra had elevated ethanol emissions during the US06 cycle. This is possibly the cause of the slightly elevated levels of NMOG seen during these tests (as compared to the other emission rates from the Sentra during the -10°C US06 tests).

As compared to the E10 fuel, the E10-Spl fuel resulted in increased ethanol emissions for Escort (at 20°C), the Caravan and the Dion and decreased ethanol emissions for the Escort (at -10°C) and the Sentra (at both 20°C and -10°C). Because of the large standard deviations associated with these data, it is difficult to establish a definite trend.

Relatively small ethanol emissions were present during some of the tests with E0 fuel including the Caravan 20°C US06, Escort -10°C Phase 1 CSLA4, Sentra -10°C Phase 1 CSLA4 and Sentra -10°C US06. The ethanol emissions with the E0 fuel generally appeared in the repeat E0 tests and were likely due to hang up of ethanol in the vehicle fuel system. The fuel lines and other components of the fuel system may have absorbed ethanol from the ethanol blend fuels and then released small but measurable quantities of ethanol into the base fuel on the repeat tests. These findings indicate that the canister conditioning and vehicle preparation procedures minimized but did not completely eliminate fuel carry-over.

Overall Conclusions

- For all vehicles:
  - Ethanol emissions were highest for cold engine start. Once the vehicles were running at operating temperature ethanol emissions were very low or undetectable
  - Operation at cold temperature resulted in higher ethanol emission rates as compared to operation at standard temperature. The cold temperature mainly affected the cycle involving cold engine start.
  - Relatively small ethanol emissions were present during some of the tests with E0 fuel, likely due to hang up of ethanol in the vehicle fuel system. These findings indicate that the canister conditioning and vehicle preparation procedures minimized but did not completely eliminate fuel carry-over.
  - There was no difference in Ethanol emissions between the E10 and E10-Spl fuels.

Figure 12: Ethanol Emission Rates (mg/mile) from 20°C Tests

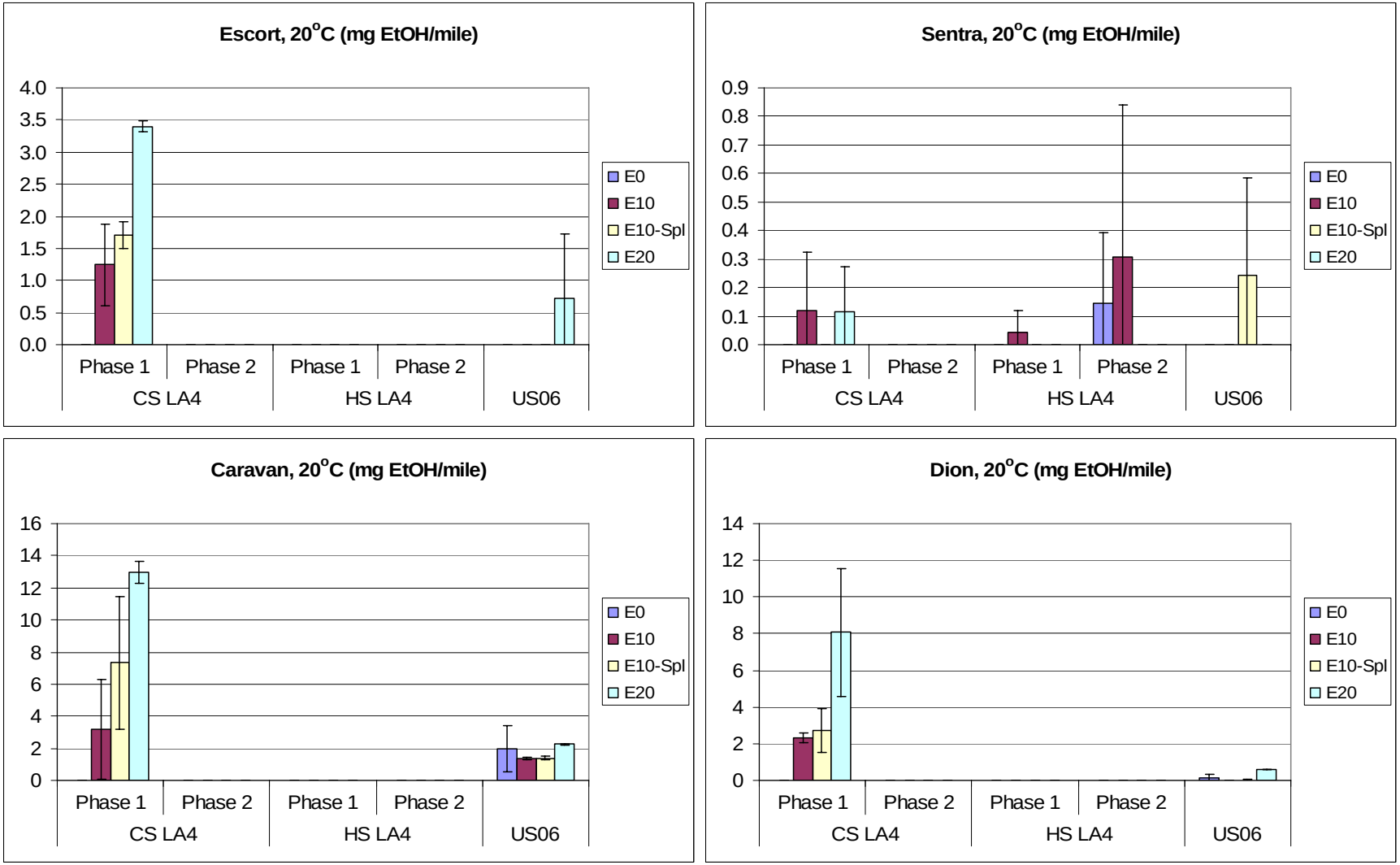
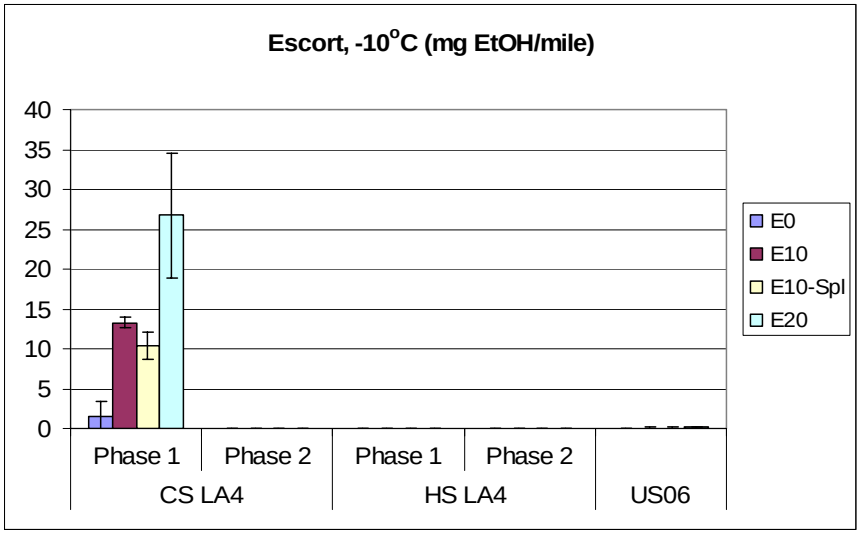
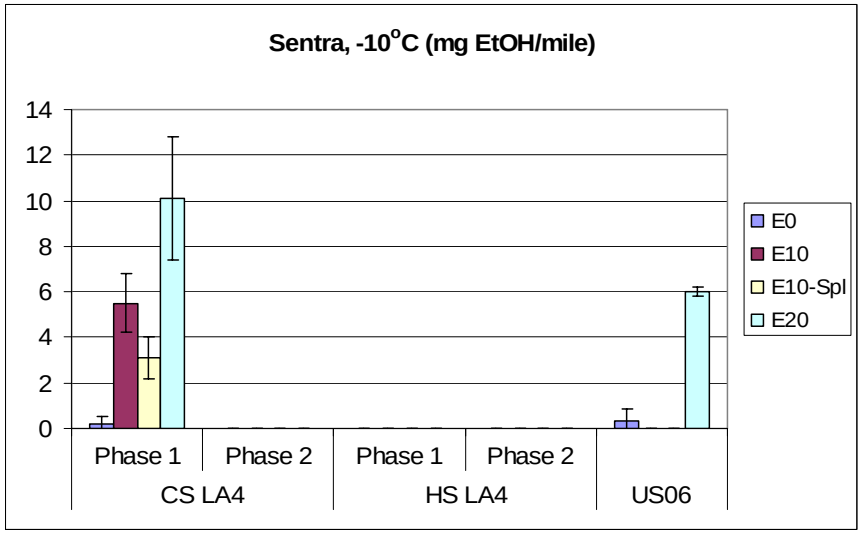


Figure 13: Ethanol Emission Rates (mg/mile) from -10°C Tests





7.6 Carbonyls

Figure 14 and Figure 15 illustrate the total named carbonyl emission rates from the LA4 and US06 tests at 20°C and -10°C respectively. These figures demonstrate that the bulk of the carbonyl emissions from the LA4 tests were a result of the phase involving cold engine start (Phase 1 CSLA4). For this reason, the remainder of the discussion on carbonyls will focus on the Phase 1 CSLA4. Carbonyl emissions from the US06 are also discussed.

Figure 16 and Figure 17 illustrate the carbonyl speciation emission rates from the 20°C tests for the Phase 1 CSLA4 and US06 cycles respectively. Figure 18 and Figure 19 show these results from the -10°C tests for the Phase 1 CSLA4 and US06 cycles respectively. These figures use units of milligrams of species per mile travelled. Numerical emission rates can be found in Appendix 8. Note that carbonyl results are not available for the 20°C Escort US06 with E0, E10-Spl and E20 and for the 20°C Sentra US06 with E10 and E10-Spl due to difficulties with the carbonyl sample collection system.

As compared to the base fuel, the ethanol blend fuels generally resulted in an increase in total carbonyl emissions during the Phase 1 CSLA4 and US06 cycles. This is true for all tests except the US06 for the Caravan and Dion; for these tests the E0 and ethanol blends had similar carbonyl emissions. The results from the Escort and Sentra show that carbonyl emission rates are higher during -10°C operation as compared to standard temperature operation.

The carbonyl emissions from the E10-Spl fuel were generally lower than those from the E10 fuel. There are three exceptions to this; the carbonyl emissions from the US06 cycles with the Caravan and Dion were higher for the E10-Spl as compared to the E10, and the carbonyl emissions from the Phase 1 CSLA4 with the Caravan were similar between the two fuels.

There is specific concern regarding the potential for increased emissions of formaldehyde and acetaldehyde with the use of ethanol gasoline blends. Formaldehyde and acetaldehyde are classified as toxic substances under Schedule 1 of the Canadian Environmental Protection Act, 1999. Emissions of these substances have negative health effects (irritation to the eyes, nose and throat, suspected carcinogens) as well as negative environmental effects (contribute to the formation of ground level ozone). As shown in the Figure 16 through Figure 19, formaldehyde and acetaldehyde were consistently present in the emissions for all vehicles, temperatures and fuel blends.

Visually, the ethanol blend fuels appear to have resulted in an increase in formaldehyde and acetaldehyde emission rates. To obtain a more objective analysis of the trends, linear regression analyses were performed on the emission rates as a function of ethanol content. The regression analysis results are presented in Appendix 8g and Appendix 8h for formaldehyde and acetaldehyde respectively.

The regression analyses show an increasing trend in formaldehyde emission rates with increasing fuel ethanol content for all four vehicles at both test temperatures and for both the Phase 1 CSLA4 and US06 driving cycles. Statistically significant trends were only seen with the Caravan during the 20°C Phase 1 CSLA4 and the Sentra during the -10°C Phase 1 CSLA4.

Likewise, the regression analyses show an increasing trend in acetaldehyde emission rates with increasing fuel ethanol content. For the Phase 1 CSLA4 driving cycle these trends are statistically significant for all four vehicles and at both temperatures. For the US06 driving cycle these trends are relatively smaller and are generally not statistically significant. The exception is the Escort US06 at -10°C, which shows a statistically significant increasing trend.

Overall Conclusions

- For all vehicles:
  - Carbonyl emissions were highest for cold engine start.

- Cold engine start at -10ºC had increased carbonyl emissions as compared to cold engine start at 20ºC.
- The carbonyl emissions from the E10-Spl fuel were 13-59% lower than those from the E10 fuel. The exception to this was the Caravan, which had similar carbonyl emissions between the E10 and E10-Spl fuels.
- The presence of ethanol in the fuel increased the formaldehyde emissions during cold engine start and aggressive driving conditions; however this increase was not always statistically significant.
- The presence of ethanol in the fuel increased the acetaldehyde emissions during cold engine start and aggressive driving conditions. For the cold engine start cycle this increase was statistically significant and ranged from 33-878% at 20°C and from 419-3992% at -10°C. For the aggressive driving cycle this increase was not always statistically significant.

Figure 14: Total Named Carbonyl Emission Rates (mg/mile) from Tests at 20°C

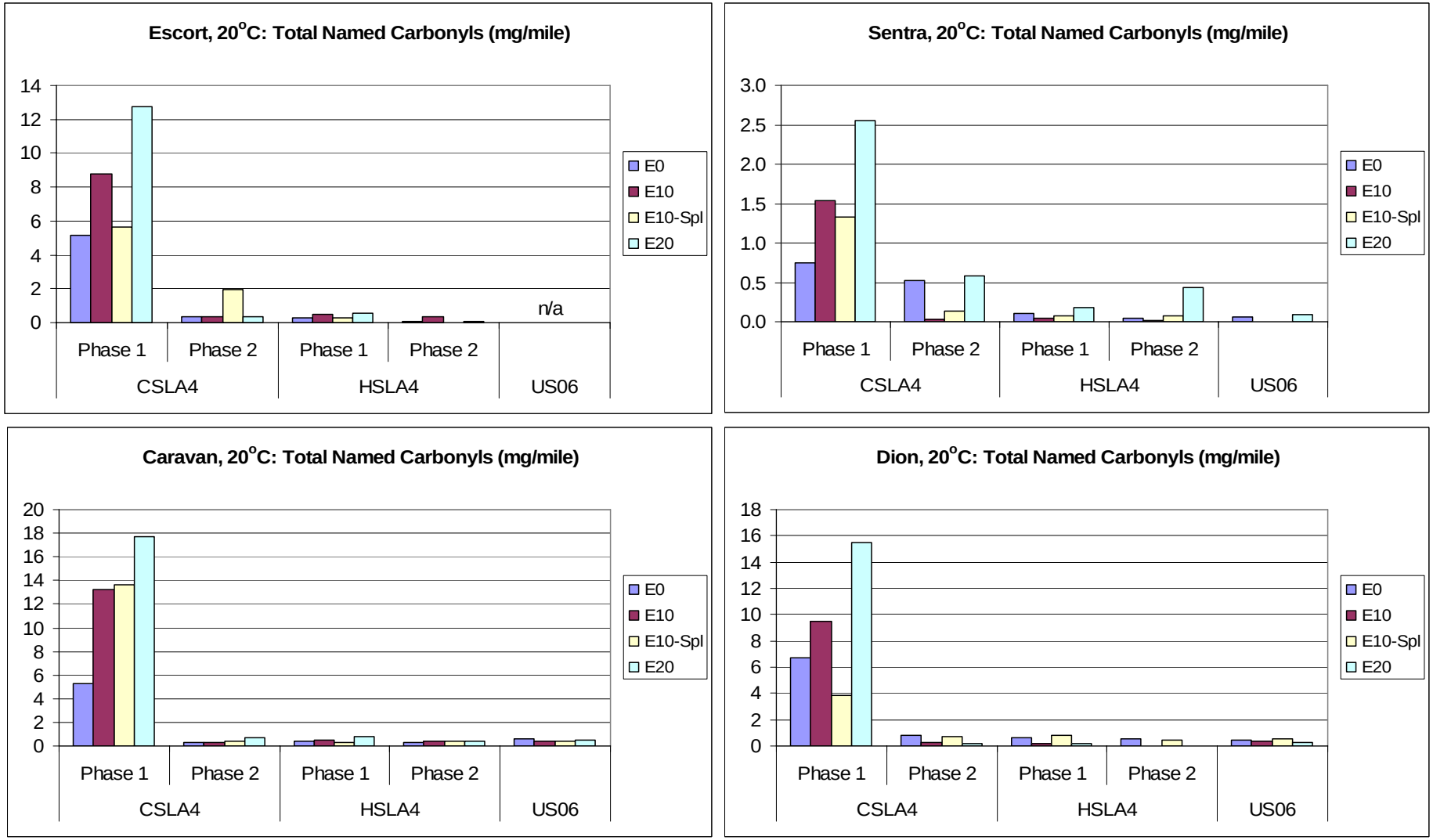
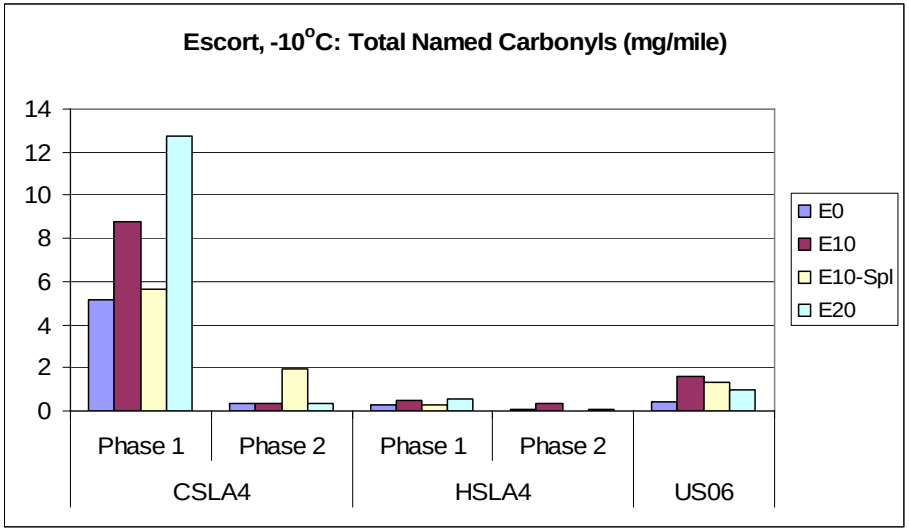


Figure 15: Total Named Carbonyl Emission Rates (mg/mile) from Tests at -10°C



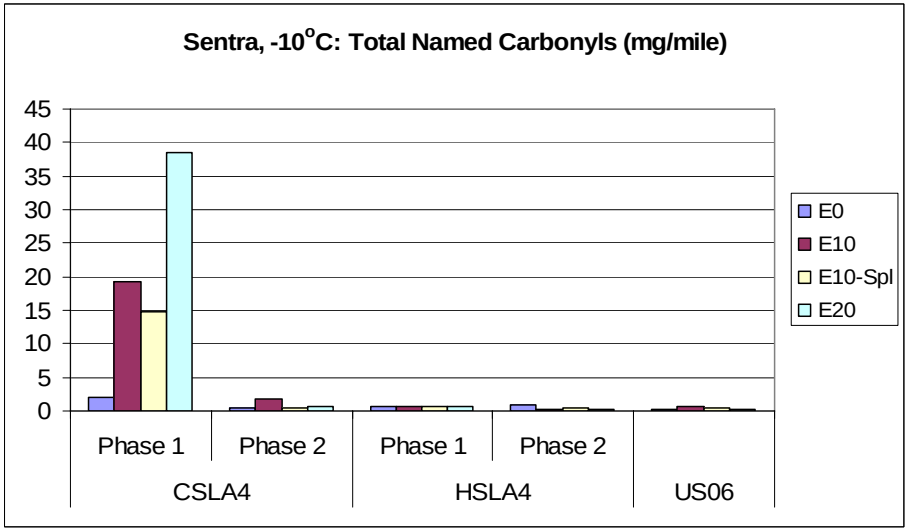
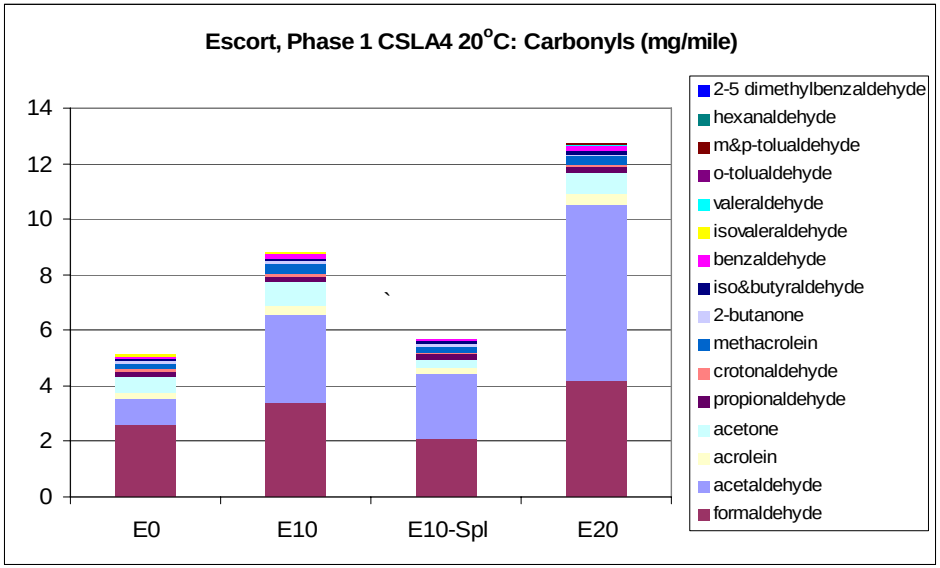
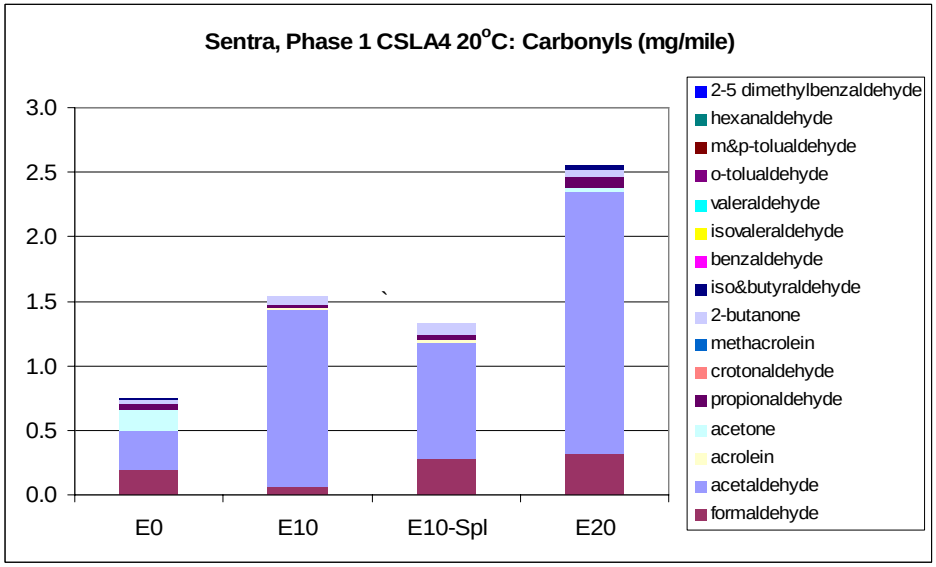
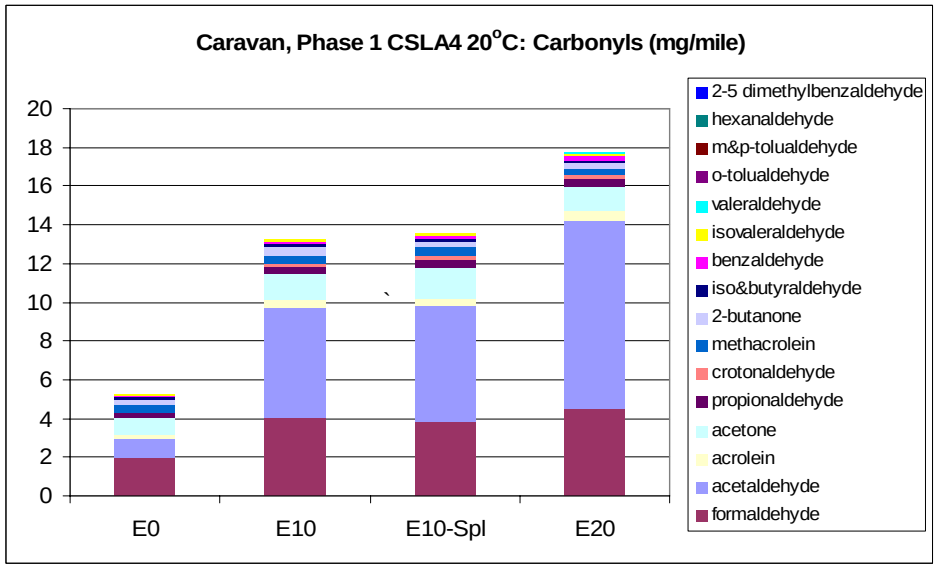


Figure 16: Carbonyl Emission Rates (mg/mile) from Phase 1 CSLA4 Tests at 20°C







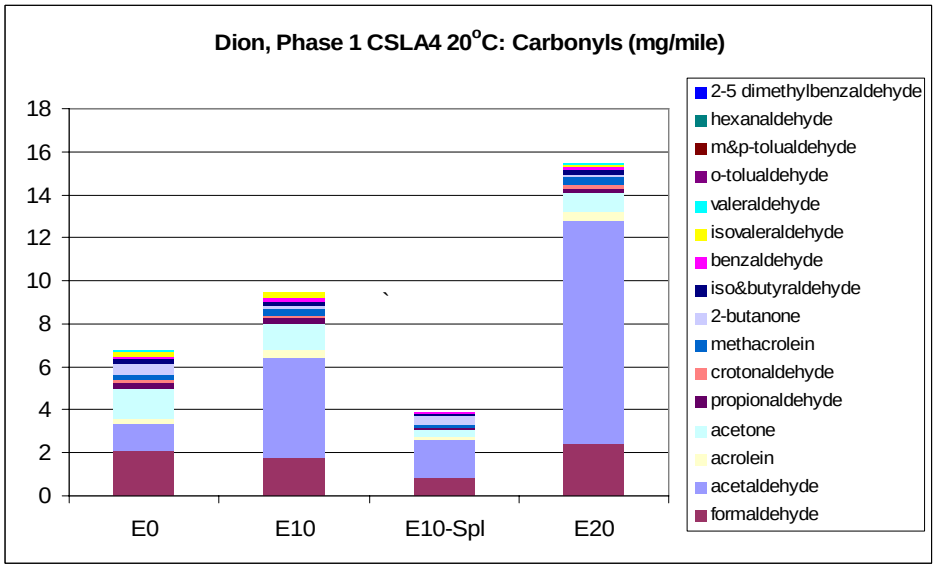
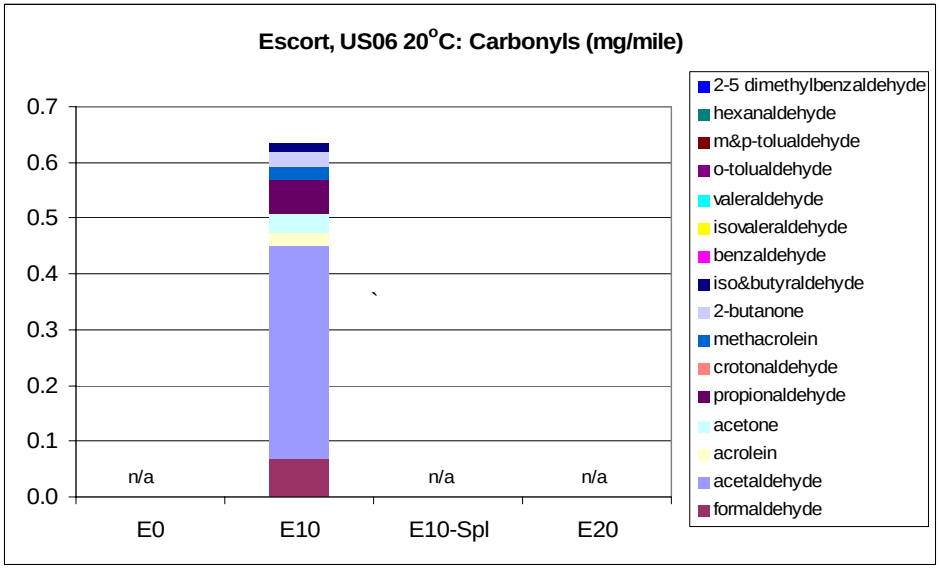
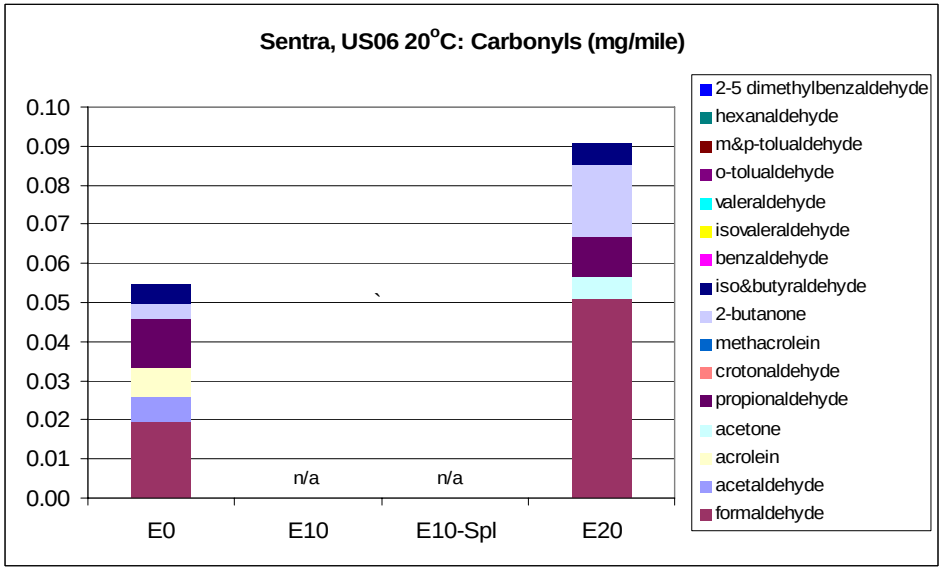
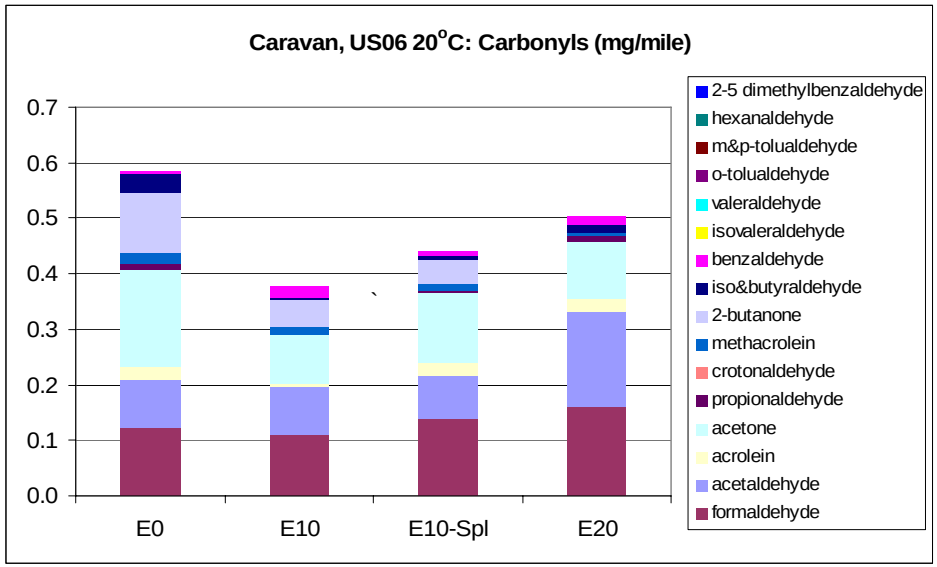


Figure 17: Carbonyl Emission Rates (mg/mile) from US06 Tests at 20°C







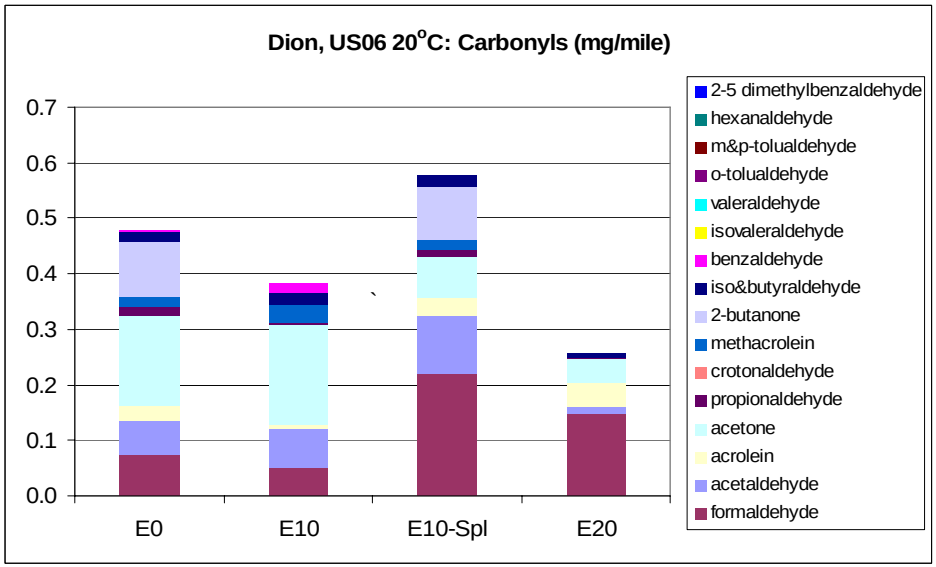
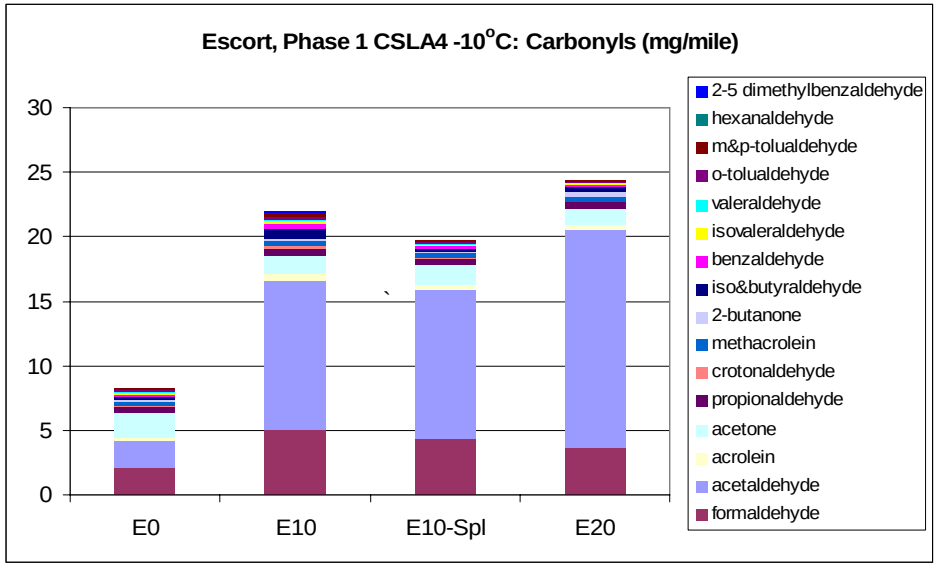


Figure 18: Carbonyl Emission Rates (mg/mile) from Phase 1 CSLA4 Tests at -10°C



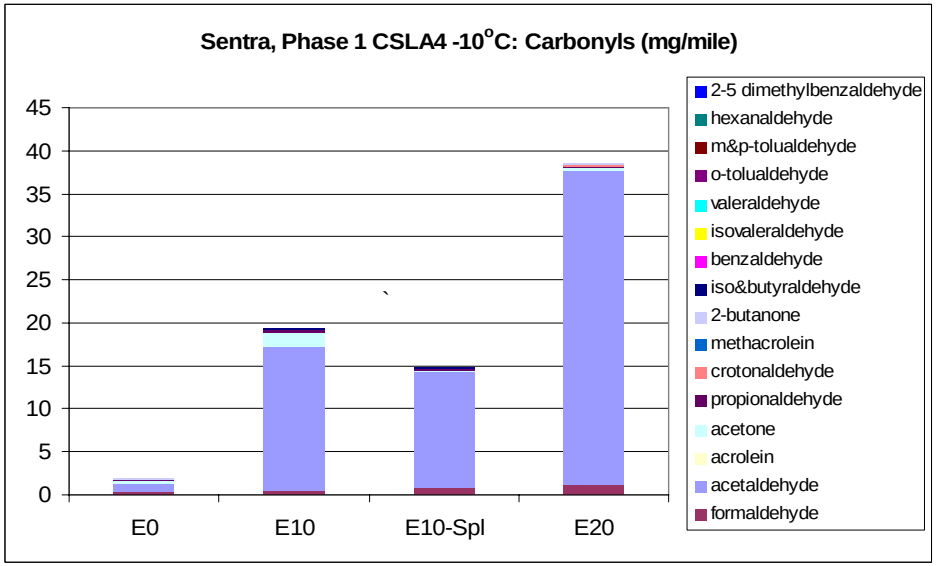
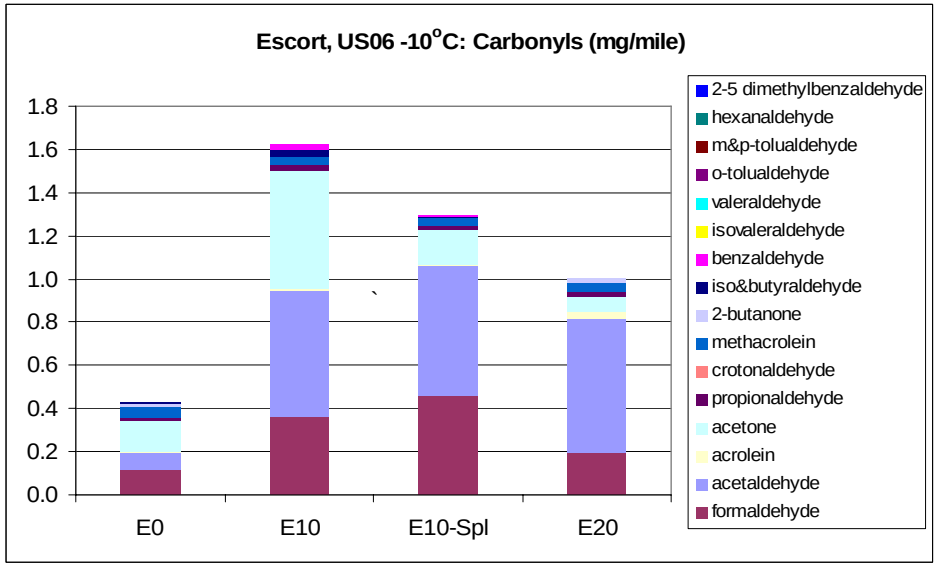
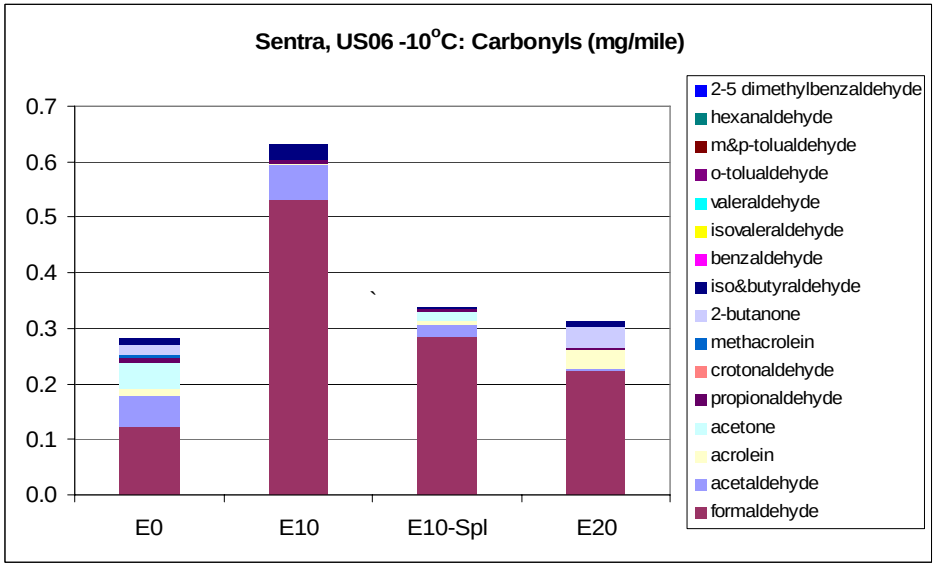


Figure 19: Carbonyl Emission Rates (mg/mile) from US06 Tests at -10°C





7.7 Speciated Volatile Organic Compounds (VOC)

Figure 20 and Figure 21 illustrate the speciated VOC emission rates from the 20°C tests for the 4-Phase Composite and US06 cycles respectively Figure 22 and Figure 23 show these results from the -10°C tests for the 4-Phase Composite and US06 cycles respectively. These figures use units of milligrams of species per mile travelled. The numbers on the x-axes of these graphs refer to the species listed in Appendix 11, which is also where numerical emission rates can be found. Note that the analyte lists for the Escort and Sentra tests at 20°C vary slightly from the analyte lists for the Escort and Sentra tests at -10°C and the Caravan and Dion tests at 20°C.

As might be expected based on oxygen-corrected THC results and detailed composition analyses of the test fuels, the VOC profiles were very similar among the four fuels for a given vehicle and were typical of a mixture of combustion gases and unburned fuel. The target compounds present were due to the gasoline content of the fuel. The quantity of these compounds in the emissions profiles generally decreased with increasing fuel ethanol content.

Figure 20: Speciated VOC Emission Rates (mg/mile) from 4-Phase Composite Tests at 20°C

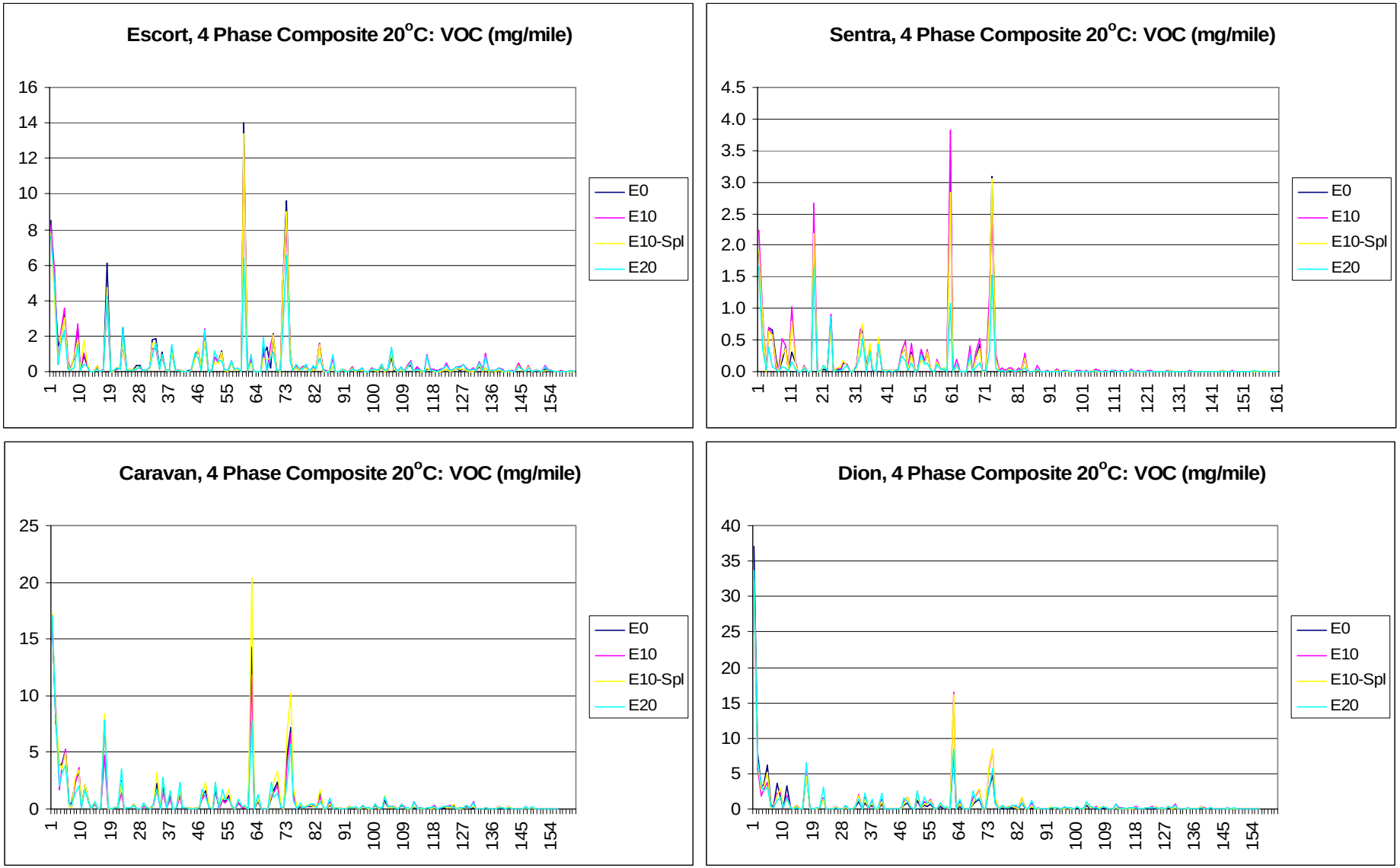


Figure 21: Speciated VOC Emission Rates (mg/mile) from US06 Tests at 20°C

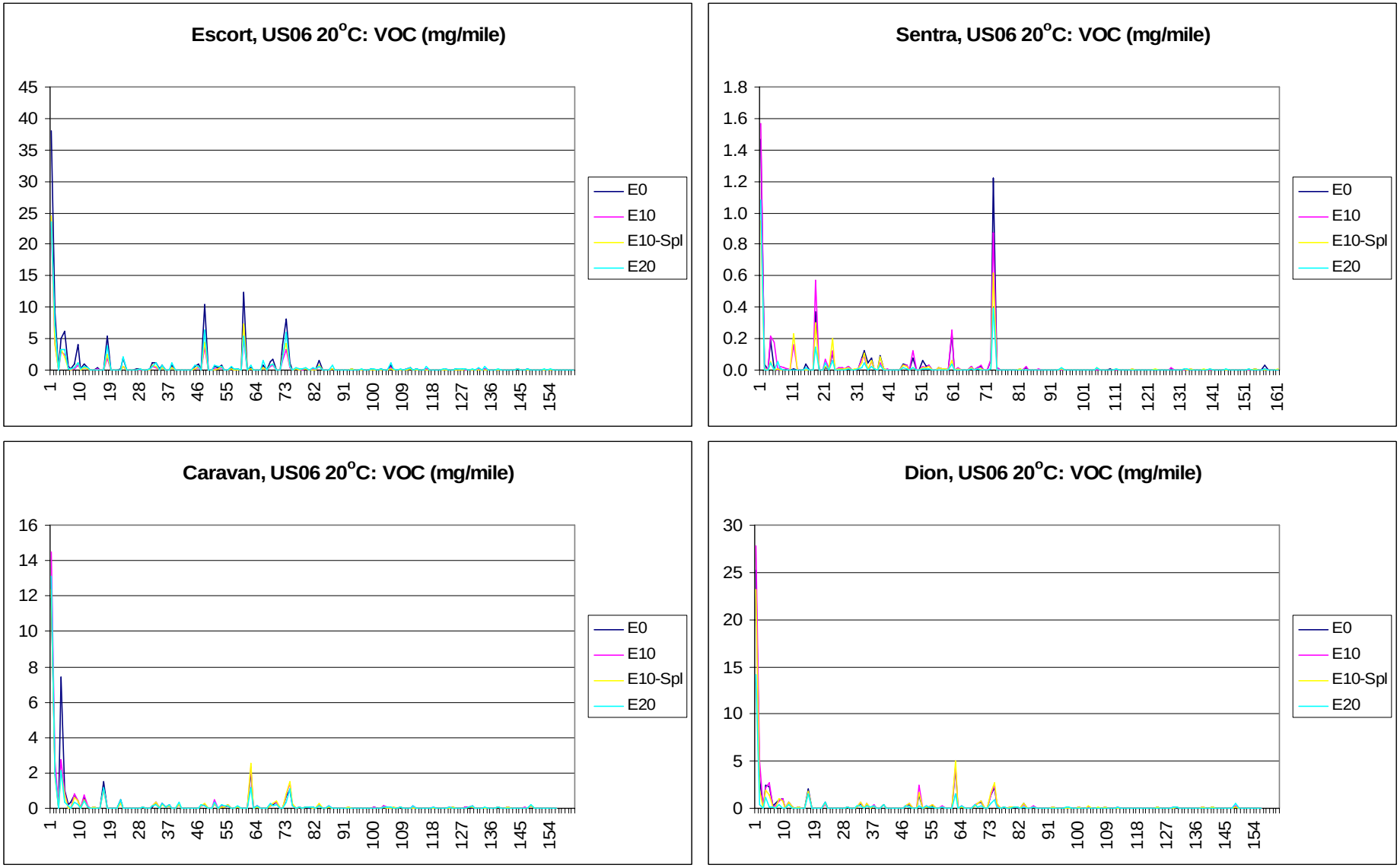


Figure 22: Speciated VOC Emission Rates (mg/mile) from 4-Phase Composite Tests at -10°C

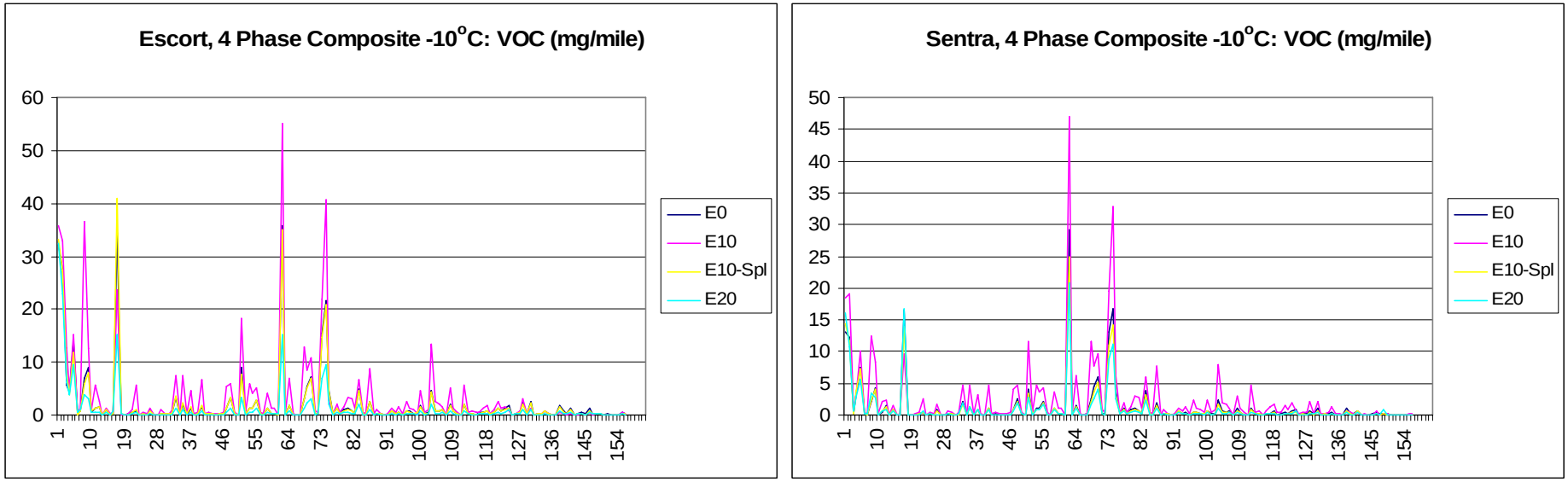
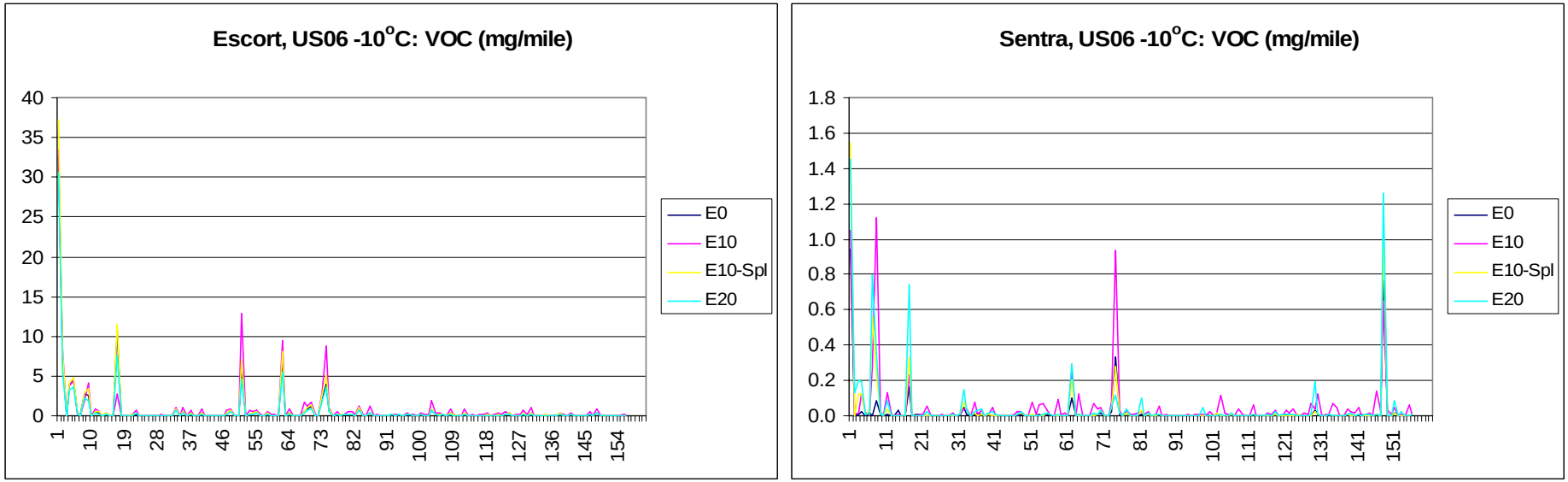


Figure 23: Speciated VOC Emission Rates (mg/mile) from US06 Tests at -10°C



7.8 Specific Reactivity and Ozone Forming Potential

Figure 24 illustrates the specific reactivity of the exhaust over the 4-Phase Composite and US06 driving cycles at the two test temperatures (20°C and -10°C respectively), using units of grams of ozone per gram of NMOG. Numerical results can be found in Appendix 9. Figure 25 illustrates the ozone forming potential over the 4-Phase Composite LA4 and US06 driving cycles at the two test temperatures (20°C and -10°C respectively), using grams of ozone per mile. Numerical results can be found in Appendix 10.

The differences in specific reactivity and ozone forming potential were larger between the different vehicle technologies, as compared to the differences caused by fuel ethanol content. For the three MPFI vehicles, fuel ethanol content did not appear to affect the specific reactivity or ozone forming potential of the exhaust. This was true for all driving cycles and at both 20°C and -10°C. The exhaust from the GDI vehicle had decreasing specific reactivity and ozone forming potential with increasing fuel ethanol content during both the 4-Phase Composite and US06 driving cycles.

For the Escort, Sentra and Caravan, the specific reactivity of the E10-Spl fuel was typically lower than that of the E10 fuel for the 20°C testing and higher than that of the E10 fuel for the -10°C testing. The ozone forming potential of the E10-Spl fuel was lower than that of the E10 fuel for all tests, with the exception of the Caravan during the 4-Phase Composite cycle. The differences between the fuels were generally small compared to the standard deviations of the data.

For the Dion, both the specific reactivity and the ozone forming potential from the E10-Spl fuel were higher than that from the E10 fuel during the 4-Phase Composite, and lower than that from the E10 fuel during the US06 cycle. Again, the differences between the fuels were generally small compared to the standard deviations of the data.

Overall Conclusions

- For the MPFI vehicles:
  - Fuel ethanol content did not affect the specific reactivity or ozone forming potential of the exhaust. This was true for both the 4-Phase Composite and the aggressive driving cycles.
  - As compared to the E10 fuel, the E10-Spl fuel resulted in lower specific reactivity during the 20°C testing and higher specific reactivity during the -10°C testing. These differences were small compared to the standard deviations of the data.
  - As compared to the E10 fuel, the E10-Spl fuel resulted in lower ozone forming potential during both the 4-Phase Composite and aggressive driving cycles. These differences were small compared to the standard deviations of the data.

- For the GDI vehicle:
  - Increasing fuel ethanol content resulted in decreasing specific reactivity and ozone forming potential of the exhaust during both the 4-Phase Composite and aggressive driving cycles.
  - As compared to the E10 fuel, the E10-Spl fuel resulted in higher specific reactivity and ozone forming potential during the 4-Phase Composite cycle and lower specific reactivity and ozone forming potential during the aggressive driving cycle. These differences were small compared to the standard deviations of the data.

Figure 24: Specific Reactivity (g O_3/g NMOG) of Emissions from 20°C and -10°C Tests

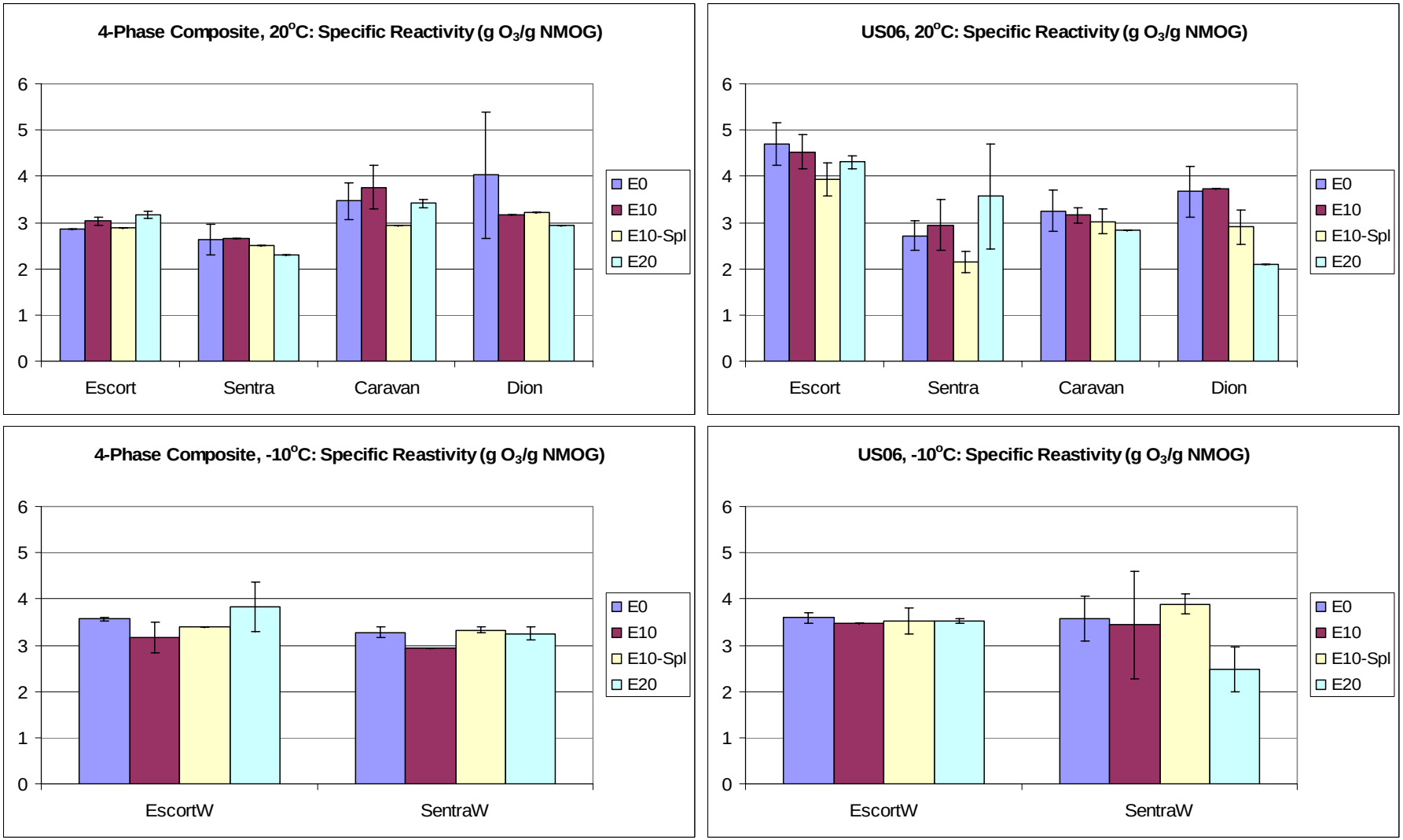
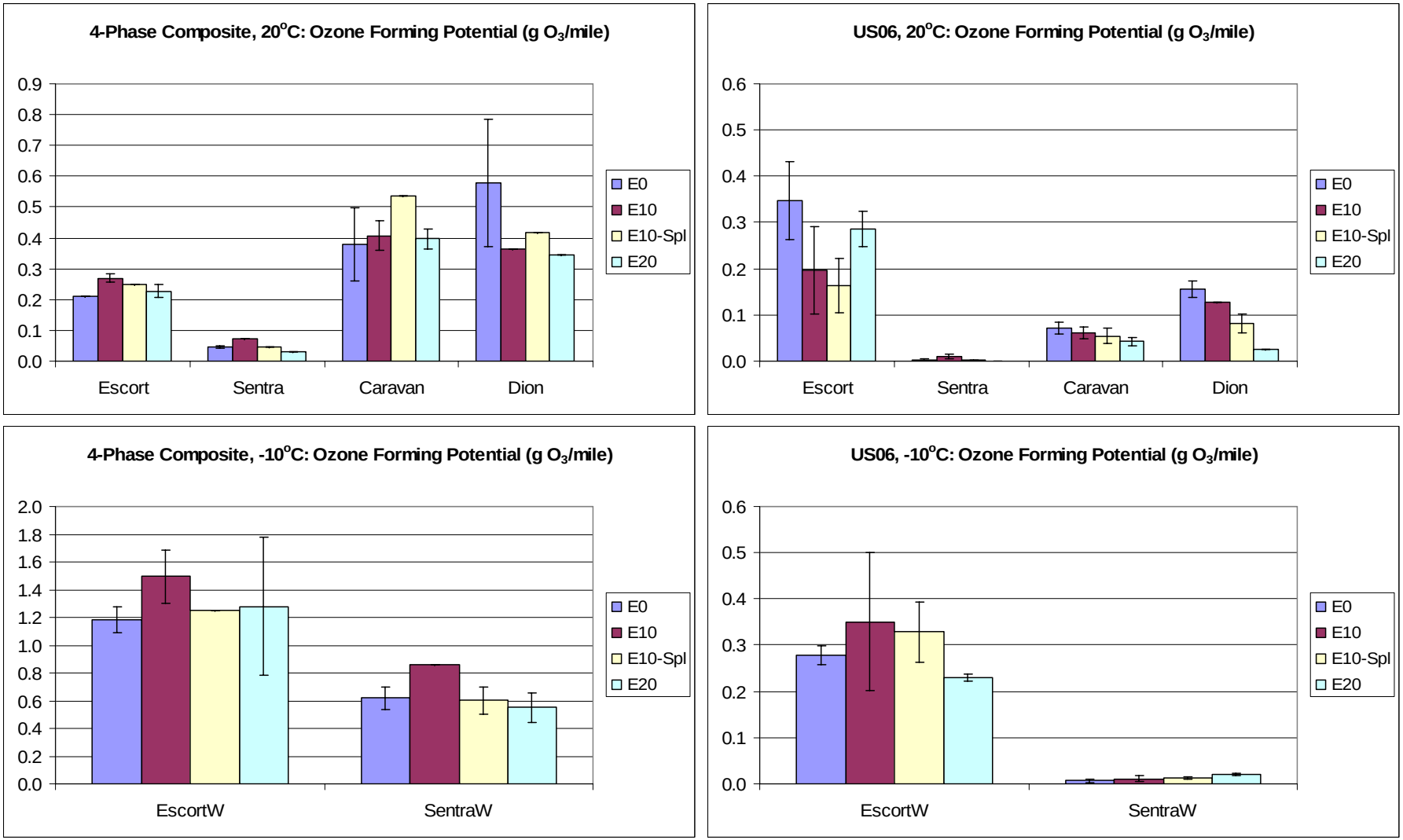


Figure 25: Ozone Forming Potential (g O_3/mile) of Emissions from 20°C and -10°C Tests



8. Other Observations

Being designed as a “flex fuel” vehicle capable of running on ethanol-gasoline blends of up to 85% ethanol, the Caravan fuel system incorporates a fuel-line sensor that measures ethanol content in the fuel. This information is then used to adjust the engine parameters to best suit the fuel blend. This sensor can be surveyed through the OBD II (On-Board Diagnostic) technology to ensure proper operation. Analysis of the information from the ethanol sensor indicates that the sensor continually measured an ethanol content of zero; therefore it is possible that the engine did not realize any specially designed engine parameters for ethanol fuel operation.

The canister conditioning and vehicle preparation procedures minimized but did not completely eliminate fuel carry-over. The fuel lines and other components of the fuel system appeared to absorb ethanol from the fuel and continued to release small but measurable quantities of ethanol into the base fuel on the repeat tests as ethanol was detected in the evaporative emissions tests conducted on the base fuel at the conclusion of the test sequence.

9. Conclusions

General

- Observed differences in emission rates were primarily found on the Phase 1 CSLA4 cycle, due to the cold engine start. The warm engine start (Phase 1 HSLA4) and aggressive driving (US06) cycles occasionally saw emissions differences. The stabilized portion of the LA4 (Phase 2 CSLA4 and Phase 2 HSLA4) rarely had emission differences.

- Cold temperature operation mainly affected the emissions from the cold engine start cycle (Phase 1 CSLA4). Cold temperature operation rarely affected emissions after the vehicles had warmed up to operating temperature.

- The Caravan "flex fuel" operation during this testing program was found to be unreliable. Monitoring of the on board fuel-line ethanol sensor via the OBD II access port indicated that the sensor continually measured an ethanol content of zero; therefore it is possible that the engine did not realize any specially designed engine parameters for ethanol fuel operation.

- Relatively small ethanol emissions were present during some of the tests with E0 fuel, likely due to hang up of ethanol in the vehicle fuel system. These findings indicate that the canister conditioning and vehicle preparation procedures minimized but did not completely eliminate fuel carry-over

CO Emissions

- For the MPFI vehicles:
  - CO emissions were highest for cold engine start and aggressive driving cycles. The exception to this was the Sentra at -10ºC, which did not have increased CO emissions during aggressive driving.
  - Cold engine start at -10ºC had increased CO emissions as compared to cold engine start at 20ºC. Although increases in CO were also seen for other driving cycles at -10°C, this effect was smaller once the vehicle had reached operating temperature.
  - The presence of ethanol in the fuel appeared to decrease the CO emissions during engine start and aggressive driving conditions; however these decreases were not always statistically significant. Decreases ranged from 15-73% during engine start and from 8-92% during aggressive driving conditions.
  - The splash blended E10 fuel resulted in 35-50% higher CO emissions during engine start at cold temperature operation, as compared to the tailor blended E10 fuel. At 20°C there was no statistical difference in CO emissions between the two fuels.
- For the GDI vehicle:
  - Cold engine start resulted in a slight increase in CO emissions over warm engine start. This increase is relatively small as compared to the increases experienced by the MPFI vehicles.
  - CO emissions decreased as the ethanol content of the fuel increases. This was particularly evident during cold engine start and aggressive driving, which had decreases ranging from 3-55% and 20-45% respectively.
  - There was no difference in CO emissions between the E10 and E10-Spl fuels

NO_X Emissions

- For the MPFI vehicles:
  - NO_X emissions were highest for cycles involving engine start (Phase 1 CSLA4, Phase 1 HSLA4 and US06).
  - The 20°C NO_X emission rates from the Sentra were low, making it difficult to conclude on definite emission trends for this vehicle; however the NO_X emission rates from this vehicle did not appear to be affected by fuel ethanol content.
  - For the Escort and Caravan at 20°C operation, increasing fuel ethanol content resulted in an increase in NO_X emissions over driving cycles involving engine start (Phase 1 CSLA4, Phase 1

HSLA4 and US06). Increases ranged from 14-91% during cold engine start, from 6-41% during warm engine start and from 1-30% during aggressive driving conditions
    - At -10°C operation with the Escort, increasing fuel ethanol content caused a 16-161% increase in NO_X emissions over the LA4 cycles and did not have a significant affect over the US06 cycle.
    - At -10°C operation with the Sentra, increasing fuel ethanol content caused an increase in NO_X emissions over all driving cycles. The relatively high NO_X emissions from the Sentra with E20 fuel are questionable.
    - For all tests except the Escort during the US06 cycle, the effect of ethanol was stronger at -10°C as compared to at 20°C.
    - There was no difference in NO_X emissions between the E10 and E10-Spl fuels.
- For the GDI vehicle:
    - NO_X emissions were highest for cycles involving engine start (Phase 1 CSLA4, Phase 1 HSLA4 and US06).
    - NO_X emissions once the vehicle had reached operating temperature (Phase 2 CSLA4 and Phase 2 HSLA4) were higher for the Dion as compared to the MPFI vehicles.
    - At 20°C operation, increasing fuel ethanol content resulted in increasing NO_X emissions over all driving cycles.
    - As compared to the tailor blended E10 fuel, the splash blended E10 fuel resulted in a 2-34% increase in NO_X emissions during all driving cycles; however the differences between the two fuels were not statistically significant.

THC Emissions

- For the MPFI vehicles:
    - THC emissions were highest for the driving cycle involving cold engine start.
    - Cold engine start at -10ºC increased THC emissions over cold engine start at 20ºC.
    - For the Escort and Sentra, the E10 fuel resulted in increased THC emissions over the E0 fuel, while the E20 fuel resulted in decreased THC emissions over the E0 fuel. For the cold engine start cycle this increase ranged from 13-31% at 20°C and from 47-66% at -10°C.
    - The THC emissions from the Caravan were similar for the E0, E10 and E20 fuels.
    - As compared to the tailor blended E10 fuel, the splash blended E10 fuel resulted in 28-41% lower THC emissions during engine start at cold temperature operation. At standard temperature operation there was no difference in THC emissions between the two fuels.
- For the GDI vehicle:
    - THC emissions were highest for the driving cycle involving cold engine start.
    - THC emissions during cold engine start were reduced as fuel ethanol content increased. During the cold engine start cycle the THC emissions from the ethanol blends were 13-22% lower than the base fuel.
    - There was no difference in THC emissions between the E10 and E10-Spl fuels

NMHC and NMOG Emissions

- For the MPFI vehicles:
    - NMHC and NMOG emissions were highest for the driving cycle involving cold engine start.
    - As compared to the E0 fuel, the Escort and Sentra had increased NMHC and NMOG emission rates with the E10 fuel and decreased emission rates with the E20 fuel. For the 4-Phase Composite cycle, the E10 fuel increased NMHC by 20-66% and NMOG by 21-56%; the E20 fuel decreased NMHC by 6-52% and NMOG by 1-27%.
    - The Caravan emissions rates of NMHC and NMOG were similar between the base fuel and the ethanol blend fuels for the 4-Phase Composite. With aggressive driving the Caravan NMHC and NMOG emission rates decreased by 3-33% with increasing fuel ethanol content.
    - Operation at -10ºC had increased NMHC and NMOG emissions as compared to operation at 20ºC, however the pattern of emissions with respect to fuel ethanol content remained the same.
    - As compared to the E10 fuel, the E10-Spl fuel resulted in 22-41% lower NMHC and NMOG emissions during the 4-Phase Composite at cold temperature operation. There was no difference in NMHC or NMOG emissions between the two fuels during the aggressive driving at -10°C or during any of the 20°C tests.
- For the GDI vehicle:
    - NMHC and NMOG emissions were highest for the driving cycle involving cold engine start.

- NMHC and NMOG emissions were lower for the ethanol blends fuels as compared to the base fuel. During the 4-Phase Composite cycle, NMHC was lowered by 13-26% and NMOG by 10-19%.
- During aggressive driving, the higher ethanol blend fuel (E20) had lower NMHC and NMOG emissions than the lower ethanol blend fuel (E10).
- There was no difference in NMHC or NMOG emissions between the E10 and E10-Spl fuels.

Ethanol Emissions

- For all vehicles:
  - Ethanol emissions were highest for cold engine start. Once the vehicles were running at operating temperature ethanol emissions were very low or undetectable
  - Operation at cold temperature resulted in higher ethanol emission rates as compared to operation at standard temperature. The cold temperature mainly affected the cycle involving cold engine start.
  - Relatively small ethanol emissions were present during some of the tests with E0 fuel, likely due to hang up of ethanol in the vehicle fuel system. These findings indicate that the canister conditioning and vehicle preparation procedures minimized but did not completely eliminate fuel carry-over.
  - There was no difference in Ethanol emissions between the E10 and E10-Spl fuels.

Carbonyl Emissions

- For all vehicles:
  - Carbonyl emissions were highest for cold engine start.
  - Cold engine start at -10ºC had increased carbonyl emissions as compared to cold engine start at 20ºC.
  - The carbonyl emissions from the E10-Spl fuel were 13-59% lower than those from the E10 fuel. The exception to this was the Caravan, which had similar carbonyl emissions between the E10 and E10-Spl fuels.
  - The presence of ethanol in the fuel increased the formaldehyde emissions during cold engine start and aggressive driving conditions; however this increase was not always statistically significant.
  - The presence of ethanol in the fuel increased the acetaldehyde emissions during cold engine start and aggressive driving conditions. For the cold engine start cycle this increase was statistically significant and ranged from 33-878% at 20°C and from 419-3992% at -10°C. For the aggressive driving cycle this increase was not always statistically significant.

VOC Emissions

- For all vehicles:
  - VOC profiles were very similar among the four fuels for a given vehicle and were typical of a mixture of combustion gases and unburned fuel.
  - The target compounds present were due to the gasoline content of the fuel. The quantity of these compounds in the emissions profiles generally decreased with increasing fuel ethanol content

Specific Reactivity and Ozone Forming Potential

- For the MPFI vehicles:
  - Fuel ethanol content did not affect the specific reactivity or ozone forming potential of the exhaust. This was true for both the 4-Phase Composite and the aggressive driving cycles.
  - As compared to the E10 fuel, the E10-Spl fuel resulted in lower specific reactivity during the 20°C testing and higher specific reactivity during the -10°C testing. These differences were small compared to the standard deviations of the data.
  - As compared to the E10 fuel, the E10-Spl fuel resulted in lower ozone forming potential during both the 4-Phase Composite and aggressive driving cycles. These differences were small compared to the standard deviations of the data.
- For the GDI vehicle:
  - Increasing fuel ethanol content resulted in decreasing specific reactivity and ozone forming potential of the exhaust during both the 4-Phase Composite and aggressive driving cycles.

- As compared to the E10 fuel, the E10-Spl fuel resulted in higher specific reactivity and ozone forming potential during the 4-Phase Composite cycle and lower specific reactivity and ozone forming potential during the aggressive driving cycle. These differences were small compared to the standard deviations of the data.

