



Mercedes-Benz MY2023 GLS450 4MATIC PEMS Report

1. Background

Mercedes-Benz Group AG (Mercedes-Benz), with headquarters in Stuttgart, Germany, is a large automotive company that sells vehicles and services in nearly every country in the world. Mercedes-Benz has production facilities in Europe, North and South America, Asia, and Africa. The current brand portfolio includes Mercedes-Benz as well as Mercedes-AMG, Mercedes-Maybach, smart, and EQ.

As part of fulfilling obligations under the Consent Decree entered on March 9, 2021 (“Consent Decree”) with the United States and California, Mercedes-Benz conducts off-cycle testing, encompassing Portable Emissions Measurement System (PEMS) testing, to demonstrate off-cycle tailpipe emissions and to screen for undisclosed auxiliary emission control devices (AECs) and defeat devices in U.S. light- and medium-duty vehicles. The testing was conducted as described in Section VII of the Consent Decree. Pursuant to the Consent Decree, Mercedes-Benz will conduct PEMS testing for any new diesel vehicles issued Certificates of Conformity or Executive Orders through and including MY2023 as light- or medium-duty diesel models, and for three vehicles certified as light- or medium-duty gasoline Test Groups per Model Year from MY2021 through and including MY2024. This PEMS report relates to MY2023 GLS450 4MATIC from Test Group PMBXT03.0HY2, which is the second highest volume Test Group applicable for MY2023 based on the projected 50 states’ sales volumes prepared for NMOG + NO_x fleet averages under Tier 3.

2. Approach

To demonstrate off-cycle tailpipe emissions, tests were performed on public roads in the Los Angeles area on city, highway, and mountain routes. These test routes have been approved by CARB. Emissions measured and/or calculated and reported include oxides of nitrogen (NO_x), carbon monoxide (CO), carbon dioxide (CO₂), total hydrocarbons (THC), and non-methane organic gases (NMOG). All tests were executed by a team in Long Beach, CA. This team is independent of Mercedes-Benz’s product development departments. All vehicles were configured and tested by MBRDNA Long Beach Compliance staff. Test results were then analyzed to ensure quality control processes took place before and after each test sequence, including instrument calibration and calibration with reference gasses.

3. Emissions Results

MY2023 vehicle with the specifications listed in Table 1 was tested in March 2022. Tables 2 through 4 provide the vehicle test results of the combined route segments performed in the default transmission mode (Comfort Mode).

Table 1: Vehicle Specification

| Model | Tier | Drive type | HP | Torque (ft.lb) | Transmission | Exh Treatment | Fuel | Start Mileage |
|-----------|--------|------------|-----|----------------|--------------|---------------|----------|---------------|
| GLS450 4M | ULEV50 | AWD | 362 | 369 | 9 Automatic | TWC | Gasoline | 2039 |

Table 2: Highway Results

| Model | A1 Highway East (g/mi) | | | | | B2 Highway West (g/mi) | | | | |
|-----------|------------------------|---------|---------|-----------------|---------|------------------------|---------|---------|-----------------|---------|
| | CO ₂ | CO | THC | NO _x | NMOG | CO ₂ | CO | THC | NO _x | NMOG |
| GLS450 4M | 285.58 | 0.26532 | 0.00031 | 0.00133 | 0.00030 | 236.34 | 0.31203 | 0.00000 | 0.00222 | 0.00000 |

Table 3: Mountain Results

| Model | A2 Mountain Uphill (g/mi) | | | | | B1 Mountain Downhill (g/mi) | | | | |
|-----------|---------------------------|---------|---------|-----------------|---------|-----------------------------|---------|---------|-----------------|---------|
| | CO ₂ | CO | THC | NO _x | NMOG | CO ₂ | CO | THC | NO _x | NMOG |
| GLS450 4M | 497.52 | 0.81182 | 0.00036 | 0.00206 | 0.00034 | 183.88 | 0.24673 | 0.00001 | 0.00670 | 0.00001 |

Table 4: Cold Start and Urban Driving Result

| Model | A0 Long Beach → CARB (g/mi) | | | | | LA City (g/mi) | | | | |
|-----------|-----------------------------|---------|---------|-----------------|---------|-----------------|---------|---------|-----------------|---------|
| | CO ₂ | CO | THC | NO _x | NMOG | CO ₂ | CO | THC | NO _x | NMOG |
| GLS450 4M | 301.51 | 0.32583 | 0.02660 | 0.00412 | 0.02706 | 404.44 | 0.70577 | 0.00057 | 0.00670 | 0.00054 |

4. Trip Statistics

Tables 5 to 10 summarize the vehicle test statistics and environmental conditions during each test cycle.

Table 5: Highway East (A1)

| Trip Duration h.mm.ss | Distance (mi) | V*Apos [‡] | Average Speed (mi/h) | Standstill % | Constant % | Acceleration % | Deceleration % | Cumulative pos. altitude (m) | Average temperature (F) |
|--------------------------|------------------|---------------------|-------------------------|-----------------|---------------|-------------------|-------------------|---------------------------------|----------------------------|
| 0.29.26 | 27.73 | 15.618 | 56.54 | 3.91 | 0.23 | 51.13 | 44.73 | 419.98 | 71.73 |

Table 6: Highway West (B2)

| Trip Duration h.mm.ss | Distance (mi) | V*Apos [‡] | Average Speed (mi/h) | Standstill % | Constant % | Acceleration % | Deceleration % | Cumulative pos. altitude (m) | Average temperature (F) |
|--------------------------|------------------|---------------------|-------------------------|-----------------|---------------|-------------------|-------------------|---------------------------------|----------------------------|
| 0.32.47 | 28.39 | 13.748 | 51.97 | 3.61 | 0.41 | 51.40 | 44.59 | 190.94 | 74.59 |

Table 7: Mountain Uphill (A2)

| Trip Duration h.mm.ss | Distance (mi) | V*Apos [‡] | Average Speed (mi/h) | Standstill % | Constant % | Acceleration % | Deceleration % | Cumulative pos. altitude (m) | Average temperature (F) |
|--------------------------|------------------|---------------------|-------------------------|-----------------|---------------|-------------------|-------------------|---------------------------------|----------------------------|
| 0.33.46 | 17.11 | 15.861 | 30.41 | 20.58 | 0.00 | 42.25 | 37.17 | 1022.70 | 69.13 |

Table 8: Mountain Downhill (B1)

| Trip Duration h.mm.ss | Distance (mi) | V*Apos [‡] | Average Speed (mi/h) | Standstill % | Constant % | Acceleration % | Deceleration % | Cumulative pos. altitude (m) | Average temperature (F) |
|--------------------------|------------------|---------------------|-------------------------|-----------------|---------------|-------------------|-------------------|---------------------------------|----------------------------|
| 0.31.50 | 18.08 | 16.549 | 34.07 | 13.30 | 0.16 | 47.54 | 39.00 | 86.40 | 67.32 |

Table 9: Long Beach to CARB (A0)

| Trip Duration h.mm.ss | Distance (mi) | V*Apos ‡ | Average Speed (mi/h) | Standstill % | Constant % | Acceleration % | Deceleration % | Cumulative pos. altitude (m) | Average temperature (F) |
|--------------------------|------------------|----------|-------------------------|-----------------|---------------|-------------------|-------------------|---------------------------------|----------------------------|
| 0.34.32 | 24.16 | 14.270 | 41.99 | 9.70 | 0.39 | 49.28 | 40.64 | 238.72 | 71.97 |

Table 10: LA City

| Trip Duration h.mm.ss | Distance (mi) | V*Apos ‡ | Average Speed (mi/h) | Standstill % | Constant % | Acceleration % | Deceleration % | Cumulative pos. altitude (m) | Average temperature (F) |
|--------------------------|------------------|----------|-------------------------|-----------------|---------------|-------------------|-------------------|---------------------------------|----------------------------|
| 0.54.27 | 15.94 | 14.520 | 17.57 | 26.08 | 0.06 | 37.04 | 36.82 | 263.63 | 75.50 |

‡V*Apos results are the 95th percentile values displayed in m²/s³

5. Routes

The routes for on-road emissions testing are approved by CARB and intended to include various road and traffic conditions. These routes include mountain driving at high elevation, urban driving, and highway driving. These routes are separated into six test sections with no key-off cycles between A0 and B2. For the Combined Test Route, the test vehicle was cold-started at the Mercedes-Benz Los Angeles Technology Center (MB LATC) and data was collected for Segment A0 between MB LATC and the official start of the route at CARB El Monte. The Urban/Downtown L.A. test route, consistent with past Off-Cycle tests was driven on a different day, and was started with a running engine after a transfer drive from MB LATC to the start of the route with no key-off cycles.

Table 11: Description of Test Routes and Calculated Trip Statistics

| Route | Distance (mi) | Segment Duration | Max – Min Elevation (m) | Average Speed (mph) | Fraction Hwy | Fraction Urban/Rural |
|---------|------------------|---------------------|----------------------------|------------------------|-----------------|-------------------------|
| A0 | 24 | 35 min | 126 | 42 | 72 | 28 |
| A1 | 28 | 29 min | 284 | 57 | 90 | 10 |
| A2 | 17 | 34 min | 976 | 30 | 1 | 99 |
| B1 | 18 | 32 min | 980 | 34 | 14 | 86 |
| B2 | 28 | 33 min | 285 | 52 | 80 | 20 |
| LA City | 16 | 54 min | 72 | 18 | 8 | 92 |

5.1 Highway Sections (A1 & B2)

These routes are representative of highway driving in California. Each route segment is approximately 28 miles and is composed of 95% highway and 5% surface roads. These segments travel between Vineyard Ave, Ontario CA and California Air Resource Board office at 9528 Telstar Ave, El Monte CA via Hwy 10. The average speed is 50mph and the net elevation change is approximately 938ft (286m).

A1 – Highway East

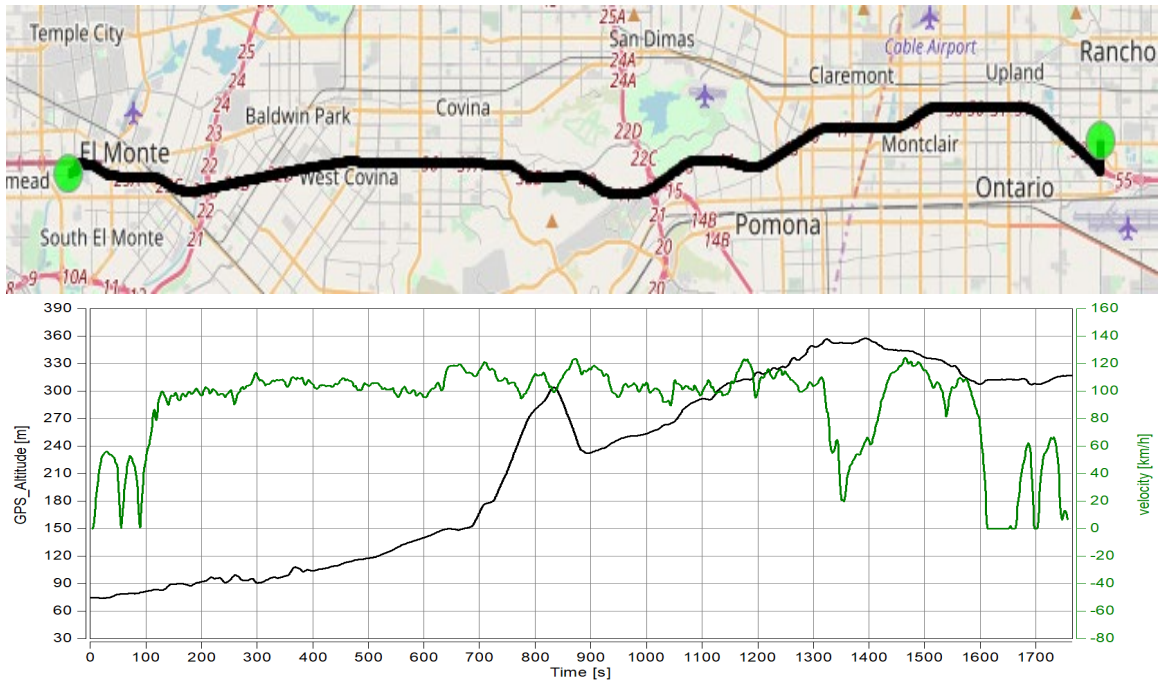


Figure 1. Map of Route A1 – Highway East. Including speed and elevation

B2 – Highway West



Figure 2. Map of Route B2 – Highway West. Including speed and elevation

5.2 Mountain Sections (A2 & B1)

This route is representative of rural uphill and downhill driving. Each route segment is approximately 17.5 miles and is composed of 90% surface roads and 10% highway, starting from Vineyard Ave in Ontario and traveling to Mt. Baldy, then returning to Vineyard Ave. The average speed is 30mph. The net elevation change is 3242ft (988m).

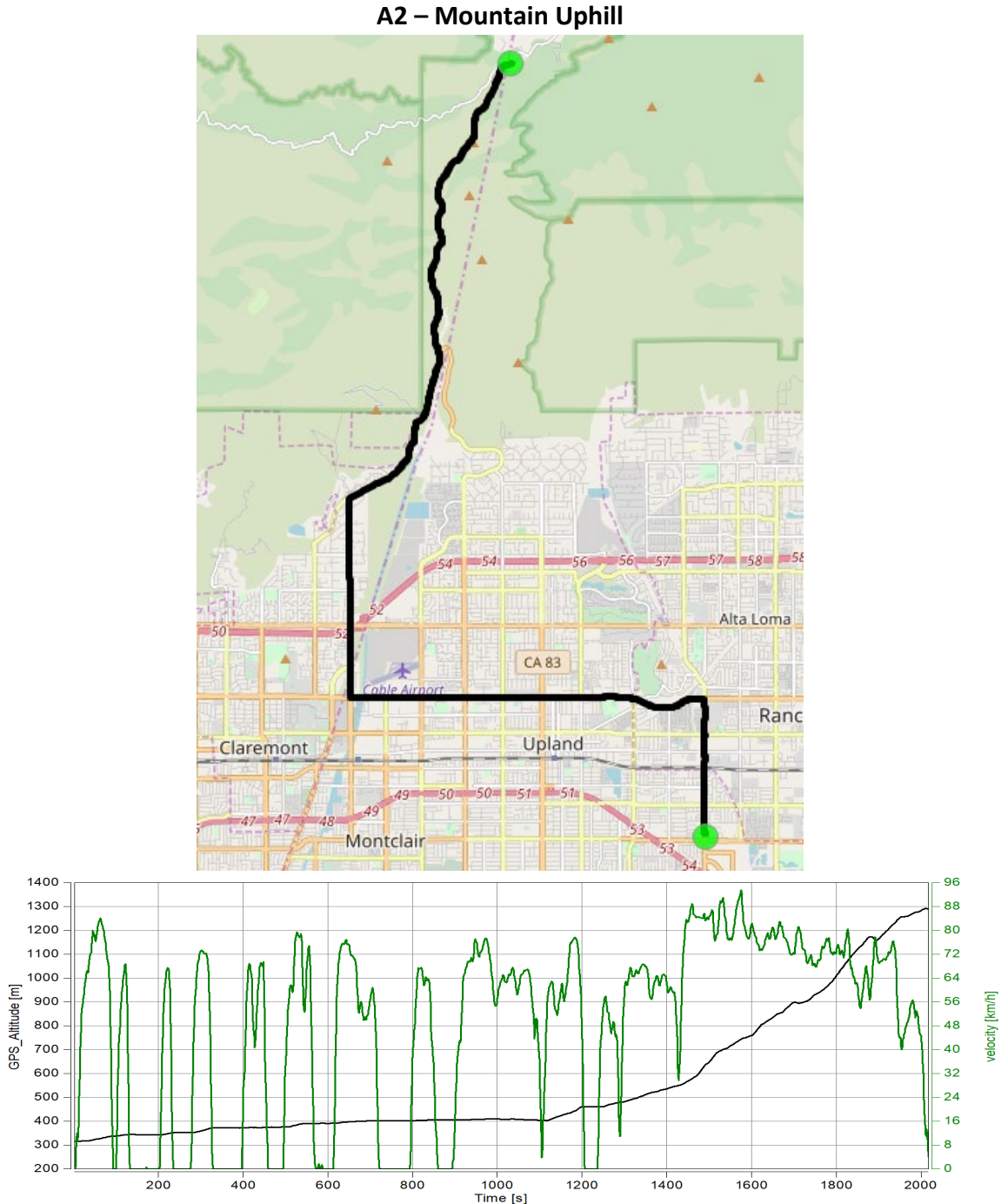


Figure 3. Map of Route A2 – Mountain Uphill. Including speed and elevation

B1 – Mountain Downhill.

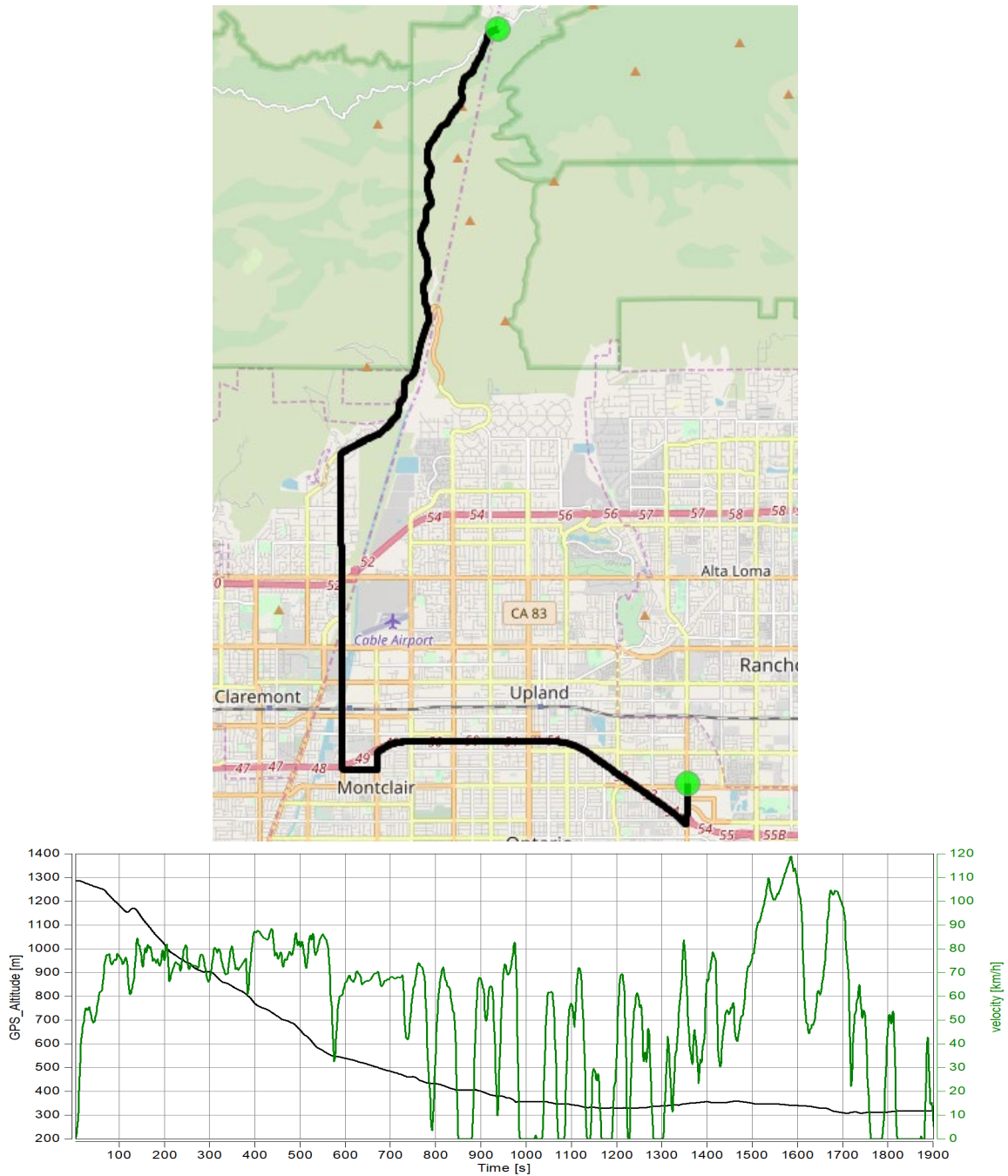


Figure 4. Map of Route B1 – Mountain Downhill. Including speed and elevation

5.3 Long Beach to CARB Section (A0)

This route travels between 4035 Via Oro Ave, Long Beach CA and 9528 Telstar Ave, El Monte CA. This route contains a cold start event with the test vehicle normalized to ambient conditions, beginning from Long Beach.

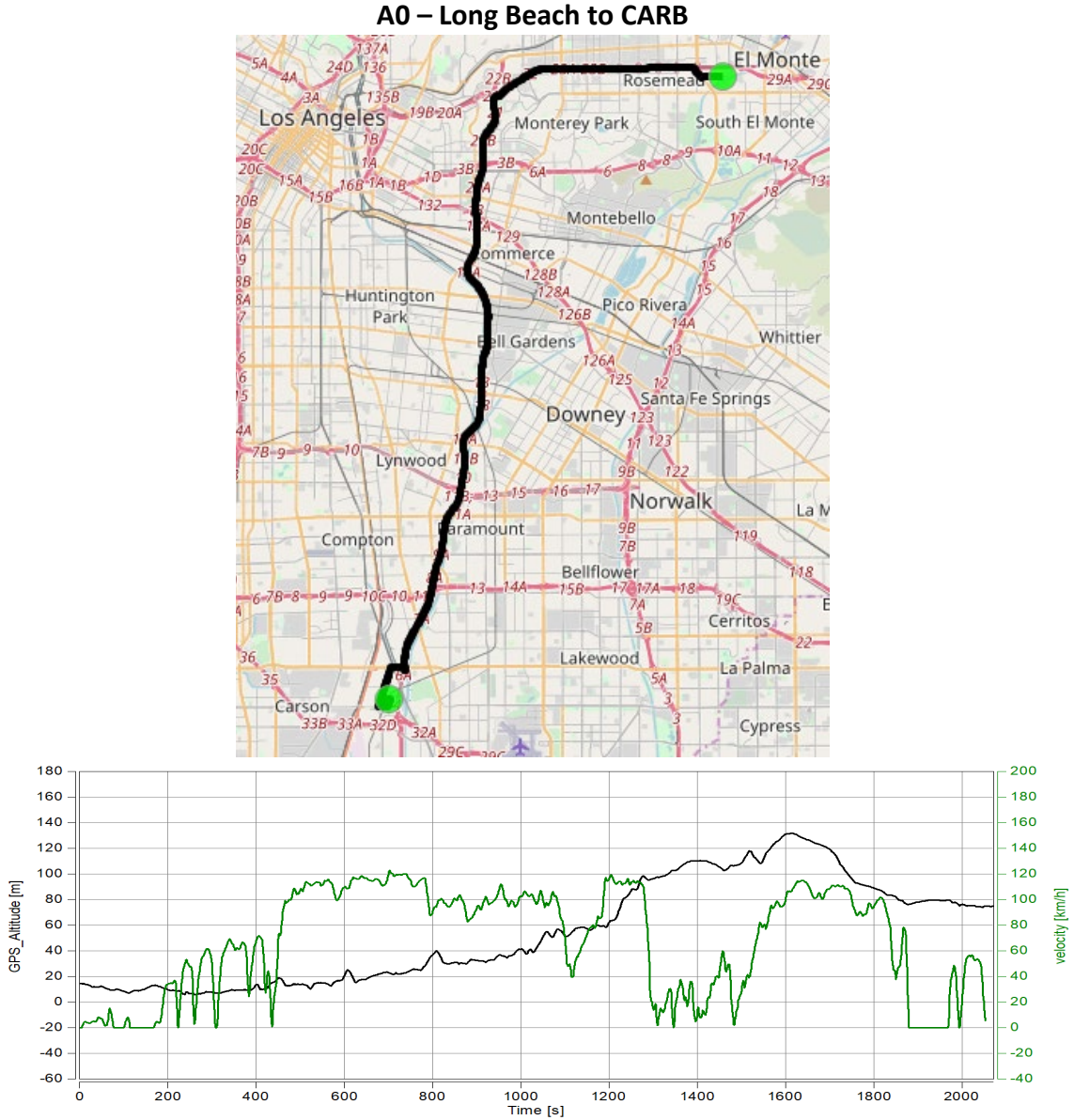


Figure 5. Map of Route A0 – Long Beach to CARB, El Monte. Including speed and elevation

5.4 LA City Driving Section

This route is intended to represent city driving and is a modernized reflection of the LA4. There are minor modifications to account for traffic patterns and roads which have changed since 1972 but this route represents a similar pattern to the original route. The route is approximately 16 miles and is 20% highway, 80% surface road with an average speed of 16mph.

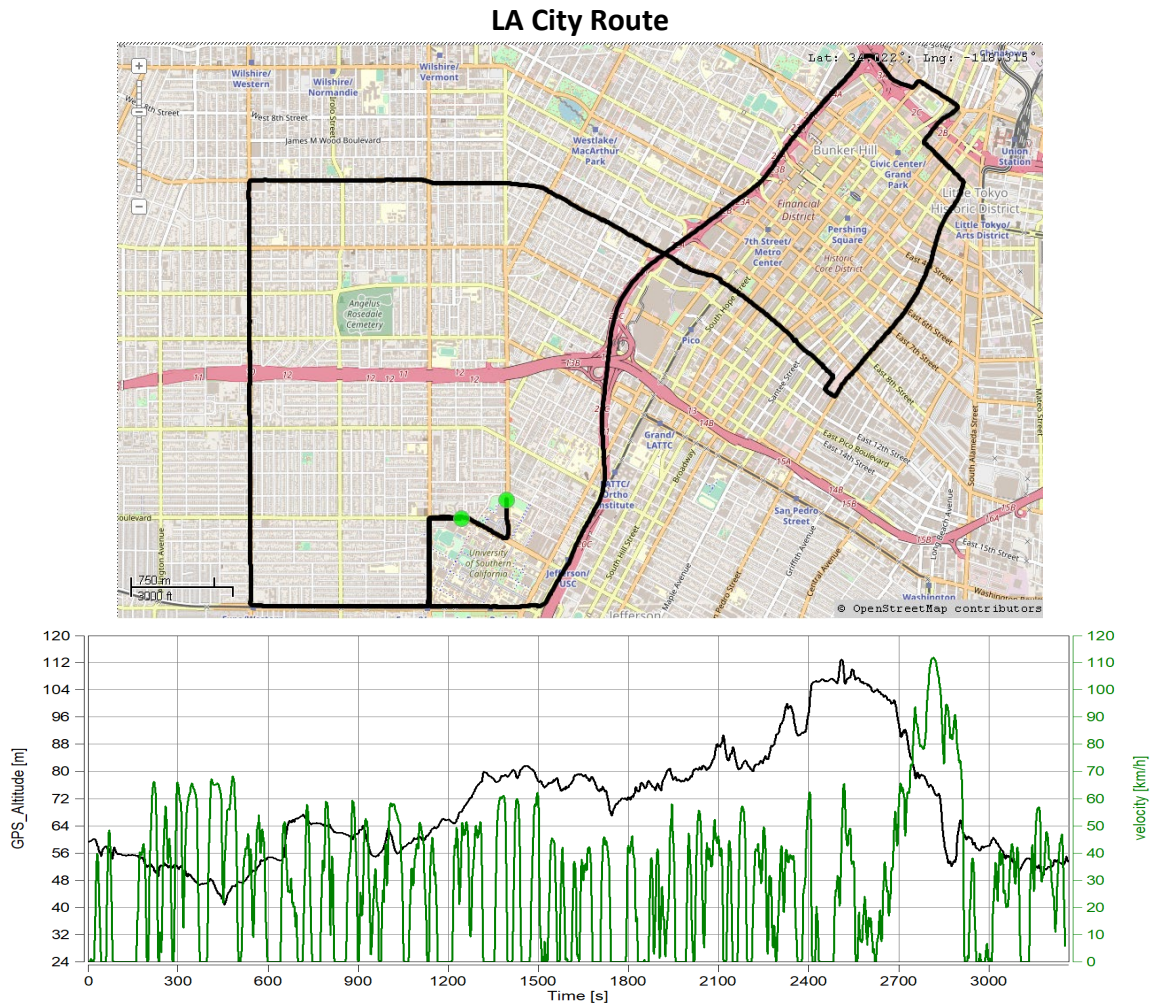


Figure 6. Map of LA City Route. Including speed and elevation

6. Log Sheets

A comprehensive list with information regarding each PEMS test conducted is provided separately as an addendum to this report. In addition to the information concerning PEMS test results, all test records will also be provided in the same file.

The information is provided in the file: Flat File Log Sheet MY2023 GLS450.pdf

This file contains log sheet information on PEMS testing conducted with the MY2023 Mercedes-Benz GLS450 4MATIC test vehicle X167-4823. The table also includes information and explanations on valid, aborted, and invalid tests.

7. Appendix

The following pages include emission report summaries for each valid test performed using the PEMS system and AVL post processing.



| | | |
|-------------------------------|--------------|--------|
| Trip Duration | 1766.00 | s |
| Trip Duration (a) | 1766.00 | s |
| Trip Distance | 27.73 | mi |
| Trip Distance (a) | 27.73 | mi |
| Trip Fuel Cons. (b) | 3.38 | kg |
| Trip Fuel Cons. (ab) | 3.38 | kg |
| Trip Fuel Cons. EU (ac) | 2.61 | kg |
| Trip Fuel Cons. US (ac) | 2.61 | kg |
| Trip Fuel Economy (b) | 23.21 | mpg_US |
| Trip Fuel Economy (ab) | 23.21 | mpg_US |
| Trip Fuel Economy EU (ac) | 30.09 | mpg_US |
| Trip Fuel Economy US (ac) | 30.11 | mpg_US |
| Trip Fuel Economy GGE (b) | 23.21 | mpg_US |
| Trip Fuel Economy GGE (ab) | 23.21 | mpg_US |
| Trip Fuel Economy EU GGE (ac) | 30.09 | mpg_US |
| Trip Fuel Economy US GGE (ac) | 30.11 | mpg_US |
| Trip Av. Eng. Speed | 1552.86 | rpm |
| Trip Av. Torque | 120.29 | lbft |
| Trip Av. Power | 38.47 | hp |
| Trip Work | | |
| Trip Work (a) | 18.87 | hphr |
| Trip Exhaust Mass | 39.64 | kg |
| Trip Exhaust Mass EU (ac) | 51.42 | kg |
| Trip Exhaust Mass US (ac) | 51.46 | kg |
| Trip Av. Amb. Temperature | 71.73 | deg_F |
| Trip Av. Humidity | 23.18 | % |
| Trip Av. GPS Altitude | 223.06 | m |
| Fuel Type | Petrol (E10) | |

| | | |
|-----------------------------------|------------|------------|
| ave THC | -2.32099 | ppm |
| ave NMHC | -2.27457 | ppm |
| ave CH4 | -0.04642 | ppm |
| ave CO | 175.68130 | ppm |
| ave CO2 | 12.39838 | % |
| ave NOx | 1.29460 | ppm |
| ave PM | n/a | mg/m3 |
| ave Soot meas | n/a | mg/m3 |
| ave Soot | n/a | mg/m3 |
| ave PN | n/a | #/cm3 |
| tot THC | 0.00868 | g |
| tot NMHC | 0.00803 | g |
| tot CH4 | 0.00019 | g |
| tot CO | 7.34526 | g |
| tot CO2 | 7911.87060 | g |
| tot NO (d) | 0.03598 | g |
| tot NO2 | 0.00321 | g |
| tot NOx | 0.03701 | g |
| tot Soot | n/a | g |
| tot Soot meas | n/a | g |
| tot PM | n/a | g |
| tot PN | n/a | # |
| PM measurement type | 0.00000 | - |
| tot Soot on PM filter (estim.) | 0.00000 | mg |
| Soot --> PM simple scaling factor | 1.00000 | - |
| Trip Av. Veh. Speed | 56.53559 | mi/hr |
| Trip Distance Share Urban | 5.54877 | % distance |
| Trip Distance Share Rural | 4.73316 | % distance |
| Trip Distance Share Motorway | 89.71807 | % distance |

| | | |
|--------------|------------|--------|
| BS CO2 | 419.28539 | g/hphr |
| BS CO | 0.38926 | g/hphr |
| BS THC | 0.00046 | g/hphr |
| BS NMHC | 0.00043 | g/hphr |
| BS CH4 | 0.00001 | g/hphr |
| BS NO (d) | 0.00191 | g/hphr |
| BS NO2 | 0.00017 | g/hphr |
| BS NOx | 0.00196 | g/hphr |
| BS Soot | n/a | g/hphr |
| BS Soot meas | n/a | g/hphr |
| BS PM | n/a | g/hphr |
| BS PN | n/a | #/hpr |
| DS CO2 | 285.27848 | g/mi |
| DS CO | 0.26485 | g/mi |
| DS THC | 0.00031 | g/mi |
| DS NMHC | 0.00029 | g/mi |
| DS CH4 | 0.00001 | g/mi |
| DS NO (d) | 0.00130 | g/mi |
| DS NO2 | 0.00012 | g/mi |
| DS NOx | 0.00133 | g/mi |
| DS Soot | n/a | g/mi |
| DS Soot meas | n/a | g/mi |
| DS PM | n/a | g/mi |
| DS PN | n/a | #/mi |
| FS CO2 | 2339.77393 | g/kg |
| FS CO | 2.17221 | g/kg |
| FS THC | 0.00257 | g/kg |
| FS NMHC | 0.00237 | g/kg |
| FS CH4 | 0.00006 | g/kg |
| FS NO (d) | 0.01064 | g/kg |
| FS NO2 | 0.00095 | g/kg |
| FS NOx | 0.01094 | g/kg |
| FS Soot | n/a | g/kg |
| FS Soot meas | n/a | g/kg |
| FS PM | n/a | g/kg |
| FS PN | n/a | #/kg |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents

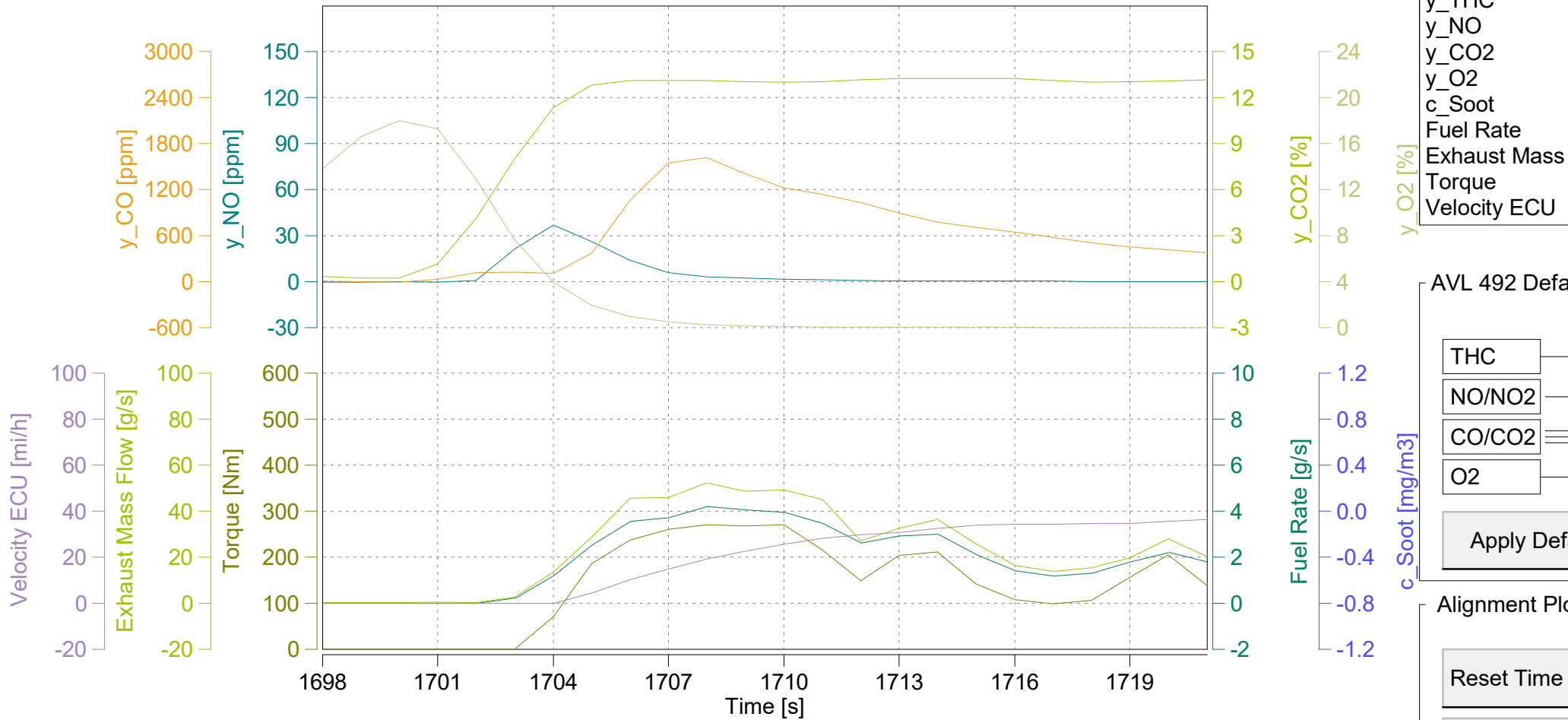


| | | | | | | | | |
|-------------------------------|--------------|--------|-----------------------------------|------------|------------|--------------|------------|--------|
| Trip Duration | 1766.00 | s | ave THC DC | -2.31542 | ppm | BS CO2 DC | 419.72146 | g/hphr |
| Trip Duration (a) | 1766.00 | s | ave NMHC DC | -2.26911 | ppm | BS CO DC | 0.38995 | g/hphr |
| Trip Distance | 27.73 | mi | ave CH4 DC | -0.04631 | ppm | BS THC DC | 0.00046 | g/hphr |
| Trip Distance (a) | 27.73 | mi | ave CO DC | 175.99524 | ppm | BS NMHC DC | 0.00042 | g/hphr |
| | | | ave CO2 DC | 12.41128 | % | BS CH4 DC | 0.00001 | g/hphr |
| Trip Fuel Cons. (b) | 3.38 | kg | ave NOx DC | 1.29383 | ppm | BS NO DC (d) | 0.00191 | g/hphr |
| Trip Fuel Cons. (ab) | 3.38 | kg | ave PM | n/a | mg/m3 | BS NO2 DC | 0.00017 | g/hphr |
| Trip Fuel Cons. EU (ac) | 2.61 | kg | ave Soot meas | n/a | mg/m3 | BS NOx DC | 0.00196 | g/hphr |
| Trip Fuel Cons. US (ac) | 2.61 | kg | ave Soot | n/a | mg/m3 | BS Soot | n/a | g/hphr |
| | | | ave PN DC | | | BS Soot meas | n/a | g/hphr |
| | | | | | | BS PM | n/a | g/hphr |
| Trip Fuel Economy (b) | 23.21 | mpg_US | ave Soot | n/a | mg/m3 | BS PN DC | | |
| Trip Fuel Economy (ab) | 23.21 | mpg_US | ave PN DC | | | DS CO2 DC | 285.57519 | g/mi |
| Trip Fuel Economy EU (ac) | 30.09 | mpg_US | tot THC DC | 0.00866 | g | DS CO DC | 0.26532 | g/mi |
| Trip Fuel Economy US (ac) | 30.11 | mpg_US | tot NMHC DC | 0.00801 | g | DS THC DC | 0.00031 | g/mi |
| Trip Fuel Economy GGE (b) | 23.21 | mpg_US | tot CH4 DC | 0.00019 | g | DS NMHC DC | 0.00029 | g/mi |
| Trip Fuel Economy GGE (ab) | 23.21 | mpg_US | tot CO DC | 7.35838 | g | DS CH4 DC | 0.00001 | g/mi |
| Trip Fuel Economy GGE (ac) | 30.09 | mpg_US | tot CO2 DC | 7920.09928 | g | DS NO DC (d) | 0.00130 | g/mi |
| Trip Fuel Economy US GGE (ac) | 30.11 | mpg_US | tot NO DC (d) | 0.03595 | g | DS NO2 DC | 0.00012 | g/mi |
| | | | tot NO2 DC | 0.00321 | g | DS NOx DC | 0.00133 | g/mi |
| | | | tot NOx DC | 0.03699 | g | DS Soot | n/a | g/mi |
| Trip Av. Eng. Speed | 1552.86 | rpm | tot Soot | n/a | g | DS Soot meas | n/a | g/mi |
| Trip Av. Torque | 120.29 | lbft | tot Soot meas | n/a | g | DS PM | n/a | g/mi |
| Trip Av. Power | 38.47 | hp | tot PM | n/a | g | DS PN DC | | |
| Trip Work | | | tot PN DC | | | FS CO2 DC | 2342.20739 | g/kg |
| Trip Work (a) | 18.87 | hphr | PM measurement type | 0.00000 | - | FS CO DC | 2.17609 | g/kg |
| | | | tot Soot on PM filter (estim.) | 0.00000 | mg | FS THC DC | 0.00256 | g/kg |
| Trip Exhaust Mass | 39.64 | kg | Soot --> PM simple scaling factor | 1.00000 | - | FS NMHC DC | 0.00237 | g/kg |
| Trip Exhaust Mass EU (ac) | 51.42 | kg | | | | FS CH4 DC | 0.00006 | g/kg |
| Trip Exhaust Mass US (ac) | 51.46 | kg | | | | FS NO DC (d) | 0.01063 | g/kg |
| | | | Trip Av. Veh. Speed | 56.53559 | mi/hr | FS NO2 DC | 0.00095 | g/kg |
| | | | | | | FS NOx DC | 0.01094 | g/kg |
| Trip Av. Amb. Temperature | 71.73 | deg_F | Trip Distance Share Urban | 5.54877 | % distance | FS Soot | n/a | g/kg |
| Trip Av. Humidity | 23.18 | % | Trip Distance Share Rural | 4.73316 | % distance | FS Soot meas | n/a | g/kg |
| Trip Av. GPS Altitude | 223.06 | m | Trip Distance Share Motorway | 89.71807 | % distance | FS PM | n/a | g/kg |
| | | | | | | FS PN DC | | |
| Fuel Type | Petrol (E10) | | | | | | | |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents



Concerto Absolute Time



- y_THC
- y_NO
- y_CO2
- y_O2
- c_Soot
- Fuel Rate
- Exhaust Mass
- Torque
- Velocity ECU

AVL 492 Defa

- THC
- NO/NO2
- CO/CO2
- O2

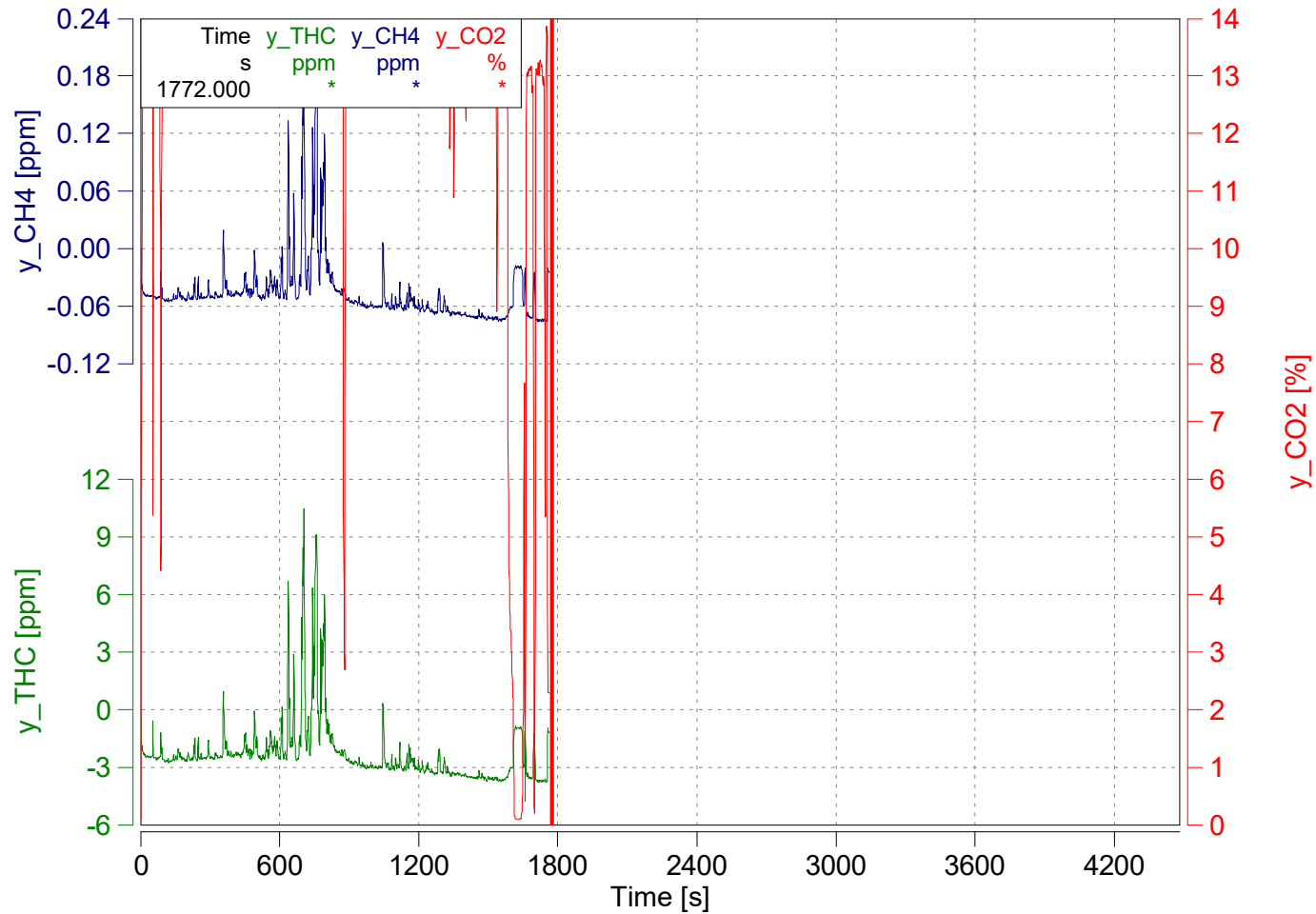
Apply Defa

Alignment Plc

Reset Time

Reset Al

Apply Curr

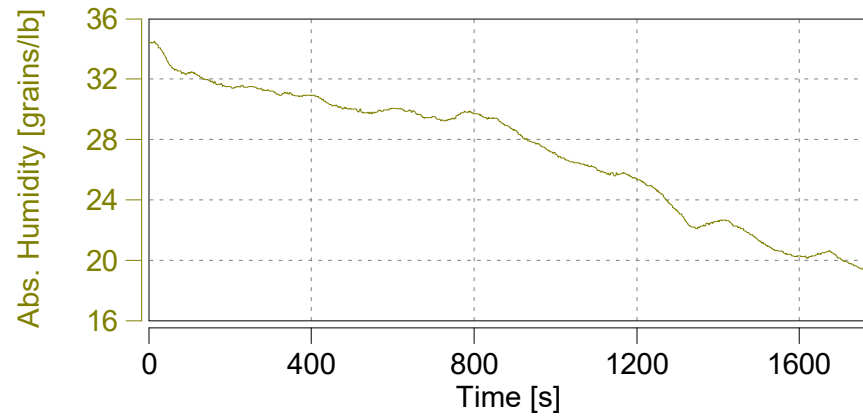
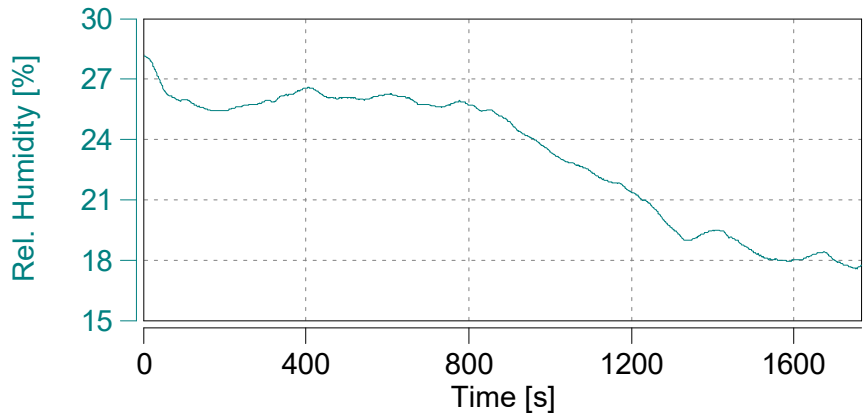
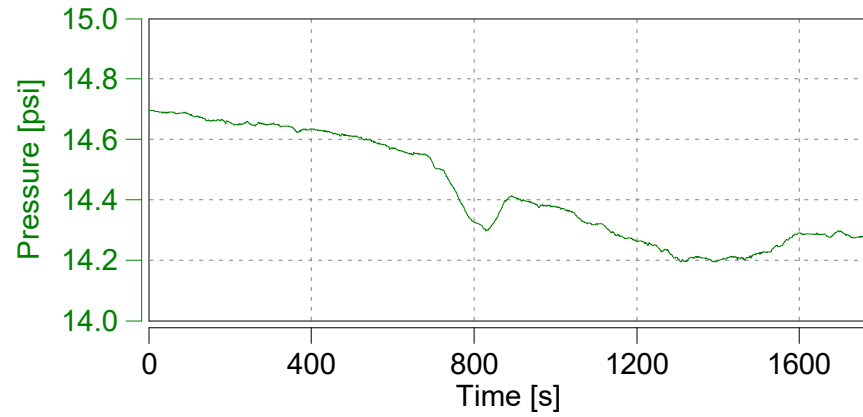
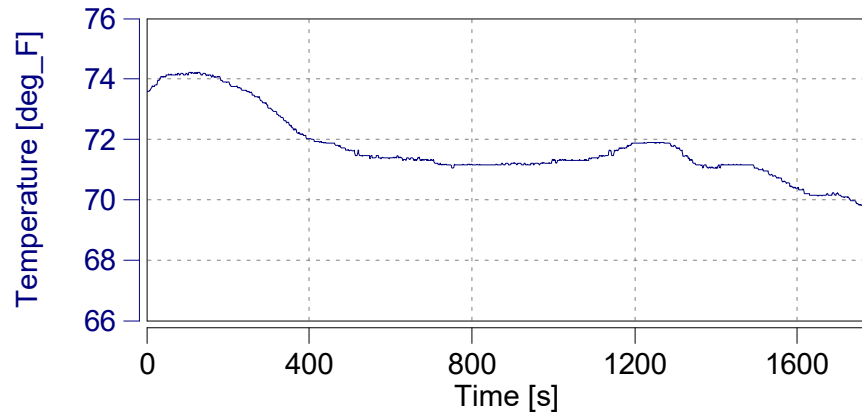


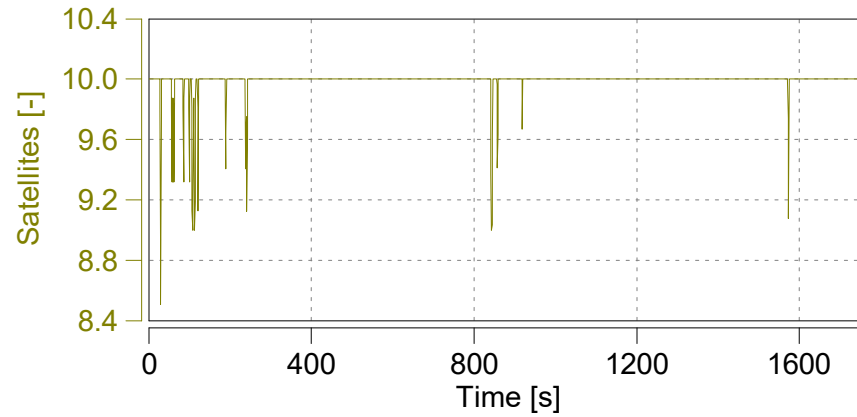
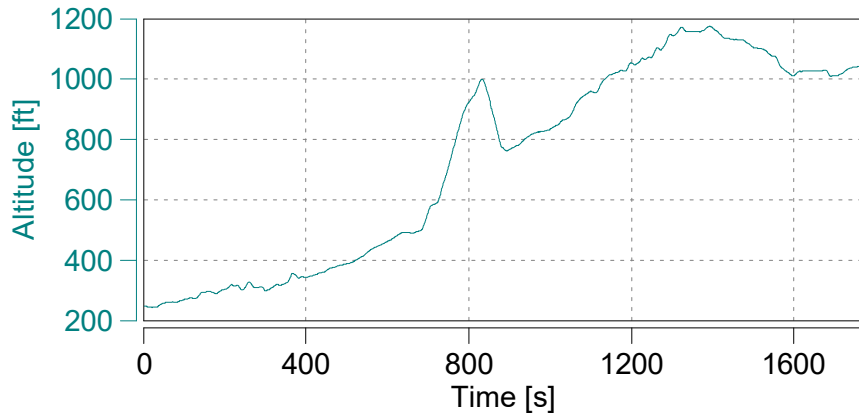
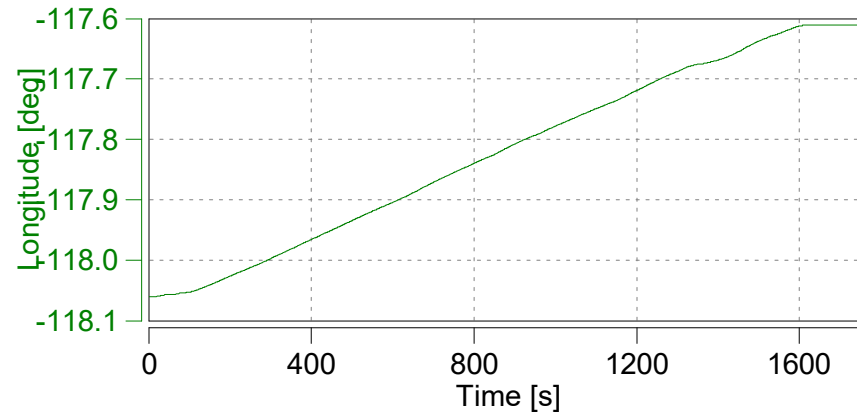
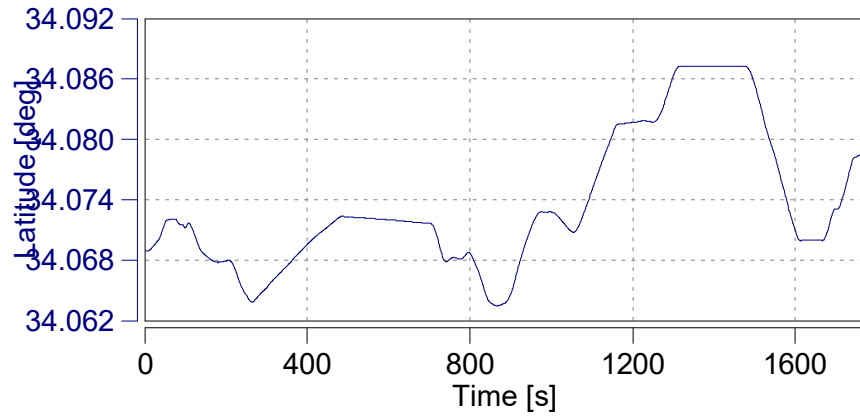
Absolute Time Shifts

