



# **PEMS Testing of Porsche Model Year 2019 Vehicles**

**Report Pursuant to Paragraph 33.e and Paragraph 33.f of the DOJ  
and California Third Partial Consent Decree**

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## Table of Contents

<b>Table of Contents</b> .....	<b>2</b>
<b>List of Figures</b> .....	<b>4</b>
<b>List of Tables</b> .....	<b>4</b>
<b>List of Abbreviations</b> .....	<b>6</b>
<b>1 Executive Summary</b> .....	<b>7</b>
<b>2 Methodology</b> .....	<b>8</b>
2.1 Vehicles Tested .....	8
2.2 PEMS Test Routes .....	8
2.3 Instruments and Elements Used for PEMS Measurements .....	10
2.3.1 Devices.....	10
2.3.2 Fuels.....	11
2.4 Correlation Testing .....	11
2.5 Emissions Testing Procedure.....	11
2.6 Data Analysis and Emission Calculations .....	12
<b>3 Results and Discussion</b> .....	<b>13</b>
3.1 Emission Measurements Summary Table.....	13
3.2 Cayenne .....	16
3.2.1 LA Downtown (1).....	17
3.2.2 LA Downtown (2).....	22
3.2.3 Highway.....	27
3.2.4 Mt. Baldy.....	32
3.3 Cayenne Turbo .....	37
3.3.1 LA Downtown .....	38
3.3.2 Highway.....	43
3.3.3 Mt. Baldy.....	48
3.4 Macan .....	53
3.4.1 LA Downtown .....	54
3.4.2 Highway.....	59
3.4.3 Mt. Baldy (1) .....	64
3.4.4 Mt. Baldy (2) .....	69
3.5 Panamera 4 E-Hybrid .....	74
3.5.1 LA Downtown (E) .....	75
3.5.2 LA Downtown (1).....	80
3.5.3 LA Downtown (2).....	85
3.5.4 Highway (1) .....	90

3.5.5	Highway (2) .....	95
3.5.6	Mt. Baldy (1) .....	100
3.5.7	Mt. Baldy (2) .....	105
3.6	Panamera Turbo S E-Hybrid .....	110
3.6.1	LA Downtown .....	111
3.6.2	Highway (1) .....	116
3.6.3	Highway (2) .....	121
3.6.4	Highway (3) .....	126
3.6.5	Mt. Baldy (1) .....	131
3.6.6	Mt. Baldy (2) .....	136
3.7	718 Cayman GTS .....	141
3.7.1	LA Downtown .....	142
3.7.2	Highway .....	147
3.7.3	Mt. Baldy .....	152
3.8	911 Turbo S .....	157
3.8.1	LA Downtown .....	158
3.8.2	Highway .....	163
3.8.3	Mt. Baldy .....	168
3.9	Cayenne E-Hybrid .....	173
3.9.1	LA Downtown .....	174
3.9.2	Highway .....	179
3.9.3	Mt. Baldy .....	184
<b>4</b>	<b>Conclusion .....</b>	<b>189</b>

## List of Figures

Figure 2-1: Porsche Test Groups MY2019 .....	8
Figure 2-3: Topographic Map of Urban Driving Route in Downtown Los Angeles .....	9
Figure 2-4: Topographic Map of Highway Driving Route in Los Angeles .....	9
Figure 2-5: Topographic Map of Rural and Uphill/Downhill Driving Route in Los Angeles Foothills.....	10
Figure 2-6: PEMS Measurement Procedure.....	12

## List of Tables

Table 1-1: Abbreviations .....	6
Table 3-1: Emission Overview for Model Year 2019 Measurements .....	13
Table 3-2: Emission Overview Porsche - Cayenne .....	16
Table 3-3: LA Downtown (1) Trip Summary for Cayenne.....	17
Table 3-4: LA Downtown (2) Trip Summary for Cayenne.....	22
Table 3-5: Highway Trip Summary for Porsche - Cayenne .....	27
Table 3-6: Mt. Baldy Trip Summary for Porsche - Cayenne .....	32
Table 3-7: Emission Overview Porsche - Cayenne Turbo.....	37
Table 3-8: LA Downtown Trip Summary for Cayenne Turbo.....	38
Table 3-9: Highway Trip Summary for Cayenne Turbo .....	43
Table 3-10: Mt. Baldy Trip Summary for Cayenne Turbo .....	48
Table 3-11: Emission Overview Porsche - Macan.....	53
Table 3-12: LA Downtown Trip Summary for Macan.....	54
Table 3-13: Highway Trip Summary for Macan .....	59
Table 3-14: Mt. Baldy (1) Trip Summary for Macan.....	64
Table 3-15: Mt. Baldy (2) Trip Summary for Macan.....	69
Table 3-16: Emission Overview Porsche - Panamera 4 E-Hybrid .....	74
Table 3-17: LA Downtown (E) Trip Summary for Panamera 4 E-Hybrid .....	75
Table 3-18: LA Downtown (1) Trip Summary for Panamera 4 E-Hybrid .....	80
Table 3-19: LA Downtown (2) Trip Summary for Panamera 4 E-Hybrid .....	85
Table 3-20: Highway (1) Trip Summary for Panamera 4 E-Hybrid.....	90
Table 3-21: Highway (2) Trip Summary for Panamera 4 E-Hybrid.....	95
Table 3-22: Mt. Baldy (1) Trip Summary for Panamera 4 E-Hybrid.....	100
Table 3-23: Mt. Baldy (2) Trip Summary for Panamera 4 E-Hybrid.....	105
Table 3-24: Emission Overview Porsche - Panamera Turbo S E-Hybrid .....	110
Table 3-25: LA Downtown Trip Summary for Panamera Turbo S E-Hybrid .....	111
Table 3-26: Highway (1) Trip Summary for Panamera Turbo S E-Hybrid .....	116

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Table 3-27: Highway (2) Trip Summary for Panamera Turbo S E-Hybrid .....	121
Table 3-28: Highway (3) Trip Summary for Panamera Turbo S E-Hybrid .....	126
Table 3-29: Mt. Baldy (1) Trip Summary for Panamera Turbo S E-Hybrid .....	131
Table 3-30: Mt. Baldy (2) Trip Summary for Panamera Turbo S E-Hybrid .....	136
Table 3-31: Emission Overview Porsche - 718 Cayman GTS.....	141
Table 3-32: LA Downtown Trip Summary for 718 Cayman GTS.....	142
Table 3-33: Highway Trip Summary for 718 Cayman GTS .....	147
Table 3-34: Mt. Baldy Trip Summary for 718 Cayman GTS.....	152
Table 3-35: Emission Overview Porsche - 911 Turbo S.....	157
Table 3-36: LA Downtown Trip Summary for 911 Turbo S.....	158
Table 3-37: Highway Trip Summary for 911 Turbo S .....	163
Table 3-38: Mt. Baldy Trip Summary for 911 Turbo S .....	168
Table 3-39: Emission Overview Porsche - Cayenne E-Hybrid .....	173
Table 3-40: LA Downtown Trip Summary for Cayenne E-Hybrid .....	174
Table 3-41: Highway Trip Summary for Cayenne E-Hybrid.....	179
Table 3-42: Mt. Baldy Trip Summary for Cayenne E-Hybrid .....	184

## List of Abbreviations

Table 1-1: Abbreviations

Amb.	Ambient Conditions (Pressure, Temperature, Relative Humidity)
AT	Automatic Transmission
AVL	AVL List GmbH
AWD	All Wheel Drive
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
EFM	Exhaust Flow Meter
FID	Flame Ionization Detector
FTP75	EPA Federal Test Procedure
LDT	Light Duty Truck
LDV	Light Duty Vehicle
MBtech	MB-technology NA LLC and AKKA Group GmbH & Co. KGaA (former MBtech Group GmbH & Co. KGaA)
MY	Model Year
PC	Passenger Car
PEMS	Portable Emissions Measurement System
PHEV	Plug-In Hybrid Electric Vehicle
Porsche	Dr. Ing. h.c. F. Porsche AG and Porsche Cars North America, Inc.
NO	Nitrogen Monoxide
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides (sum of NO + NO <sub>2</sub> )
SUV	Sport Utility Vehicle
TCC	Emission Compliance Lab and Test Center in Oxnard, California
THCs	Total Hydrocarbon
TWC	Three-Way-Catalytic Converter
USC	University of Southern California

## 1 Executive Summary

MB Technology NA LLC (“MBtech”) was retained as an independent Third-Party Emissions Tester by Porsche Cars North America, Inc. to conduct emission testing on certain model year (“MY”) 2017, 2018 and 2019 Porsche light duty vehicles using a portable emission measurement system (“PEMS”). In 2019, MBtech conducted PEMS testing on eight MY2019 Porsche series-production light-duty gasoline vehicles provided by Porsche. MBtech carried out all testing required under paragraph 33.a and 33.b of the DOJ and California Third Partial Consent Decree. The vehicle models tested included a Cayenne (vehicle with the highest project sales), Cayenne Turbo, Cayenne E-Hybrid, Macan, Panamera 4 E-Hybrid, Panamera Turbo S E-Hybrid, as well as the sports cars 718 Cayman GTS and 911 Turbo S. Dr. Ing. h.c. F. Porsche AG and Porsche Cars North America, Inc. (together, “Porsche”) were not involved in any of the vehicle testing and had no influence on the evaluation of the results summarized in this report.

Emission measurements were performed using a portable emissions measurement system (PEMS) and a flame ionization detector (FID) manufactured by AVL List GmbH (“AVL”). Three pre-defined routes reflecting a diversity of topological characteristics, driving patterns and ambient temperatures and pressures were driven for each test vehicle. These routes included an urban, highway and high altitude driving scenario. The urban route was located in Downtown Los Angeles. The highway route started in Los Angeles and ended at the Ontario Convention Center. The final route started and ended at the Ontario Convention Center and went up and down Mount Baldy.

Following the PEMS measurements under real driving conditions, correlation tests were then conducted on a chassis dynamometer at the Emission Compliance Lab and Test Center (“TCC”) in Oxnard, California. The PEMS and FID devices, as well as the dynamometer’s emission laboratory analyzers, were used in parallel during correlation testing. A FTP75 chassis dynamometer certification test cycle was run for all eight vehicles after the PEMS measurements had been completed.

There is a total amount of 33 on-road measurements and 11 tests on the chassis dynamometer. The PEMS measured the gaseous emissions of carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>); whereas NO<sub>x</sub> is the sum of nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>). The FID analyzer measured the hydrocarbons (THC) for all vehicles except the sports cars due to safety concerns and lack of space. The ambient pressure, temperature, humidity and altitude were also recorded for all on-road measurements through an external GPS and humidity sensor measuring device.

The following report provides the test data of all PEMS measurements and correlation test results on the chassis dynamometer and describes all test methods used.

## 2 Methodology

### 2.1 Vehicles Tested

PEMS testing was conducted with eight series-production light-duty gasoline vehicles provided by Porsche. Each vehicle tested belongs to a different test group, as depicted below in Figure 2-1. These vehicles included four passenger cars (light duty vehicle) and four sport utility vehicles (SUV). The vehicle models tested included a Cayenne (vehicle with highest project sales), Cayenne Turbo, Cayenne E-Hybrid, Macan, Panamera 4 E-Hybrid, Panamera Turbo S E-Hybrid, as well as the sports cars 718 Cayman GTS and 911 Turbo S.

No.	Models in test group	MY2019
1	Turbo S (991 II)	x
2	Cayman GTS (982 S)	x
3	Carrera (991 II)	x
4	Panamera Turbo (LK5) (G2)	x
5	Panamera (LK2) (G2)	x
6	Panamera PHEV (LK3) (G2)	x
7	Panamera Turbo S PHEV (G2)	x
8	New Cayenne (E3)	x
9	New Cayenne PHEV (E3)	x
10	New Cayenne Turbo (E3)	x
11	New Macan (II)	x

Figure 2-1: Porsche Test Groups MY2019

### 2.2 PEMS Test Routes

Three pre-defined routes were selected to perform PEMS testing on the eight vehicles. The test routes were defined within main areas in Southern California, primarily, Los Angeles and the Inland Empire. These three routes reflected the diversity in topological characteristics, driving patterns and ambient conditions that are expected to be representative of typical vehicle operations within the area. Each route was driven once per vehicle unless (i) data was deemed invalid due to analyzer drift; (ii) unforeseen deviations from the original route occurred; (iii) a second test was performed to validate a prior measurement; (iv) a vehicle was stuck in heavy traffic for a prolonged period of time during emission measurements; (v) data was deemed invalid due to reasons further explained in this report. Unforeseen deviations can also include, but are not limited to road closures. All PEMS measurement results, whether repeated or not, are included in this report. The order of the test routes was adapted to the traffic situation in the Los Angeles area and was not fixed in advance.



The “Los Angeles Route” started and ended at the parking lot from the University of Southern California’s (USC’s) Religious Center. The complete route is approx. 15.2 miles in distance long. Most of the route is representative of urban driving affected by dense traffic conditions except for approx. 3.3 miles toward the end of the route, which is on the 110 South Highway. A topographical map of this route is depicted below in *Figure 2-2*.

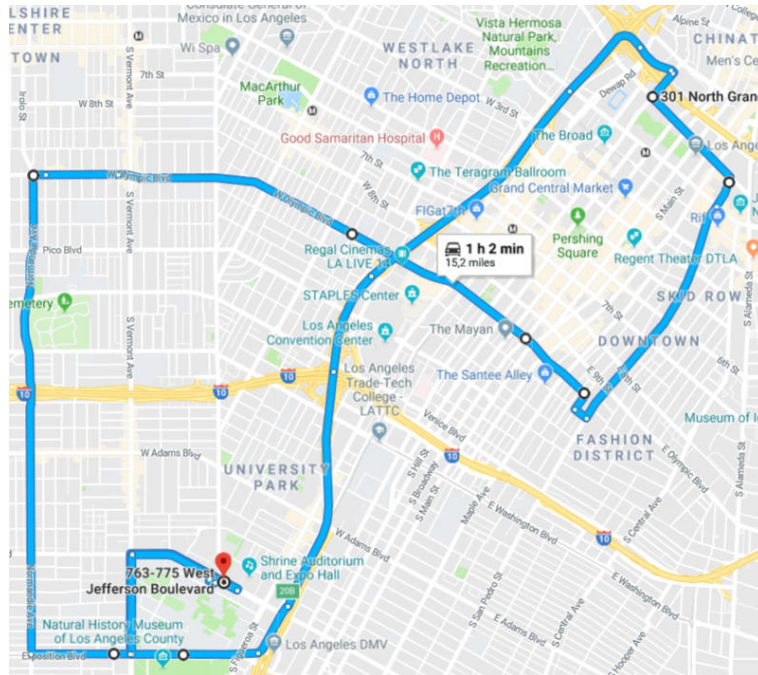


Figure 2-2: Topographic Map of Urban Driving Route in Downtown Los Angeles

The “Highway Route” shown below in *Figure 2-3* is approx. 45 miles long and comprised of approx. 95% highway and approx. 5% urban driving. The route starts at the same starting and ending location as the “Los Angeles Route”, which is at USC’s main campus. The route primarily follows interstate I-10E until reaching exit 54 (N Vineyard). The end point of this route is a parking lot near the Ontario Convention Center.

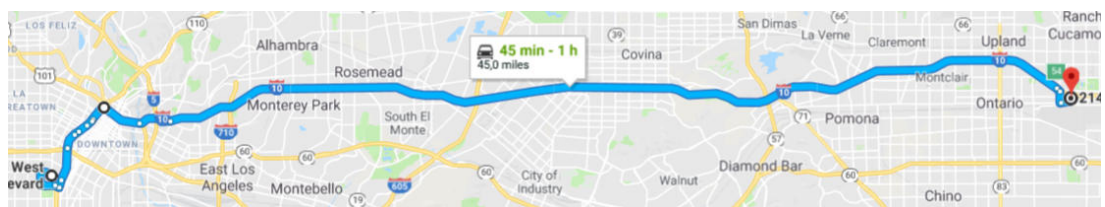


Figure 2-3: Topographic Map of Highway Driving Route in Los Angeles

The third route driven is the “Mt. Baldy Route” shown in Figure 2-4 and is approx. 45.5 miles long. This route is representative of rural and uphill/downhill driving that includes significant variations in altitude, grade and ambient temperature and pressure. The starting and end point of the route was at a parking lot near the Ontario Convention Center.

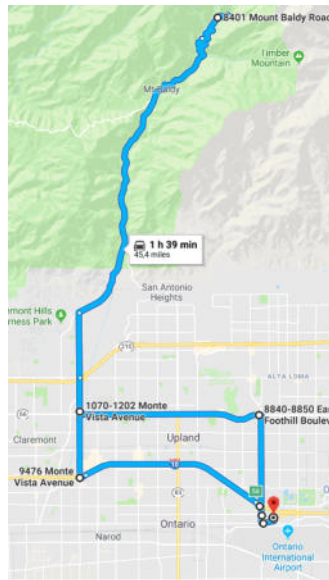


Figure 2-4: Topographic Map of Rural and Uphill/Downhill Driving Route in Los Angeles Foothills

## 2.3 Instruments and Elements Used for PEMS Measurements

### 2.3.1 Devices

Each tested vehicle was equipped with an AVL M.O.V.E 492 GAS PEMS iS system (“Gas PEMS”) manufactured by AVL. The Gas PEMS was responsible for measuring carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO) and nitrogen oxides (NO<sub>x</sub>), which is a combination of nitrogen monoxide (NO) and nitrogen dioxide (NO<sub>2</sub>) measurements. The Gas PEMS was installed according to the manufacturer’s recommendations. This included providing an isolated power source such as a generator or batteries, system controller and an ambient enclosure.

In addition to the Gas PEMS, all vehicles (except the sports cars 718 Cayman GTS and 911 Turbo S) were equipped with an AVL M.O.V.E 4925 FID iS and an exhaust flow meter (EFM) to measure total hydrocarbons (THCs) and the exhaust gas volume flow respectively. The PEMS, FID and EFM were always mounted on the car hitch of each individual vehicle.

### 2.3.2 **Fuels**

All eight test vehicles had their fuel tanks emptied and refilled with standard fuel (91 RON) from the same batch.

## 2.4 **Correlation Testing**

Laboratory chassis dynamometer testing was performed on all vehicles at the Emission Compliance Lab and Test Center in Oxnard, California. These tests are used to validate the PEMS system by comparing the results of the PEMS with the dynamometer. Both the PEMS and the dynamometer emission laboratory's analyzers have been used in parallel during correlation tests. A FTP75 chassis dynamometer certification test cycle was run for all eight vehicles, which is a cycle based on the Los Angeles route shown in *Figure 2-2* (California Air Resource Board). Additionally, US06 cycles were driven without the PEMS system for the two sports cars 718 Cayman GTS and 911 Turbo S.

## 2.5 **Emissions Testing Procedure**

All eight vehicles tested underwent the same procedure in order to execute proper PEMS measurements. A flow chart of the exact procedure used for PEMS measurements in this project is depicted below in *Figure 2-5*. First, exhaust pipe adapters were installed onto the vehicles and smoke checks were carried out to ensure that there were no leaks from the pipes. After exhaust pipe adapters were mounted, all measurement systems, such as the PEMS, FID and EFM, were mounted along with auxiliary components, such as a battery, an inverter and connections. Once the vehicle was set up, pre-checks were performed to ensure the measurement systems were operating correctly. If successful, pre-calibrations were carried out and PEMS measurements were done on the street. Directly after each PEMS measurement trip, post-calibrations were run to help correct drifts. Measurements were analyzed after completion. Once PEMS measurements were completed and analyzed, the vehicles were taken to a chassis dynamometer laboratory for correlation tests. After all tests have been completed, all measurement equipment was removed from the vehicle and a report was prepared.

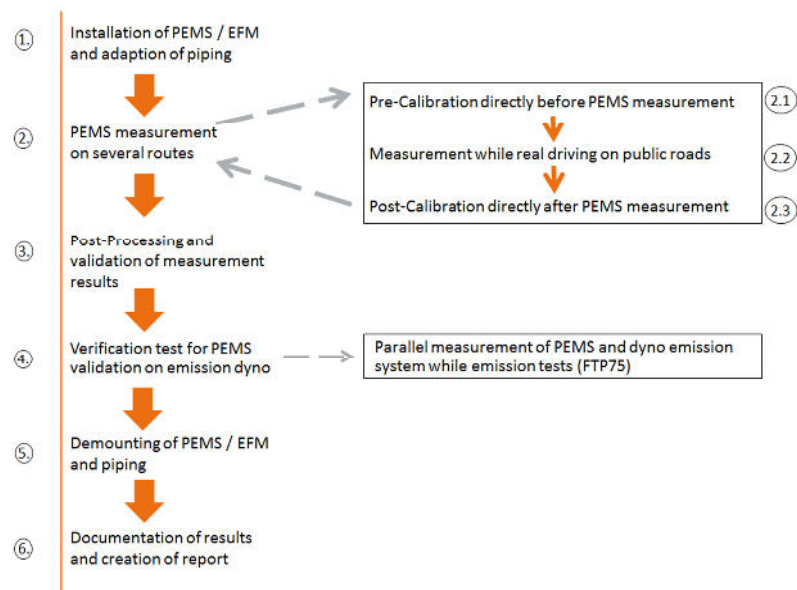


Figure 2-5: PEMS Measurement Procedure

## 2.6 Data Analysis and Emission Calculations

Data analysis was performed with AVL CONCERTO FOR PEMS 4 R8.2. The post-processing of data was executed with CONCERTO Workfile PEMS\_Rel\_10\_B192.

### 3 Results and Discussion

#### 3.1 Emission Measurements Summary Table

The following tables summarize the emissions from all the routes and vehicles tested.

Table 3-1: Emission Overview for Model Year 2019 Measurements

Cayenne		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
03/27/2019	LA Downtown (1)*	536,8	0,433	0,027	0,007	3987	15,52
04/01/2019	LA Downtown (2)	550,6	0,755	0,022	0,005	3672	15,54
04/01/2019	Highway	409,6	1,886	0,012	0,008	6147	43,32
03/26/2019	Mt. Baldy	455,1	0,886	0,012	0,008	5995	44,31
04/03/2019	FTP75 (PEMS)	439,5	0,357	0,027	0,014	2495	10,77
04/03/2019	FTP75 (Dyno)	414,8	0,338	0,027	0,021		11,00

Cayenne Turbo		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
04/25/2019	LA Downtown	667,5	0,107	0,022	0,013	4265	15,43
04/25/2019	Highway	568,1	0,433	0,016	0,009	8687	43,02
04/24/2019	Mt. Baldy	503,9	0,654	0,007	0,013	5290	44,27
04/26/2019	FTP75 (PEMS)	614,4	0,502	0,023	0,030	2486	10,77
04/26/2019	FTP75 (Dyno)	585,6	0,453	0,013	0,026		11,01

Macan		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
05/01/2019	LA Downtown	469,8	0,050	0,025	0,002	3872	15,84
05/01/2019	Highway	334,4	0,131	0,014	0,006	4284	44,21
04/30/2019	Mt. Baldy (1)	404,8	0,303	0,022	0,025	5617	45,04
05/01/2019	Mt. Baldy (2) **	412,4	0,199	0,020	0,025	5365	44,66
05/03/2019	FTP75 (PEMS)	356,1	0,223	0,014	0,022	2463	11,08
05/03/2019	FTP75 (Dyno)	360,4	0,252	0,012	0,024		11,04

\*: Test deemed invalid due to analyzer drifts for CO<sub>2</sub>, CO and THC.

\*\* : Test deemed invalid due to route deviation.

Panamera 4 E-Hybrid		Emissions				Test		
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]	Battery-level at start
05/07/2019	LA Downtown (E)***	143,7	0,208	0,024	0,072	3653	15,47	~ 50%
05/08/2019	LA Downtown (1)*	409,8	0,589	0,002	0,005	3636	15,46	< 20%
05/10/2019	LA Downtown (2)	469,3	0,556	0,003	0,033	5242	15,41	< 20%
05/07/2019	Highway (1)	352,8	0,749	0,004	0,018	5492	43,24	< 20%
05/10/2019	Highway (2)****	381,8	0,678	0,006	0,010	9625	42,96	< 20%
05/07/2019	Mt. Baldy (1)*	416,5	1,826	0,006	0,019	5064	44,11	< 20%
05/10/2019	Mt. Baldy (2)	405,1	2,077	0,005	0,030	4911	44,12	< 20%
05/15/2019	FTP75 (PEMS)	445,4	0,327	0,004	0,008	2455	10,79	< 20%
05/15/2019	FTP75 (Dyno)	375,8	0,246	0,002	0,008		11,03	

Panamera Turbo S E-Hybrid		Emissions				Test		
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]	Battery-level at start
05/16/2019	LA Downtown	505,6	0,027	0,008	0,007	4769	15,36	< 20%
05/17/2019	Highway (1)*	378,7	0,372	0,009	0,009	3526	43,35	< 20%
05/23/2019	Highway (2)*	400,6	0,409	0,006	0,024	4092	43,34	< 20%
05/24/2019	Highway (3)	379,6	0,451	0,004	0,015	3246	43,39	< 20%
05/17/2019	Mt. Baldy (1)****	478,5	0,605	0,005	0,033	12033	43,89	< 20%
05/24/2019	Mt. Baldy (2)	417,3	0,464	0,006	0,015	5008	44,03	< 20%
05/29/2019	FTP75 (PEMS)	432,0	0,181	0,006	0,039	2523	10,75	< 20%
05/29/2019	FTP75 (Dyno)	379,8	0,194	0,003	0,040		11,02	

\*: Test deemed invalid due to analyzer drift for THC.

\*\*\*: Test was done with randomly charged battery level; measurement was repeated with low battery level. All further measurements were done with low battery for reproducibility.

\*\*\*\*: Test deemed invalid due to long duration:

- Panamera 4 E-Hybrid: Heavy delays due to traffic.
- Panamera Turbo S E-Hybrid: Delays caused by Amgen Tour of California bicycle race.

Cayman GTS		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
06/03/2019	LA Downtown	399,7	0,022	0,015	n.a.	3203	15,98
05/31/2019	Highway	319,8	0,051	0,014	n.a.	3544	44,78
05/31/2019	Mt. Baldy	365,0	0,702	0,021	n.a.	5605	45,51
06/04/2019	FTP75 (PEMS) *****	407,9	0,146	0,036	n.a.	2466	11,10
06/04/2019	FTP75 (Dyno)	404,7	0,171	0,033	0,047		11,10
06/19/2019	FTP75 (PEMS)	364,7	0,154	0,024	n.a.	2496	11,16
06/19/2019	FTP75 (Dyno)	407,1	0,193	0,024	0,050		11,07
06/19/2019	US06 (Dyno)	367,7	0,869	0,018	0,017	596	8,02

911 Turbo S		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
06/05/2019	LA Downtown	627,5	0,039	0,051	n.a.	5543	15,37
06/07/2019	Highway	345,3	0,125	0,029	n.a.	3351	43,59
06/07/2019	Mt. Baldy	416,7	0,038	0,037	n.a.	5017	44,28
06/11/2019	FTP75 (PEMS)	427,3	0,265	0,087	n.a.	2565	10,80
06/11/2019	FTP75 (Dyno)	436,8	0,270	0,081	0,040		10,97
06/21/2019	US06 (Dyno)	375,6	0,000	0,054	0,004	596	8,00

Cayenne E-Hybrid		Emissions				Test		
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]	Battery- level at start
06/12/2019	LA Downtown	447,0	0,249	0,005	0,001	4299	15,61	< 20%
06/13/2019	Highway	344,1	0,327	0,008	0,008	3904	43,84	< 20%
06/13/2019	Mt. Baldy	411,1	0,625	0,008	0,010	5373	44,54	< 20%
06/18/2019	FTP75 (PEMS)	518,0	0,320	0,012	0,029	2493	10,89	< 20%
06/18/2019	FTP75 (Dyno)	457,2	0,330	0,009	0,026		11,01	

\*\*\*\*\*: Test was repeated due to connection loss to vehicle's OBD.

### 3.2 Cayenne

The following table summarizes the emission measurement results from the Cayenne vehicle.

Table 3-2: Emission Overview Porsche - Cayenne

Cayenne		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
03/27/2019	LA Downtown (1)*	536,8	0,433	0,027	0,007	3987	15,52
04/01/2019	LA Downtown (2)	550,6	0,755	0,022	0,005	3672	15,54
04/01/2019	Highway	409,6	1,886	0,012	0,008	6147	43,32
03/26/2019	Mt. Baldy	455,1	0,886	0,012	0,008	5995	44,31
04/03/2019	FTP75 (PEMS)	439,5	0,357	0,027	0,014	2495	10,77
04/03/2019	FTP75 (Dyno)	414,8	0,338	0,027	0,021		11,00

\*: Test deemed invalid due to analyzer drifts for CO<sub>2</sub>, CO and THC.

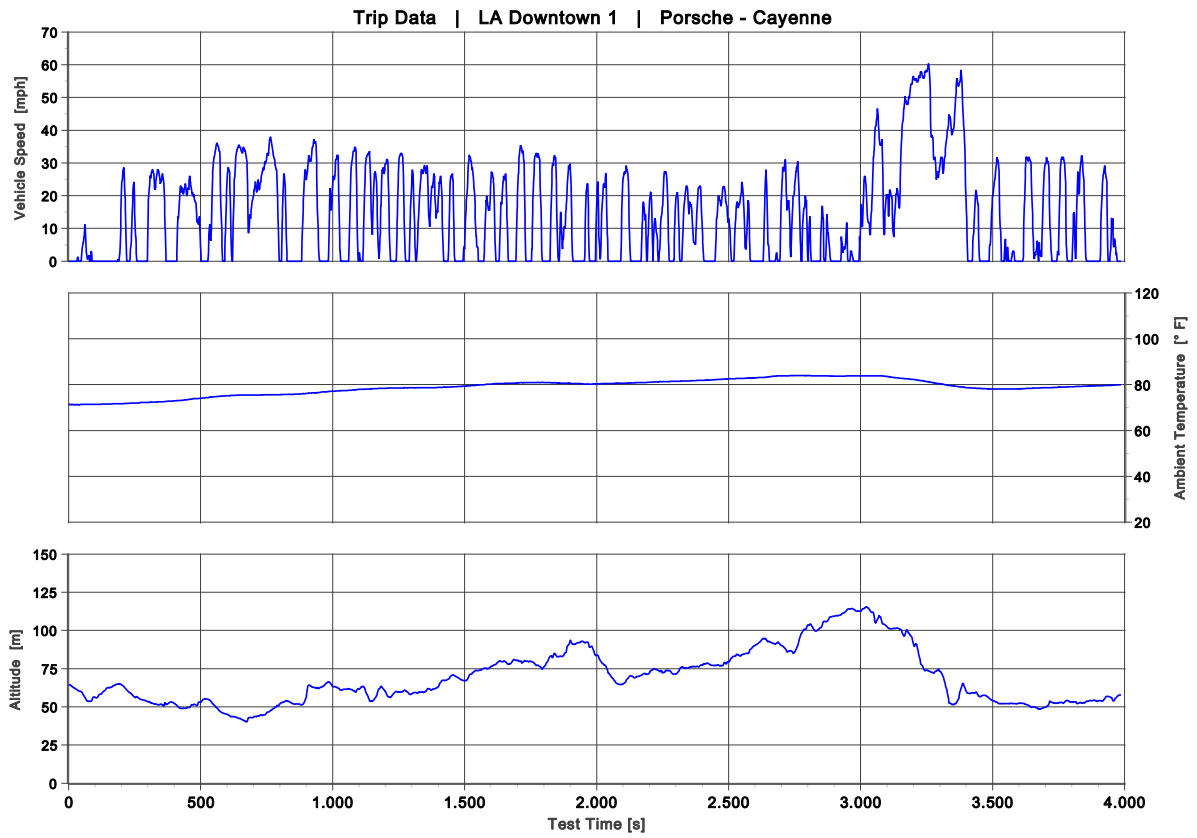


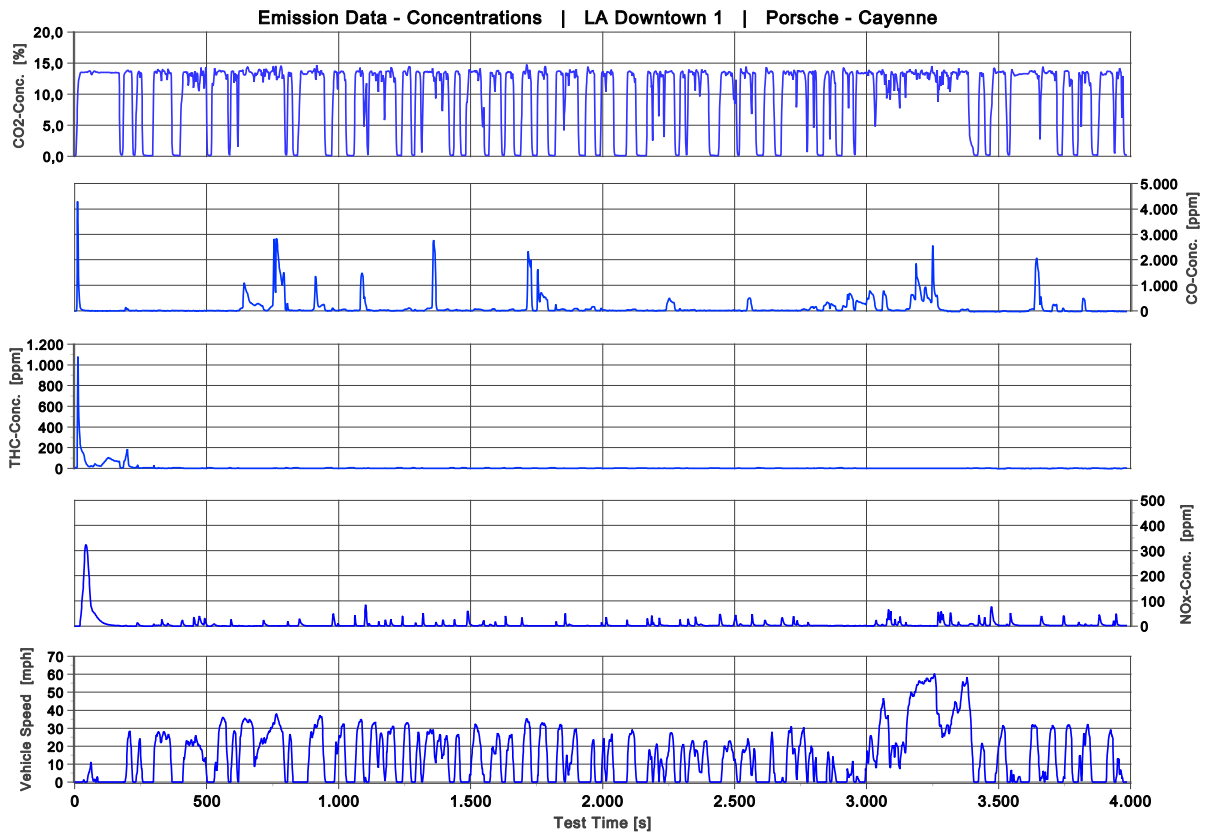
### 3.2.1 LA Downtown (1)

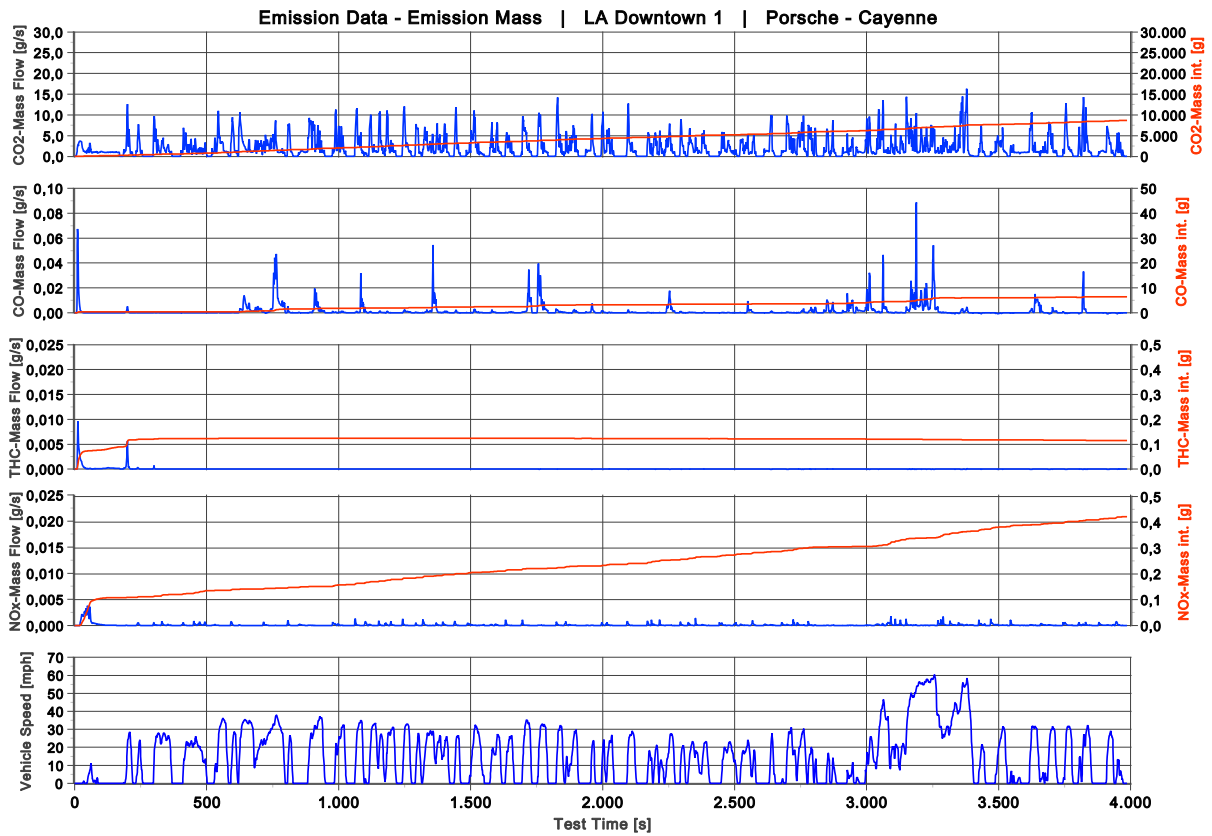
Table 3-3: LA Downtown (1) Trip Summary for Cayenne

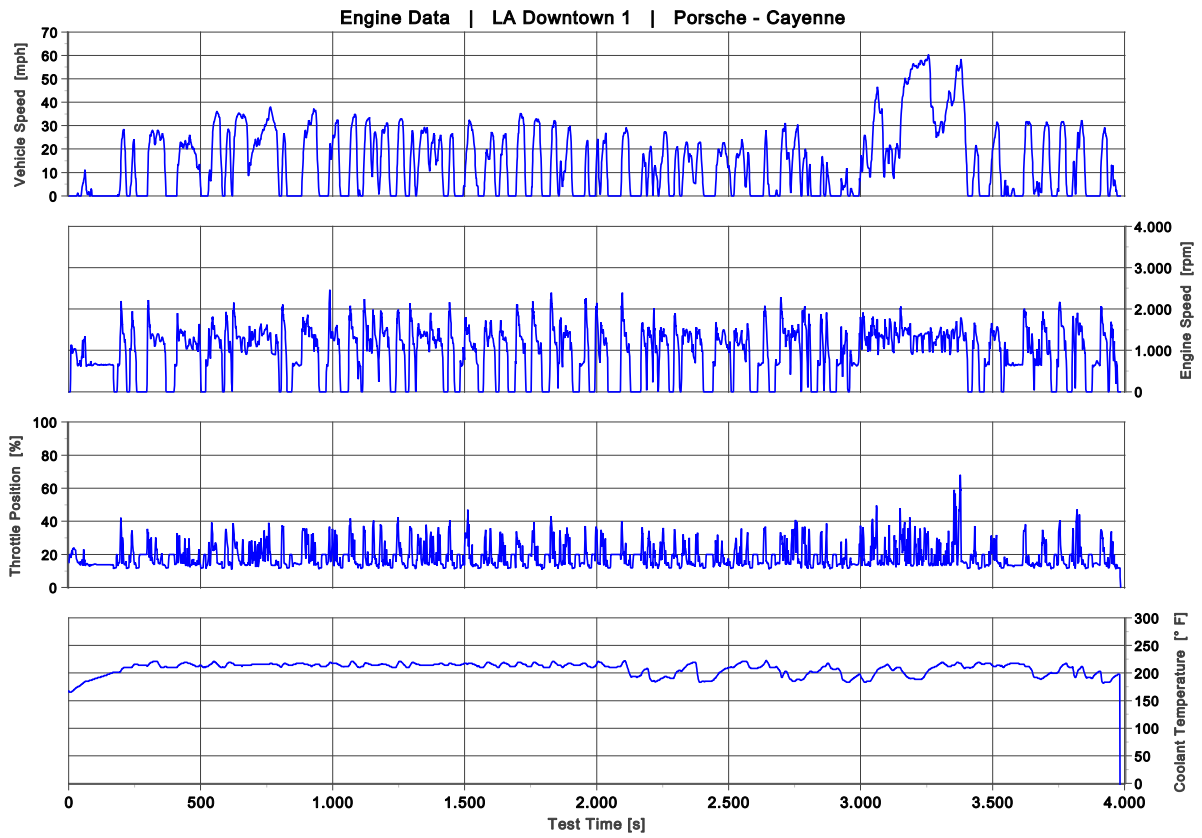
<b>Test Data</b>			
Test Name:	2019-03-27_Cayenne_LA-Downtown		
Department:	MBtech	Test Date:	03/27/2019
Driving Mode:	Default	Number of Passengers:	1
<b>Vehicle Data</b>			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	250
Vehicle Modell:	Cayenne	Nominal Torque [Nm]:	450
VIN:	WP1AA2AY8KDA00212	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 5600
<b>Emission Summary</b>			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	536,8	
CO	[g/mi]	0,433	
NO <sub>x</sub>	[g/mi]	0,027	
THC	[g/mi]	0,007	
<b>Trip Data</b>			
	Unit	Total Trip	
Trip Duration	[s]	3987	
Distance	[mi]	15,52	
Average Speed	[mph]	14,0	
Average Ambient Temperature	[°F]	79,0	

Test deemed invalid due to analyzer drifts for CO<sub>2</sub>, CO and THC.





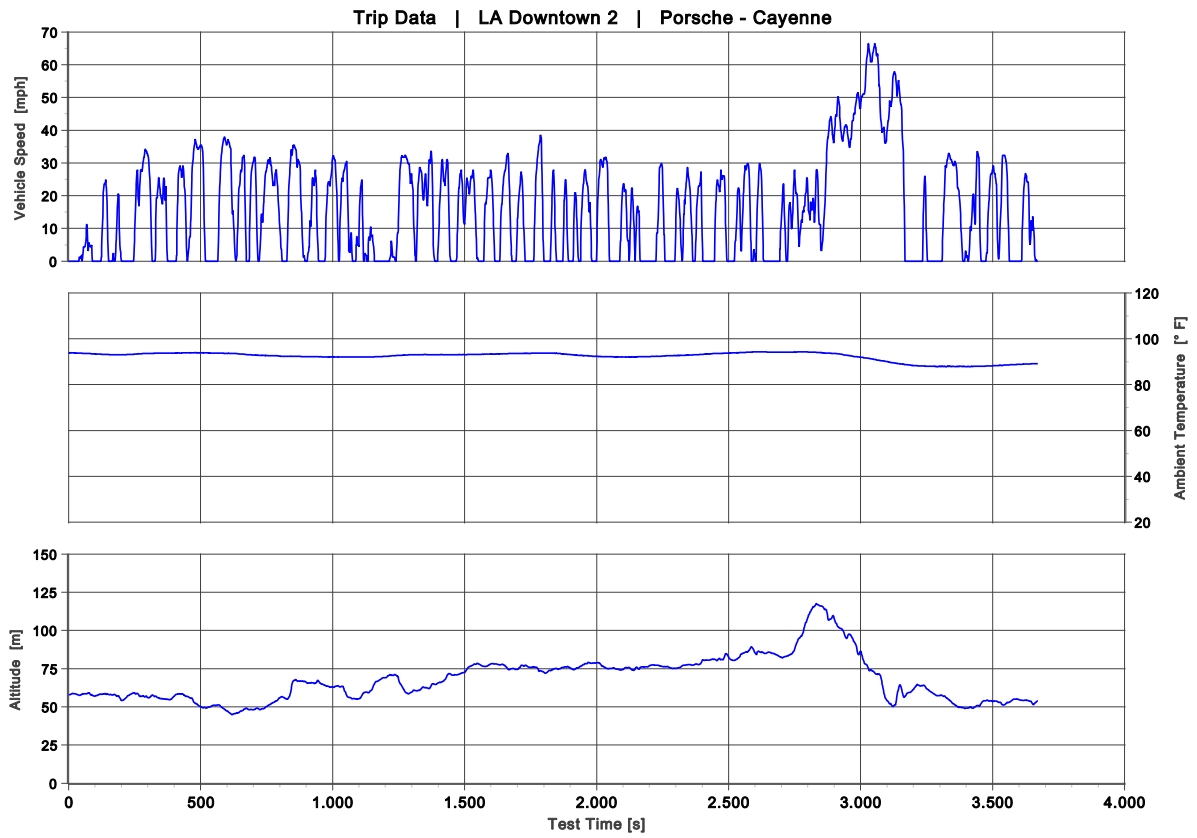


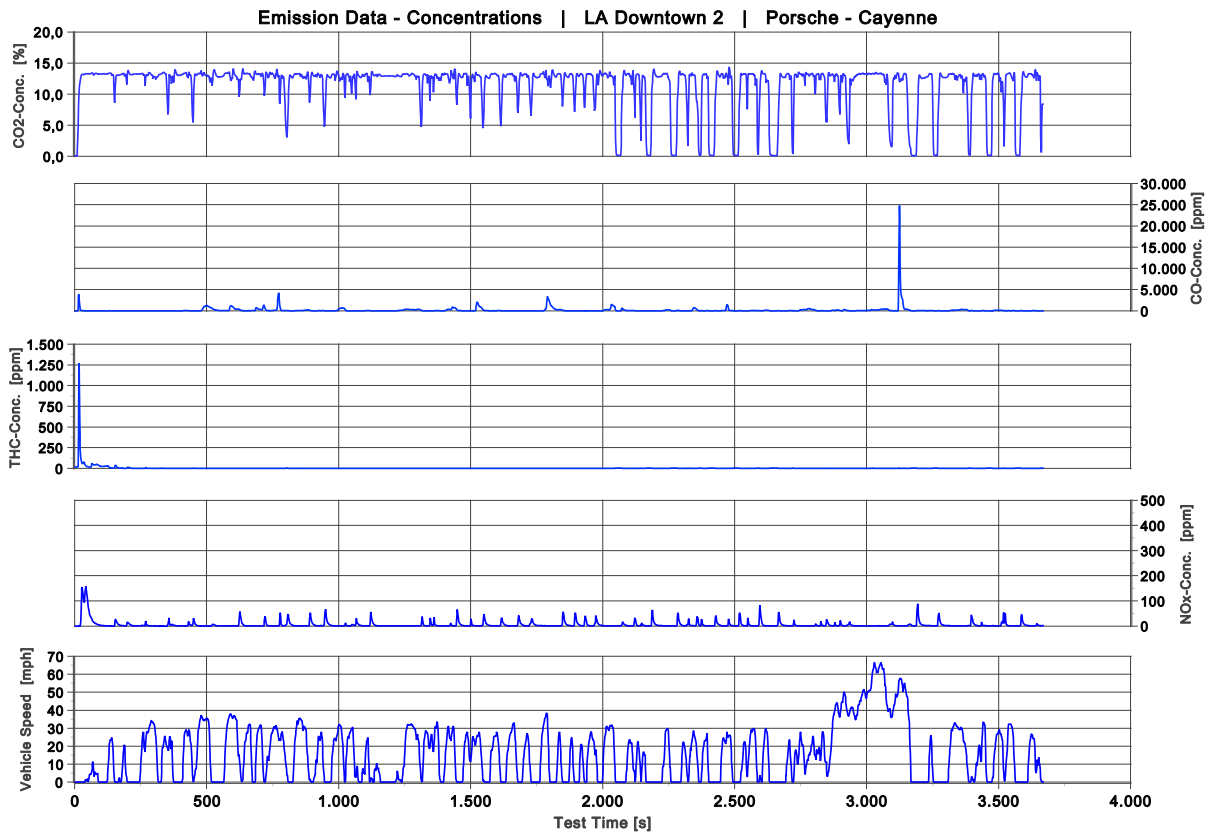


### 3.2.2 LA Downtown (2)

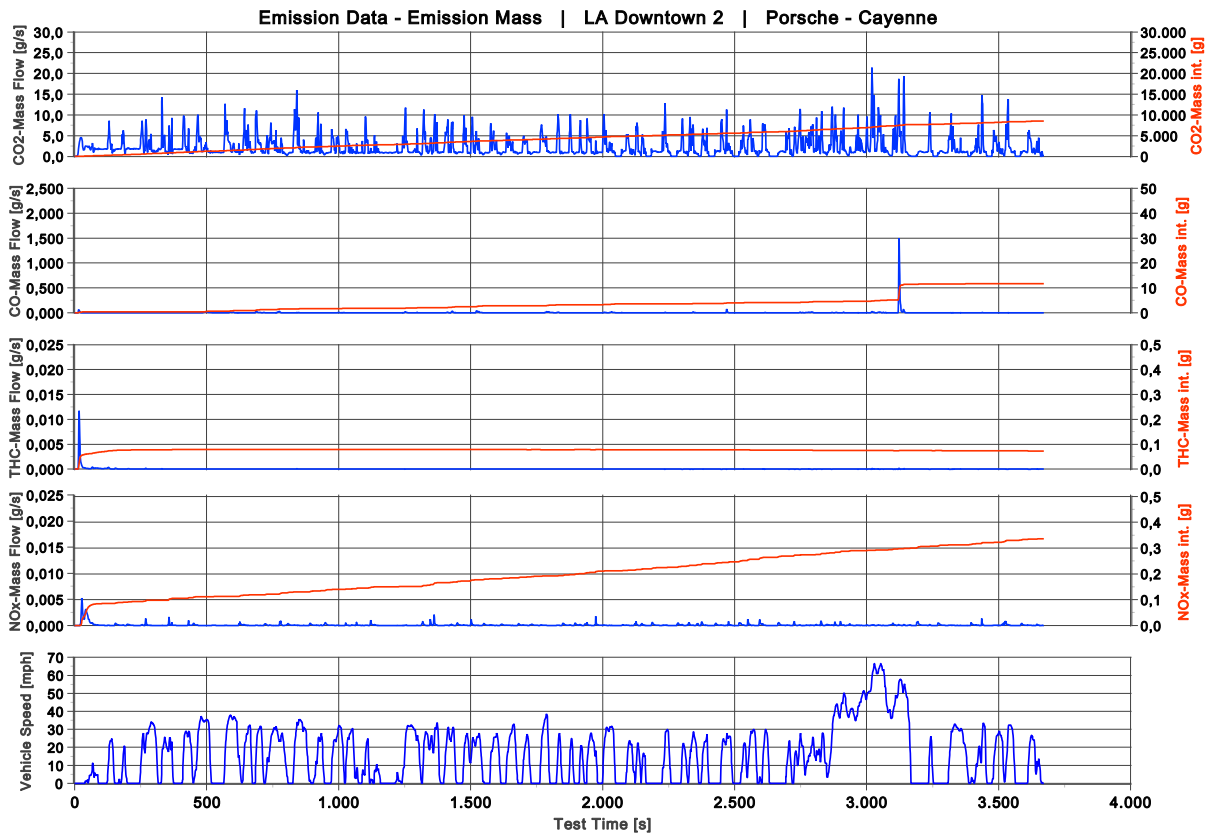
Table 3-4: LA Downtown (2) Trip Summary for Cayenne

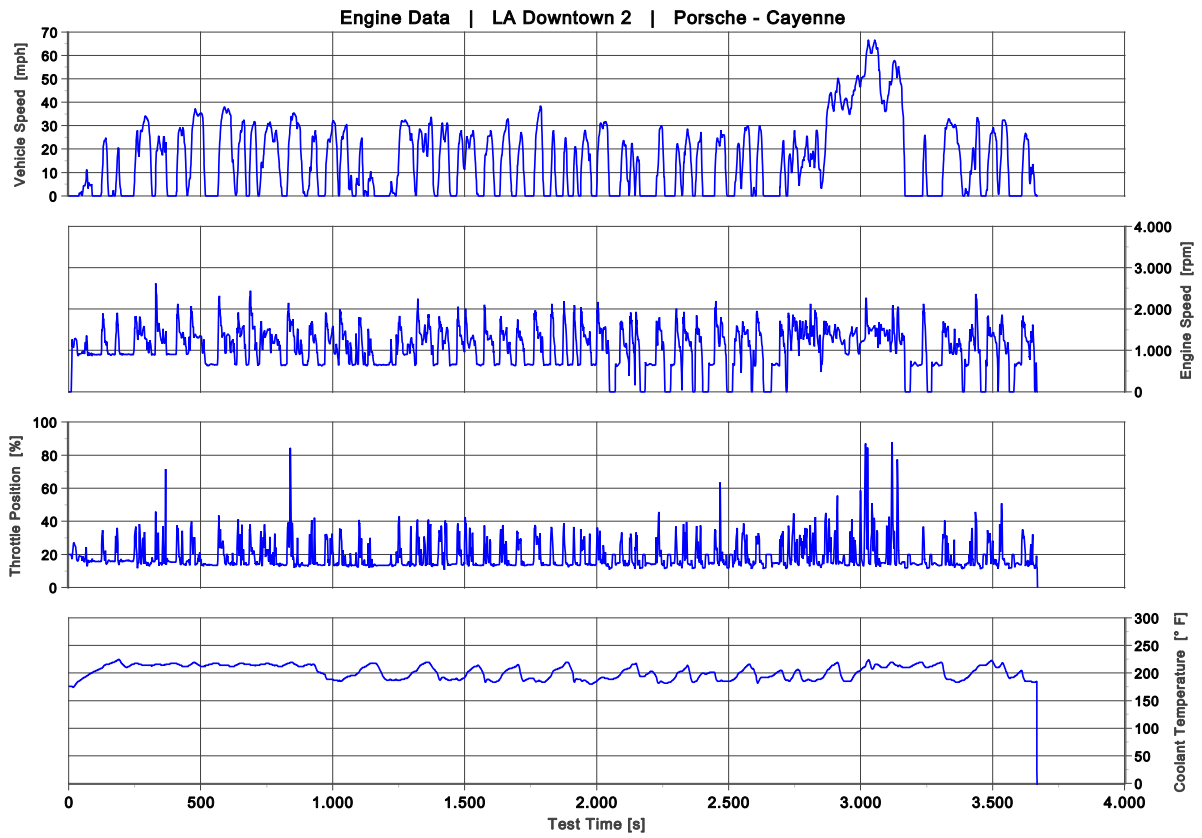
<b>Test Data</b>			
Test Name:	2019-04-01_Cayenne_LA-Downtown		
Department:	MBtech	Test Date:	04/01/2019
Driving Mode:	Default	Number of Passengers:	1
<b>Vehicle Data</b>			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	250
Vehicle Modell:	Cayenne	Nominal Torque [Nm]:	450
VIN:	WP1AA2AY8KDA00212	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 5600
<b>Emission Summary</b>			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	550,6	
CO	[g/mi]	0,755	
NO <sub>x</sub>	[g/mi]	0,022	
THC	[g/mi]	0,005	
<b>Trip Data</b>			
	Unit	Total Trip	
Trip Duration	[s]	3672	
Distance	[mi]	15,54	
Average Speed	[mph]	15,2	
Average Ambient Temperature	[°F]	92,4	