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Appendices

Please note:
- ***<DL = value less than detection limit***
- ***NSD = no statistically significant difference***
- ***When the emission rates for both groups in a comparison are zero, ANOVA tests cannot be performed, hence the p-value is listed as "n/a" and the change as "NSD"***
- ***When the E0 results are null value, "% Diff" cannot be calculated and is listed as "n/a"***
- ***When multiple results are not available, standard deviation cannot be calculated and is listed as "n/a"***

Appendix 1 Detailed Fuel Analysis

Test	Method	Units	Summer Grade Fuel				Winter Grade Fuel			
			E0	E10	E10-Spl	E20	E0	E10	E10-Spl	E20
Distillation - IBP	ASTM D86	°C	32	42	39	38	32	35	30	32
5%	ASTM D86	°C	49	54	49	51	40	42	36	38
10%	ASTM D86	°C	58	59	55	56	46	53	41	43
20%	ASTM D86	°C	72	64	62	62	55	64	48	51
30%	ASTM D86	°C	84	68	66	66	65	69	55	58
40%	ASTM D86	°C	93	78	70	69	78	74	62	65
50%	ASTM D86	°C	100	104	99	71	95	104	68	70
60%	ASTM D86	°C	105	110	105	73	106	112	100	72
70%	ASTM D86	°C	110	118	109	112	112	120	109	79
80%	ASTM D86	°C	116	130	117	125	121	132	118	115
90%	ASTM D86	°C	134	158	135	153	141	158	138	135
95%	ASTM D86	°C	167	174	166	170	168	173	166	164
Distillation - EP	ASTM D86	°C	201	202	198	192	198	196	197	195
Recovery	ASTM D86	vol %	97.5	97.9	97.0	98.3	96.9	95.0	96.6	97.1
Residue	ASTM D86	vol %	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Loss	ASTM D86	vol %	1.5	1.1	2.0	0.7	2.1	4.0	2.4	1.9
% Evaporated @ 200°C	ASTM D86	vol %	97.5	>98	>97	>97	--	--	--	--
% Evaporated @ 300°C	ASTM D86	vol %	--	>98	>97	>97	--	--	--	--
Gravity	ASTM D4052	°API	69.2	63.6	65.9	61.4	72.7	63.4	69.3	66.8
Reid Vapor Pressure	ASTM D5191	psi	8.8	8.6	9.4	8.7	13.4	13.1	13.8	13.2
Driveability Index	ASTM D4814	°C	521	559	515	450	495	554	404	410
Carbon	ASTM D5291	wt fraction	84.82	85.62	84.26	85.08	84.7	84.6	83.6	83.4
Hydrogen	ASTM D5291	wt fraction	15.18	14.38	15.74	14.92	15.3	15.4	16.4	16.4
Ethanol Content	ASTM D4815	vol %	<0.01	10.0	10.0	20.2	0.0	9.9	10.2	20.2
Sulfur	ASTM D5453	ppm	34	34	31	35	33	33	26	27
Lead	ASTM D3237	mg/l	<2	<2	<2	<2	<2	<2	<2	<2
Manganese	ASTM D3831	mg/l	<0.2	<0.2	<0.2	<0.2	<1	<1	<1	<1
Phosphorus	ASTM D3231	mg/l	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3
Group Types		vol %								
Paraffins	ASTM D6623B	vol %	9.8	9.5	8.1	13.1	5.8	11.1	5.4	4.9
Isoparaffins	ASTM D6623B	vol %	72.4	56.5	67.1	37.3	78.5	51.7	71.9	61.7
Olefins	ASTM D6623B	vol %	1.2	1.3	1.1	1.5	0.8	1.2	0.8	0.7
Naphthenes	ASTM D6623B	vol %	5.3	9.2	4.5	13.0	4.7	11.0	4.6	4.0
Aromatics	ASTM D6623B	vol %	7.9	11.0	8.1	14.1	8.3	12.6	7.3	6.3
Unknowns	ASTM D6623B	vol %	3.4	2.5	1.1	1.0	1.9	2.4	0.0	2.4
Oxygenates	ASTM D6623B	vol %	0.0	10.0	10.0	20.0	0.0	10.0	10.0	20.0
Benzene Content	ASTM D3606	vol %	0.1	0.5	0.7	0.8	0.5	0.5	0.4	0.3
Oxidation Stability	ASTM D525	minutes	>240	>240	>240	>240	>240	<240	<240	>240
Copper Corrosion	ASTM D130	-	1	1	1	1	1	1	1	1
Ferrous Corrosion	D665 M	-	B++	B++	A	B+	B+	B++	A	A
Existent Gum, Washed	ASTM D381	mg/100min	<1	<1	<1	<1	<1	<1	<1	<1
Research Octane No.	ASTM D2699	-	88.6	90.0	96.0	92.0	88.2	90.0	94.0	100.0
Motor Octane No.	ASTM D2700	-	86.0	85.0	89.0	85.7	85.0	84.3	89.5	90.0
R+M / 2	D2699/2700	-	87.8	87.5	92.5	88.9	86.6	87.2	91.8	95.0
Additives										
Ornite OGA 402	Calculated	ptb	50	50	50	50	50	50	50	50
Corrosion Inhibitor	Calculated	ptb	5	5	5	5	5	5	5	5

Appendix 2 CO Results

2.a Emission Rates

Escort, CO Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
20℃ Testing										
E0	4.39	0.51	0.08	0.01	0.67	0.16	0.07	0.01	12.46	0.22
E10	3.11	0.01	0.07	0.008	0.40	0.04	0.06	0.01	5.13	0.38
E10-Spl	3.09	0.88	0.04	0.005	0.37	0.06	0.04	0.009	6.17	0.98
E20	3.12	0.34	0.07	0.008	0.31	0.07	0.09	0.01	6.60	0.68
-10℃ Testing										
E0	24.27	3.23	0.09	0.02	1.54	1.61	0.09	0.05	11.93	2.49
E10	13.14	3.20	0.10	0.03	1.16	1.05	0.06	0.02	13.34	1.52
E10-Spl	19.69	1.29	0.13	0.03	0.85	0.45	0.05	0.007	13.59	2.51
E20	15.50	4.72	0.08	0.0007	0.58	0.29	0.08	0.007	10.41	1.57

Sentra, CO Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
20℃ Testing										
E0	0.54	0.34	0.04	0.05	0.05	0.06	0.01	0.006	1.03	0.39
E10	0.46	0.14	0.02	0.001	0.02	0.004	0.02	0.002	0.94	0.03
E10-Spl	0.43	0.06	0.02	0.007	0.01	0.001	0.01	0.0005	0.60	0.40
E20	0.14	0.03	0.02	0.006	0.02	0.006	0.02	0.003	0.29	0.07
-10℃ Testing										
E0	5.42	1.28	0.13	0.04	0.09	0.06	0.08	0.06	0.07	0.06
E10	3.38	0.45	0.13	0.11	0.18	0.14	0.04	0.005	0.04	0.02
E10-Spl	4.58	0.27	0.12	0.02	0.23	0.08	0.08	0.06	0.04	0.03
E20	4.16	0.25	0.09	0.03	0.02	0.001	0.10	0.03	0.006	0.001

Caravan, CO Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
E0	4.10	0.89	0.09	0.02	0.29	0.08	0.08	0.01	0.59	0.15
E10	4.00	0.54	0.09	0.01	0.20	0.04	0.09	0.02	0.75	0.29
E10-Spl	4.22	1.01	0.10	0.02	0.21	0.07	0.11	0.02	0.48	0.10
E20	3.39	0.63	0.11	0.04	0.17	0.08	0.09	0.02	0.53	0.11

Dion, CO Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
E0	2.60	0.48	0.48	0.22	1.13	0.19	0.53	0.38	9.23	1.66
E10	1.36	0.17	0.22	0.09	0.94	0.36	0.25	0.27	7.38	1.41
E10-Spl	2.52	1.06	0.38	0.33	0.76	0.11	0.26	0.12	5.87	2.29
E20	1.16	0.15	0.19	0.17	0.73	0.22	0.30	0.26	5.06	2.13

2.b Regression Analysis

Slopes of Regression Analysis – CO Emission Rates from E0, E10 & E20 Fuels

	20°C Testing			-10°C Testing		
	Slope	Upper 95%	Lower 95%	Slope	Upper 95%	Lower 95%
Phase 1 CSLA4						
Escort	-0.063	-0.130	0.003	***-0.538***	-0.973	-0.103
Sentra	-0.019	-0.046	0.008	-0.080	-0.189	0.028
Caravan	-0.036	-0.082	0.010			
Dion	***-0.071***	-0.096	-0.046			
Phase 2 CSLA4						
Escort	-0.0007	-0.002	0.0004	-0.0002	-0.002	0.002
Sentra	-0.001	-0.005	0.002	-0.002	-0.007	0.003
Caravan	0.0009	-0.0009	0.003			
Dion	***-0.014***	-0.025	-0.003			
Phase 1 HSLA4						
Escort	***-0.018***	-0.033	-0.004	-0.047	-0.164	0.071
Sentra	-0.002	-0.006	0.002	-0.002	-0.010	0.007
Caravan	***-0.006***	-0.011	-0.001			
Dion	***-0.020***	-0.036	-0.004			
Phase 2 HSLA4						
Escort	0.001	-0.001	0.003	-0.0006	-0.004	0.003
Sentra	0.0005	-0.00003	0.001	0.0006	-0.004	0.006
Caravan	0.0003	-0.0006	0.001			
Dion	-0.011	-0.031	0.009			
US06						
Escort	-0.293	-0.628	0.042	-0.044	-0.256	0.167
Sentra	***-0.036***	-0.070	-0.002	-0.003	-0.008	0.001
Caravan	-0.004	-0.016	0.009			
Dion	***-0.209***	-0.330	-0.088			

NOTE:
- ***Negative slope values indicate decreasing emissions with increasing fuel ethanol content***
- ***Positive slope values indicate increasing emissions with increasing fuel ethanol content***
- ***Slopes that have upper and lower limits of the same sign are considered "significant" and are italicized and shown in bold text***

2.c ANOVA Analysis

Escort, ANOVA Results – CO Emission Rates from 20°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.071	NSD	--	0.136	NSD	--
	E0 vs. E10-Spl	0.213	NSD	--	0.035	E0 > E10-Spl	-51%
	E0 vs. E20	0.099	NSD	--	0.244	NSD	--
HSLA4	E0 vs. E10	0.149	NSD	--	0.470	NSD	--
	E0 vs. E10-Spl	0.133	NSD	--	0.156	NSD	--
	E0 vs. E20	0.101	NSD	--	0.291	NSD	--
US06	E0 vs. E10	0.0002	E0 > E10	-59%			
	E0 vs. E10-Spl	0.013	E0 > E10-Spl	-51%			
	E0 vs. E20	0.007	E0 > E20	-47%			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.979	NSD	--	0.026	E10 > E10-Spl	-39%
HSLA4	E10 vs. E10-Spl	0.627	NSD	--	0.149	NSD	--
US06	E10 vs. E10-Spl	0.178	NSD	--			

Escort, ANOVA Results – CO Emission Rates from -10°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.003	E0 > E10	-46%	0.486	NSD	--
	E0 vs. E10-Spl	0.033	E0 > E10-Spl	-19%	0.017	E10-Spl > E0	51%
	E0 vs. E20	0.033	E0 > E20	-36%	0.489	NSD	--
HSLA4	E0 vs. E10	0.730	NSD	--	0.400	NSD	--
	E0 vs. E10-Spl	0.436	NSD	--	0.170	NSD	--
	E0 vs. E20	0.463	NSD	--	0.903	NSD	--
US06	E0 vs. E10	0.418	NSD	--			
	E0 vs. E10-Spl	0.355	NSD	--			
	E0 vs. E20	0.470	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.013	E10-Spl > E10	50%	0.229	NSD	--
HSLA4	E10 vs. E10-Spl	0.609	NSD	--	0.374	NSD	--
US06	E10 vs. E10-Spl	0.884	NSD	--			

Sentra, ANOVA Results – CO Emission Rates from 20°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.774	NSD	--	0.401	NSD	--
	E0 vs. E10-Spl	0.707	NSD	--	0.488	NSD	--
	E0 vs. E20	0.214	NSD	--	0.540	NSD	--
HSLA4	E0 vs. E10	0.363	NSD	--	0.152	NSD	--
	E0 vs. E10-Spl	0.320	NSD	--	0.688	NSD	--
	E0 vs. E20	0.484	NSD	--	0.185	NSD	--
US06	E0 vs. E10	0.784	NSD	--			
	E0 vs. E10-Spl	0.316	NSD	--			
	E0 vs. E20	0.084	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.857	NSD	--	0.587	NSD	--
HSLA4	E10 vs. E10-Spl	0.251	NSD	--	0.018	E10 > E10-Spl	-29%
US06	E10 vs. E10-Spl	0.351	NSD	--			

Sentra, ANOVA Results – CO Emission Rates from -10°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.080	E10 > E0		1.000	NSD	--
	E0 vs. E10-Spl	0.314	NSD	--	0.616	NSD	--
	E0 vs. E20	0.237	NSD	--	0.196	NSD	--
HSLA4	E0 vs. E10	0.205	NSD	--	0.429	NSD	--
	E0 vs. E10-Spl	0.027	E10-Spl > E0	154%	0.981	NSD	--
	E0 vs. E20	0.223	NSD	--	0.602	NSD	--
US06	E0 vs. E10	0.505	NSD	--			
	E0 vs. E10-Spl	0.483	NSD	--			
	E0 vs. E20	0.199	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.031	E10-Spl > E10	35%	0.845	NSD	--
HSLA4	E10 vs. E10-Spl	0.694	NSD	--	0.433	NSD	--
US06	E10 vs. E10-Spl	0.868	NSD	--			

Caravan, CO Emission Rates (g/mile) from 20℃ Tests, ANOVA Results – E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.867	NSD	--	0.823	NSD	--
	E0 vs. E10-Spl	0.859	NSD	--	0.670	NSD	--
	E0 vs. E20	0.155	NSD	--	0.361	NSD	--
HSLA4	E0 vs. E10	0.114	NSD	--	0.507	NSD	--
	E0 vs. E10-Spl	0.150	NSD	--	0.023	E10-Spl > E0	31%
	E0 vs. E20	0.032	E0 > E20	-41%	0.464	NSD	--
US06	E0 vs. E10	0.325	NSD	--			
	E0 vs. E10-Spl	0.246	NSD	--			
	E0 vs. E20	0.442	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.752	NSD	--	0.497	NSD	--
HSLA4	E10 vs. E10-Spl	0.837	NSD	--	0.201	NSD	--
US06	E10 vs. E10-Spl	0.128	NSD	--			

Dion, CO Emission Rates (g/mile) from 20℃ Tests, ANOVA Results – E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.002	E0 > E10	-48%	0.063	NSD	--
	E0 vs. E10-Spl	0.886	NSD	--	0.626	NSD	--
	E0 vs. E20	0.00006	E0 > E20	-55%	0.038	E0 > E20	-59%
HSLA4	E0 vs. E10	0.355	NSD	--	0.260	NSD	--
	E0 vs. E10-Spl	0.012	E0 > E10-Spl	-33%	0.211	NSD	--
	E0 vs. E20	0.012	E0 > E20	-35%	0.261	NSD	--
US06	E0 vs. E10	0.160	NSD	--			
	E0 vs. E10-Spl	0.038	E0 > E10-Spl	-36%			
	E0 vs. E20	0.009	E0 > E20	-45%			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.074	NSD	--	0.378	NSD	--
HSLA4	E10 vs. E10-Spl	0.360	NSD	--	0.989	NSD	--
US06	E10 vs. E10-Spl	0.366	NSD	--			

Appendix 3 NO_X Results

3.a Emission Rates

Escort, NO_X Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
20℃ Testing										
E0	0.20	0.01	0.007	0.0002	0.08	0.007	0.004	0.004	0.33	0.01
E10	0.39	0.03	0.02	0.008	0.11	0.03	0.02	0.01	0.39	0.08
E10-Spl	0.34	0.04	0.01	0.001	0.11	0.02	0.02	0.002	0.39	0.03
E20	0.37	0.0003	0.02	0.001	0.12	0.01	0.02	0.008	0.43	0.11
-10℃ Testing										
E0	0.21	0.05	0.03	0.01	0.14	0.05	0.03	0.009	0.39	0.12
E10	0.55	0.10	0.03	0.01	0.19	0.06	0.05	0.02	0.41	0.08
E10-Spl	0.28	0.06	0.04	0.02	0.17	0.02	0.03	0.01	0.33	0.03
E20	0.42	0.07	0.06	0.01	0.25	0.04	0.06	0.01	0.34	0.09

Sentra, NO_X Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
20℃ Testing										
E0	0.006	0.004	< DL	n/a	0.003	0.003	< DL	n/a	0.02	0.009
E10	0.004	0.002	< DL	n/a	0.0003	0.0006	< DL	n/a	0.04	0.02
E10-Spl	< DL	n/a	< DL	n/a	0.0004	0.0007	-0.002	0.003	0.03	0.002
E20	0.01	0.0002	< DL	n/a	0.0004	0.0006	< DL	n/a	0.008	0.002
-10℃ Testing										
E0	0.57	0.49	0.004	0.007	0.35	0.27	0.02	0.03	1.31	0.73
E10	0.38	0.27	0.005	0.004	0.29	0.32	0.006	0.006	1.67	0.74
E10-Spl	0.81	0.14	< DL	n/a	0.45	0.04	0.0005	0.0008	1.75	0.14
E20	3.11	0.19	0.06	0.03	2.10	0.17	0.10	0.14	3.83	0.27

Caravan, NO_X Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
E0	0.48	0.04	0.06	0.02	0.25	0.07	0.04	0.02	0.27	0.03
E10	0.54	0.05	0.09	0.04	0.26	0.04	0.03	0.02	0.28	0.05
E10-Spl	0.54	0.05	0.04	0.03	0.27	0.07	0.09	0.14	0.18	0.03
E20	0.60	0.08	0.04	0.01	0.35	0.04	0.02	0.01	0.31	0.04

Dion, NO_X Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
E0	0.39	0.08	0.12	0.02	0.29	0.14	0.10	0.04	0.43	0.13
E10	0.24	0.09	0.12	0.05	0.24	0.08	0.10	0.04	0.34	0.12
E10-Spl	0.32	0.10	0.12	0.08	0.32	0.08	0.13	0.04	0.45	0.09
E20	0.45	0.07	0.17	0.04	0.38	0.05	0.18	0.03	0.57	0.12

3.b Regression Analysis

Slopes of Regression Analysis – NO_X Emission Rates from E0, E10 & E20 Fuels

	20°C Testing			-10°C Testing		
	Slope	Upper 95%	Lower 95%	Slope	Upper 95%	Lower 95%
Phase 1 CSLA4						
Escort	***0.009***	0.0008	0.016	***0.014***	0.001	0.026
Sentra	0.0003	-0.0002	0.0008	***0.108***	0.040	0.177
Caravan	***0.006***	0.002	0.010			
Dion	0.003	-0.004	0.011			
Phase 2 CSLA4						
Escort	0.0007	-0.0001	0.002	***0.001***	0.0003	0.002
Sentra	n/a	n/a	n/a	***0.003***	0.001	0.004
Caravan	-0.001	-0.003	0.0006			
Dion	***0.003***	0.0003	0.005			
Phase 1 HSLA4						
Escort	0.002	-0.0006	0.004	***0.006***	0.001	0.010
Sentra	-0.0001	-0.0003	0.00008	***0.076***	0.032	0.119
Caravan	***0.005***	0.001	0.009			
Dion	0.005	-0.002	0.012			
Phase 2 HSLA4						
Escort	0.0008	-0.0003	0.002	***0.001***	0.0004	0.003
Sentra	n/a	n/a	n/a	0.004	-0.002	0.009
Caravan	-0.0009	-0.002	0.0001			
Dion	***0.004***	0.002	0.007			
US06						
Escort	0.005	-0.004	0.014	-0.002	-0.011	0.008
Sentra	-0.0005	-0.002	0.001	***0.115***	0.046	0.183
Caravan	0.002	-0.0004	0.004			
Dion	0.007	-0.003	0.016			

NOTE:
- ***Negative slope values indicate decreasing emissions with increasing fuel ethanol content***
- ***Positive slope values indicate increasing emissions with increasing fuel ethanol content***
- ***Slopes that have upper and lower limits of the same sign are considered "significant" and are italicized and shown in bold text***

3.c ANOVA Analysis

Escort, ANOVA Results – NO_X Emission Rates from 20°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.003	E10 > E0	91%	0.082	NSD	--
	E0 vs. E10-Spl	0.038	E10-Spl > E0	67%	0.016	E10-Spl > E0	98%
	E0 vs. E20	0.002	E20 > E0	85%	0.003	E20 > E0	225%
HSLA4	E0 vs. E10	0.339	NSD	--	0.151	NSD	--
	E0 vs. E10-Spl	0.287	NSD	--	0.063	NSD	--
	E0 vs. E20	0.070	NSD	--	0.130	NSD	--
US06	E0 vs. E10	0.377	NSD	--			
	E0 vs. E10-Spl	0.096	NSD	--			
	E0 vs. E20	0.315	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.165	NSD	--	0.235	NSD	--
HSLA4	E10 vs. E10-Spl	0.999	NSD	--	0.785	NSD	--
US06	E10 vs. E10-Spl	0.969	NSD	--			

Escort, ANOVA Results – NO_X Emission Rates from -10°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.0006	E10 > E0	161%	0.594	NSD	--
	E0 vs. E10-Spl	0.094	NSD	--	0.317	NSD	--
	E0 vs. E20	0.007	E20 > E0	97%	0.015	E20 > E0	106%
HSLA4	E0 vs. E10	0.200	NSD	--	0.089	NSD	--
	E0 vs. E10-Spl	0.255	NSD	--	0.681	NSD	--
	E0 vs. E20	0.042	E20 > E0	85%	0.019	E20 > E0	97%
US06	E0 vs. E10	0.797	NSD	--			
	E0 vs. E10-Spl	0.328	NSD	--			
	E0 vs. E20	0.646	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.005	E10 > E10-Spl	-49%	0.635	NSD	--
HSLA4	E10 vs. E10-Spl	0.514	NSD	--	0.114	NSD	--
US06	E10 vs. E10-Spl	0.105	NSD	--			

Sentra, ANOVA Results – NO_X Emission Rates from 20°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.449	NSD	--	n/a	n/a	--
	E0 vs. E10-Spl	0.165	NSD	--	n/a	n/a	--
	E0 vs. E20	0.099	NSD	--	n/a	n/a	--
HSLA4	E0 vs. E10	0.218	NSD	--	n/a	n/a	--
	E0 vs. E10-Spl	0.240	NSD	--	0.374	NSD	--
	E0 vs. E20	0.355	NSD	--	n/a	n/a	--
US06	E0 vs. E10	0.231	NSD	--			
	E0 vs. E10-Spl	0.249	NSD	--			
	E0 vs. E20	0.173	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.123	NSD	--	n/a	n/a	--
HSLA4	E10 vs. E10-Spl	0.846	NSD	--	0.374	NSD	--
US06	E10 vs. E10-Spl	0.611	NSD	--			

Sentra, ANOVA Results – NO_X Emission Rates from -10°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.621	E10 > E0		0.852	NSD	--
	E0 vs. E10-Spl	0.455	NSD	--	0.446	NSD	--
	E0 vs. E20	0.0005	E20 > E0	442%	0.001	E20 > E0	1630%
HSLA4	E0 vs. E10	0.802	NSD	--	0.657	NSD	--
	E0 vs. E10-Spl	0.595	NSD	--	0.399	NSD	--
	E0 vs. E20	0.0002	E20 > E0	492%	0.148	NSD	--
US06	E0 vs. E10	0.572	NSD	--			
	E0 vs. E10-Spl	0.347	NSD	--			
	E0 vs. E20	0.004	E20 > E0	192%			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.090	NSD	--	0.094	NSD	--
HSLA4	E10 vs. E10-Spl	0.445	NSD	--	0.170	NSD	--
US06	E10 vs. E10-Spl	0.846	NSD	--			

Caravan, ANOVA Results – NO_X Emission Rates from 20℃ Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.097	NSD	--	0.308	NSD	--
	E0 vs. E10-Spl	0.065	NSD	--	0.345	NSD	--
	E0 vs. E20	0.011	E20 > E0	27%	0.067	NSD	--
HSLA4	E0 vs. E10	0.756	NSD	--	0.481	NSD	--
	E0 vs. E10-Spl	0.670	NSD	--	0.498	NSD	--
	E0 vs. E20	0.028	E20 > E0	39%	0.077	NSD	--
US06	E0 vs. E10	0.934	NSD	--			
	E0 vs. E10-Spl	0.007	E0 > E10-Spl	-33%			
	E0 vs. E20	0.096	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.962	NSD	--	0.183	NSD	--
HSLA4	E10 vs. E10-Spl	0.900	NSD	--	0.538	NSD	--
US06	E10 vs. E10-Spl	0.044	E10 > E10-Spl	-33%			

Dion, ANOVA Results – NO_X Emission Rates from 20℃ Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.034	E0 > E10	-38%	0.857	NSD	--
	E0 vs. E10-Spl	0.264	NSD	--	0.863	NSD	--
	E0 vs. E20	0.216	NSD	--	0.021	E20 > E0	46%
HSLA4	E0 vs. E10	0.545	NSD	--	0.993	NSD	--
	E0 vs. E10-Spl	0.725	NSD	--	0.474	NSD	--
	E0 vs. E20	0.186	NSD	--	0.003	E20 > E0	75%
US06	E0 vs. E10	0.341	NSD	--			
	E0 vs. E10-Spl	0.833	NSD	--			
	E0 vs. E20	0.137	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.368	NSD	--	0.967	NSD	--
HSLA4	E10 vs. E10-Spl	0.223	NSD	--	0.515	NSD	--
US06	E10 vs. E10-Spl	0.247	NSD	--			

Appendix 4 Oxy-Corrected THC Results

4.a Emission Rates

Escort, Oxy-Corrected THC Emission Rates (g/mile) from 20°C and -10°C Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
20°C Testing										
E0	0.33	0.0004	0.01	0.01	0.04	n/a	0.07	0.09	0.11	0.01
E10	0.37	0.01	0.01	0.002	0.05	0.004	0.01	0.003	0.06	0.02
E10-Spl	0.33	0.04	0.007	0.004	0.04	0.01	0.008	0.006	0.06	0.01
E20	0.31	0.02	0.005	0.002	0.03	0.003	0.007	0.002	0.09	0.01
-10°C Testing										
E0	1.61	0.10	0.01	0.002	0.08	0.06	0.004	0.003	0.11	0.007
E10	2.37	0.13	0.02	0.006	0.07	0.02	0.004	0.002	0.13	0.03
E10-Spl	1.71	0.20	0.03	0.003	0.06	0.01	0.006	0.005	0.14	0.02
E20	1.52	0.36	0.02	0.008	0.05	0.02	0.005	0.001	0.10	0.004

Sentra, Oxy-Corrected THC Emission Rates (g/mile) from 20°C and -10°C Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
20°C Testing										
E0	0.07	0.01	0.002	0.003	0.005	0.005	0.003	0.003	0.002	0.002
E10	0.10	0.008	0.007	0.003	0.008	0.003	0.009	0.006	0.005	0.001
E10-Spl	0.07	0.008	0.005	0.004	0.002	0.003	0.002	0.005	0.001	0.002
E20	0.04	0.02	0.002	0.002	0.001	0.002	0.002	0.002	0.0007	0.0007
-10°C Testing										
E0	0.91	0.16	0.005	0.003	0.006	0.003	0.003	0.002	0.002	0.001
E10	1.51	0.09	0.008	0.0008	0.01	0.004	0.004	0.0004	0.003	0.0001
E10-Spl	0.88	0.12	0.02	0.0005	0.01	0.003	0.005	0.001	0.004	0.0002
E20	0.83	0.20	0.005	0.0005	0.008	0.0003	0.003	0.0004	0.003	0.0002

Caravan, Oxy-Corrected THC Emission Rates (g/mile) from 20°C Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
E0	0.53	0.19	0.006	0.005	0.05	0.008	0.006	0.004	0.03	0.004
E10	0.50	0.15	0.009	0.01	0.05	0.003	0.01	0.003	0.03	0.003
E10-Spl	0.68	0.21	0.01	0.0003	0.06	0.005	0.01	0.004	0.03	0.004
E20	0.53	0.06	0.01	0.005	0.05	0.009	0.009	0.002	0.03	0.005

Dion, Oxy-Corrected THC Emission Rates (g/mile) from 20°C Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
E0	0.66	0.03	0.03	0.01	0.07	0.03	0.03	0.003	0.06	0.02
E10	0.54	0.02	0.04	0.001	0.07	0.02	0.04	0.004	0.06	n/a
E10-Spl	0.57	0.05	0.04	0.008	0.05	0.005	0.04	0.0006	0.05	0.005
E20	0.51	0.04	0.03	0.005	0.05	0.005	0.03	0.005	0.03	n/a

4.b Regression Analysis\

Slopes of Regression Analysis – Oxy-Corrected THC Emission Rates from E0, E10 & E20 Fuels

	20°C Testing			-10°C Testing		
	Slope	Upper 95%	Lower 95%	Slope	Upper 95%	Lower 95%
Phase 1 CSLA4						
Escort	-0.0009	-0.005	0.003	0.005	-0.035	0.044
Sentra	-0.001	-0.004	0.001	-0.002	-0.034	0.031
Caravan	-0.0002	-0.016	0.016			
Dion	***-0.007***	-0.012	-0.003			
Phase 2 CSLA4						
Escort	-0.0004	-0.001	0.0005	0.0004	-0.0001	0.0009
Sentra	0.00004	-0.0004	0.0004	0.00002	-0.0002	0.0003
Caravan	0.0002	-0.0005	0.0009			
Dion	0.0001	-0.0007	0.0009			
Phase 1 HSLA4						
Escort	-0.0007	-0.002	0.0004	-0.0009	-0.005	0.003
Sentra	-0.0001	-0.0006	0.0003	0.0001	-0.0001	0.0004
Caravan	-0.0004	-0.001	0.0004			
Dion	-0.0007	-0.003	0.002			
Phase 2 HSLA4						
Escort	-0.003	-0.009	0.003	0.00001	-0.0002	0.0002
Sentra	-0.00003	-0.0006	0.0005	0.00003	-0.0001	0.0002
Caravan	0.0002	-0.0002	0.0006			
Dion	0.0002	-0.0002	0.0006			
US06						
Escort	-0.001	-0.004	0.002	0.0002	-0.002	0.002
Sentra	-0.00004	-0.0003	0.0002	***0.00009***	0.0000007	0.0002
Caravan	-0.0002	-0.0006	0.0003			
Dion	-0.002	-0.004	0.0007			

NOTE:
- ***Negative slope values indicate decreasing emissions with increasing fuel ethanol content***
- ***Positive slope values indicate increasing emissions with increasing fuel ethanol content***
- ***Slopes that have upper and lower limits of the same sign are considered "significant" and are italicized and shown in bold text***

4.c ANOVA Analysis

Escort, ANOVA Results – Oxy-Corrected THC Emission Rates from 20°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.024	E10 > E0	13%	0.822	NSD	--
	E0 vs. E10-Spl	0.994	NSD	--	0.645	NSD	--
	E0 vs. E20	0.281	NSD	--	0.539	NSD	--
HSLA4	E0 vs. E10	0.448	NSD	--	0.338	NSD	--
	E0 vs. E10-Spl	0.860	NSD	--	0.458	NSD	--
	E0 vs. E20	0.235	NSD	--	0.451	NSD	--
US06	E0 vs. E10	0.045	E0 > E10	-41%			
	E0 vs. E10-Spl	0.073	NSD	--			
	E0 vs. E20	0.254	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.142	NSD	--	0.207	NSD	--
HSLA4	E10 vs. E10-Spl	0.811	NSD	--	0.347	NSD	--
US06	E10 vs. E10-Spl	0.974	NSD	--			

Escort, ANOVA Results – Oxy-Corrected THC Emission Rates from -10°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.0003	E10 > E0	47%	0.016	E10 > E0	106%
	E0 vs. E10-Spl	0.404	NSD	--	0.0003	E10-Spl > E0	177%
	E0 vs. E20	0.636	NSD	--	0.210	NSD	--
HSLA4	E0 vs. E10	0.860	NSD	--	0.772	NSD	--
	E0 vs. E10-Spl	0.694	NSD	--	0.572	NSD	--
	E0 vs. E20	0.636	NSD	--	0.912	NSD	--
US06	E0 vs. E10	0.224	NSD	--			
	E0 vs. E10-Spl	0.027	E10-Spl > E0	30%			
	E0 vs. E20	0.146	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.008	E10-Spl > E10	6%	0.139	NSD	--
HSLA4	E10 vs. E10-Spl	0.582	NSD	--	0.478	NSD	--
US06	E10 vs. E10-Spl	0.712	NSD	--			

Sentra, ANOVA Results – Oxy-Corrected THC Emission Rates from 20°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.050	NSD	--	0.086	NSD	--
	E0 vs. E10-Spl	0.530	NSD	--	0.367	NSD	--
	E0 vs. E20	0.097	NSD	--	0.997	NSD	--
HSLA4	E0 vs. E10	0.442	NSD	--	0.225	NSD	--
	E0 vs. E10-Spl	0.439	NSD	--	0.699	NSD	--
	E0 vs. E20	0.424	NSD	--	0.538	NSD	--
US06	E0 vs. E10	0.193	NSD	--			
	E0 vs. E10-Spl	0.658	NSD	--			
	E0 vs. E20	0.468	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.027	E10 > E10-Spl	-9%	0.576	NSD	--
HSLA4	E10 vs. E10-Spl	0.093	NSD	--	0.202	NSD	--
US06	E10 vs. E10-Spl	0.136	NSD	--			

Sentra, ANOVA Results – Oxy-Corrected THC Emission Rates from -10°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.009	E10 > E0	66%	0.143	NSD	--
	E0 vs. E10-Spl	0.848	NSD	--	0.005	E10-Spl > E0	232%
	E0 vs. E20	0.622	NSD	--	0.990	NSD	--
HSLA4	E0 vs. E10	0.186	NSD	--	0.621	NSD	--
	E0 vs. E10-Spl	0.153	NSD	--	0.315	NSD	--
	E0 vs. E20	0.287	NSD	--	0.997	NSD	--
US06	E0 vs. E10	0.186	NSD	--			
	E0 vs. E10-Spl	0.071	NSD	--			
	E0 vs. E20	0.183	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.025	E10 > E10-Spl	-3%	0.008	E10-Spl > E10	232%
HSLA4	E10 vs. E10-Spl	0.946	NSD	--	0.357	NSD	--
US06	E10 vs. E10-Spl	0.043	E10-Spl > E10	140%			

Caravan, ANOVA Results – Oxy-Corrected THC Emission Rates from 20°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.874	NSD	--	0.726	NSD	--
	E0 vs. E10-Spl	0.415	NSD	--	0.267	NSD	--
	E0 vs. E20	0.996	NSD	--	0.464	NSD	--
HSLA4	E0 vs. E10	0.259	NSD	--	0.323	NSD	--
	E0 vs. E10-Spl	0.519	NSD	--	0.155	NSD	--
	E0 vs. E20	0.410	NSD	--	0.434	NSD	--
US06	E0 vs. E10	0.503	NSD	--			
	E0 vs. E10-Spl	0.816	NSD	--			
	E0 vs. E20	0.342	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.430	NSD	--	0.790	NSD	--
HSLA4	E10 vs. E10-Spl	0.088	NSD	--	0.532	NSD	--
US06	E10 vs. E10-Spl	0.463	NSD	--			

Dion, ANOVA Results – Oxy-Corrected THC Emission Rates from 20°C Tests, E0 vs. Ethanol Blends

	Comparison Type	Phase 1 P-Value	Phase 1 Change	Phase 1 % Diff	Phase 2 P-Value	Phase 2 Change	Phase 2 % Diff
E0 Fuel Compared to Ethanol Blends							
CSLA4	E0 vs. E10	0.019	E0 > E10	-18%	0.649	NSD	--
	E0 vs. E10-Spl	0.102	NSD	--	0.531	NSD	--
	E0 vs. E20	0.023	E0 > E20	-22%	0.875	NSD	--
HSLA4	E0 vs. E10	0.843	NSD	--	0.265	NSD	--
	E0 vs. E10-Spl	0.499	NSD	--	0.152	NSD	--
	E0 vs. E20	0.446	NSD	--	0.364	NSD	--
US06	E0 vs. E10	0.951	NSD	--			
	E0 vs. E10-Spl	0.383	NSD	--			
	E0 vs. E20	0.126	NSD	--			
E10 Fuel Compared to E10-Splash Fuel							
CSLA4	E10 vs. E10-Spl	0.440	NSD	--	0.757	NSD	--
HSLA4	E10 vs. E10-Spl	0.373	NSD	--	0.901	NSD	--
US06	E10 vs. E10-Spl	0.359	NSD	--			

Appendix 5 NMHC Results

Escort, NMHC Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				LA4		US06	
	Phase 1		Phase 2		Phase 1		Phase 2		4-Phase Composite			
Fuel	Avg	StDev	Avg	StDev	Avg	StDev	Avg	StDev	Avg	St Dev	Avg	StDev
20℃ Testing												
E0	0.31	0.01	0.02	0.03	0.03	n/a	0.08	0.11	0.07	0.01	0.31	0.01
E10	0.34	0.01	0.01	0.002	0.04	0.004	0.01	0.003	0.04	0.02	0.34	0.01
E10-Spl	0.30	0.03	0.006	0.004	0.03	0.009	0.006	0.006	0.04	0.01	0.30	0.03
E20	0.29	0.02	0.004	0.003	0.02	0.001	0.006	0.001	0.07	0.01	0.29	0.02
-10℃ Testing												
E0	1.48	0.09	0.008	0.002	0.07	0.06	0.003	0.002	0.07	0.005	1.48	0.09
E10	2.21	0.11	0.02	0.006	0.06	0.02	0.003	0.001	0.10	0.03	2.21	0.11
E10-Spl	1.57	0.18	0.03	0.003	0.05	0.01	0.005	0.006	0.10	0.02	1.57	0.18
E20	1.38	0.33	0.01	0.008	0.04	0.02	0.003	0.001	0.06	0.003	1.38	0.33

Sentra, NMHC Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				LA4		US06	
	Phase 1		Phase 2		Phase 1		Phase 2		4-Phase Composite			
Fuel	Avg	StDev	Avg	StDev	Avg	StDev	Avg	StDev	Avg	St Dev	Avg	StDev
20℃ Testing												
E0	0.07	0.01	0.002	0.002	0.003	0.003	0.002	0.002	0.001	0.001	0.07	0.01
E10	0.09	0.006	0.007	0.003	0.005	0.003	0.008	0.006	0.003	0.0009	0.09	0.006
E10-Spl	0.06	0.009	0.005	0.004	0.001	0.002	0.002	0.003	0.0006	0.0009	0.06	0.009
E20	0.03	0.02	0.002	0.0008	0.00009	0.0001	0.001	0.002	< DL	n/a	0.03	0.02
-10℃ Testing												
E0	0.86	0.15	0.004	0.003	0.006	0.005	0.003	0.002	0.001	0.0009	0.86	0.15
E10	1.42	0.07	0.007	0.0003	0.007	0.002	0.003	0.0008	0.002	0.0002	1.42	0.07
E10-Spl	0.82	0.11	0.01	0.001	0.006	0.003	0.004	0.0006	0.003	0.0004	0.82	0.11
E20	0.76	0.18	0.004	0.0003	0.005	0.0003	0.002	0.0007	0.002	0.0003	0.76	0.18

Caravan, NMHC Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				LA4		US06	
	Phase 1		Phase 2		Phase 1		Phase 2		4-Phase Composite			
Fuel	Avg	StDev	Avg	StDev	Avg	StDev	Avg	StDev	Avg	St Dev	Avg	StDev
E0	0.48	0.18	0.003	0.004	0.04	0.006	0.003	0.003	0.02	0.004	0.48	0.18
E10	0.45	0.14	0.007	0.01	0.03	0.001	0.008	0.0002	0.02	0.003	0.45	0.14
E10-Spl	0.63	0.21	0.008	0.0008	0.04	0.006	0.01	0.002	0.02	0.004	0.63	0.21
E20	0.48	0.05	0.004	0.002	0.03	0.006	0.005	0.0004	0.01	0.003	0.48	0.05

Dion, NMHC Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				LA4		US06	
	Phase 1		Phase 2		Phase 1		Phase 2		4-Phase Composite			
Fuel	Avg	StDev	Avg	StDev	Avg	StDev	Avg	StDev	Avg	St Dev	Avg	StDev
E0	0.60	0.02	0.006	0.004	0.04	0.02	0.004	0.002	0.04	0.01	0.60	0.02
E10	0.49	0.02	0.009	0.0005	0.05	0.02	0.01	0.003	0.03	n/a	0.49	0.02
E10-Spl	0.52	0.05	0.01	0.002	0.03	0.008	0.01	0.0001	0.03	0.003	0.52	0.05
E20	0.45	0.05	0.006	0.003	0.02	0.006	0.009	0.002	0.01	n/a	0.45	0.05

Appendix 6 NMOG Results

Escort, NMOG Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				LA4		US06	
	Phase 1		Phase 2		Phase 1		Phase 2		4-Phase Composite			
Fuel	Avg	StDev	Avg	StDev	Avg	StDev	Avg	StDev	Avg	St Dev	Avg	StDev
20℃ Testing												
E0	0.31	n/a	0.003	n/a	0.03	n/a	0.001	n/a	0.07	0.01	0.31	n/a
E10	0.35	0.01	0.01	0.002	0.04	0.004	0.01	0.003	0.04	0.02	0.35	0.01
E10-Spl	0.33	n/a	0.01	n/a	0.04	n/a	0.01	n/a	0.04	0.01	0.33	n/a
E20	0.30	0.02	0.004	0.003	0.02	0.002	0.006	0.001	0.07	0.01	0.30	0.02
-10℃ Testing												
E0	1.49	0.10	0.009	0.002	0.07	0.06	0.004	0.003	0.08	0.004	1.49	0.10
E10	2.18	0.01	0.02	0.004	0.06	0.03	0.004	0.002	0.10	0.04	2.18	0.01
E10-Spl	1.64	n/a	0.03	n/a	0.05	n/a	0.013	n/a	0.09	0.01	1.64	n/a
E20	1.43	0.34	0.01	0.008	0.09	0.06	0.003	0.001	0.07	0.003	1.43	0.34

Sentra, NMOG Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				LA4		US06	
	Phase 1		Phase 2		Phase 1		Phase 2		4-Phase Composite			
Fuel	Avg	StDev	Avg	StDev	Avg	StDev	Avg	StDev	Avg	St Dev	Avg	StDev
20℃ Testing												
E0	0.07	0.01	0.003	0.003	0.003	0.005	0.002	0.002	0.001	0.001	0.07	0.01
E10	0.10	n/a	0.006	n/a	0.007	n/a	0.012	n/a	0.003	0.0009	0.10	n/a
E10-Spl	0.07	n/a	0.008	n/a	0.001	0.002	0.003	0.004	0.0009	0.0006	0.07	n/a
E20	0.05	n/a	0.003	n/a	0.0004	n/a	0.003	n/a	0.00009	0.0001	0.05	n/a
-10℃ Testing												
E0	0.90	0.16	0.005	0.004	0.004	0.003	0.004	0.003	0.002	0.001	0.90	0.16
E10	1.40	n/a	0.009	n/a	0.006	n/a	0.004	n/a	0.003	0.0007	1.40	n/a
E10-Spl	0.84	0.11	0.02	0.0009	0.006	0.003	0.004	0.0002	0.003	0.0006	0.84	0.11
E20	0.79	0.22	0.005	0.00005	0.005	0.0004	0.002	0.0006	0.008	0.0003	0.79	0.22

Caravan, NMOG Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				LA4		US06	
	Phase 1		Phase 2		Phase 1		Phase 2		4-Phase Composite			
Fuel	Avg	StDev	Avg	StDev	Avg	StDev	Avg	StDev	Avg	St Dev	Avg	StDev
E0	0.48	0.22	0.004	0.004	0.04	0.005	0.004	0.003	0.02	0.002	0.48	0.22
E10	0.47	0.15	0.008	0.01	0.03	0.002	0.009	0.0001	0.02	0.003	0.47	0.15
E10-Spl	0.81	n/a	0.008	n/a	0.04	n/a	0.01	n/a	0.02	0.004	0.81	n/a
E20	0.51	0.05	0.004	0.002	0.03	0.005	0.005	0.0006	0.01	0.003	0.51	0.05

Dion, NMOG Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				LA4		US06	
	Phase 1		Phase 2		Phase 1		Phase 2		4-Phase Composite			
Fuel	Avg	StDev	Avg	StDev	Avg	StDev	Avg	StDev	Avg	St Dev	Avg	StDev
E0	0.59	0.009	0.009	0.001	0.05	0.03	0.005	0.002	0.04	0.01	0.59	0.009
E10	0.48	n/a	0.01	n/a	0.04	n/a	0.01	n/a	0.03	n/a	0.48	n/a
E10-Spl	0.56	n/a	0.01	n/a	0.03	n/a	0.01	n/a	0.03	0.004	0.56	n/a
E20	0.51	n/a	0.008	n/a	0.03	n/a	0.01	n/a	0.01	n/a	0.51	n/a

Appendix 7 Ethanol Results

Escort, Ethanol Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
20℃ Testing										
E0	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a
E10	1.24	0.64	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a
E10-Spl	1.70	0.21	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a
E20	3.40	0.09	< DL	n/a	< DL	n/a	< DL	n/a	0.72	1.02
-10℃ Testing										
E0	1.56	1.87	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a
E10	13.26	0.65	< DL	n/a	< DL	n/a	< DL	n/a	0.05	0.09
E10-Spl	10.37	1.65	< DL	n/a	< DL	n/a	< DL	n/a	0.05	0.09
E20	26.70	7.89	< DL	n/a	< DL	n/a	< DL	n/a	0.15	0.10

Sentra, Ethanol Emission Rates (g/mile) from 20℃ and -10ºC Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
20℃ Testing										
E0	< DL	n/a	< DL	n/a	< DL	n/a	0.14	0.25	< DL	n/a
E10	0.12	0.20	< DL	n/a	0.04	0.08	0.31	0.53	< DL	n/a
E10-Spl	0.00	< DL	< DL	n/a	< DL	n/a	< DL	n/a	0.24	0.34
E20	0.11	0.16	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a
-10℃ Testing										
E0	0.21	0.35	< DL	n/a	< DL	n/a	< DL	n/a	0.36	0.50
E10	5.50	1.27	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a
E10-Spl	3.12	0.93	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a
E20	10.08	2.72	< DL	n/a	< DL	n/a	< DL	n/a	6.01	0.17

Caravan, Ethanol Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
E0	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a	1.97	1.46
E10	3.17	3.11	< DL	n/a	< DL	n/a	< DL	n/a	1.36	0.10
E10-Spl	7.34	4.13	< DL	n/a	< DL	n/a	< DL	n/a	1.38	0.11
E20	12.96	0.67	< DL	n/a	< DL	n/a	< DL	n/a	2.25	0.03

Dion, Ethanol Emission Rates (g/mile) from 20℃ Tests

	Cold Start LA4				Hot Start LA4				US06	
	Phase 1		Phase 2		Phase 1		Phase 2			
Fuel	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dv	Avg	St Dev
E0	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a	0.12	0.23
E10	2.31	0.27	< DL	n/a	< DL	n/a	< DL	n/a	< DL	n/a
E10-Spl	2.72	1.19	< DL	n/a	< DL	n/a	< DL	n/a	0.02	0.03
E20	8.07	3.49	< DL	n/a	< DL	n/a	< DL	n/a	0.58	n/a

Appendix 8 Carbonyl Analysis Results

8.a Escort Emission Rates, 20° Tests

Escort, Carbonyl Emission Rates (mg/mile) from E0 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	2.562	n/a	0.267	n/a	0.125	n/a	<DL	n/a	0.626	n/a	n/a	n/a
2	acetaldehyde	0.975	n/a	0.066	n/a	0.121	n/a	0.043	n/a	0.263	n/a	n/a	n/a
3	acrolein	0.191	n/a	<DL	n/a	0.004	n/a	<DL	n/a	0.041	n/a	n/a	n/a
4	acetone	0.598	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.124	n/a	n/a	n/a
5	propionaldehyde	0.176	n/a	0.001	n/a	0.009	n/a	0.022	n/a	0.046	n/a	n/a	n/a
6	crotonaldehyde	0.099	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.021	n/a	n/a	n/a
7	methacrolein	0.211	n/a	<DL	n/a	0.018	n/a	<DL	n/a	0.049	n/a	n/a	n/a
8	2-butanone	0.067	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.014	n/a	n/a	n/a
9	iso&butyraldehyde	0.079	n/a	0.00008	n/a	<DL	n/a	0.003	n/a	0.017	n/a	n/a	n/a
10	benzaldehyde	0.102	n/a	0.015	n/a	0.013	n/a	0.004	n/a	0.029	n/a	n/a	n/a
11	isovaleraldehyde	0.072	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.015	n/a	n/a	n/a
12	valeraldehyde	0.039	n/a	0.011	n/a	<DL	n/a	0.003	n/a	0.012	n/a	n/a	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a

Escort, Carbonyl Emission Rates (mg/mile) from E10 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	3.398	1.064	0.203	0.133	0.249	0.077	0.121	0.033	0.855	0.214	0.069	n/a
2	acetaldehyde	3.180	1.210	0.029	0.050	0.056	0.096	0.033	0.056	0.692	0.299	0.381	n/a
3	acrolein	0.314	0.124	0.010	0.010	0.011	0.015	0.006	0.010	0.072	0.024	0.025	n/a
4	acetone	0.848	0.343	0.047	0.040	0.063	0.109	0.112	0.190	0.237	0.157	0.034	n/a
5	propionaldehyde	0.182	0.075	0.035	0.024	0.038	0.022	0.034	0.023	0.066	0.021	0.060	n/a
6	crotonaldehyde	0.128	0.040	<DL	n/a	<DL	n/a	<DL	n/a	0.027	0.008	<DL	n/a
7	methacrolein	0.322	0.090	<DL	n/a	<DL	n/a	<DL	n/a	0.067	0.019	0.023	n/a
8	2-butanone	0.140	0.042	0.032	0.031	0.038	0.035	0.028	0.034	0.055	0.035	0.028	n/a
9	iso&butyraldehyde	0.101	0.042	0.010	0.017	<DL	n/a	0.003	0.005	0.024	0.005	0.016	n/a
10	benzaldehyde	0.127	0.038	<DL	n/a	<DL	n/a	<DL	n/a	0.026	0.008	<DL	n/a
11	isovaleraldehyde	0.041	0.071	<DL	n/a	<DL	n/a	<DL	n/a	0.008	0.015	<DL	n/a
12	valeraldehyde	0.018	0.031	<DL	n/a	<DL	n/a	<DL	n/a	0.004	0.007	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	0.008	0.014	<DL	n/a	0.008	0.014	0.004	0.007	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Escort, Carbonyl Emission Rates (mg/mile) from E10-Spl Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	2.061	n/a	0.382	n/a	0.056	n/a	<DL	n/a	0.528	n/a	n/a	n/a
2	acetaldehyde	2.407	n/a	0.249	n/a	0.150	n/a	<DL	n/a	0.597	n/a	n/a	n/a
3	acrolein	0.197	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.041	n/a	n/a	n/a
4	acetone	0.308	n/a	0.514	n/a	<DL	n/a	<DL	n/a	0.178	n/a	n/a	n/a
5	propionaldehyde	0.160	n/a	0.163	n/a	0.046	n/a	0.003	n/a	0.083	n/a	n/a	n/a
6	crotonaldehyde	0.077	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.016	n/a	n/a	n/a
7	methacrolein	0.179	n/a	0.017	n/a	<DL	n/a	<DL	n/a	0.041	n/a	n/a	n/a
8	2-butanone	0.122	n/a	0.155	n/a	0.016	n/a	0.009	n/a	0.067	n/a	n/a	n/a
9	iso&butyraldehyde	0.076	n/a	0.106	n/a	<DL	n/a	<DL	n/a	0.039	n/a	n/a	n/a
10	benzaldehyde	0.052	n/a	0.092	n/a	<DL	n/a	<DL	n/a	0.031	n/a	n/a	n/a
11	isovaleraldehyde	<DL	n/a	0.018	n/a	<DL	n/a	<DL	n/a	0.004	n/a	n/a	n/a
12	valeraldehyde	<DL	n/a	0.132	n/a	<DL	n/a	<DL	n/a	0.029	n/a	n/a	n/a
13	o-tolualdehyde	<DL	n/a	0.030	n/a	<DL	n/a	<DL	n/a	0.007	n/a	n/a	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
15	hexanaldehyde	<DL	n/a	0.059	n/a	<DL	n/a	<DL	n/a	0.013	n/a	n/a	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a

Escort, Carbonyl Emission Rates (mg/mile) from E20 Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	4.203	0.023	0.285	0.017	0.286	0.153	0.021	0.029	1.021	0.054	n/a	n/a
2	acetaldehyde	6.293	0.360	0.063	0.012	0.149	0.011	0.037	0.027	1.372	0.054	n/a	n/a
3	acrolein	0.402	0.036	0.0007	0.001	0.003	0.004	0.0004	0.0006	0.085	0.005	n/a	n/a
4	acetone	0.775	0.163	0.014	0.020	0.065	0.091	<DL	n/a	0.182	0.063	n/a	n/a
5	propionaldehyde	0.197	0.021	0.010	0.0008	0.030	0.015	0.006	0.008	0.053	0.002	n/a	n/a
6	crotonaldehyde	0.130	0.012	<DL	n/a	<DL	n/a	<DL	n/a	0.027	0.002	n/a	n/a
7	methacrolein	0.274	0.009	<DL	n/a	<DL	n/a	0.013	0.019	0.061	0.008	n/a	n/a
8	2-butanone	0.058	0.007	<DL	n/a	0.003	0.004	<DL	n/a	0.013	0.003	n/a	n/a
9	iso&butyraldehyde	0.126	0.017	0.002	0.003	<DL	n/a	<DL	n/a	0.027	0.003	n/a	n/a
10	benzaldehyde	0.186	0.011	<DL	n/a	<DL	n/a	<DL	n/a	0.039	0.002	n/a	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
12	valeraldehyde	0.036	0.005	<DL	n/a	<DL	n/a	<DL	n/a	0.008	0.001	n/a	n/a
13	o-tolualdehyde	0.017	0.024	<DL	n/a	<DL	n/a	<DL	n/a	0.003	0.005	n/a	n/a
14	m&p-tolualdehyde	0.046	0.066	<DL	n/a	<DL	n/a	<DL	n/a	0.010	0.014	n/a	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a

8.b Escort Emission Rates, -10° Tests

Escort, Carbonyl Emission Rates (mg/mile) from E0 Fuel, -10℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	2.054	0.398	0.491	0.275	0.421	0.170	0.230	0.114	0.720	0.190	0.118	0.074
2	acetaldehyde	2.221	0.288	0.093	0.108	0.158	0.140	0.098	0.130	0.555	0.134	0.075	0.073
3	acrolein	0.205	0.082	0.024	0.030	0.005	0.010	0.008	0.009	0.052	0.012	0.011	0.010
4	acetone	1.957	0.170	0.130	0.150	0.229	0.283	0.102	0.104	0.529	0.128	0.140	0.143
5	propionaldehyde	0.438	0.042	0.016	0.013	0.023	0.027	0.022	0.025	0.108	0.021	0.013	0.004
6	crotonaldehyde	0.088	0.020	<DL	n/a	<DL	n/a	<DL	n/a	0.018	0.004	<DL	n/a
7	methacrolein	0.259	0.037	0.025	0.049	0.006	0.012	0.007	0.014	0.063	0.009	0.048	0.017
8	2-butanone	0.172	0.063	<DL	n/a	0.057	0.114	0.002	0.003	0.052	0.030	0.016	0.028
9	iso&butyraldehyde	0.193	0.069	0.043	0.046	0.049	0.038	0.021	0.043	0.069	0.034	0.007	0.012
10	benzaldehyde	0.227	0.022	<DL	n/a	<DL	n/a	<DL	n/a	0.047	0.005	<DL	n/a
11	isovaleraldehyde	0.128	0.034	<DL	n/a	<DL	n/a	<DL	n/a	0.027	0.007	<DL	n/a
12	valeraldehyde	0.034	0.045	<DL	n/a	<DL	n/a	<DL	n/a	0.007	0.009	<DL	n/a
13	o-tolualdehyde	0.106	0.036	<DL	n/a	<DL	n/a	<DL	n/a	0.022	0.008	<DL	n/a
14	m&p-tolualdehyde	0.164	0.046	<DL	n/a	<DL	n/a	<DL	n/a	0.034	0.010	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Escort, Carbonyl Emission Rates (mg/mile) from E10 Fuel, -10℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	5.072	0.170	0.937	0.458	1.032	0.438	0.593	0.434	1.715	0.317	0.364	0.204
2	acetaldehyde	11.535	1.330	0.092	0.013	0.865	0.236	0.072	0.003	2.661	0.206	0.579	0.221
3	acrolein	0.528	0.128	<DL	n/a	0.0009	0.001	0.0003	0.0004	0.109	0.026	0.010	0.014
4	acetone	1.415	0.421	<DL	n/a	0.056	0.033	<DL	n/a	0.308	0.078	0.551	0.659
5	propionaldehyde	0.521	0.017	0.011	0.002	0.086	0.044	0.013	0.002	0.137	0.010	0.025	0.016
6	crotonaldehyde	0.206	0.017	<DL	n/a	<DL	n/a	<DL	n/a	0.042	0.004	<DL	n/a
7	methacrolein	0.423	0.116	<DL	n/a	0.022	0.032	<DL	n/a	0.093	0.033	0.037	0.004
8	2-butanone	0.167	0.017	<DL	n/a	<DL	n/a	<DL	n/a	0.035	0.004	<DL	n/a
9	iso&butyraldehyde	0.657	0.247	0.038	0.028	0.133	0.064	0.041	0.019	0.193	0.057	0.035	0.015
10	benzaldehyde	0.513	0.001	<DL	n/a	<DL	n/a	<DL	n/a	0.106	0.0004	0.024	0.001
11	isovaleraldehyde	0.153	0.032	<DL	n/a	<DL	n/a	<DL	n/a	0.032	0.007	<DL	n/a
12	valeraldehyde	0.106	0.031	<DL	n/a	<DL	n/a	<DL	n/a	0.022	0.006	<DL	n/a
13	o-tolualdehyde	0.208	0.099	<DL	n/a	<DL	n/a	<DL	n/a	0.043	0.020	<DL	n/a
14	m&p-tolualdehyde	0.348	0.012	<DL	n/a	<DL	n/a	<DL	n/a	0.072	0.002	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	0.113	0.057	<DL	n/a	<DL	n/a	<DL	n/a	0.023	0.012	<DL	n/a

Escort, Carbonyl Emission Rates (mg/mile) from E10-Spl Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	4.319	n/a	1.163	n/a	0.694	n/a	1.043	n/a	1.654	n/a	0.462	0.262
2	acetaldehyde	11.596	n/a	0.118	n/a	0.332	n/a	0.082	n/a	2.551	n/a	0.602	0.063
3	acrolein	0.310	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.064	n/a	0.003	0.004
4	acetone	1.624	n/a	<DL	n/a	0.288	n/a	0.344	n/a	0.518	n/a	0.161	0.031
5	propionaldehyde	0.480	n/a	0.001	n/a	0.024	n/a	0.003	n/a	0.107	n/a	0.019	0.003
6	crotonaldehyde	0.092	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.019	n/a	<DL	n/a
7	methacrolein	0.290	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.060	n/a	0.034	0.010
8	2-butanone	0.184	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.038	n/a	<DL	n/a
9	iso&butyraldehyde	0.175	n/a	0.003	n/a	0.028	n/a	<DL	n/a	0.045	n/a	0.008	0.003
10	benzaldehyde	0.231	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.048	n/a	0.007	0.010
11	isovaleraldehyde	0.126	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.026	n/a	<DL	n/a
12	valeraldehyde	0.025	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.005	n/a	<DL	n/a
13	o-tolualdehyde	0.131	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.027	n/a	<DL	n/a
14	m&p-tolualdehyde	0.138	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.029	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Escort, Carbonyl Emission Rates (mg/mile) from E20 Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	3.730	1.170	0.088	0.104	0.278	0.095	0.183	0.065	0.925	0.257	0.197	0.005
2	acetaldehyde	16.840	5.125	0.057	0.081	0.377	0.528	0.027	0.038	3.624	0.881	0.616	0.115
3	acrolein	0.381	0.082	0.081	0.012	0.091	0.023	0.075	0.006	0.144	0.006	0.034	0.001
4	acetone	1.291	0.127	<DL	n/a	0.145	0.001	<DL	n/a	0.308	0.026	0.070	0.030
5	propionaldehyde	0.548	0.005	0.023	0.012	0.029	0.041	0.003	0.004	0.128	0.017	0.018	0.005
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
7	methacrolein	0.264	0.022	<DL	n/a	0.015	0.021	<DL	n/a	0.059	0.001	0.050	0.033
8	2-butanone	0.474	0.285	0.184	0.175	0.201	0.168	0.173	0.095	0.246	0.172	0.016	0.023
9	iso&butyraldehyde	0.264	0.001	0.024	0.033	0.044	0.062	0.033	0.047	0.082	0.038	<DL	n/a
10	benzaldehyde	0.210	0.041	<DL	n/a	<DL	n/a	<DL	n/a	0.044	0.008	<DL	n/a
11	isovaleraldehyde	0.102	0.059	<DL	n/a	<DL	n/a	<DL	n/a	0.021	0.012	<DL	n/a
12	valeraldehyde	0.035	0.049	<DL	n/a	<DL	n/a	<DL	n/a	0.007	0.010	<DL	n/a
13	o-tolualdehyde	0.093	0.036	<DL	n/a	<DL	n/a	<DL	n/a	0.019	0.008	<DL	n/a
14	m&p-tolualdehyde	0.133	0.058	<DL	n/a	<DL	n/a	<DL	n/a	0.028	0.012	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	0.043	0.061	<DL	n/a	<DL	n/a	<DL	n/a	0.009	0.013	<DL	n/a

8.c Sentra Emission Rates, 20° Tests

Sentra, Carbonyl Emission Rates (mg/mile) from E0 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	0.197	0.037	0.178	0.075	0.013	0.018	0.039	0.055	0.095	0.030	0.019	0.034
2	acetaldehyde	0.305	0.052	0.104	0.105	0.019	0.010	<DL	n/a	0.092	0.010	0.007	0.012
3	acrolein	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.007	0.013
4	acetone	0.159	0.210	0.185	0.262	<DL	n/a	<DL	n/a	0.074	0.102	<DL	n/a
5	propionaldehyde	0.044	0.012	0.037	0.043	0.033	0.010	<DL	n/a	0.026	0.009	0.013	0.013
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
7	methacrolein	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
8	2-butanone	0.034	0.049	0.001	0.002	0.025	0.036	0.007	0.011	0.017	0.023	0.003	0.004
9	iso&butyraldehyde	0.005	0.007	0.022	0.032	0.009	0.007	<DL	n/a	0.008	0.010	0.005	0.009
10	benzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Sentra, Carbonyl Emission Rates (mg/mile) from E10 Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	0.068	n/a	<DL	n/a	0.007	n/a	<DL	n/a	0.016	n/a	n/a	n/a
2	acetaldehyde	1.360	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.282	n/a	n/a	n/a
3	acrolein	0.025	n/a	0.019	n/a	0.023	n/a	0.021	n/a	0.022	n/a	n/a	n/a
4	acetone	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
5	propionaldehyde	0.022	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.005	n/a	n/a	n/a
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
7	methacrolein	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
8	2-butanone	0.066	n/a	0.010	n/a	0.017	n/a	<DL	n/a	0.021	n/a	n/a	n/a
9	iso&butyraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
10	benzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a

Sentra, Carbonyl Emission Rates (mg/mile) from E10-Spl Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	0.281	n/a	0.004	n/a	<DL	n/a	<DL	n/a	0.059	n/a	n/a	n/a
2	acetaldehyde	0.894	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.185	n/a	n/a	n/a
3	acrolein	0.024	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.005	n/a	n/a	n/a
4	acetone	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
5	propionaldehyde	0.045	n/a	0.042	n/a	<DL	n/a	<DL	n/a	0.019	n/a	n/a	n/a
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
7	methacrolein	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
8	2-butanone	0.089	n/a	0.086	n/a	0.072	n/a	0.075	n/a	0.079	n/a	n/a	n/a
9	iso&butyraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
10	benzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	n/a	n/a

Sentra, Carbonyl Emission Rates (mg/mile) from E20 Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	0.315	n/a	0.441	n/a	0.075	n/a	0.276	n/a	0.266	n/a	0.051	0.072
2	acetaldehyde	2.030	n/a	0.061	n/a	0.013	n/a	0.047	n/a	0.453	n/a	<DL	n/a
3	acrolein	0.004	n/a	0.002	n/a	<DL	n/a	0.002	n/a	0.002	n/a	<DL	n/a
4	acetone	0.033	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.007	n/a	0.005	0.007
5	propionaldehyde	0.090	n/a	0.068	n/a	0.056	n/a	0.054	n/a	0.065	n/a	0.010	0.010
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
7	methacrolein	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
8	2-butanone	0.054	n/a	0.010	n/a	0.016	n/a	0.023	n/a	0.025	n/a	0.019	0.026
9	iso&butyraldehyde	0.029	n/a	<DL	n/a	0.020	n/a	0.035	n/a	0.022	n/a	0.005	0.008
10	benzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

8.d Sentra Emission Rates, -10° Tests

Sentra, Carbonyl Emission Rates (mg/mile) from E0 Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	0.396	0.088	0.119	0.097	0.157	0.032	0.196	0.079	0.209	0.047	0.124	0.043
2	acetaldehyde	0.890	0.134	0.085	0.077	0.132	0.006	0.134	0.143	0.279	0.032	0.054	0.067
3	acrolein	0.038	0.056	0.026	0.041	0.033	0.052	0.021	0.036	0.029	0.046	0.012	0.018
4	acetone	0.351	0.185	0.121	0.113	0.268	0.207	0.409	0.271	0.294	0.081	0.049	0.036
5	propionaldehyde	0.135	0.041	0.015	0.020	0.036	0.010	0.030	0.013	0.050	0.013	0.008	0.017
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
7	methacrolein	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.003	0.006
8	2-butanone	0.087	0.150	0.020	0.035	0.005	0.009	0.005	0.009	0.025	0.044	0.018	0.036
9	iso&butyraldehyde	0.090	0.045	<DL	n/a	0.017	0.016	0.020	0.035	0.029	0.009	0.013	0.025
10	benzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Sentra, Carbonyl Emission Rates (mg/mile) from E10 Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	0.504	n/a	0.309	n/a	0.202	n/a	0.076	n/a	0.251	n/a	0.532	0.527
2	acetaldehyde	16.733	n/a	0.212	n/a	0.156	n/a	0.098	n/a	3.583	n/a	0.063	0.020
3	acrolein	<DL	n/a	0.013	n/a	<DL	n/a	<DL	n/a	0.003	n/a	0.0009	0.001
4	acetone	1.648	n/a	1.032	n/a	0.140	n/a	<DL	n/a	0.610	n/a	0.0008	0.001
5	propionaldehyde	0.248	n/a	0.052	n/a	0.022	n/a	0.019	n/a	0.074	n/a	0.008	0.011
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
7	methacrolein	0.048	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.010	n/a	<DL	n/a
8	2-butanone	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
9	iso&butyraldehyde	0.102	n/a	0.094	n/a	0.043	n/a	0.062	n/a	0.072	n/a	0.027	0.016
10	benzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Sentra, Carbonyl Emission Rates (mg/mile) from E10-Spl Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	0.847	0.249	0.345	0.121	0.540	0.062	0.443	0.050	0.531	0.110	0.284	0.142
2	acetaldehyde	13.414	0.807	0.023	0.032	0.040	0.057	0.021	0.029	2.801	0.109	0.023	0.024
3	acrolein	0.047	0.007	0.028	0.014	0.029	0.016	0.020	0.0007	0.030	0.006	0.008	0.003
4	acetone	0.227	0.110	0.020	0.029	0.042	0.060	0.022	0.032	0.070	0.055	0.015	0.021
5	propionaldehyde	0.128	0.016	0.016	0.021	0.022	0.006	0.009	0.012	0.039	0.006	0.006	0.003
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
7	methacrolein	0.014	0.019	<DL	n/a	<DL	n/a	<DL	n/a	0.003	0.004	<DL	n/a
8	2-butanone	0.003	0.004	<DL	n/a	<DL	n/a	<DL	n/a	0.0006	0.0009	<DL	n/a
9	iso&butyraldehyde	0.039	0.001	0.0006	0.0009	0.009	0.013	0.002	0.003	0.011	0.004	0.003	0.002
10	benzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Sentra, Carbonyl Emission Rates (mg/mile) from E20 Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	1.217	0.039	0.294	0.059	0.246	0.106	0.179	0.052	0.438	0.008	0.224	0.060
2	acetaldehyde	36.400	3.898	0.064	0.090	0.045	0.033	<DL	n/a	7.556	0.871	0.003	0.005
3	acrolein	0.109	0.019	0.075	0.017	0.083	0.001	0.065	0.004	0.081	0.0008	0.034	0.005
4	acetone	0.323	0.034	0.042	0.060	0.042	0.010	0.009	0.013	0.090	0.027	<DL	n/a
5	propionaldehyde	0.154	0.016	0.010	0.007	0.019	0.010	<DL	n/a	0.039	0.004	0.002	0.003
6	crotonaldehyde	0.060	0.026	<DL	n/a	<DL	n/a	<DL	n/a	0.012	0.005	<DL	n/a
7	methacrolein	0.032	0.0005	<DL	n/a	<DL	n/a	<DL	n/a	0.007	0.0001	<DL	n/a
8	2-butanone	0.137	0.132	0.131	0.136	0.140	0.167	0.019	0.010	0.101	0.100	0.038	0.053
9	iso&butyraldehyde	0.052	0.058	0.039	0.056	0.051	0.036	<DL	n/a	0.033	0.034	0.010	0.012
10	benzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

8.e Caravan Emission Rates, 20° Tests

Caravan, Carbonyl Emission Rates (mg/mile) from E0 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	1.925	1.375	0.021	0.025	0.023	0.046	0.015	0.031	0.415	0.294	0.124	0.122
2	acetaldehyde	1.002	0.746	<DL	n/a	0.011	0.021	<DL	n/a	0.211	0.155	0.084	0.008
3	acrolein	0.239	0.192	0.033	0.028	0.055	0.042	0.041	0.037	0.084	0.060	0.023	0.021
4	acetone	0.906	0.686	0.012	0.025	<DL	n/a	<DL	n/a	0.191	0.142	0.178	0.078
5	propionaldehyde	0.227	0.192	0.001	0.002	0.003	0.006	0.001	0.002	0.049	0.041	0.009	0.002
6	crotonaldehyde	0.067	0.084	<DL	n/a	<DL	n/a	<DL	n/a	0.014	0.018	<DL	n/a
7	methacrolein	0.295	0.236	<DL	n/a	<DL	n/a	<DL	n/a	0.061	0.049	0.020	0.005
8	2-butanone	0.327	0.239	0.163	0.118	0.269	0.249	0.234	0.222	0.247	0.183	0.107	0.037
9	iso&butyraldehyde	0.125	0.113	0.024	0.028	0.061	0.043	0.016	0.031	0.052	0.044	0.034	0.003
10	benzaldehyde	0.063	0.056	<DL	n/a	<DL	n/a	<DL	n/a	0.013	0.012	0.005	0.008
11	isovaleraldehyde	0.083	0.097	<DL	n/a	<DL	n/a	<DL	n/a	0.017	0.020	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Caravan, Carbonyl Emission Rates (mg/mile) from E10 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	4.014	0.789	0.083	0.063	0.161	0.005	0.225	0.111	0.962	0.212	0.111	0.124
2	acetaldehyde	5.745	0.228	0.002	0.003	0.043	0.061	0.008	0.012	1.206	0.023	0.085	0.120
3	acrolein	0.332	0.064	0.022	0.0005	0.019	0.002	0.017	0.003	0.084	0.012	0.004	0.005
4	acetone	1.411	0.077	0.001	0.002	0.048	0.008	0.022	0.031	0.313	0.029	0.090	0.072
5	propionaldehyde	0.334	0.029	0.003	0.004	<DL	n/a	0.005	0.007	0.071	0.003	<DL	n/a
6	crotonaldehyde	0.166	0.027	<DL	n/a	<DL	n/a	<DL	n/a	0.034	0.006	<DL	n/a
7	methacrolein	0.444	0.077	<DL	n/a	<DL	n/a	<DL	n/a	0.092	0.016	0.014	0.005
8	2-butanone	0.412	0.259	0.193	0.273	0.219	0.310	0.160	0.227	0.236	0.267	0.048	0.069
9	iso&butyraldehyde	0.142	0.059	0.004	0.006	0.0003	0.0004	0.002	0.003	0.031	0.015	0.006	0.008
10	benzaldehyde	0.147	0.050	<DL	n/a	<DL	n/a	<DL	n/a	0.031	0.010	0.018	0.003
11	isovaleraldehyde	0.128	0.012	<DL	n/a	<DL	n/a	<DL	n/a	0.027	0.002	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Caravan, Carbonyl Emission Rates (mg/mile) from E10-Spl Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	3.844	n/a	0.258	n/a	0.120	n/a	0.317	n/a	0.984	n/a	0.139	0.037
2	acetaldehyde	5.941	n/a	<DL	n/a	<DL	n/a	<DL	n/a	1.236	n/a	0.078	0.035
3	acrolein	0.390	n/a	<DL	n/a	0.007	n/a	<DL	n/a	0.083	n/a	0.022	0.031
4	acetone	1.628	n/a	0.059	n/a	0.202	n/a	0.103	n/a	0.438	n/a	0.126	0.081
5	propionaldehyde	0.389	n/a	0.011	n/a	<DL	n/a	0.013	n/a	0.087	n/a	0.006	0.001
6	crotonaldehyde	0.229	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.048	n/a	<DL	n/a
7	methacrolein	0.449	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.093	n/a	0.011	0.002
8	2-butanone	0.263	n/a	0.025	n/a	0.015	n/a	0.003	n/a	0.065	n/a	0.043	0.061
9	iso&butyraldehyde	0.149	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.031	n/a	0.007	0.009
10	benzaldehyde	0.134	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.028	n/a	0.008	0.011
11	isovaleraldehyde	0.147	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.031	n/a	<DL	n/a
12	valeraldehyde	0.041	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.008	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Caravan, Carbonyl Emission Rates (mg/mile) from E20 Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	4.445	1.056	0.294	0.083	0.415	0.233	0.320	0.187	1.192	0.079	0.160	0.078
2	acetaldehyde	9.798	0.340	0.098	0.035	0.180	0.254	<DL	n/a	2.094	0.150	0.174	0.066
3	acrolein	0.468	0.026	0.080	0.013	0.032	0.045	0.033	0.047	0.133	0.029	0.022	0.032
4	acetone	1.270	0.009	0.126	0.141	0.107	0.151	0.034	0.048	0.330	0.089	0.104	0.043
5	propionaldehyde	0.427	0.018	0.047	0.017	0.009	0.013	0.001	0.002	0.101	0.004	0.009	0.007
6	crotonaldehyde	0.188	0.008	<DL	n/a	<DL	n/a	<DL	n/a	0.039	0.002	<DL	n/a
7	methacrolein	0.327	0.040	<DL	n/a	<DL	n/a	<DL	n/a	0.068	0.008	0.005	0.007
8	2-butanone	0.256	0.044	0.019	0.017	0.018	0.026	<DL	n/a	0.062	0.012	<DL	n/a
9	iso&butyraldehyde	0.167	0.020	0.037	0.005	0.023	0.014	0.011	0.008	0.052	0.003	0.015	0.001
10	benzaldehyde	0.203	0.002	<DL	n/a	<DL	n/a	<DL	n/a	0.042	0.0003	0.016	0.00006
11	isovaleraldehyde	0.138	0.008	<DL	n/a	<DL	n/a	<DL	n/a	0.029	0.002	<DL	n/a
12	valeraldehyde	0.052	0.024	<DL	n/a	<DL	n/a	<DL	n/a	0.011	0.005	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

8.f Dion Emission Rates, 20° Tests

Dion, Carbonyl Emission Rates (mg/mile) from E0 Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	2.075	1.451	0.095	0.121	0.070	0.060	0.058	0.060	0.486	0.257	0.074	0.066
2	acetaldehyde	1.293	0.237	0.030	0.046	0.011	0.020	0.036	0.063	0.288	0.030	0.062	0.042
3	acrolein	0.217	0.031	0.051	0.050	0.057	0.065	0.038	0.052	0.083	0.044	0.025	0.027
4	acetone	1.391	0.395	0.150	0.028	0.098	0.113	0.058	0.100	0.365	0.057	0.164	0.066
5	propionaldehyde	0.312	0.097	0.011	0.015	0.012	0.020	0.020	0.034	0.076	0.005	0.015	0.011
6	crotonaldehyde	0.104	0.036	0.015	0.026	<DL	n/a	<DL	n/a	0.025	0.004	<DL	n/a
7	methacrolein	0.294	0.144	<DL	n/a	<DL	n/a	<DL	n/a	0.061	0.029	0.018	0.012
8	2-butanone	0.465	0.104	0.349	0.238	0.362	0.278	0.291	0.210	0.359	0.185	0.101	0.022
9	iso&butyraldehyde	0.218	0.108	0.042	0.039	0.022	0.037	0.046	0.046	0.074	0.043	0.017	0.016
10	benzaldehyde	0.097	0.039	0.025	0.023	<DL	n/a	0.005	0.009	0.027	0.002	0.004	0.007
11	isovaleraldehyde	0.241	0.121	<DL	n/a	<DL	n/a	<DL	n/a	0.050	0.025	<DL	n/a
12	valeraldehyde	0.033	0.032	<DL	n/a	<DL	n/a	<DL	n/a	0.007	0.007	<DL	n/a
13	o-tolualdehyde	<DL	n/a	0.022	0.038	<DL	n/a	<DL	n/a	0.005	0.008	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Dion, Carbonyl Emission Rates (mg/mile) from E10 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	1.781	n/a	0.247	n/a	0.110	n/a	<DL	n/a	0.453	n/a	0.051	n/a
2	acetaldehyde	4.680	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.966	n/a	0.070	n/a
3	acrolein	0.340	n/a	0.016	n/a	0.032	n/a	0.011	n/a	0.086	n/a	0.007	n/a
4	acetone	1.201	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.248	n/a	0.180	n/a
5	propionaldehyde	0.231	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.048	n/a	0.005	n/a
6	crotonaldehyde	0.162	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.033	n/a	<DL	n/a
7	methacrolein	0.288	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.059	n/a	0.031	n/a
8	2-butanone	0.150	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.031	n/a	<DL	n/a
9	iso&butyraldehyde	0.222	n/a	0.001	n/a	0.005	n/a	<DL	n/a	0.047	n/a	0.021	n/a
10	benzaldehyde	0.151	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.031	n/a	0.019	n/a
11	isovaleraldehyde	0.266	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.055	n/a	<DL	n/a
12	valeraldehyde	0.042	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.009	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

Dion, Carbonyl Emission Rates (mg/mile) from E10-Spl Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	0.850	n/a	0.573	n/a	0.244	n/a	0.045	n/a	0.384	n/a	0.219	0.022
2	acetaldehyde	1.723	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.359	n/a	0.105	0.053
3	acrolein	0.183	n/a	<DL	n/a	0.097	n/a	0.077	n/a	0.087	n/a	0.034	0.011
4	acetone	0.320	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.067	n/a	0.072	0.020
5	propionaldehyde	0.106	n/a	0.001	n/a	<DL	n/a	<DL	n/a	0.022	n/a	0.014	0.008
6	crotonaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
7	methacrolein	0.122	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.025	n/a	0.018	0.006
8	2-butanone	0.416	n/a	0.148	n/a	0.403	n/a	0.335	n/a	0.329	n/a	0.095	0.010
9	iso&butyraldehyde	0.122	n/a	0.036	n/a	0.040	n/a	0.015	n/a	0.049	n/a	0.020	0.008
10	benzaldehyde	0.040	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.008	n/a	<DL	n/a
11	isovaleraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
12	valeraldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	#DIV/0!	<DL	n/a	<DL	n/a	<DL	n/a