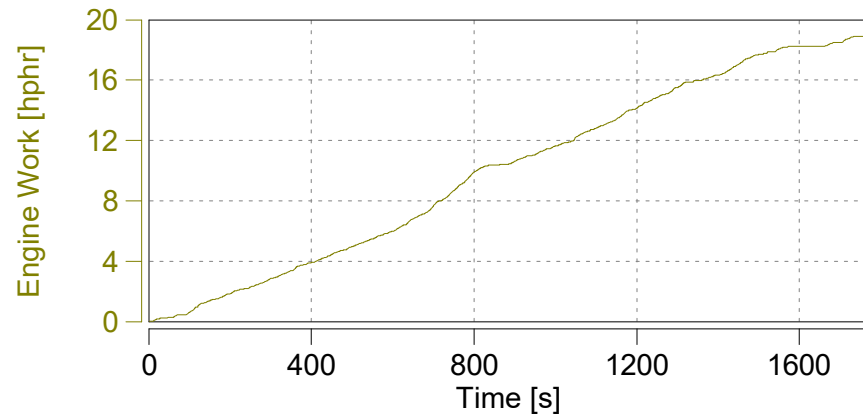
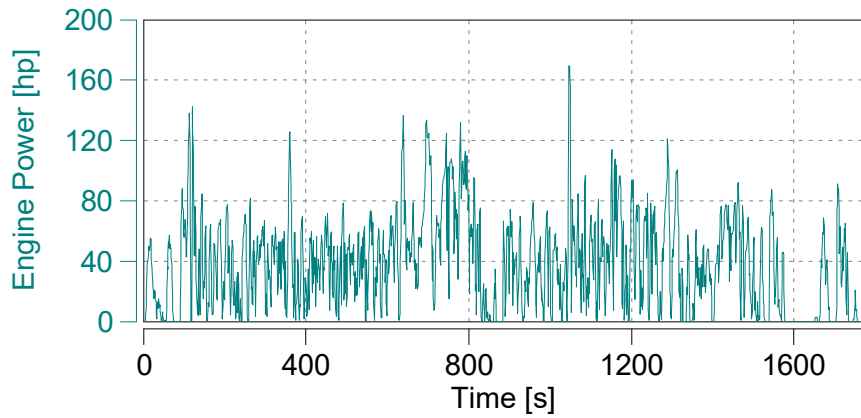
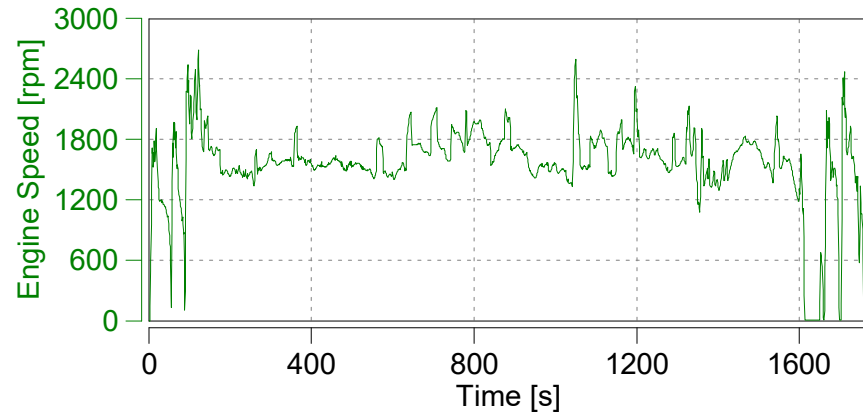
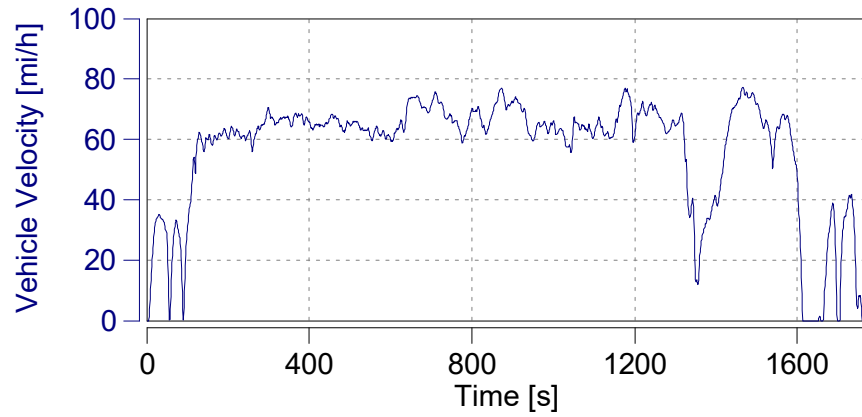
| | | |
|-------|---|------|
| y_THC | s | -4.3 |
| y_CH4 | s | -6.3 |

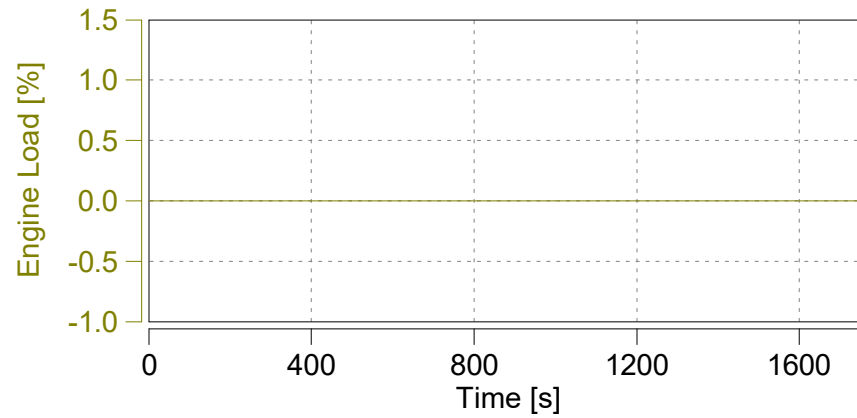
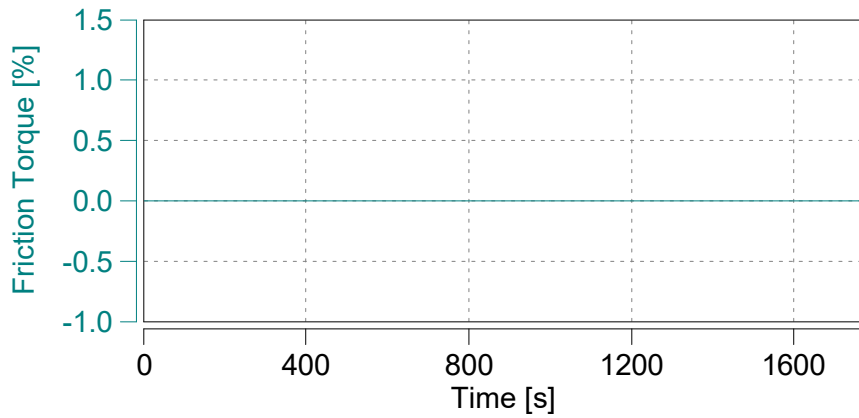
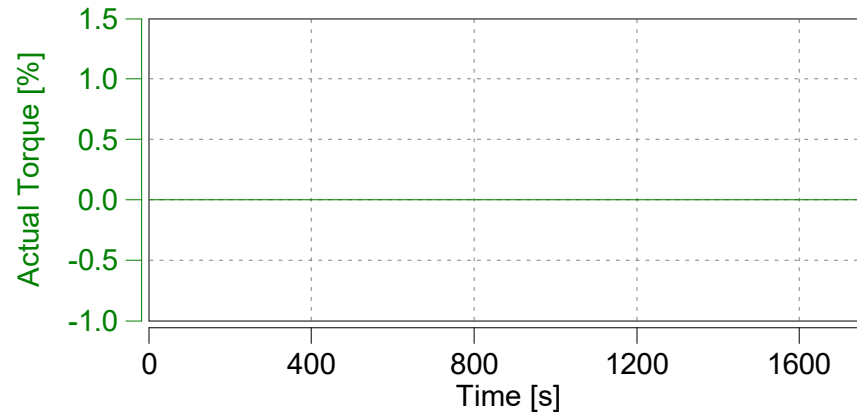
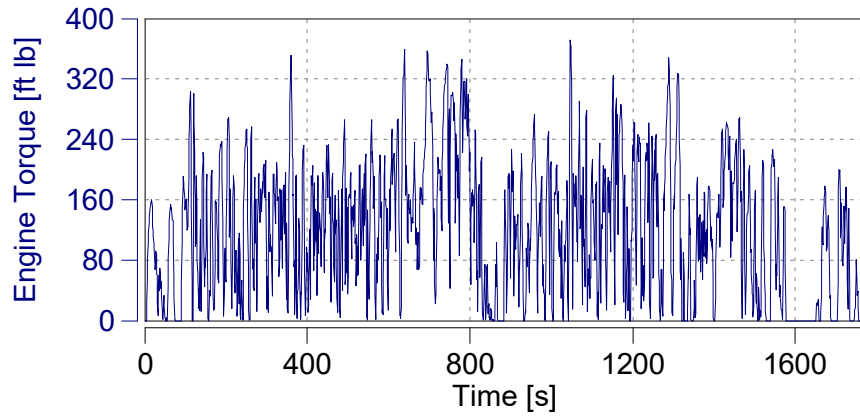
Reset Time Shifts in Plot

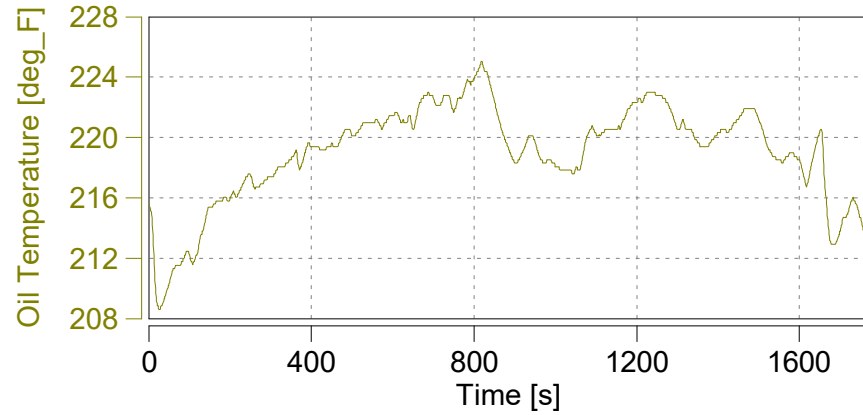
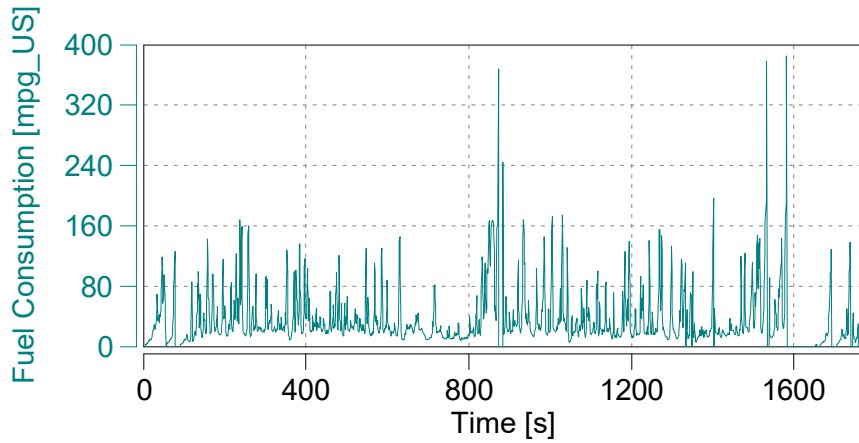
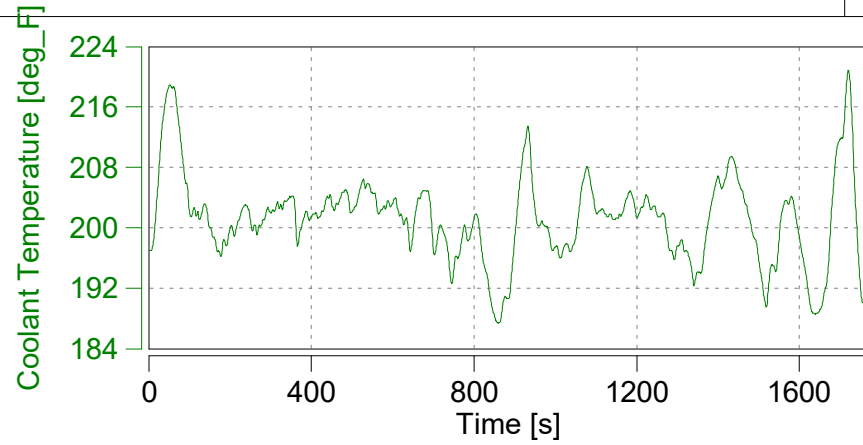
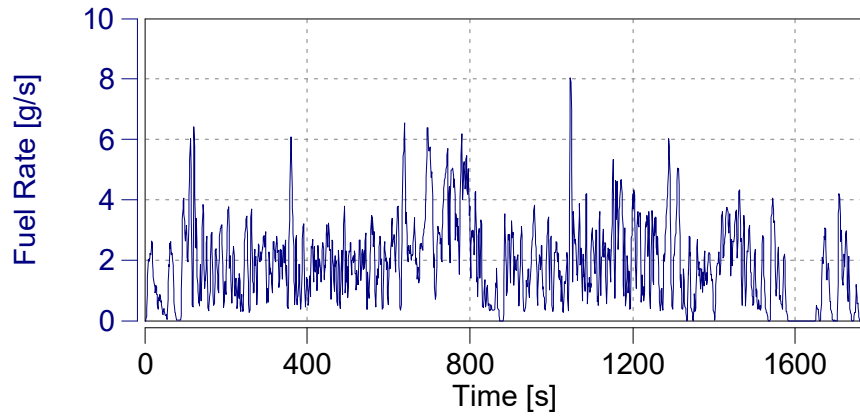
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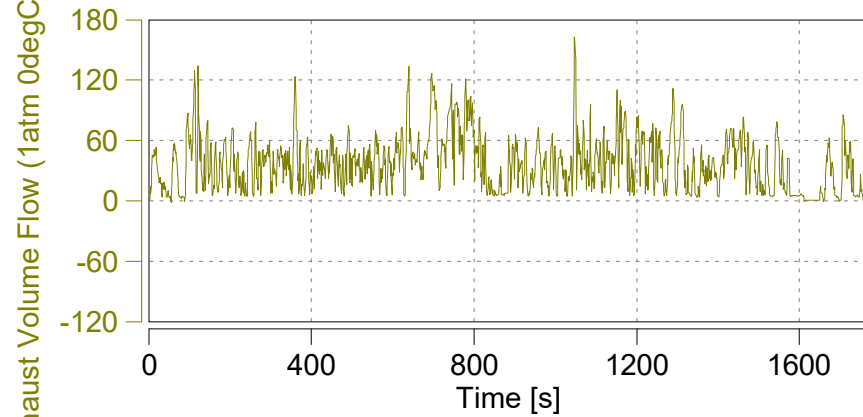
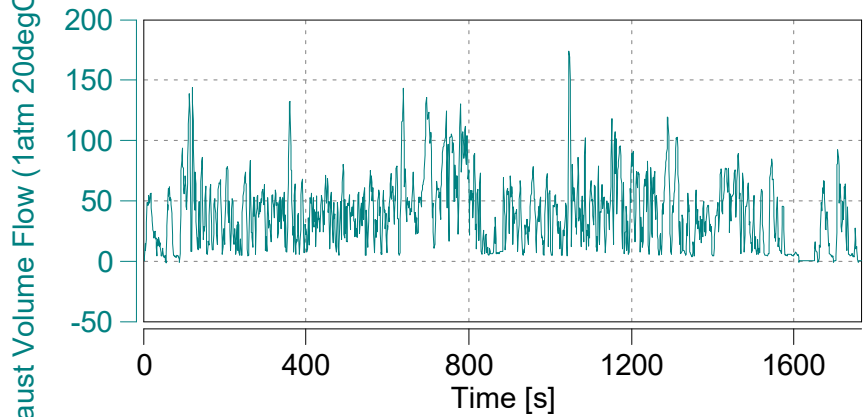
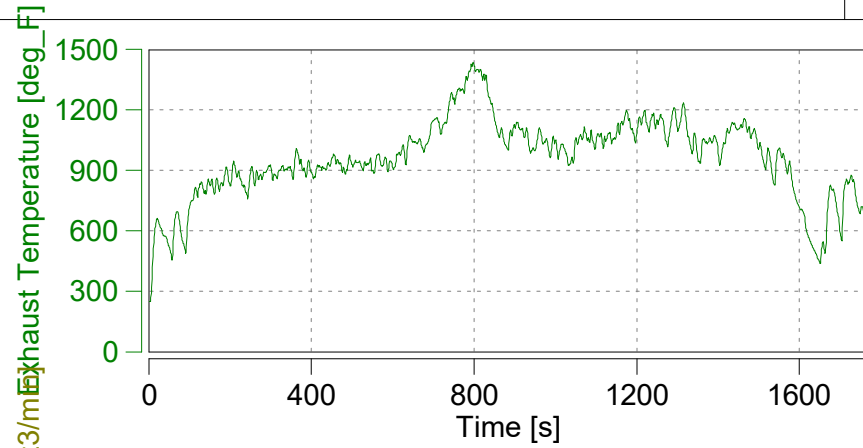
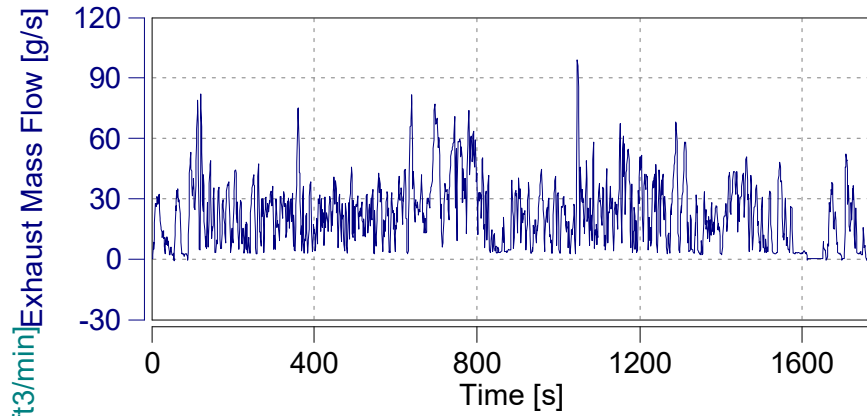


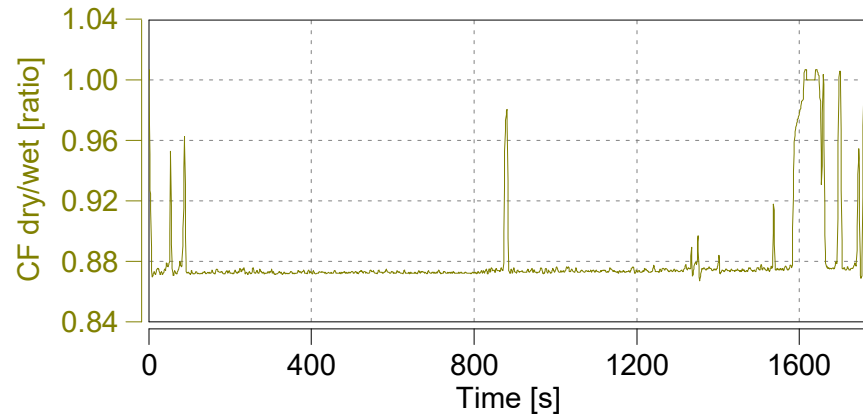
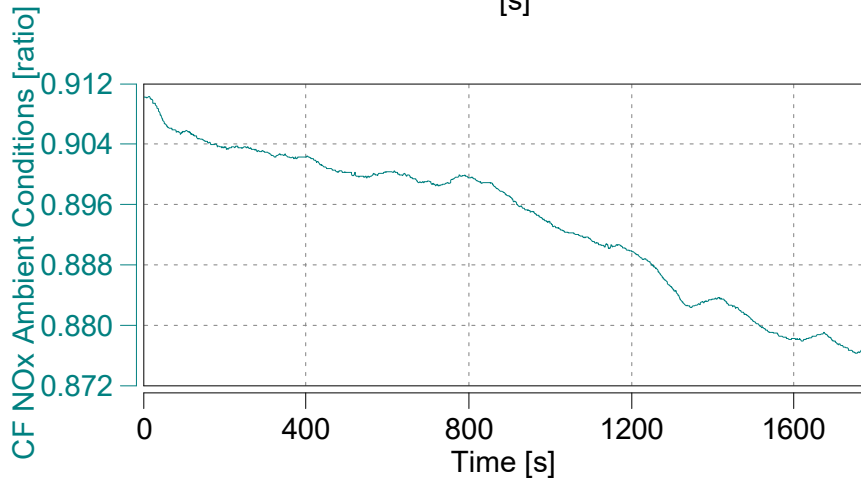
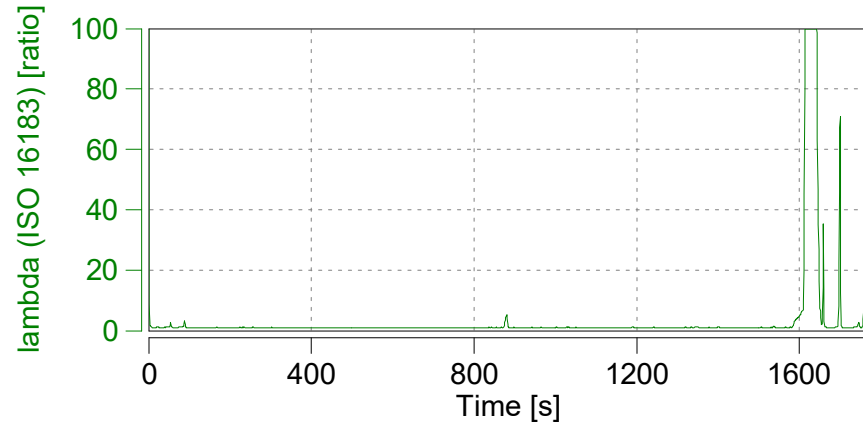
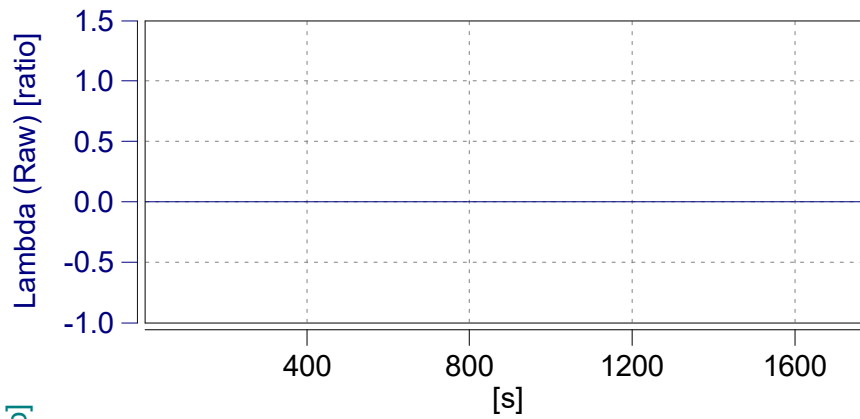


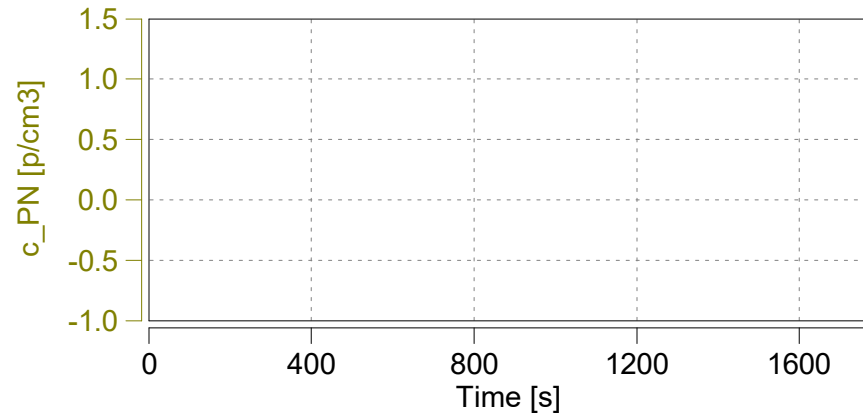
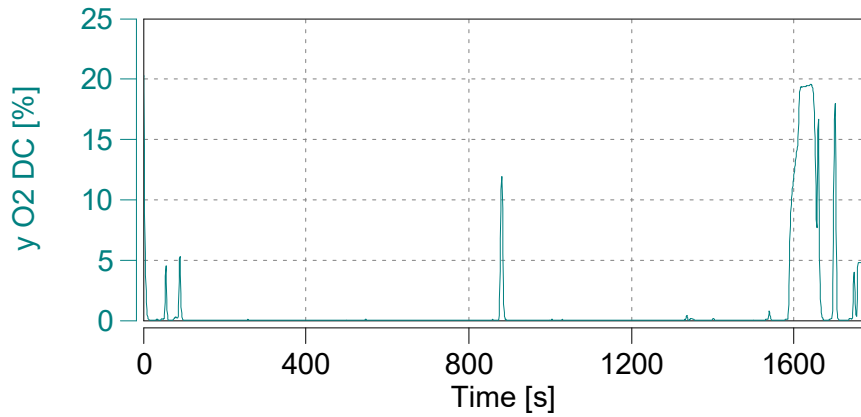
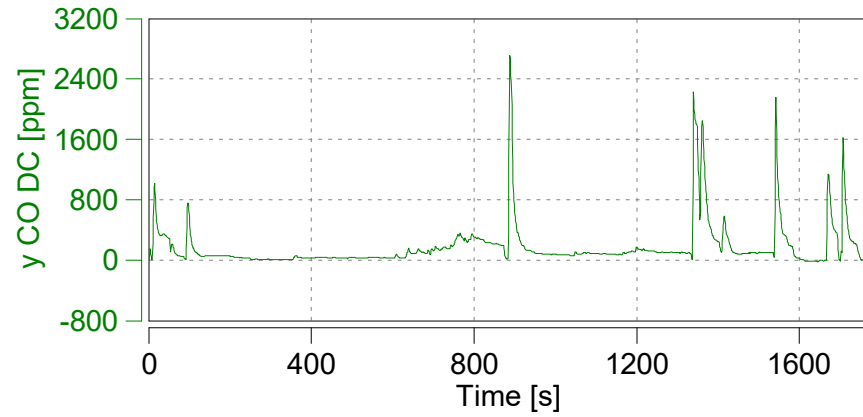
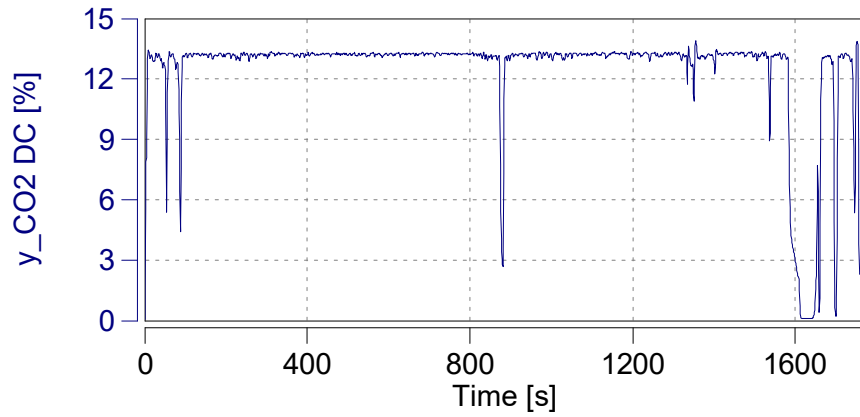


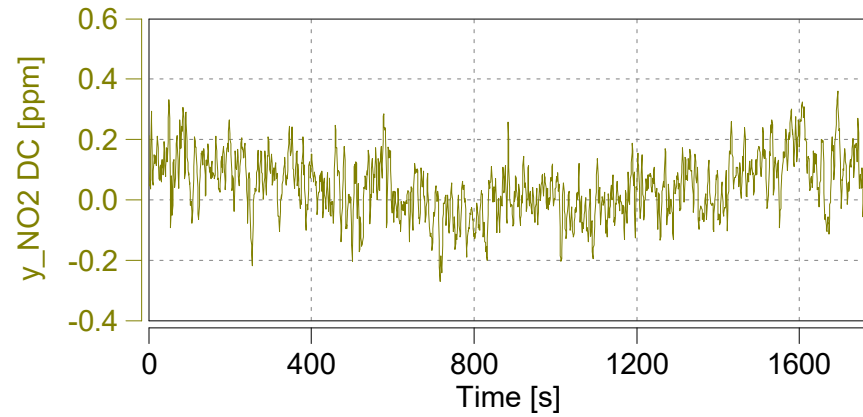
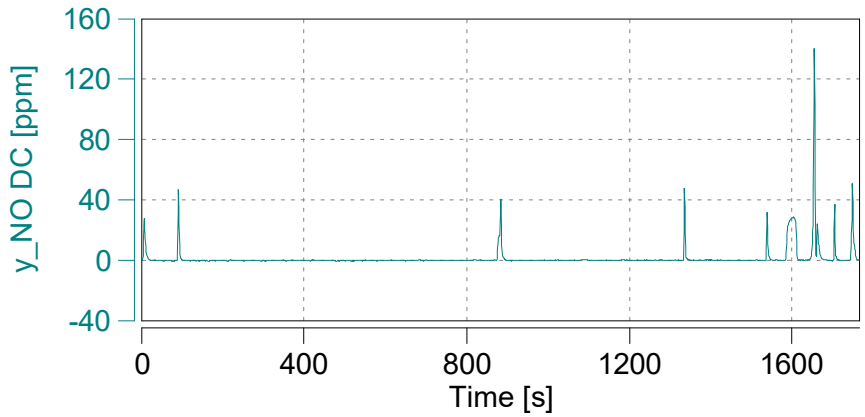
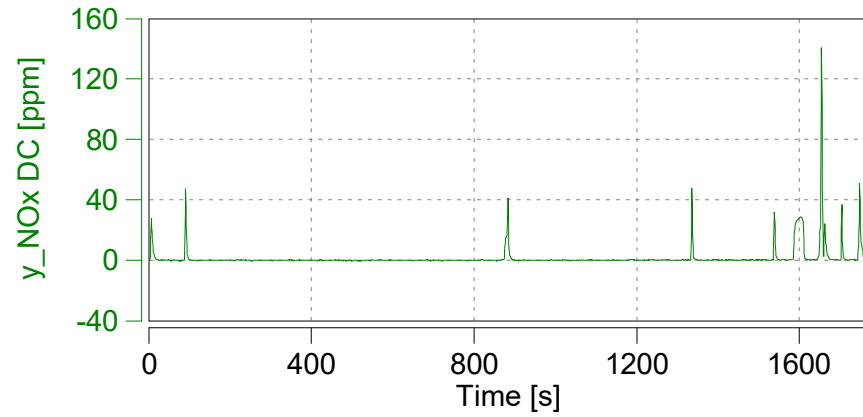
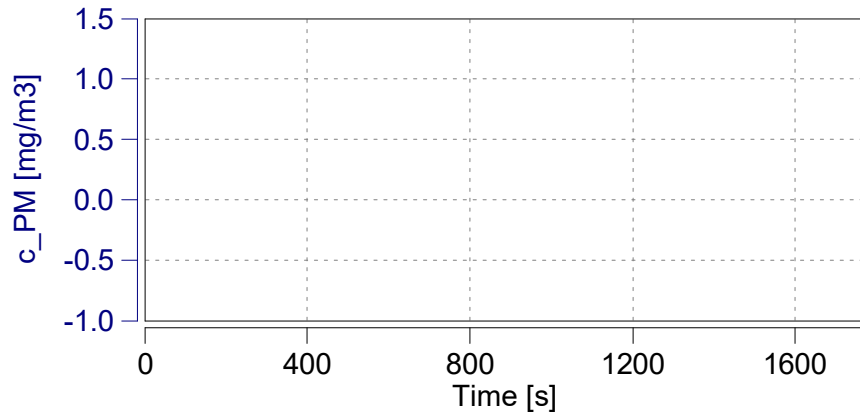


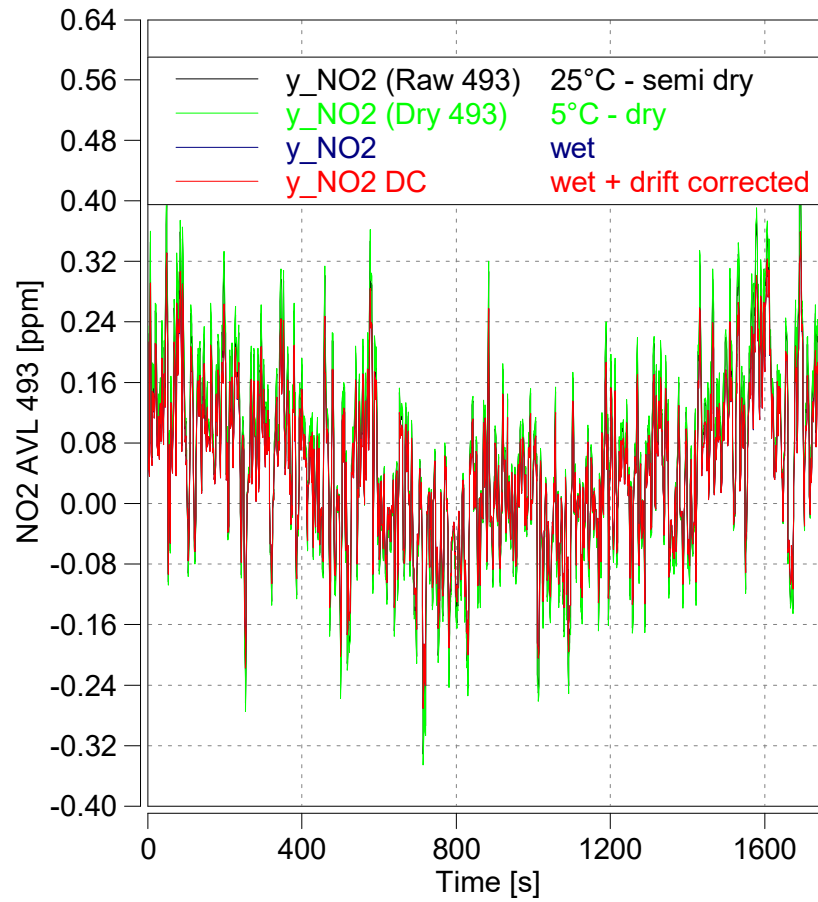
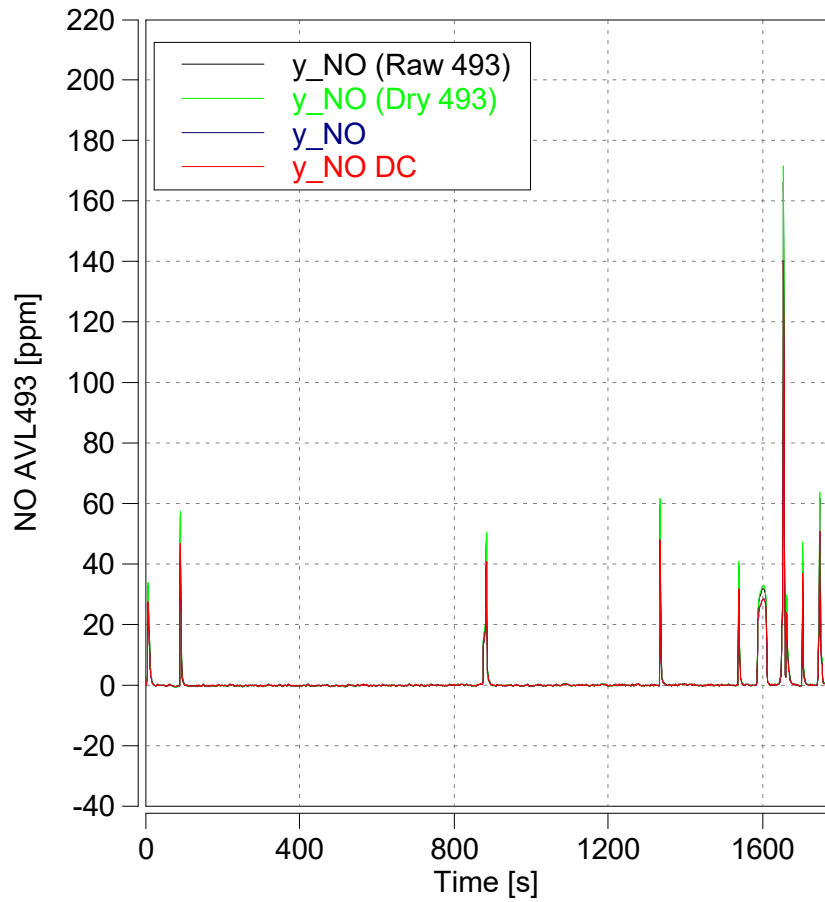




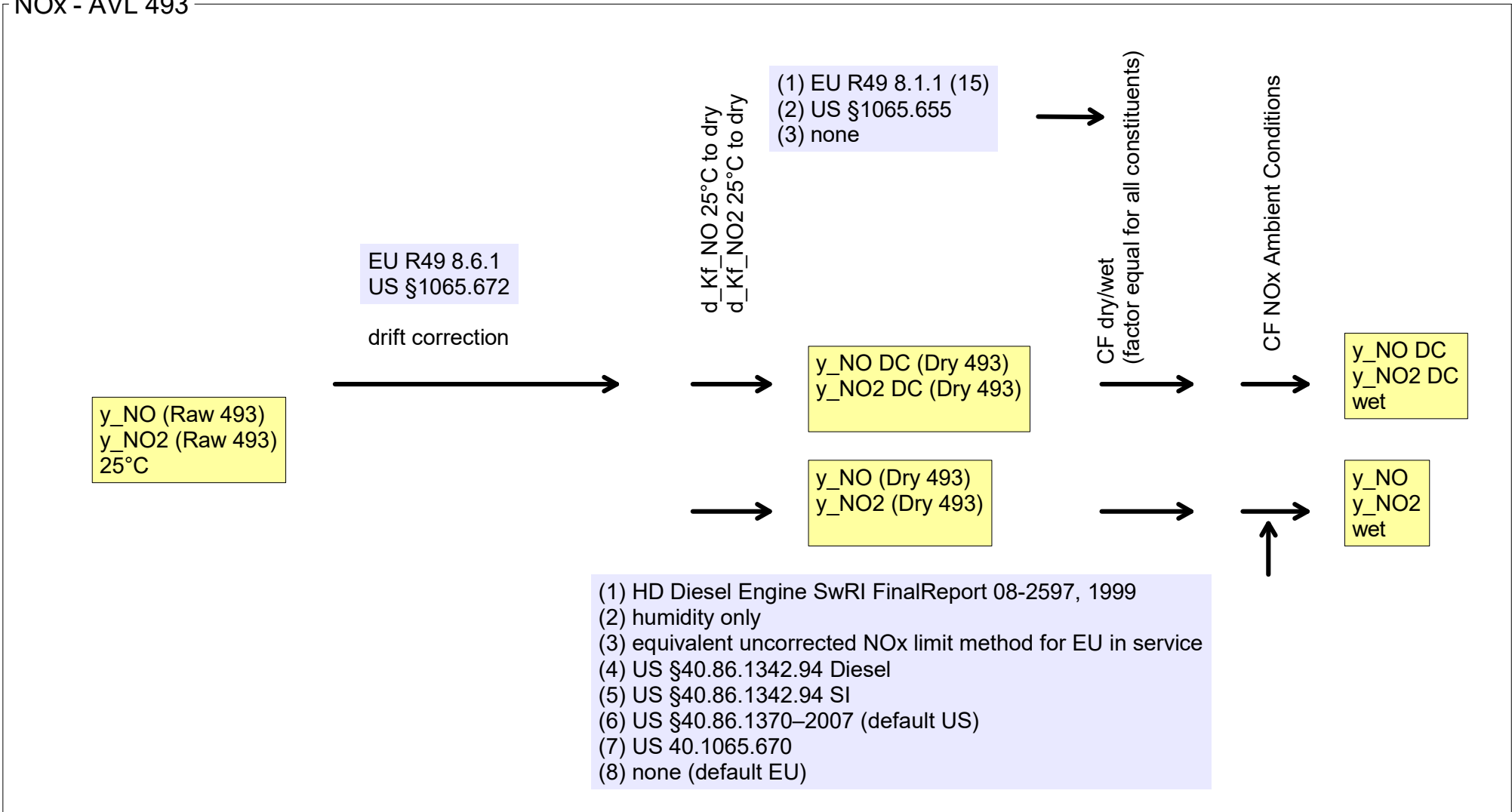


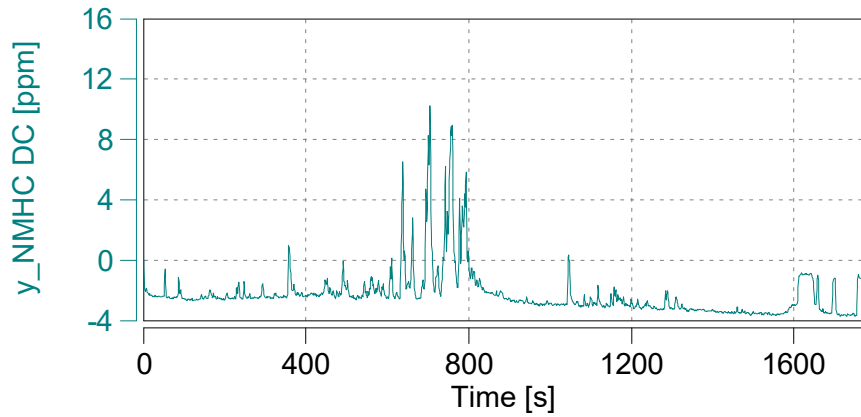
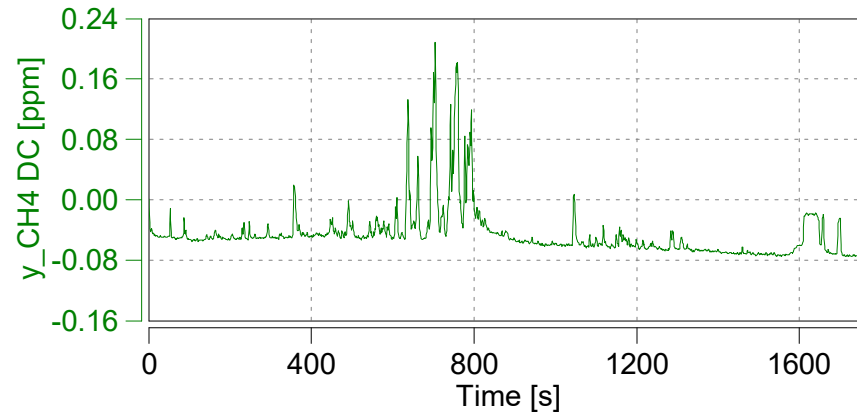
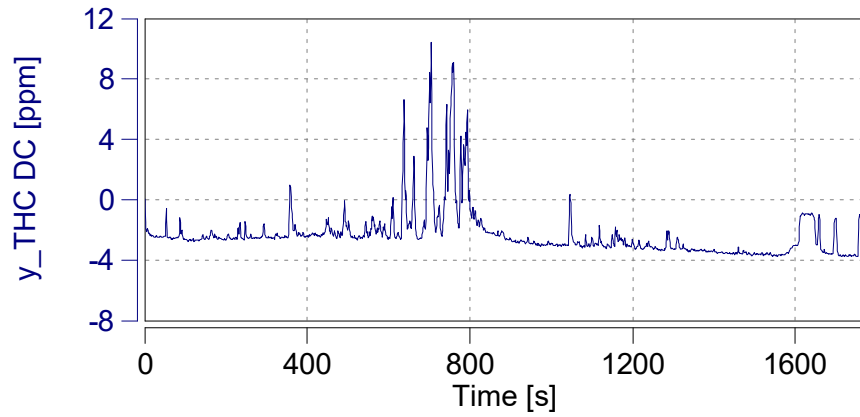


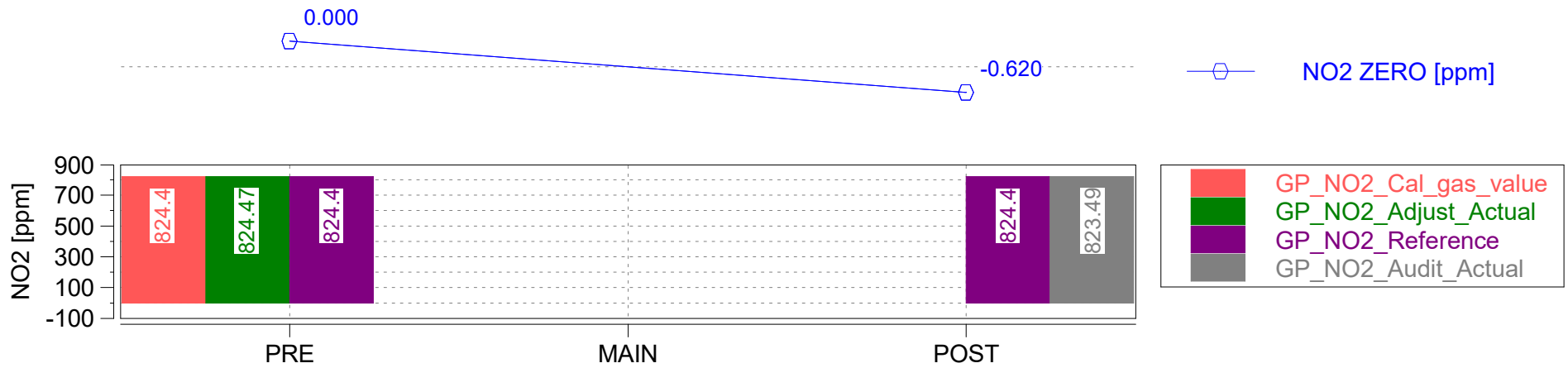
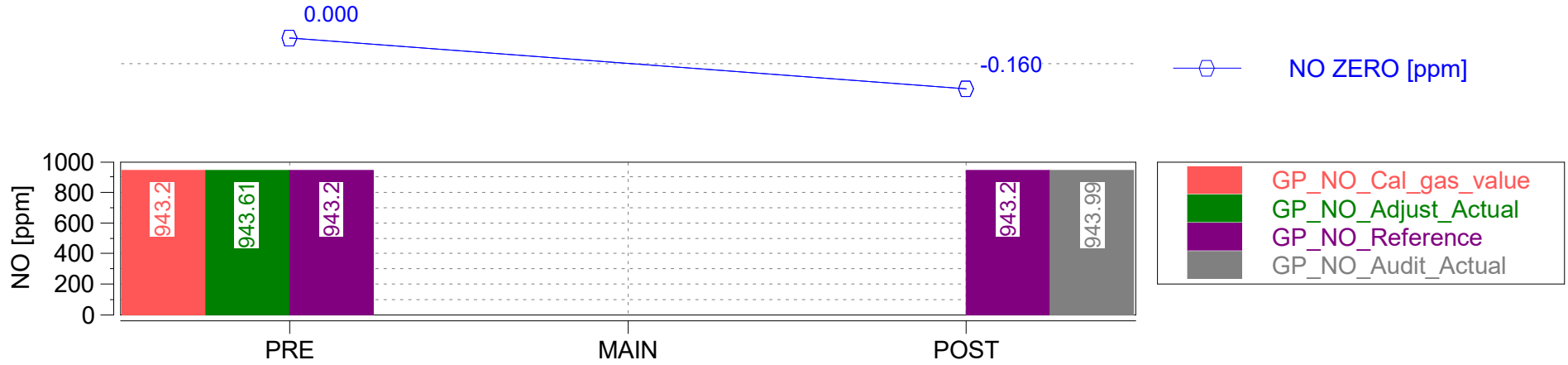


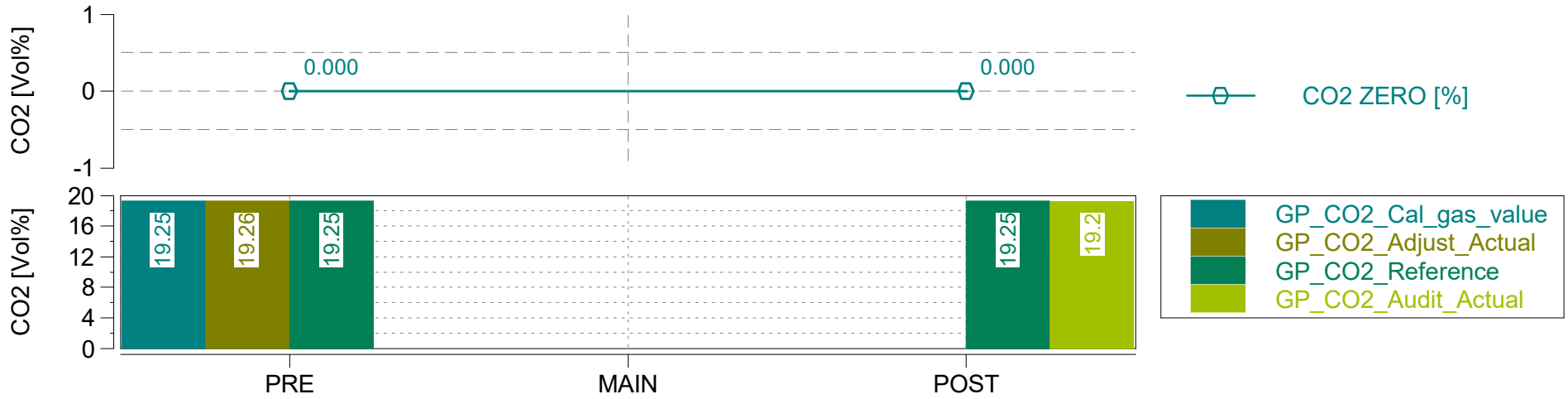
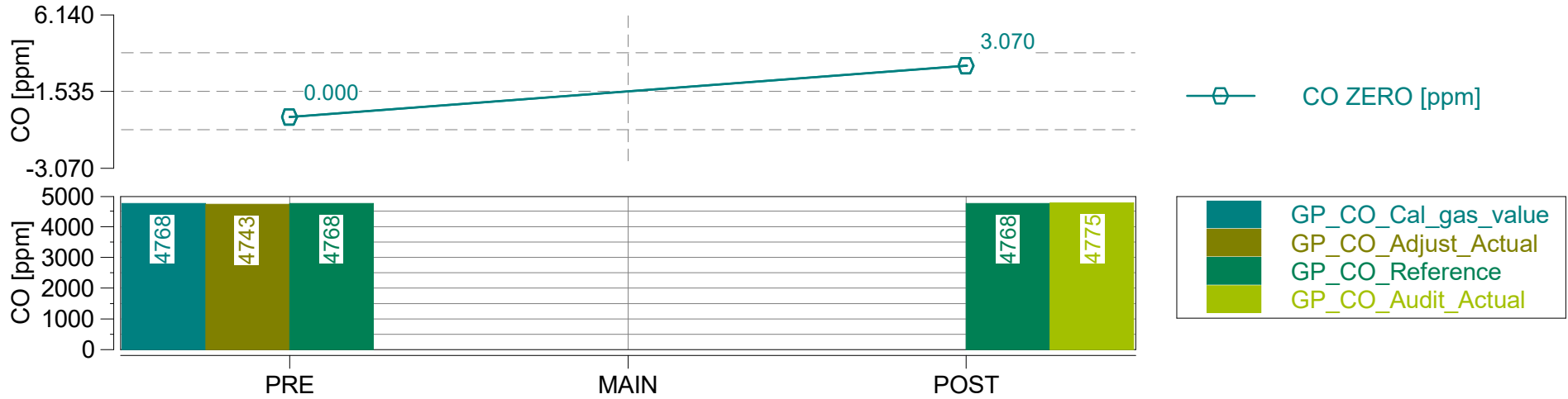


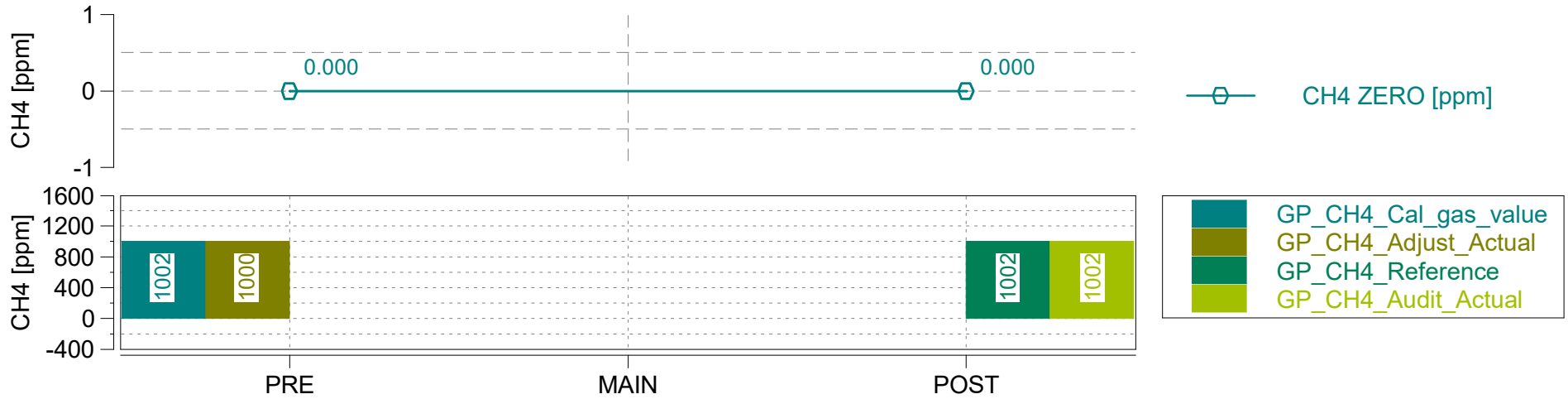
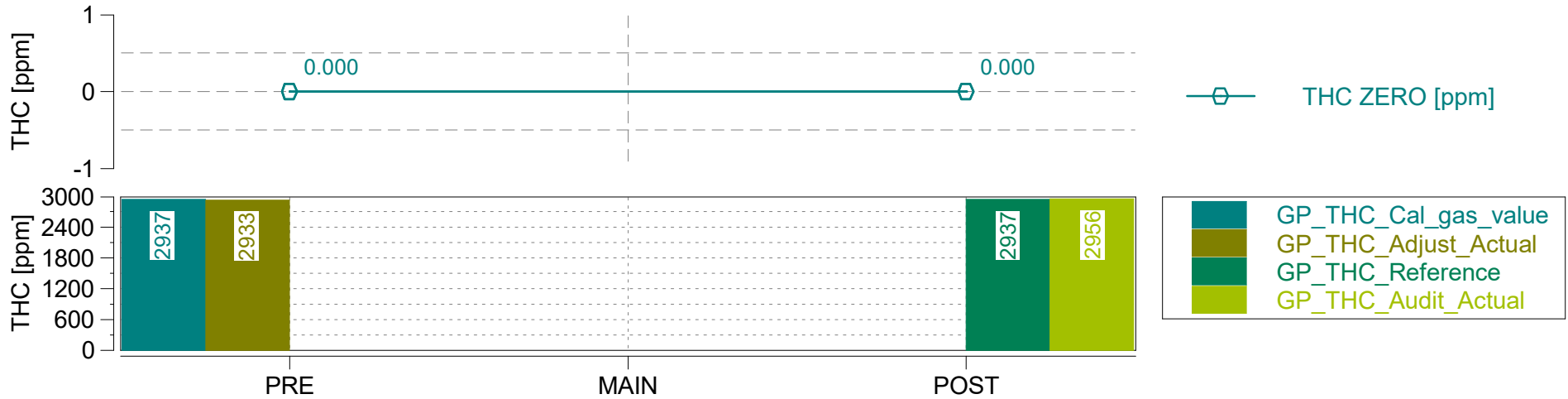
NOx - AVL 493













| § | criterium | condition | value | unit | pass/fail |
|-----------------------|--|--------------------------|-------------|------------|-----------|
| GAS Leak Check | The leakage rate on the vacuum side shall not exceed 0.5 per cent of the in-use flow rate for the portion of the system being checked. | The leakage rate <= 0.5% | 0.10 | % | pass |
| PN Leak Check | n/a | n/a | n/a | n/a | n/a |
| PM Leak Check | n/a | n/a | n/a | n/a | n/a |