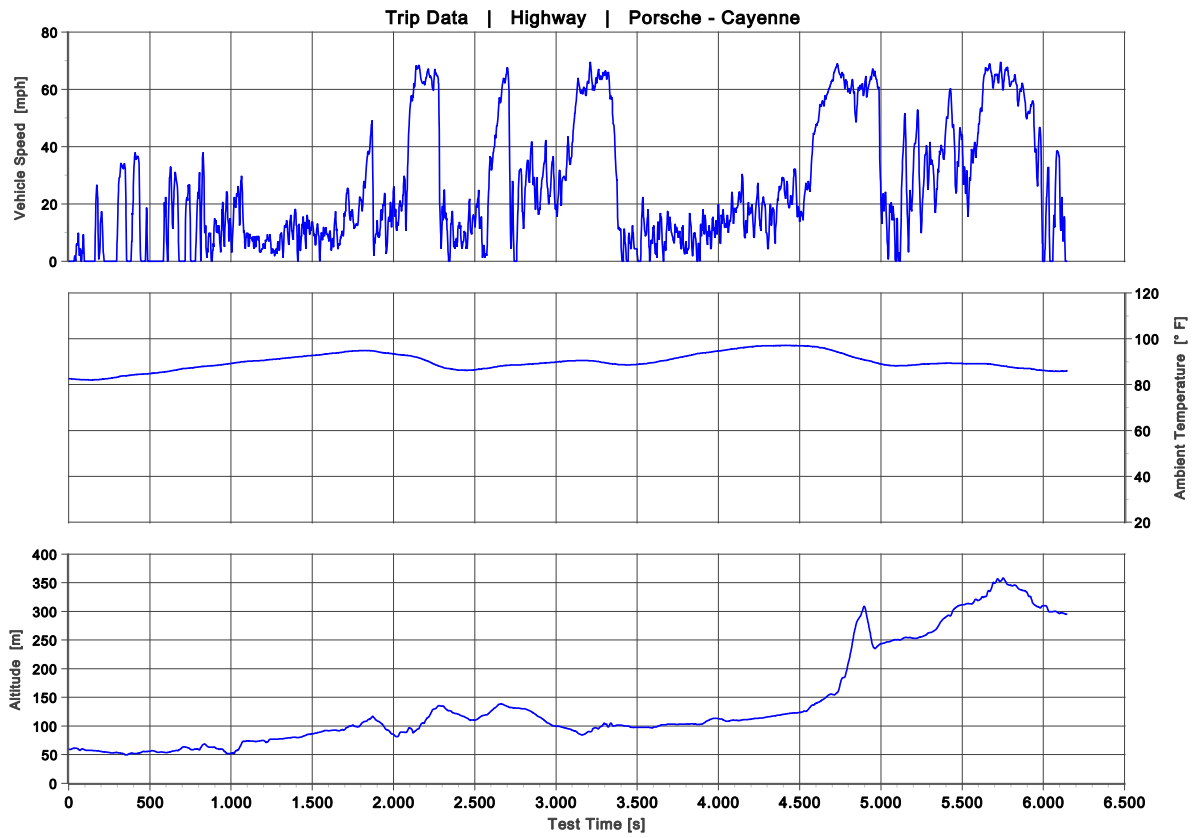


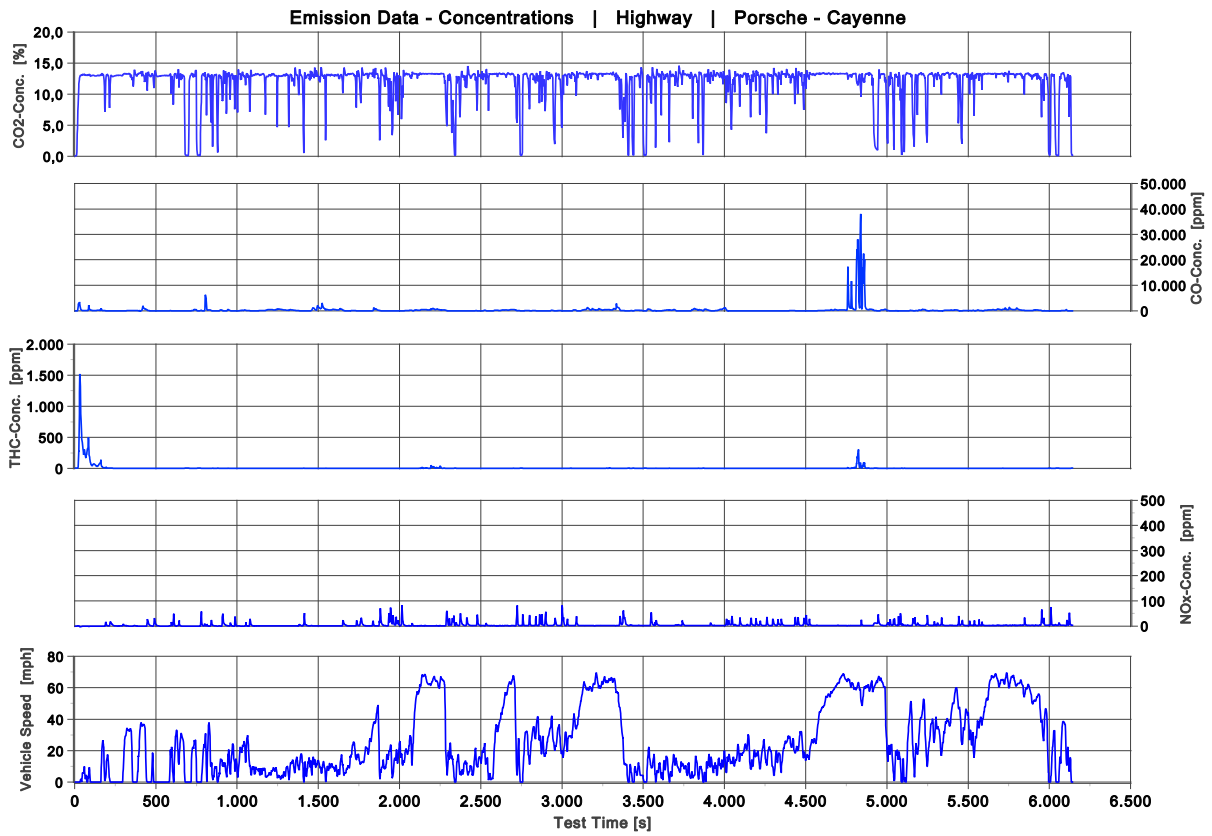


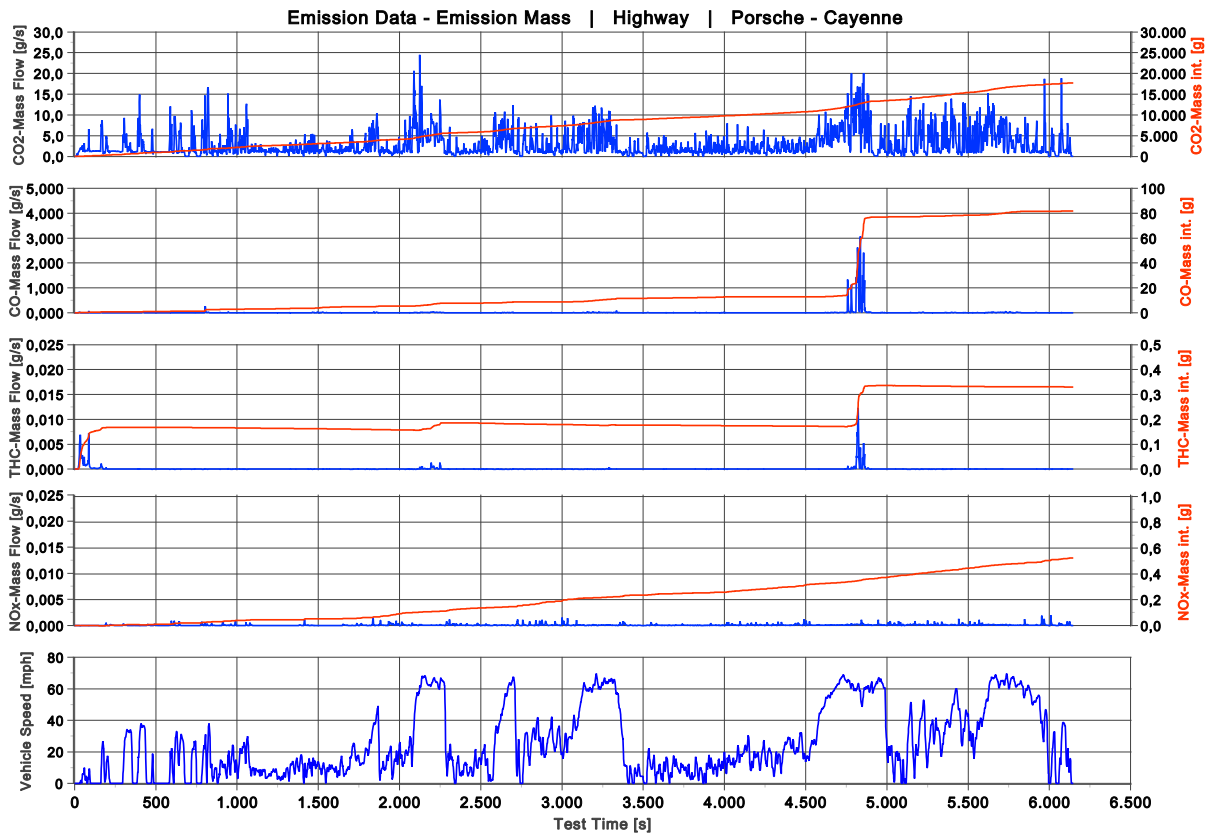
### 3.2.3 Highway

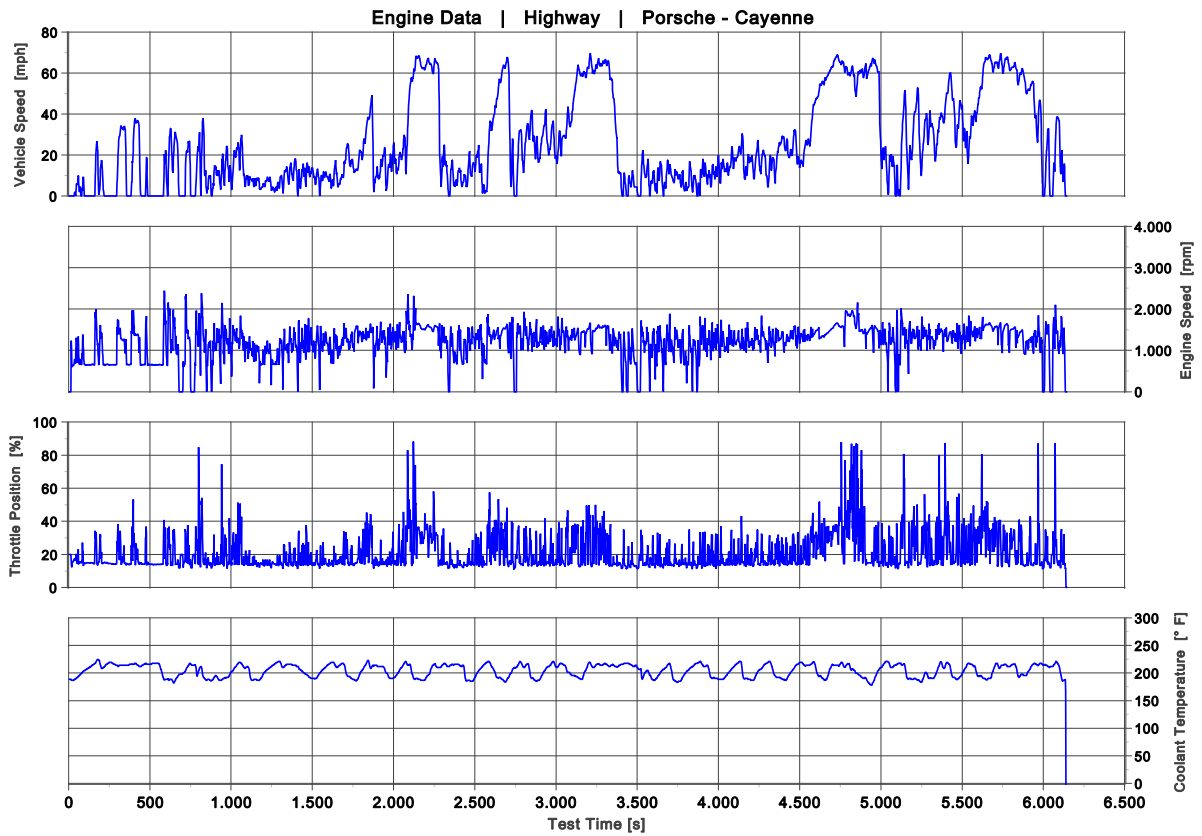
Table 3-5: Highway Trip Summary for Porsche - Cayenne

Test Data			
Test Name:	2019-04-01_Cayenne_Highway		
Department:	MBtech	Test Date:	04/01/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	250
Vehicle Modell:	Cayenne	Nominal Torque [Nm]:	450
VIN:	WP1AA2AY8KDA00212	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 5600
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	409,6	
CO	[g/mi]	1,886	
NO <sub>x</sub>	[g/mi]	0,012	
THC	[g/mi]	0,008	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	6147	
Distance	[mi]	43,32	
Average Speed	[mph]	25,4	
Average Ambient Temperature	[°F]	90,1	







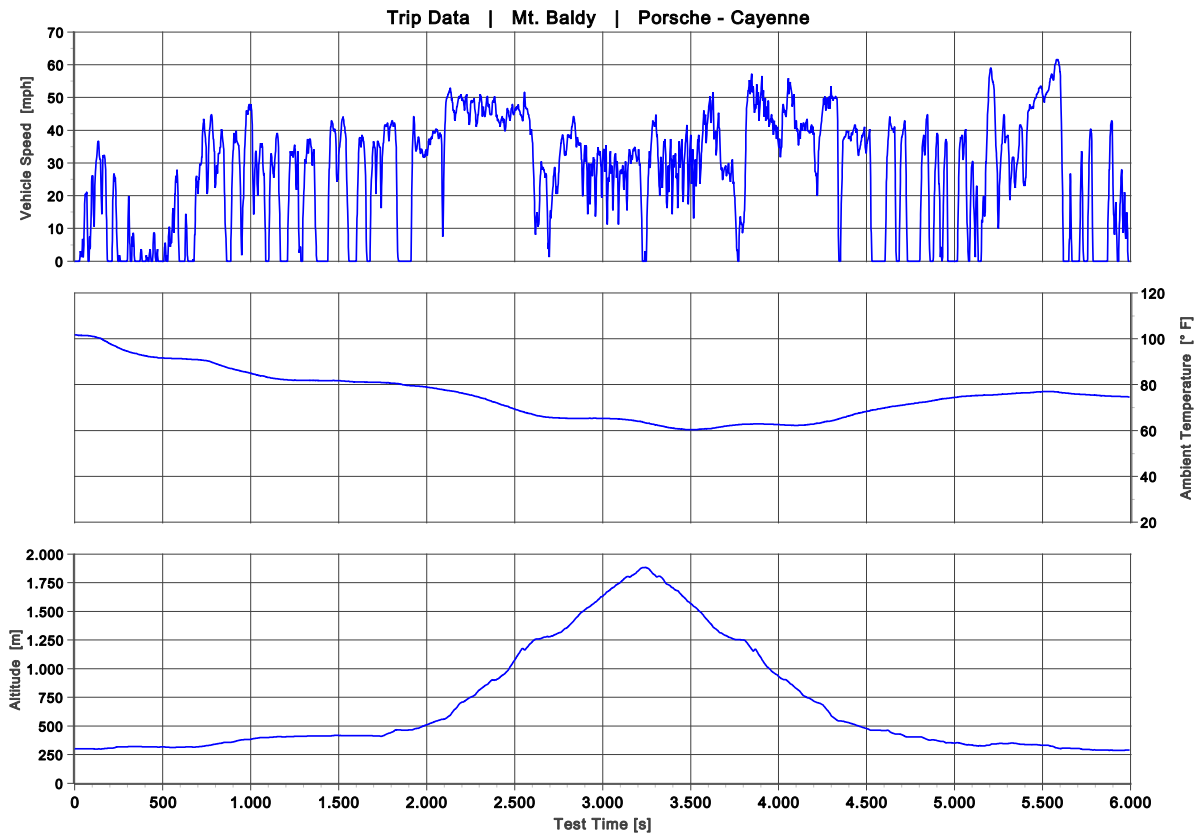


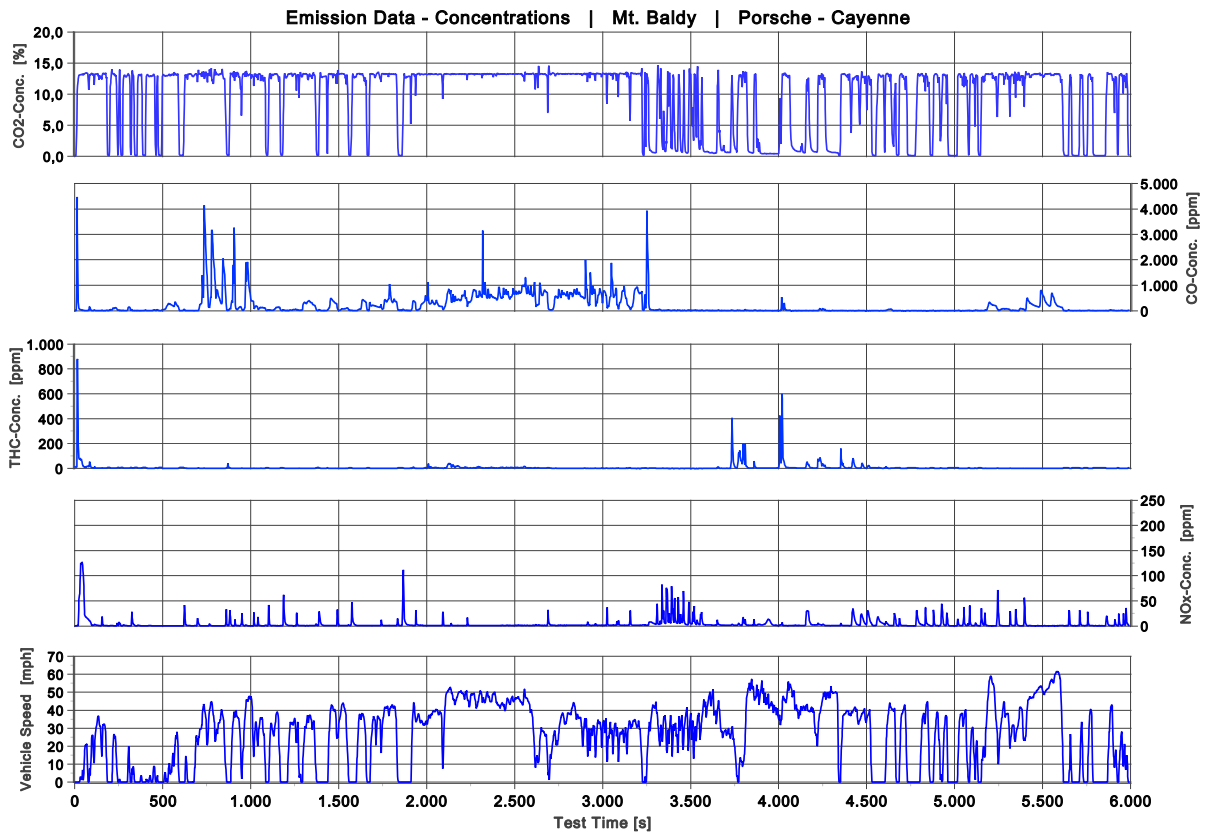
### 3.2.4 Mt. Baldy

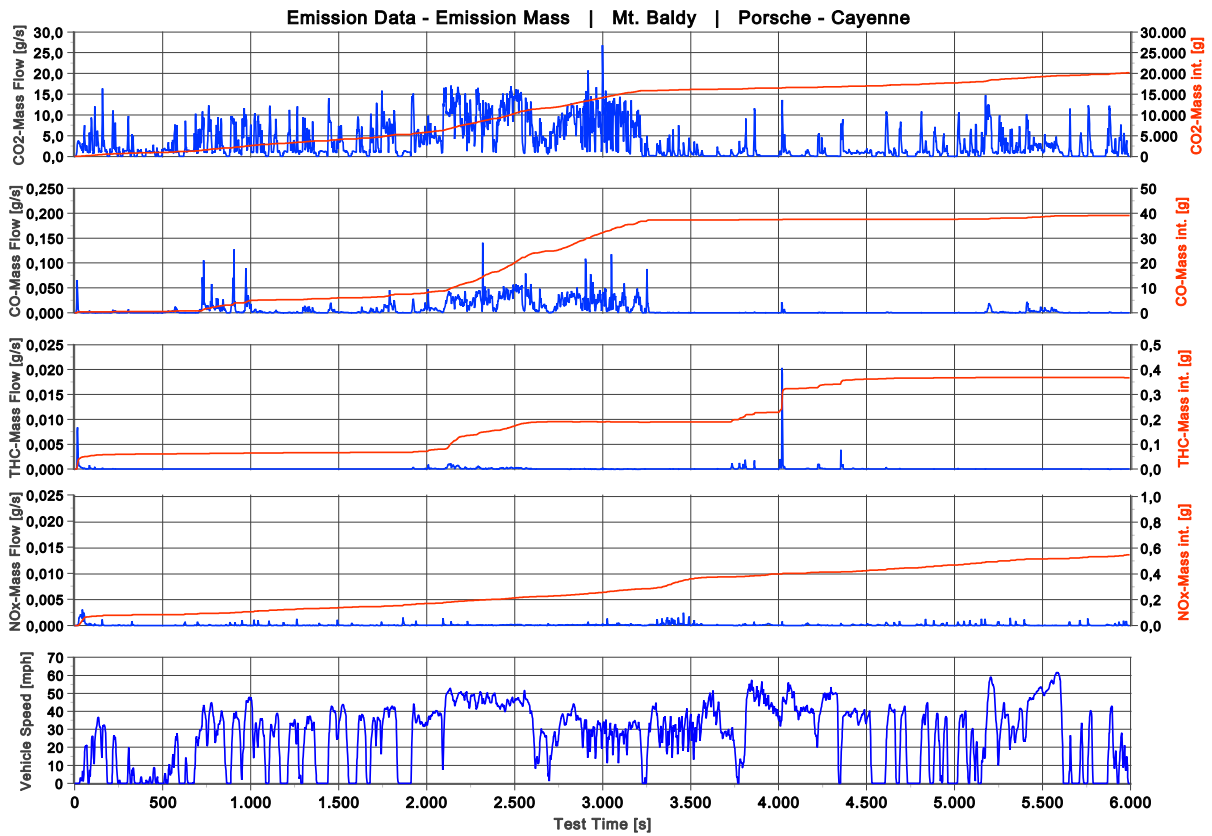
Table 3-6: Mt. Baldy Trip Summary for Porsche - Cayenne

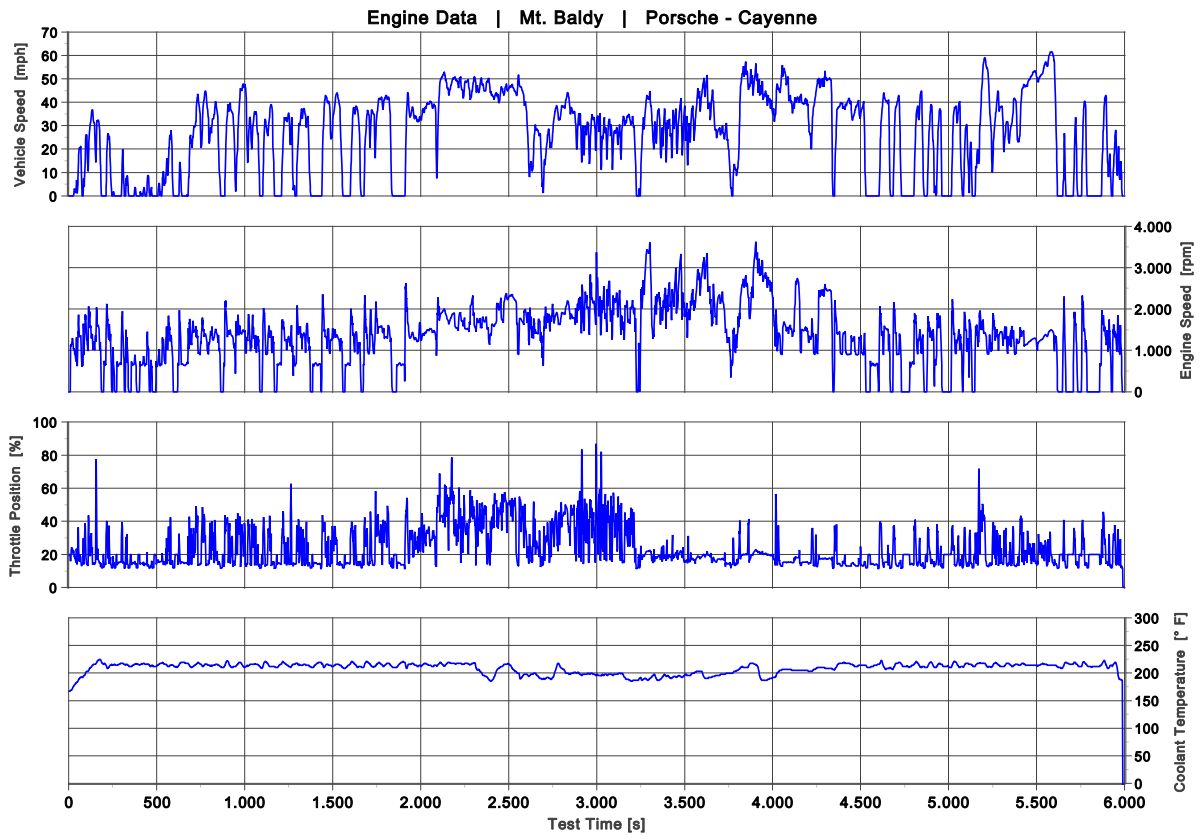
<b>Test Data</b>			
Test Name:	2019-03-26_Cayenne_Mt.Baldy		
Department:	MBtech	Test Date:	03/26/2019
Driving Mode:	Default	Number of Passengers:	1
<b>Vehicle Data</b>			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	250
Vehicle Modell:	Cayenne	Nominal Torque [Nm]:	450
VIN:	WP1AA2AY8KDA00212	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 5600
<b>Emission Summary</b>			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	455,1	
CO	[g/mi]	0,886	
NO <sub>x</sub>	[g/mi]	0,012	
THC	[g/mi]	0,008	
<b>Trip Data</b>			
	Unit	Total Trip	
Trip Duration	[s]	5995	
Distance	[mi]	44,31	
Average Speed	[mph]	26,6	
Average Ambient Temperature	[°F]	75,2	











### 3.3 Cayenne Turbo

The following table summarizes the emission measurement results from the Cayenne Turbo vehicle.

Table 3-7: Emission Overview Porsche - Cayenne Turbo

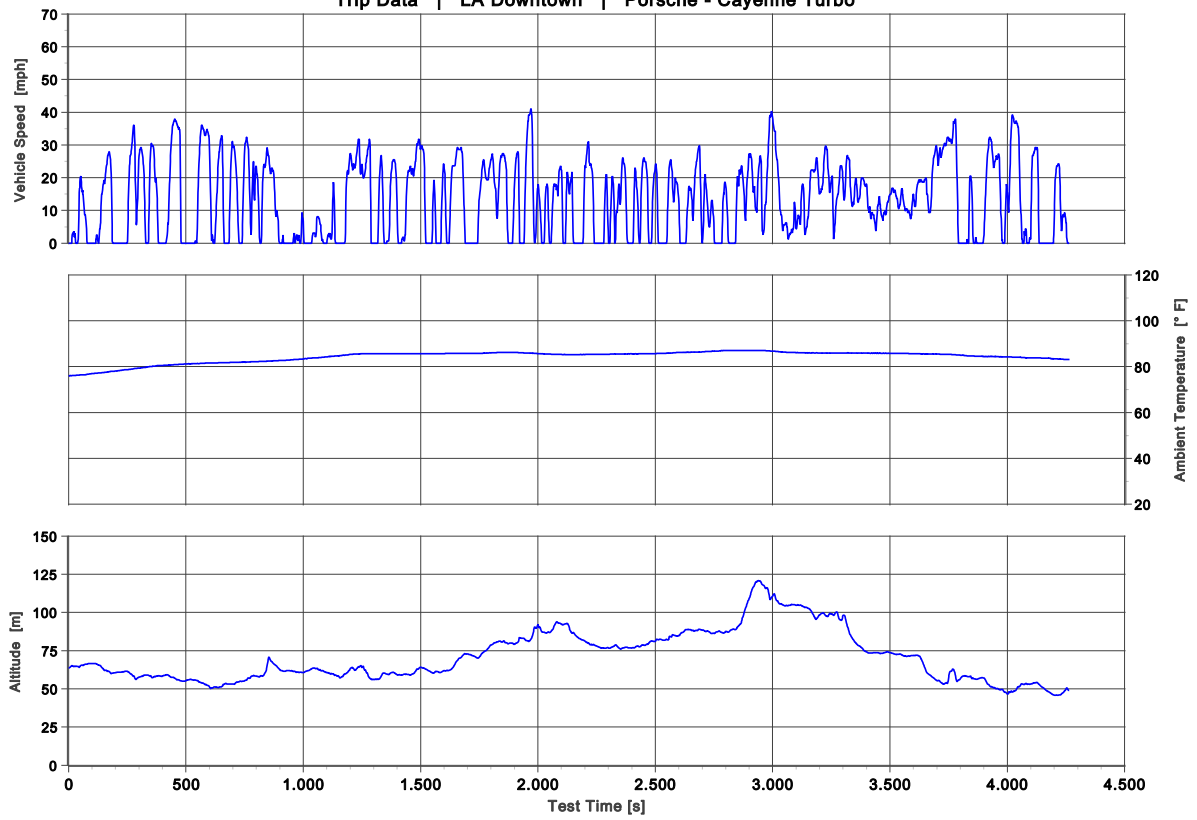
Cayenne Turbo		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
04/25/2019	LA Downtown	667,5	0,107	0,022	0,013	4265	15,43
04/25/2019	Highway	568,1	0,433	0,016	0,009	8687	43,02
04/24/2019	Mt. Baldy	503,9	0,654	0,007	0,013	5290	44,27
04/26/2019	FTP75 (PEMS)	614,4	0,502	0,023	0,030	2486	10,77
04/26/2019	FTP75 (Dyno)	585,6	0,453	0,013	0,026		11,01

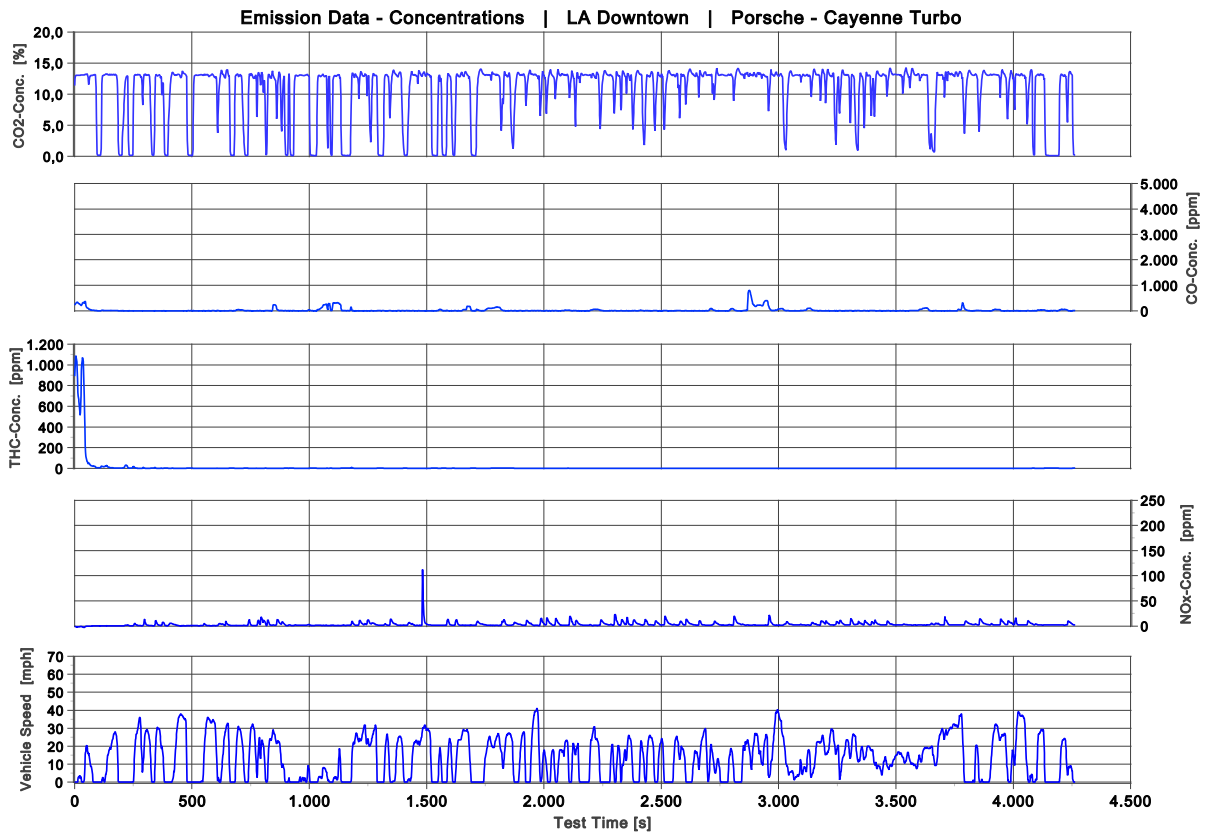
### 3.3.1 LA Downtown

Table 3-8: LA Downtown Trip Summary for Cayenne Turbo

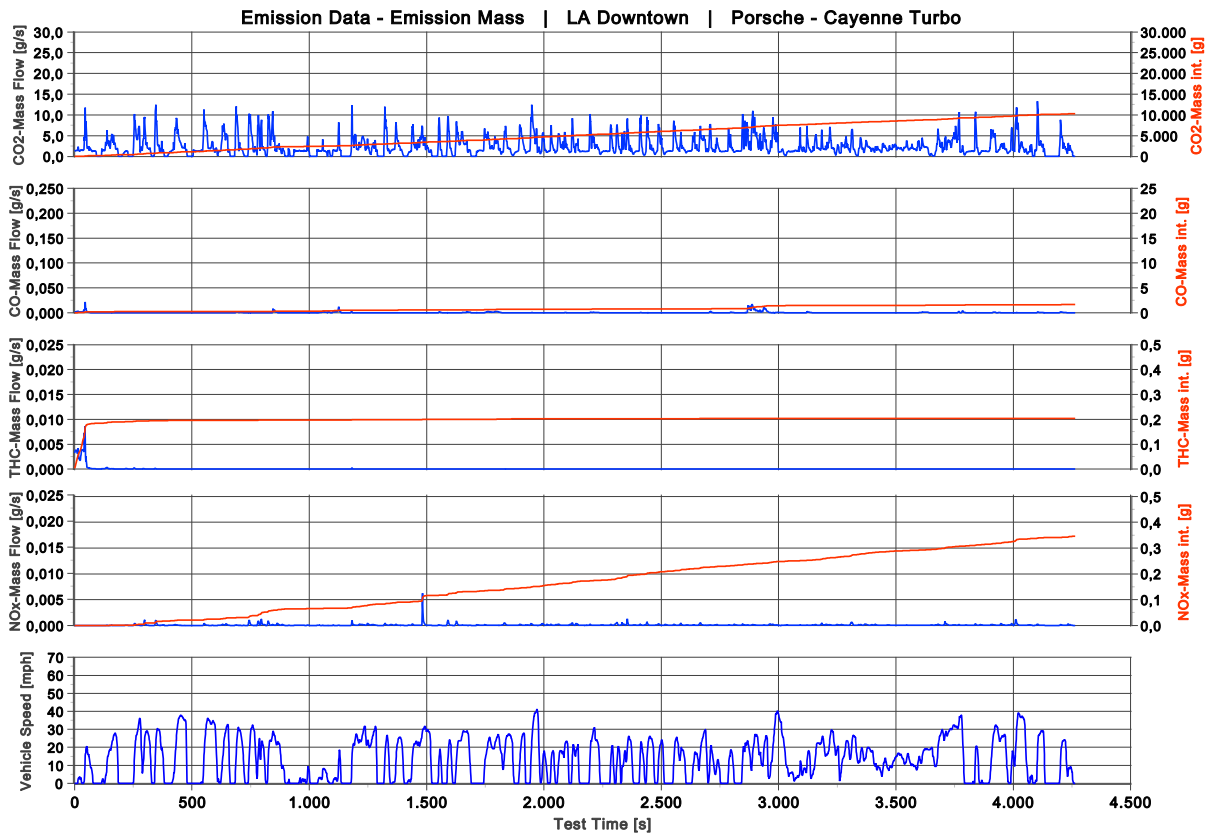
Test Data			
Test Name:	2019-04-25_Cayenne-Turbo_LA-Downtown		
Department:	MBtech	Test Date:	04/25/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	404
Vehicle Modell:	Cayenne Turbo	Nominal Torque [Nm]:	770
VIN:	WP1AF2AY4KDA80318	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 500
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	667,5	
CO	[g/mi]	0,107	
NO <sub>x</sub>	[g/mi]	0,022	
THC	[g/mi]	0,013	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	4265	
Distance	[mi]	15,43	
Average Speed	[mph]	13,0	
Average Ambient Temperature	[°F]	84,4	

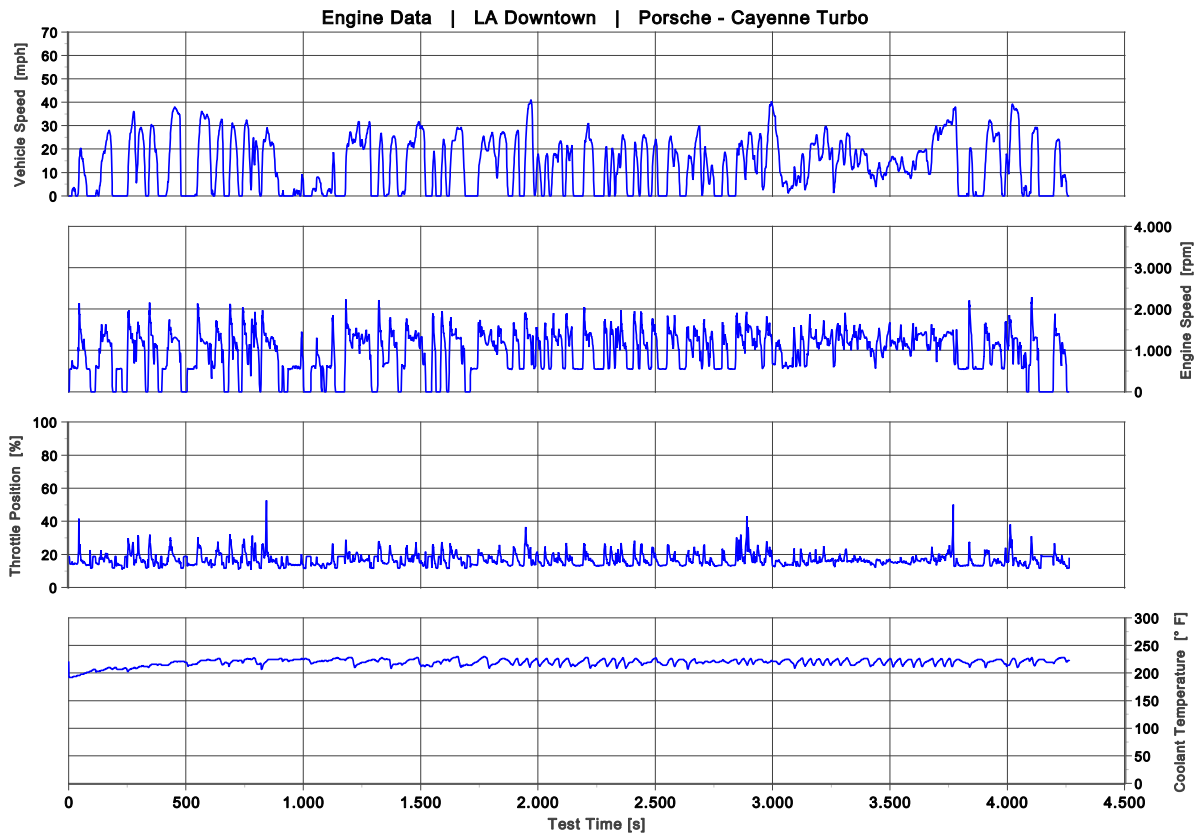
Trip Data | LA Downtown | Porsche - Cayenne Turbo







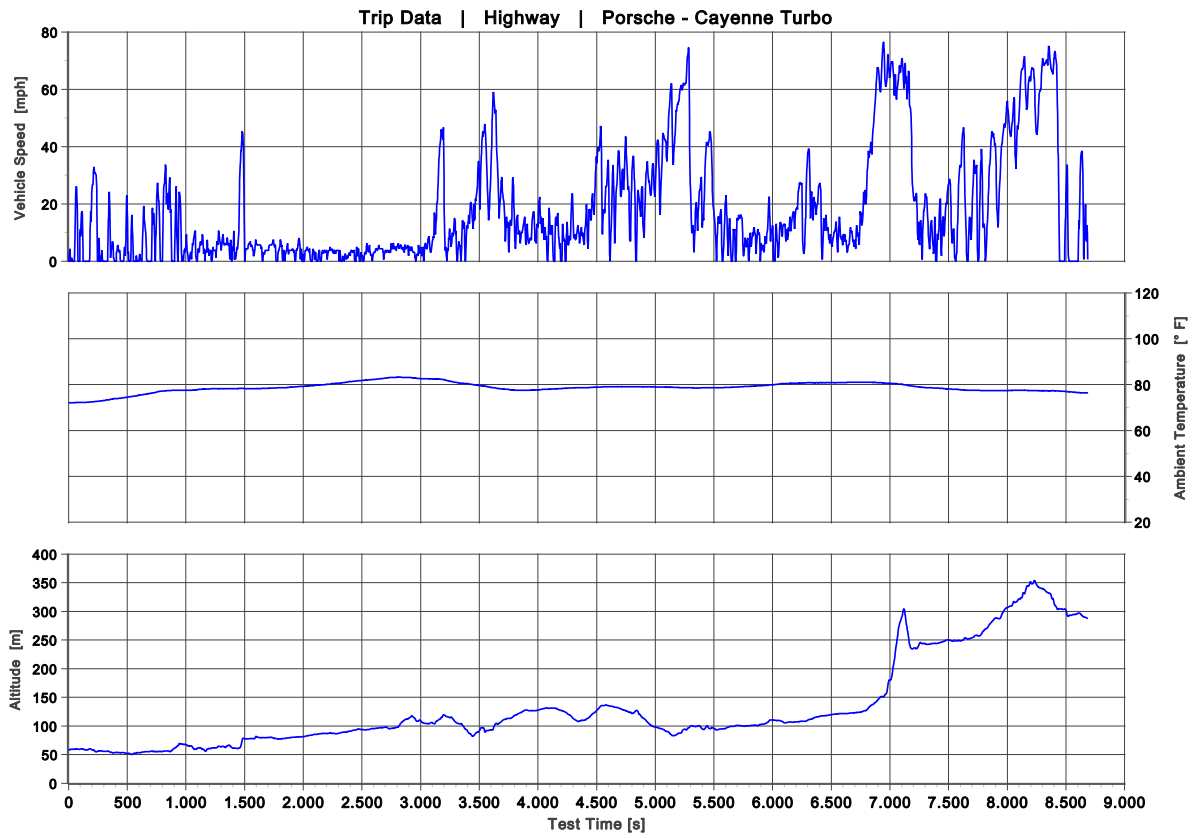


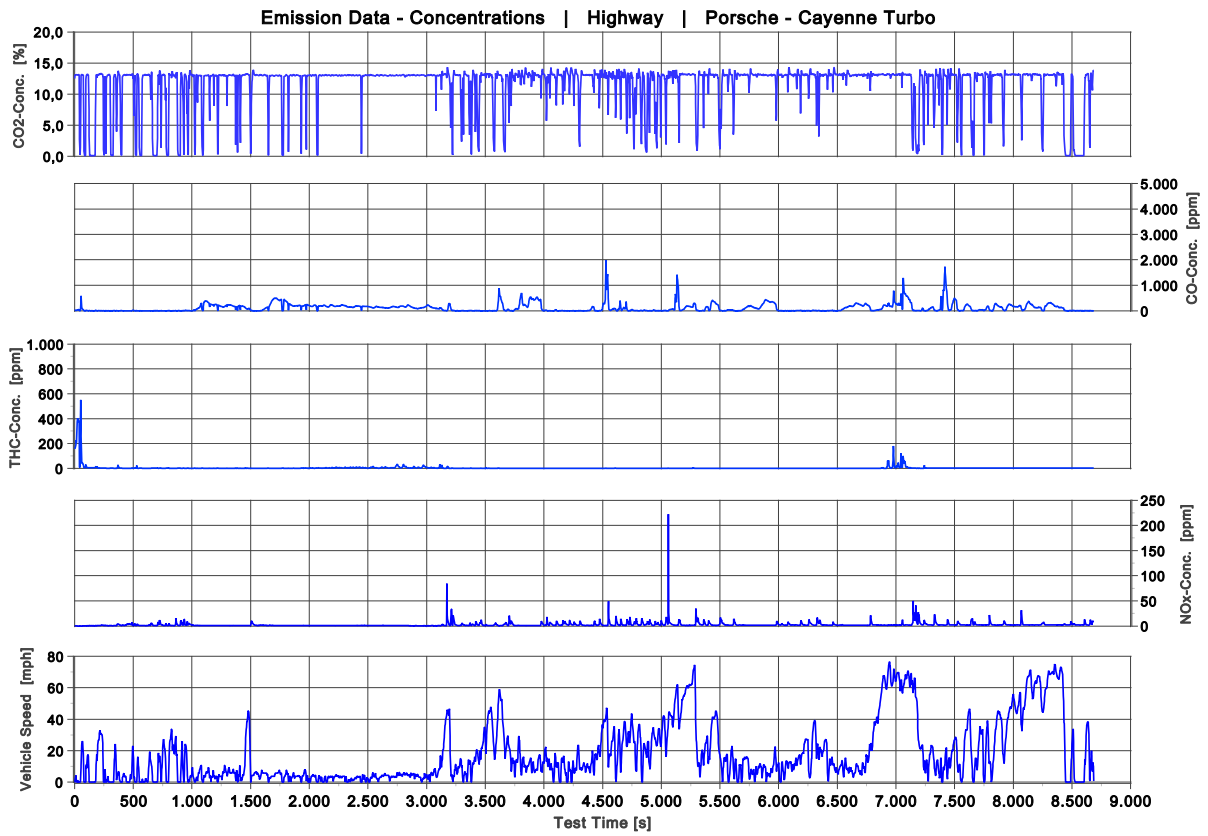


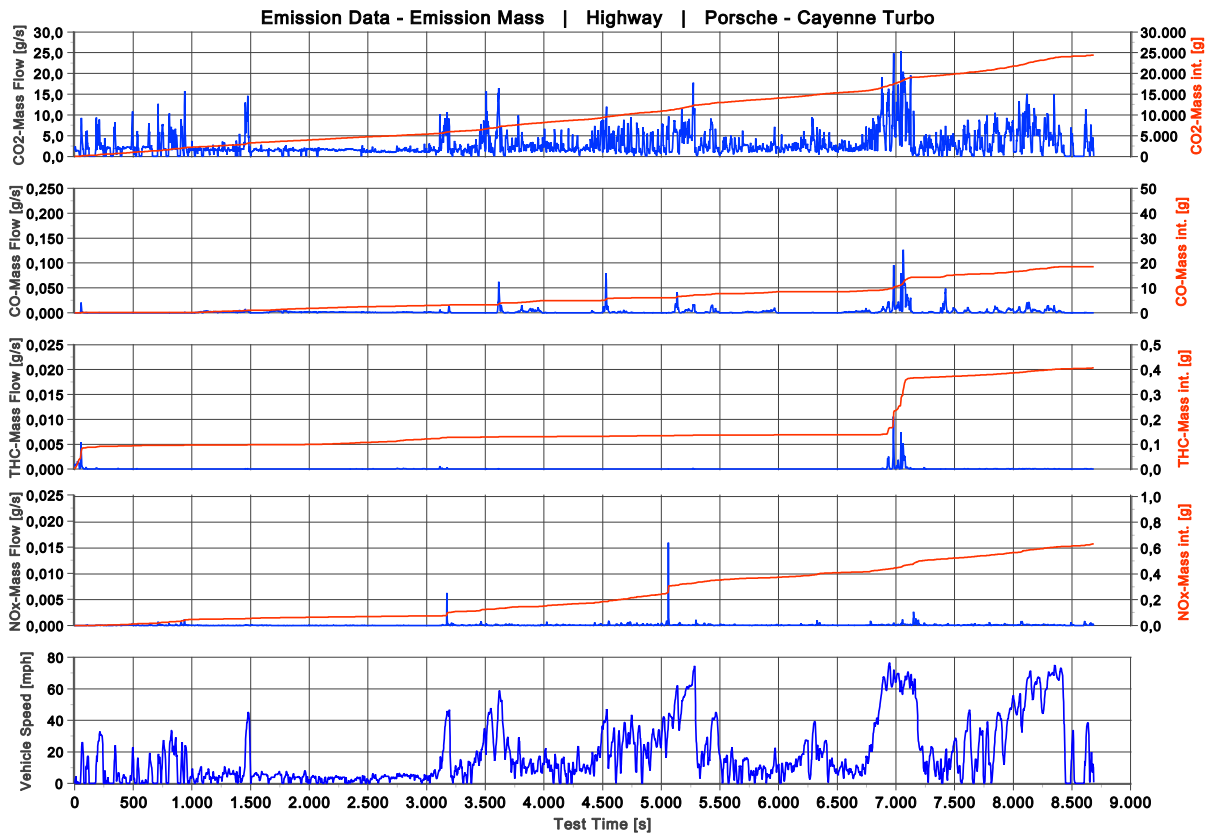
### 3.3.2 Highway

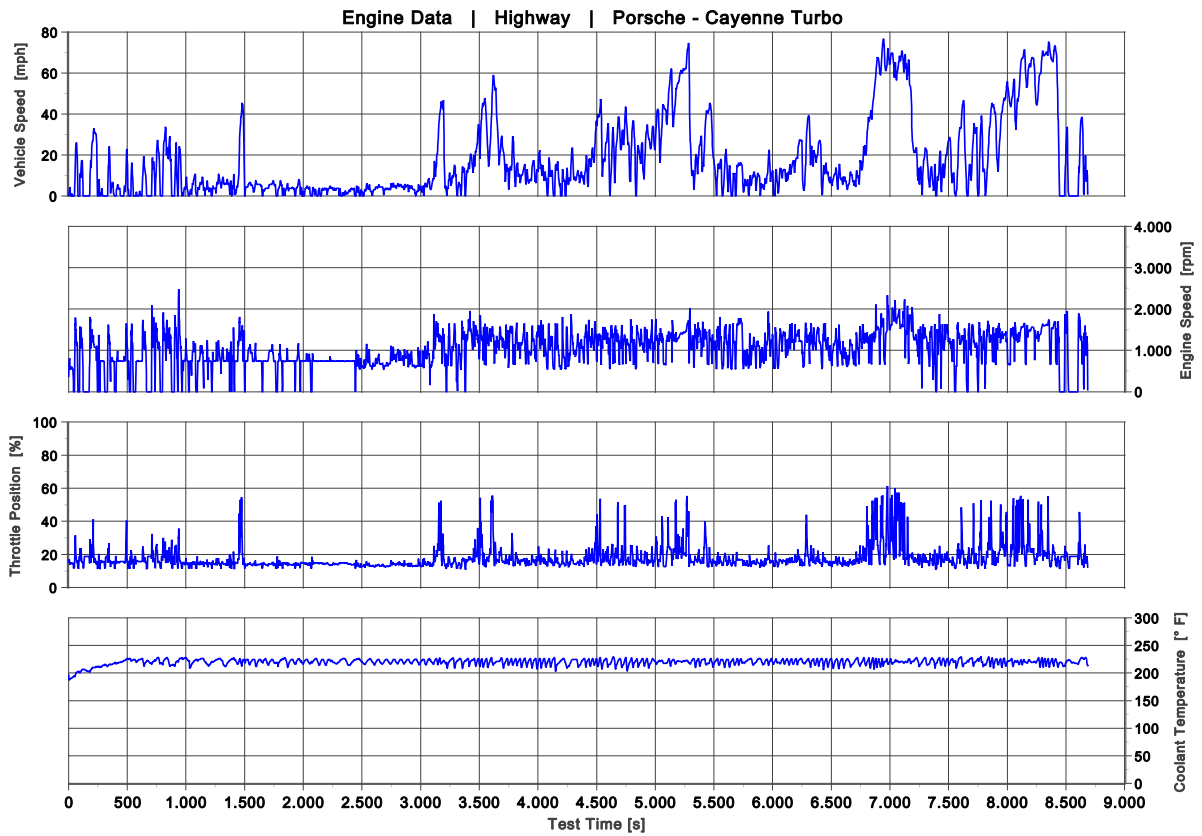
Table 3-9: Highway Trip Summary for Cayenne Turbo

Test Data			
Test Name:	2019-04-25_Cayenne-Turbo-Highway		
Department:	MBtech	Test Date:	04/25/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	404
Vehicle Modell:	Cayenne Turbo	Nominal Torque [Nm]:	770
VIN:	WP1AF2AY4KDA80318	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 500
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	568,1	
CO	[g/mi]	0,433	
NO <sub>x</sub>	[g/mi]	0,016	
THC	[g/mi]	0,009	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	8687	
Distance	[mi]	43,02	
Average Speed	[mph]	17,8	
Average Ambient Temperature	[°F]	78,8	







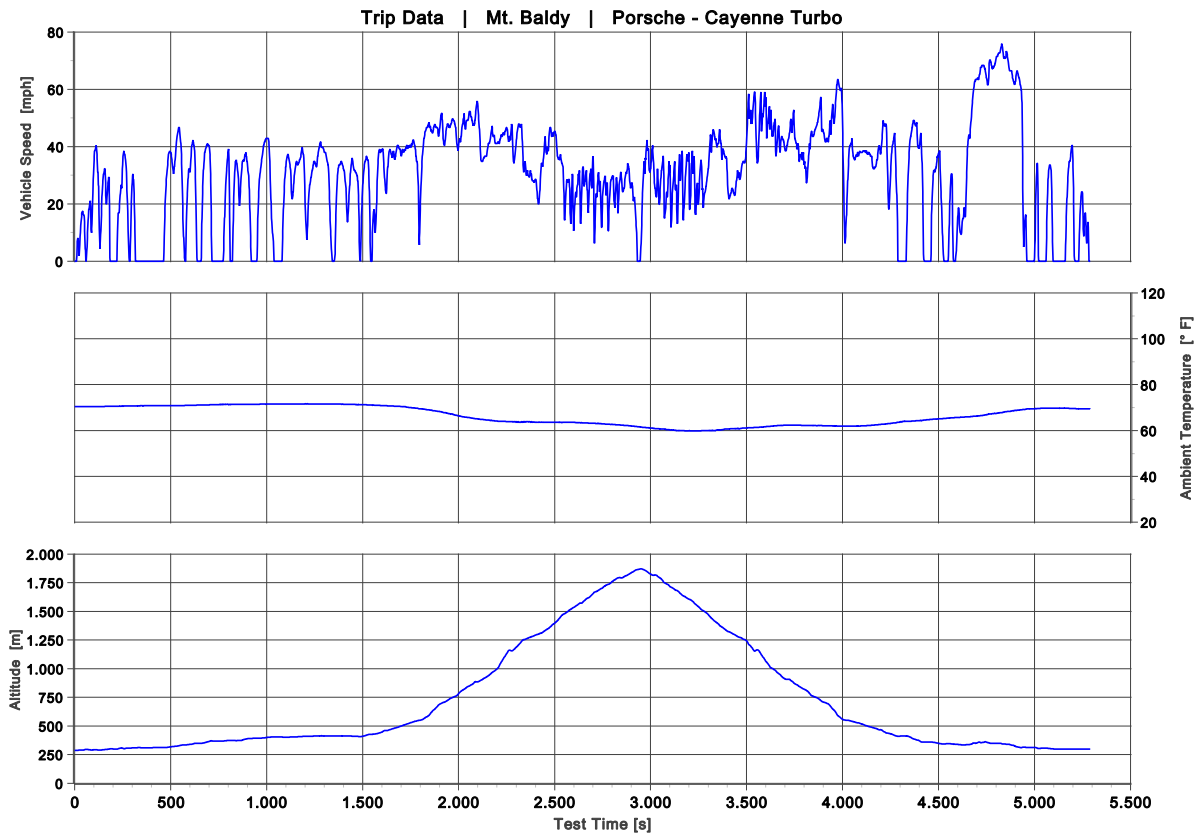


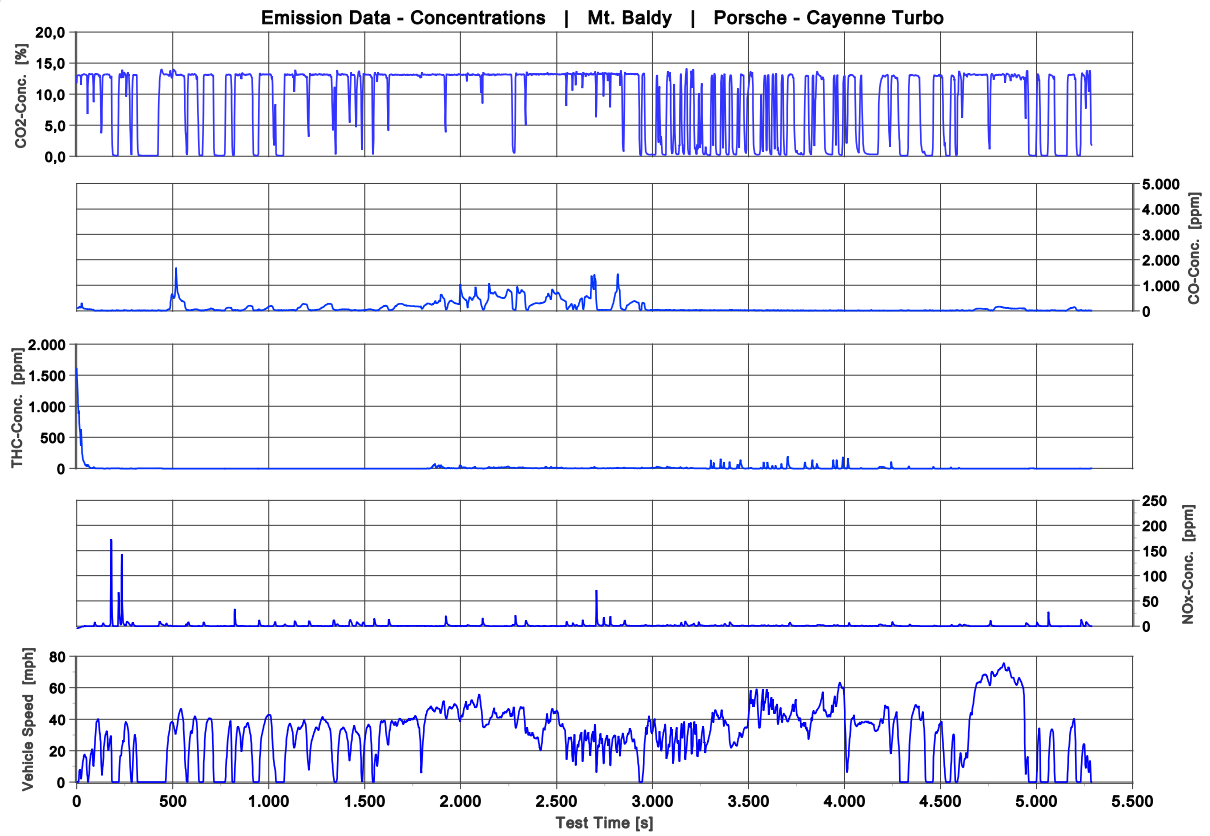
### 3.3.3 Mt. Baldy

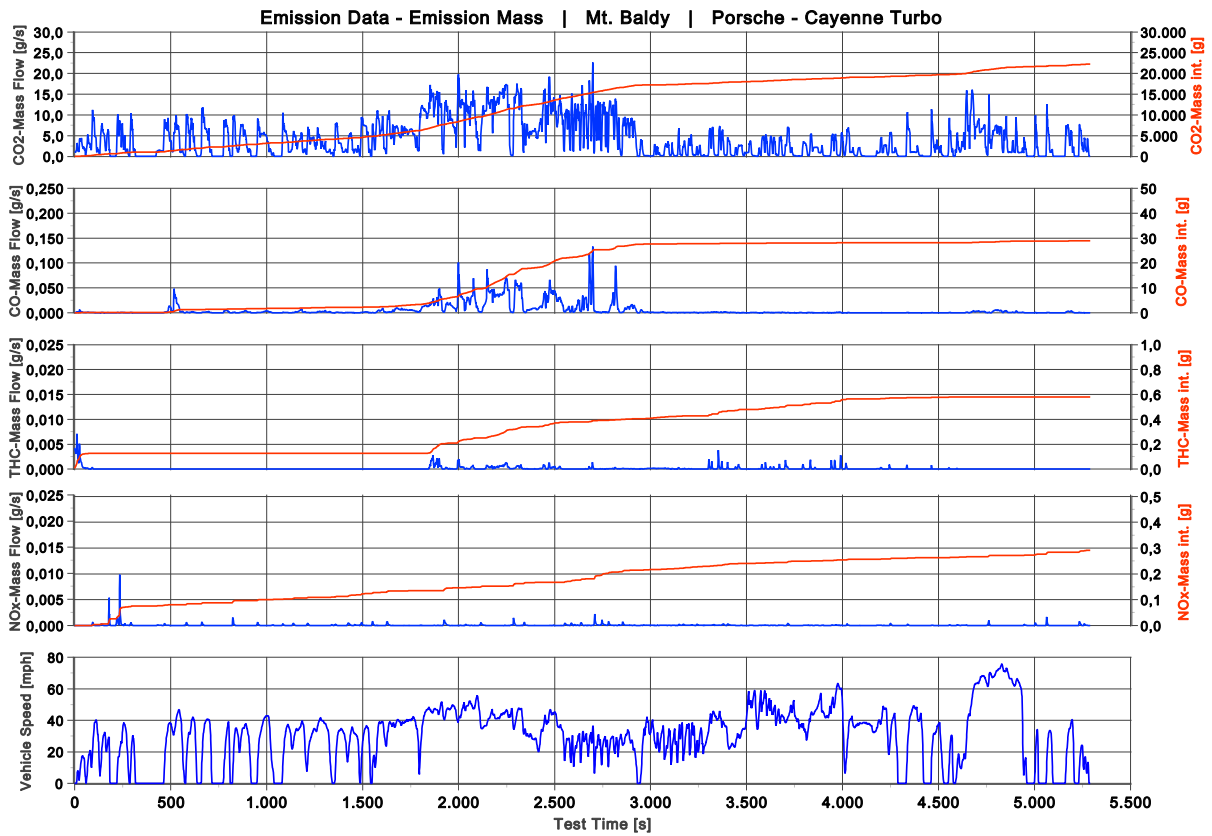
Table 3-10: Mt. Baldy Trip Summary for Cayenne Turbo

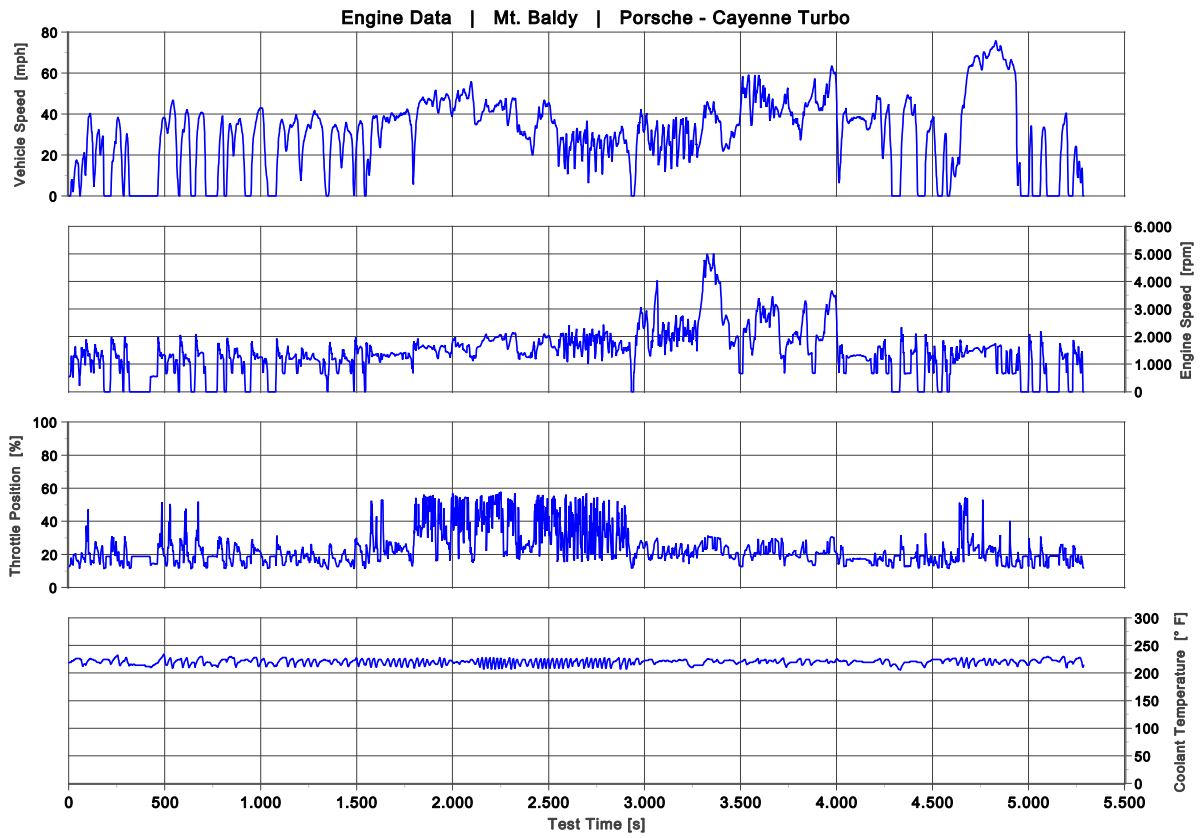
Test Data			
Test Name:	2019-04-24_Cayenne-Turbo_Mt.-Baldy		
Department:	MBtech	Test Date:	04/24/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	404
Vehicle Modell:	Cayenne Turbo	Nominal Torque [Nm]:	770
VIN:	WP1AF2AY4KDA80318	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 500
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	503,9	
CO	[g/mi]	0,654	
NO <sub>x</sub>	[g/mi]	0,007	
THC	[g/mi]	0,013	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5290	
Distance	[mi]	44,27	
Average Speed	[mph]	30,1	
Average Ambient Temperature	[°F]	66,5	











### 3.4 Macan

The following table summarizes the emission measurement results from the Macan vehicle.