Dion, Carbonyl Emission Rates (mg/mile) from E20 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	formaldehyde	2.410	n/a	0.175	n/a	0.166	n/a	<DL	n/a	0.579	n/a	0.149	n/a
2	acetaldehyde	10.383	n/a	<DL	n/a	<DL	n/a	<DL	n/a	2.131	n/a	0.013	n/a
3	acrolein	0.394	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.081	n/a	0.042	n/a
4	acetone	0.907	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.186	n/a	0.043	n/a
5	propionaldehyde	0.232	n/a	0.0003	n/a	<DL	n/a	<DL	n/a	0.048	n/a	0.002	n/a
6	crotonaldehyde	0.180	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.037	n/a	<DL	n/a
7	methacrolein	0.303	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.062	n/a	<DL	n/a
8	2-butanone	0.127	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.026	n/a	<DL	n/a
9	iso&butyraldehyde	0.177	n/a	0.019	n/a	0.005	n/a	<DL	n/a	0.042	n/a	0.008	n/a
10	benzaldehyde	0.168	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.035	n/a	<DL	n/a
11	isovaleraldehyde	0.146	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.030	n/a	<DL	n/a
12	valeraldehyde	0.039	n/a	<DL	n/a	<DL	n/a	<DL	n/a	0.008	n/a	<DL	n/a
13	o-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
14	m&p-tolualdehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
15	hexanaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a
16	2-5 dimethylbenzaldehyde	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a	<DL	n/a

8.g Formaldehyde Regression Analysis

Slopes of Regression Analysis – Formaldehyde Emission Rates from Phase 1 CSLA4, E0, E10 & E20 Fuels

	20°C Testing			-10°C Testing		
	Slope	Upper 95%	Lower 95%	Slope	Upper 95%	Lower 95%
Phase 1 CSLA4						
Escort	0.082	-0.042	0.206	0.104	-0.023	0.230
Sentra	0.004	-0.026	0.034	***0.040***	0.021	0.059
Caravan	***0.134***	0.010	0.257			
Dion	0.011	-0.204	0.226			
US06						
Escort	n/a	n/a	n/a	0.005	-0.012	0.023
Sentra	0.002	-0.006	0.009	0.008	-0.021	0.038
Caravan	0.002	-0.010	0.014			
Dion	0.003	-0.008	0.014			

NOTE:
- ***Negative slope values indicate decreasing emissions with increasing fuel ethanol content***
- ***Positive slope values indicate increasing emissions with increasing fuel ethanol content***
- ***Slopes that have upper and lower limits of the same sign are considered "significant" and are italicized and shown in bold text***

8.h Acetaldehyde Regression Analysis

Slopes of Regression Analysis – Acetaldehyde Emission Rates from Phase 1 CSLA4, E0, E10 & E20 Fuels

	20°C Testing			-10°C Testing		
	Slope	Upper 95%	Lower 95%	Slope	Upper 95%	Lower 95%
Phase 1 CSLA4						
Escort	***0.274***	0.123	0.425	***0.749***	0.500	0.998
Sentra	***0.088***	0.056	0.120	***1.769***	1.499	2.039
Caravan	***0.443***	0.383	0.503			
Dion	***0.440***	0.331	0.549			
US06						
Escort	n/a	n/a	n/a	***0.028***	0.008	0.049
Sentra	-0.0003	-0.002	0.001	-0.002	-0.008	0.003
Caravan	0.004	-0.003	0.012			
Dion	-0.002	-0.009	0.005			

NOTE:
- ***Negative slope values indicate decreasing emissions with increasing fuel ethanol content***
- ***Positive slope values indicate increasing emissions with increasing fuel ethanol content***
- ***Slopes that have upper and lower limits of the same sign are considered "significant" and are italicized and shown in bold text***

Appendix 9 Specific Reactivity Results

Escort, Specific Reactivity (g O_3/g NMOG) of Exhaust from 20°C and -10°C Tests

Fuel	4-Phase Composite Avg	St Dev	US06 Avg	St Dev
20°C Testing				
E0	2.87	n/a	4.69	0.46
E10	3.03	0.08	4.53	0.37
E10-Spl	2.89	n/a	3.94	0.36
E20	3.16	0.07	4.31	0.14
-10°C Testing				
E0	3.57	0.04	3.59	0.12
E10	3.16	0.33	3.47	0.002
E10-Spl	3.41	n/a	3.52	0.28
E20	3.83	0.53	3.52	0.05

Sentra, Specific Reactivity (g O_3/g NMOG) of Exhaust from 20°C and -10°C Tests

Fuel	4-Phase Composite Avg	St Dev	US06 Avg	St Dev
20°C Testing				
E0	2.63	0.34	2.72	0.33
E10	2.66	n/a	2.94	0.55
E10-Spl	2.50	n/a	2.15	0.24
E20	2.29	n/a	3.57	1.14
-10°C Testing				
E0	3.28	0.11	3.57	0.49
E10	2.93	n/a	3.44	1.15
E10-Spl	3.33	0.07	3.89	0.22
E20	3.25	0.14	2.48	0.47

Caravan, Specific Reactivity (g O_3/g NMOG) of Exhaust from 20°C Tests

Fuel	4-Phase Composite Avg	St Dev	US06 Avg	St Dev
20°C Testing				
E0	3.46	0.40	3.25	0.44
E10	3.76	0.48	3.15	0.16
E10-Spl	2.93	n/a	3.02	0.27
E20	3.42	0.09	2.84	0.002

Dion, Specific Reactivity (g O_3/g NMOG) of Exhaust from 20°C Tests

Fuel	4-Phase Composite Avg	St Dev	US06 Avg	St Dev
20°C Testing				
E0	4.03	1.37	3.67	0.54
E10	3.16	n/a	3.73	n/a
E10-Spl	3.23	n/a	2.91	0.37
E20	2.94	n/a	2.10	n/a

Appendix 10 Ozone Forming Potential Results

Escort, Ozone Forming Potential (g O_3/mile) of Exhaust from 20℃ and -10ºC Tests

Fuel	4-Phase Composite Avg	4-Phase Composite St Dev	US06 Avg	US06 St Dev
20℃ Testing				
E0	0.21	n/a	0.35	0.08
E10	0.27	0.01	0.20	0.10
E10-Spl	0.25	n/a	0.16	0.06
E20	0.23	0.02	0.29	0.04
-10℃ Testing				
E0	1.19	0.09	0.28	0.02
E10	1.49	0.19	0.35	0.15
E10-Spl	1.25	n/a	0.33	0.06
E20	1.28	0.50	0.23	0.007

Sentra, Ozone Forming Potential (g O_3/mile) of Exhaust from 20℃ and -10ºC Tests

Fuel	4-Phase Composite Avg	4-Phase Composite St Dev	US06 Avg	US06 St Dev
20℃ Testing				
E0	0.05	0.005	0.003	0.003
E10	0.07	n/a	0.01	0.004
E10-Spl	0.05	n/a	0.002	0.001
E20	0.03	n/a	0.0004	0.0005
-10℃ Testing				
E0	0.62	0.08	0.006	0.003
E10	0.86	n/a	0.01	0.006
E10-Spl	0.60	0.10	0.01	0.003
E20	0.55	0.11	0.02	0.003

Caravan, Ozone Forming Potential (g O_3/mile) of Exhaust from 20℃ Tests

Fuel	4-Phase Composite Avg	4-Phase Composite St Dev	US06 Avg	US06 St Dev
20℃ Testing				
E0	0.38	0.12	0.07	0.01
E10	0.41	0.05	0.06	0.01
E10-Spl	0.54	n/a	0.05	0.02
E20	0.40	0.03	0.04	0.009

Dion, Ozone Forming Potential (g O_3/mile) of Exhaust from 20℃ Tests

Fuel	4-Phase Composite Avg	4-Phase Composite St Dev	US06 Avg	US06 St Dev
20℃ Testing				
E0	0.58	0.21	0.16	0.02
E10	0.36	n/a	0.13	n/a
E10-Spl	0.42	n/a	0.08	0.02
E20	0.35	n/a	0.02	n/a

Appendix 11 Speciated VOC Results

11.a Escort Emission Rates, 20° Tests

Escort, Speciated VOC Emission Rates (mg/mile) from E0 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	20.214	12.101	<DL	<DL	9.200	n/a	<DL	<DL	8.510	n/a	38.143	1.683
2	ethylene	20.214	0.619	0.001	0.002	1.634	n/a	0.005	0.003	4.746	n/a	9.216	1.712
3	acetylene	4.289	3.732	<DL	<DL	<DL	n/a	<DL	<DL	1.441	n/a	0.088	0.019
4	ethane	5.189	0.729	<DL	<DL	2.389	n/a	<DL	<DL	1.842	n/a	5.082	0.140
5	propylene	14.581	0.050	<DL	<DL	0.756	n/a	<DL	<DL	3.249	n/a	6.270	0.130
6	propane	0.432	0.322	<DL	<DL	0.249	n/a	<DL	<DL	0.205	n/a	0.639	0.059
7	propyne	0.638	0.428	<DL	<DL	<DL	n/a	<DL	<DL	0.196	n/a	0.134	0.030
8	isobutane	2.943	0.068	<DL	<DL	0.376	n/a	<DL	<DL	0.725	n/a	0.923	0.731
9	isobutene/1-butene	11.142	0.049	0.002	0.003	0.590	n/a	<DL	<DL	2.474	n/a	4.033	1.723
10	13-butadiene	0.372	0.059	<DL	<DL	0.014	n/a	<DL	<DL	0.090	n/a	0.173	0.002
11	n-butane	2.542	0.604	0.150	0.212	0.775	n/a	<DL	<DL	0.897	n/a	0.987	0.944
12	t2-butene	1.150	0.020	0.001	0.002	0.191	n/a	0.003	0.005	0.289	n/a	0.366	0.179
13	22-dm-propane	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	0.002	0.003
14	1-butyne	0.024	0.009	<DL	<DL	<DL	n/a	<DL	<DL	0.006	n/a	<DL	<DL
15	c2-butene	1.295	0.059	0.013	0.002	0.138	n/a	0.004	0.005	0.301	n/a	0.410	0.174
16	12-butadiene	0.040	0.007	<DL	<DL	<DL	n/a	<DL	<DL	0.009	n/a	<DL	<DL
17	3m1-butene	0.406	0.007	0.004	0.006	0.011	n/a	0.004	0.006	0.091	n/a	0.081	0.024
18	2m-butane	20.232	0.916	1.294	0.498	3.684	n/a	0.625	0.884	6.090	n/a	5.374	1.653
19	14-pentadiene	0.104	0.134	<DL	<DL	<DL	n/a	<DL	<DL	0.002	n/a	<DL	<DL
20	2-butyne	0.060	0.010	<DL	<DL	<DL	n/a	<DL	<DL	0.011	n/a	<DL	<DL
21	1-pentene	0.281	0.008	0.071	0.007	0.051	n/a	0.040	0.057	0.112	n/a	0.056	0.017
22	2m1-butene	0.997	0.038	0.036	0.019	0.062	n/a	0.022	0.030	0.254	n/a	0.185	0.075
23	n-pentane	8.244	0.580	0.348	0.377	1.461	n/a	0.223	0.315	2.470	n/a	1.852	0.443
24	2m-13-butadiene	0.144	0.036	<DL	<DL	<DL	n/a	<DL	<DL	0.035	n/a	0.002	0.003
25	t2-pentene	0.427	0.015	0.040	0.023	0.049	n/a	0.026	0.037	0.132	n/a	0.074	0.027
26	c2-pentene	0.232	0.022	0.019	0.026	0.031	n/a	0.016	0.023	0.078	n/a	0.032	0.002
27	2m2-butene	1.363	0.053	0.052	0.036	0.105	n/a	0.035	0.049	0.342	n/a	0.114	0.106
28	22-dm-butane	1.013	0.094	0.079	0.018	0.213	n/a	0.031	0.044	0.322	n/a	0.252	0.043
29	cyclopentene	0.316	0.015	<DL	<DL	0.020	n/a	<DL	<DL	0.069	n/a	0.060	0.021
30	4m1-pentene	0.146	0.005	0.016	0.011	0.018	n/a	0.013	0.018	0.047	n/a	0.074	0.008
31	cyclopentane	0.874	0.009	0.030	0.009	0.121	n/a	0.013	0.018	0.229	n/a	0.207	0.047
32	23-dm-butane	6.076	0.460	0.233	0.144	0.995	n/a	0.150	0.212	1.768	n/a	1.219	0.120
33	c/t-4m2-pentene	5.704	0.140	0.553	0.280	1.053	n/a	0.350	0.495	1.870	n/a	1.132	0.150
34	2m-pentane	0.395	0.123	0.147	0.208	<DL	n/a	0.185	0.262	0.239	n/a	0.127	0.055
35	3m-pentane	3.408	0.049	0.332	0.165	0.646	n/a	0.211	0.299	1.104	n/a	0.695	0.093
36	1-hexene/2m1-pentene	0.151	0.011	0.046	0.009	0.032	n/a	0.047	0.039	0.073	n/a	0.025	0.002
37	c/t-3-hexene	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
38	n-hexane	4.232	0.066	0.421	0.195	0.760	n/a	0.253	0.358	1.353	n/a	0.795	0.075
39	t2-hexene	0.135	0.001	0.026	0.014	0.026	n/a	0.018	0.025	0.054	n/a	0.021	0.002
40	2m2-pentene	0.243	0.026	0.016	0.005	0.020	n/a	0.009	0.012	0.062	n/a	0.021	0.009
41	t-3m2-pentene	0.212	0.026	0.010	0.014	0.015	n/a	0.010	0.014	0.054	n/a	0.022	0.006
42	c2-hexene	0.064	0.007	0.010	0.013	0.001	n/a	0.003	0.004	0.020	n/a	0.012	0.0003
43	c-3m2-pentene	0.172	0.013	0.013	0.008	0.016	n/a	0.009	0.013	0.048	n/a	0.007	0.010
44	22-dm-pentane	0.269	0.021	0.008	0.011	0.049	n/a	0.008	0.009	0.074	n/a	0.059	0.008
45	m-cyclopentane	3.242	0.123	0.184	0.089	0.446	n/a	0.111	0.157	0.936	n/a	0.557	0.040
46	24-dm-pentane	5.000	0.275	0.108	0.092	0.666	n/a	0.077	0.109	1.267	n/a	0.994	0.156
47	223-tm-butane	0.422	0.037	0.011	0.0009	0.059	n/a	0.002	0.003	0.101	n/a	0.084	0.013
48	benzene	6.826	0.642	0.105	0.109	0.869	n/a	0.066	0.093	1.833	n/a	10.343	0.143
49	1m-cyclopentene	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
50	33-dm-pentane	0.486	0.074	0.017	0.005	0.057	n/a	0.009	0.013	0.137	n/a	0.084	0.012
51	cyclohexane	3.069	0.105	0.196	0.110	0.323	n/a	0.014	0.009	0.810	n/a	0.503	0.052
52	2m-hexane	2.036	0.086	0.071	0.066	0.279	n/a	0.058	0.082	0.548	n/a	0.405	0.048
53	23-dm-pentane	4.310	0.076	0.092	0.130	0.609	n/a	0.085	0.121	1.166	n/a	0.866	0.071
54	11-dm-cyP	0.256	0.017	0.008	0.011	0.034	n/a	0.008	0.011	0.068	n/a	0.055	0.006
55	cyclohexene	0.100	0.001	<DL	<DL	<DL	n/a	<DL	<DL	0.021	n/a	<DL	<DL
56	3m-hexane	2.231	0.304	0.081	0.069	0.290	n/a	<DL	<DL	0.528	n/a	0.462	0.151
57	c-13-dm-cyP	0.415	0.001	0.027	0.018	0.058	n/a	0.020	0.025	0.122	n/a	0.073	0.006
58	3e-pentane/t-13-dm-cyP	0.542	0.021	0.036	0.025	0.079	n/a	0.025	0.035	0.158	n/a	0.100	0.010
59	t-12-dm-cyP/1-heptene	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
60	224-tm-pentane	56.231	0.027	0.219	0.310	7.774	n/a	0.154	0.218	14.017	n/a	12.306	1.019
61	t3-heptene	0.036	0.003	<DL	<DL	<DL	n/a	<DL	<DL	0.007	n/a	0.002	0.003
62	n-heptane	2.247	0.140	0.031	0.044	0.250	n/a	0.028	0.040	0.546	n/a	0.401	0.058
63	c3-heptene	0.111	0.002	<DL	<DL	<DL	n/a	<DL	<DL	0.023	n/a	<DL	<DL
64	t2-heptene	0.034	0.002	<DL	<DL	<DL	n/a	<DL	<DL	0.007	n/a	0.004	0.0001
65	c2-heptene	0.093	0.020	<DL	<DL	<DL	n/a	<DL	<DL	0.022	n/a	0.007	0.001
66	m-cyclohexane/22-dm-hexane	4.008	0.210	0.080	0.066	0.431	n/a	0.053	0.076	0.981	n/a	0.685	0.069
67	12dm-cyH	6.642	0.232	<DL	<DL	<DL	n/a	<DL	<DL	1.348	n/a	<DL	<DL
68	25-dm-hexane/e-cyP	<DL	<DL	0.020	0.028	0.698	n/a	0.010	0.014	0.206	n/a	1.306	0.152
69	24-dm-hexane/223-tm-pentane	8.990	0.117	0.021	0.030	1.041	n/a	0.010	0.014	2.154	n/a	1.781	0.205
70	33-dm-hexane/ctc124-tm-cyP	0.230	0.009	<DL	<DL	0.027	n/a	<DL	<DL	0.054	n/a	0.067	0.006
71	ctc123-tm-cyP	0.131	0.006	<DL	<DL	0.013	n/a	<DL	<DL	0.030	n/a	0.032	0.003
72	234-tm-pentane	21.557	0.541	0.043	0.061	2.458	n/a	0.018	0.026	5.110	n/a	3.992	0.495
73	toluene/233-tm-pentane	29.626	1.001	3.490	0.951	5.305	n/a	3.041	1.400	9.588	n/a	8.191	1.329
74	23-dm-hexane	5.628	0.087	0.007	0.010	0.627	n/a	0.003	0.005	1.335	n/a	1.096	0.164
75	112-tm-cyP	0.243	0.004	<DL	<DL	<DL	n/a	<DL	<DL	0.050	n/a	0.026	0.037
76	2m-heptane	0.957	0.038	0.001	0.001	0.095	n/a	0.002	0.003	0.221	n/a	0.185	0.027
77	4m-C7/3m3e-C5/1m-cyHexene	0.329	0.002	<DL	<DL	0.036	n/a	<DL	<DL	0.078	n/a	0.066	0.0006
78	34-dm-hexane	1.065	0.008	<DL	<DL	0.119	n/a	<DL	<DL	0.253	n/a	0.199	0.019
79	3m-heptane/3e-hexane	0.959	0.025	0.002	0.003	0.106	n/a	0.006	0.008	0.229	n/a	0.181	0.022
80	t-13-dm-cyH	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
81	cct-124-tm-cyP/c-13-dm-cyH	0.657	0.143	<DL	<DL	0.034	n/a	<DL	<DL	0.125	n/a	0.188	0.157
82	t-14-dm-cyH	0.256	0.018	<DL	<DL	0.027	n/a	<DL	<DL	0.058	n/a	0.051	0.008
83	225-tm-hexane	6.737	0.206	0.005	0.008	0.736	n/a	<DL	<DL	1.576	n/a	1.451	0.187

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
84	11-dm-cyH/1-octene	0.133	0.016	<DL	<DL	0.012	n/a	<DL	<DL	0.029	n/a	0.028	0.009
85	1e1m-cyP	0.093	0.066	<DL	<DL	0.017	n/a	<DL	<DL	0.014	n/a	0.030	0.002
86	224-tm-hexane	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
87	n-octane/t12-dm-cyH	1.369	0.091	<DL	<DL	0.119	n/a	<DL	<DL	0.304	n/a	0.231	0.038
88	t2-octene	0.035	0.003	<DL	<DL	<DL	n/a	<DL	<DL	0.007	n/a	0.002	0.002
89	ccc-123-tm-cyP	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
90	244-tm-hexane	0.230	0.006	<DL	<DL	0.019	n/a	<DL	<DL	0.052	n/a	0.037	0.002
91	c2-octene	0.240	0.002	<DL	<DL	0.024	n/a	<DL	<DL	0.056	n/a	0.045	0.007
92	ip-cyP	0.031	0.001	<DL	<DL	<DL	n/a	<DL	<DL	0.007	n/a	0.002	0.003
93	235-tm-hexane	1.038	0.012	<DL	<DL	0.103	n/a	<DL	<DL	0.243	n/a	0.189	0.023
94	44&22-dm-heptane	0.009	0.012	<DL	<DL	<DL	n/a	0.012	0.017	0.011	n/a	0.009	0.012
95	24-dm-heptane	0.227	0.004	<DL	<DL	0.020	n/a	<DL	<DL	0.052	n/a	0.040	0.0002
96	26-dm-heptane/c12-dm-cyH	0.394	0.022	<DL	<DL	0.034	n/a	<DL	<DL	0.088	n/a	0.068	0.010
97	np-cyP/e-cyH	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
98	ccc-135-tm-cyH	0.035	0.002	<DL	<DL	<DL	n/a	<DL	<DL	0.007	n/a	0.005	0.0005
99	25-dm-heptane/35-dm-heptane	0.601	0.010	<DL	<DL	0.047	n/a	<DL	<DL	0.137	n/a	0.102	0.011
100	33-dm-heptane	0.182	0.005	<DL	<DL	0.013	n/a	<DL	<DL	0.041	n/a	0.030	0.0006
101	114-tm-cyH	0.068	0.001	<DL	<DL	<DL	n/a	<DL	<DL	0.014	n/a	0.009	0.0009
102	e-benzene	1.279	0.011	0.007	0.010	0.045	n/a	0.005	0.007	0.286	n/a	0.174	0.036
103	cct-124-tm-cyH	0.095	0.007	<DL	<DL	<DL	n/a	<DL	<DL	0.019	n/a	0.014	0.00008
104	23-dm-heptane	0.288	0.011	<DL	<DL	0.031	n/a	<DL	<DL	0.067	n/a	0.045	0.005
105	m&p-xylene/34-dm-heptane	3.666	0.029	<DL	<DL	0.128	n/a	<DL	<DL	0.802	n/a	0.853	0.190
106	2m-octane	0.454	0.015	<DL	<DL	0.034	n/a	<DL	<DL	0.102	n/a	0.074	0.004
107	246-tm-hexane	0.031	0.002	<DL	<DL	<DL	n/a	<DL	<DL	0.007	n/a	<DL	<DL
108	3m-octane	0.342	0.021	<DL	<DL	0.017	n/a	<DL	<DL	0.073	n/a	0.052	0.012
109	ctc-124-tm-cyH	0.083	0.006	0.001	0.002	0.021	n/a	<DL	<DL	0.022	n/a	0.049	0.038
110	33-de-C5/3e-C7	1.195	0.067	<DL	<DL	0.068	n/a	<DL	<DL	0.277	n/a	0.186	0.078
111	o-xylene	1.622	0.018	<DL	<DL	0.060	n/a	<DL	<DL	0.351	n/a	0.332	0.074
112	112-tm-cyH	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
113	1-nonene	0.762	0.016	0.0003	0.0005	0.068	n/a	<DL	<DL	0.180	n/a	0.146	0.011
114	t3-nonene	0.074	0.004	<DL	<DL	<DL	n/a	<DL	<DL	0.015	n/a	0.010	0.001
115	c3-nonene/ib-cyP	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
116	n-nonane	0.738	0.053	<DL	<DL	0.036	n/a	<DL	<DL	0.156	n/a	0.105	0.027
117	t2-nonene	0.440	0.013	<DL	<DL	0.037	n/a	<DL	<DL	0.104	n/a	0.077	0.007
118	c2-nonene	0.033	0.004	<DL	<DL	<DL	n/a	<DL	<DL	0.006	n/a	0.007	0.002
119	ip-benzene	0.164	0.232	<DL	<DL	<DL	n/a	<DL	<DL	0.068	n/a	0.021	0.030
120	22-dm-octane	0.105	0.047	<DL	<DL	<DL	n/a	<DL	<DL	0.015	n/a	0.030	0.031
121	ip-cyH	0.172	0.004	<DL	<DL	0.013	n/a	<DL	<DL	0.039	n/a	0.026	0.002
122	nb-cyP	0.509	0.026	<DL	<DL	0.025	n/a	<DL	<DL	0.117	n/a	0.084	0.019
123	33-dm-octane	0.058	0.009	0.009	0.013	<DL	n/a	<DL	<DL	0.011	n/a	0.017	0.007
124	n-propylbenzene	0.214	0.0004	<DL	<DL	0.0008	n/a	<DL	<DL	0.045	n/a	0.020	0.009
125	3e-toluene	0.831	0.056	0.006	0.009	0.006	n/a	<DL	<DL	0.186	n/a	0.108	0.054
126	4e-toluene/23-dm-octane	0.433	0.011	<DL	<DL	0.009	n/a	<DL	<DL	0.094	n/a	0.052	0.020
127	135-tm-benzene	0.569	0.020	<DL	<DL	0.020	n/a	<DL	<DL	0.127	n/a	0.090	0.028
128	2m-nonane	<DL	<DL	<DL	<DL	0.223	n/a	<DL	<DL	0.061	n/a	<DL	<DL
129	3e-octane	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
130	3m-nonane	0.107	0.001	<DL	<DL	0.004	n/a	<DL	<DL	0.024	n/a	0.018	0.008
131	2e-toluene	0.288	0.018	<DL	<DL	0.003	n/a	<DL	<DL	0.064	n/a	0.029	0.010
132	124-tm-benzene/tb-benz/1-decene	1.227	0.207	<DL	<DL	0.015	n/a	<DL	<DL	0.290	n/a	0.171	0.042
133	ib-cyH	0.048	0.041	<DL	<DL	0.054	n/a	0.005	0.007	0.022	n/a	0.037	0.052
134	n-decane	0.971	0.089	<DL	<DL	0.049	n/a	<DL	<DL	0.229	n/a	0.134	0.033
135	ib-benzene/t-1m-2p-CyH	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
136	sb-benzene	0.195	0.011	<DL	<DL	0.018	n/a	<DL	<DL	0.044	n/a	0.027	0.005
137	3-ip-toluene	0.122	0.002	<DL	<DL	0.003	n/a	<DL	<DL	0.026	n/a	0.025	0.011
138	123-tm-benzene	0.372	0.048	<DL	<DL	<DL	n/a	<DL	<DL	0.085	n/a	0.052	0.016
139	4-ip-toluene	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
140	indan	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
141	2-ip-toluene	0.058	0.082	<DL	<DL	<DL	n/a	<DL	<DL	0.024	n/a	<DL	<DL
142	13-de-benzene	0.016	0.023	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
143	14-de-benzene	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
144	3-np-toluene	1.716	0.021	0.006	0.0004	0.131	n/a	<DL	<DL	0.397	n/a	0.263	0.062
145	4-np-toluene/nb-benz/13dm5e-benzene	0.351	0.029	<DL	<DL	0.006	n/a	<DL	<DL	0.079	n/a	0.040	0.015
146	12de-benzene	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
147	2-np-toluene	1.314	0.071	0.002	0.001	0.081	n/a	<DL	<DL	0.286	n/a	0.179	0.042
148	14dm-2e-benzene	0.098	0.019	<DL	<DL	<DL	n/a	<DL	<DL	0.023	n/a	<DL	<DL
149	13dm-4e-benzene	0.249	0.018	<DL	<DL	<DL	n/a	<DL	<DL	0.055	n/a	0.024	0.034
150	12dm-4e-benzene	0.227	0.035	<DL	<DL	<DL	n/a	<DL	<DL	0.052	n/a	<DL	<DL
151	13dm-2e-benzene	0.141	0.010	<DL	<DL	<DL	n/a	<DL	<DL	0.031	n/a	0.017	0.003
152	n-undecane/12dm-3e-benzene	0.566	0.133	<DL	<DL	0.003	n/a	<DL	<DL	0.138	n/a	0.065	0.016
153	1245-ttm-benzene	0.369	0.017	<DL	<DL	0.020	n/a	<DL	<DL	0.085	n/a	0.039	0.017
154	2mb-benzene	0.139	0.001	0.024	0.033	0.024	n/a	0.012	0.017	0.035	n/a	0.061	0.017
155	tb-2m-benzene	0.037	0.003	<DL	<DL	<DL	n/a	<DL	<DL	0.008	n/a	<DL	<DL
156	1234-ttm-benzene	0.053	0.009	<DL	<DL	<DL	n/a	<DL	<DL	0.012	n/a	<DL	<DL
157	npentyl-benzene/t-1m-2-(4mp)CyP	0.107	0.083	<DL	<DL	0.007	n/a	<DL	<DL	0.012	n/a	0.044	0.053
158	tb-35dm-benzene	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
159	tb-4e-benzene	<DL	<DL	<DL	<DL	<DL	n/a	<DL	<DL	<DL	n/a	<DL	<DL
160	naphthalene	0.061	0.086	<DL	<DL	<DL	n/a	<DL	<DL	0.025	n/a	0.030	0.042
161	n-dodecane	0.064	0.022	<DL	<DL	<DL	n/a	<DL	<DL	0.017	n/a	0.006	0.007

Escort, Speciated VOC Emission Rates (mg/mile) from E10 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	27.152	0.969	<DL	<DL	9.375	0.416	<DL	<DL	8.209	0.228	22.850	0.851
2	ethylene	24.832	0.329	0.022	0.004	1.876	0.337	0.016	0.008	5.679	0.123	4.322	1.859
3	acetylene	2.056	0.406	0.002	0.003	0.015	0.019	0.007	0.012	0.433	0.084	0.041	0.025
4	ethane	7.307	0.506	0.140	0.021	2.140	0.163	0.134	0.031	2.175	0.063	2.910	0.154
5	propylene	16.459	2.300	0.010	0.018	0.670	0.060	0.0004	0.0006	3.601	0.453	2.441	1.260
6	propane	2.828	2.668	<DL	<DL	0.088	0.106	0.013	0.023	0.613	0.550	0.332	0.241
7	propyne	0.415	0.171	<DL	<DL	<DL	<DL	<DL	<DL	0.086	0.035	0.005	0.005

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
8	isobutane	2.793	0.070	0.139	0.199	0.519	0.398	0.366	0.347	0.862	0.217	0.267	0.199
9	isobutene/1-butene	12.345	1.809	0.007	0.006	0.343	0.094	0.005	0.005	2.659	0.352	0.764	0.504
10	13-butadiene	0.593	0.095	0.071	0.123	0.053	0.074	<DL	<DL	0.153	0.067	0.150	0.134
11	n-butane	2.529	0.908	0.198	0.342	0.593	0.515	1.099	0.604	1.055	0.388	0.297	0.319
12	t2-butene	1.378	0.332	0.0004	0.0006	0.104	0.022	0.008	0.008	0.317	0.074	0.125	0.082
13	22-dm-propane	0.007	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.003	<DL	<DL
14	1-butyne	0.022	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.004	<DL	<DL
15	c2-butene	1.446	0.155	0.094	0.115	<DL	<DL	0.053	0.046	0.336	0.052	0.199	0.187
16	12-butadiene	0.044	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.002	<DL	<DL
17	3m1-butene	0.565	0.055	0.005	0.008	0.008	0.002	0.008	0.007	0.123	0.008	0.028	0.012
18	2m-butane	13.618	0.573	0.287	0.282	2.462	0.368	1.245	0.501	3.934	0.234	1.841	0.383
19	14-pentadiene	0.014	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.003	<DL	<DL
20	2-butyne	0.065	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.0003	<DL	<DL
21	1-pentene	0.549	0.027	0.126	0.042	0.080	0.023	0.183	0.063	0.218	0.030	0.078	0.041
22	2m1-butene	1.089	0.069	0.019	0.013	0.027	0.013	0.035	0.012	0.248	0.013	0.047	0.016
23	n-pentane	5.270	0.254	0.059	0.058	0.853	0.113	0.313	0.106	1.434	0.082	0.586	0.132
24	2m-13-butadiene	0.200	0.053	<DL	<DL	0.0009	0.001	0.001	0.002	0.042	0.010	0.007	0.008
25	t2-pentene	0.470	0.019	0.023	0.010	0.036	0.008	0.055	0.009	0.129	0.008	0.039	0.018
26	c2-pentene	0.260	0.019	0.010	0.009	0.016	0.007	0.037	0.016	0.071	0.008	0.019	0.008
27	2m2-butene	0.837	0.167	0.022	0.022	0.023	0.040	0.044	0.021	0.198	0.044	0.007	0.007
28	22-dm-butane	0.743	0.027	0.028	0.013	0.128	0.019	0.058	0.020	0.213	0.019	0.092	0.009
29	cyclopentene	0.341	0.029	<DL	<DL	0.008	0.008	<DL	<DL	0.073	0.004	0.020	0.013
30	4m1-pentene	0.215	0.008	0.010	0.011	0.013	0.007	0.009	0.013	0.053	0.006	0.029	0.011
31	cyclopentane	0.689	0.034	0.013	0.008	0.094	0.016	0.041	0.017	0.184	0.013	0.068	0.017
32	23-dm-butane	5.128	0.229	0.051	0.037	0.719	0.118	0.123	0.080	1.309	0.099	0.520	0.067
33	c/t-4m2-pentene	4.818	0.345	0.123	0.129	0.679	0.169	0.287	0.197	1.298	0.200	0.480	0.079
34	2m-pentane	0.560	0.026	<DL	<DL	0.003	0.005	0.004	0.006	0.118	0.002	0.008	0.003
35	3m-pentane	3.085	0.164	0.081	0.075	0.414	0.083	0.181	0.089	0.825	0.095	0.302	0.064
36	1-hexene/2m1-pentene	0.493	0.113	0.017	0.016	0.018	0.004	0.032	0.012	0.120	0.020	0.026	0.002
37	c/t-3-hexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
38	n-hexane	3.902	0.197	0.123	0.093	0.535	0.085	0.227	0.087	1.051	0.108	0.373	0.068
39	t2-hexene	0.163	0.029	0.012	0.016	0.010	0.010	0.020	0.021	0.045	0.018	0.009	0.009
40	2m2-pentene	0.213	0.025	0.017	0.019	0.012	0.014	0.021	0.024	0.057	0.019	0.010	0.005
41	t-3m2-pentene	0.141	0.019	0.004	0.008	<DL	<DL	0.007	0.012	0.032	0.005	0.003	0.006
42	c2-hexene	0.094	0.002	0.011	0.011	0.008	0.001	0.013	0.002	0.028	0.004	0.004	0.003
43	c-3m2-pentene	0.068	0.025	0.0006	0.001	0.004	0.007	0.006	0.010	0.017	0.009	<DL	<DL
44	22-dm-pentane	0.294	0.006	0.005	0.009	0.044	0.004	<DL	<DL	0.074	0.003	0.032	0.005
45	m-cyclopentane	2.868	0.126	0.045	0.029	0.316	0.049	0.117	0.041	0.727	0.053	0.240	0.055
46	24-dm-pentane	4.815	0.205	0.008	0.008	0.559	0.080	0.068	0.028	1.175	0.061	0.440	0.082
47	223-tm-butane	0.428	0.026	<DL	<DL	0.052	0.007	0.004	0.007	0.104	0.006	0.036	0.006
48	benzene	10.408	0.534	<DL	<DL	0.829	0.301	<DL	<DL	2.388	0.032	3.590	0.638
49	1m-cyclopentene	0.024	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.001	<DL	<DL
50	33-dm-pentane	0.471	0.048	0.011	0.002	0.031	0.003	0.010	0.002	0.112	0.010	0.025	0.003
51	cyclohexane	3.218	0.148	0.006	0.011	0.357	0.094	0.107	0.109	0.799	0.053	0.200	0.028
52	2m-hexane	2.316	0.106	0.010	0.012	0.246	0.039	0.038	0.013	0.562	0.032	0.198	0.043
53	23-dm-pentane	4.141	0.176	0.012	0.022	0.469	0.073	0.062	0.028	1.009	0.055	0.369	0.073

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
54	11-dm-cyP	0.309	0.015	<DL	<DL	0.033	0.001	<DL	<DL	0.073	0.003	0.026	0.007
55	cyclohexene	0.207	0.025	<DL	<DL	<DL	<DL	<DL	<DL	0.043	0.005	<DL	<DL
56	3m-hexane	2.282	0.092	0.006	0.011	0.258	0.045	0.283	0.425	0.630	0.129	0.240	0.096
57	c-13-dm-cyP	0.479	0.020	0.005	0.003	0.049	0.011	0.016	0.008	0.119	0.007	0.038	0.010
58	3e-pentane/t-13-dm-cyP	0.675	0.029	0.009	0.004	0.071	0.015	0.025	0.012	0.169	0.012	0.055	0.012
59	t-12-dm-cyP/1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
60	224-tm-pentane	53.811	1.732	<DL	<DL	6.137	0.836	0.143	0.144	12.897	0.344	5.033	0.948
61	t3-heptene	0.053	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.0006	0.003	0.005
62	n-heptane	3.143	0.087	<DL	<DL	0.308	0.053	0.015	0.009	0.741	0.022	0.255	0.066
63	c3-heptene	0.045	0.040	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.008	<DL	<DL
64	t2-heptene	0.061	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.003	0.002	0.003
65	c2-heptene	0.088	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.002	0.001	0.002
66	m-cyclohexane/22-dm-hexane	5.787	0.212	0.002	0.003	0.527	0.090	0.031	0.011	1.356	0.050	0.432	0.125
67	12dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
68	25-dm-hexane/e-cyP	6.419	0.176	<DL	<DL	0.602	0.118	0.007	0.012	1.500	0.046	0.529	0.137
69	24-dm-hexane/223-tm-pentane	8.893	0.260	<DL	<DL	0.866	0.150	0.017	0.030	2.089	0.055	0.724	0.181
70	33-dm-hexane/ctc124-tm-cyP	0.361	0.014	<DL	<DL	0.034	0.006	<DL	<DL	0.084	0.003	0.034	0.009
71	ctc123-tm-cyP	0.239	0.005	<DL	<DL	0.017	0.003	<DL	<DL	0.054	0.001	0.019	0.005
72	234-tm-pentane	21.185	0.640	<DL	<DL	2.073	0.358	0.022	0.039	4.973	0.142	1.640	0.424
73	toluene/233-tm-pentane	32.462	1.165	0.719	0.636	3.433	0.484	1.403	0.173	8.255	0.277	3.189	0.741
74	23-dm-hexane	5.576	0.145	<DL	<DL	0.513	0.095	0.005	0.008	1.300	0.035	0.437	0.120
75	112-tm-cyP	0.285	0.011	<DL	<DL	0.026	0.004	<DL	<DL	0.066	0.001	0.023	0.003
76	2m-heptane	1.607	0.035	<DL	<DL	0.144	0.030	0.0008	0.001	0.373	0.010	0.130	0.040
77	4m-C7/3m3e-C5/1m-cyHexene	0.516	0.006	<DL	<DL	0.047	0.008	<DL	<DL	0.120	0.001	0.041	0.012
78	34-dm-hexane	1.102	0.028	<DL	<DL	0.102	0.015	<DL	<DL	0.257	0.007	0.085	0.024
79	3m-heptane/3e-hexane	1.454	0.140	<DL	<DL	0.132	0.026	0.002	0.004	0.339	0.022	0.116	0.037
80	t-13-dm-cyH	0.067	0.117	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.024	<DL	<DL
81	cct-124-tm-cyP/c-13-dm-cyH	1.165	0.040	<DL	<DL	0.134	0.030	0.044	0.076	0.292	0.024	0.104	0.062
82	t-14-dm-cyH	0.513	0.021	<DL	<DL	0.043	0.007	<DL	<DL	0.118	0.004	0.040	0.013
83	225-tm-hexane	6.805	0.142	0.002	0.004	0.640	0.121	0.005	0.009	1.590	0.040	0.590	0.144
84	11-dm-cyH/1-octene	0.479	0.020	<DL	<DL	0.023	0.005	<DL	<DL	0.106	0.004	0.032	0.016
85	1e1m-cyP	0.194	0.004	<DL	<DL	0.011	0.002	<DL	<DL	0.043	0.0006	0.021	0.015
86	224-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
87	n-octane/t12-dm-cyH	3.254	0.066	<DL	<DL	0.250	0.053	0.0008	0.001	0.744	0.015	0.228	0.079
88	t2-octene	0.073	0.0001	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.00006	0.002	0.004
89	ccc-123-tm-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
90	244-tm-hexane	0.412	0.017	<DL	<DL	0.027	0.004	<DL	<DL	0.093	0.003	0.026	0.008
91	c2-octene	0.254	0.006	<DL	<DL	0.018	0.003	<DL	<DL	0.058	0.0006	0.016	0.005
92	ip-cyP	0.067	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.001	0.002	0.003
93	235-tm-hexane	1.073	0.022	<DL	<DL	0.090	0.018	<DL	<DL	0.248	0.005	0.080	0.025
94	44&22-dm-heptane	0.133	0.008	0.013	0.009	<DL	<DL	<DL	<DL	0.030	0.003	0.001	0.002
95	24-dm-heptane	0.365	0.009	<DL	<DL	0.026	0.006	<DL	<DL	0.083	0.001	0.027	0.010
96	26-dm-heptane/c12-dm-cyH	0.751	0.021	<DL	<DL	0.058	0.014	0.010	0.018	0.175	0.006	0.054	0.017
97	np-cyP/e-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
98	ccc-135-tm-cyH	0.076	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.0008	<DL	<DL
99	25-dm-heptane/35-dm-heptane	0.874	0.013	0.001	0.003	0.063	0.014	<DL	<DL	0.199	0.004	0.060	0.018

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
100	33-dm-heptane	0.475	0.016	<DL	<DL	0.034	0.006	<DL	<DL	0.108	0.003	0.033	0.010
101	114-tm-cyH	0.161	0.004	<DL	<DL	0.009	0.002	<DL	<DL	0.036	0.001	0.009	0.004
102	e-benzene	1.917	0.077	<DL	<DL	0.021	0.012	0.004	0.007	0.405	0.013	0.083	0.066
103	cct-124-tm-cyH	0.338	0.010	<DL	<DL	0.023	0.004	<DL	<DL	0.076	0.002	0.020	0.007
104	23-dm-heptane	0.561	0.016	<DL	<DL	0.042	0.008	<DL	<DL	0.128	0.003	0.036	0.012
105	m&p-xylene/34-dm-heptane	6.259	0.308	<DL	<DL	0.109	0.057	<DL	<DL	1.329	0.054	0.340	0.194
106	2m-octane	1.439	0.031	0.0005	0.0009	0.096	0.023	<DL	<DL	0.325	0.005	0.092	0.033
107	246-tm-hexane	0.042	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.0008	<DL	<DL
108	3m-octane	1.151	0.025	<DL	<DL	0.071	0.019	0.0006	0.001	0.259	0.005	0.070	0.027
109	ctc-124-tm-cyH	0.137	0.012	0.005	0.005	<DL	<DL	0.004	0.005	0.031	0.003	0.003	0.003
110	33-de-C5/3e-C7	1.499	0.033	<DL	<DL	0.120	0.060	<DL	<DL	0.344	0.013	0.117	0.044
111	o-xylene	2.827	0.136	<DL	<DL	0.073	0.033	0.002	0.003	0.608	0.024	0.149	0.085
112	112-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
113	1-nonene	1.104	0.020	<DL	<DL	0.076	0.019	<DL	<DL	0.250	0.002	0.082	0.032
114	t3-nonene	0.361	0.011	<DL	<DL	0.023	0.008	<DL	<DL	0.081	0.002	0.024	0.009
115	c3-nonene/ib-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
116	n-nonane	4.321	0.093	0.004	0.005	0.266	0.062	0.001	0.002	0.971	0.015	0.269	0.105
117	t2-nonene	0.486	0.009	<DL	<DL	0.033	0.006	<DL	<DL	0.110	0.002	0.034	0.012
118	c2-nonene	0.542	0.021	<DL	<DL	0.033	0.019	<DL	<DL	0.121	0.006	0.022	0.013
119	ip-benzene	0.040	0.070	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.015	<DL	<DL
120	22-dm-octane	0.492	0.427	<DL	<DL	0.019	0.032	<DL	<DL	0.107	0.093	0.032	0.033
121	ip-cyH	1.012	0.059	<DL	<DL	0.064	0.016	<DL	<DL	0.227	0.009	0.064	0.021
122	nb-cyP	2.182	0.063	<DL	<DL	0.144	0.037	0.013	0.022	0.496	0.010	0.142	0.059
123	33-dm-octane	0.283	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.059	0.004	0.021	0.005
124	n-propylbenzene	0.542	0.010	<DL	<DL	0.019	0.010	<DL	<DL	0.118	0.003	0.022	0.012
125	3e-toluene	1.387	0.074	0.0009	0.002	0.002	0.004	<DL	<DL	0.289	0.015	0.058	0.040
126	4e-toluene/23-dm-octane	1.276	0.021	<DL	<DL	0.056	0.018	<DL	<DL	0.280	0.004	0.065	0.032
127	135-tm-benzene	1.995	0.252	0.0006	0.001	0.064	0.014	0.001	0.002	0.432	0.047	0.098	0.043
128	2m-nonane	0.969	0.031	0.002	0.003	0.042	0.016	<DL	<DL	0.213	0.003	0.051	0.026
129	3e-octane	0.225	0.010	<DL	<DL	0.016	0.002	<DL	<DL	0.051	0.002	0.015	0.006
130	3m-nonane	0.961	0.025	0.001	0.001	0.065	0.016	<DL	<DL	0.218	0.007	0.060	0.020
131	2e-toluene	0.416	0.023	0.002	0.003	<DL	<DL	<DL	<DL	0.087	0.004	0.010	0.013
132	124-tm-benzene/tb-benz/1-decene	2.484	0.181	<DL	<DL	0.037	0.026	<DL	<DL	0.526	0.036	0.100	0.061
133	ib-cyH	0.447	0.092	0.116	0.124	0.014	0.013	<DL	<DL	0.123	0.026	0.039	0.023
134	n-decane	4.629	0.110	0.013	0.011	0.268	0.058	0.004	0.007	1.039	0.014	0.280	0.128
135	ib-benzene/t-1m-2p-CyH	0.193	0.006	<DL	<DL	0.006	0.006	<DL	<DL	0.042	0.0006	0.007	0.007
136	sb-benzene	0.365	0.015	<DL	<DL	0.025	0.009	<DL	<DL	0.083	0.005	0.025	0.010
137	3-ip-toluene	0.423	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.088	0.004	0.031	0.013
138	123-tm-benzene	0.822	0.053	0.001	0.002	0.010	0.017	<DL	<DL	0.174	0.014	0.030	0.023
139	4-ip-toluene	0.483	0.018	<DL	<DL	0.034	0.006	<DL	<DL	0.110	0.003	0.032	0.011
140	indan	0.132	0.116	<DL	<DL	<DL	<DL	0.005	0.008	0.029	0.026	<DL	<DL
141	2-ip-toluene	0.070	0.122	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.025	0.004	0.008
142	13-de-benzene	0.215	0.014	<DL	<DL	0.002	0.003	<DL	<DL	0.045	0.003	0.012	0.005
143	14-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
144	3-np-toluene	2.020	0.062	0.013	0.003	0.127	0.029	<DL	<DL	0.457	0.012	0.121	0.051
145	4-np-toluene/nb-benz/13dm5e-benzene	0.725	0.021	0.001	0.002	0.018	0.010	<DL	<DL	0.156	0.001	0.027	0.021

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
146	12de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
147	2-np-toluene	1.626	0.057	0.017	0.012	0.103	0.024	0.004	0.008	0.371	0.007	0.095	0.044
148	14dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
149	13dm-4e-benzene	0.332	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.069	0.003	0.008	0.013
150	12dm-4e-benzene	0.362	0.017	0.004	0.006	<DL	<DL	<DL	<DL	0.076	0.005	0.007	0.012
151	13dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
152	n-undecane/12dm-3e-benzene	1.609	0.069	0.010	0.003	0.058	0.019	<DL	<DL	0.352	0.008	0.080	0.049
153	1245-ttm-benzene	0.494	0.053	<DL	<DL	0.019	0.007	<DL	<DL	0.108	0.012	0.017	0.007
154	2mb-benzene	0.210	0.027	0.047	0.021	0.033	0.009	0.021	0.018	0.069	0.005	0.054	0.024
155	tb-2m-benzene	0.046	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.0007	<DL	<DL
156	1234-ttm-benzene	0.084	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.0008	<DL	<DL
157	npentyl-benzene/t-1m-2-(4mp)CyP	0.105	0.012	0.060	0.071	<DL	<DL	<DL	<DL	0.035	0.017	0.010	0.015
158	tb-35dm-benzene	0.033	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.0005	<DL	<DL
159	tb-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
160	naphthalene	0.262	0.227	<DL	<DL	<DL	<DL	<DL	<DL	0.054	0.047	<DL	<DL
161	n-dodecane	0.098	0.011	0.003	0.005	0.005	0.005	<DL	<DL	0.023	0.003	0.005	0.007

Escort, Speciated VOC Emission Rates (mg/mile) from E10-Spl Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	24.116	3.431	<DL	<DL	10.139	1.049	<DL	<DL	7.776	1.020	24.568	1.908
2	ethylene	17.336	2.324	0.006	0.008	1.405	0.506	0.005	0.007	3.979	0.634	4.118	1.202
3	acetylene	2.032	0.178	<DL	<DL	0.002	0.003	<DL	<DL	0.421	0.036	0.015	0.009
4	ethane	6.081	0.813	0.083	0.015	2.257	0.446	0.061	0.087	1.915	0.267	3.321	0.155
5	propylene	14.021	1.060	<DL	<DL	0.492	0.230	<DL	<DL	3.039	0.297	2.146	0.882
6	propane	1.775	0.111	<DL	<DL	0.166	0.004	<DL	<DL	0.413	0.020	0.204	0.136
7	propyne	0.350	0.035	<DL	<DL	<DL	<DL	<DL	<DL	0.073	0.008	0.011	0.003
8	isobutane	3.775	0.982	<DL	<DL	0.323	0.244	<DL	<DL	0.871	0.140	0.401	0.064
9	isobutene/1-butene	8.225	0.725	0.013	0.0002	0.414	0.248	<DL	<DL	1.819	0.074	1.085	0.651
10	13-butadiene	0.399	0.106	<DL	<DL	0.042	0.024	<DL	<DL	0.094	0.016	0.069	0.097
11	n-butane	4.253	0.248	1.528	0.865	1.127	0.675	0.787	0.030	1.763	0.441	0.456	0.100
12	t2-butene	1.724	0.459	0.010	0.008	0.136	0.091	<DL	<DL	0.397	0.123	0.099	0.039
13	22-dm-propane	0.011	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
14	1-butyne	0.010	0.015	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
15	c2-butene	1.276	0.366	0.110	0.039	<DL	<DL	0.093	0.028	0.316	0.060	<DL	<DL
16	12-butadiene	0.039	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.001	<DL	<DL
17	3m1-butene	0.469	0.097	0.007	0.010	0.007	0.010	0.007	0.010	0.103	0.029	0.034	0.009
18	2m-butane	16.960	4.170	0.311	0.211	3.447	0.135	0.682	0.341	4.730	0.863	2.513	0.418
19	14-pentadiene	0.013	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0006	<DL	<DL
20	2-butyne	0.076	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.002	<DL	<DL
21	1-pentene	0.375	0.067	0.160	0.016	0.087	0.012	0.177	0.100	0.190	0.050	0.041	0.017
22	2m1-butene	1.063	0.250	0.046	0.012	0.042	0.015	0.036	0.007	0.253	0.062	0.049	0.033
23	n-pentane	6.003	1.490	<DL	<DL	1.063	0.033	0.058	0.081	1.552	0.281	0.645	0.076

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
24	2m-13-butadiene	0.176	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.036	0.002	0.006	0.005
25	t2-pentene	0.455	0.108	0.053	0.013	0.039	0.011	0.045	0.009	0.130	0.031	0.026	0.014
26	c2-pentene	0.245	0.052	0.040	0.044	0.013	0.0004	0.065	0.007	0.082	0.023	0.007	0.007
27	2m2-butene	0.911	0.212	0.065	0.020	0.026	0.020	0.052	0.019	0.226	0.060	0.0004	0.0006
28	22-dm-butane	0.841	0.178	0.072	0.010	0.191	0.035	0.059	0.016	0.260	0.054	0.121	0.053
29	cyclopentene	0.271	0.080	<DL	<DL	0.010	0.004	<DL	<DL	0.059	0.018	0.012	0.007
30	4m1-pentene	0.167	0.043	0.008	0.002	0.014	0.001	0.007	0.009	0.042	0.011	0.040	0.004
31	cyclopentane	0.730	0.118	0.041	0.009	0.115	0.016	0.028	0.005	0.200	0.030	0.067	0.026
32	23-dm-butane	5.806	1.154	0.180	0.010	1.061	0.120	0.145	0.038	1.577	0.264	0.717	0.199
33	c/t-4m2-pentene	5.173	0.978	0.476	0.105	1.016	0.196	0.448	0.143	1.589	0.327	0.665	0.230
34	2m-pentane	0.512	0.062	<DL	<DL	0.006	0.008	<DL	<DL	0.108	0.016	0.008	0.004
35	3m-pentane	3.202	0.559	0.284	0.065	0.608	0.106	0.276	0.101	0.975	0.192	0.393	0.140
36	1-hexene/2m1-pentene	0.196	0.026	0.056	0.010	0.026	0.008	0.043	0.017	0.073	0.011	0.017	0.008
37	c/t-3-hexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
38	n-hexane	3.605	0.596	0.336	0.056	0.679	0.134	0.330	0.109	1.105	0.208	0.443	0.170
39	t2-hexene	0.148	0.030	0.028	0.007	0.022	0.011	0.028	0.013	0.051	0.015	0.012	0.008
40	2m2-pentene	0.198	0.041	0.010	0.015	0.011	0.016	0.010	0.014	0.049	0.020	0.002	0.003
41	t-3m2-pentene	0.160	0.052	0.013	0.019	0.007	0.010	0.016	0.022	0.043	0.024	0.008	0.003
42	c2-hexene	0.078	0.013	0.015	0.005	0.012	0.006	0.016	0.007	0.027	0.007	0.007	0.003
43	c-3m2-pentene	0.087	0.024	0.018	0.003	0.006	0.009	0.018	0.009	0.029	0.011	<DL	<DL
44	22-dm-pentane	0.260	0.038	<DL	<DL	0.052	0.012	0.011	0.015	0.071	0.016	0.039	0.009
45	m-cyclopentane	2.536	0.383	0.157	0.033	0.363	0.064	0.132	0.028	0.699	0.115	0.263	0.088
46	24-dm-pentane	5.073	0.691	0.078	0.031	0.751	0.132	0.085	0.031	1.299	0.200	0.626	0.161
47	223-tm-butane	0.417	0.054	<DL	<DL	0.070	0.014	0.008	0.011	0.108	0.019	0.051	0.012
48	benzene	7.514	2.325	0.064	0.040	0.571	0.093	0.030	0.042	1.737	0.536	4.464	1.559
49	1m-cyclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
50	33-dm-pentane	0.446	0.034	0.013	0.003	0.040	0.011	0.013	0.006	0.110	0.013	0.031	0.010
51	cyclohexane	2.144	0.248	<DL	<DL	0.169	0.161	0.029	0.041	0.499	0.003	0.093	0.079
52	2m-hexane	1.992	0.242	0.053	0.027	0.267	0.058	0.057	0.031	0.514	0.083	0.233	0.059
53	23-dm-pentane	4.220	0.511	0.079	0.032	0.601	0.114	0.088	0.036	1.082	0.159	0.511	0.119
54	11-dm-cyP	0.210	0.029	<DL	<DL	0.027	0.007	<DL	<DL	0.051	0.008	0.022	0.005
55	cyclohexene	0.095	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.001	<DL	<DL
56	3m-hexane	1.953	0.233	0.062	0.029	0.278	0.064	0.071	0.044	0.516	0.087	0.251	0.047
57	c-13-dm-cyP	0.348	0.048	0.016	0.007	0.046	0.008	0.021	0.005	0.095	0.015	0.036	0.012
58	3e-pentane/t-13-dm-cyP	0.509	0.065	0.038	0.010	0.073	0.019	0.037	0.018	0.145	0.027	0.058	0.016
59	t-12-dm-cyP/1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
60	224-tm-pentane	54.158	5.519	<DL	<DL	7.838	1.382	0.105	0.009	13.398	1.573	7.320	1.215
61	t3-heptene	0.052	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.001	<DL	<DL
62	n-heptane	2.018	0.248	0.018	0.017	0.234	0.049	0.020	0.019	0.492	0.076	0.224	0.052
63	c3-heptene	0.084	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.001	<DL	<DL
64	t2-heptene	0.037	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.001	<DL	<DL
65	c2-heptene	0.078	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.002	<DL	<DL
66	m-cyclohexane/22-dm-hexane	3.158	0.389	0.036	0.025	0.357	0.074	0.047	0.028	0.774	0.118	0.315	0.077
67	12dm-cyH	3.378	4.777	<DL	<DL	<DL	<DL	<DL	<DL	0.702	0.993	<DL	<DL
68	25-dm-hexane/e-cyP	2.886	4.082	<DL	<DL	0.662	0.124	<DL	<DL	0.777	0.808	0.720	0.104
69	24-dm-hexane/223-tm-pentane	8.545	0.768	<DL	<DL	1.007	0.184	<DL	<DL	2.046	0.218	0.998	0.143

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
70	33-dm-hexane/ctc124-tm-cyP	0.215	0.023	<DL	<DL	0.025	0.005	<DL	<DL	0.051	0.006	0.034	0.006
71	ctc123-tm-cyP	0.119	0.010	<DL	<DL	0.010	0.002	<DL	<DL	0.027	0.003	0.014	0.002
72	234-tm-pentane	20.812	1.857	<DL	<DL	2.439	0.469	<DL	<DL	4.979	0.534	2.267	0.302
73	toluene/233-tm-pentane	30.947	3.407	2.589	1.071	4.539	1.338	2.698	1.445	9.030	1.767	4.274	1.029
74	23-dm-hexane	5.365	0.473	<DL	<DL	0.592	0.112	<DL	<DL	1.274	0.134	0.584	0.079
75	112-tm-cyP	0.238	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.049	0.003	0.025	0.006
76	2m-heptane	0.938	0.083	<DL	<DL	0.093	0.017	<DL	<DL	0.220	0.023	0.101	0.016
77	4m-C7/3m3e-C5/1m-cyHexene	0.330	0.030	<DL	<DL	0.035	0.007	<DL	<DL	0.078	0.009	0.035	0.006
78	34-dm-hexane	1.014	0.081	<DL	<DL	0.111	0.022	<DL	<DL	0.240	0.024	0.108	0.015
79	3m-heptane/3e-hexane	0.978	0.101	<DL	<DL	0.097	0.019	<DL	<DL	0.229	0.027	0.101	0.016
80	t-13-dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
81	cct-124-tm-cyP/c-13-dm-cyH	0.489	0.051	<DL	<DL	0.039	0.018	<DL	<DL	0.112	0.006	0.047	0.025
82	t-14-dm-cyH	0.224	0.036	<DL	<DL	0.013	0.018	<DL	<DL	0.050	0.013	0.023	0.005
83	225-tm-hexane	6.453	0.540	<DL	<DL	0.694	0.144	<DL	<DL	1.527	0.158	0.803	0.078
84	11-dm-cyH/1-octene	0.125	0.015	<DL	<DL	0.010	0.014	<DL	<DL	0.029	0.007	0.011	0.002
85	1e1m-cyP	0.129	0.005	<DL	<DL	0.004	0.006	<DL	<DL	0.028	0.0007	0.013	0.001
86	224-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
87	n-octane/t12-dm-cyH	1.334	0.170	<DL	<DL	0.105	0.023	<DL	<DL	0.305	0.043	0.119	0.019
88	t2-octene	0.035	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.0009	<DL	<DL
89	ccc-123-tm-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
90	244-tm-hexane	0.219	0.016	<DL	<DL	0.015	0.004	<DL	<DL	0.049	0.005	0.016	0.002
91	c2-octene	0.227	0.022	<DL	<DL	0.020	0.004	<DL	<DL	0.052	0.006	0.020	0.002
92	ip-cyP	0.037	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.002	<DL	<DL
93	235-tm-hexane	0.976	0.084	<DL	<DL	0.095	0.018	<DL	<DL	0.228	0.023	0.099	0.011
94	44&22-dm-heptane	0.025	0.012	0.002	0.003	<DL	<DL	<DL	<DL	0.006	0.003	<DL	<DL
95	24-dm-heptane	0.224	0.016	<DL	<DL	0.020	0.002	<DL	<DL	0.052	0.004	0.022	0.008
96	26-dm-heptane/c12-dm-cyH	0.377	0.041	<DL	<DL	0.029	0.004	<DL	<DL	0.086	0.010	0.034	0.001
97	np-cyP/e-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
98	ccc-135-tm-cyH	0.035	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.0006	<DL	<DL
99	25-dm-heptane/35-dm-heptane	0.577	0.068	<DL	<DL	0.045	0.007	<DL	<DL	0.132	0.017	0.054	0.005
100	33-dm-heptane	0.174	0.017	<DL	<DL	0.014	0.001	<DL	<DL	0.040	0.004	0.015	0.002
101	114-tm-cyH	0.064	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.002	0.002	0.002
102	e-benzene	1.532	0.148	<DL	<DL	0.019	0.006	<DL	<DL	0.323	0.034	0.052	0.017
103	cct-124-tm-cyH	0.096	0.013	<DL	<DL	0.004	0.005	<DL	<DL	0.021	0.004	0.006	0.0009
104	23-dm-heptane	0.281	0.032	<DL	<DL	0.026	0.001	<DL	<DL	0.065	0.007	0.024	0.003
105	m&p-xylene/34-dm-heptane	4.998	0.734	<DL	<DL	0.060	0.022	<DL	<DL	1.052	0.163	0.266	0.117
106	2m-octane	0.491	0.070	<DL	<DL	0.035	0.002	<DL	<DL	0.111	0.016	0.038	0.006
107	246-tm-hexane	0.023	0.0009	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.0002	<DL	<DL
108	3m-octane	0.374	0.052	<DL	<DL	0.022	0.003	<DL	<DL	0.084	0.012	0.027	0.003
109	ctc-124-tm-cyH	0.071	0.003	0.005	0.008	0.022	0.005	0.002	0.002	0.022	0.0002	0.018	0.025
110	33-de-C5/3e-C7	1.141	0.165	<DL	<DL	0.062	0.011	<DL	<DL	0.253	0.038	0.090	0.023
111	o-xylene	2.154	0.299	<DL	<DL	0.049	0.015	<DL	<DL	0.460	0.068	0.118	0.045
112	112-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
113	1-nonene	0.722	0.101	<DL	<DL	0.059	0.010	<DL	<DL	0.166	0.024	0.075	0.013
114	t3-nonene	0.079	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.003	0.006	0.0003
115	c3-nonene/ib-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
116	n-nonane	0.800	0.174	<DL	<DL	0.047	0.011	<DL	<DL	0.179	0.040	0.057	0.010
117	t2-nonene	0.400	0.052	<DL	<DL	0.033	0.006	<DL	<DL	0.092	0.013	0.038	0.003
118	c2-nonene	0.033	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.0009	0.008	0.005
119	ip-benzene	0.064	0.023	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.005	0.012	0.018
120	22-dm-octane	0.021	0.016	<DL	<DL	0.005	0.007	<DL	<DL	0.006	0.005	0.002	0.002
121	ip-cyH	0.171	0.046	<DL	<DL	0.011	0.003	<DL	<DL	0.038	0.010	0.015	0.002
122	nb-cyP	0.469	0.100	<DL	<DL	0.030	0.0003	<DL	<DL	0.106	0.021	0.038	0.007
123	33-dm-octane	0.024	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.002	0.009	0.002
124	n-propylbenzene	0.271	0.041	<DL	<DL	0.004	0.005	0.001	0.002	0.058	0.007	0.004	0.002
125	3e-toluene	1.068	0.182	0.004	0.006	0.025	0.014	0.015	0.006	0.234	0.032	0.026	0.014
126	4e-toluene/23-dm-octane	0.543	0.094	0.001	0.001	0.016	0.006	0.002	0.003	0.118	0.017	0.018	0.006
127	135-tm-benzene	0.711	0.145	<DL	<DL	0.028	0.009	0.008	0.011	0.157	0.025	0.032	0.013
128	2m-nonane	<DL	<DL	<DL	<DL	0.170	0.024	<DL	<DL	0.047	0.007	0.187	0.028
129	3e-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
130	3m-nonane	0.105	0.032	<DL	<DL	0.012	0.004	<DL	<DL	0.025	0.006	0.009	0.0005
131	2e-toluene	0.376	0.051	<DL	<DL	0.009	0.013	0.006	0.008	0.082	0.005	0.008	0.004
132	124-tm-benzene/tb-benz/1-decene	1.615	0.296	<DL	<DL	0.019	0.027	0.005	0.007	0.341	0.054	0.052	0.027
133	ib-cyH	0.037	0.016	0.012	0.016	0.018	0.012	<DL	<DL	0.015	0.004	0.011	0.002
134	n-decane	0.862	0.191	<DL	<DL	0.043	0.001	<DL	<DL	0.190	0.040	0.059	0.012
135	ib-benzene/t-1m-2p-CyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
136	sb-benzene	0.180	0.028	<DL	<DL	0.004	0.006	<DL	<DL	0.038	0.004	0.015	0.002
137	3-ip-toluene	0.114	0.025	<DL	<DL	0.010	0.014	<DL	<DL	0.027	0.009	<DL	<DL
138	123-tm-benzene	0.455	0.068	0.009	0.012	0.004	0.006	0.006	0.008	0.099	0.008	0.026	0.012
139	4-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
140	indan	0.098	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.002	<DL	<DL
141	2-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
142	13-de-benzene	0.018	0.025	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.005	<DL	<DL
143	14-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
144	3-np-toluene	1.589	0.308	0.005	0.007	0.121	0.021	<DL	<DL	0.363	0.070	0.134	0.029
145	4-np-toluene/nb-benz/13dm5e-benzene	0.385	0.053	0.011	0.015	0.009	0.013	0.006	0.008	0.086	0.002	0.011	0.005
146	12de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
147	2-np-toluene	1.120	0.224	0.003	0.004	0.085	0.008	<DL	<DL	0.256	0.049	0.096	0.027
148	14dm-2e-benzene	0.109	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.023	0.002	<DL	<DL
149	13dm-4e-benzene	0.240	0.043	<DL	<DL	<DL	<DL	<DL	<DL	0.050	0.009	<DL	<DL
150	12dm-4e-benzene	0.249	0.042	<DL	<DL	<DL	<DL	<DL	<DL	0.052	0.009	<DL	<DL
151	13dm-2e-benzene	0.128	0.026	<DL	<DL	<DL	<DL	<DL	<DL	0.027	0.006	0.009	0.003
152	n-undecane/12dm-3e-benzene	0.431	0.093	<DL	<DL	0.004	0.006	<DL	<DL	0.090	0.018	0.021	0.006
153	1245-ttm-benzene	0.317	0.064	<DL	<DL	0.018	0.006	<DL	<DL	0.071	0.015	0.023	0.006
154	2mb-benzene	0.144	0.007	0.050	0.007	0.030	0.006	0.012	0.017	0.053	0.007	0.046	0.002
155	tb-2m-benzene	0.033	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.002	<DL	<DL
156	1234-ttm-benzene	0.076	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.003	<DL	<DL
157	npentyl-benzene/t-1m-2-(4mp)CyP	0.050	0.011	<DL	<DL	<DL	<DL	0.006	0.009	0.012	0.0004	0.007	0.010
158	tb-35dm-benzene	0.009	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
159	tb-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
160	naphthalene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
161	n-dodecane	0.055	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.0006	<DL	<DL

Escort, Speciated VOC Emission Rates (mg/mile) from E20 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	24.755	1.740	1.033	1.460	8.158	1.617	<DL	<DL	7.615	0.221	23.559	2.262
2	ethylene	22.681	0.744	0.012	0.003	0.947	0.241	0.004	0.005	4.972	0.063	7.154	1.082
3	acetylene	2.085	0.346	<DL	<DL	0.002	0.002	<DL	<DL	0.433	0.074	0.053	0.010
4	ethane	5.490	0.561	0.089	0.003	1.244	0.242	0.136	0.033	1.542	0.053	3.212	0.156
5	propylene	11.159	0.005	<DL	<DL	0.161	0.095	<DL	<DL	2.361	0.038	3.236	0.518
6	propane	0.727	0.169	<DL	<DL	0.027	0.039	<DL	<DL	0.158	0.045	0.150	0.212
7	propyne	0.243	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.050	0.001	0.100	0.044
8	isobutane	0.871	0.056	<DL	<DL	0.040	0.057	<DL	<DL	0.192	0.026	0.304	0.278
9	isobutene/1-butene	7.172	0.111	0.003	0.004	0.092	0.042	<DL	<DL	1.515	0.042	1.211	0.890
10	13-butadiene	0.467	0.012	<DL	<DL	0.008	0.011	<DL	<DL	0.099	0.006	0.158	0.001
11	n-butane	1.255	0.306	0.164	0.232	0.370	0.031	0.135	0.191	0.438	0.162	0.594	0.425
12	t2-butene	1.202	0.577	0.008	0.011	0.039	0.016	0.012	0.017	0.266	0.118	0.416	0.251
13	22-dm-propane	0.012	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
14	1-butyne	0.009	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
15	c2-butene	0.547	0.773	0.045	0.064	<DL	<DL	0.009	0.013	0.127	0.179	<DL	<DL
16	12-butadiene	0.031	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.002	<DL	<DL
17	3m1-butene	0.357	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.074	0.001	0.047	0.013
18	2m-butane	16.438	0.275	0.402	0.568	2.623	0.802	0.185	0.262	4.279	0.465	3.912	0.562
19	14-pentadiene	0.030	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.0009	<DL	<DL
20	2-butyne	0.060	0.0006	0.108	0.152	<DL	<DL	<DL	<DL	0.036	0.034	<DL	<DL
21	1-pentene	0.505	0.007	0.064	0.045	0.106	0.058	0.224	0.035	0.214	0.005	0.088	0.029
22	2m1-butene	0.728	0.042	0.012	0.017	0.008	0.006	0.011	0.015	0.159	0.0006	0.095	0.035
23	n-pentane	9.781	0.012	0.076	0.108	1.399	0.346	0.049	0.069	2.447	0.132	2.087	0.326
24	2m-13-butadiene	0.178	0.065	<DL	<DL	<DL	<DL	<DL	<DL	0.037	0.014	0.008	0.004
25	t2-pentene	0.423	0.021	0.014	0.020	0.012	0.011	0.013	0.019	0.098	0.017	0.085	0.026
26	c2-pentene	0.213	0.005	0.002	0.003	0.002	0.003	0.025	0.010	0.053	0.004	0.036	0.013
27	2m2-butene	0.553	0.105	0.017	0.024	<DL	<DL	0.012	0.017	0.122	0.012	0.009	0.010
28	22-dm-butane	1.147	0.016	0.020	0.028	0.184	0.019	0.026	0.036	0.301	0.024	0.248	0.038
29	cyclopentene	0.386	0.041	<DL	<DL	0.0008	0.001	<DL	<DL	0.080	0.008	0.085	0.015
30	4m1-pentene	0.163	0.003	<DL	<DL	0.013	0.002	<DL	<DL	0.037	0.00007	0.035	0.009
31	cyclopentane	1.174	0.016	<DL	<DL	0.131	0.036	0.010	0.014	0.283	0.016	0.235	0.056
32	23-dm-butane	3.471	0.079	0.077	0.068	0.450	0.016	0.054	0.050	0.877	0.014	0.648	0.153
33	c/t-4m2-pentene	6.052	0.092	0.219	0.262	0.783	0.050	0.175	0.130	1.572	0.123	1.167	0.246
34	2m-pentane	0.528	0.070	<DL	<DL	<DL	<DL	<DL	<DL	0.110	0.015	0.011	0.004
35	3m-pentane	3.788	0.088	0.102	0.107	0.477	0.028	0.108	0.075	0.972	0.068	0.730	0.157
36	1-hexene/2m1-pentene	0.467	0.073	0.032	0.029	0.021	0.012	0.008	0.011	0.112	0.028	0.045	0.015
37	c/t-3-hexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
38	n-hexane	5.868	0.108	0.111	0.121	0.719	0.025	0.155	0.099	1.487	0.079	1.095	0.244
39	t2-hexene	0.169	0.014	0.010	0.014	0.010	0.003	0.016	0.010	0.045	0.010	0.033	0.014
40	2m2-pentene	0.197	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.041	0.002	0.018	0.006
41	t-3m2-pentene	0.065	0.009	<DL	<DL	<DL	<DL	0.016	0.005	0.018	0.003	0.011	0.008
42	c2-hexene	0.085	0.009	0.006	0.007	<DL	<DL	<DL	<DL	0.019	0.003	0.012	0.008

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
43	c-3m2-pentene	0.052	0.0007	0.007	0.008	<DL	<DL	0.008	0.007	0.015	0.004	<DL	<DL
44	22-dm-pentane	0.400	0.005	0.009	0.012	0.059	0.004	0.009	0.012	0.104	0.009	0.083	0.016
45	m-cyclopentane	4.231	0.049	0.041	0.057	0.399	0.030	0.047	0.067	1.011	0.046	0.740	0.166
46	24-dm-pentane	2.739	0.046	0.031	0.043	0.287	0.002	0.029	0.014	0.663	0.0005	0.515	0.116
47	223-tm-butane	0.313	0.002	0.009	0.012	0.036	0.0008	<DL	<DL	0.077	0.002	0.055	0.013
48	benzene	10.452	0.624	0.012	0.018	0.497	0.121	<DL	<DL	2.310	0.171	6.432	0.796
49	1m-cyclopentene	0.012	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
50	33-dm-pentane	0.376	0.010	0.005	0.007	0.031	0.001	0.006	0.006	0.089	0.001	0.058	0.019
51	cyclohexane	5.041	0.059	0.008	0.011	0.469	0.018	0.018	0.025	1.182	0.022	0.838	0.195
52	2m-hexane	2.656	0.014	0.011	0.015	0.244	0.009	0.014	0.019	0.625	0.012	0.508	0.106
53	23-dm-pentane	2.576	0.031	0.026	0.037	0.258	0.004	0.018	0.0003	0.617	0.002	0.484	0.102
54	11-dm-cyP	0.461	0.014	<DL	<DL	0.042	0.002	0.0004	0.0006	0.107	0.003	0.083	0.016
55	cyclohexene	0.262	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.054	0.003	<DL	<DL
56	3m-hexane	2.727	0.045	0.016	0.022	0.252	0.015	0.015	0.021	0.643	0.022	0.636	0.205
57	c-13-dm-cyP	0.680	0.012	0.003	0.005	0.054	0.003	0.006	0.005	0.159	0.005	0.120	0.025
58	3e-pentane/t-13-dm-cyP	0.874	0.009	0.005	0.008	0.079	0.009	0.017	0.018	0.209	0.010	0.157	0.032
59	t-12-dm-cyP/1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
60	224-tm-pentane	27.073	0.827	0.020	0.028	2.727	0.054	0.028	0.040	6.384	0.198	5.359	0.987
61	t3-heptene	0.048	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.0005	0.009	0.004
62	n-heptane	4.267	0.062	<DL	<DL	0.358	0.013	0.005	0.007	0.986	0.014	0.822	0.176
63	c3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
64	t2-heptene	0.051	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.001	0.009	0.005
65	c2-heptene	0.052	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.0007	0.006	0.002
66	m-cyclohexane/22-dm-hexane	8.425	0.177	<DL	<DL	0.661	0.020	0.011	0.015	1.934	0.038	1.500	0.336
67	12dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
68	25-dm-hexane/e-cyP	3.472	0.095	<DL	<DL	0.260	0.003	<DL	<DL	0.792	0.023	0.678	0.150
69	24-dm-hexane/223-tm-pentane	4.724	0.116	<DL	<DL	0.375	0.00002	<DL	<DL	1.084	0.029	0.875	0.177
70	33-dm-hexane/ctc124-tm-cyP	0.442	0.006	<DL	<DL	0.035	0.0009	<DL	<DL	0.101	0.0004	0.091	0.016
71	ctc123-tm-cyP	0.286	0.0008	<DL	<DL	0.019	0.0001	<DL	<DL	0.065	0.0005	0.052	0.010
72	234-tm-pentane	10.236	0.315	<DL	<DL	0.841	0.003	<DL	<DL	2.357	0.078	1.842	0.397
73	toluene/233-tm-pentane	23.664	0.008	1.839	0.303	2.383	0.122	1.931	0.500	6.547	0.225	5.891	0.345
74	23-dm-hexane	2.842	0.073	<DL	<DL	0.222	0.009	<DL	<DL	0.651	0.016	0.525	0.107
75	112-tm-cyP	0.178	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.037	0.001	0.030	0.005
76	2m-heptane	1.890	0.040	<DL	<DL	0.128	0.005	<DL	<DL	0.428	0.007	0.363	0.072
77	4m-C7/3m3e-C5/1m-cyHexene	0.572	0.009	<DL	<DL	0.045	0.0006	<DL	<DL	0.131	0.001	0.109	0.024
78	34-dm-hexane	0.630	0.010	<DL	<DL	0.049	0.002	<DL	<DL	0.144	0.003	0.110	0.023
79	3m-heptane/3e-hexane	1.695	0.036	<DL	<DL	0.119	0.002	<DL	<DL	0.384	0.006	0.325	0.062
80	t-13-dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
81	cct-124-tm-cyP/c-13-dm-cyH	1.597	0.039	<DL	<DL	0.099	0.005	<DL	<DL	0.359	0.008	0.307	0.096
82	t-14-dm-cyH	0.683	0.020	<DL	<DL	0.051	0.0006	<DL	<DL	0.156	0.003	0.133	0.025
83	225-tm-hexane	3.286	0.089	<DL	<DL	0.245	0.005	<DL	<DL	0.750	0.023	0.645	0.118
84	11-dm-cyH/1-octene	0.565	0.003	<DL	<DL	0.025	0.0005	<DL	<DL	0.124	0.0001	0.079	0.0005
85	1e1m-cyP	0.155	0.002	<DL	<DL	0.006	0.0001	<DL	<DL	0.034	0.0003	0.030	0.004
86	224-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
87	n-octane/t12-dm-cyH	4.156	0.106	<DL	<DL	0.254	0.010	<DL	<DL	0.932	0.020	0.760	0.158
88	t2-octene	0.080	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.0001	0.015	0.003