GAS PEMS Devices

| | |
|-----------------------|------------|
| Device ID | AVL492 |
| Serial Number | 0182 |
| Firmware Version | V1.17 |
| Main Test Date | 2022-03-07 |
| Leak Check Age [days] | 0 |

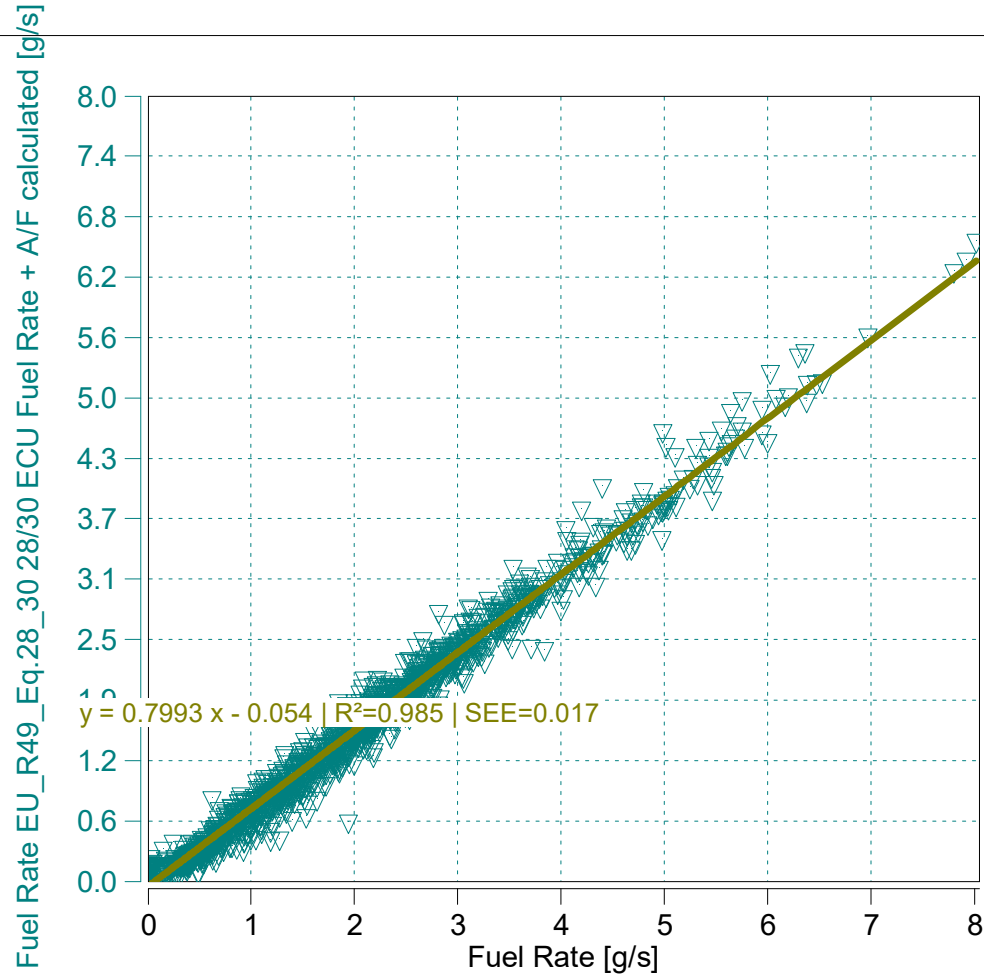
| | |
|------------------|-----------|
| Device ID | AVL4925iS |
| Serial Number | 202 |
| Firmware Version | 1.22.0.4 |

EFM

| | |
|--------------------|--------|
| Device ID | AVL495 |
| Serial Number | 00915 |
| Serial Number Tube | 01115 |
| Firmware Version | V1.16 |

System Control

| | |
|------------------|----------|
| SC Version | V2.9_237 |
| SC Serial Number | 60300923 |



EU 582/2011/Appendix I/3.2.1 | Fuel Rate ECU and calculated

$y = 0.7993 x - 0.054 \mid R^2=0.985 \mid SEE=0.017$
 $m = 0.80$ (0.9 - 1.1 recommended)
 $R^2 = 0.99$ (min 0.9 mandatory)

Data from - to [% of Maximum]

0

100



| | | |
|-------------------------------|--------------|--------|
| Trip Duration | 1967.00 | s |
| Trip Duration (a) | 1967.00 | s |
| Trip Distance | 28.39 | mi |
| Trip Distance (a) | 28.39 | mi |
| Trip Fuel Cons. (b) | 2.81 | kg |
| Trip Fuel Cons. (ab) | 2.81 | kg |
| Trip Fuel Cons. EU (ac) | 2.21 | kg |
| Trip Fuel Cons. US (ac) | 2.21 | kg |
| Trip Fuel Economy (b) | 28.62 | mpg_US |
| Trip Fuel Economy (ab) | 28.62 | mpg_US |
| Trip Fuel Economy EU (ac) | 36.39 | mpg_US |
| Trip Fuel Economy US (ac) | 36.36 | mpg_US |
| Trip Fuel Economy GGE (b) | 28.62 | mpg_US |
| Trip Fuel Economy GGE (ab) | 28.62 | mpg_US |
| Trip Fuel Economy EU GGE (ac) | 36.39 | mpg_US |
| Trip Fuel Economy US GGE (ac) | 36.36 | mpg_US |
| Trip Av. Eng. Speed | 1549.88 | rpm |
| Trip Av. Torque | 85.62 | lbft |
| Trip Av. Power | 27.07 | hp |
| Trip Work | | |
| Trip Work (a) | 14.79 | hphr |
| Trip Exhaust Mass | 33.68 | kg |
| Trip Exhaust Mass EU (ac) | 42.69 | kg |
| Trip Exhaust Mass US (ac) | 42.68 | kg |
| Trip Av. Amb. Temperature | 74.59 | deg_F |
| Trip Av. Humidity | 17.08 | % |
| Trip Av. GPS Altitude | 216.77 | m |
| Fuel Type | Petrol (E10) | |

| | | |
|-----------------------------------|------------|------------|
| ave THC | -3.78531 | ppm |
| ave NMHC | -3.70961 | ppm |
| ave CH4 | -0.07571 | ppm |
| ave CO | 268.56009 | ppm |
| ave CO2 | 12.34590 | % |
| ave NOx | 2.17292 | ppm |
| ave PM | n/a | mg/m3 |
| ave Soot meas | n/a | mg/m3 |
| ave Soot | n/a | mg/m3 |
| ave PN | n/a | #/cm3 |
| tot THC | 0.00000 | g |
| tot NMHC | 0.00000 | g |
| tot CH4 | 0.00000 | g |
| tot CO | 8.84434 | g |
| tot CO2 | 6703.83525 | g |
| tot NO (d) | 0.06145 | g |
| tot NO2 | 0.00319 | g |
| tot NOx | 0.06307 | g |
| tot Soot | n/a | g |
| tot Soot meas | n/a | g |
| tot PM | n/a | g |
| tot PN | n/a | # |
| PM measurement type | 0.00000 | - |
| tot Soot on PM filter (estim.) | 0.00000 | mg |
| Soot --> PM simple scaling factor | 1.00000 | - |
| Trip Av. Veh. Speed | 51.96837 | mi/hr |
| Trip Distance Share Urban | 12.04758 | % distance |
| Trip Distance Share Rural | 8.48591 | % distance |
| Trip Distance Share Motorway | 79.46651 | % distance |

| | | |
|--------------|------------|--------|
| BS CO2 | 453.17447 | g/hphr |
| BS CO | 0.59787 | g/hphr |
| BS THC | 0.00000 | g/hphr |
| BS NMHC | 0.00000 | g/hphr |
| BS CH4 | 0.00000 | g/hphr |
| BS NO (d) | 0.00415 | g/hphr |
| BS NO2 | 0.00022 | g/hphr |
| BS NOx | 0.00426 | g/hphr |
| BS Soot | n/a | g/hphr |
| BS Soot meas | n/a | g/hphr |
| BS PM | n/a | g/hphr |
| BS PN | n/a | #/hpr |
| DS CO2 | 236.09262 | g/mi |
| DS CO | 0.31148 | g/mi |
| DS THC | 0.00000 | g/mi |
| DS NMHC | 0.00000 | g/mi |
| DS CH4 | 0.00000 | g/mi |
| DS NO (d) | 0.00216 | g/mi |
| DS NO2 | 0.00011 | g/mi |
| DS NOx | 0.00222 | g/mi |
| DS Soot | n/a | g/mi |
| DS Soot meas | n/a | g/mi |
| DS PM | n/a | g/mi |
| DS PN | n/a | #/mi |
| FS CO2 | 2388.03415 | g/kg |
| FS CO | 3.15052 | g/kg |
| FS THC | 0.00000 | g/kg |
| FS NMHC | 0.00000 | g/kg |
| FS CH4 | 0.00000 | g/kg |
| FS NO (d) | 0.02189 | g/kg |
| FS NO2 | 0.00114 | g/kg |
| FS NOx | 0.02247 | g/kg |
| FS Soot | n/a | g/kg |
| FS Soot meas | n/a | g/kg |
| FS PM | n/a | g/kg |
| FS PN | n/a | #/kg |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents

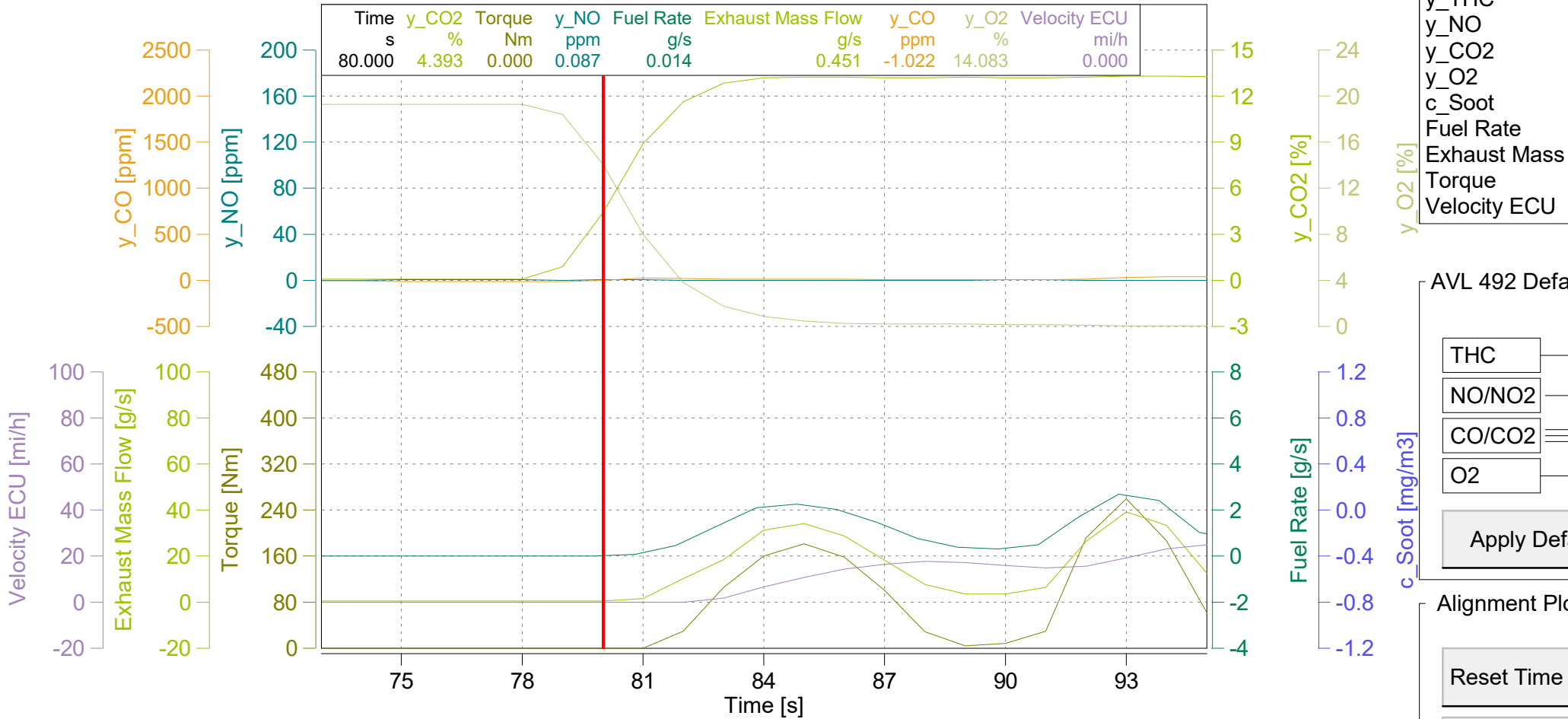


| | | | | | | | | |
|-------------------------------|--------------|--------|-----------------------------------|------------|------------|--------------|------------|--------|
| Trip Duration | 1967.00 | s | ave THC DC | -3.77624 | ppm | BS CO2 DC | 453.64579 | g/hphr |
| Trip Duration (a) | 1967.00 | s | ave NMHC DC | -3.70072 | ppm | BS CO DC | 0.59894 | g/hphr |
| Trip Distance | 28.39 | mi | ave CH4 DC | -0.07552 | ppm | BS THC DC | 0.00000 | g/hphr |
| Trip Distance (a) | 28.39 | mi | ave CO DC | 269.04000 | ppm | BS NMHC DC | 0.00000 | g/hphr |
| | | | ave CO2 DC | 12.35874 | % | BS CH4 DC | 0.00000 | g/hphr |
| Trip Fuel Cons. (b) | 2.81 | kg | ave NOx DC | 2.17159 | ppm | BS NO DC (d) | 0.00415 | g/hphr |
| Trip Fuel Cons. (ab) | 2.81 | kg | ave PM | n/a | mg/m3 | BS NO2 DC | 0.00022 | g/hphr |
| Trip Fuel Cons. EU (ac) | 2.21 | kg | ave Soot meas | n/a | mg/m3 | BS NOx DC | 0.00426 | g/hphr |
| Trip Fuel Cons. US (ac) | 2.21 | kg | ave Soot | n/a | mg/m3 | BS Soot | n/a | g/hphr |
| | | | ave PN DC | | | BS Soot meas | n/a | g/hphr |
| | | | | | | BS PM | n/a | g/hphr |
| Trip Fuel Economy (b) | 28.62 | mpg_US | | | | BS PN DC | | |
| Trip Fuel Economy (ab) | 28.62 | mpg_US | tot THC DC | 0.00000 | g | | | |
| Trip Fuel Economy EU (ac) | 36.39 | mpg_US | tot NMHC DC | 0.00000 | g | | | |
| Trip Fuel Economy US (ac) | 36.36 | mpg_US | tot CH4 DC | 0.00000 | g | DS CO2 DC | 236.33817 | g/mi |
| Trip Fuel Economy GGE (b) | 28.62 | mpg_US | tot CO DC | 8.86015 | g | DS CO DC | 0.31203 | g/mi |
| Trip Fuel Economy GGE (ab) | 28.62 | mpg_US | tot CO2 DC | 6710.80751 | g | DS THC DC | 0.00000 | g/mi |
| Trip Fuel Economy EU GGE (ac) | 36.39 | mpg_US | tot NO DC (d) | 0.06141 | g | DS NMHC DC | 0.00000 | g/mi |
| Trip Fuel Economy US GGE (ac) | 36.36 | mpg_US | tot NO2 DC | 0.00319 | g | DS CH4 DC | 0.00000 | g/mi |
| | | | tot NOx DC | 0.06304 | g | DS NO DC (d) | 0.00216 | g/mi |
| Trip Av. Eng. Speed | 1549.88 | rpm | tot Soot | n/a | g | DS NO2 DC | 0.00011 | g/mi |
| Trip Av. Torque | 85.62 | lbft | tot Soot meas | n/a | g | DS NOx DC | 0.00222 | g/mi |
| Trip Av. Power | 27.07 | hp | tot PM | n/a | g | DS Soot | n/a | g/mi |
| Trip Work | | | tot PN DC | | | DS Soot meas | n/a | g/mi |
| Trip Work (a) | 14.79 | hphr | | | | DS PM | n/a | g/mi |
| | | | | | | DS PN DC | | |
| Trip Exhaust Mass | 33.68 | kg | PM measurement type | 0.00000 | - | FS CO2 DC | 2390.51781 | g/kg |
| Trip Exhaust Mass EU (ac) | 42.69 | kg | tot Soot on PM filter (estim.) | 0.00000 | mg | FS CO DC | 3.15615 | g/kg |
| Trip Exhaust Mass US (ac) | 42.68 | kg | Soot --> PM simple scaling factor | 1.00000 | - | FS THC DC | 0.00000 | g/kg |
| | | | | | | FS NMHC DC | 0.00000 | g/kg |
| Trip Av. Amb. Temperature | 74.59 | deg_F | Trip Av. Veh. Speed | 51.96837 | mi/hr | FS CH4 DC | 0.00000 | g/kg |
| Trip Av. Humidity | 17.08 | % | | | | FS NO DC (d) | 0.02188 | g/kg |
| Trip Av. GPS Altitude | 216.77 | m | Trip Distance Share Urban | 12.04758 | % distance | FS NO2 DC | 0.00114 | g/kg |
| | | | Trip Distance Share Rural | 8.48591 | % distance | FS NOx DC | 0.02245 | g/kg |
| | | | Trip Distance Share Motorway | 79.46651 | % distance | FS Soot | n/a | g/kg |
| Fuel Type | Petrol (E10) | | | | | FS Soot meas | n/a | g/kg |
| | | | | | | FS PM | n/a | g/kg |
| | | | | | | FS PN DC | | |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
 (d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents



Concerto Absolute Time



- y_THC
- y_NO
- y_CO2
- y_O2
- c_Soot
- Fuel Rate
- Exhaust Mass
- Torque
- Velocity ECU

AVL 492 Defa

- THC
- NO/NO2
- CO/CO2
- O2

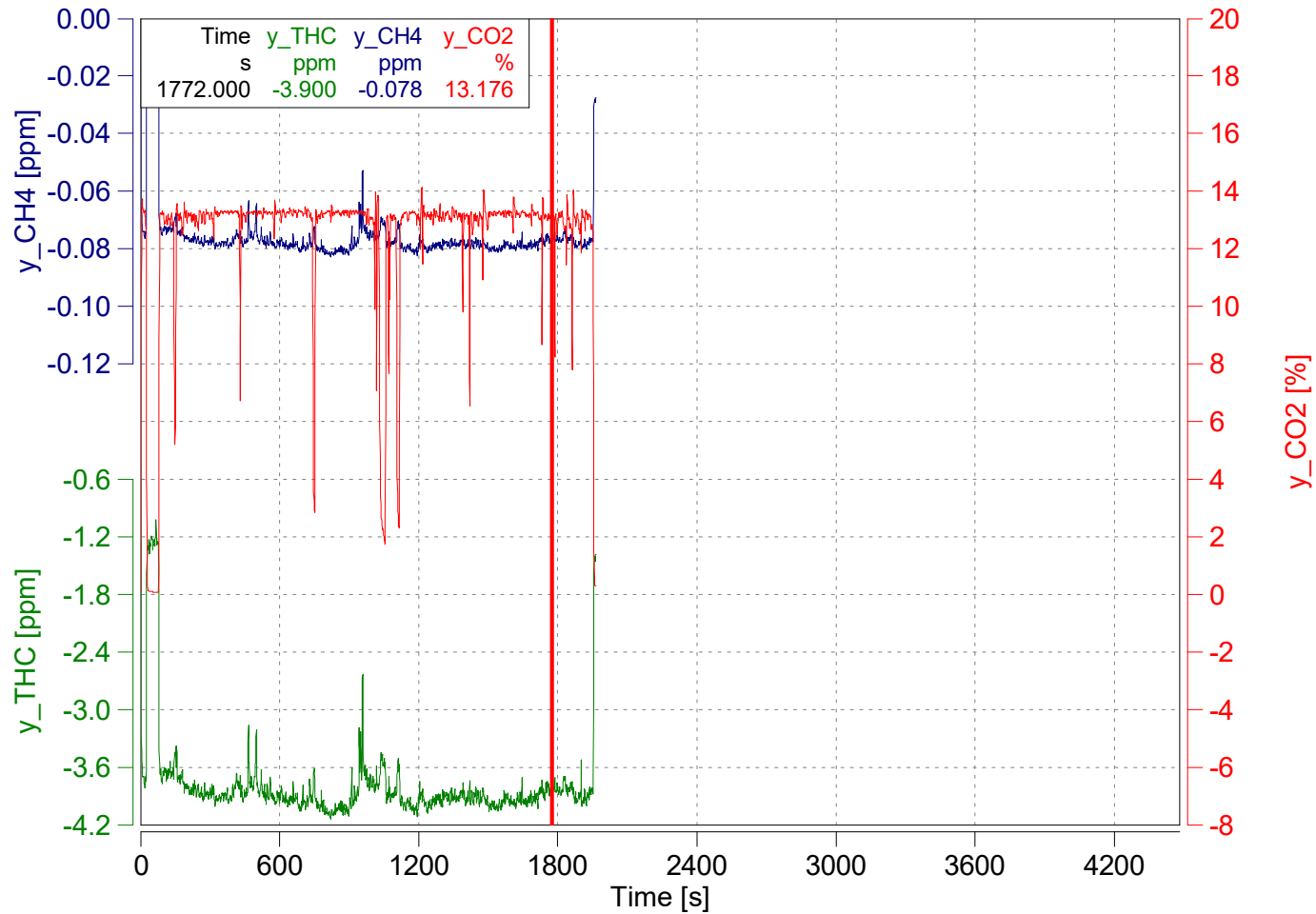
Apply Def

Alignment Plc

Reset Time

Reset A

Apply Cur

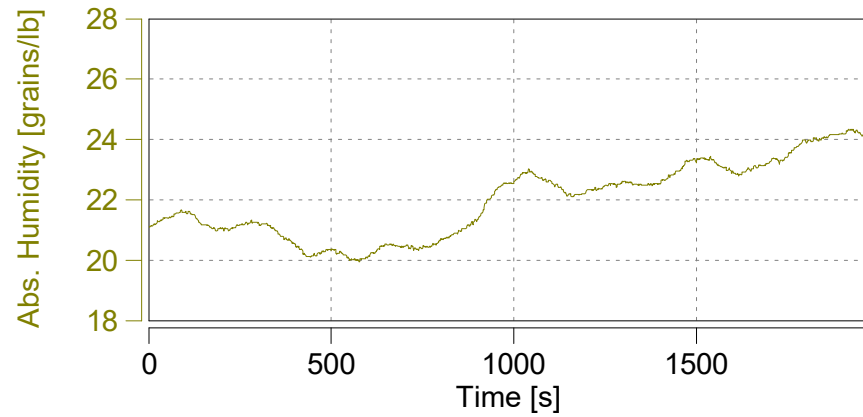
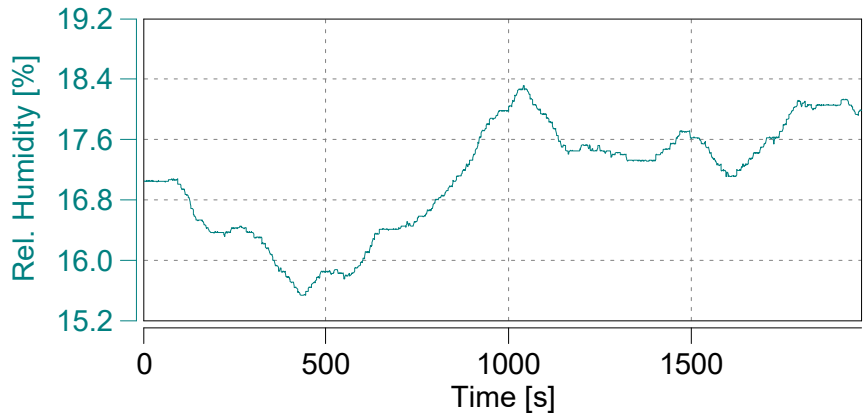
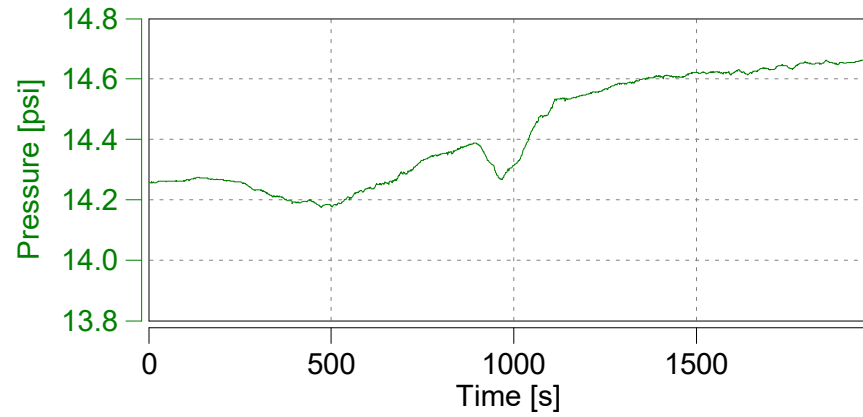
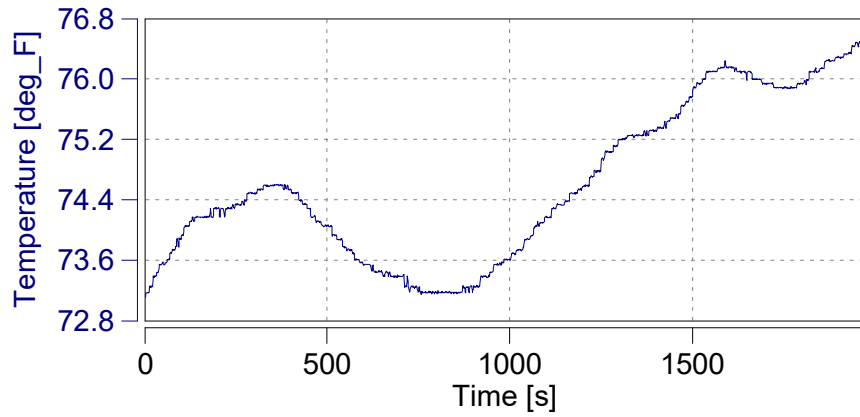


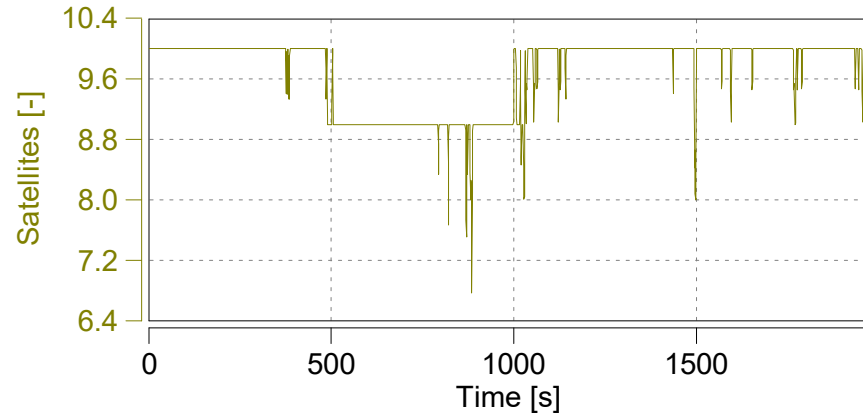
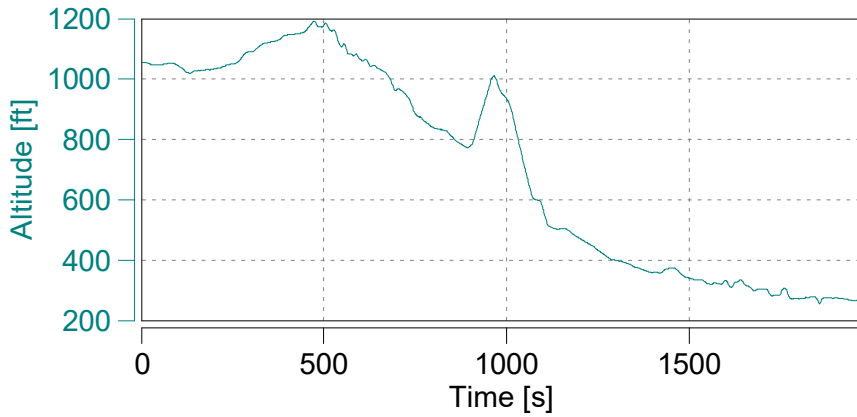
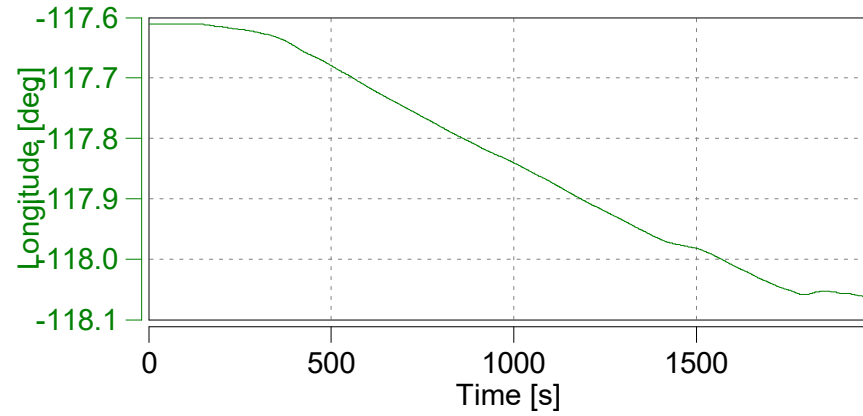
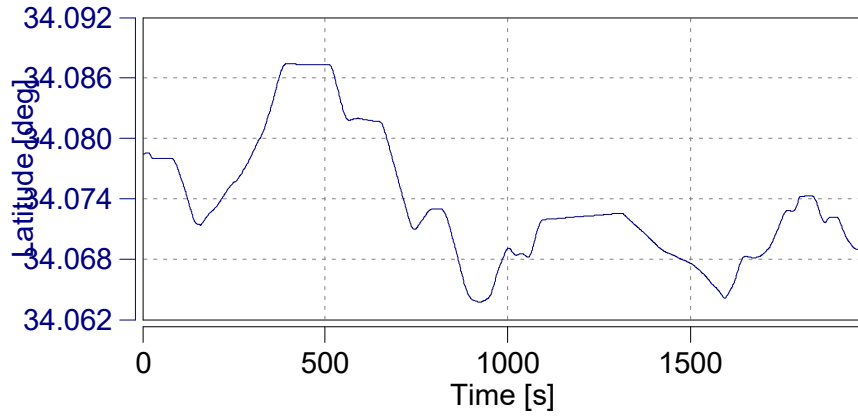
Absolute Time Shifts

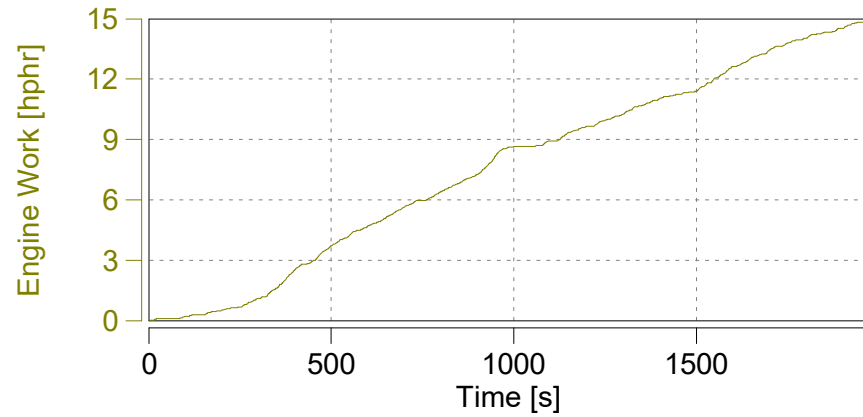
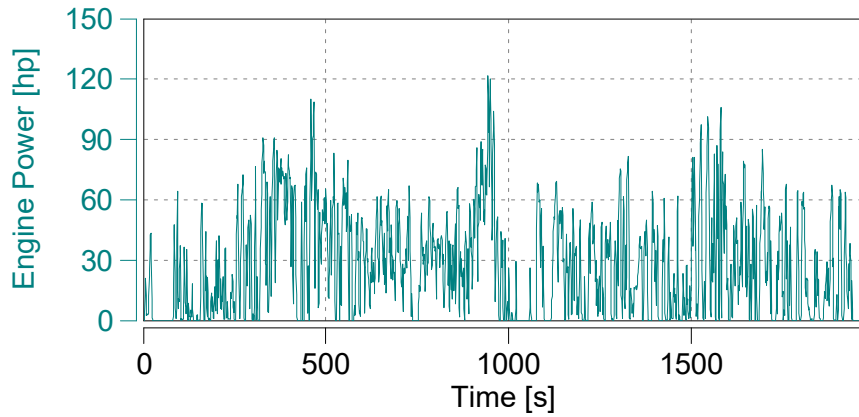
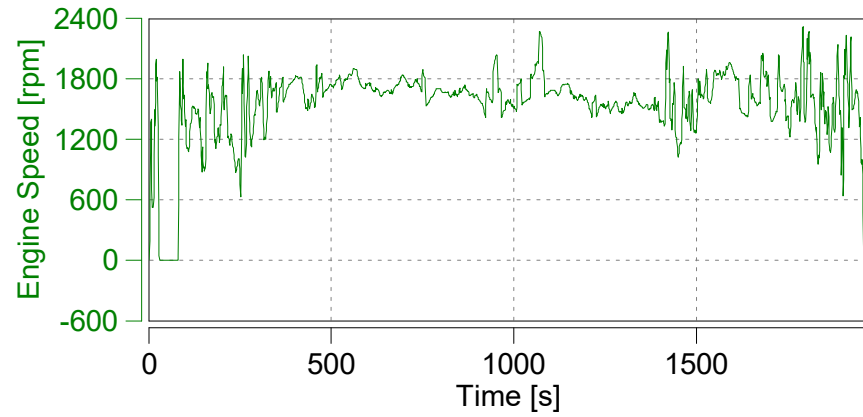
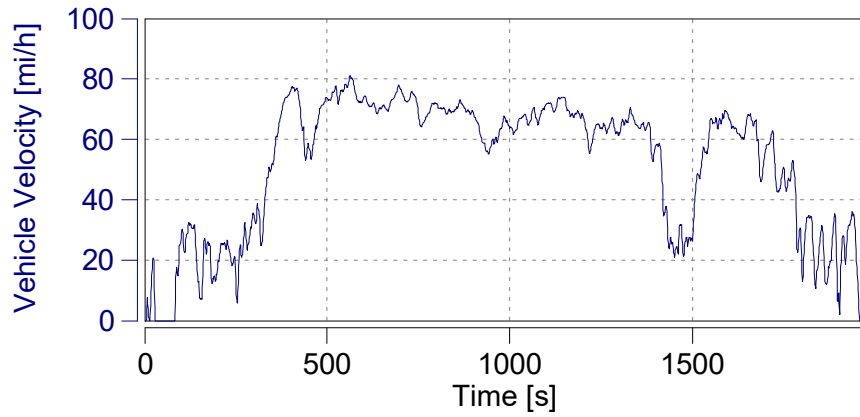
| | | |
|-------|---|------|
| y_THC | s | -4.3 |
| y_CH4 | s | -6.3 |

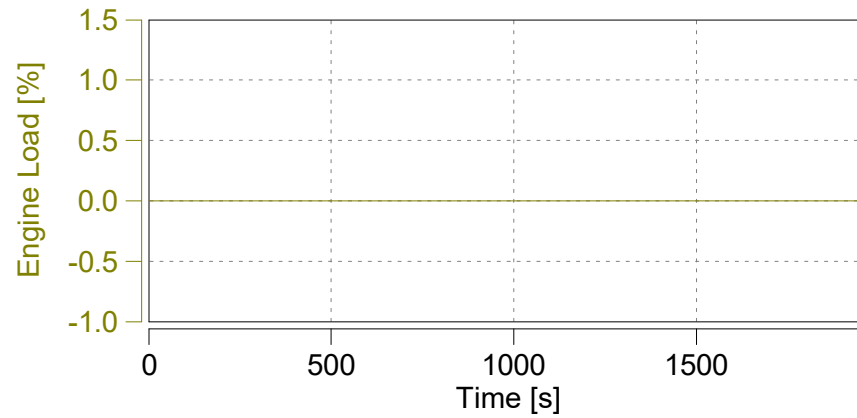
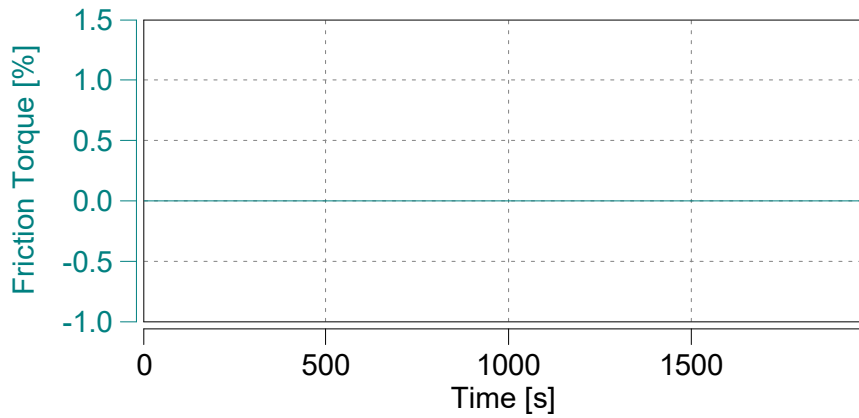
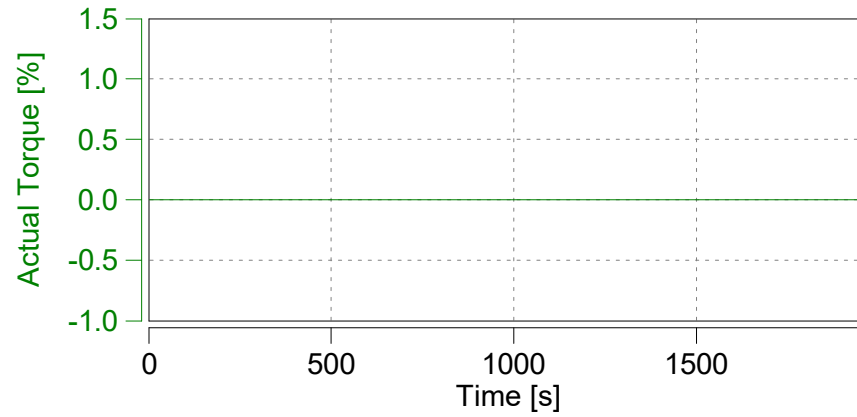
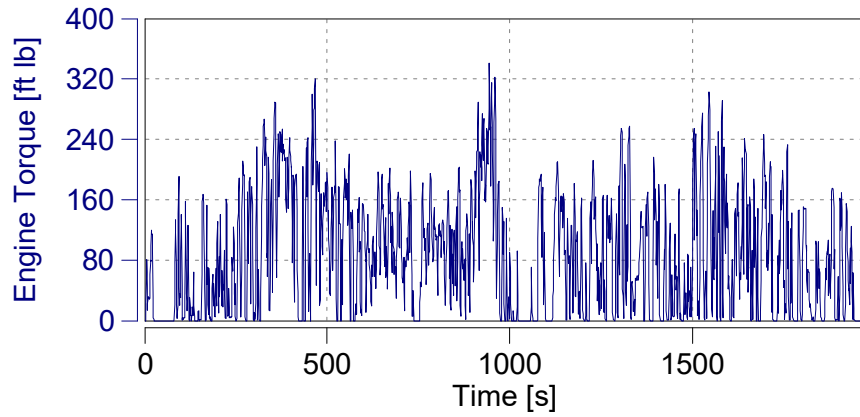
Reset Time Shifts in Plot

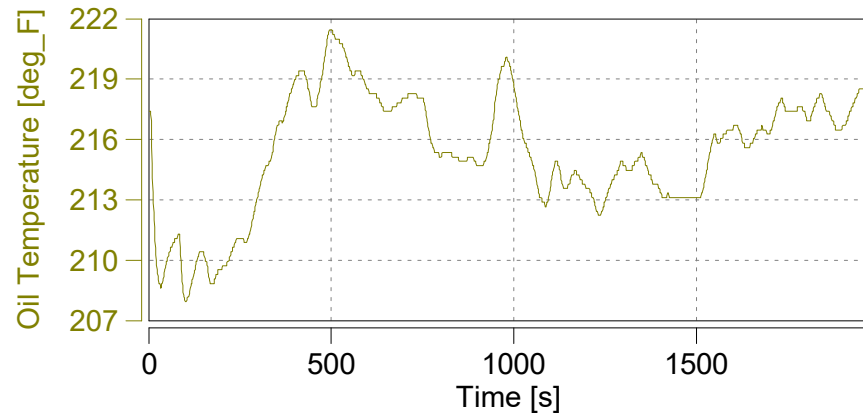
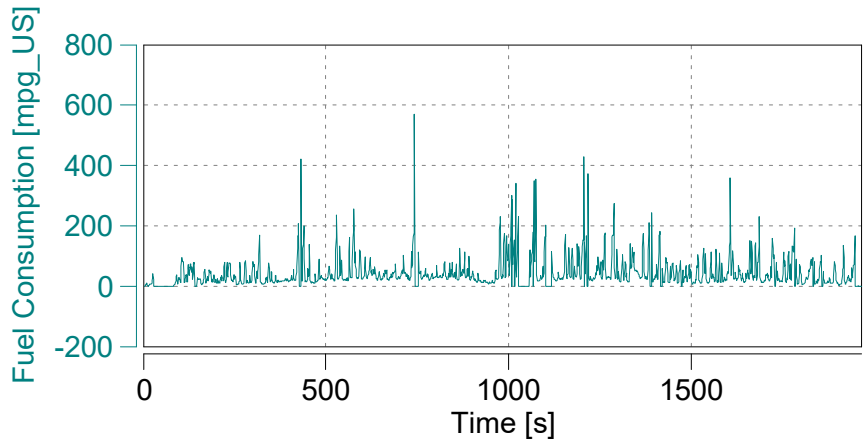
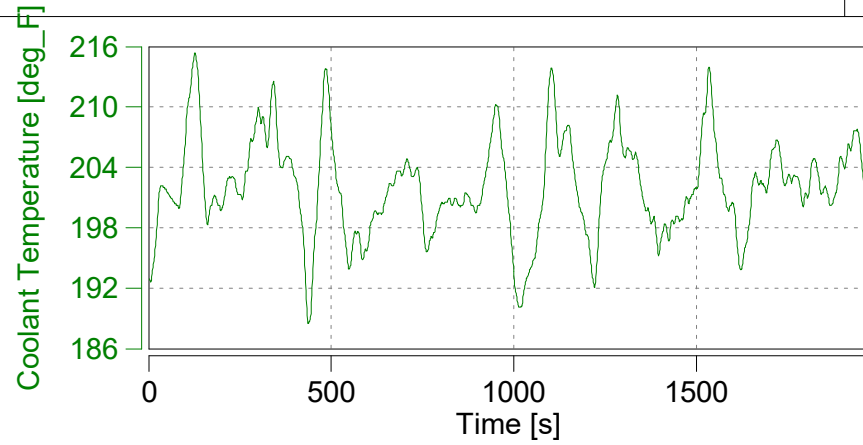
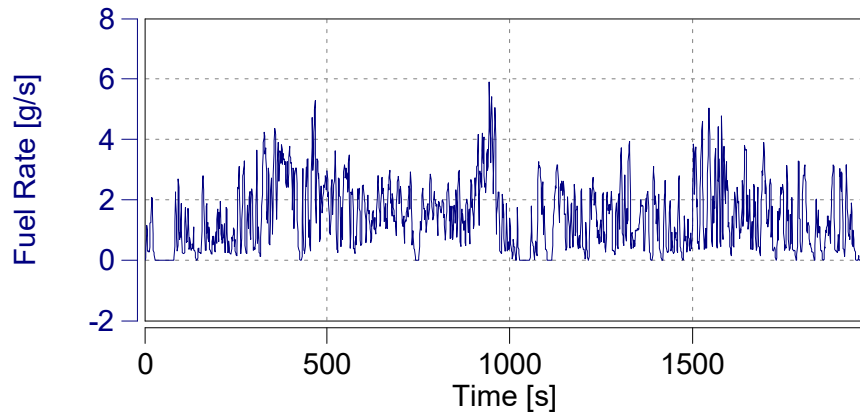
Apply Current Values

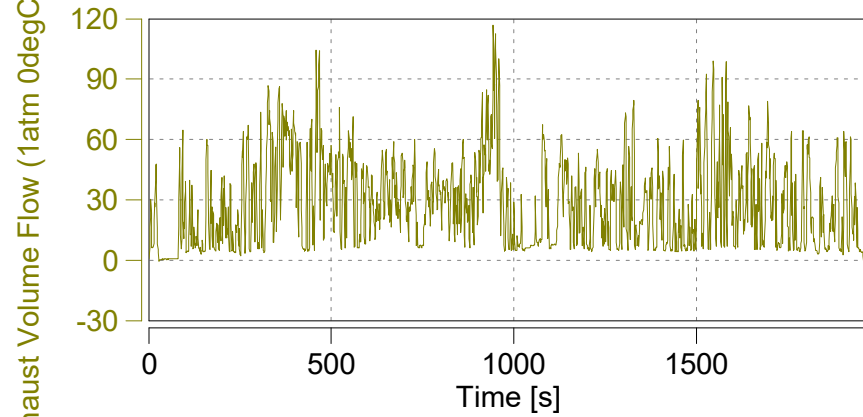
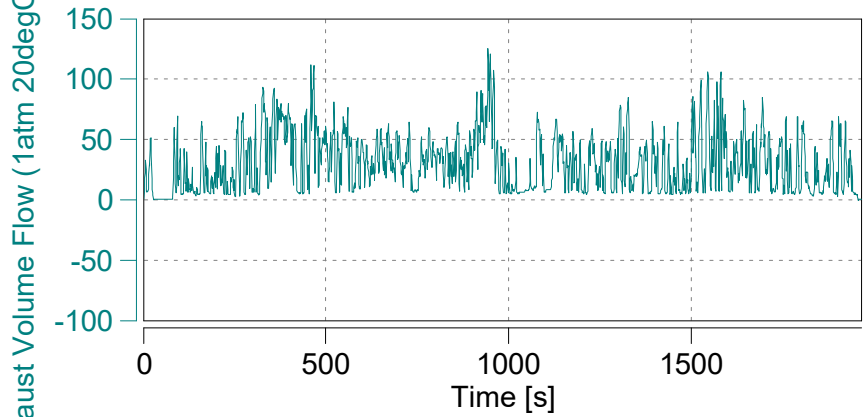
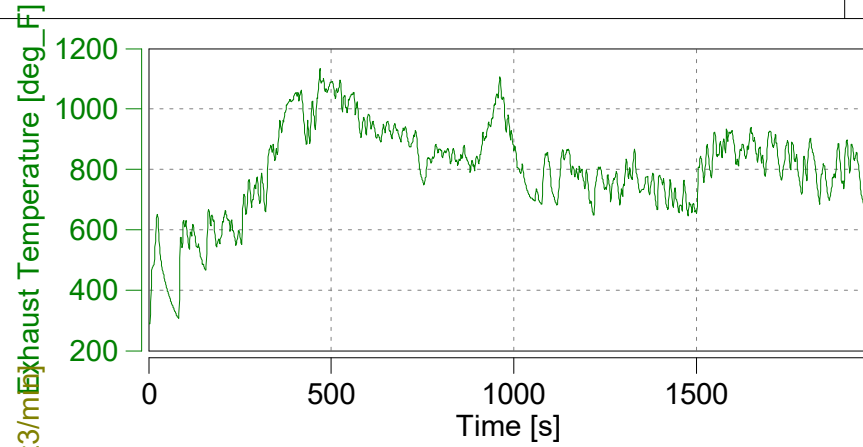
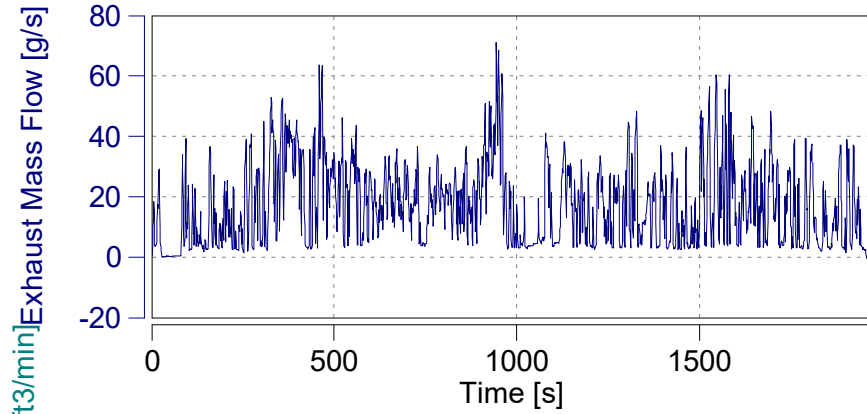


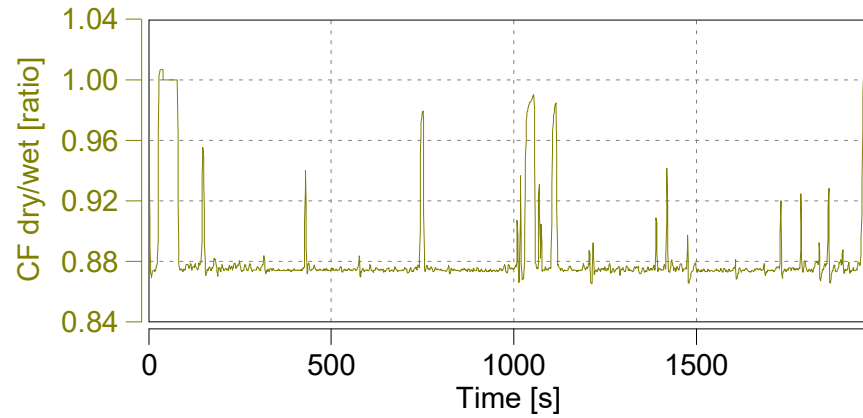
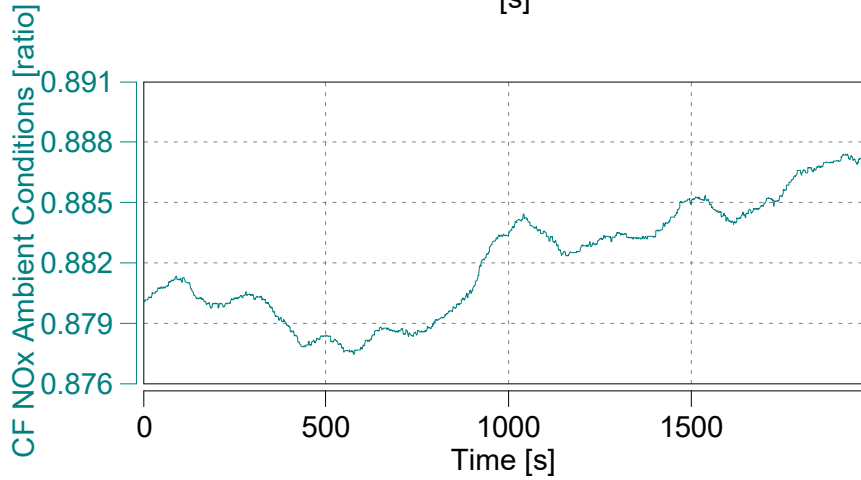
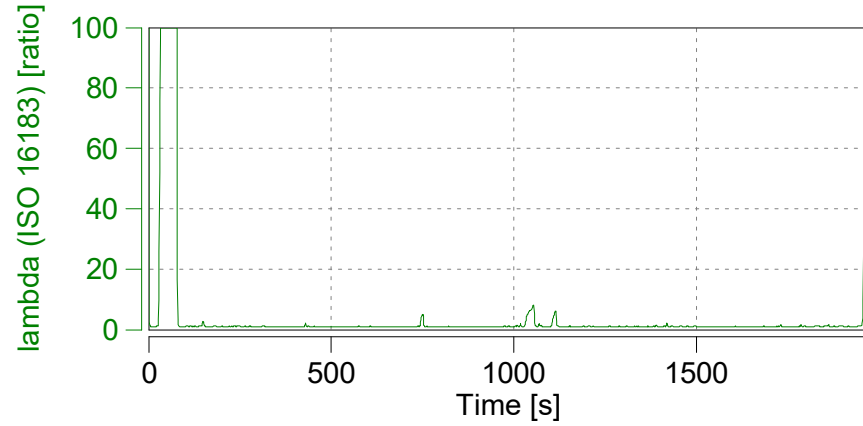
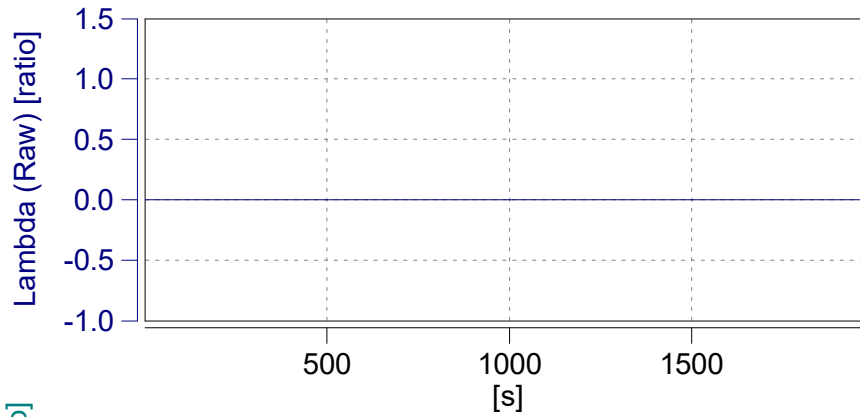