Table 3-11: Emission Overview Porsche - Macan

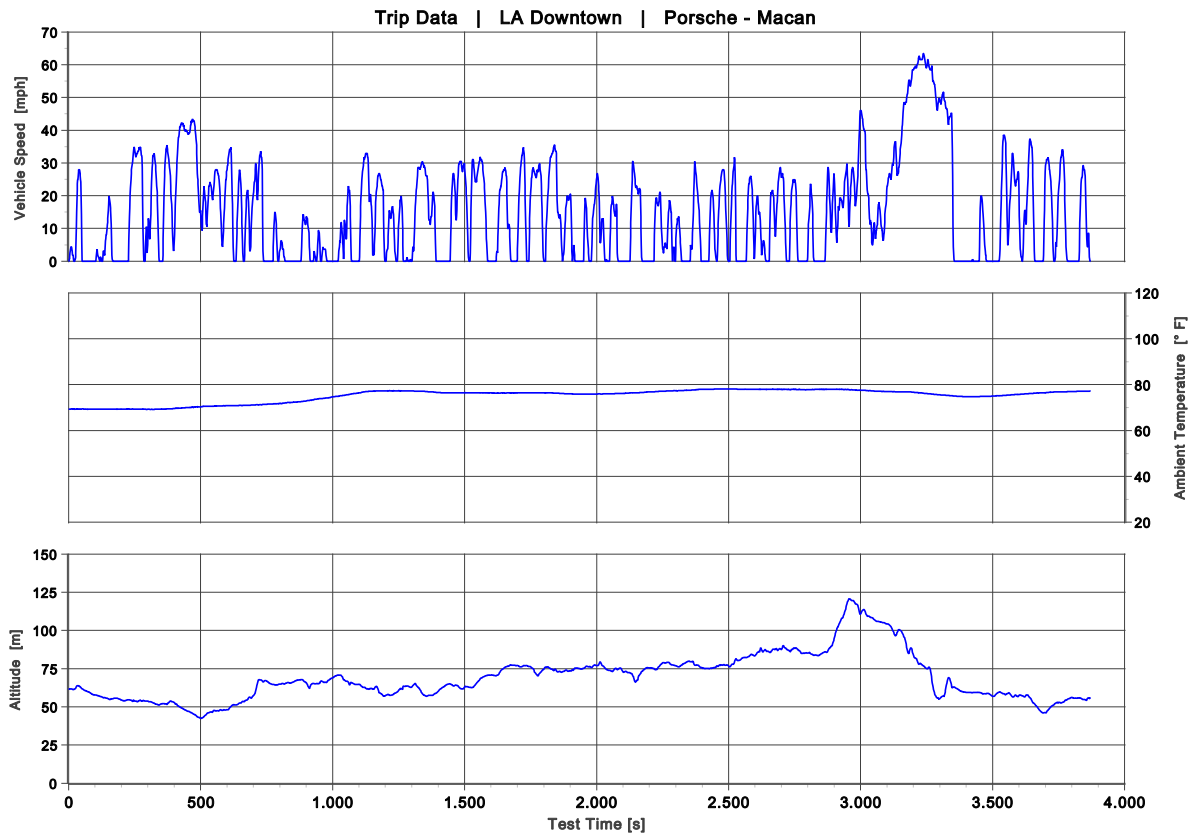
Macan		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
05/01/2019	LA Downtown	469,8	0,050	0,025	0,002	3872	15,84
05/01/2019	Highway	334,4	0,131	0,014	0,006	4284	44,21
04/30/2019	Mt. Baldy (1)	404,8	0,303	0,022	0,025	5617	45,04
05/01/2019	Mt. Baldy (2) **	412,4	0,199	0,020	0,025	5365	44.66
05/03/2019	FTP75 (PEMS)	356,1	0,223	0,014	0,022	2463	11,08
05/03/2019	FTP75 (Dyno)	360,4	0,252	0,012	0,024		11,04

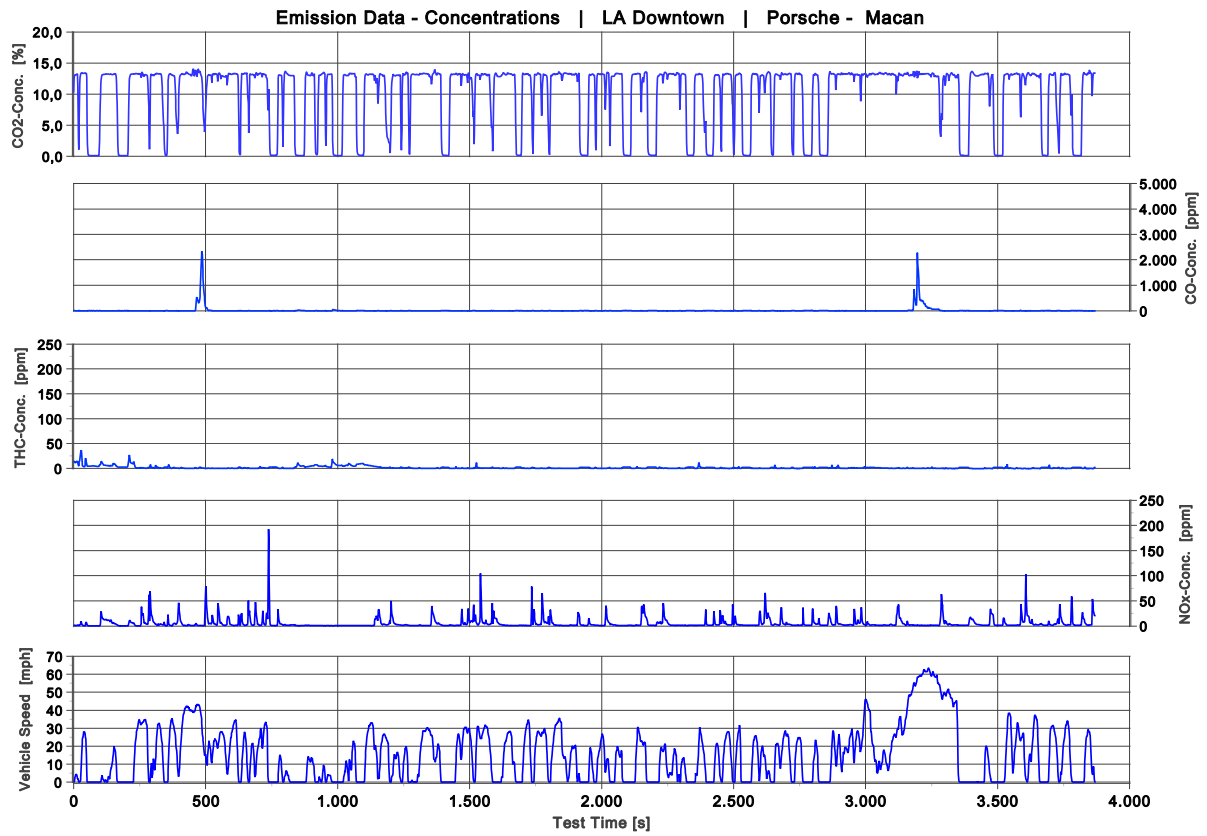
\*\* : Test deemed invalid due to route deviation.

### 3.4.1 LA Downtown

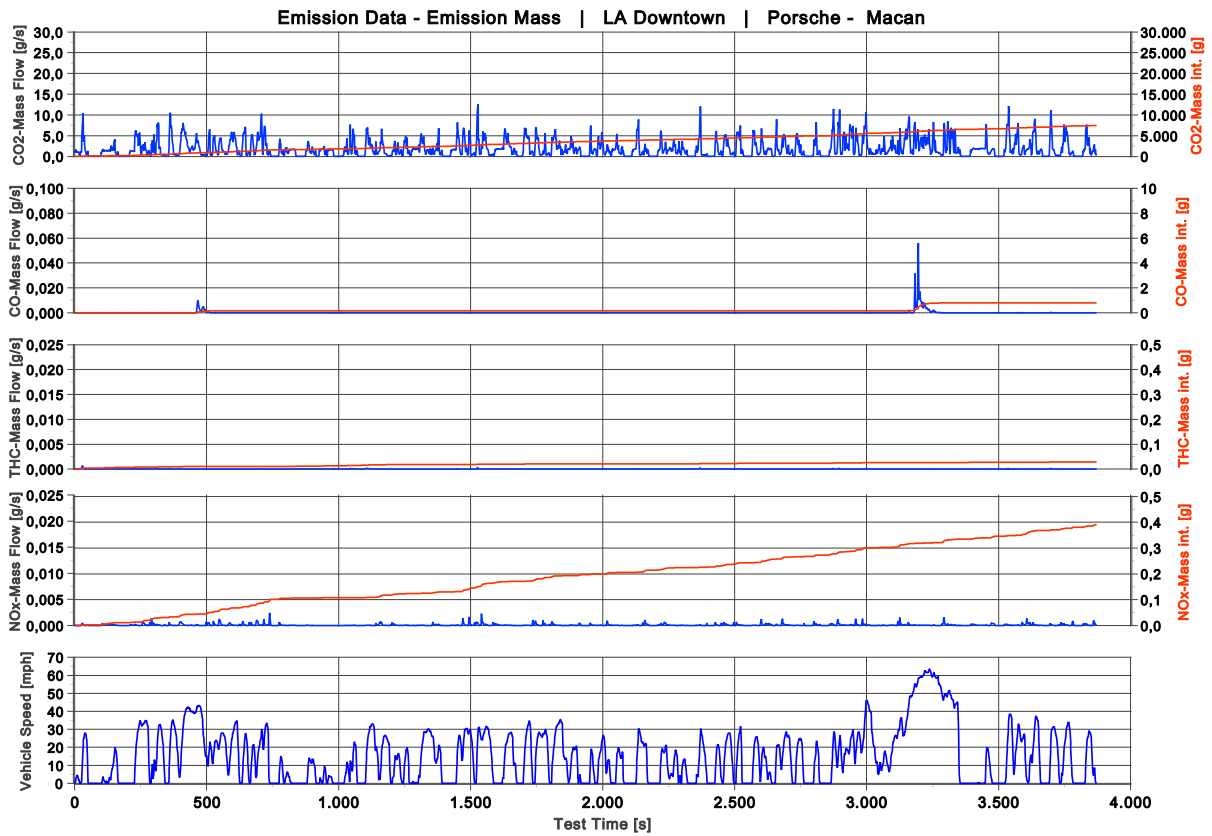
Table 3-12: LA Downtown Trip Summary for Macan

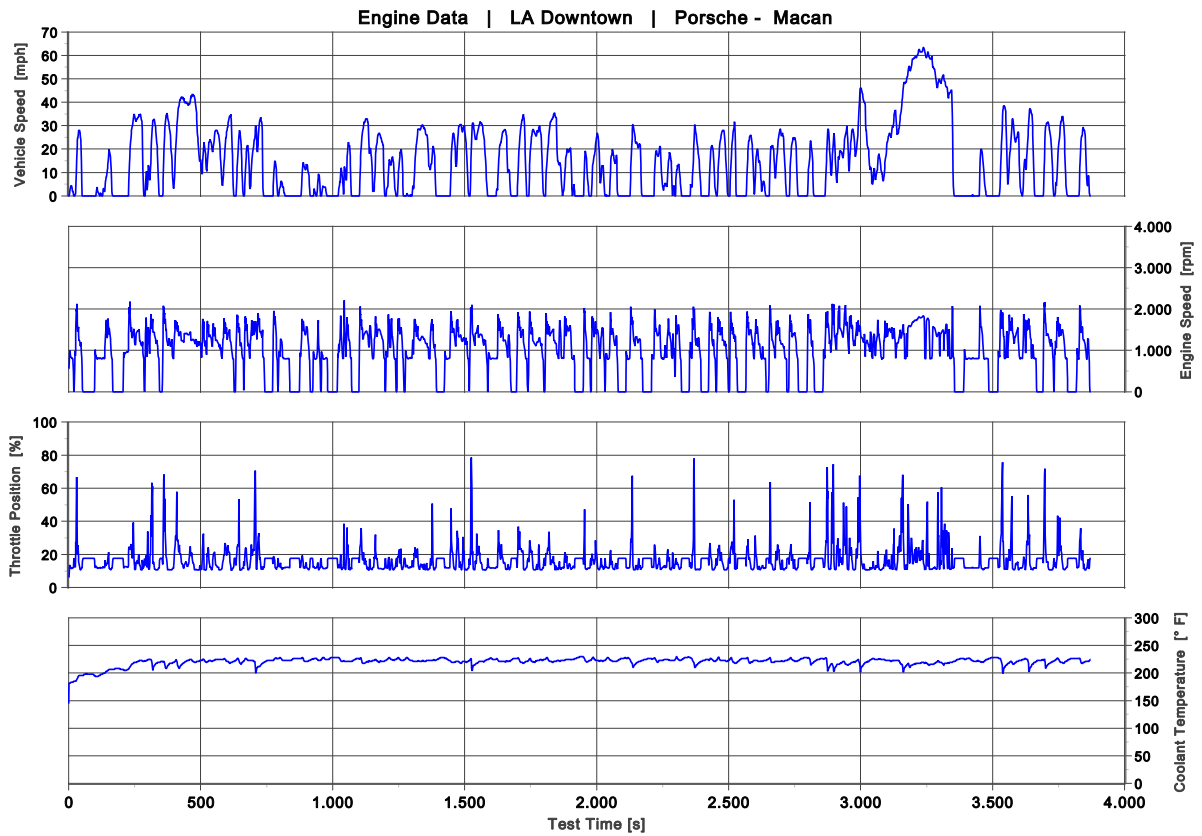
Test Data			
Test Name:	2019-05-01_Macan_LA-Downtown		
Department:	MBtech	Test Date:	05/01/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	180
Vehicle Modell:	Macan	Nominal Torque [Nm]:	370
VIN:	WP1AA2A57KLB01169	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 700
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	469,8	
CO	[g/mi]	0,050	
NO <sub>x</sub>	[g/mi]	0,025	
THC	[g/mi]	0,002	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3872	
Distance	[mi]	15,84	
Average Speed	[mph]	14,7	
Average Ambient Temperature	[°F]	75,2	







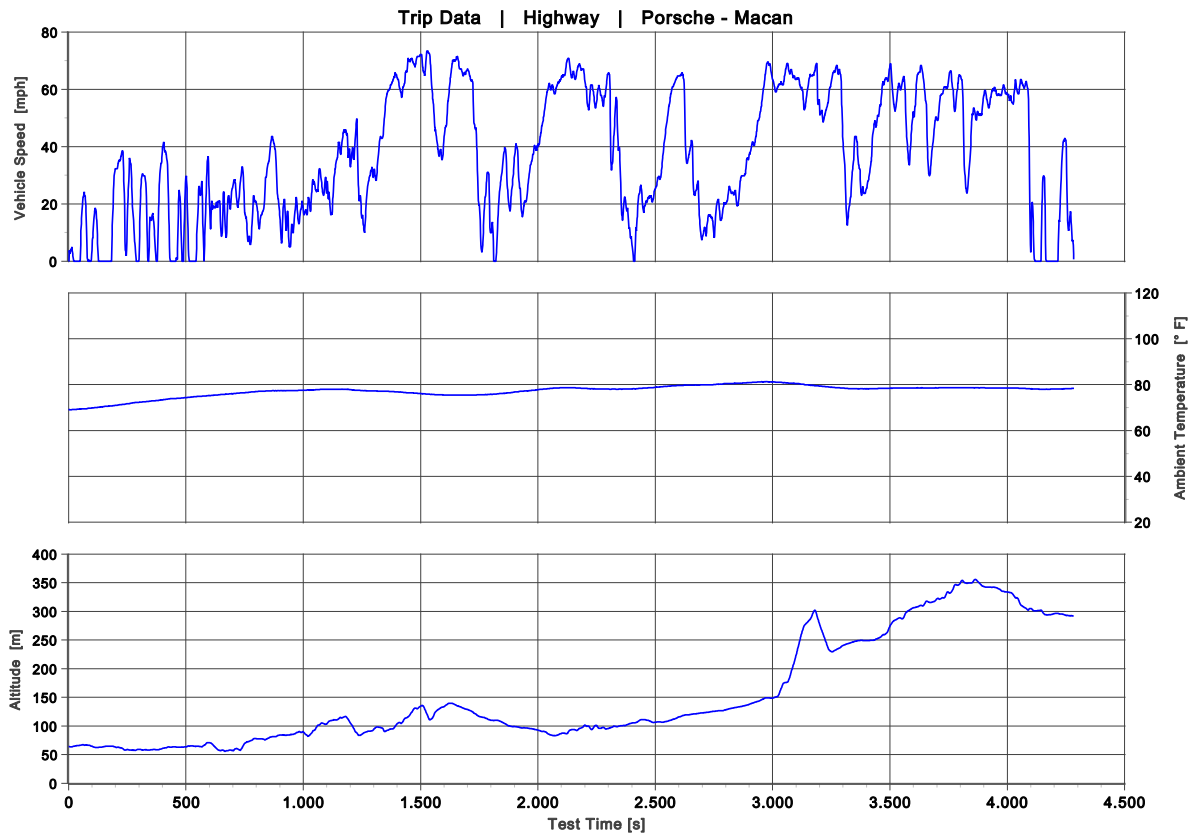


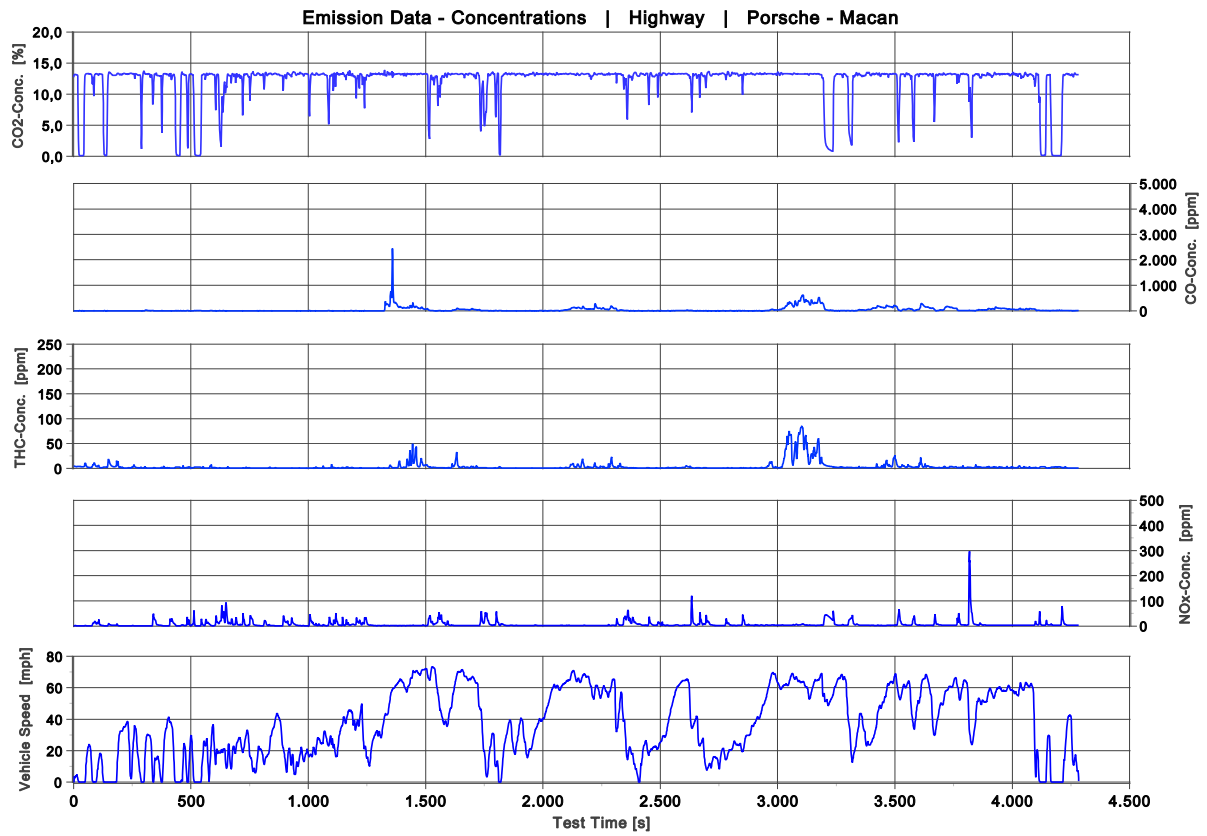


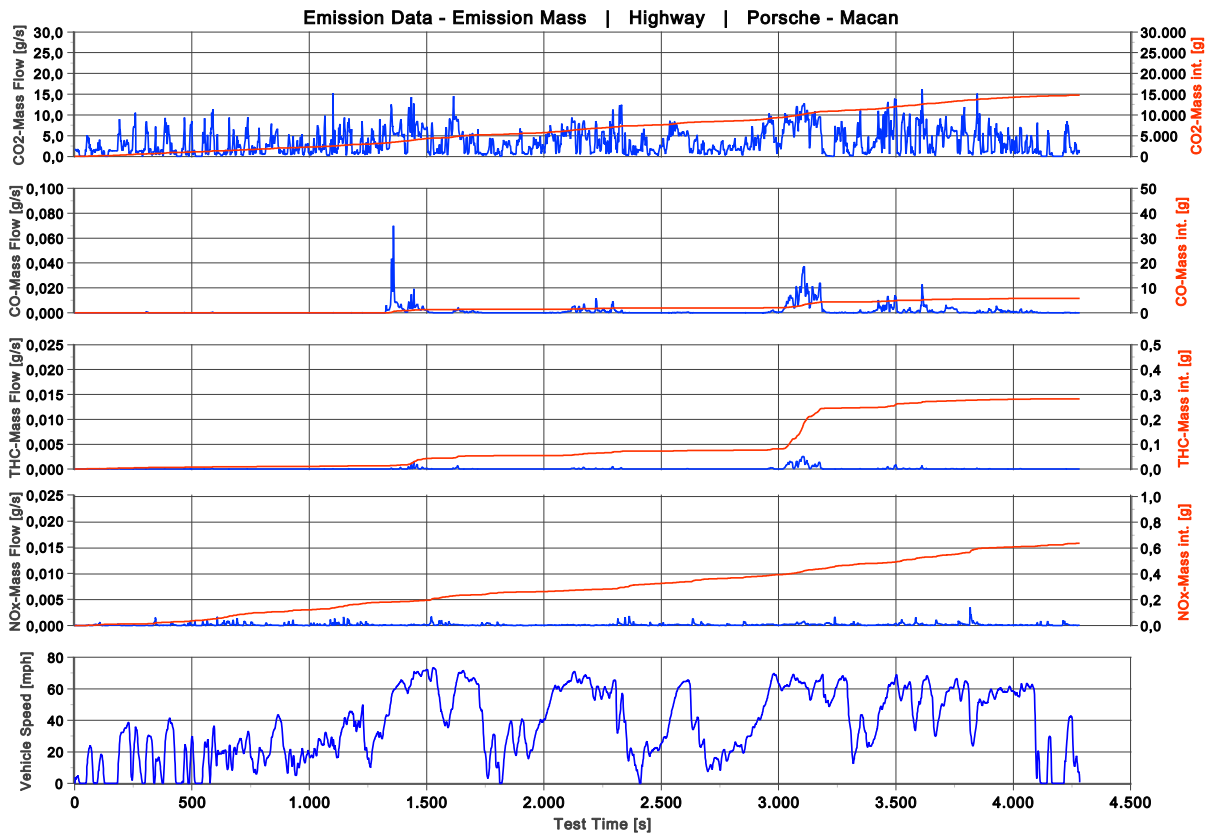
### 3.4.2 Highway

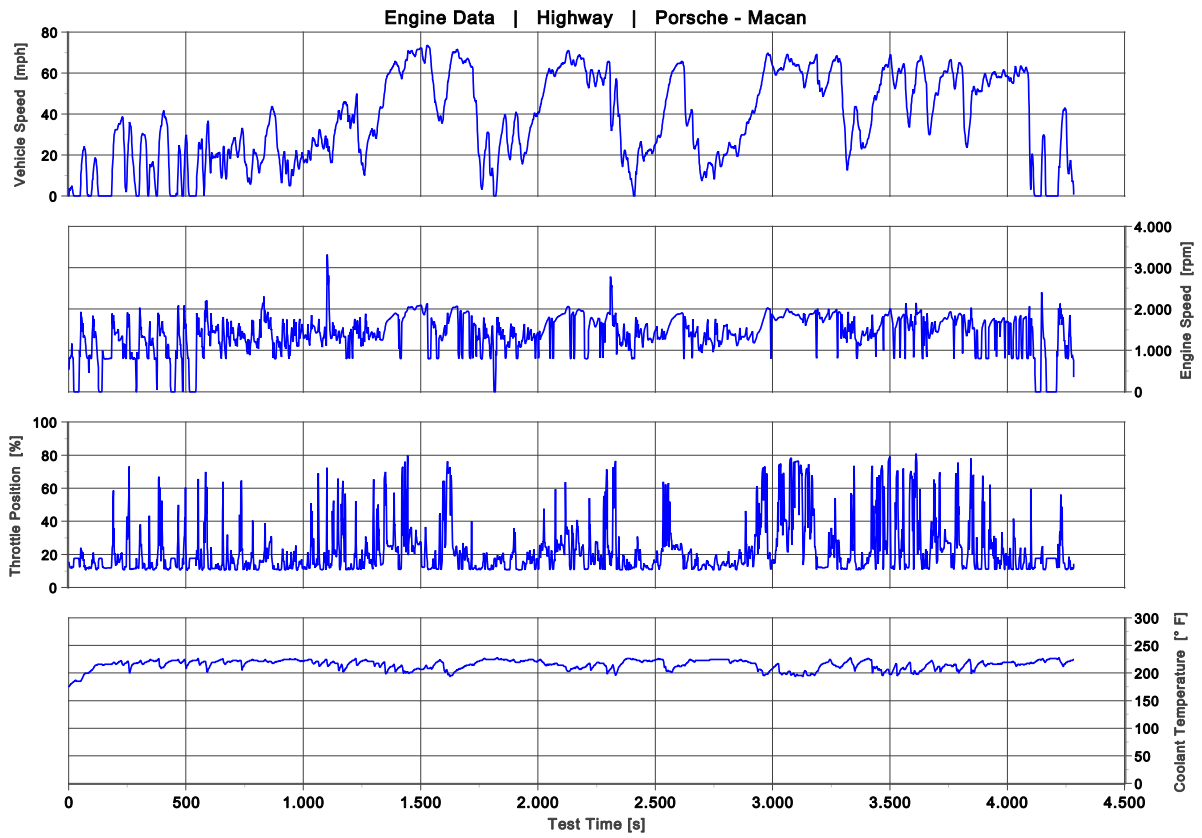
Table 3-13: Highway Trip Summary for Macan

Test Data			
Test Name:	2019-05-01_Macan_Highway		
Department:	MBtech	Test Date:	05/01/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	180
Vehicle Modell:	Macan	Nominal Torque [Nm]:	370
VIN:	WP1AA2A57KLB01169	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 700
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	334,4	
CO	[g/mi]	0,131	
NO <sub>x</sub>	[g/mi]	0,014	
THC	[g/mi]	0,006	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	4284	
Distance	[mi]	44,21	
Average Speed	[mph]	37,2	
Average Ambient Temperature	[°F]	77,3	







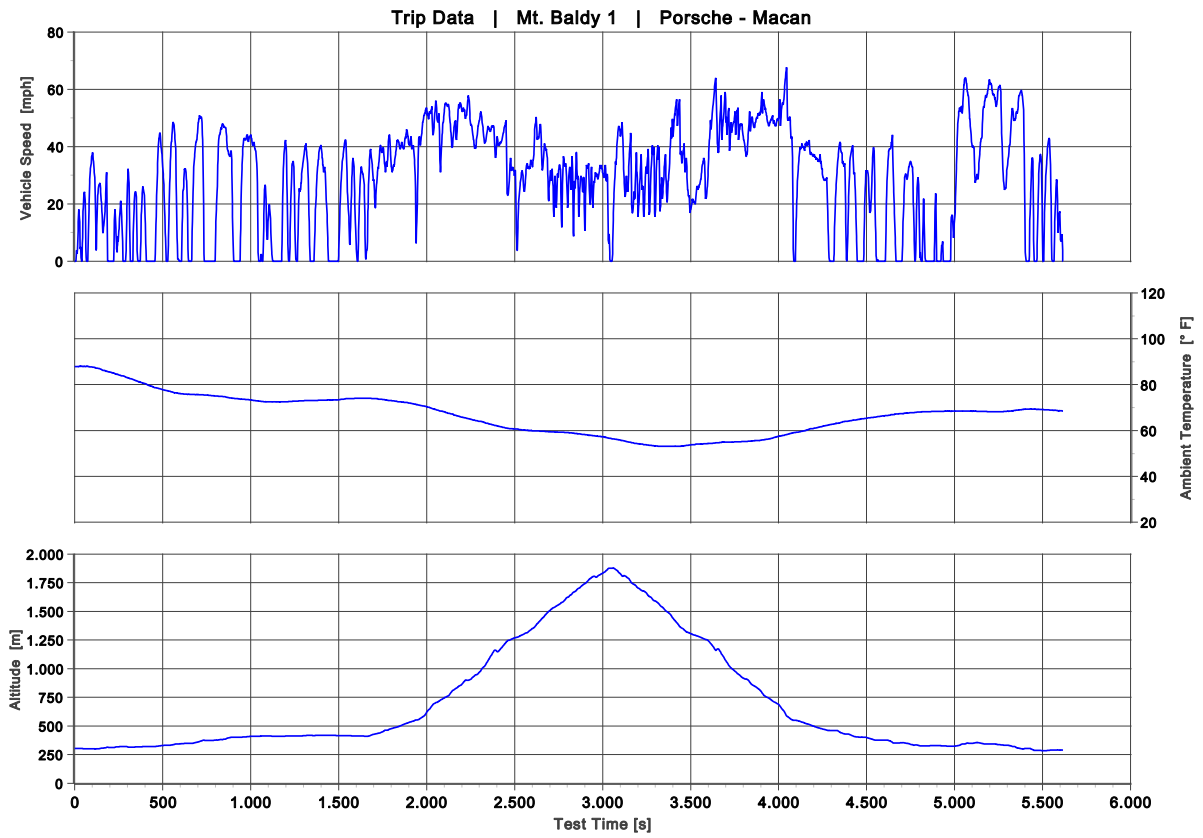


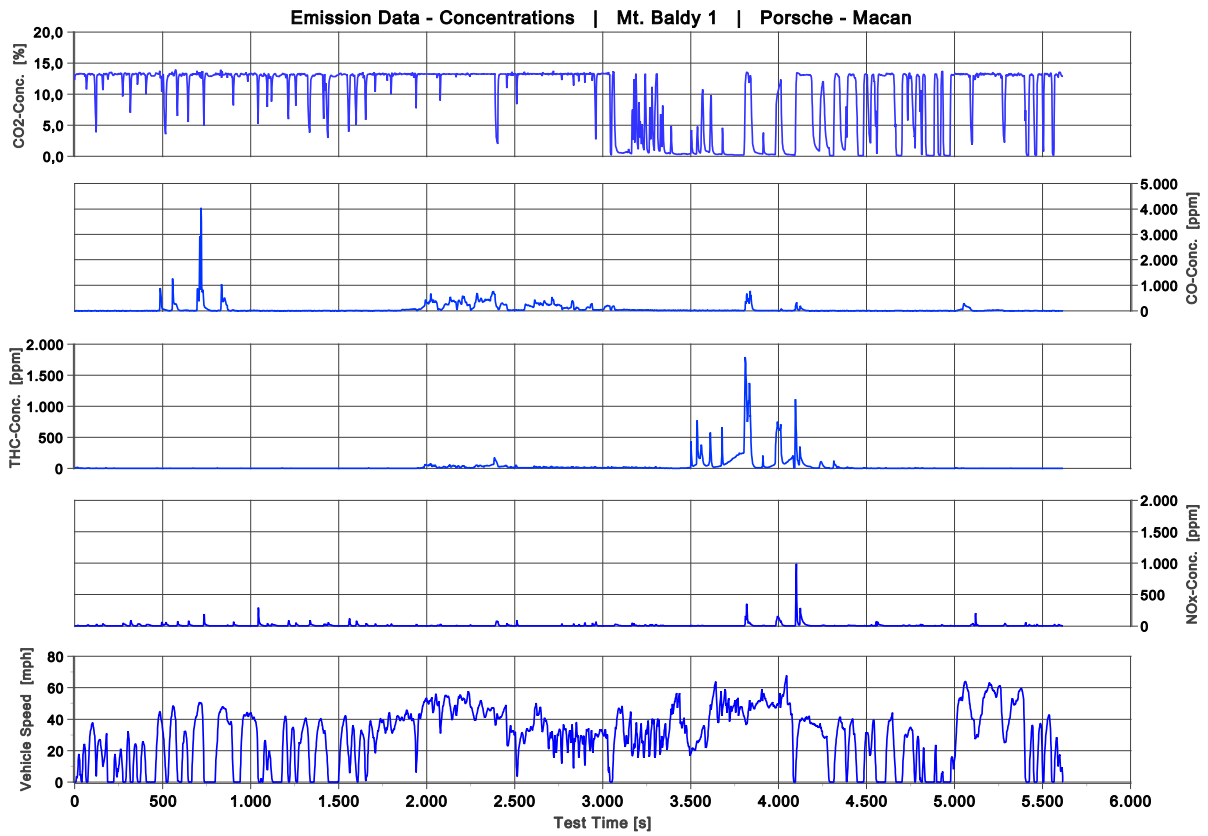
### 3.4.3 Mt. Baldy (1)

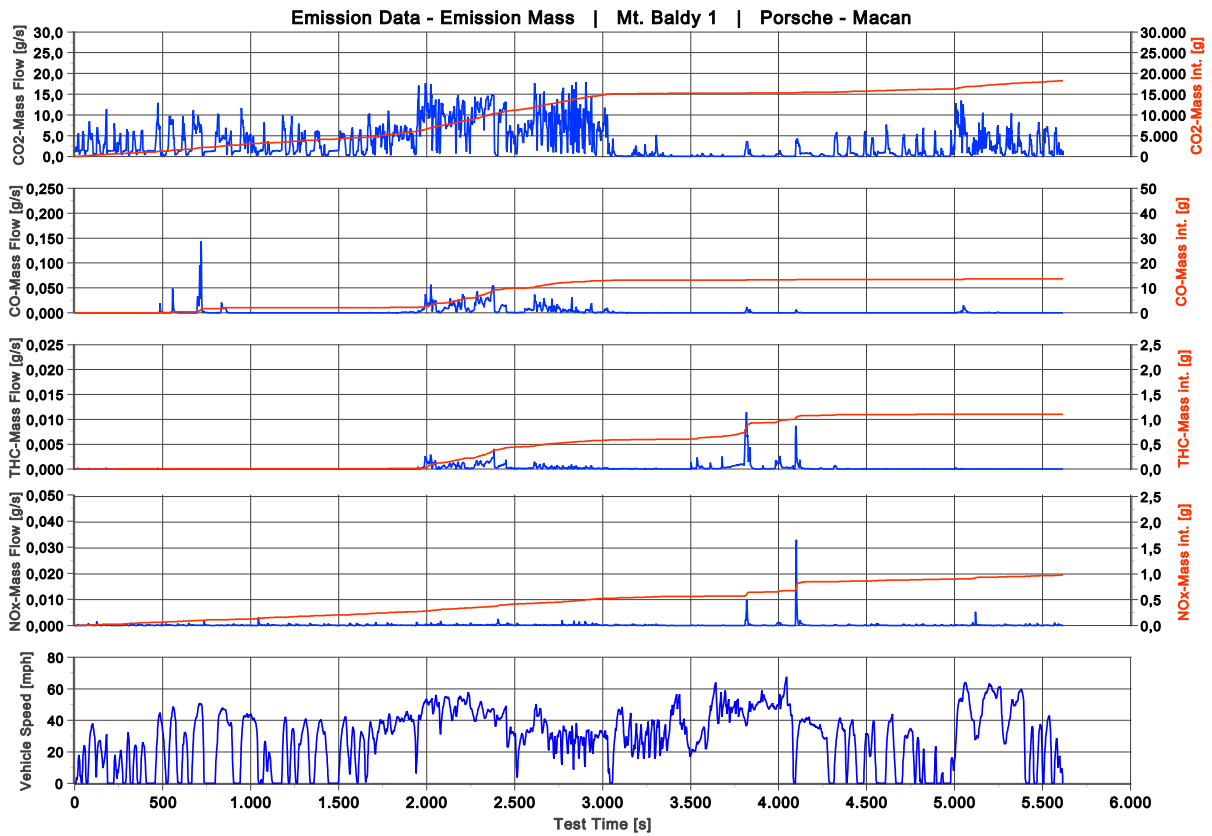
Table 3-14: Mt. Baldy (1) Trip Summary for Macan

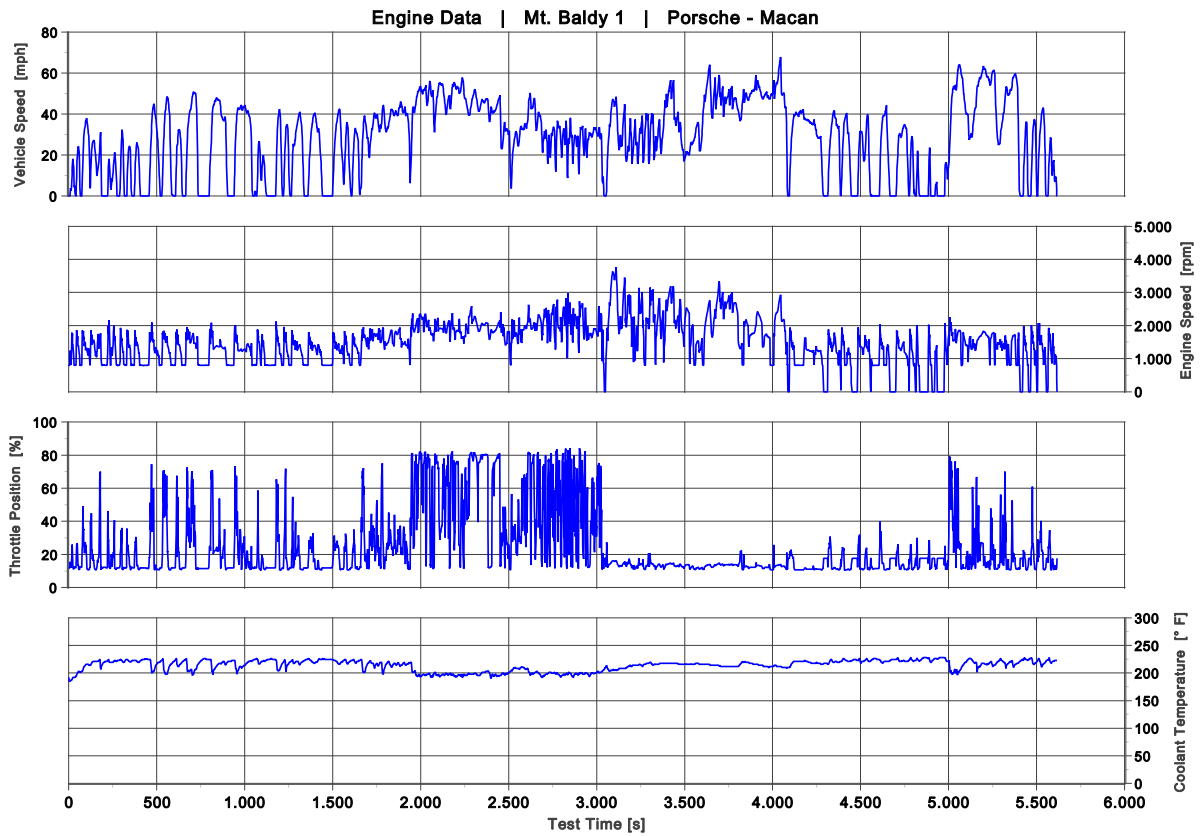
Test Data			
Test Name:	2019-04-30_Macan_Mt.Baldy		
Department:	MBtech	Test Date:	04/30/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	180
Vehicle Modell:	Macan	Nominal Torque [Nm]:	370
VIN:	WP1AA2A57KLB01169	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 700
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	404,8	
CO	[g/mi]	0,303	
NO <sub>x</sub>	[g/mi]	0,022	
THC	[g/mi]	0,025	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5617	
Distance	[mi]	45,04	
Average Speed	[mph]	28,9	
Average Ambient Temperature	[°F]	67,0	









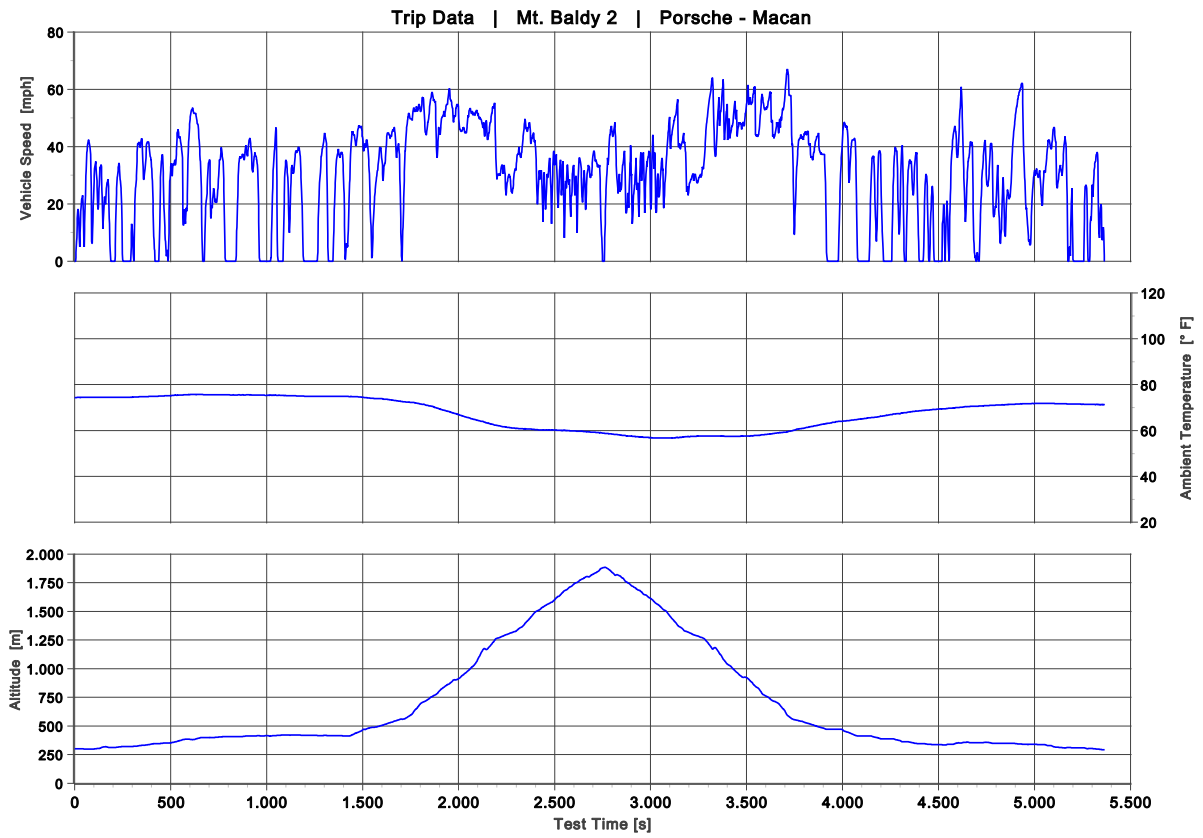


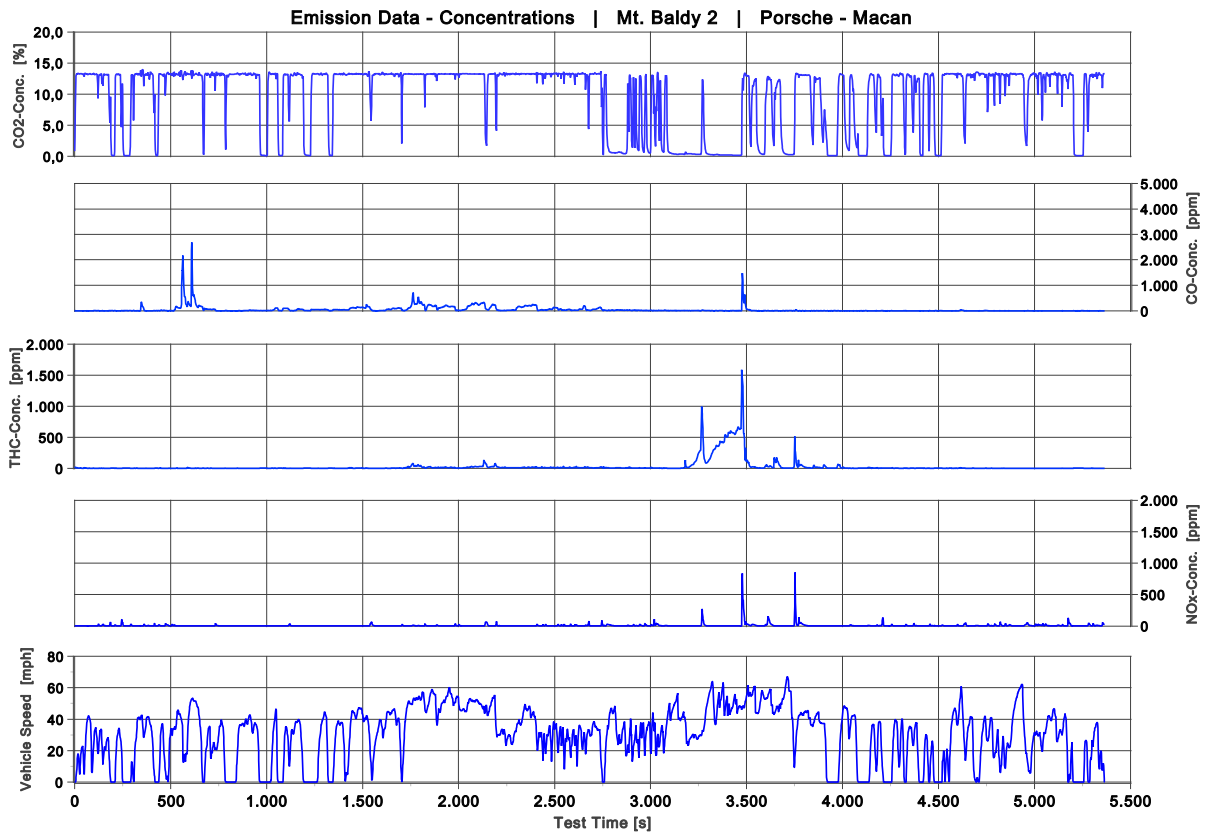
### 3.4.4 Mt. Baldy (2)

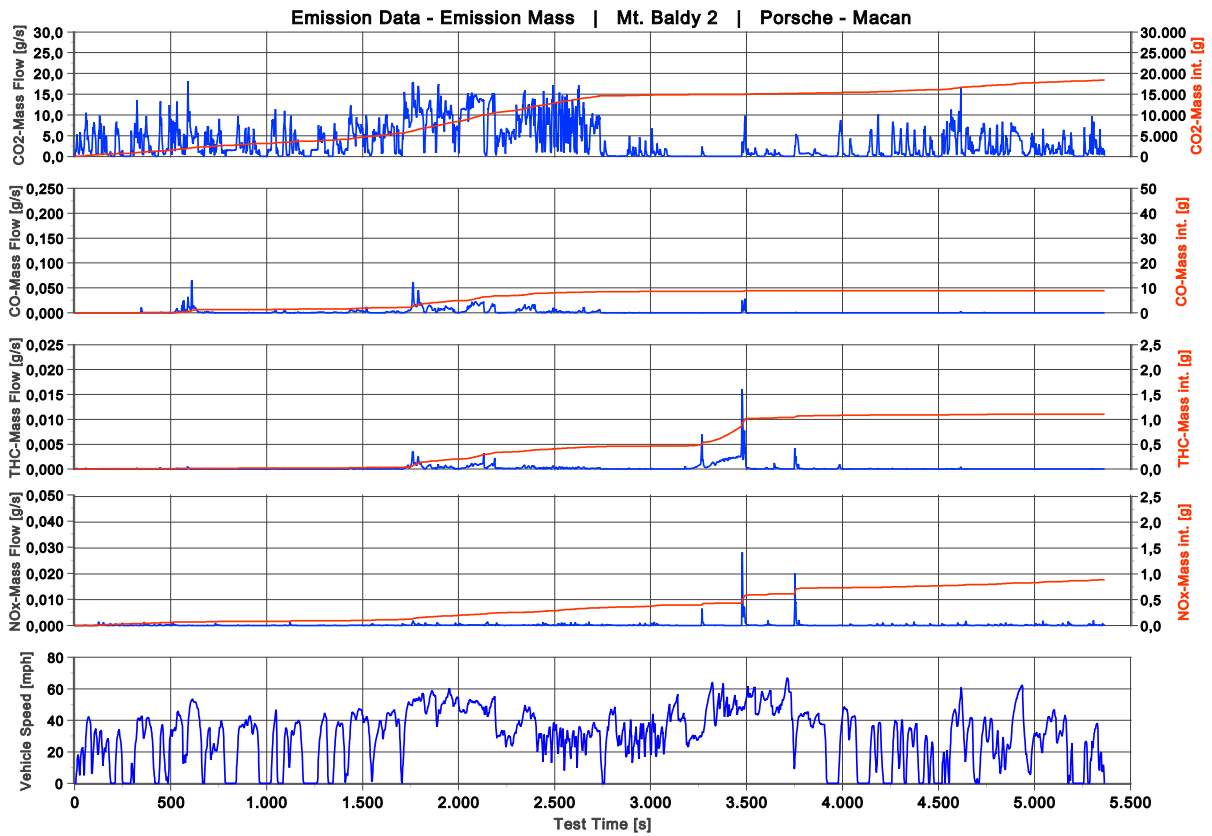
Table 3-15: Mt. Baldy (2) Trip Summary for Macan

Test Data			
Test Name:	2019-05-01_Macan_Mt.Baldy		
Department:	MBtech	Test Date:	05/01/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	180
Vehicle Modell:	Macan	Nominal Torque [Nm]:	370
VIN:	WP1AA2A57KLB01169	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 700
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	412,4	
CO	[g/mi]	0,199	
NO <sub>x</sub>	[g/mi]	0,020	
THC	[g/mi]	0,025	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5365	
Distance	[mi]	44,66	
Average Speed	[mph]	30,0	
Average Ambient Temperature	[°F]	67,6	

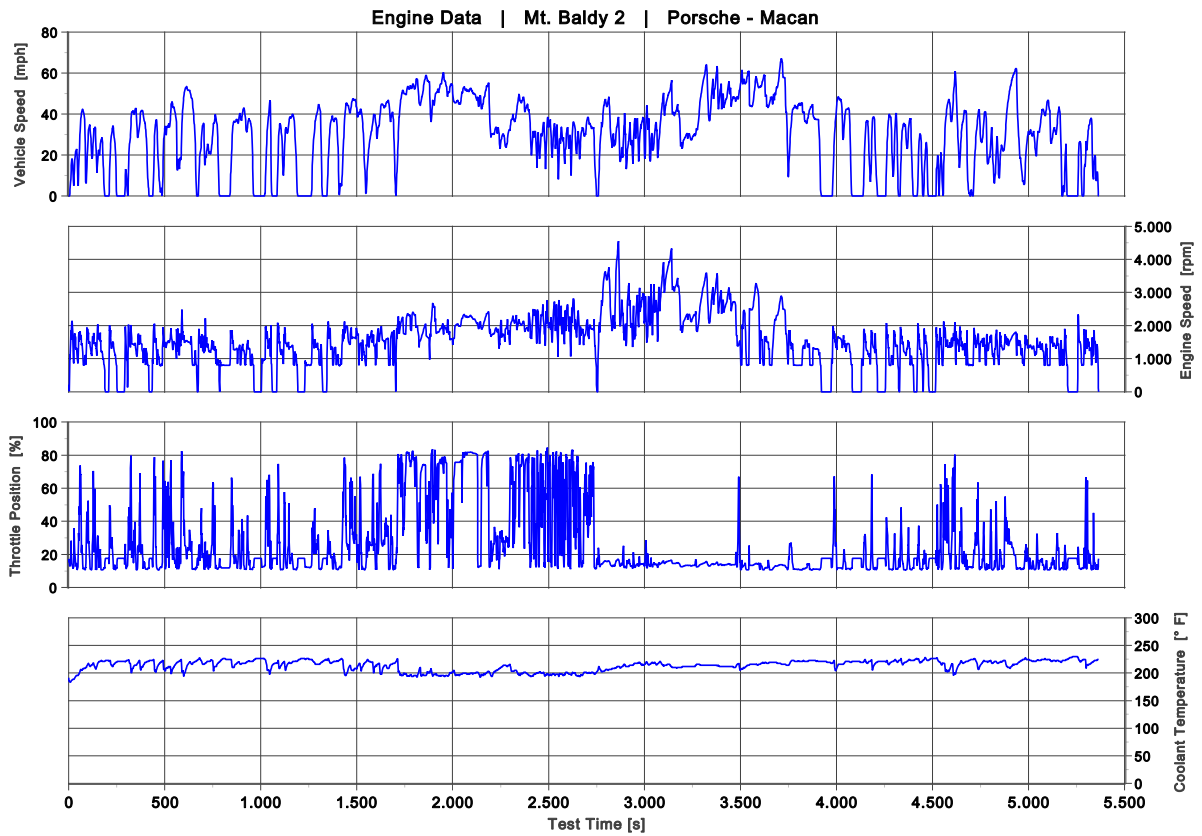
Test deemed invalid due to route deviation.











### 3.5 Panamera 4 E-Hybrid

The following table summarizes the emission measurement results from the Panamera 4 E-Hybrid vehicle.

Table 3-16: Emission Overview Porsche - Panamera 4 E-Hybrid

Panamera 4 E-Hybrid		Emissions				Test		
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]	Battery-level at start
05/07/2019	LA Downtown (E)***	143,7	0,208	0,024	0,072	3653	15,47	~ 50%
05/08/2019	LA Downtown (1)*	409,8	0,589	0,002	0,005	3636	15,46	< 20%
05/10/2019	LA Downtown (2)	469,3	0,556	0,003	0,033	5242	15,41	< 20%
05/07/2019	Highway (1)	352,8	0,749	0,004	0,018	5492	43,24	< 20%
05/10/2019	Highway (2)****	381,8	0,678	0,006	0,010	9625	42,96	< 20%
05/07/2019	Mt. Baldy (1)*	416,5	1,826	0,006	0,019	5064	44,11	< 20%
05/10/2019	Mt. Baldy (2)	405,1	2,077	0,005	0,030	4911	44,12	< 20%
05/15/2019	FTP75 (PEMS)	445,4	0,327	0,004	0,008	2455	10,79	< 20%
05/15/2019	FTP75 (Dyno)	375,8	0,246	0,002	0,008		11,03	

\*: Test deemed invalid due to analyzer drift for THC.

\*\*\*: Test was done with randomly charged battery level; measurement was repeated with low battery level. All further measurements were done with low battery for reproducibility.