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
89	ccc-123-tm-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
90	244-tm-hexane	0.467	0.005	<DL	<DL	0.027	0.0002	<DL	<DL	0.104	0.0005	0.079	0.017
91	c2-octene	0.130	0.004	<DL	<DL	0.006	0.0004	<DL	<DL	0.029	0.001	0.019	0.004
92	ip-cyP	0.067	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.0003	0.010	0.003
93	235-tm-hexane	0.538	0.011	<DL	<DL	0.035	0.002	<DL	<DL	0.121	0.003	0.096	0.020
94	44&22-dm-heptane	0.179	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.037	0.002	0.029	0.016
95	24-dm-heptane	0.336	0.00005	<DL	<DL	0.019	0.001	<DL	<DL	0.075	0.0001	0.063	0.008
96	26-dm-heptane/c12-dm-cyH	0.773	0.013	<DL	<DL	0.053	0.002	<DL	<DL	0.175	0.001	0.146	0.036
97	np-cyP/e-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
98	ccc-135-tm-cyH	0.097	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.0004	0.017	0.004
99	25-dm-heptane/35-dm-heptane	0.711	0.003	<DL	<DL	0.038	0.005	<DL	<DL	0.158	0.0001	0.130	0.028
100	33-dm-heptane	0.529	0.016	<DL	<DL	0.034	0.0007	<DL	<DL	0.119	0.003	0.098	0.018
101	114-tm-cyH	0.180	0.003	<DL	<DL	0.011	0.002	<DL	<DL	0.040	0.0002	0.032	0.006
102	e-benzene	1.944	0.026	<DL	<DL	0.003	0.004	<DL	<DL	0.404	0.004	0.270	0.086
103	cct-124-tm-cyH	0.320	0.009	<DL	<DL	0.018	0.0002	<DL	<DL	0.071	0.001	0.057	0.011
104	23-dm-heptane	0.504	0.007	<DL	<DL	0.030	0.0005	<DL	<DL	0.113	0.0008	0.087	0.019
105	m&p-xylene/34-dm-heptane	6.753	0.045	<DL	<DL	0.011	0.016	<DL	<DL	1.405	0.006	1.130	0.068
106	2m-octane	1.472	0.028	<DL	<DL	0.070	0.0006	<DL	<DL	0.325	0.004	0.257	0.049
107	246-tm-hexane	0.039	0.0001	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.00008	<DL	<DL
108	3m-octane	1.174	0.024	<DL	<DL	0.053	0.001	<DL	<DL	0.258	0.004	0.200	0.044
109	ctc-124-tm-cyH	0.078	0.004	0.012	0.018	0.008	0.004	0.010	0.003	0.024	0.004	0.013	0.001
110	33-de-C5/3e-C7	0.986	0.077	<DL	<DL	0.030	0.004	<DL	<DL	0.213	0.018	0.156	0.026
111	o-xylene	2.730	0.004	<DL	<DL	0.010	0.007	<DL	<DL	0.569	0.002	0.425	0.075
112	112-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
113	1-nonene	0.702	0.012	<DL	<DL	0.035	0.004	<DL	<DL	0.155	0.004	0.122	0.025
114	t3-nonene	0.320	0.009	<DL	<DL	0.016	0.002	<DL	<DL	0.071	0.002	0.055	0.012
115	c3-nonene/ib-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
116	n-nonane	3.910	0.076	0.004	0.006	0.170	0.003	<DL	<DL	0.859	0.009	0.653	0.155
117	t2-nonene	0.248	0.002	<DL	<DL	0.011	0.001	<DL	<DL	0.055	0.0004	0.045	0.008
118	c2-nonene	0.417	0.010	<DL	<DL	0.008	0.00009	<DL	<DL	0.089	0.002	0.053	0.043
119	ip-benzene	0.092	0.089	<DL	<DL	<DL	<DL	<DL	<DL	0.019	0.018	<DL	<DL
120	22-dm-octane	0.235	0.295	<DL	<DL	<DL	<DL	<DL	<DL	0.049	0.061	0.029	0.041
121	ip-cyH	0.837	0.010	<DL	<DL	0.035	0.005	<DL	<DL	0.183	0.004	0.148	0.034
122	nb-cyP	1.680	0.028	0.003	0.004	0.070	0.007	<DL	<DL	0.369	0.001	0.284	0.078
123	33-dm-octane	0.234	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.049	0.001	0.036	0.004
124	n-propylbenzene	0.528	0.012	<DL	<DL	0.0007	0.001	<DL	<DL	0.110	0.002	0.062	0.022
125	3e-toluene	1.445	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.300	0.001	0.156	0.037
126	4e-toluene/23-dm-octane	1.082	0.012	<DL	<DL	0.018	0.001	<DL	<DL	0.230	0.001	0.136	0.031
127	135-tm-benzene	1.843	0.017	0.002	0.002	0.026	0.003	<DL	<DL	0.390	0.0001	0.212	0.035
128	2m-nonane	0.748	0.012	0.019	0.027	0.030	0.005	<DL	<DL	0.168	0.003	0.121	0.033
129	3e-octane	0.173	0.005	<DL	<DL	0.009	0.002	<DL	<DL	0.038	0.0001	0.030	0.007
130	3m-nonane	0.686	0.012	0.002	0.002	0.028	0.005	<DL	<DL	0.150	0.0003	0.111	0.030
131	2e-toluene	0.452	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.094	0.001	0.041	0.020
132	124-tm-benzene/tb-benz/1-decene	2.457	0.037	<DL	<DL	<DL	<DL	<DL	<DL	0.510	0.011	0.291	0.069
133	ib-cyH	0.319	0.002	0.007	0.006	0.010	0.015	0.001	0.002	0.071	0.002	0.056	0.028
134	n-decane	3.672	0.023	0.026	0.021	0.118	0.008	<DL	<DL	0.800	0.006	0.577	0.169

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
135	ib-benzene/t-1m-2p-CyH	0.188	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.039	0.002	0.025	0.007
136	sb-benzene	0.273	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.057	0.002	0.045	0.002
137	3-ip-toluene	0.368	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.076	0.0007	0.064	0.023
138	123-tm-benzene	0.852	0.016	0.008	0.007	0.002	0.002	<DL	<DL	0.179	0.006	0.104	0.014
139	4-ip-toluene	0.319	0.007	<DL	<DL	0.009	0.012	<DL	<DL	0.069	0.002	0.054	0.015
140	indan	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
141	2-ip-toluene	0.240	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.050	0.0009	0.019	0.027
142	13-de-benzene	0.160	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.033	0.002	0.026	0.007
143	14-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
144	3-np-toluene	1.182	0.018	0.006	0.002	0.042	0.007	<DL	<DL	0.258	0.007	0.172	0.051
145	4-np-toluene/nb-benz/13dm5e-benzene	0.643	0.004	0.011	0.015	<DL	<DL	<DL	<DL	0.136	0.003	0.072	0.021
146	12de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
147	2-np-toluene	0.944	0.027	0.005	0.002	0.037	0.004	<DL	<DL	0.207	0.008	0.142	0.045
148	14dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
149	13dm-4e-benzene	0.246	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.051	0.002	0.026	0.010
150	12dm-4e-benzene	0.296	0.010	0.005	0.007	<DL	<DL	<DL	<DL	0.063	0.004	0.030	0.012
151	13dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
152	n-undecane/12dm-3e-benzene	1.431	0.055	0.012	0.010	0.022	0.002	<DL	<DL	0.306	0.015	0.211	0.073
153	1245-ttm-benzene	0.178	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.037	0.002	0.045	0.018
154	2mb-benzene	0.168	0.011	0.040	0.023	0.042	0.006	0.040	0.007	0.067	0.004	0.100	0.026
155	tb-2m-benzene	0.018	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.0002	<DL	<DL
156	1234-ttm-benzene	0.070	0.0009	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.0003	0.007	0.011
157	npentyl-benzene/t-1m-2-(4mp)CyP	0.100	0.037	<DL	<DL	<DL	<DL	<DL	<DL	0.021	0.008	0.010	0.011
158	tb-35dm-benzene	0.025	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.0007	0.005	0.002
159	tb-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
160	naphthalene	0.252	0.356	<DL	<DL	<DL	<DL	<DL	<DL	0.052	0.074	0.053	0.074
161	n-dodecane	0.140	0.004	0.005	0.003	0.0008	0.001	<DL	<DL	0.030	0.002	0.018	0.008

11.b Escort Emission Rates, -10° Tests

Escort, Speciated VOC Emission Rates (mg/mile) from E0 Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	141.353	10.242	<DL	<DL	8.808	1.535	1.417	1.643	32.260	2.239	32.665	2.265
2	ethylene	128.248	14.555	0.030	0.026	2.656	1.819	<DL	<DL	27.433	3.080	6.972	1.788
3	acetylene	26.597	2.515	0.011	0.012	0.007	0.009	0.037	0.075	5.552	0.535	0.032	0.024
4	ethane	17.692	0.756	0.062	0.087	2.778	1.730	0.087	0.146	4.485	0.603	3.932	0.469
5	propylene	64.093	5.093	0.055	0.023	1.662	1.749	0.004	0.003	13.810	1.285	4.384	1.136
6	propane	1.644	0.091	<DL	<DL	0.176	0.185	0.124	0.237	0.427	0.068	0.182	0.071
7	propyne	3.113	0.110	0.006	0.005	0.0002	0.0003	<DL	<DL	0.649	0.023	0.206	0.370
8	isobutane	29.548	1.714	0.134	0.039	2.646	1.495	0.088	0.075	6.934	0.264	2.832	0.517
9	isobutene / 1-butene	42.089	2.673	0.046	0.019	1.061	1.125	0.0008	0.002	9.062	0.826	2.527	0.446
10	1,3-butadiene	2.556	0.163	0.009	0.006	0.026	0.011	0.0005	0.001	0.541	0.036	0.026	0.007
11	n-butane	5.861	0.301	0.029	0.021	0.507	0.284	0.012	0.025	1.369	0.127	0.475	0.084
12	trans-2-butene	7.653	0.633	0.016	0.019	0.231	0.226	<DL	<DL	1.660	0.174	0.310	0.054
13	1-butyne	0.193	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.040	0.001	0.004	0.0007
14	cis-2-butene	4.275	0.358	0.043	0.037	0.137	0.134	0.022	0.020	0.943	0.105	0.191	0.020
15	1,2-butadiene	0.271	0.024	0.004	0.007	0.002	0.004	0.003	0.006	0.059	0.007	<DL	<DL
16	3-methyl-1-butene	1.291	0.077	<DL	<DL	0.009	0.008	<DL	<DL	0.271	0.018	0.070	0.016
17	2-methylbutane	150.813	5.930	0.663	0.329	10.490	5.935	0.356	0.323	34.527	0.854	10.703	1.233
18	1,4-pentadiene	0.152	0.176	<DL	<DL	<DL	<DL	<DL	<DL	0.032	0.037	<DL	<DL
19	2-butyne	0.239	0.022	0.008	0.015	0.003	0.005	0.003	0.007	0.053	0.006	<DL	<DL
20	1-pentene	0.617	0.012	0.005	0.008	0.011	0.008	0.008	0.011	0.135	0.006	0.013	0.003
21	2-methyl-1-butene	2.673	0.066	0.012	0.009	0.048	0.053	0.001	0.001	0.572	0.013	0.088	0.031
22	n-pentane	3.137	0.380	0.030	0.027	0.233	0.123	0.015	0.013	0.728	0.119	0.175	0.014
23	2-methyl-1,3-butadiene	0.426	0.035	0.003	0.004	0.002	0.002	<DL	<DL	0.090	0.007	0.002	0.003
24	trans-2-pentene	0.942	0.036	0.008	0.007	0.028	0.028	0.003	0.004	0.206	0.005	0.029	0.012
25	cis-2-pentene	0.575	0.017	0.006	0.005	0.013	0.011	<DL	<DL	0.125	0.004	0.015	0.006
26	2-methyl-2-butene	4.774	0.119	0.010	0.008	0.112	0.173	0.004	0.003	1.028	0.026	0.020	0.023
27	trans-1,3-pentadiene	0.045	0.004	<DL	<DL	<DL	<DL	0.006	0.012	0.011	0.003	<DL	<DL
28	1,3-cyclopentadiene	0.023	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.003	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	0.904	0.065	0.006	0.006	0.055	0.037	0.002	0.005	0.206	0.026	0.059	0.008
30	cyclopentene	1.020	0.047	0.002	0.004	0.026	0.026	<DL	<DL	0.220	0.015	0.027	0.014
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.664	0.082	<DL	<DL	0.015	0.004	0.008	0.009	0.145	0.015	0.022	0.004
32	cyclopentane	0.710	0.061	0.007	0.012	0.046	0.023	<DL	<DL	0.162	0.020	0.005	0.006
33	2,3-dimethylbutane	14.534	0.650	0.043	0.013	0.742	0.487	0.014	0.009	3.243	0.178	0.805	0.081
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	9.298	0.373	0.041	0.016	0.436	0.287	0.015	0.013	2.069	0.133	0.458	0.036
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.550	0.045	0.010	0.008	0.006	0.007	<DL	<DL	0.118	0.006	0.008	0.005
37	3-methylpentane	5.936	0.288	0.015	0.010	0.267	0.177	0.002	0.004	1.313	0.081	0.302	0.024
38	2-methyl-1-pentene	0.374	0.032	0.003	0.004	0.006	0.009	0.0003	0.0005	0.080	0.006	0.005	0.006
39	1-hexene	0.806	0.060	0.002	0.002	0.006	0.004	0.004	0.006	0.171	0.012	0.016	0.002
40	n-hexane	6.874	0.375	0.012	0.014	0.277	0.203	0.004	0.007	1.511	0.119	0.289	0.022

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
41	trans-2-hexene	0.593	0.031	0.009	0.008	0.011	0.015	0.003	0.006	0.129	0.011	0.010	0.002
42	2-methyl-2-pentene	0.870	0.054	0.0009	0.002	0.014	0.022	<DL	<DL	0.185	0.012	0.004	0.004
43	trans-3-methyl-2-pentene	0.820	0.046	<DL	<DL	0.011	0.016	<DL	<DL	0.174	0.013	0.010	0.002
44	cis-2-hexene	0.315	0.017	<DL	<DL	0.005	0.007	<DL	<DL	0.067	0.005	0.005	0.001
45	cis-3-methyl-2-pentene	0.768	0.042	0.0008	0.002	0.010	0.015	0.0009	0.001	0.163	0.011	0.003	0.004
46	2,2-dimethylpentane	0.565	0.032	<DL	<DL	0.030	0.016	<DL	<DL	0.126	0.008	0.030	0.002
47	methylcyclopentane	5.305	0.320	0.009	0.009	0.196	0.150	0.002	0.004	1.161	0.091	0.216	0.013
48	2,4-dimethylpentane	15.066	0.911	0.042	0.007	0.590	0.400	0.007	0.006	3.309	0.209	0.650	0.037
49	2,2,3-trimethylbutane	1.118	0.060	<DL	<DL	0.048	0.031	<DL	<DL	0.246	0.017	0.051	0.007
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	41.851	0.523	0.143	0.036	0.997	0.743	<DL	<DL	9.016	0.247	5.800	0.505
52	3,3-dimethylpentane	0.936	0.302	0.002	0.004	0.029	0.037	0.0006	0.001	0.203	0.068	0.033	0.012
53	cyclohexane	5.706	0.433	0.011	0.023	0.173	0.171	0.004	0.005	1.239	0.115	0.167	0.019
54	2-methylhexane	6.226	0.369	0.017	0.004	0.182	0.176	0.008	0.012	1.352	0.092	0.225	0.024
55	2,3-dimethylpentane	12.487	0.774	0.033	0.005	0.433	0.319	0.009	0.009	2.728	0.178	0.485	0.028
56	1,1-dimethylcyclopentane	0.614	0.038	<DL	<DL	0.025	0.016	<DL	<DL	0.135	0.009	0.027	0.002
57	cyclohexene	0.231	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.048	0.003	<DL	<DL
58	3-methylhexane	6.205	0.375	0.010	0.007	0.187	0.178	0.010	0.020	1.348	0.092	0.228	0.039
59	cis-1,3-dimethylcylcopentane	1.263	0.086	0.006	0.004	0.034	0.031	0.0008	0.001	0.274	0.020	0.040	0.003
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	1.728	0.096	0.010	0.012	0.050	0.048	0.006	0.008	0.377	0.026	0.058	0.010
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	163.383	9.869	0.433	0.088	6.206	4.029	0.122	0.057	35.845	2.328	6.897	0.308
63	trans-3-heptene	0.180	0.012	0.0004	0.0008	0.002	0.004	<DL	<DL	0.038	0.003	0.003	0.004
64	n-heptane	8.677	0.493	0.026	0.007	0.237	0.237	0.017	0.029	1.882	0.120	0.272	0.043
65	cis-3-heptene	0.434	0.026	<DL	<DL	0.004	0.009	<DL	<DL	0.092	0.006	<DL	<DL
66	trans-2-heptene	0.182	0.010	<DL	<DL	0.003	0.005	<DL	<DL	0.039	0.003	0.004	0.003
67	cis-2-heptene	0.400	0.026	<DL	<DL	0.005	0.010	<DL	<DL	0.085	0.007	0.007	0.002
68	methylcyclohexane / 2,2-dimethylhexane	14.050	0.943	0.035	0.008	0.382	0.310	0.009	0.007	3.040	0.207	0.435	0.028
69	2,5-dimethylhexane / ethylcyclopentane	24.943	1.443	0.075	0.024	0.719	0.542	0.016	0.009	5.411	0.351	0.838	0.046
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	33.043	1.918	0.098	0.024	1.031	0.735	0.022	0.011	7.189	0.465	1.146	0.058
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	1.169	0.082	<DL	<DL	0.037	0.025	<DL	<DL	0.254	0.016	0.055	0.005
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.663	0.042	<DL	<DL	0.016	0.011	<DL	<DL	0.142	0.009	0.024	0.003
73	2,3,4-trimethylpentane	71.095	4.118	0.194	0.038	2.156	1.523	0.044	0.021	15.447	0.985	2.270	0.139
74	toluene/2,3,3-trimethylpentane	97.478	6.680	1.197	0.194	3.094	1.970	0.816	0.207	21.646	1.519	4.007	0.544
75	2,3-dimethylhexane	21.782	1.221	0.066	0.007	0.659	0.476	0.014	0.007	4.734	0.300	0.706	0.051
76	2-methyl-3-ethylpentane	0.899	0.058	<DL	<DL	0.005	0.011	<DL	<DL	0.189	0.010	0.033	0.006
77	2-methylheptane / 1-methylcyclohexene	5.691	0.344	0.020	0.007	0.153	0.111	0.003	0.006	1.232	0.075	0.194	0.030
78	4-methylheptane / 3-methyl-3-ethylpentane	1.906	0.111	0.002	0.005	0.052	0.030	<DL	<DL	0.411	0.023	0.073	0.013
79	3,4-dimethylhexane	4.212	0.242	0.020	0.005	0.127	0.082	<DL	<DL	0.916	0.058	0.139	0.013
80	3-methylheptane / 3-ethylhexane	5.473	0.316	0.023	0.011	0.149	0.107	0.003	0.006	1.186	0.072	0.165	0.003
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	3.849	0.261	0.002	0.003	0.099	0.069	<DL	<DL	0.829	0.057	0.128	0.018
82	trans-1,4-dimethylcyclohexane	1.474	0.104	0.002	0.005	0.044	0.032	<DL	<DL	0.319	0.020	0.052	0.012
83	2,2,5-trimethylhexane	22.651	1.166	0.059	0.011	0.669	0.476	0.011	0.005	4.915	0.291	0.797	0.041
84	1-octene	0.932	0.041	<DL	<DL	0.027	0.014	<DL	<DL	0.201	0.010	0.033	0.005

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
85	1-ethyl-1-methylcyclopentane	0.361	0.023	<DL	<DL	0.004	0.008	<DL	<DL	0.076	0.005	0.007	0.009
86	n-octane/trans-1,2-dimethylcyclohexane	11.639	0.730	0.051	0.007	0.292	0.235	0.008	0.005	2.517	0.151	0.330	0.022
87	trans-2-octene	0.313	0.021	<DL	<DL	0.005	0.010	<DL	<DL	0.067	0.005	0.010	0.002
88	cis-cis-cis-1,2,3-trimethylcyclopentane	1.442	0.082	0.003	0.005	0.032	0.027	<DL	<DL	0.309	0.017	0.040	0.003
89	2,4,4-trimethylhexane	0.964	0.064	<DL	<DL	0.030	0.029	<DL	<DL	0.209	0.017	0.032	0.003
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.213	0.025	<DL	<DL	<DL	<DL	<DL	<DL	0.044	0.005	0.010	0.002
92	2,3,5-trimethylhexane	3.997	0.225	0.011	0.008	0.095	0.093	<DL	<DL	0.861	0.059	0.123	0.006
93	2,4-dimethylheptane	1.249	0.075	<DL	<DL	0.029	0.020	<DL	<DL	0.268	0.016	0.035	0.003
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	2.496	0.138	0.014	0.001	0.055	0.044	<DL	<DL	0.538	0.030	0.073	0.004
95	n-propylcyclopentane	0.325	0.021	<DL	<DL	0.003	0.007	<DL	<DL	0.069	0.004	0.013	0.005
96	cis-cis-cis-1,3,5-trimethylcyclohexane	3.067	0.211	0.011	0.002	0.066	0.055	<DL	<DL	0.659	0.042	0.085	0.018
97	2,5-dimethylheptane/3,5-dimethylheptane	3.073	0.168	0.013	0.001	0.071	0.058	<DL	<DL	0.662	0.038	0.096	0.018
98	3,3-dimethylheptane	1.469	0.089	<DL	<DL	0.034	0.029	<DL	<DL	0.315	0.019	0.040	0.029
99	1,1,4-trimethylcyclohexane	0.548	0.033	<DL	<DL	0.015	0.018	<DL	<DL	0.118	0.009	0.021	0.010
100	ethylbenzene	8.156	0.749	0.050	0.034	0.069	0.072	0.008	0.008	1.730	0.167	0.130	0.023
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.847	0.069	0.024	0.047	0.019	0.019	<DL	<DL	0.187	0.009	0.025	0.009
102	2,3-dimethylheptane	1.861	0.107	<DL	<DL	0.042	0.038	0.010	0.019	0.402	0.015	0.049	0.008
103	m&p-xylene/3,4-dimethylheptane	21.883	2.227	0.253	0.035	0.254	0.280	0.012	0.014	4.684	0.489	0.687	0.170
104	2-methyloctane	4.078	0.247	0.025	0.002	0.091	0.076	<DL	<DL	0.879	0.049	0.107	0.008
105	3-methyloctane	3.251	0.198	0.008	0.001	0.063	0.054	0.003	0.005	0.697	0.040	0.087	0.003
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	4.791	0.281	0.014	0.003	0.115	0.078	0.004	0.003	1.033	0.060	0.133	0.003
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	9.524	0.931	0.099	0.020	0.107	0.122	0.005	0.005	2.035	0.204	0.261	0.050
109	1-nonene/1,1,2-trimethylcyclohexane	3.355	0.159	0.021	0.003	0.078	0.061	<DL	<DL	0.724	0.037	0.102	0.004
110	trans-3-nonene	0.771	0.051	<DL	<DL	0.015	0.011	<DL	<DL	0.165	0.010	0.020	0.002
111	cis-3-nonene/isobutylcyclopentane	0.078	0.091	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.019	0.0008	0.002
112	n-nonane	9.389	0.567	0.078	0.012	0.202	0.158	0.007	0.005	2.029	0.114	0.236	0.017
113	trans-2-nonene	1.667	0.080	0.007	0.005	0.040	0.032	<DL	<DL	0.359	0.019	0.048	0.004
114	cis-2-nonene	0.897	0.080	<DL	<DL	0.018	0.014	<DL	<DL	0.192	0.016	0.021	0.007
115	isopropylbenzene	0.265	0.312	0.005	0.006	<DL	<DL	<DL	<DL	0.056	0.065	<DL	<DL
116	2,2-dimethyloctane	1.961	0.414	0.012	0.016	0.040	0.025	0.001	0.001	0.422	0.091	0.053	0.008
117	isopropylcyclohexane	1.977	0.131	0.014	0.004	0.038	0.028	<DL	<DL	0.425	0.028	0.044	0.004
118	n-butylcyclopentane	4.098	0.267	0.030	0.006	0.086	0.073	0.010	0.019	0.886	0.064	0.105	0.010
119	3,3-dimethyloctane	0.667	0.023	<DL	<DL	<DL	<DL	0.001	0.002	0.139	0.005	0.020	0.004
120	n-propylbenzene	1.946	0.113	0.034	0.008	0.022	0.025	0.009	0.009	0.421	0.025	0.033	0.008
121	3-ethyltoluene	6.204	0.475	0.114	0.017	0.060	0.047	0.012	0.009	1.337	0.106	0.096	0.026
122	4-ethyltoluene/2,3-dimethyloctane	3.592	0.260	0.058	0.013	0.047	0.032	0.005	0.007	0.775	0.057	0.063	0.017
123	1,3,5-trimethylbenzene	5.463	0.420	0.089	0.016	0.082	0.054	0.008	0.006	1.182	0.091	0.126	0.031
124	2-methylnonane	9.148	5.185	0.014	0.016	0.023	0.018	0.027	0.046	1.921	1.087	0.258	0.138
125	3-ethyloctane	0.259	0.174	<DL	<DL	0.007	0.006	<DL	<DL	0.056	0.037	0.003	0.006
126	3-methylnonane	1.604	0.084	0.015	0.006	0.029	0.018	0.003	0.007	0.346	0.017	0.038	0.005
127	2-ethyltoluene	2.240	0.176	0.035	0.013	0.021	0.013	0.003	0.005	0.481	0.041	0.029	0.008
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	10.308	1.072	0.254	0.035	0.123	0.072	0.010	0.010	2.238	0.233	0.208	0.060
129	isobutylcyclohexane	1.018	0.539	0.036	0.019	0.103	0.147	0.037	0.042	0.259	0.147	0.055	0.056

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
130	n-decane	11.945	0.771	0.218	0.035	0.264	0.159	0.006	0.005	2.609	0.151	0.285	0.031
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.486	0.025	<DL	<DL	0.004	0.005	<DL	<DL	0.102	0.006	0.009	0.006
132	sec-butylbenzene	1.058	0.047	<DL	<DL	0.017	0.024	<DL	<DL	0.225	0.011	0.029	0.006
133	3-isopropyltoluene	1.157	0.066	<DL	<DL	0.015	0.011	0.001	0.003	0.245	0.013	0.031	0.011
134	4-isopropyltoluene	3.585	0.346	0.110	0.033	0.049	0.028	0.021	0.016	0.790	0.084	0.077	0.021
135	indan	1.282	0.137	0.001	0.003	<DL	<DL	0.003	0.005	0.268	0.030	0.003	0.006
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.176	0.203	<DL	<DL	0.004	0.008	0.002	0.005	0.038	0.044	0.003	0.006
138	3-n-propyltoluene	8.394	0.341	0.166	0.026	0.205	0.114	0.010	0.006	1.843	0.090	0.204	0.030
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	3.058	0.147	0.110	0.015	0.046	0.022	0.005	0.0003	0.675	0.033	0.053	0.011
140	1,2-diethylbenzene	1.356	0.042	0.042	0.012	0.030	0.015	0.0006	0.001	0.300	0.011	0.032	0.006
141	2-n-propyltoluene	6.343	0.248	0.163	0.026	0.170	0.081	0.017	0.0009	1.408	0.068	0.158	0.023
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	0.013	0.025	<DL	<DL	0.004	0.007	0.004	0.006	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	1.452	0.223	0.062	0.009	0.028	0.016	<DL	<DL	0.324	0.043	0.025	0.012
144	1,2-dimethyl-4-ethylbenzene	1.811	0.090	0.091	0.014	0.034	0.007	0.009	0.001	0.409	0.021	0.021	0.020
145	1,3-dimethyl-2-ethylbenzene	1.116	0.040	0.064	0.050	0.015	0.018	<DL	<DL	0.251	0.010	0.023	0.016
146	n-undecane	6.009	0.366	0.368	0.054	0.179	0.061	0.016	0.008	1.386	0.086	0.152	0.024
147	1,2-dimethyl-3-ethylbenzene	1.566	0.333	0.066	0.023	0.033	0.013	<DL	<DL	0.350	0.073	0.046	0.025
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	1.016	0.075	0.072	0.018	0.079	0.046	0.013	0.018	0.253	0.028	0.356	0.109
149	1,2,3,5-tetramethylbenzene	1.654	0.099	0.131	0.025	0.038	0.006	0.007	0.006	0.386	0.019	0.012	0.023
150	tert-butyl-2-methylbenzene	0.269	0.083	0.016	0.004	0.003	0.006	<DL	<DL	0.060	0.017	0.0008	0.002
151	n-pentylbenzene	0.544	0.185	0.069	0.026	0.044	0.030	0.009	0.018	0.143	0.043	0.018	0.010
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.184	0.070	0.034	0.009	0.006	0.002	0.0005	0.001	0.048	0.016	0.003	0.002
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	1.222	0.284	0.570	0.201	0.038	0.026	0.040	0.040	0.403	0.100	0.042	0.015
156	n-dodecane	0.643	0.518	0.297	0.074	0.053	0.011	0.012	0.007	0.218	0.123	0.034	0.010

Escort, Speciated VOC Emission Rates (mg/mile) from E10 Fuel, -10℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	162.933	18.563	0.841	1.456	7.134	6.472	<DL	<DL	35.803	4.067	33.534	2.942
2	ethylene	155.728	16.477	0.012	0.020	3.236	1.143	<DL	<DL	33.060	3.663	8.431	3.284
3	acetylene	60.962	8.211	0.025	0.024	0.055	0.050	<DL	<DL	12.615	1.686	0.037	0.036
4	ethane	17.800	0.372	0.022	0.039	2.465	0.742	0.031	0.054	4.367	0.211	3.724	0.521
5	propylene	72.174	2.782	0.015	0.026	1.479	0.883	0.002	0.004	15.319	0.757	4.399	1.513
6	propane	2.854	0.640	0.003	0.004	0.158	0.153	<DL	<DL	0.633	0.113	0.190	0.199
7	propyne	6.837	0.315	0.008	0.007	0.007	0.006	<DL	<DL	1.416	0.063	0.016	0.016
8	isobutane	167.993	95.100	0.371	0.525	6.325	0.714	0.315	0.445	36.594	19.555	1.897	2.683
9	isobutene / 1-butene	59.956	26.635	0.062	0.024	0.924	0.382	<DL	<DL	12.647	5.391	4.083	2.999
10	1,3-butadiene	3.873	0.259	0.028	0.008	0.018	0.015	0.0012	0.002	0.812	0.051	0.022	0.007
11	n-butane	25.985	14.887	0.041	0.057	0.829	0.044	0.027	0.038	5.609	3.058	0.786	0.431

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
12	trans-2-butene	11.815	4.928	0.021	0.011	0.241	0.106	<DL	<DL	2.510	0.989	0.520	0.383
13	1-butyne	0.530	0.228	<DL	<DL	<DL	<DL	<DL	<DL	0.110	0.047	0.006	0.004
14	cis-2-butene	5.509	1.690	0.100	0.035	0.173	0.071	0.123	0.095	1.243	0.365	0.329	0.242
15	1,2-butadiene	0.700	0.291	<DL	<DL	<DL	<DL	<DL	<DL	0.145	0.060	0.004	0.006
16	3-methyl-1-butene	2.388	1.189	0.002	0.003	0.015	0.012	<DL	<DL	0.498	0.242	0.067	0.039
17	2-methylbutane	110.993	74.131	0.193	0.009	2.685	0.082	0.069	0.098	23.715	15.236	2.792	1.396
18	1,4-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
19	2-butyne	0.396	0.087	<DL	<DL	<DL	<DL	<DL	<DL	0.082	0.018	0.002	0.003
20	1-pentene	1.789	0.796	0.005	0.007	0.010	0.015	0.004	0.006	0.374	0.157	0.034	0.014
21	2-methyl-1-butene	4.574	2.213	0.011	0.004	0.045	0.026	<DL	<DL	0.959	0.450	0.135	0.111
22	n-pentane	26.171	14.697	0.061	0.013	0.806	0.106	0.019	0.027	5.643	2.991	0.683	0.266
23	2-methyl-1,3-butadiene	0.256	0.053	0.007	0.005	<DL	<DL	<DL	<DL	0.054	0.012	0.007	0.004
24	trans-2-pentene	2.023	0.854	0.002	0.002	0.029	0.041	<DL	<DL	0.426	0.164	0.062	0.034
25	cis-2-pentene	1.263	0.545	0.004	0.003	0.017	0.009	<DL	<DL	0.266	0.111	0.031	0.017
26	2-methyl-2-butene	6.366	3.068	0.018	0.011	0.007	0.009	<DL	<DL	1.320	0.632	0.046	0.066
27	trans-1,3-pentadiene	0.020	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.001	<DL	<DL
28	1,3-cyclopentadiene	0.007	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	4.952	2.625	0.012	0.001	0.160	0.004	0.006	0.009	1.071	0.540	0.181	0.100
30	cyclopentene	1.346	0.498	0.003	0.004	0.024	0.018	<DL	<DL	0.285	0.098	0.064	0.047
31	4-methyl-1-pentene / 3-methyl-1-pentene	1.473	0.735	0.004	0.005	0.026	0.007	0.013	0.018	0.316	0.160	0.025	0.008
32	cyclopentane	4.154	2.233	<DL	<DL	0.061	0.019	<DL	<DL	0.875	0.455	0.079	0.053
33	2,3-dimethylbutane	35.401	18.736	0.070	0.041	0.900	0.104	0.011	0.016	7.575	3.839	1.095	0.630
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	35.485	17.656	0.034	0.048	0.898	0.094	0.018	0.025	7.586	3.596	1.076	0.623
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	1.107	0.420	0.151	0.198	0.009	0.013	0.003	0.004	0.266	0.126	0.022	0.024
37	3-methylpentane	21.788	10.770	0.036	0.031	0.566	0.064	<DL	<DL	4.662	2.210	0.690	0.401
38	2-methyl-1-pentene	0.978	0.437	0.009	0.013	0.008	0.004	<DL	<DL	0.206	0.092	0.013	0.019
39	1-hexene	2.951	1.317	0.006	0.008	0.008	0.000	0.006	0.009	0.615	0.272	0.053	0.029
40	n-hexane	31.014	14.707	0.016	0.022	0.741	0.115	<DL	<DL	6.610	2.995	0.937	0.577
41	trans-2-hexene	1.391	0.626	0.009	0.000	0.016	0.009	0.0010	0.001	0.294	0.127	0.030	0.022
42	2-methyl-2-pentene	2.000	0.913	<DL	<DL	0.003	0.005	<DL	<DL	0.414	0.187	0.015	0.014
43	trans-3-methyl-2-pentene	1.610	0.818	0.003	0.004	0.005	0.007	<DL	<DL	0.334	0.168	0.012	0.007
44	cis-2-hexene	0.727	0.324	0.0012	0.002	0.007	0.006	<DL	<DL	0.152	0.066	0.015	0.011
45	cis-3-methyl-2-pentene	1.625	0.845	0.004	0.005	0.0004	0.0006	0.0010	0.001	0.337	0.176	<DL	<DL
46	2,2-dimethylpentane	2.127	1.010	0.002	0.003	0.072	0.002	0.008	0.011	0.462	0.213	0.079	0.045
47	methylcyclopentane	24.841	11.631	0.051	0.014	0.545	0.131	0.009	0.013	5.293	2.361	0.727	0.441
48	2,4-dimethylpentane	28.052	13.451	0.062	0.032	0.678	0.112	0.005	0.008	5.993	2.747	0.915	0.564
49	2,2,3-trimethylbutane	2.307	1.108	0.003	0.004	0.062	0.005	<DL	<DL	0.494	0.228	0.080	0.052
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	86.263	34.486	0.295	0.143	1.440	0.225	<DL	<DL	18.273	7.077	12.797	7.093
52	3,3-dimethylpentane	2.321	1.073	<DL	<DL	0.032	0.045	<DL	<DL	0.488	0.209	0.079	0.063
53	cyclohexane	27.549	12.732	0.023	0.032	0.567	0.110	<DL	<DL	5.849	2.587	0.689	0.437
54	2-methylhexane	19.662	8.971	0.014	0.019	0.439	0.077	0.003	0.004	4.184	1.823	0.532	0.270
55	2,3-dimethylpentane	23.716	10.760	0.015	0.022	0.570	0.101	0.005	0.007	5.058	2.183	0.735	0.435
56	1,1-dimethylcyclopentane	2.570	1.150	<DL	<DL	0.066	0.010	<DL	<DL	0.549	0.234	0.087	0.048

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
57	cyclohexene	1.001	0.466	<DL	<DL	<DL	<DL	<DL	<DL	0.207	0.096	<DL	<DL
58	3-methylhexane	19.640	8.751	0.010	0.015	0.460	0.073	<DL	<DL	4.184	1.780	0.530	0.244
59	cis-1,3-dimethylcylcopentane	5.530	2.467	0.004	0.006	0.103	0.029	0.0011	0.002	1.171	0.499	0.146	0.090
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	6.239	2.470	0.005	0.008	0.138	0.034	<DL	<DL	1.327	0.498	0.178	0.103
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	257.089	116.482	0.619	0.324	7.043	0.724	0.138	0.020	55.193	23.889	9.381	5.877
63	trans-3-heptene	0.385	0.163	<DL	<DL	<DL	<DL	<DL	<DL	0.080	0.034	0.007	0.005
64	n-heptane	32.130	14.131	0.030	0.042	0.707	0.124	0.005	0.007	6.836	2.867	0.836	0.429
65	cis-3-heptene	0.882	0.382	<DL	<DL	<DL	<DL	<DL	<DL	0.182	0.079	<DL	<DL
66	trans-2-heptene	0.422	0.183	<DL	<DL	<DL	<DL	<DL	<DL	0.087	0.038	0.009	0.008
67	cis-2-heptene	0.435	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.090	0.003	0.014	0.012
68	methylcyclohexane / 2,2-dimethylhexane	61.094	26.388	0.086	0.020	1.214	0.300	0.008	0.012	12.969	5.349	1.720	1.106
69	2,5-dimethylhexane / ethylcyclopentane	40.202	17.903	0.078	0.024	0.836	0.204	0.007	0.010	8.550	3.636	1.265	0.815
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	50.321	22.016	0.111	0.047	1.180	0.203	0.017	0.004	10.744	4.491	1.676	1.087
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	3.880	1.660	0.013	0.001	0.085	0.021	<DL	<DL	0.827	0.336	0.148	0.093
72	cis-trans-cis-1,2,3-trimethylcyclopentane	2.542	1.090	0.023	0.032	0.049	0.011	<DL	<DL	0.544	0.229	0.083	0.050
73	2,3,4-trimethylpentane	102.741	45.031	0.242	0.113	2.349	0.450	0.058	0.015	21.929	9.187	3.165	2.061
74	toluene/2,3,3-trimethylpentane	187.264	78.274	2.051	0.833	3.997	0.468	1.383	0.388	40.631	16.305	8.740	6.119
75	2,3-dimethylhexane	12.175	14.198	0.088	0.004	0.722	0.158	0.018	0.005	2.738	2.975	1.037	0.640
76	2-methyl-3-ethylpentane	0.577	0.815	<DL	<DL	0.039	0.010	<DL	<DL	0.130	0.171	0.061	0.034
77	2-methylheptane / 1-methylcyclohexene	9.606	3.848	0.048	0.011	0.372	0.104	0.006	0.008	2.099	0.825	0.581	0.368
78	4-methylheptane / 3-methyl-3-ethylpentane	1.886	2.667	0.014	0.004	0.118	0.031	0.007	0.010	0.427	0.556	0.198	0.119
79	3,4-dimethylhexane	6.673	2.907	0.022	0.010	0.153	0.051	<DL	<DL	1.425	0.587	0.223	0.139
80	3-methylheptane / 3-ethylhexane	15.587	6.685	0.051	0.022	0.337	0.095	<DL	<DL	3.322	1.356	0.500	0.322
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	14.886	6.332	0.028	0.009	0.305	0.080	<DL	<DL	3.164	1.285	0.479	0.315
82	trans-1,4-dimethylcyclohexane	5.485	2.314	0.020	0.010	0.120	0.035	<DL	<DL	1.170	0.470	0.178	0.116
83	2,2,5-trimethylhexane	31.008	13.665	0.071	0.021	0.713	0.159	0.006	0.009	6.616	2.775	1.123	0.727
84	1-octene	1.968	0.345	0.012	0.017	0.065	0.013	<DL	<DL	0.427	0.071	0.106	0.070
85	1-ethyl-1-methylcyclopentane	1.197	0.503	<DL	<DL	0.030	0.006	<DL	<DL	0.255	0.102	0.036	0.018
86	n-octane/trans-1,2-dimethylcyclohexane	41.109	17.398	0.172	0.083	0.810	0.192	0.021	0.004	8.755	3.550	1.263	0.853
87	trans-2-octene	0.771	0.321	0.011	0.016	0.020	0.007	0.017	0.024	0.172	0.061	0.027	0.020
88	cis-cis-cis-1,2,3-trimethylcyclopentane	4.675	1.984	0.018	0.008	0.088	0.025	<DL	<DL	0.993	0.404	0.138	0.095
89	2,4,4-trimethylhexane	1.219	0.547	<DL	<DL	0.032	0.011	<DL	<DL	0.261	0.110	0.048	0.033
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.699	0.279	0.011	0.016	0.021	0.010	<DL	<DL	0.153	0.051	0.031	0.024
92	2,3,5-trimethylhexane	5.569	2.419	0.016	0.007	0.123	0.029	<DL	<DL	1.187	0.492	0.181	0.124
93	2,4-dimethylheptane	2.940	1.231	0.006	0.009	0.059	0.016	<DL	<DL	0.625	0.251	0.088	0.063
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	6.944	2.888	0.024	0.008	0.140	0.036	<DL	<DL	1.478	0.587	0.221	0.155
95	n-propylcyclopentane	1.164	0.455	<DL	<DL	0.025	0.007	<DL	<DL	0.247	0.092	0.034	0.026
96	cis-cis-cis-1,3,5-trimethylcyclohexane	11.940	5.057	0.013	0.019	0.328	0.210	0.006	0.008	2.560	0.983	0.337	0.236
97	2,5-dimethylheptane/3,5-dimethylheptane	6.100	2.348	0.029	0.022	0.263	0.221	<DL	<DL	1.338	0.428	0.199	0.138
98	3,3-dimethylheptane	4.287	1.692	0.014	0.019	0.190	0.160	<DL	<DL	0.940	0.309	0.143	0.102
99	1,1,4-trimethylcyclohexane	1.701	0.592	0.009	0.013	0.110	0.037	<DL	<DL	0.383	0.115	0.034	0.048
100	ethylbenzene	21.765	8.201	0.186	0.097	0.133	0.051	0.003	0.005	4.573	1.699	0.428	0.342

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
101	cis-trans-trans-1,2,4-trimethylcyclohexane	2.560	0.955	0.159	0.164	0.091	0.020	<DL	<DL	0.589	0.228	0.089	0.088
102	2,3-dimethylheptane	4.417	1.782	0.042	0.012	0.112	0.023	<DL	<DL	0.952	0.364	0.128	0.121
103	m&p-xylene/3,4-dimethylheptane	63.438	24.480	0.716	0.319	0.609	0.201	0.065	0.037	13.445	5.071	1.900	2.554
104	2-methyloctane	11.712	4.727	0.079	0.040	0.262	0.058	0.006	0.008	2.509	0.970	0.362	0.280
105	3-methyloctane	9.502	3.651	0.053	0.019	0.196	0.048	<DL	<DL	2.028	0.743	0.298	0.210
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	7.482	2.728	0.129	0.065	0.175	0.018	<DL	<DL	1.622	0.572	0.226	0.157
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	24.745	9.247	0.247	0.112	0.245	0.082	0.023	0.013	5.239	1.912	0.858	0.684
109	1-nonene/1,1,2-trimethylcyclohexane	5.571	1.989	0.037	0.031	0.122	0.024	0.005	0.007	1.193	0.412	0.199	0.140
110	trans-3-nonene	2.151	0.536	0.007	0.010	0.044	0.014	<DL	<DL	0.458	0.109	0.073	0.056
111	cis-3-nonene/isobutylcyclopentane	0.286	0.086	<DL	<DL	<DL	<DL	<DL	<DL	0.059	0.018	<DL	<DL
112	n-nonane	26.660	6.966	0.247	0.130	0.578	0.111	0.029	0.008	5.727	1.435	0.943	0.663
113	trans-2-nonene	1.950	0.689	0.005	0.007	0.044	0.010	<DL	<DL	0.416	0.141	0.073	0.051
114	cis-2-nonene	3.157	1.327	0.004	0.006	0.055	0.014	<DL	<DL	0.668	0.271	0.089	0.062
115	isopropylbenzene	2.012	0.805	0.016	0.004	<DL	<DL	<DL	<DL	0.419	0.167	<DL	<DL
116	2,2-dimethyloctane	2.321	0.064	0.016	0.002	0.062	0.046	<DL	<DL	0.500	0.026	0.133	0.074
117	isopropylcyclohexane	5.769	1.435	0.032	0.015	0.120	0.027	<DL	<DL	1.231	0.291	0.204	0.143
118	n-butylcyclopentane	8.660	1.149	0.072	0.039	0.184	0.098	<DL	<DL	1.855	0.218	0.356	0.237
119	3,3-dimethyloctane	1.314	0.025	<DL	<DL	0.047	0.048	0.005	0.008	0.286	0.010	0.072	0.045
120	n-propylbenzene	4.242	0.327	0.064	0.029	0.046	0.009	0.008	0.007	0.905	0.069	0.107	0.069
121	3-ethyltoluene	11.855	1.242	0.285	0.134	0.124	0.010	0.029	0.001	2.555	0.231	0.326	0.255
122	4-ethyltoluene/2,3-dimethyloctane	5.981	1.289	0.144	0.069	0.111	0.013	0.019	0.001	1.304	0.255	0.212	0.156
123	1,3,5-trimethylbenzene	7.381	4.633	0.266	0.169	0.195	0.021	0.017	0.007	1.643	0.924	0.457	0.354
124	2-methylnonane	4.145	1.751	0.063	0.041	0.097	0.009	0.005	0.004	0.898	0.369	0.154	0.110
125	3-ethyloctane	0.478	0.677	0.007	0.010	0.037	0.017	<DL	<DL	0.111	0.142	0.032	0.024
126	3-methylnonane	1.376	1.946	0.048	0.020	0.095	0.000	0.0008	0.0012	0.322	0.397	0.145	0.100
127	2-ethyltoluene	4.108	0.998	0.103	0.051	0.044	0.006	0.009	0.001	0.886	0.197	0.091	0.069
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	13.955	7.389	0.640	0.310	0.289	0.010	0.055	0.030	3.121	1.448	0.713	0.561
129	isobutylcyclohexane	0.636	0.285	0.005	0.006	0.033	0.007	<DL	<DL	0.141	0.062	0.105	0.086
130	n-decane	4.728	6.686	0.605	0.341	0.698	0.016	0.058	0.017	1.320	1.296	1.030	0.714
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.560	0.792	0.025	0.036	0.025	0.001	<DL	<DL	0.128	0.156	0.033	0.023
132	sec-butylbenzene	0.765	1.082	0.025	0.035	0.055	0.001	<DL	<DL	0.179	0.216	0.059	0.040
133	3-isopropyltoluene	0.740	1.047	<DL	<DL	0.044	0.003	0.019	0.026	0.170	0.223	0.080	0.053
134	4-isopropyltoluene	3.507	4.513	0.425	0.263	0.145	0.021	0.055	0.078	0.876	0.845	0.255	0.201
135	indan	0.738	1.044	0.017	0.024	<DL	<DL	<DL	<DL	0.156	0.210	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.217	0.306	0.068	0.058	<DL	<DL	<DL	<DL	0.060	0.050	0.030	0.030
138	3-n-propyltoluene	1.307	1.848	0.271	0.193	0.252	0.019	0.015	0.008	0.404	0.331	0.340	0.258
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.815	1.153	0.379	0.307	0.105	0.028	0.009	0.002	0.285	0.161	0.150	0.124
140	1,2-diethylbenzene	<DL	<DL	0.120	0.113	0.062	0.012	0.005	0.007	0.045	0.031	0.084	0.068
141	2-n-propyltoluene	0.429	0.606	0.289	0.200	0.223	0.021	0.019	0.004	0.220	0.074	0.287	0.206
142	1,4-dimethyl-2-ethylbenzene	0.056	0.079	0.185	0.123	<DL	<DL	<DL	<DL	0.053	0.011	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.038	0.053	0.178	0.143	0.056	0.022	0.007	0.009	0.065	0.030	0.069	0.056
144	1,2-dimethyl-4-ethylbenzene	<DL	<DL	0.626	0.724	0.067	0.030	0.015	0.006	0.163	0.172	0.080	0.065
145	1,3-dimethyl-2-ethylbenzene	<DL	<DL	0.173	0.179	<DL	<DL	<DL	<DL	0.039	0.040	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
146	n-undecane	<DL	<DL	1.098	0.739	0.489	0.175	0.056	0.025	0.396	0.221	0.527	0.385
147	1,2-dimethyl-3-ethylbenzene	<DL	<DL	0.224	0.241	0.128	0.079	<DL	<DL	0.085	0.075	0.059	0.046
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	<DL	<DL	0.394	0.164	0.202	0.069	0.111	0.149	0.176	0.026	0.896	0.639
149	1,2,3,5-tetramethylbenzene	<DL	<DL	0.367	0.299	0.158	0.223	0.013	0.019	0.129	0.134	<DL	<DL
150	tert-butyl-2-methylbenzene	<DL	<DL	0.067	0.059	0.011	0.015	<DL	<DL	0.018	0.017	0.012	0.008
151	n-pentylbenzene	<DL	<DL	0.278	0.193	0.012	0.016	<DL	<DL	0.065	0.039	0.060	0.051
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	0.119	0.169	0.035	0.050	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	<DL	<DL	0.094	0.033	0.009	0.013	0.003	0.004	0.024	0.003	0.016	0.009
154	tert-butyl-4-ethylbenzene	0.061	0.086	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.018	<DL	<DL
155	naphthalene	<DL	<DL	1.920	1.266	0.149	0.101	0.035	0.040	0.480	0.299	0.137	0.090
156	n-dodecane	0.312	0.441	0.304	0.430	0.059	0.083	0.037	0.009	0.159	0.207	0.095	0.059

Escort, Speciated VOC Emission Rates (mg/mile) from E10-Spl Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	144.697	20.086	0.795	1.377	10.483	0.859	<DL	<DL	33.114	4.448	37.245	4.850
2	ethylene	128.178	19.221	0.009	0.016	2.419	0.900	0.089	0.155	27.318	3.731	7.997	1.728
3	acetylene	38.341	6.558	0.012	0.021	0.030	0.051	<DL	<DL	7.975	1.357	0.060	0.052
4	ethane	15.431	2.064	0.031	0.028	2.211	0.371	0.072	0.125	3.841	0.307	4.084	0.206
5	propylene	55.449	5.413	0.027	0.024	0.912	0.599	0.045	0.078	11.787	0.944	4.753	1.372
6	propane	0.529	0.734	0.003	0.005	0.048	0.084	<DL	<DL	0.124	0.176	0.260	0.233
7	propyne	3.727	0.691	0.0009	0.002	0.100	0.163	0.005	0.009	0.803	0.180	0.019	0.017
8	isobutane	24.052	3.740	0.486	0.255	2.360	0.518	0.170	0.240	5.801	0.928	2.867	0.339
9	isobutene / 1-butene	37.232	2.311	0.028	0.039	0.709	0.364	0.003	0.004	7.933	0.397	3.352	0.974
10	1,3-butadiene	3.705	0.982	0.008	0.012	0.010	0.006	0.0010	0.001	0.774	0.208	0.061	0.022
11	n-butane	5.437	0.288	0.043	0.061	0.478	0.037	<DL	<DL	1.270	0.055	0.555	0.073
12	trans-2-butene	6.905	0.638	<DL	<DL	0.157	0.104	<DL	<DL	1.477	0.105	0.431	0.055
13	1-butyne	0.215	0.035	<DL	<DL	<DL	<DL	<DL	<DL	0.045	0.007	0.004	0.001
14	cis-2-butene	4.400	0.305	0.072	0.006	0.092	0.051	0.005	0.008	0.957	0.054	0.294	0.017
15	1,2-butadiene	0.304	0.034	<DL	<DL	<DL	<DL	<DL	<DL	0.063	0.007	0.005	0.000
16	3-methyl-1-butene	1.243	0.119	<DL	<DL	0.013	0.000	<DL	<DL	0.262	0.025	0.084	0.021
17	2-methylbutane	183.166	12.115	0.482	0.682	9.894	0.932	<DL	<DL	40.861	2.146	11.470	1.254
18	1,4-pentadiene	1.365	1.386	<DL	<DL	<DL	<DL	<DL	<DL	0.284	0.288	<DL	<DL
19	2-butyne	0.223	0.022	<DL	<DL	<DL	<DL	<DL	<DL	0.046	0.005	<DL	<DL
20	1-pentene	0.599	0.020	0.0010	0.001	0.005	0.007	0.002	0.003	0.126	0.001	0.024	0.006
21	2-methyl-1-butene	2.307	0.047	<DL	<DL	0.019	0.027	<DL	<DL	0.484	0.003	0.153	0.016
22	n-pentane	4.638	0.894	0.013	0.018	0.301	0.073	0.012	0.017	1.052	0.158	0.314	0.046
23	2-methyl-1,3-butadiene	0.337	0.086	0.003	0.004	<DL	<DL	<DL	<DL	0.071	0.019	0.007	0.002
24	trans-2-pentene	0.841	0.039	<DL	<DL	0.018	0.018	0.0014	0.002	0.180	0.003	0.047	0.008
25	cis-2-pentene	0.512	0.014	<DL	<DL	0.007	0.010	0.002	0.002	0.109	0.000	0.025	0.004
26	2-methyl-2-butene	3.937	0.158	<DL	<DL	<DL	<DL	<DL	<DL	0.817	0.033	0.035	0.011
27	trans-1,3-pentadiene	0.094	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.019	0.002	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
28	1,3-cyclopentadiene	0.064	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.004	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	1.074	0.236	<DL	<DL	0.060	0.010	0.005	0.007	0.241	0.044	0.079	0.003
30	cyclopentene	0.835	0.041	<DL	<DL	0.016	0.010	<DL	<DL	0.178	0.006	0.046	0.012
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.667	0.084	0.005	0.007	0.013	0.000	<DL	<DL	0.143	0.016	0.040	0.009
32	cyclopentane	0.789	0.067	<DL	<DL	0.039	0.055	0.005	0.007	0.176	0.003	0.052	0.012
33	2,3-dimethylbutane	16.268	3.751	0.032	0.046	0.721	0.111	0.010	0.014	3.586	0.737	0.891	0.106
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	10.885	2.357	0.014	0.020	0.453	0.075	0.026	0.018	2.396	0.461	0.571	0.045
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.562	0.119	0.133	0.188	0.009	0.012	0.013	0.018	0.153	0.058	0.041	0.012
37	3-methylpentane	6.697	1.473	0.023	0.032	0.281	0.041	0.018	0.012	1.478	0.285	0.371	0.029
38	2-methyl-1-pentene	0.375	0.064	<DL	<DL	<DL	<DL	0.004	0.006	0.079	0.011	0.010	0.003
39	1-hexene	0.891	0.125	<DL	<DL	0.0005	0.0007	0.0009	0.001	0.185	0.026	0.023	0.002
40	n-hexane	8.092	1.765	<DL	<DL	0.293	0.059	<DL	<DL	1.761	0.352	0.383	0.013
41	trans-2-hexene	0.632	0.125	<DL	<DL	0.002	0.003	0.0006	0.0008	0.132	0.025	0.016	0.002
42	2-methyl-2-pentene	0.874	0.150	0.004	0.006	<DL	<DL	<DL	<DL	0.183	0.030	0.009	0.001
43	trans-3-methyl-2-pentene	0.791	0.131	<DL	<DL	0.003	0.004	<DL	<DL	0.165	0.026	0.014	0.002
44	cis-2-hexene	0.325	0.055	<DL	<DL	<DL	<DL	<DL	<DL	0.068	0.011	0.008	0.001
45	cis-3-methyl-2-pentene	0.776	0.166	<DL	<DL	<DL	<DL	0.003	0.004	0.162	0.036	0.003	0.004
46	2,2-dimethylpentane	0.618	0.142	<DL	<DL	0.029	0.008	0.004	0.006	0.138	0.026	0.036	0.005
47	methylcyclopentane	5.744	1.180	<DL	<DL	0.187	0.037	0.007	0.010	1.246	0.239	0.269	0.026
48	2,4-dimethylpentane	15.556	2.890	0.021	0.030	0.564	0.087	0.002	0.003	3.391	0.573	0.747	0.101
49	2,2,3-trimethylbutane	1.175	0.240	<DL	<DL	0.046	0.004	<DL	<DL	0.257	0.049	0.061	0.009
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	35.755	0.072	0.102	0.114	0.701	0.073	<DL	<DL	7.640	0.053	7.006	1.713
52	3,3-dimethylpentane	0.993	0.115	<DL	<DL	0.010	0.015	<DL	<DL	0.209	0.028	0.040	0.016
53	cyclohexane	6.177	1.202	0.044	0.062	0.109	0.048	<DL	<DL	1.322	0.224	0.181	0.040
54	2-methylhexane	6.393	1.042	0.005	0.008	0.187	0.053	<DL	<DL	1.380	0.202	0.279	0.037
55	2,3-dimethylpentane	12.586	1.936	0.014	0.019	0.429	0.077	0.003	0.004	2.735	0.378	0.575	0.071
56	1,1-dimethylcyclopentane	0.632	0.117	<DL	<DL	0.023	0.005	<DL	<DL	0.138	0.023	0.032	0.004
57	cyclohexene	0.248	0.040	<DL	<DL	<DL	<DL	<DL	<DL	0.052	0.008	<DL	<DL
58	3-methylhexane	6.359	0.984	0.004	0.006	0.186	0.057	<DL	<DL	1.373	0.188	0.288	0.033
59	cis-1,3-dimethylcylcopentane	1.373	0.231	0.004	0.005	0.034	0.007	<DL	<DL	0.295	0.045	0.051	0.005
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	1.787	0.275	<DL	<DL	0.045	0.012	<DL	<DL	0.384	0.054	0.071	0.007
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	160.177	21.163	0.209	0.296	6.110	0.824	0.063	0.089	35.006	4.160	8.081	1.088
63	trans-3-heptene	0.179	0.025	<DL	<DL	<DL	<DL	<DL	<DL	0.037	0.005	0.003	0.000
64	n-heptane	8.840	1.322	0.013	0.018	0.229	0.075	<DL	<DL	1.901	0.251	0.348	0.041
65	cis-3-heptene	0.435	0.073	<DL	<DL	<DL	<DL	<DL	<DL	0.090	0.015	<DL	<DL
66	trans-2-heptene	0.176	0.025	<DL	<DL	<DL	<DL	<DL	<DL	0.037	0.005	0.005	0.002
67	cis-2-heptene	0.370	0.043	<DL	<DL	<DL	<DL	<DL	<DL	0.077	0.009	0.007	0.003
68	methylcyclohexane / 2,2-dimethylhexane	14.308	2.288	0.018	0.026	0.370	0.085	<DL	<DL	3.077	0.449	0.535	0.062
69	2,5-dimethylhexane / ethylcyclopentane	24.033	2.700	0.033	0.031	0.674	0.126	<DL	<DL	5.183	0.524	1.009	0.131
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	31.743	3.479	0.045	0.050	0.986	0.162	0.005	0.007	6.874	0.675	1.376	0.168
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	1.118	0.122	<DL	<DL	0.036	0.003	<DL	<DL	0.242	0.025	0.065	0.012
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.662	0.085	<DL	<DL	0.015	0.002	<DL	<DL	0.142	0.017	0.028	0.006

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
73	2,3,4-trimethylpentane	67.879	7.145	0.118	0.091	2.051	0.342	0.014	0.020	14.689	1.389	2.730	0.293
74	toluene/2,3,3-trimethylpentane	94.804	8.380	1.269	0.543	2.747	0.222	0.487	0.689	20.867	1.780	5.134	0.993
75	2,3-dimethylhexane	20.662	2.061	0.046	0.023	0.598	0.121	0.004	0.005	4.466	0.395	0.855	0.099
76	2-methyl-3-ethylpentane	0.859	0.085	<DL	<DL	0.030	0.012	<DL	<DL	0.187	0.015	0.041	0.006
77	2-methylheptane / 1-methylcyclohexene	5.561	0.640	0.003	0.004	0.153	0.032	<DL	<DL	1.197	0.124	0.233	0.026
78	4-methylheptane / 3-methyl-3-ethylpentane	1.770	0.172	<DL	<DL	0.060	0.008	<DL	<DL	0.384	0.034	0.092	0.018
79	3,4-dimethylhexane	4.006	0.372	0.010	0.011	0.127	0.019	<DL	<DL	0.869	0.070	0.172	0.016
80	3-methylheptane / 3-ethylhexane	5.319	0.567	0.009	0.012	0.151	0.024	<DL	<DL	1.148	0.109	0.200	0.044
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	3.817	0.474	0.005	0.008	0.101	0.012	<DL	<DL	0.821	0.094	0.163	0.016
82	trans-1,4-dimethylcyclohexane	1.442	0.177	<DL	<DL	0.041	0.006	<DL	<DL	0.311	0.035	0.061	0.005
83	2,2,5-trimethylhexane	21.161	1.817	0.043	0.030	0.620	0.108	<DL	<DL	4.574	0.345	0.971	0.112
84	1-octene	0.932	0.095	<DL	<DL	0.021	0.002	<DL	<DL	0.199	0.019	0.047	0.013
85	1-ethyl-1-methylcyclopentane	0.364	0.046	<DL	<DL	<DL	<DL	<DL	<DL	0.076	0.010	0.014	0.004
86	n-octane/trans-1,2-dimethylcyclohexane	11.393	1.282	0.024	0.034	0.272	0.045	0.004	0.005	2.447	0.250	0.418	0.044
87	trans-2-octene	0.316	0.030	0.006	0.009	0.010	0.002	<DL	<DL	0.070	0.005	0.016	0.005
88	cis-cis-cis-1,2,3-trimethylcyclopentane	1.408	0.151	0.007	0.010	0.031	0.006	<DL	<DL	0.302	0.028	0.055	0.001
89	2,4,4-trimethylhexane	0.877	0.070	<DL	<DL	0.024	0.007	<DL	<DL	0.189	0.013	0.042	0.001
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.208	0.017	0.004	0.006	0.009	0.012	<DL	<DL	0.047	0.001	0.022	0.000
92	2,3,5-trimethylhexane	3.726	0.287	0.012	0.003	0.103	0.020	<DL	<DL	0.804	0.054	0.150	0.010
93	2,4-dimethylheptane	1.192	0.113	<DL	<DL	0.028	0.010	<DL	<DL	0.255	0.021	0.045	0.001
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	2.379	0.226	0.008	0.012	0.058	0.015	<DL	<DL	0.512	0.041	0.093	0.004
95	n-propylcyclopentane	0.318	0.036	<DL	<DL	0.005	0.007	<DL	<DL	0.067	0.006	0.012	0.001
96	cis-cis-cis-1,3,5-trimethylcyclohexane	3.009	0.352	0.009	0.001	0.069	0.009	<DL	<DL	0.646	0.072	0.101	0.008
97	2,5-dimethylheptane/3,5-dimethylheptane	2.893	0.243	0.005	0.007	0.071	0.018	<DL	<DL	0.621	0.045	0.112	0.007
98	3,3-dimethylheptane	1.405	0.136	<DL	<DL	0.037	0.011	<DL	<DL	0.302	0.026	0.057	0.002
99	1,1,4-trimethylcyclohexane	0.514	0.078	<DL	<DL	<DL	<DL	1.358	1.920	0.508	0.551	<DL	<DL
100	ethylbenzene	8.031	0.434	0.018	0.025	0.005	0.007	<DL	<DL	1.673	0.088	0.168	0.026
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.849	0.074	<DL	<DL	0.011	0.001	<DL	<DL	0.179	0.015	0.023	0.004
102	2,3-dimethylheptane	1.772	0.154	<DL	<DL	0.026	0.003	<DL	<DL	0.375	0.031	0.050	0.009
103	m&p-xylene/3,4-dimethylheptane	20.799	0.691	0.109	0.154	0.052	0.074	<DL	<DL	4.357	0.133	0.934	0.174
104	2-methyloctane	3.915	0.367	0.012	0.016	0.103	0.037	<DL	<DL	0.844	0.063	0.134	0.018
105	3-methyloctane	3.137	0.297	<DL	<DL	0.088	0.028	<DL	<DL	0.675	0.055	0.125	0.007
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	4.376	0.360	<DL	<DL	0.125	0.031	<DL	<DL	0.943	0.067	0.166	0.023
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	8.935	0.305	0.046	0.065	0.045	0.017	<DL	<DL	1.878	0.055	0.358	0.082
109	1-nonene/1,1,2-trimethylcyclohexane	3.108	0.238	0.014	0.020	0.075	0.016	<DL	<DL	0.669	0.041	0.128	0.008
110	trans-3-nonene	0.741	0.078	<DL	<DL	0.014	0.005	<DL	<DL	0.158	0.015	0.024	0.002
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
112	n-nonane	9.104	0.909	0.061	0.008	0.193	0.044	0.0006	0.0009	1.957	0.177	0.308	0.036
113	trans-2-nonene	1.513	0.106	<DL	<DL	0.036	0.012	<DL	<DL	0.324	0.019	0.060	0.005
114	cis-2-nonene	0.867	0.099	<DL	<DL	0.021	0.005	<DL	<DL	0.186	0.020	0.030	0.004
115	isopropylbenzene	0.512	0.077	<DL	<DL	<DL	<DL	<DL	<DL	0.106	0.016	<DL	<DL
116	2,2-dimethyloctane	1.568	0.131	0.006	0.009	0.036	0.008	0.0012	0.002	0.337	0.027	0.061	0.011

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
117	isopropylcyclohexane	1.960	0.169	0.009	0.013	0.050	0.003	<DL	<DL	0.423	0.032	0.067	0.007
118	n-butylcyclopentane	3.771	0.332	0.021	0.030	0.068	0.012	0.008	0.011	0.809	0.083	0.129	0.040
119	3,3-dimethyloctane	0.664	0.007	0.055	0.077	0.028	0.039	0.043	0.061	0.170	0.044	0.012	0.017
120	n-propylbenzene	1.893	0.104	0.018	0.026	0.024	0.024	0.008	0.011	0.406	0.026	0.049	0.016
121	3-ethyltoluene	6.035	0.210	0.065	0.074	0.009	0.013	<DL	<DL	1.270	0.032	0.127	0.019
122	4-ethyltoluene/2,3-dimethyloctane	3.458	0.157	0.028	0.030	0.026	0.010	<DL	<DL	0.731	0.024	0.084	0.010
123	1,3,5-trimethylbenzene	5.190	0.247	0.056	0.024	0.046	0.000	<DL	<DL	1.103	0.047	0.170	0.023
124	2-methylnonane	6.127	6.681	0.010	0.001	0.175	0.199	0.005	0.008	1.325	1.336	0.407	0.057
125	3-ethyloctane	0.176	0.248	<DL	<DL	0.004	0.005	<DL	<DL	0.037	0.053	<DL	<DL
126	3-methylnonane	1.498	0.128	0.010	0.001	0.030	0.008	<DL	<DL	0.322	0.024	0.055	0.001
127	2-ethyltoluene	2.181	0.078	0.016	0.022	0.002	0.003	<DL	<DL	0.457	0.012	0.038	0.006
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	9.749	0.010	0.174	0.093	0.038	0.025	<DL	<DL	2.073	0.014	0.290	0.045
129	isobutylcyclohexane	0.659	0.052	<DL	<DL	0.027	0.038	<DL	<DL	0.144	0.021	0.048	0.006
130	n-decane	11.127	0.041	0.189	0.008	0.244	0.039	0.004	0.006	2.421	0.017	0.414	0.020
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.485	0.060	<DL	<DL	0.003	0.004	<DL	<DL	0.101	0.014	<DL	<DL
132	sec-butylbenzene	0.982	0.107	<DL	<DL	0.023	0.010	<DL	<DL	0.210	0.020	0.044	0.002
133	3-isopropyltoluene	1.100	0.098	0.064	0.014	0.027	0.011	0.025	0.004	0.257	0.025	0.025	0.005
134	4-isopropyltoluene	3.309	0.002	0.064	0.060	0.040	0.028	0.009	0.013	0.715	0.001	0.099	0.018
135	indan	0.992	0.226	0.009	0.013	<DL	<DL	0.008	0.012	0.210	0.047	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.312	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.065	0.003	<DL	<DL
138	3-n-propyltoluene	6.633	1.029	0.138	0.007	0.157	0.010	0.001	0.002	1.452	0.216	0.261	0.010
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	2.450	0.525	0.077	0.019	0.026	0.002	<DL	<DL	0.533	0.112	0.073	0.002
140	1,2-diethylbenzene	0.812	0.551	0.030	0.001	0.020	0.004	<DL	<DL	0.181	0.116	0.041	0.004
141	2-n-propyltoluene	4.441	1.606	0.141	0.011	0.137	0.006	0.002	0.002	0.992	0.333	0.216	0.016
142	1,4-dimethyl-2-ethylbenzene	0.300	0.424	0.025	0.035	<DL	<DL	<DL	<DL	0.068	0.080	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	1.066	0.533	0.059	0.003	0.022	0.001	<DL	<DL	0.240	0.111	0.040	0.005
144	1,2-dimethyl-4-ethylbenzene	1.233	0.684	0.082	0.004	0.018	0.000	<DL	<DL	0.279	0.143	0.038	0.006
145	1,3-dimethyl-2-ethylbenzene	0.560	0.608	0.018	0.025	<DL	<DL	<DL	<DL	0.120	0.120	0.034	0.005
146	n-undecane	2.918	3.831	0.375	0.049	0.137	0.014	0.004	0.006	0.728	0.786	0.206	0.011
147	1,2-dimethyl-3-ethylbenzene	0.695	0.740	0.099	0.033	0.032	0.012	<DL	<DL	0.175	0.149	0.075	0.018
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.525	0.708	0.210	0.104	0.254	0.077	0.076	0.107	0.248	0.117	0.279	0.066
149	1,2,3,5-tetramethylbenzene	0.811	1.042	0.111	0.024	<DL	<DL	<DL	<DL	0.193	0.211	<DL	<DL
150	tert-butyl-2-methylbenzene	0.145	0.204	0.034	0.004	<DL	<DL	<DL	<DL	0.037	0.041	0.004	0.005
151	n-pentylbenzene	0.310	0.439	0.128	0.019	0.009	0.012	0.004	0.006	0.096	0.082	0.019	0.003
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.112	0.158	0.056	0.005	0.009	0.001	0.005	0.007	0.040	0.032	0.006	0.005
154	tert-butyl-4-ethylbenzene	<DL	<DL	0.076	0.108	<DL	<DL	<DL	<DL	0.017	0.024	<DL	<DL
155	naphthalene	0.703	0.995	0.431	0.183	0.035	0.006	0.021	0.029	0.257	0.237	0.079	0.026
156	n-dodecane	0.469	0.663	0.367	0.013	0.066	0.005	0.028	0.015	0.205	0.137	0.049	0.009

Escort, Speciated VOC Emission Rates (mg/mile) from E20 Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	140.358	33.097	<DL	<DL	11.743	2.816	<DL	<DL	32.407	6.035	30.616	0.859
2	ethylene	107.356	19.595	0.045	0.064	1.807	1.351	<DL	<DL	22.823	3.655	5.515	0.704
3	acetylene	29.852	6.196	0.022	0.031	0.007	0.00004	<DL	<DL	6.212	1.277	0.044	0.007
4	ethane	14.509	2.675	0.096	0.136	2.947	1.129	0.067	0.043	3.868	0.257	3.325	0.267
5	propylene	44.475	8.333	0.048	0.029	0.732	0.587	0.001	0.001	9.457	1.551	3.666	0.377
6	propane	1.309	0.405	0.179	0.254	0.314	0.074	<DL	<DL	0.399	0.160	0.146	0.095
7	propyne	2.828	0.478	<DL	<DL	1.218	1.722	<DL	<DL	0.924	0.573	0.017	0.003
8	isobutane	15.388	13.146	0.568	0.804	1.597	2.258	0.334	0.044	3.867	3.197	2.259	0.418
9	isobutene / 1-butene	14.894	13.864	0.038	0.022	0.270	0.381	<DL	<DL	3.183	2.991	1.951	0.335
10	1,3-butadiene	1.175	0.865	0.014	0.001	0.847	1.181	<DL	<DL	0.481	0.146	0.024	0.006
11	n-butane	2.154	2.220	0.609	0.861	0.217	0.307	<DL	<DL	0.644	0.355	0.286	0.035
12	trans-2-butene	2.664	2.339	0.021	0.029	0.072	0.102	0.001	0.002	0.579	0.510	0.242	0.029
13	1-butyne	0.083	0.072	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.015	0.002	0.002
14	cis-2-butene	1.416	1.823	0.599	0.610	0.030	0.043	0.220	0.018	0.501	0.251	0.091	0.089
15	1,2-butadiene	0.125	0.112	<DL	<DL	<DL	<DL	<DL	<DL	0.026	0.023	<DL	<DL
16	3-methyl-1-butene	0.514	0.450	<DL	<DL	2.686	3.789	<DL	<DL	0.849	0.953	0.058	0.022
17	2-methylbutane	65.793	54.015	0.706	0.750	4.706	6.656	0.170	0.018	15.196	12.926	7.613	1.280
18	1,4-pentadiene	0.868	1.202	<DL	<DL	<DL	<DL	<DL	<DL	0.181	0.251	<DL	<DL
19	2-butyne	0.141	0.073	<DL	<DL	0.006	0.009	<DL	<DL	0.031	0.013	<DL	<DL
20	1-pentene	0.292	0.169	0.005	0.007	<DL	<DL	0.009	0.013	0.065	0.038	0.013	0.001
21	2-methyl-1-butene	0.985	0.727	0.007	0.001	0.189	0.267	<DL	<DL	0.258	0.078	0.042	0.0003
22	n-pentane	2.362	1.598	0.095	0.096	0.183	0.259	0.011	0.016	0.566	0.388	0.264	0.056
23	2-methyl-1,3-butadiene	0.118	0.018	<DL	<DL	0.006	0.009	<DL	<DL	0.026	0.006	0.002	0.0004
24	trans-2-pentene	0.372	0.255	0.008	0.009	<DL	<DL	<DL	<DL	0.079	0.051	0.027	0.006
25	cis-2-pentene	0.220	0.143	0.010	0.006	0.001	0.002	<DL	<DL	0.048	0.029	0.013	0.002
26	2-methyl-2-butene	1.537	1.089	0.003	0.004	0.0009	0.001	<DL	<DL	0.321	0.229	<DL	<DL
27	trans-1,3-pentadiene	0.012	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
28	1,3-cyclopentadiene	0.041	0.040	<DL	<DL	0.029	0.041	<DL	<DL	0.017	0.003	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	0.450	0.376	0.012	0.016	0.030	0.043	<DL	<DL	0.105	0.087	0.052	0.007
30	cyclopentene	0.352	0.246	<DL	<DL	0.008	0.002	<DL	<DL	0.076	0.051	0.020	0.007
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.355	0.343	0.006	0.009	0.073	0.081	<DL	<DL	0.096	0.051	0.022	0.015
32	cyclopentane	0.313	0.256	0.012	0.017	0.155	0.109	0.010	0.014	0.114	0.024	0.038	0.022
33	2,3-dimethylbutane	6.246	5.307	0.054	0.033	0.347	0.491	0.009	0.001	1.410	1.235	0.609	0.090
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	4.419	3.786	0.082	0.065	0.223	0.316	0.023	0.003	1.006	0.863	0.388	0.048
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.255	0.156	0.037	0.021	0.067	0.095	0.004	0.006	0.081	0.003	0.016	0.008
37	3-methylpentane	2.673	2.273	0.071	0.010	0.146	0.206	0.011	0.003	0.616	0.529	0.253	0.033
38	2-methyl-1-pentene	0.155	0.130	<DL	<DL	0.004	0.006	<DL	<DL	0.033	0.026	<DL	<DL
39	1-hexene	0.420	0.381	0.007	0.005	0.109	0.154	<DL	<DL	0.119	0.036	0.014	0.0009
40	n-hexane	3.155	2.718	0.064	0.073	0.145	0.205	0.004	0.006	0.712	0.605	0.250	0.021
41	trans-2-hexene	0.254	0.220	<DL	<DL	<DL	<DL	<DL	<DL	0.053	0.046	0.008	0.002
42	2-methyl-2-pentene	0.339	0.277	<DL	<DL	<DL	<DL	<DL	<DL	0.071	0.058	<DL	<DL
43	trans-3-methyl-2-pentene	0.312	0.278	<DL	<DL	<DL	<DL	<DL	<DL	0.065	0.058	0.007	0.0004