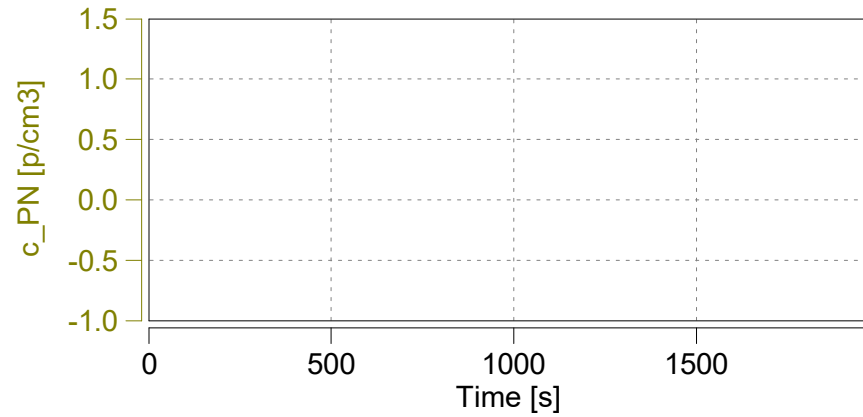
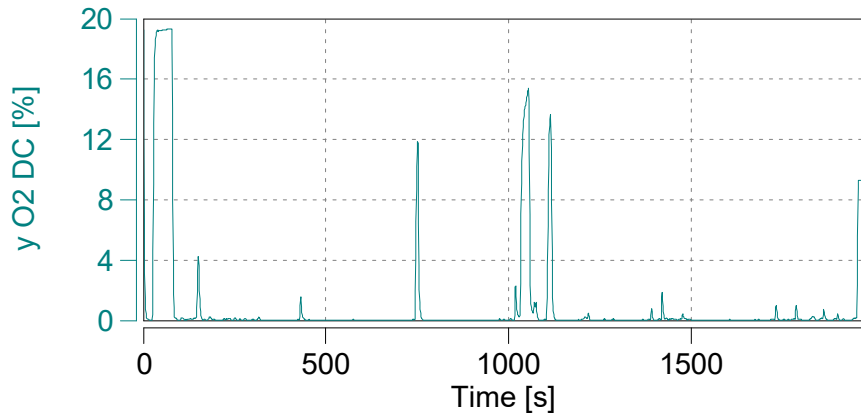
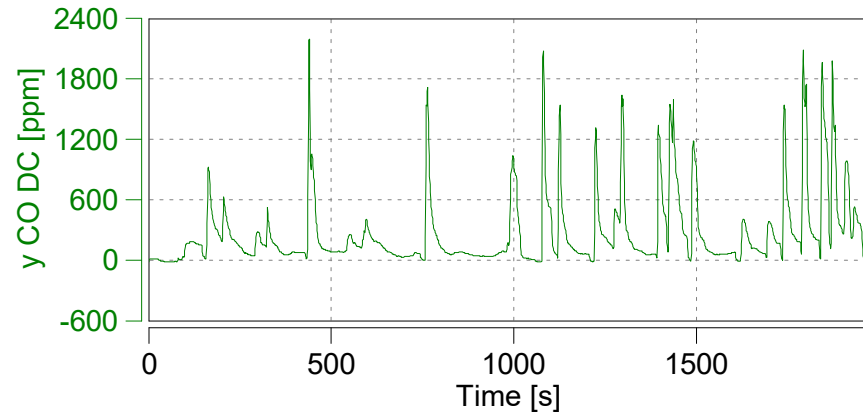
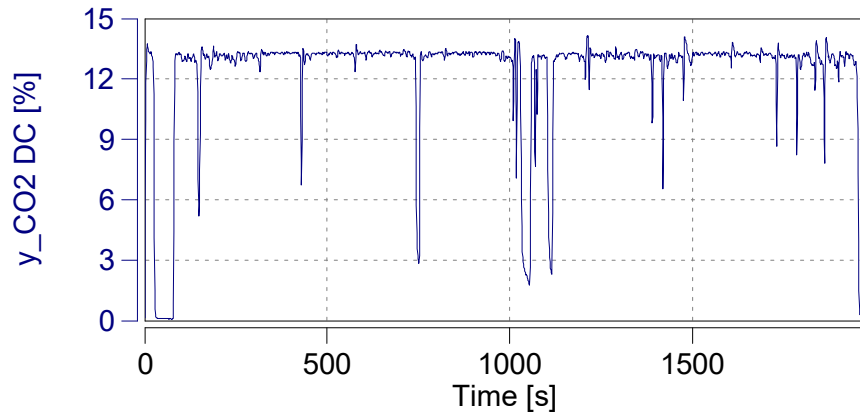


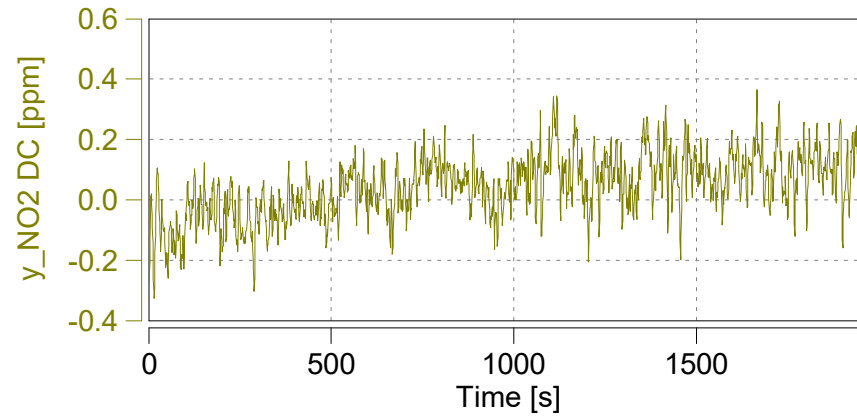
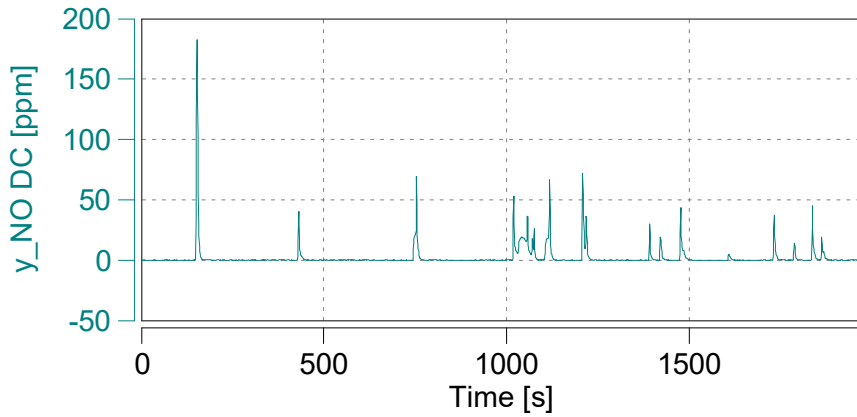
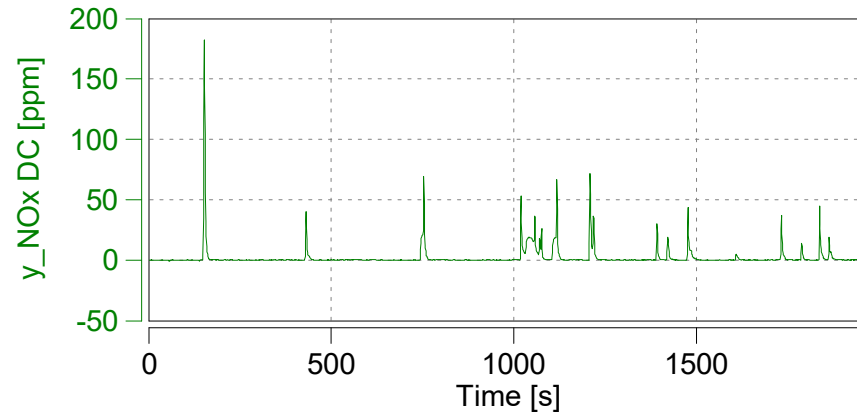
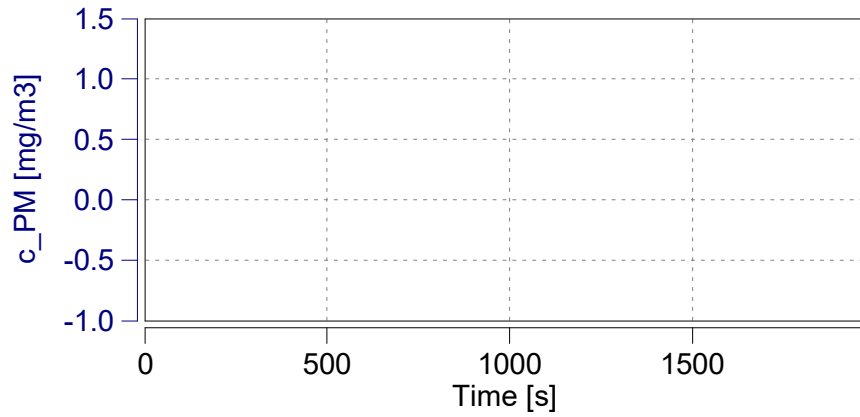


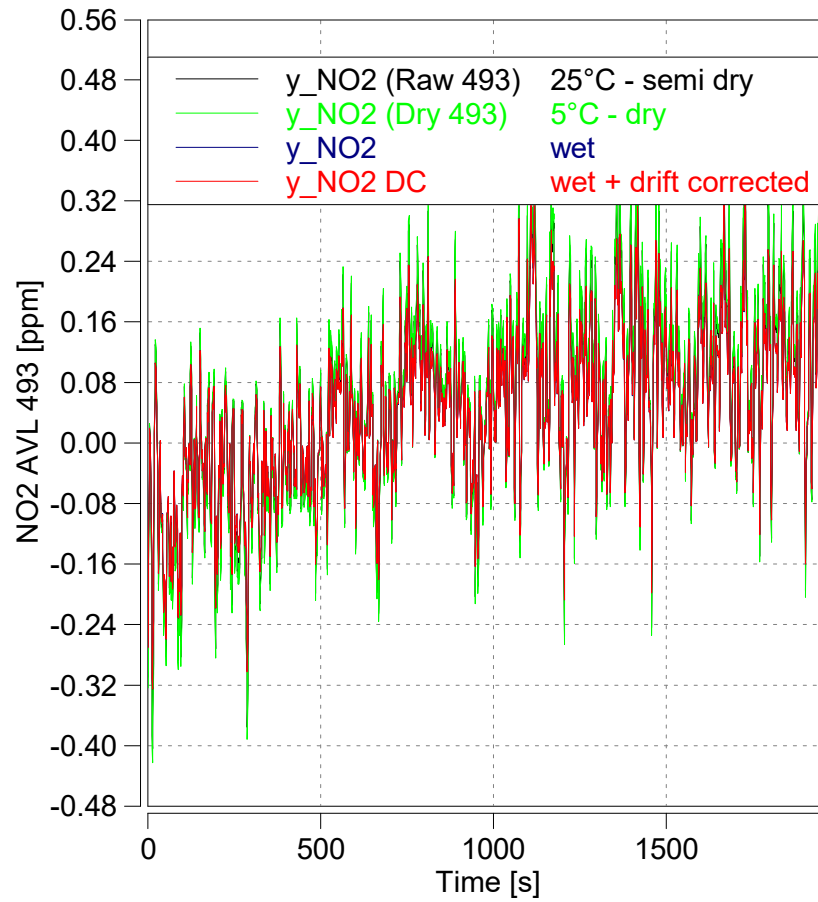
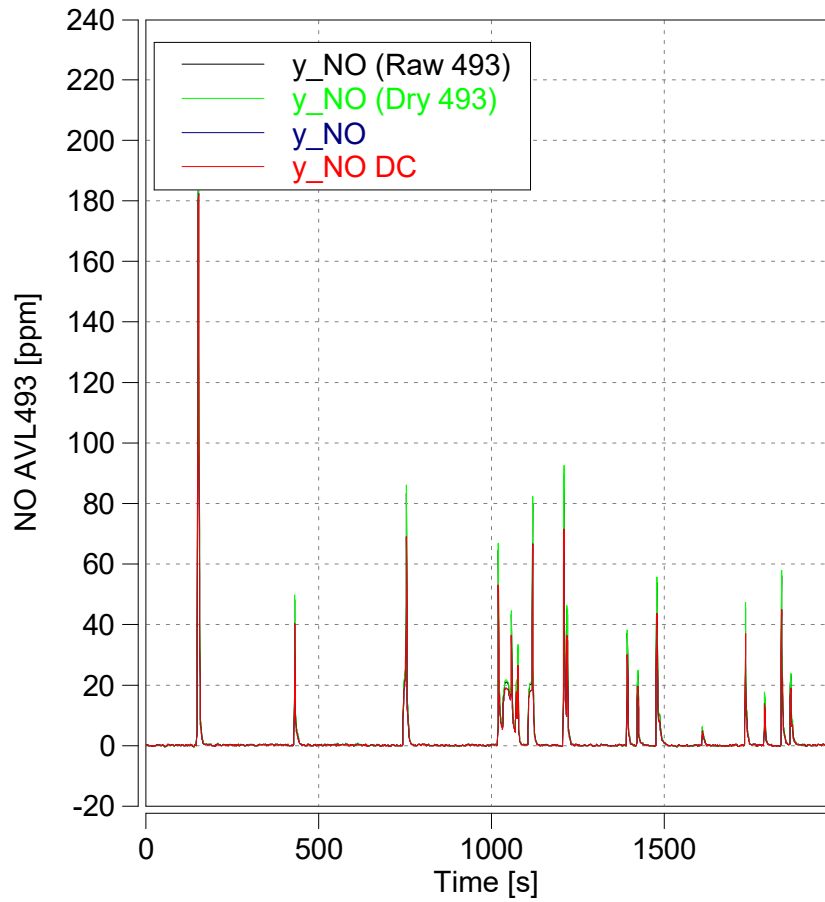




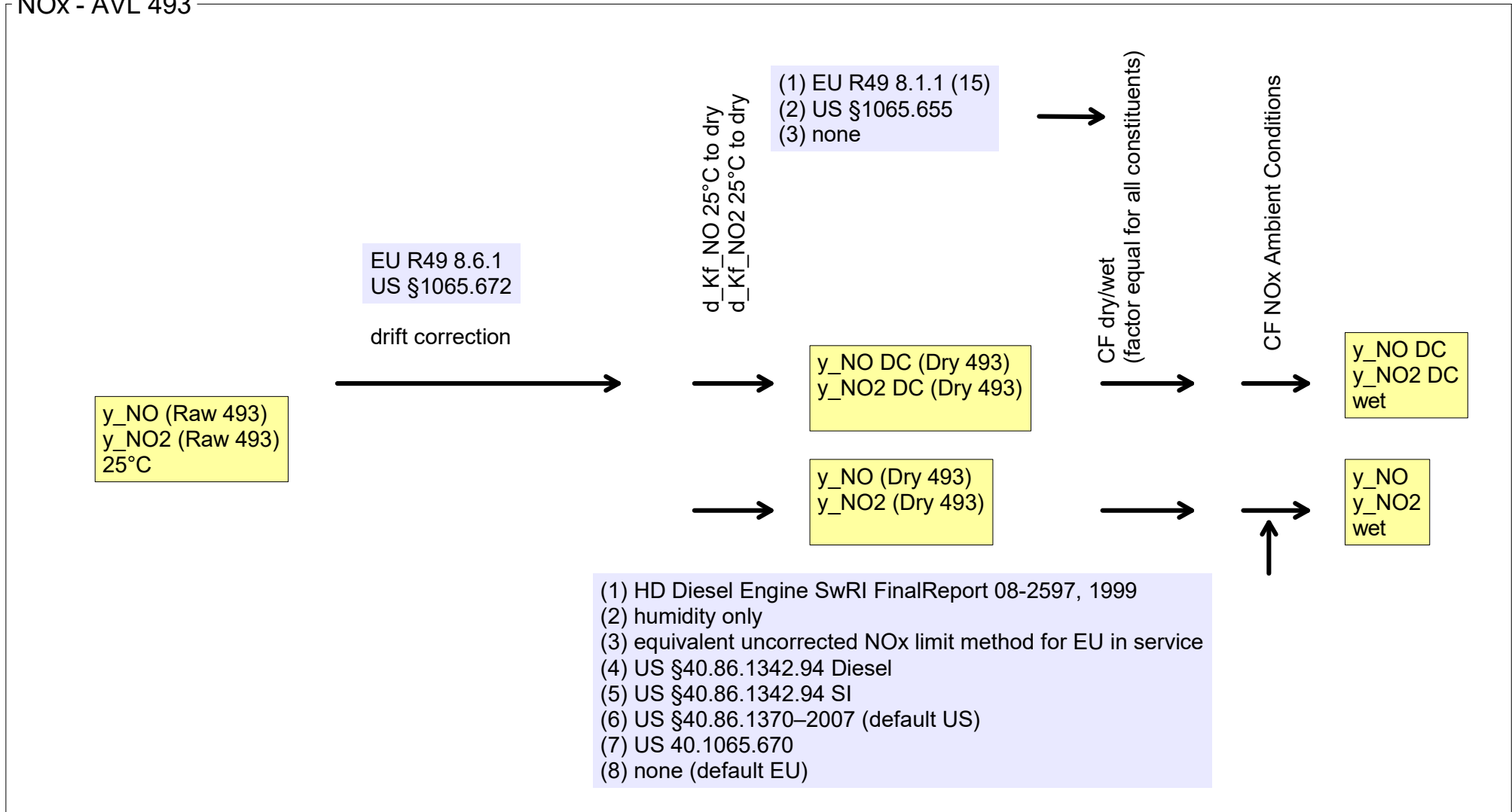


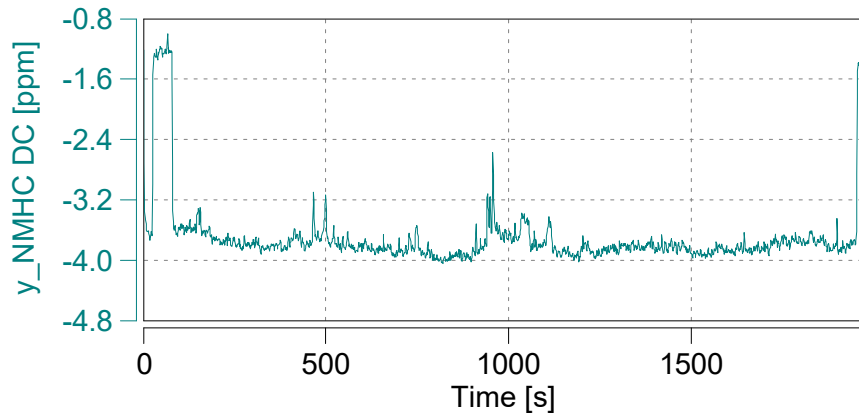
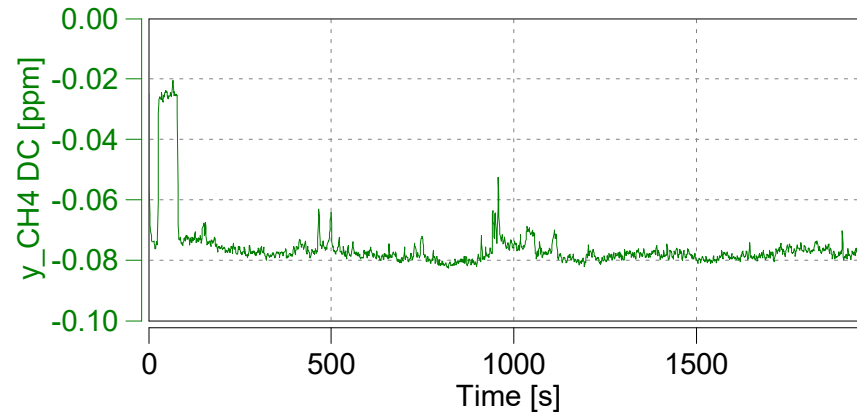
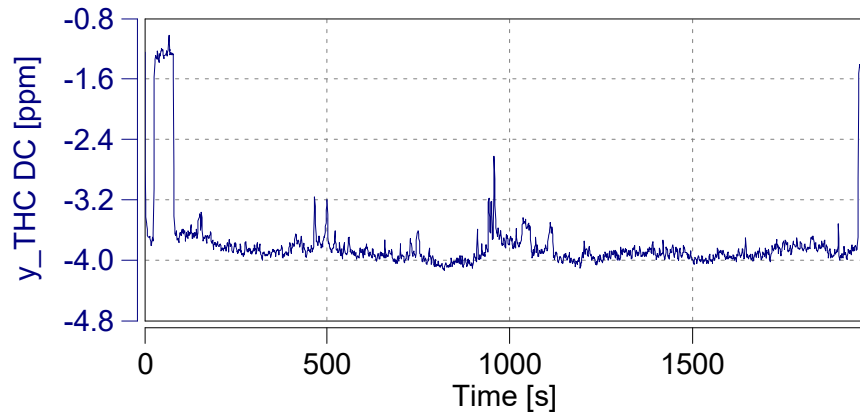


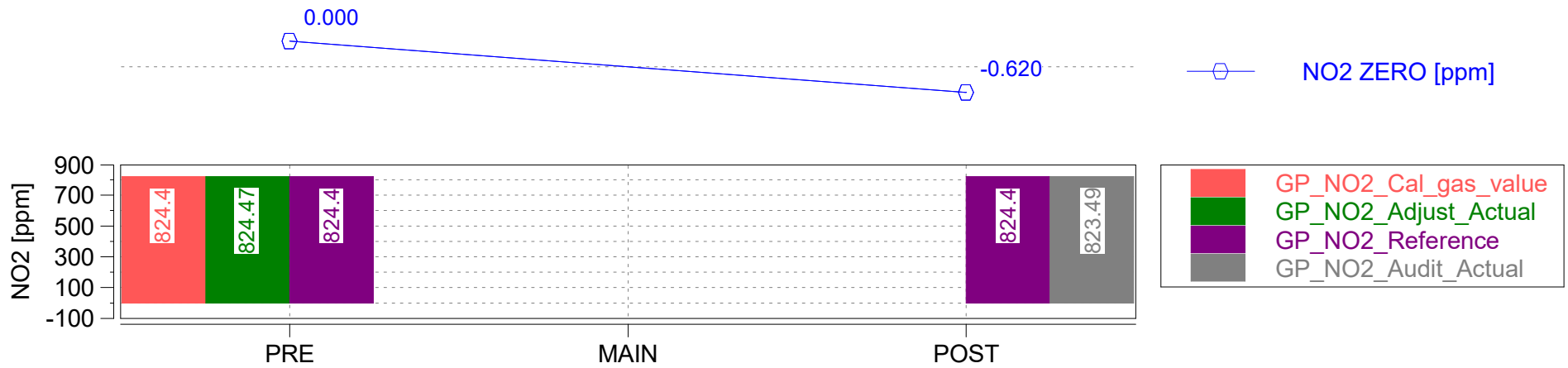
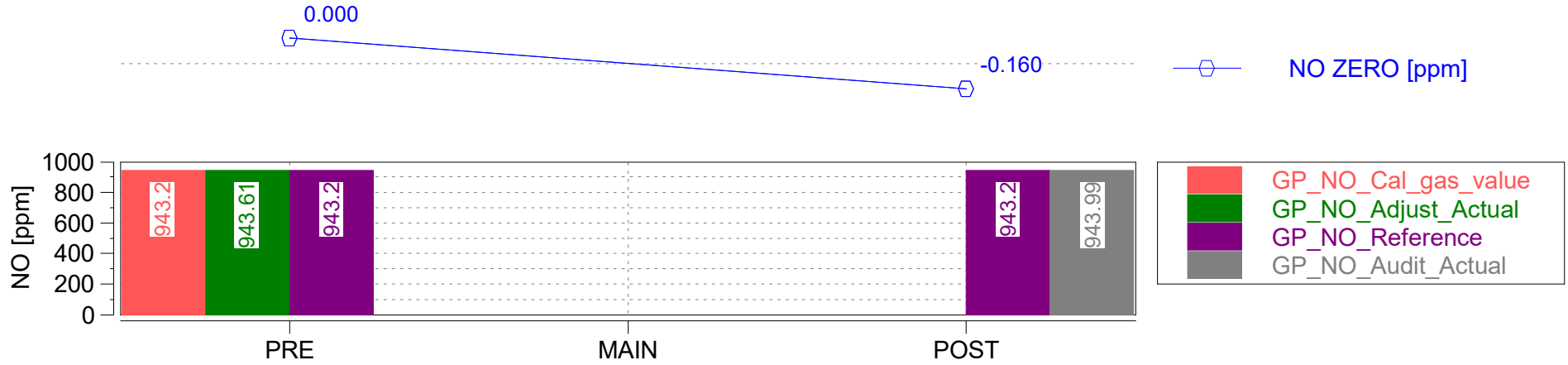


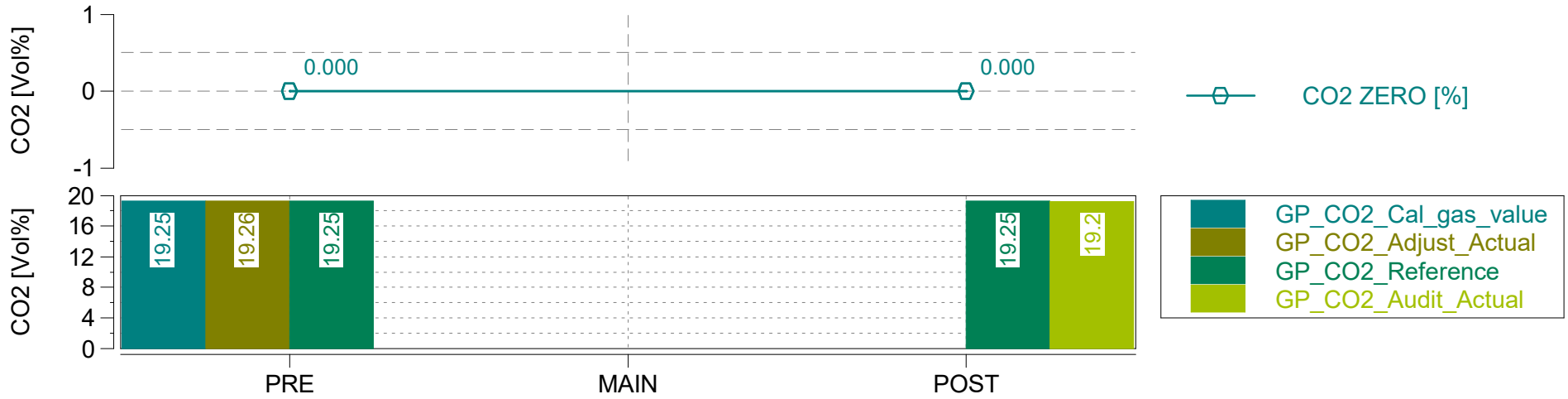
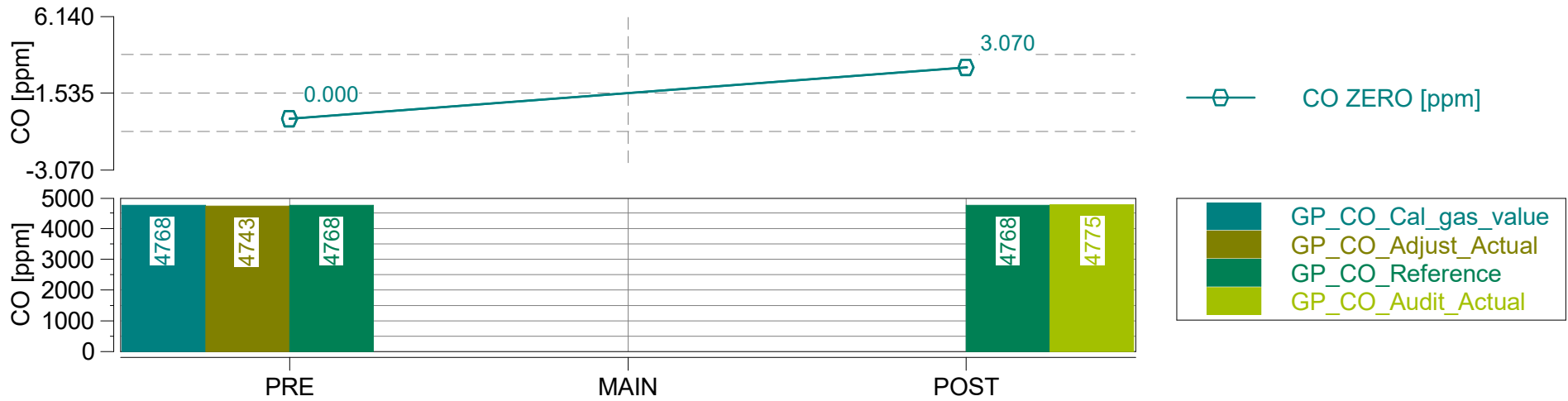


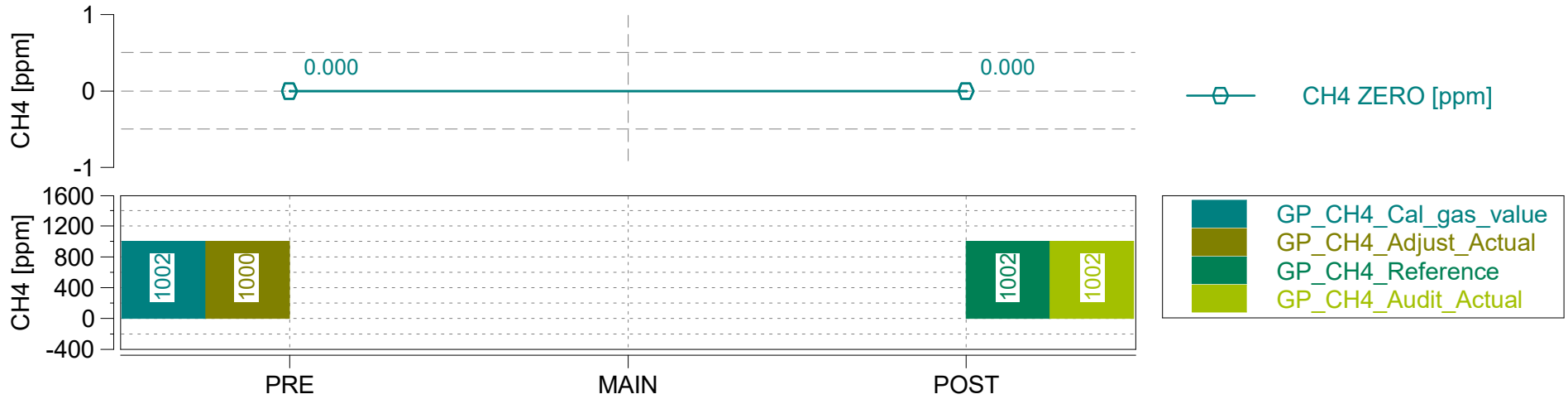
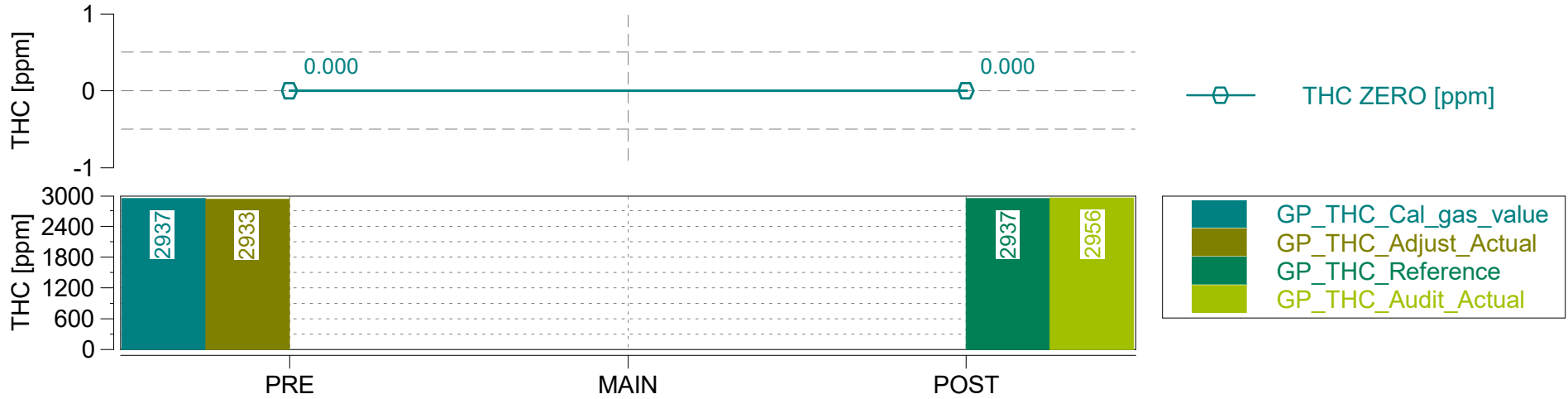
NOx - AVL 493













| § | criterium | condition | value | unit | pass/fail |
|-----------------------|--|--------------------------|-------------|------------|-----------|
| GAS Leak Check | The leakage rate on the vacuum side shall not exceed 0.5 per cent of the in-use flow rate for the portion of the system being checked. | The leakage rate <= 0.5% | 0.10 | % | pass |
| PN Leak Check | n/a | n/a | n/a | n/a | n/a |
| PM Leak Check | n/a | n/a | n/a | n/a | n/a |

GAS PEMS Devices

| | |
|-----------------------|------------|
| Device ID | AVL492 |
| Serial Number | 0182 |
| Firmware Version | V1.17 |
| Main Test Date | 2022-03-07 |
| Leak Check Age [days] | 0 |

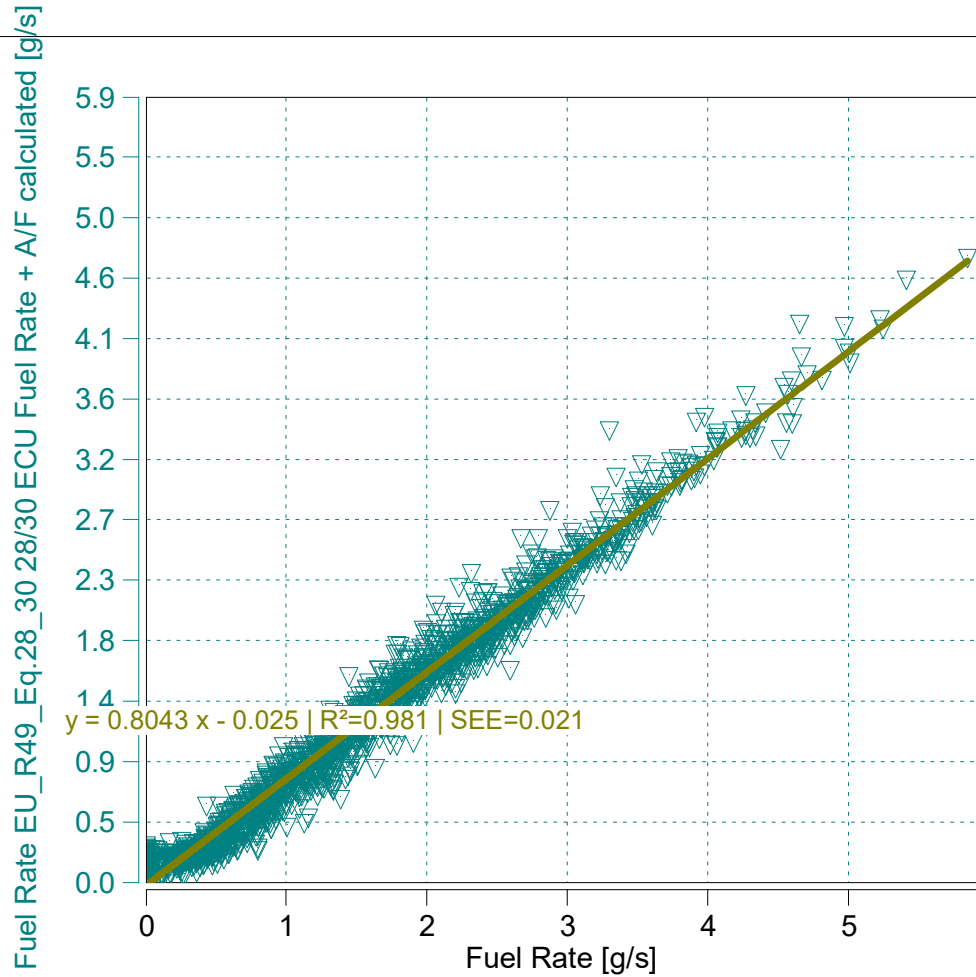
| | |
|------------------|-----------|
| Device ID | AVL4925iS |
| Serial Number | 202 |
| Firmware Version | 1.22.0.4 |

EFM

| | |
|--------------------|--------|
| Device ID | AVL495 |
| Serial Number | 00915 |
| Serial Number Tube | 01115 |
| Firmware Version | V1.16 |

System Control

| | |
|------------------|----------|
| SC Version | V2.9_237 |
| SC Serial Number | 60300923 |



EU 582/2011/Appendix I/3.2.1 | Fuel Rate ECU and calculated

$y = 0.8043 x - 0.025 \mid R^2=0.981 \mid SEE=0.021$
 $m = 0.80$ (0.9 - 1.1 recommended)
 $R^2 = 0.98$ (min 0.9 mandatory)

Data from - to [% of Maximum]

0

100



| | | |
|-------------------------------|--------------|--------|
| Trip Duration | 2026.00 | s |
| Trip Duration (a) | 2026.00 | s |
| Trip Distance | 17.11 | mi |
| Trip Distance (a) | 17.11 | mi |
| Trip Fuel Cons. (b) | 3.66 | kg |
| Trip Fuel Cons. (ab) | 3.66 | kg |
| Trip Fuel Cons. EU (ac) | 2.80 | kg |
| Trip Fuel Cons. US (ac) | 2.80 | kg |
| Trip Fuel Economy (b) | 13.23 | mpg_US |
| Trip Fuel Economy (ab) | 13.23 | mpg_US |
| Trip Fuel Economy EU (ac) | 17.28 | mpg_US |
| Trip Fuel Economy US (ac) | 17.26 | mpg_US |
| Trip Fuel Economy GGE (b) | 13.23 | mpg_US |
| Trip Fuel Economy GGE (ab) | 13.23 | mpg_US |
| Trip Fuel Economy EU GGE (ac) | 17.28 | mpg_US |
| Trip Fuel Economy US GGE (ac) | 17.26 | mpg_US |
| Trip Av. Eng. Speed | 1272.71 | rpm |
| Trip Av. Torque | 109.21 | lbft |
| Trip Av. Power | 36.96 | hp |
| Trip Work | | |
| Trip Work (a) | 20.80 | hphr |
| Trip Exhaust Mass | 42.58 | kg |
| Trip Exhaust Mass EU (ac) | 56.13 | kg |
| Trip Exhaust Mass US (ac) | 56.12 | kg |
| Trip Av. Amb. Temperature | 69.13 | deg_F |
| Trip Av. Humidity | 18.62 | % |
| Trip Av. GPS Altitude | 559.85 | m |
| Fuel Type | Petrol (E10) | |

| | | |
|-----------------------------------|------------|------------|
| ave THC | -2.38540 | ppm |
| ave NMHC | -2.33769 | ppm |
| ave CH4 | -0.04771 | ppm |
| ave CO | 234.21217 | ppm |
| ave CO2 | 10.46091 | % |
| ave NOx | 0.84176 | ppm |
| ave PM | n/a | mg/m3 |
| ave Soot meas | n/a | mg/m3 |
| ave Soot | n/a | mg/m3 |
| ave PN | n/a | #/cm3 |
| tot THC | 0.00614 | g |
| tot NMHC | 0.00568 | g |
| tot CH4 | 0.00014 | g |
| tot CO | 13.86793 | g |
| tot CO2 | 8505.20314 | g |
| tot NO (d) | 0.03777 | g |
| tot NO2 | 0.00060 | g |
| tot NOx | 0.03536 | g |
| tot Soot | n/a | g |
| tot Soot meas | n/a | g |
| tot PM | n/a | g |
| tot PN | n/a | # |
| PM measurement type | 0.00000 | - |
| tot Soot on PM filter (estim.) | 0.00000 | mg |
| Soot --> PM simple scaling factor | 1.00000 | - |
| Trip Av. Veh. Speed | 30.40809 | mi/hr |
| Trip Distance Share Urban | 23.28668 | % distance |
| Trip Distance Share Rural | 75.51420 | % distance |
| Trip Distance Share Motorway | 1.19912 | % distance |

| | | |
|--------------|------------|--------|
| BS CO2 | 408.85255 | g/hphr |
| BS CO | 0.66664 | g/hphr |
| BS THC | 0.00030 | g/hphr |
| BS NMHC | 0.00027 | g/hphr |
| BS CH4 | 0.00001 | g/hphr |
| BS NO (d) | 0.00182 | g/hphr |
| BS NO2 | 0.00003 | g/hphr |
| BS NOx | 0.00170 | g/hphr |
| BS Soot | n/a | g/hphr |
| BS Soot meas | n/a | g/hphr |
| BS PM | n/a | g/hphr |
| BS PN | n/a | #/hpr |
| DS CO2 | 497.00257 | g/mi |
| DS CO | 0.81037 | g/mi |
| DS THC | 0.00036 | g/mi |
| DS NMHC | 0.00033 | g/mi |
| DS CH4 | 0.00001 | g/mi |
| DS NO (d) | 0.00221 | g/mi |
| DS NO2 | 0.00004 | g/mi |
| DS NOx | 0.00207 | g/mi |
| DS Soot | n/a | g/mi |
| DS Soot meas | n/a | g/mi |
| DS PM | n/a | g/mi |
| DS PN | n/a | #/mi |
| FS CO2 | 2324.17604 | g/kg |
| FS CO | 3.78962 | g/kg |
| FS THC | 0.00168 | g/kg |
| FS NMHC | 0.00155 | g/kg |
| FS CH4 | 0.00004 | g/kg |
| FS NO (d) | 0.01032 | g/kg |
| FS NO2 | 0.00017 | g/kg |
| FS NOx | 0.00966 | g/kg |
| FS Soot | n/a | g/kg |
| FS Soot meas | n/a | g/kg |
| FS PM | n/a | g/kg |
| FS PN | n/a | #/kg |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents

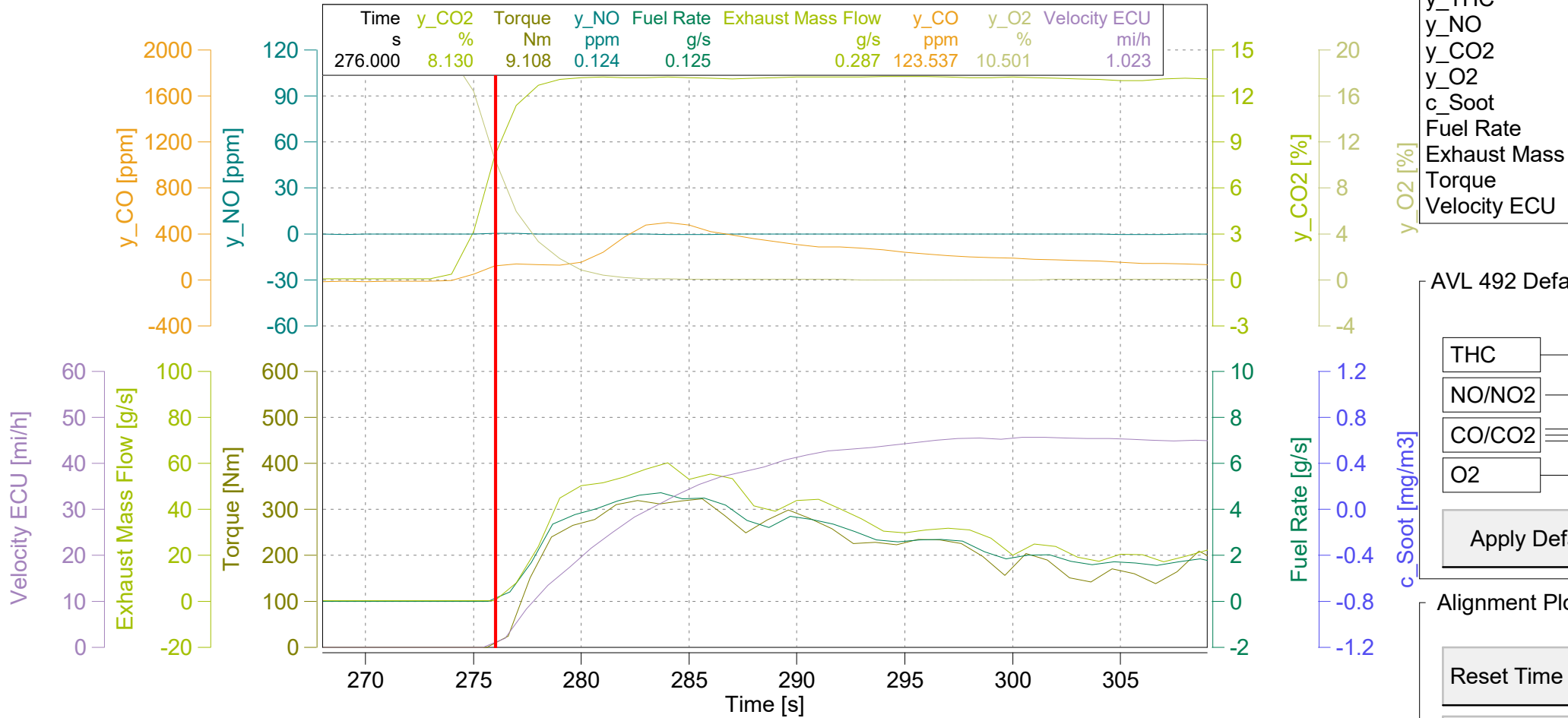


| | | | | | | | | |
|-------------------------------|--------------|--------|-----------------------------------|------------|------------|--------------|------------|--------|
| Trip Duration | 2026.00 | s | ave THC DC | -2.37968 | ppm | BS CO2 DC | 409.27777 | g/hphr |
| Trip Duration (a) | 2026.00 | s | ave NMHC DC | -2.33208 | ppm | BS CO DC | 0.66784 | g/hphr |
| Trip Distance | 17.11 | mi | ave CH4 DC | -0.04759 | ppm | BS THC DC | 0.00029 | g/hphr |
| Trip Distance (a) | 17.11 | mi | ave CO DC | 234.63069 | ppm | BS NMHC DC | 0.00027 | g/hphr |
| | | | ave CO2 DC | 10.47179 | % | BS CH4 DC | 0.00001 | g/hphr |
| Trip Fuel Cons. (b) | 3.66 | kg | ave NOx DC | 0.84109 | ppm | BS NO DC (d) | 0.00181 | g/hphr |
| Trip Fuel Cons. (ab) | 3.66 | kg | ave PM | n/a | mg/m3 | BS NO2 DC | 0.00003 | g/hphr |
| Trip Fuel Cons. EU (ac) | 2.80 | kg | ave Soot meas | n/a | mg/m3 | BS NOx DC | 0.00170 | g/hphr |
| Trip Fuel Cons. US (ac) | 2.80 | kg | ave Soot | n/a | mg/m3 | BS Soot | n/a | g/hphr |
| | | | ave PN DC | | | BS Soot meas | n/a | g/hphr |
| | | | | | | BS PM | n/a | g/hphr |
| Trip Fuel Economy (b) | 13.23 | mpg_US | tot THC DC | 0.00613 | g | BS PN DC | | |
| Trip Fuel Economy (ab) | 13.23 | mpg_US | tot NMHC DC | 0.00567 | g | | | |
| Trip Fuel Economy EU (ac) | 17.28 | mpg_US | tot CH4 DC | 0.00014 | g | DS CO2 DC | 497.51947 | g/mi |
| Trip Fuel Economy US (ac) | 17.26 | mpg_US | tot CO DC | 13.89272 | g | DS CO DC | 0.81182 | g/mi |
| Trip Fuel Economy GGE (b) | 13.23 | mpg_US | tot CO2 DC | 8514.04890 | g | DS THC DC | 0.00036 | g/mi |
| Trip Fuel Economy GGE (ab) | 13.23 | mpg_US | tot NO DC (d) | 0.03775 | g | DS NMHC DC | 0.00033 | g/mi |
| Trip Fuel Economy EU GGE (ac) | 17.28 | mpg_US | tot NO2 DC | 0.00060 | g | DS CH4 DC | 0.00001 | g/mi |
| Trip Fuel Economy US GGE (ac) | 17.26 | mpg_US | tot NOx DC | 0.03534 | g | DS NO DC (d) | 0.00221 | g/mi |
| | | | tot Soot | n/a | g | DS NO2 DC | 0.00004 | g/mi |
| Trip Av. Eng. Speed | 1272.71 | rpm | tot Soot meas | n/a | g | DS NOx DC | 0.00206 | g/mi |
| Trip Av. Torque | 109.21 | lbft | tot PM | n/a | g | DS Soot | n/a | g/mi |
| Trip Av. Power | 36.96 | hp | tot PN DC | | | DS Soot meas | n/a | g/mi |
| Trip Work | | | | | | DS PM | n/a | g/mi |
| Trip Work (a) | 20.80 | hphr | | | | DS PN DC | | |
| | | | PM measurement type | 0.00000 | - | | | |
| Trip Exhaust Mass | 42.58 | kg | tot Soot on PM filter (estim.) | 0.00000 | mg | FS CO2 DC | 2326.59328 | g/kg |
| Trip Exhaust Mass EU (ac) | 56.13 | kg | Soot --> PM simple scaling factor | 1.00000 | - | FS CO DC | 3.79640 | g/kg |
| Trip Exhaust Mass US (ac) | 56.12 | kg | | | | FS THC DC | 0.00167 | g/kg |
| | | | Trip Av. Veh. Speed | 30.40809 | mi/hr | FS NMHC DC | 0.00155 | g/kg |
| Trip Av. Amb. Temperature | 69.13 | deg_F | | | | FS CH4 DC | 0.00004 | g/kg |
| Trip Av. Humidity | 18.62 | % | Trip Distance Share Urban | 23.28668 | % distance | FS NO DC (d) | 0.01031 | g/kg |
| Trip Av. GPS Altitude | 559.85 | m | Trip Distance Share Rural | 75.51420 | % distance | FS NO2 DC | 0.00017 | g/kg |
| | | | Trip Distance Share Motorway | 1.19912 | % distance | FS NOx DC | 0.00966 | g/kg |
| Fuel Type | Petrol (E10) | | | | | FS Soot | n/a | g/kg |
| | | | | | | FS Soot meas | n/a | g/kg |
| | | | | | | FS PM | n/a | g/kg |
| | | | | | | FS PN DC | | |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
 (d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents



Concerto Absolute Time



- y_THC
- y_NO
- y_CO2
- y_O2
- c_Soot
- Fuel Rate
- Exhaust Mass
- Torque
- Velocity ECU

AVL 492 Defa

- THC
- NO/NO2
- CO/CO2
- O2

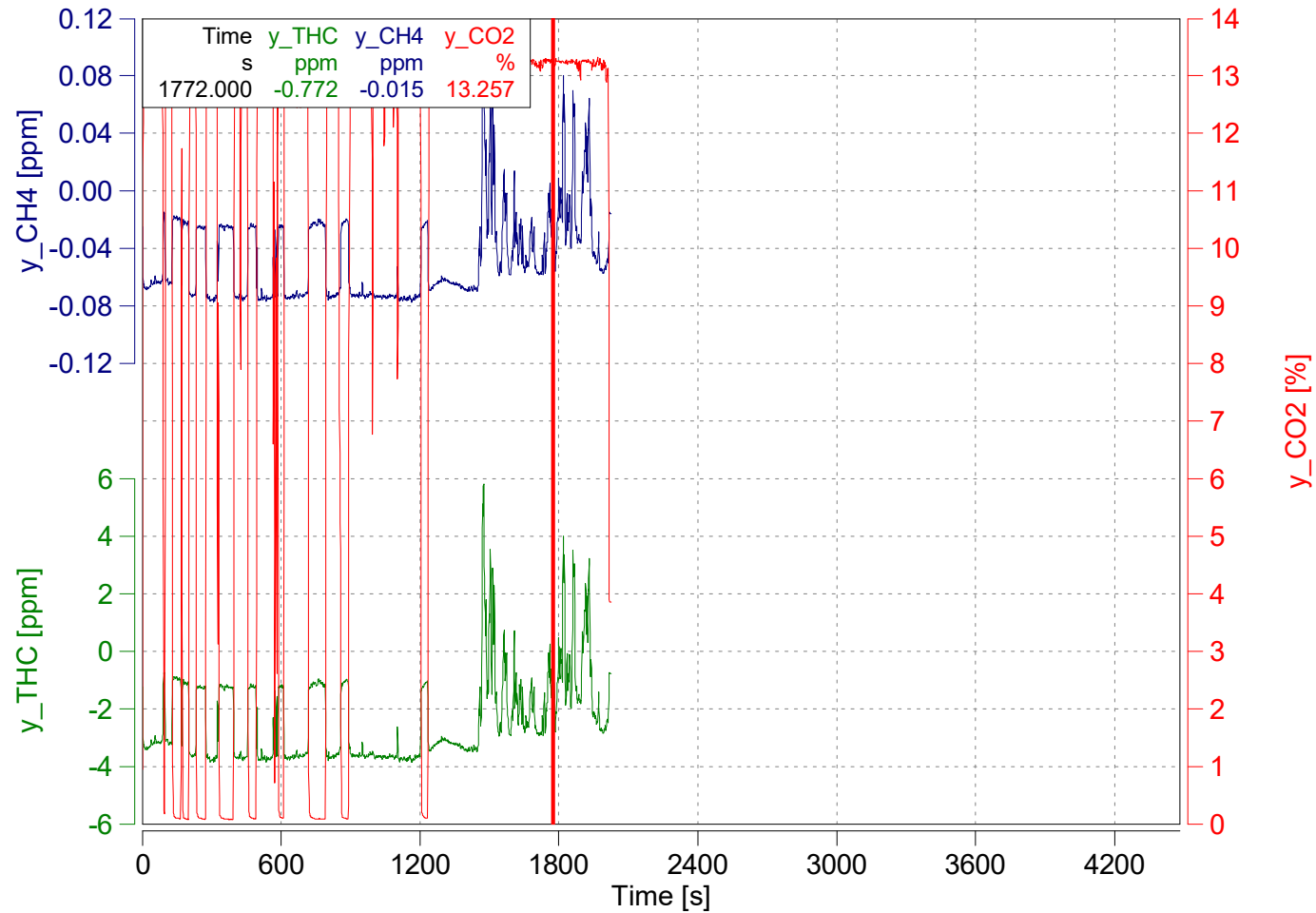
Apply Def

Alignment Plc

Reset Time

Reset A

Apply Curr

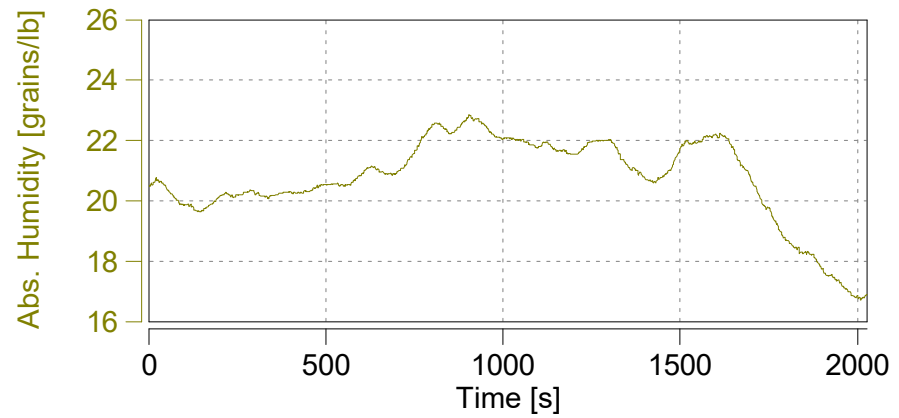
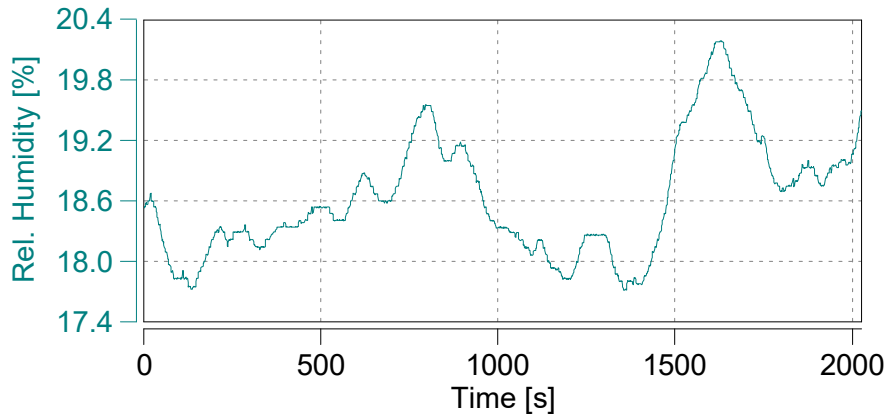
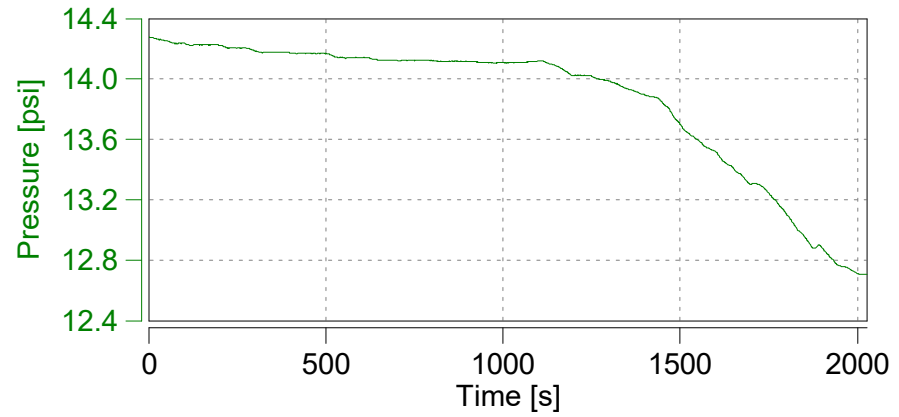
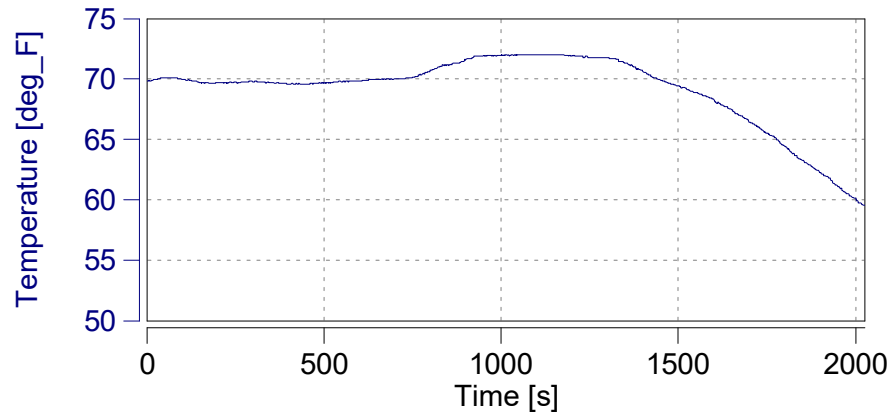