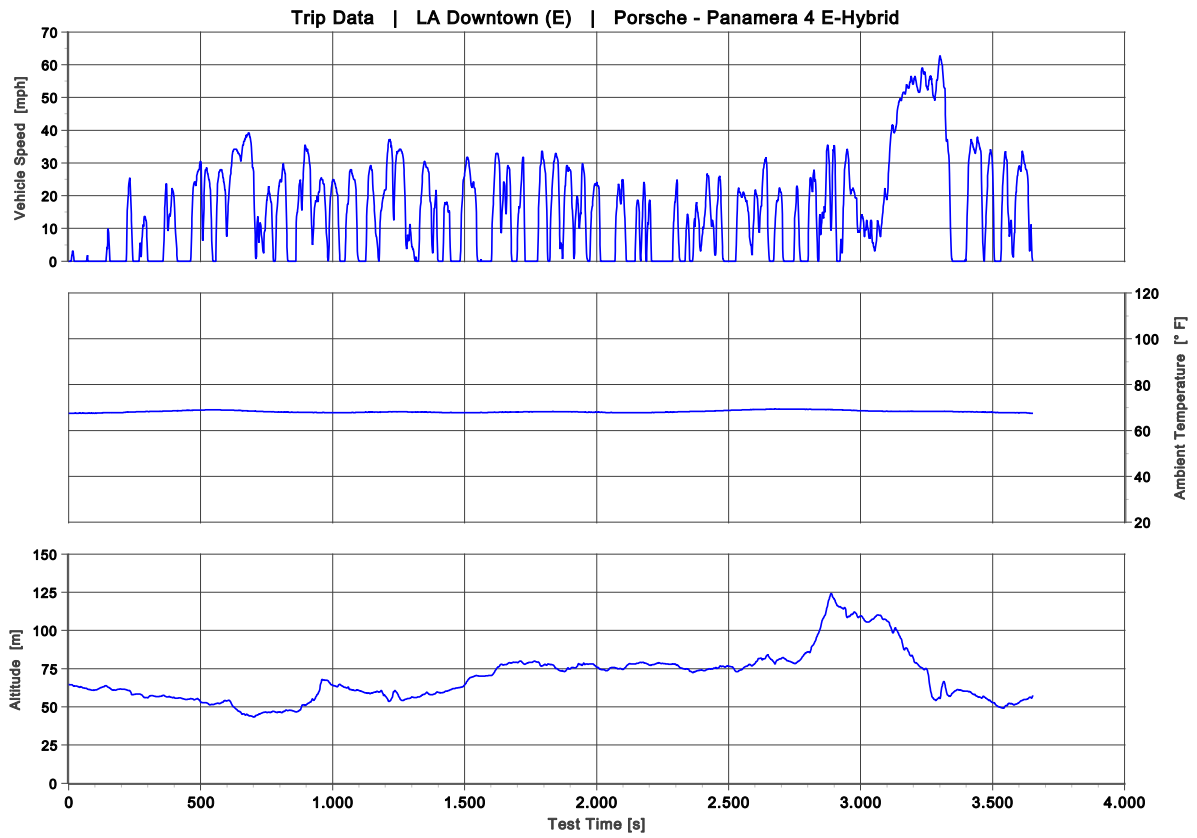
\*\*\*\*: Test deemed invalid due to long duration caused by traffic.

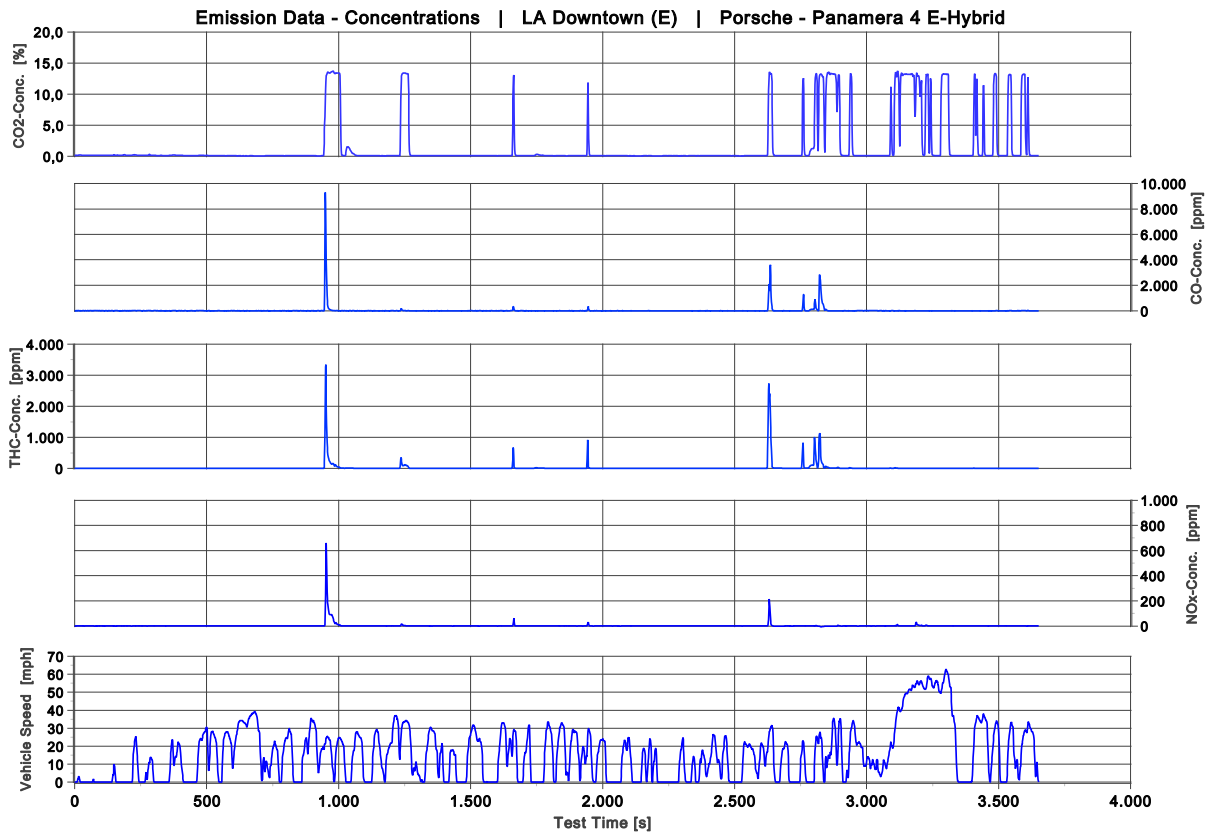
### 3.5.1 LA Downtown (E)

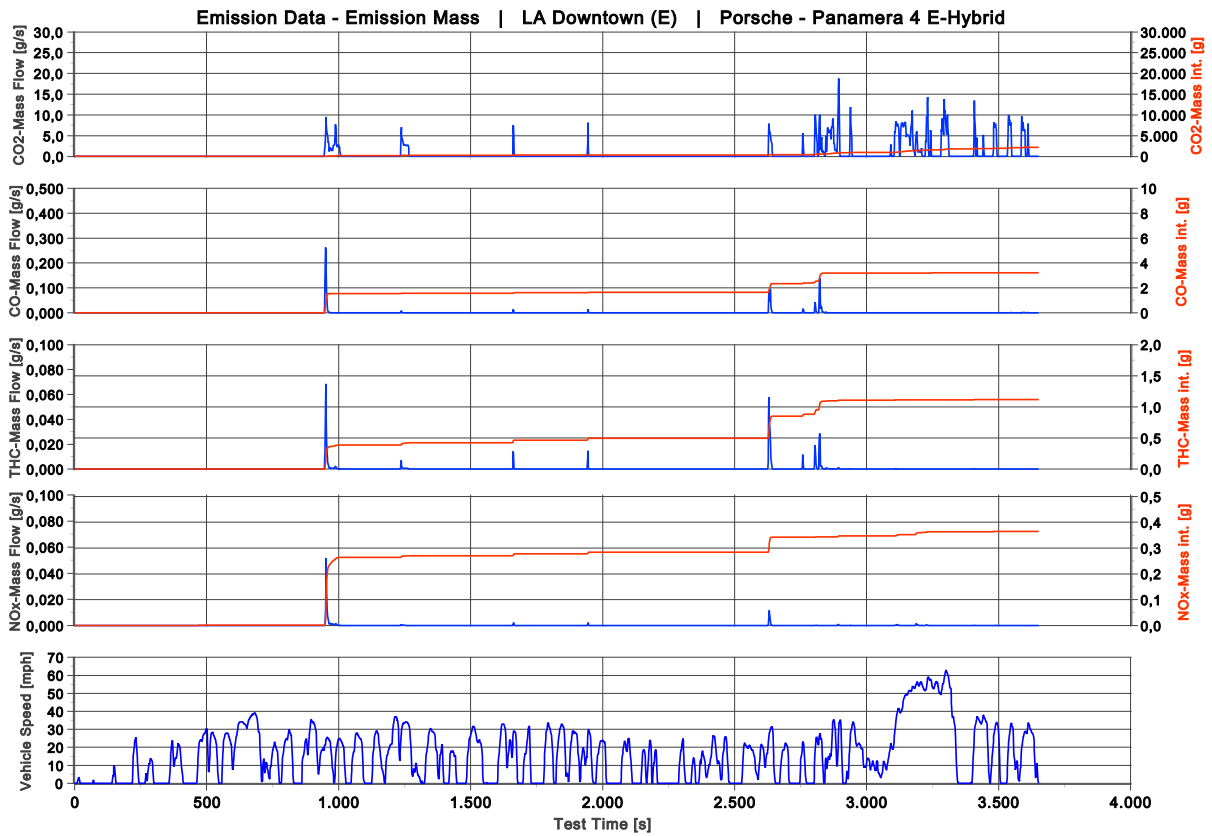
Table 3-17: LA Downtown (E) Trip Summary for Panamera 4 E-Hybrid

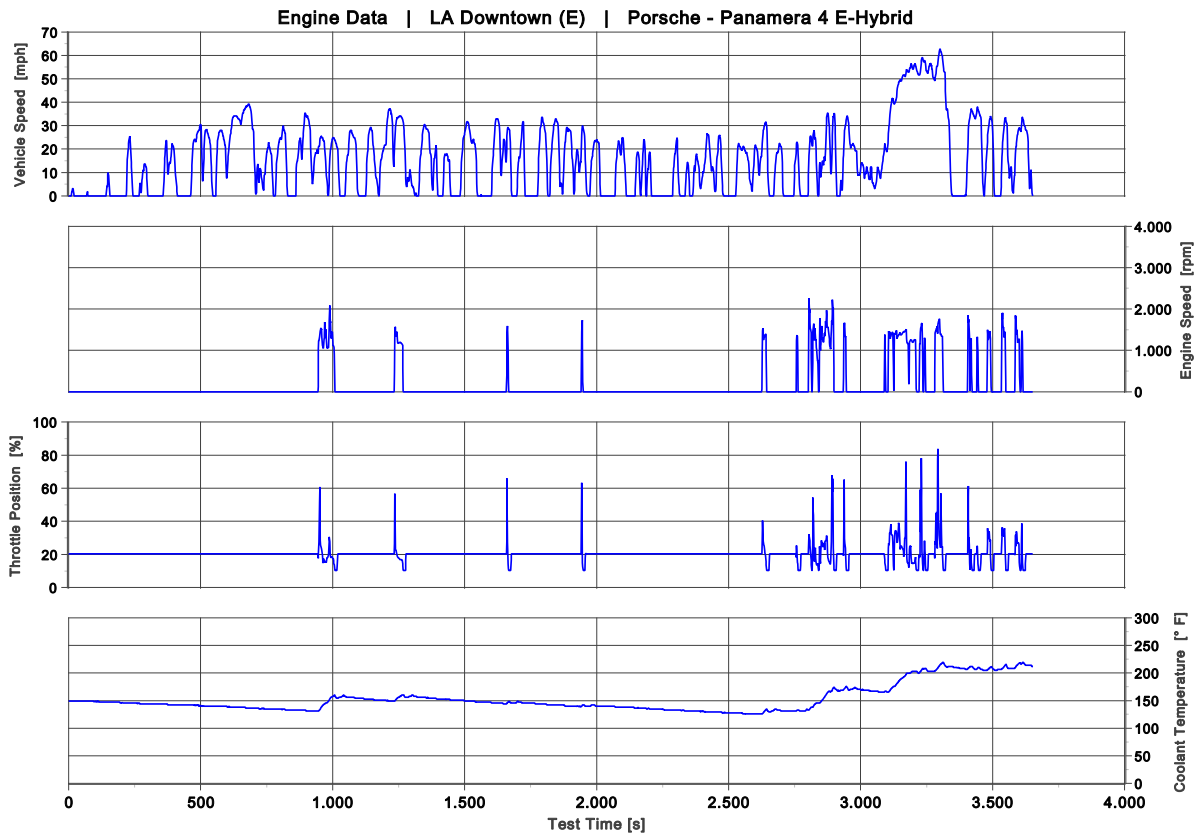
Test Data			
Test Name:	2019-05-07_Panamera-4_E-Hybrid_LA-Downtown		
Department:	MBtech	Test Date:	05/07/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	340
Vehicle Modell:	Panamera 4 E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP0AE2A77KL123390	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 900
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	143,7	
CO	[g/mi]	0,208	
NO <sub>x</sub>	[g/mi]	0,024	
THC	[g/mi]	0,072	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3653	
Distance	[mi]	15,47	
Average Speed	[mph]	15,2	
Average Ambient Temperature	[°F]	68,3	

Test was done with randomly charged battery level (~50% of E-Power driving range).









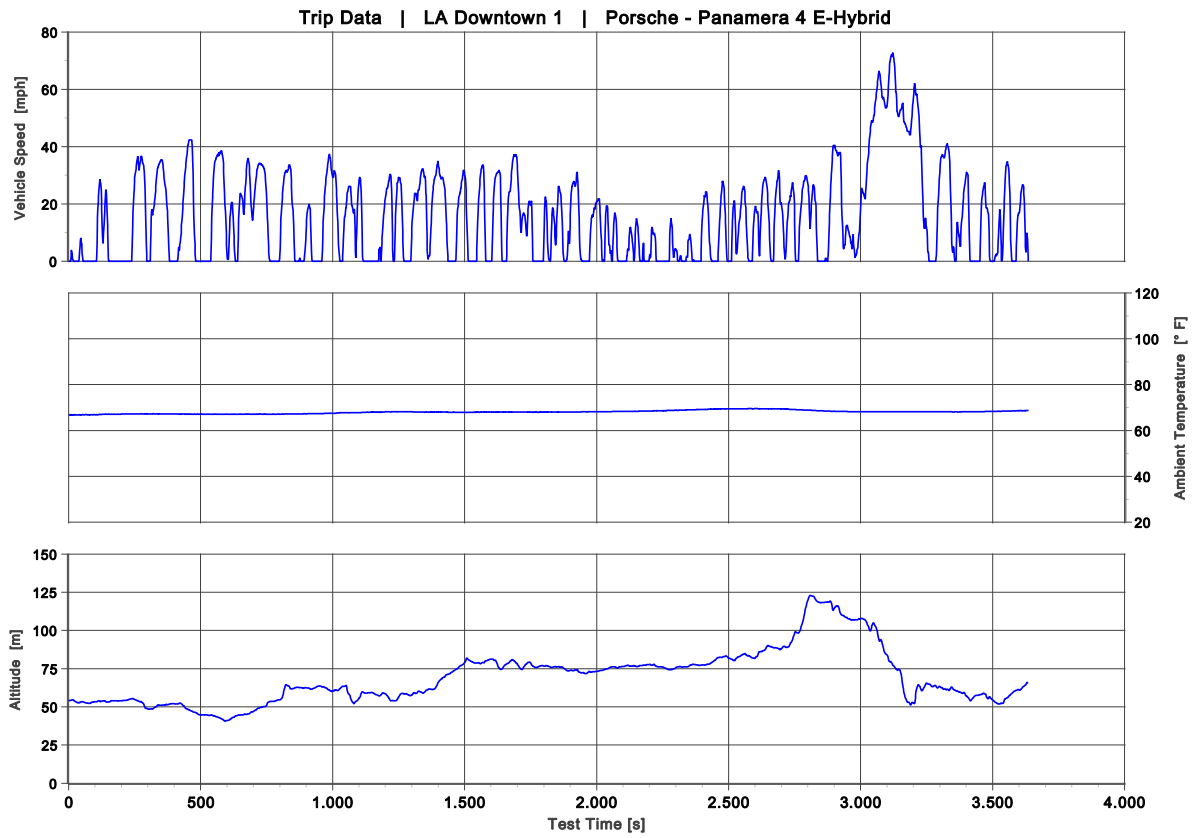
### 3.5.2 LA Downtown (1)

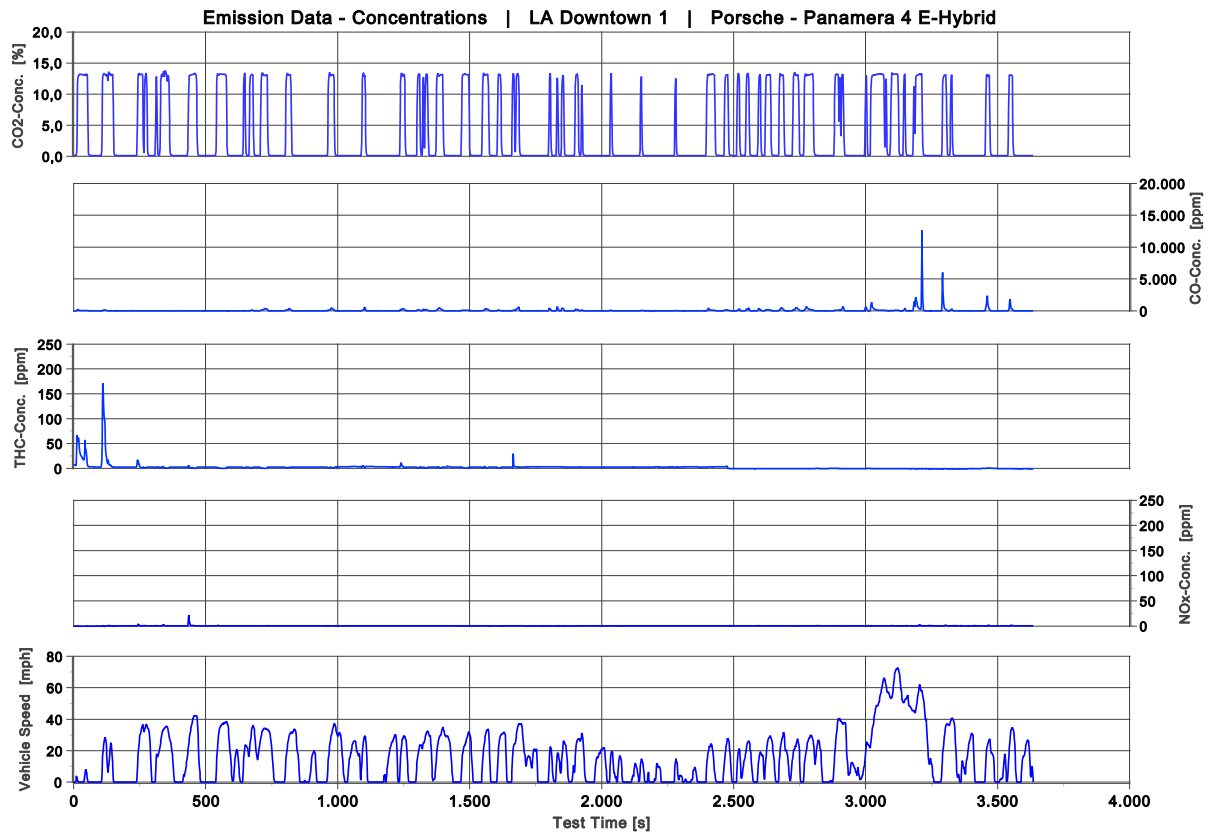
Table 3-18: LA Downtown (1) Trip Summary for Panamera 4 E-Hybrid

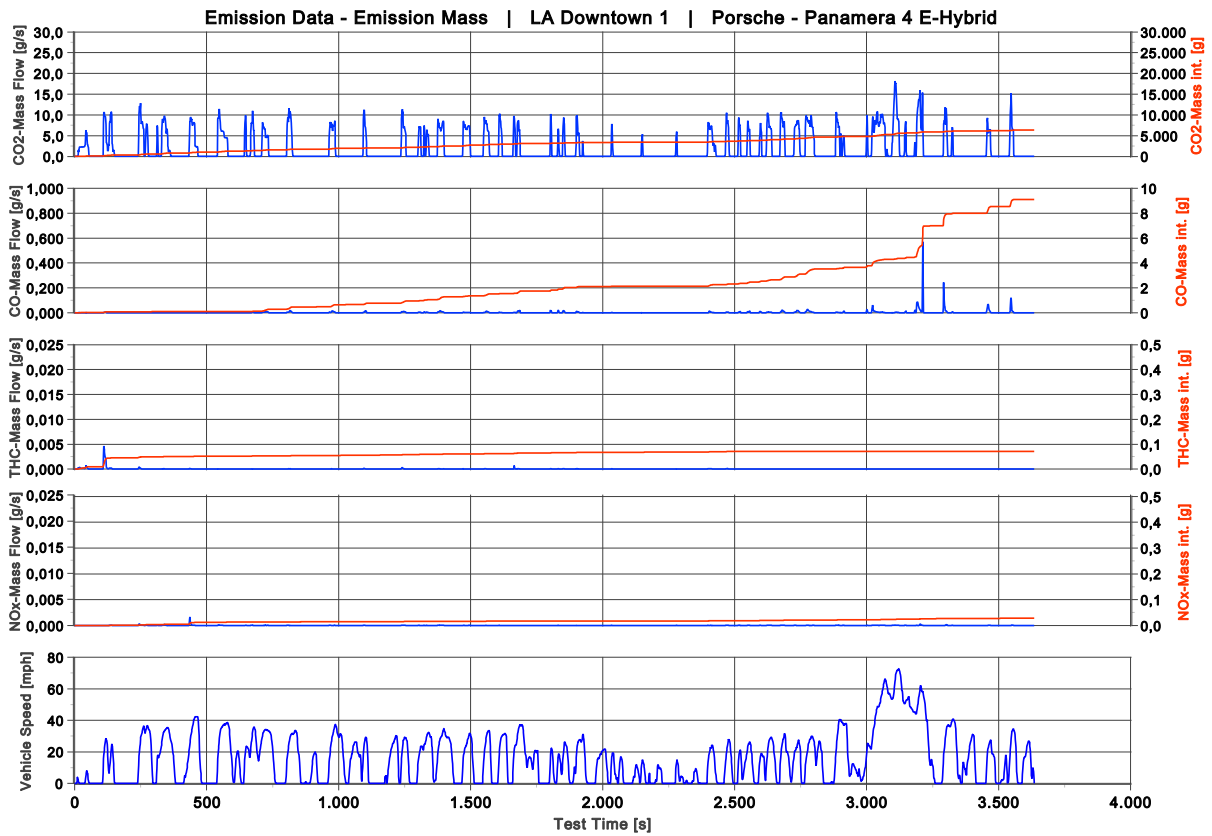
Test Data			
Test Name:	2019-05-08_Panamera-4_E-Hybrid_LA-Downtown		
Department:	MBtech	Test Date:	05/08/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	340
Vehicle Modell:	Panamera 4 E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP0AE2A77KL123390	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 900
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	409,8	
CO	[g/mi]	0,589	
NO <sub>x</sub>	[g/mi]	0,002	
THC	[g/mi]	0,005	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3636	
Distance	[mi]	15,46	
Average Speed	[mph]	15,3	
Average Ambient Temperature	[°F]	68,1	

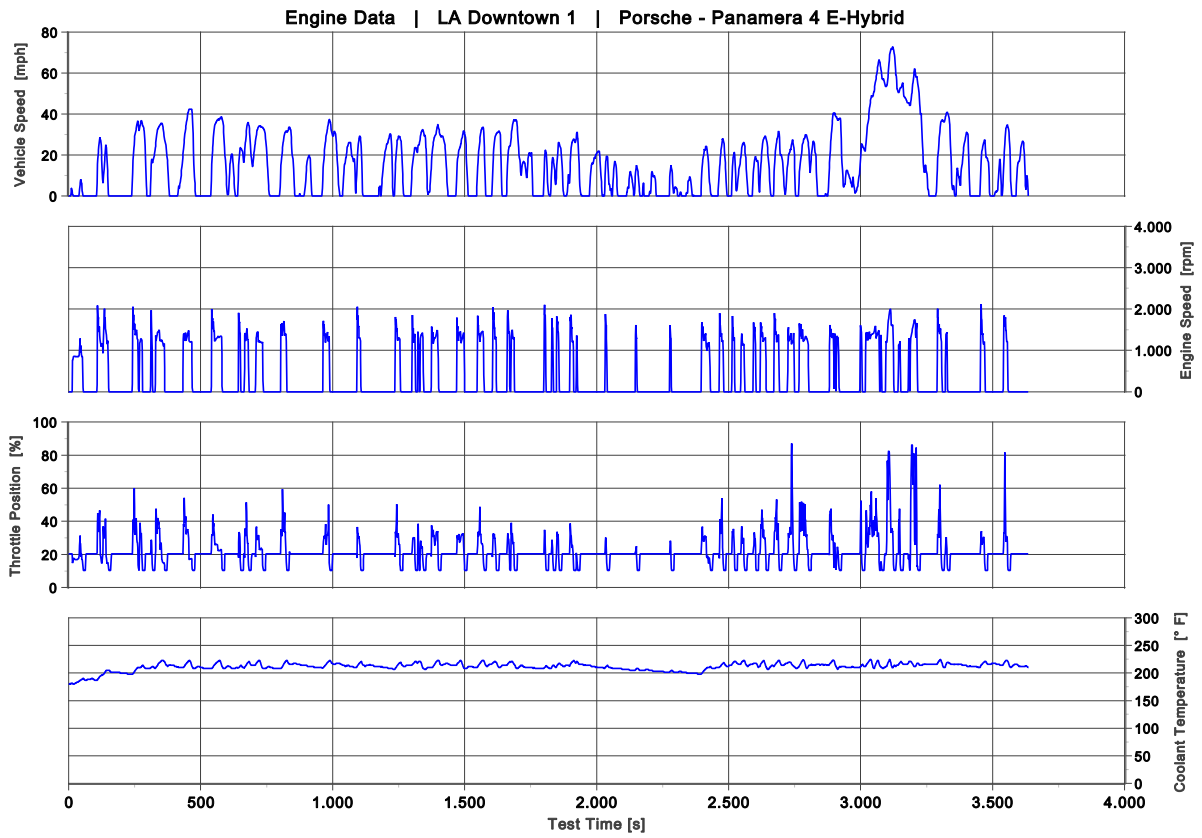
Test deemed invalid due to analyzer drift for THC.







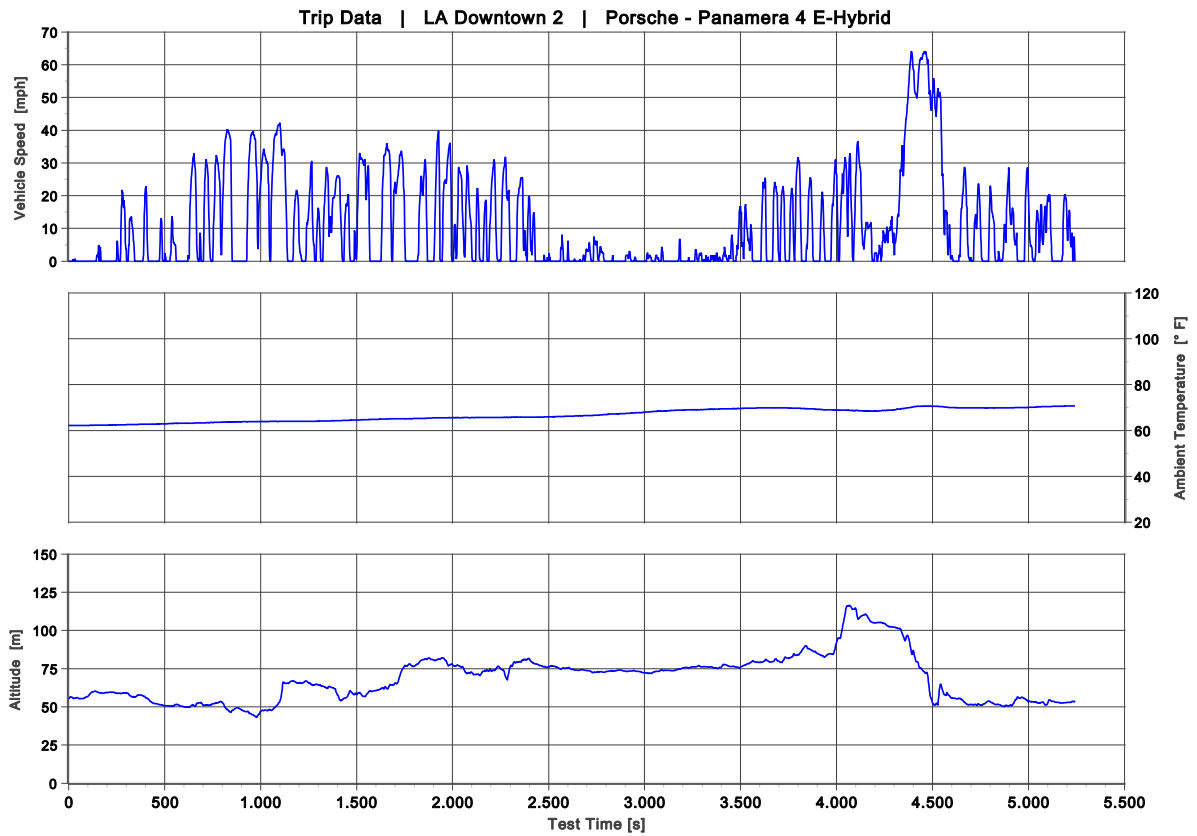


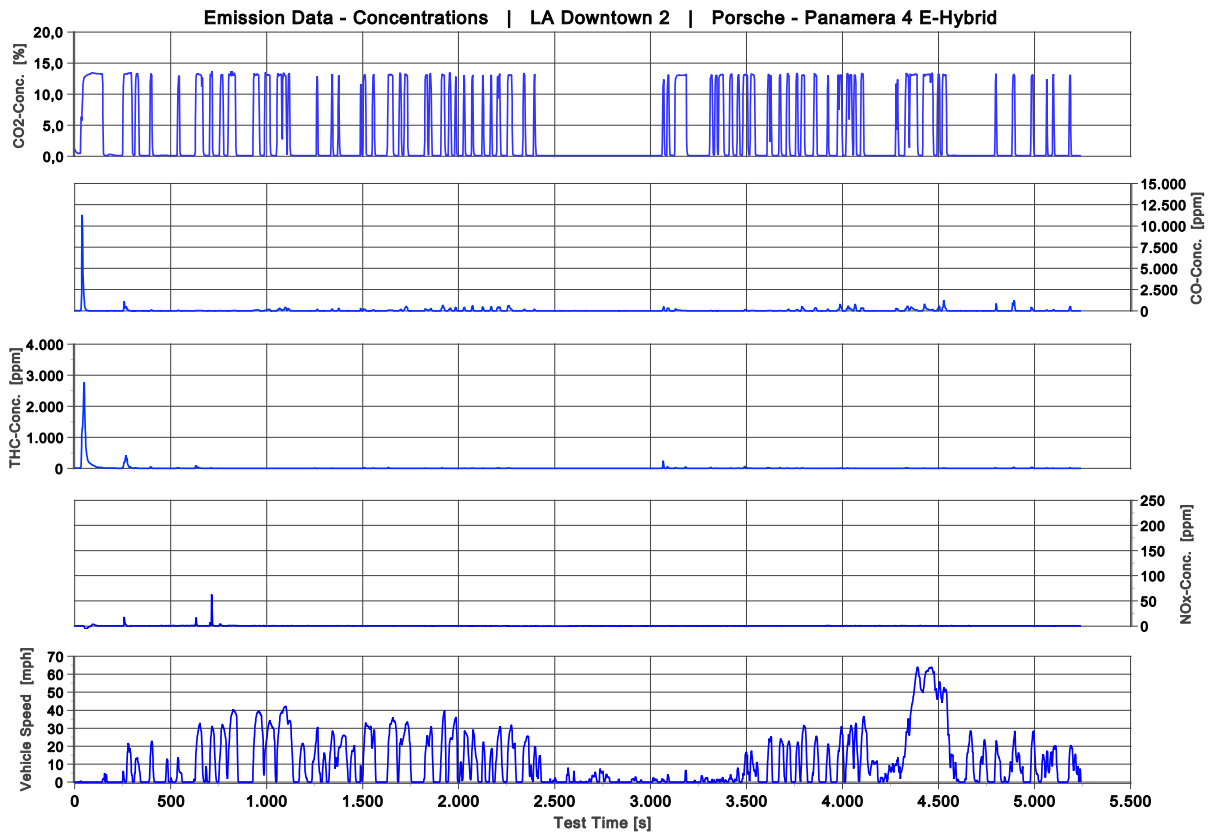


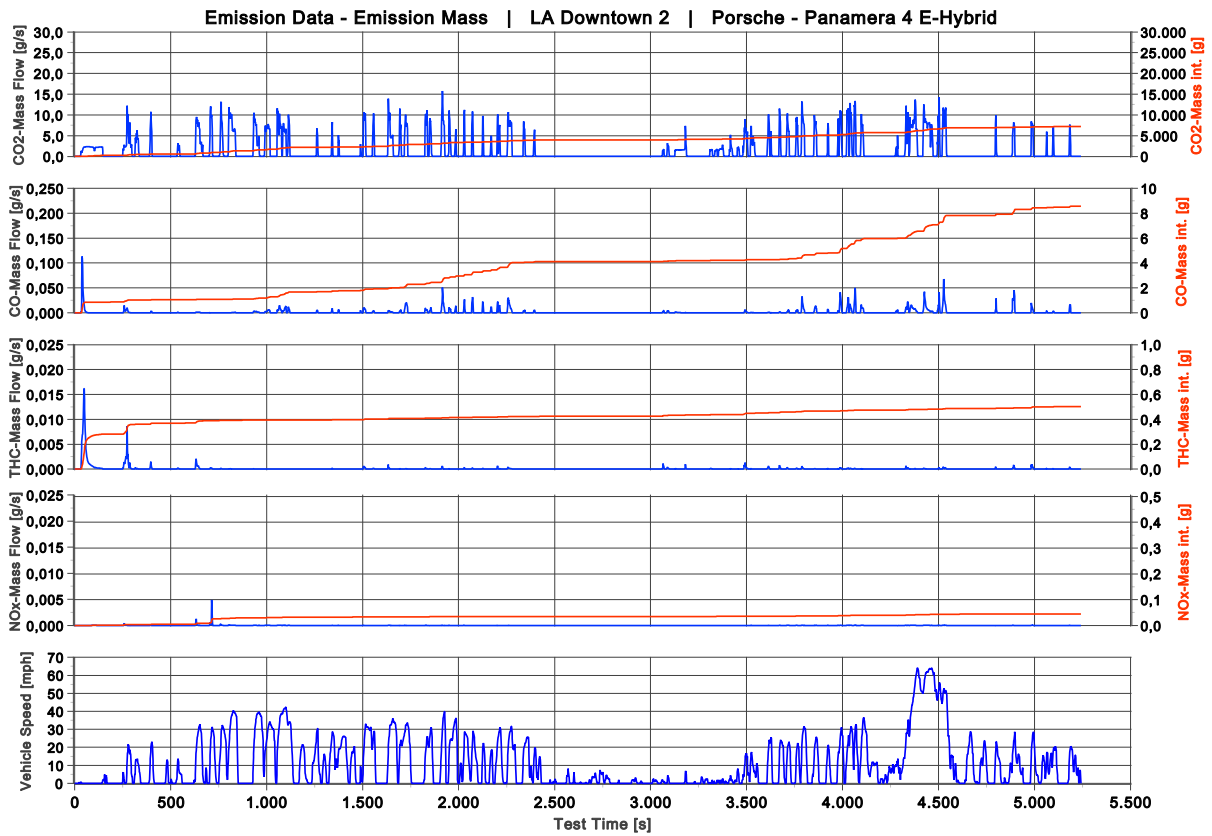
### 3.5.3 LA Downtown (2)

Table 3-19: LA Downtown (2) Trip Summary for Panamera 4 E-Hybrid

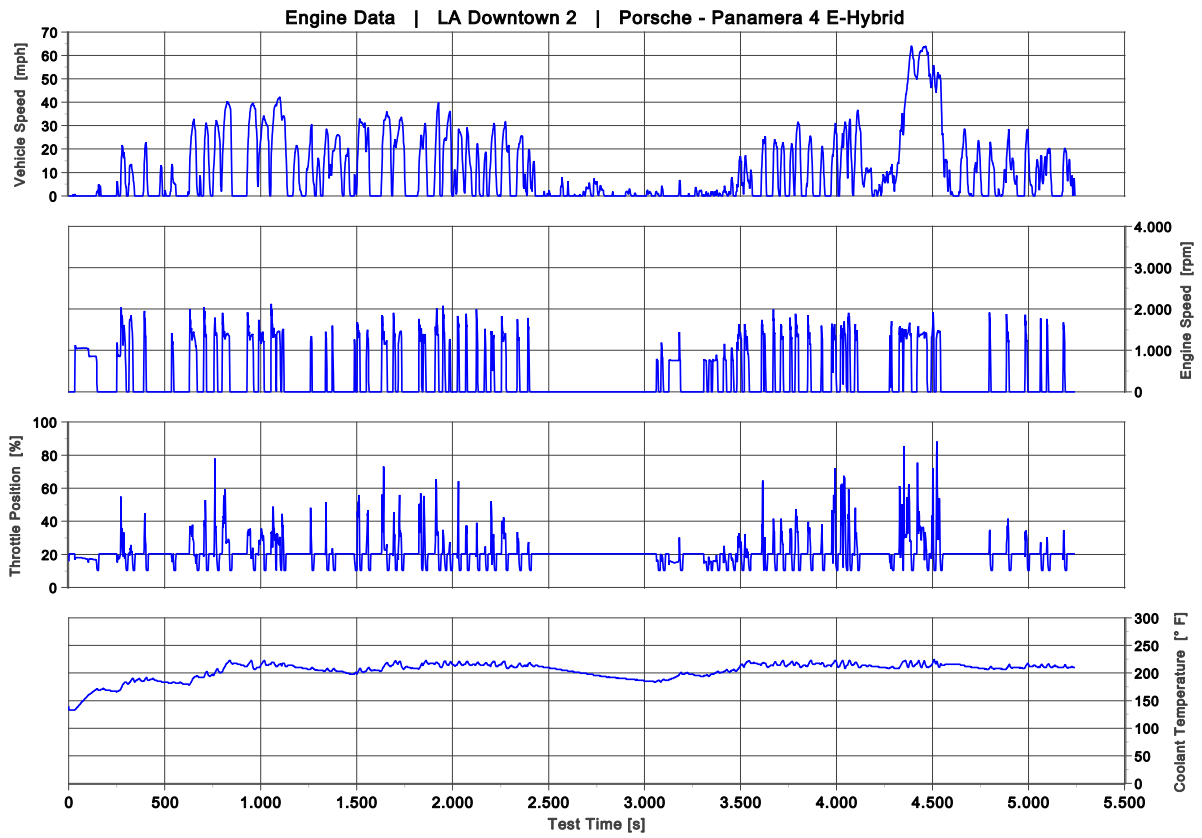
Test Data			
Test Name:	2019-05-10_Panamera-4_E-Hybrid_LA-Downtown		
Department:	MBtech	Test Date:	05/10/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	340
Vehicle Modell:	Panamera 4 E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP0AE2A77KL123390	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 900
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	469,3	
CO	[g/mi]	0,556	
NO <sub>x</sub>	[g/mi]	0,003	
THC	[g/mi]	0,033	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5242	
Distance	[mi]	15,41	
Average Speed	[mph]	10,6	
Average Ambient Temperature	[°F]	66,8	







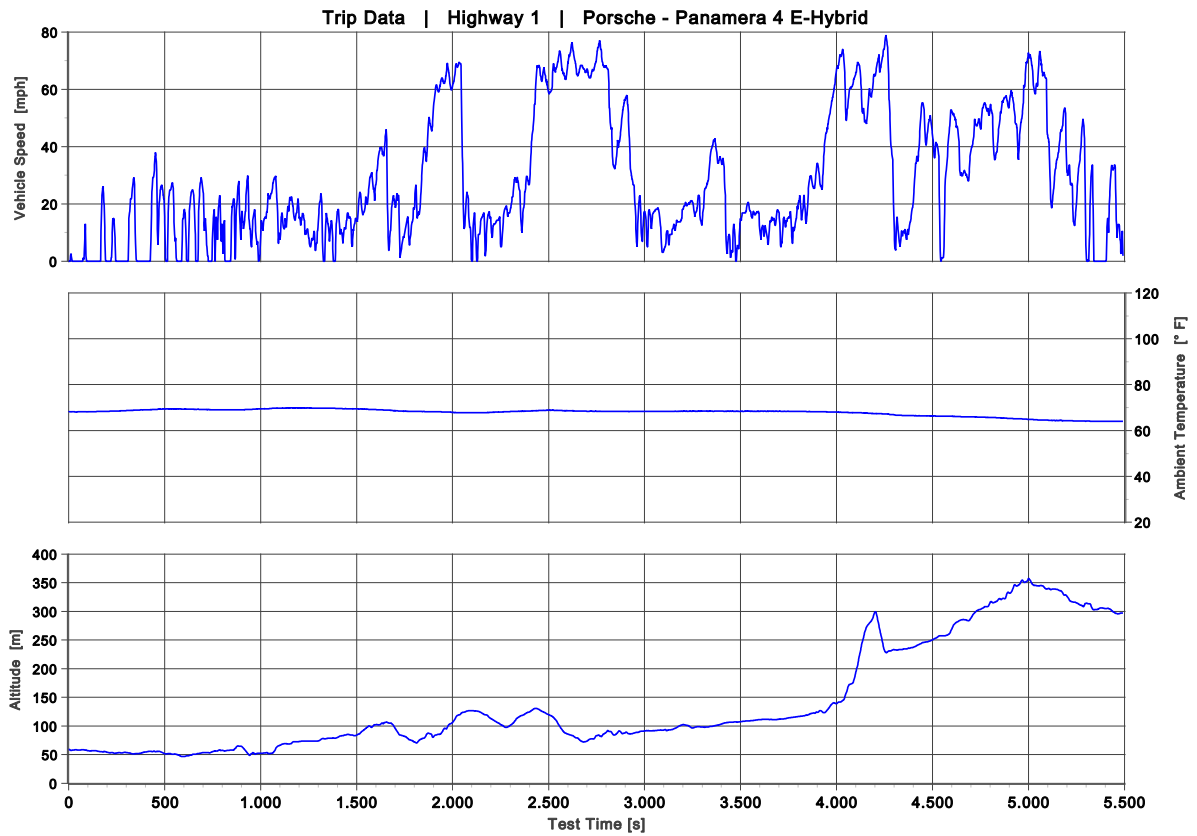


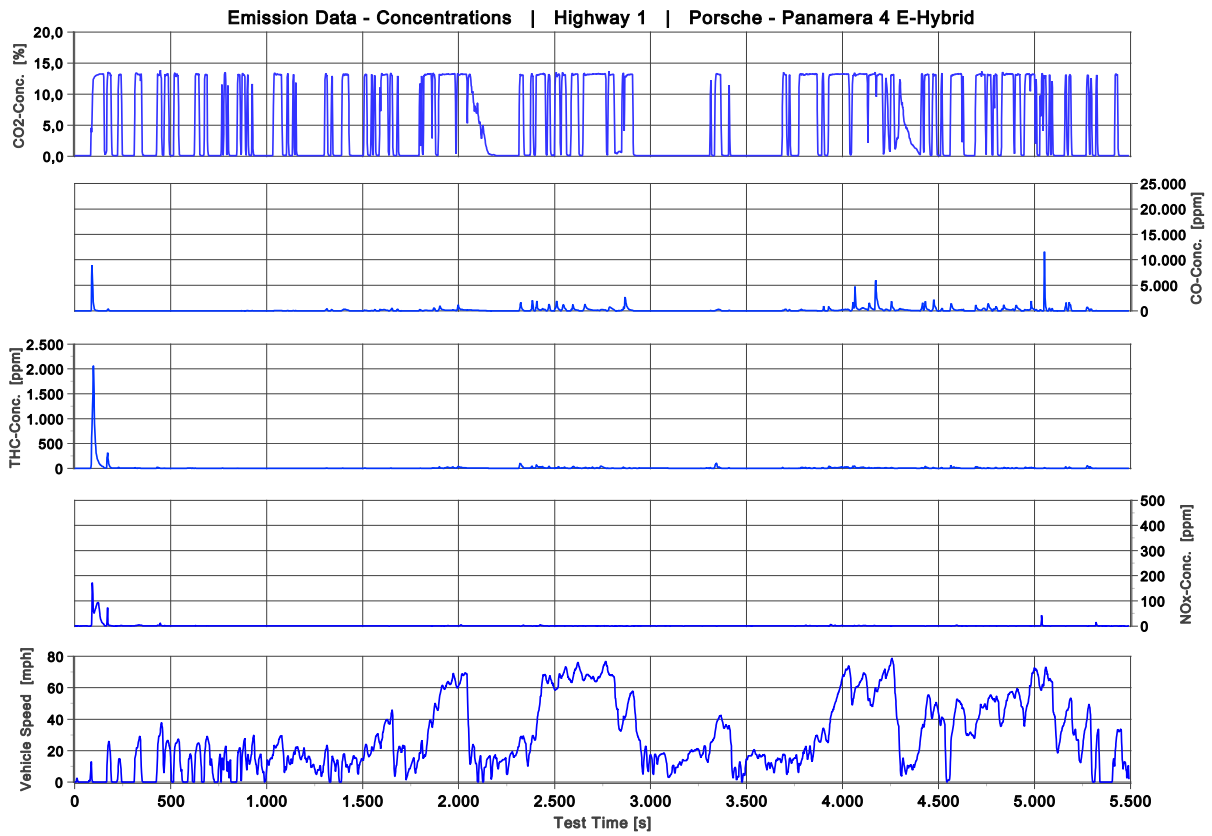


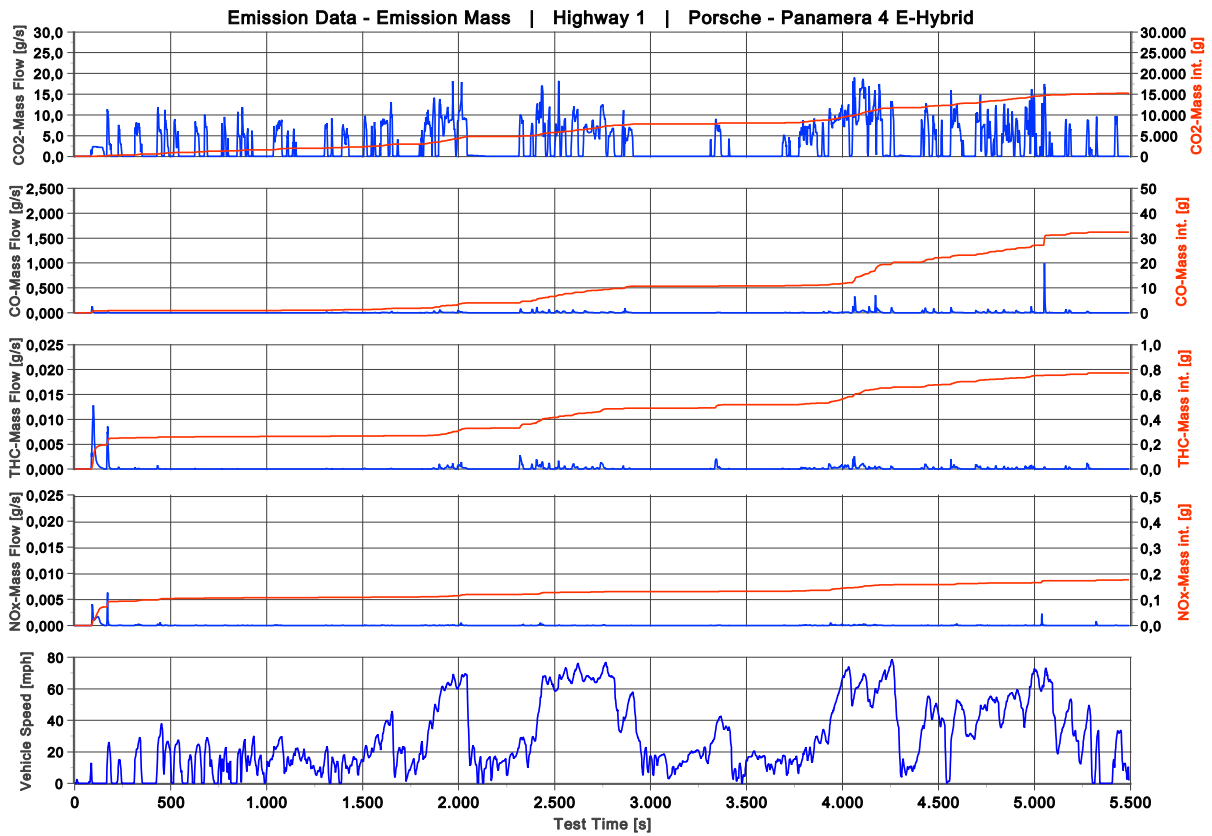
### 3.5.4 Highway (1)

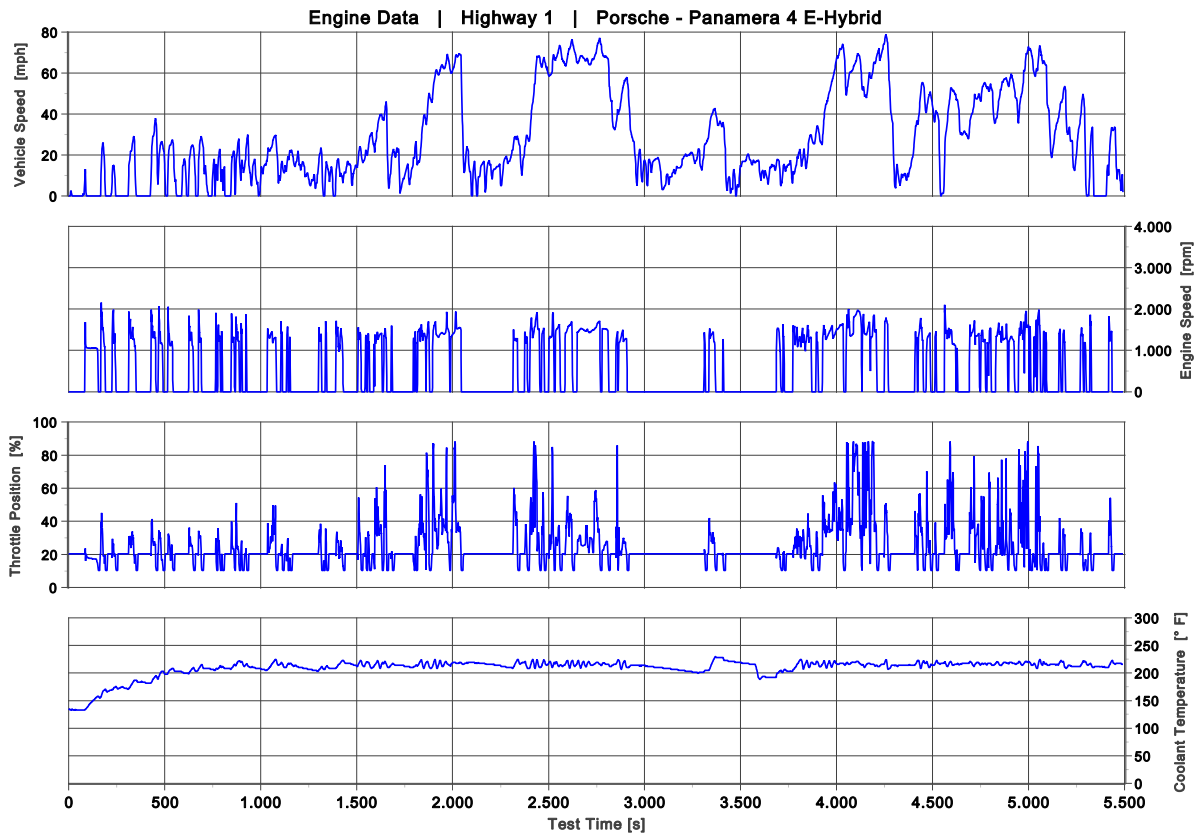
Table 3-20: Highway (1) Trip Summary for Panamera 4 E-Hybrid

Test Data			
Test Name:	2019-05-07_Panamera-4_E-Hybrid_Highway		
Department:	MBtech	Test Date:	05/07/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	340
Vehicle Modell:	Panamera 4 E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP0AE2A77KL123390	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 900
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	352,8	
CO	[g/mi]	0,749	
NO <sub>x</sub>	[g/mi]	0,004	
THC	[g/mi]	0,018	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5492	
Distance	[mi]	43,24	
Average Speed	[mph]	28,3	
Average Ambient Temperature	[°F]	67,9	







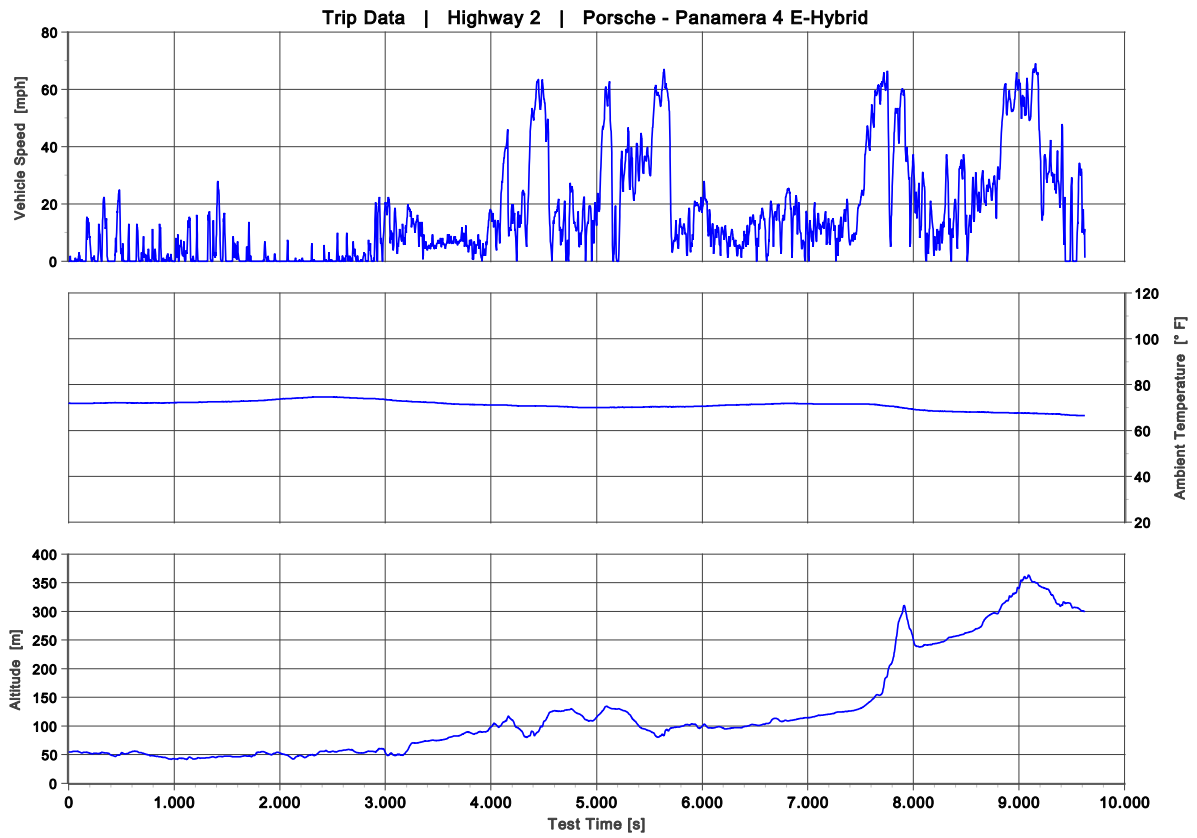


### 3.5.5 Highway (2)

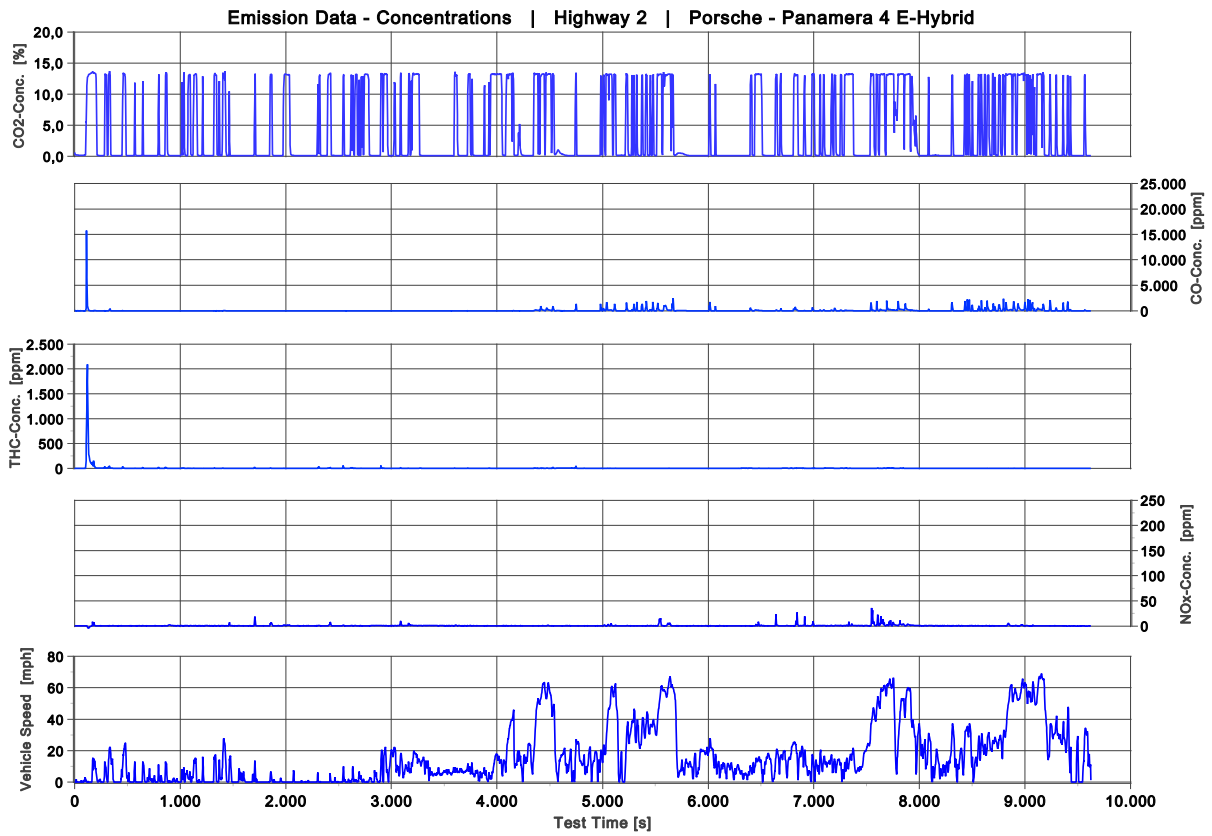
Table 3-21: Highway (2) Trip Summary for Panamera 4 E-Hybrid

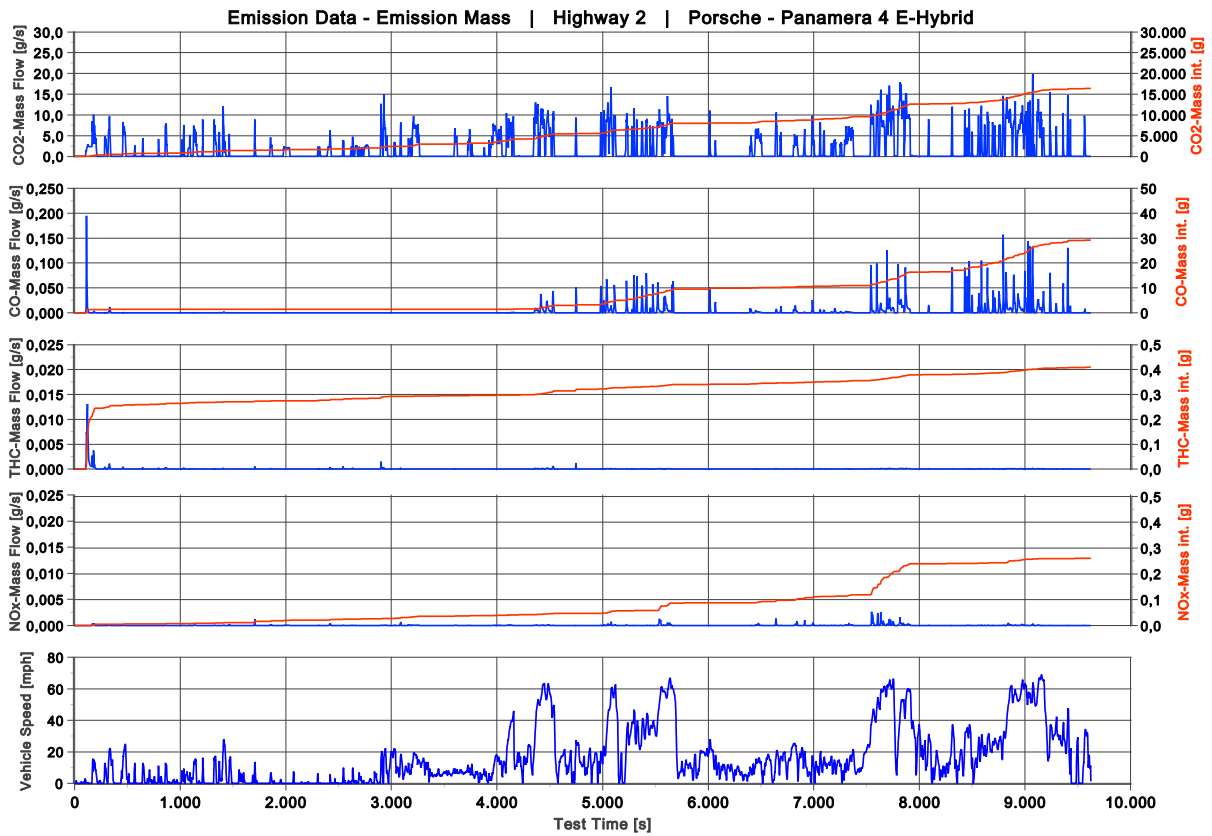
Test Data			
Test Name:	2019-05-10_Panamera-4_E-Hybrid_Highway		
Department:	MBtech	Test Date:	05/10/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	340
Vehicle Modell:	Panamera 4 E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP0AE2A77KL123390	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 900
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	381,8	
CO	[g/mi]	0,678	
NO <sub>x</sub>	[g/mi]	0,006	
THC	[g/mi]	0,010	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	9625	
Distance	[mi]	42,96	
Average Speed	[mph]	16,1	
Average Ambient Temperature	[°F]	71,1	

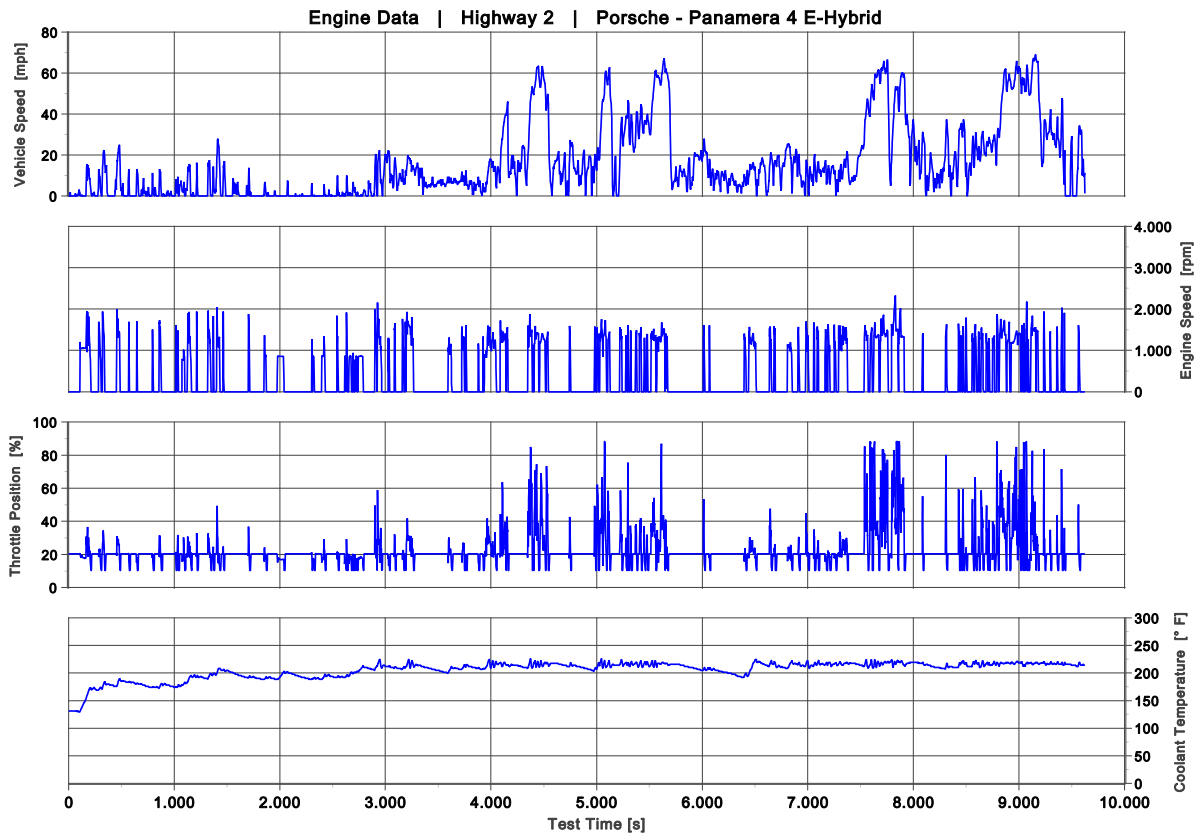
Test deemed invalid due to long duration caused by traffic.