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
44	cis-2-hexene	0.134	0.117	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.024	0.004	0.0003
45	cis-3-methyl-2-pentene	0.293	0.247	<DL	<DL	0.008	0.011	<DL	<DL	0.063	0.049	<DL	<DL
46	2,2-dimethylpentane	0.253	0.218	<DL	<DL	0.068	0.055	<DL	<DL	0.071	0.030	0.024	0.003
47	methylcyclopentane	2.202	1.906	0.033	0.027	0.188	0.017	0.006	0.0004	0.519	0.387	0.177	0.011
48	2,4-dimethylpentane	6.297	5.468	0.044	0.022	0.279	0.395	0.006	0.005	1.399	1.246	0.512	0.058
49	2,2,3-trimethylbutane	0.479	0.382	<DL	<DL	0.023	0.032	<DL	<DL	0.106	0.088	0.039	0.005
50	1-methylclopentene	<DL	<DL	<DL	<DL	0.176	0.249	<DL	<DL	0.049	0.069	<DL	<DL
51	benzene	14.823	12.287	0.131	0.084	0.450	0.636	<DL	<DL	3.238	2.719	4.570	1.334
52	3,3-dimethylpentane	0.415	0.378	<DL	<DL	0.061	0.052	<DL	<DL	0.103	0.064	0.018	0.001
53	cyclohexane	2.431	2.169	0.012	0.016	0.101	0.093	0.038	0.054	0.548	0.465	0.130	0.008
54	2-methylhexane	2.632	2.298	0.023	0.014	0.181	0.018	0.001	0.002	0.603	0.482	0.187	0.019
55	2,3-dimethylpentane	5.250	4.592	0.039	0.022	0.214	0.302	0.003	0.005	1.161	1.037	0.393	0.043
56	1,1-dimethylcyclopentane	0.257	0.216	0.004	0.006	0.013	0.018	<DL	<DL	0.058	0.051	0.022	0.004
57	cyclohexene	0.108	0.099	<DL	<DL	0.056	0.079	<DL	<DL	0.038	0.001	0.006	0.008
58	3-methylhexane	2.643	2.303	0.025	0.019	0.105	0.148	0.002	0.0002	0.585	0.517	0.198	0.018
59	cis-1,3-dimethylcylcopentane	0.575	0.519	0.012	0.0002	0.032	0.007	0.0004	0.0006	0.131	0.110	0.035	0.002
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	0.749	0.659	0.001	0.002	0.023	0.032	0.008	0.012	0.165	0.143	0.047	0.001
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	1.254	1.774	<DL	<DL	0.346	0.490	<DL	<DL
62	2,2,4-timethylpentane	68.354	59.800	0.381	0.120	3.067	4.337	0.101	0.010	15.187	13.642	5.537	0.614
63	trans-3-heptene	0.073	0.059	<DL	<DL	0.051	0.072	<DL	<DL	0.029	0.007	0.001	0.002
64	n-heptane	3.639	3.160	0.027	0.013	0.121	0.171	0.003	0.0002	0.798	0.703	0.234	0.015
65	cis-3-heptene	0.169	0.147	<DL	<DL	<DL	<DL	<DL	<DL	0.035	0.031	<DL	<DL
66	trans-2-heptene	0.067	0.062	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.013	<DL	<DL
67	cis-2-heptene	0.172	0.096	<DL	<DL	0.070	0.099	<DL	<DL	0.055	0.007	0.002	0.003
68	methylcyclohexane / 2,2-dimethylhexane	5.911	5.204	0.029	0.011	0.287	0.101	0.008	0.003	1.319	1.110	0.353	0.016
69	2,5-dimethylhexane / ethylcyclopentane	10.352	9.039	0.061	0.007	0.502	0.215	0.014	0.003	2.311	1.942	0.673	0.050
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	13.829	12.046	0.079	0.014	0.482	0.676	0.017	0.0008	3.034	2.695	0.914	0.069
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.486	0.430	<DL	<DL	0.016	0.023	<DL	<DL	0.106	0.096	0.042	0.005
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.298	0.265	<DL	<DL	0.370	0.506	<DL	<DL	0.164	0.084	0.020	0.002
73	2,3,4-trimethylpentane	29.889	26.016	0.156	0.042	2.187	0.254	0.035	0.002	6.870	5.346	1.840	0.125
74	toluene/2,3,3-trimethylpentane	41.089	35.271	1.688	0.697	1.472	2.082	0.903	0.118	9.600	7.810	3.583	0.353
75	2,3-dimethylhexane	9.133	7.914	0.051	0.005	0.285	0.403	0.011	0.001	1.994	1.760	0.575	0.034
76	2-methyl-3-ethylpentane	0.385	0.332	<DL	<DL	0.042	0.017	<DL	<DL	0.092	0.064	0.032	0.002
77	2-methylheptane / 1-methylcyclohexene	2.441	2.054	0.017	0.005	0.098	0.087	0.005	0.007	0.540	0.449	0.181	0.008
78	4-methylheptane / 3-methyl-3-ethylpentane	0.801	0.667	0.015	0.021	0.061	0.024	<DL	<DL	0.187	0.141	0.072	0.005
79	3,4-dimethylhexane	1.798	1.528	0.022	0.009	0.089	0.068	<DL	<DL	0.403	0.335	0.122	0.006
80	3-methylheptane / 3-ethylhexane	2.338	2.007	0.022	0.006	0.122	0.049	<DL	<DL	0.525	0.431	0.136	0.010
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	1.699	1.468	0.013	0.005	0.085	0.120	0.011	0.004	0.383	0.337	0.162	0.057
82	trans-1,4-dimethylcyclohexane	0.622	0.531	<DL	<DL	0.130	0.113	<DL	<DL	0.165	0.079	0.053	0.0004
83	2,2,5-trimethylhexane	9.436	8.165	0.052	0.007	0.310	0.429	0.011	0.005	2.064	1.821	0.636	0.049
84	1-octene	0.422	0.362	0.004	0.006	0.012	0.017	<DL	<DL	0.092	0.081	0.033	0.006
85	1-ethyl-1-methylcyclopentane	0.162	0.130	<DL	<DL	0.046	0.065	<DL	<DL	0.046	0.009	0.016	0.005
86	n-octane/trans-1,2-dimethylcyclohexane	4.963	4.283	0.037	0.0002	0.126	0.179	0.005	0.0005	1.078	0.942	0.270	0.011
87	trans-2-octene	0.140	0.103	<DL	<DL	0.007	0.010	<DL	<DL	0.031	0.019	0.016	0.003

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.626	0.516	<DL	<DL	0.021	0.017	<DL	<DL	0.136	0.112	0.039	0.003
89	2,4,4-trimethylhexane	0.399	0.326	<DL	<DL	0.012	0.017	<DL	<DL	0.086	0.073	0.031	0.001
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.110	0.077	0.013	0.019	0.015	0.022	<DL	<DL	0.030	0.014	0.008	0.001
92	2,3,5-trimethylhexane	1.690	1.447	0.009	0.002	0.046	0.065	<DL	<DL	0.366	0.319	0.100	0.003
93	2,4-dimethylheptane	0.545	0.443	<DL	<DL	0.020	0.004	<DL	<DL	0.119	0.093	0.030	0.002
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	1.064	0.905	<DL	<DL	0.025	0.035	<DL	<DL	0.228	0.198	0.102	0.049
95	n-propylcyclopentane	0.141	0.118	<DL	<DL	0.009	0.013	<DL	<DL	0.032	0.021	0.022	0.019
96	cis-cis-cis-1,3,5-trimethylcyclohexane	1.319	1.141	0.004	0.006	0.035	0.023	<DL	<DL	0.285	0.246	0.099	0.016
97	2,5-dimethylheptane/3,5-dimethylheptane	1.308	1.113	0.010	0.003	0.027	0.023	<DL	<DL	0.282	0.239	0.122	0.008
98	3,3-dimethylheptane	0.628	0.537	<DL	<DL	0.013	0.019	<DL	<DL	0.134	0.117	0.080	0.009
99	1,1,4-trimethylcyclohexane	0.241	0.202	<DL	<DL	0.024	0.021	<DL	<DL	0.057	0.036	0.044	0.001
100	ethylbenzene	3.627	2.971	0.044	0.016	0.018	0.026	<DL	<DL	0.770	0.623	0.153	0.092
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.376	0.280	<DL	<DL	0.009	0.002	<DL	<DL	0.081	0.059	0.025	0.022
102	2,3-dimethylheptane	0.808	0.677	<DL	<DL	0.089	0.090	<DL	<DL	0.193	0.116	0.035	0.020
103	m&p-xylene/3,4-dimethylheptane	9.412	7.265	0.182	0.052	0.081	0.115	0.007	0.010	2.024	1.533	0.614	0.031
104	2-methyloctane	1.758	1.484	0.013	0.002	0.050	0.032	<DL	<DL	0.383	0.318	0.089	0.023
105	3-methyloctane	1.413	1.189	0.012	0.002	0.058	0.011	<DL	<DL	0.313	0.250	0.070	0.013
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	1.954	1.574	0.014	0.003	0.036	0.051	0.006	0.008	0.421	0.341	0.099	0.005
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	0.029	0.042	<DL	<DL	0.008	0.011	<DL	<DL
108	o-xylene	4.053	3.136	0.074	0.011	0.044	0.062	0.004	0.002	0.873	0.670	0.217	0.007
109	1-nonene/1,1,2-trimethylcyclohexane	1.412	1.188	0.020	0.010	0.032	0.045	<DL	<DL	0.307	0.263	0.079	0.0007
110	trans-3-nonene	0.334	0.280	<DL	<DL	0.007	0.010	<DL	<DL	0.071	0.061	0.015	0.001
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	0.034	0.048	<DL	<DL	0.009	0.013	<DL	<DL
112	n-nonane	4.035	3.378	0.076	0.010	0.087	0.118	0.002	0.003	0.881	0.738	0.187	0.0002
113	trans-2-nonene	0.690	0.578	<DL	<DL	0.014	0.020	<DL	<DL	0.148	0.126	0.036	0.002
114	cis-2-nonene	0.389	0.333	0.0005	0.0007	0.012	0.017	<DL	<DL	0.084	0.074	0.019	0.0008
115	isopropylbenzene	0.053	0.075	<DL	<DL	0.010	0.015	<DL	<DL	0.014	0.020	<DL	<DL
116	2,2-dimethyloctane	0.948	0.929	0.013	0.013	0.023	0.027	0.0006	0.0009	0.207	0.204	0.044	0.0001
117	isopropylcyclohexane	0.856	0.726	0.010	0.014	0.029	0.002	<DL	<DL	0.189	0.155	0.034	0.001
118	n-butylcyclopentane	1.695	1.401	0.014	0.020	0.062	0.027	<DL	<DL	0.373	0.304	0.071	0.013
119	3,3-dimethyloctane	0.250	0.223	<DL	<DL	<DL	<DL	<DL	<DL	0.052	0.046	0.023	0.016
120	n-propylbenzene	0.847	0.644	0.026	0.005	0.031	0.020	0.002	0.002	0.191	0.129	0.022	0.003
121	3-ethyltoluene	2.657	1.917	0.101	0.000004	0.023	0.032	0.009	0.013	0.584	0.405	0.086	0.011
122	4-ethyltoluene/2,3-dimethyloctane	1.537	1.143	0.051	0.001	0.032	0.011	0.003	0.004	0.341	0.241	0.053	0.008
123	1,3,5-trimethylbenzene	2.320	1.746	0.076	0.015	0.046	0.029	0.002	0.003	0.513	0.375	0.110	0.007
124	2-methylnonane	4.637	3.737	0.011	0.016	0.009	0.013	0.008	0.011	0.972	0.784	0.145	0.171
125	3-ethyloctane	0.151	0.123	0.006	0.008	0.012	0.007	<DL	<DL	0.036	0.025	0.004	0.006
126	3-methylnonane	0.670	0.531	0.025	0.002	0.020	0.015	<DL	<DL	0.150	0.115	0.032	0.0004
127	2-ethyltoluene	0.957	0.680	0.037	0.010	0.050	0.037	0.0007	0.001	0.221	0.134	0.026	0.003
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	4.386	2.957	0.217	0.003	0.071	0.072	0.010	0.014	0.983	0.633	0.184	0.012
129	isobutylcyclohexane	0.396	0.338	0.036	0.020	0.062	0.026	0.011	0.015	0.111	0.072	0.026	0.023
130	n-decane	4.823	3.696	0.182	0.016	0.110	0.155	<DL	<DL	1.075	0.817	0.234	0.012
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.214	0.168	0.016	0.023	0.007	0.010	<DL	<DL	0.050	0.043	0.010	0.002
132	sec-butylbenzene	0.432	0.345	0.007	0.011	0.018	0.009	<DL	<DL	0.097	0.072	0.023	0.012

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
133	3-isopropyltoluene	0.472	0.361	<DL	<DL	0.027	0.005	0.015	0.022	0.110	0.083	0.007	0.002
134	4-isopropyltoluene	1.527	1.007	0.041	0.048	0.057	0.019	0.023	0.032	0.349	0.195	0.060	0.007
135	indan	0.531	0.382	<DL	<DL	<DL	<DL	<DL	<DL	0.111	0.080	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.119	0.168	0.006	0.009	0.047	0.044	<DL	<DL	0.039	0.025	<DL	<DL
138	3-n-propyltoluene	3.305	2.344	0.101	0.015	0.101	0.098	0.002	0.003	0.739	0.512	0.165	0.010
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	1.265	0.831	0.077	0.005	0.022	0.032	0.003	0.005	0.288	0.180	0.048	0.0004
140	1,2-diethylbenzene	0.538	0.380	0.026	0.001	0.045	0.028	<DL	<DL	0.130	0.071	0.024	0.003
141	2-n-propyltoluene	2.480	1.690	0.109	0.009	0.067	0.095	0.004	0.005	0.560	0.378	0.125	0.009
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	<DL	<DL	0.007	0.010	<DL	<DL	0.002	0.003	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.630	0.395	0.031	0.013	0.023	0.012	0.006	0.008	0.146	0.091	0.028	0.001
144	1,2-dimethyl-4-ethylbenzene	0.748	0.443	0.063	0.004	0.013	0.019	0.001	0.002	0.174	0.097	0.024	0.005
145	1,3-dimethyl-2-ethylbenzene	0.434	0.291	<DL	<DL	0.042	0.059	<DL	<DL	0.102	0.044	<DL	<DL
146	n-undecane	2.417	1.427	0.226	0.006	0.062	0.088	0.006	0.003	0.572	0.322	0.117	0.006
147	1,2-dimethyl-3-ethylbenzene	0.807	0.496	0.049	0.015	0.095	0.104	<DL	<DL	0.205	0.072	0.022	0.002
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.531	0.273	0.131	0.019	0.143	0.203	0.083	0.091	0.203	0.135	0.342	0.117
149	1,2,3,5-tetramethylbenzene	0.661	0.355	0.084	0.003	<DL	<DL	<DL	<DL	0.156	0.073	<DL	<DL
150	tert-butyl-2-methylbenzene	0.120	0.068	0.023	0.003	0.020	0.020	<DL	<DL	0.036	0.008	0.004	0.0004
151	n-pentylbenzene	0.262	0.110	0.066	0.026	0.003	0.004	0.001	0.002	0.070	0.018	0.015	0.006
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	0.003	0.005	<DL	<DL	0.0009	0.001	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.087	0.043	0.031	0.001	0.005	0.007	<DL	<DL	0.026	0.011	0.007	0.0004
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	0.661	0.096	0.328	0.102	<DL	<DL	<DL	<DL	0.210	0.002	<DL	<DL
156	n-dodecane	0.375	0.111	0.183	0.024	0.021	0.030	0.006	0.002	0.126	0.026	0.028	0.008

11.c Sentra Emission Rates, 20° Tests

Sentra, Speciated VOC Emission Rates (mg/mile) from E0 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	5.709	0.955	<DL	<DL	2.593	0.616	<DL	<DL	1.892	0.341	1.464	0.411
2	ethylene	4.001	0.995	<DL	<DL	0.026	0.046	0.017	0.030	0.839	0.209	0.036	0.036
3	acetylene	0.002	0.003	<DL	<DL	<DL	<DL	0.004	0.007	0.002	0.002	0.00004	0.00007
4	ethane	2.687	0.776	0.003	0.005	0.475	0.252	0.002	0.004	0.687	0.217	0.192	0.106
5	propylene	3.110	0.568	<DL	<DL	0.012	0.021	0.003	0.006	0.647	0.120	0.005	0.009
6	propane	0.591	0.246	<DL	<DL	0.234	0.349	0.114	0.198	0.220	0.117	<DL	<DL
7	propyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.020
8	isobutane	0.788	0.832	<DL	<DL	0.043	0.074	<DL	<DL	0.175	0.172	<DL	<DL
9	isobutene/1-butene	1.906	1.035	<DL	<DL	0.017	0.030	0.0008	0.001	0.399	0.221	0.006	0.008
10	13-butadiene	0.052	0.070	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.015	<DL	<DL
11	n-butane	1.449	0.682	<DL	<DL	0.025	0.043	0.039	0.067	0.318	0.169	0.011	0.010
12	t2-butene	0.675	0.239	<DL	<DL	<DL	<DL	<DL	<DL	0.139	0.049	0.001	0.002
13	22-dm-propane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
14	1-butyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
15	c2-butene	0.313	0.145	<DL	<DL	0.002	0.002	<DL	<DL	0.065	0.029	0.039	0.018
16	12-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
17	3m1-butene	0.013	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0004	<DL	<DL
18	2m-butane	7.940	1.951	0.340	0.391	0.564	0.320	0.588	0.655	2.046	0.637	0.370	0.266
19	14-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
20	2-butyne	<DL	<DL	0.009	0.016	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
21	1-pentene	0.028	0.015	0.049	0.025	0.029	0.013	0.049	0.027	0.039	0.020	0.015	0.006
22	2m1-butene	0.083	0.010	0.014	0.018	0.011	0.010	0.018	0.021	0.029	0.011	0.006	0.005
23	n-pentane	3.314	0.801	0.154	0.170	0.163	0.145	0.215	0.248	0.828	0.278	0.118	0.115
24	2m-13-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
25	t2-pentene	0.080	0.010	0.016	0.018	0.011	0.012	0.020	0.021	0.029	0.013	0.007	0.006
26	c2-pentene	0.021	0.018	0.010	0.011	0.010	0.009	0.022	0.009	0.016	0.010	0.004	0.004
27	2m2-butene	0.527	0.181	0.026	0.028	0.018	0.018	0.030	0.034	0.129	0.018	0.007	0.010
28	22-dm-butane	0.388	0.077	0.036	0.032	0.039	0.020	0.043	0.023	0.112	0.021	0.021	0.010
29	cyclopentene	0.034	0.016	<DL	<DL	0.0002	0.0004	<DL	<DL	0.007	0.003	<DL	<DL
30	4m1-pentene	0.012	0.007	0.008	0.014	0.005	0.005	0.004	0.007	0.007	0.007	0.003	0.003
31	cyclopentane	0.317	0.046	0.007	0.006	0.018	0.010	0.021	0.007	0.078	0.008	0.011	0.003
32	23-dm-butane	2.312	0.532	0.117	0.128	0.141	0.060	0.153	0.176	0.588	0.166	0.076	0.054
33	c/t-4m2-pentene	2.045	0.388	0.268	0.306	0.254	0.143	0.349	0.296	0.655	0.235	0.127	0.093
34	2m-pentane	0.068	0.104	0.111	0.191	0.067	0.116	0.119	0.207	0.092	0.157	0.047	0.082
35	3m-pentane	1.202	0.226	0.165	0.186	0.156	0.088	0.212	0.179	0.391	0.143	0.074	0.056
36	1-hexene/2m1-pentene	0.019	0.010	0.030	0.016	0.020	0.009	0.025	0.022	0.023	0.014	0.010	0.005
37	c/t-3-hexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
38	n-hexane	1.419	0.275	0.215	0.252	0.200	0.114	0.278	0.214	0.478	0.165	0.093	0.073
39	t2-hexene	0.019	0.007	0.018	0.017	0.015	0.007	0.018	0.015	0.017	0.011	0.005	0.004
40	2m2-pentene	0.032	0.008	0.006	0.010	0.005	0.005	0.006	0.010	0.011	0.006	0.002	0.004
41	t-3m2-pentene	0.025	0.003	0.006	0.010	0.004	0.007	0.006	0.011	0.009	0.007	0.002	0.003

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
42	c2-hexene	0.010	0.006	0.011	0.009	0.006	0.006	0.010	0.010	0.009	0.006	0.002	0.003
43	c-3m2-pentene	0.033	0.003	0.006	0.011	0.004	0.005	0.006	0.009	0.011	0.006	0.002	0.003
44	22-dm-pentane	0.094	0.010	0.004	0.008	0.007	0.006	0.004	0.007	0.023	0.003	0.004	0.003
45	m-cyclopentane	1.019	0.223	0.092	0.100	0.084	0.045	0.119	0.088	0.289	0.081	0.042	0.031
46	24-dm-pentane	1.576	0.278	0.047	0.062	0.075	0.047	0.062	0.077	0.375	0.053	0.033	0.035
47	223-tm-butane	0.121	0.018	<DL	<DL	0.008	0.008	<DL	<DL	0.027	0.002	0.004	0.003
48	benzene	1.304	0.298	0.038	0.066	0.088	0.101	0.039	0.067	0.314	0.022	0.078	0.125
49	1m-cyclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
50	33-dm-pentane	0.081	0.015	0.006	0.009	0.006	0.006	0.008	0.008	0.022	0.004	0.002	0.004
51	cyclohexane	1.225	0.223	0.206	0.187	0.084	0.077	0.084	0.145	0.347	0.069	0.059	0.041
52	2m-hexane	0.484	0.105	0.037	0.047	0.038	0.024	0.043	0.053	0.131	0.034	0.020	0.020
53	23-dm-pentane	1.273	0.283	0.048	0.061	0.062	0.038	0.064	0.081	0.310	0.069	0.031	0.039
54	11-dm-cyP	0.071	0.014	0.0005	0.0009	0.007	0.007	0.004	0.007	0.018	0.0006	0.001	0.002
55	cyclohexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
56	3m-hexane	0.507	0.093	0.037	0.051	0.040	0.026	0.047	0.054	0.138	0.035	0.013	0.007
57	c-13-dm-cyP	0.101	0.021	0.018	0.019	0.013	0.008	0.019	0.016	0.034	0.013	0.007	0.005
58	3e-pentane/t-13-dm-cyP	0.130	0.025	0.020	0.018	0.018	0.010	0.025	0.022	0.044	0.014	0.011	0.006
59	t-12-dm-cyP/1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
60	224-tm-pentane	15.080	3.013	0.061	0.106	0.601	0.785	0.123	0.213	3.332	0.444	0.235	0.300
61	t3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	n-heptane	0.395	0.089	0.017	0.023	0.021	0.015	0.020	0.027	0.097	0.015	0.011	0.014
63	c3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
64	t2-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
65	c2-heptene	0.022	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.002	<DL	<DL
66	m-cyclohexane/22-dm-hexane	0.914	0.177	0.036	0.041	0.046	0.025	0.051	0.042	0.224	0.029	0.024	0.022
67	12dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
68	25-dm-hexane/e-cyP	1.066	0.275	0.006	0.007	0.027	0.031	0.010	0.017	0.232	0.048	0.016	0.019
69	24-dm-hexane/223-tm-pentane	1.930	0.388	0.003	0.003	0.056	0.079	0.010	0.017	0.418	0.068	0.027	0.033
70	33-dm-hexane/ctc124-tm-cyP	0.047	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.002	<DL	<DL
71	ctc123-tm-cyP	0.021	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.0003	<DL	<DL
72	234-tm-pentane	4.927	0.829	0.009	0.008	0.159	0.236	0.020	0.035	1.070	0.148	0.063	0.080
73	toluene/233-tm-pentane	7.029	0.389	2.532	0.900	1.521	0.493	2.235	0.897	3.096	0.495	1.221	0.506
74	23-dm-hexane	1.024	0.205	0.0007	0.001	0.026	0.039	0.002	0.004	0.219	0.040	0.012	0.016
75	112-tm-cyP	0.050	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.001	<DL	<DL
76	2m-heptane	0.105	0.027	<DL	<DL	<DL	<DL	<DL	<DL	0.022	0.006	0.001	0.002
77	4m-C7/3m3e-C5/1m-cyHexene	0.043	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.003	<DL	<DL
78	34-dm-hexane	0.196	0.037	<DL	<DL	0.006	0.010	<DL	<DL	0.042	0.008	0.002	0.004
79	3m-heptane/3e-hexane	0.114	0.037	<DL	<DL	<DL	<DL	0.0002	0.0004	0.024	0.008	0.002	0.004
80	t-13-dm-cyH	0.006	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
81	cct-124-tm-cyP/c-13-dm-cyH	0.058	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.012	0.004	<DL	<DL
82	t-14-dm-cyH	0.041	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.003	<DL	<DL
83	225-tm-hexane	1.034	0.220	0.001	0.002	0.029	0.049	<DL	<DL	0.222	0.048	0.016	0.017
84	11-dm-cyH/1-octene	0.022	0.015	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.003	<DL	<DL
85	1e1m-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
86	224-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
87	n-octane/t12-dm-cyH	0.114	0.035	<DL	<DL	<DL	<DL	<DL	<DL	0.024	0.007	0.0008	0.001

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
88	t2-octene	0.002	0.003	<DL	<DL	0.003	0.003	<DL	<DL	0.001	0.001	<DL	<DL
89	ccc-123-tm-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
90	244-tm-hexane	0.026	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.0005	<DL	<DL
91	c2-octene	0.020	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.004	<DL	<DL
92	ip-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
93	235-tm-hexane	0.148	0.028	<DL	<DL	0.004	0.008	<DL	<DL	0.032	0.006	0.002	0.003
94	44&22-dm-heptane	0.012	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002	0.0003	0.0005
95	24-dm-heptane	0.023	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.0009	<DL	<DL
96	26-dm-heptane/c12-dm-cyH	0.029	0.006	<DL	<DL	0.003	0.005	<DL	<DL	0.007	0.002	<DL	<DL
97	np-cyP/e-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
98	ccc-135-tm-cyH	0.010	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
99	25-dm-heptane/35-dm-heptane	0.043	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.002	<DL	<DL
100	33-dm-heptane	0.023	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.001	<DL	<DL
101	114-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
102	e-benzene	0.008	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002	<DL	<DL
103	cct-124-tm-cyH	0.011	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
104	23-dm-heptane	0.096	0.130	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.027	<DL	<DL
105	m&p-xylene/34-dm-heptane	0.017	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
106	2m-octane	0.009	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002	<DL	<DL
107	246-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	3m-octane	0.005	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.001	<DL	<DL
109	ctc-124-tm-cyH	0.030	0.026	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.005	0.004	0.005
110	33-de-C5/3e-C7	0.085	0.032	<DL	<DL	0.002	0.002	<DL	<DL	0.018	0.006	<DL	<DL
111	o-xylene	0.023	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.005	<DL	<DL
112	112-tm-cyH	0.021	0.036	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.007	<DL	<DL
113	1-nonene	0.031	0.028	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.006	0.001	0.002
114	t3-nonene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
115	c3-nonene/ib-cyP	0.011	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.004	<DL	<DL
116	n-nonane	0.016	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.003	<DL	<DL
117	t2-nonene	0.021	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.004	<DL	<DL
118	c2-nonene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
119	ip-benzene	0.002	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.0004	0.0007	<DL	<DL
120	22-dm-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
121	ip-cyH	0.007	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.001	<DL	<DL
122	nb-cyP	0.016	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.003	<DL	<DL
123	33-dm-octane	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.012	0.002	0.003	0.0008	0.001
124	n-propylbenzene	0.002	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.0004	0.0007	<DL	<DL
125	3e-toluene	<DL	<DL	0.010	0.017	<DL	<DL	<DL	<DL	0.002	0.004	<DL	<DL
126	4e-toluene/23-dm-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
127	135-tm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
128	2m-nonane	0.080	0.070	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.014	0.005	0.008
129	3e-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
130	3m-nonane	0.002	0.003	0.0004	0.0007	<DL	<DL	<DL	<DL	0.0005	0.0009	<DL	<DL
131	2e-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
132	124-tm-benzene/tb-benz/1-decene	0.003	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.0006	0.001	<DL	<DL
133	ib-cyH	0.008	0.008	<DL	<DL	0.004	0.007	<DL	<DL	0.003	0.003	0.0004	0.0007

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
134	n-decane	0.019	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.004	<DL	<DL
135	ib-benzene/t-1m-2p-CyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
136	sb-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	3-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
138	123-tm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
139	4-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
140	indan	0.006	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
141	2-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
142	13-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
143	14-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
144	3-np-toluene	0.063	0.018	<DL	<DL	0.0007	0.001	<DL	<DL	0.013	0.004	0.002	0.003
145	4-np-toluene/nb-benz/13dm5e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
146	12de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
147	2-np-toluene	0.042	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.003	0.0008	0.001
148	14dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
149	13dm-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
150	12dm-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
151	13dm-2e-benzene	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL	0.0005	0.0008	<DL	<DL
152	n-undecane/12dm-3e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	1245-ttm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
154	2mb-benzene	0.005	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	0.005	0.005
155	tb-2m-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
156	1234-ttm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
157	npentyl-benzene/t-1m-2-(4mp)CyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.049
158	tb-35dm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
159	tb-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
160	naphthalene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
161	n-dodecane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL

Sentra, Speciated VOC Emission Rates (mg/mile) from E10 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	7.620	1.776	<DL	<DL	2.430	0.542	<DL	<DL	2.246	0.363	1.570	0.447
2	ethylene	4.366	1.117	0.006	0.0003	0.031	0.036	0.010	0.010	0.917	0.236	0.018	0.025
3	acetylene	0.012	0.021	0.042	0.073	0.036	0.055	0.057	0.094	0.039	0.064	0.010	0.014
4	ethane	2.678	0.631	0.011	0.018	0.454	0.108	0.030	0.008	0.691	0.119	0.219	0.055
5	propylene	2.774	1.213	<DL	<DL	<DL	<DL	<DL	<DL	0.575	0.253	0.179	0.159
6	propane	0.279	0.094	0.007	0.012	0.052	0.080	0.006	0.006	0.076	0.030	<DL	<DL
7	propyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.024	0.034
8	isobutane	2.065	0.827	0.089	0.085	0.081	0.102	0.159	0.150	0.517	0.252	0.013	0.018
9	isobutene/1-butene	1.960	0.289	0.002	0.004	<DL	<DL	0.001	0.003	0.407	0.061	0.010	0.014
10	13-butadiene	0.081	0.140	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.029	<DL	<DL
11	n-butane	2.985	1.330	0.757	0.371	0.258	0.270	0.574	0.539	1.027	0.531	0.162	0.035

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
12	t2-butene	0.686	0.296	0.011	0.009	<DL	<DL	0.005	0.006	0.146	0.064	0.004	0.005
13	22-dm-propane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
14	1-butyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
15	c2-butene	0.441	0.060	0.003	0.005	0.003	0.006	0.003	0.006	0.094	0.017	<DL	<DL
16	12-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
17	3m1-butene	0.025	0.005	<DL	<DL	<DL	<DL	0.004	0.007	0.006	0.001	<DL	<DL
18	2m-butane	10.162	0.178	0.997	0.197	0.370	0.335	0.813	0.726	2.669	0.284	0.568	0.078
19	14-pentadiene	0.001	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.0002	0.0004	<DL	<DL
20	2-butyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
21	1-pentene	0.074	0.008	0.123	0.027	0.059	0.008	0.124	0.006	0.095	0.011	0.069	0.027
22	2m1-butene	0.116	0.017	0.025	0.007	0.011	0.004	0.024	0.012	0.040	0.005	0.010	0.002
23	n-pentane	3.801	0.178	0.212	0.078	0.086	0.075	0.191	0.174	0.915	0.056	0.124	0.006
24	2m-13-butadiene	<DL	<DL	<DL	<DL	0.0005	0.0008	0.001	0.002	0.0005	0.0009	<DL	<DL
25	t2-pentene	0.141	0.005	0.033	0.004	0.023	0.014	0.045	0.027	0.056	0.010	0.013	0.003
26	c2-pentene	0.069	0.024	0.043	0.029	0.021	0.018	0.037	0.021	0.041	0.023	0.018	0.018
27	2m2-butene	0.652	0.087	0.043	0.006	0.018	0.003	0.040	0.013	0.161	0.018	0.011	0.003
28	22-dm-butane	0.423	0.038	0.043	0.003	0.024	0.011	0.041	0.025	0.116	0.002	0.022	0.002
29	cyclopentene	0.037	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.001	<DL	<DL
30	4m1-pentene	0.008	0.013	0.006	0.010	0.005	0.009	0.008	0.014	0.007	0.012	0.003	0.004
31	cyclopentane	0.386	0.048	0.025	0.022	0.007	0.012	0.015	0.025	0.092	0.019	0.009	0.006
32	23-dm-butane	2.926	0.267	0.058	0.042	0.039	0.035	0.078	0.071	0.653	0.029	0.066	0.009
33	c/t-4m2-pentene	2.737	0.243	0.173	0.151	0.088	0.054	0.289	0.208	0.715	0.068	0.086	0.026
34	2m-pentane	0.037	0.041	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.008	<DL	<DL
35	3m-pentane	1.610	0.164	0.126	0.055	0.058	0.019	0.123	0.062	0.414	0.035	0.058	0.006
36	1-hexene/2m1-pentene	0.022	0.011	0.044	0.028	0.016	0.005	0.027	0.005	0.027	0.008	0.010	0.006
37	c/t-3-hexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
38	n-hexane	2.006	0.181	0.167	0.047	0.051	0.045	0.106	0.086	0.498	0.063	0.047	0.003
39	t2-hexene	0.020	0.017	0.013	0.011	0.006	0.006	0.035	0.044	0.019	0.019	0.002	0.003
40	2m2-pentene	0.055	0.0009	0.016	0.018	0.006	0.011	0.005	0.009	0.018	0.009	0.010	0.010
41	t-3m2-pentene	0.037	0.003	0.012	0.011	<DL	<DL	<DL	<DL	0.010	0.002	<DL	<DL
42	c2-hexene	0.016	0.0008	0.012	0.0003	0.006	0.005	0.010	0.008	0.010	0.004	<DL	<DL
43	c-3m2-pentene	0.046	0.003	0.010	0.006	0.003	0.005	0.011	0.004	0.016	0.004	<DL	<DL
44	22-dm-pentane	0.134	0.012	0.004	0.006	0.002	0.004	<DL	<DL	0.029	0.001	0.002	0.003
45	m-cyclopentane	1.317	0.128	0.086	0.016	0.031	0.014	0.066	0.045	0.320	0.017	0.033	0.00006
46	24-dm-pentane	2.181	0.171	0.039	0.024	0.018	0.017	0.038	0.038	0.477	0.026	0.031	0.001
47	223-tm-butane	0.162	0.015	<DL	<DL	<DL	<DL	<DL	<DL	0.034	0.003	<DL	<DL
48	benzene	2.102	0.404	<DL	<DL	<DL	<DL	<DL	<DL	0.436	0.085	0.123	0.124
49	1m-cyclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
50	33-dm-pentane	0.095	0.007	0.006	0.005	0.002	0.003	0.004	0.005	0.023	0.004	0.002	0.003
51	cyclohexane	1.600	0.121	0.042	0.015	0.015	0.014	0.031	0.029	0.354	0.015	0.024	0.005
52	2m-hexane	0.810	0.054	0.022	0.016	0.008	0.010	0.020	0.021	0.181	0.010	0.017	0.004
53	23-dm-pentane	1.643	0.128	0.029	0.032	0.010	0.018	0.026	0.038	0.357	0.030	0.027	0.004
54	11-dm-cyP	0.111	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.023	0.002	<DL	<DL
55	cyclohexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
56	3m-hexane	0.834	0.065	0.024	0.018	0.009	0.012	0.021	0.024	0.187	0.015	0.017	0.004
57	c-13-dm-cyP	0.173	0.013	0.011	0.007	0.005	0.003	0.009	0.008	0.042	0.004	0.005	0.001

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
58	3e-pentane/t-13-dm-cyP	0.229	0.017	0.016	0.009	0.007	0.005	0.014	0.010	0.057	0.006	0.006	0.002
59	t-12-dm-cyP/1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
60	224-tm-pentane	18.224	1.159	0.069	0.120	0.071	0.061	0.073	0.126	3.831	0.211	0.254	0.112
61	t3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	n-heptane	0.878	0.048	0.008	0.013	0.003	0.006	0.007	0.013	0.187	0.007	0.014	0.004
63	c3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
64	t2-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
65	c2-heptene	0.027	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.0007	<DL	<DL
66	m-cyclohexane/22-dm-hexane	1.875	0.140	0.025	0.012	0.012	0.011	0.025	0.022	0.405	0.018	0.023	0.006
67	12dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
68	25-dm-hexane/e-cyP	1.558	0.073	0.007	0.012	0.003	0.005	0.006	0.010	0.327	0.010	0.019	0.004
69	24-dm-hexane/223-tm-pentane	2.471	0.123	0.008	0.013	0.003	0.006	0.007	0.012	0.516	0.023	0.032	0.010
70	33-dm-hexane/ctc124-tm-cyP	0.094	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.019	0.002	<DL	<DL
71	ctc123-tm-cyP	0.051	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.001	<DL	<DL
72	234-tm-pentane	5.981	0.307	0.017	0.029	0.011	0.014	0.018	0.031	1.251	0.057	0.071	0.032
73	toluene/233-tm-pentane	8.060	0.479	1.476	0.275	0.354	0.612	1.418	0.357	2.514	0.412	0.875	0.080
74	23-dm-hexane	1.365	0.064	0.006	0.010	0.003	0.005	0.005	0.009	0.286	0.011	0.016	0.006
75	112-tm-cyP	0.064	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.0008	<DL	<DL
76	2m-heptane	0.283	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.059	0.002	0.003	0.003
77	4m-C7/3m3e-C5/1m-cyHexene	0.102	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.021	0.001	<DL	<DL
78	34-dm-hexane	0.266	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.055	0.002	0.003	0.004
79	3m-heptane/3e-hexane	0.274	0.021	0.004	0.006	<DL	<DL	<DL	<DL	0.057	0.005	0.003	0.003
80	t-13-dm-cyH	0.018	0.031	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.006	<DL	<DL
81	cct-124-tm-cyP/c-13-dm-cyH	0.246	0.051	<DL	<DL	0.003	0.005	<DL	<DL	0.052	0.012	0.009	0.012
82	t-14-dm-cyH	0.112	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.023	0.002	<DL	<DL
83	225-tm-hexane	1.412	0.064	0.006	0.010	0.004	0.006	0.005	0.009	0.296	0.009	0.022	0.008
84	11-dm-cyH/1-octene	0.072	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.001	<DL	<DL
85	1e1m-cyP	0.015	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0008	<DL	<DL
86	224-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
87	n-octane/t12-dm-cyH	0.428	0.017	0.006	0.010	0.0005	0.0008	0.0005	0.0009	0.090	0.0009	0.009	0.001
88	t2-octene	0.007	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
89	ccc-123-tm-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
90	244-tm-hexane	0.069	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.001	<DL	<DL
91	c2-octene	0.044	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.0004	<DL	<DL
92	ip-cyP	0.010	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.0003	<DL	<DL
93	235-tm-hexane	0.203	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.042	0.002	0.002	0.003
94	44&22-dm-heptane	0.018	0.007	0.001	0.002	0.001	0.002	0.002	0.002	0.005	0.002	<DL	<DL
95	24-dm-heptane	0.049	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.002	<DL	<DL
96	26-dm-heptane/c12-dm-cyH	0.091	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.019	0.001	<DL	<DL
97	np-cyP/e-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
98	ccc-135-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
99	25-dm-heptane/35-dm-heptane	0.102	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.021	0.002	0.002	0.002
100	33-dm-heptane	0.087	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.001	<DL	<DL
101	114-tm-cyH	0.025	0.0006	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.0001	<DL	<DL
102	e-benzene	0.052	0.020	0.001	0.002	<DL	<DL	0.002	0.004	0.012	0.005	0.002	0.003
103	cct-124-tm-cyH	0.043	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.0007	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
104	23-dm-heptane	0.066	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.001	<DL	<DL
105	m&p-xylene/34-dm-heptane	0.195	0.046	<DL	<DL	<DL	<DL	<DL	<DL	0.040	0.010	0.001	0.002
106	2m-octane	0.098	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.0008	0.0002	0.0003
107	246-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	3m-octane	0.087	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.0006	0.002	0.003
109	ctc-124-tm-cyH	0.018	0.031	0.004	0.004	<DL	<DL	0.002	0.002	0.005	0.007	0.003	0.001
110	33-de-C5/3e-C7	0.121	0.053	<DL	<DL	<DL	<DL	<DL	<DL	0.025	0.011	0.001	0.001
111	o-xylene	0.125	0.020	<DL	<DL	0.0008	0.001	0.001	0.002	0.026	0.005	0.001	0.002
112	112-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
113	1-nonene	0.106	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.022	0.001	<DL	<DL
114	t3-nonene	0.022	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.0007	<DL	<DL
115	c3-nonene/ib-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
116	n-nonane	0.187	0.009	<DL	<DL	0.001	0.002	0.0009	0.002	0.039	0.0009	0.005	0.001
117	t2-nonene	0.044	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.002	<DL	<DL
118	c2-nonene	0.048	0.022	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.005	<DL	<DL
119	ip-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
120	22-dm-octane	0.034	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.004	<DL	<DL
121	ip-cyH	0.074	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.001	<DL	<DL
122	nb-cyP	0.140	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.029	0.001	0.002	0.003
123	33-dm-octane	0.019	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.001	0.0008	0.001
124	n-propylbenzene	0.026	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.002	<DL	<DL
125	3e-toluene	0.012	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.003	<DL	<DL
126	4e-toluene/23-dm-octane	0.042	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.002	0.002	0.003
127	135-tm-benzene	0.058	0.011	0.004	0.007	<DL	<DL	<DL	<DL	0.013	0.004	0.002	0.003
128	2m-nonane	<DL	<DL	<DL	<DL	0.011	0.011	0.016	0.013	0.008	0.007	0.013	0.006
129	3e-octane	0.005	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
130	3m-nonane	0.031	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.0007	0.002	0.004
131	2e-toluene	0.0006	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.0001	0.0002	<DL	<DL
132	124-tm-benzene/tb-benz/1-decene	0.013	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.003	<DL	<DL
133	ib-cyH	0.015	0.012	0.017	0.015	<DL	<DL	<DL	<DL	0.007	0.001	0.002	0.003
134	n-decane	0.089	0.005	<DL	<DL	0.002	0.003	0.002	0.003	0.019	0.002	0.004	0.001
135	ib-benzene/t-1m-2p-CyH	0.005	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.0009	0.002	<DL	<DL
136	sb-benzene	0.009	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
137	3-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
138	123-tm-benzene	0.017	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.004	<DL	<DL
139	4-ip-toluene	0.021	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.001	<DL	<DL
140	indan	<DL	<DL	<DL	<DL	0.0006	0.001	<DL	<DL	0.0002	0.0003	<DL	<DL
141	2-ip-toluene	0.002	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.0005	0.0008	<DL	<DL
142	13-de-benzene	0.002	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.0004	0.0007	<DL	<DL
143	14-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
144	3-np-toluene	0.100	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.021	0.004	0.003	0.005
145	4-np-toluene/nb-benz/13dm5e-benzene	0.006	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
146	12de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
147	2-np-toluene	0.060	0.010	0.004	0.006	0.002	0.004	<DL	<DL	0.014	0.004	0.003	0.004
148	14dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
149	13dm-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
150	12dm-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
151	13dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
152	n-undecane/12dm-3e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	1245-ttm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
154	2mb-benzene	0.007	0.012	0.007	0.012	<DL	<DL	<DL	<DL	0.003	0.005	0.002	0.004
155	tb-2m-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
156	1234-ttm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
157	npentyl-benzene/t-1m-2-(4mp)CyP	0.002	0.003	0.010	0.017	<DL	<DL	<DL	<DL	0.003	0.003	0.005	0.007
158	tb-35dm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
159	tb-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
160	naphthalene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
161	n-dodecane	0.003	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.0007	0.001	<DL	<DL

Sentra, Speciated VOC Emission Rates (mg/mile) from E10-Spl Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	6.356	0.284	<DL	<DL	2.210	0.055	<DL	<DL	1.921	0.046	0.952	0.081
2	ethylene	3.953	0.183	<DL	<DL	0.016	0.023	0.014	0.020	0.826	0.037	0.004	0.006
3	acetylene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.005
4	ethane	2.745	0.119	<DL	<DL	0.252	0.016	<DL	<DL	0.637	0.030	0.051	0.072
5	propylene	2.766	0.313	<DL	<DL	<DL	<DL	0.006	0.008	0.574	0.067	0.004	0.005
6	propane	0.672	0.047	<DL	<DL	<DL	<DL	<DL	<DL	0.139	0.010	0.004	0.006
7	propyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
8	isobutane	0.917	0.330	<DL	<DL	0.107	0.062	0.081	0.078	0.243	0.108	0.003	0.004
9	isobutene/1-butene	1.800	0.138	<DL	<DL	<DL	<DL	0.006	0.008	0.374	0.031	0.0004	0.00009
10	13-butadiene	0.044	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.002	<DL	<DL
11	n-butane	1.171	0.563	0.613	0.608	0.547	0.215	0.892	0.281	0.793	0.394	0.235	0.133
12	t2-butene	0.552	0.119	0.002	0.003	<DL	<DL	0.007	0.009	0.117	0.021	<DL	<DL
13	22-dm-propane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
14	1-butyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
15	c2-butene	0.340	0.082	0.007	0.004	0.007	0.009	0.006	0.002	0.076	0.015	<DL	<DL
16	12-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
17	3m1-butene	0.019	0.005	0.006	0.009	<DL	<DL	0.006	0.009	0.007	0.006	<DL	<DL
18	2m-butane	6.950	2.402	0.809	1.144	0.810	0.501	1.182	1.109	2.190	1.217	0.298	0.421
19	14-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
20	2-butyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
21	1-pentene	0.047	0.047	0.066	0.094	0.061	0.012	0.110	0.021	0.074	0.040	0.020	0.029
22	2m1-butene	0.110	0.028	0.031	0.026	0.025	0.007	0.043	0.017	0.049	0.018	0.006	0.009
23	n-pentane	2.305	1.085	0.168	0.238	0.203	0.287	0.346	0.489	0.672	0.501	0.202	0.007
24	2m-13-butadiene	0.003	0.004	<DL	<DL	<DL	<DL	0.001	0.001	0.0009	0.001	0.004	0.005
25	t2-pentene	0.107	0.026	0.039	0.023	0.029	0.008	0.049	0.019	0.053	0.018	0.008	0.011
26	c2-pentene	0.080	0.026	0.071	0.046	0.057	0.020	0.075	0.035	0.071	0.032	0.006	0.008
27	2m2-butene	0.613	0.078	0.058	0.030	0.041	0.011	0.071	0.023	0.172	0.033	0.005	0.007

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
28	22-dm-butane	0.266	0.148	0.050	0.071	0.050	0.025	0.080	0.050	0.103	0.068	0.016	0.023
29	cyclopentene	0.027	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.0005	<DL	<DL
30	4m1-pentene	0.019	0.007	0.013	0.019	0.008	0.012	0.015	0.021	0.014	0.015	0.004	0.006
31	cyclopentane	0.205	0.109	0.020	0.028	0.023	0.003	0.036	0.013	0.064	0.033	0.006	0.009
32	23-dm-butane	1.999	0.554	0.124	0.135	0.143	0.051	0.216	0.144	0.544	0.201	0.046	0.065
33	c/t-4m2-pentene	1.871	0.606	0.457	0.356	0.337	0.162	0.588	0.312	0.755	0.341	0.105	0.149
34	2m-pentane	0.129	0.182	<DL	<DL	<DL	<DL	0.008	0.011	0.029	0.041	<DL	<DL
35	3m-pentane	1.099	0.348	0.273	0.219	0.203	0.096	0.337	0.175	0.443	0.199	0.064	0.090
36	1-hexene/2m1-pentene	0.023	0.013	0.046	0.021	0.031	0.012	0.053	0.019	0.039	0.016	0.008	0.012
37	c/t-3-hexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
38	n-hexane	1.234	0.416	0.368	0.299	0.275	0.144	0.450	0.257	0.546	0.268	0.085	0.120
39	t2-hexene	0.026	0.011	0.030	0.016	0.019	0.009	0.029	0.018	0.026	0.014	0.005	0.008
40	2m2-pentene	0.041	0.007	0.012	0.017	0.011	0.004	0.012	0.016	0.018	0.011	0.003	0.004
41	t-3m2-pentene	0.031	0.008	0.024	0.011	0.016	0.006	0.017	0.024	0.021	0.013	0.004	0.005
42	c2-hexene	0.017	0.001	0.024	0.018	0.012	0.005	0.024	0.017	0.019	0.011	0.003	0.005
43	c-3m2-pentene	0.037	0.006	0.018	0.009	0.012	0.005	0.019	0.009	0.021	0.007	0.002	0.003
44	22-dm-pentane	0.084	0.015	0.011	0.015	0.010	0.005	<DL	<DL	0.022	0.008	0.003	0.004
45	m-cyclopentane	0.740	0.209	0.144	0.093	0.106	0.042	0.187	0.095	0.270	0.104	0.031	0.044
46	24-dm-pentane	1.497	0.324	0.096	0.098	0.083	0.040	0.133	0.071	0.393	0.121	0.024	0.034
47	223-tm-butane	0.109	0.023	0.007	0.010	0.005	0.007	<DL	<DL	0.025	0.009	0.002	0.003
48	benzene	1.200	0.022	0.025	0.036	0.022	0.015	0.046	0.021	0.273	0.014	0.017	0.005
49	1m-cyclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
50	33-dm-pentane	0.063	0.012	0.009	0.012	0.006	0.008	0.014	0.006	0.021	0.009	0.003	0.004
51	cyclohexane	0.625	0.540	0.042	0.059	0.051	0.016	0.082	0.027	0.177	0.137	0.015	0.021
52	2m-hexane	0.449	0.107	0.057	0.061	0.046	0.025	0.073	0.040	0.140	0.054	0.014	0.019
53	23-dm-pentane	1.120	0.245	0.090	0.095	0.073	0.036	0.117	0.060	0.307	0.099	0.021	0.030
54	11-dm-cyP	0.050	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.002	<DL	<DL
55	cyclohexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
56	3m-hexane	0.483	0.113	0.068	0.069	0.052	0.029	0.082	0.044	0.154	0.060	0.016	0.022
57	c-13-dm-cyP	0.084	0.019	0.023	0.009	0.018	0.010	0.029	0.018	0.036	0.014	0.004	0.006
58	3e-pentane/t-13-dm-cyP	0.124	0.033	0.039	0.022	0.024	0.014	0.039	0.023	0.053	0.022	0.008	0.011
59	t-12-dm-cyP/1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
60	224-tm-pentane	12.793	2.094	0.174	0.246	0.208	0.089	0.307	0.151	2.833	0.555	0.065	0.091
61	t3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	n-heptane	0.346	0.077	0.025	0.035	0.022	0.015	0.033	0.023	0.093	0.035	0.007	0.010
63	c3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
64	t2-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
65	c2-heptene	0.018	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.0004	<DL	<DL
66	m-cyclohexane/22-dm-hexane	0.689	0.150	0.055	0.053	0.048	0.018	0.078	0.030	0.191	0.057	0.013	0.019
67	12dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
68	25-dm-hexane/e-cyP	0.952	0.129	0.012	0.017	0.017	0.007	0.024	0.012	0.212	0.036	0.005	0.007
69	24-dm-hexane/223-tm-pentane	1.685	0.250	0.013	0.018	0.018	0.007	0.025	0.011	0.364	0.061	0.005	0.008
70	33-dm-hexane/ctc124-tm-cyP	0.043	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.002	<DL	<DL
71	ctc123-tm-cyP	0.017	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.0006	<DL	<DL
72	234-tm-pentane	4.321	0.658	0.027	0.038	0.043	0.018	0.061	0.027	0.930	0.157	0.011	0.016
73	toluene/233-tm-pentane	6.446	1.920	2.205	1.632	1.507	0.755	2.738	0.602	3.049	1.146	0.617	0.872

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
74	23-dm-hexane	0.925	0.129	0.005	0.008	0.008	0.0004	0.009	0.0008	0.198	0.028	0.002	0.002
75	112-tm-cyP	0.044	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.001	<DL	<DL
76	2m-heptane	0.102	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.021	0.003	<DL	<DL
77	4m-C7/3m3e-C5/1m-cyHexene	0.046	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.001	<DL	<DL
78	34-dm-hexane	0.183	0.025	<DL	<DL	<DL	<DL	<DL	<DL	0.038	0.005	<DL	<DL
79	3m-heptane/3e-hexane	0.124	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.026	0.004	<DL	<DL
80	t-13-dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
81	cct-124-tm-cyP/c-13-dm-cyH	0.069	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.0006	0.007	0.010
82	t-14-dm-cyH	0.037	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.0007	<DL	<DL
83	225-tm-hexane	0.974	0.104	0.002	0.002	0.008	0.0005	0.003	0.005	0.205	0.023	0.002	0.003
84	11-dm-cyH/1-octene	0.025	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.002	<DL	<DL
85	1e1m-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
86	224-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
87	n-octane/t12-dm-cyH	0.104	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.022	0.004	0.001	0.002
88	t2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
89	ccc-123-tm-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
90	244-tm-hexane	0.022	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.0009	<DL	<DL
91	c2-octene	0.015	0.022	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.005	<DL	<DL
92	ip-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
93	235-tm-hexane	0.137	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.003	<DL	<DL
94	44&22-dm-heptane	<DL	<DL	<DL	<DL	0.003	0.004	0.012	0.017	0.004	0.006	0.006	0.008
95	24-dm-heptane	0.021	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.0007	<DL	<DL
96	26-dm-heptane/c12-dm-cyH	0.034	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.001	<DL	<DL
97	np-cyP/e-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
98	ccc-135-tm-cyH	0.014	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
99	25-dm-heptane/35-dm-heptane	0.045	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.001	<DL	<DL
100	33-dm-heptane	0.024	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.0006	<DL	<DL
101	114-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
102	e-benzene	0.014	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0008	0.004	0.005
103	cct-124-tm-cyH	0.011	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.0005	<DL	<DL
104	23-dm-heptane	0.123	0.137	<DL	<DL	<DL	<DL	<DL	<DL	0.025	0.028	<DL	<DL
105	m&p-xylene/34-dm-heptane	0.019	0.027	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.006	0.015	0.022
106	2m-octane	0.014	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
107	246-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	3m-octane	0.009	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	0.003	0.004
109	ctc-124-tm-cyH	0.029	0.026	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.005	0.0009	0.001
110	33-de-C5/3e-C7	0.061	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.005	0.003	0.004
111	o-xylene	0.031	0.043	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.009	0.005	0.006
112	112-tm-cyH	0.023	0.032	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.007	<DL	<DL
113	1-nonene	0.030	0.042	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.009	<DL	<DL
114	t3-nonene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
115	c3-nonene/ib-cyP	0.013	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
116	n-nonane	0.012	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0006	0.004	0.006
117	t2-nonene	0.017	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.005	<DL	<DL
118	c2-nonene	0.010	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
119	ip-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
120	22-dm-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
121	ip-cyH	0.010	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.0005	<DL	<DL
122	nb-cyP	0.015	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0002	0.003	0.005
123	33-dm-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.008
124	n-propylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004
125	3e-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
126	4e-toluene/23-dm-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.005
127	135-tm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004
128	2m-nonane	0.046	0.065	0.008	0.011	0.003	0.004	0.003	0.004	0.013	0.013	0.003	0.004
129	3e-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
130	3m-nonane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003
131	2e-toluene	0.001	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.0003	0.0004	0.003	0.004
132	124-tm-benzene/tb-benz/1-decene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.014
133	ib-cyH	<DL	<DL	<DL	<DL	0.005	0.007	0.009	0.013	0.004	0.006	<DL	<DL
134	n-decane	0.002	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.0004	0.0006	0.008	0.011
135	ib-benzene/t-1m-2p-CyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
136	sb-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	3-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004
138	123-tm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.007
139	4-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
140	indan	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.016
141	2-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
142	13-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
143	14-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
144	3-np-toluene	0.065	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.003	0.002	0.003
145	4-np-toluene/nb-benz/13dm5e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.005
146	12de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
147	2-np-toluene	0.035	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.003	0.002	0.003
148	14dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
149	13dm-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
150	12dm-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
151	13dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
152	n-undecane/12dm-3e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.011
153	1245-ttm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
154	2mb-benzene	0.015	0.0004	0.010	0.014	<DL	<DL	<DL	<DL	0.005	0.003	0.005	0.008
155	tb-2m-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
156	1234-ttm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
157	npentyl-benzene/t-1m-2-(4mp)CyP	0.030	0.042	<DL	<DL	0.013	0.019	0.004	0.006	0.011	0.002	0.002	0.003
158	tb-35dm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
159	tb-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
160	naphthalene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
161	n-dodecane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.007

Sentra, Speciated VOC Emission Rates (mg/mile) from E20 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	4.937	0.428	<DL	<DL	2.311	0.373	<DL	<DL	1.659	0.191	1.083	0.222
2	ethylene	1.777	0.449	<DL	<DL	0.0008	0.001	0.024	0.013	0.376	0.090	<DL	<DL
3	acetylene	0.001	0.002	0.129	0.183	<DL	<DL	0.004	0.005	0.030	0.040	0.0004	0.0006
4	ethane	1.262	0.097	<DL	<DL	0.445	0.041	0.015	0.021	0.389	0.025	0.049	0.070
5	propylene	0.410	0.377	<DL	<DL	<DL	<DL	0.002	0.001	0.086	0.079	0.001	0.002
6	propane	0.160	0.098	<DL	<DL	0.028	0.039	0.009	0.013	0.044	0.035	0.056	0.080
7	propyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.012
8	isobutane	0.276	0.229	<DL	<DL	0.019	0.028	0.029	0.041	0.071	0.067	0.001	0.0004
9	isobutene/1-butene	0.272	0.171	<DL	<DL	<DL	<DL	<DL	<DL	0.057	0.036	0.0005	0.0007
10	13-butadiene	0.028	0.039	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.008	<DL	<DL
11	n-butane	0.436	0.462	<DL	<DL	0.072	0.102	0.134	0.189	0.150	0.180	<DL	<DL
12	t2-butene	0.170	0.094	0.007	0.011	<DL	<DL	<DL	<DL	0.037	0.022	<DL	<DL
13	22-dm-propane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
14	1-butyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
15	c2-butene	0.247	0.121	<DL	<DL	<DL	<DL	<DL	<DL	0.051	0.025	0.016	0.023
16	12-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
17	3m1-butene	0.004	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.0009	0.001	<DL	<DL
18	2m-butane	5.670	3.292	0.333	0.107	0.551	0.422	0.842	0.681	1.651	1.024	0.144	0.203
19	14-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
20	2-butyne	<DL	<DL	<DL	<DL	0.071	0.100	<DL	<DL	0.019	0.028	<DL	<DL
21	1-pentene	0.032	0.006	0.101	0.115	0.094	0.076	0.131	0.096	0.094	0.074	0.049	0.069
22	2m1-butene	0.026	0.014	0.011	0.004	0.011	0.006	0.019	0.010	0.016	0.009	0.002	0.003
23	n-pentane	3.454	2.070	0.077	0.109	0.182	0.063	0.260	0.091	0.861	0.450	0.058	0.082
24	2m-13-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002
25	t2-pentene	0.037	0.029	0.013	0.004	0.013	0.008	0.022	0.011	0.020	0.012	0.004	0.005
26	c2-pentene	0.015	0.002	0.014	0.007	0.021	0.029	0.041	0.021	0.024	0.013	0.004	0.005
27	2m2-butene	0.132	0.084	0.020	0.001	0.020	0.010	0.034	0.016	0.047	0.025	0.004	0.005
28	22-dm-butane	0.350	0.194	0.015	0.010	0.030	0.014	0.042	0.017	0.096	0.047	0.010	0.014
29	cyclopentene	0.006	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
30	4m1-pentene	0.013	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0003	<DL	<DL
31	cyclopentane	0.337	0.214	0.014	0.009	0.017	0.004	0.027	0.005	0.086	0.045	0.006	0.008
32	23-dm-butane	1.027	0.642	0.036	0.032	0.055	0.029	0.070	0.045	0.257	0.147	0.017	0.025
33	c/t-4m2-pentene	1.763	1.146	0.149	0.012	0.162	0.075	0.267	0.128	0.522	0.294	0.047	0.066
34	2m-pentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	3m-pentane	1.058	0.667	0.088	0.008	0.095	0.042	0.157	0.071	0.312	0.169	0.027	0.038
36	1-hexene/2m1-pentene	0.009	0.012	0.016	0.022	0.017	0.0005	0.072	0.007	0.031	0.006	0.004	0.006
37	c/t-3-hexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
38	n-hexane	1.517	1.043	0.100	0.016	0.118	0.056	0.198	0.101	0.428	0.258	0.034	0.049
39	t2-hexene	0.015	0.002	0.014	0.009	0.012	0.003	0.021	0.005	0.016	0.0009	0.002	0.003
40	2m2-pentene	0.016	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.003	<DL	<DL
41	t-3m2-pentene	0.010	0.013	0.018	0.007	0.006	0.009	0.019	0.004	0.013	0.005	<DL	<DL
42	c2-hexene	0.001	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.0002	0.0003	0.002	0.003
43	c-3m2-pentene	0.015	0.008	0.013	0.001	0.008	0.0004	0.014	0.002	0.012	0.003	<DL	<DL
44	22-dm-pentane	0.103	0.058	<DL	<DL	<DL	<DL	0.007	0.010	0.024	0.015	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
45	m-cyclopentane	0.983	0.689	0.055	0.019	0.058	0.026	0.090	0.039	0.259	0.157	0.017	0.025
46	24-dm-pentane	0.621	0.428	0.034	0.0008	0.037	0.019	0.063	0.032	0.165	0.103	0.011	0.016
47	223-tm-butane	0.070	0.040	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.008	<DL	<DL
48	benzene	0.658	0.398	<DL	<DL	<DL	<DL	<DL	<DL	0.137	0.083	0.012	0.003
49	1m-cyclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
50	33-dm-pentane	0.060	0.034	0.005	0.007	0.004	0.005	0.006	0.009	0.016	0.013	0.001	0.002
51	cyclohexane	1.203	0.715	0.018	0.013	0.011	0.015	0.018	0.025	0.262	0.134	0.009	0.013
52	2m-hexane	0.425	0.321	0.017	0.004	0.021	0.007	0.035	0.012	0.108	0.071	0.007	0.010
53	23-dm-pentane	0.524	0.359	0.029	0.0009	0.030	0.010	0.050	0.019	0.138	0.083	0.010	0.014
54	11-dm-cyP	0.087	0.060	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.012	<DL	<DL
55	cyclohexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
56	3m-hexane	0.463	0.335	0.023	0.00006	0.008	0.012	0.014	0.019	0.108	0.061	<DL	<DL
57	c-13-dm-cyP	0.101	0.080	0.007	0.002	0.012	0.004	0.020	0.005	0.032	0.020	0.002	0.003
58	3e-pentane/t-13-dm-cyP	0.135	0.101	0.008	0.0006	0.016	0.004	0.027	0.007	0.042	0.024	0.003	0.005
59	t-12-dm-cyP/1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
60	224-tm-pentane	4.810	3.136	0.070	0.017	0.093	0.029	0.148	0.045	1.083	0.668	0.036	0.051
61	t3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	n-heptane	0.497	0.385	0.006	0.003	0.011	0.004	0.018	0.005	0.113	0.082	0.004	0.005
63	c3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
64	t2-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
65	c2-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
66	m-cyclohexane/22-dm-hexane	1.222	0.904	0.013	0.010	0.023	0.007	0.041	0.009	0.275	0.190	0.008	0.011
67	12dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
68	25-dm-hexane/e-cyP	0.334	0.267	0.004	0.006	0.003	0.004	0.005	0.007	0.073	0.051	0.004	0.006
69	24-dm-hexane/223-tm-pentane	0.606	0.426	0.012	0.007	0.005	0.003	0.005	0.007	0.131	0.087	0.004	0.005
70	33-dm-hexane/ctc124-tm-cyP	0.053	0.036	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.008	<DL	<DL
71	ctc123-tm-cyP	0.029	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.004	<DL	<DL
72	234-tm-pentane	1.463	1.006	0.008	0.002	0.020	0.004	0.033	0.001	0.321	0.210	0.007	0.010
73	toluene/233-tm-pentane	2.822	1.265	0.889	0.277	0.988	0.294	1.624	0.562	1.535	0.448	0.397	0.562
74	23-dm-hexane	0.306	0.237	<DL	<DL	0.004	0.006	0.006	0.009	0.067	0.053	0.002	0.003
75	112-tm-cyP	0.015	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
76	2m-heptane	0.120	0.106	<DL	<DL	<DL	<DL	<DL	<DL	0.025	0.022	<DL	<DL
77	4m-C7/3m3e-C5/1m-cyHexene	0.044	0.038	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.008	<DL	<DL
78	34-dm-hexane	0.068	0.052	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.011	<DL	<DL
79	3m-heptane/3e-hexane	0.126	0.098	<DL	<DL	<DL	<DL	0.005	0.007	0.028	0.018	0.002	0.002
80	t-13-dm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
81	cct-124-tm-cyP/c-13-dm-cyH	0.117	0.051	0.005	0.007	<DL	<DL	<DL	<DL	0.025	0.012	<DL	<DL
82	t-14-dm-cyH	0.050	0.040	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.008	<DL	<DL
83	225-tm-hexane	0.285	0.221	0.005	0.007	0.003	0.005	<DL	<DL	0.061	0.049	0.002	0.002
84	11-dm-cyH/1-octene	0.044	0.036	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.007	<DL	<DL
85	1e1m-cyP	0.006	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
86	224-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
87	n-octane/t12-dm-cyH	0.202	0.156	<DL	<DL	0.0006	0.0009	0.002	0.003	0.043	0.031	0.0004	0.0006
88	t2-octene	0.006	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
89	ccc-123-tm-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
90	244-tm-hexane	0.038	0.029	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.006	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
91	c2-octene	0.007	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002	<DL	<DL
92	ip-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
93	235-tm-hexane	0.043	0.033	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.007	<DL	<DL
94	44&22-dm-heptane	0.009	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.0003	0.013	0.018
95	24-dm-heptane	0.016	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.002	<DL	<DL
96	26-dm-heptane/c12-dm-cyH	0.040	0.025	0.013	0.018	<DL	<DL	<DL	<DL	0.011	0.009	<DL	<DL
97	np-cyP/e-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
98	ccc-135-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
99	25-dm-heptane/35-dm-heptane	0.026	0.022	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.004	<DL	<DL
100	33-dm-heptane	0.039	0.029	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.006	<DL	<DL
101	114-tm-cyH	0.006	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
102	e-benzene	0.017	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.002	0.002	0.003
103	cct-124-tm-cyH	0.015	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.002	<DL	<DL
104	23-dm-heptane	0.021	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.003	<DL	<DL
105	m&p-xylene/34-dm-heptane	0.068	0.037	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.008	0.012	0.018
106	2m-octane	0.036	0.026	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.005	<DL	<DL
107	246-tm-hexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	3m-octane	0.029	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.005	0.0005	0.0008
109	ctc-124-tm-cyH	0.004	0.006	0.003	0.0003	<DL	<DL	0.003	0.0005	0.002	0.001	0.001	0.002
110	33-de-C5/3e-C7	0.044	0.048	<DL	<DL	<DL	<DL	0.003	0.004	0.010	0.009	0.003	0.004
111	o-xylene	0.034	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.005	0.004	0.006
112	112-tm-cyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
113	1-nonene	0.028	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.004	<DL	<DL
114	t3-nonene	0.005	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.001	<DL	<DL
115	c3-nonene/ib-cyP	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
116	n-nonane	0.049	0.048	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.010	0.001	0.002
117	t2-nonene	0.005	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.001	<DL	<DL
118	c2-nonene	0.013	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
119	ip-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
120	22-dm-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
121	ip-cyH	0.019	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.003	<DL	<DL
122	nb-cyP	0.019	0.014	0.006	0.009	<DL	<DL	<DL	<DL	0.005	0.005	<DL	<DL
123	33-dm-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.0006	0.0008
124	n-propylbenzene	0.004	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.0009	0.001	<DL	<DL
125	3e-toluene	0.007	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	0.0005	0.0007
126	4e-toluene/23-dm-octane	0.008	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002	0.001	0.001
127	135-tm-benzene	0.009	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	0.001	0.002
128	2m-nonane	0.009	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	0.0002	0.0003
129	3e-octane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
130	3m-nonane	0.003	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.0007	0.0009	0.002	0.003
131	2e-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003
132	124-tm-benzene/tb-benz/1-decene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.008
133	ib-cyH	0.027	0.038	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.008	0.010	0.015
134	n-decane	0.012	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	0.003	0.004
135	ib-benzene/t-1m-2p-CyH	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
136	sb-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
137	3-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
138	123-tm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004
139	4-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
140	indan	0.002	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.0005	0.0007	0.008	0.011
141	2-ip-toluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
142	13-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
143	14-de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
144	3-np-toluene	0.023	0.015	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.003	<DL	<DL
145	4-np-toluene/nb-benz/13dm5e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.011	0.002	0.003	0.005	0.007
146	12de-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
147	2-np-toluene	0.007	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.001	0.002	0.003
148	14dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
149	13dm-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
150	12dm-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
151	13dm-2e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
152	n-undecane/12dm-3e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.007
153	1245-ttm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
154	2mb-benzene	0.019	0.001	0.025	0.001	<DL	<DL	<DL	<DL	0.010	0.0005	<DL	<DL
155	tb-2m-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
156	1234-ttm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
157	npentyl-benzene/t-1m-2-(4mp)CyP	0.023	0.024	<DL	<DL	0.005	0.007	<DL	<DL	0.006	0.007	0.008	0.011
158	tb-35dm-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
159	tb-4e-benzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
160	naphthalene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
161	n-dodecane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004

11.d Sentra Emission Rates, -10° Tests

Sentra, Speciated VOC Emission Rates (mg/mile) from E0 Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	61.442	17.549	<DL	<DL	1.722	1.587	<DL	<DL	13.148	3.686	0.939	0.125
2	ethylene	59.063	17.699	<DL	<DL	0.008	0.019	<DL	<DL	12.188	3.645	<DL	<DL
3	acetylene	0.805	0.170	0.019	0.031	0.001	0.003	0.009	0.019	0.173	0.040	0.005	0.008
4	ethane	16.156	2.225	<DL	<DL	0.187	0.160	<DL	<DL	3.384	0.474	0.022	0.015
5	propylene	36.613	6.092	0.027	0.010	0.015	0.019	<DL	<DL	7.565	1.258	0.002	0.0004
6	propane	1.726	0.487	0.005	0.012	0.037	0.036	0.133	0.298	0.407	0.092	0.012	0.008
7	propyne	0.039	0.010	0.0003	0.0007	0.0002	0.0005	0.0003	0.0007	0.008	0.002	0.000002	0.000004
8	isobutane	10.545	3.169	0.031	0.044	0.051	0.054	0.020	0.028	2.202	0.655	0.086	0.026
9	isobutene / 1-butene	20.422	3.731	0.016	0.010	0.004	0.006	0.0006	0.001	4.219	0.771	0.011	0.015
10	1,3-butadiene	0.133	0.128	0.0001	0.0003	0.0001	0.0002	0.0003	0.0007	0.028	0.027	<DL	<DL
11	n-butane	2.502	0.726	0.019	0.026	<DL	<DL	0.023	0.038	0.527	0.148	0.011	0.015
12	trans-2-butene	6.997	1.349	0.012	0.007	0.003	0.003	0.0001	0.0003	1.447	0.277	0.001	0.001
13	1-butyne	0.007	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.0009	<DL	<DL
14	cis-2-butene	3.816	0.796	0.020	0.023	0.006	0.008	0.006	0.011	0.795	0.158	0.035	0.048
15	1,2-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.005	0.0006	0.001	<DL	<DL
16	3-methyl-1-butene	0.377	0.081	<DL	<DL	<DL	<DL	<DL	<DL	0.078	0.017	<DL	<DL
17	2-methylbutane	79.899	20.217	0.213	0.213	0.159	0.220	0.151	0.236	16.620	4.209	0.159	0.080
18	1,4-pentadiene	<DL	<DL	<DL	<DL	0.002	0.004	<DL	<DL	0.0005	0.001	<DL	<DL
19	2-butyne	0.009	0.014	<DL	<DL	0.001	0.003	<DL	<DL	0.002	0.004	0.005	0.007
20	1-pentene	0.197	0.056	0.0007	0.001	0.003	0.006	0.006	0.007	0.043	0.012	0.007	0.007
21	2-methyl-1-butene	1.141	0.283	0.004	0.003	0.004	0.004	0.003	0.003	0.238	0.060	<DL	<DL
22	n-pentane	1.767	0.414	0.023	0.024	0.004	0.009	0.011	0.018	0.374	0.088	<DL	<DL
23	2-methyl-1,3-butadiene	0.020	0.019	<DL	<DL	0.0009	0.002	0.0002	0.0004	0.004	0.004	0.001	0.003
24	trans-2-pentene	1.145	0.253	0.014	0.014	0.029	0.063	0.002	0.003	0.248	0.053	0.0001	0.0002
25	cis-2-pentene	0.475	0.113	0.005	0.004	0.002	0.005	0.0008	0.0008	0.100	0.024	0.00002	0.00004
26	2-methyl-2-butene	4.020	2.792	0.019	0.006	0.002	0.003	0.002	0.002	0.835	0.576	0.0007	0.002
27	trans-1,3-pentadiene	0.005	0.007	<DL	<DL	0.002	0.004	<DL	<DL	0.002	0.002	<DL	<DL
28	1,3-cyclopentadiene	0.029	0.046	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.009	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	0.551	0.114	0.004	0.004	0.0005	0.001	0.001	0.002	0.115	0.023	0.001	0.001
30	cyclopentene	0.990	0.426	0.004	0.006	0.001	0.003	<DL	<DL	0.205	0.088	<DL	<DL
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.123	0.034	<DL	<DL	0.002	0.005	<DL	<DL	0.026	0.006	<DL	<DL
32	cyclopentane	0.484	0.105	0.009	0.021	0.012	0.027	0.012	0.021	0.109	0.019	0.048	0.065
33	2,3-dimethylbutane	10.053	2.421	0.031	0.023	0.016	0.024	0.016	0.020	2.090	0.512	0.010	0.002
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	6.509	1.553	0.037	0.019	0.014	0.016	0.021	0.018	1.361	0.327	0.010	0.007
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.233	0.055	0.009	0.009	0.004	0.007	0.011	0.011	0.055	0.016	0.018	0.018
37	3-methylpentane	4.234	0.985	0.018	0.018	0.001	0.003	0.001	0.003	0.878	0.203	0.006	0.006
38	2-methyl-1-pentene	0.229	0.135	0.002	0.005	0.002	0.003	0.002	0.004	0.049	0.030	<DL	<DL
39	1-hexene	0.048	0.047	0.004	0.006	0.0007	0.001	0.002	0.003	0.012	0.010	0.005	0.003
40	n-hexane	5.073	1.296	0.008	0.010	0.003	0.006	0.001	0.003	1.049	0.269	0.003	0.003