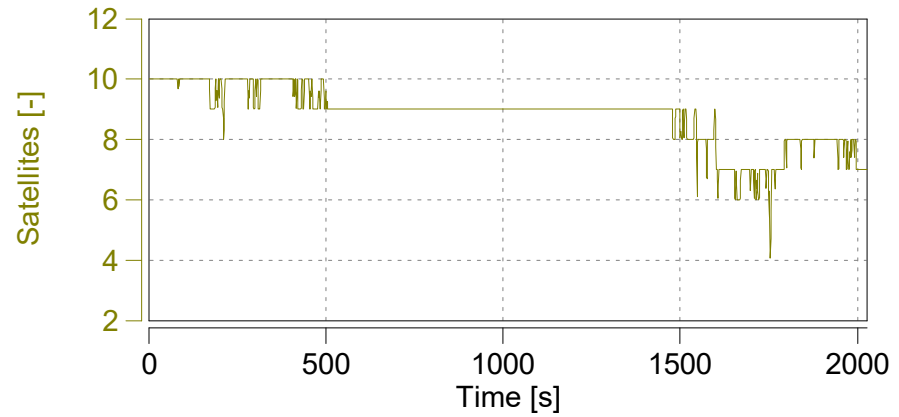
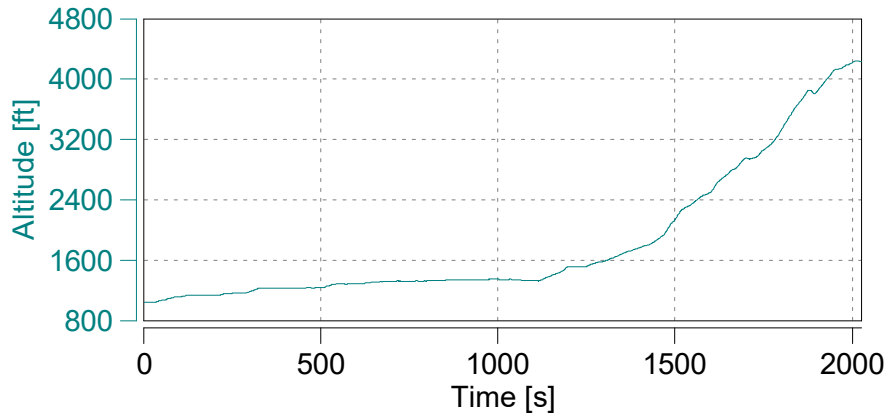
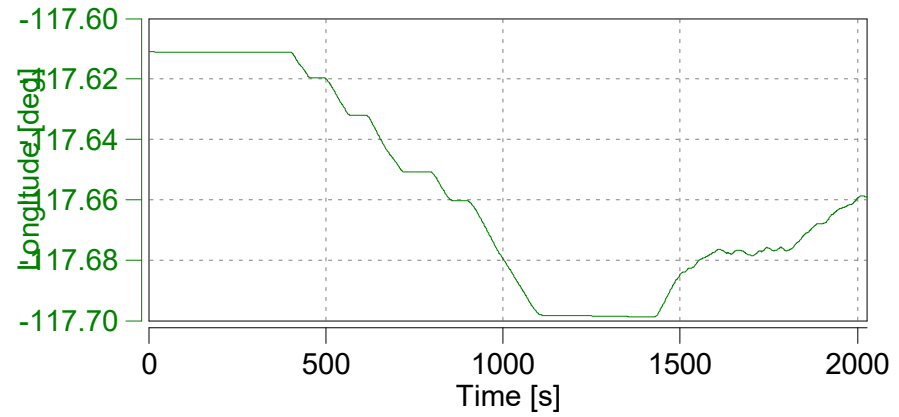
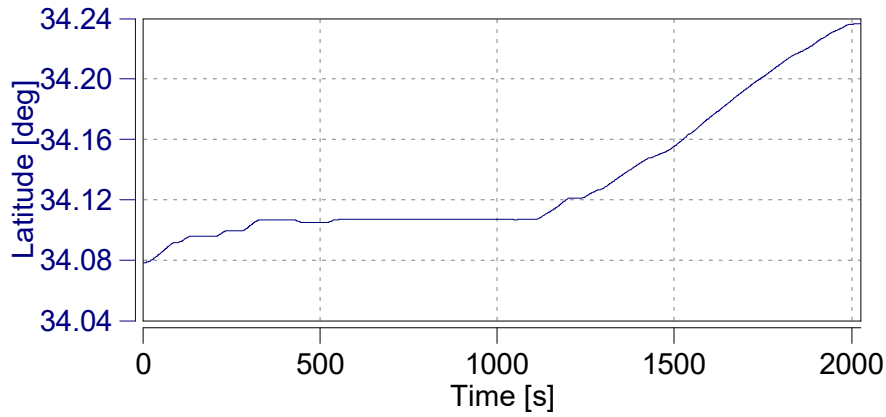
Absolute Time Shifts

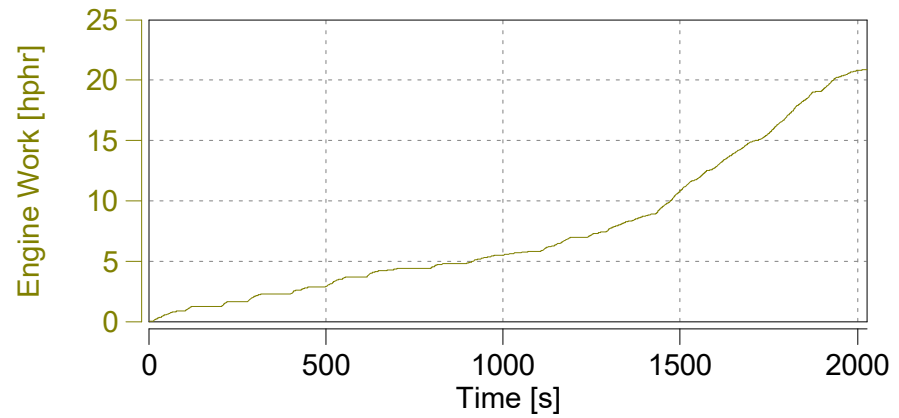
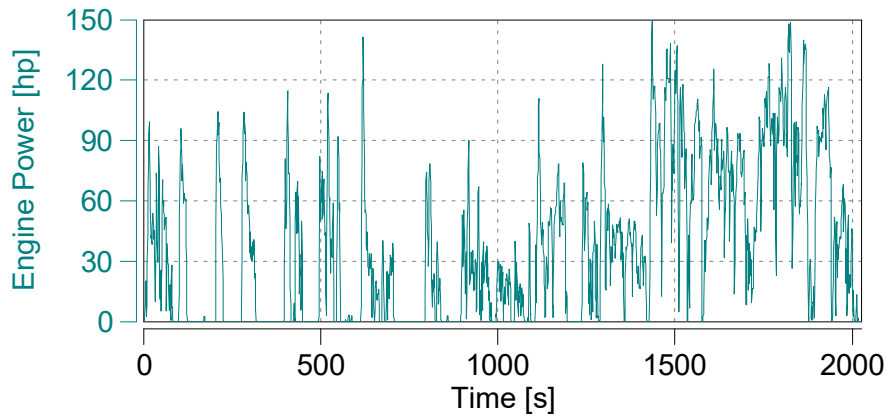
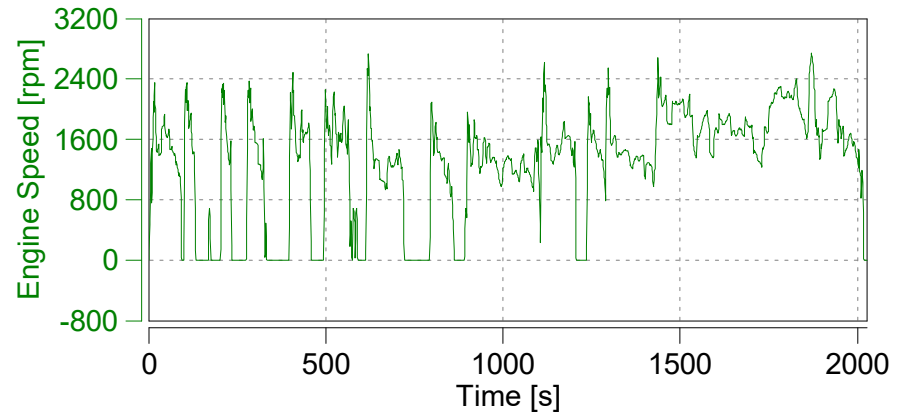
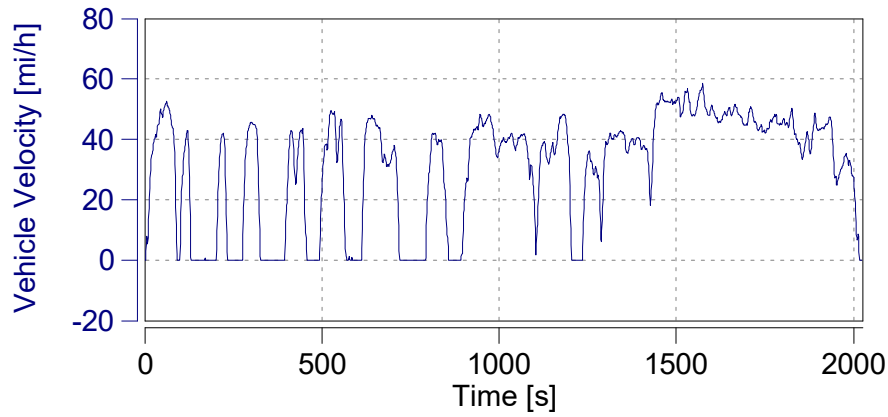
| | | |
|-------|---|------|
| y_THC | s | -4.3 |
| y_CH4 | s | -6.3 |

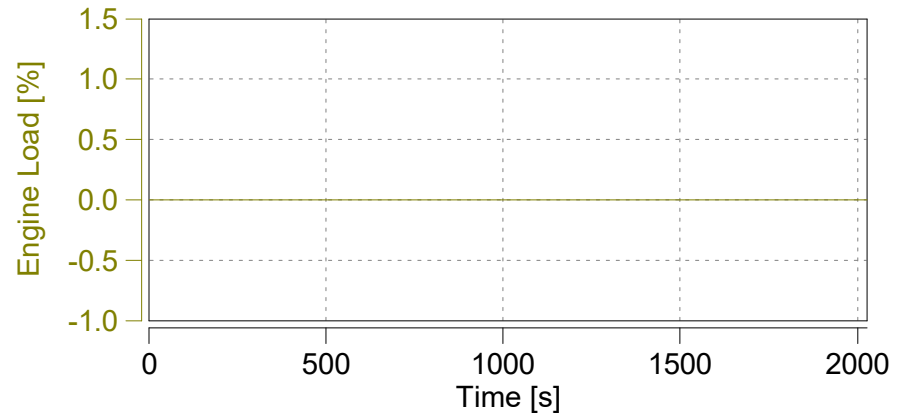
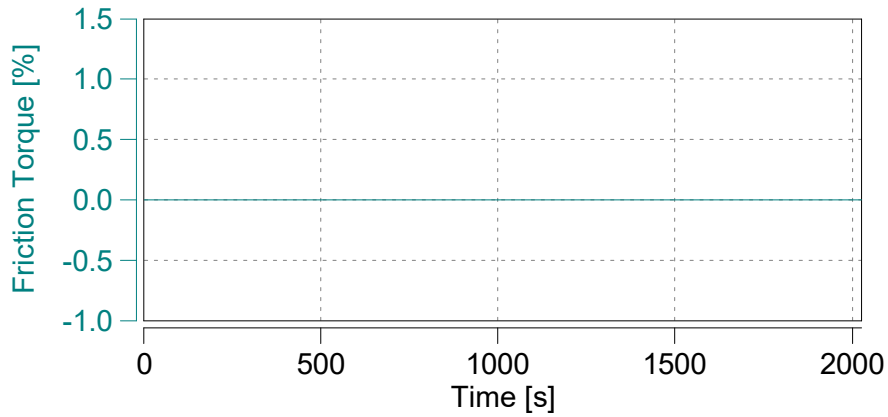
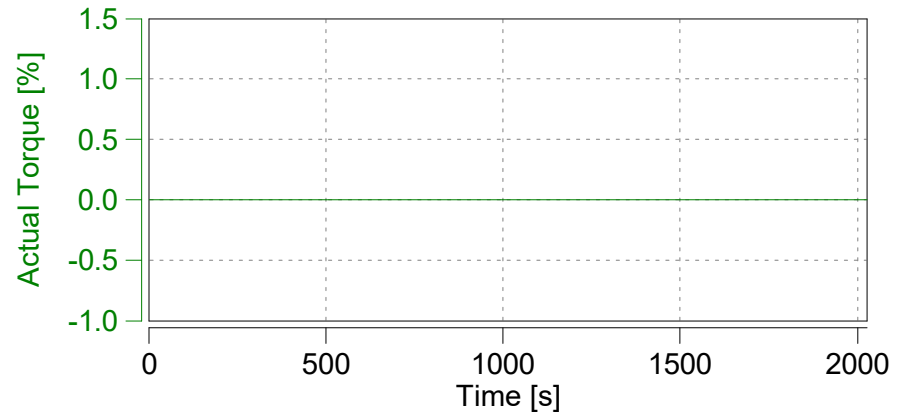
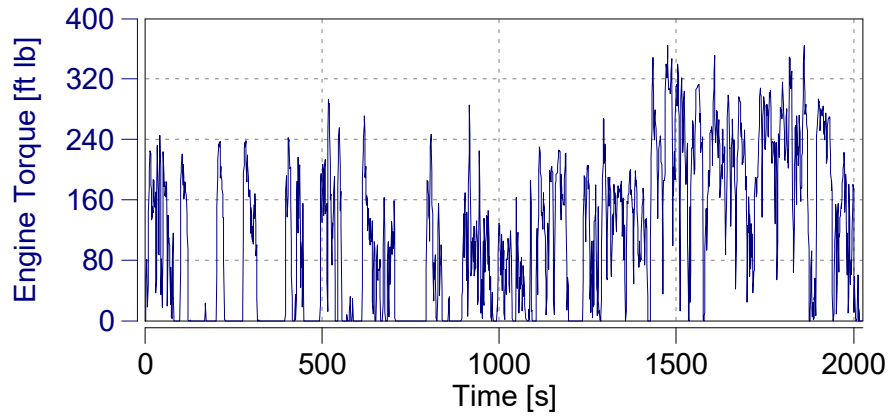
Reset Time Shifts in Plot

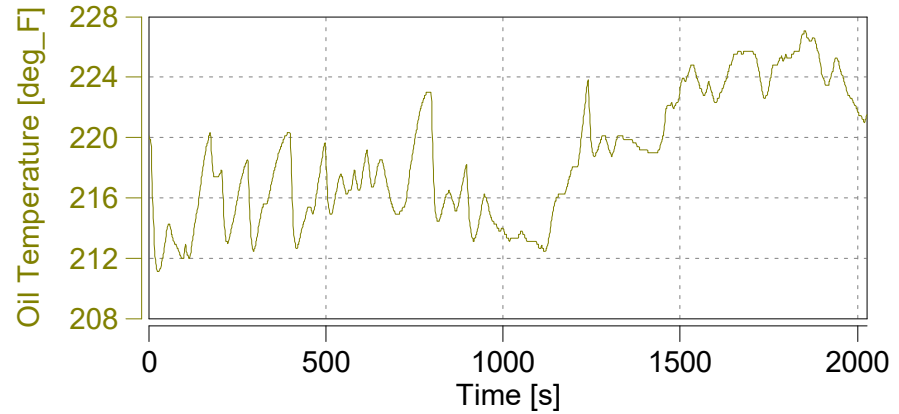
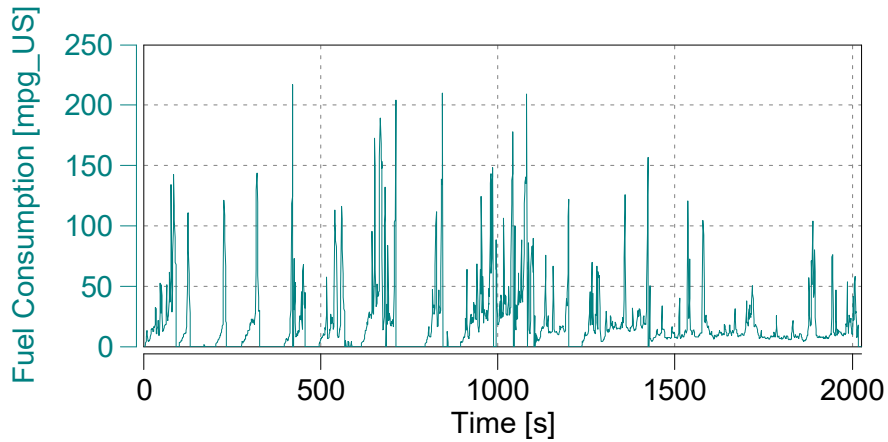
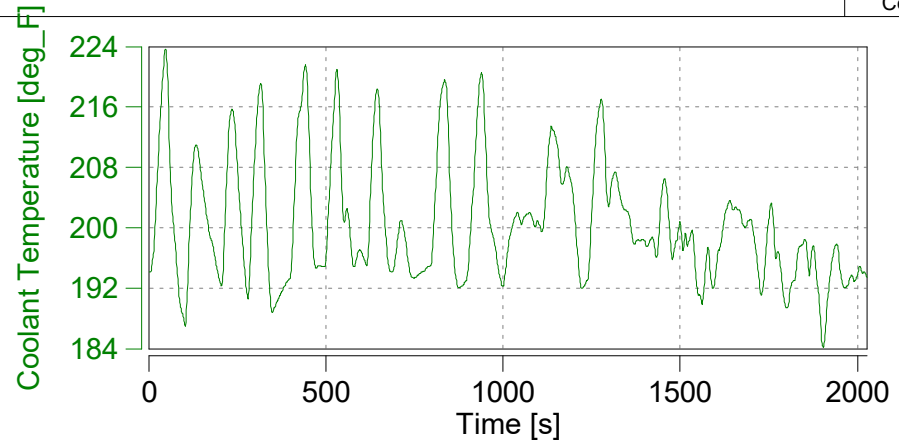
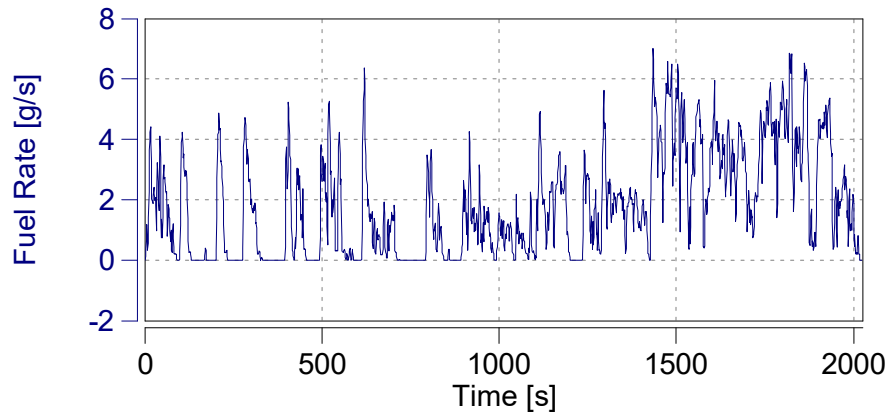
Apply Current Values

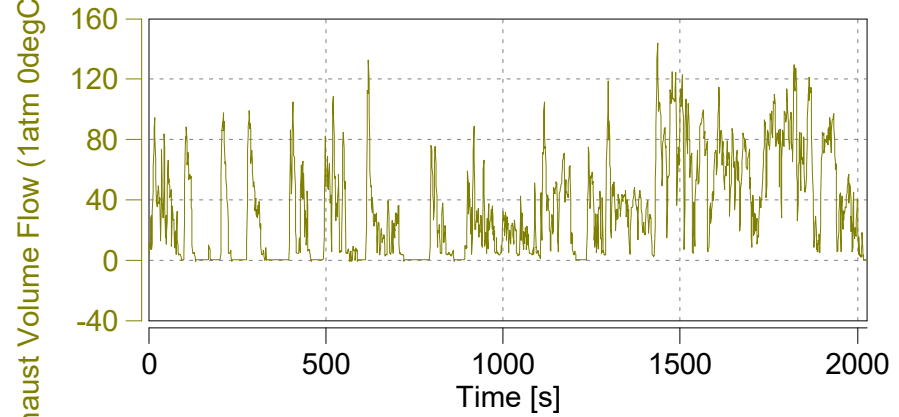
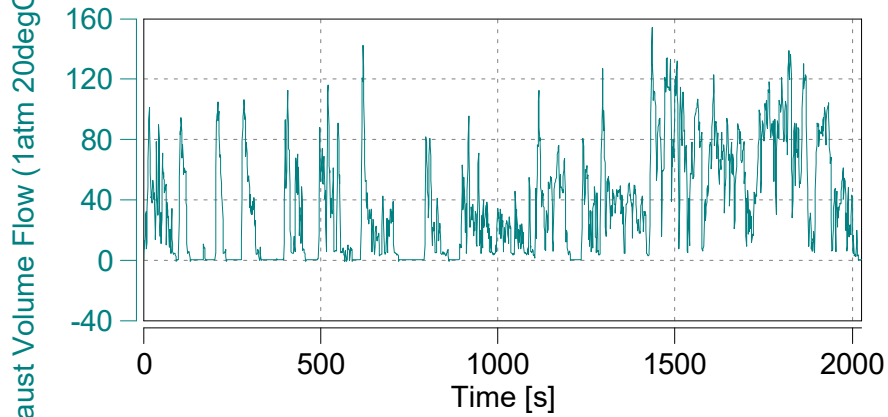
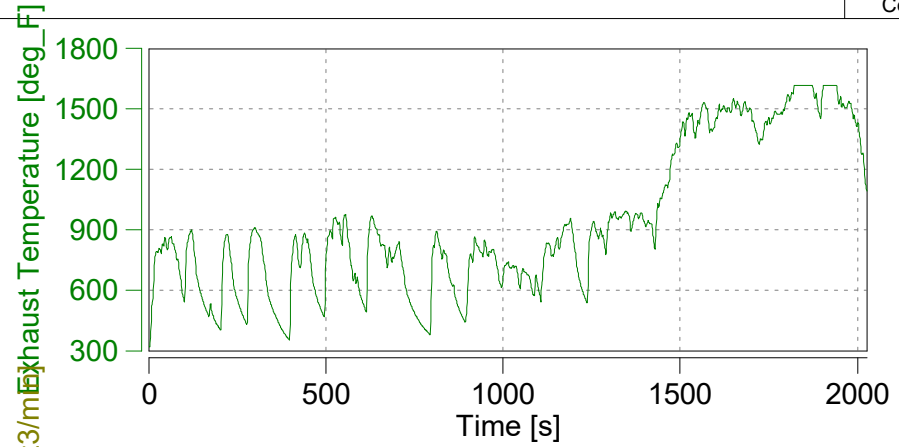
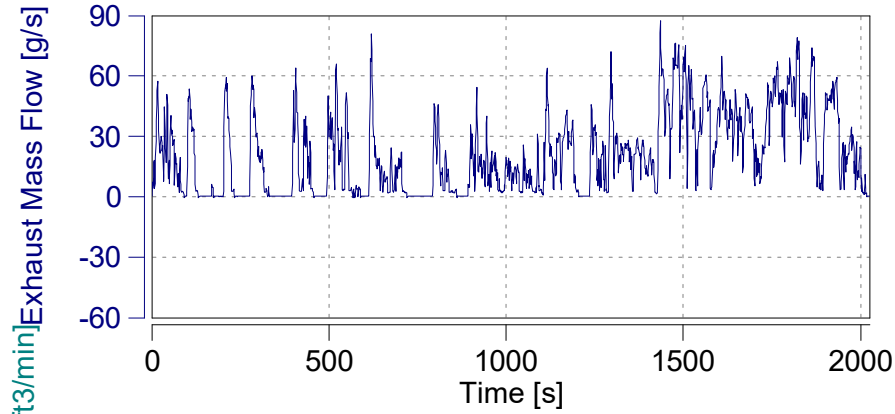


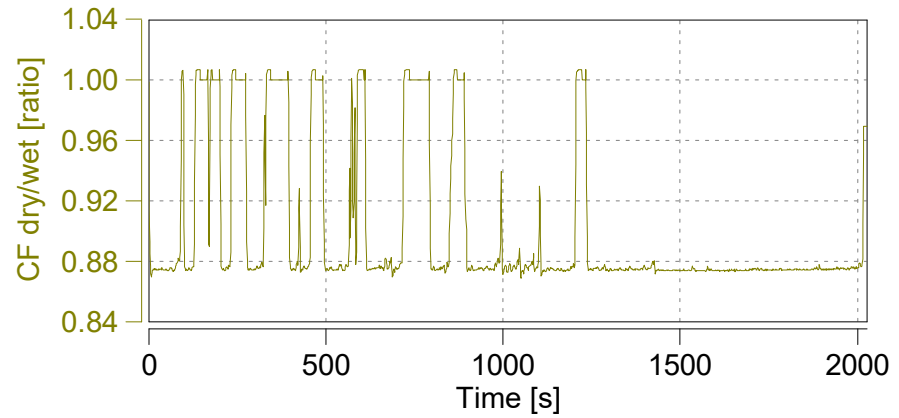
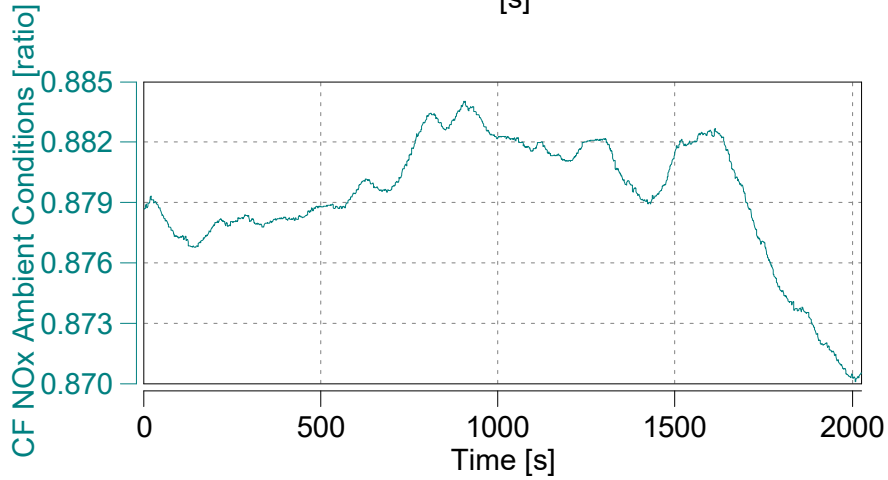
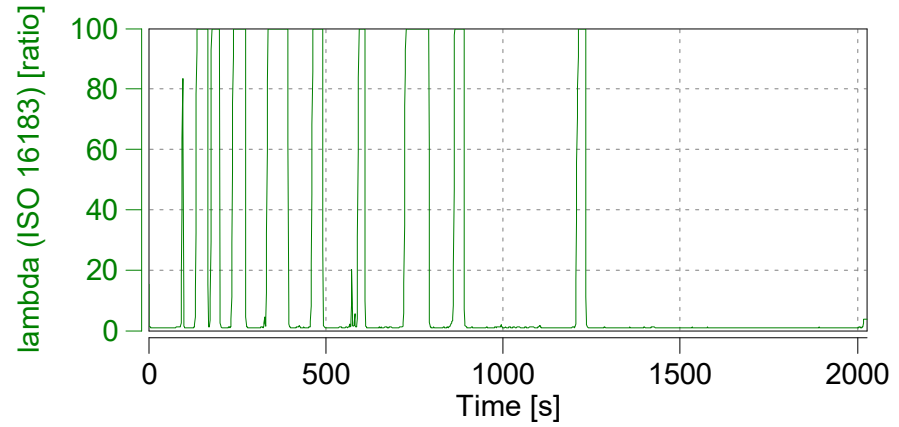
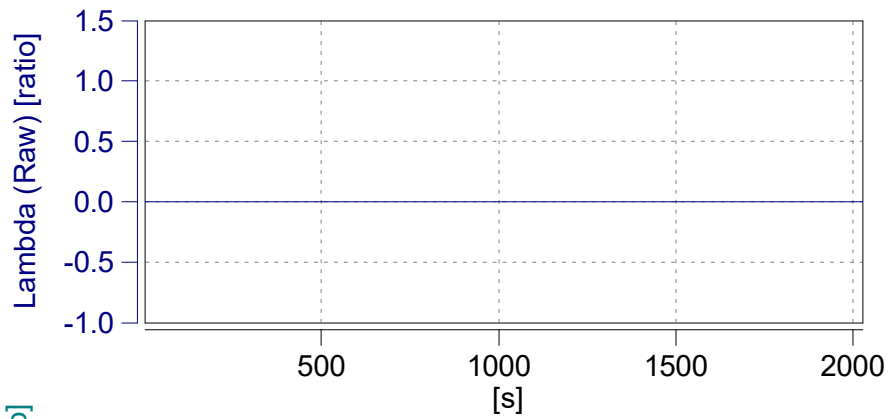


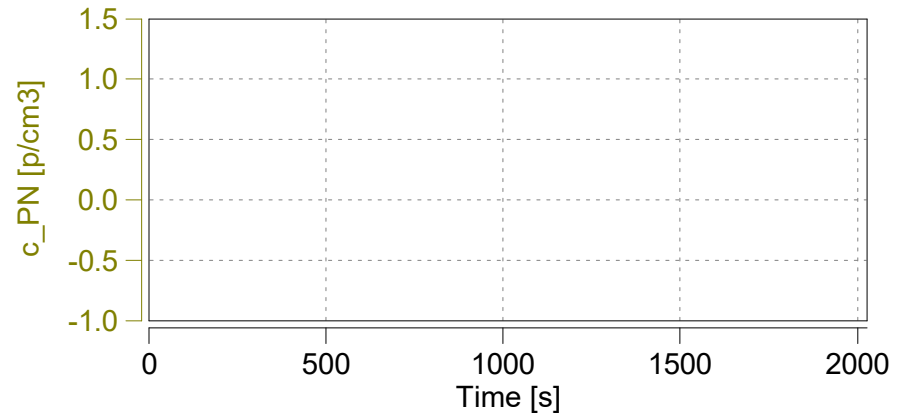
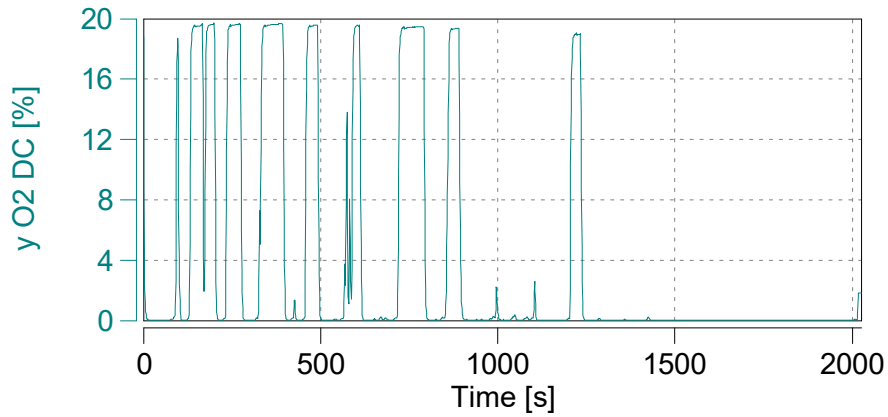
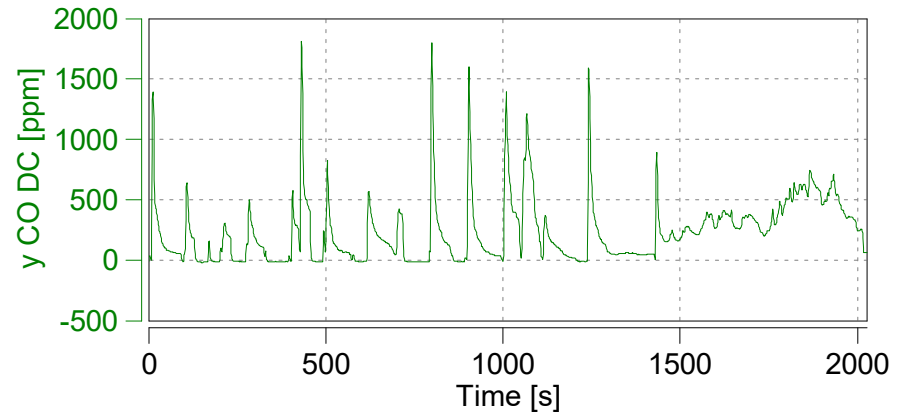
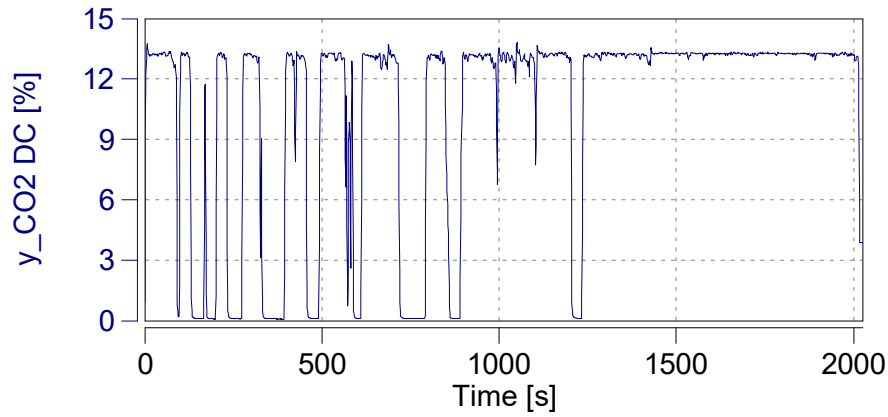


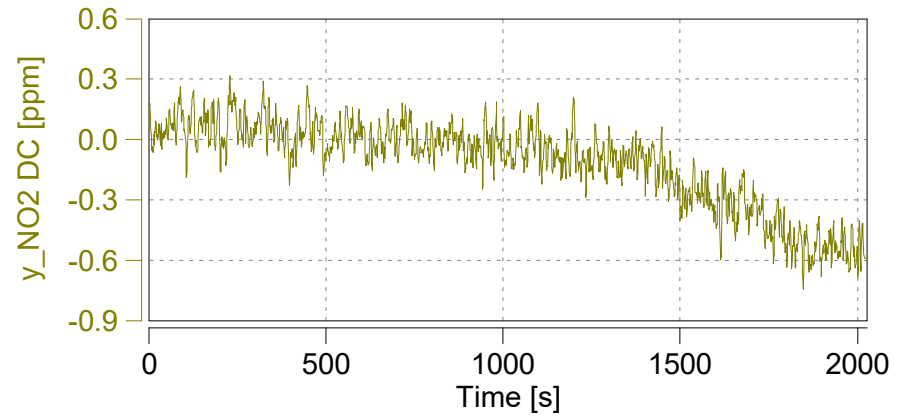
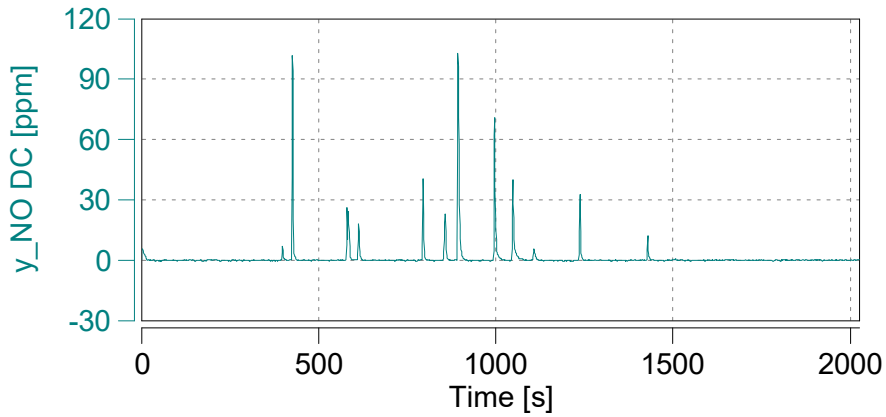
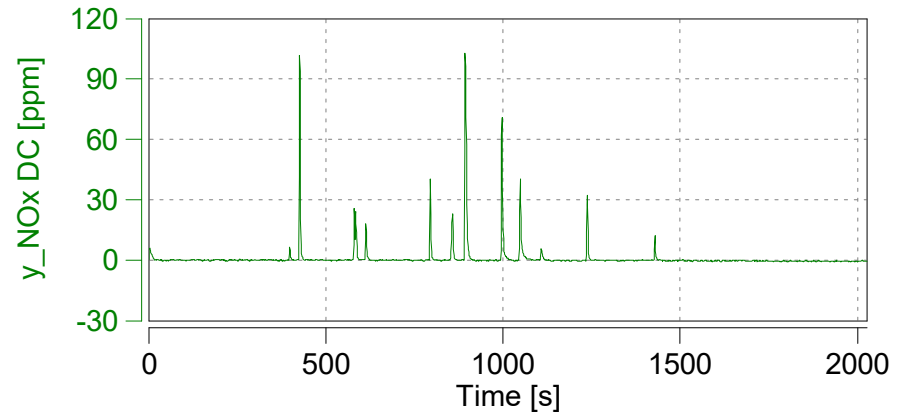
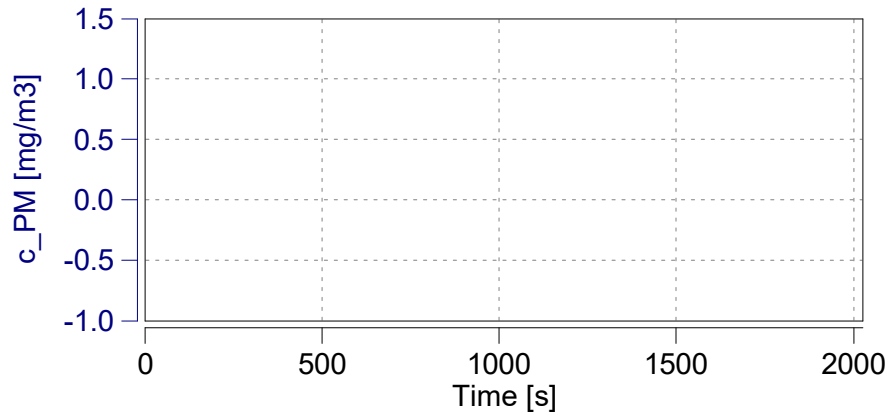


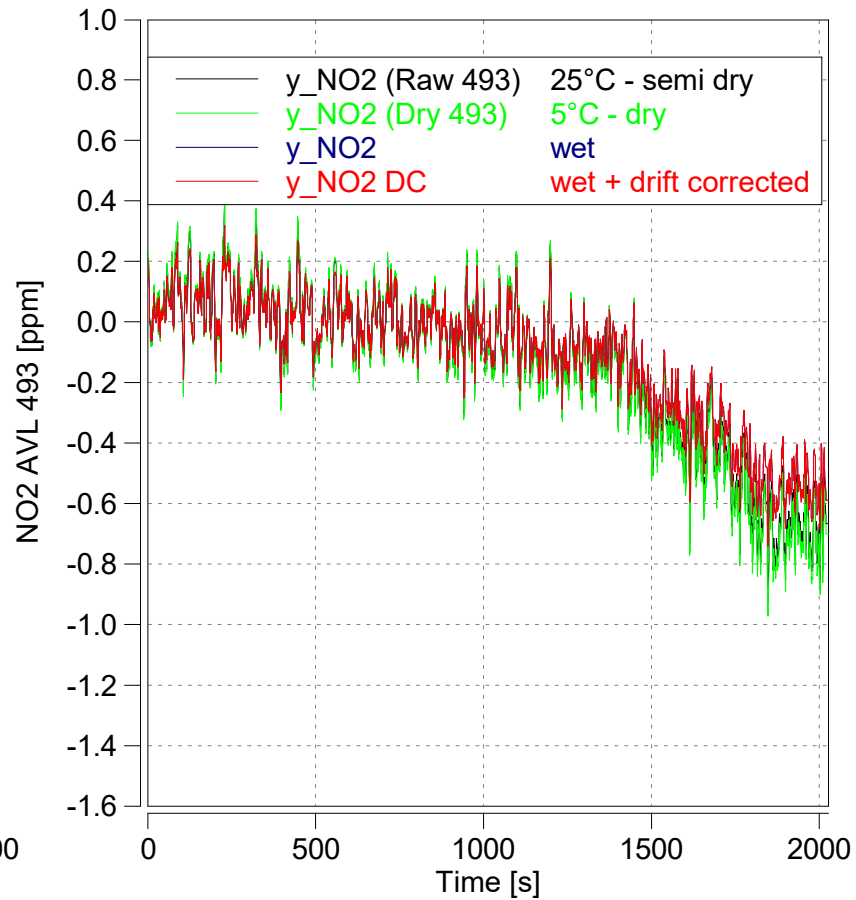
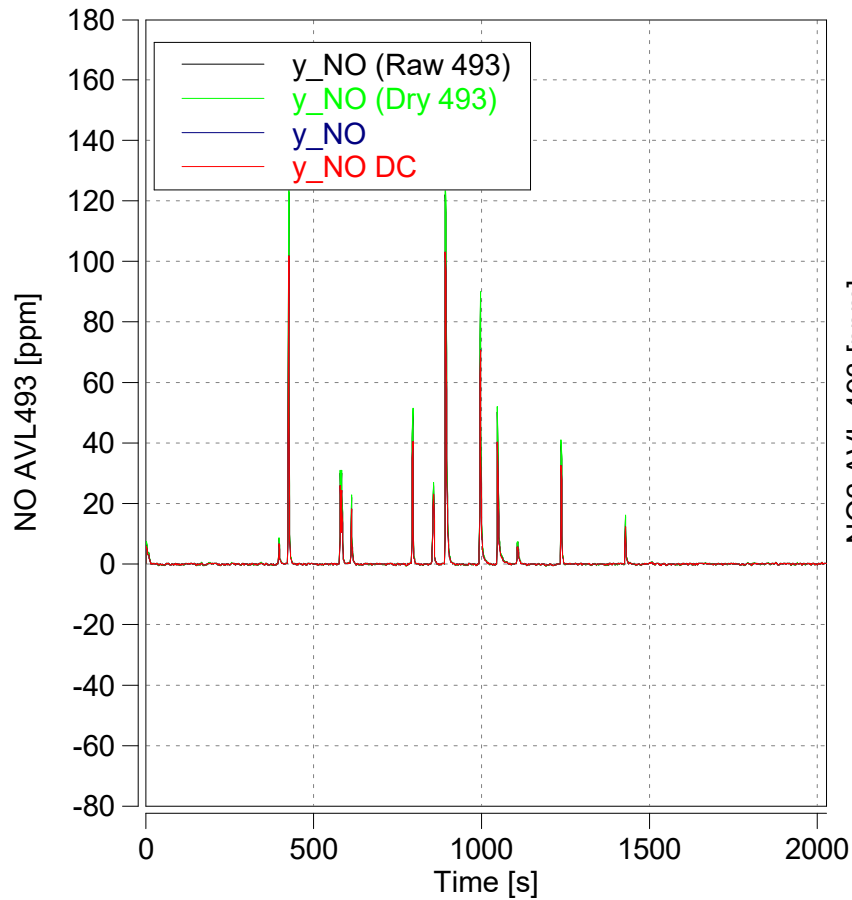


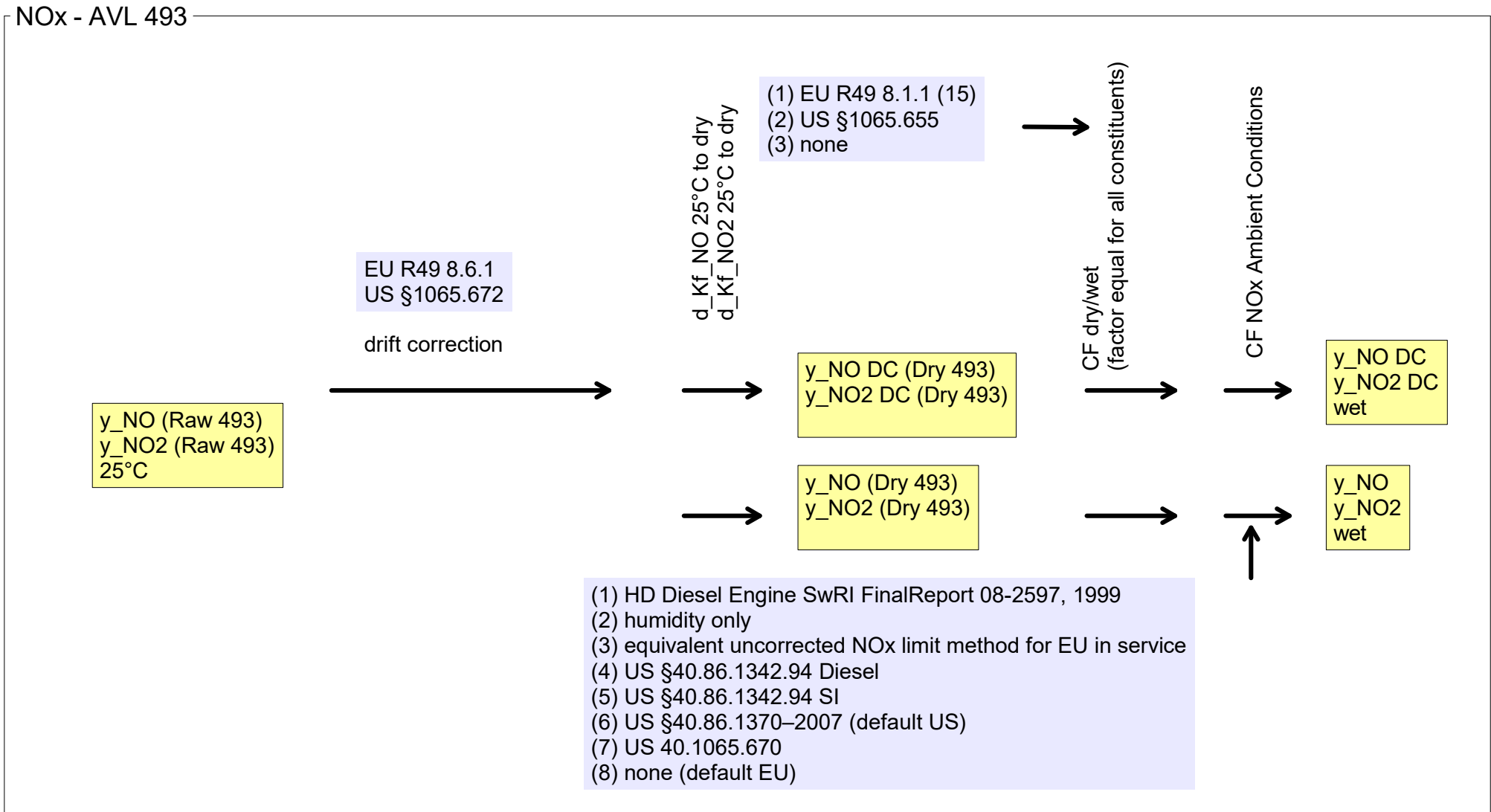


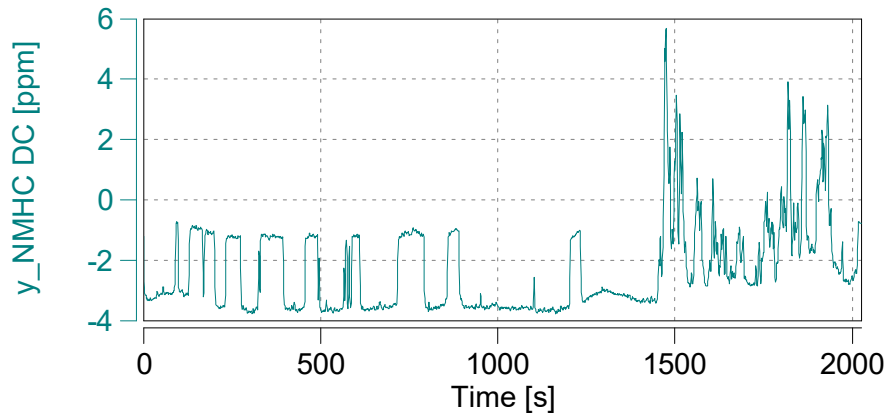
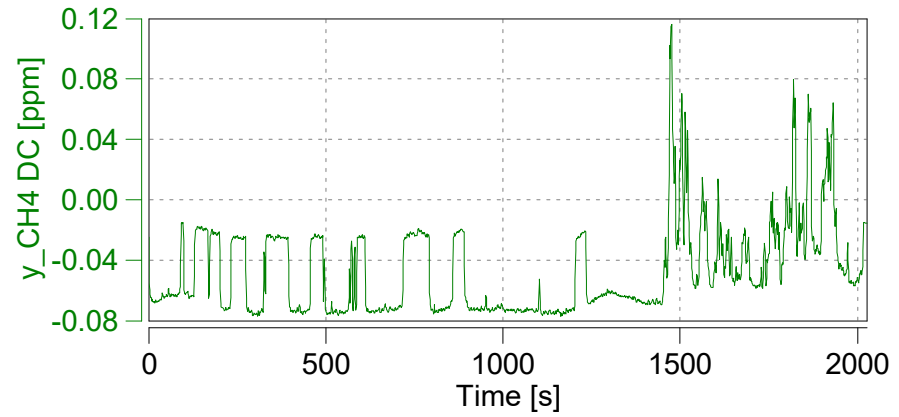
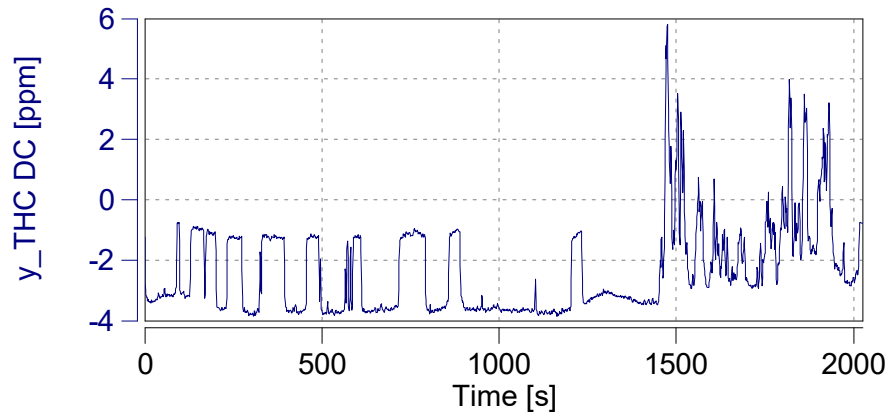