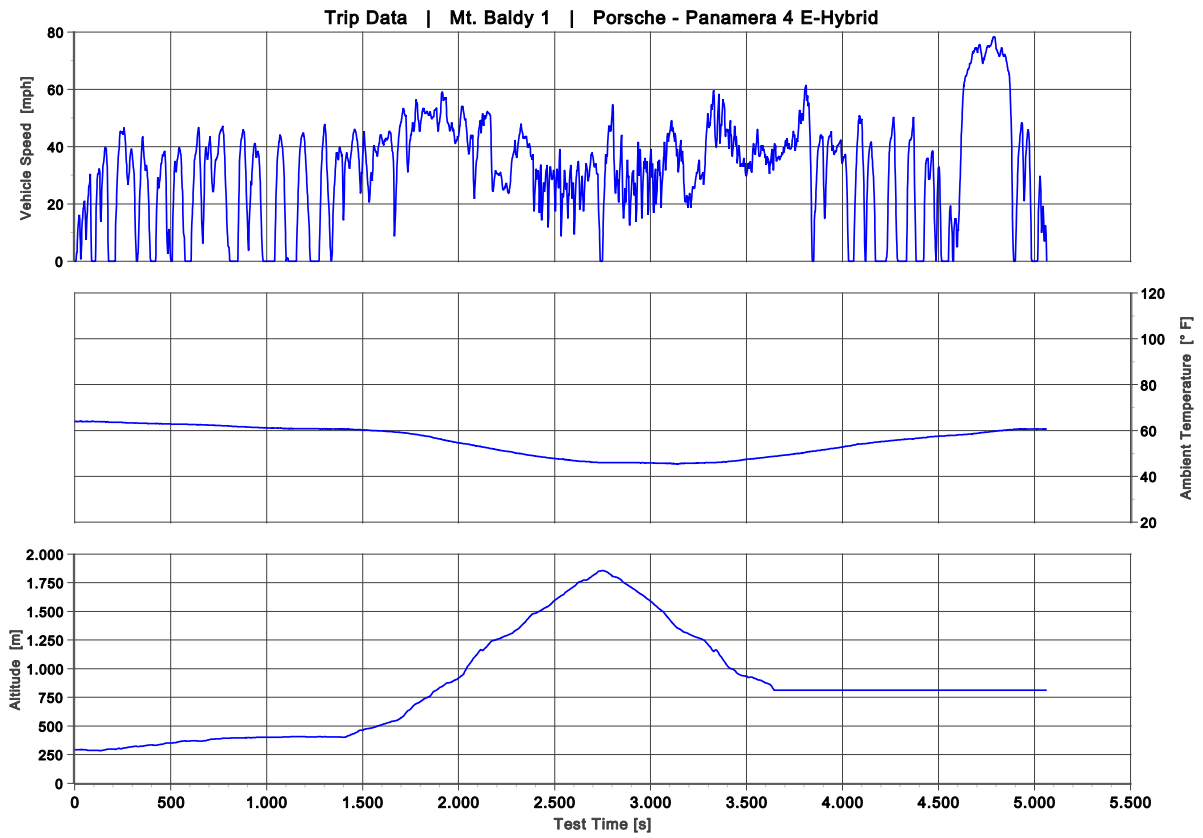


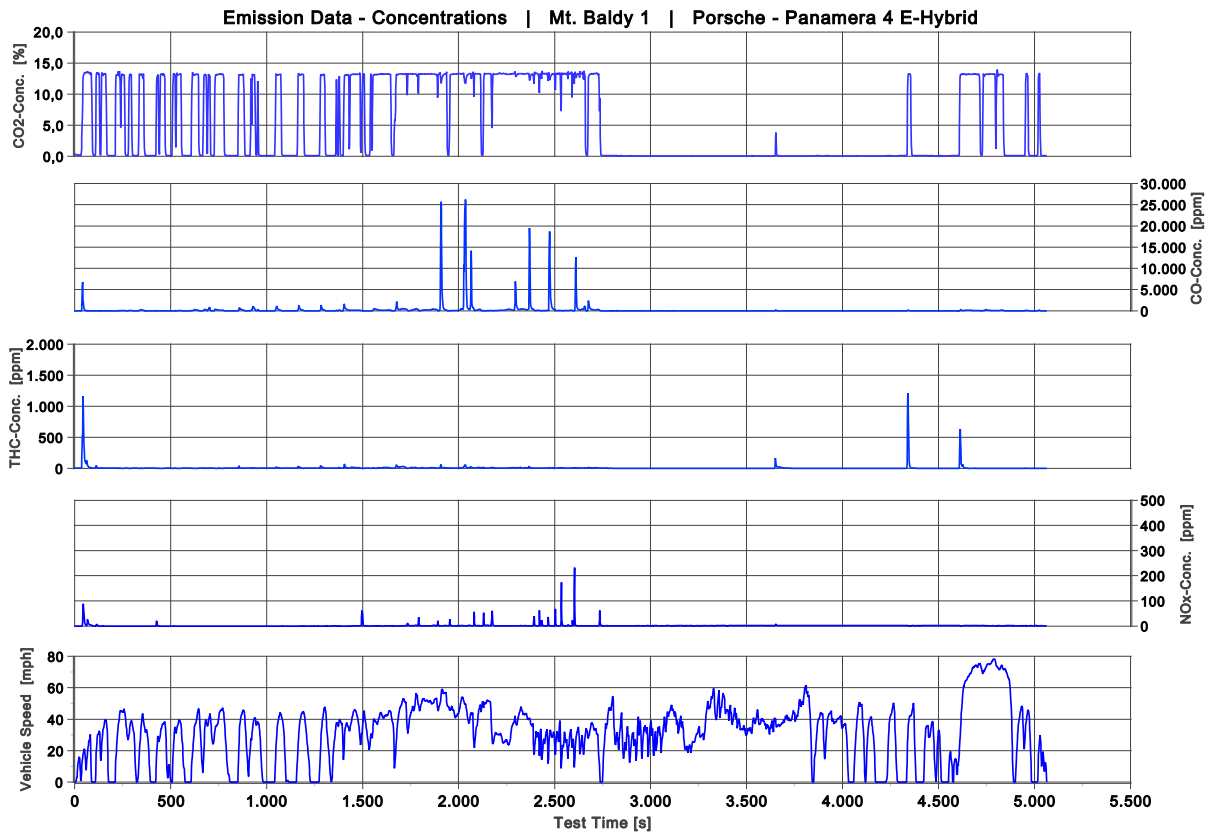
### 3.5.6 Mt. Baldy (1)

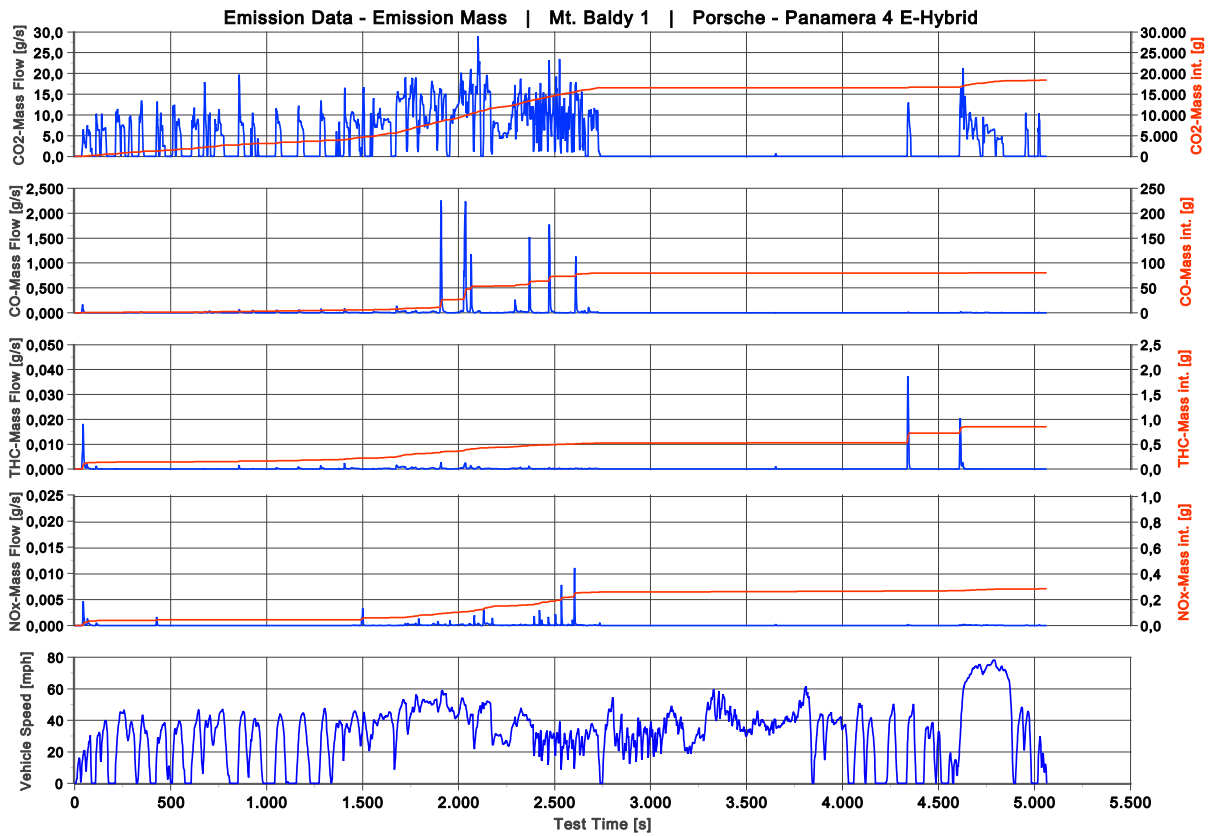
Table 3-22: Mt. Baldy (1) Trip Summary for Panamera 4 E-Hybrid

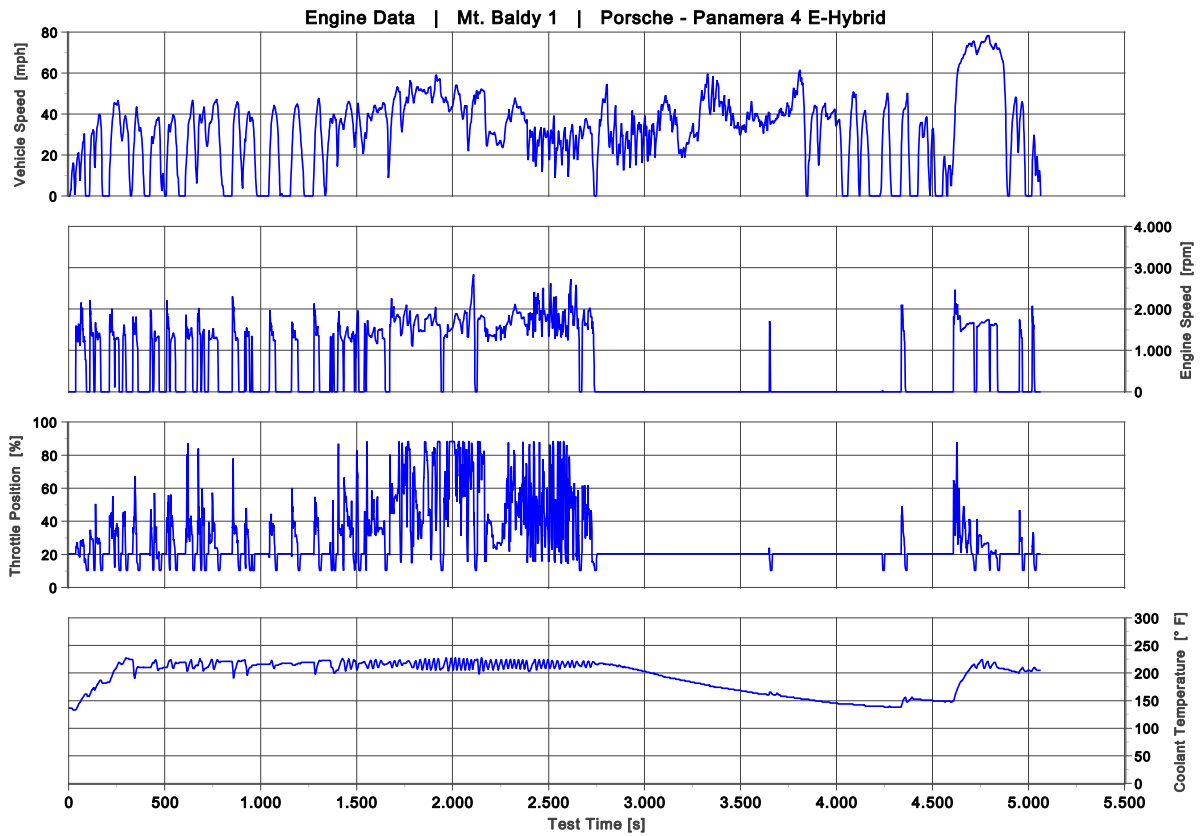
Test Data			
Test Name:	2019-05-07_Panamera-4_E-Hybrid_Mt.Baldy		
Department:	MBtech	Test Date:	05/07/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	340
Vehicle Modell:	Panamera 4 E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP0AE2A77KL123390	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 900
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	416,5	
CO	[g/mi]	1,826	
NO <sub>x</sub>	[g/mi]	0,006	
THC	[g/mi]	0,019	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5064	
Distance	[mi]	44,11	
Average Speed	[mph]	31,4	
Average Ambient Temperature	[°F]	55,3	

Test deemed invalid due to analyzer drift for THC.







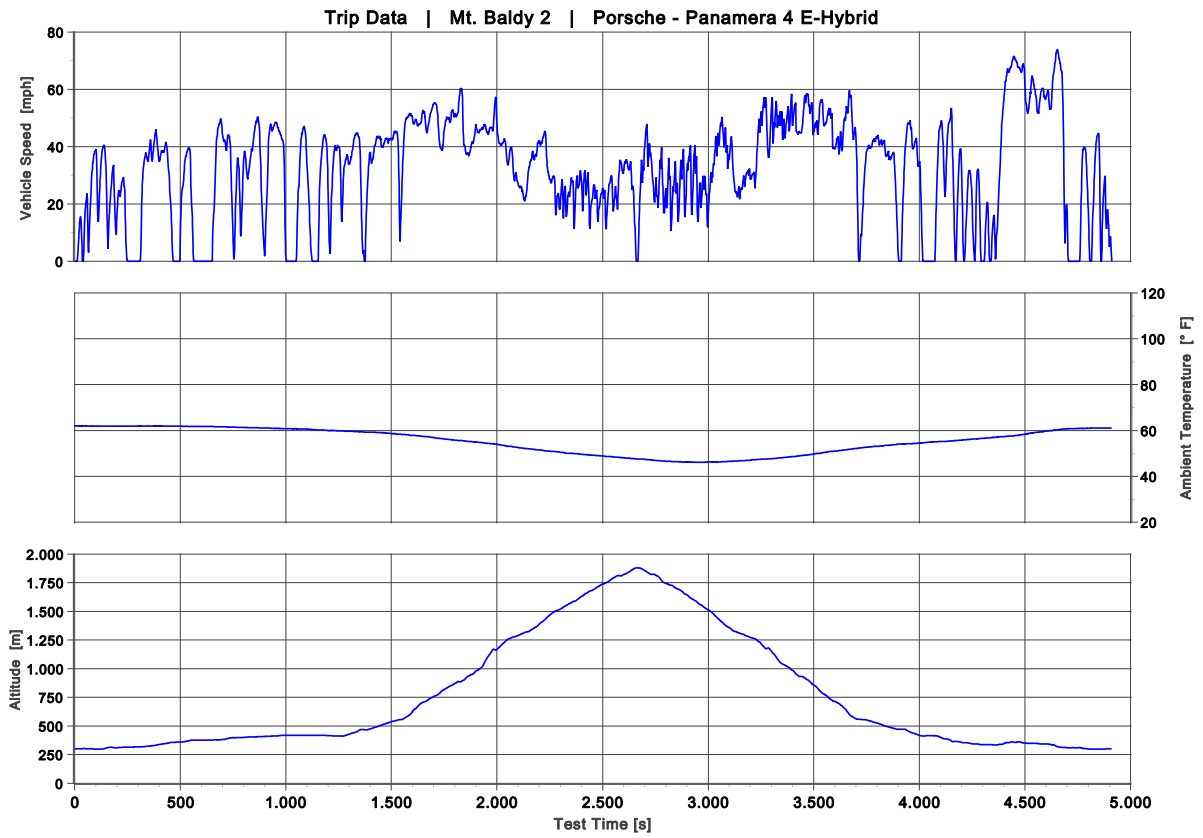


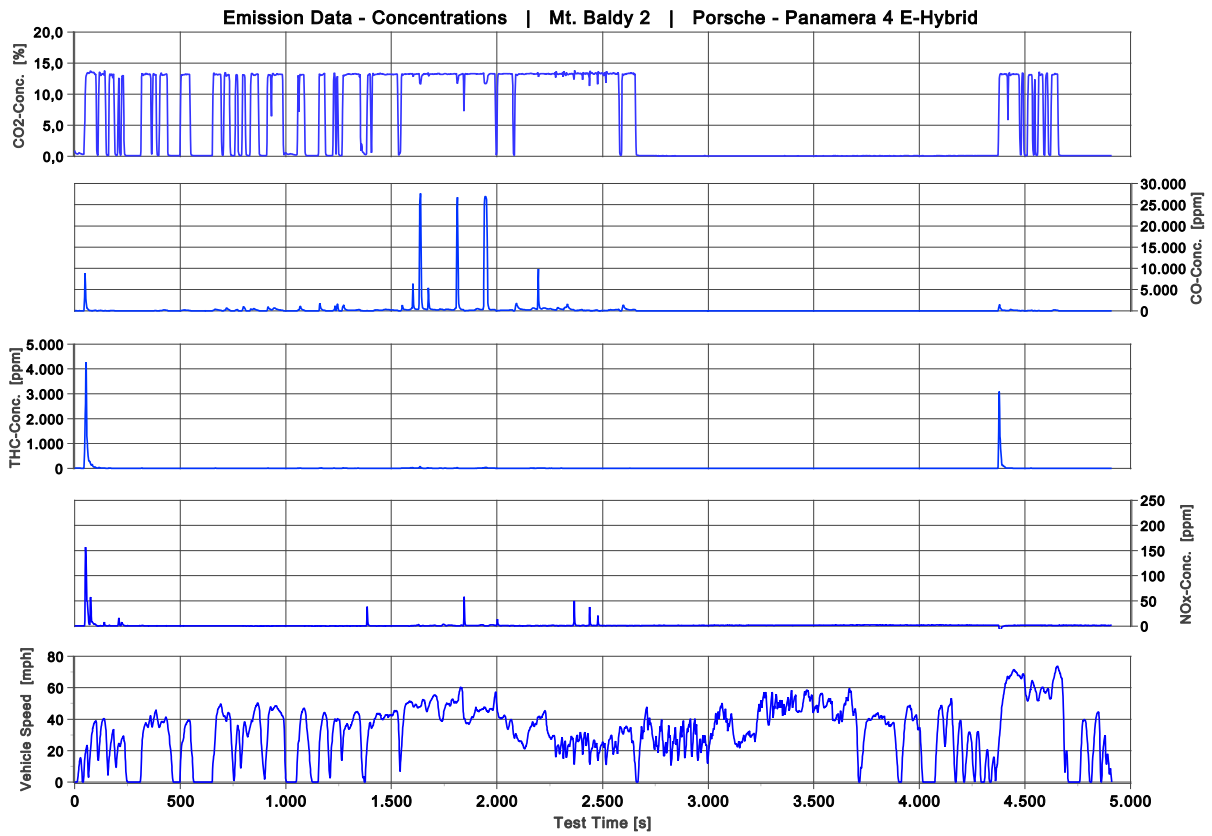


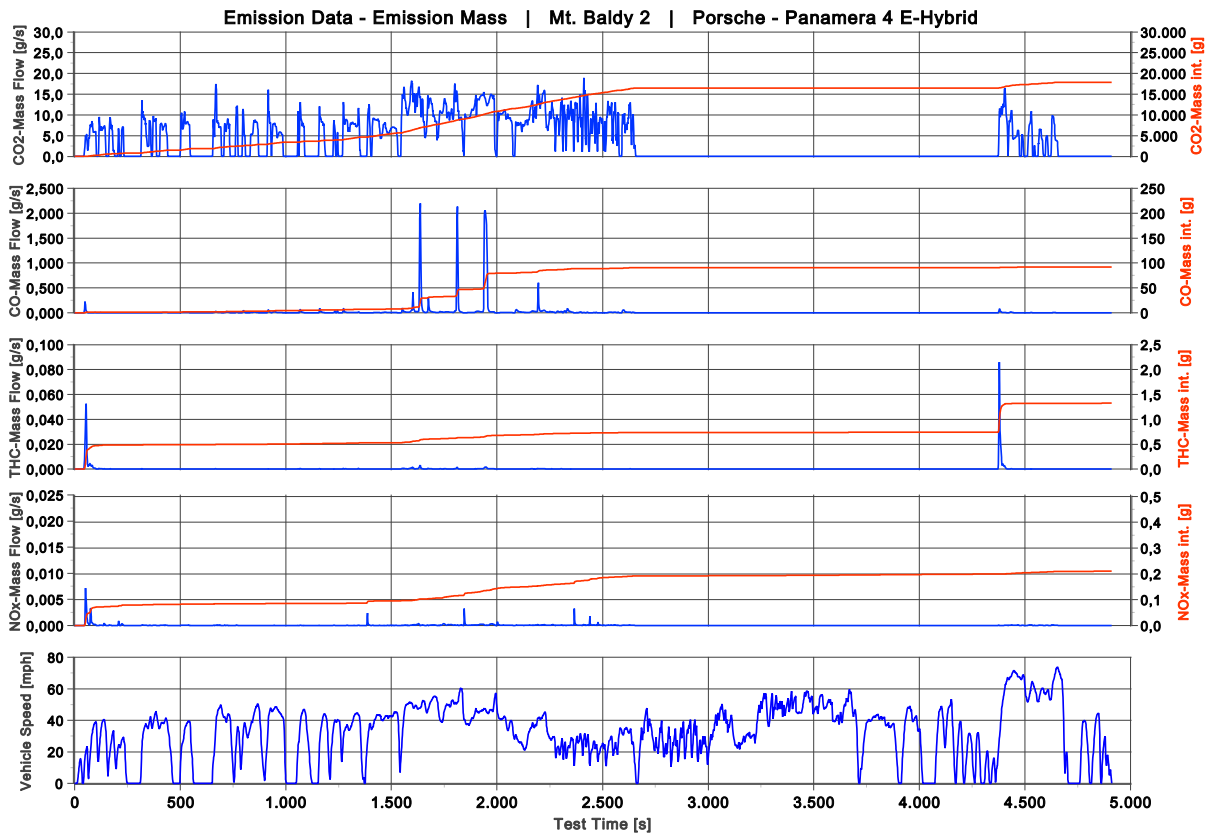
### 3.5.7 Mt. Baldy (2)

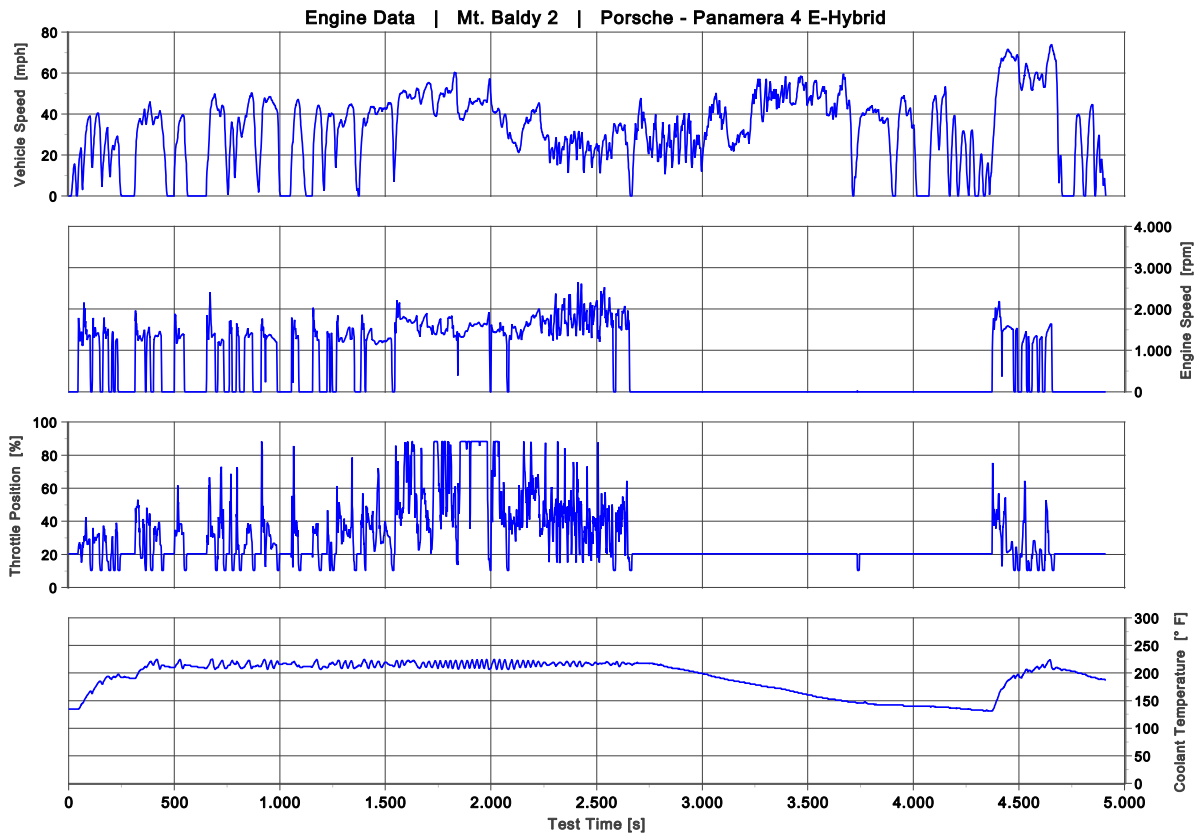
Table 3-23: Mt. Baldy (2) Trip Summary for Panamera 4 E-Hybrid

Test Data			
Test Name:	2019-05-10_Panamera-4_E-Hybrid_Mt.Baldy		
Department:	MBtech	Test Date:	05/10/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	340
Vehicle Modell:	Panamera 4 E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP0AE2A77KL123390	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 900
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	405,1	
CO	[g/mi]	2,077	
NO <sub>x</sub>	[g/mi]	0,005	
THC	[g/mi]	0,030	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	4911	
Distance	[mi]	44,12	
Average Speed	[mph]	32,3	
Average Ambient Temperature	[°F]	55,4	









### 3.6 Panamera Turbo S E-Hybrid

The following table summarizes the emission measurement results from the Panamera Turbo S E-Hybrid vehicle.

Table 3-24: Emission Overview Porsche - Panamera Turbo S E-Hybrid

Panamera Turbo S E-Hybrid		Emissions				Test		
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]	Battery- level at start
05/16/2019	LA Downtown	505,6	0,027	0,008	0,007	4769	15,36	< 20%
05/17/2019	Highway (1)*	378,7	0,372	0,009	0,009	3526	43,35	< 20%
05/23/2019	Highway (2)*	400,6	0,409	0,006	0,024	4092	43,34	< 20%
05/24/2019	Highway (3)	379,6	0,451	0,004	0,015	3246	43,39	< 20%
05/17/2019	Mt. Baldy (1)****	478,5	0,605	0,005	0,033	12033	43,89	< 20%
05/24/2019	Mt. Baldy (2)	417,3	0,464	0,006	0,015	5008	44,03	< 20%
05/29/2019	FTP75 (PEMS)	432,0	0,181	0,006	0,039	2523	10,75	< 20%
05/29/2019	FTP75 (Dyno)	379,8	0,194	0,003	0,040		11,02	

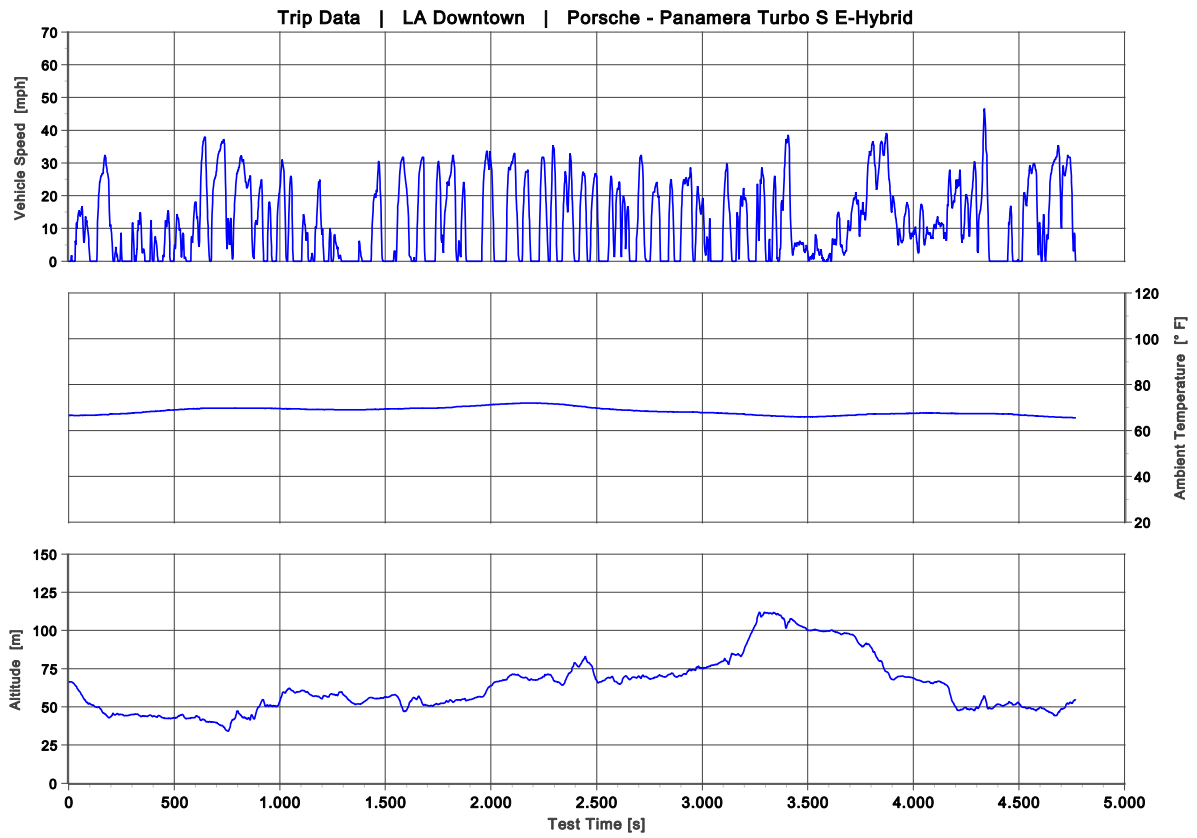
\*: Test deemed invalid due to analyzer drift for THC.

\*\*\*\*: Test deemed invalid due to long duration caused by Amgen Tour of California bicycle race.

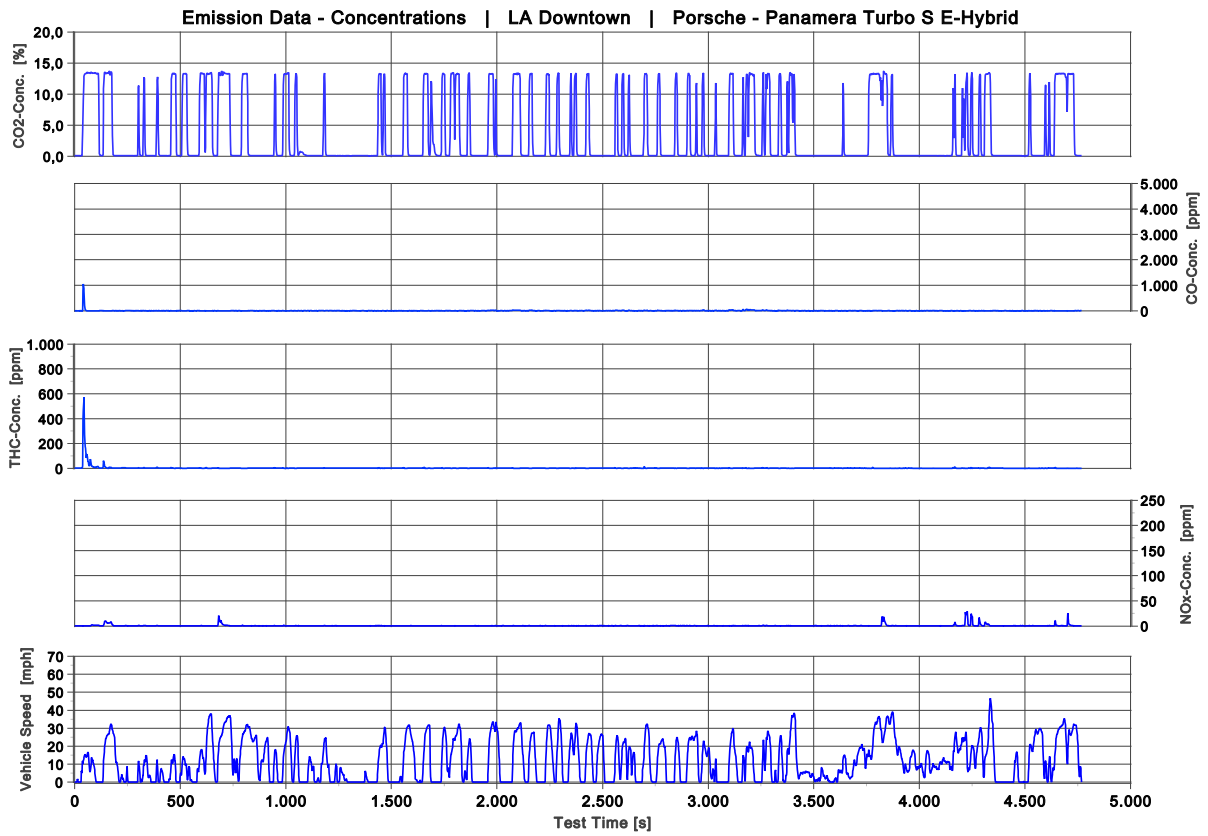
### 3.6.1 LA Downtown

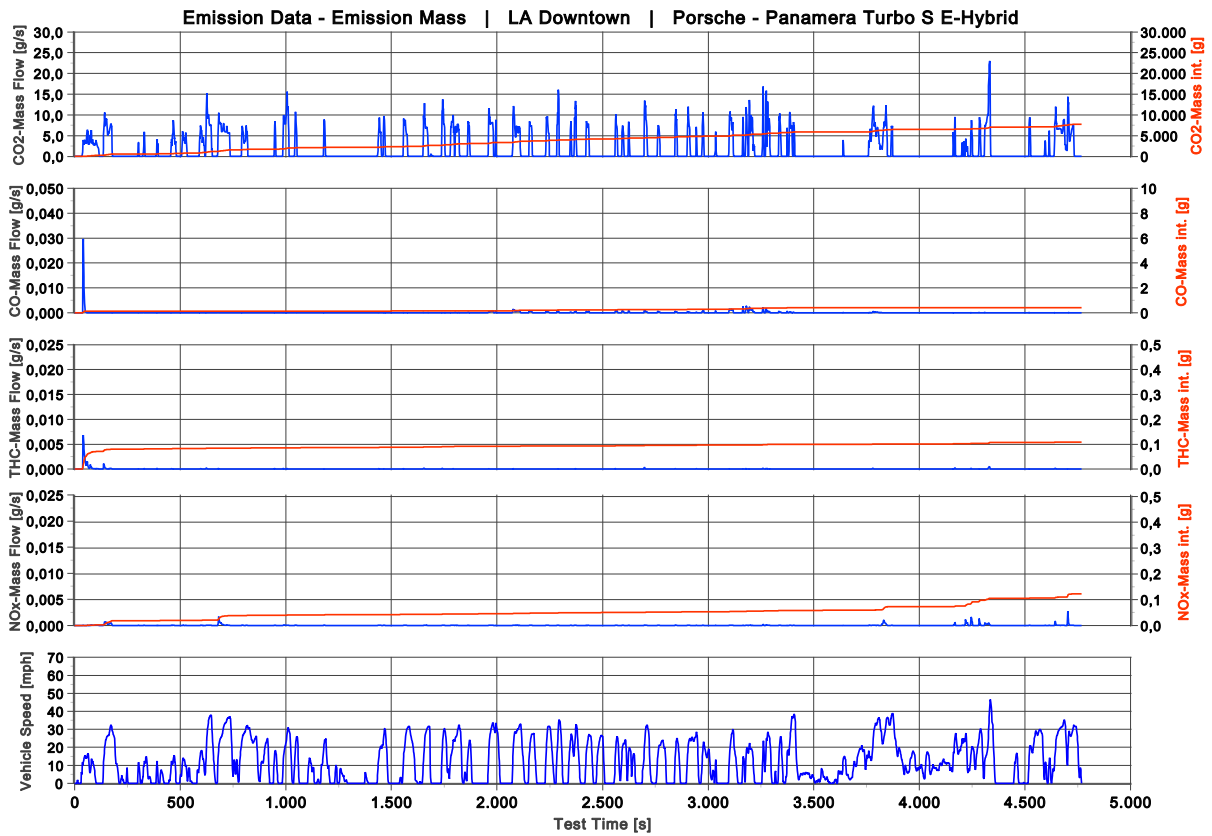
Table 3-25: LA Downtown Trip Summary for Panamera Turbo S E-Hybrid

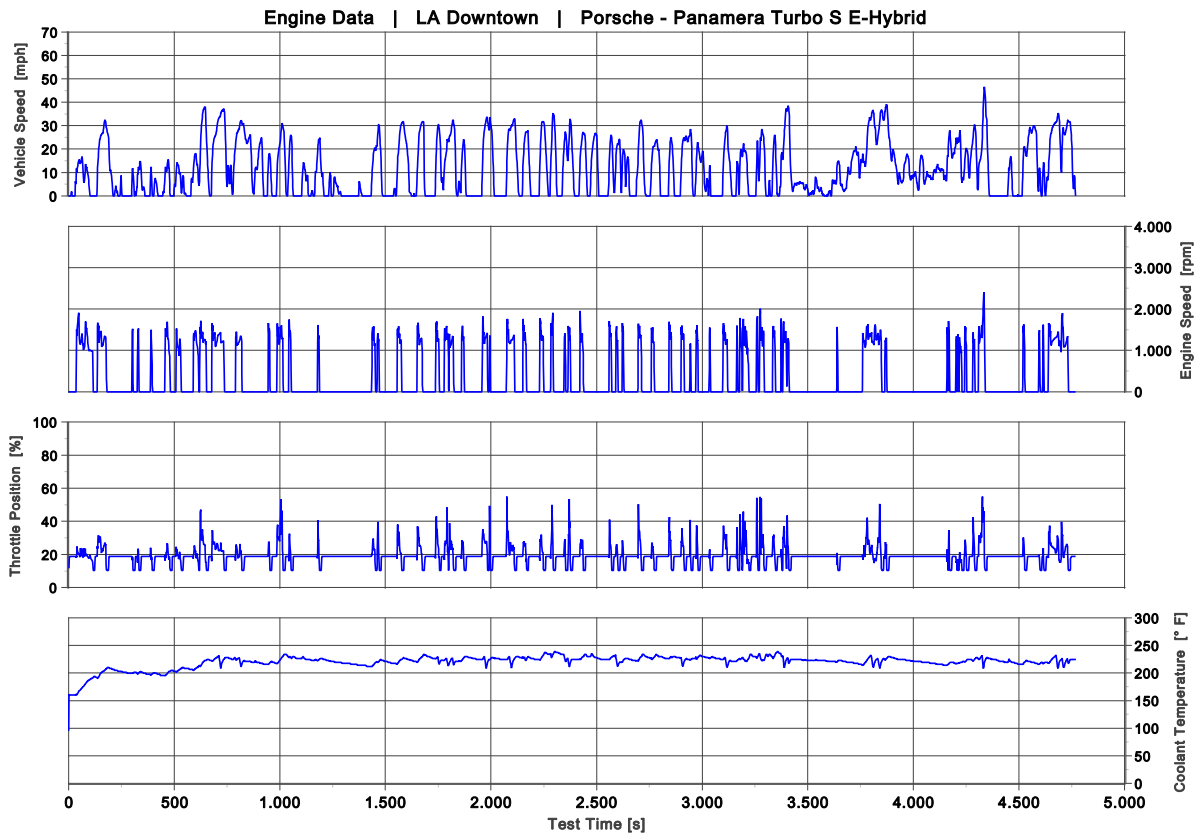
Test Data			
Test Name:	2019-05-16_Panamera-Turbo-S_E-Hybrid_LA-Downtown		
Department:	MBtech	Test Date:	05/16/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	500
Vehicle Modell:	Panamera Turbo S E-Hybrid	Nominal Torque [Nm]:	850
VIN:	WP0AH2A74KL147038	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1120
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	505,6	
CO	[g/mi]	0,027	
NO <sub>x</sub>	[g/mi]	0,008	
THC	[g/mi]	0,007	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	4769	
Distance	[mi]	15,36	
Average Speed	[mph]	11,6	
Average Ambient Temperature	[°F]	68,5	









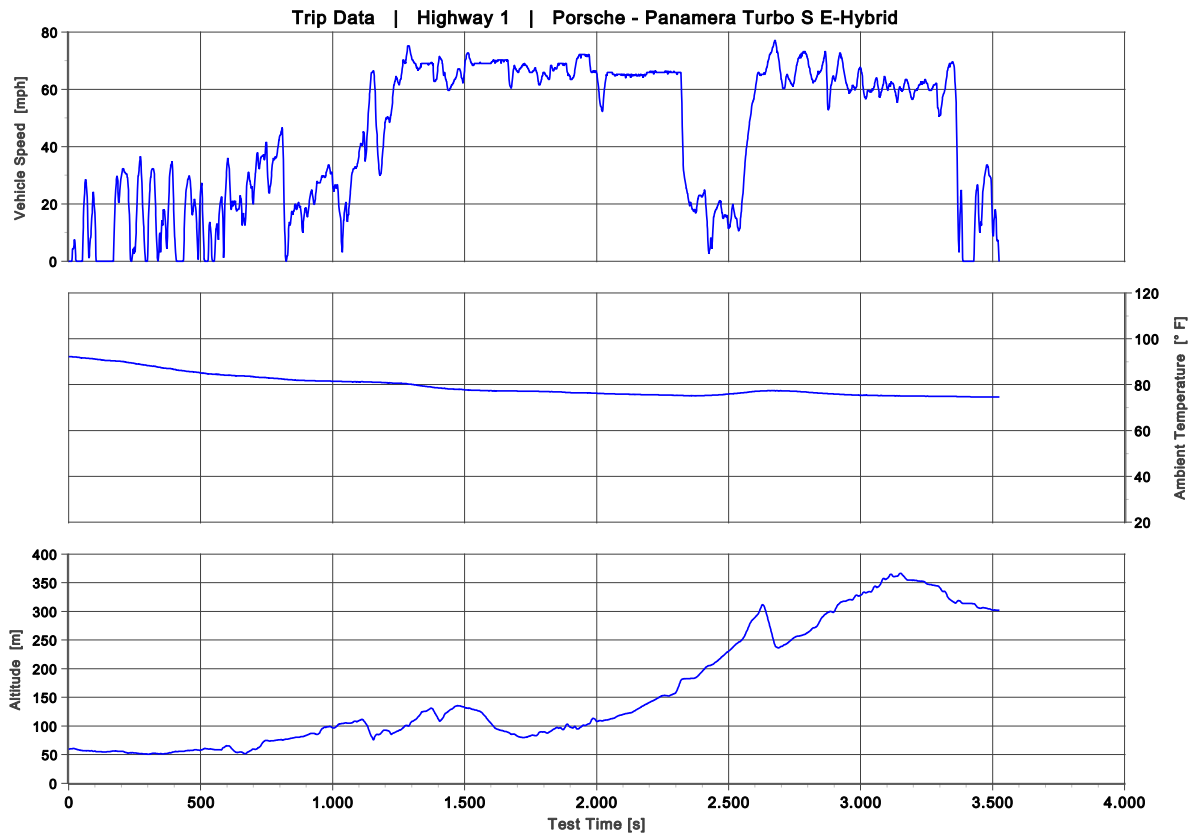


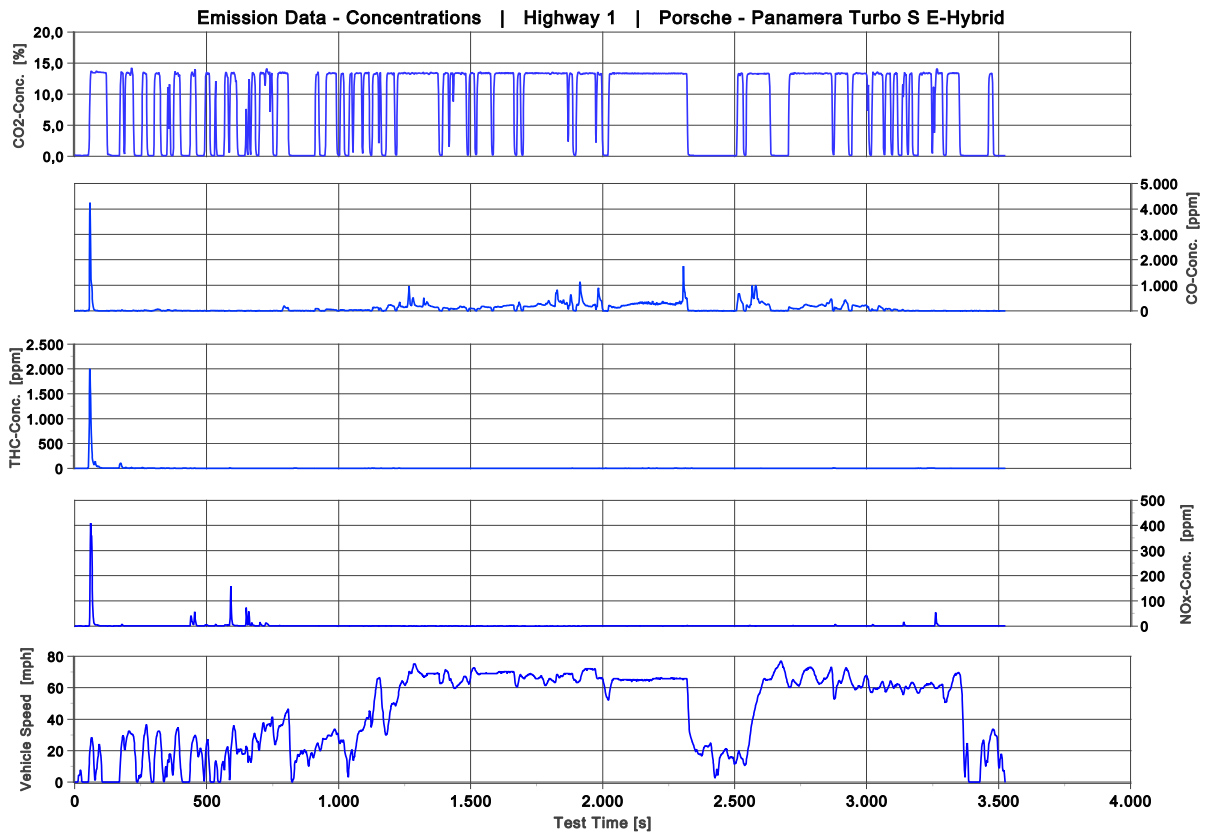
### 3.6.2 Highway (1)

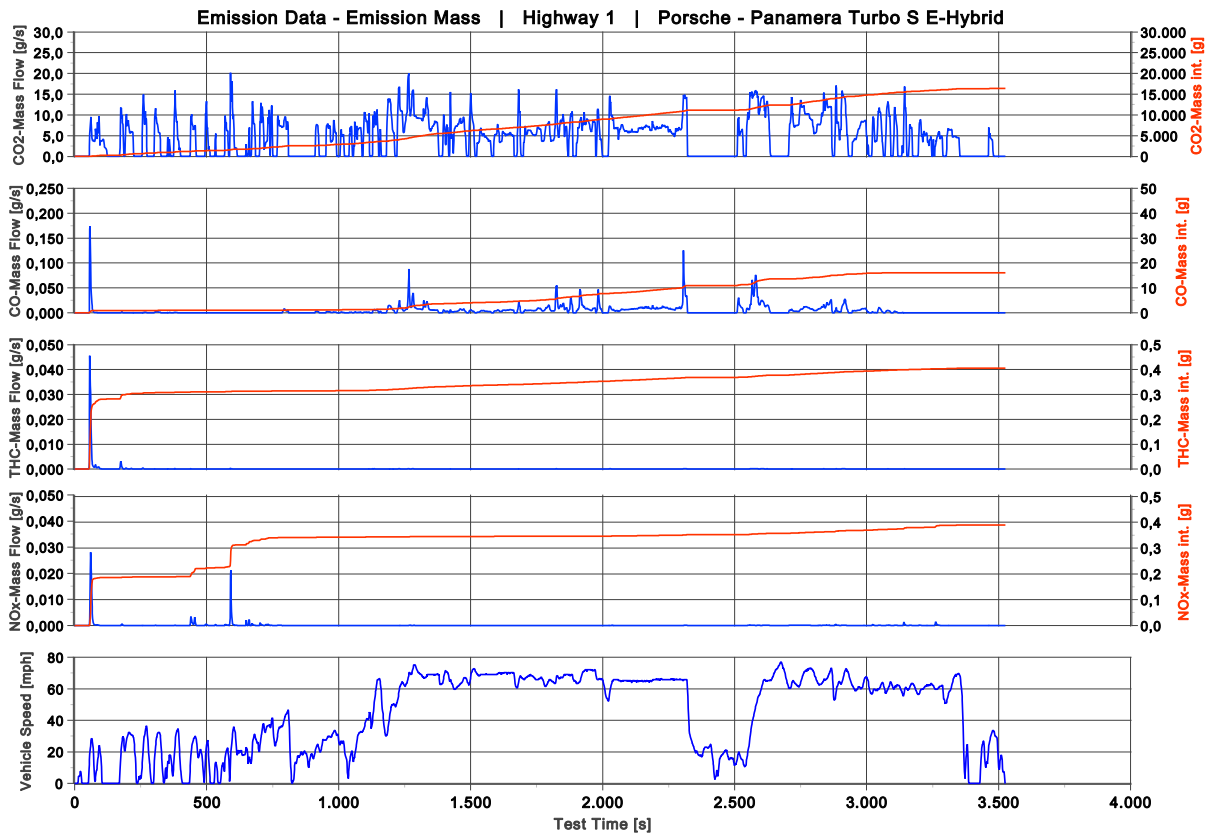
Table 3-26: Highway (1) Trip Summary for Panamera Turbo S E-Hybrid

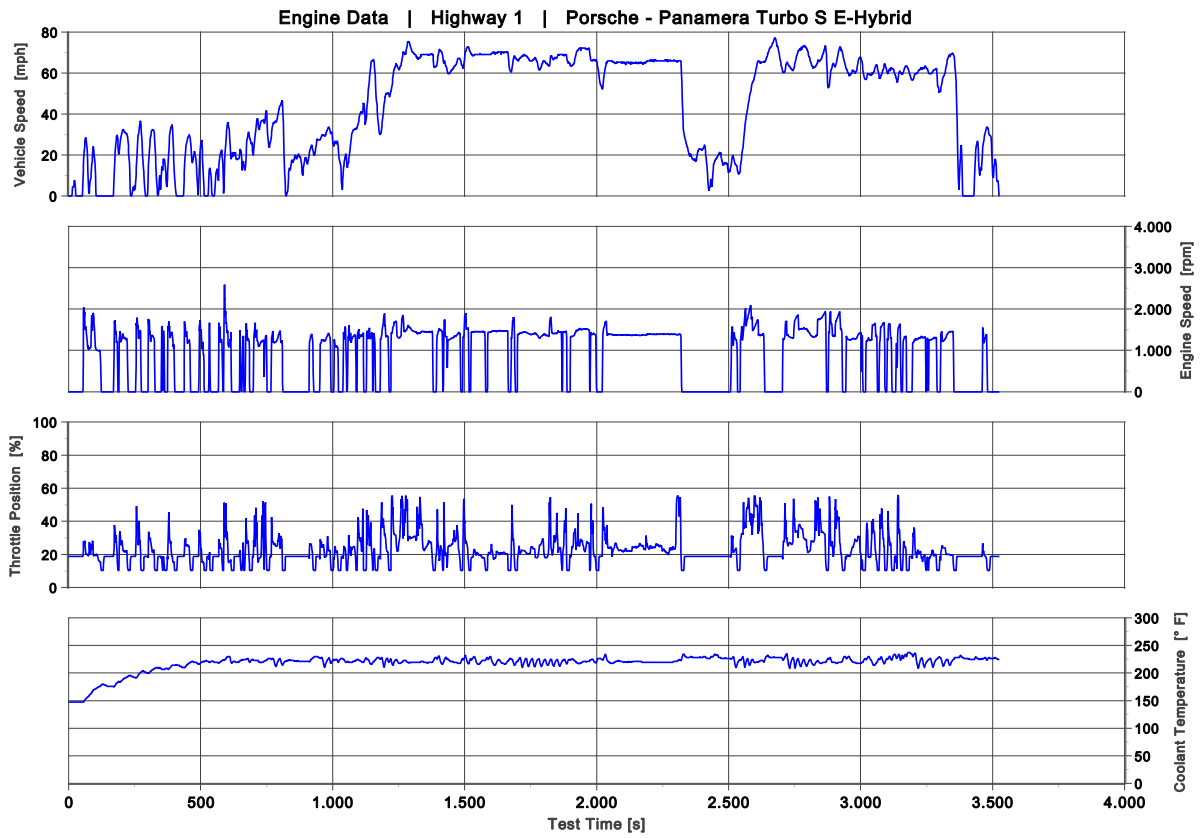
Test Data			
Test Name:	2019-05-17_Panamera-Turbo-S_E-Hybrid_Highway		
Department:	MBtech	Test Date:	05/17/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	500
Vehicle Modell:	Panamera Turbo S E-Hybrid	Nominal Torque [Nm]:	850
VIN:	WP0AH2A74KL147038	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1120
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	378,7	
CO	[g/mi]	0,372	
NO <sub>x</sub>	[g/mi]	0,009	
THC	[g/mi]	0,009	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3526	
Distance	[mi]	43,35	
Average Speed	[mph]	44,3	
Average Ambient Temperature	[°F]	79,4	

Test deemed invalid due to analyzer drift for THC.