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
41	trans-2-hexene	0.463	0.154	0.011	0.004	0.003	0.003	0.002	0.002	0.099	0.032	0.0003	0.0006
42	2-methyl-2-pentene	0.576	0.448	<DL	<DL	0.0004	0.0008	0.0001	0.0003	0.119	0.092	<DL	<DL
43	trans-3-methyl-2-pentene	0.429	0.307	<DL	<DL	<DL	<DL	<DL	<DL	0.088	0.063	<DL	<DL
44	cis-2-hexene	0.200	0.073	<DL	<DL	<DL	<DL	<DL	<DL	0.041	0.015	<DL	<DL
45	cis-3-methyl-2-pentene	0.481	0.448	0.010	0.002	0.003	0.004	0.002	0.004	0.103	0.094	0.001	0.002
46	2,2-dimethylpentane	0.457	0.104	<DL	<DL	<DL	<DL	<DL	<DL	0.094	0.021	0.0005	0.001
47	methylcyclopentane	4.082	0.892	0.008	0.009	0.004	0.009	0.003	0.005	0.846	0.188	0.003	0.003
48	2,4-dimethylpentane	12.559	2.963	0.042	0.028	0.014	0.012	0.004	0.004	2.606	0.614	0.007	0.0007
49	2,2,3-trimethylbutane	0.851	0.205	0.012	0.026	<DL	<DL	<DL	<DL	0.178	0.039	<DL	<DL
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	19.906	6.152	0.047	0.038	0.016	0.037	0.002	0.004	4.122	1.277	<DL	<DL
52	3,3-dimethylpentane	0.481	0.285	<DL	<DL	<DL	<DL	<DL	<DL	0.099	0.059	<DL	<DL
53	cyclohexane	4.688	1.098	0.025	0.048	0.010	0.022	0.004	0.005	0.977	0.225	0.005	0.009
54	2-methylhexane	5.298	1.250	0.015	0.007	0.004	0.004	0.002	0.002	1.098	0.258	0.003	0.001
55	2,3-dimethylpentane	10.709	2.454	0.029	0.010	0.012	0.010	0.007	0.005	2.221	0.507	0.007	0.003
56	1,1-dimethylcyclopentane	0.508	0.109	<DL	<DL	<DL	<DL	<DL	<DL	0.105	0.022	0.002	0.002
57	cyclohexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.003
58	3-methylhexane	5.400	1.231	0.008	0.006	0.0007	0.002	0.0005	0.001	1.116	0.253	0.002	0.002
59	cis-1,3-dimethylcylcopentane	1.075	0.249	0.004	0.003	0.004	0.003	0.0001	0.0003	0.224	0.051	0.0004	0.0004
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	1.380	0.310	0.011	0.012	0.006	0.006	0.003	0.006	0.290	0.065	0.002	0.003
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	140.865	31.364	0.329	0.099	0.161	0.128	0.035	0.023	29.192	6.473	0.103	0.013
63	trans-3-heptene	0.088	0.032	<DL	<DL	0.003	0.005	<DL	<DL	0.019	0.006	0.003	0.007
64	n-heptane	7.421	1.832	0.026	0.010	0.007	0.006	0.001	0.001	1.539	0.378	0.005	0.004
65	cis-3-heptene	0.244	0.199	<DL	<DL	<DL	<DL	<DL	<DL	0.050	0.041	<DL	<DL
66	trans-2-heptene	0.084	0.029	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.006	<DL	<DL
67	cis-2-heptene	0.579	0.276	<DL	<DL	<DL	<DL	<DL	<DL	0.119	0.057	<DL	<DL
68	methylcyclohexane / 2,2-dimethylhexane	12.242	2.757	0.034	0.010	0.008	0.006	0.003	0.003	2.537	0.569	0.003	0.001
69	2,5-dimethylhexane / ethylcyclopentane	21.375	5.209	0.067	0.019	0.016	0.010	0.004	0.003	4.431	1.074	0.007	0.001
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	29.148	6.447	0.082	0.024	0.026	0.017	0.007	0.004	6.041	1.330	0.014	0.002
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	1.052	0.230	<DL	<DL	<DL	<DL	<DL	<DL	0.217	0.047	0.0009	0.002
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.521	0.115	<DL	<DL	<DL	<DL	<DL	<DL	0.107	0.024	<DL	<DL
73	2,3,4-trimethylpentane	63.168	13.944	0.175	0.051	0.060	0.039	0.014	0.009	13.093	2.877	0.024	0.004
74	toluene/2,3,3-trimethylpentane	78.295	18.310	1.043	0.131	0.570	0.082	0.745	0.416	16.764	3.705	0.334	0.056
75	2,3-dimethylhexane	19.113	4.215	0.064	0.020	0.018	0.011	0.008	0.006	3.965	0.870	0.007	0.002
76	2-methyl-3-ethylpentane	0.787	0.170	<DL	<DL	<DL	<DL	<DL	<DL	0.162	0.035	<DL	<DL
77	2-methylheptane / 1-methylcyclohexene	4.661	1.199	0.014	0.010	0.012	0.023	0.00008	0.0002	0.968	0.244	0.015	0.019
78	4-methylheptane / 3-methyl-3-ethylpentane	1.520	0.353	0.006	0.006	<DL	<DL	<DL	<DL	0.315	0.073	<DL	<DL
79	3,4-dimethylhexane	3.673	0.789	0.020	0.008	0.007	0.007	<DL	<DL	0.764	0.162	<DL	<DL
80	3-methylheptane / 3-ethylhexane	4.661	1.128	0.027	0.016	0.008	0.007	<DL	<DL	0.970	0.231	0.001	0.002
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	3.298	0.740	<DL	<DL	0.013	0.028	0.0005	0.001	0.684	0.148	0.007	0.009
82	trans-1,4-dimethylcyclohexane	1.334	0.313	0.005	0.005	0.002	0.004	<DL	<DL	0.277	0.065	<DL	<DL
83	2,2,5-trimethylhexane	19.043	4.300	0.058	0.020	0.008	0.009	0.0003	0.0004	3.944	0.886	0.005	0.003
84	1-octene	0.624	0.128	<DL	<DL	<DL	<DL	<DL	<DL	0.129	0.026	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
85	1-ethyl-1-methylcyclopentane	0.232	0.066	<DL	<DL	<DL	<DL	<DL	<DL	0.048	0.014	<DL	<DL
86	n-octane/trans-1,2-dimethylcyclohexane	9.036	2.564	0.048	0.021	0.010	0.008	0.002	0.003	1.878	0.528	0.006	0.004
87	trans-2-octene	0.098	0.053	0.0006	0.001	<DL	<DL	0.00008	0.0002	0.020	0.011	<DL	<DL
88	cis-cis-cis-1,2,3-trimethylcyclopentane	1.061	0.271	<DL	<DL	<DL	<DL	<DL	<DL	0.219	0.056	0.0007	0.002
89	2,4,4-trimethylhexane	0.728	0.164	<DL	<DL	<DL	<DL	<DL	<DL	0.150	0.034	<DL	<DL
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.253	0.058	0.051	0.076	<DL	<DL	<DL	<DL	0.064	0.028	<DL	<DL
92	2,3,5-trimethylhexane	3.355	0.744	0.011	0.007	0.001	0.003	<DL	<DL	0.695	0.154	<DL	<DL
93	2,4-dimethylheptane	0.971	0.244	<DL	<DL	<DL	<DL	<DL	<DL	0.200	0.050	<DL	<DL
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	1.847	0.527	0.013	0.003	<DL	<DL	<DL	<DL	0.384	0.109	0.001	0.003
95	n-propylcyclopentane	0.308	0.076	<DL	<DL	<DL	<DL	<DL	<DL	0.063	0.016	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	2.573	0.607	0.011	0.008	0.001	0.003	<DL	<DL	0.534	0.126	<DL	<DL
97	2,5-dimethylheptane/3,5-dimethylheptane	2.337	0.651	0.011	0.007	<DL	<DL	0.0001	0.0003	0.485	0.134	<DL	<DL
98	3,3-dimethylheptane	1.271	0.263	0.002	0.005	0.0004	0.0008	0.00009	0.0002	0.263	0.054	<DL	<DL
99	1,1,4-trimethylcyclohexane	0.421	0.102	<DL	<DL	<DL	<DL	<DL	<DL	0.087	0.021	0.008	0.016
100	ethylbenzene	3.546	1.042	0.039	0.021	0.004	0.005	0.003	0.004	0.742	0.214	0.0004	0.0008
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.639	0.165	<DL	<DL	<DL	<DL	<DL	<DL	0.132	0.034	<DL	<DL
102	2,3-dimethylheptane	1.466	0.383	0.002	0.004	<DL	<DL	<DL	<DL	0.303	0.079	<DL	<DL
103	m&p-xylene/3,4-dimethylheptane	11.071	3.242	0.127	0.079	0.015	0.018	0.007	0.010	2.319	0.670	0.003	0.006
104	2-methyloctane	2.728	0.911	0.020	0.012	0.002	0.003	0.0002	0.0004	0.568	0.188	0.0001	0.0003
105	3-methyloctane	2.305	0.691	0.016	0.007	0.001	0.002	0.0002	0.0005	0.480	0.142	0.0002	0.0003
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	3.026	0.795	0.017	0.014	0.006	0.012	0.001	0.002	0.630	0.161	0.003	0.003
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	4.710	1.215	0.046	0.028	0.009	0.008	0.003	0.004	0.985	0.250	0.002	0.001
109	1-nonene/1,1,2-trimethylcyclohexane	2.398	0.640	0.015	0.007	0.008	0.005	0.0003	0.0006	0.500	0.132	0.002	0.002
110	trans-3-nonene	0.492	0.155	<DL	<DL	<DL	<DL	0.0001	0.0003	0.102	0.032	0.0005	0.001
111	cis-3-nonene/isobutylcyclopentane	0.031	0.070	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.014	<DL	<DL
112	n-nonane	5.487	2.040	0.065	0.030	0.012	0.011	0.003	0.003	1.151	0.422	0.006	0.006
113	trans-2-nonene	1.221	0.296	0.018	0.025	<DL	<DL	<DL	<DL	0.256	0.060	<DL	<DL
114	cis-2-nonene	0.671	0.154	0.002	0.004	0.002	0.004	0.0003	0.0007	0.139	0.031	0.003	0.004
115	isopropylbenzene	<DL	<DL	0.002	0.003	0.0005	0.0009	0.0001	0.0003	0.0005	0.001	0.0006	0.001
116	2,2-dimethyloctane	1.210	0.369	0.010	0.008	0.003	0.004	0.0007	0.001	0.253	0.077	0.006	0.004
117	isopropylcyclohexane	1.407	0.395	0.038	0.045	0.0003	0.0006	0.0005	0.001	0.299	0.081	0.001	0.002
118	n-butylcyclopentane	2.654	0.804	0.027	0.014	0.005	0.006	0.001	0.003	0.555	0.166	0.006	0.014
119	3,3-dimethyloctane	0.485	0.129	0.015	0.034	0.006	0.009	0.007	0.012	0.107	0.035	0.0008	0.002
120	n-propylbenzene	0.671	0.185	0.011	0.011	0.053	0.115	0.0006	0.001	0.156	0.039	0.001	0.002
121	3-ethyltoluene	2.058	0.586	0.054	0.014	0.015	0.014	0.007	0.008	0.443	0.117	0.004	0.005
122	4-ethyltoluene/2,3-dimethyloctane	1.329	0.401	0.031	0.011	0.007	0.007	0.004	0.006	0.284	0.080	0.002	0.002
123	1,3,5-trimethylbenzene	2.789	0.900	0.058	0.023	0.011	0.012	0.002	0.003	0.592	0.189	0.002	0.001
124	2-methylnonane	3.701	5.159	0.017	0.029	0.019	0.021	0.003	0.005	0.773	1.057	0.005	0.007
125	3-ethyloctane	0.109	0.159	<DL	<DL	<DL	<DL	0.0002	0.0004	0.023	0.033	<DL	<DL
126	3-methylnonane	0.861	0.339	0.016	0.011	0.002	0.002	0.001	0.002	0.182	0.070	0.002	0.002
127	2-ethyltoluene	0.668	0.182	0.014	0.006	0.008	0.012	0.002	0.004	0.144	0.034	0.0008	0.001
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	3.243	0.962	0.099	0.032	0.014	0.013	0.004	0.004	0.696	0.199	0.002	0.003
129	isobutylcyclohexane	0.410	0.103	0.013	0.018	0.111	0.157	0.005	0.009	0.119	0.040	0.031	0.018

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
130	n-decane	5.249	2.088	0.142	0.076	0.035	0.027	0.006	0.008	1.126	0.440	0.008	0.006
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.171	0.102	0.004	0.010	0.006	0.009	0.0002	0.0005	0.038	0.022	0.0001	0.0003
132	sec-butylbenzene	0.664	0.148	0.006	0.013	<DL	<DL	0.0003	0.0007	0.138	0.029	<DL	<DL
133	3-isopropyltoluene	0.594	0.156	0.003	0.005	0.011	0.009	0.0008	0.001	0.127	0.034	0.003	0.003
134	4-isopropyltoluene	1.620	0.484	0.057	0.049	0.033	0.020	0.0003	0.0006	0.356	0.100	0.004	0.006
135	indan	0.397	0.261	<DL	<DL	<DL	<DL	0.0005	0.001	0.082	0.054	<DL	<DL
136	2-isopropyltoluene	0.064	0.143	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.030	<DL	<DL
137	1,3-diethylbenzene	0.213	0.078	0.0008	0.002	0.001	0.003	0.00008	0.0002	0.044	0.016	<DL	<DL
138	3-n-propyltoluene	4.740	1.323	0.122	0.037	0.098	0.150	0.001	0.001	1.033	0.269	0.008	0.003
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	1.040	0.332	0.044	0.012	0.012	0.010	0.006	0.010	0.230	0.066	0.002	0.002
140	1,2-diethylbenzene	0.608	0.241	0.024	0.012	0.005	0.007	0.0004	0.0008	0.132	0.051	0.0003	0.0006
141	2-n-propyltoluene	3.212	1.692	0.140	0.040	0.034	0.025	0.004	0.004	0.705	0.351	0.007	0.003
142	1,4-dimethyl-2-ethylbenzene	0.033	0.074	0.022	0.049	<DL	<DL	0.002	0.004	0.012	0.017	0.004	0.010
143	1,3-dimethyl-4-ethylbenzene	0.360	0.317	0.027	0.016	<DL	<DL	<DL	<DL	0.080	0.068	<DL	<DL
144	1,2-dimethyl-4-ethylbenzene	0.418	0.170	0.027	0.016	0.002	0.004	0.0002	0.0005	0.093	0.034	<DL	<DL
145	1,3-dimethyl-2-ethylbenzene	0.505	0.176	0.015	0.021	<DL	<DL	<DL	<DL	0.108	0.038	<DL	<DL
146	n-undecane	2.135	0.867	0.196	0.102	0.065	0.063	0.007	0.006	0.505	0.196	0.011	0.006
147	1,2-dimethyl-3-ethylbenzene	0.779	0.294	0.047	0.014	0.008	0.008	<DL	<DL	0.174	0.061	<DL	<DL
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.568	0.187	0.043	0.026	0.052	0.050	0.005	0.011	0.143	0.057	0.762	0.335
149	1,2,3,5-tetramethylbenzene	0.520	0.383	0.073	0.024	0.007	0.007	0.0006	0.0009	0.125	0.083	<DL	<DL
150	tert-butyl-2-methylbenzene	0.103	0.041	0.004	0.009	<DL	<DL	<DL	<DL	0.022	0.010	<DL	<DL
151	n-pentylbenzene	0.113	0.080	0.019	0.018	0.015	0.024	0.004	0.009	0.033	0.016	0.015	0.009
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	0.027	0.060	<DL	<DL	<DL	<DL	0.006	0.013	0.009	0.020
153	tert-butyl-3,5-dimethylbenzene	0.044	0.034	0.028	0.027	0.007	0.009	0.0002	0.0003	0.017	0.007	0.004	0.008
154	tert-butyl-4-ethylbenzene	0.008	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.004	<DL	<DL
155	naphthalene	0.295	0.278	0.167	0.116	0.011	0.025	<DL	<DL	0.101	0.086	<DL	<DL
156	n-dodecane	0.192	0.168	0.140	0.063	0.011	0.010	0.004	0.007	0.075	0.042	0.006	0.006

Sentra, Speciated VOC Emission Rates (mg/mile) from E10 Fuel, -10℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	86.928	12.572	<DL	<DL	2.106	2.978	<DL	<DL	18.557	3.399	1.048	0.144
2	ethylene	91.977	2.759	0.011	0.015	0.060	0.072	<DL	<DL	19.042	0.532	0.004	0.006
3	acetylene	4.240	0.037	<DL	<DL	0.006	0.008	<DL	<DL	0.879	0.011	0.012	0.017
4	ethane	15.204	1.136	0.119	0.168	0.657	0.617	<DL	<DL	3.352	0.106	0.124	0.030
5	propylene	48.950	0.257	0.017	0.023	0.085	0.057	<DL	<DL	10.151	0.075	0.018	0.020
6	propane	1.886	0.357	0.051	0.072	0.105	0.088	0.003	0.005	0.431	0.065	0.023	0.0009
7	propyne	0.427	0.067	<DL	<DL	<DL	<DL	<DL	<DL	0.088	0.014	0.276	0.386
8	isobutane	54.756	14.120	0.999	1.413	1.445	0.394	1.592	0.729	12.417	3.572	1.122	0.922
9	isobutene / 1-butene	40.758	20.301	0.046	0.026	0.043	0.029	<DL	<DL	8.454	4.222	0.026	0.009
10	1,3-butadiene	1.516	1.735	<DL	<DL	0.001	0.002	<DL	<DL	0.314	0.360	0.002	0.002
11	n-butane	9.736	2.984	0.072	0.101	0.179	0.022	0.140	0.076	2.121	0.670	0.129	0.182

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
12	trans-2-butene	11.598	5.193	0.011	0.001	0.021	0.006	0.009	0.002	2.410	1.078	0.007	0.008
13	1-butyne	0.017	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.001	<DL	<DL
14	cis-2-butene	6.986	2.332	0.005	0.007	0.135	0.191	0.013	0.0003	1.487	0.535	0.004	0.006
15	1,2-butadiene	0.016	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.002	<DL	<DL
16	3-methyl-1-butene	1.182	0.493	0.0008	0.001	<DL	<DL	<DL	<DL	0.245	0.102	0.003	0.004
17	2-methylbutane	45.673	20.869	0.081	0.115	0.226	0.021	0.204	0.058	9.589	4.364	0.230	0.153
18	1,4-pentadiene	0.005	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
19	2-butyne	0.043	0.021	0.006	0.009	<DL	<DL	<DL	<DL	0.010	0.006	<DL	<DL
20	1-pentene	0.670	0.258	<DL	<DL	0.001	0.002	0.007	0.001	0.141	0.053	0.005	0.003
21	2-methyl-1-butene	2.088	0.929	0.004	0.006	0.002	0.003	0.002	0.003	0.434	0.193	0.005	0.007
22	n-pentane	12.666	4.906	0.018	0.026	0.038	0.003	0.022	0.032	2.641	1.002	0.052	0.041
23	2-methyl-1,3-butadiene	0.085	0.107	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.022	0.0009	0.001
24	trans-2-pentene	2.231	0.830	0.005	0.006	0.003	0.001	0.001	0.001	0.464	0.171	0.0002	0.0003
25	cis-2-pentene	1.028	0.359	<DL	<DL	0.002	0.0002	0.0002	0.0003	0.213	0.074	0.002	0.003
26	2-methyl-2-butene	7.784	4.771	0.009	0.012	0.010	0.014	0.003	0.004	1.616	0.991	0.011	0.016
27	trans-1,3-pentadiene	0.027	0.038	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.008	<DL	<DL
28	1,3-cyclopentadiene	0.086	0.075	<DL	<DL	<DL	<DL	0.0005	0.0007	0.018	0.016	0.00004	0.00006
29	2,2-dimethylbutane / cis-1,3-pentadiene	2.866	1.164	0.009	0.013	0.013	0.001	0.004	0.003	0.600	0.245	0.012	0.002
30	cyclopentene	1.874	0.631	0.005	0.006	0.006	0.006	<DL	<DL	0.390	0.128	0.003	0.004
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.388	0.085	<DL	<DL	0.007	0.004	0.001	0.002	0.083	0.017	0.005	0.003
32	cyclopentane	2.427	0.995	<DL	<DL	0.018	0.025	<DL	<DL	0.507	0.199	0.039	0.056
33	2,3-dimethylbutane	22.288	8.847	0.032	0.016	0.058	0.001	0.027	0.017	4.642	1.843	0.037	0.014
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	23.116	8.642	0.025	0.035	0.067	0.001	0.051	0.011	4.821	1.788	0.078	0.111
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.528	0.149	0.003	0.004	<DL	<DL	<DL	<DL	0.110	0.030	0.010	0.014
37	3-methylpentane	15.021	5.625	0.025	0.008	0.043	0.002	0.026	0.0007	3.133	1.164	0.035	0.022
38	2-methyl-1-pentene	0.574	0.233	<DL	<DL	<DL	<DL	0.005	0.006	0.120	0.047	0.003	0.005
39	1-hexene	0.446	0.142	0.011	0.015	0.011	0.011	0.004	0.003	0.099	0.031	0.009	0.008
40	n-hexane	22.933	8.697	<DL	<DL	0.037	0.009	<DL	<DL	4.754	1.802	0.047	0.030
41	trans-2-hexene	1.397	0.501	0.004	0.005	0.005	0.0008	0.007	0.003	0.293	0.104	0.005	0.0004
42	2-methyl-2-pentene	1.909	1.037	<DL	<DL	<DL	<DL	<DL	<DL	0.395	0.215	0.002	0.003
43	trans-3-methyl-2-pentene	1.181	1.000	<DL	<DL	0.001	0.001	0.001	0.002	0.245	0.208	0.002	0.004
44	cis-2-hexene	0.646	0.220	0.0008	0.001	<DL	<DL	<DL	<DL	0.134	0.046	0.002	0.003
45	cis-3-methyl-2-pentene	1.485	1.092	0.006	0.008	0.002	0.003	0.0007	0.001	0.309	0.225	0.002	0.003
46	2,2-dimethylpentane	1.701	0.681	0.006	0.008	0.006	0.007	<DL	<DL	0.355	0.145	0.004	0.002
47	methylcyclopentane	19.175	7.289	0.022	0.031	0.026	0.002	0.010	0.015	3.982	1.501	0.026	0.021
48	2,4-dimethylpentane	23.069	9.708	0.032	0.003	0.038	0.002	0.010	0.002	4.793	2.012	0.024	0.018
49	2,2,3-trimethylbutane	1.774	0.730	0.005	0.007	0.006	0.0007	<DL	<DL	0.370	0.153	0.004	0.0008
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	56.033	22.778	0.070	0.099	0.112	0.119	<DL	<DL	11.638	4.670	0.077	0.092
52	3,3-dimethylpentane	2.196	1.058	0.002	0.003	0.006	0.001	<DL	<DL	0.456	0.220	0.005	0.002
53	cyclohexane	22.907	8.914	0.065	0.091	0.012	0.016	<DL	<DL	4.756	1.833	0.060	0.081
54	2-methylhexane	17.580	7.285	0.015	0.021	0.045	0.036	0.003	0.004	3.653	1.515	0.070	0.072
55	2,3-dimethylpentane	20.365	7.814	0.014	0.019	0.041	0.008	0.004	0.006	4.228	1.617	0.031	0.043
56	1,1-dimethylcyclopentane	2.211	0.867	<DL	<DL	0.007	0.00007	<DL	<DL	0.459	0.180	0.007	0.002

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
57	cyclohexene	0.253	0.119	<DL	<DL	<DL	<DL	<DL	<DL	0.052	0.025	<DL	<DL
58	3-methylhexane	17.863	7.418	0.017	0.023	0.053	0.044	0.002	0.002	3.714	1.545	0.089	0.097
59	cis-1,3-dimethylcylcopentane	4.804	1.889	0.003	0.005	0.011	0.002	0.006	0.008	0.999	0.389	0.009	0.012
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	5.443	2.006	0.003	0.005	0.015	0.009	<DL	<DL	1.131	0.418	0.018	0.022
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	225.578	86.998	0.403	0.088	0.435	0.010	0.066	0.022	46.895	18.076	0.262	0.074
63	trans-3-heptene	0.257	0.091	<DL	<DL	<DL	<DL	<DL	<DL	0.053	0.019	<DL	<DL
64	n-heptane	29.870	12.516	0.035	0.049	0.079	0.073	0.003	0.004	6.210	2.604	0.123	0.151
65	cis-3-heptene	0.833	0.363	<DL	<DL	<DL	<DL	<DL	<DL	0.172	0.075	<DL	<DL
66	trans-2-heptene	0.271	0.102	<DL	<DL	<DL	<DL	<DL	<DL	0.056	0.021	<DL	<DL
67	cis-2-heptene	1.316	0.606	<DL	<DL	<DL	<DL	<DL	<DL	0.272	0.126	<DL	<DL
68	methylcyclohexane / 2,2-dimethylhexane	55.583	21.707	0.058	0.066	0.085	0.042	0.006	0.009	11.536	4.497	0.071	0.075
69	2,5-dimethylhexane / ethylcyclopentane	37.028	14.954	0.048	0.036	0.046	0.020	0.007	0.0008	7.685	3.099	0.037	0.036
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	46.079	17.932	0.076	0.015	0.072	0.009	0.011	0.003	9.572	3.720	0.048	0.026
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	3.735	1.449	0.013	0.018	0.003	0.005	0.0005	0.0007	0.777	0.306	0.004	0.005
72	cis-trans-cis-1,2,3-trimethylcyclopentane	2.253	0.862	<DL	<DL	0.003	0.004	<DL	<DL	0.467	0.180	0.003	0.004
73	2,3,4-trimethylpentane	94.504	36.560	0.142	0.038	0.149	0.001	0.030	0.014	19.632	7.580	0.079	0.047
74	toluene/2,3,3-trimethylpentane	153.712	58.886	1.572	0.392	1.085	0.223	1.451	0.340	32.876	12.465	0.937	0.557
75	2,3-dimethylhexane	30.041	11.892	0.049	0.021	0.037	0.008	0.010	0.0004	6.239	2.464	0.027	0.022
76	2-methyl-3-ethylpentane	1.524	0.585	<DL	<DL	<DL	<DL	<DL	<DL	0.315	0.121	<DL	<DL
77	2-methylheptane / 1-methylcyclohexene	8.823	3.890	0.042	0.0004	0.019	0.006	0.0009	0.001	1.839	0.801	0.028	0.003
78	4-methylheptane / 3-methyl-3-ethylpentane	1.738	2.458	0.014	0.001	0.014	0.004	<DL	<DL	0.366	0.509	0.005	0.006
79	3,4-dimethylhexane	6.104	2.392	0.007	0.010	0.012	0.002	<DL	<DL	1.268	0.495	0.005	0.007
80	3-methylheptane / 3-ethylhexane	14.617	5.857	0.028	0.016	0.020	0.010	0.003	0.004	3.037	1.215	0.015	0.015
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	13.920	5.555	0.006	0.008	0.036	0.022	<DL	<DL	2.891	1.144	0.023	0.020
82	trans-1,4-dimethylcyclohexane	5.309	2.137	0.008	0.011	0.009	0.013	<DL	<DL	1.103	0.444	0.005	0.007
83	2,2,5-trimethylhexane	28.520	11.619	0.040	0.012	0.039	0.006	0.006	0.003	5.921	2.408	0.022	0.015
84	1-octene	1.698	0.021	0.005	0.008	<DL	<DL	<DL	<DL	0.352	0.002	0.004	0.005
85	1-ethyl-1-methylcyclopentane	1.027	0.406	<DL	<DL	<DL	<DL	<DL	<DL	0.212	0.084	<DL	<DL
86	n-octane/trans-1,2-dimethylcyclohexane	36.726	15.370	0.107	0.032	0.053	0.020	0.016	0.005	7.641	3.188	0.054	0.051
87	trans-2-octene	0.261	0.082	<DL	<DL	0.004	0.005	<DL	<DL	0.055	0.018	0.003	0.004
88	cis-cis-cis-1,2,3-trimethylcyclopentane	4.251	1.750	0.005	0.007	0.005	0.007	<DL	<DL	0.882	0.363	0.007	0.010
89	2,4,4-trimethylhexane	1.059	0.429	<DL	<DL	<DL	<DL	<DL	<DL	0.219	0.089	<DL	<DL
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.842	0.323	<DL	<DL	<DL	<DL	<DL	<DL	0.174	0.067	<DL	<DL
92	2,3,5-trimethylhexane	5.098	2.141	0.004	0.006	0.010	0.002	<DL	<DL	1.058	0.445	<DL	<DL
93	2,4-dimethylheptane	2.663	1.109	0.004	0.006	0.005	0.007	<DL	<DL	0.553	0.227	0.003	0.004
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	6.139	2.574	0.010	0.014	0.006	0.008	<DL	<DL	1.274	0.533	0.005	0.008
95	n-propylcyclopentane	1.257	0.516	<DL	<DL	<DL	<DL	<DL	<DL	0.260	0.107	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	11.127	4.514	0.021	0.012	0.017	0.004	<DL	<DL	2.311	0.935	0.011	0.011
97	2,5-dimethylheptane/3,5-dimethylheptane	5.466	2.284	0.008	0.011	0.005	0.007	0.006	0.008	1.135	0.476	0.005	0.007
98	3,3-dimethylheptane	4.087	1.654	0.005	0.007	0.007	0.001	<DL	<DL	0.848	0.345	0.004	0.002
99	1,1,4-trimethylcyclohexane	1.574	0.648	<DL	<DL	<DL	<DL	<DL	<DL	0.326	0.134	<DL	<DL
100	ethylbenzene	11.562	4.149	0.041	0.058	0.033	0.032	0.150	0.199	2.454	0.916	0.025	0.035

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
101	cis-trans-trans-1,2,4-trimethylcyclohexane	2.331	0.958	0.039	0.056	<DL	<DL	0.046	0.065	0.505	0.205	<DL	<DL
102	2,3-dimethylheptane	4.099	1.681	0.021	0.030	<DL	<DL	0.014	0.020	0.857	0.336	0.016	0.017
103	m&p-xylene/3,4-dimethylheptane	37.657	14.309	0.209	0.255	0.081	0.034	0.033	0.012	7.869	2.924	0.116	0.149
104	2-methyloctane	9.710	4.192	0.038	0.025	0.016	0.007	0.005	0.006	2.023	0.868	0.015	0.015
105	3-methyloctane	8.318	3.516	0.016	0.023	0.015	0.001	<DL	<DL	1.729	0.724	0.010	0.014
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	5.581	2.347	0.006	0.008	0.020	0.009	0.005	0.008	1.163	0.485	0.007	0.001
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	0.012	0.017	0.004	0.005	<DL	<DL
108	o-xylene	13.873	5.133	0.067	0.075	0.033	0.015	0.012	0.009	2.897	1.055	0.041	0.049
109	1-nonene/1,1,2-trimethylcyclohexane	5.004	2.075	0.010	0.005	0.016	0.0005	<DL	<DL	1.042	0.432	0.009	0.006
110	trans-3-nonene	2.005	0.850	<DL	<DL	<DL	<DL	<DL	<DL	0.415	0.176	0.003	0.004
111	cis-3-nonene/isobutylcyclopentane	0.237	0.334	<DL	<DL	<DL	<DL	<DL	<DL	0.049	0.069	<DL	<DL
112	n-nonane	22.390	9.690	0.125	0.048	0.066	0.028	0.016	0.009	4.683	2.009	0.064	0.066
113	trans-2-nonene	1.788	0.700	<DL	<DL	<DL	<DL	<DL	<DL	0.370	0.145	0.002	0.003
114	cis-2-nonene	2.673	1.048	0.004	0.006	0.003	0.005	<DL	<DL	0.555	0.217	0.003	0.005
115	isopropylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002
116	2,2-dimethyloctane	3.340	1.182	0.016	0.022	0.009	0.001	0.0006	0.0009	0.697	0.250	0.017	0.013
117	isopropylcyclohexane	5.787	2.404	0.021	0.004	0.018	0.007	<DL	<DL	1.207	0.500	0.011	0.015
118	n-butylcyclopentane	8.669	3.610	0.037	0.024	0.016	0.023	0.002	0.003	1.807	0.750	0.030	0.003
119	3,3-dimethyloctane	1.557	0.570	<DL	<DL	0.016	0.023	0.030	0.042	0.335	0.099	<DL	<DL
120	n-propylbenzene	2.165	0.565	0.014	0.019	0.006	0.005	0.004	0.006	0.454	0.110	0.004	0.005
121	3-ethyltoluene	7.144	2.386	0.067	0.063	0.028	0.018	0.024	0.004	1.507	0.485	0.032	0.045
122	4-ethyltoluene/2,3-dimethyloctane	4.153	1.365	0.024	0.034	0.017	0.007	0.0008	0.001	0.869	0.278	0.018	0.017
123	1,3,5-trimethylbenzene	9.399	3.195	0.076	0.080	0.047	0.026	0.010	0.005	1.977	0.654	0.041	0.051
124	2-methylnonane	2.542	0.859	0.058	0.083	0.009	0.013	<DL	<DL	0.541	0.163	0.0003	0.0005
125	3-ethyloctane	0.829	0.244	<DL	<DL	0.003	0.004	<DL	<DL	0.172	0.052	0.002	0.003
126	3-methylnonane	2.499	0.460	0.023	0.019	0.016	0.001	<DL	<DL	0.527	0.092	0.013	0.012
127	2-ethyltoluene	2.194	0.665	0.022	0.026	0.010	0.0004	<DL	<DL	0.461	0.132	0.009	0.013
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	9.813	2.950	0.123	0.114	0.065	0.024	0.017	0.013	2.080	0.597	0.067	0.089
129	isobutylcyclohexane	1.019	0.002	0.126	0.178	0.056	0.008	0.051	0.047	0.269	0.029	0.041	0.050
130	n-decane	9.749	4.162	0.252	0.126	0.139	0.058	0.026	0.006	2.118	0.869	0.125	0.140
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.953	0.486	<DL	<DL	<DL	<DL	<DL	<DL	0.197	0.101	0.003	0.005
132	sec-butylbenzene	1.411	0.426	<DL	<DL	<DL	<DL	<DL	<DL	0.292	0.088	0.005	0.007
133	3-isopropyltoluene	1.703	0.453	<DL	<DL	0.007	0.010	<DL	<DL	0.354	0.091	0.008	0.012
134	4-isopropyltoluene	5.819	2.603	0.115	0.115	0.089	0.053	<DL	<DL	1.254	0.528	0.068	0.079
135	indan	0.593	0.838	0.064	0.091	0.053	0.001	<DL	<DL	0.151	0.193	0.049	0.069
136	2-isopropyltoluene	0.646	0.913	<DL	<DL	<DL	<DL	<DL	<DL	0.134	0.189	<DL	<DL
137	1,3-diethylbenzene	0.243	0.344	<DL	<DL	<DL	<DL	<DL	<DL	0.050	0.071	<DL	<DL
138	3-n-propyltoluene	3.314	3.416	0.095	0.062	0.068	0.016	0.006	0.008	0.727	0.718	0.041	0.046
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	1.532	1.149	0.055	0.053	0.039	0.005	0.004	0.005	0.341	0.246	0.025	0.028
140	1,2-diethylbenzene	0.567	0.802	0.028	0.009	0.017	0.007	<DL	<DL	0.128	0.166	0.012	0.017
141	2-n-propyltoluene	2.146	3.035	0.100	0.057	0.067	0.023	0.005	0.007	0.486	0.632	0.048	0.057
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.485	0.686	0.026	0.014	0.014	0.005	<DL	<DL	0.110	0.143	0.011	0.015
144	1,2-dimethyl-4-ethylbenzene	0.467	0.661	0.028	0.020	0.012	0.005	0.002	0.003	0.107	0.139	0.013	0.018
145	1,3-dimethyl-2-ethylbenzene	0.265	0.374	0.009	0.013	<DL	<DL	<DL	<DL	0.057	0.080	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
146	n-undecane	2.281	3.225	0.276	0.146	0.144	0.078	0.025	0.022	0.580	0.671	0.141	0.161
147	1,2-dimethyl-3-ethylbenzene	0.441	0.623	0.030	0.023	0.024	0.005	<DL	<DL	0.104	0.132	0.029	0.041
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.449	0.636	0.433	0.537	0.134	0.125	0.034	0.024	0.236	0.053	0.648	0.890
149	1,2,3,5-tetramethylbenzene	0.637	0.901	0.059	0.084	0.023	0.033	0.005	0.007	0.153	0.194	0.032	0.046
150	tert-butyl-2-methylbenzene	0.076	0.107	0.007	0.010	0.004	0.006	<DL	<DL	0.018	0.023	0.004	0.006
151	n-pentylbenzene	0.140	0.197	0.071	0.021	0.075	0.100	0.008	0.011	0.067	0.012	0.044	0.005
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.052	0.073	0.024	0.022	0.010	0.0006	0.001	0.002	0.019	0.019	0.009	0.007
154	tert-butyl-4-ethylbenzene	0.272	0.361	<DL	<DL	<DL	<DL	<DL	<DL	0.056	0.075	<DL	<DL
155	naphthalene	0.267	0.377	0.145	0.095	0.039	0.055	0.037	0.052	0.109	0.069	0.063	0.089
156	n-dodecane	0.244	0.194	0.217	0.113	0.087	0.009	0.068	0.092	0.143	0.036	0.005	0.007

Sentra, Speciated VOC Emission Rates (mg/mile) from E10-Spl Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	63.727	4.336	<DL	<DL	4.545	0.540	<DL	<DL	14.452	1.175	1.547	0.208
2	ethylene	56.221	7.687	<DL	<DL	0.021	0.029	0.025	0.036	11.671	1.724	<DL	<DL
3	acetylene	0.282	0.399	0.128	0.180	0.043	0.061	0.059	0.084	0.116	0.082	0.124	0.154
4	ethane	17.688	1.505	<DL	<DL	0.849	0.177	<DL	<DL	3.899	0.396	0.120	0.077
5	propylene	35.041	9.680	0.015	0.021	0.031	0.043	0.017	0.024	7.288	2.100	0.011	0.009
6	propane	1.027	0.271	<DL	<DL	0.122	0.141	0.042	0.050	0.259	0.0007	0.031	0.028
7	propyne	0.012	0.009	<DL	<DL	0.003	0.004	<DL	<DL	0.003	0.003	0.562	0.795
8	isobutane	8.224	0.002	0.361	0.093	0.693	0.622	1.005	0.454	2.272	0.341	0.232	0.126
9	isobutene / 1-butene	19.765	5.099	0.024	0.00008	0.028	0.040	0.010	0.015	4.117	1.112	0.016	0.021
10	1,3-butadiene	0.026	0.036	0.007	0.010	<DL	<DL	0.007	0.010	0.009	0.008	<DL	<DL
11	n-butane	2.140	0.064	0.078	0.024	0.251	0.180	0.288	0.264	0.615	0.150	0.039	0.009
12	trans-2-butene	6.607	0.750	0.006	0.006	0.008	0.009	0.008	0.012	1.376	0.176	0.003	0.002
13	1-butyne	0.008	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.0004	<DL	<DL
14	cis-2-butene	4.057	0.533	0.079	0.028	0.009	0.013	0.012	0.017	0.865	0.126	<DL	<DL
15	1,2-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
16	3-methyl-1-butene	0.409	0.155	<DL	<DL	<DL	<DL	<DL	<DL	0.085	0.033	<DL	<DL
17	2-methylbutane	65.691	5.956	0.149	0.211	0.427	0.603	0.486	0.461	13.912	1.714	0.333	0.081
18	1,4-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
19	2-butyne	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
20	1-pentene	0.200	0.041	0.011	0.009	0.008	0.0005	0.007	0.010	0.048	0.010	0.004	0.0008
21	2-methyl-1-butene	1.029	0.192	0.019	0.014	0.002	0.003	0.011	0.004	0.222	0.039	<DL	<DL
22	n-pentane	2.015	0.232	0.042	0.001	0.038	0.036	0.097	0.077	0.466	0.084	0.003	0.004
23	2-methyl-1,3-butadiene	0.006	0.003	0.009	0.013	<DL	<DL	0.0004	0.0005	0.003	0.003	<DL	<DL
24	trans-2-pentene	0.897	0.084	0.008	0.004	0.006	0.005	0.011	0.010	0.193	0.024	<DL	<DL
25	cis-2-pentene	0.383	0.050	0.006	0.004	0.002	0.003	0.006	0.002	0.083	0.012	<DL	<DL
26	2-methyl-2-butene	2.852	0.902	0.039	0.016	<DL	<DL	0.011	0.009	0.604	0.192	<DL	<DL
27	trans-1,3-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
28	1,3-cyclopentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	0.519	0.073	0.005	0.007	0.009	0.013	0.010	0.015	0.114	0.023	0.002	0.002
30	cyclopentene	0.797	0.145	0.004	0.006	<DL	<DL	<DL	<DL	0.166	0.033	<DL	<DL
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.107	0.035	<DL	<DL	0.005	0.007	<DL	<DL	0.024	0.010	0.006	0.007
32	cyclopentane	0.426	0.026	<DL	<DL	0.008	0.011	<DL	<DL	0.090	0.007	0.078	0.006
33	2,3-dimethylbutane	8.441	1.125	0.049	0.069	0.046	0.060	0.038	0.028	1.785	0.290	0.028	0.012
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	5.759	0.818	0.026	0.037	0.047	0.050	0.062	0.050	1.231	0.218	0.014	0.003
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.226	0.059	0.008	0.011	0.014	0.009	<DL	<DL	0.052	0.017	<DL	<DL
37	3-methylpentane	3.795	0.510	0.030	0.00009	0.035	0.039	0.088	0.102	0.829	0.154	0.010	0.004
38	2-methyl-1-pentene	0.178	0.032	<DL	<DL	0.033	0.047	0.005	0.007	0.048	0.004	<DL	<DL
39	1-hexene	0.068	0.027	0.010	0.006	0.005	0.007	0.010	0.014	0.021	0.013	0.005	0.004
40	n-hexane	4.745	0.649	0.052	0.073	0.053	0.047	0.072	0.101	1.031	0.170	<DL	<DL
41	trans-2-hexene	0.372	0.082	0.0009	0.001	0.006	0.0004	0.005	0.008	0.081	0.020	0.0003	0.0004
42	2-methyl-2-pentene	0.314	0.104	<DL	<DL	0.004	0.002	0.0004	0.0005	0.066	0.023	<DL	<DL
43	trans-3-methyl-2-pentene	0.226	0.087	<DL	<DL	<DL	<DL	<DL	<DL	0.047	0.019	<DL	<DL
44	cis-2-hexene	0.162	0.039	<DL	<DL	<DL	<DL	<DL	<DL	0.034	0.008	<DL	<DL
45	cis-3-methyl-2-pentene	0.145	0.065	0.010	0.001	<DL	<DL	0.004	0.006	0.033	0.016	<DL	<DL
46	2,2-dimethylpentane	0.415	0.056	<DL	<DL	0.003	0.004	<DL	<DL	0.087	0.014	0.002	0.003
47	methylcyclopentane	3.688	0.595	0.006	0.008	0.025	0.020	0.032	0.045	0.782	0.151	0.005	0.003
48	2,4-dimethylpentane	10.405	1.512	0.017	0.024	0.025	0.030	0.019	0.014	2.174	0.352	0.013	0.003
49	2,2,3-trimethylbutane	0.713	0.105	<DL	<DL	<DL	<DL	<DL	<DL	0.148	0.023	0.002	0.002
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	16.184	2.441	0.019	0.027	0.073	0.104	0.020	0.029	3.387	0.581	0.005	0.008
52	3,3-dimethylpentane	0.675	0.141	0.005	0.007	<DL	<DL	<DL	<DL	0.141	0.032	0.001	0.002
53	cyclohexane	4.087	0.555	<DL	<DL	<DL	<DL	<DL	<DL	0.847	0.123	<DL	<DL
54	2-methylhexane	4.535	0.713	0.003	0.004	0.015	0.015	0.011	0.011	0.948	0.164	0.002	0.003
55	2,3-dimethylpentane	9.087	1.291	0.012	0.018	0.024	0.026	0.018	0.015	1.899	0.301	0.013	0.003
56	1,1-dimethylcyclopentane	0.446	0.070	0.0009	0.001	0.003	0.005	<DL	<DL	0.094	0.017	0.005	0.002
57	cyclohexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
58	3-methylhexane	4.675	0.715	0.004	0.005	0.017	0.014	0.005	0.006	0.977	0.162	0.0003	0.0004
59	cis-1,3-dimethylcylcopentane	0.929	0.153	0.003	0.0006	0.003	0.004	0.006	0.0002	0.196	0.035	<DL	<DL
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	1.199	0.191	0.001	0.002	0.0007	0.001	0.004	0.005	0.250	0.044	0.0002	0.0003
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	119.460	17.323	0.155	0.220	0.221	0.295	0.071	0.040	24.888	3.971	0.198	0.065
63	trans-3-heptene	0.066	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.004	<DL	<DL
64	n-heptane	6.254	1.073	0.003	0.005	0.015	0.017	0.007	0.010	1.304	0.242	0.003	0.004
65	cis-3-heptene	0.201	0.089	<DL	<DL	<DL	<DL	<DL	<DL	0.042	0.019	<DL	<DL
66	trans-2-heptene	0.065	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.005	<DL	<DL
67	cis-2-heptene	0.484	0.136	<DL	<DL	<DL	<DL	<DL	<DL	0.100	0.029	<DL	<DL
68	methylcyclohexane / 2,2-dimethylhexane	10.542	1.779	0.019	0.007	0.015	0.021	0.012	0.011	2.198	0.400	0.003	0.0003
69	2,5-dimethylhexane / ethylcyclopentane	17.214	2.420	0.041	0.020	0.014	0.020	0.017	0.005	3.587	0.544	0.010	0.0002
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	24.436	3.551	0.043	0.045	0.034	0.037	0.009	0.012	5.089	0.809	0.029	0.005
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.910	0.133	<DL	<DL	<DL	<DL	<DL	<DL	0.189	0.029	<DL	<DL
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.455	0.074	<DL	<DL	<DL	<DL	<DL	<DL	0.094	0.016	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
73	2,3,4-trimethylpentane	52.997	7.583	0.084	0.100	0.072	0.095	0.026	0.015	11.036	1.730	0.049	0.019
74	toluene/2,3,3-trimethylpentane	65.361	9.552	0.785	0.672	0.592	0.730	1.091	0.647	14.213	2.650	0.274	0.002
75	2,3-dimethylhexane	15.919	2.247	0.035	0.023	0.029	0.034	0.008	0.011	3.319	0.515	0.012	0.0006
76	2-methyl-3-ethylpentane	0.680	0.098	<DL	<DL	<DL	<DL	<DL	<DL	0.141	0.022	<DL	<DL
77	2-methylheptane / 1-methylcyclohexene	3.704	0.572	0.012	0.001	0.002	0.003	0.003	0.004	0.772	0.128	0.017	0.024
78	4-methylheptane / 3-methyl-3-ethylpentane	1.257	0.214	0.026	0.010	0.006	0.008	0.004	0.006	0.269	0.049	<DL	<DL
79	3,4-dimethylhexane	3.076	0.445	0.012	0.017	<DL	<DL	<DL	<DL	0.641	0.102	<DL	<DL
80	3-methylheptane / 3-ethylhexane	3.789	0.580	0.012	0.005	0.006	0.009	0.004	0.005	0.791	0.133	0.002	0.002
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	2.762	0.445	<DL	<DL	0.013	0.019	<DL	<DL	0.576	0.103	0.030	0.002
82	trans-1,4-dimethylcyclohexane	1.122	0.199	0.002	0.003	0.006	0.009	0.008	0.011	0.237	0.050	<DL	<DL
83	2,2,5-trimethylhexane	15.414	2.093	0.032	0.014	0.012	0.017	0.005	0.004	3.208	0.471	0.010	0.002
84	1-octene	0.539	0.092	<DL	<DL	<DL	<DL	0.006	0.008	0.114	0.023	<DL	<DL
85	1-ethyl-1-methylcyclopentane	0.189	0.048	<DL	<DL	<DL	<DL	<DL	<DL	0.039	0.010	<DL	<DL
86	n-octane/trans-1,2-dimethylcyclohexane	6.936	1.182	0.030	0.014	0.009	0.011	0.007	0.002	1.450	0.264	0.005	0.001
87	trans-2-octene	0.082	0.024	<DL	<DL	0.004	0.006	0.005	0.007	0.020	0.009	<DL	<DL
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.885	0.164	<DL	<DL	0.005	0.008	0.005	0.007	0.187	0.040	0.00002	0.00002
89	2,4,4-trimethylhexane	0.591	0.083	<DL	<DL	<DL	<DL	<DL	<DL	0.122	0.018	<DL	<DL
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.299	0.028	0.033	0.005	<DL	<DL	<DL	<DL	0.069	0.007	<DL	<DL
92	2,3,5-trimethylhexane	2.723	0.375	0.009	0.005	0.002	0.003	<DL	<DL	0.567	0.085	0.002	0.002
93	2,4-dimethylheptane	0.759	0.119	<DL	<DL	0.003	0.004	0.004	0.006	0.159	0.029	<DL	<DL
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	1.375	0.201	<DL	<DL	0.007	0.010	0.002	0.003	0.288	0.048	<DL	<DL
95	n-propylcyclopentane	0.259	0.053	<DL	<DL	<DL	<DL	<DL	<DL	0.054	0.011	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	2.090	0.360	<DL	<DL	0.006	0.008	0.005	0.008	0.436	0.083	0.0002	0.0003
97	2,5-dimethylheptane/3,5-dimethylheptane	1.718	0.221	0.0005	0.0007	0.003	0.005	<DL	<DL	0.357	0.051	<DL	<DL
98	3,3-dimethylheptane	1.073	0.170	0.001	0.002	0.002	0.003	<DL	<DL	0.223	0.039	<DL	<DL
99	1,1,4-trimethylcyclohexane	0.150	0.212	<DL	<DL	0.641	0.907	<DL	<DL	0.206	0.204	<DL	<DL
100	ethylbenzene	2.581	0.498	<DL	<DL	0.114	0.108	0.022	0.032	0.573	0.088	<DL	<DL
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.490	0.065	<DL	<DL	0.004	0.006	<DL	<DL	0.103	0.016	<DL	<DL
102	2,3-dimethylheptane	1.111	0.154	<DL	<DL	<DL	<DL	<DL	<DL	0.230	0.034	0.014	0.020
103	m&p-xylene/3,4-dimethylheptane	7.904	1.243	0.019	0.027	0.068	0.097	0.075	0.106	1.684	0.325	<DL	<DL
104	2-methyloctane	1.903	0.299	0.012	0.005	0.004	0.005	0.0007	0.0009	0.399	0.066	0.0001	0.0002
105	3-methyloctane	1.681	0.269	0.013	0.0007	0.003	0.005	0.002	0.002	0.353	0.061	0.002	0.003
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	2.283	0.345	0.053	0.075	0.009	0.013	0.002	0.002	0.488	0.097	0.009	0.008
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	3.434	0.567	0.014	0.006	0.019	0.021	0.017	0.023	0.725	0.136	0.0004	0.0006
109	1-nonene/1,1,2-trimethylcyclohexane	1.791	0.260	0.031	0.019	0.006	0.008	<DL	<DL	0.380	0.055	0.002	0.003
110	trans-3-nonene	0.350	0.058	<DL	<DL	<DL	<DL	<DL	<DL	0.073	0.013	<DL	<DL
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
112	n-nonane	3.669	0.644	0.041	0.009	0.007	0.008	0.004	0.006	0.773	0.146	0.005	0.001
113	trans-2-nonene	0.921	0.123	<DL	<DL	<DL	<DL	<DL	<DL	0.191	0.027	<DL	<DL
114	cis-2-nonene	0.535	0.096	<DL	<DL	<DL	<DL	<DL	<DL	0.111	0.021	0.002	0.003
115	isopropylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
116	2,2-dimethyloctane	0.847	0.171	0.005	0.008	0.006	0.0009	0.002	0.003	0.179	0.035	0.003	0.005

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
117	isopropylcyclohexane	1.026	0.154	0.013	0.019	<DL	<DL	<DL	<DL	0.216	0.038	<DL	<DL
118	n-butylcyclopentane	1.958	0.317	0.016	0.016	0.003	0.004	<DL	<DL	0.410	0.074	0.010	0.015
119	3,3-dimethyloctane	0.359	0.028	0.011	0.015	0.007	0.010	0.002	0.003	0.079	0.001	<DL	<DL
120	n-propylbenzene	0.476	0.095	0.010	0.007	0.002	0.003	0.006	0.008	0.103	0.022	<DL	<DL
121	3-ethyltoluene	1.454	0.346	0.026	0.018	0.011	0.001	0.007	0.010	0.313	0.081	<DL	<DL
122	4-ethyltoluene/2,3-dimethyloctane	0.908	0.172	0.009	0.003	0.002	0.002	0.0005	0.0007	0.191	0.039	0.00009	0.0001
123	1,3,5-trimethylbenzene	1.913	0.352	0.027	0.018	0.006	0.008	0.005	0.007	0.406	0.085	0.002	0.001
124	2-methylnonane	2.278	3.222	0.004	0.005	0.009	0.008	<DL	<DL	0.472	0.664	0.004	0.006
125	3-ethyloctane	0.084	0.119	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.025	<DL	<DL
126	3-methylnonane	0.537	0.083	0.003	0.002	0.005	0.0001	0.0006	0.0008	0.114	0.019	0.0004	0.0005
127	2-ethyltoluene	0.468	0.115	0.005	0.007	0.004	0.006	0.006	0.009	0.101	0.031	<DL	<DL
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	2.211	0.451	0.042	0.044	0.014	0.020	0.007	0.010	0.474	0.116	<DL	<DL
129	isobutylcyclohexane	0.299	0.031	0.007	0.011	0.004	0.005	0.031	0.025	0.074	0.004	0.020	0.028
130	n-decane	3.267	0.540	0.064	0.040	0.022	0.027	0.012	0.011	0.701	0.138	0.008	0.0005
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
132	sec-butylbenzene	0.598	0.113	<DL	<DL	<DL	<DL	<DL	<DL	0.124	0.025	<DL	<DL
133	3-isopropyltoluene	0.444	0.098	<DL	<DL	0.006	0.008	<DL	<DL	0.094	0.023	0.007	0.004
134	4-isopropyltoluene	1.086	0.206	0.023	0.009	0.017	0.024	<DL	<DL	0.235	0.053	0.003	0.004
135	indan	0.296	0.099	<DL	<DL	0.006	0.008	<DL	<DL	0.063	0.019	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.137	0.025	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.006	<DL	<DL
138	3-n-propyltoluene	3.302	0.462	0.056	0.035	0.019	0.024	<DL	<DL	0.702	0.117	0.006	0.00002
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.686	0.138	0.011	0.016	0.005	0.007	0.001	0.002	0.147	0.036	0.003	0.002
140	1,2-diethylbenzene	0.353	0.049	0.017	0.002	0.004	0.005	<DL	<DL	0.078	0.013	<DL	<DL
141	2-n-propyltoluene	2.515	0.522	0.077	0.045	0.018	0.026	0.006	0.008	0.546	0.132	0.006	0.001
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	0.014	0.020	0.006	0.008	<DL	<DL	0.005	0.002	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.376	0.070	0.006	0.008	0.002	0.003	<DL	<DL	0.080	0.018	<DL	<DL
144	1,2-dimethyl-4-ethylbenzene	0.272	0.067	0.013	0.018	0.003	0.005	<DL	<DL	0.060	0.020	<DL	<DL
145	1,3-dimethyl-2-ethylbenzene	0.303	0.053	<DL	<DL	<DL	<DL	<DL	<DL	0.063	0.012	<DL	<DL
146	n-undecane	1.215	0.151	0.085	0.033	0.015	0.021	0.005	0.007	0.276	0.049	0.009	0.002
147	1,2-dimethyl-3-ethylbenzene	0.455	0.184	0.032	0.001	0.004	0.005	<DL	<DL	0.103	0.040	<DL	<DL
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.698	0.114	0.043	0.061	0.167	0.212	0.034	0.047	0.210	0.111	1.028	0.648
149	1,2,3,5-tetramethylbenzene	0.357	0.078	0.037	0.003	<DL	<DL	0.004	0.005	0.084	0.016	<DL	<DL
150	tert-butyl-2-methylbenzene	0.042	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.003	<DL	<DL
151	n-pentylbenzene	0.070	0.020	<DL	<DL	0.003	0.004	0.012	0.008	0.019	0.008	0.015	0.021
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.023	0.012	0.009	0.010	0.004	0.005	0.005	0.006	0.009	0.008	<DL	<DL
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.005	0.001	0.002	<DL	<DL
155	naphthalene	0.151	0.117	0.050	0.070	0.018	0.009	0.013	0.018	0.051	0.043	<DL	<DL
156	n-dodecane	0.108	0.045	0.045	0.056	0.015	0.008	0.020	0.011	0.042	0.021	0.004	0.002

Sentra, Speciated VOC Emission Rates (mg/mile) from E20 Fuel, -10°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	73.117	10.572	<DL	<DL	3.638	0.053	<DL	<DL	16.121	2.241	1.450	0.090
2	ethylene	51.339	6.573	<DL	<DL	0.022	0.032	<DL	<DL	10.626	1.418	0.133	0.186
3	acetylene	3.369	2.477	0.002	0.003	0.006	0.003	<DL	<DL	0.700	0.517	0.198	0.279
4	ethane	14.318	0.981	0.029	0.041	0.206	0.006	<DL	<DL	3.023	0.181	0.197	0.180
5	propylene	27.286	4.213	0.008	0.012	0.015	0.021	<DL	<DL	5.651	0.901	0.008	0.002
6	propane	1.106	0.065	0.010	0.014	<DL	<DL	<DL	<DL	0.231	0.018	0.013	0.019
7	propyne	0.191	0.115	<DL	<DL	0.242	0.342	0.322	0.456	0.201	0.253	0.794	1.122
8	isobutane	15.227	0.927	<DL	<DL	0.441	0.098	0.461	0.175	3.407	0.285	0.352	0.291
9	isobutene / 1-butene	13.822	2.184	0.008	0.011	0.006	0.009	<DL	<DL	2.863	0.465	0.010	0.013
10	1,3-butadiene	0.017	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.005	<DL	<DL
11	n-butane	2.567	0.288	0.059	0.084	0.023	0.033	<DL	<DL	0.551	0.090	0.084	0.056
12	trans-2-butene	4.215	0.069	0.024	0.033	0.004	0.003	0.002	0.002	0.878	0.001	0.0004	0.0003
13	1-butyne	0.003	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.0007	0.0009	<DL	<DL
14	cis-2-butene	2.404	0.162	0.185	0.261	<DL	<DL	0.122	0.173	0.575	0.043	<DL	<DL
15	1,2-butadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
16	3-methyl-1-butene	0.307	0.086	<DL	<DL	<DL	<DL	<DL	<DL	0.064	0.018	<DL	<DL
17	2-methylbutane	80.621	21.414	0.065	0.092	0.118	0.167	0.079	0.111	16.753	4.606	0.741	0.314
18	1,4-pentadiene	0.014	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL
19	2-butyne	0.013	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0005	<DL	<DL
20	1-pentene	0.108	0.018	0.006	0.009	<DL	<DL	<DL	<DL	0.024	0.006	<DL	<DL
21	2-methyl-1-butene	0.424	0.076	0.003	0.004	<DL	<DL	<DL	<DL	0.088	0.017	<DL	<DL
22	n-pentane	2.742	0.700	<DL	<DL	<DL	<DL	0.011	0.016	0.571	0.152	0.021	0.009
23	2-methyl-1,3-butadiene	0.011	0.005	0.006	0.009	<DL	<DL	<DL	<DL	0.004	0.003	<DL	<DL
24	trans-2-pentene	0.525	0.009	0.002	0.003	0.0009	0.001	<DL	<DL	0.109	0.003	<DL	<DL
25	cis-2-pentene	0.222	0.020	0.037	0.047	<DL	<DL	<DL	<DL	0.054	0.006	<DL	<DL
26	2-methyl-2-butene	0.226	0.044	0.053	0.074	<DL	<DL	<DL	<DL	0.058	0.026	<DL	<DL
27	trans-1,3-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
28	1,3-cyclopentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	0.613	0.201	<DL	<DL	<DL	<DL	<DL	<DL	0.127	0.042	0.007	0.004
30	cyclopentene	0.399	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.083	0.001	<DL	<DL
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.111	0.037	<DL	<DL	0.005	0.007	<DL	<DL	0.024	0.010	0.008	0.004
32	cyclopentane	0.768	0.152	0.067	0.005	0.135	0.026	0.015	0.021	0.216	0.017	0.146	0.060
33	2,3-dimethylbutane	8.790	2.991	0.006	0.009	0.013	0.008	0.004	0.006	1.825	0.629	0.035	0.014
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	5.809	1.928	0.015	0.021	0.014	0.019	0.015	0.022	1.214	0.412	0.025	0.009
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.140	0.060	<DL	<DL	0.007	0.002	<DL	<DL	0.031	0.012	0.031	0.031
37	3-methylpentane	3.859	1.218	<DL	<DL	0.021	0.013	<DL	<DL	0.804	0.259	0.038	0.015
38	2-methyl-1-pentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
39	1-hexene	0.098	0.042	0.005	0.008	0.011	0.010	0.007	0.008	0.026	0.016	0.013	0.011
40	n-hexane	4.389	1.408	0.008	0.011	0.018	0.025	0.012	0.017	0.919	0.305	0.022	0.011
41	trans-2-hexene	0.252	0.042	<DL	<DL	<DL	<DL	0.005	0.006	0.053	0.007	0.005	0.0006
42	2-methyl-2-pentene	0.049	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.004	<DL	<DL
43	trans-3-methyl-2-pentene	0.124	0.031	<DL	<DL	<DL	<DL	<DL	<DL	0.026	0.006	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
44	cis-2-hexene	0.106	0.025	<DL	<DL	<DL	<DL	<DL	<DL	0.022	0.005	<DL	<DL
45	cis-3-methyl-2-pentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
46	2,2-dimethylpentane	0.368	0.114	<DL	<DL	<DL	<DL	<DL	<DL	0.076	0.024	0.004	0.0008
47	methylcyclopentane	3.239	0.969	0.006	0.009	0.004	0.005	0.010	0.002	0.675	0.204	0.007	0.004
48	2,4-dimethylpentane	9.065	2.813	0.009	0.013	0.009	0.009	0.003	0.004	1.881	0.592	0.020	0.007
49	2,2,3-trimethylbutane	0.634	0.209	<DL	<DL	<DL	<DL	0.101	0.143	0.161	0.002	0.002	0.003
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	13.486	3.694	0.007	0.010	<DL	<DL	<DL	<DL	2.792	0.775	<DL	<DL
52	3,3-dimethylpentane	0.335	0.111	<DL	<DL	<DL	<DL	<DL	<DL	0.069	0.023	0.002	0.002
53	cyclohexane	3.634	1.100	0.002	0.003	<DL	<DL	<DL	<DL	0.752	0.232	0.004	0.005
54	2-methylhexane	3.638	1.034	0.005	0.007	0.004	0.006	0.003	0.004	0.756	0.219	0.006	0.0007
55	2,3-dimethylpentane	7.784	2.291	0.012	0.017	0.008	0.012	0.006	0.009	1.618	0.483	0.015	0.002
56	1,1-dimethylcyclopentane	0.390	0.110	0.006	0.004	<DL	<DL	<DL	<DL	0.082	0.024	0.005	0.0003
57	cyclohexene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
58	3-methylhexane	3.855	1.076	0.003	0.005	0.003	0.005	<DL	<DL	0.799	0.227	0.005	0.0002
59	cis-1,3-dimethylcylcopentane	0.758	0.215	<DL	<DL	0.003	0.004	<DL	<DL	0.158	0.046	0.00007	0.00009
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	0.975	0.265	<DL	<DL	<DL	<DL	0.0008	0.001	0.202	0.056	0.001	0.002
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	99.960	28.122	0.110	0.156	0.088	0.069	0.029	0.026	20.742	5.905	0.295	0.080
63	trans-3-heptene	0.036	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.002	<DL	<DL
64	n-heptane	4.707	1.248	0.009	0.012	0.006	0.006	0.002	0.004	0.978	0.263	0.010	0.001
65	cis-3-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
66	trans-2-heptene	0.044	0.022	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.005	<DL	<DL
67	cis-2-heptene	0.024	0.018	0.015	0.021	<DL	<DL	<DL	<DL	0.008	0.008	<DL	<DL
68	methylcyclohexane / 2,2-dimethylhexane	8.435	2.251	0.011	0.015	0.008	0.005	0.006	0.006	1.752	0.473	0.012	0.006
69	2,5-dimethylhexane / ethylcyclopentane	12.618	2.968	0.103	0.146	0.011	0.013	0.006	0.007	2.639	0.664	0.011	0.0001
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	19.262	4.928	0.018	0.025	0.020	0.015	0.008	0.011	3.997	1.040	0.033	0.005
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.704	0.196	<DL	<DL	<DL	<DL	<DL	<DL	0.146	0.041	0.003	0.001
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.354	0.100	0.0007	0.001	<DL	<DL	0.014	0.020	0.078	0.027	<DL	<DL
73	2,3,4-trimethylpentane	42.355	11.001	0.054	0.077	0.036	0.030	0.014	0.010	8.790	2.310	0.054	0.013
74	toluene/2,3,3-trimethylpentane	50.949	11.677	0.462	0.654	0.605	0.094	0.904	0.083	11.079	2.369	0.117	0.165
75	2,3-dimethylhexane	12.118	2.905	0.002	0.002	0.009	0.013	<DL	<DL	2.510	0.616	0.015	0.003
76	2-methyl-3-ethylpentane	0.521	0.130	<DL	<DL	<DL	<DL	<DL	<DL	0.108	0.027	<DL	<DL
77	2-methylheptane / 1-methylcyclohexene	2.955	0.553	<DL	<DL	0.071	0.009	<DL	<DL	0.631	0.115	0.037	0.001
78	4-methylheptane / 3-methyl-3-ethylpentane	0.941	0.218	0.033	0.047	<DL	<DL	0.075	0.025	0.225	0.028	<DL	<DL
79	3,4-dimethylhexane	2.384	0.589	<DL	<DL	<DL	<DL	<DL	<DL	0.493	0.124	0.002	0.002
80	3-methylheptane / 3-ethylhexane	2.685	0.621	0.0008	0.001	<DL	<DL	<DL	<DL	0.556	0.131	<DL	<DL
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	2.095	0.478	0.012	0.017	0.094	0.017	0.025	0.016	0.469	0.107	0.101	0.045
82	trans-1,4-dimethylcyclohexane	0.730	0.164	<DL	<DL	<DL	<DL	<DL	<DL	0.151	0.035	<DL	<DL
83	2,2,5-trimethylhexane	11.248	2.475	0.021	0.030	0.011	0.005	0.004	0.005	2.336	0.519	0.012	0.002
84	1-octene	0.420	0.108	<DL	<DL	<DL	<DL	<DL	<DL	0.087	0.023	<DL	<DL
85	1-ethyl-1-methylcyclopentane	0.169	0.011	<DL	<DL	<DL	<DL	<DL	<DL	0.035	0.002	0.005	0.007
86	n-octane/trans-1,2-dimethylcyclohexane	4.674	1.013	0.012	0.017	0.004	0.005	0.001	0.001	0.971	0.212	0.008	0.0001
87	trans-2-octene	0.108	0.026	<DL	<DL	<DL	<DL	<DL	<DL	0.022	0.006	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.618	0.151	0.008	0.011	<DL	<DL	<DL	<DL	0.130	0.034	<DL	<DL
89	2,4,4-trimethylhexane	0.439	0.110	<DL	<DL	<DL	<DL	<DL	<DL	0.091	0.023	<DL	<DL
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.195	0.039	0.074	0.023	<DL	<DL	0.008	0.011	0.059	0.0003	<DL	<DL
92	2,3,5-trimethylhexane	2.014	0.441	<DL	<DL	<DL	<DL	<DL	<DL	0.417	0.093	<DL	<DL
93	2,4-dimethylheptane	0.516	0.119	0.013	0.019	<DL	<DL	0.018	0.025	0.115	0.014	<DL	<DL
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.930	0.187	<DL	<DL	0.046	0.065	<DL	<DL	0.205	0.022	<DL	<DL
95	n-propylcyclopentane	0.155	0.037	<DL	<DL	<DL	<DL	<DL	<DL	0.032	0.008	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	1.471	0.331	<DL	<DL	<DL	<DL	<DL	<DL	0.304	0.070	<DL	<DL
97	2,5-dimethylheptane/3,5-dimethylheptane	1.161	0.221	<DL	<DL	<DL	<DL	<DL	<DL	0.240	0.047	<DL	<DL
98	3,3-dimethylheptane	0.804	0.190	0.005	0.007	<DL	<DL	<DL	<DL	0.167	0.042	0.049	0.069
99	1,1,4-trimethylcyclohexane	0.235	0.051	<DL	<DL	<DL	<DL	<DL	<DL	0.049	0.011	<DL	<DL
100	ethylbenzene	1.696	0.109	0.007	0.010	<DL	<DL	<DL	<DL	0.352	0.022	0.004	0.005
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.343	0.054	<DL	<DL	<DL	<DL	<DL	<DL	0.071	0.011	<DL	<DL
102	2,3-dimethylheptane	0.759	0.151	<DL	<DL	<DL	<DL	<DL	<DL	0.157	0.032	<DL	<DL
103	m&p-xylene/3,4-dimethylheptane	5.140	0.600	0.029	0.042	<DL	<DL	<DL	<DL	1.070	0.120	0.006	0.002
104	2-methyloctane	1.192	0.211	<DL	<DL	<DL	<DL	<DL	<DL	0.247	0.045	0.002	0.003
105	3-methyloctane	1.097	0.204	0.0006	0.0008	0.002	0.002	<DL	<DL	0.228	0.044	0.001	0.001
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	1.579	0.320	<DL	<DL	0.011	0.003	<DL	<DL	0.330	0.067	0.018	0.003
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	2.366	0.314	0.012	0.017	<DL	<DL	<DL	<DL	0.492	0.063	0.003	0.0009
109	1-nonene/1,1,2-trimethylcyclohexane	1.213	0.238	0.0008	0.001	0.004	0.005	<DL	<DL	0.252	0.052	0.002	0.003
110	trans-3-nonene	0.229	0.041	<DL	<DL	<DL	<DL	<DL	<DL	0.047	0.009	<DL	<DL
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
112	n-nonane	2.188	0.367	0.018	0.026	<DL	<DL	<DL	<DL	0.457	0.072	0.006	0.004
113	trans-2-nonene	0.650	0.132	0.008	0.008	<DL	<DL	<DL	<DL	0.136	0.030	<DL	<DL
114	cis-2-nonene	0.374	0.081	<DL	<DL	<DL	<DL	<DL	<DL	0.077	0.017	0.002	0.003
115	isopropylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
116	2,2-dimethyloctane	0.577	0.099	0.003	0.005	0.018	0.007	0.011	0.013	0.128	0.016	0.009	0.001
117	isopropylcyclohexane	0.699	0.135	0.008	0.011	<DL	<DL	<DL	<DL	0.146	0.031	0.0004	0.0005
118	n-butylcyclopentane	1.284	0.233	<DL	<DL	<DL	<DL	<DL	<DL	0.266	0.049	0.022	0.021
119	3,3-dimethyloctane	0.266	0.093	0.067	0.069	<DL	<DL	0.046	0.064	0.083	0.016	0.003	0.005
120	n-propylbenzene	0.321	0.050	0.004	0.006	0.002	0.0003	<DL	<DL	0.068	0.012	0.006	0.002
121	3-ethyltoluene	0.882	0.092	0.021	0.016	0.004	0.006	0.011	0.016	0.191	0.013	0.011	0.012
122	4-ethyltoluene/2,3-dimethyloctane	0.585	0.088	0.002	0.003	<DL	<DL	<DL	<DL	0.121	0.019	0.004	0.002
123	1,3,5-trimethylbenzene	1.180	0.176	<DL	<DL	0.005	0.003	<DL	<DL	0.246	0.038	0.007	0.003
124	2-methylnonane	3.266	0.582	<DL	<DL	<DL	<DL	0.018	0.004	0.681	0.125	<DL	<DL
125	3-ethyloctane	<DL	<DL	<DL	<DL	0.003	0.004	<DL	<DL	0.0008	0.001	<DL	<DL
126	3-methylnonane	0.331	0.045	0.007	0.008	<DL	<DL	<DL	<DL	0.070	0.012	0.002	0.00009
127	2-ethyltoluene	0.297	0.023	0.001	0.0002	0.003	0.0009	<DL	<DL	0.063	0.005	0.002	0.001
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	1.373	0.175	0.030	0.018	0.013	0.009	<DL	<DL	0.294	0.036	0.010	0.002
129	isobutylcyclohexane	0.322	0.057	0.033	0.006	0.177	0.020	0.002	0.003	0.123	0.015	0.196	0.135
130	n-decane	1.865	0.268	0.021	0.030	0.002	0.002	<DL	<DL	0.391	0.050	0.010	0.007
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
132	sec-butylbenzene	0.385	0.069	<DL	<DL	0.002	0.003	<DL	<DL	0.080	0.016	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
133	3-isopropyltoluene	0.306	0.047	0.021	0.025	0.015	0.003	0.0008	0.001	0.072	0.016	0.010	0.001
134	4-isopropyltoluene	0.668	0.033	0.030	0.042	0.022	0.031	0.041	0.058	0.163	0.024	0.003	0.004
135	indan	0.173	0.029	0.019	0.027	<DL	<DL	<DL	<DL	0.040	0.012	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.077	0.015	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.003	0.002	0.003
138	3-n-propyltoluene	2.224	0.354	0.022	0.032	0.019	0.008	<DL	<DL	0.470	0.071	0.011	0.003
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.396	0.047	0.012	0.005	0.012	0.003	<DL	<DL	0.088	0.010	0.016	0.003
140	1,2-diethylbenzene	0.188	0.024	0.001	0.002	<DL	<DL	<DL	<DL	0.039	0.005	0.002	0.002
141	2-n-propyltoluene	1.549	0.211	0.034	0.048	0.014	0.004	<DL	<DL	0.332	0.035	0.006	0.003
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003
143	1,3-dimethyl-4-ethylbenzene	0.210	0.029	<DL	<DL	0.004	0.006	<DL	<DL	0.045	0.008	0.004	0.002
144	1,2-dimethyl-4-ethylbenzene	0.137	0.015	0.0005	0.0008	0.005	0.002	<DL	<DL	0.030	0.003	0.004	0.003
145	1,3-dimethyl-2-ethylbenzene	0.152	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.031	0.005	<DL	<DL
146	n-undecane	0.616	0.057	0.017	0.025	0.008	0.006	<DL	<DL	0.134	0.009	0.011	0.007
147	1,2-dimethyl-3-ethylbenzene	0.213	0.048	<DL	<DL	<DL	<DL	<DL	<DL	0.044	0.010	<DL	<DL
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	2.214	0.396	0.081	0.068	1.310	0.445	0.141	0.006	0.876	0.219	1.258	0.323
149	1,2,3,5-tetramethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
150	tert-butyl-2-methylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002
151	n-pentylbenzene	0.095	0.013	0.016	0.008	0.040	0.004	<DL	<DL	0.034	0.002	0.087	0.052
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.041	0.047	<DL	<DL	0.001	0.002	<DL	<DL	0.009	0.009	0.024	0.033
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	0.077	0.008	<DL	<DL	0.016	0.003	<DL	<DL	0.020	0.0008	<DL	<DL
156	n-dodecane	0.085	0.017	0.025	0.035	0.013	0.001	<DL	<DL	0.027	0.011	0.005	0.002

11.e Caravan Emission Rates, 20° Tests

Caravan, Speciated VOC Emission Rates (mg/mile) from E0 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	52.651	11.655	4.979	1.013	15.065	1.868	3.453	2.827	17.191	2.660	11.847	1.355
2	ethylene	32.198	7.395	0.005	0.007	3.331	1.331	0.010	0.012	7.602	1.546	2.227	0.820
3	acetylene	18.270	10.727	0.028	0.022	0.004	0.009	0.053	0.073	3.819	2.220	0.028	0.017
4	ethane	11.291	1.778	0.048	0.027	5.770	1.194	0.053	0.094	3.952	0.529	7.432	10.476
5	propylene	22.215	3.753	0.045	0.009	2.144	0.682	0.014	0.020	5.213	0.847	1.062	0.338
6	propane	0.679	0.710	0.160	0.194	0.553	0.199	0.052	0.104	0.344	0.203	0.215	0.160
7	propyne	0.900	0.444	0.398	0.797	0.326	0.652	0.399	0.797	0.483	0.674	0.329	0.223
8	isobutane	7.151	4.616	0.885	0.474	1.397	0.255	0.965	1.044	2.351	0.982	0.769	0.534
9	isobutene / 1-butene	14.136	3.756	0.034	0.005	1.306	0.338	0.012	0.019	3.303	0.845	0.400	0.347
10	1,3-butadiene	0.411	0.156	0.013	0.0007	0.002	0.004	<DL	<DL	0.089	0.033	0.008	0.007
11	n-butane	6.482	4.069	0.632	0.618	1.346	0.395	0.798	0.779	2.092	0.773	0.634	0.511
12	trans-2-butene	2.343	0.713	0.015	0.011	0.393	0.127	0.018	0.026	0.603	0.166	0.096	0.084
13	1-butyne	0.030	0.023	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.005	<DL	<DL
14	cis-2-butene	1.450	0.447	0.110	0.152	0.348	0.224	0.063	0.056	0.440	0.145	0.053	0.058
15	1,2-butadiene	0.053	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.004	<DL	<DL
16	3-methyl-1-butene	0.548	0.146	0.007	0.005	0.009	0.005	0.002	0.003	0.118	0.031	0.009	0.008
17	2-methylbutane	31.614	19.122	0.757	0.822	2.846	0.746	0.625	0.877	7.701	3.802	1.526	0.723
18	1,4-pentadiene	0.011	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002	<DL	<DL
19	2-butyne	0.059	0.038	<DL	<DL	<DL	<DL	<DL	<DL	0.012	0.008	<DL	<DL
20	1-pentene	0.227	0.070	0.016	0.012	0.016	0.014	0.011	0.016	0.058	0.019	0.006	0.006
21	2-methyl-1-butene	1.049	0.310	0.014	0.014	0.066	0.033	0.008	0.011	0.241	0.068	0.019	0.021
22	n-pentane	10.150	5.618	0.214	0.206	0.937	0.308	0.138	0.204	2.454	1.125	0.492	0.258
23	2-methyl-1,3-butadiene	0.157	0.052	0.0006	0.001	0.002	0.004	0.0008	0.002	0.033	0.011	0.002	0.003
24	trans-2-pentene	0.450	0.155	0.003	0.004	0.017	0.002	0.005	0.010	0.100	0.031	0.014	0.016
25	cis-2-pentene	0.264	0.091	0.006	0.005	0.015	0.008	0.003	0.006	0.061	0.018	0.009	0.007
26	2-methyl-2-butene	2.000	0.608	0.022	0.022	0.090	0.148	0.009	0.018	0.448	0.136	0.024	0.033
27	trans-1,3-pentadiene	0.005	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.001	<DL	<DL
28	1,3-cyclopentadiene	0.007	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.003	0.0009	0.002
29	2,2-dimethylbutane / cis-1,3-pentadiene	1.606	0.885	0.010	0.014	0.144	0.022	0.016	0.025	0.380	0.179	0.060	0.037
30	cyclopentene	0.326	0.100	0.003	0.002	0.030	0.011	0.001	0.002	0.077	0.023	0.007	0.009
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.242	0.080	0.016	0.008	0.019	0.008	0.007	0.011	0.061	0.014	0.009	0.010
32	cyclopentane	1.127	0.583	0.046	0.069	0.202	0.176	0.063	0.074	0.318	0.164	0.098	0.143
33	2,3-dimethylbutane	10.067	5.719	0.039	0.028	0.681	0.162	0.054	0.085	2.302	1.188	0.317	0.154
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	8.499	4.698	0.047	0.060	0.574	0.116	0.068	0.093	1.953	0.966	0.288	0.138
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.263	0.140	<DL	<DL	0.032	0.064	0.077	0.142	0.086	0.032	0.048	0.033
37	3-methylpentane	5.041	2.720	0.046	0.033	0.353	0.056	0.057	0.073	1.171	0.570	0.166	0.083
38	2-methyl-1-pentene	0.134	0.061	0.003	0.007	0.007	0.004	0.002	0.002	0.031	0.013	0.004	0.005
39	1-hexene	0.221	0.096	0.005	0.005	0.003	0.003	0.002	0.004	0.048	0.017	0.002	0.003
40	n-hexane	6.096	3.234	0.024	0.036	0.414	0.106	0.045	0.070	1.398	0.667	0.190	0.111