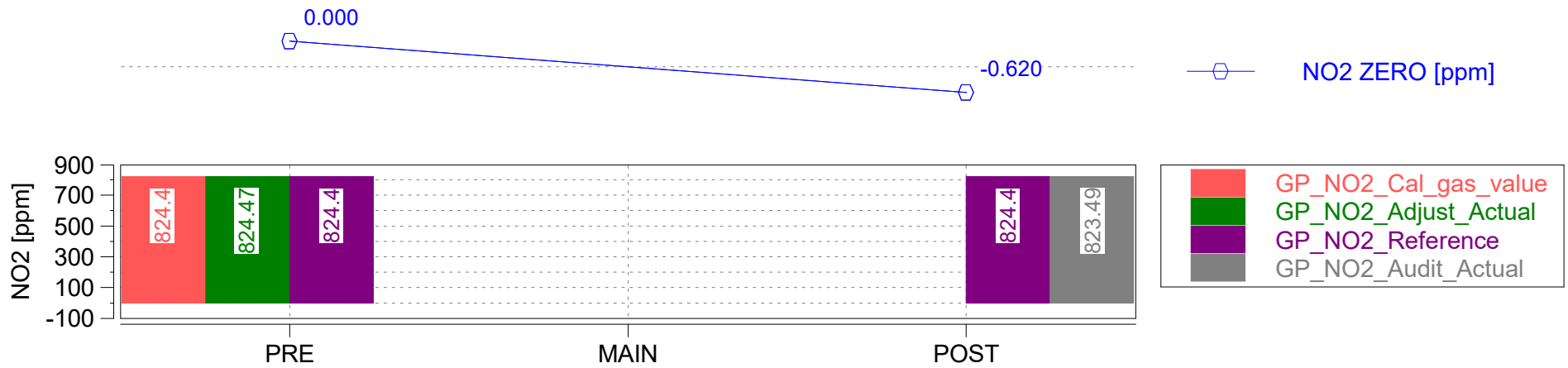
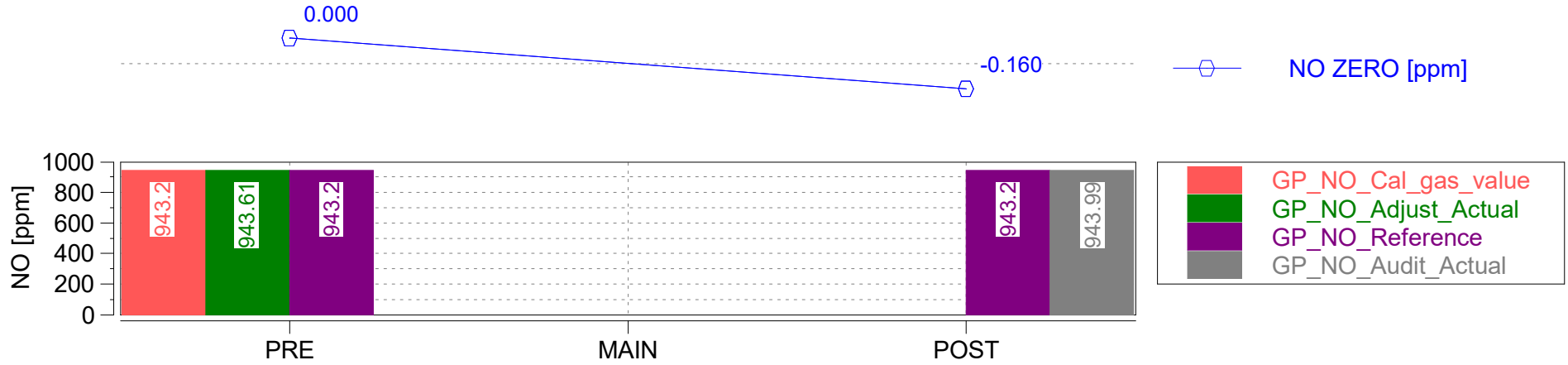


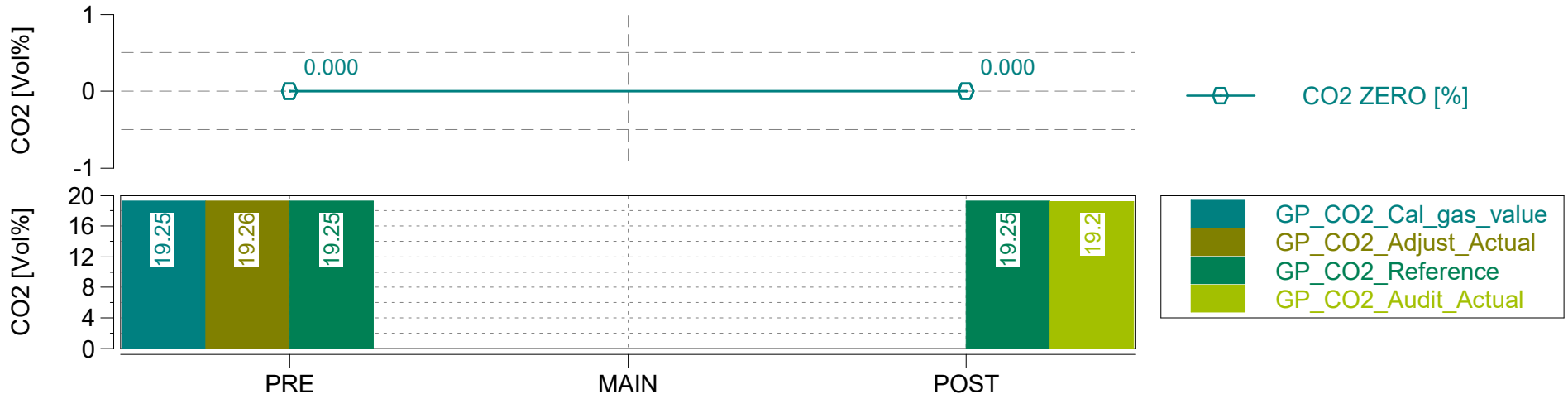
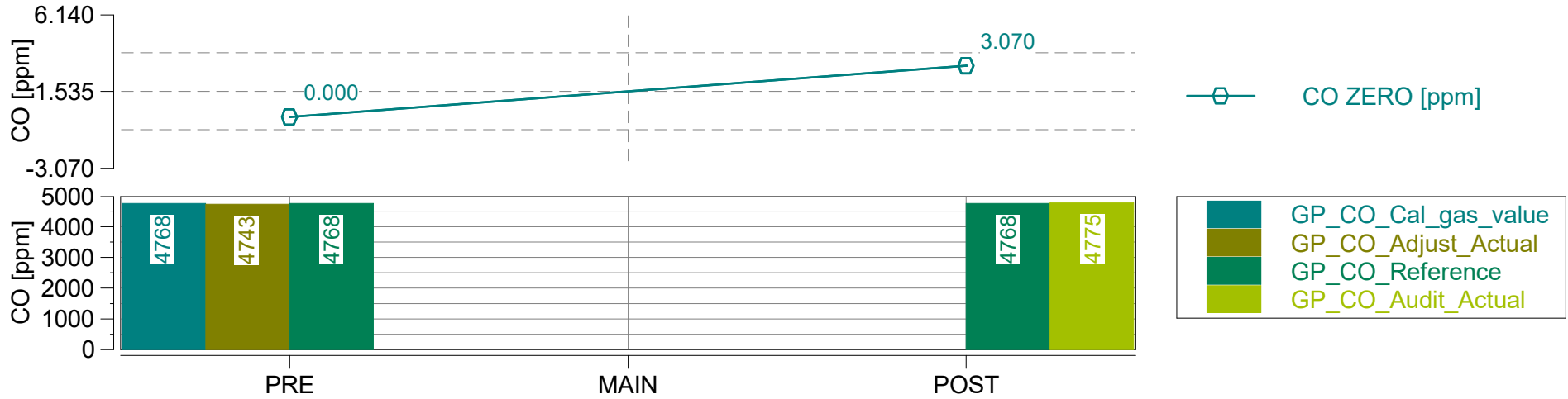


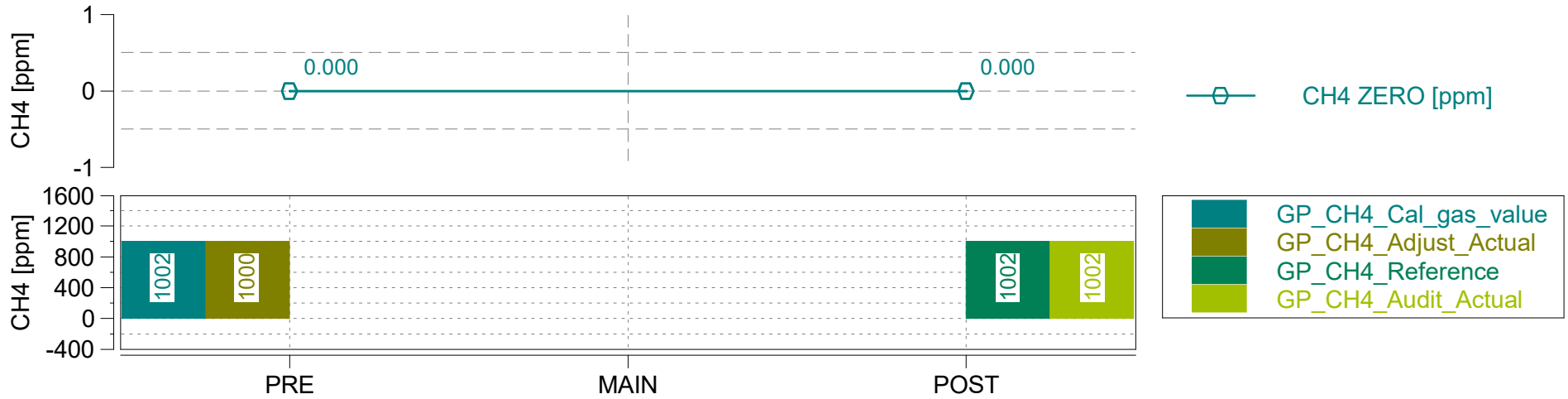
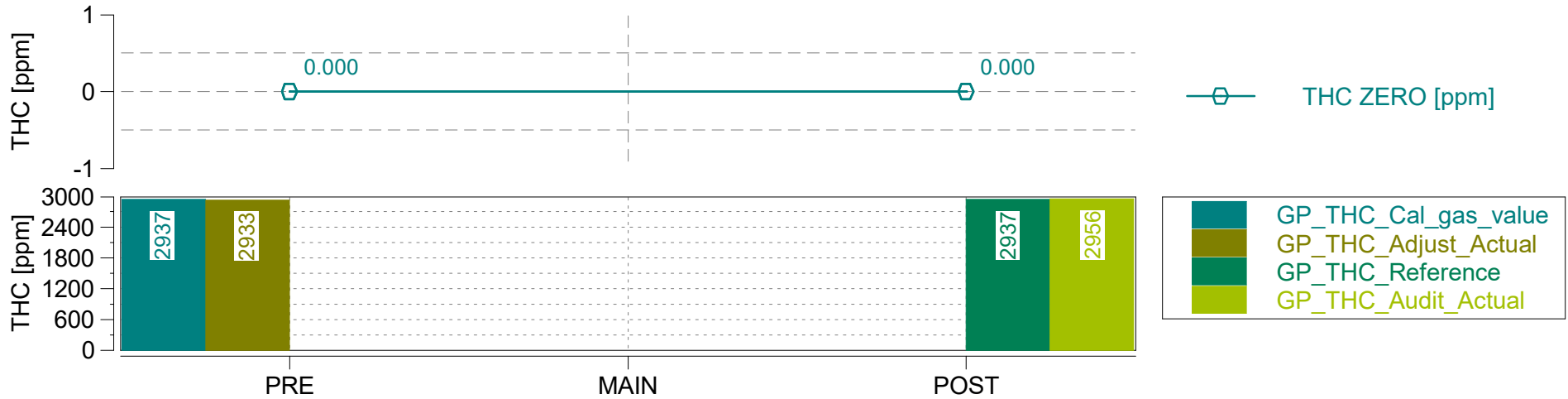














| § | criterium | condition | value | unit | pass/fail |
|-----------------------|--|--------------------------|-------------|------------|-------------|
| GAS Leak Check | The leakage rate on the vacuum side shall not exceed 0.5 per cent of the in-use flow rate for the portion of the system being checked. | The leakage rate <= 0.5% | 0.10 | % | pass |
| PN Leak Check | n/a | n/a | n/a | n/a | n/a |
| PM Leak Check | n/a | n/a | n/a | n/a | n/a |

GAS PEMS Devices

| | |
|-----------------------|------------|
| Device ID | AVL492 |
| Serial Number | 0182 |
| Firmware Version | V1.17 |
| Main Test Date | 2022-03-07 |
| Leak Check Age [days] | 0 |

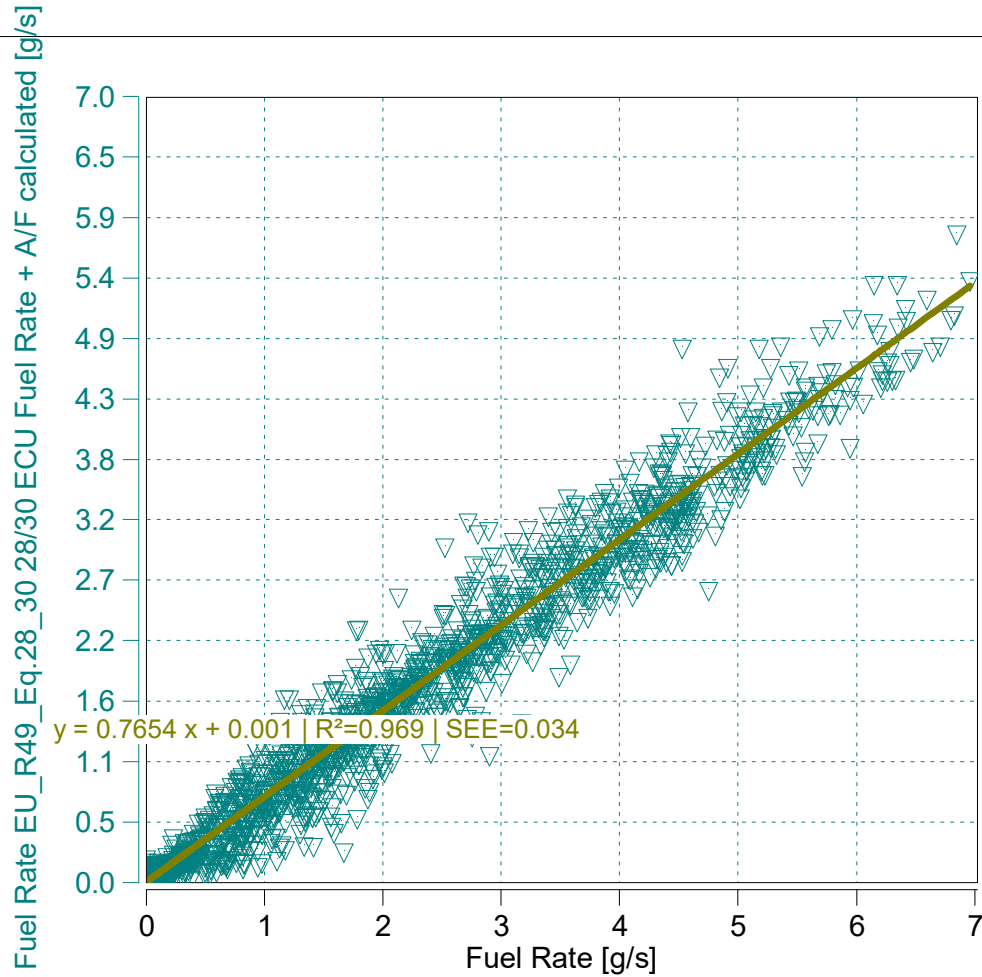
| | |
|------------------|-----------|
| Device ID | AVL4925iS |
| Serial Number | 202 |
| Firmware Version | 1.22.0.4 |

EFM

| | |
|--------------------|--------|
| Device ID | AVL495 |
| Serial Number | 00915 |
| Serial Number Tube | 01115 |
| Firmware Version | V1.16 |

System Control

| | |
|------------------|----------|
| SC Version | V2.9_237 |
| SC Serial Number | 60300923 |



EU 582/2011/Appendix I/3.2.1 | Fuel Rate ECU and calculated

$y = 0.7654 x + 0.001 \mid R^2=0.969 \mid SEE=0.034$
 $m = 0.77$ (0.9 - 1.1 recommended)
 $R^2 = 0.97$ (min 0.9 mandatory)

Data from - to [% of Maximum]

0

100



| | | |
|-------------------------------|--------------|--------|
| Trip Duration | 1910.00 | s |
| Trip Duration (a) | 1910.00 | s |
| Trip Distance | 18.08 | mi |
| Trip Distance (a) | 18.08 | mi |
| Trip Fuel Cons. (b) | 1.32 | kg |
| Trip Fuel Cons. (ab) | 1.32 | kg |
| Trip Fuel Cons. EU (ac) | 1.09 | kg |
| Trip Fuel Cons. US (ac) | 1.09 | kg |
| Trip Fuel Economy (b) | 38.85 | mpg_US |
| Trip Fuel Economy (ab) | 38.85 | mpg_US |
| Trip Fuel Economy EU (ac) | 46.77 | mpg_US |
| Trip Fuel Economy US (ac) | 46.74 | mpg_US |
| Trip Fuel Economy GGE (b) | 38.85 | mpg_US |
| Trip Fuel Economy GGE (ab) | 38.85 | mpg_US |
| Trip Fuel Economy EU GGE (ac) | 46.77 | mpg_US |
| Trip Fuel Economy US GGE (ac) | 46.74 | mpg_US |
| Trip Av. Eng. Speed | 1460.50 | rpm |
| Trip Av. Torque | 34.84 | lbft |
| Trip Av. Power | 11.58 | hp |
| Trip Work | | |
| Trip Work (a) | 6.14 | hphr |
| Trip Exhaust Mass | 18.86 | kg |
| Trip Exhaust Mass EU (ac) | 21.73 | kg |
| Trip Exhaust Mass US (ac) | 21.77 | kg |
| Trip Av. Amb. Temperature | 67.32 | deg_F |
| Trip Av. Humidity | 20.76 | % |
| Trip Av. GPS Altitude | 538.34 | m |
| Fuel Type | Petrol (E10) | |

| | | |
|-----------------------------------|------------|------------|
| ave THC | -3.35912 | ppm |
| ave NMHC | -3.29194 | ppm |
| ave CH4 | -0.06718 | ppm |
| ave CO | 147.95637 | ppm |
| ave CO2 | 8.76918 | % |
| ave NOx | 4.32424 | ppm |
| ave PM | n/a | mg/m3 |
| ave Soot meas | n/a | mg/m3 |
| ave Soot | n/a | mg/m3 |
| ave PN | n/a | #/cm3 |
| tot THC | 0.00019 | g |
| tot NMHC | 0.00017 | g |
| tot CH4 | 0.00000 | g |
| tot CO | 4.45221 | g |
| tot CO2 | 3320.64723 | g |
| tot NO (d) | 0.12732 | g |
| tot NO2 | 0.00001 | g |
| tot NOx | 0.12126 | g |
| tot Soot | n/a | g |
| tot Soot meas | n/a | g |
| tot PM | n/a | g |
| tot PN | n/a | # |
| PM measurement type | 0.00000 | - |
| tot Soot on PM filter (estim.) | 0.00000 | mg |
| Soot --> PM simple scaling factor | 1.00000 | - |
| Trip Av. Veh. Speed | 34.07251 | mi/hr |
| Trip Distance Share Urban | 21.98923 | % distance |
| Trip Distance Share Rural | 64.10246 | % distance |
| Trip Distance Share Motorway | 13.90831 | % distance |

| | | |
|--------------|------------|--------|
| BS CO2 | 540.65001 | g/hphr |
| BS CO | 0.72489 | g/hphr |
| BS THC | 0.00003 | g/hphr |
| BS NMHC | 0.00003 | g/hphr |
| BS CH4 | 0.00000 | g/hphr |
| BS NO (d) | 0.02073 | g/hphr |
| BS NO2 | 0.00000 | g/hphr |
| BS NOx | 0.01974 | g/hphr |
| BS Soot | n/a | g/hphr |
| BS Soot meas | n/a | g/hphr |
| BS PM | n/a | g/hphr |
| BS PN | n/a | #/hpr |
| DS CO2 | 183.69097 | g/mi |
| DS CO | 0.24629 | g/mi |
| DS THC | 0.00001 | g/mi |
| DS NMHC | 0.00001 | g/mi |
| DS CH4 | 0.00000 | g/mi |
| DS NO (d) | 0.00704 | g/mi |
| DS NO2 | 0.00000 | g/mi |
| DS NOx | 0.00671 | g/mi |
| DS Soot | n/a | g/mi |
| DS Soot meas | n/a | g/mi |
| DS PM | n/a | g/mi |
| DS PN | n/a | #/mi |
| FS CO2 | 2521.88659 | g/kg |
| FS CO | 3.38126 | g/kg |
| FS THC | 0.00014 | g/kg |
| FS NMHC | 0.00013 | g/kg |
| FS CH4 | 0.00000 | g/kg |
| FS NO (d) | 0.09670 | g/kg |
| FS NO2 | 0.00001 | g/kg |
| FS NOx | 0.09209 | g/kg |
| FS Soot | n/a | g/kg |
| FS Soot meas | n/a | g/kg |
| FS PM | n/a | g/kg |
| FS PN | n/a | #/kg |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents

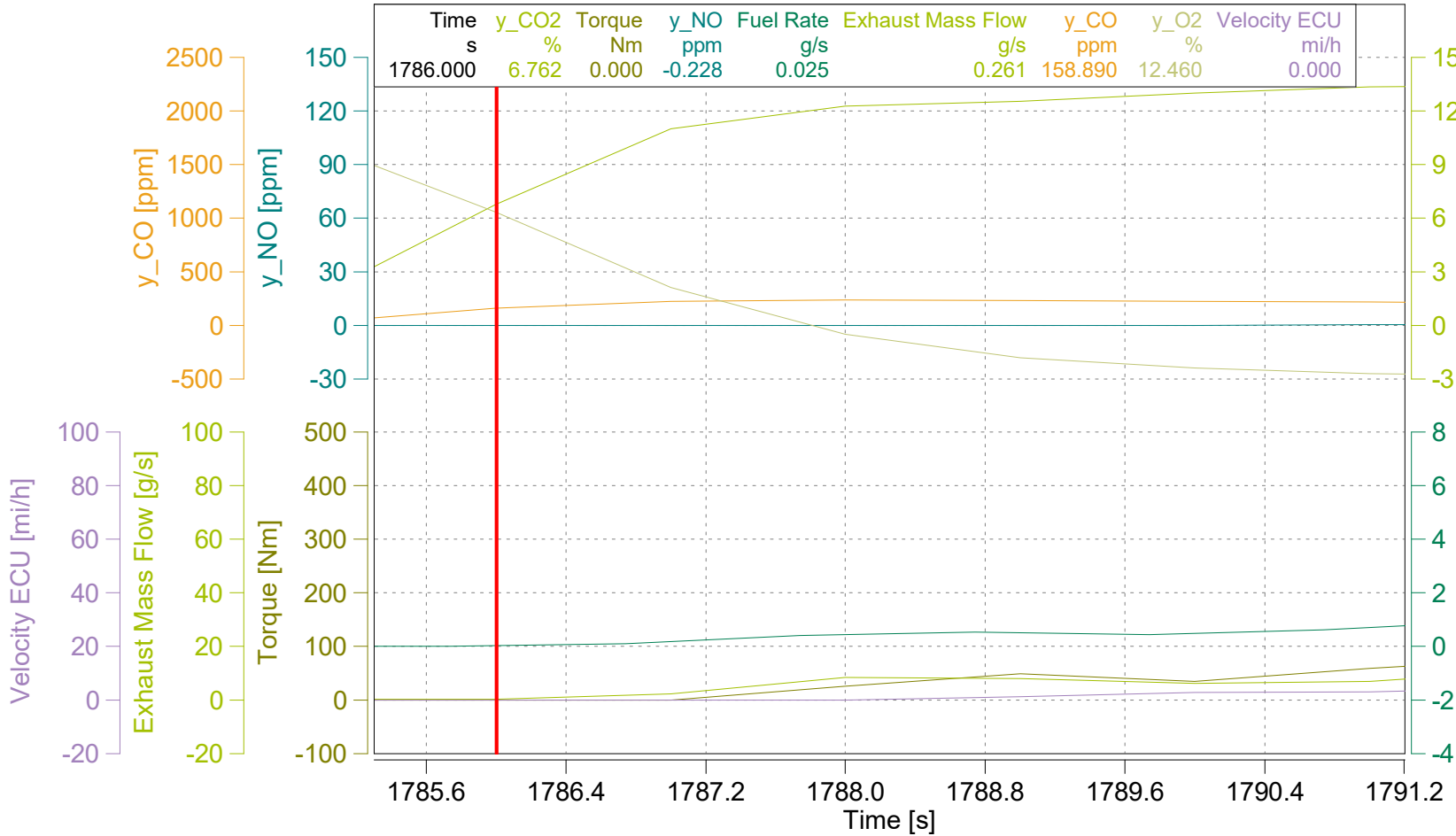


| | | | | | | | | |
|-------------------------------|--------------|--------|-----------------------------------|------------|------------|--------------|------------|--------|
| Trip Duration | 1910.00 | s | ave THC DC | -3.35107 | ppm | BS CO2 DC | 541.21231 | g/hphr |
| Trip Duration (a) | 1910.00 | s | ave NMHC DC | -3.28405 | ppm | BS CO DC | 0.72618 | g/hphr |
| Trip Distance | 18.08 | mi | ave CH4 DC | -0.06702 | ppm | BS THC DC | 0.00003 | g/hphr |
| Trip Distance (a) | 18.08 | mi | ave CO DC | 148.22076 | ppm | BS NMHC DC | 0.00003 | g/hphr |
| | | | ave CO2 DC | 8.77830 | % | BS CH4 DC | 0.00000 | g/hphr |
| Trip Fuel Cons. (b) | 1.32 | kg | ave NOx DC | 4.32115 | ppm | BS NO DC (d) | 0.02072 | g/hphr |
| Trip Fuel Cons. (ab) | 1.32 | kg | ave PM | n/a | mg/m3 | BS NO2 DC | 0.00000 | g/hphr |
| Trip Fuel Cons. EU (ac) | 1.09 | kg | ave Soot meas | n/a | mg/m3 | BS NOx DC | 0.01973 | g/hphr |
| Trip Fuel Cons. US (ac) | 1.09 | kg | ave Soot | n/a | mg/m3 | BS Soot | n/a | g/hphr |
| | | | ave PN DC | | | BS Soot meas | n/a | g/hphr |
| | | | | | | BS PM | n/a | g/hphr |
| Trip Fuel Economy (b) | 38.85 | mpg_US | ave Soot | n/a | mg/m3 | BS PN DC | | |
| Trip Fuel Economy (ab) | 38.85 | mpg_US | tot THC DC | 0.00019 | g | DS CO2 DC | 183.88201 | g/mi |
| Trip Fuel Economy EU (ac) | 46.77 | mpg_US | tot NMHC DC | 0.00017 | g | DS CO DC | 0.24673 | g/mi |
| Trip Fuel Economy US (ac) | 46.74 | mpg_US | tot CH4 DC | 0.00000 | g | DS THC DC | 0.00001 | g/mi |
| Trip Fuel Economy GGE (b) | 38.85 | mpg_US | tot CO DC | 4.46017 | g | DS NMHC DC | 0.00001 | g/mi |
| Trip Fuel Economy GGE (ab) | 38.85 | mpg_US | tot CO2 DC | 3324.10084 | g | DS CH4 DC | 0.00000 | g/mi |
| Trip Fuel Economy EU GGE (ac) | 46.77 | mpg_US | tot NO DC (d) | 0.12724 | g | DS NO DC (d) | 0.00704 | g/mi |
| Trip Fuel Economy US GGE (ac) | 46.74 | mpg_US | tot NO2 DC | 0.00001 | g | DS NO2 DC | 0.00000 | g/mi |
| | | | tot NOx DC | 0.12117 | g | DS NOx DC | 0.00670 | g/mi |
| Trip Av. Eng. Speed | 1460.50 | rpm | tot Soot | n/a | g | DS Soot | n/a | g/mi |
| Trip Av. Torque | 34.84 | lbft | tot Soot meas | n/a | g | DS Soot meas | n/a | g/mi |
| Trip Av. Power | 11.58 | hp | tot PM | n/a | g | DS PM | n/a | g/mi |
| Trip Work | | | tot PN DC | | | DS PN DC | | |
| Trip Work (a) | 6.14 | hphr | | | | | | |
| | | | PM measurement type | 0.00000 | - | FS CO2 DC | 2524.50945 | g/kg |
| Trip Exhaust Mass | 18.86 | kg | tot Soot on PM filter (estim.) | 0.00000 | mg | FS CO DC | 3.38730 | g/kg |
| Trip Exhaust Mass EU (ac) | 21.73 | kg | Soot --> PM simple scaling factor | 1.00000 | - | FS THC DC | 0.00014 | g/kg |
| Trip Exhaust Mass US (ac) | 21.77 | kg | | | | FS NMHC DC | 0.00013 | g/kg |
| | | | Trip Av. Veh. Speed | 34.07251 | mi/hr | FS CH4 DC | 0.00000 | g/kg |
| Trip Av. Amb. Temperature | 67.32 | deg_F | | | | FS NO DC (d) | 0.09664 | g/kg |
| Trip Av. Humidity | 20.76 | % | Trip Distance Share Urban | 21.98923 | % distance | FS NO2 DC | 0.00001 | g/kg |
| Trip Av. GPS Altitude | 538.34 | m | Trip Distance Share Rural | 64.10246 | % distance | FS NOx DC | 0.09203 | g/kg |
| | | | Trip Distance Share Motorway | 13.90831 | % distance | FS Soot | n/a | g/kg |
| Fuel Type | Petrol (E10) | | | | | FS Soot meas | n/a | g/kg |
| | | | | | | FS PM | n/a | g/kg |
| | | | | | | FS PN DC | | |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents



Concerto Absolute Time



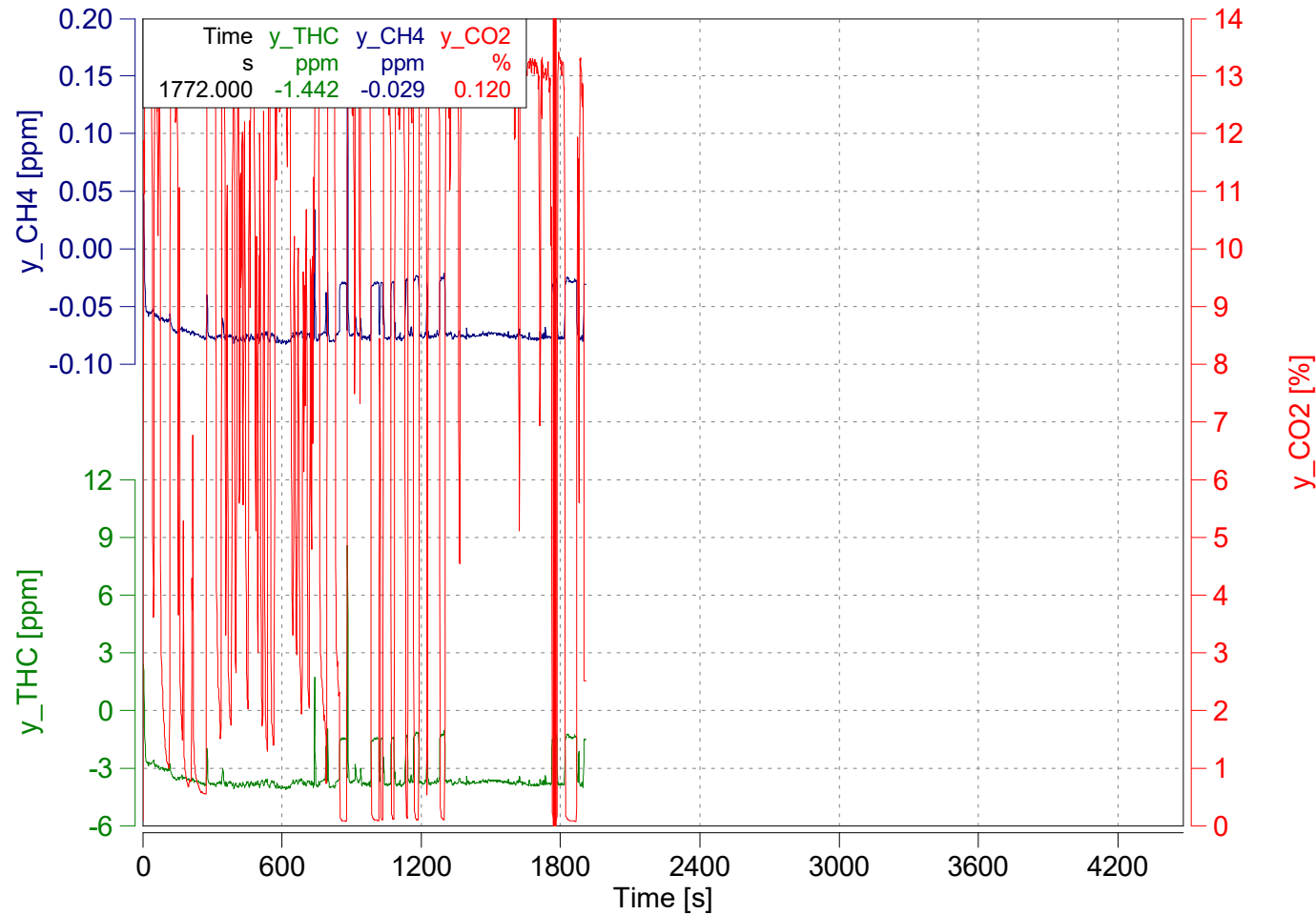
- y_THC
- y_NO
- y_CO2
- y_O2
- c_Soot
- Fuel Rate
- Exhaust Mass
- Torque
- Velocity ECU

AVL 492 Defa

- THC
- NO/NO2
- CO/CO2
- O2
- Apply Defa

Alignment Plc

- Reset Time
- Reset Al
- Apply Curr

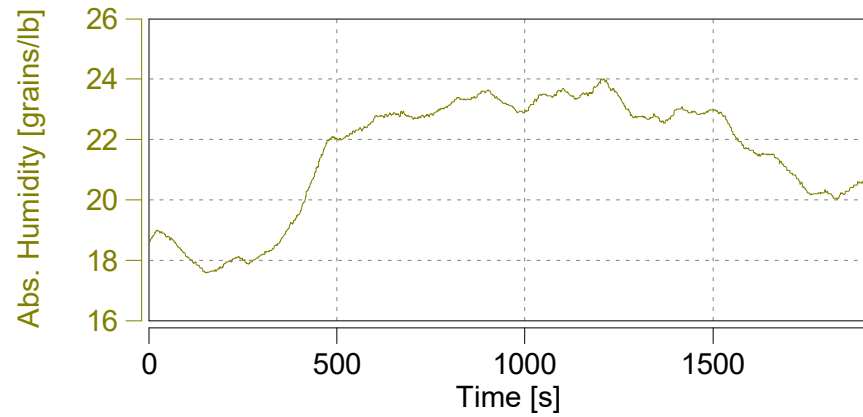
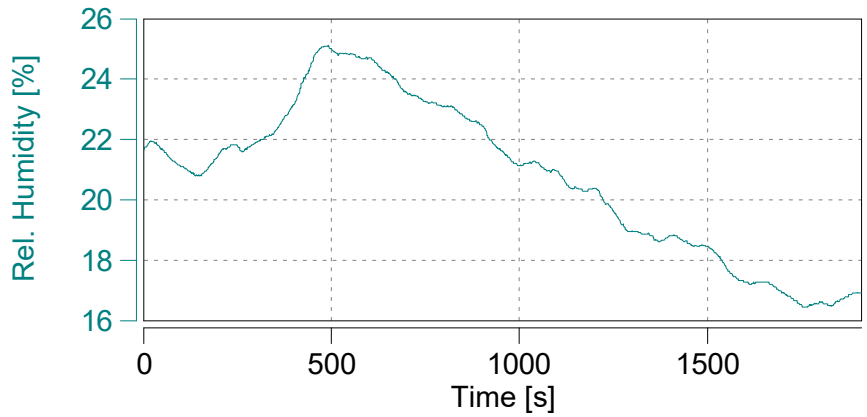
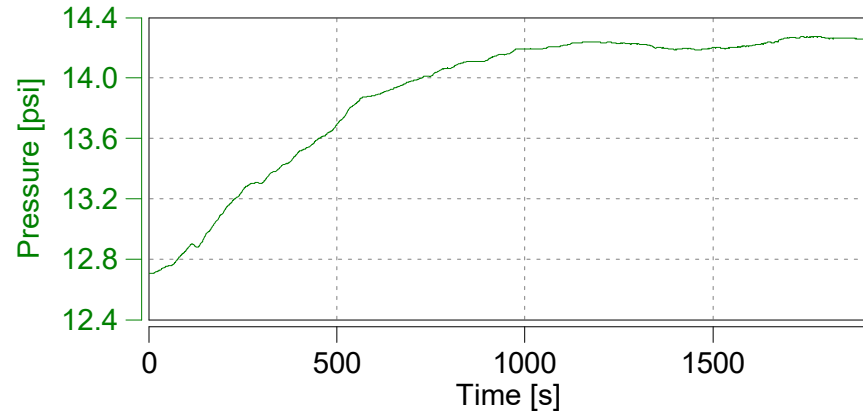
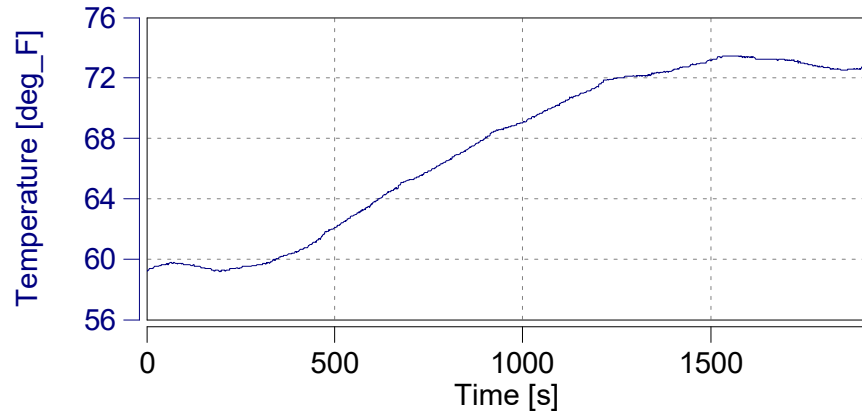


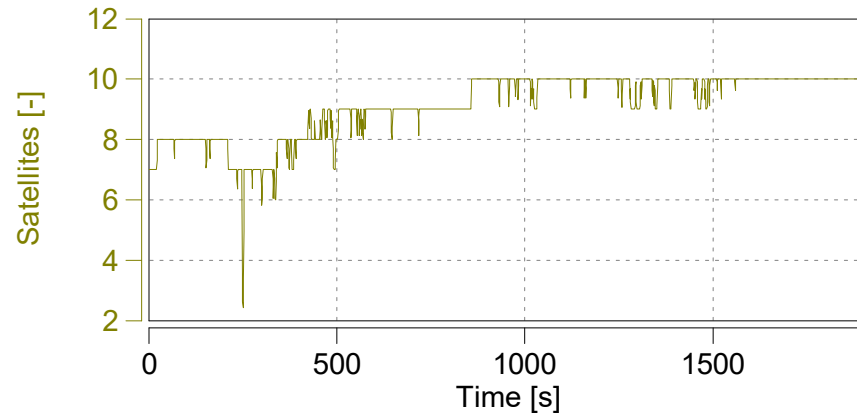
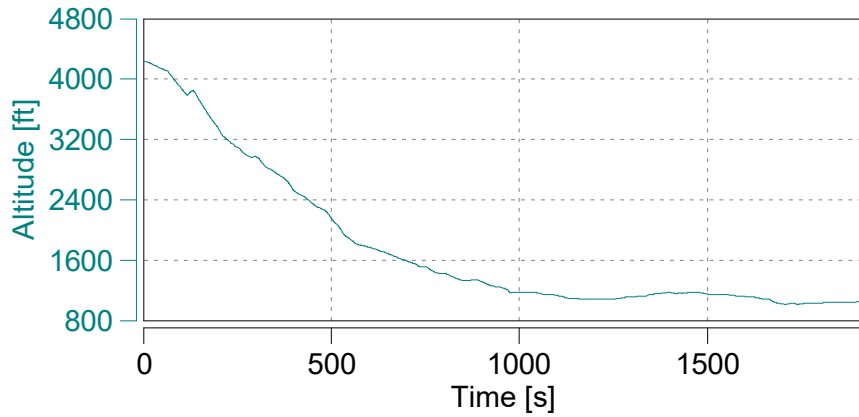
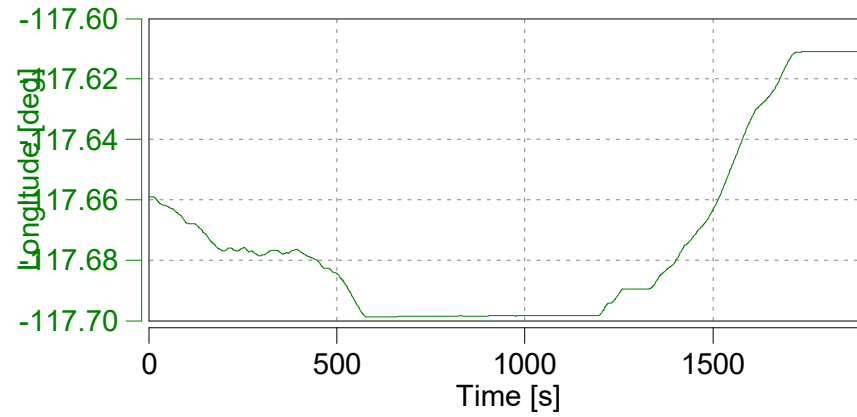
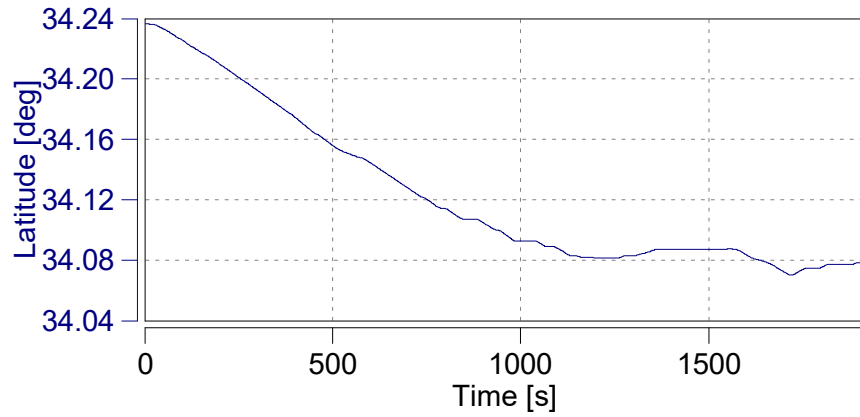
Absolute Time Shifts

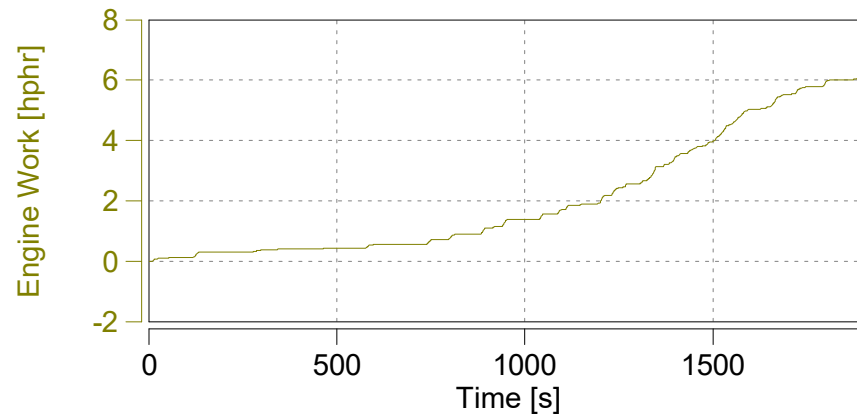
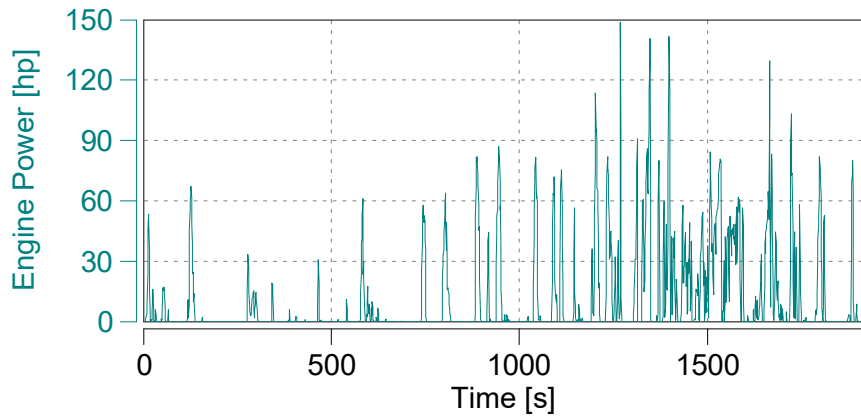
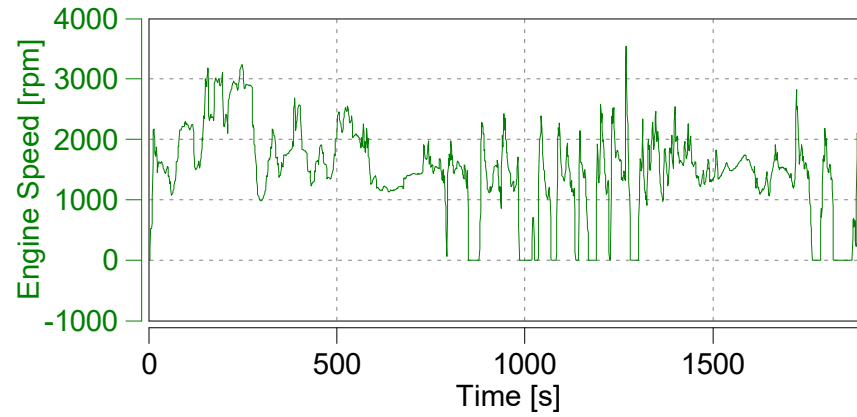
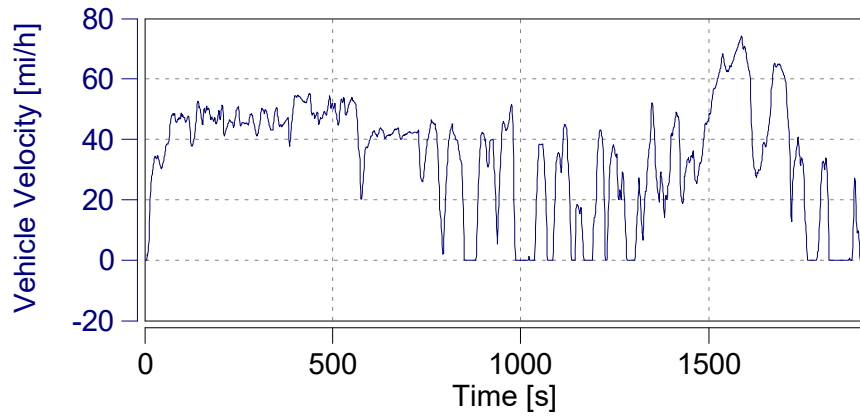
| | | |
|-------|---|------|
| y_THC | s | -4.3 |
| y_CH4 | s | -6.3 |

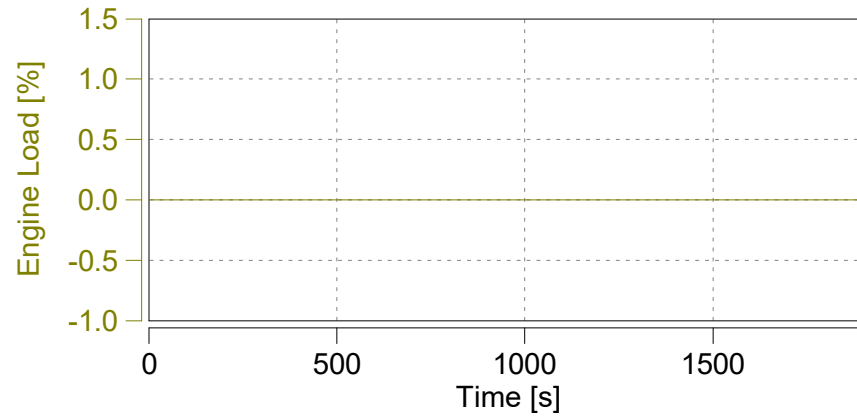
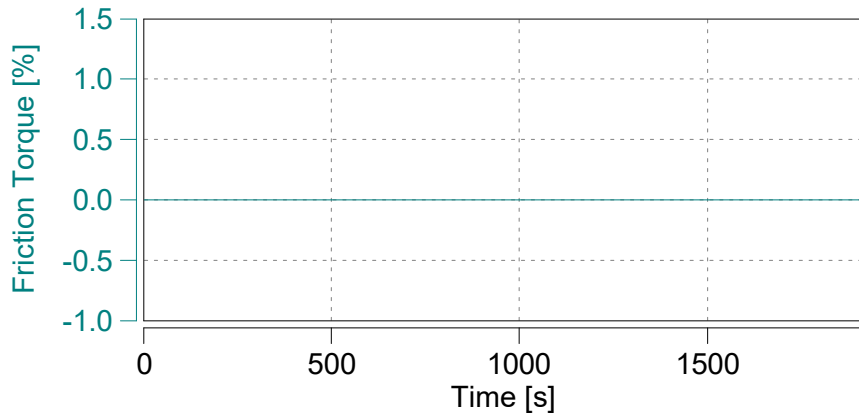
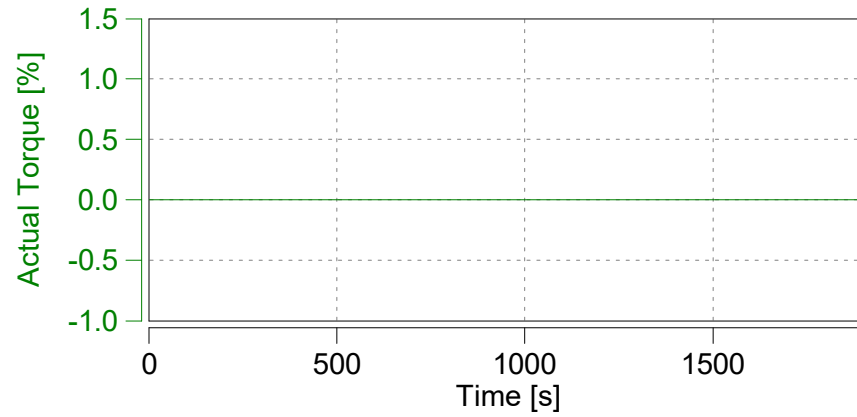
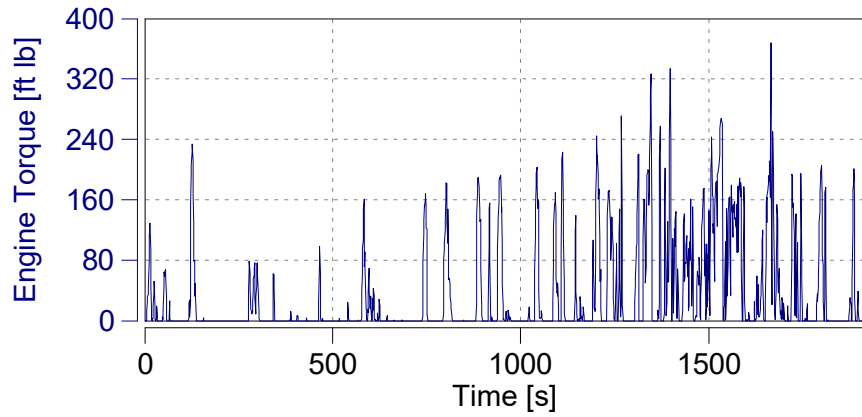
Reset Time Shifts in Plot

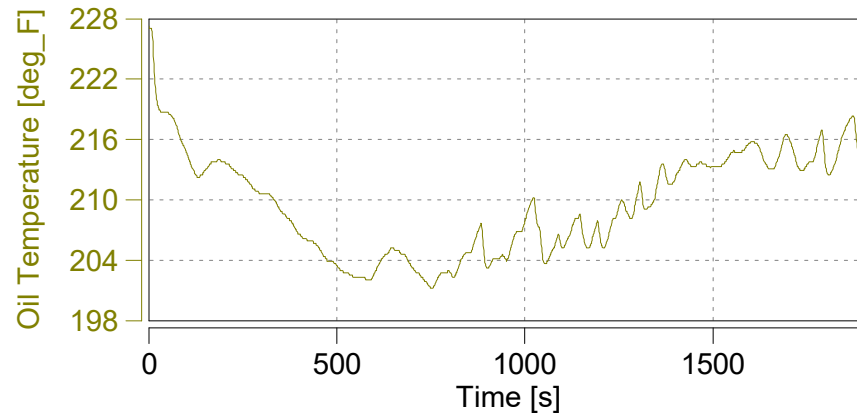
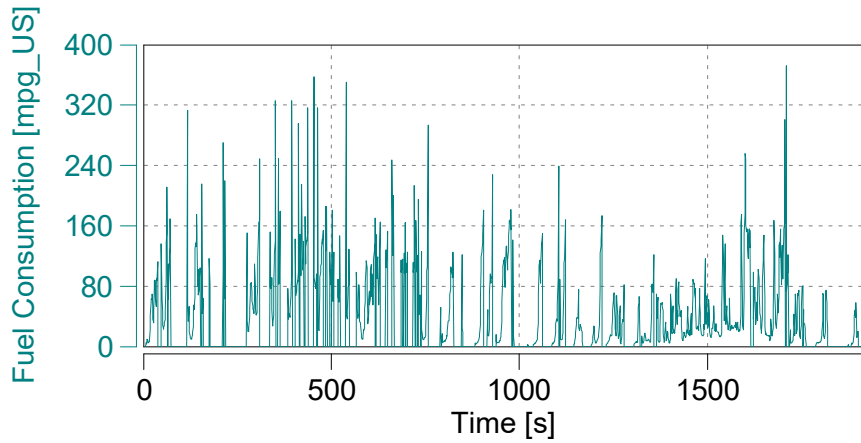
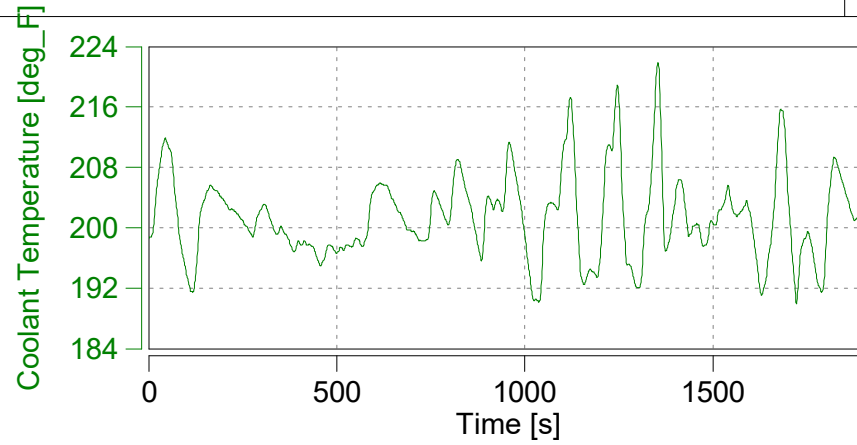
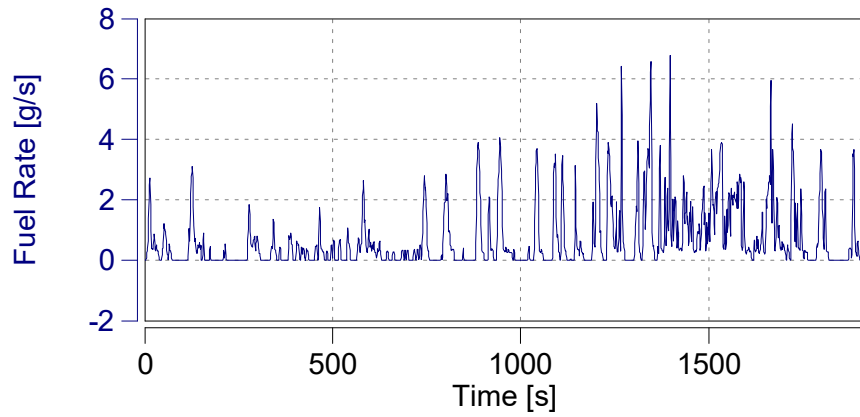
Apply Current Values