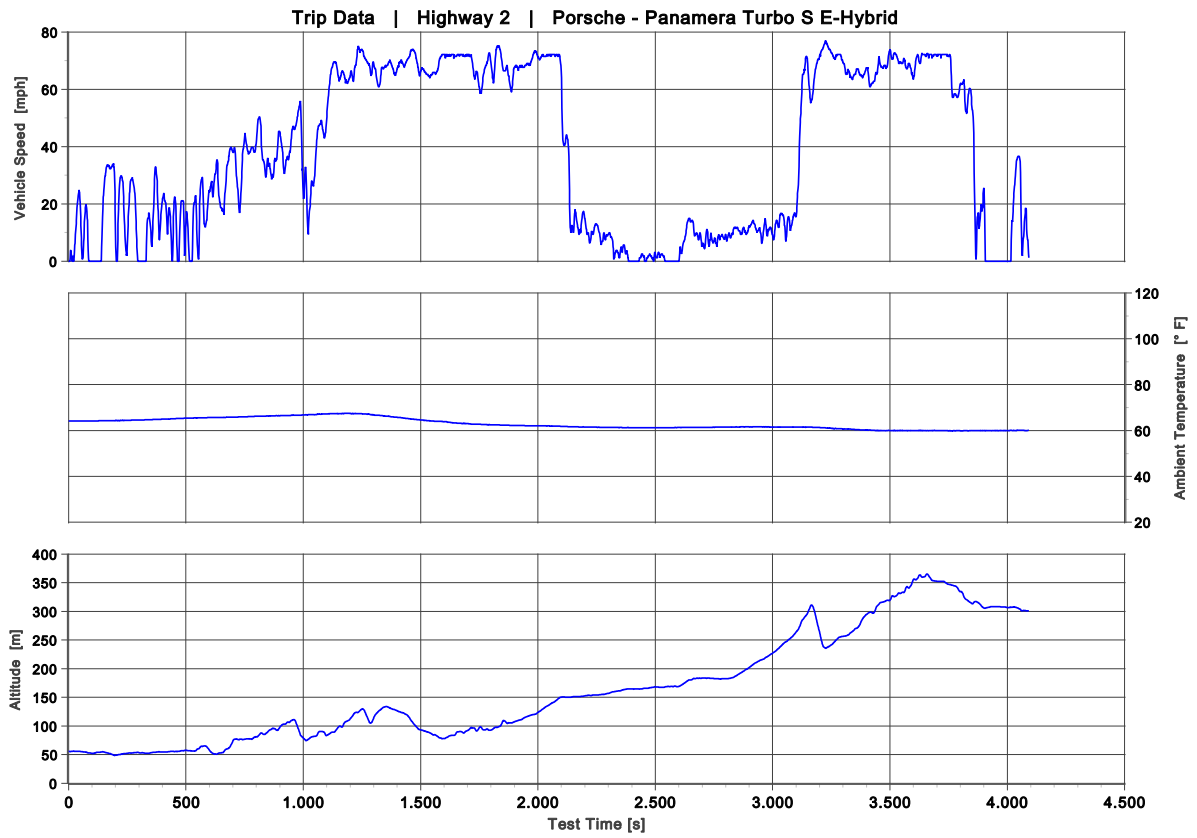


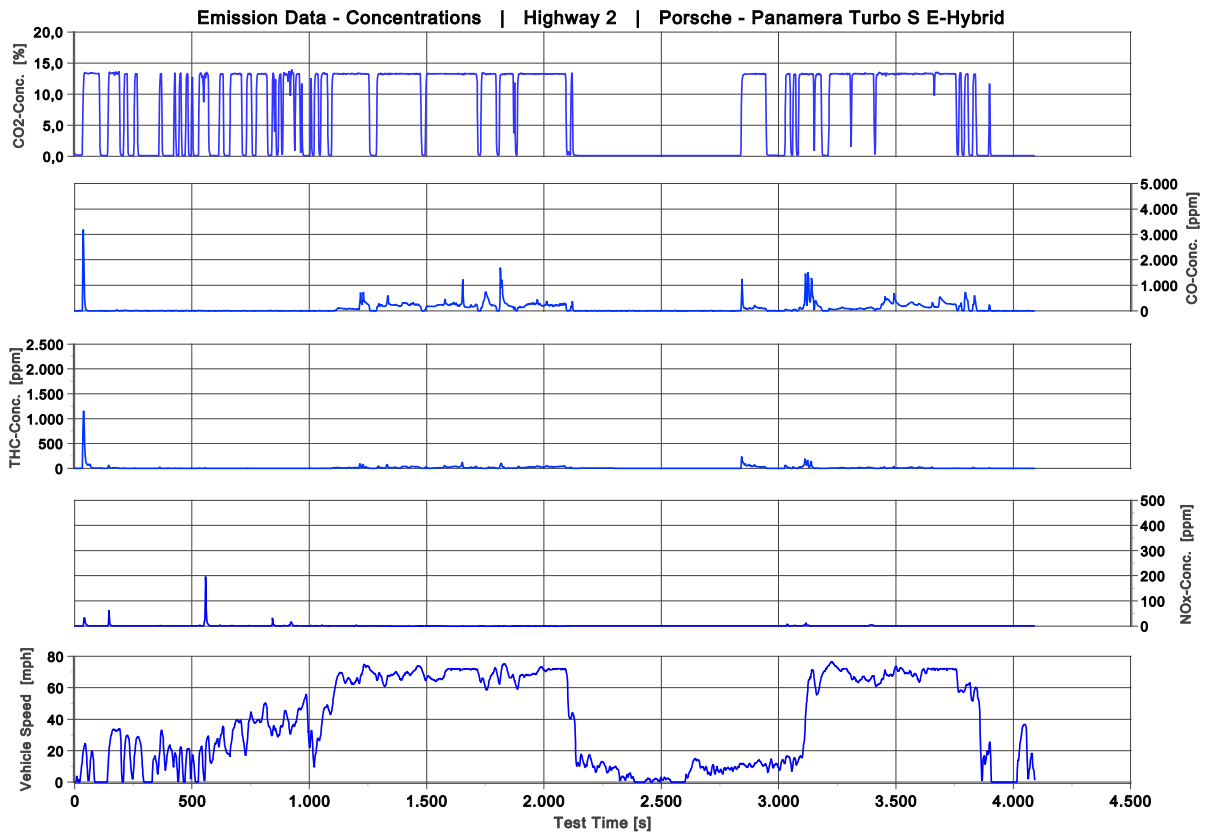
### 3.6.3 Highway (2)

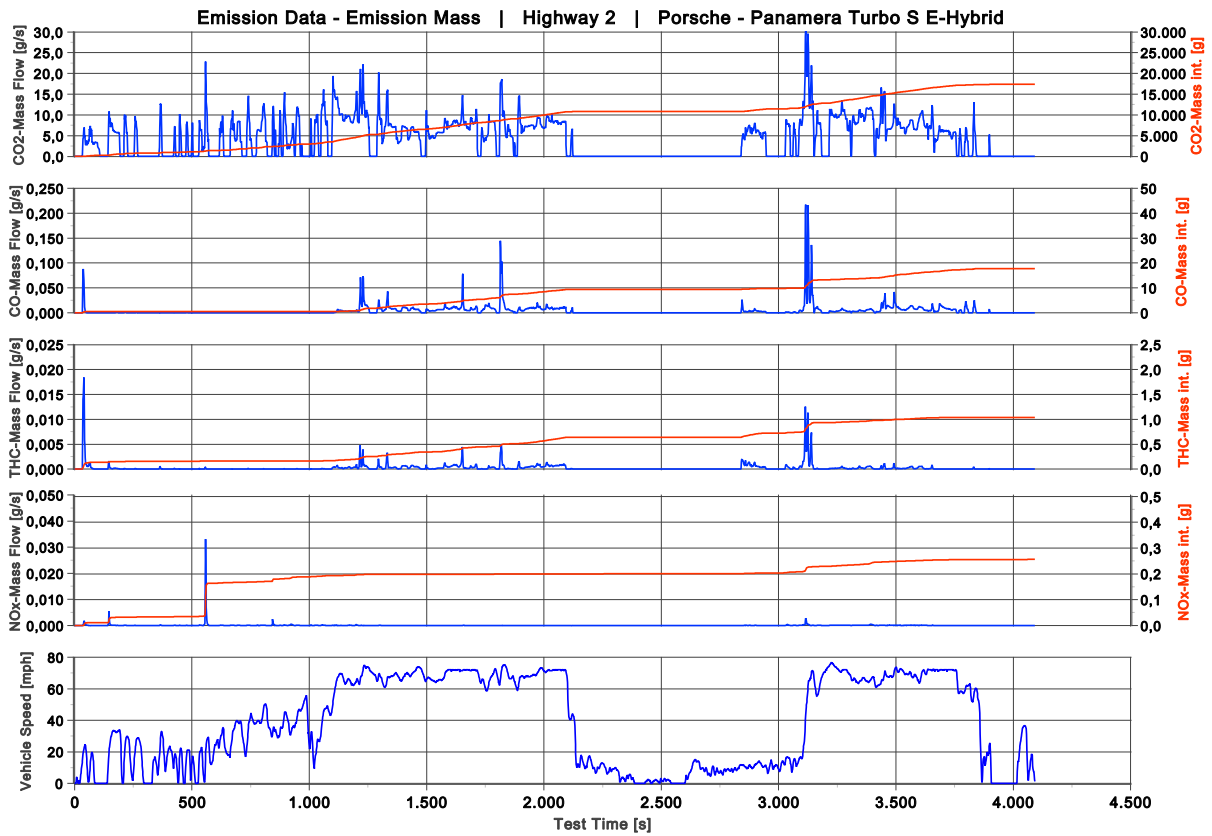
Table 3-27: Highway (2) Trip Summary for Panamera Turbo S E-Hybrid

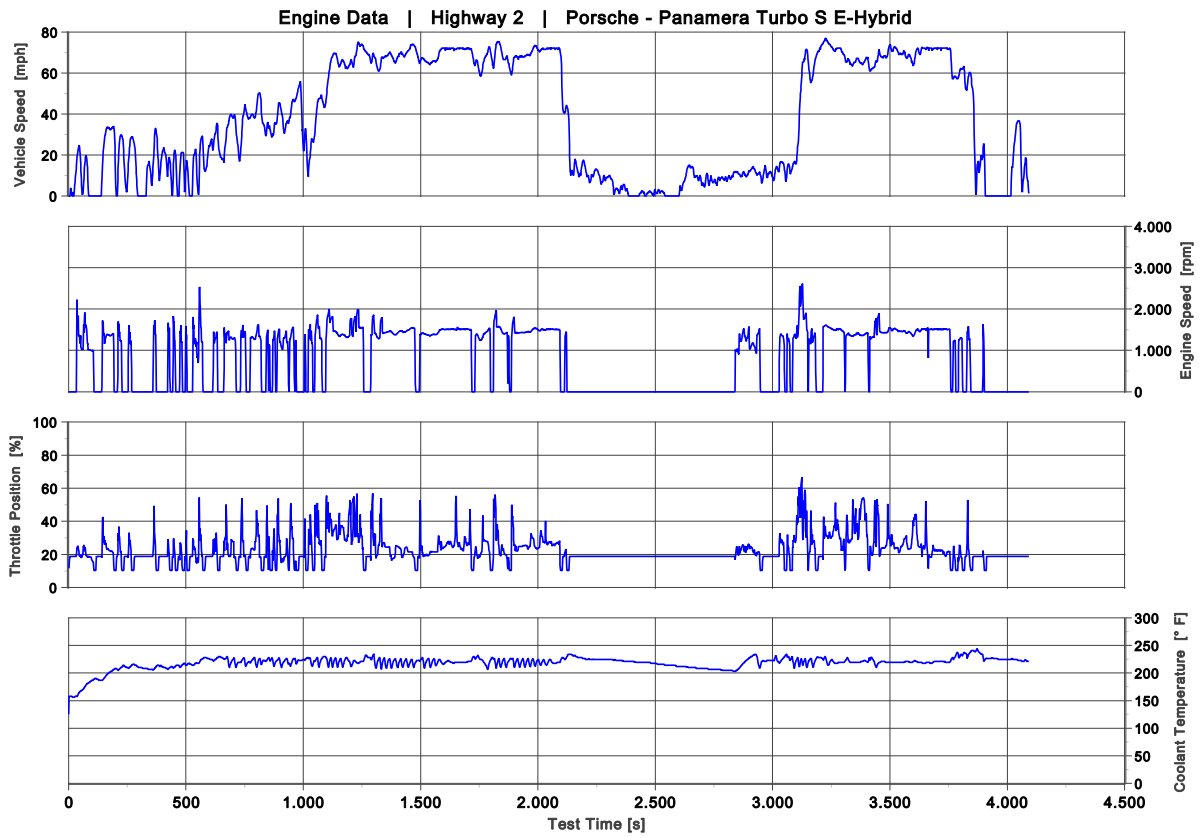
Test Data			
Test Name:	2019-05-23_Panamera-Turbo-S_E-Hybrid_Highway		
Department:	MBtech	Test Date:	05/23/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	500
Vehicle Modell:	Panamera Turbo S E-Hybrid	Nominal Torque [Nm]:	850
VIN:	WP0AH2A74KL147038	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1120
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	400,6	
CO	[g/mi]	0,409	
NO <sub>x</sub>	[g/mi]	0,006	
THC	[g/mi]	0,024	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	4092	
Distance	[mi]	43,34	
Average Speed	[mph]	38,1	
Average Ambient Temperature	[°F]	62,9	

Test deemed invalid due to analyzer drift for THC.





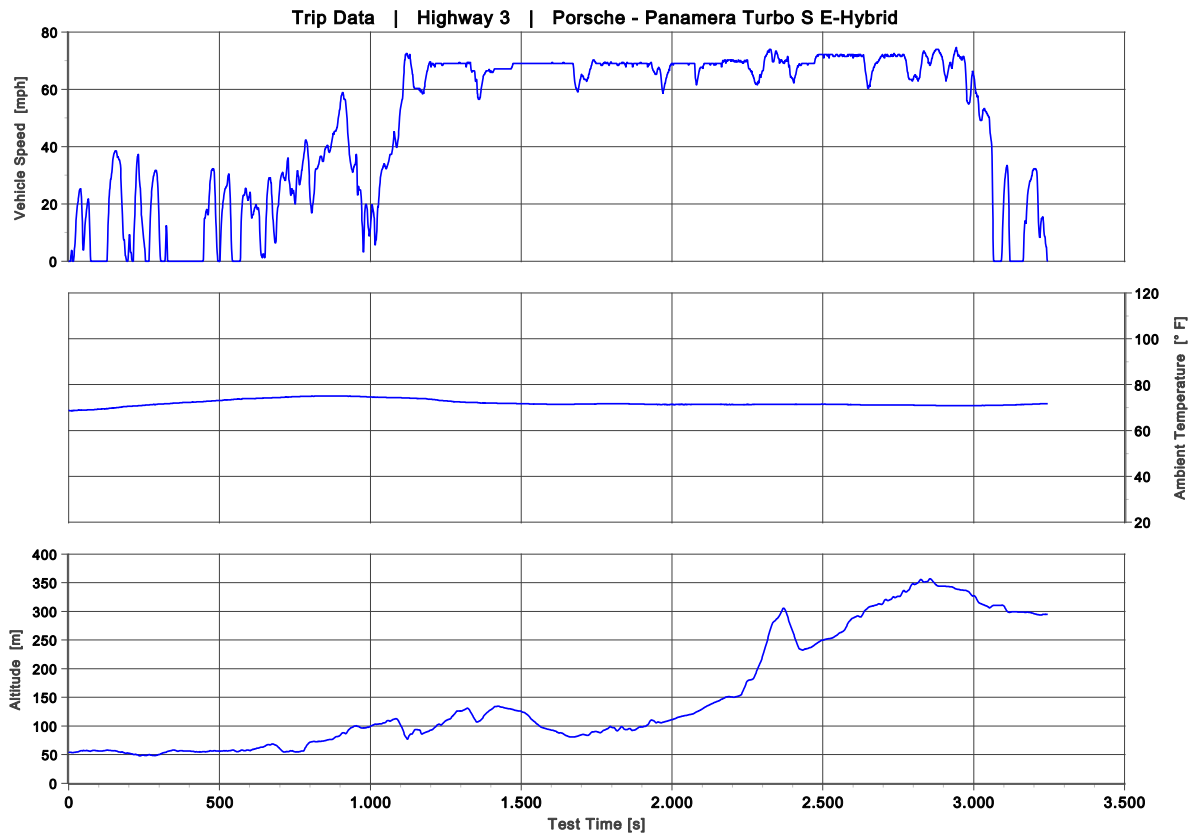


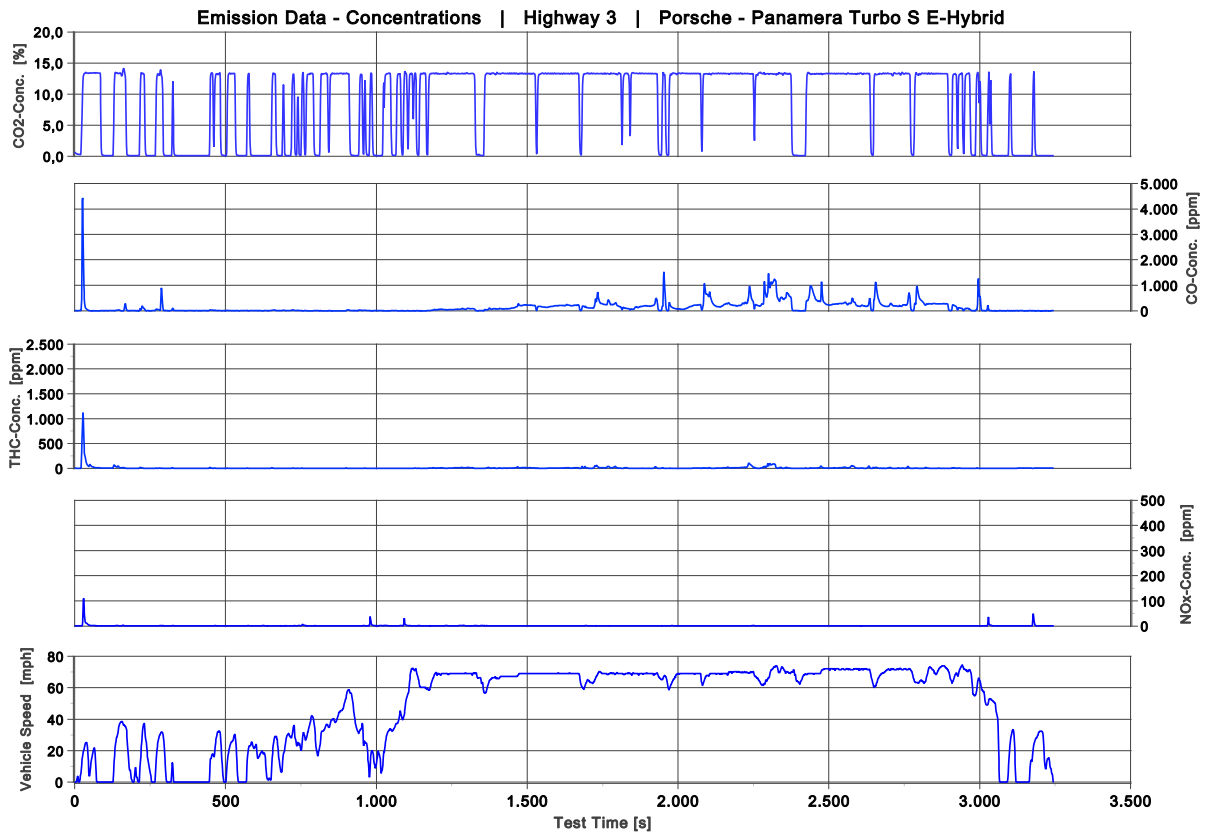


### 3.6.4 Highway (3)

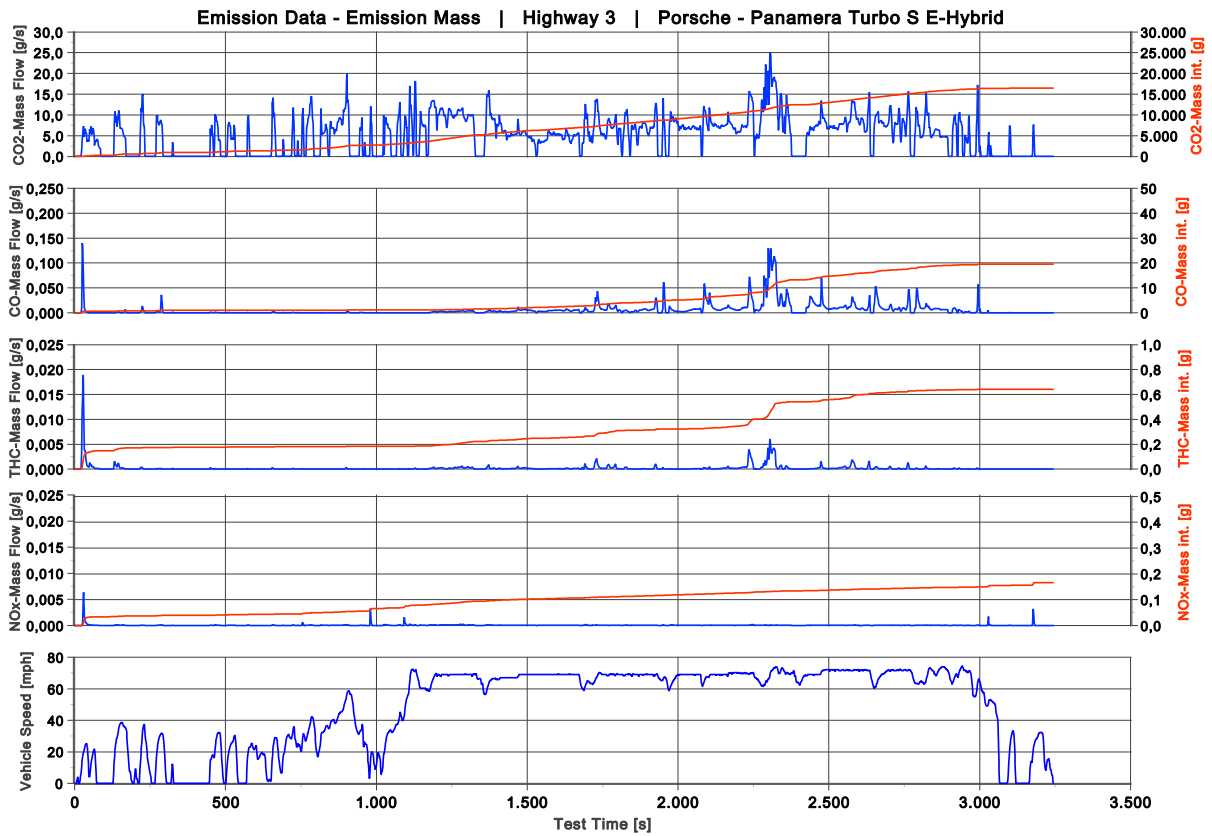
Table 3-28: Highway (3) Trip Summary for Panamera Turbo S E-Hybrid

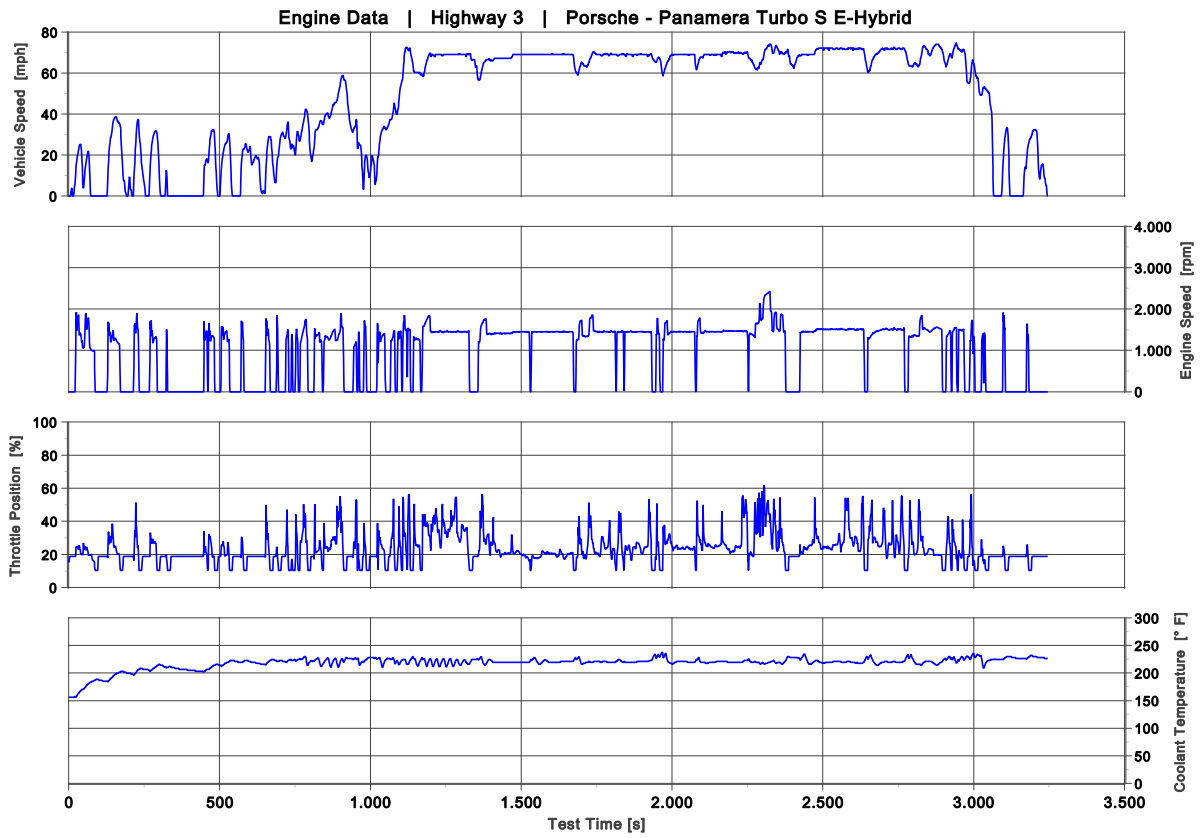
Test Data			
Test Name:	2019-05-24_Panamera-Turbo-S_E-Hybrid_Highway		
Department:	MBtech	Test Date:	05/24/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	500
Vehicle Modell:	Panamera Turbo S E-Hybrid	Nominal Torque [Nm]:	850
VIN:	WP0AH2A74KL147038	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1120
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	379,6	
CO	[g/mi]	0,451	
NO <sub>x</sub>	[g/mi]	0,004	
THC	[g/mi]	0,015	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3246	
Distance	[mi]	43,39	
Average Speed	[mph]	48,1	
Average Ambient Temperature	[°F]	72,0	









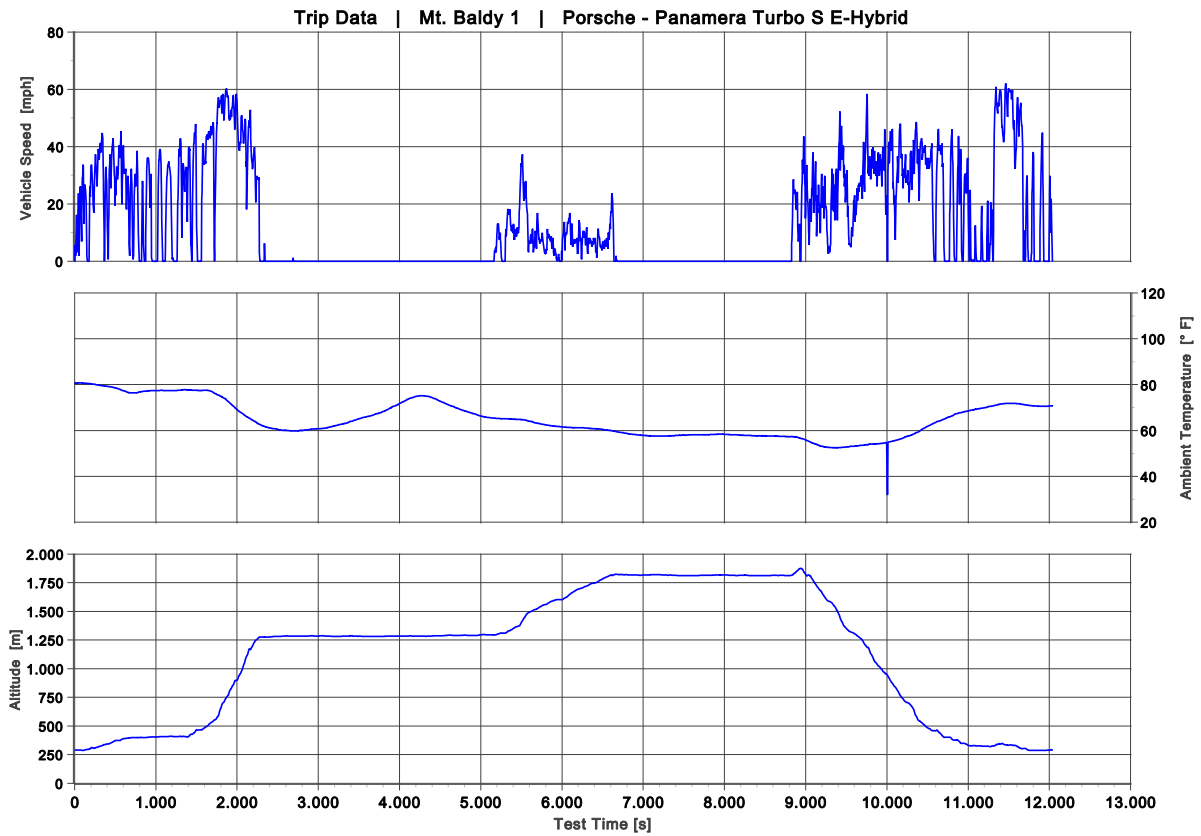


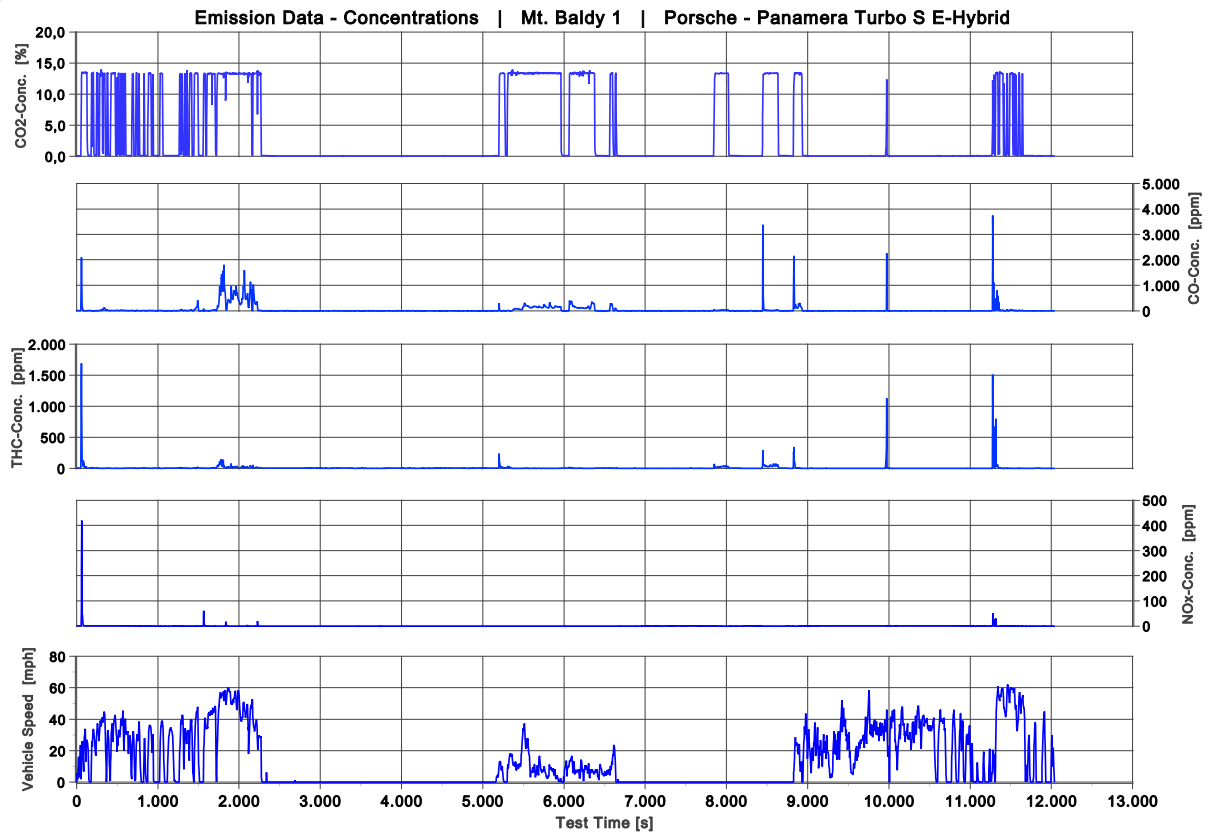
### 3.6.5 Mt. Baldy (1)

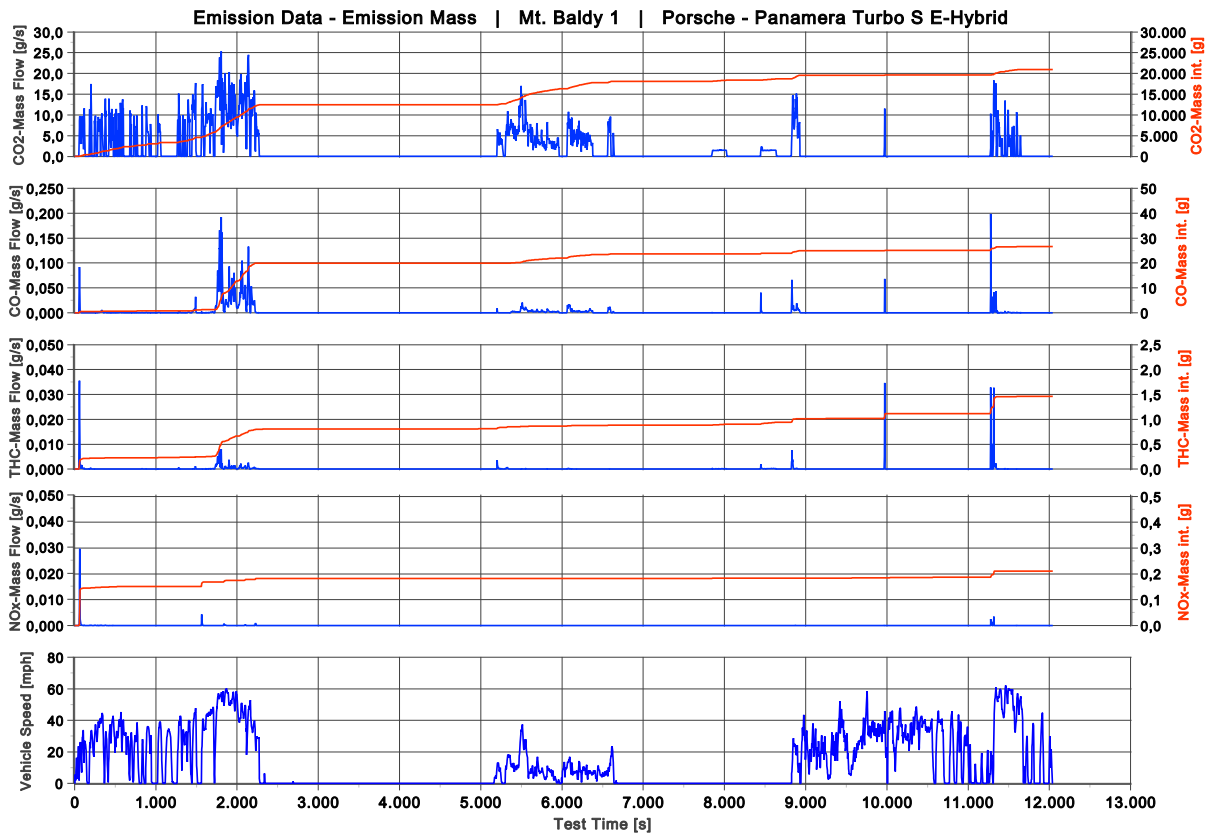
Table 3-29: Mt. Baldy (1) Trip Summary for Panamera Turbo S E-Hybrid

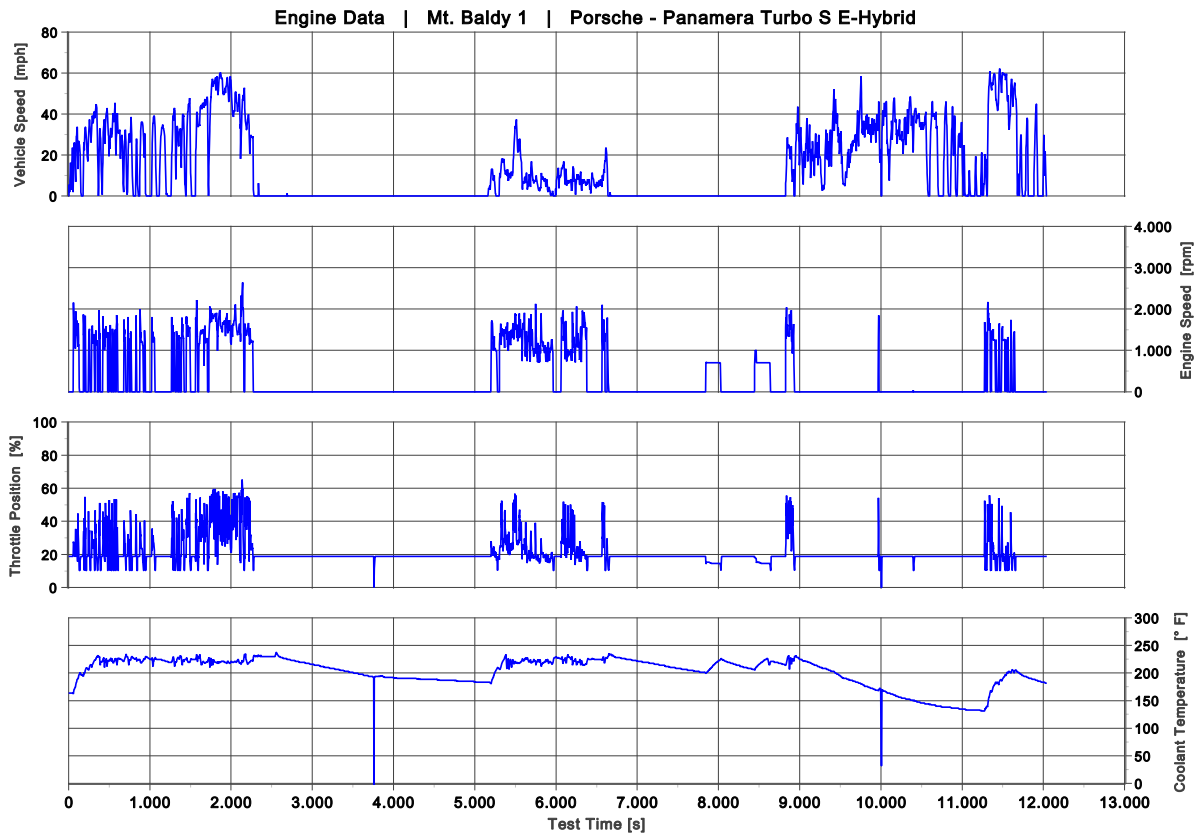
Test Data			
Test Name:	2019-05-17_Panamera-Turbo-S_E-Hybrid_Mt.Baldy		
Department:	MBtech	Test Date:	05/17/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	500
Vehicle Modell:	Panamera Turbo S E-Hybrid	Nominal Torque [Nm]:	850
VIN:	WP0AH2A74KL147038	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1120
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	478,5	
CO	[g/mi]	0,605	
NO <sub>x</sub>	[g/mi]	0,005	
THC	[g/mi]	0,033	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	12041	
Distance	[mi]	43,89	
Average Speed	[mph]	13,1	
Average Ambient Temperature	[°F]	65,0	

Test deemed invalid due to long duration caused by Amgen Tour of California bicycle race.







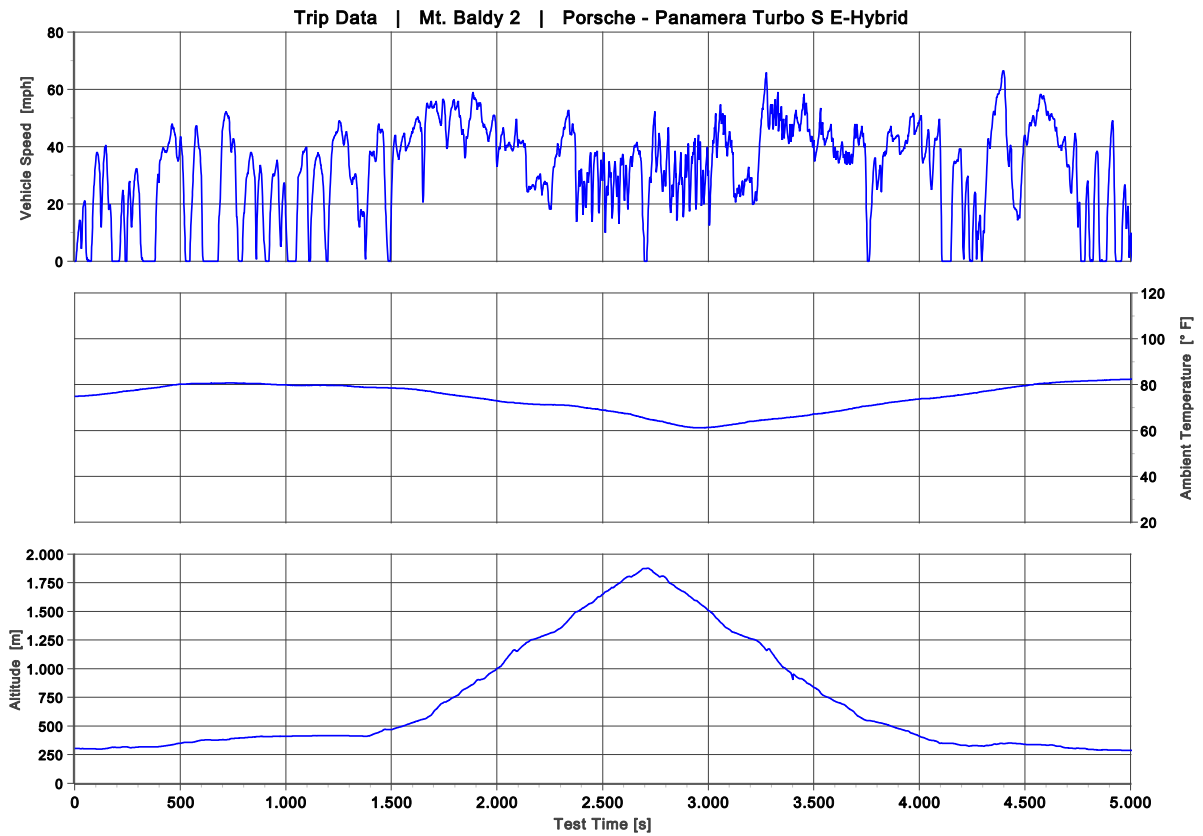


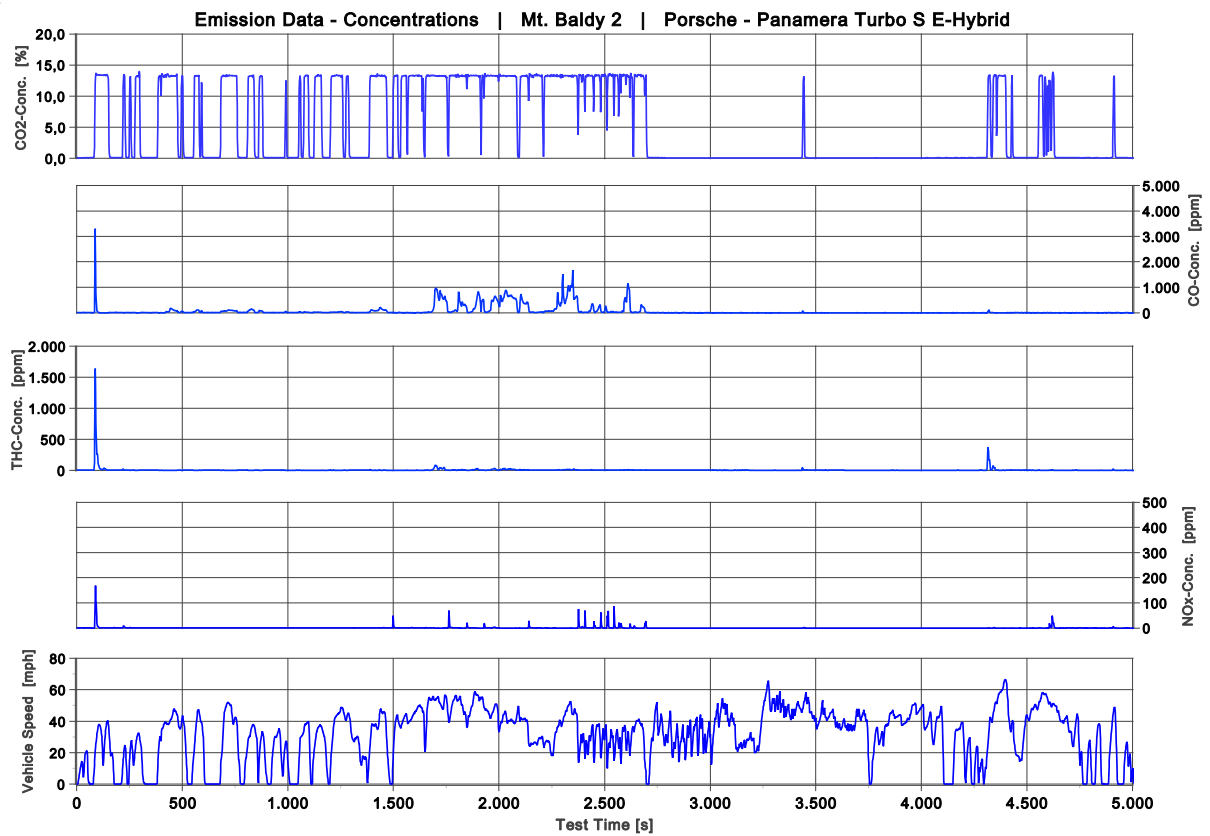
### 3.6.6 Mt. Baldy (2)

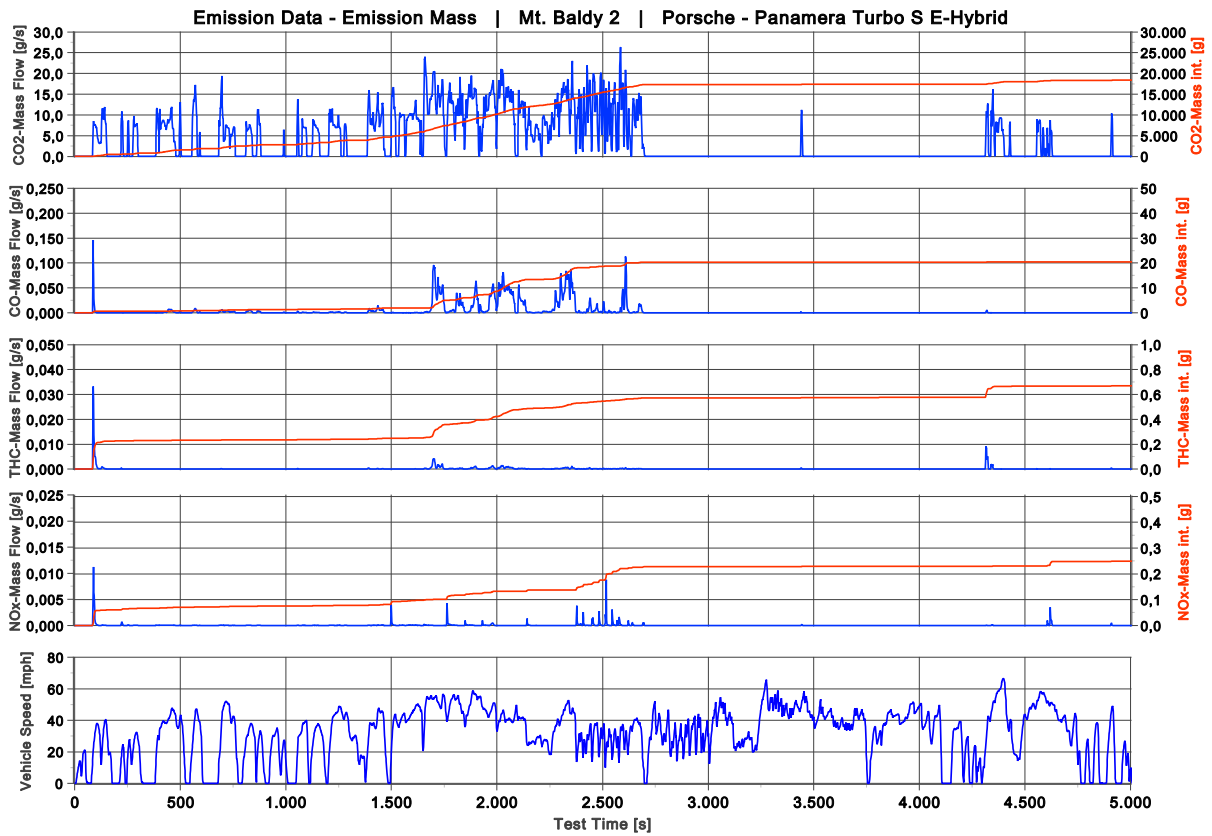
Table 3-30: Mt. Baldy (2) Trip Summary for Panamera Turbo S E-Hybrid

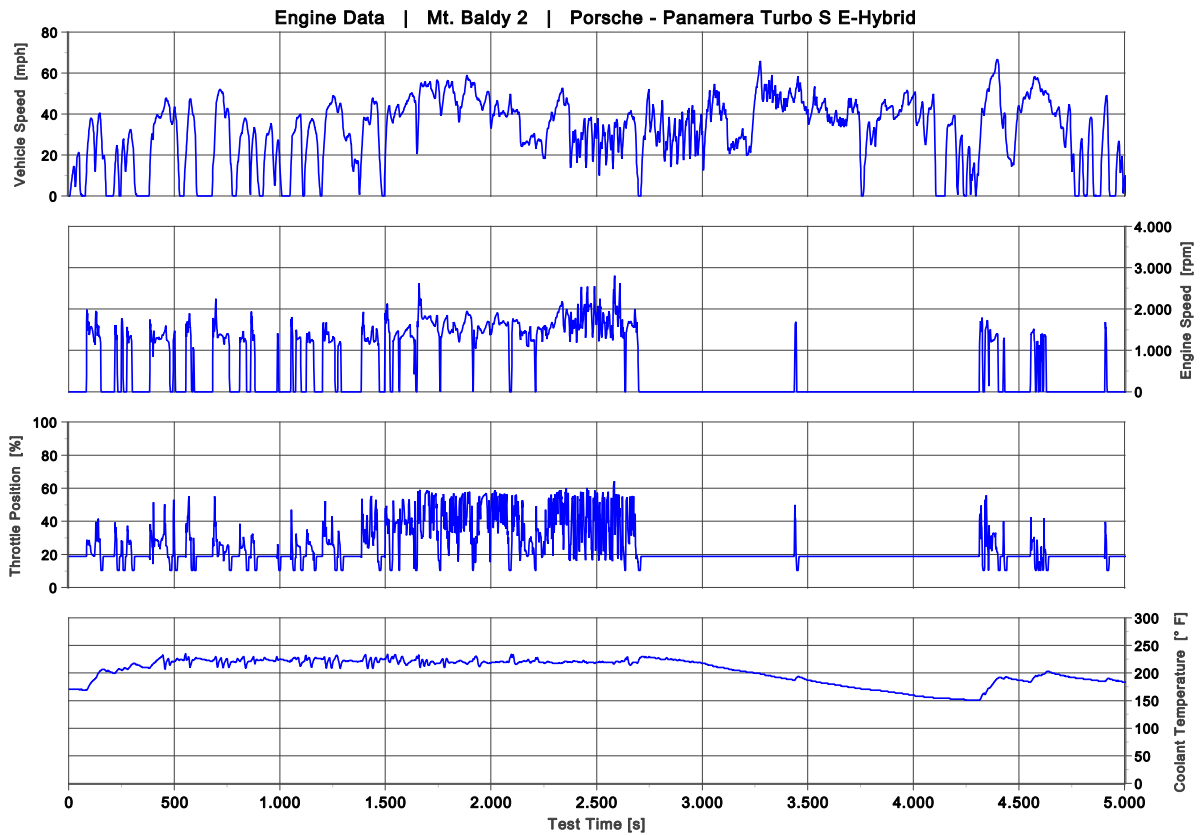
Test Data			
Test Name:	2019-05-24_Panamera-Turbo-S_E-Hybrid_Mt.Baldy		
Department:	MBtech	Test Date:	05/24/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	500
Vehicle Modell:	Panamera Turbo S E-Hybrid	Nominal Torque [Nm]:	850
VIN:	WP0AH2A74KL147038	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1120
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	417,3	
CO	[g/mi]	0,464	
NO <sub>x</sub>	[g/mi]	0,006	
THC	[g/mi]	0,015	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5008	
Distance	[mi]	44,03	
Average Speed	[mph]	31,7	
Average Ambient Temperature	[°F]	74,2	











### 3.7 718 Cayman GTS

The following table summarizes the emission measurement results from the 718 Cayman GTS vehicle.

Table 3-31: Emission Overview Porsche - 718 Cayman GTS

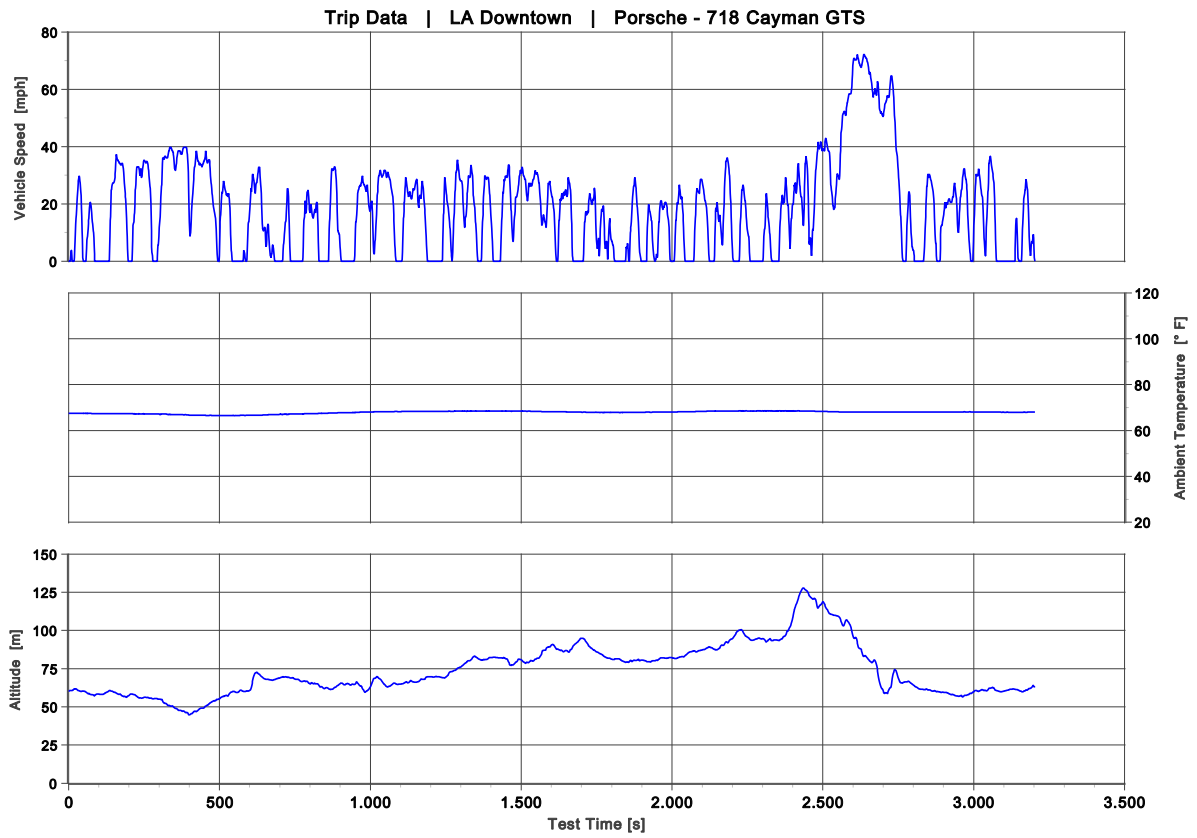
Cayman GTS		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
06/03/2019	LA Downtown	399,7	0,022	0,015	n.a.	3203	15,98
05/31/2019	Highway	319,8	0,051	0,014	n.a.	3544	44,78
05/31/2019	Mt. Baldy	365,0	0,702	0,021	n.a.	5605	45,51
06/04/2019	FTP75 (PEMS)*****	407,9	0,146	0,036	n.a.	2466	11,10
06/04/2019	FTP75 (Dyno)	404,7	0,171	0,033	0,047		11,10
06/19/2019	FTP75 (PEMS)	364,7	0,154	0,024	n.a.	2496	11,16
06/19/2019	FTP75 (Dyno)	407,1	0,193	0,024	0,050		11,07
06/19/2019	US06 (Dyno)	367,7	0,869	0,018	0,017	596	8,02

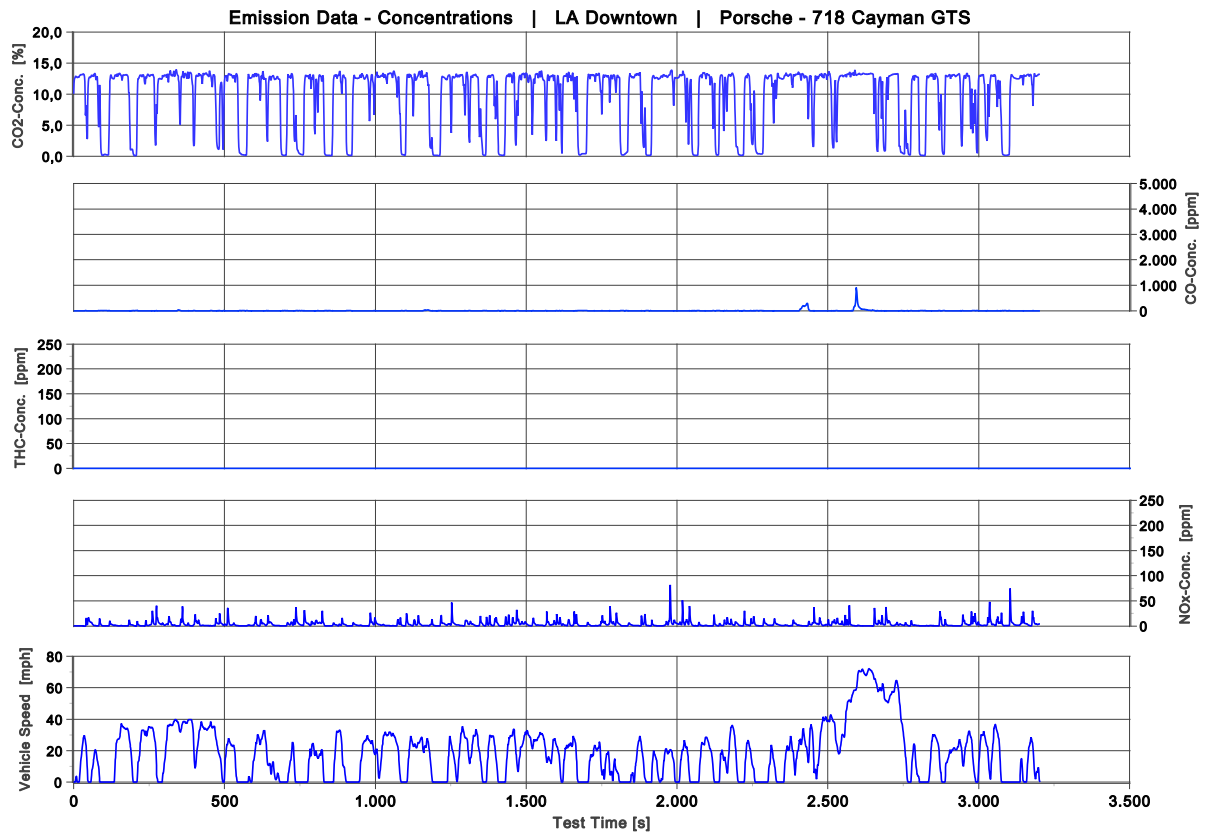
\*\*\*\*\*: Test was repeated due to connection loss to vehicle's OBD.