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
41	trans-2-hexene	0.204	0.091	0.006	0.008	0.011	0.004	0.002	0.004	0.047	0.018	0.006	0.004
42	2-methyl-2-pentene	0.356	0.143	<DL	<DL	0.004	0.007	0.003	0.006	0.076	0.028	0.006	0.008
43	trans-3-methyl-2-pentene	0.257	0.114	0.0007	0.001	0.005	0.010	0.003	0.007	0.056	0.023	0.005	0.003
44	cis-2-hexene	0.110	0.050	0.002	0.005	0.007	0.002	0.003	0.005	0.026	0.009	0.003	0.002
45	cis-3-methyl-2-pentene	0.262	0.117	0.006	0.005	0.012	0.017	0.004	0.004	0.060	0.025	0.005	0.006
46	2,2-dimethylpentane	0.386	0.187	0.004	0.009	0.037	0.010	0.002	0.002	0.092	0.040	0.014	0.010
47	methylcyclopentane	4.577	2.367	0.023	0.017	0.274	0.065	0.028	0.037	1.039	0.493	0.128	0.068
48	2,4-dimethylpentane	7.255	3.648	0.030	0.016	0.475	0.112	0.026	0.039	1.651	0.760	0.213	0.132
49	2,2,3-trimethylbutane	0.566	0.273	0.002	0.004	0.044	0.012	0.001	0.003	0.130	0.057	0.018	0.013
50	1-methylclopentene	<DL	<DL	<DL	<DL	0.003	0.006	<DL	<DL	0.0008	0.002	<DL	<DL
51	benzene	7.237	2.789	0.021	0.025	0.679	0.094	0.041	0.081	1.705	0.578	0.256	0.225
52	3,3-dimethylpentane	0.249	0.149	<DL	<DL	0.030	0.022	0.005	0.006	0.061	0.031	0.011	0.013
53	cyclohexane	3.930	2.035	0.019	0.018	0.223	0.069	0.019	0.033	0.887	0.418	0.100	0.053
54	2-methylhexane	2.614	1.226	0.014	0.009	0.170	0.038	0.011	0.014	0.596	0.257	0.088	0.032
55	2,3-dimethylpentane	5.130	2.472	0.020	0.014	0.343	0.075	0.021	0.029	1.170	0.517	0.165	0.082
56	1,1-dimethylcyclopentane	0.336	0.157	0.010	0.009	0.033	0.007	0.005	0.005	0.083	0.035	0.013	0.008
57	cyclohexene	0.133	0.037	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.008	<DL	<DL
58	3-methylhexane	2.449	1.149	0.002	0.004	0.178	0.027	0.012	0.023	0.561	0.236	0.090	0.041
59	cis-1,3-dimethylcylcopentane	0.546	0.267	0.002	0.002	0.030	0.007	0.002	0.003	0.123	0.056	0.018	0.006
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	0.686	0.311	0.008	0.013	0.029	0.021	0.003	0.005	0.153	0.065	0.028	0.016
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	61.964	27.336	0.316	0.104	4.907	1.143	0.128	0.191	14.321	5.721	2.081	1.587
63	trans-3-heptene	0.047	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.004	0.0006	0.001
64	n-heptane	2.664	1.174	0.014	0.010	0.184	0.035	0.007	0.010	0.609	0.244	0.119	0.056
65	cis-3-heptene	0.132	0.045	<DL	<DL	<DL	<DL	<DL	<DL	0.027	0.009	<DL	<DL
66	trans-2-heptene	0.048	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.004	<DL	<DL
67	cis-2-heptene	0.133	0.037	<DL	<DL	0.004	0.005	<DL	<DL	0.029	0.008	<DL	<DL
68	methylcyclohexane / 2,2-dimethylhexane	4.332	1.958	0.021	0.014	0.285	0.060	0.012	0.016	0.986	0.409	0.154	0.051
69	2,5-dimethylhexane / ethylcyclopentane	7.585	3.185	0.042	0.019	0.522	0.117	0.014	0.020	1.732	0.670	0.216	0.165
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	10.361	4.299	0.058	0.018	0.784	0.184	0.019	0.026	2.385	0.904	0.324	0.251
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.262	0.100	<DL	<DL	0.028	0.007	<DL	<DL	0.062	0.020	0.013	0.004
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.131	0.051	<DL	<DL	0.013	0.003	<DL	<DL	0.031	0.010	0.006	0.002
73	2,3,4-trimethylpentane	21.040	8.710	0.119	0.028	1.591	0.366	0.034	0.050	4.842	1.828	0.652	0.508
74	toluene/2,3,3-trimethylpentane	26.714	10.754	1.650	0.357	3.127	0.279	1.515	1.386	7.219	2.253	1.027	0.968
75	2,3-dimethylhexane	6.110	2.424	0.034	0.008	0.482	0.125	0.007	0.015	1.410	0.508	0.199	0.153
76	2-methyl-3-ethylpentane	0.244	0.091	<DL	<DL	0.010	0.011	<DL	<DL	0.053	0.020	0.005	0.009
77	2-methylheptane / 1-methylcyclohexene	1.028	0.380	0.003	0.003	0.075	0.012	0.002	0.004	0.235	0.078	0.039	0.023
78	4-methylheptane / 3-methyl-3-ethylpentane	0.382	0.143	0.004	0.006	0.033	0.011	<DL	<DL	0.089	0.031	0.016	0.012
79	3,4-dimethylhexane	1.137	0.446	0.013	0.009	0.094	0.018	0.002	0.004	0.265	0.094	0.039	0.031
80	3-methylheptane / 3-ethylhexane	1.021	0.382	0.006	0.005	0.079	0.017	0.002	0.004	0.236	0.081	0.034	0.027
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	0.646	0.193	0.014	0.028	0.107	0.140	0.013	0.016	0.171	0.045	0.038	0.054
82	trans-1,4-dimethylcyclohexane	0.249	0.089	0.002	0.004	0.026	0.005	<DL	<DL	0.059	0.019	0.010	0.008
83	2,2,5-trimethylhexane	5.846	2.153	0.036	0.004	0.479	0.093	0.006	0.012	1.355	0.451	0.206	0.163
84	1-octene	0.147	0.053	<DL	<DL	0.019	0.005	<DL	<DL	0.036	0.010	0.005	0.006

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
85	1-ethyl-1-methylcyclopentane	0.053	0.021	<DL	<DL	0.002	0.004	<DL	<DL	0.012	0.004	<DL	<DL
86	n-octane/trans-1,2-dimethylcyclohexane	1.336	0.467	0.007	0.005	0.093	0.018	0.002	0.004	0.305	0.095	0.039	0.030
87	trans-2-octene	0.057	0.018	<DL	<DL	0.001	0.003	0.0007	0.001	0.012	0.003	<DL	<DL
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.241	0.080	<DL	<DL	0.019	0.004	<DL	<DL	0.055	0.016	0.007	0.006
89	2,4,4-trimethylhexane	0.242	0.080	<DL	<DL	0.021	0.006	<DL	<DL	0.056	0.017	0.008	0.006
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.068	0.035	0.023	0.022	0.003	0.007	0.003	0.007	0.021	0.016	0.002	0.003
92	2,3,5-trimethylhexane	0.862	0.319	0.003	0.004	0.039	0.047	<DL	<DL	0.190	0.068	0.030	0.024
93	2,4-dimethylheptane	0.222	0.099	<DL	<DL	0.018	0.005	0.017	0.034	0.056	0.029	0.006	0.005
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.326	0.110	<DL	<DL	0.063	0.097	<DL	<DL	0.085	0.029	0.015	0.024
95	n-propylcyclopentane	0.036	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.004	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	0.260	0.088	<DL	<DL	0.022	0.028	<DL	<DL	0.060	0.017	0.014	0.018
97	2,5-dimethylheptane/3,5-dimethylheptane	0.539	0.162	<DL	<DL	0.047	0.030	<DL	<DL	0.125	0.037	0.018	0.019
98	3,3-dimethylheptane	0.195	0.075	<DL	<DL	0.012	0.013	<DL	<DL	0.044	0.017	0.006	0.007
99	1,1,4-trimethylcyclohexane	0.092	0.041	<DL	<DL	<DL	<DL	<DL	<DL	0.019	0.008	<DL	<DL
100	ethylbenzene	1.203	0.394	0.043	0.028	0.074	0.035	0.008	0.016	0.282	0.075	0.043	0.040
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.087	0.028	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.006	<DL	<DL
102	2,3-dimethylheptane	0.214	0.066	<DL	<DL	0.015	0.011	<DL	<DL	0.049	0.015	0.004	0.003
103	m&p-xylene/3,4-dimethylheptane	3.073	0.992	0.050	0.045	0.171	0.058	0.018	0.024	0.701	0.197	0.104	0.060
104	2-methyloctane	0.312	0.083	<DL	<DL	0.025	0.004	<DL	<DL	0.072	0.017	0.011	0.007
105	3-methyloctane	0.268	0.089	0.005	0.008	0.020	0.007	0.005	0.010	0.064	0.016	0.009	0.009
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	0.734	0.248	<DL	<DL	0.085	0.013	0.008	0.010	0.178	0.048	0.034	0.032
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	1.275	0.418	0.029	0.009	0.079	0.017	0.007	0.008	0.295	0.089	0.046	0.018
109	1-nonene/1,1,2-trimethylcyclohexane	0.521	0.172	0.004	0.002	0.055	0.007	0.00003	0.00006	0.124	0.036	0.022	0.017
110	trans-3-nonene	0.053	0.017	<DL	<DL	0.003	0.007	<DL	<DL	0.012	0.004	0.001	0.002
111	cis-3-nonene/isobutylcyclopentane	0.007	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.003	<DL	<DL
112	n-nonane	0.486	0.144	0.012	0.007	0.050	0.009	0.001	0.003	0.118	0.031	0.018	0.017
113	trans-2-nonene	0.294	0.098	0.003	0.007	0.032	0.008	<DL	<DL	0.071	0.022	0.013	0.010
114	cis-2-nonene	0.046	0.025	0.005	0.010	0.007	0.006	0.002	0.003	0.013	0.005	0.001	0.002
115	isopropylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002
116	2,2-dimethyloctane	0.246	0.082	0.008	0.009	0.023	0.003	<DL	<DL	0.059	0.017	0.009	0.006
117	isopropylcyclohexane	0.116	0.042	<DL	<DL	0.010	0.001	<DL	<DL	0.027	0.009	0.003	0.002
118	n-butylcyclopentane	0.297	0.094	0.029	0.039	0.035	0.011	<DL	<DL	0.078	0.022	0.008	0.010
119	3,3-dimethyloctane	0.005	0.010	<DL	<DL	0.003	0.005	<DL	<DL	0.002	0.002	0.006	0.010
120	n-propylbenzene	0.171	0.058	0.003	0.004	0.008	0.004	0.001	0.002	0.039	0.011	0.007	0.007
121	3-ethyltoluene	0.661	0.210	0.040	0.003	0.034	0.007	0.006	0.007	0.157	0.046	0.024	0.014
122	4-ethyltoluene/2,3-dimethyloctane	0.324	0.105	0.016	0.011	0.012	0.009	0.002	0.004	0.075	0.022	0.011	0.008
123	1,3,5-trimethylbenzene	0.379	0.122	0.027	0.005	0.025	0.007	0.002	0.003	0.092	0.027	0.014	0.004
124	2-methylnonane	1.417	0.450	0.045	0.003	0.155	0.086	0.016	0.020	0.351	0.108	0.079	0.066
125	3-ethyloctane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
126	3-methylnonane	0.047	0.028	<DL	<DL	0.003	0.007	<DL	<DL	0.011	0.005	0.003	0.004
127	2-ethyltoluene	0.242	0.073	0.020	0.011	0.013	0.007	0.002	0.002	0.059	0.016	0.008	0.004
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	0.819	0.278	0.072	0.017	0.050	0.015	0.005	0.009	0.201	0.060	0.035	0.016
129	isobutylcyclohexane	0.049	0.046	0.053	0.056	0.045	0.053	0.071	0.084	0.055	0.061	0.061	0.058

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
130	n-decane	0.541	0.171	0.039	0.011	0.071	0.014	0.007	0.009	0.143	0.036	0.031	0.027
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
132	sec-butylbenzene	0.107	0.033	<DL	<DL	0.004	0.006	<DL	<DL	0.023	0.007	0.003	0.004
133	3-isopropyltoluene	0.065	0.023	0.039	0.064	0.005	0.010	<DL	<DL	0.024	0.012	0.005	0.007
134	4-isopropyltoluene	0.226	0.069	0.038	0.044	0.028	0.022	0.003	0.007	0.064	0.018	0.009	0.008
135	indan	0.068	0.033	0.047	0.093	<DL	<DL	0.005	0.006	0.026	0.020	0.001	0.003
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
138	3-n-propyltoluene	0.836	0.265	0.071	0.014	0.115	0.005	0.004	0.007	0.222	0.056	0.048	0.041
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.193	0.064	0.025	0.002	0.019	0.008	0.003	0.006	0.052	0.012	0.009	0.009
140	1,2-diethylbenzene	0.078	0.025	0.015	0.0008	0.010	0.002	<DL	<DL	0.022	0.005	0.004	0.003
141	2-n-propyltoluene	0.564	0.177	0.063	0.016	0.085	0.003	0.003	0.006	0.155	0.038	0.035	0.029
142	1,4-dimethyl-2-ethylbenzene	0.060	0.024	0.007	0.014	<DL	<DL	<DL	<DL	0.014	0.008	0.002	0.003
143	1,3-dimethyl-4-ethylbenzene	0.114	0.039	0.026	0.005	0.012	0.010	<DL	<DL	0.033	0.008	0.004	0.005
144	1,2-dimethyl-4-ethylbenzene	0.108	0.039	0.031	0.008	0.009	0.006	0.002	0.004	0.032	0.009	0.005	0.005
145	1,3-dimethyl-2-ethylbenzene	0.053	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.004	0.002	0.003
146	n-undecane	0.169	0.056	0.034	0.013	0.022	0.008	0.006	0.009	0.050	0.009	0.015	0.016
147	1,2-dimethyl-3-ethylbenzene	0.126	0.042	0.039	0.009	0.022	0.007	<DL	<DL	0.041	0.010	0.009	0.007
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.249	0.121	0.019	0.023	0.080	0.057	0.022	0.024	0.084	0.046	0.109	0.086
149	1,2,3,5-tetramethylbenzene	0.031	0.040	0.042	0.014	0.003	0.007	0.004	0.007	0.018	0.013	0.002	0.005
150	tert-butyl-2-methylbenzene	0.003	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.0006	0.001	<DL	<DL
151	n-pentylbenzene	0.008	0.011	0.011	0.010	0.009	0.012	0.010	0.011	0.009	0.007	0.012	0.016
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	0.171	0.341	0.043	0.086	<DL	<DL	<DL	<DL	0.045	0.090	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.064	0.129	0.016	0.026	<DL	<DL	<DL	<DL	0.017	0.032	<DL	<DL
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	<DL	<DL	0.021	0.030	<DL	<DL	<DL	<DL	0.005	0.007	<DL	<DL
156	n-dodecane	0.002	0.004	0.013	0.013	0.005	0.009	0.005	0.011	0.006	0.006	0.005	0.005

Caravan, Speciated VOC Emission Rates (mg/mile) from E10 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	51.955	6.161	3.461	0.471	13.957	1.815	2.206	3.120	16.016	0.088	14.461	0.436
2	ethylene	39.487	3.532	0.024	0.034	3.201	0.057	<DL	<DL	9.068	0.680	2.660	0.744
3	acetylene	8.132	9.868	<DL	<DL	<DL	<DL	<DL	<DL	1.683	2.041	0.049	0.008
4	ethane	11.784	0.746	0.140	0.198	4.288	0.311	<DL	<DL	3.649	0.298	2.763	0.070
5	propylene	23.708	1.986	0.037	0.053	1.359	0.146	0.011	0.015	5.298	0.428	0.923	0.110
6	propane	0.717	0.651	<DL	<DL	0.118	0.166	0.016	0.022	0.185	0.186	0.015	0.021
7	propyne	0.615	0.555	<DL	<DL	0.0004	0.0006	0.0006	0.0008	0.128	0.115	0.004	0.0004
8	isobutane	6.206	4.320	1.483	0.861	1.297	0.183	0.897	0.244	2.236	0.823	0.830	0.119
9	isobutene / 1-butene	16.359	1.381	0.033	0.032	0.808	0.104	<DL	<DL	3.620	0.296	0.422	0.003
10	1,3-butadiene	0.343	0.206	0.007	0.009	<DL	<DL	<DL	<DL	0.072	0.040	0.005	0.004
11	n-butane	6.075	4.127	1.105	0.391	1.036	0.002	0.880	0.348	2.049	0.869	0.756	0.120

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
12	trans-2-butene	2.782	0.105	0.015	0.010	0.268	0.057	0.009	0.005	0.656	0.034	0.121	0.014
13	1-butyne	0.033	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.004	<DL	<DL
14	cis-2-butene	2.044	0.384	0.026	0.037	0.194	0.026	0.071	0.022	0.503	0.071	0.069	0.0008
15	1,2-butadiene	0.056	0.032	<DL	<DL	<DL	<DL	<DL	<DL	0.012	0.007	<DL	<DL
16	3-methyl-1-butene	0.657	0.140	0.003	0.004	0.003	0.002	0.001	0.001	0.138	0.029	0.011	0.001
17	2-methylbutane	19.805	12.505	0.640	0.905	1.352	0.137	0.274	0.388	4.697	2.530	1.106	0.195
18	1,4-pentadiene	0.097	0.124	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.026	<DL	<DL
19	2-butyne	0.064	0.054	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.011	<DL	<DL
20	1-pentene	0.352	0.143	0.004	0.006	<DL	<DL	0.002	0.003	0.074	0.029	0.008	0.003
21	2-methyl-1-butene	1.094	0.171	0.009	0.013	0.017	0.0002	0.004	0.006	0.235	0.034	0.004	0.002
22	n-pentane	5.833	3.887	0.141	0.200	0.378	0.029	0.061	0.086	1.361	0.791	0.273	0.039
23	2-methyl-1,3-butadiene	0.105	0.049	<DL	<DL	<DL	<DL	<DL	<DL	0.022	0.010	<DL	<DL
24	trans-2-pentene	0.466	0.122	0.011	0.015	0.007	0.009	0.003	0.005	0.102	0.018	0.008	0.011
25	cis-2-pentene	0.266	0.084	0.003	0.004	0.007	0.004	0.004	0.002	0.059	0.018	0.006	0.002
26	2-methyl-2-butene	1.347	0.737	0.009	0.012	<DL	<DL	0.008	0.011	0.283	0.152	<DL	<DL
27	trans-1,3-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
28	1,3-cyclopentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	1.082	0.579	0.010	0.015	0.078	0.007	<DL	<DL	0.248	0.114	0.057	0.010
30	cyclopentene	0.398	0.019	0.002	0.003	0.009	0.005	0.002	0.0003	0.086	0.005	0.007	0.004
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.296	0.052	0.007	0.011	0.007	0.010	<DL	<DL	0.065	0.016	0.014	0.002
32	cyclopentane	0.701	0.564	0.111	0.156	0.162	0.123	<DL	<DL	0.214	0.048	0.124	0.049
33	2,3-dimethylbutane	7.662	4.335	0.067	0.095	0.424	0.051	0.013	0.019	1.722	0.864	0.317	0.024
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	6.534	3.920	0.091	0.129	0.267	0.157	0.029	0.041	1.456	0.749	0.294	0.179
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.352	0.055	<DL	<DL	0.098	0.139	<DL	<DL	0.100	0.049	0.047	0.067
37	3-methylpentane	3.964	2.223	0.040	0.057	0.222	0.022	0.015	0.022	0.895	0.446	0.174	0.022
38	2-methyl-1-pentene	0.129	0.037	0.001	0.002	<DL	<DL	0.001	0.002	0.027	0.008	<DL	<DL
39	1-hexene	0.449	0.199	0.004	0.006	0.004	0.003	0.008	0.008	0.098	0.038	0.010	0.003
40	n-hexane	4.878	2.684	0.043	0.061	0.284	0.023	0.025	0.035	1.105	0.544	0.203	0.023
41	trans-2-hexene	0.265	0.086	0.004	0.003	0.007	0.003	0.002	0.001	0.058	0.018	0.005	0.002
42	2-methyl-2-pentene	0.322	0.172	<DL	<DL	<DL	<DL	<DL	<DL	0.067	0.035	<DL	<DL
43	trans-3-methyl-2-pentene	0.145	0.071	<DL	<DL	<DL	<DL	<DL	<DL	0.030	0.015	<DL	<DL
44	cis-2-hexene	0.140	0.042	0.004	0.006	0.0008	0.001	0.003	0.005	0.031	0.006	0.002	0.002
45	cis-3-methyl-2-pentene	0.147	0.128	0.004	0.006	<DL	<DL	0.004	0.003	0.032	0.026	<DL	<DL
46	2,2-dimethylpentane	0.352	0.171	0.007	0.010	0.025	0.001	<DL	<DL	0.081	0.033	0.019	0.0004
47	methylcyclopentane	3.678	1.954	0.031	0.043	0.174	0.023	0.021	0.004	0.823	0.388	0.130	0.014
48	2,4-dimethylpentane	5.904	3.028	0.037	0.052	0.296	0.039	0.007	0.011	1.315	0.605	0.231	0.020
49	2,2,3-trimethylbutane	0.474	0.225	0.002	0.003	0.027	0.0005	<DL	<DL	0.106	0.046	0.020	0.0004
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	8.887	1.716	0.062	0.088	0.668	0.022	<DL	<DL	2.039	0.336	0.503	0.036
52	3,3-dimethylpentane	0.063	0.089	<DL	<DL	0.013	0.019	0.004	0.005	0.018	0.012	0.007	0.010
53	cyclohexane	3.619	1.979	0.021	0.029	0.168	0.041	0.008	0.011	0.803	0.393	0.121	0.028
54	2-methylhexane	2.602	1.271	0.016	0.023	0.128	0.015	0.008	0.004	0.580	0.254	0.098	0.008
55	2,3-dimethylpentane	4.431	2.198	0.030	0.042	0.227	0.033	0.008	0.012	0.989	0.438	0.180	0.019
56	1,1-dimethylcyclopentane	0.346	0.162	0.007	0.010	0.025	0.003	0.005	0.007	0.081	0.028	0.017	0.0007

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
57	cyclohexene	0.204	0.065	<DL	<DL	<DL	<DL	<DL	<DL	0.042	0.013	<DL	<DL
58	3-methylhexane	2.507	1.235	0.006	0.009	0.125	0.017	0.003	0.004	0.556	0.249	0.103	0.012
59	cis-1,3-dimethylcylcopentane	0.579	0.300	0.004	0.003	0.024	0.003	0.002	0.00009	0.128	0.060	0.018	0.002
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	0.737	0.367	0.009	0.006	<DL	<DL	0.006	0.008	0.156	0.072	0.010	0.014
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	52.716	23.100	0.288	0.408	3.083	0.438	0.063	0.089	11.851	4.568	2.363	0.120
63	trans-3-heptene	0.069	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.004	<DL	<DL
64	n-heptane	3.256	1.574	0.019	0.026	0.170	0.020	0.004	0.005	0.726	0.314	0.125	0.008
65	cis-3-heptene	0.081	0.114	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.024	<DL	<DL
66	trans-2-heptene	0.073	0.031	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.006	0.001	0.002
67	cis-2-heptene	0.118	0.089	<DL	<DL	<DL	<DL	<DL	<DL	0.025	0.018	<DL	<DL
68	methylcyclohexane / 2,2-dimethylhexane	5.656	2.729	0.032	0.037	0.273	0.037	0.007	0.010	1.256	0.547	0.194	0.012
69	2,5-dimethylhexane / ethylcyclopentane	6.662	2.775	0.038	0.042	0.328	0.044	0.007	0.010	1.481	0.553	0.252	0.006
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	9.136	3.736	0.054	0.056	0.497	0.074	0.014	0.011	2.045	0.739	0.372	0.018
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.382	0.151	<DL	<DL	0.024	0.002	<DL	<DL	0.086	0.030	0.020	0.002
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.226	0.079	<DL	<DL	0.011	0.001	<DL	<DL	0.050	0.016	0.009	0.003
73	2,3,4-trimethylpentane	18.380	7.501	0.102	0.112	0.995	0.167	0.019	0.027	4.110	1.480	0.752	0.027
74	toluene/2,3,3-trimethylpentane	26.575	10.024	0.877	1.240	2.166	0.044	1.362	0.022	6.698	1.767	1.465	0.082
75	2,3-dimethylhexane	5.449	2.074	0.033	0.039	0.327	0.019	0.006	0.008	1.228	0.415	0.240	0.026
76	2-methyl-3-ethylpentane	0.268	0.086	<DL	<DL	0.014	0.020	<DL	<DL	0.059	0.012	0.006	0.008
77	2-methylheptane / 1-methylcyclohexene	1.548	0.622	0.010	0.011	0.106	0.009	0.004	0.006	0.353	0.121	0.064	0.012
78	4-methylheptane / 3-methyl-3-ethylpentane	0.563	0.232	0.006	0.008	0.039	0.0005	<DL	<DL	0.128	0.046	0.027	0.011
79	3,4-dimethylhexane	1.072	0.396	<DL	<DL	0.077	0.009	0.005	0.007	0.245	0.081	0.057	0.007
80	3-methylheptane / 3-ethylhexane	1.436	0.537	0.007	0.010	0.106	0.027	0.0009	0.001	0.328	0.101	0.075	0.015
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	1.114	0.420	0.049	0.058	0.112	0.017	<DL	<DL	0.272	0.095	0.054	0.004
82	trans-1,4-dimethylcyclohexane	0.444	0.160	<DL	<DL	0.036	0.007	<DL	<DL	0.102	0.031	0.025	0.003
83	2,2,5-trimethylhexane	5.166	1.786	0.030	0.032	0.137	0.194	0.007	0.005	1.117	0.415	0.240	0.008
84	1-octene	0.339	0.127	<DL	<DL	0.015	0.008	<DL	<DL	0.074	0.028	0.016	0.003
85	1-ethyl-1-methylcyclopentane	0.133	0.080	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.017	<DL	<DL
86	n-octane/trans-1,2-dimethylcyclohexane	2.816	1.165	0.022	0.020	0.156	0.014	0.020	0.015	0.637	0.227	0.111	0.002
87	trans-2-octene	0.120	0.081	<DL	<DL	0.004	0.005	0.010	0.015	0.029	0.011	0.002	0.003
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.412	0.193	<DL	<DL	0.019	0.003	<DL	<DL	0.091	0.039	0.015	0.001
89	2,4,4-trimethylhexane	0.256	0.103	<DL	<DL	0.015	0.002	<DL	<DL	0.057	0.022	0.010	0.00008
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.116	0.073	0.067	0.094	0.009	0.013	0.014	0.002	0.046	0.002	0.0009	0.001
92	2,3,5-trimethylhexane	0.808	0.248	0.007	0.010	0.048	0.003	<DL	<DL	0.182	0.048	0.035	0.0001
93	2,4-dimethylheptane	0.303	0.126	<DL	<DL	0.015	0.001	<DL	<DL	0.067	0.026	0.026	0.021
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.574	0.218	<DL	<DL	0.028	0.0006	<DL	<DL	0.127	0.045	0.027	0.011
95	n-propylcyclopentane	0.073	0.030	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.006	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	0.775	0.306	0.005	0.007	0.039	0.001	<DL	<DL	0.172	0.061	0.034	0.013
97	2,5-dimethylheptane/3,5-dimethylheptane	0.647	0.227	0.008	0.011	0.032	0.0003	<DL	<DL	0.145	0.044	0.029	0.006
98	3,3-dimethylheptane	0.363	0.132	<DL	<DL	0.021	0.0005	<DL	<DL	0.081	0.027	0.017	0.004
99	1,1,4-trimethylcyclohexane	0.143	0.055	<DL	<DL	<DL	<DL	<DL	<DL	0.030	0.011	0.004	0.0006
100	ethylbenzene	1.860	0.621	0.051	0.072	0.029	0.041	0.009	0.003	0.407	0.154	0.066	0.014

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.275	0.088	0.015	0.022	0.010	0.0005	<DL	<DL	0.063	0.013	0.019	0.0004
102	2,3-dimethylheptane	0.394	0.127	0.012	0.017	0.015	0.002	<DL	<DL	0.088	0.022	0.020	0.0006
103	m&p-xylene/3,4-dimethylheptane	4.580	1.488	0.096	0.119	0.175	0.059	0.015	0.021	1.023	0.301	0.119	0.003
104	2-methyloctane	0.964	0.327	0.021	0.012	0.050	0.0002	0.006	0.006	0.220	0.066	0.039	0.002
105	3-methyloctane	0.773	0.267	<DL	<DL	0.041	0.009	0.003	0.004	0.172	0.058	0.031	0.001
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	0.875	0.249	0.010	0.004	0.064	0.005	0.001	0.002	0.202	0.049	0.048	0.0006
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	1.903	0.639	0.029	0.035	0.080	0.018	0.009	0.005	0.426	0.130	0.051	0.002
109	1-nonene/1,1,2-trimethylcyclohexane	0.707	0.210	0.009	0.013	0.045	0.003	0.010	0.0003	0.164	0.039	0.034	0.0005
110	trans-3-nonene	0.239	0.082	<DL	<DL	0.013	0.001	<DL	<DL	0.053	0.017	0.010	0.0002
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
112	n-nonane	2.637	0.880	0.042	0.027	0.158	0.003	0.011	0.005	0.602	0.177	0.112	0.00001
113	trans-2-nonene	0.306	0.082	0.010	0.015	0.018	0.001	<DL	<DL	0.071	0.013	0.015	0.00007
114	cis-2-nonene	0.373	0.126	0.010	0.014	0.024	0.001	<DL	<DL	0.086	0.023	0.016	0.00007
115	isopropylbenzene	0.040	0.057	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.012	<DL	<DL
116	2,2-dimethyloctane	0.534	0.239	0.006	0.008	0.033	0.001	<DL	<DL	0.121	0.047	0.025	0.001
117	isopropylcyclohexane	0.614	0.226	<DL	<DL	0.036	0.002	<DL	<DL	0.137	0.046	0.025	0.0008
118	n-butylcyclopentane	1.249	0.337	0.030	0.001	0.080	0.002	0.005	0.002	0.289	0.070	0.056	0.001
119	3,3-dimethyloctane	0.164	0.054	<DL	<DL	<DL	<DL	<DL	<DL	0.034	0.011	0.010	0.002
120	n-propylbenzene	0.367	0.129	0.007	0.006	0.011	0.0005	0.001	0.002	0.081	0.025	0.009	0.001
121	3-ethyltoluene	1.064	0.353	0.033	0.038	0.029	0.007	0.010	0.002	0.239	0.067	0.023	0.00004
122	4-ethyltoluene/2,3-dimethyloctane	0.804	0.248	0.021	0.025	0.040	0.001	0.006	0.001	0.184	0.045	0.027	0.001
123	1,3,5-trimethylbenzene	1.260	0.382	0.042	0.042	0.064	0.017	0.011	0.005	0.291	0.075	0.042	0.010
124	2-methylnonane	0.614	0.184	0.029	0.011	0.038	0.003	<DL	<DL	0.144	0.036	0.027	0.002
125	3-ethyloctane	0.140	0.042	<DL	<DL	0.009	0.0009	<DL	<DL	0.031	0.009	0.006	0.0004
126	3-methylnonane	0.588	0.170	0.004	0.006	0.030	0.002	<DL	<DL	0.131	0.034	0.024	0.0002
127	2-ethyltoluene	0.336	0.116	0.017	0.015	0.007	0.002	0.001	0.0004	0.075	0.021	0.007	0.0002
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	1.517	0.536	0.124	0.009	0.066	0.014	0.009	0.0002	0.363	0.116	0.042	0.010
129	isobutylcyclohexane	0.295	0.056	0.058	0.083	0.056	0.016	0.078	0.012	0.112	0.006	0.095	0.006
130	n-decane	2.759	0.806	0.111	0.092	0.186	0.017	0.026	0.0002	0.655	0.149	0.136	0.015
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.110	0.038	<DL	<DL	<DL	<DL	<DL	<DL	0.023	0.008	0.003	0.004
132	sec-butylbenzene	0.197	0.053	<DL	<DL	0.008	0.0009	<DL	<DL	0.043	0.011	0.008	0.003
133	3-isopropyltoluene	0.223	0.063	<DL	<DL	<DL	<DL	<DL	<DL	0.046	0.013	0.004	0.005
134	4-isopropyltoluene	0.480	0.161	0.048	0.069	0.010	0.014	0.025	0.015	0.120	0.010	0.012	0.008
135	indan	0.125	0.008	0.007	0.010	<DL	<DL	0.011	0.001	0.031	0.003	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.092	0.026	<DL	<DL	<DL	<DL	<DL	<DL	0.019	0.005	0.005	0.002
138	3-n-propyltoluene	0.945	0.250	0.041	0.048	0.079	0.0007	0.004	0.0003	0.228	0.040	0.060	0.005
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.363	0.138	0.034	0.040	0.022	0.003	0.011	0.007	0.092	0.016	0.014	0.004
140	1,2-diethylbenzene	0.209	0.065	0.013	0.018	0.017	0.004	0.005	0.007	0.052	0.013	0.011	0.004
141	2-n-propyltoluene	0.679	0.186	0.048	0.053	0.065	0.0009	0.013	0.004	0.173	0.026	0.045	0.004
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	0.005	0.007	<DL	<DL	0.005	0.008	0.003	0.004	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.111	0.081	0.014	0.020	0.006	0.008	<DL	<DL	0.028	0.015	0.004	0.006
144	1,2-dimethyl-4-ethylbenzene	0.142	0.070	0.020	0.028	0.004	0.005	0.001	0.002	0.035	0.010	0.003	0.004
145	1,3-dimethyl-2-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
146	n-undecane	0.591	0.210	0.101	0.127	0.050	0.022	0.025	0.006	0.166	0.023	0.036	0.010
147	1,2-dimethyl-3-ethylbenzene	0.102	0.017	0.015	0.021	0.011	0.002	<DL	<DL	0.027	0.0006	0.008	0.001
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.236	0.208	0.060	0.022	0.118	0.092	0.019	0.008	0.100	0.070	0.127	0.066
149	1,2,3,5-tetramethylbenzene	0.068	0.017	0.021	0.030	<DL	<DL	0.009	0.013	0.022	0.0008	<DL	<DL
150	tert-butyl-2-methylbenzene	0.007	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
151	n-pentylbenzene	0.018	0.002	0.020	0.006	0.008	0.004	0.013	0.008	0.014	0.003	0.013	0.0006
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.004	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.0008	0.001	<DL	<DL
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	<DL	<DL	0.016	0.023	<DL	<DL	<DL	<DL	0.004	0.005	<DL	<DL
156	n-dodecane	0.164	0.182	0.029	0.014	0.006	0.008	0.008	0.012	0.045	0.035	0.003	0.005

Caravan, Speciated VOC Emission Rates (mg/mile) from E10-Spl Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	53.224	0.770	4.159	0.492	16.273	1.126	2.910	4.115	17.317	1.260	12.388	0.087
2	ethylene	36.646	1.284	0.007	0.009	3.924	1.296	0.005	0.007	8.699	0.614	1.880	0.531
3	acetylene	19.150	1.596	0.025	0.0003	0.048	0.068	<DL	<DL	4.000	0.316	0.003	0.00005
4	ethane	10.029	1.145	0.059	0.045	5.279	0.400	0.042	0.060	3.560	0.320	2.153	0.279
5	propylene	21.170	0.991	0.041	0.0001	1.946	0.657	0.013	0.008	4.949	0.031	0.789	0.173
6	propane	0.165	0.233	0.211	0.167	0.294	0.245	<DL	<DL	0.162	0.153	0.019	0.026
7	propyne	0.697	0.036	<DL	<DL	0.005	0.007	<DL	<DL	0.146	0.006	0.004	0.0003
8	isobutane	9.191	4.014	1.472	0.248	1.268	0.287	0.846	0.198	2.836	0.760	0.619	0.183
9	isobutene / 1-butene	15.133	1.346	0.038	0.010	1.111	0.589	0.011	0.016	3.463	0.127	0.390	0.129
10	1,3-butadiene	0.410	0.223	0.012	0.0002	<DL	<DL	<DL	<DL	0.088	0.047	0.008	0.011
11	n-butane	7.233	3.148	1.018	0.059	0.852	0.141	0.762	0.165	2.189	0.653	0.454	0.069
12	trans-2-butene	2.406	0.252	0.023	0.0008	0.307	0.172	0.013	0.004	0.594	0.007	0.093	0.013
13	1-butyne	0.043	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.001	<DL	<DL
14	cis-2-butene	2.198	0.938	0.187	0.026	0.235	0.140	0.057	0.019	0.580	0.168	0.045	0.033
15	1,2-butadiene	0.063	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.002	<DL	<DL
16	3-methyl-1-butene	0.604	0.101	0.004	0.00005	0.005	0.004	0.003	0.001	0.129	0.021	0.010	0.003
17	2-methylbutane	35.826	14.889	1.158	0.256	1.719	0.175	0.636	0.160	8.367	3.044	1.066	0.120
18	1,4-pentadiene	0.006	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
19	2-butyne	0.069	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.0006	<DL	<DL
20	1-pentene	0.255	0.071	0.007	0.003	0.003	0.004	0.006	0.001	0.057	0.013	0.002	0.001
21	2-methyl-1-butene	1.127	0.316	0.021	0.002	0.034	0.048	0.012	0.002	0.252	0.053	0.008	0.011
22	n-pentane	10.182	4.371	0.284	0.061	0.457	0.070	0.075	0.106	2.328	0.909	0.245	0.009
23	2-methyl-1,3-butadiene	0.138	0.049	0.005	0.0003	0.003	0.005	<DL	<DL	0.031	0.009	0.0009	0.001
24	trans-2-pentene	0.511	0.138	0.023	0.004	0.017	0.011	0.015	0.003	0.121	0.026	0.006	0.005
25	cis-2-pentene	0.295	0.083	0.011	0.002	0.006	0.008	0.006	0.000002	0.067	0.015	0.002	0.003
26	2-methyl-2-butene	1.851	0.754	0.040	0.001	0.014	0.020	0.020	0.002	0.404	0.152	<DL	<DL
27	trans-1,3-pentadiene	0.007	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
28	1,3-cyclopentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	1.894	0.904	0.020	0.0003	0.103	0.0002	0.007	0.009	0.429	0.191	0.058	0.002
30	cyclopentene	0.321	0.079	0.004	0.0009	0.019	0.022	0.003	0.0006	0.074	0.011	0.005	0.007
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.299	0.077	0.017	0.00008	0.012	0.017	<DL	<DL	0.069	0.011	0.011	0.006
32	cyclopentane	1.079	0.594	0.061	0.087	0.080	0.113	<DL	<DL	0.260	0.174	0.104	0.088
33	2,3-dimethylbutane	14.309	7.200	0.127	0.004	0.604	0.038	0.010	0.015	3.173	1.492	0.334	0.036
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	11.222	5.849	0.175	0.016	0.318	0.046	0.081	0.0003	2.484	1.209	0.218	0.081
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.351	0.077	<DL	<DL	0.157	0.010	<DL	<DL	0.116	0.019	0.037	0.052
37	3-methylpentane	6.616	3.235	0.076	0.007	0.286	0.016	0.033	0.005	1.481	0.672	0.164	0.014
38	2-methyl-1-pentene	0.219	0.141	0.0004	0.0005	0.002	0.003	0.001	0.0005	0.046	0.029	<DL	<DL
39	1-hexene	0.320	0.063	0.010	0.007	0.003	0.001	0.003	0.0009	0.070	0.011	0.005	0.002
40	n-hexane	7.387	3.828	0.035	0.011	0.320	0.015	0.015	0.022	1.636	0.802	0.181	0.006
41	trans-2-hexene	0.345	0.163	0.006	0.003	0.009	0.006	0.005	0.0009	0.077	0.033	0.004	0.003
42	2-methyl-2-pentene	0.514	0.305	<DL	<DL	0.002	0.002	<DL	<DL	0.107	0.063	<DL	<DL
43	trans-3-methyl-2-pentene	0.331	0.270	0.008	0.006	<DL	<DL	0.001	0.001	0.071	0.054	0.0007	0.001
44	cis-2-hexene	0.178	0.077	0.001	0.002	0.002	0.003	0.0004	0.0006	0.038	0.015	0.0003	0.0004
45	cis-3-methyl-2-pentene	0.380	0.337	0.014	0.008	0.003	0.004	0.003	0.0006	0.084	0.067	<DL	<DL
46	2,2-dimethylpentane	0.527	0.281	0.002	0.001	0.026	0.002	<DL	<DL	0.117	0.058	0.016	0.001
47	methylcyclopentane	5.351	2.731	0.047	0.006	0.207	0.028	0.016	0.0003	1.185	0.562	0.108	0.016
48	2,4-dimethylpentane	10.944	6.001	0.074	0.015	0.434	0.030	0.007	0.010	2.414	1.247	0.241	0.032
49	2,2,3-trimethylbutane	0.818	0.429	0.010	0.002	0.034	0.0003	0.0003	0.0004	0.182	0.090	0.021	0.0002
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	9.413	3.653	0.076	0.041	0.943	0.564	0.028	0.039	2.241	0.627	0.301	0.043
52	3,3-dimethylpentane	0.698	0.242	0.007	0.003	0.031	0.006	0.180	0.243	0.208	0.024	0.015	0.005
53	cyclohexane	4.593	2.503	0.085	0.040	0.120	0.010	0.010	0.014	1.010	0.514	0.053	0.011
54	2-methylhexane	3.941	2.099	0.032	0.007	0.157	0.013	0.006	0.002	0.872	0.435	0.086	0.012
55	2,3-dimethylpentane	7.921	4.251	0.062	0.015	0.326	0.017	0.012	0.005	1.754	0.885	0.183	0.022
56	1,1-dimethylcyclopentane	0.403	0.200	0.014	0.003	0.025	0.002	<DL	<DL	0.094	0.042	0.014	0.002
57	cyclohexene	0.129	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.027	0.004	<DL	<DL
58	3-methylhexane	3.768	1.997	0.023	0.004	0.157	0.010	0.004	0.006	0.833	0.416	0.089	0.011
59	cis-1,3-dimethylcylcopentane	0.744	0.412	0.006	0.001	0.025	0.004	0.003	0.0004	0.164	0.085	0.013	0.001
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	0.969	0.508	0.003	0.005	0.057	0.002	0.025	0.030	0.225	0.114	0.024	0.003
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	91.379	47.033	0.558	0.172	4.377	0.105	0.122	0.172	20.364	9.853	2.564	0.303
63	trans-3-heptene	0.083	0.044	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.009	<DL	<DL
64	n-heptane	3.721	2.009	0.030	0.011	0.158	0.011	0.006	0.003	0.826	0.419	0.083	0.009
65	cis-3-heptene	0.218	0.168	<DL	<DL	<DL	<DL	<DL	<DL	0.045	0.035	<DL	<DL
66	trans-2-heptene	0.080	0.034	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.007	<DL	<DL
67	cis-2-heptene	0.162	0.087	<DL	<DL	<DL	<DL	<DL	<DL	0.034	0.018	0.002	0.003
68	methylcyclohexane / 2,2-dimethylhexane	5.509	2.984	0.039	0.012	0.223	0.018	0.009	0.005	1.218	0.620	0.113	0.016
69	2,5-dimethylhexane / ethylcyclopentane	10.931	5.521	0.078	0.029	0.478	0.051	0.014	0.020	2.426	1.148	0.263	0.038
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	14.939	7.430	0.104	0.039	0.712	0.041	0.021	0.029	3.331	1.553	0.401	0.055
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.375	0.172	0.008	0.011	0.024	0.001	<DL	<DL	0.086	0.038	0.015	0.001
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.182	0.080	<DL	<DL	0.009	0.0001	<DL	<DL	0.040	0.017	0.007	0.001

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
73	2,3,4-trimethylpentane	30.690	15.364	0.214	0.083	1.460	0.082	0.042	0.060	6.843	3.213	0.831	0.105
74	toluene/2,3,3-trimethylpentane	39.823	19.214	2.247	0.336	3.255	0.910	1.775	0.321	10.198	3.920	1.529	0.157
75	2,3-dimethylhexane	8.607	4.102	0.071	0.035	0.427	0.032	0.028	0.025	1.931	0.861	0.266	0.016
76	2-methyl-3-ethylpentane	0.348	0.145	<DL	<DL	0.027	0.001	<DL	<DL	0.080	0.030	<DL	<DL
77	2-methylheptane / 1-methylcyclohexene	1.467	0.689	0.012	0.006	0.081	0.004	0.006	0.009	0.332	0.147	0.045	0.001
78	4-methylheptane / 3-methyl-3-ethylpentane	0.538	0.216	0.007	0.003	0.029	0.001	0.002	0.003	0.122	0.045	0.019	0.002
79	3,4-dimethylhexane	1.586	0.741	0.017	0.010	0.087	0.003	0.004	0.005	0.358	0.157	0.052	0.009
80	3-methylheptane / 3-ethylhexane	1.498	0.707	0.019	0.005	0.074	0.005	0.006	0.009	0.338	0.152	0.042	0.002
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	0.791	0.373	<DL	<DL	0.051	0.029	0.005	0.007	0.180	0.088	0.012	0.009
82	trans-1,4-dimethylcyclohexane	0.322	0.156	0.004	0.006	0.019	0.0003	<DL	<DL	0.073	0.034	0.009	0.0003
83	2,2,5-trimethylhexane	7.716	3.455	0.064	0.027	0.431	0.045	0.016	0.022	1.742	0.720	0.252	0.039
84	1-octene	0.203	0.099	<DL	<DL	0.013	0.005	<DL	<DL	0.046	0.019	0.012	0.010
85	1-ethyl-1-methylcyclopentane	0.084	0.050	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.010	0.003	0.0003
86	n-octane/trans-1,2-dimethylcyclohexane	1.884	0.910	0.021	0.010	0.097	0.013	0.002	0.003	0.424	0.187	0.050	0.006
87	trans-2-octene	0.090	0.061	<DL	<DL	<DL	<DL	<DL	<DL	0.019	0.013	<DL	<DL
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.338	0.189	<DL	<DL	0.014	0.0002	<DL	<DL	0.074	0.039	0.010	0.001
89	2,4,4-trimethylhexane	0.316	0.146	<DL	<DL	0.017	0.0009	<DL	<DL	0.070	0.031	0.011	0.0004
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.087	0.040	0.079	0.012	<DL	<DL	0.023	0.005	0.042	0.004	<DL	<DL
92	2,3,5-trimethylhexane	1.182	0.534	0.016	0.011	0.041	0.037	0.001	0.002	0.261	0.103	0.037	0.004
93	2,4-dimethylheptane	0.279	0.141	0.021	0.013	0.017	0.0005	<DL	<DL	0.067	0.032	0.009	0.0006
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.433	0.203	0.007	0.009	0.024	0.0002	<DL	<DL	0.098	0.044	0.013	0.0009
95	n-propylcyclopentane	0.055	0.030	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.006	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	0.373	0.182	0.004	0.006	0.019	0.0002	<DL	<DL	0.084	0.039	0.010	0.001
97	2,5-dimethylheptane/3,5-dimethylheptane	0.651	0.279	0.013	0.002	0.034	0.004	0.004	0.005	0.149	0.059	0.017	0.001
98	3,3-dimethylheptane	0.205	0.095	<DL	<DL	0.013	0.006	<DL	<DL	0.046	0.021	0.005	0.001
99	1,1,4-trimethylcyclohexane	0.097	0.048	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.010	<DL	<DL
100	ethylbenzene	1.818	0.721	<DL	<DL	0.120	0.122	0.005	0.006	0.412	0.115	0.028	0.0007
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.120	0.067	0.012	0.017	<DL	<DL	<DL	<DL	0.028	0.010	0.004	0.006
102	2,3-dimethylheptane	0.297	0.123	0.010	0.014	0.011	0.0004	<DL	<DL	0.067	0.022	0.011	0.005
103	m&p-xylene/3,4-dimethylheptane	4.840	2.035	0.176	0.036	0.443	0.456	0.024	0.012	1.174	0.310	0.076	0.010
104	2-methyloctane	0.486	0.197	0.009	0.0006	0.027	0.0006	0.007	0.005	0.113	0.042	0.014	0.0003
105	3-methyloctane	0.377	0.161	0.001	0.002	0.017	0.0005	<DL	<DL	0.083	0.034	0.013	0.000008
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	0.926	0.355	0.006	0.004	0.075	0.001	0.012	0.010	0.218	0.077	0.047	0.007
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	1.948	0.803	0.062	0.017	0.178	0.163	0.010	0.005	0.471	0.128	0.036	0.008
109	1-nonene/1,1,2-trimethylcyclohexane	0.628	0.226	0.007	0.003	0.042	0.004	0.005	0.003	0.145	0.047	0.024	0.004
110	trans-3-nonene	0.075	0.033	<DL	<DL	0.002	0.003	<DL	<DL	0.016	0.006	0.001	0.002
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
112	n-nonane	0.729	0.291	0.021	0.007	0.053	0.00005	0.005	0.004	0.172	0.063	0.026	0.006
113	trans-2-nonene	0.346	0.115	0.019	0.005	0.025	0.002	<DL	<DL	0.083	0.022	0.014	0.0006
114	cis-2-nonene	0.081	0.033	0.011	0.015	0.008	0.0008	<DL	<DL	0.021	0.004	0.001	0.002
115	isopropylbenzene	0.081	0.036	<DL	<DL	0.004	0.006	<DL	<DL	0.018	0.006	<DL	<DL
116	2,2-dimethyloctane	0.234	0.083	0.005	0.007	0.020	0.002	<DL	<DL	0.055	0.018	0.013	0.002

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
117	isopropylcyclohexane	0.155	0.065	<DL	<DL	0.014	0.0007	<DL	<DL	0.036	0.014	0.007	0.001
118	n-butylcyclopentane	0.384	0.142	0.011	0.004	0.032	0.007	0.005	0.007	0.092	0.035	0.014	0.003
119	3,3-dimethyloctane	0.037	0.018	0.003	0.005	<DL	<DL	<DL	<DL	0.008	0.005	0.002	0.002
120	n-propylbenzene	0.274	0.108	0.012	0.003	0.018	0.018	0.003	0.0004	0.066	0.018	0.003	0.001
121	3-ethyltoluene	0.985	0.352	0.063	0.017	0.087	0.084	0.011	0.002	0.246	0.055	0.017	0.006
122	4-ethyltoluene/2,3-dimethyloctane	0.486	0.176	0.028	0.009	0.045	0.037	0.005	0.0003	0.121	0.029	0.011	0.003
123	1,3,5-trimethylbenzene	0.569	0.203	0.047	0.014	0.059	0.043	0.005	0.0005	0.147	0.034	0.016	0.004
124	2-methylnonane	1.622	0.515	0.043	0.061	0.150	0.012	0.015	0.003	0.393	0.119	0.084	0.011
125	3-ethyloctane	0.009	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
126	3-methylnonane	0.087	0.036	<DL	<DL	0.002	0.001	<DL	<DL	0.019	0.008	0.003	0.001
127	2-ethyltoluene	0.356	0.134	0.021	0.004	0.030	0.029	0.003	0.0005	0.088	0.021	0.005	0.001
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	1.248	0.478	0.127	0.034	0.154	0.144	0.011	0.001	0.333	0.067	0.023	0.005
129	isobutylcyclohexane	0.075	0.056	0.058	0.083	0.048	0.013	0.049	0.004	0.056	0.025	0.050	0.011
130	n-decane	0.710	0.227	0.044	0.013	0.075	0.0009	0.006	0.008	0.180	0.052	0.039	0.003
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
132	sec-butylbenzene	0.131	0.043	<DL	<DL	<DL	<DL	<DL	<DL	0.027	0.009	0.002	0.003
133	3-isopropyltoluene	0.087	0.017	<DL	<DL	0.005	0.007	<DL	<DL	0.019	0.001	<DL	<DL
134	4-isopropyltoluene	0.346	0.116	0.073	0.006	0.062	0.038	0.010	0.014	0.108	0.019	0.014	0.011
135	indan	0.114	0.068	<DL	<DL	<DL	<DL	0.006	0.009	0.026	0.011	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.007	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002	<DL	<DL
138	3-n-propyltoluene	0.924	0.263	0.071	0.017	0.111	0.022	0.009	0.003	0.241	0.053	0.056	0.003
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.248	0.082	0.039	0.013	0.029	0.016	0.007	0.002	0.070	0.016	0.008	0.001
140	1,2-diethylbenzene	0.088	0.026	0.012	0.005	0.011	0.0004	<DL	<DL	0.024	0.007	0.005	0.001
141	2-n-propyltoluene	0.597	0.167	0.066	0.024	0.080	0.003	0.009	0.004	0.164	0.040	0.041	0.002
142	1,4-dimethyl-2-ethylbenzene	0.076	0.027	0.022	0.007	0.008	0.012	<DL	<DL	0.023	0.004	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.128	0.041	0.023	0.010	0.016	0.005	<DL	<DL	0.036	0.009	0.003	0.005
144	1,2-dimethyl-4-ethylbenzene	0.139	0.048	0.036	0.015	0.019	0.008	0.006	0.009	0.044	0.014	0.005	0.0004
145	1,3-dimethyl-2-ethylbenzene	0.063	0.016	0.008	0.012	<DL	<DL	<DL	<DL	0.015	0.006	<DL	<DL
146	n-undecane	0.226	0.069	0.061	0.032	0.029	0.006	0.009	0.0009	0.071	0.020	0.016	0.002
147	1,2-dimethyl-3-ethylbenzene	0.140	0.042	0.029	0.009	0.019	0.005	<DL	<DL	0.041	0.009	0.008	0.003
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.232	0.053	0.076	0.017	0.157	0.059	0.034	0.015	0.118	0.028	0.112	0.081
149	1,2,3,5-tetramethylbenzene	0.068	0.020	0.037	0.012	<DL	<DL	0.005	0.007	0.024	0.009	<DL	<DL
150	tert-butyl-2-methylbenzene	0.005	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.0009	0.001	<DL	<DL
151	n-pentylbenzene	0.013	0.015	0.013	0.0005	0.004	0.006	0.004	0.006	0.008	0.0004	0.009	0.005
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	0.007	0.010	0.054	0.021	<DL	<DL	<DL	<DL	0.013	0.003	<DL	<DL
156	n-dodecane	0.008	0.012	0.025	0.009	<DL	<DL	<DL	<DL	0.007	0.005	<DL	<DL

Caravan, Speciated VOC Emission Rates (mg/mile) from E20 Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	50.154	7.559	6.603	3.426	15.543	2.644	3.205	4.533	17.038	4.370	13.097	1.855
2	ethylene	34.834	3.059	0.051	0.072	2.879	0.306	<DL	<DL	7.992	0.722	1.901	0.022
3	acetylene	9.624	6.098	0.008	0.011	0.006	0.008	0.025	0.035	1.997	1.252	0.0005	0.0007
4	ethane	9.195	0.580	0.125	0.108	4.335	1.118	0.083	0.007	3.138	0.445	2.163	0.273
5	propylene	17.454	1.497	0.053	0.005	0.936	0.162	<DL	<DL	3.872	0.350	0.353	0.067
6	propane	1.217	0.127	0.262	0.136	0.383	0.028	<DL	<DL	0.415	0.049	0.127	0.015
7	propyne	1.319	0.073	<DL	<DL	<DL	<DL	0.011	0.016	0.276	0.010	0.004	0.0005
8	isobutane	4.199	1.165	0.934	0.124	0.829	0.004	0.303	0.429	1.393	0.340	0.369	0.020
9	isobutene / 1-butene	9.058	1.546	0.017	0.00001	0.496	0.191	<DL	<DL	2.010	0.369	0.196	0.004
10	1,3-butadiene	0.422	0.015	0.006	0.0009	0.004	0.005	0.007	0.009	0.092	0.001	0.004	0.004
11	n-butane	5.724	1.061	0.809	0.367	0.907	0.040	0.268	0.379	1.690	0.259	0.431	0.052
12	trans-2-butene	2.118	0.419	0.020	0.005	0.259	0.078	0.003	0.004	0.514	0.107	0.071	0.011
13	1-butyne	0.021	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.001	<DL	<DL
14	cis-2-butene	2.198	0.438	0.293	0.231	0.232	0.091	0.043	0.031	0.596	0.157	0.029	0.002
15	1,2-butadiene	0.034	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.001	<DL	<DL
16	3-methyl-1-butene	0.376	0.055	0.005	0.001	0.005	0.0006	0.001	0.001	0.080	0.011	0.007	0.0002
17	2-methylbutane	33.674	5.004	0.916	0.521	2.374	0.087	0.173	0.244	7.859	0.956	1.152	0.070
18	1,4-pentadiene	0.552	0.639	<DL	<DL	<DL	<DL	<DL	<DL	0.114	0.132	<DL	<DL
19	2-butyne	0.039	0.00002	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.000004	<DL	<DL
20	1-pentene	0.318	0.004	0.013	0.005	0.004	0.005	<DL	<DL	0.070	0.0005	0.012	0.006
21	2-methyl-1-butene	0.700	0.164	0.013	0.004	0.019	0.026	0.002	0.004	0.153	0.041	<DL	<DL
22	n-pentane	15.624	0.739	0.133	0.189	1.149	0.050	<DL	<DL	3.571	0.092	0.485	0.044
23	2-methyl-1,3-butadiene	0.081	0.038	0.002	0.003	<DL	<DL	<DL	<DL	0.017	0.007	<DL	<DL
24	trans-2-pentene	0.459	0.001	<DL	<DL	0.006	0.008	<DL	<DL	0.096	0.002	0.0002	0.0002
25	cis-2-pentene	0.264	0.007	0.003	0.005	0.011	0.005	0.002	0.002	0.059	0.002	0.002	0.002
26	2-methyl-2-butene	1.347	0.057	0.010	0.014	0.013	0.018	0.004	0.006	0.285	0.002	<DL	<DL
27	trans-1,3-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
28	1,3-cyclopentadiene	0.006	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	2.434	0.341	0.008	0.012	0.166	0.004	<DL	<DL	0.550	0.071	0.085	0.008
30	cyclopentene	0.435	0.041	0.005	0.0008	0.026	0.010	0.0007	0.001	0.098	0.011	0.003	0.002
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.214	0.041	<DL	<DL	<DL	<DL	<DL	<DL	0.044	0.008	0.006	0.0006
32	cyclopentane	1.769	0.236	0.188	0.002	0.025	0.035	<DL	<DL	0.414	0.039	0.134	0.057
33	2,3-dimethylbutane	7.629	1.383	0.027	0.005	0.372	0.042	<DL	<DL	1.683	0.294	0.203	0.017
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	12.536	1.773	0.106	0.026	0.490	0.128	<DL	<DL	2.746	0.392	0.272	0.058
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.237	0.031	<DL	<DL	0.133	0.007	0.155	0.024	0.131	0.003	0.036	0.052
37	3-methylpentane	7.080	0.937	0.043	0.018	0.371	0.034	<DL	<DL	1.573	0.197	0.200	0.012
38	2-methyl-1-pentene	0.092	0.130	<DL	<DL	0.004	0.006	0.006	0.008	0.022	0.031	<DL	<DL
39	1-hexene	0.477	0.056	0.013	0.006	0.001	0.002	<DL	<DL	0.102	0.010	0.004	0.0006
40	n-hexane	10.529	1.036	0.040	0.057	0.589	0.051	<DL	<DL	2.344	0.212	0.310	0.024
41	trans-2-hexene	0.337	0.052	0.002	0.003	0.011	0.002	0.003	0.004	0.074	0.012	0.004	0.0008
42	2-methyl-2-pentene	0.374	0.029	<DL	<DL	<DL	<DL	<DL	<DL	0.077	0.006	<DL	<DL
43	trans-3-methyl-2-pentene	0.141	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.029	0.003	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
44	cis-2-hexene	0.167	0.024	0.005	0.007	0.008	0.001	<DL	<DL	0.038	0.004	0.003	0.0004
45	cis-3-methyl-2-pentene	0.232	0.010	0.002	0.003	0.003	0.004	0.003	0.004	0.050	0.005	<DL	<DL
46	2,2-dimethylpentane	0.664	0.093	0.018	0.002	0.049	0.004	0.006	0.009	0.156	0.022	0.026	0.002
47	methylcyclopentane	7.807	0.941	0.013	0.019	0.358	0.052	<DL	<DL	1.713	0.202	0.180	0.004
48	2,4-dimethylpentane	4.674	0.881	0.023	0.007	0.225	0.035	<DL	<DL	1.032	0.192	0.121	0.006
49	2,2,3-trimethylbutane	0.483	0.080	0.0008	0.001	0.025	0.001	0.001	0.001	0.107	0.017	0.014	0.002
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	10.132	1.553	0.059	0.083	0.757	0.272	<DL	<DL	2.312	0.411	0.370	0.076
52	3,3-dimethylpentane	0.550	0.089	0.009	0.006	0.035	0.003	0.005	0.007	0.127	0.020	0.017	0.001
53	cyclohexane	7.983	1.126	0.051	0.009	0.373	0.039	0.018	0.025	1.767	0.247	0.183	0.005
54	2-methylhexane	4.010	0.580	0.029	0.005	0.205	0.035	0.009	0.012	0.893	0.131	0.108	0.008
55	2,3-dimethylpentane	3.738	0.688	0.026	0.004	0.196	0.033	0.008	0.012	0.834	0.153	0.106	0.008
56	1,1-dimethylcyclopentane	0.694	0.090	0.015	0.016	0.049	0.005	0.010	0.003	0.163	0.015	0.026	0.002
57	cyclohexene	0.226	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.047	0.003	<DL	<DL
58	3-methylhexane	3.885	0.545	<DL	<DL	0.194	0.034	<DL	<DL	0.855	0.121	0.105	0.005
59	cis-1,3-dimethylcylcopentane	1.128	0.159	0.007	0.001	0.047	0.012	0.002	0.003	0.248	0.036	0.024	0.002
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	1.304	0.188	0.008	0.00007	0.062	0.011	0.004	0.005	0.289	0.043	0.031	0.002
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	34.209	6.476	0.275	0.056	2.075	0.310	0.042	0.060	7.705	1.444	1.176	0.074
63	trans-3-heptene	0.070	0.015	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.003	<DL	<DL
64	n-heptane	5.865	0.740	0.047	0.007	0.326	0.049	0.009	0.012	1.313	0.170	0.170	0.009
65	cis-3-heptene	0.137	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.004	<DL	<DL
66	trans-2-heptene	0.087	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.003	<DL	<DL
67	cis-2-heptene	0.106	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.022	0.004	<DL	<DL
68	methylcyclohexane / 2,2-dimethylhexane	10.832	1.439	0.073	0.0004	0.563	0.105	0.012	0.017	2.411	0.328	0.280	0.011
69	2,5-dimethylhexane / ethylcyclopentane	4.651	0.846	0.036	0.005	0.241	0.062	0.004	0.006	1.035	0.194	0.131	0.010
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	6.064	1.097	0.050	0.008	0.352	0.073	0.009	0.013	1.362	0.251	0.193	0.011
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.582	0.073	<DL	<DL	0.038	0.005	<DL	<DL	0.130	0.016	0.021	0.0008
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.333	0.045	<DL	<DL	0.017	0.003	<DL	<DL	0.074	0.010	0.011	0.0003
73	2,3,4-trimethylpentane	11.196	2.109	0.091	0.015	0.668	0.152	0.009	0.013	2.518	0.482	0.365	0.023
74	toluene/2,3,3-trimethylpentane	21.808	3.413	1.786	0.053	2.115	0.391	0.633	0.895	5.669	1.060	1.086	0.092
75	2,3-dimethylhexane	3.468	0.616	0.023	0.005	0.192	0.069	<DL	<DL	0.774	0.146	0.124	0.0002
76	2-methyl-3-ethylpentane	0.209	0.030	<DL	<DL	<DL	<DL	<DL	<DL	0.043	0.006	0.011	0.0006
77	2-methylheptane / 1-methylcyclohexene	2.225	0.252	0.008	0.011	0.113	0.045	<DL	<DL	0.492	0.066	0.088	0.002
78	4-methylheptane / 3-methyl-3-ethylpentane	0.684	0.073	0.014	0.004	0.043	0.010	0.005	0.008	0.158	0.019	0.034	0.001
79	3,4-dimethylhexane	0.734	0.120	0.005	0.003	0.039	0.013	<DL	<DL	0.163	0.028	0.037	0.001
80	3-methylheptane / 3-ethylhexane	1.940	0.223	0.014	0.0002	0.113	0.032	0.002	0.002	0.435	0.055	0.070	0.005
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	1.798	0.203	<DL	<DL	0.032	0.023	<DL	<DL	0.380	0.048	0.076	0.008
82	trans-1,4-dimethylcyclohexane	0.696	0.071	0.011	0.004	0.045	0.006	<DL	<DL	0.158	0.015	0.028	0.006
83	2,2,5-trimethylhexane	3.040	0.520	0.056	0.041	0.195	0.073	<DL	<DL	0.694	0.136	0.116	0.005
84	1-octene	0.532	0.141	0.015	0.022	0.019	0.007	<DL	<DL	0.118	0.032	0.021	0.007
85	1-ethyl-1-methylcyclopentane	0.136	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.003	0.005	0.007
86	n-octane/trans-1,2-dimethylcyclohexane	4.281	0.422	0.050	0.004	0.242	0.056	<DL	<DL	0.961	0.100	0.154	0.0002
87	trans-2-octene	0.128	0.018	0.006	0.009	<DL	<DL	<DL	<DL	0.028	0.002	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.595	0.127	0.004	0.006	0.029	0.005	<DL	<DL	0.132	0.026	0.026	0.017
89	2,4,4-trimethylhexane	0.183	0.069	<DL	<DL	0.005	0.008	<DL	<DL	0.039	0.016	0.008	0.011
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.139	0.055	0.021	0.007	<DL	<DL	0.007	0.009	0.035	0.016	0.008	0.011
92	2,3,5-trimethylhexane	0.535	0.111	<DL	<DL	<DL	<DL	<DL	<DL	0.110	0.023	0.012	0.017
93	2,4-dimethylheptane	0.343	0.061	<DL	<DL	0.011	0.016	0.004	0.006	0.075	0.019	0.014	0.007
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.796	0.050	0.007	0.010	0.042	0.005	0.005	0.006	0.179	0.005	0.028	0.009
95	n-propylcyclopentane	0.128	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.026	0.002	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	1.184	0.075	0.017	0.013	0.068	0.011	0.005	0.007	0.268	0.023	0.032	0.002
97	2,5-dimethylheptane/3,5-dimethylheptane	0.652	0.040	0.008	0.012	0.033	0.012	<DL	<DL	0.146	0.009	0.021	0.001
98	3,3-dimethylheptane	0.486	0.024	0.003	0.004	0.030	0.005	<DL	<DL	0.109	0.005	0.016	0.00007
99	1,1,4-trimethylcyclohexane	0.199	0.005	<DL	<DL	0.005	0.006	<DL	<DL	0.042	0.0008	0.004	0.0006
100	ethylbenzene	1.933	0.214	0.013	0.019	0.095	0.041	<DL	<DL	0.428	0.051	0.031	0.007
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.305	0.021	<DL	<DL	0.038	0.003	<DL	<DL	0.073	0.004	0.016	0.002
102	2,3-dimethylheptane	0.413	0.039	<DL	<DL	0.039	0.003	<DL	<DL	0.096	0.009	0.016	0.003
103	m&p-xylene/3,4-dimethylheptane	4.819	0.519	0.120	0.002	0.356	0.113	<DL	<DL	1.119	0.137	0.087	0.0006
104	2-methyloctane	1.127	0.099	0.010	0.002	0.093	0.016	0.007	0.010	0.263	0.027	0.044	0.005
105	3-methyloctane	0.916	0.068	0.004	0.006	0.067	0.0006	0.005	0.007	0.210	0.010	0.037	0.006
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	0.543	0.082	<DL	<DL	0.032	0.013	<DL	<DL	0.121	0.020	0.023	0.005
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	1.833	0.209	0.044	0.006	0.133	0.042	<DL	<DL	0.425	0.056	0.038	0.006
109	1-nonene/1,1,2-trimethylcyclohexane	0.499	0.061	0.005	0.0001	0.040	0.012	<DL	<DL	0.115	0.016	0.022	0.005
110	trans-3-nonene	0.238	0.021	<DL	<DL	0.017	0.004	<DL	<DL	0.054	0.005	0.009	0.0008
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
112	n-nonane	2.651	0.220	0.058	0.0008	0.209	0.053	0.010	0.010	0.620	0.062	0.111	0.0006
113	trans-2-nonene	0.180	0.030	<DL	<DL	0.012	0.004	<DL	<DL	0.041	0.007	0.008	0.0001
114	cis-2-nonene	0.332	0.023	<DL	<DL	0.026	0.007	<DL	<DL	0.076	0.007	0.010	0.005
115	isopropylbenzene	0.145	0.018	<DL	<DL	<DL	<DL	<DL	<DL	0.030	0.004	<DL	<DL
116	2,2-dimethyloctane	0.342	0.030	0.019	0.003	0.039	0.009	<DL	<DL	0.085	0.008	0.020	0.0007
117	isopropylcyclohexane	0.593	0.047	0.010	0.015	0.042	0.014	<DL	<DL	0.136	0.010	0.021	0.0003
118	n-butylcyclopentane	1.084	0.083	0.013	0.018	0.093	0.027	0.008	0.011	0.255	0.032	0.047	0.0005
119	3,3-dimethyloctane	0.100	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.021	0.002	0.001	0.002
120	n-propylbenzene	0.363	0.042	0.007	0.004	0.020	0.001	<DL	<DL	0.082	0.010	0.010	0.0005
121	3-ethyltoluene	1.039	0.132	0.059	0.003	0.072	0.017	<DL	<DL	0.247	0.032	0.021	0.0004
122	4-ethyltoluene/2,3-dimethyloctane	0.687	0.071	0.030	0.002	0.049	0.003	<DL	<DL	0.162	0.016	0.021	0.001
123	1,3,5-trimethylbenzene	1.088	0.096	0.058	0.010	0.091	0.024	<DL	<DL	0.263	0.028	0.038	0.0009
124	2-methylnonane	0.491	0.041	0.039	0.041	0.027	0.008	<DL	<DL	0.118	0.020	0.030	0.008
125	3-ethyloctane	0.112	0.007	<DL	<DL	<DL	<DL	<DL	<DL	0.023	0.001	<DL	<DL
126	3-methylnonane	0.423	0.032	<DL	<DL	0.023	0.012	<DL	<DL	0.094	0.010	0.014	0.003
127	2-ethyltoluene	0.331	0.040	0.018	0.0008	0.022	0.006	<DL	<DL	0.078	0.010	0.007	0.003
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	1.361	0.132	0.118	0.011	0.128	0.030	<DL	<DL	0.343	0.037	0.031	0.004
129	isobutylcyclohexane	0.225	0.022	0.047	0.040	0.012	0.016	<DL	<DL	0.060	0.009	0.042	0.017
130	n-decane	2.206	0.153	0.149	0.007	0.225	0.054	0.018	0.016	0.555	0.052	0.120	0.003
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.110	0.008	<DL	<DL	<DL	<DL	<DL	<DL	0.023	0.002	<DL	<DL
132	sec-butylbenzene	0.147	0.012	<DL	<DL	<DL	<DL	<DL	<DL	0.030	0.002	0.001	0.002

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
133	3-isopropyltoluene	0.213	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.044	0.002	<DL	<DL
134	4-isopropyltoluene	0.438	0.045	0.070	0.015	0.039	0.042	<DL	<DL	0.117	0.001	0.036	0.002
135	indan	0.134	0.015	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.003	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	0.070	0.00004	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.00002	<DL	<DL
138	3-n-propyltoluene	0.581	0.059	0.059	0.006	0.078	0.022	<DL	<DL	0.155	0.019	0.040	0.009
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.322	0.017	0.050	0.009	0.031	0.005	<DL	<DL	0.086	0.007	0.013	0.002
140	1,2-diethylbenzene	0.154	0.002	0.023	0.002	0.021	0.005	0.005	0.007	0.044	0.003	0.009	0.001
141	2-n-propyltoluene	0.401	0.027	0.054	0.008	0.057	0.015	0.001	0.002	0.111	0.011	0.033	0.004
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	0.049	0.002	<DL	<DL	<DL	<DL	0.011	0.0004	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.104	0.0007	0.030	0.004	0.017	0.003	<DL	<DL	0.033	0.002	<DL	<DL
144	1,2-dimethyl-4-ethylbenzene	0.123	0.0006	0.035	0.006	0.006	0.001	<DL	<DL	0.035	0.001	0.004	0.002
145	1,3-dimethyl-2-ethylbenzene	0.041	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.008	0.0002	<DL	<DL
146	n-undecane	0.529	0.012	0.195	0.013	0.066	0.011	0.009	0.012	0.173	0.007	0.034	0.0004
147	1,2-dimethyl-3-ethylbenzene	0.066	0.001	0.032	0.009	0.019	0.008	<DL	<DL	0.026	0.004	0.010	0.001
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.392	0.056	0.071	0.016	0.293	0.072	0.042	0.008	0.189	0.038	0.227	0.071
149	1,2,3,5-tetramethylbenzene	<DL	<DL	0.065	0.012	<DL	<DL	<DL	<DL	0.014	0.003	<DL	<DL
150	tert-butyl-2-methylbenzene	<DL	<DL	0.004	0.006	<DL	<DL	<DL	<DL	0.0009	0.001	<DL	<DL
151	n-pentylbenzene	0.034	0.011	0.023	0.012	0.005	0.007	<DL	<DL	0.014	0.002	0.003	0.004
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	0.006	0.0008	0.013	0.0003	<DL	<DL	<DL	<DL	0.004	0.0002	<DL	<DL
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	<DL	<DL	0.028	0.039	<DL	<DL	<DL	<DL	0.006	0.009	<DL	<DL
156	n-dodecane	0.011	0.002	0.054	0.006	0.006	0.006	<DL	<DL	0.016	0.0001	0.003	0.004

11.e Dion Emission Rates, 20° Tests

Dion, Speciated VOC Emission Rates (mg/mile) from E0 Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	63.185	8.275	31.396	2.942	28.750	4.215	28.919	3.297	37.062	3.566	25.264	1.651
2	ethylene	36.804	5.312	0.014	0.010	0.785	1.319	0.055	0.059	7.928	1.076	3.135	0.678
3	acetylene	14.399	3.406	0.023	0.027	0.005	0.010	0.050	0.034	3.008	0.706	0.006	0.009
4	ethane	9.898	0.487	0.947	0.391	3.546	1.636	0.776	0.517	3.385	0.637	2.419	0.430
5	propylene	28.508	1.566	0.059	0.026	0.486	0.908	0.071	0.075	6.125	0.408	2.344	0.642
6	propane	0.426	0.569	0.489	0.442	0.243	0.347	0.283	0.528	0.434	0.389	0.193	0.245
7	propyne	0.999	0.096	0.386	0.765	0.280	0.561	<DL	<DL	0.424	0.392	0.480	0.426
8	isobutane	3.050	1.610	2.498	0.669	2.808	2.523	3.557	3.317	3.521	2.117	0.876	0.541
9	isobutene / 1-butene	6.675	11.489	0.051	0.026	0.268	0.499	0.056	0.081	1.511	2.580	1.007	0.760
10	1,3-butadiene	0.314	0.542	0.005	0.007	0.003	0.007	0.007	0.008	0.071	0.117	0.003	0.003
11	n-butane	2.758	1.294	2.139	0.918	2.499	2.789	3.429	4.362	3.275	2.569	0.608	0.498
12	trans-2-butene	1.185	2.011	0.030	0.014	0.071	0.129	0.039	0.041	0.292	0.470	0.149	0.105
13	1-butyne	0.027	0.046	<DL	<DL	<DL	<DL	<DL	<DL	0.006	0.010	<DL	<DL
14	cis-2-butene	1.163	1.504	0.485	0.506	0.147	0.171	0.229	0.336	0.495	0.463	0.095	0.069
15	1,2-butadiene	0.035	0.060	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.013	<DL	<DL
16	3-methyl-1-butene	0.224	0.379	0.006	0.005	0.004	0.008	0.009	0.017	0.053	0.088	0.024	0.017
17	2-methylbutane	10.135	14.317	2.123	1.024	3.496	2.531	3.018	3.540	4.830	5.110	2.051	1.150
18	1,4-pentadiene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
19	2-butyne	0.060	0.104	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.022	<DL	<DL
20	1-pentene	0.114	0.193	0.013	0.014	0.018	0.018	0.022	0.027	0.039	0.056	0.009	0.003
21	2-methyl-1-butene	0.586	0.998	0.018	0.014	0.018	0.036	0.027	0.047	0.142	0.238	0.056	0.038
22	n-pentane	3.718	5.676	0.542	0.320	1.067	0.890	0.858	1.066	1.551	1.872	0.601	0.375
23	2-methyl-1,3-butadiene	0.086	0.148	<DL	<DL	0.003	0.004	0.009	0.012	0.022	0.030	0.001	0.002
24	trans-2-pentene	0.203	0.346	0.008	0.011	0.019	0.031	0.053	0.071	0.069	0.104	0.018	0.013
25	cis-2-pentene	0.133	0.226	0.007	0.005	0.009	0.015	0.014	0.024	0.038	0.060	0.013	0.006
26	2-methyl-2-butene	1.067	1.847	<DL	<DL	0.039	0.050	0.070	0.084	0.264	0.402	0.017	0.021
27	trans-1,3-pentadiene	0.005	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
28	1,3-cyclopentadiene	0.003	0.005	<DL	<DL	<DL	<DL	0.002	0.004	0.001	0.001	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	0.537	0.874	0.029	0.025	0.133	0.113	0.046	0.077	0.169	0.247	0.103	0.075
30	cyclopentene	0.135	0.232	0.003	0.002	0.003	0.007	0.005	0.011	0.032	0.055	0.021	0.017
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.095	0.126	0.040	0.032	0.007	0.010	0.005	0.011	0.033	0.040	0.013	0.016
32	cyclopentane	0.549	0.662	0.189	0.054	0.091	0.133	0.085	0.170	0.221	0.238	0.070	0.020
33	2,3-dimethylbutane	3.455	5.755	0.160	0.113	0.591	0.495	0.200	0.221	0.983	1.426	0.548	0.444
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	3.086	5.346	0.121	0.143	0.446	0.423	0.201	0.324	0.858	1.393	0.425	0.362
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.233	0.132	0.066	0.132	0.072	0.067	0.054	0.109	0.114	0.082	0.046	0.021
37	3-methylpentane	1.900	3.241	0.084	0.061	0.297	0.262	0.114	0.153	0.535	0.814	0.280	0.220
38	2-methyl-1-pentene	0.074	0.121	0.006	0.007	0.003	0.006	0.005	0.009	0.019	0.022	0.004	0.004
39	1-hexene	0.083	0.142	0.003	0.006	0.005	0.009	0.009	0.017	0.023	0.040	0.004	0.003
40	n-hexane	2.505	4.290	0.086	0.063	0.320	0.270	0.092	0.093	0.658	1.011	0.341	0.271