### 3.7.1 LA Downtown

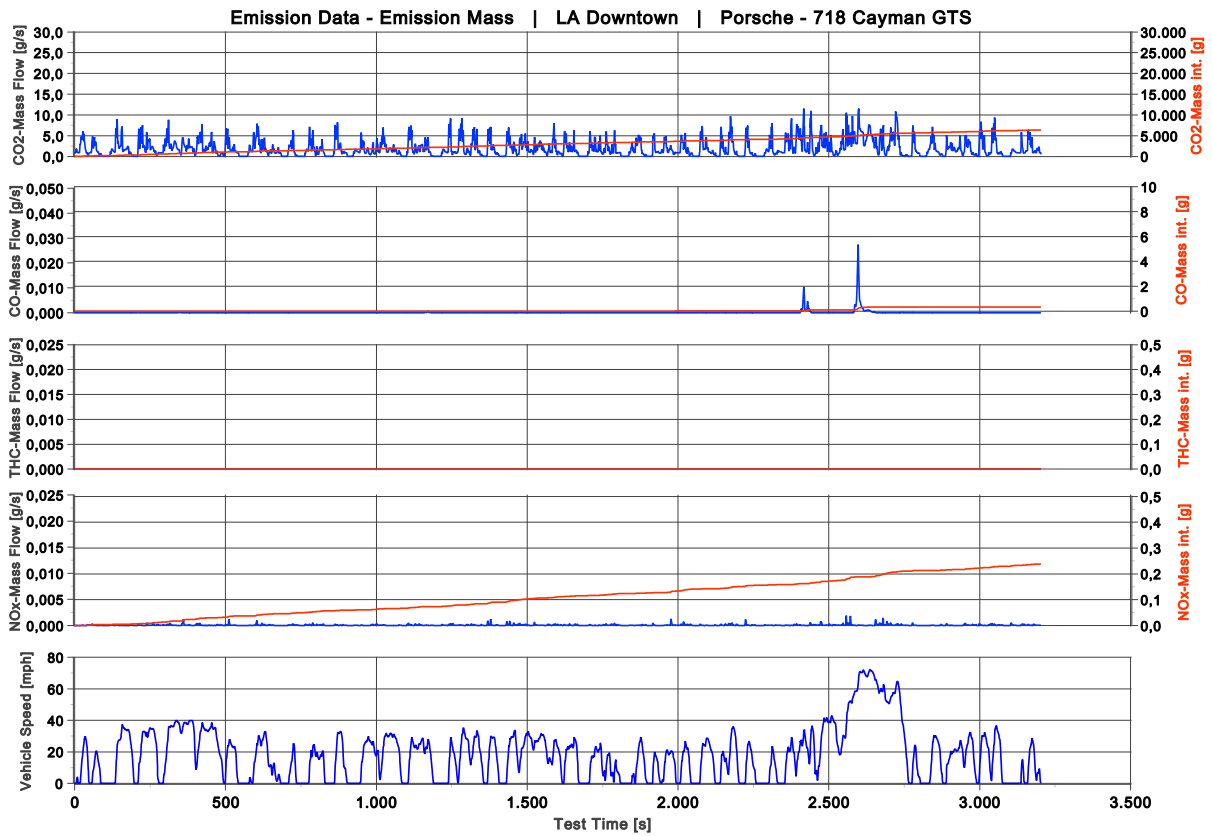
Table 3-32: LA Downtown Trip Summary for 718 Cayman GTS

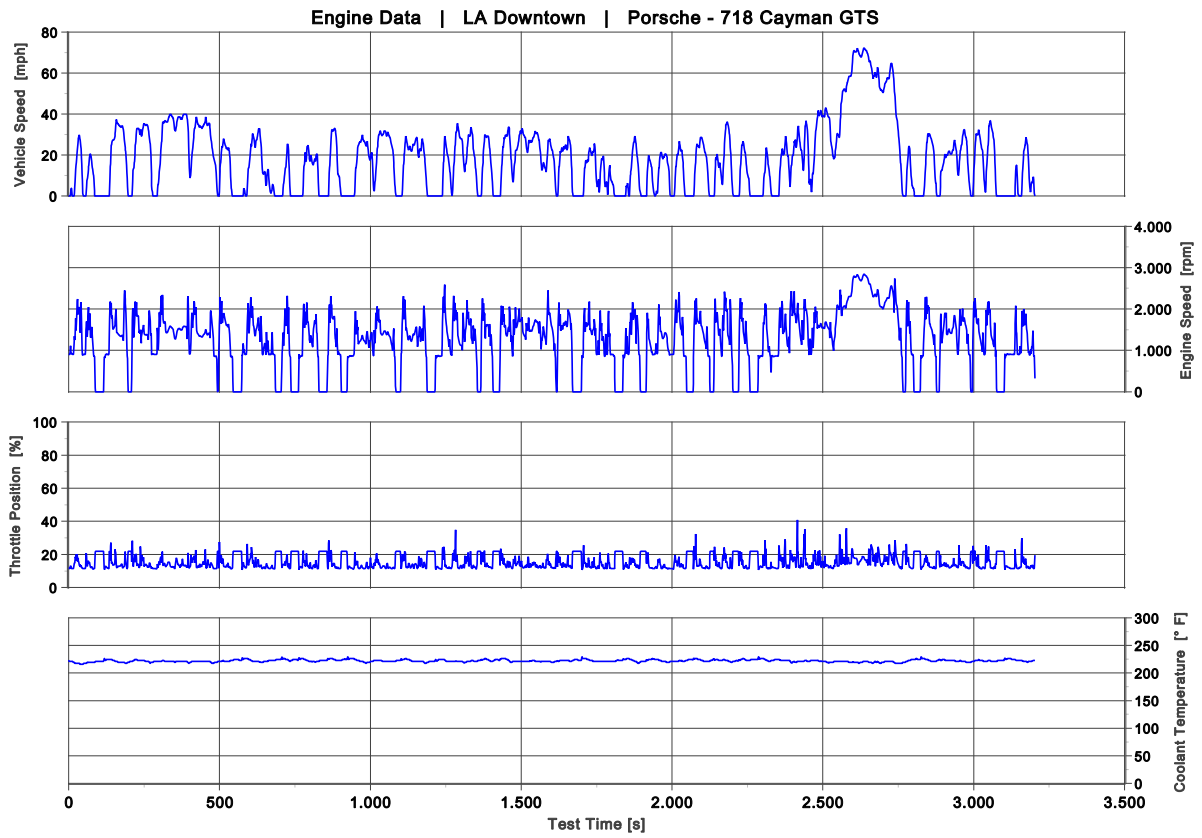
Test Data			
Test Name:	2019-06-03_Cayman-GTS_LA-Downtown		
Department:	MBtech	Test Date:	06/03/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	RWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	269
Vehicle Modell:	718 Cayman GTS	Nominal Torque [Nm]:	420
VIN:	WP0AB2A83KS278218	Transmission:	MT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 2700
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	399,7	
CO	[g/mi]	0,022	
NO <sub>x</sub>	[g/mi]	0,015	
THC	[g/mi]	n.a.	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3203	
Distance	[mi]	15,98	
Average Speed	[mph]	18,0	
Average Ambient Temperature	[°F]	67,9	







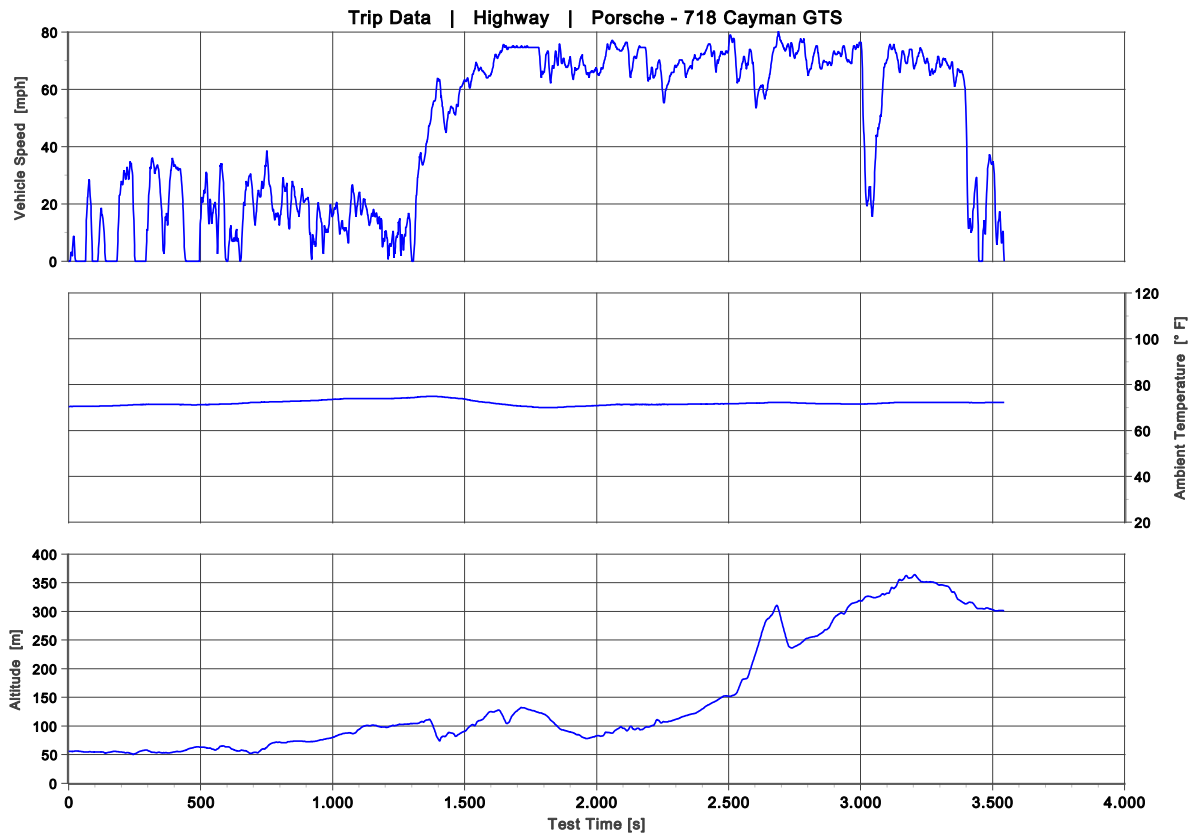


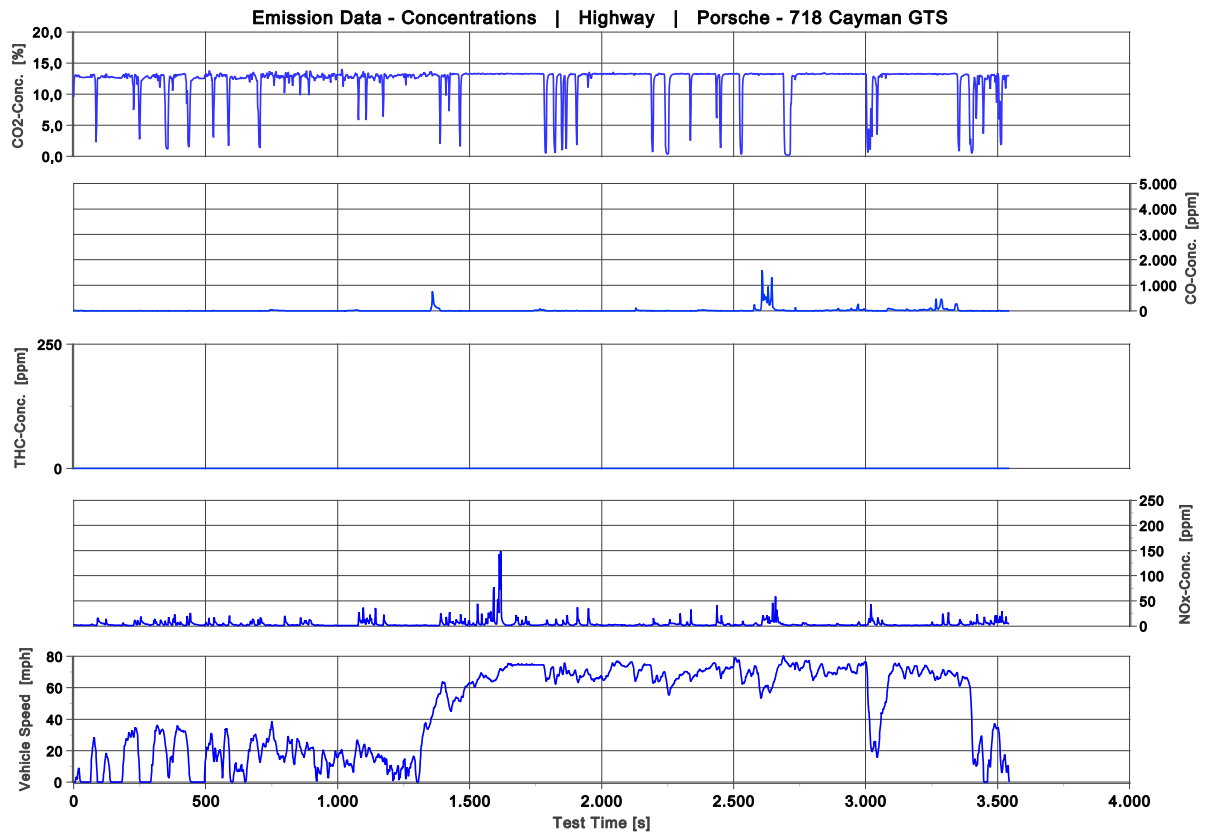


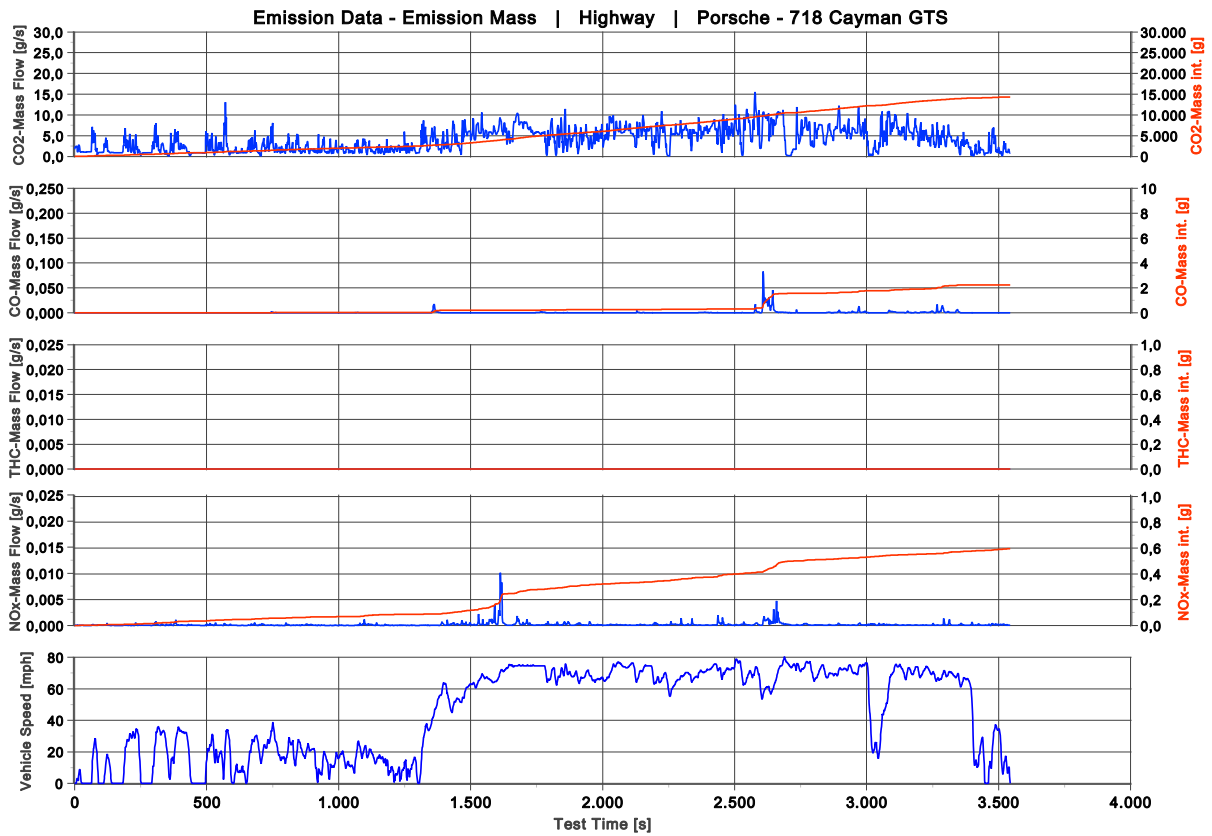
### 3.7.2 Highway

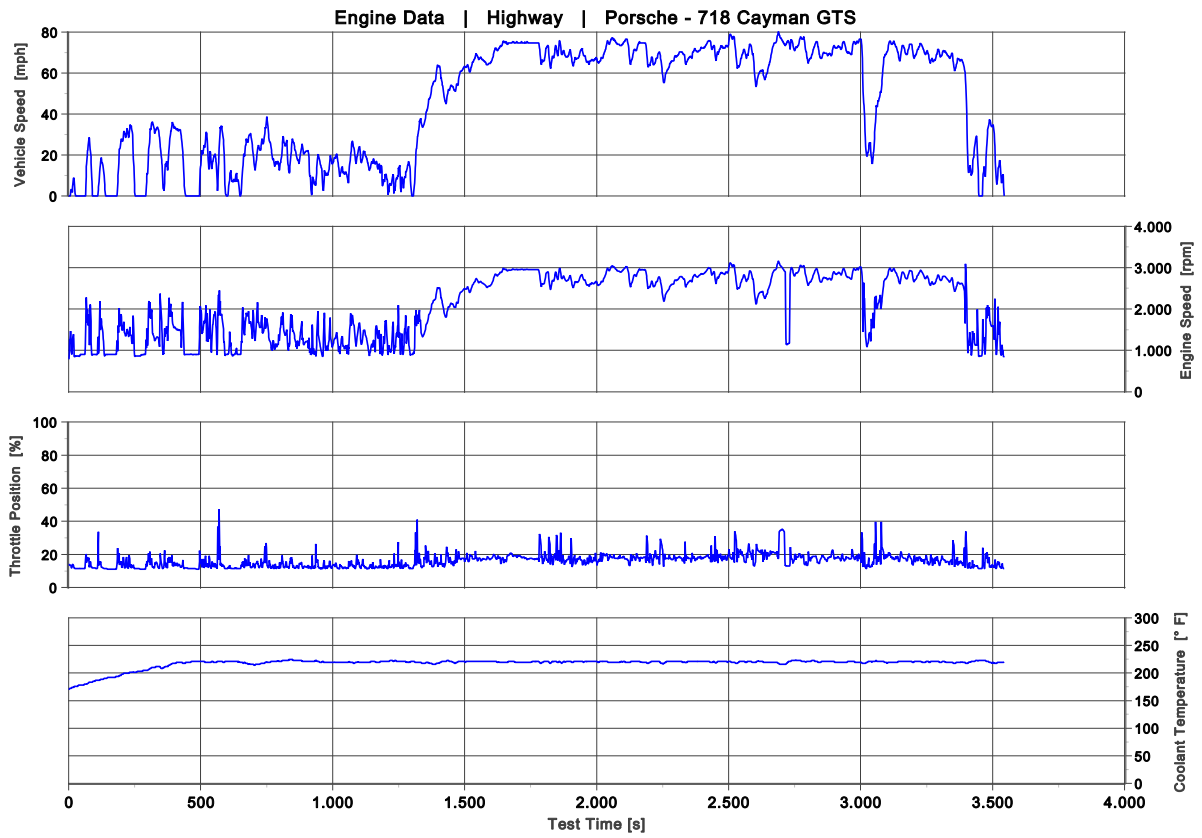
Table 3-33: Highway Trip Summary for 718 Cayman GTS

Test Data			
Test Name:	2019-05-31_Cayman-GTS_Highway		
Department:	MBtech	Test Date:	05/31/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	RWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	269
Vehicle Modell:	718 Cayman GTS	Nominal Torque [Nm]:	420
VIN:	WP0AB2A83KS278218	Transmission:	MT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 2700
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	319,8	
CO	[g/mi]	0,051	
NO <sub>x</sub>	[g/mi]	0,014	
THC	[g/mi]	n.a.	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3544	
Distance	[mi]	44,78	
Average Speed	[mph]	45,5	
Average Ambient Temperature	[°F]	72,0	







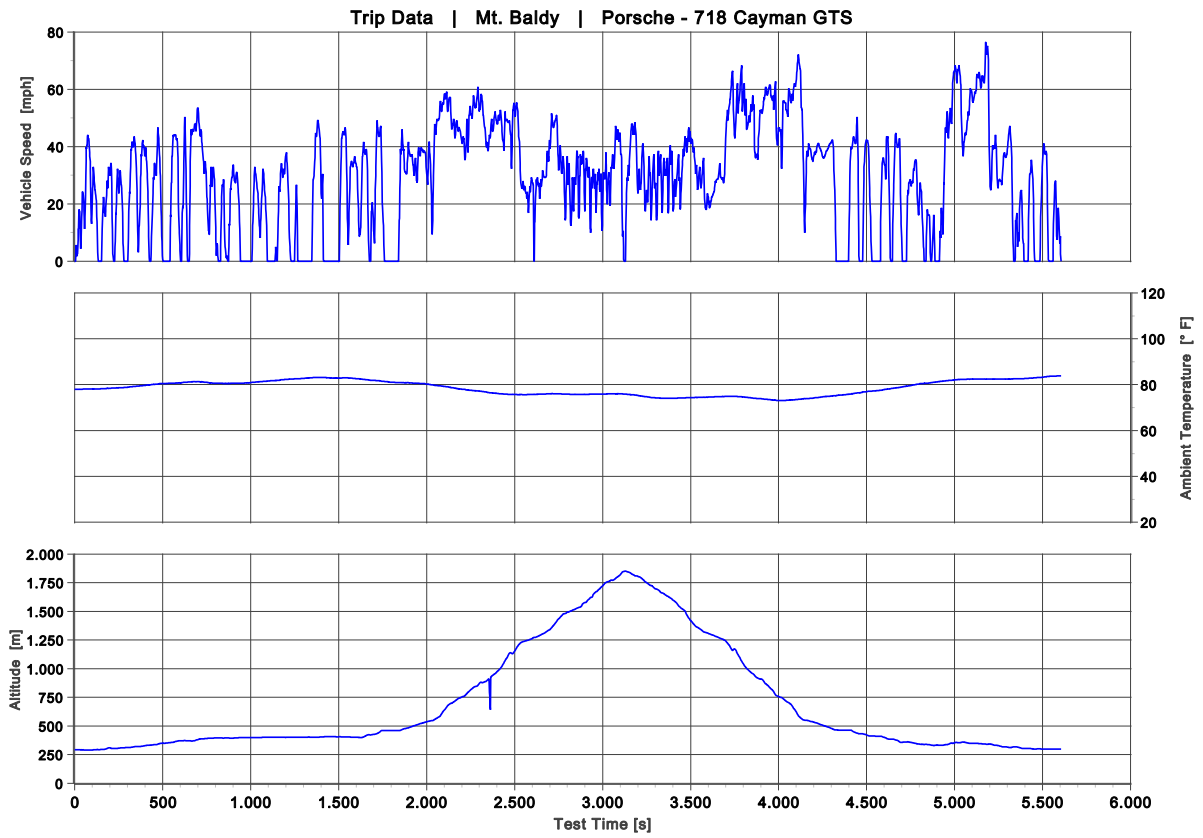


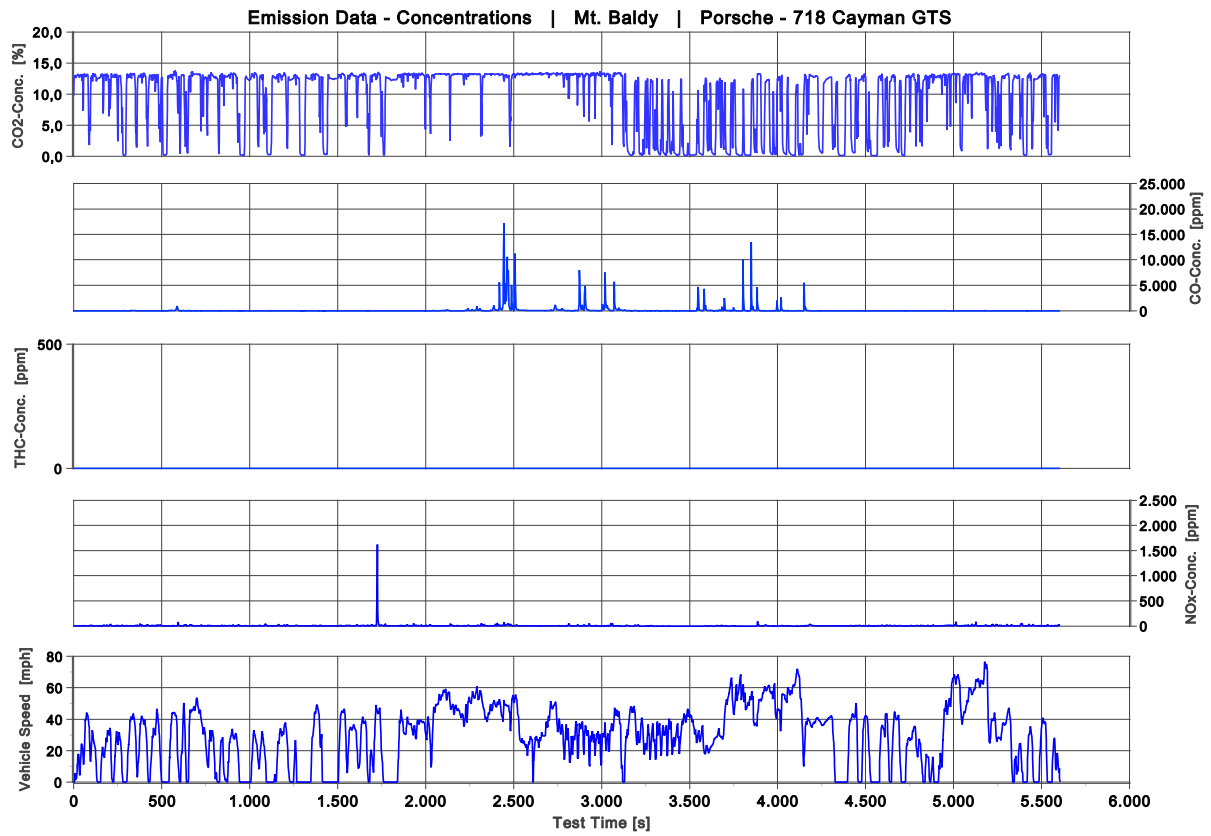
### 3.7.3 Mt. Baldy

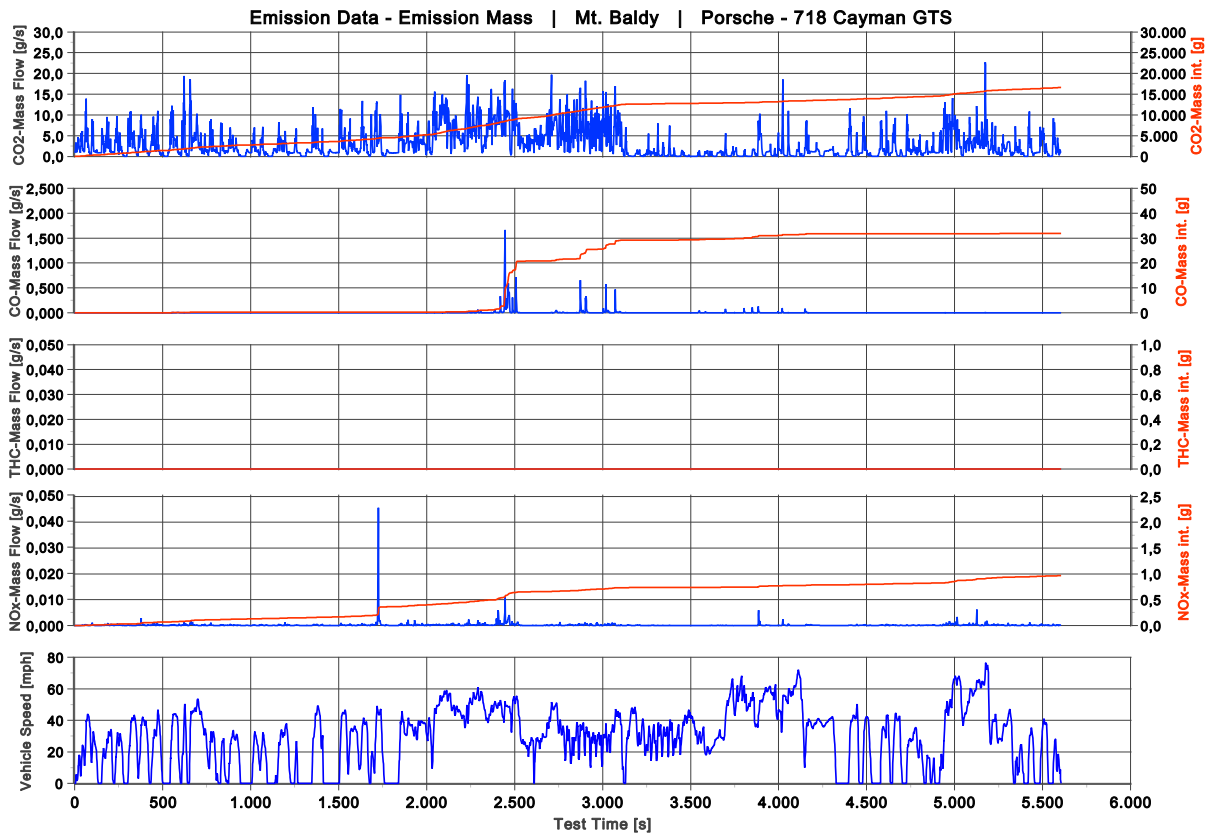
Table 3-34: Mt. Baldy Trip Summary for 718 Cayman GTS

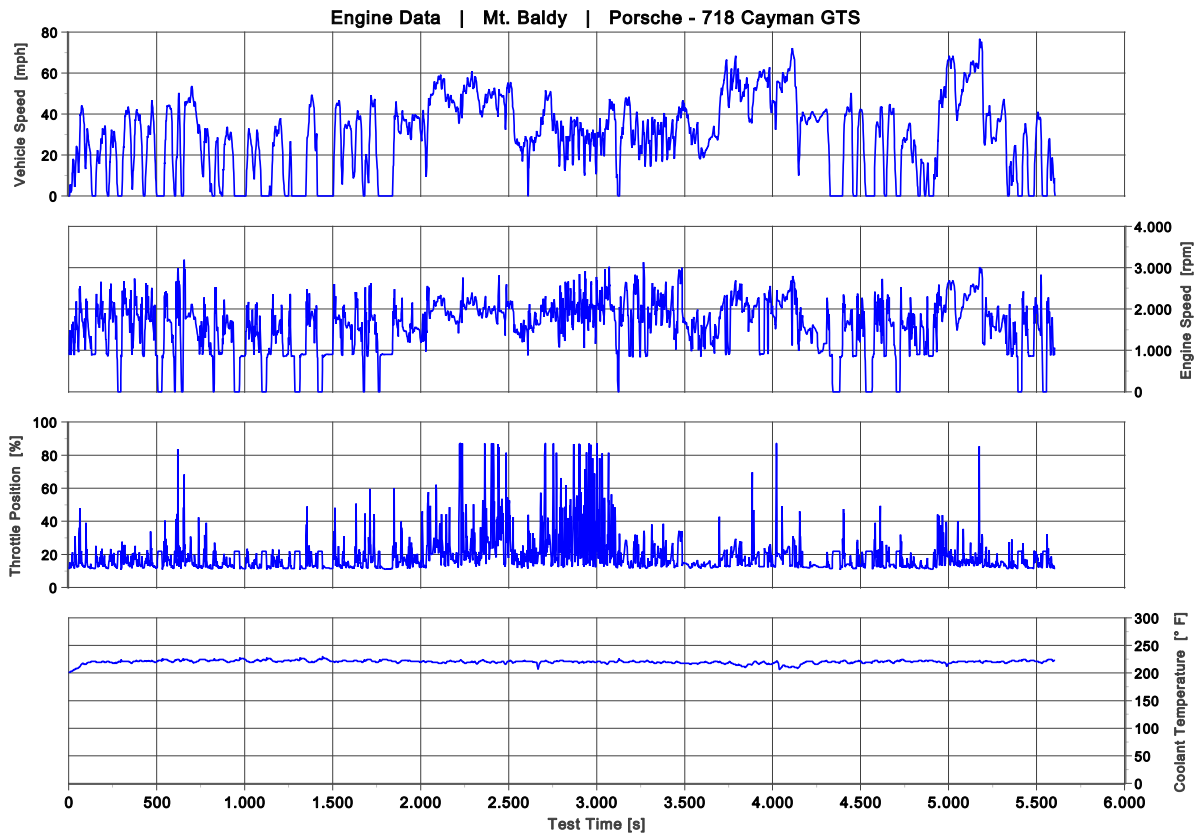
<b>Test Data</b>			
Test Name:	2019-05-31_Cayman-GTS_Mt.Baldy		
Department:	MBtech	Test Date:	05/31/2019
Driving Mode:	Default	Number of Passengers:	1
<b>Vehicle Data</b>			
Manufacturer:	Porsche	Type of Drive:	RWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	269
Vehicle Modell:	718 Cayman GTS	Nominal Torque [Nm]:	420
VIN:	WP0AB2A83KS278218	Transmission:	MT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 125	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 2700
<b>Emission Summary</b>			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	365,0	
CO	[g/mi]	0,702	
NO <sub>x</sub>	[g/mi]	0,021	
THC	[g/mi]	n.a.	
<b>Trip Data</b>			
	Unit	Total Trip	
Trip Duration	[s]	5605	
Distance	[mi]	45,51	
Average Speed	[mph]	29,2	
Average Ambient Temperature	[°F]	78,6	











### 3.8 911 Turbo S

The following table summarizes the emission measurement results from the 911 Turbo S vehicle.

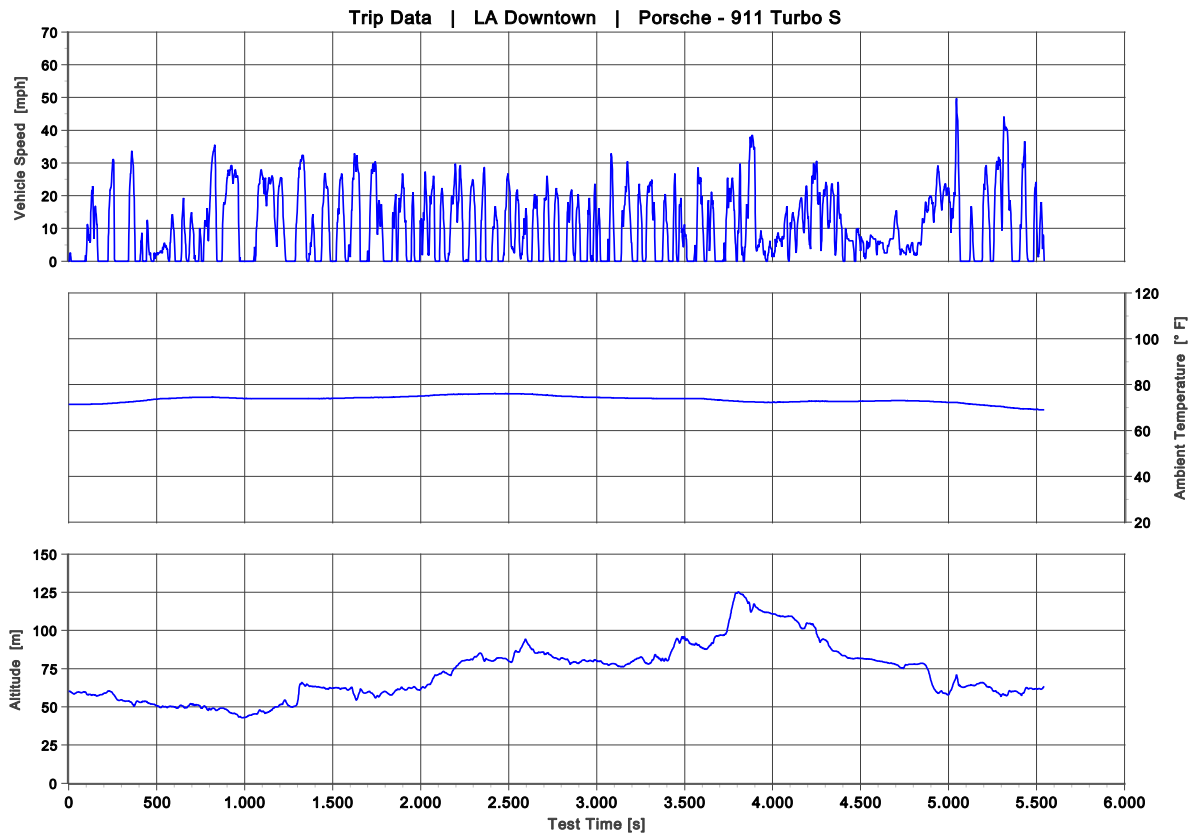
Table 3-35: Emission Overview Porsche - 911 Turbo S

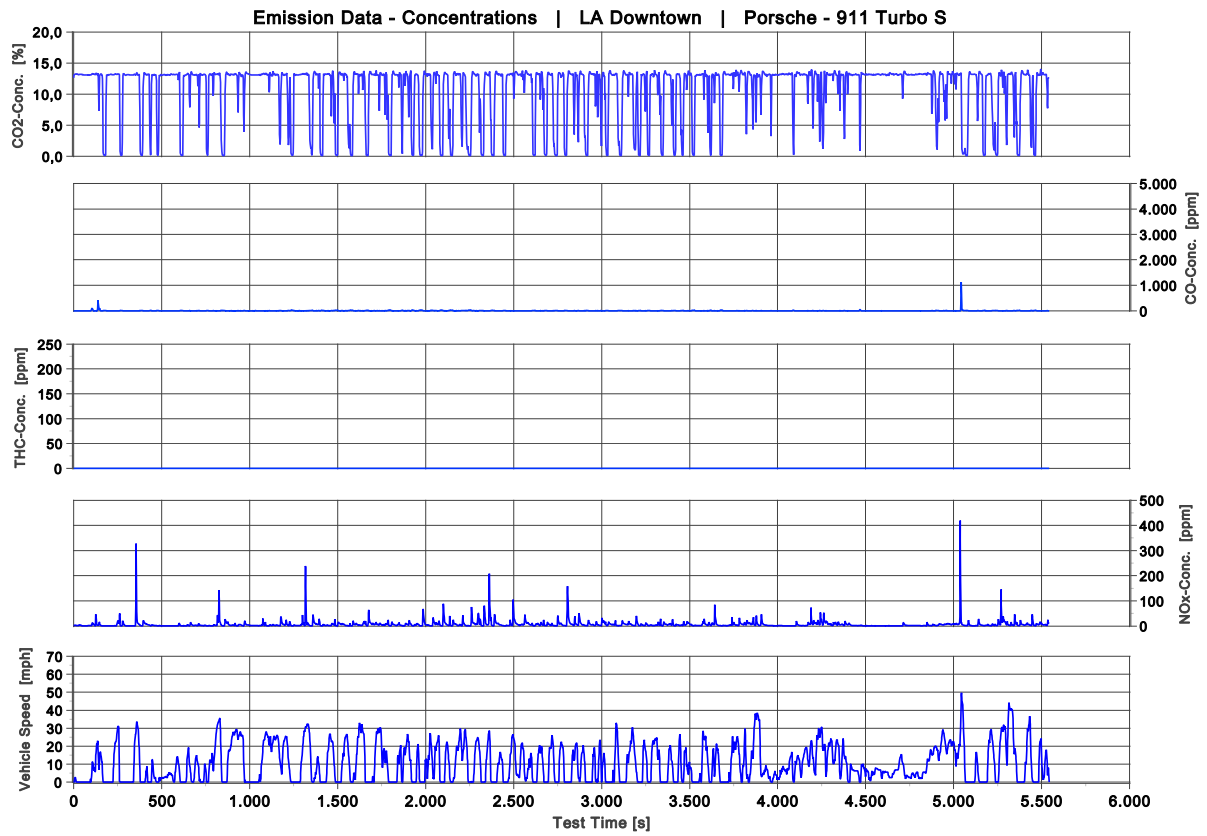
911 Turbo S		Emissions				Test	
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]
06/05/2019	LA Downtown	627,5	0,039	0,051	n.a.	5543	15,37
06/07/2019	Highway	345,3	0,125	0,029	n.a.	3351	43,59
06/07/2019	Mt. Baldy	416,7	0,038	0,037	n.a.	5017	44,28
06/11/2019	FTP75 (PEMS)	427,3	0,265	0,087	n.a.	2565	10,80
06/11/2019	FTP75 (Dyno)	436,8	0,270	0,081	0,040		10,97
06/21/2019	US06 (Dyno)	375,6	0,000	0,054	0,004	596	8,00

### 3.8.1 LA Downtown

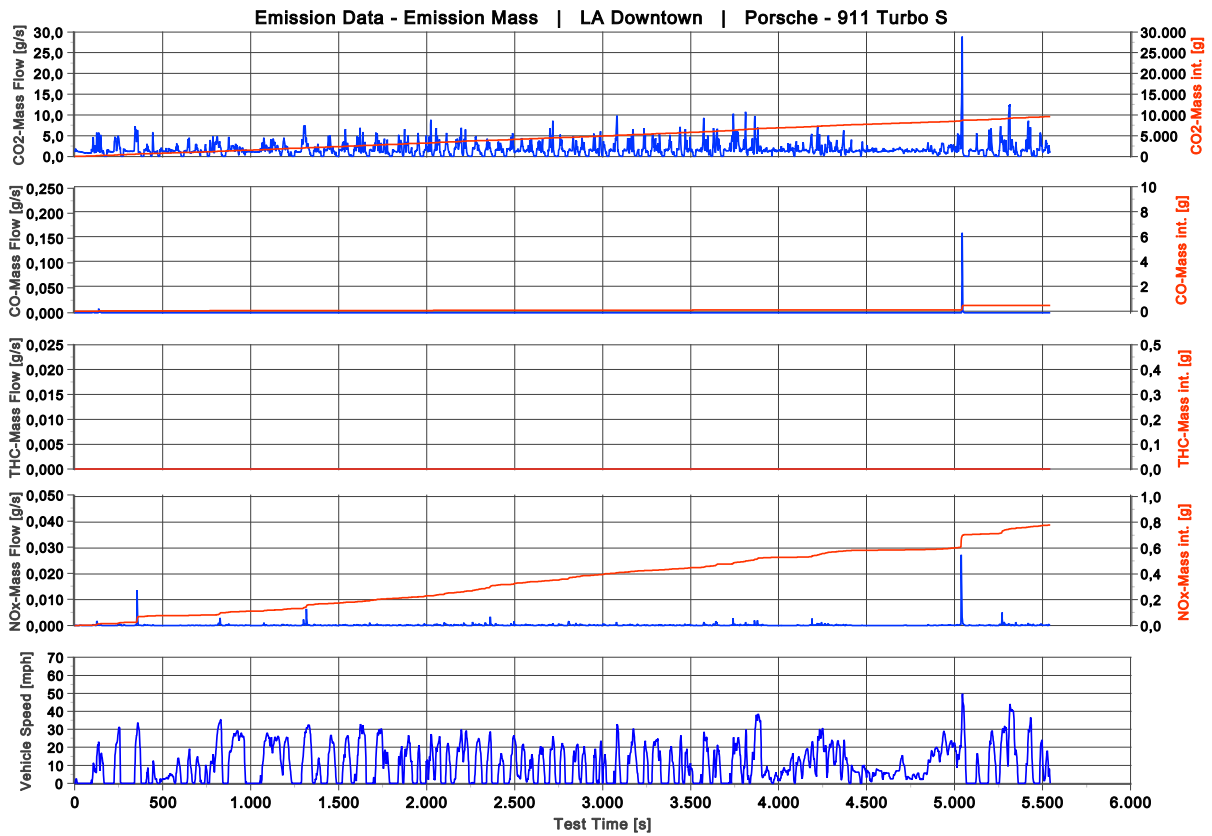
Table 3-36: LA Downtown Trip Summary for 911 Turbo S

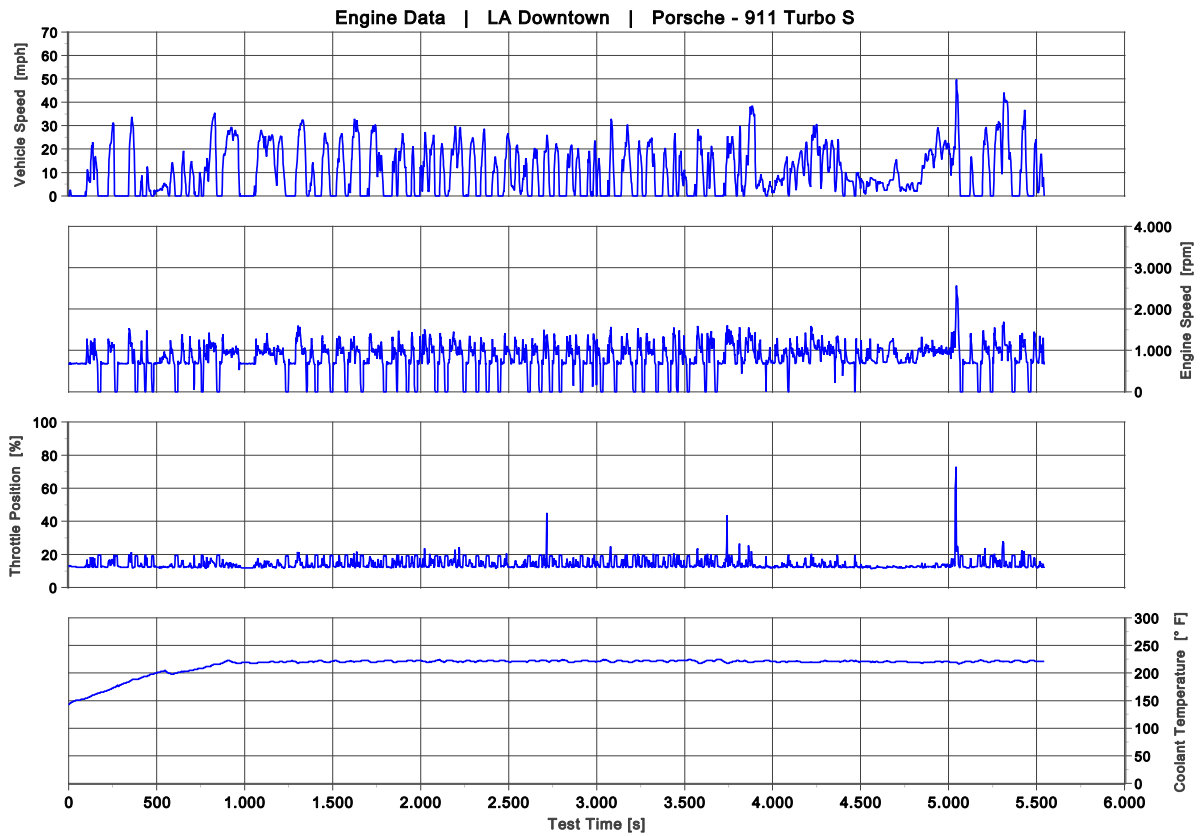
Test Data			
Test Name:	2019-06-05_911-Turbo.S_LA-Downtown		
Department:	MBtech	Test Date:	06/05/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	412
Vehicle Modell:	911 Turbo S	Nominal Torque [Nm]:	700
VIN:	WP0AD2A90KS140171	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 2 Bin 5	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 2640
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	627,5	
CO	[g/mi]	0,039	
NO <sub>x</sub>	[g/mi]	0,051	
THC	[g/mi]	n.a.	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5543	
Distance	[mi]	15,37	
Average Speed	[mph]	10,0	
Average Ambient Temperature	[°F]	73,5	







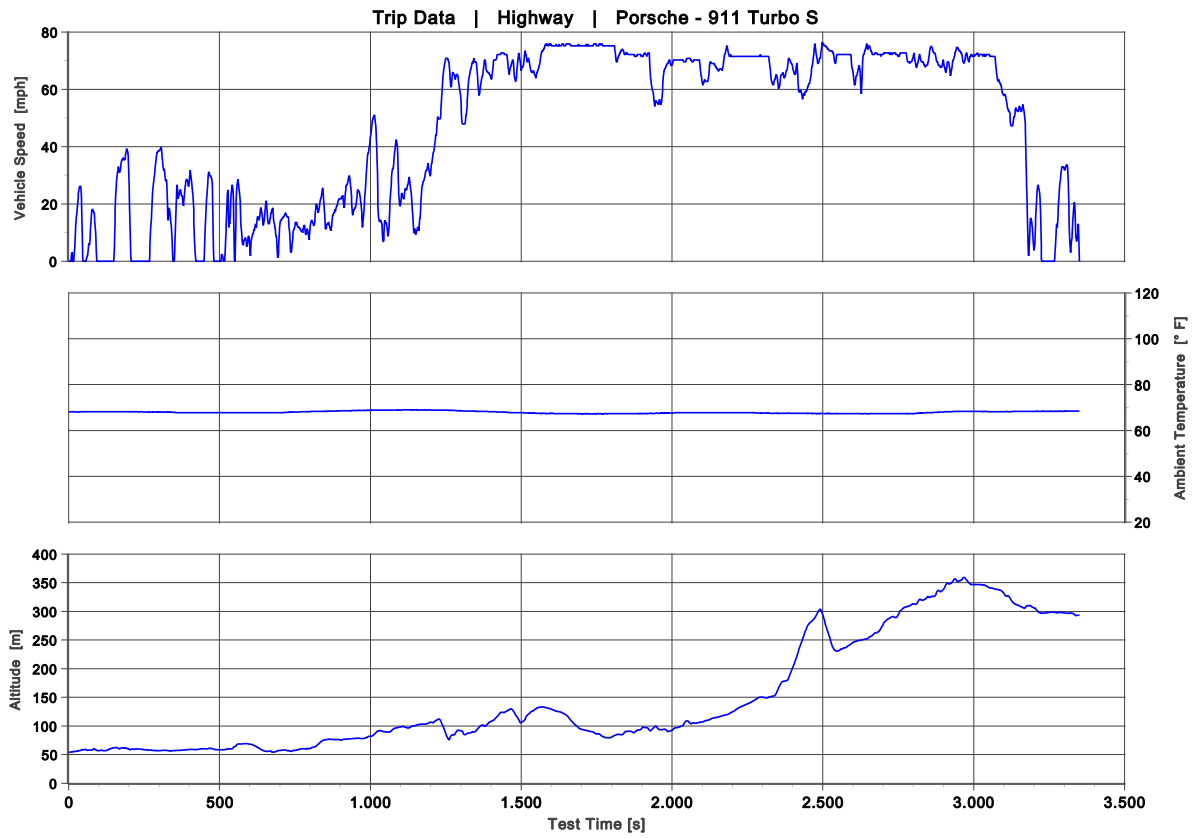


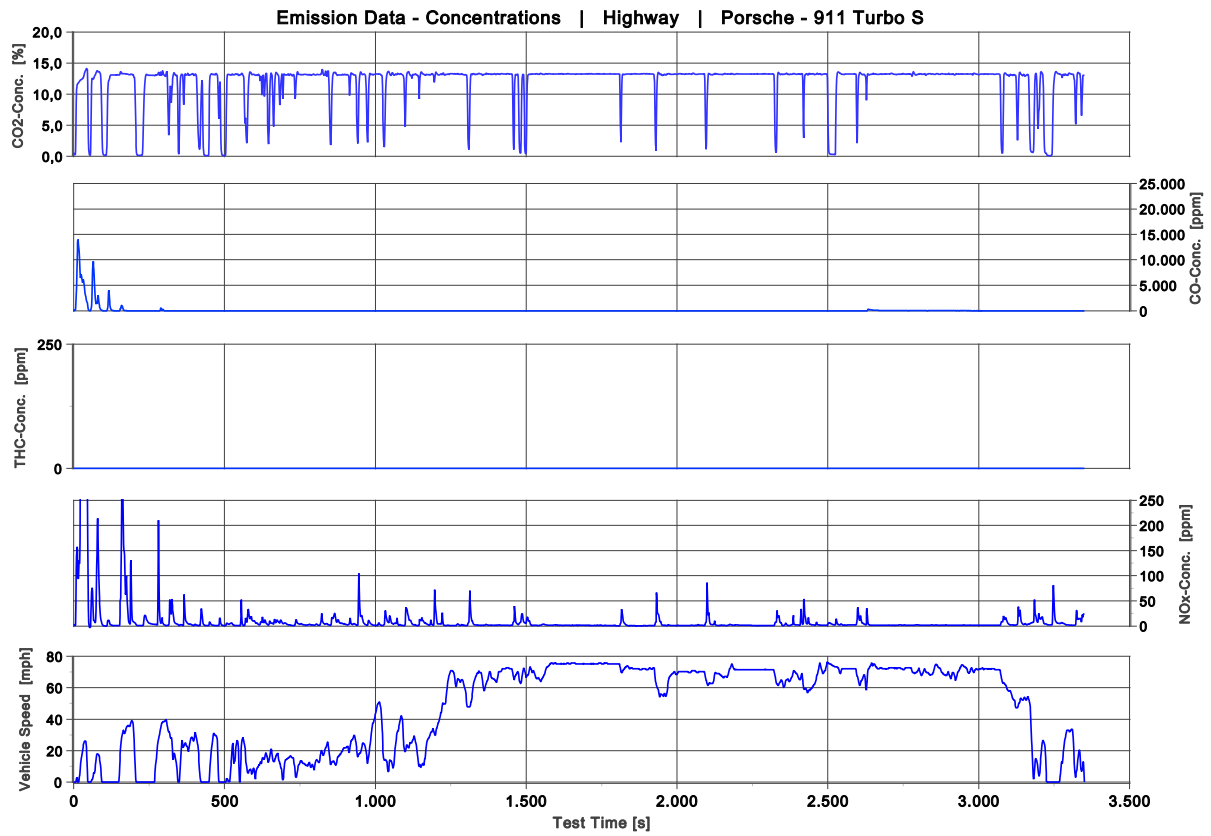


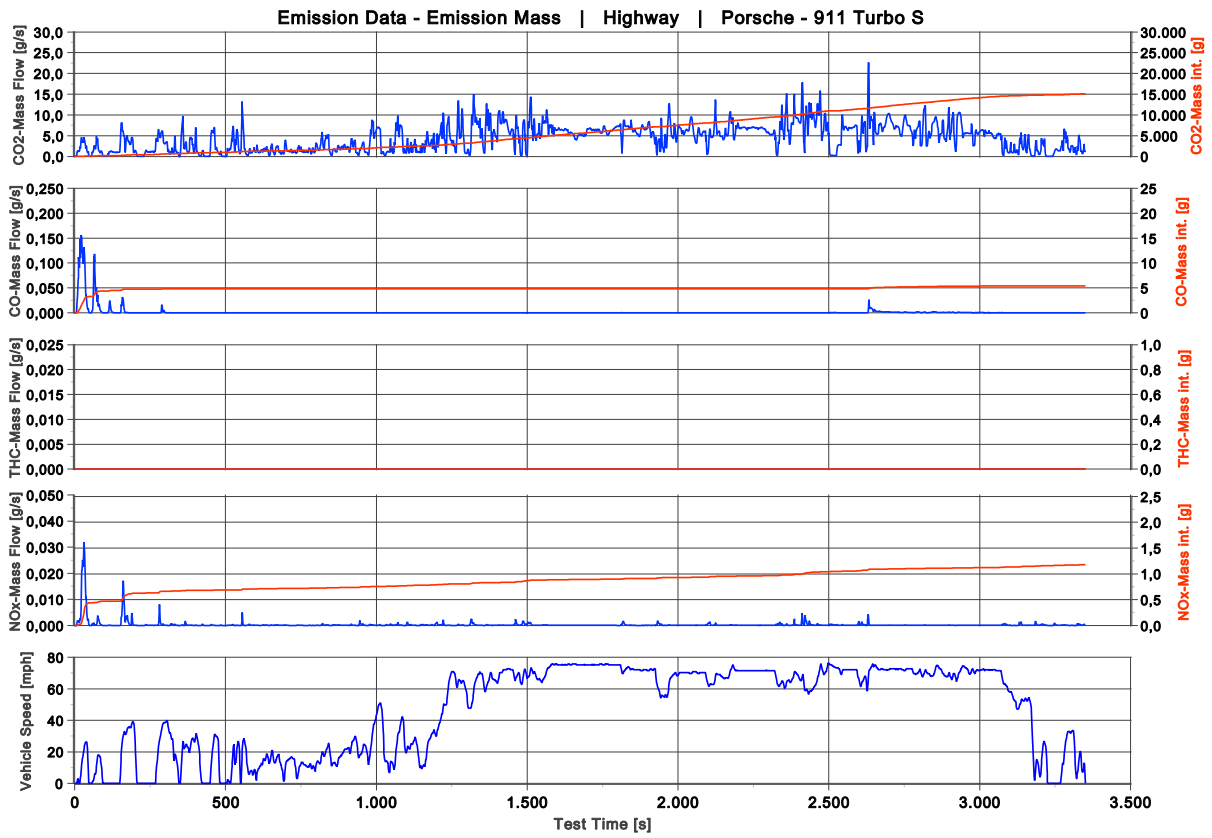
### 3.8.2 Highway

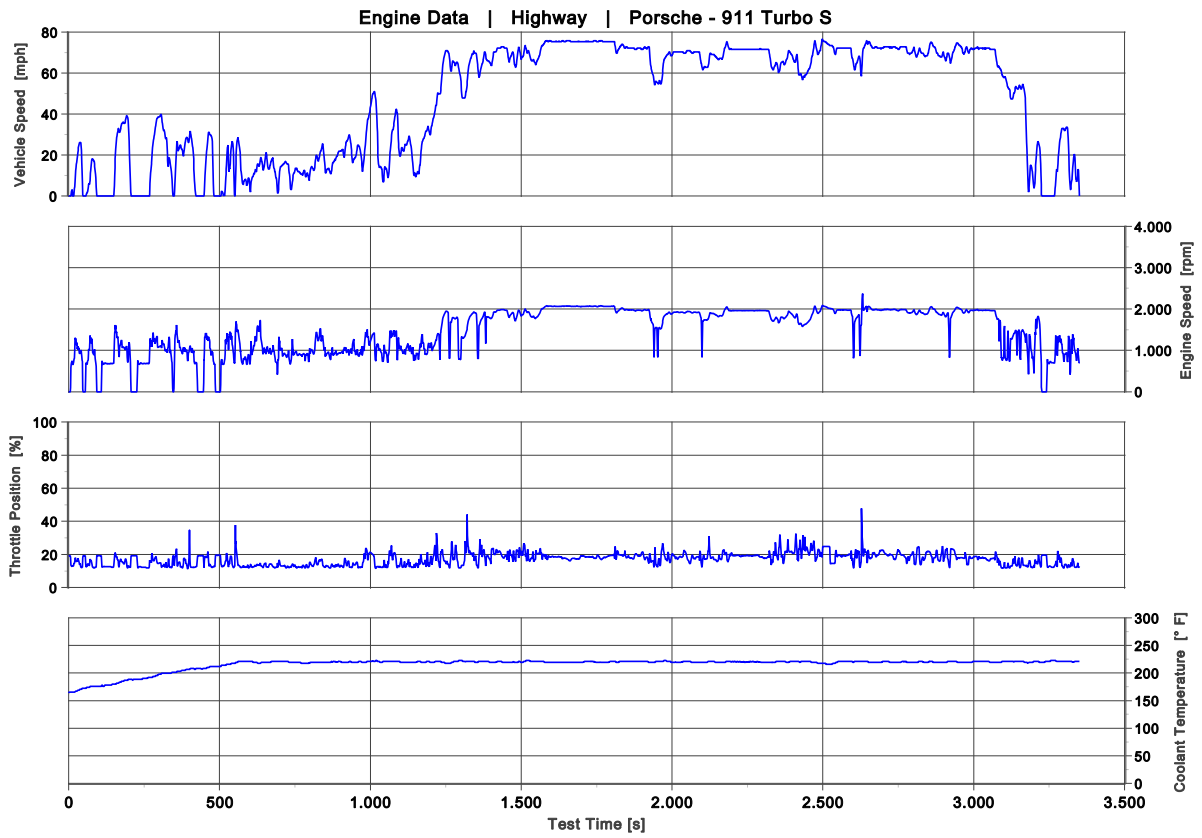
Table 3-37: Highway Trip Summary for 911 Turbo S

Test Data			
Test Name:	2019-06-07_911-Turbo-S_Highway		
Department:	MBtech	Test Date:	06/07/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	412
Vehicle Modell:	911 Turbo S	Nominal Torque [Nm]:	700
VIN:	WP0AD2A90KS140171	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 2 Bin 5	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 2640
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	345,3	
CO	[g/mi]	0,125	
NO <sub>x</sub>	[g/mi]	0,029	
THC	[g/mi]	n.a.	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3351	
Distance	[mi]	43,59	
Average Speed	[mph]	46,8	
Average Ambient Temperature	[°F]	68,0	







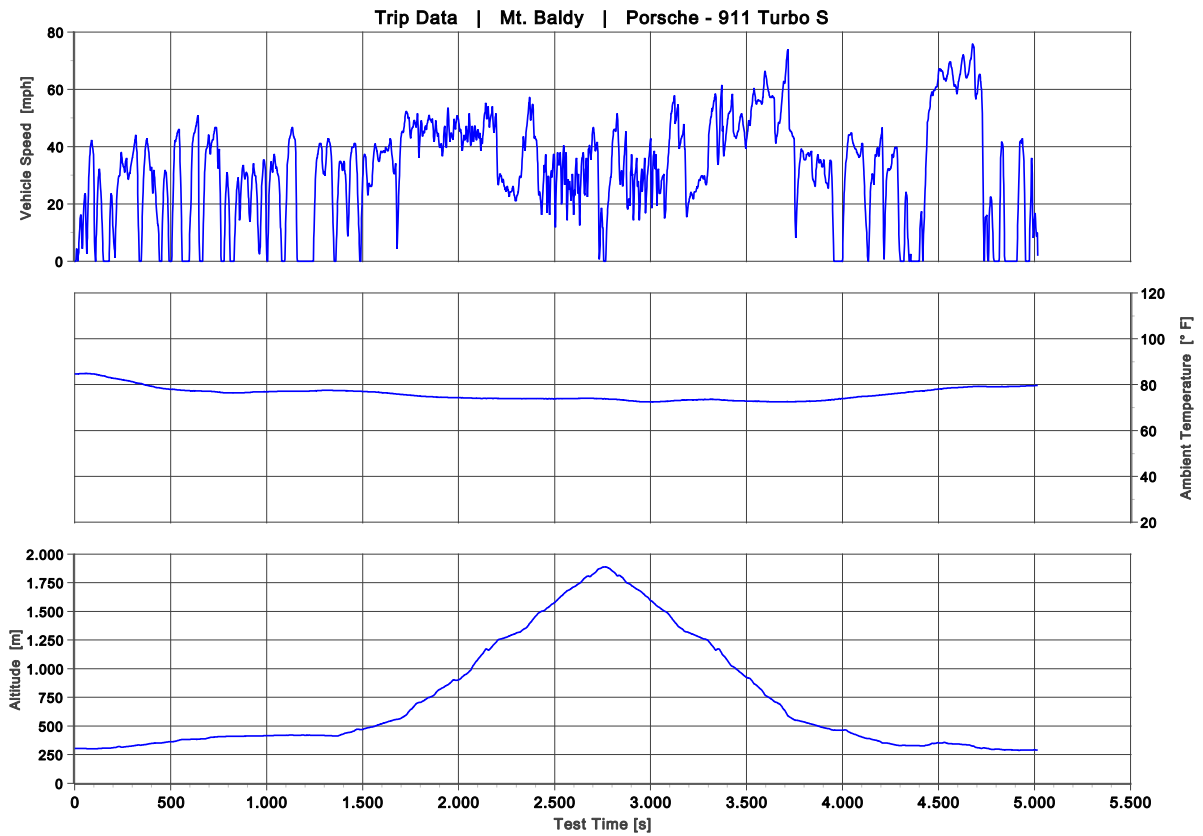


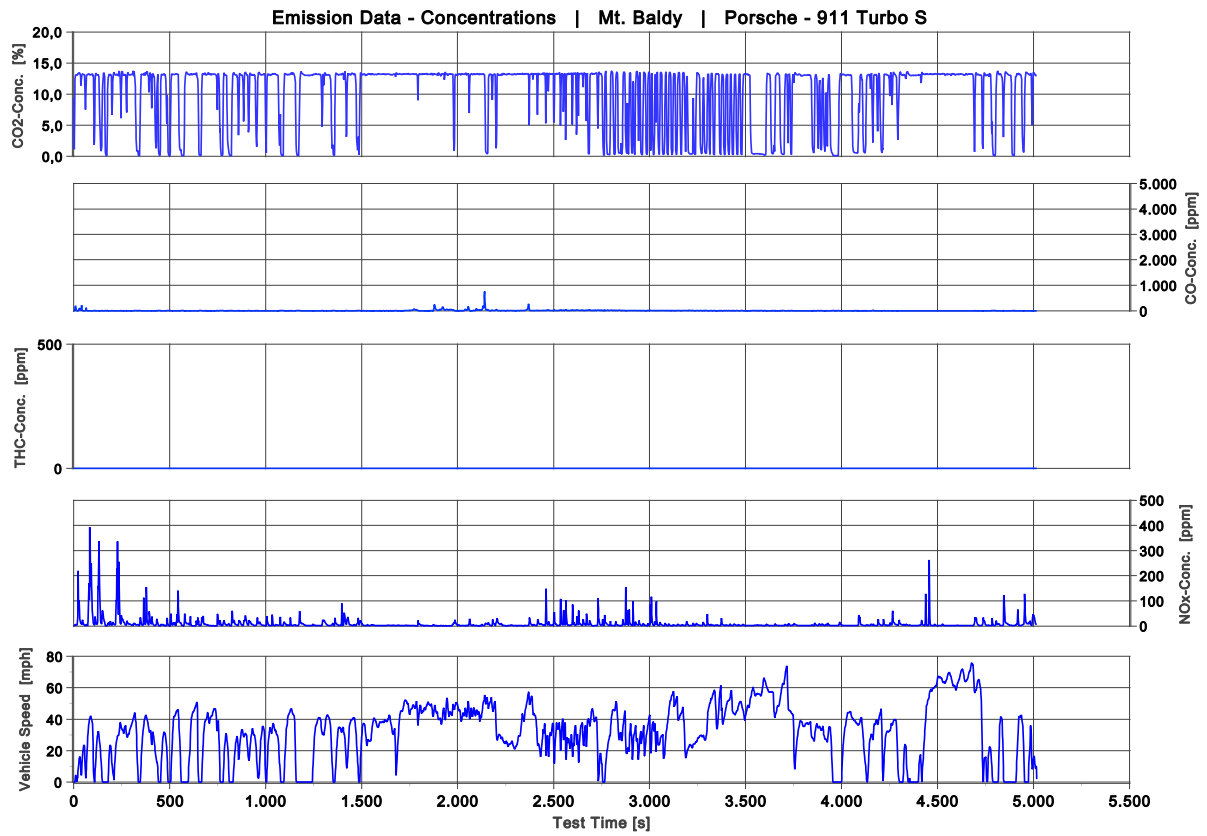
### 3.8.3 Mt. Baldy

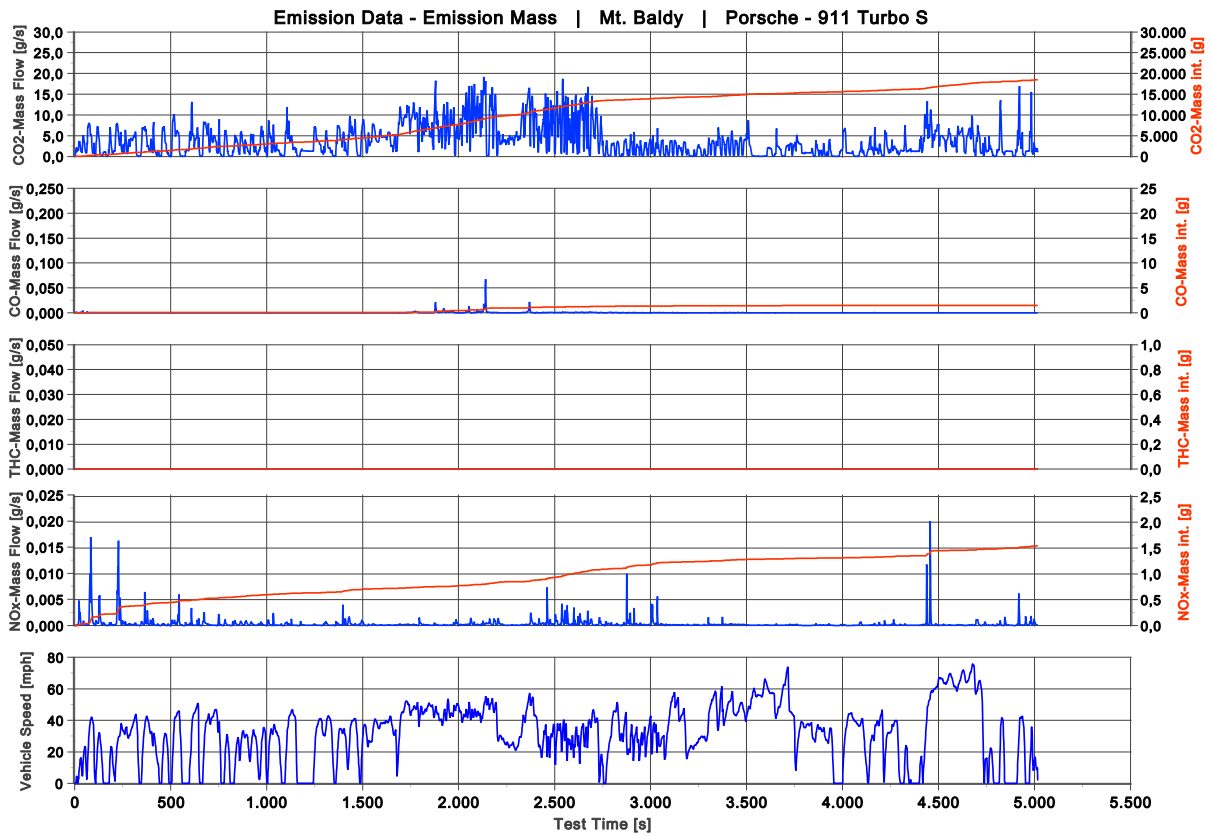
Table 3-38: Mt. Baldy Trip Summary for 911 Turbo S

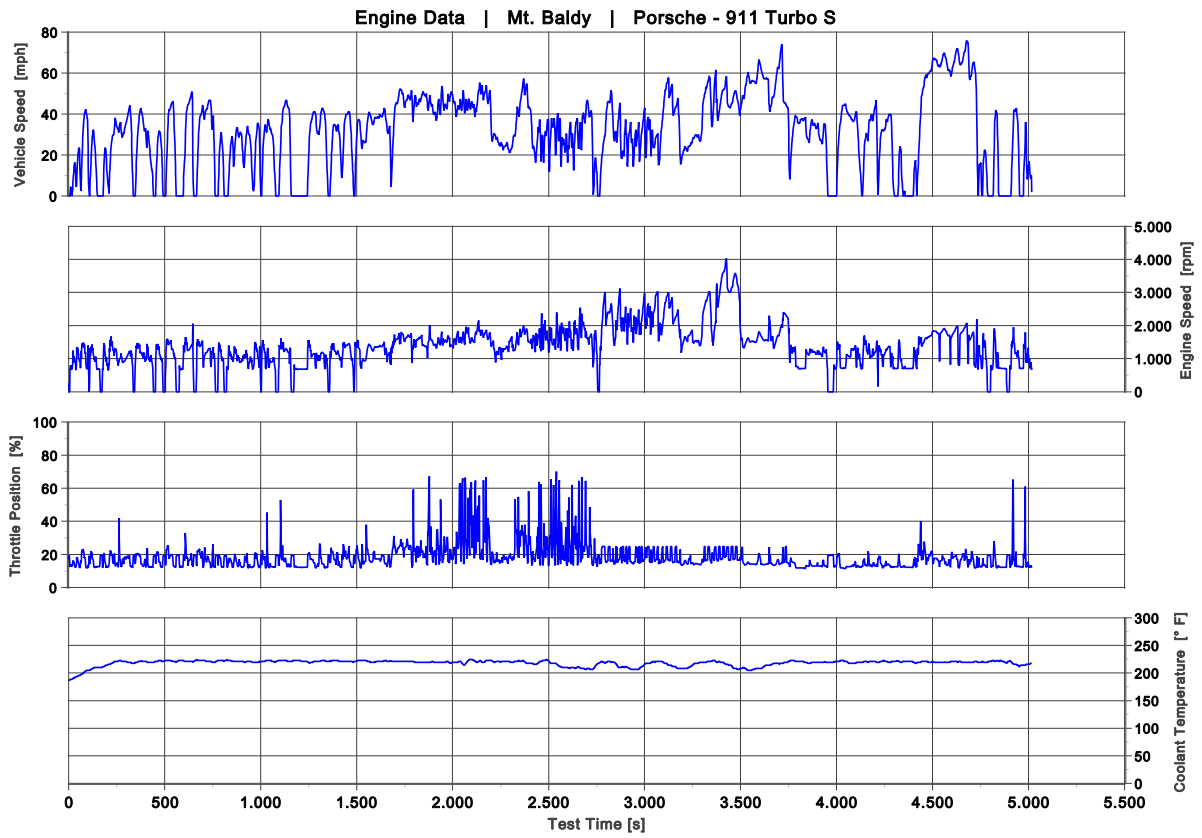
Test Data			
Test Name:	2019-06-07_911-Turbo-S_Mt.Baldy		
Department:	MBtech	Test Date:	06/07/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	PC / LDV	Nominal Power [kW]:	412
Vehicle Modell:	911 Turbo S	Nominal Torque [Nm]:	700
VIN:	WP0AD2A90KS140171	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 2 Bin 5	Type of Fuel:	Gasoline
Drive concept:	Combustion Engine	Mileage [mi]:	ca. 2640
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	416,7	
CO	[g/mi]	0,038	
NO <sub>x</sub>	[g/mi]	0,037	
THC	[g/mi]	n.a.	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	5017	
Distance	[mi]	44,28	
Average Speed	[mph]	31,8	
Average Ambient Temperature	[°F]	76,0	











### 3.9 Cayenne E-Hybrid

The following table summarizes the emission measurement results from the Cayenne E-Hybrid vehicle.

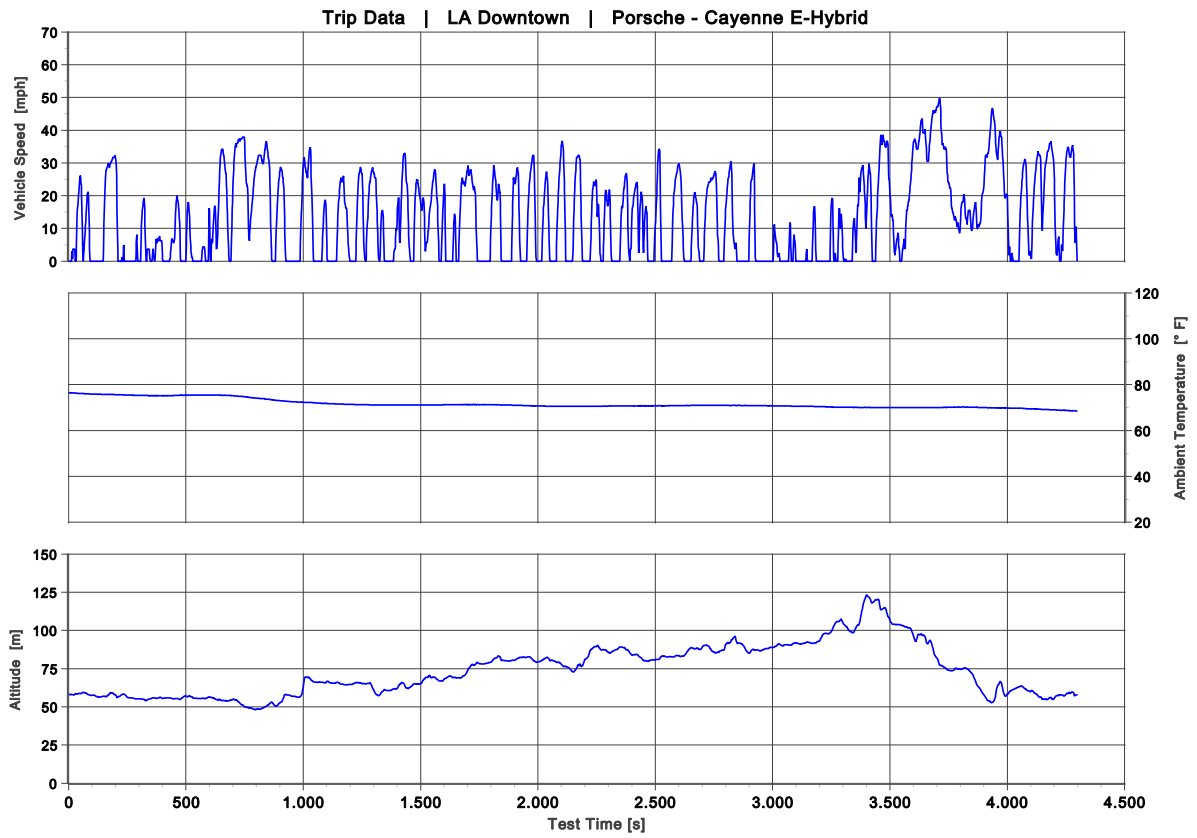
Table 3-39: Emission Overview Porsche - Cayenne E-Hybrid

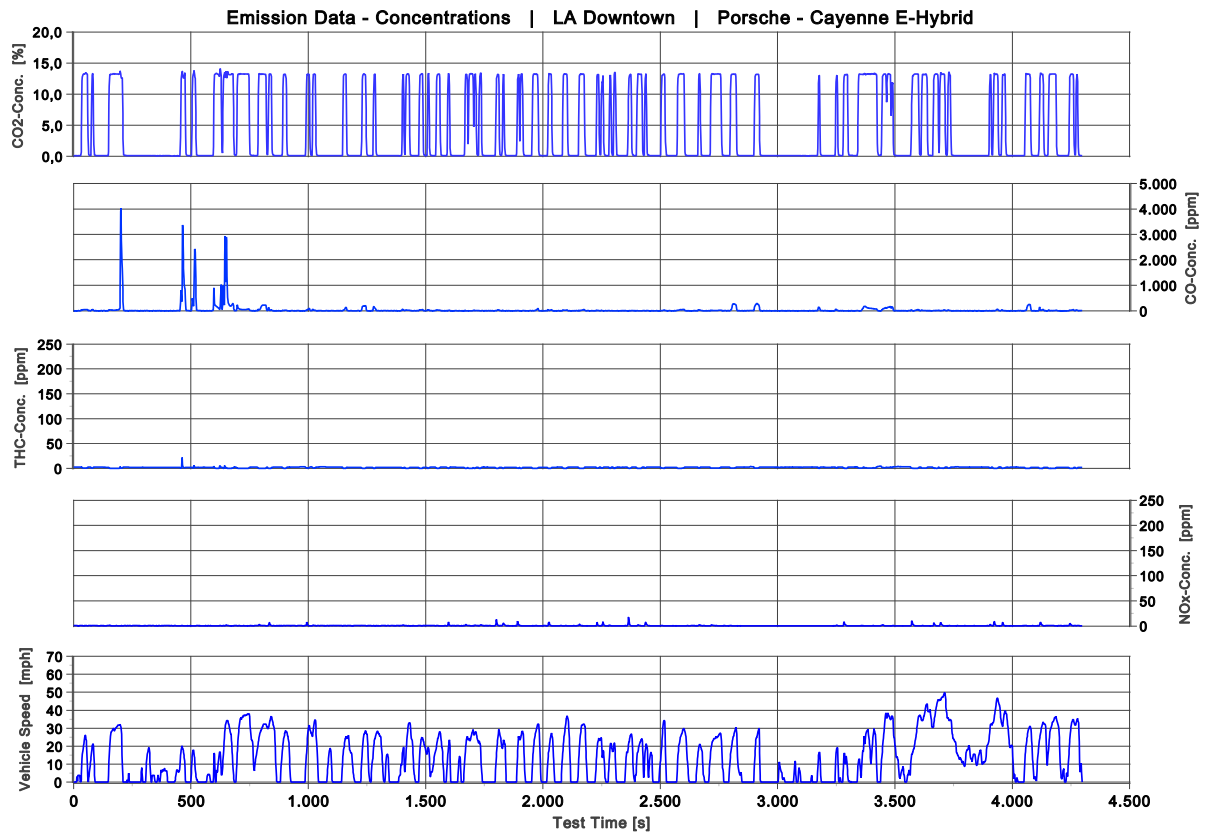
Cayenne E-Hybrid		Emissions				Test		
Date	Route / Test	CO <sub>2</sub> [g/mi]	CO [g/mi]	NO <sub>x</sub> [g/mi]	THC [g/mi]	Duration [s]	Distance [mi]	Battery-level at start
06/12/2019	LA Downtown	447,0	0,249	0,005	0,001	4299	15,61	< 20%
06/13/2019	Highway	344,1	0,327	0,008	0,008	3904	43,84	< 20%
06/13/2019	Mt. Baldy	411,1	0,625	0,008	0,010	5373	44,54	< 20%
06/18/2019	FTP75 (PEMS)	518,0	0,320	0,012	0,029	2493	10,89	< 20%
06/18/2019	FTP75 (Dyno)	457,2	0,330	0,009	0,026		11,01	

### 3.9.1 LA Downtown

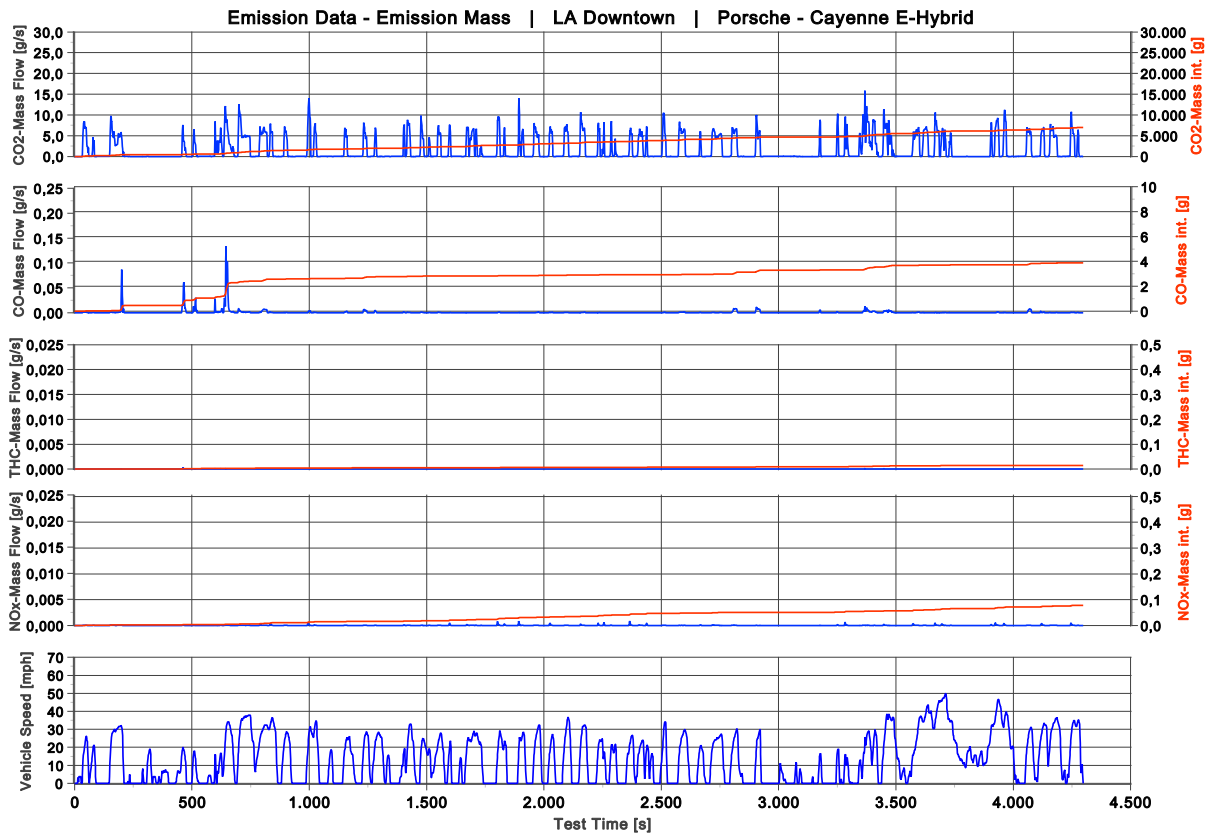
Table 3-40: LA Downtown Trip Summary for Cayenne E-Hybrid

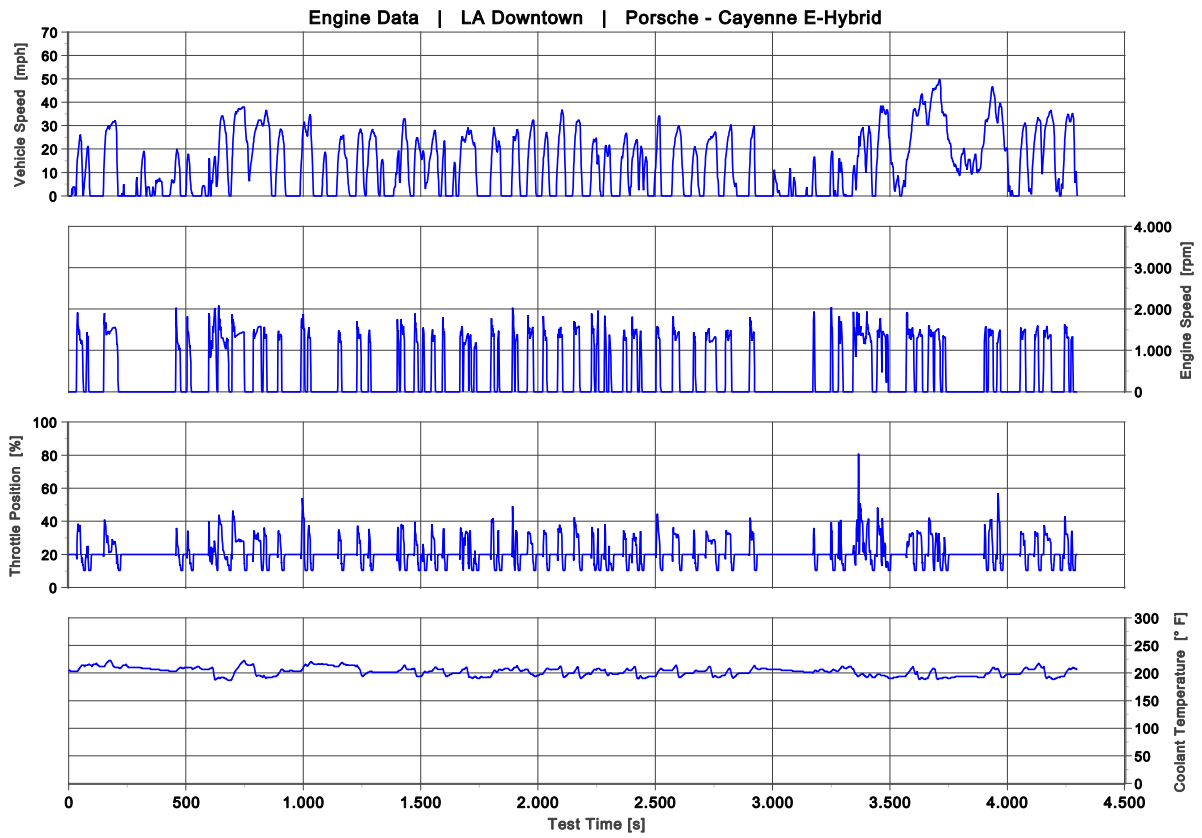
Test Data			
Test Name:	2019-06-12_Cayenne-E-Hybrid_LA-Downtown		
Department:	MBtech	Test Date:	06/12/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	340
Vehicle Modell:	Cayenne E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP1AE2AY0KDA50039	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1575
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	447,0	
CO	[g/mi]	0,249	
NO <sub>x</sub>	[g/mi]	0,005	
THC	[g/mi]	0,001	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	4299	
Distance	[mi]	15,61	
Average Speed	[mph]	13,1	
Average Ambient Temperature	[°F]	71,6	







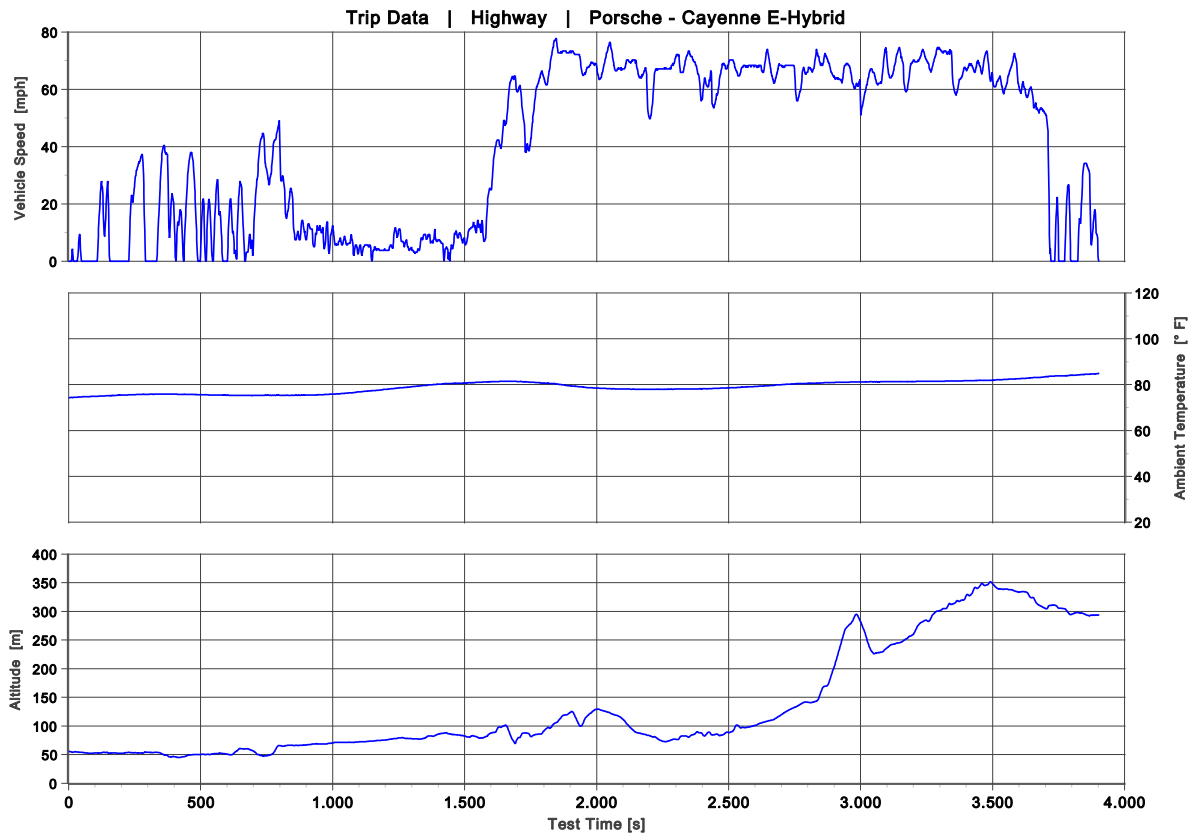


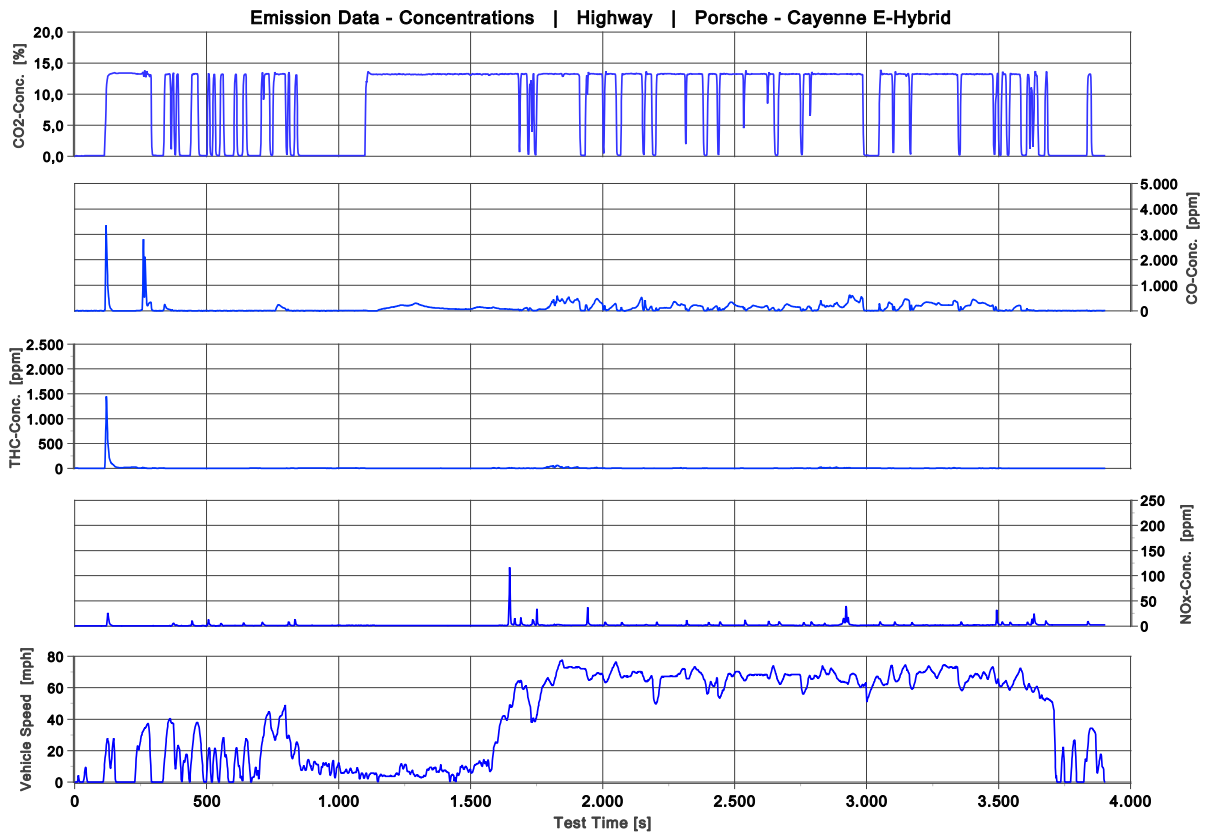


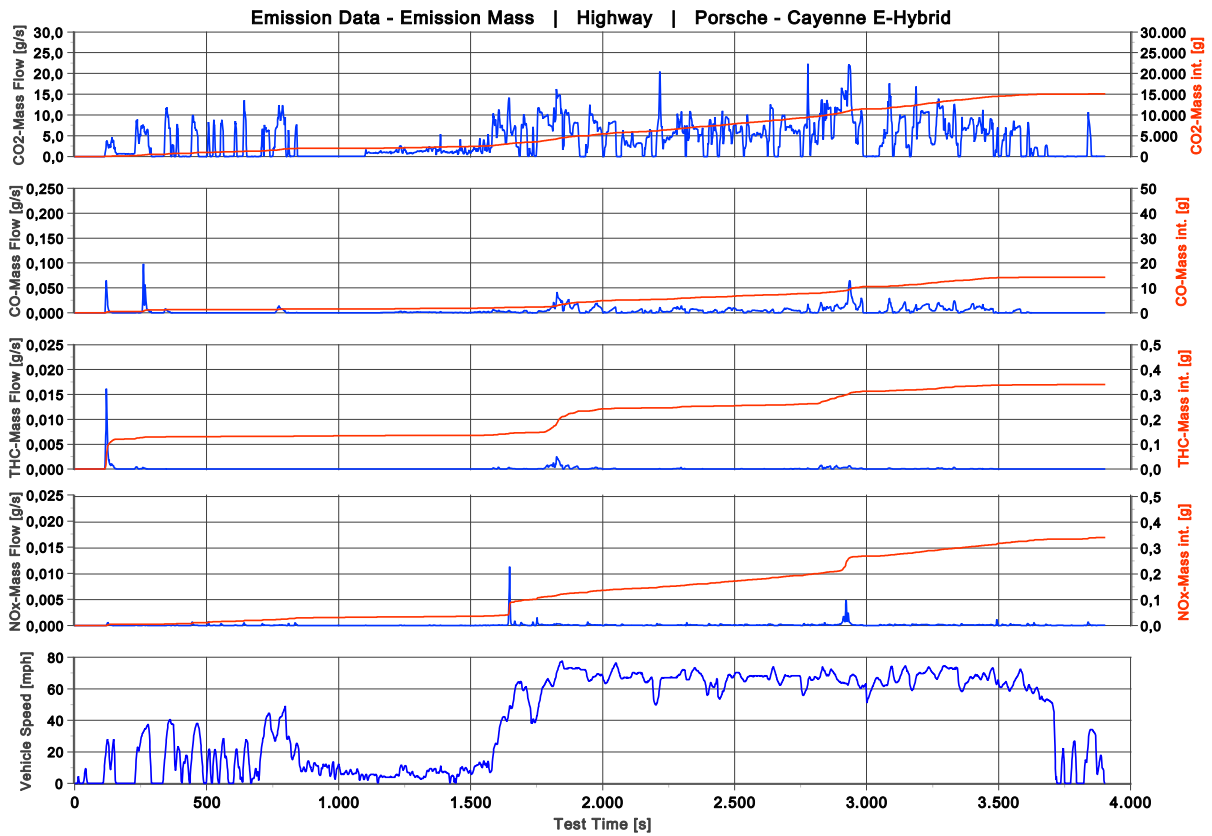
### 3.9.2 Highway

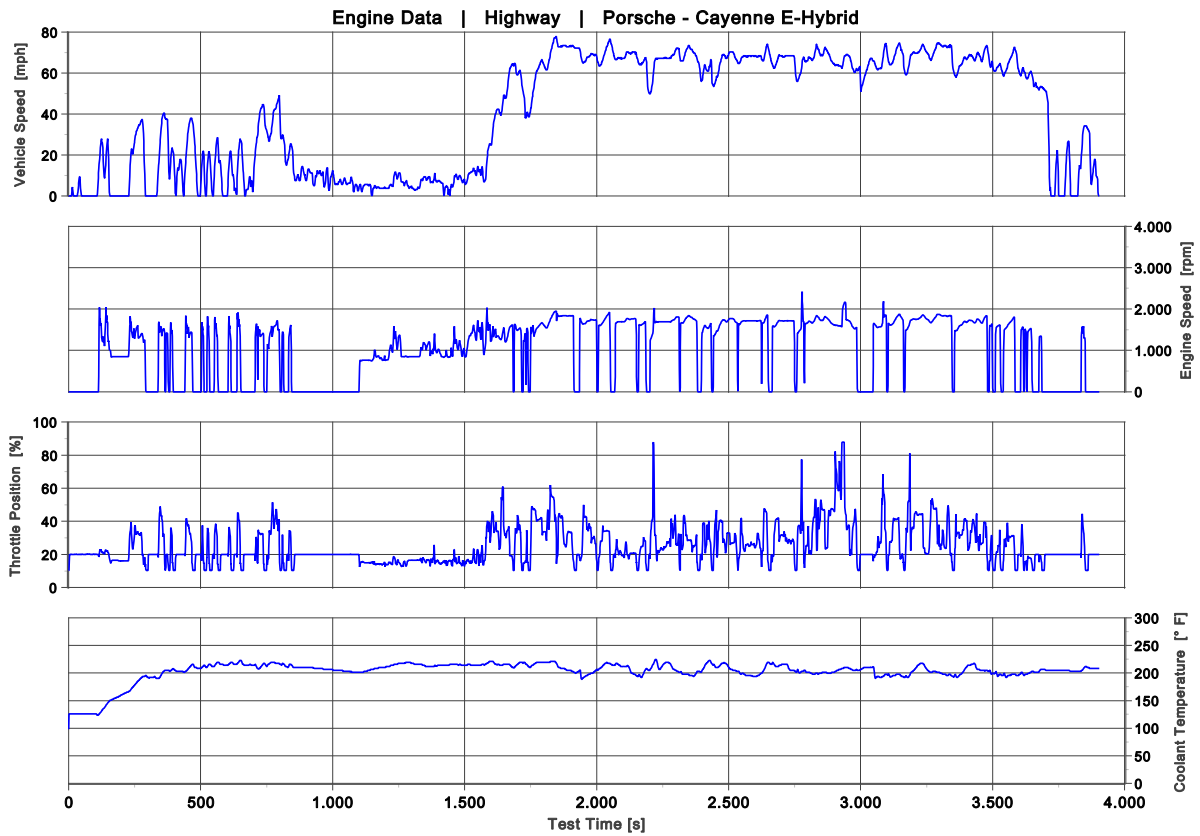
Table 3-41: Highway Trip Summary for Cayenne E-Hybrid

Test Data			
Test Name:	2019-06-13_Cayenne-E-Hybrid_Highway		
Department:	MBtech	Test Date:	06/13/2019
Driving Mode:	Default	Number of Passengers:	1
Vehicle Data			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	340
Vehicle Modell:	Cayenne E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP1AE2AY0KDA50039	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1575
Emission Summary			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	344,1	
CO	[g/mi]	0,327	
NO <sub>x</sub>	[g/mi]	0,008	
THC	[g/mi]	0,008	
Trip Data			
	Unit	Total Trip	
Trip Duration	[s]	3904	
Distance	[mi]	43,84	
Average Speed	[mph]	40,4	
Average Ambient Temperature	[°F]	79,0	







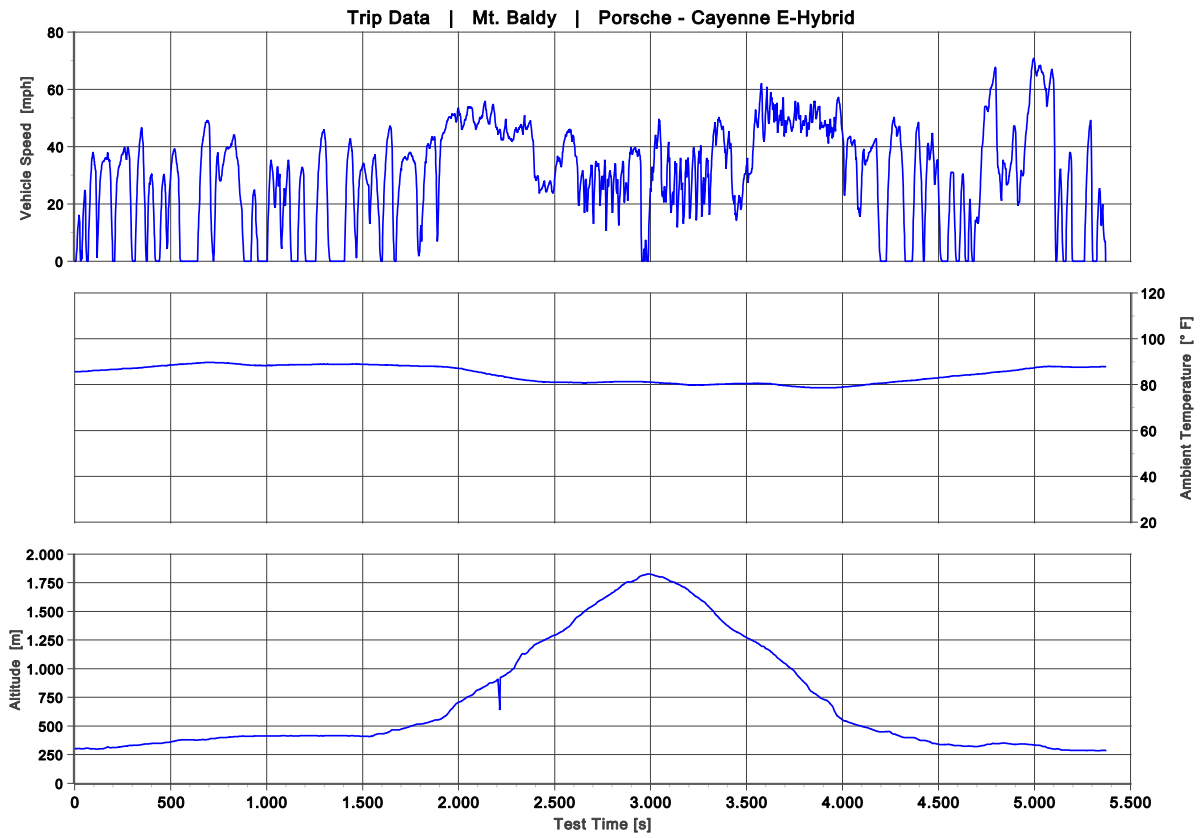


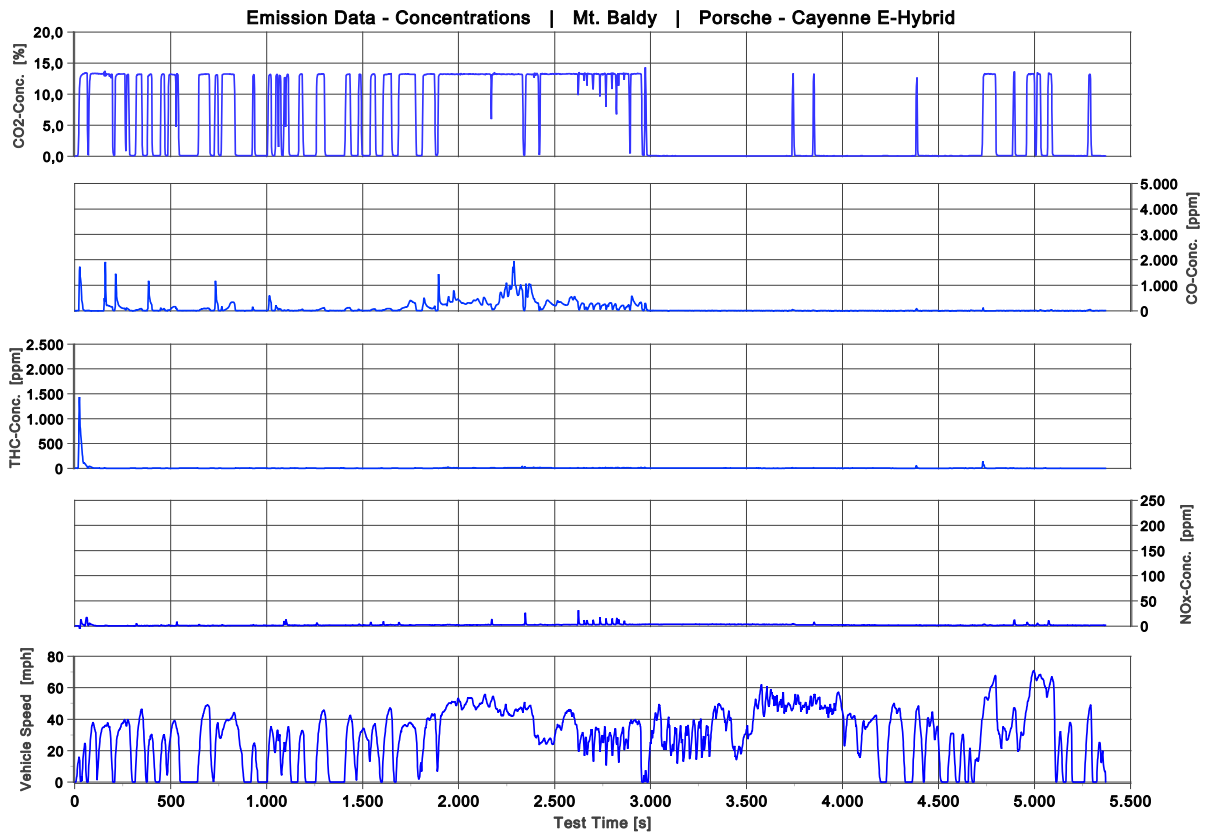
### 3.9.3 Mt. Baldy

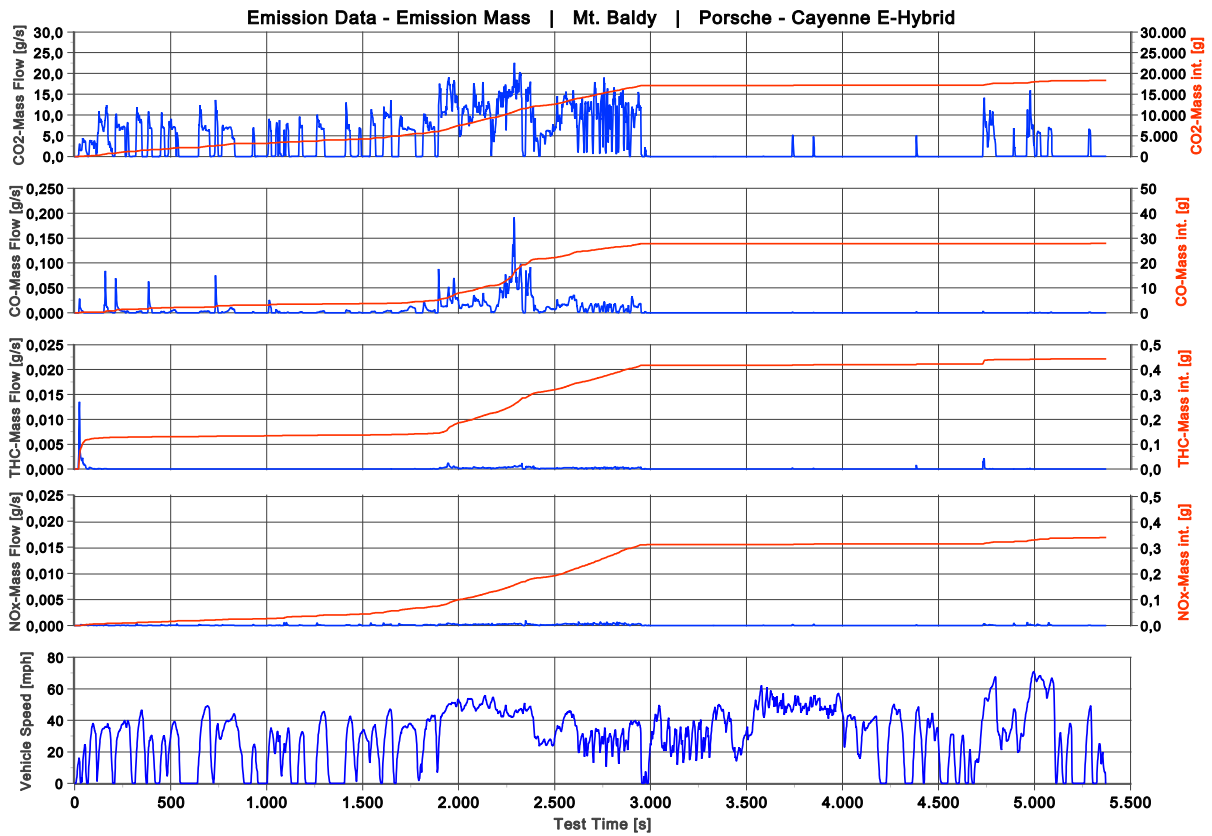
Table 3-42: Mt. Baldy Trip Summary for Cayenne E-Hybrid

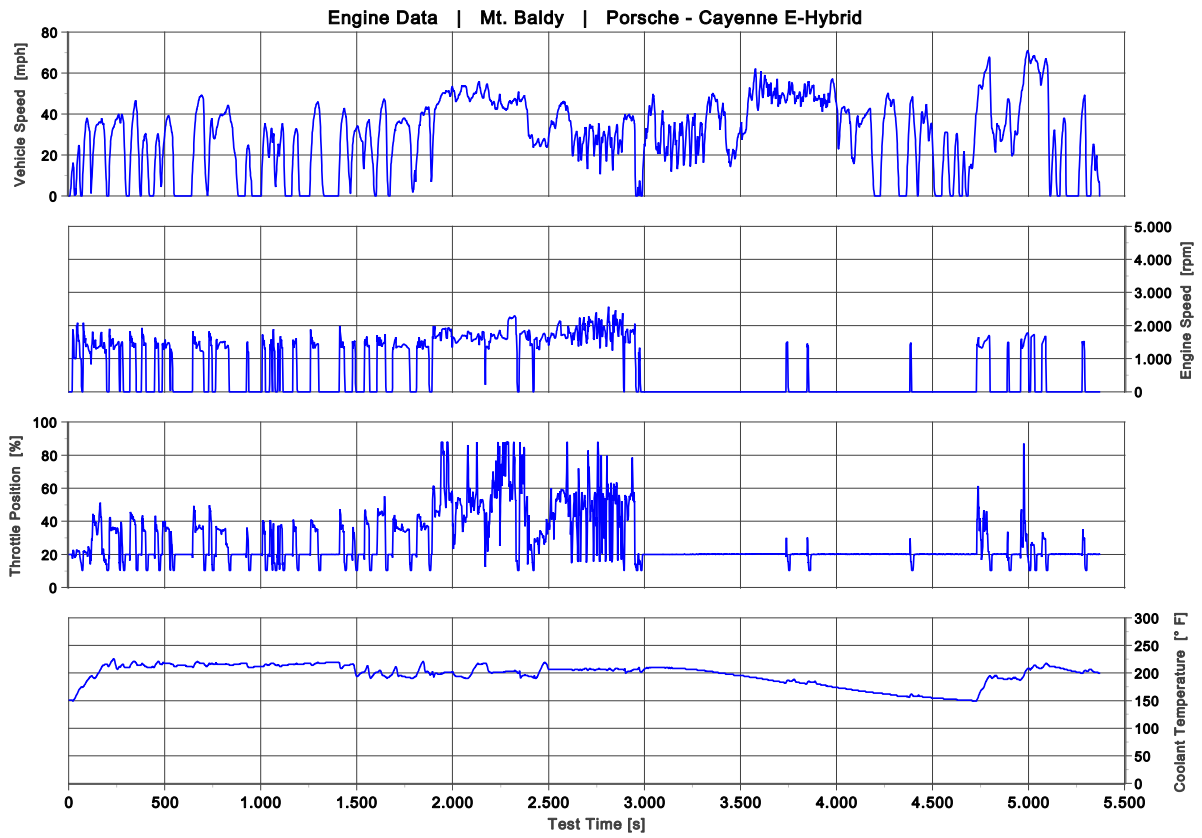
<b>Test Data</b>			
Test Name:	2019-06-13_Cayenne-E-Hybrid_Mt.Baldy		
Department:	MBtech	Test Date:	06/13/2019
Driving Mode:	Default	Number of Passengers:	1
<b>Vehicle Data</b>			
Manufacturer:	Porsche	Type of Drive:	AWD
Vehicle Type:	LDT	Nominal Power [kW]:	340
Vehicle Modell:	Cayenne E-Hybrid	Nominal Torque [Nm]:	700
VIN:	WP1AE2AY0KDA50039	Transmission:	AT
License Plate:	PCNA plate	Exhaust Gas Treatment:	TWC
Emission Class:	Tier 3 Bin 70	Type of Fuel:	Gasoline
Drive concept:	PHEV	Mileage [mi]:	ca. 1575
<b>Emission Summary</b>			
Exhaust Gas Components	Unit	Total Trip	
CO <sub>2</sub>	[g/mi]	411,1	
CO	[g/mi]	0,625	
NO <sub>x</sub>	[g/mi]	0,008	
THC	[g/mi]	0,010	
<b>Trip Data</b>			
	Unit	Total Trip	
Trip Duration	[s]	5373	
Distance	[mi]	44,54	
Average Speed	[mph]	29,8	
Average Ambient Temperature	[°F]	84,6	











## 4 Conclusion

PEMS testing was conducted by MBtech on eight series-production light-duty gasoline vehicles provided by Porsche. The vehicle models tested included a Cayenne (vehicle with the highest project sales), Cayenne Turbo, Cayenne E-Hybrid, Panamera 4 E-Hybrid, Panamera Turbo S E-Hybrid, Macan, 718 Cayman GTS and 911 Turbo S.

Three pre-defined routes were used to perform PEMS testing of the eight vehicles. The tests routes were defined within main areas in Southern California, primarily Los Angeles and the Inland Empire. These three routes reflected the diversity in topological characteristics, driving patterns and ambient conditions that are expected to be representative of typical vehicle operations within the area. In addition to PEMS measurements on the road, correlation tests between the PEMS and a chassis dynamometer at the Emission Compliance Lab and Test Center in Oxnard, California were carried out.

The gaseous emissions from the test vehicles were measured with a PEMS and FID from AVL. The specific pollutants measured were CO, CO<sub>2</sub>, NO<sub>x</sub> (the sum of NO and NO<sub>2</sub>) and THC (except the sports cars). Since U.S. and California law does not set forth a standard by which PEMS testing can be used to determine compliance for purposes of certification under Title II of the Clean Air Act and under California law, no emissions comparisons to current U.S. and California Regulations can be drawn.

This document confirms all eight test vehicles from the model year 2019 have successfully undergone on-road testing using PEMS devices on three pre-defined routes in California. Characterization tests using the FTP75 test cycle were also successfully executed. The differences in results between PEMS devices and chassis dynamometer are within the acceptable tolerance range. Results of all these measurements have been compiled and delivered in the result section of this report.