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
41	trans-2-hexene	0.099	0.170	0.011	0.017	0.003	0.005	0.004	0.007	0.026	0.044	0.010	0.007
42	2-methyl-2-pentene	0.154	0.267	<DL	<DL	0.003	0.005	0.007	0.008	0.036	0.059	0.004	0.005
43	trans-3-methyl-2-pentene	0.146	0.252	<DL	<DL	0.002	0.003	<DL	<DL	0.031	0.053	0.008	0.007
44	cis-2-hexene	0.062	0.108	<DL	<DL	0.001	0.003	0.002	0.004	0.014	0.025	0.004	0.003
45	cis-3-methyl-2-pentene	0.137	0.237	0.002	0.002	0.002	0.005	0.009	0.011	0.033	0.050	0.002	0.002
46	2,2-dimethylpentane	0.171	0.284	0.009	0.010	0.032	0.023	0.005	0.008	0.047	0.063	0.027	0.021
47	methylcyclopentane	1.969	3.392	0.042	0.035	0.182	0.191	0.071	0.098	0.497	0.806	0.228	0.185
48	2,4-dimethylpentane	3.095	5.309	0.075	0.052	0.398	0.334	0.091	0.082	0.801	1.228	0.408	0.349
49	2,2,3-trimethylbutane	0.242	0.404	0.008	0.006	0.039	0.031	0.006	0.009	0.065	0.095	0.035	0.031
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	5.073	8.707	0.047	0.056	0.419	0.458	0.093	0.186	1.224	2.027	1.431	1.024
52	3,3-dimethylpentane	0.264	0.456	0.253	0.497	0.017	0.021	0.221	0.428	0.223	0.236	0.027	0.023
53	cyclohexane	1.845	3.166	0.014	0.029	0.153	0.164	0.052	0.040	0.447	0.723	0.177	0.166
54	2-methylhexane	1.313	2.252	0.028	0.020	0.129	0.115	0.032	0.028	0.326	0.512	0.148	0.125
55	2,3-dimethylpentane	2.395	4.105	0.054	0.039	0.294	0.246	0.065	0.056	0.612	0.943	0.301	0.258
56	1,1-dimethylcyclopentane	0.170	0.281	0.009	0.010	0.022	0.016	0.009	0.010	0.046	0.065	0.023	0.019
57	cyclohexene	0.053	0.092	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.019	<DL	<DL
58	3-methylhexane	1.249	2.151	0.014	0.010	0.137	0.126	0.034	0.065	0.315	0.510	0.148	0.132
59	cis-1,3-dimethylcylcopentane	0.283	0.486	0.006	0.004	0.020	0.022	0.006	0.010	0.068	0.112	0.026	0.022
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	0.351	0.604	0.004	0.005	0.029	0.028	0.006	0.012	0.085	0.139	0.035	0.028
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	30.788	52.181	0.802	0.558	4.522	3.540	0.884	0.638	8.095	11.985	4.292	3.692
63	trans-3-heptene	0.025	0.043	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.009	0.0007	0.001
64	n-heptane	1.519	2.605	0.034	0.023	0.133	0.122	0.030	0.028	0.371	0.589	0.152	0.130
65	cis-3-heptene	0.075	0.130	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.027	<DL	<DL
66	trans-2-heptene	0.025	0.043	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.009	0.002	0.002
67	cis-2-heptene	0.073	0.127	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.026	0.004	0.005
68	methylcyclohexane / 2,2-dimethylhexane	2.498	4.295	0.043	0.029	0.204	0.198	0.044	0.039	0.603	0.968	0.243	0.214
69	2,5-dimethylhexane / ethylcyclopentane	4.254	7.280	0.081	0.056	0.378	0.357	0.077	0.058	1.038	1.636	0.478	0.423
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	5.698	9.721	0.122	0.084	0.646	0.548	0.123	0.088	1.432	2.202	0.694	0.620
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.162	0.273	0.004	0.007	0.018	0.016	<DL	<DL	0.040	0.061	0.024	0.021
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.075	0.130	<DL	<DL	0.003	0.006	<DL	<DL	0.017	0.029	0.009	0.008
73	2,3,4-trimethylpentane	11.835	20.183	0.246	0.170	1.371	1.156	0.250	0.182	2.983	4.572	1.407	1.283
74	toluene/2,3,3-trimethylpentane	15.634	24.250	1.568	0.510	2.354	2.026	1.677	1.609	4.723	6.282	2.177	1.702
75	2,3-dimethylhexane	3.535	6.030	0.079	0.053	0.357	0.314	0.061	0.046	0.873	1.361	0.434	0.382
76	2-methyl-3-ethylpentane	0.137	0.237	<DL	<DL	0.008	0.016	<DL	<DL	0.031	0.054	0.011	0.022
77	2-methylheptane / 1-methylcyclohexene	0.657	1.135	0.007	0.007	0.051	0.055	0.013	0.018	0.159	0.260	0.078	0.065
78	4-methylheptane / 3-methyl-3-ethylpentane	0.249	0.424	0.006	0.007	0.021	0.018	<DL	<DL	0.059	0.093	0.031	0.025
79	3,4-dimethylhexane	0.656	1.123	0.013	0.009	0.069	0.061	0.012	0.016	0.163	0.257	0.083	0.075
80	3-methylheptane / 3-ethylhexane	0.653	1.121	0.011	0.008	0.057	0.056	0.012	0.014	0.160	0.255	0.072	0.062
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	0.423	0.697	0.025	0.029	0.068	0.076	0.029	0.058	0.124	0.196	0.047	0.061
82	trans-1,4-dimethylcyclohexane	0.164	0.276	0.007	0.008	0.013	0.014	<DL	<DL	0.040	0.063	0.021	0.018
83	2,2,5-trimethylhexane	3.516	5.971	0.072	0.051	0.359	0.331	0.067	0.053	0.875	1.351	0.458	0.399
84	1-octene	0.090	0.157	<DL	<DL	0.007	0.014	0.006	0.013	0.024	0.041	0.011	0.010

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
85	1-ethyl-1-methylcyclopentane	0.036	0.062	0.002	0.005	<DL	<DL	<DL	<DL	0.008	0.012	0.007	0.006
86	n-octane/trans-1,2-dimethylcyclohexane	0.960	1.644	0.015	0.018	0.058	0.078	0.015	0.027	0.230	0.375	0.085	0.071
87	trans-2-octene	0.033	0.057	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.012	0.0009	0.002
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.150	0.260	<DL	<DL	0.010	0.008	<DL	<DL	0.034	0.057	0.015	0.012
89	2,4,4-trimethylhexane	0.139	0.240	<DL	<DL	0.014	0.013	<DL	<DL	0.033	0.054	0.018	0.016
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.041	0.042	0.020	0.016	0.002	0.004	<DL	<DL	0.013	0.011	0.004	0.005
92	2,3,5-trimethylhexane	0.534	0.923	0.033	0.067	0.029	0.033	0.004	0.007	0.133	0.187	0.066	0.059
93	2,4-dimethylheptane	0.158	0.273	0.025	0.049	0.013	0.013	<DL	<DL	0.044	0.073	0.012	0.011
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.239	0.411	0.004	0.006	0.016	0.015	0.002	0.005	0.057	0.093	0.020	0.017
95	n-propylcyclopentane	0.032	0.055	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.011	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	0.212	0.362	0.002	0.004	0.013	0.014	<DL	<DL	0.049	0.079	0.014	0.012
97	2,5-dimethylheptane/3,5-dimethylheptane	0.341	0.581	0.007	0.008	0.021	0.022	<DL	<DL	0.079	0.128	0.029	0.029
98	3,3-dimethylheptane	0.116	0.200	<DL	<DL	0.005	0.010	<DL	<DL	0.026	0.045	0.010	0.012
99	1,1,4-trimethylcyclohexane	0.056	0.096	<DL	<DL	<DL	<DL	<DL	<DL	0.012	0.020	<DL	<DL
100	ethylbenzene	0.758	1.313	0.043	0.063	0.009	0.011	0.025	0.038	0.171	0.294	0.066	0.054
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.067	0.115	<DL	<DL	0.002	0.004	<DL	<DL	0.015	0.025	0.005	0.007
102	2,3-dimethylheptane	0.158	0.274	<DL	<DL	0.007	0.010	<DL	<DL	0.035	0.060	0.013	0.012
103	m&p-xylene/3,4-dimethylheptane	1.761	2.975	0.113	0.077	0.047	0.058	0.086	0.156	0.432	0.704	0.152	0.111
104	2-methyloctane	0.261	0.448	0.009	0.007	0.016	0.020	0.003	0.005	0.062	0.103	0.024	0.020
105	3-methyloctane	0.203	0.342	0.004	0.009	0.013	0.022	0.002	0.005	0.049	0.079	0.018	0.015
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	0.498	0.838	0.013	0.015	0.055	0.056	0.033	0.067	0.135	0.219	0.062	0.050
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
108	o-xylene	0.747	1.262	0.047	0.032	0.033	0.035	0.034	0.061	0.186	0.300	0.066	0.054
109	1-nonene/1,1,2-trimethylcyclohexane	0.347	0.593	0.011	0.009	0.034	0.036	0.010	0.016	0.088	0.141	0.045	0.037
110	trans-3-nonene	0.042	0.072	<DL	<DL	<DL	<DL	<DL	<DL	0.009	0.015	0.002	0.004
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
112	n-nonane	0.431	0.728	0.023	0.017	0.030	0.037	0.009	0.016	0.107	0.172	0.036	0.026
113	trans-2-nonene	0.192	0.319	0.013	0.010	0.020	0.019	0.004	0.005	0.049	0.074	0.027	0.023
114	cis-2-nonene	0.046	0.080	0.002	0.005	0.006	0.009	<DL	<DL	0.011	0.020	0.004	0.003
115	isopropylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
116	2,2-dimethyloctane	0.165	0.285	0.004	0.008	0.011	0.012	<DL	<DL	0.039	0.065	0.019	0.015
117	isopropylcyclohexane	0.095	0.164	0.0003	0.0007	0.005	0.006	0.003	0.005	0.023	0.034	0.008	0.007
118	n-butylcyclopentane	0.237	0.389	0.039	0.041	0.019	0.024	0.027	0.040	0.077	0.110	0.021	0.024
119	3,3-dimethyloctane	0.014	0.013	0.016	0.032	0.001	0.003	0.003	0.006	0.009	0.012	0.007	0.006
120	n-propylbenzene	0.108	0.182	0.008	0.006	0.005	0.007	0.008	0.015	0.028	0.046	0.006	0.003
121	3-ethyltoluene	0.377	0.623	0.047	0.032	0.009	0.009	0.021	0.035	0.097	0.150	0.030	0.022
122	4-ethyltoluene/2,3-dimethyloctane	0.199	0.335	0.019	0.014	0.007	0.014	0.012	0.024	0.052	0.085	0.017	0.012
123	1,3,5-trimethylbenzene	0.262	0.434	0.033	0.023	0.011	0.016	0.009	0.017	0.068	0.106	0.024	0.017
124	2-methylnonane	0.981	1.601	0.062	0.056	0.096	0.114	0.040	0.028	0.260	0.380	0.149	0.125
125	3-ethyloctane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
126	3-methylnonane	0.054	0.093	<DL	<DL	0.002	0.005	<DL	<DL	0.012	0.021	0.003	0.004
127	2-ethyltoluene	0.139	0.228	0.016	0.011	0.008	0.010	0.008	0.015	0.036	0.055	0.010	0.007
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	0.498	0.788	0.106	0.071	0.024	0.020	0.047	0.081	0.146	0.210	0.036	0.031
129	isobutylcyclohexane	0.071	0.057	0.050	0.037	0.029	0.034	0.029	0.044	0.030	0.021	0.062	0.104

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
130	n-decane	0.451	0.757	0.047	0.035	0.046	0.048	0.014	0.019	0.120	0.185	0.059	0.042
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
132	sec-butylbenzene	0.077	0.134	<DL	<DL	0.004	0.007	<DL	<DL	0.017	0.030	0.011	0.008
133	3-isopropyltoluene	0.053	0.075	0.077	0.135	0.002	0.003	0.056	0.112	0.056	0.088	0.006	0.009
134	4-isopropyltoluene	0.150	0.228	0.042	0.036	0.021	0.022	0.032	0.051	0.059	0.080	0.016	0.011
135	indan	0.027	0.046	0.014	0.028	0.012	0.023	0.057	0.053	0.035	0.030	0.006	0.010
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
138	3-n-propyltoluene	0.578	0.908	0.097	0.071	0.068	0.060	0.032	0.029	0.165	0.228	0.103	0.080
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.126	0.200	0.035	0.030	0.011	0.012	0.012	0.024	0.038	0.057	0.015	0.007
140	1,2-diethylbenzene	0.058	0.095	0.013	0.012	0.005	0.005	<DL	<DL	0.016	0.024	0.009	0.008
141	2-n-propyltoluene	0.435	0.675	0.079	0.058	0.048	0.046	0.017	0.023	0.123	0.171	0.069	0.054
142	1,4-dimethyl-2-ethylbenzene	0.031	0.053	0.009	0.017	<DL	<DL	<DL	<DL	0.009	0.016	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.081	0.110	0.026	0.021	0.003	0.006	0.004	0.008	0.025	0.030	0.005	0.007
144	1,2-dimethyl-4-ethylbenzene	0.073	0.107	0.034	0.031	0.003	0.004	0.009	0.013	0.025	0.034	0.002	0.003
145	1,3-dimethyl-2-ethylbenzene	0.039	0.067	0.015	0.018	<DL	<DL	<DL	<DL	0.011	0.018	0.006	0.007
146	n-undecane	0.149	0.233	0.057	0.057	0.015	0.020	0.010	0.017	0.048	0.074	0.025	0.016
147	1,2-dimethyl-3-ethylbenzene	0.108	0.134	0.048	0.033	0.010	0.012	<DL	<DL	0.033	0.037	0.016	0.013
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.087	0.059	0.063	0.045	0.057	0.048	0.035	0.047	0.052	0.035	0.159	0.101
149	1,2,3,5-tetramethylbenzene	0.050	0.051	0.044	0.031	<DL	<DL	0.011	0.014	0.022	0.020	<DL	<DL
150	tert-butyl-2-methylbenzene	0.007	0.013	0.004	0.005	<DL	<DL	<DL	<DL	0.002	0.004	<DL	<DL
151	n-pentylbenzene	0.015	0.020	0.021	0.028	0.015	0.018	0.029	0.032	0.015	0.013	0.005	0.011
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	0.108	0.216	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	<DL	<DL	0.002	0.004	<DL	<DL	0.028	0.057	0.0006	0.001	<DL	<DL
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	0.026	0.045	0.058	0.067	<DL	<DL	<DL	<DL	0.014	0.025	<DL	<DL
156	n-dodecane	0.007	0.006	0.032	0.027	0.001	0.003	0.004	0.008	0.008	0.007	0.003	0.005

Dion, Speciated VOC Emission Rates (mg/mile) from E10 Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	52.212	3.645	27.542	0.795	23.780	3.056	26.406	1.574	31.262	0.943	27.797	n/a
2	ethylene	27.057	0.976	0.275	0.371	0.243	0.344	0.061	0.049	5.727	0.180	4.971	n/a
3	acetylene	9.046	0.456	0.092	0.130	0.111	0.089	0.071	0.100	1.938	0.119	0.021	n/a
4	ethane	8.063	1.749	0.546	0.076	2.478	1.033	0.687	0.592	2.668	0.485	2.203	n/a
5	propylene	17.790	0.678	0.032	0.0005	0.087	0.109	0.071	0.041	3.721	0.101	2.731	n/a
6	propane	0.444	0.196	<DL	<DL	0.077	0.027	0.265	0.029	0.191	0.056	0.101	n/a
7	propyne	0.984	0.019	0.492	0.099	<DL	<DL	0.135	0.190	0.353	0.074	0.229	n/a
8	isobutane	2.845	4.024	0.943	1.333	0.550	0.778	4.218	0.013	2.196	1.338	0.800	n/a
9	isobutene / 1-butene	11.662	0.288	0.010	0.015	0.063	0.089	0.052	0.032	2.440	0.024	0.992	n/a
10	1,3-butadiene	1.064	0.566	0.013	0.001	<DL	<DL	0.0002	0.0004	0.223	0.117	0.006	n/a
11	n-butane	3.613	3.378	0.678	0.959	0.601	0.849	3.039	0.151	1.960	1.099	0.684	n/a

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
12	trans-2-butene	1.548	0.224	0.008	0.011	0.013	0.018	0.037	0.004	0.336	0.055	0.132	n/a
13	1-butyne	0.035	0.005	<DL	<DL	<DL	<DL	<DL	<DL	0.007	0.001	<DL	n/a
14	cis-2-butene	1.377	0.009	0.504	0.186	<DL	<DL	0.076	0.005	0.419	0.038	0.071	n/a
15	1,2-butadiene	0.074	0.006	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.001	<DL	n/a
16	3-methyl-1-butene	0.510	0.071	0.002	0.003	0.007	0.010	0.020	0.017	0.114	0.006	0.019	n/a
17	2-methylbutane	16.949	5.065	0.615	0.869	2.435	1.469	3.301	0.186	5.277	1.695	1.615	n/a
18	1,4-pentadiene	0.070	0.078	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.016	<DL	n/a
19	2-butyne	0.126	0.039	<DL	<DL	<DL	<DL	<DL	<DL	0.026	0.008	<DL	n/a
20	1-pentene	0.278	0.057	0.004	0.005	<DL	<DL	0.016	0.002	0.063	0.010	0.006	n/a
21	2-methyl-1-butene	0.946	0.098	0.005	0.007	<DL	<DL	0.040	0.005	0.208	0.017	0.004	n/a
22	n-pentane	5.248	0.914	0.151	0.213	0.772	0.516	0.860	0.039	1.582	0.388	0.419	n/a
23	2-methyl-1,3-butadiene	0.197	0.132	0.006	0.009	<DL	<DL	0.006	0.009	0.044	0.027	<DL	n/a
24	trans-2-pentene	0.320	0.008	0.006	0.009	<DL	<DL	0.029	0.020	0.076	0.006	0.010	n/a
25	cis-2-pentene	0.201	0.002	0.005	0.007	<DL	<DL	0.021	0.003	0.049	0.002	0.005	n/a
26	2-methyl-2-butene	1.366	0.567	0.003	0.004	<DL	<DL	<DL	<DL	0.282	0.118	<DL	n/a
27	trans-1,3-pentadiene	0.022	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.004	0.004	<DL	n/a
28	1,3-cyclopentadiene	0.017	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.005	<DL	n/a
29	2,2-dimethylbutane / cis-1,3-pentadiene	1.103	0.215	0.014	0.020	0.176	0.085	0.077	0.007	0.302	0.070	0.104	n/a
30	cyclopentene	0.185	0.003	0.0007	0.001	0.006	0.008	0.013	0.012	0.044	0.005	0.005	n/a
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.212	0.001	0.004	0.006	0.019	0.004	0.021	0.004	0.056	0.004	0.014	n/a
32	cyclopentane	0.746	0.171	0.225	0.153	0.104	0.103	0.044	0.063	0.246	0.079	0.189	n/a
33	2,3-dimethylbutane	7.817	1.189	0.079	0.111	1.152	0.551	0.410	0.061	2.067	0.402	0.623	n/a
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
35	2-methylpentane	6.886	0.828	0.067	0.095	0.803	0.461	0.405	0.034	1.775	0.307	0.504	n/a
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.177	0.006	<DL	<DL	0.144	0.0006	<DL	<DL	0.076	0.001	<DL	n/a
37	3-methylpentane	4.134	0.467	0.029	0.040	0.586	0.267	0.196	0.003	1.078	0.177	0.324	n/a
38	2-methyl-1-pentene	0.134	0.015	0.006	0.008	<DL	<DL	0.003	0.004	0.030	0.006	<DL	n/a
39	1-hexene	0.358	0.029	0.002	0.002	0.009	0.011	0.023	0.024	0.083	0.004	0.007	n/a
40	n-hexane	5.339	0.509	0.042	0.060	0.720	0.336	0.169	0.010	1.358	0.212	0.405	n/a
41	trans-2-hexene	0.194	0.006	0.003	0.00007	0.005	0.007	0.015	0.007	0.046	0.003	0.005	n/a
42	2-methyl-2-pentene	0.293	0.038	0.008	0.012	0.005	0.007	0.010	0.014	0.067	0.004	<DL	n/a
43	trans-3-methyl-2-pentene	0.260	0.075	<DL	<DL	<DL	<DL	<DL	<DL	0.054	0.015	<DL	n/a
44	cis-2-hexene	0.105	0.001	0.002	0.003	0.004	0.005	0.006	0.004	0.025	0.002	0.006	n/a
45	cis-3-methyl-2-pentene	0.202	0.067	0.006	0.009	<DL	<DL	0.009	0.005	0.046	0.014	<DL	n/a
46	2,2-dimethylpentane	0.414	0.028	0.008	0.007	0.062	0.029	0.017	0.005	0.109	0.017	0.029	n/a
47	methylcyclopentane	3.853	0.331	0.029	0.040	0.466	0.216	0.133	0.001	0.968	0.135	0.254	n/a
48	2,4-dimethylpentane	6.915	0.669	0.035	0.049	0.877	0.399	0.147	0.020	1.718	0.251	0.460	n/a
49	2,2,3-trimethylbutane	0.553	0.056	0.007	0.005	0.081	0.037	0.016	0.008	0.143	0.025	0.035	n/a
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
51	benzene	10.332	1.582	0.116	0.065	0.248	0.318	0.066	0.003	2.244	0.396	2.399	n/a
52	3,3-dimethylpentane	0.521	0.485	0.001	0.002	<DL	<DL	<DL	<DL	0.108	0.101	<DL	n/a
53	cyclohexane	4.015	0.370	0.013	0.018	0.530	0.215	0.039	0.055	0.988	0.155	0.234	n/a
54	2-methylhexane	3.049	0.232	0.019	0.011	0.369	0.168	0.053	0.004	0.750	0.095	0.193	n/a
55	2,3-dimethylpentane	5.299	0.508	0.031	0.023	0.698	0.307	0.097	0.008	1.320	0.191	0.346	n/a
56	1,1-dimethylcyclopentane	0.402	0.029	0.007	0.008	0.058	0.025	0.015	0.003	0.105	0.015	0.032	n/a

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
57	cyclohexene	0.202	0.034	<DL	<DL	<DL	<DL	<DL	<DL	0.042	0.007	<DL	n/a
58	3-methylhexane	3.000	0.212	0.012	0.004	0.389	0.166	0.033	0.016	0.738	0.083	0.202	n/a
59	cis-1,3-dimethylcylcopentane	0.633	0.042	0.004	0.002	0.072	0.042	0.020	0.013	0.157	0.024	0.036	n/a
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	0.841	0.048	0.010	0.002	0.104	0.025	0.004	0.006	0.206	0.015	0.019	n/a
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
62	2,2,4-timethylpentane	65.901	6.337	0.414	0.411	9.042	3.815	0.995	0.274	16.459	2.353	4.483	n/a
63	trans-3-heptene	0.054	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.0009	<DL	n/a
64	n-heptane	3.969	0.200	0.033	0.011	0.497	0.223	0.048	0.005	0.976	0.103	0.257	n/a
65	cis-3-heptene	0.125	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.026	0.004	<DL	n/a
66	trans-2-heptene	0.063	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.0007	<DL	n/a
67	cis-2-heptene	0.143	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.029	0.003	<DL	n/a
68	methylcyclohexane / 2,2-dimethylhexane	6.735	0.391	0.036	0.029	0.823	0.385	0.081	0.003	1.647	0.190	0.411	n/a
69	2,5-dimethylhexane / ethylcyclopentane	8.086	0.566	0.050	0.027	0.922	0.468	0.085	0.016	1.957	0.245	0.491	n/a
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	11.438	0.829	0.069	0.052	1.474	0.661	0.131	0.029	2.818	0.353	0.720	n/a
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.493	0.007	0.008	0.012	0.061	0.025	0.007	0.010	0.122	0.0005	0.033	n/a
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.248	0.001	<DL	<DL	0.025	0.011	<DL	<DL	0.058	0.003	0.019	n/a
73	2,3,4-trimethylpentane	23.108	1.717	0.139	0.101	3.122	1.380	0.252	0.058	5.728	0.734	1.451	n/a
74	toluene/2,3,3-trimethylpentane	30.964	1.904	2.004	0.510	3.908	1.507	1.661	0.101	8.398	0.717	2.428	n/a
75	2,3-dimethylhexane	6.579	0.429	0.042	0.020	0.837	0.383	0.072	0.004	1.617	0.196	0.448	n/a
76	2-methyl-3-ethylpentane	0.308	0.018	<DL	<DL	0.039	0.013	0.004	0.006	0.076	0.009	0.030	n/a
77	2-methylheptane / 1-methylcyclohexene	1.842	0.051	0.014	0.00007	0.221	0.108	0.029	0.018	0.452	0.045	0.130	n/a
78	4-methylheptane / 3-methyl-3-ethylpentane	0.625	0.026	0.008	0.004	0.072	0.033	0.011	0.006	0.154	0.017	0.051	n/a
79	3,4-dimethylhexane	1.288	0.088	0.013	0.007	0.170	0.075	0.021	0.006	0.321	0.042	0.091	n/a
80	3-methylheptane / 3-ethylhexane	1.691	0.069	0.007	0.009	0.214	0.105	0.033	0.014	0.419	0.049	0.114	n/a
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	1.305	0.011	0.017	0.012	0.185	0.063	<DL	<DL	0.324	0.017	0.085	n/a
82	trans-1,4-dimethylcyclohexane	0.527	0.011	0.006	0.008	0.062	0.030	0.008	0.004	0.129	0.010	0.035	n/a
83	2,2,5-trimethylhexane	6.278	0.357	0.042	0.023	0.760	0.382	0.066	0.013	1.532	0.179	0.425	n/a
84	1-octene	0.372	0.001	<DL	<DL	0.044	0.026	0.006	0.008	0.091	0.010	0.021	n/a
85	1-ethyl-1-methylcyclopentane	0.119	0.011	<DL	<DL	0.007	0.003	<DL	<DL	0.026	0.003	0.011	n/a
86	n-octane/trans-1,2-dimethylcyclohexane	3.313	0.062	0.045	0.0006	0.383	0.182	0.031	0.001	0.807	0.062	0.210	n/a
87	trans-2-octene	0.114	0.009	<DL	<DL	<DL	<DL	<DL	<DL	0.024	0.002	0.006	n/a
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.453	0.009	0.007	0.009	0.047	0.031	<DL	<DL	0.108	0.008	0.023	n/a
89	2,4,4-trimethylhexane	0.297	0.004	<DL	<DL	0.033	0.023	<DL	<DL	0.070	0.005	0.017	n/a
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
91	isopropylcyclopentane	0.095	0.017	0.045	0.057	0.009	0.013	0.004	0.006	0.034	0.011	<DL	n/a
92	2,3,5-trimethylhexane	1.039	0.023	0.008	0.003	0.124	0.075	0.009	0.0006	0.253	0.026	0.065	n/a
93	2,4-dimethylheptane	0.369	0.021	0.005	0.008	0.050	0.041	<DL	<DL	0.091	0.005	0.021	n/a
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.674	0.009	0.009	0.003	0.075	0.048	0.005	0.007	0.163	0.010	0.038	n/a
95	n-propylcyclopentane	0.083	0.005	<DL	<DL	0.012	0.007	<DL	<DL	0.020	0.001	<DL	n/a
96	cis-cis-cis-1,3,5-trimethylcyclohexane	0.879	0.003	0.015	0.008	0.107	0.060	0.011	0.006	0.217	0.016	0.062	n/a
97	2,5-dimethylheptane/3,5-dimethylheptane	0.765	0.008	0.016	0.003	0.080	0.045	0.010	0.001	0.186	0.014	0.049	n/a
98	3,3-dimethylheptane	0.422	0.002	0.005	0.008	0.054	0.028	0.004	0.005	0.104	0.007	0.034	n/a
99	1,1,4-trimethylcyclohexane	0.166	0.004	<DL	<DL	0.016	0.009	<DL	<DL	0.039	0.001	0.012	n/a
100	ethylbenzene	1.523	0.024	0.033	0.021	0.046	0.025	0.007	0.010	0.336	0.010	0.081	n/a

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.305	0.006	0.019	0.026	0.053	0.019	<DL	<DL	0.082	0.010	0.026	n/a
102	2,3-dimethylheptane	0.462	0.002	0.011	0.016	0.061	0.028	<DL	<DL	0.115	0.012	0.029	n/a
103	m&p-xylene/3,4-dimethylheptane	4.169	0.161	0.145	0.022	0.079	0.051	0.027	0.021	0.922	0.057	0.192	n/a
104	2-methyloctane	1.096	0.00009	0.021	0.011	0.109	0.066	0.011	0.006	0.264	0.022	0.061	n/a
105	3-methyloctane	0.879	0.013	0.003	0.002	0.089	0.052	0.018	0.006	0.212	0.013	0.047	n/a
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	1.054	0.008	0.007	0.010	0.133	0.063	0.017	0.015	0.261	0.022	0.058	n/a
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
108	o-xylene	1.804	0.043	0.053	0.001	0.052	0.033	0.016	0.008	0.403	0.020	0.080	n/a
109	1-nonene/1,1,2-trimethylcyclohexane	0.793	0.019	0.013	0.004	0.082	0.043	0.019	0.002	0.195	0.017	0.044	n/a
110	trans-3-nonene	0.254	0.004	<DL	<DL	0.025	0.014	<DL	<DL	0.059	0.003	0.014	n/a
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
112	n-nonane	2.959	0.009	0.069	0.018	0.272	0.169	0.050	0.026	0.715	0.056	0.162	n/a
113	trans-2-nonene	0.359	0.009	0.014	0.004	0.035	0.023	<DL	<DL	0.087	0.009	0.020	n/a
114	cis-2-nonene	0.415	0.006	0.005	0.007	0.043	0.025	<DL	<DL	0.099	0.004	0.025	n/a
115	isopropylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
116	2,2-dimethyloctane	0.638	0.009	0.013	0.019	0.047	0.027	<DL	<DL	0.147	0.005	0.032	n/a
117	isopropylcyclohexane	0.683	0.018	0.013	0.004	0.060	0.041	0.013	0.002	0.164	0.009	0.032	n/a
118	n-butylcyclopentane	1.396	0.006	0.030	0.011	0.129	0.083	0.019	0.010	0.335	0.029	0.054	n/a
119	3,3-dimethyloctane	0.224	0.028	0.026	0.037	0.011	0.016	<DL	<DL	0.055	0.010	<DL	n/a
120	n-propylbenzene	0.348	0.0002	0.011	0.0004	0.020	0.018	0.007	0.010	0.082	0.008	0.014	n/a
121	3-ethyltoluene	0.867	0.015	0.049	0.007	0.018	0.014	0.006	0.003	0.196	0.009	0.031	n/a
122	4-ethyltoluene/2,3-dimethyloctane	0.772	0.009	0.032	0.007	0.049	0.037	0.017	0.017	0.185	0.019	0.035	n/a
123	1,3,5-trimethylbenzene	1.128	0.173	0.047	0.018	0.058	0.028	0.023	0.020	0.266	0.053	0.045	n/a
124	2-methylnonane	0.633	0.006	0.011	0.016	0.058	0.027	0.015	0.012	0.154	0.016	0.035	n/a
125	3-ethyloctane	0.150	0.002	<DL	<DL	0.012	0.008	<DL	<DL	0.034	0.002	0.009	n/a
126	3-methylnonane	0.641	0.006	0.016	0.006	0.047	0.047	0.011	0.015	0.152	0.015	0.029	n/a
127	2-ethyltoluene	0.270	0.004	0.015	0.002	<DL	<DL	0.007	0.007	0.061	0.003	0.011	n/a
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	1.343	0.035	0.115	0.010	0.038	0.022	0.007	0.004	0.315	0.016	0.050	n/a
129	isobutylcyclohexane	0.321	0.036	0.064	0.030	0.034	0.019	0.043	0.035	0.102	0.001	0.076	n/a
130	n-decane	2.891	0.046	0.192	0.042	0.184	0.124	0.072	0.047	0.711	0.066	0.148	n/a
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.113	0.005	<DL	<DL	0.006	0.009	<DL	<DL	0.025	0.001	0.005	n/a
132	sec-butylbenzene	0.208	0.003	0.006	0.008	0.011	0.016	<DL	<DL	0.047	0.003	0.011	n/a
133	3-isopropyltoluene	0.235	0.002	<DL	<DL	0.014	0.013	<DL	<DL	0.052	0.003	0.012	n/a
134	4-isopropyltoluene	0.428	0.008	0.023	0.027	0.021	0.016	0.010	0.011	0.102	0.015	0.016	n/a
135	indan	0.133	0.007	0.007	0.010	<DL	<DL	0.003	0.004	0.030	0.0004	<DL	n/a
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
137	1,3-diethylbenzene	0.096	0.002	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.0004	<DL	n/a
138	3-n-propyltoluene	1.035	0.054	0.077	0.025	0.091	0.054	0.029	0.020	0.264	0.037	0.065	n/a
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.325	0.007	0.051	0.015	0.022	0.010	0.009	0.012	0.087	0.011	0.011	n/a
140	1,2-diethylbenzene	0.208	0.001	0.025	0.008	0.013	0.003	<DL	<DL	0.052	0.002	0.010	n/a
141	2-n-propyltoluene	0.741	0.027	0.087	0.033	0.060	0.035	0.026	0.016	0.197	0.027	0.048	n/a
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
143	1,3-dimethyl-4-ethylbenzene	0.114	0.0006	0.024	0.003	0.003	0.005	<DL	<DL	0.030	0.0008	<DL	n/a
144	1,2-dimethyl-4-ethylbenzene	0.116	0.004	0.032	0.007	0.003	0.005	<DL	<DL	0.032	0.004	<DL	n/a
145	1,3-dimethyl-2-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
146	n-undecane	0.470	0.049	0.168	0.018	0.040	0.011	0.031	0.031	0.155	0.006	0.028	n/a
147	1,2-dimethyl-3-ethylbenzene	0.101	0.021	0.028	0.0003	0.007	0.0006	<DL	<DL	0.029	0.004	0.005	n/a
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.201	0.031	0.049	0.054	0.066	0.007	0.047	0.014	0.084	0.012	0.256	n/a
149	1,2,3,5-tetramethylbenzene	<DL	<DL	0.040	0.001	<DL	<DL	<DL	<DL	0.009	0.0003	<DL	n/a
150	tert-butyl-2-methylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
151	n-pentylbenzene	0.016	0.005	0.031	0.010	0.004	0.006	0.003	0.004	0.012	0.006	0.006	n/a
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
153	tert-butyl-3,5-dimethylbenzene	<DL	<DL	0.004	0.006	<DL	<DL	<DL	<DL	0.001	0.001	<DL	n/a
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
155	naphthalene	<DL	<DL	0.044	0.006	<DL	<DL	<DL	<DL	0.010	0.001	<DL	n/a
156	n-dodecane	0.006	0.009	0.037	0.010	<DL	<DL	0.025	0.015	0.017	0.009	<DL	n/a

Dion, Speciated VOC Emission Rates (mg/mile) from E10-Spl Fuel, 20°C Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	59.534	5.002	26.541	5.963	23.409	3.457	25.673	0.451	32.276	3.469	23.236	1.949
2	ethylene	30.471	2.817	0.004	0.006	0.345	0.024	0.072	0.041	6.450	0.605	1.948	0.687
3	acetylene	13.465	8.128	0.011	0.016	<DL	<DL	0.078	0.018	2.826	1.704	0.004	0.003
4	ethane	9.219	0.893	1.042	0.104	2.795	0.585	0.840	0.315	3.163	0.089	1.936	0.562
5	propylene	24.222	0.879	0.039	0.013	0.048	0.003	0.070	0.044	5.077	0.208	1.427	0.620
6	propane	0.367	0.287	0.157	0.221	0.025	0.036	<DL	<DL	0.118	0.0007	0.100	0.141
7	propyne	1.190	0.317	0.004	0.006	<DL	<DL	<DL	<DL	0.248	0.065	<DL	<DL
8	isobutane	2.593	1.193	3.152	1.405	1.192	0.187	1.376	0.266	1.973	0.690	1.078	0.259
9	isobutene / 1-butene	13.725	4.665	0.030	0.017	0.025	0.004	0.048	0.031	2.881	0.987	0.806	0.299
10	1,3-butadiene	0.790	0.180	0.007	0.010	<DL	<DL	<DL	<DL	0.166	0.040	<DL	<DL
11	n-butane	2.573	1.401	1.773	0.829	0.830	0.042	0.853	0.197	1.409	0.545	0.696	0.131
12	trans-2-butene	1.902	0.945	0.031	0.007	0.013	0.0009	0.015	0.008	0.410	0.201	0.141	0.076
13	1-butyne	0.052	0.035	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.007	<DL	<DL
14	cis-2-butene	1.761	0.886	<DL	<DL	<DL	<DL	0.272	0.384	0.446	0.072	0.073	0.051
15	1,2-butadiene	0.077	0.046	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.010	<DL	<DL
16	3-methyl-1-butene	0.464	0.237	0.020	0.023	0.001	0.001	0.006	0.002	0.103	0.056	0.018	0.006
17	2-methylbutane	15.057	7.158	2.277	1.121	2.204	0.736	1.128	0.205	4.577	1.597	1.832	0.048
18	1,4-pentadiene	0.016	0.014	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.003	<DL	<DL
19	2-butyne	0.082	0.066	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.014	<DL	<DL
20	1-pentene	0.163	0.081	0.015	0.013	<DL	<DL	<DL	<DL	0.037	0.020	0.006	0.003
21	2-methyl-1-butene	1.000	0.418	0.017	0.024	<DL	<DL	0.007	0.002	0.214	0.092	0.015	0.006
22	n-pentane	4.503	1.670	0.505	0.282	0.612	0.364	0.246	0.037	1.290	0.321	0.462	0.058
23	2-methyl-1,3-butadiene	0.196	0.007	0.011	0.016	<DL	<DL	<DL	<DL	0.043	0.005	<DL	<DL
24	trans-2-pentene	0.295	0.142	0.020	0.014	<DL	<DL	0.011	0.003	0.069	0.033	0.018	0.012
25	cis-2-pentene	0.189	0.095	0.011	0.004	<DL	<DL	0.004	0.0004	0.043	0.021	0.010	0.006
26	2-methyl-2-butene	1.686	0.610	<DL	<DL	<DL	<DL	<DL	<DL	0.350	0.127	<DL	<DL
27	trans-1,3-pentadiene	0.014	0.001	<DL	<DL	<DL	<DL	<DL	<DL	0.003	0.0003	<DL	<DL

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
28	1,3-cyclopentadiene	0.003	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.0006	0.0008	<DL	<DL
29	2,2-dimethylbutane / cis-1,3-pentadiene	0.958	0.379	0.046	0.034	0.129	0.025	0.031	0.017	0.254	0.085	0.103	0.006
30	cyclopentene	0.130	0.079	0.013	0.017	<DL	<DL	0.002	0.0002	0.030	0.020	0.011	0.004
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.173	0.103	0.022	0.006	0.010	0.014	<DL	<DL	0.044	0.027	0.017	0.009
32	cyclopentane	0.608	0.316	0.152	0.005	0.033	0.047	<DL	<DL	0.169	0.077	0.112	0.037
33	2,3-dimethylbutane	7.402	2.991	0.261	0.145	0.718	0.290	0.184	0.063	1.849	0.594	0.609	0.071
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
35	2-methylpentane	5.998	2.289	0.198	0.113	0.480	0.302	0.075	0.051	1.445	0.404	0.456	0.057
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.265	0.132	0.062	0.087	0.056	0.068	0.075	0.107	0.107	0.058	0.010	0.008
37	3-methylpentane	3.621	1.385	0.091	0.064	0.318	0.138	0.088	0.036	0.887	0.276	0.300	0.026
38	2-methyl-1-pentene	0.147	0.088	0.008	0.011	<DL	<DL	<DL	<DL	0.032	0.021	<DL	<DL
39	1-hexene	0.176	0.117	0.012	0.015	0.001	0.0007	0.003	0.0006	0.040	0.028	0.006	0.002
40	n-hexane	4.194	1.547	0.109	0.068	0.308	0.209	0.081	0.025	1.005	0.288	0.330	0.0007
41	trans-2-hexene	0.177	0.117	0.012	0.014	0.0004	0.0006	0.003	0.002	0.040	0.028	0.009	0.007
42	2-methyl-2-pentene	0.313	0.186	0.009	0.013	<DL	<DL	<DL	<DL	0.067	0.042	0.001	0.002
43	trans-3-methyl-2-pentene	0.280	0.147	<DL	<DL	<DL	<DL	<DL	<DL	0.058	0.031	0.007	0.003
44	cis-2-hexene	0.105	0.076	0.005	0.008	<DL	<DL	<DL	<DL	0.023	0.018	0.004	0.002
45	cis-3-methyl-2-pentene	0.262	0.152	0.004	0.005	<DL	<DL	<DL	<DL	0.055	0.033	<DL	<DL
46	2,2-dimethylpentane	0.329	0.115	0.012	0.014	0.030	0.010	0.004	0.0003	0.081	0.024	0.029	0.002
47	methylcyclopentane	3.193	1.161	0.067	0.036	0.192	0.119	0.059	0.030	0.749	0.226	0.204	0.015
48	2,4-dimethylpentane	6.967	2.282	0.090	0.036	0.502	0.224	0.085	0.035	1.632	0.433	0.465	0.054
49	2,2,3-trimethylbutane	0.523	0.164	0.017	0.009	0.046	0.014	0.008	0.003	0.128	0.033	0.040	0.002
50	1-methylclopentene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
51	benzene	9.098	2.651	0.073	0.031	0.296	0.179	0.018	0.025	1.994	0.618	1.612	0.697
52	3,3-dimethylpentane	0.602	0.196	0.014	0.004	0.026	0.007	0.007	0.009	0.137	0.043	0.025	0.001
53	cyclohexane	2.851	1.001	0.151	0.061	0.126	0.134	0.019	0.027	0.667	0.151	0.122	0.039
54	2-methylhexane	2.719	0.897	0.031	0.011	0.164	0.081	0.025	0.014	0.625	0.171	0.165	0.016
55	2,3-dimethylpentane	5.402	1.713	0.054	0.010	0.388	0.173	0.055	0.025	1.258	0.320	0.352	0.041
56	1,1-dimethylcyclopentane	0.271	0.090	0.015	0.008	0.023	0.009	0.003	0.004	0.067	0.019	0.022	0.002
57	cyclohexene	0.104	0.063	<DL	<DL	<DL	<DL	<DL	<DL	0.022	0.013	<DL	<DL
58	3-methylhexane	2.647	0.847	0.020	0.020	0.191	0.080	0.037	0.012	0.618	0.156	0.181	0.020
59	cis-1,3-dimethylcylcopentane	0.505	0.183	0.016	0.019	0.022	0.014	0.006	0.0005	0.116	0.039	0.025	0.0008
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	0.671	0.221	<DL	<DL	0.032	0.045	0.016	0.023	0.153	0.027	0.037	0.002
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
62	2,2,4-timethylpentane	68.040	19.905	0.861	0.205	5.621	1.812	0.903	0.296	16.150	3.787	5.031	0.465
63	trans-3-heptene	0.048	0.032	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.007	<DL	<DL
64	n-heptane	2.802	0.906	0.032	0.006	0.168	0.078	0.024	0.009	0.643	0.172	0.164	0.017
65	cis-3-heptene	0.157	0.084	<DL	<DL	<DL	<DL	<DL	<DL	0.033	0.018	<DL	<DL
66	trans-2-heptene	0.047	0.028	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.006	0.001	0.002
67	cis-2-heptene	0.164	0.069	<DL	<DL	<DL	<DL	<DL	<DL	0.034	0.015	<DL	<DL
68	methylcyclohexane / 2,2-dimethylhexane	4.100	1.351	0.042	0.016	0.224	0.122	0.037	0.020	0.934	0.258	0.228	0.021
69	2,5-dimethylhexane / ethylcyclopentane	9.075	2.649	0.082	0.021	0.460	0.234	0.070	0.033	2.052	0.503	0.543	0.030
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	12.309	3.562	0.125	0.028	0.835	0.348	0.120	0.045	2.852	0.667	0.807	0.071
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.316	0.086	0.009	0.013	0.027	0.007	<DL	<DL	0.075	0.019	0.030	0.001
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.143	0.053	<DL	<DL	0.007	0.001	<DL	<DL	0.032	0.011	0.013	0.0001

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
73	2,3,4-trimethylpentane	25.773	7.511	0.257	0.057	1.786	0.746	0.239	0.098	5.978	1.404	1.682	0.164
74	toluene/2,3,3-trimethylpentane	32.250	10.635	1.953	0.351	2.778	0.390	1.749	0.528	8.419	2.347	2.695	0.192
75	2,3-dimethylhexane	7.498	2.193	0.072	0.008	0.465	0.211	0.058	0.025	1.720	0.409	0.531	0.0005
76	2-methyl-3-ethylpentane	0.295	0.090	<DL	<DL	0.033	0.009	<DL	<DL	0.071	0.016	0.021	0.029
77	2-methylheptane / 1-methylcyclohexene	1.307	0.406	0.008	0.004	0.087	0.036	0.006	0.004	0.299	0.077	0.090	0.007
78	4-methylheptane / 3-methyl-3-ethylpentane	0.477	0.164	0.008	0.011	0.038	0.018	0.001	0.002	0.112	0.032	0.039	0.004
79	3,4-dimethylhexane	1.413	0.410	0.033	0.014	0.111	0.050	0.017	0.002	0.337	0.074	0.105	0.010
80	3-methylheptane / 3-ethylhexane	1.351	0.404	0.011	0.011	0.091	0.062	0.013	0.0005	0.312	0.070	0.092	0.023
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	0.691	0.225	<DL	<DL	0.042	0.030	<DL	<DL	0.155	0.055	0.084	0.030
82	trans-1,4-dimethylcyclohexane	0.288	0.082	0.006	0.009	0.018	0.004	<DL	<DL	0.066	0.018	0.025	0.003
83	2,2,5-trimethylhexane	7.167	2.027	0.074	0.018	0.420	0.160	0.052	0.030	1.637	0.392	0.523	0.005
84	1-octene	0.168	0.057	<DL	<DL	0.020	0.004	<DL	<DL	0.041	0.013	0.012	0.003
85	1-ethyl-1-methylcyclopentane	0.067	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.005	0.003	0.004
86	n-octane/trans-1,2-dimethylcyclohexane	1.738	0.593	0.028	0.007	0.088	0.024	0.009	0.012	0.394	0.123	0.110	0.007
87	trans-2-octene	0.064	0.038	<DL	<DL	0.004	0.006	0.0008	0.001	0.015	0.010	0.012	0.017
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.311	0.141	0.006	0.008	0.018	0.006	<DL	<DL	0.071	0.033	0.024	0.016
89	2,4,4-trimethylhexane	0.299	0.118	<DL	<DL	0.022	0.0003	<DL	<DL	0.068	0.024	0.029	0.013
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
91	isopropylcyclopentane	0.076	0.055	0.045	0.002	<DL	<DL	<DL	<DL	0.026	0.012	0.007	0.009
92	2,3,5-trimethylhexane	1.149	0.360	0.037	0.028	0.062	0.028	0.008	0.004	0.267	0.075	0.083	0.012
93	2,4-dimethylheptane	0.283	0.106	0.014	0.020	0.013	0.004	0.005	0.006	0.067	0.027	0.025	0.013
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.438	0.153	0.008	0.012	0.018	0.006	0.005	0.007	0.099	0.035	0.035	0.018
95	n-propylcyclopentane	0.057	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.012	0.004	<DL	<DL
96	cis-cis-cis-1,3,5-trimethylcyclohexane	0.357	0.128	0.006	0.008	0.017	0.007	<DL	<DL	0.080	0.027	0.026	0.012
97	2,5-dimethylheptane/3,5-dimethylheptane	0.653	0.216	0.011	0.008	0.028	0.014	<DL	<DL	0.146	0.043	0.045	0.010
98	3,3-dimethylheptane	0.208	0.071	0.003	0.004	0.011	0.003	<DL	<DL	0.047	0.015	0.017	0.006
99	1,1,4-trimethylcyclohexane	0.095	0.038	<DL	<DL	<DL	<DL	<DL	<DL	0.020	0.008	0.005	0.008
100	ethylbenzene	1.468	0.753	0.030	0.019	0.013	0.002	0.006	0.008	0.317	0.164	0.067	0.030
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.130	0.041	0.019	0.027	0.012	0.017	<DL	<DL	0.035	0.010	0.009	0.003
102	2,3-dimethylheptane	0.308	0.098	0.011	0.016	0.018	0.015	<DL	<DL	0.071	0.020	0.024	0.0006
103	m&p-xylene/3,4-dimethylheptane	4.081	1.787	0.133	0.048	0.036	0.002	0.013	0.019	0.892	0.388	0.212	0.099
104	2-methyloctane	0.513	0.182	0.023	0.012	0.019	0.009	0.002	0.004	0.118	0.039	0.029	0.002
105	3-methyloctane	0.396	0.155	0.016	0.023	0.015	0.010	0.003	0.005	0.091	0.033	0.023	0.002
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	0.609	0.182	0.020	0.020	0.073	0.002	0.022	0.020	0.157	0.040	0.077	0.005
107	3,3-diethylpentane	0.415	0.587	<DL	<DL	<DL	<DL	<DL	<DL	0.086	0.122	<DL	<DL
108	o-xylene	1.713	0.726	0.044	0.012	0.028	0.003	0.007	0.009	0.376	0.156	0.085	0.035
109	1-nonene/1,1,2-trimethylcyclohexane	0.661	0.223	0.015	0.014	0.034	0.009	0.005	0.005	0.152	0.049	0.051	0.004
110	trans-3-nonene	0.077	0.032	<DL	<DL	<DL	<DL	<DL	<DL	0.016	0.007	0.005	0.0008
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
112	n-nonane	0.766	0.313	0.025	0.003	0.033	0.003	0.006	0.008	0.175	0.063	0.051	0.008
113	trans-2-nonene	0.359	0.116	0.012	0.0005	0.019	0.005	0.004	0.006	0.084	0.021	0.029	0.003
114	cis-2-nonene	0.084	0.038	0.008	0.011	0.007	0.001	<DL	<DL	0.021	0.011	0.004	0.001
115	isopropylbenzene	<DL	<DL	0.004	0.006	<DL	<DL	<DL	<DL	0.0009	0.001	<DL	<DL
116	2,2-dimethyloctane	0.329	0.144	0.008	0.011	0.015	0.0002	<DL	<DL	0.074	0.033	0.022	0.006

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
117	isopropylcyclohexane	0.168	0.068	0.009	0.013	0.007	0.004	<DL	<DL	0.039	0.016	0.011	0.0002
118	n-butylcyclopentane	0.406	0.159	0.008	0.004	0.015	0.00005	0.001	0.0006	0.091	0.034	0.031	0.005
119	3,3-dimethyloctane	0.026	0.023	<DL	<DL	0.004	0.006	0.013	0.018	0.010	0.002	0.007	0.0008
120	n-propylbenzene	0.236	0.142	0.021	0.020	0.004	0.004	0.002	0.0001	0.055	0.035	0.011	0.003
121	3-ethyltoluene	0.826	0.437	0.046	0.012	0.011	0.004	0.009	0.003	0.188	0.094	0.040	0.020
122	4-ethyltoluene/2,3-dimethyloctane	0.428	0.211	0.019	0.0002	0.007	0.002	0.005	0.006	0.096	0.042	0.024	0.009
123	1,3,5-trimethylbenzene	0.548	0.251	0.031	0.0005	0.011	0.004	0.003	0.004	0.125	0.052	0.036	0.014
124	2-methylnonane	1.122	1.586	0.093	0.039	0.096	0.002	0.037	0.010	0.291	0.342	0.172	0.027
125	3-ethyloctane	0.009	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	<DL
126	3-methylnonane	0.106	0.055	0.011	0.016	<DL	<DL	<DL	<DL	0.024	0.015	0.007	0.002
127	2-ethyltoluene	0.316	0.178	0.027	0.022	0.004	0.001	0.008	0.008	0.075	0.040	0.012	0.006
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	1.141	0.531	0.101	0.025	0.022	0.007	0.006	0.003	0.267	0.119	0.060	0.034
129	isobutylcyclohexane	0.084	0.060	0.059	0.038	0.013	0.019	0.082	0.086	0.058	0.0008	0.060	0.0003
130	n-decane	0.790	0.368	0.053	0.022	0.040	0.003	0.013	0.003	0.191	0.080	0.072	0.020
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.002
132	sec-butylbenzene	0.141	0.061	<DL	<DL	<DL	<DL	<DL	<DL	0.029	0.013	0.010	0.003
133	3-isopropyltoluene	0.081	0.042	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.009	0.008	0.011
134	4-isopropyltoluene	0.312	0.143	0.049	0.037	<DL	<DL	0.007	0.010	0.078	0.041	0.018	0.015
135	indan	0.026	0.037	0.037	0.052	0.023	0.026	0.008	0.004	0.022	0.028	<DL	<DL
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
137	1,3-diethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
138	3-n-propyltoluene	1.028	0.412	0.096	0.024	0.056	0.001	0.025	0.0005	0.258	0.092	0.107	0.022
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.247	0.143	0.045	0.024	0.012	0.002	0.010	0.012	0.068	0.032	0.017	0.009
140	1,2-diethylbenzene	0.099	0.046	0.014	0.004	0.004	0.005	<DL	<DL	0.025	0.012	0.010	0.004
141	2-n-propyltoluene	0.725	0.332	0.073	0.008	0.038	0.004	0.020	0.003	0.183	0.069	0.080	0.019
142	1,4-dimethyl-2-ethylbenzene	0.070	0.042	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.009	<DL	<DL
143	1,3-dimethyl-4-ethylbenzene	0.132	0.064	0.006	0.009	<DL	<DL	<DL	<DL	0.029	0.015	0.006	0.009
144	1,2-dimethyl-4-ethylbenzene	0.132	0.076	0.026	0.010	0.004	0.006	0.004	0.006	0.036	0.021	0.006	0.009
145	1,3-dimethyl-2-ethylbenzene	0.069	0.034	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.007	0.007	0.010
146	n-undecane	0.234	0.117	0.043	0.019	0.017	0.005	0.006	0.0004	0.065	0.030	0.035	0.012
147	1,2-dimethyl-3-ethylbenzene	0.152	0.076	0.025	0.003	0.004	0.005	<DL	<DL	0.038	0.018	0.014	0.001
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.133	0.064	0.070	0.014	0.083	0.047	0.052	0.013	0.081	0.033	0.130	0.042
149	1,2,3,5-tetramethylbenzene	0.070	0.037	0.035	0.010	<DL	<DL	<DL	<DL	0.022	0.010	<DL	<DL
150	tert-butyl-2-methylbenzene	0.007	0.010	<DL	<DL	<DL	<DL	<DL	<DL	0.001	0.002	<DL	<DL
151	n-pentylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
153	tert-butyl-3,5-dimethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL
155	naphthalene	<DL	<DL	0.042	0.004	<DL	<DL	<DL	<DL	0.009	0.0009	<DL	<DL
156	n-dodecane	<DL	<DL	0.020	0.004	<DL	<DL	<DL	<DL	0.004	0.0009	<DL	<DL

Dion, Speciated VOC Emission Rates (mg/mile) from E20 Fuel, 20℃ Tests

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
1	methane	59.565	4.588	27.115	1.815	28.473	0.737	25.280	3.433	33.632	0.241	14.120	n/a
2	ethylene	32.105	3.595	0.004	0.005	0.198	0.107	0.020	0.028	6.675	0.795	0.424	n/a
3	acetylene	16.931	0.025	0.017	0.002	<DL	<DL	0.010	0.003	3.494	0.023	0.00002	n/a
4	ethane	7.149	0.463	0.557	0.047	2.587	0.132	0.623	0.099	2.490	0.028	1.116	n/a
5	propylene	14.655	0.994	0.029	0.002	0.020	0.017	0.025	0.015	3.038	0.220	0.079	n/a
6	propane	0.842	0.249	0.400	0.011	0.170	0.032	0.242	0.019	0.381	0.056	0.082	n/a
7	propyne	1.232	0.235	0.010	0.0007	<DL	<DL	<DL	<DL	0.256	0.049	<DL	n/a
8	isobutane	2.907	1.123	1.127	0.022	0.472	0.086	0.628	0.021	1.166	0.252	0.372	n/a
9	isobutene / 1-butene	8.081	0.111	<DL	<DL	<DL	<DL	<DL	<DL	1.664	0.031	0.014	n/a
10	1,3-butadiene	1.018	0.157	0.016	0.004	<DL	<DL	<DL	<DL	0.213	0.031	<DL	n/a
11	n-butane	4.203	1.810	1.337	0.458	0.568	0.069	0.761	0.123	1.546	0.528	0.369	n/a
12	trans-2-butene	0.843	0.602	0.023	0.0004	0.009	0.0005	0.019	0.004	0.187	0.125	0.005	n/a
13	1-butyne	0.057	0.022	<DL	<DL	<DL	<DL	<DL	<DL	0.012	0.005	<DL	n/a
14	cis-2-butene	1.201	0.295	<DL	<DL	<DL	<DL	<DL	<DL	0.247	0.060	<DL	n/a
15	1,2-butadiene	0.082	0.019	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.004	<DL	n/a
16	3-methyl-1-butene	0.364	0.072	0.004	0.003	0.0004	0.0006	0.001	0.002	0.076	0.016	0.004	n/a
17	2-methylbutane	26.080	11.458	1.726	0.445	1.926	0.866	1.032	0.172	6.585	2.723	1.492	n/a
18	1,4-pentadiene	0.052	0.074	<DL	<DL	<DL	<DL	<DL	<DL	0.011	0.015	<DL	n/a
19	2-butyne	0.083	0.037	<DL	<DL	<DL	<DL	<DL	<DL	0.017	0.008	<DL	n/a
20	1-pentene	0.353	0.065	0.041	0.005	0.015	0.021	<DL	<DL	0.086	0.006	<DL	n/a
21	2-methyl-1-butene	0.741	0.143	0.004	0.006	<DL	<DL	<DL	<DL	0.153	0.030	<DL	n/a
22	n-pentane	12.749	5.846	0.602	0.162	1.038	0.565	0.336	0.159	3.141	1.429	0.657	n/a
23	2-methyl-1,3-butadiene	0.063	0.003	<DL	<DL	<DL	<DL	<DL	<DL	0.013	0.0006	<DL	n/a
24	trans-2-pentene	0.326	0.107	<DL	<DL	<DL	<DL	<DL	<DL	0.067	0.022	<DL	n/a
25	cis-2-pentene	0.215	0.055	0.007	0.003	<DL	<DL	0.002	0.002	0.046	0.012	<DL	n/a
26	2-methyl-2-butene	0.964	0.283	<DL	<DL	<DL	<DL	<DL	<DL	0.198	0.057	<DL	n/a
27	trans-1,3-pentadiene	0.009	0.004	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.0008	<DL	n/a
28	1,3-cyclopentadiene	0.012	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.002	0.003	<DL	n/a
29	2,2-dimethylbutane / cis-1,3-pentadiene	1.981	0.678	0.045	0.003	0.178	0.034	0.023	0.018	0.473	0.153	0.103	n/a
30	cyclopentene	0.178	0.056	0.0009	0.001	<DL	<DL	<DL	<DL	0.037	0.012	<DL	n/a
31	4-methyl-1-pentene / 3-methyl-1-pentene	0.141	0.071	0.003	0.004	0.013	0.005	0.001	0.001	0.034	0.013	<DL	n/a
32	cyclopentane	1.373	0.862	0.101	0.142	0.064	0.091	<DL	<DL	0.323	0.233	0.226	n/a
33	2,3-dimethylbutane	6.325	1.994	0.101	0.021	0.352	0.157	0.064	0.037	1.440	0.463	0.269	n/a
34	MTBE	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
35	2-methylpentane	10.458	3.718	0.021	0.029	0.435	0.297	0.017	0.025	2.281	0.850	0.261	n/a
36	cis-4-methyl-2-pentene / trans-4-methyl-2-pentene	0.236	0.015	0.210	0.058	0.142	0.036	0.218	0.076	0.199	0.042	0.124	n/a
37	3-methylpentane	6.163	2.039	0.098	0.045	0.355	0.161	0.067	0.052	1.407	0.483	0.258	n/a
38	2-methyl-1-pentene	0.088	0.124	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.025	<DL	n/a
39	1-hexene	0.492	0.017	0.003	0.004	0.0008	0.001	<DL	<DL	0.102	0.004	0.001	n/a
40	n-hexane	9.624	3.072	0.152	0.034	0.539	0.223	0.097	0.054	2.191	0.707	0.422	n/a
41	trans-2-hexene	0.207	0.125	0.002	0.003	0.0005	0.0007	0.0008	0.00006	0.043	0.026	<DL	n/a
42	2-methyl-2-pentene	0.289	0.070	0.005	0.007	<DL	<DL	<DL	<DL	0.061	0.013	<DL	n/a
43	trans-3-methyl-2-pentene	0.138	0.056	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.011	<DL	n/a

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
44	cis-2-hexene	0.123	0.034	<DL	<DL	<DL	<DL	<DL	<DL	0.025	0.007	<DL	n/a
45	cis-3-methyl-2-pentene	0.177	0.077	<DL	<DL	<DL	<DL	<DL	<DL	0.037	0.016	<DL	n/a
46	2,2-dimethylpentane	0.638	0.182	0.017	0.0003	0.053	0.010	0.020	0.001	0.156	0.040	0.033	n/a
47	methylcyclopentane	7.186	2.284	0.070	0.019	0.293	0.166	0.045	0.036	1.588	0.523	0.236	n/a
48	2,4-dimethylpentane	4.439	1.080	0.052	0.026	0.209	0.093	0.027	0.038	0.991	0.260	0.161	n/a
49	2,2,3-trimethylbutane	0.475	0.131	0.011	0.003	0.029	0.009	0.003	0.005	0.109	0.031	0.022	n/a
50	1-methylclopentene	<DL	<DL	<DL	<DL	0.005	0.006	<DL	<DL	0.001	0.002	<DL	n/a
51	benzene	12.329	1.272	0.032	0.00007	<DL	<DL	<DL	<DL	2.547	0.274	0.305	n/a
52	3,3-dimethylpentane	0.571	0.123	0.012	0.0005	0.033	0.009	0.010	0.006	0.132	0.029	0.018	n/a
53	cyclohexane	7.762	2.373	0.049	0.030	0.358	0.195	0.061	0.086	1.725	0.567	0.258	n/a
54	2-methylhexane	4.164	1.035	0.044	0.015	0.177	0.080	0.032	0.023	0.925	0.241	0.141	n/a
55	2,3-dimethylpentane	3.816	0.877	0.045	0.018	0.187	0.085	0.028	0.040	0.855	0.216	0.139	n/a
56	1,1-dimethylcyclopentane	0.716	0.185	0.019	0.002	0.046	0.013	0.018	0.004	0.169	0.042	0.033	n/a
57	cyclohexene	0.293	0.053	<DL	<DL	<DL	<DL	<DL	<DL	0.060	0.011	<DL	n/a
58	3-methylhexane	4.105	1.010	0.097	0.137	0.171	0.090	0.021	0.030	0.920	0.268	0.147	n/a
59	cis-1,3-dimethylcylcopentane	1.139	0.299	0.011	0.003	0.032	0.020	0.007	0.007	0.248	0.069	0.029	n/a
60	3-ethylpentane / trans-1,3-dimethylcyclopentane	1.352	0.346	0.011	0.005	0.047	0.025	0.007	0.010	0.296	0.081	0.038	n/a
61	trans-1,2-dimethylcyclopentane / 1-heptene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
62	2,2,4-timethylpentane	36.832	7.036	0.506	0.141	2.255	0.630	0.391	0.284	8.429	1.699	1.547	n/a
63	trans-3-heptene	0.046	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.010	0.003	<DL	n/a
64	n-heptane	6.418	1.535	0.070	0.022	0.279	0.120	0.039	0.036	1.424	0.358	0.224	n/a
65	cis-3-heptene	0.101	0.037	<DL	<DL	<DL	<DL	<DL	<DL	0.021	0.008	<DL	n/a
66	trans-2-heptene	0.066	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.014	0.004	<DL	n/a
67	cis-2-heptene	0.089	0.016	<DL	<DL	<DL	<DL	<DL	<DL	0.018	0.003	<DL	n/a
68	methylcyclohexane / 2,2-dimethylhexane	11.801	2.901	0.097	0.028	0.461	0.223	0.070	0.050	2.598	0.668	0.386	n/a
69	2,5-dimethylhexane / ethylcyclopentane	5.244	0.909	0.051	0.023	0.169	0.085	0.025	0.036	1.145	0.221	0.162	n/a
70	2,4-dimethylhexane / 2,2,3-trimethylpentane	6.885	1.208	0.075	0.020	0.325	0.118	0.047	0.050	1.537	0.293	0.250	n/a
71	3,3-dimethylhexane / cis-trans-cis-1,2,4-trimethylcyclopentane	0.649	0.133	<DL	<DL	0.034	0.008	<DL	<DL	0.143	0.029	0.029	n/a
72	cis-trans-cis-1,2,3-trimethylcyclopentane	0.361	0.074	<DL	<DL	0.010	0.010	<DL	<DL	0.077	0.018	0.016	n/a
73	2,3,4-trimethylpentane	12.810	2.264	0.139	0.042	0.636	0.238	0.082	0.101	2.867	0.558	0.495	n/a
74	toluene/2,3,3-trimethylpentane	23.048	4.007	1.679	0.009	1.074	0.466	0.815	0.536	5.656	1.092	0.890	n/a
75	2,3-dimethylhexane	3.980	0.662	0.052	0.001	0.175	0.080	0.035	0.0006	0.889	0.154	0.150	n/a
76	2-methyl-3-ethylpentane	0.232	0.043	<DL	<DL	0.008	0.011	<DL	<DL	0.050	0.012	0.015	n/a
77	2-methylheptane / 1-methylcyclohexene	2.620	0.531	0.028	0.012	0.086	0.058	0.008	0.012	0.571	0.129	0.105	n/a
78	4-methylheptane / 3-methyl-3-ethylpentane	0.828	0.121	0.008	0.011	0.034	0.015	0.013	0.002	0.185	0.025	0.041	n/a
79	3,4-dimethylhexane	0.850	0.144	0.021	0.006	0.037	0.026	0.009	0.009	0.193	0.040	0.037	n/a
80	3-methylheptane / 3-ethylhexane	2.290	0.447	0.029	0.004	0.089	0.047	0.015	0.012	0.507	0.107	0.084	n/a
81	cis-cis-trans-1,2,4-trimethylcyclopentane/cis-1,3-dimethylcyclohexane	2.054	0.503	0.110	0.156	0.136	0.010	0.088	0.069	0.511	0.113	0.096	n/a
82	trans-1,4-dimethylcyclohexane	0.809	0.160	0.014	0.003	0.032	0.014	0.006	0.009	0.180	0.039	0.033	n/a
83	2,2,5-trimethylhexane	3.582	0.493	0.039	0.012	0.139	0.056	0.018	0.026	0.790	0.124	0.137	n/a
84	1-octene	0.690	0.131	0.010	0.015	0.021	0.009	<DL	<DL	0.150	0.032	0.027	n/a
85	1-ethyl-1-methylcyclopentane	0.152	0.013	<DL	<DL	<DL	<DL	<DL	<DL	0.031	0.003	0.011	n/a
86	n-octane/trans-1,2-dimethylcyclohexane	5.126	0.960	0.056	0.008	0.173	0.093	0.019	0.027	1.121	0.228	0.181	n/a
87	trans-2-octene	0.137	0.0006	<DL	<DL	<DL	<DL	<DL	<DL	0.028	0.0003	0.008	n/a

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
88	cis-cis-cis-1,2,3-trimethylcyclopentane	0.641	0.096	<DL	<DL	0.034	0.012	<DL	<DL	0.141	0.016	0.023	n/a
89	2,4,4-trimethylhexane	0.177	0.006	<DL	<DL	0.012	0.009	<DL	<DL	0.040	0.004	0.009	n/a
90	cis-2-octene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
91	isopropylcyclopentane	0.130	0.017	0.069	0.076	<DL	<DL	<DL	<DL	0.042	0.020	0.006	n/a
92	2,3,5-trimethylhexane	0.500	0.094	<DL	<DL	<DL	<DL	<DL	<DL	0.103	0.019	0.025	n/a
93	2,4-dimethylheptane	0.395	0.043	0.012	0.017	0.014	0.006	<DL	<DL	0.088	0.006	0.019	n/a
94	2,6-dimethylheptane/cis-1,2-dimethylcyclohexane	0.822	0.125	0.018	0.006	0.025	0.008	0.006	0.009	0.182	0.031	0.031	n/a
95	n-propylcyclopentane	0.143	0.044	<DL	<DL	<DL	<DL	<DL	<DL	0.029	0.009	<DL	n/a
96	cis-cis-cis-1,3,5-trimethylcyclohexane	1.395	0.321	0.022	0.003	0.045	0.022	0.005	0.007	0.306	0.073	0.125	n/a
97	2,5-dimethylheptane/3,5-dimethylheptane	0.779	0.163	<DL	<DL	0.018	0.006	<DL	<DL	0.165	0.035	0.069	n/a
98	3,3-dimethylheptane	0.579	0.133	<DL	<DL	0.021	0.012	<DL	<DL	0.125	0.030	0.058	n/a
99	1,1,4-trimethylcyclohexane	0.226	0.058	<DL	<DL	0.004	0.005	0.041	0.058	0.059	0.004	0.037	n/a
100	ethylbenzene	1.703	0.372	0.015	0.022	0.004	0.006	<DL	<DL	0.355	0.082	0.028	n/a
101	cis-trans-trans-1,2,4-trimethylcyclohexane	0.344	0.063	<DL	<DL	0.005	0.007	<DL	<DL	0.072	0.015	0.024	n/a
102	2,3-dimethylheptane	0.490	0.088	<DL	<DL	0.011	0.005	<DL	<DL	0.104	0.019	0.027	n/a
103	m&p-xylene/3,4-dimethylheptane	4.494	0.809	0.080	0.071	0.012	0.017	<DL	<DL	0.946	0.183	<DL	n/a
104	2-methyloctane	1.333	0.243	0.027	0.008	0.037	0.016	0.008	0.007	0.293	0.057	0.059	n/a
105	3-methyloctane	1.068	0.205	0.004	0.006	0.030	0.033	<DL	<DL	0.229	0.052	0.042	n/a
106	styrene/cis-trans-cis-1,2,4-trimethylcyclohexane	0.637	0.030	0.011	0.015	0.017	0.024	<DL	<DL	0.138	0.016	0.041	n/a
107	3,3-diethylpentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
108	o-xylene	1.744	0.316	0.032	0.025	0.014	0.019	0.004	0.006	0.371	0.076	<DL	n/a
109	1-nonene/1,1,2-trimethylcyclohexane	0.585	0.089	0.012	0.005	0.021	0.014	0.002	0.002	0.129	0.023	0.025	n/a
110	trans-3-nonene	0.271	0.048	<DL	<DL	0.008	0.004	<DL	<DL	0.058	0.011	0.009	n/a
111	cis-3-nonene/isobutylcyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
112	n-nonane	3.062	0.513	0.076	0.022	0.090	0.032	0.023	0.018	0.679	0.122	0.107	n/a
113	trans-2-nonene	0.194	0.023	<DL	<DL	0.008	0.002	0.006	0.009	0.044	0.002	0.010	n/a
114	cis-2-nonene	0.384	0.068	0.009	0.012	0.013	0.005	0.012	0.002	0.088	0.017	0.007	n/a
115	isopropylbenzene	0.142	0.038	<DL	<DL	<DL	<DL	<DL	<DL	0.029	0.008	<DL	n/a
116	2,2-dimethyloctane	0.393	0.058	0.013	0.018	0.014	0.005	0.005	0.007	0.089	0.019	0.017	n/a
117	isopropylcyclohexane	0.686	0.118	0.016	0.007	0.018	0.005	0.005	0.007	0.151	0.029	0.018	n/a
118	n-butylcyclopentane	1.154	0.186	0.021	0.029	0.037	0.008	0.013	0.018	0.256	0.051	0.047	n/a
119	3,3-dimethyloctane	0.177	0.035	0.005	0.007	<DL	<DL	<DL	<DL	0.038	0.005	0.004	n/a
120	n-propylbenzene	0.369	0.075	0.005	0.007	0.003	0.004	<DL	<DL	0.078	0.018	<DL	n/a
121	3-ethyltoluene	0.915	0.168	0.031	0.022	0.004	0.006	<DL	<DL	0.197	0.041	<DL	n/a
122	4-ethyltoluene/2,3-dimethyloctane	0.674	0.116	0.009	0.013	0.006	0.008	<DL	<DL	0.142	0.028	<DL	n/a
123	1,3,5-trimethylbenzene	1.108	0.177	0.043	0.012	0.014	0.020	0.003	0.004	0.243	0.045	0.003	n/a
124	2-methylnonane	0.538	0.084	0.030	0.014	0.017	0.019	0.026	0.037	0.130	0.030	0.013	n/a
125	3-ethyloctane	0.127	0.020	<DL	<DL	<DL	<DL	<DL	<DL	0.026	0.004	<DL	n/a
126	3-methylnonane	0.479	0.076	0.001	0.001	<DL	<DL	<DL	<DL	0.099	0.015	0.015	n/a
127	2-ethyltoluene	0.295	0.055	0.008	0.011	0.005	0.008	0.007	0.010	0.066	0.019	<DL	n/a
128	1,2,4-trimethylbenzene/tert-butylbenzene/1-decene	1.223	0.231	0.064	0.049	0.009	0.013	<DL	<DL	0.268	0.061	<DL	n/a
129	isobutylcyclohexane	0.469	0.020	0.020	0.003	0.014	0.020	0.007	0.010	0.107	0.001	0.071	n/a
130	n-decane	2.395	0.362	0.161	0.025	0.056	0.016	0.018	0.025	0.550	0.090	0.081	n/a
131	isobutylbenzene/trans-1-methyl-2-propylcyclohexane	0.119	0.021	<DL	<DL	<DL	<DL	<DL	<DL	0.025	0.004	<DL	n/a
132	sec-butylbenzene	0.158	0.024	<DL	<DL	<DL	<DL	<DL	<DL	0.033	0.005	<DL	n/a

		Phase 1 CSLA4		Phase 2 CSLA4		Phase 1 HSLA4		Phase 2 HSLA4		4-Phase Composite		US06	
		Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev	Avg	St Dev
133	3-isopropyltoluene	0.220	0.033	<DL	<DL	0.045	0.063	<DL	<DL	0.058	0.011	0.041	n/a
134	4-isopropyltoluene	0.399	0.083	0.048	0.050	0.004	0.005	0.019	0.026	0.099	0.037	<DL	n/a
135	indan	0.068	0.047	0.028	0.022	0.009	0.013	0.002	0.002	0.023	0.019	<DL	n/a
136	2-isopropyltoluene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
137	1,3-diethylbenzene	0.075	0.017	<DL	<DL	<DL	<DL	<DL	<DL	0.015	0.003	<DL	n/a
138	3-n-propyltoluene	0.595	0.099	0.049	0.014	0.015	0.021	0.005	0.007	0.139	0.031	0.015	n/a
139	4-n-propyltoluene/n-butylbenzene/1,3-dimethyl-5-ethylbenzene	0.297	0.070	0.026	0.016	0.002	0.003	<DL	<DL	0.068	0.019	<DL	n/a
140	1,2-diethylbenzene	0.156	0.045	0.017	0.010	0.004	0.005	<DL	<DL	0.037	0.013	0.002	n/a
141	2-n-propyltoluene	0.421	0.083	0.046	0.013	0.011	0.016	0.008	0.011	0.102	0.027	0.009	n/a
142	1,4-dimethyl-2-ethylbenzene	<DL	<DL	0.022	0.031	<DL	<DL	<DL	<DL	0.005	0.007	<DL	n/a
143	1,3-dimethyl-4-ethylbenzene	0.093	0.029	0.021	0.001	<DL	<DL	<DL	<DL	0.024	0.006	<DL	n/a
144	1,2-dimethyl-4-ethylbenzene	0.103	0.042	0.015	0.007	0.0005	0.0007	<DL	<DL	0.025	0.010	<DL	n/a
145	1,3-dimethyl-2-ethylbenzene	0.024	0.034	<DL	<DL	<DL	<DL	<DL	<DL	0.005	0.007	<DL	n/a
146	n-undecane	0.526	0.167	0.170	0.028	0.016	0.015	<DL	<DL	0.151	0.044	0.006	n/a
147	1,2-dimethyl-3-ethylbenzene	0.059	0.025	0.031	0.007	<DL	<DL	<DL	<DL	0.019	0.003	<DL	n/a
148	1,2,4,5-tetramethylbenzene/2-methylbutylbenzene	0.421	0.017	0.140	0.018	0.086	0.047	0.111	0.045	0.175	0.019	0.468	n/a
149	1,2,3,5-tetramethylbenzene	<DL	<DL	0.012	0.017	<DL	<DL	<DL	<DL	0.003	0.004	<DL	n/a
150	tert-butyl-2-methylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
151	n-pentylbenzene	0.038	0.021	0.002	0.003	<DL	<DL	<DL	<DL	0.008	0.005	0.009	n/a
152	trans-1-methyl-2-(4-methylpentyl)cyclopentane	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
153	tert-butyl-3,5-dimethylbenzene	0.004	0.005	0.011	0.0005	<DL	<DL	<DL	<DL	0.003	0.001	<DL	n/a
154	tert-butyl-4-ethylbenzene	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	<DL	n/a
155	naphthalene	<DL	<DL	0.049	0.069	<DL	<DL	<DL	<DL	0.011	0.015	<DL	n/a
156	n-dodecane	0.009	0.003	0.038	0.006	0.0006	0.0009	0.0003	0.0004	0.011	0.002	<DL	n/a