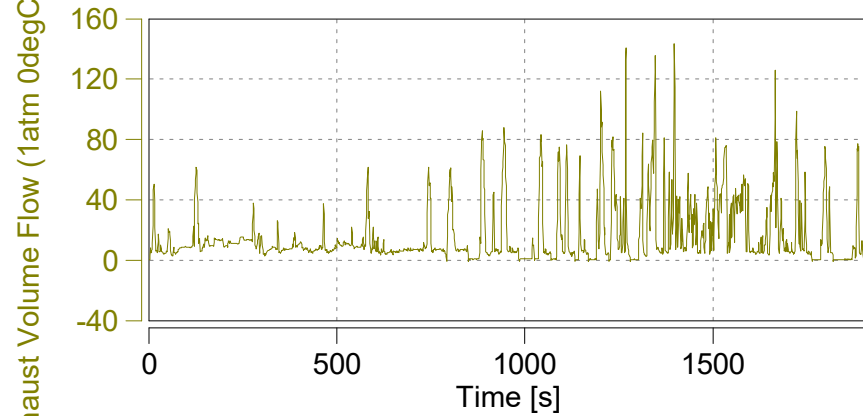
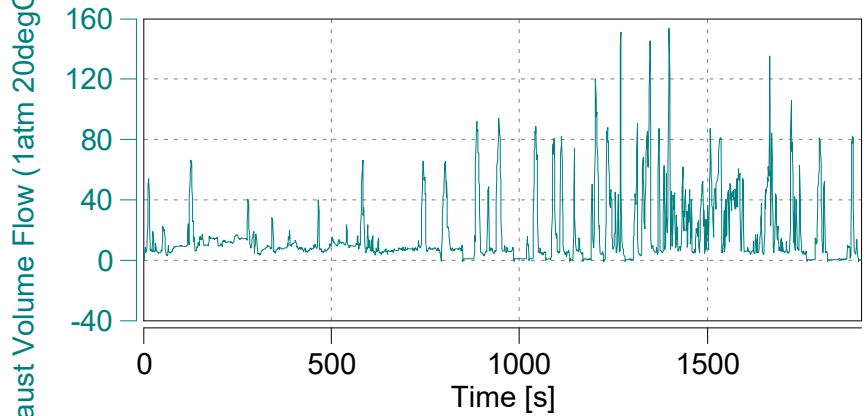
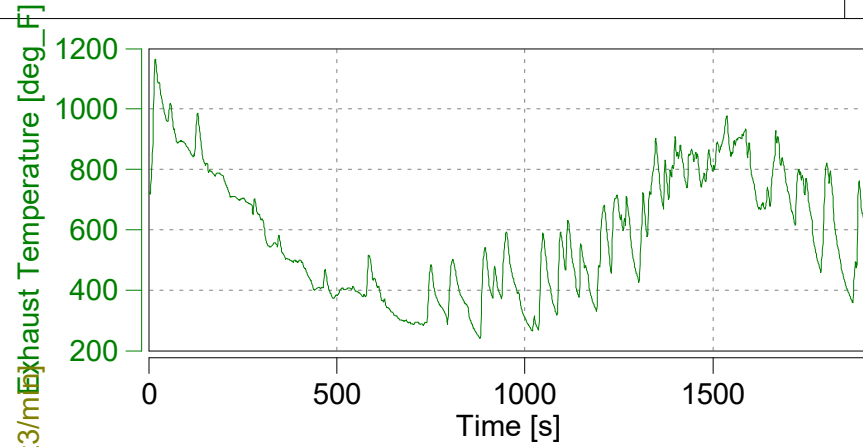
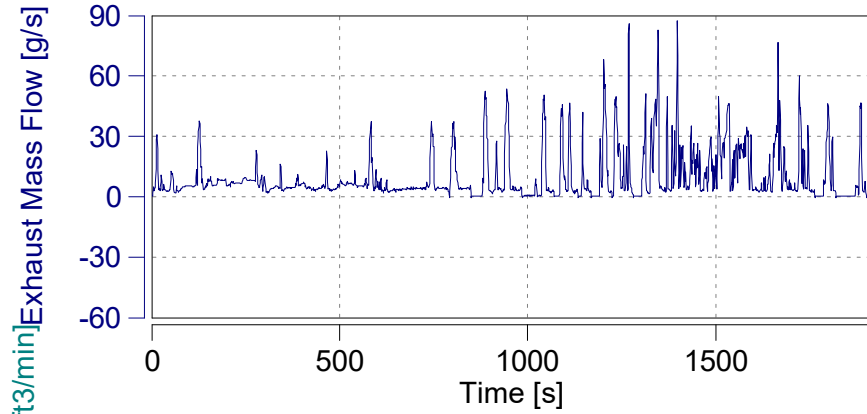


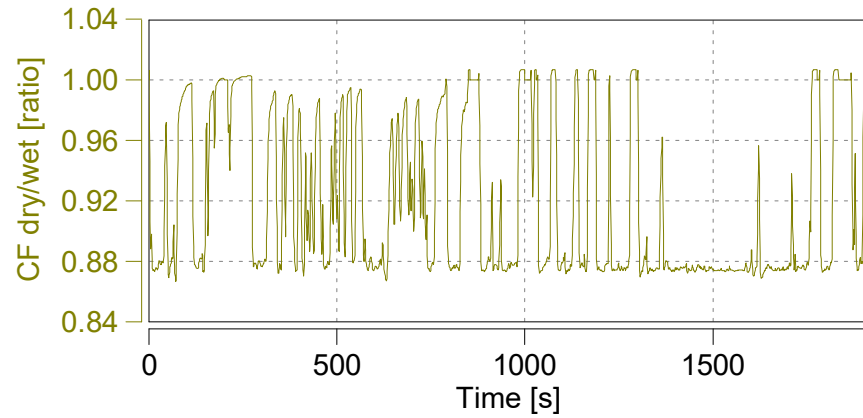
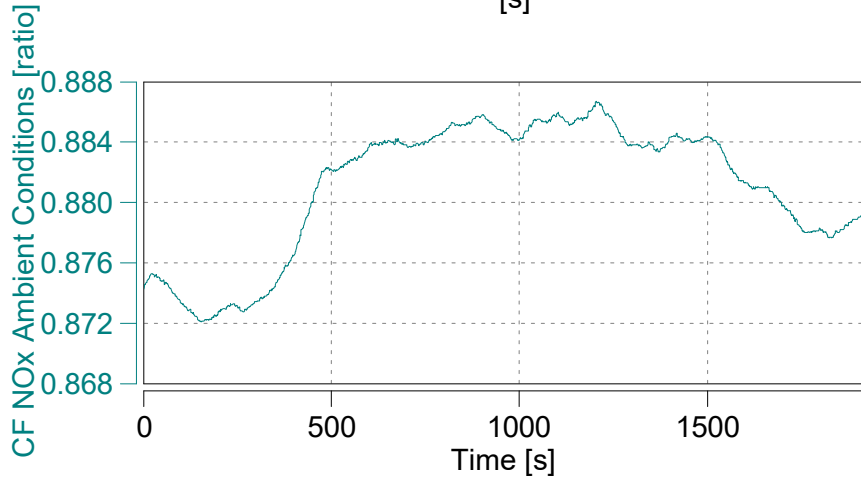
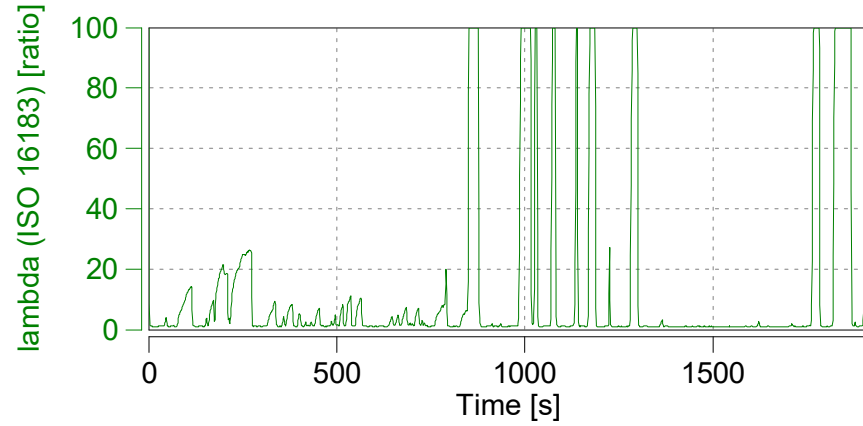
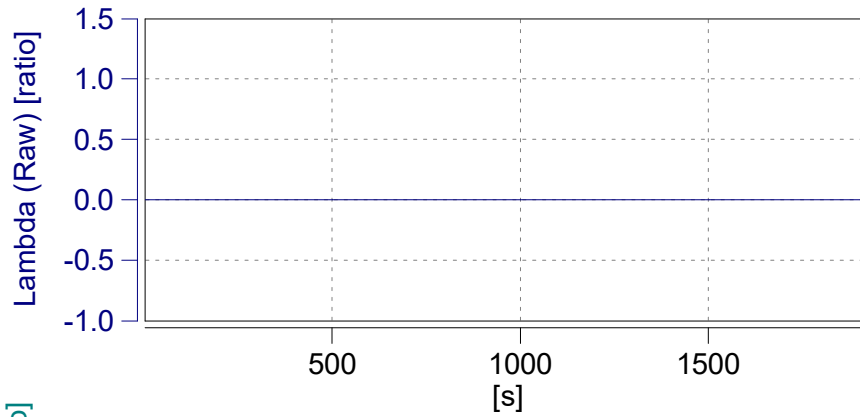


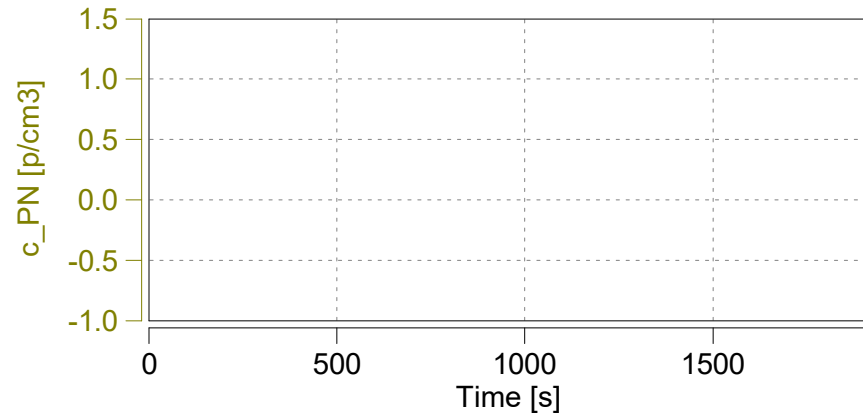
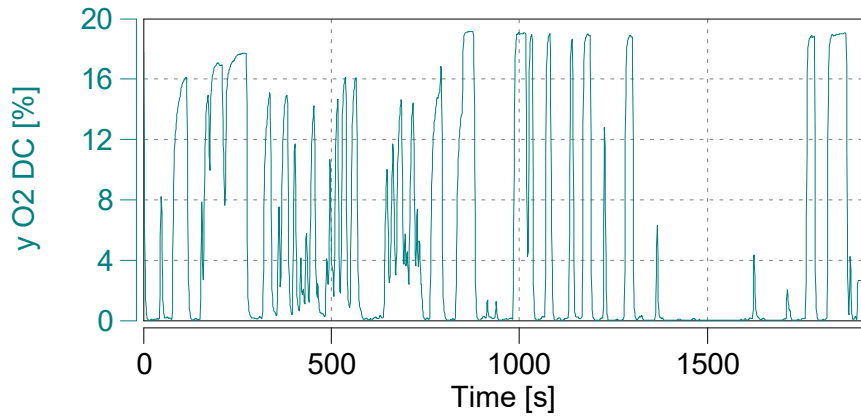
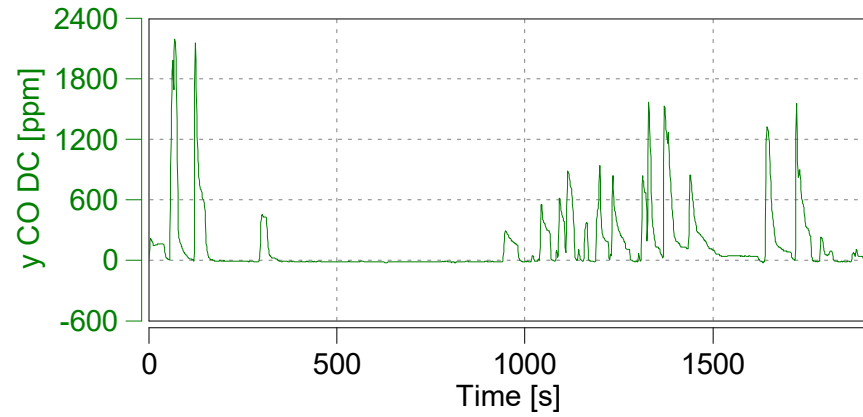
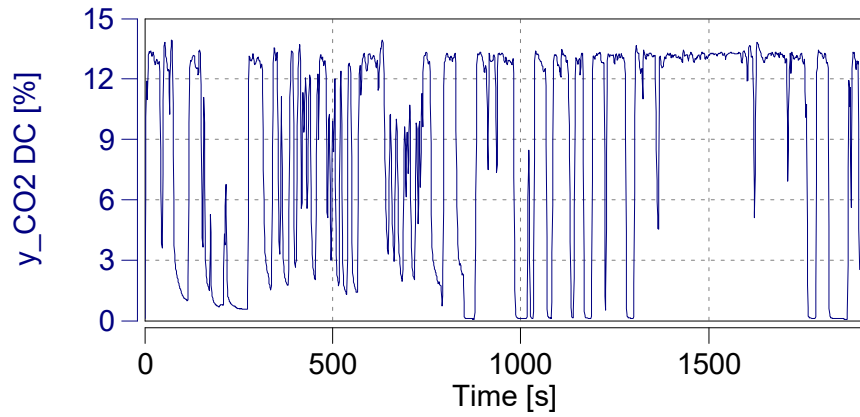


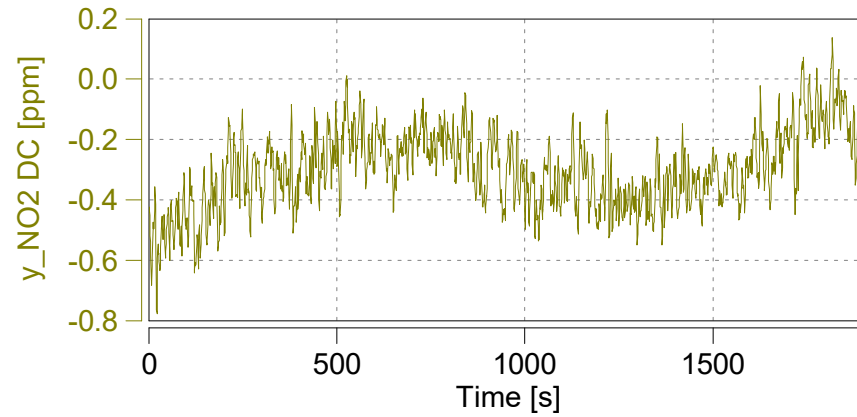
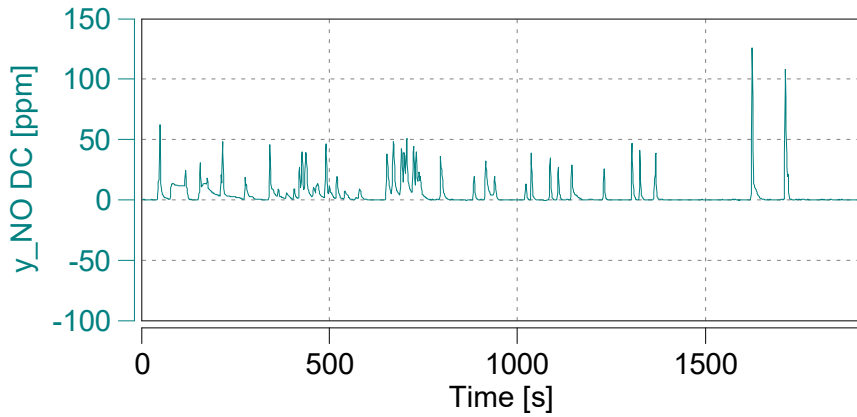
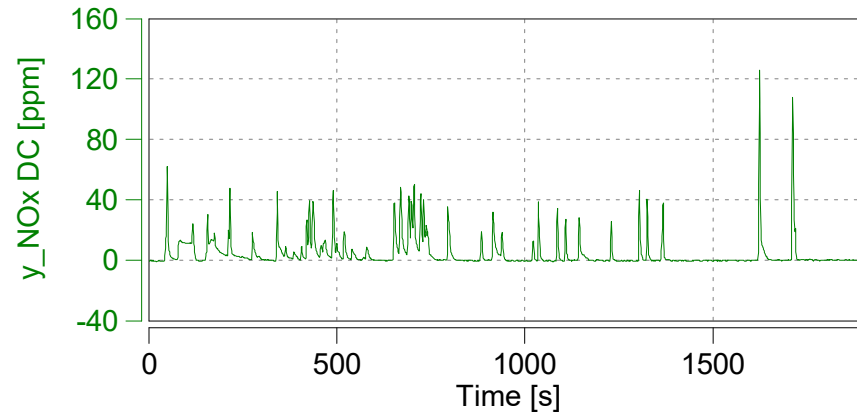
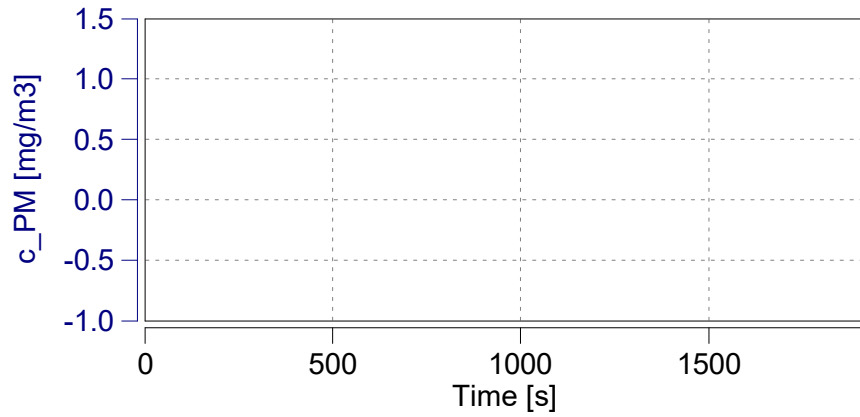


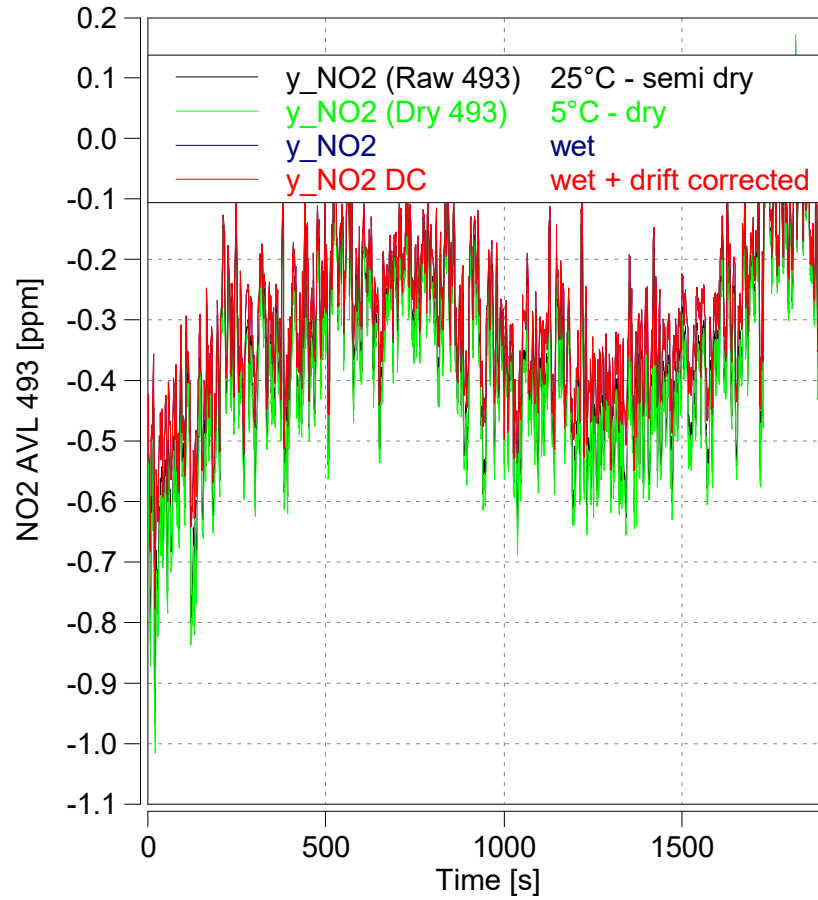
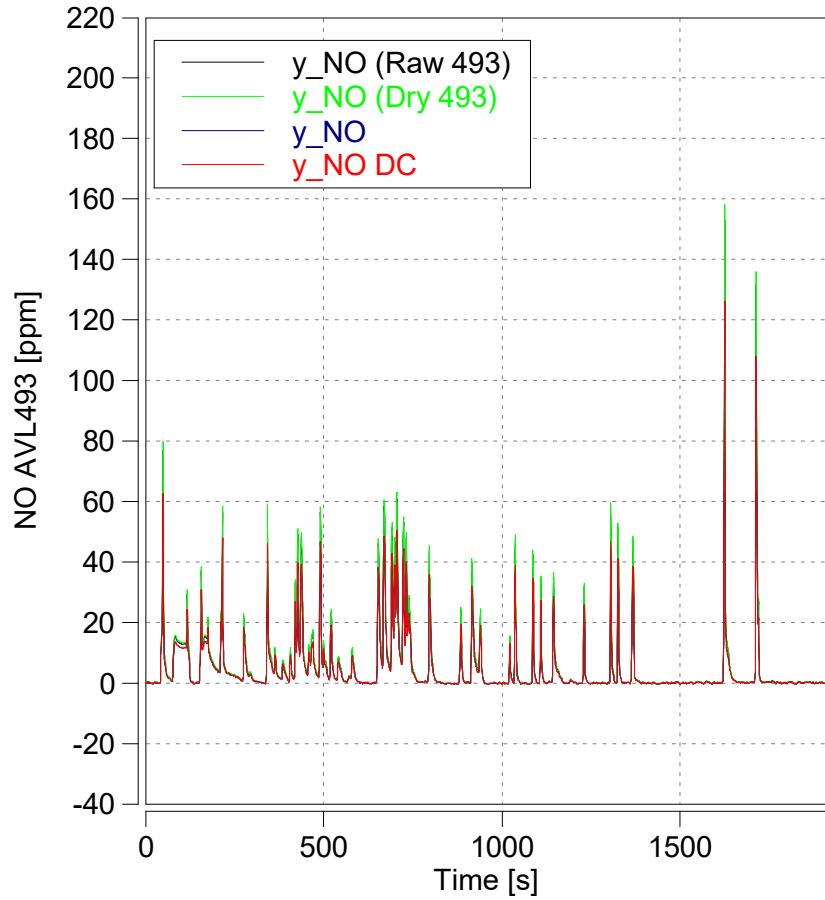




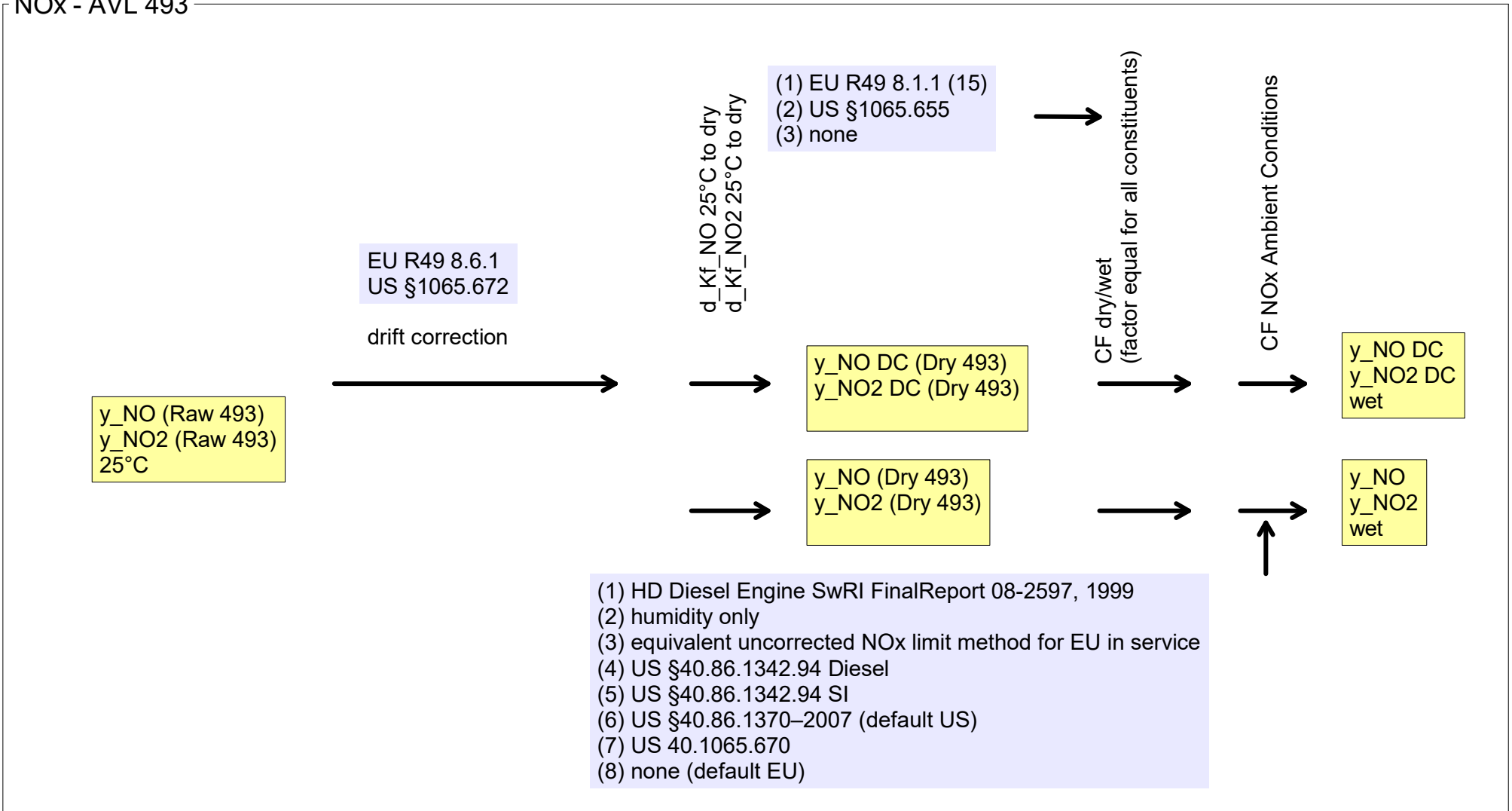


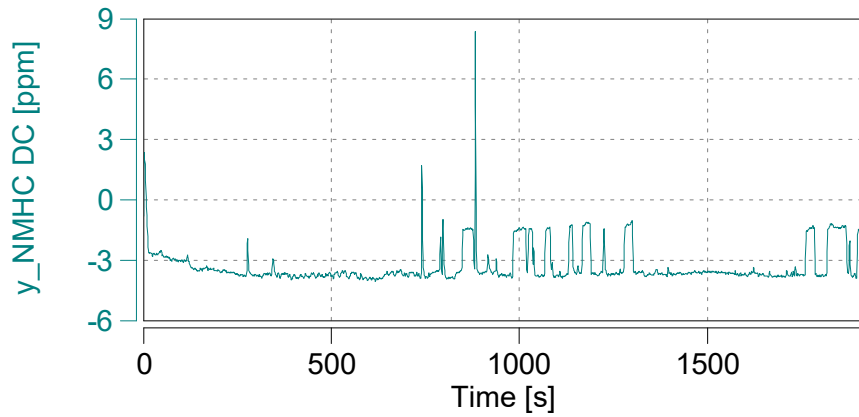
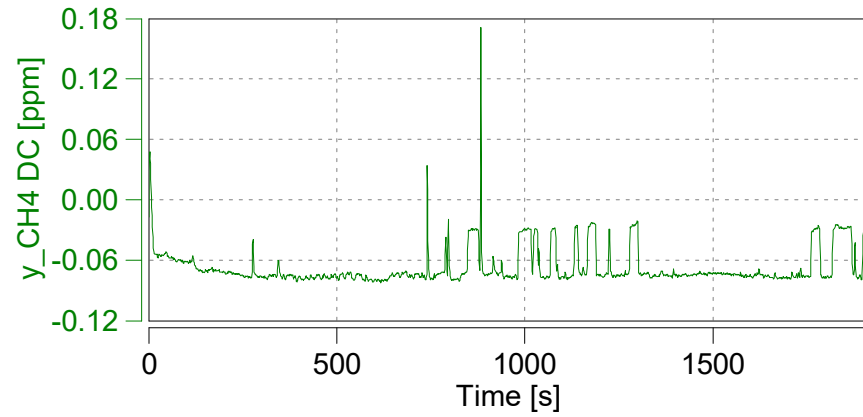
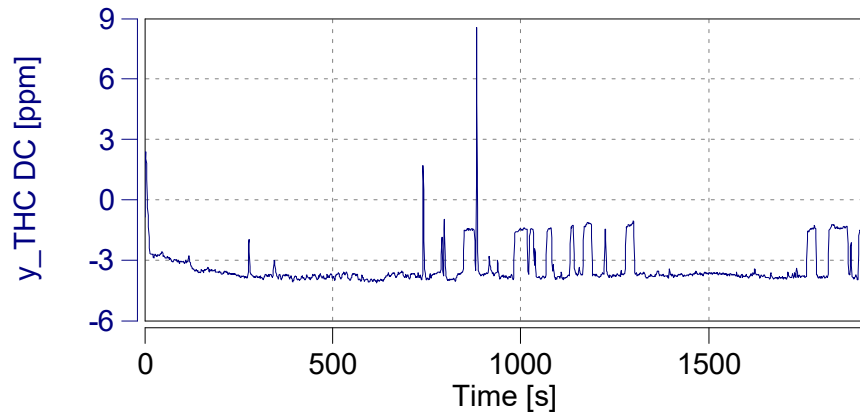


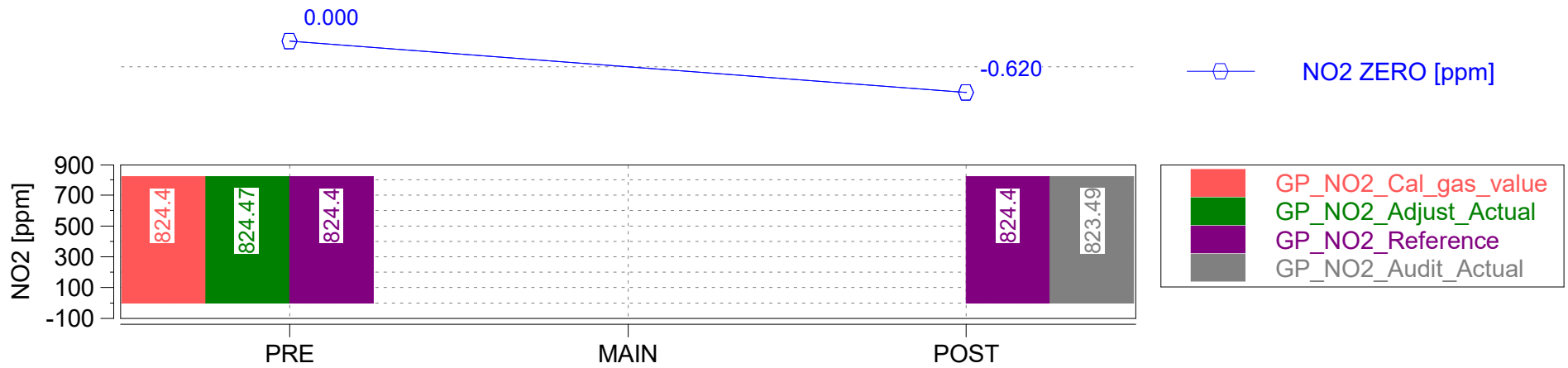
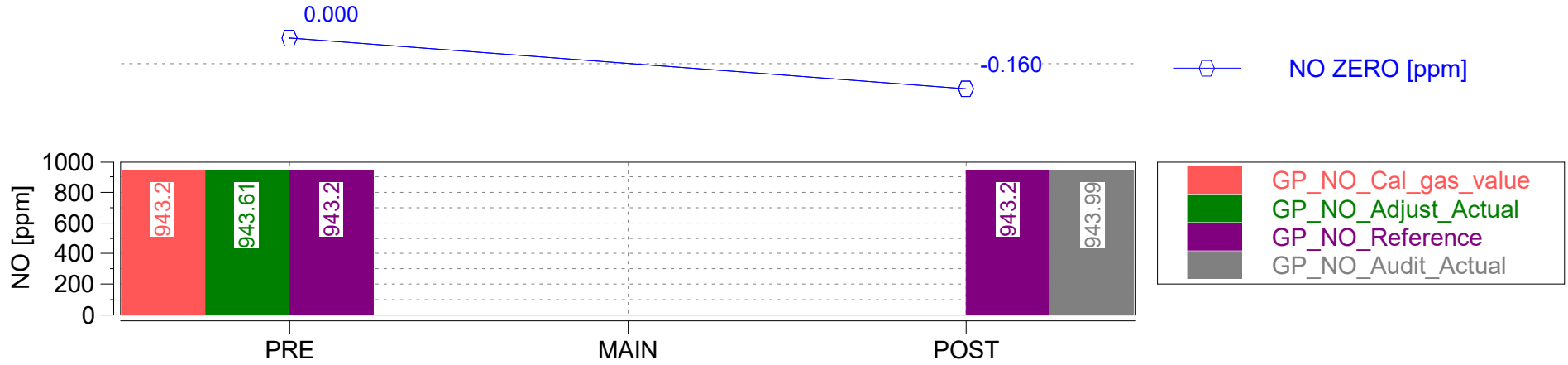


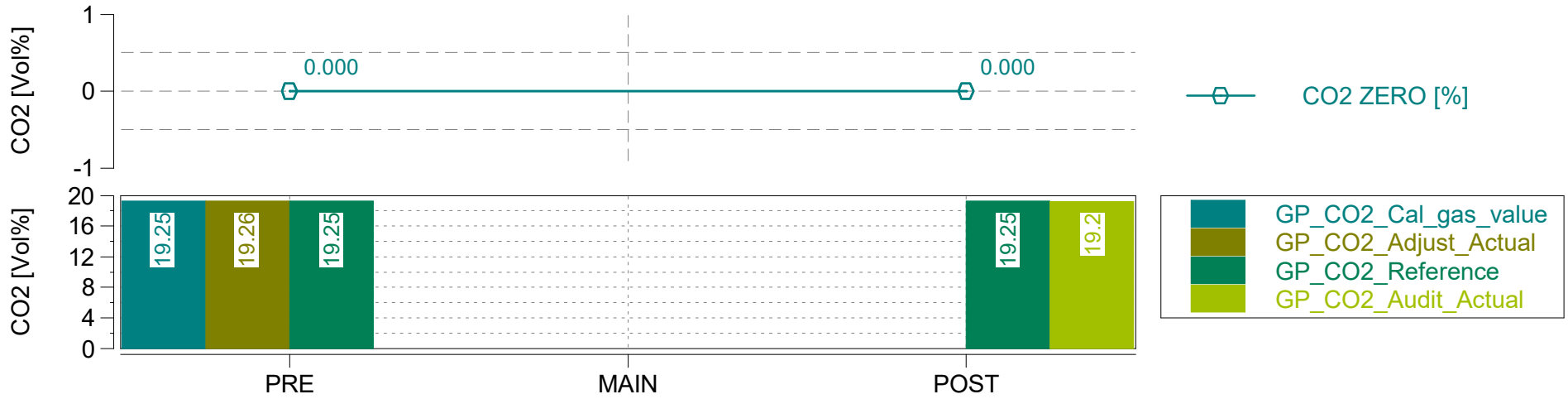
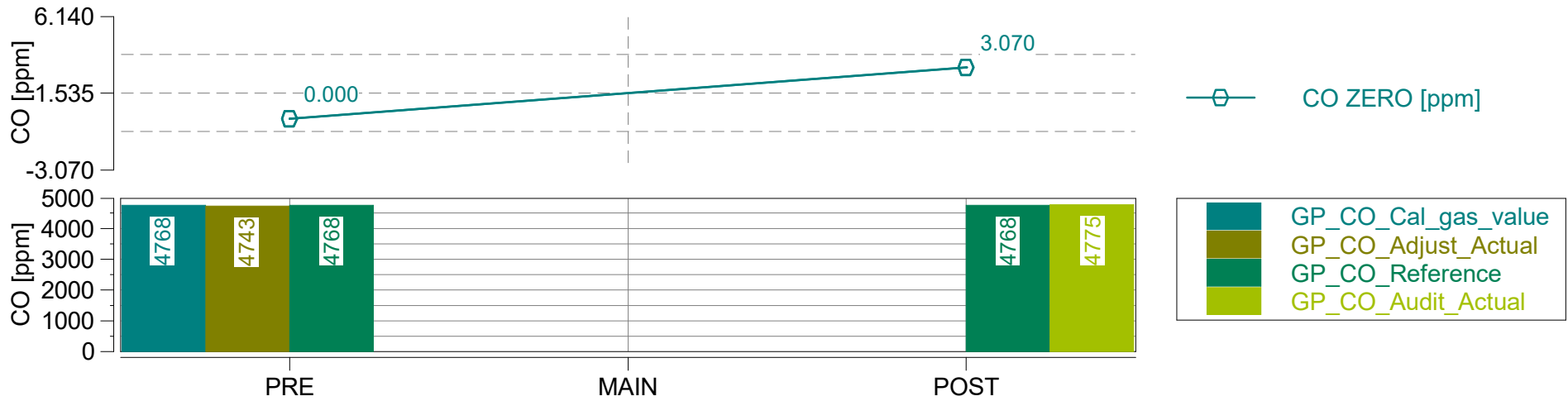


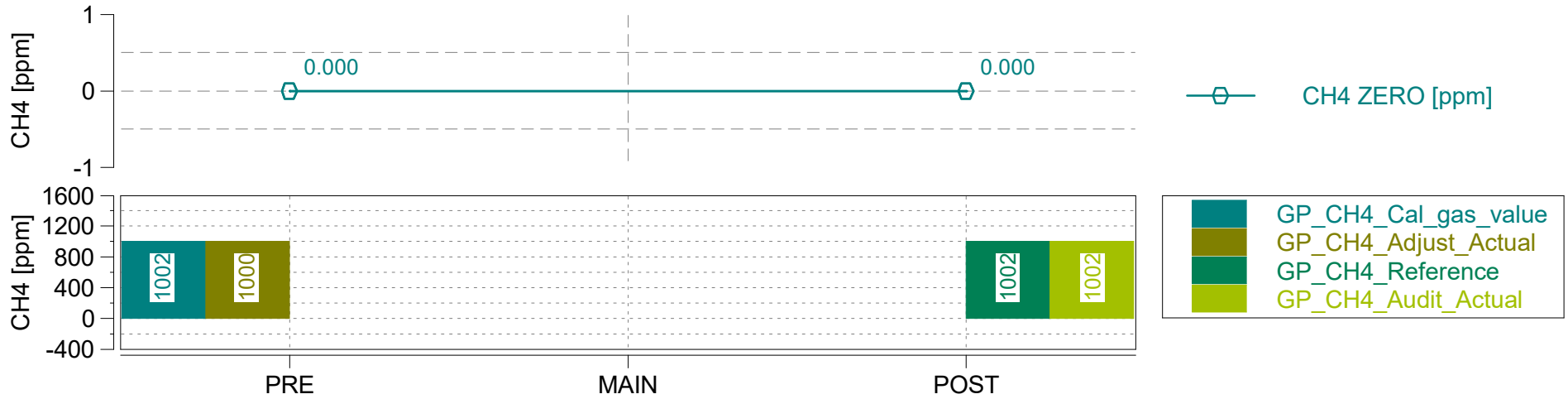
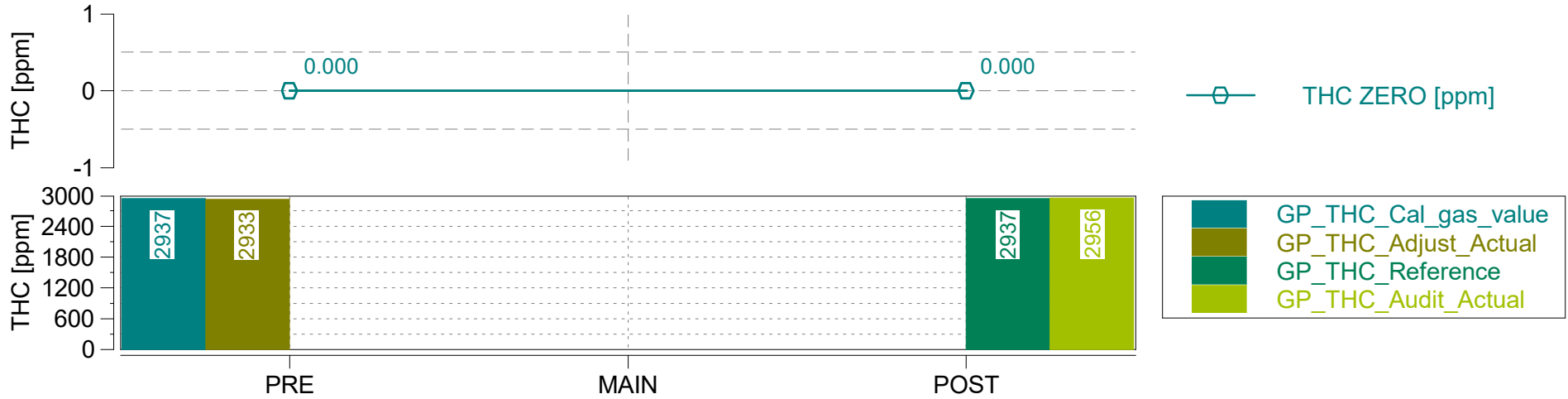
NOx - AVL 493













| § | criterium | condition | value | unit | pass/fail |
|-----------------------|--|--------------------------|-------------|------------|-----------|
| GAS Leak Check | The leakage rate on the vacuum side shall not exceed 0.5 per cent of the in-use flow rate for the portion of the system being checked. | The leakage rate <= 0.5% | 0.10 | % | pass |
| PN Leak Check | n/a | n/a | n/a | n/a | n/a |
| PM Leak Check | n/a | n/a | n/a | n/a | n/a |

GAS PEMS Devices

| | |
|-----------------------|------------|
| Device ID | AVL492 |
| Serial Number | 0182 |
| Firmware Version | V1.17 |
| Main Test Date | 2022-03-07 |
| Leak Check Age [days] | 0 |

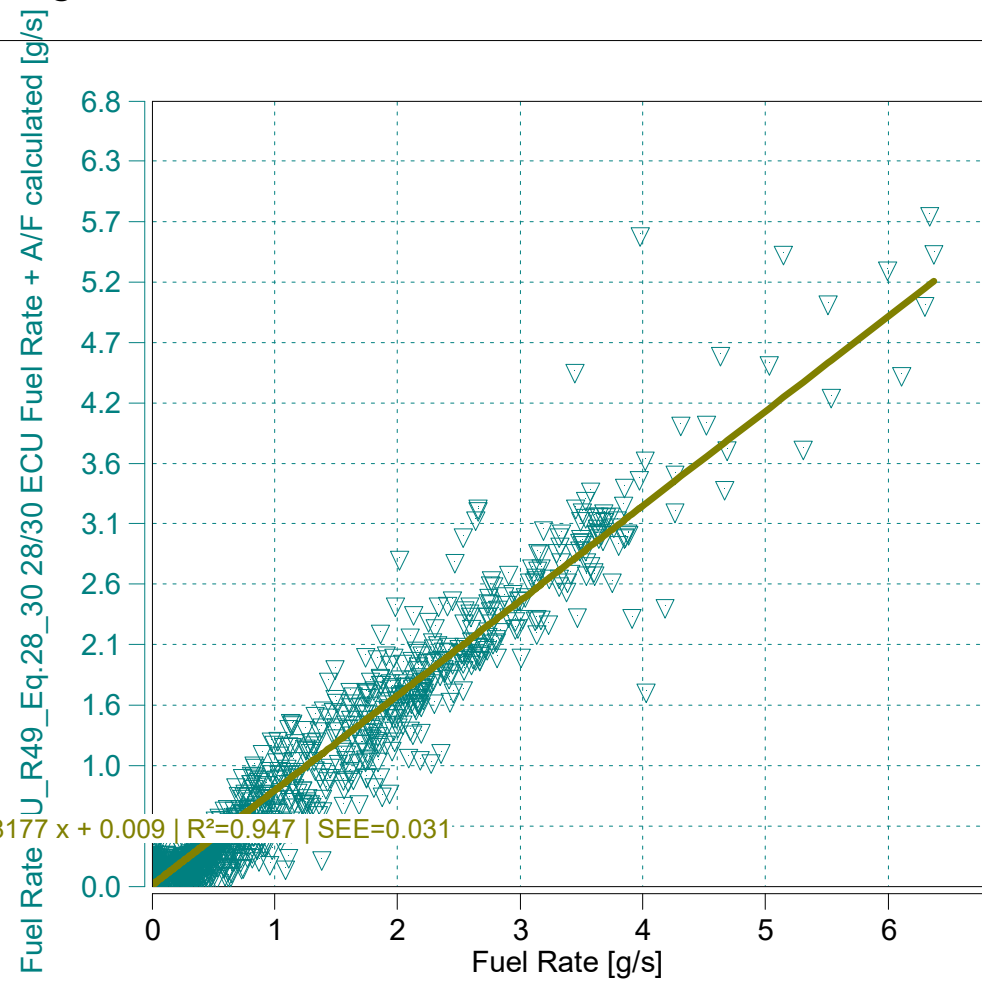
| | |
|------------------|-----------|
| Device ID | AVL4925iS |
| Serial Number | 202 |
| Firmware Version | 1.22.0.4 |

EFM

| | |
|--------------------|--------|
| Device ID | AVL495 |
| Serial Number | 00915 |
| Serial Number Tube | 01115 |
| Firmware Version | V1.16 |

System Control

| | |
|------------------|----------|
| SC Version | V2.9_237 |
| SC Serial Number | 60300923 |



EU 582/2011/Appendix I/3.2.1 | Fuel Rate ECU and calculated

$y = 0.8177x + 0.009 \mid R^2=0.947 \mid SEE=0.031$
 $m = 0.82$ (0.9 - 1.1 recommended)
 $R^2 = 0.95$ (min 0.9 mandatory)

Data from - to [% of Maximum]

0

100



| | | |
|-------------------------------|--------------|--------|
| Trip Duration | 2072.00 | s |
| Trip Duration (a) | 2072.00 | s |
| Trip Distance | 24.16 | mi |
| Trip Distance (a) | 24.16 | mi |
| Trip Fuel Cons. (b) | 3.01 | kg |
| Trip Fuel Cons. (ab) | 3.01 | kg |
| Trip Fuel Cons. EU (ac) | 2.40 | kg |
| Trip Fuel Cons. US (ac) | 2.40 | kg |
| Trip Fuel Economy (b) | 22.68 | mpg_US |
| Trip Fuel Economy (ab) | 22.68 | mpg_US |
| Trip Fuel Economy EU (ac) | 28.46 | mpg_US |
| Trip Fuel Economy US (ac) | 28.51 | mpg_US |
| Trip Fuel Economy GGE (b) | 22.68 | mpg_US |
| Trip Fuel Economy GGE (ab) | 22.68 | mpg_US |
| Trip Fuel Economy EU GGE (ac) | 28.46 | mpg_US |
| Trip Fuel Economy US GGE (ac) | 28.51 | mpg_US |
| Trip Av. Eng. Speed | 1398.96 | rpm |
| Trip Av. Torque | 86.48 | lbft |
| Trip Av. Power | 27.20 | hp |
| Trip Work | | |
| Trip Work (a) | 15.65 | hphr |
| Trip Exhaust Mass | 36.61 | kg |
| Trip Exhaust Mass EU (ac) | 46.11 | kg |
| Trip Exhaust Mass US (ac) | 46.19 | kg |
| Trip Av. Amb. Temperature | 71.97 | deg_F |
| Trip Av. Humidity | 27.76 | % |
| Trip Av. GPS Altitude | 55.12 | m |
| Fuel Type | Petrol (E10) | |

| | | |
|-----------------------------------|------------|------------|
| ave THC | 49.08677 | ppm |
| ave NMHC | 48.10503 | ppm |
| ave CH4 | 0.98174 | ppm |
| ave CO | 236.89893 | ppm |
| ave CO2 | 12.10039 | % |
| ave NOx | 2.65936 | ppm |
| ave PM | n/a | mg/m3 |
| ave Soot meas | n/a | mg/m3 |
| ave Soot | n/a | mg/m3 |
| ave PN | n/a | #/cm3 |
| tot THC | 0.64428 | g |
| tot NMHC | 0.59597 | g |
| tot CH4 | 0.01428 | g |
| tot CO | 7.85958 | g |
| tot CO2 | 7278.19976 | g |
| tot NO (d) | 0.07831 | g |
| tot NO2 | 0.02876 | g |
| tot NOx | 0.09958 | g |
| tot Soot | n/a | g |
| tot Soot meas | n/a | g |
| tot PM | n/a | g |
| tot PN | n/a | # |
| PM measurement type | 0.00000 | - |
| tot Soot on PM filter (estim.) | 0.00000 | mg |
| Soot --> PM simple scaling factor | 1.00000 | - |
| Trip Av. Veh. Speed | 41.98468 | mi/hr |
| Trip Distance Share Urban | 13.85380 | % distance |
| Trip Distance Share Rural | 14.36441 | % distance |
| Trip Distance Share Motorway | 71.78179 | % distance |

| | | |
|--------------|------------|--------|
| BS CO2 | 464.92602 | g/hphr |
| BS CO | 0.50206 | g/hphr |
| BS THC | 0.04116 | g/hphr |
| BS NMHC | 0.03807 | g/hphr |
| BS CH4 | 0.00091 | g/hphr |
| BS NO (d) | 0.00500 | g/hphr |
| BS NO2 | 0.00184 | g/hphr |
| BS NOx | 0.00636 | g/hphr |
| BS Soot | n/a | g/hphr |
| BS Soot meas | n/a | g/hphr |
| BS PM | n/a | g/hphr |
| BS PN | n/a | #/hpr |
| DS CO2 | 301.19367 | g/mi |
| DS CO | 0.32525 | g/mi |
| DS THC | 0.02666 | g/mi |
| DS NMHC | 0.02466 | g/mi |
| DS CH4 | 0.00059 | g/mi |
| DS NO (d) | 0.00324 | g/mi |
| DS NO2 | 0.00119 | g/mi |
| DS NOx | 0.00412 | g/mi |
| DS Soot | n/a | g/mi |
| DS Soot meas | n/a | g/mi |
| DS PM | n/a | g/mi |
| DS PN | n/a | #/mi |
| FS CO2 | 2414.52085 | g/kg |
| FS CO | 2.60739 | g/kg |
| FS THC | 0.21374 | g/kg |
| FS NMHC | 0.19771 | g/kg |
| FS CH4 | 0.00474 | g/kg |
| FS NO (d) | 0.02598 | g/kg |
| FS NO2 | 0.00954 | g/kg |
| FS NOx | 0.03304 | g/kg |
| FS Soot | n/a | g/kg |
| FS Soot meas | n/a | g/kg |
| FS PM | n/a | g/kg |
| FS PN | n/a | #/kg |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents

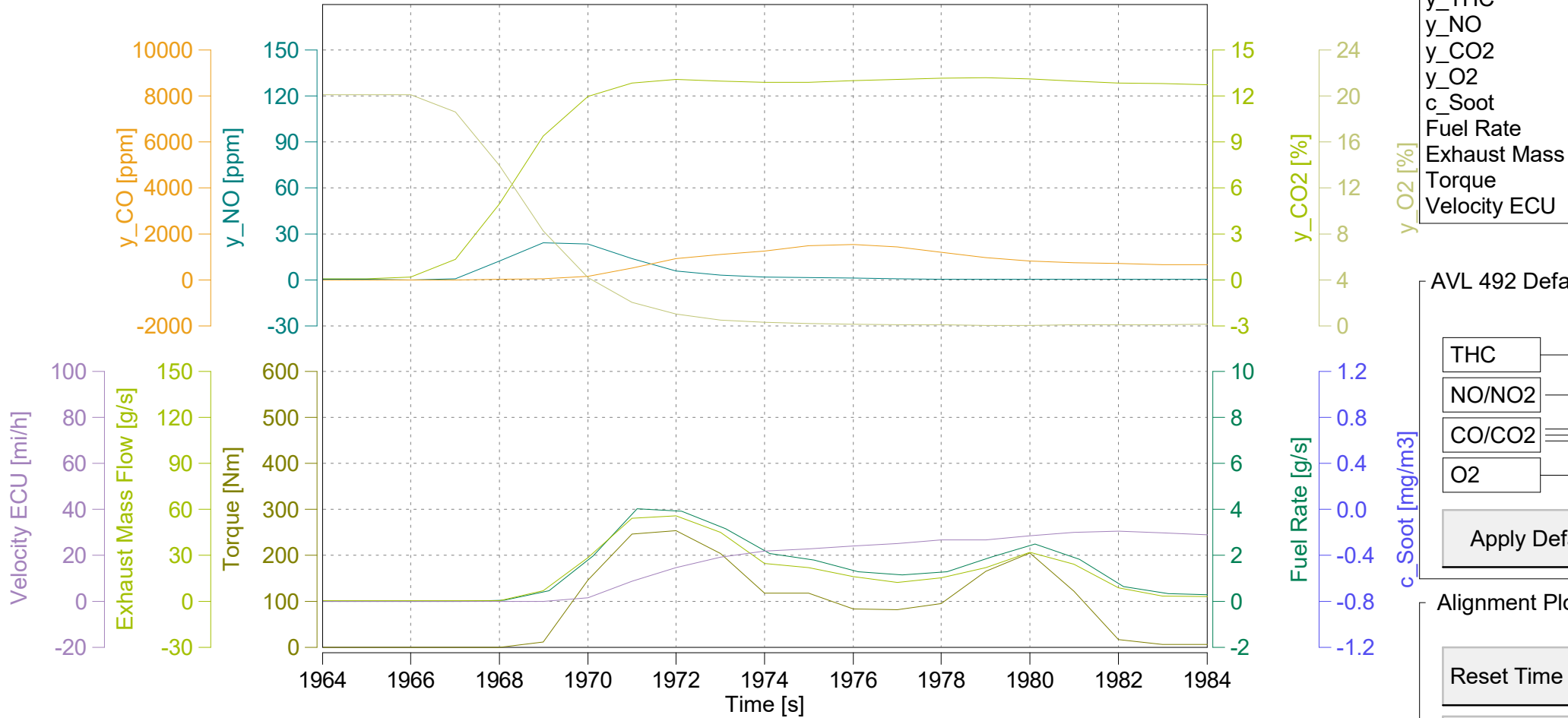


| | | | | | | | | |
|-------------------------------|--------------|--------|-----------------------------------|------------|------------|--------------|------------|--------|
| Trip Duration | 2072.00 | s | ave THC DC | 48.96909 | ppm | BS CO2 DC | 465.40957 | g/hphr |
| Trip Duration (a) | 2072.00 | s | ave NMHC DC | 47.98971 | ppm | BS CO DC | 0.50296 | g/hphr |
| Trip Distance | 24.16 | mi | ave CH4 DC | 0.97938 | ppm | BS THC DC | 0.04106 | g/hphr |
| Trip Distance (a) | 24.16 | mi | ave CO DC | 237.32226 | ppm | BS NMHC DC | 0.03798 | g/hphr |
| | | | ave CO2 DC | 12.11297 | % | BS CH4 DC | 0.00091 | g/hphr |
| Trip Fuel Cons. (b) | 3.01 | kg | ave NOx DC | 2.65821 | ppm | BS NO DC (d) | 0.00500 | g/hphr |
| Trip Fuel Cons. (ab) | 3.01 | kg | ave PM | n/a | mg/m3 | BS NO2 DC | 0.00184 | g/hphr |
| Trip Fuel Cons. EU (ac) | 2.40 | kg | ave Soot meas | n/a | mg/m3 | BS NOx DC | 0.00636 | g/hphr |
| Trip Fuel Cons. US (ac) | 2.40 | kg | ave Soot | n/a | mg/m3 | BS Soot | n/a | g/hphr |
| | | | ave PN DC | | | BS Soot meas | n/a | g/hphr |
| | | | | | | BS PM | n/a | g/hphr |
| Trip Fuel Economy (b) | 22.68 | mpg_US | tot THC DC | 0.64274 | g | BS PN DC | | |
| Trip Fuel Economy (ab) | 22.68 | mpg_US | tot NMHC DC | 0.59454 | g | | | |
| Trip Fuel Economy EU (ac) | 28.46 | mpg_US | tot CH4 DC | 0.01425 | g | DS CO2 DC | 301.50692 | g/mi |
| Trip Fuel Economy US (ac) | 28.51 | mpg_US | tot CO DC | 7.87363 | g | DS CO DC | 0.32583 | g/mi |
| Trip Fuel Economy GGE (b) | 22.68 | mpg_US | tot CO2 DC | 7285.76939 | g | DS THC DC | 0.02660 | g/mi |
| Trip Fuel Economy GGE (ab) | 22.68 | mpg_US | tot NO DC (d) | 0.07826 | g | DS NMHC DC | 0.02460 | g/mi |
| Trip Fuel Economy EU GGE (ac) | 28.46 | mpg_US | tot NO2 DC | 0.02878 | g | DS CH4 DC | 0.00059 | g/mi |
| Trip Fuel Economy US GGE (ac) | 28.51 | mpg_US | tot NOx DC | 0.09955 | g | DS NO DC (d) | 0.00324 | g/mi |
| | | | tot Soot | n/a | g | DS NO2 DC | 0.00119 | g/mi |
| Trip Av. Eng. Speed | 1398.96 | rpm | tot Soot meas | n/a | g | DS NOx DC | 0.00412 | g/mi |
| Trip Av. Torque | 86.48 | lbft | tot PM | n/a | g | DS Soot | n/a | g/mi |
| Trip Av. Power | 27.20 | hp | tot PN DC | | | DS Soot meas | n/a | g/mi |
| Trip Work | | | | | | DS PM | n/a | g/mi |
| Trip Work (a) | 15.65 | hphr | | | | DS PN DC | | |
| | | | PM measurement type | 0.00000 | - | | | |
| Trip Exhaust Mass | 36.61 | kg | tot Soot on PM filter (estim.) | 0.00000 | mg | FS CO2 DC | 2417.03205 | g/kg |
| Trip Exhaust Mass EU (ac) | 46.11 | kg | Soot --> PM simple scaling factor | 1.00000 | - | FS CO DC | 2.61205 | g/kg |
| Trip Exhaust Mass US (ac) | 46.19 | kg | | | | FS THC DC | 0.21323 | g/kg |
| | | | Trip Av. Veh. Speed | 41.98468 | mi/hr | FS NMHC DC | 0.19724 | g/kg |
| Trip Av. Amb. Temperature | 71.97 | deg_F | | | | FS CH4 DC | 0.00473 | g/kg |
| Trip Av. Humidity | 27.76 | % | Trip Distance Share Urban | 13.85380 | % distance | FS NO DC (d) | 0.02596 | g/kg |
| Trip Av. GPS Altitude | 55.12 | m | Trip Distance Share Rural | 14.36441 | % distance | FS NO2 DC | 0.00955 | g/kg |
| | | | Trip Distance Share Motorway | 71.78179 | % distance | FS NOx DC | 0.03303 | g/kg |
| Fuel Type | Petrol (E10) | | | | | FS Soot | n/a | g/kg |
| | | | | | | FS Soot meas | n/a | g/kg |
| | | | | | | FS PM | n/a | g/kg |
| | | | | | | FS PN DC | | |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
 (d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents



Concerto Absolute Time



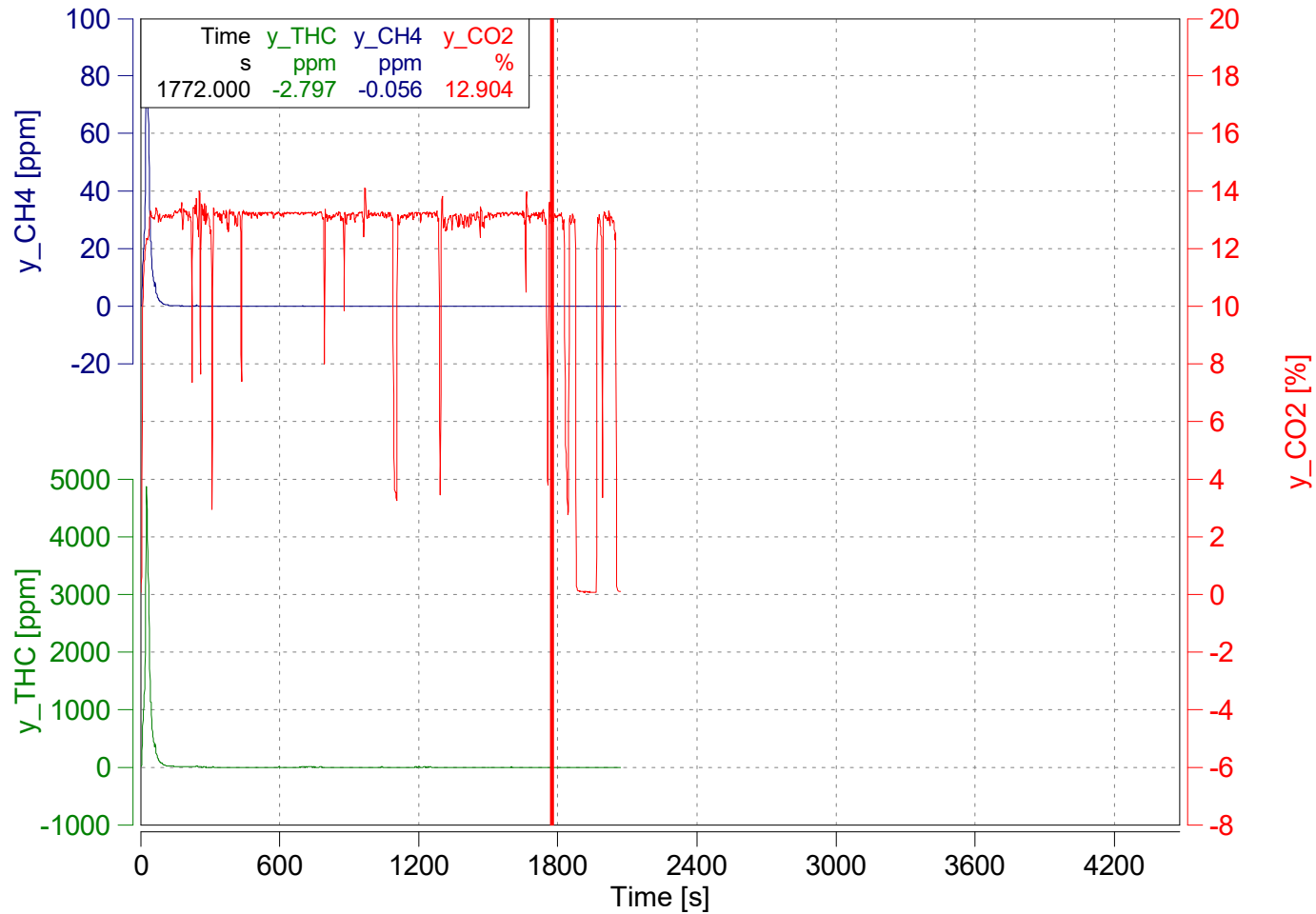
- y_THC
- y_NO
- y_CO2
- y_O2
- c_Soot
- Fuel Rate
- Exhaust Mass
- Torque
- Velocity ECU

AVL 492 Defa

- THC
- NO/NO2
- CO/CO2
- O2
- Apply Defa

Alignment Plc

- Reset Time
- Reset Al
- Apply Curr

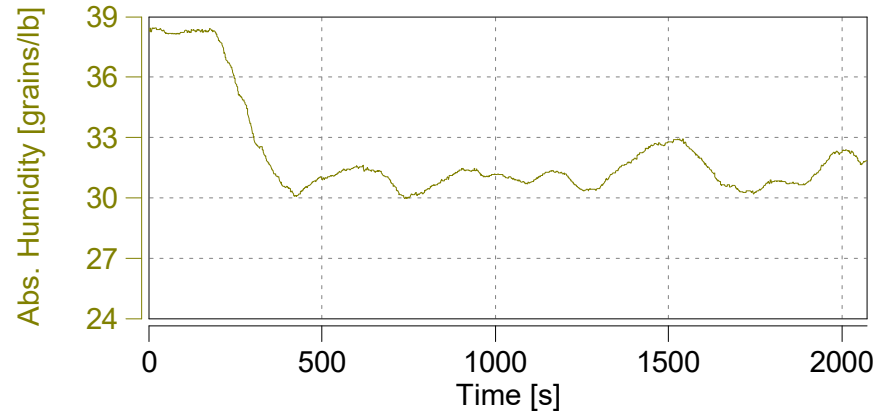
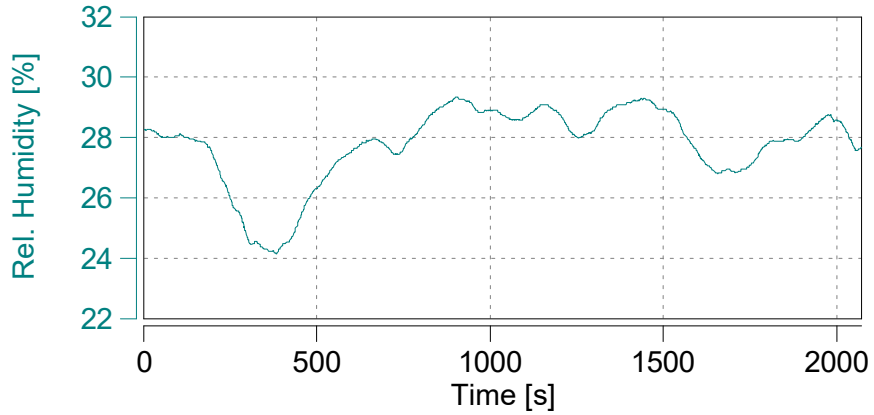
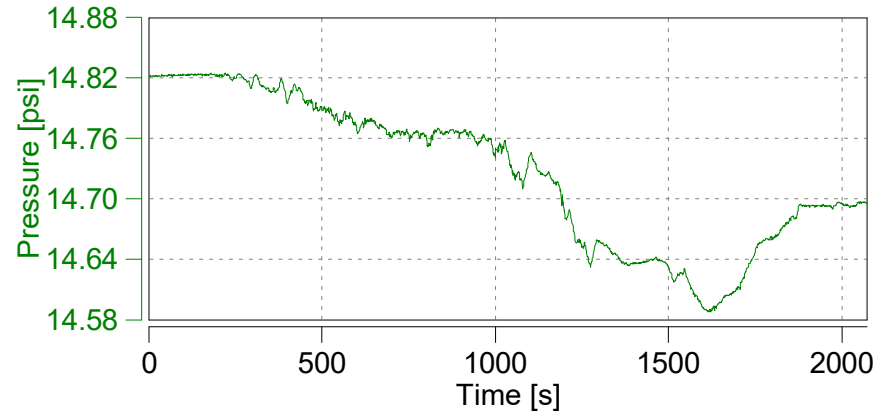
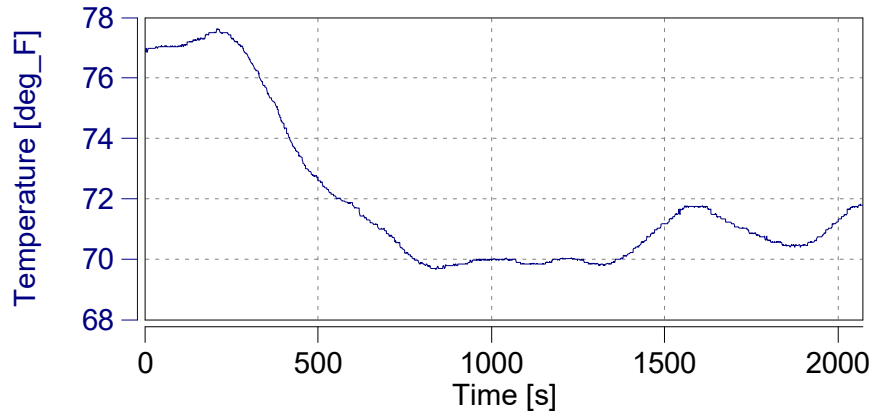


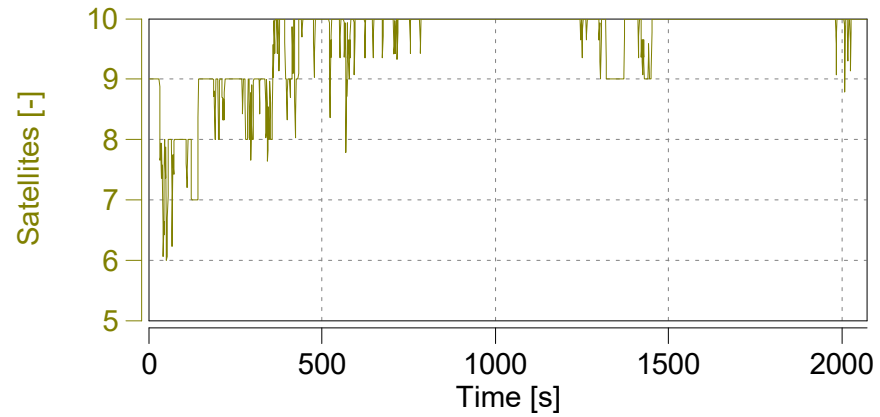
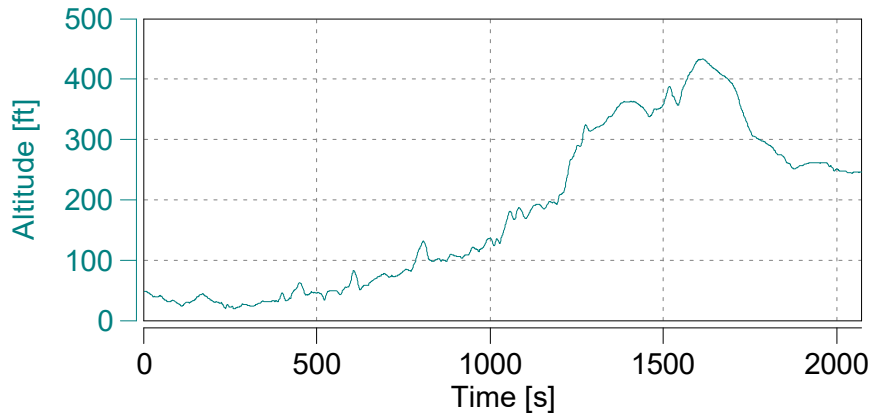
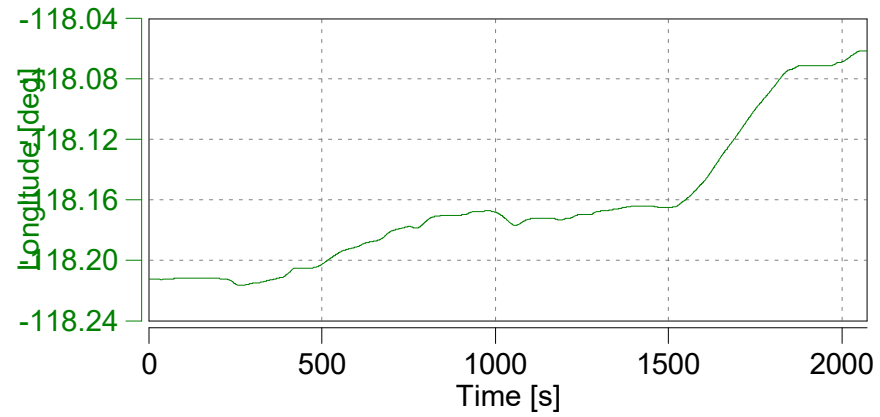
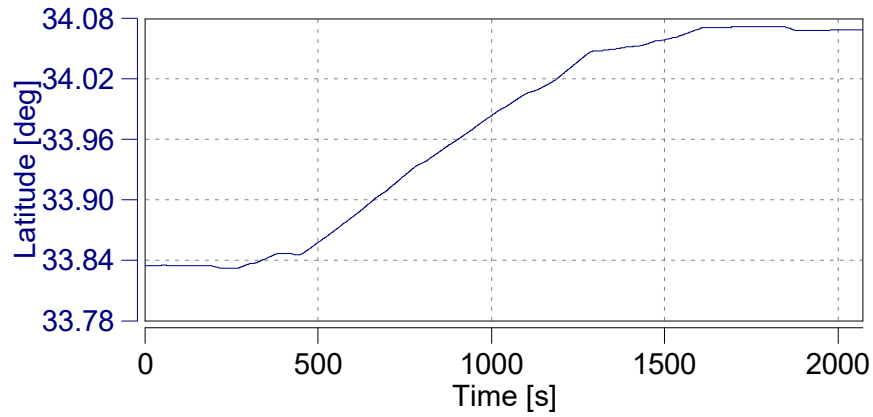
Absolute Time Shifts

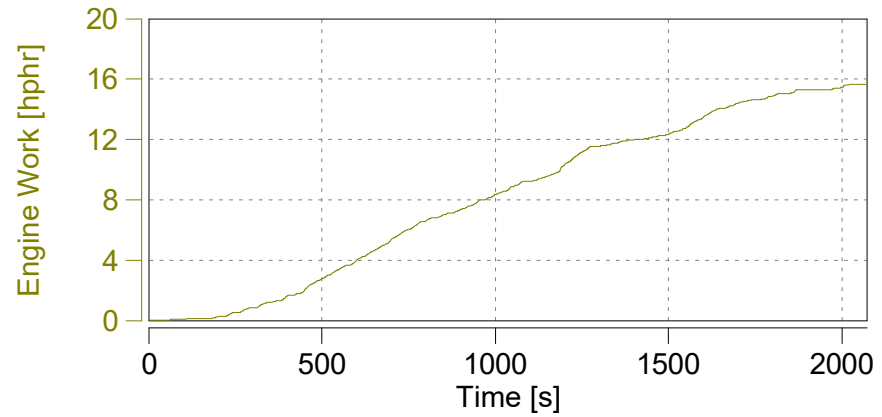
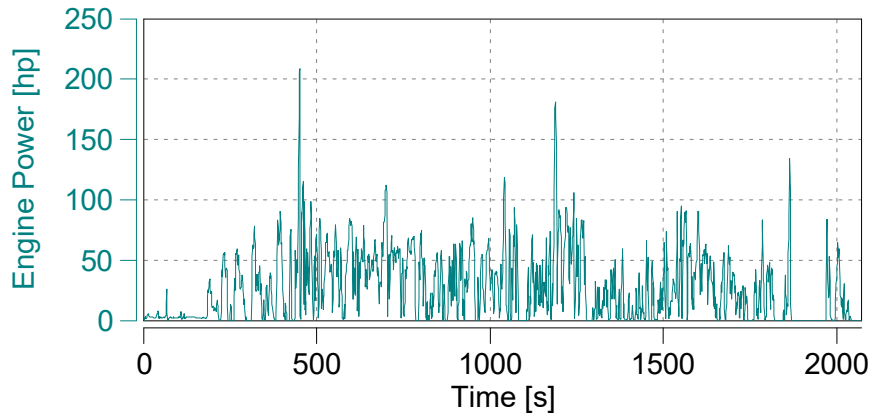
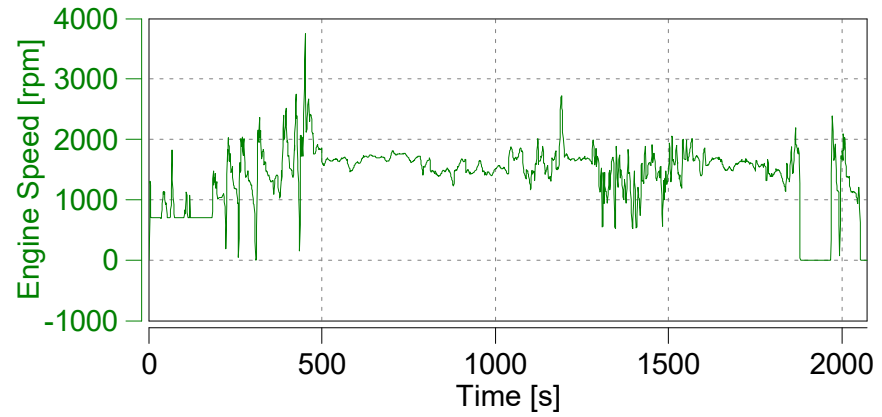
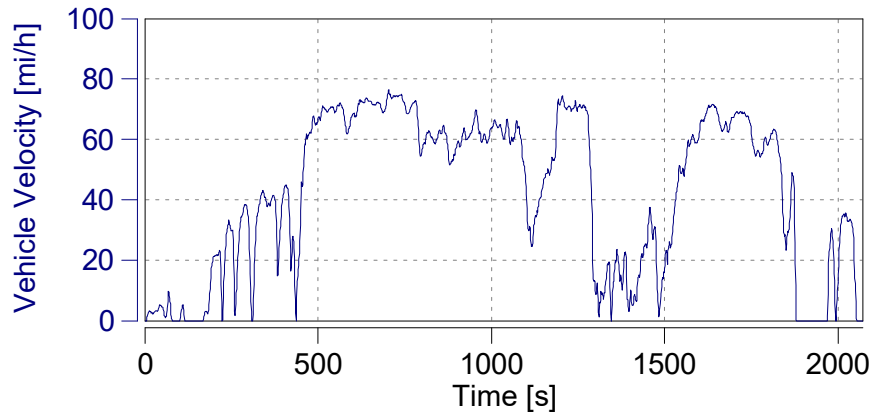
| | | |
|-------|---|------|
| y_THC | s | -4.3 |
| y_CH4 | s | -6.3 |

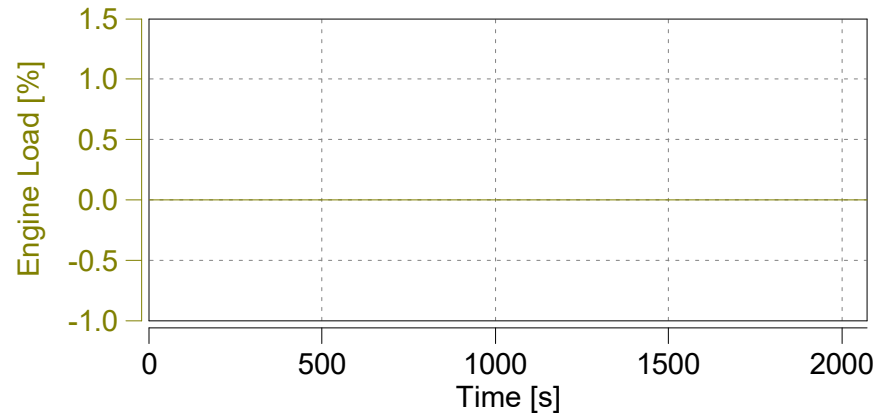
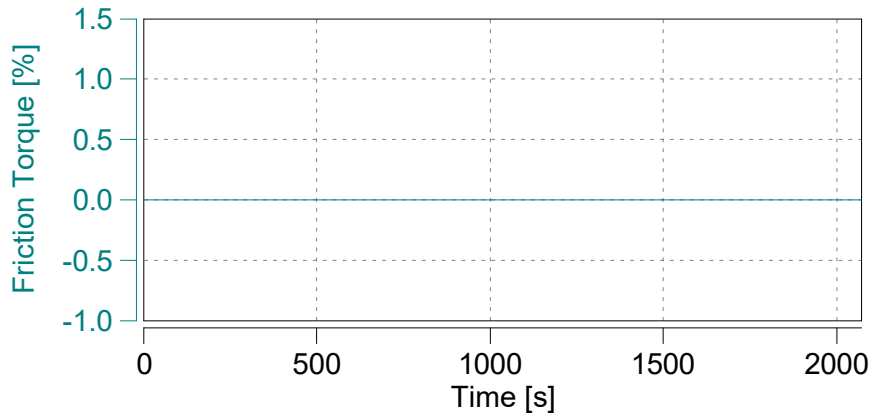
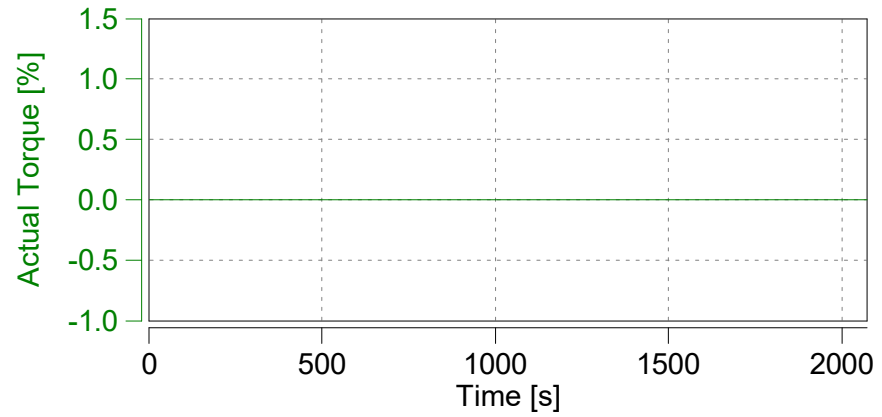
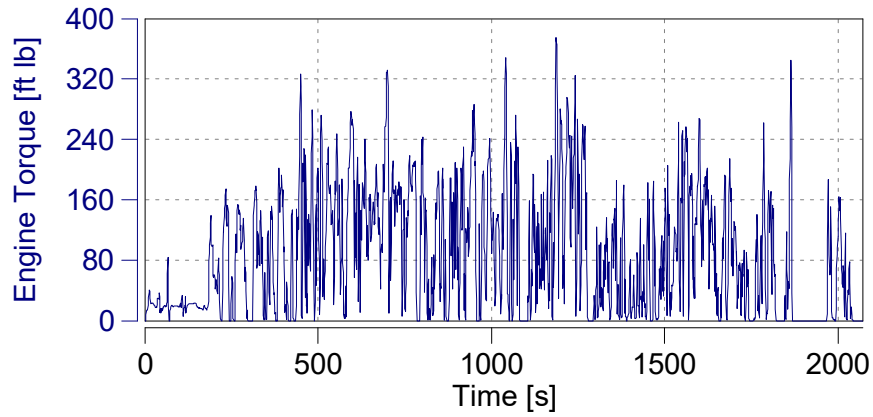
Reset Time Shifts in Plot

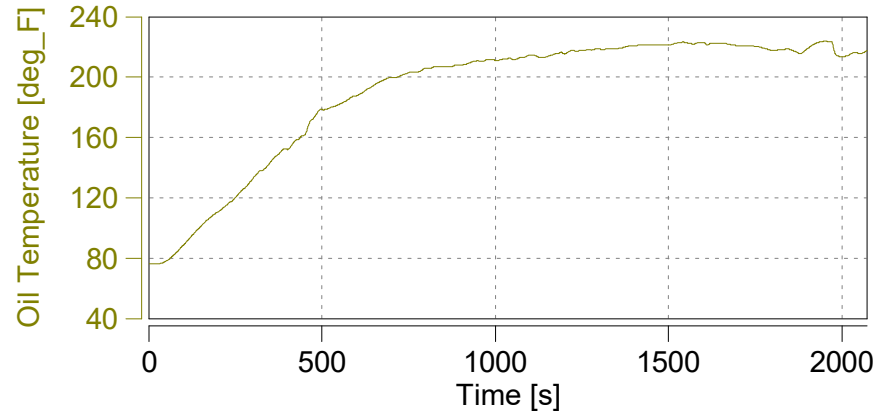
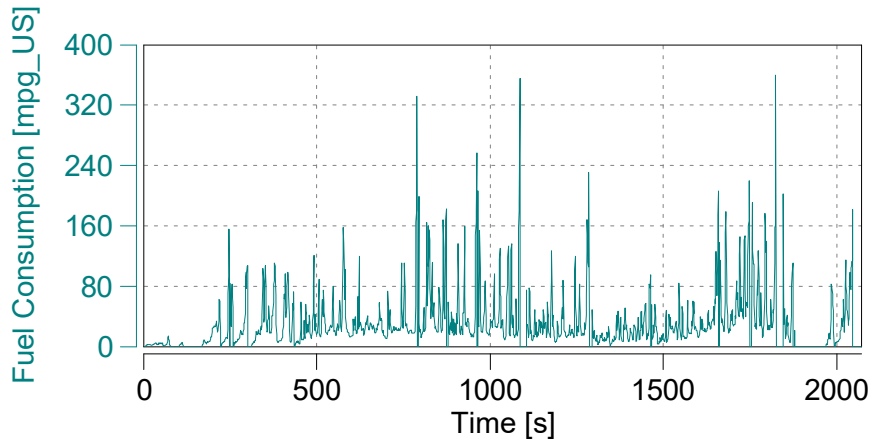
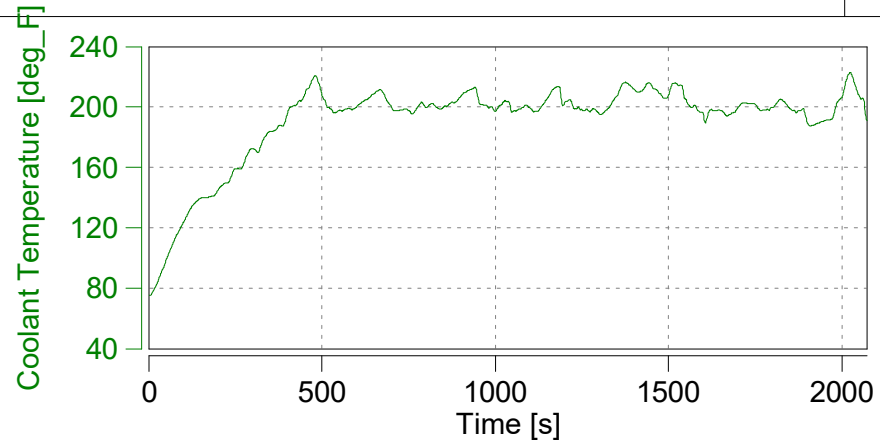
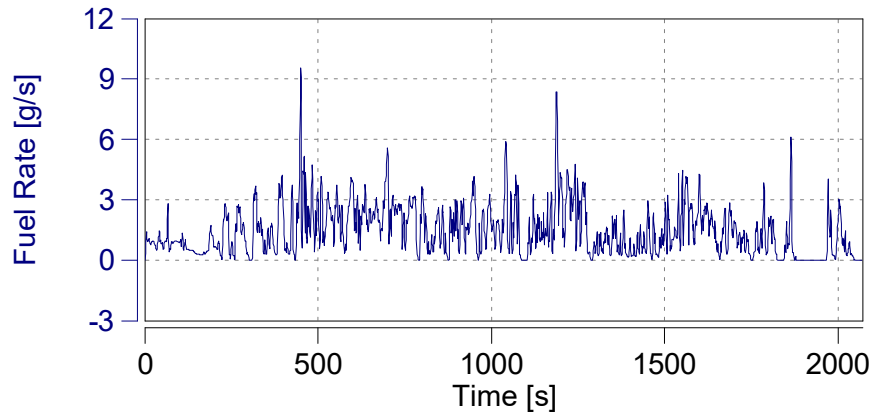
Apply Current Values

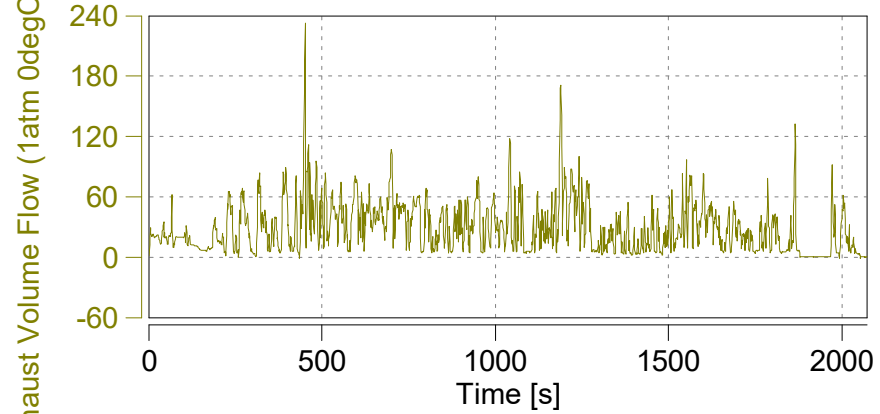
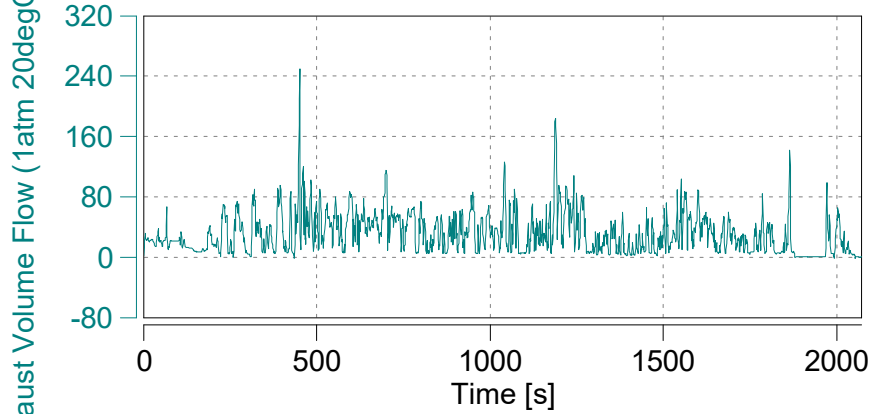
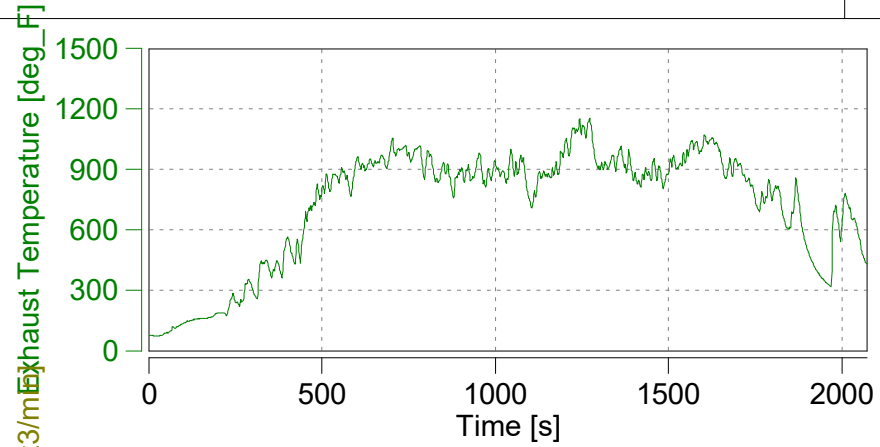
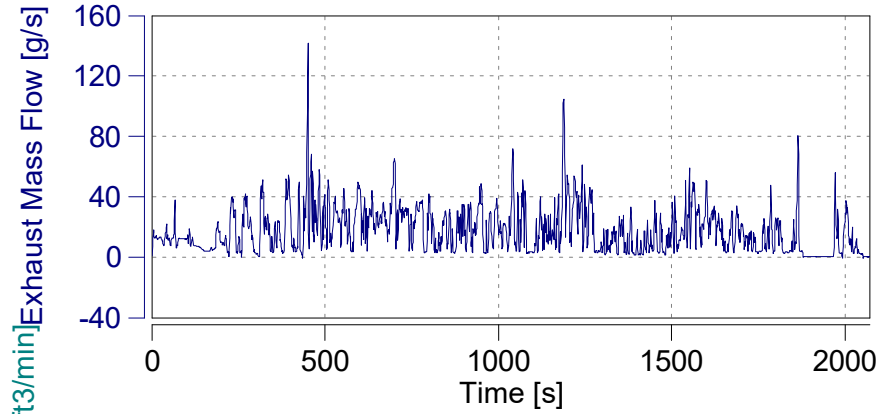


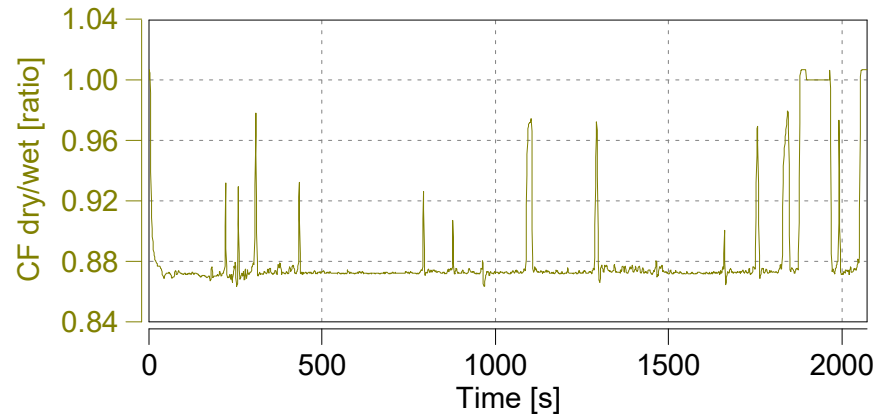
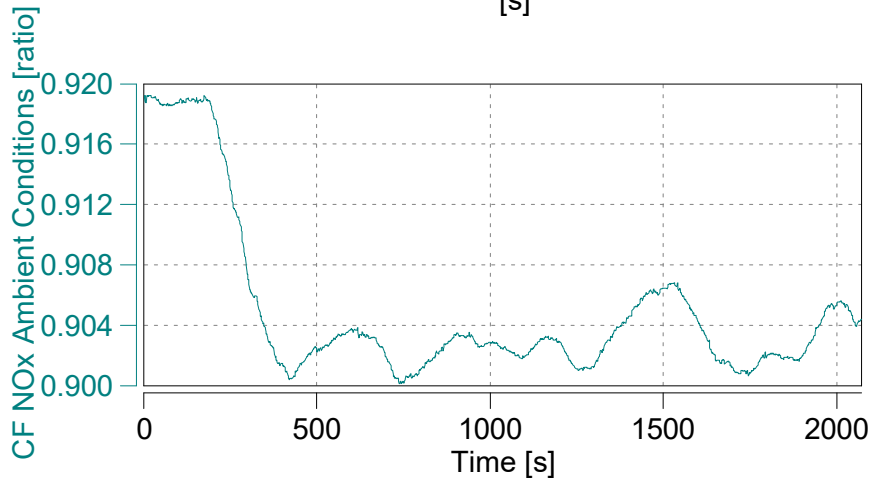
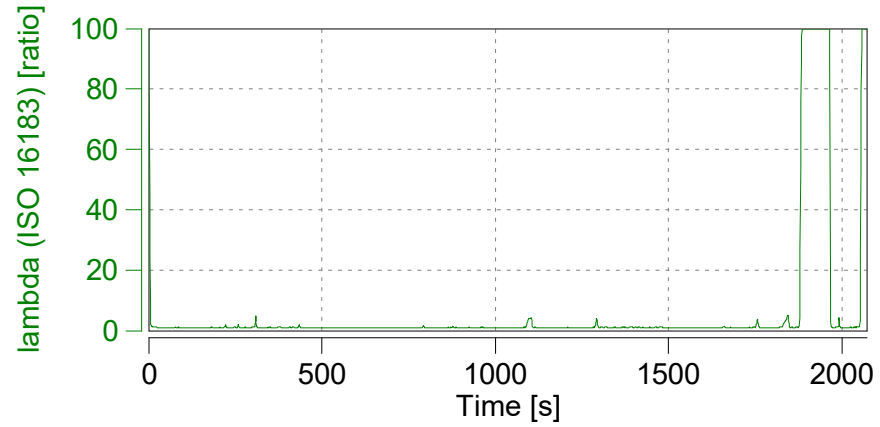
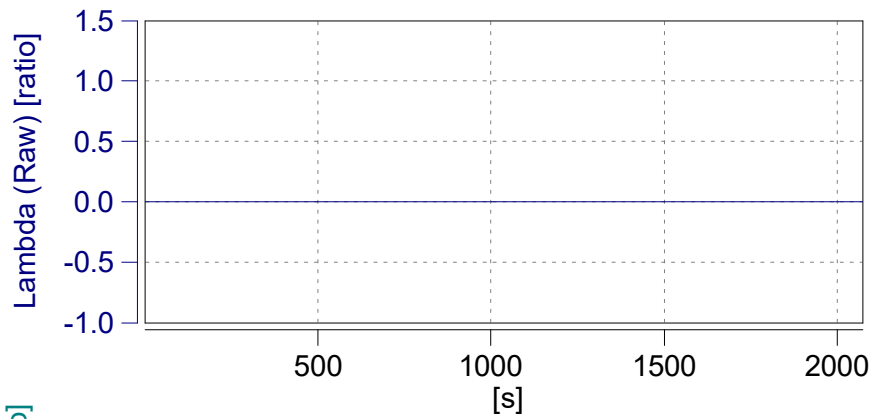


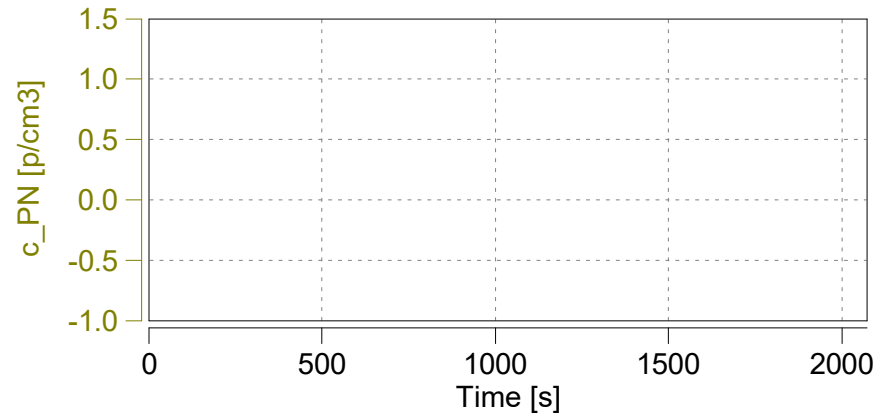
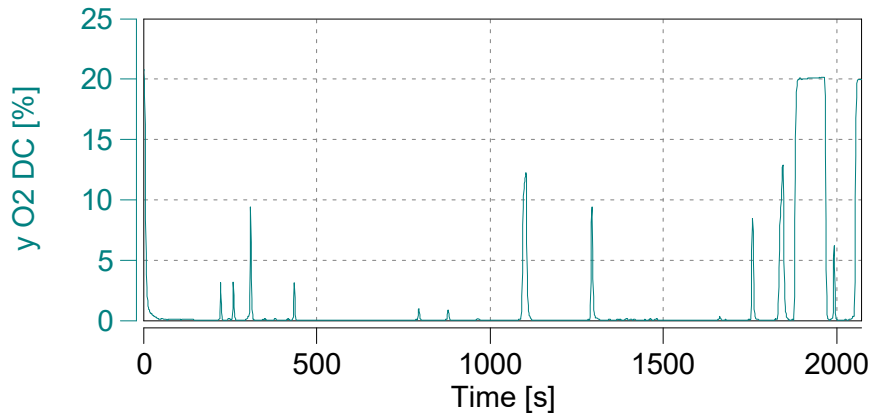
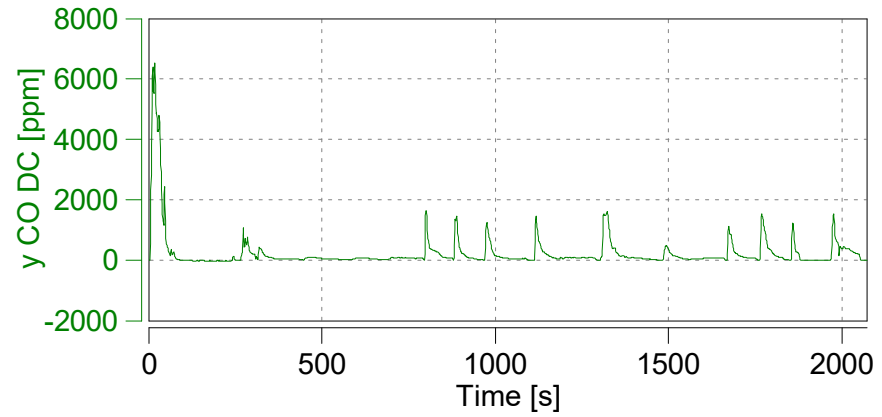
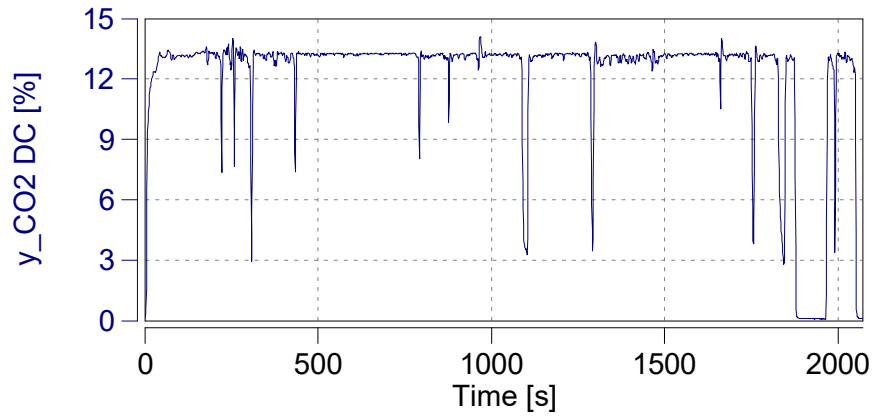


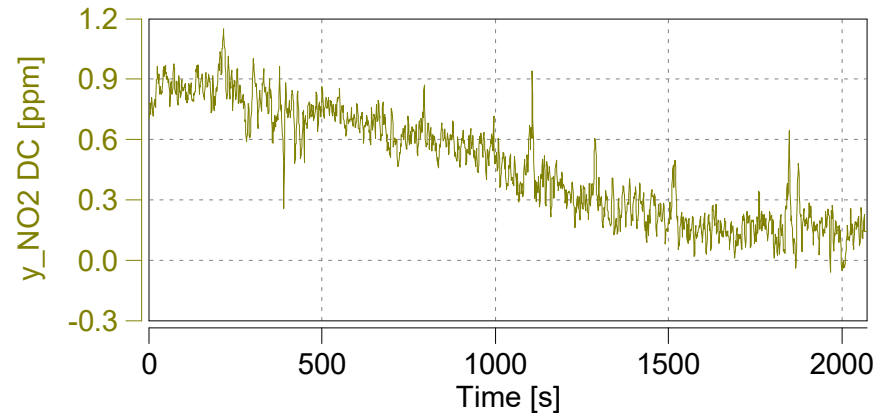
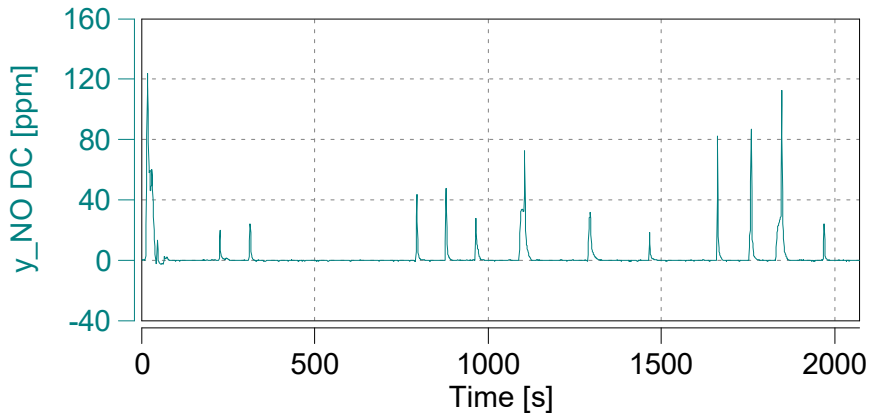
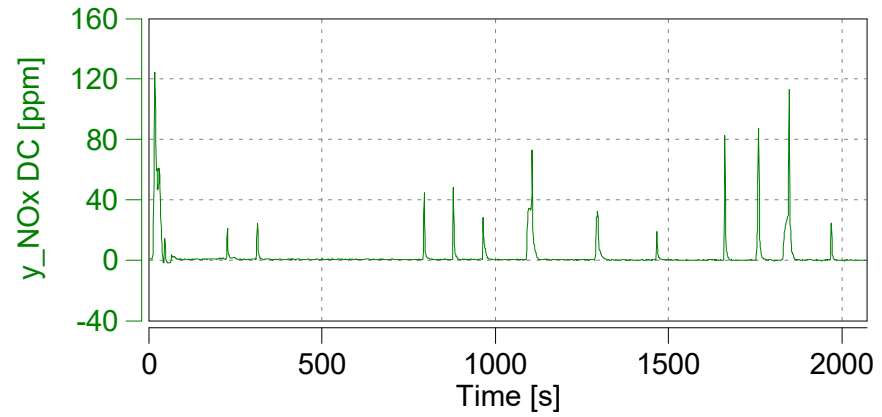
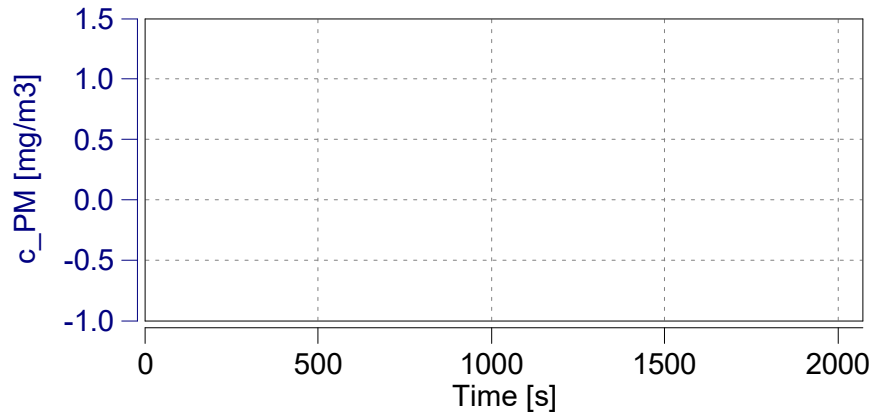


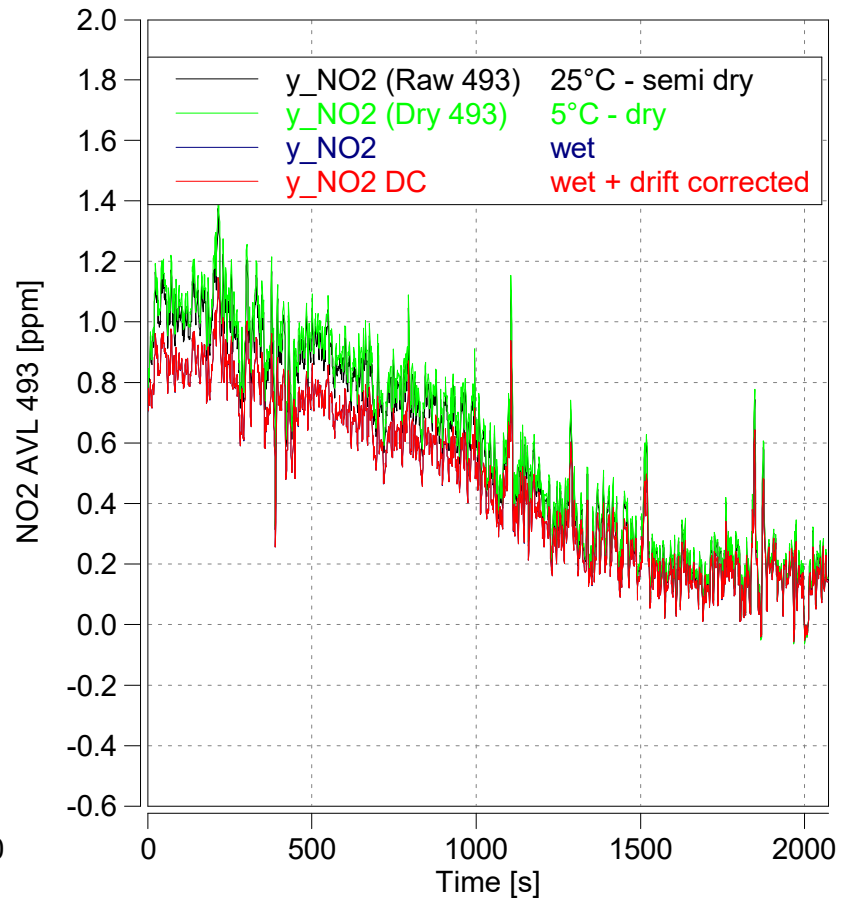
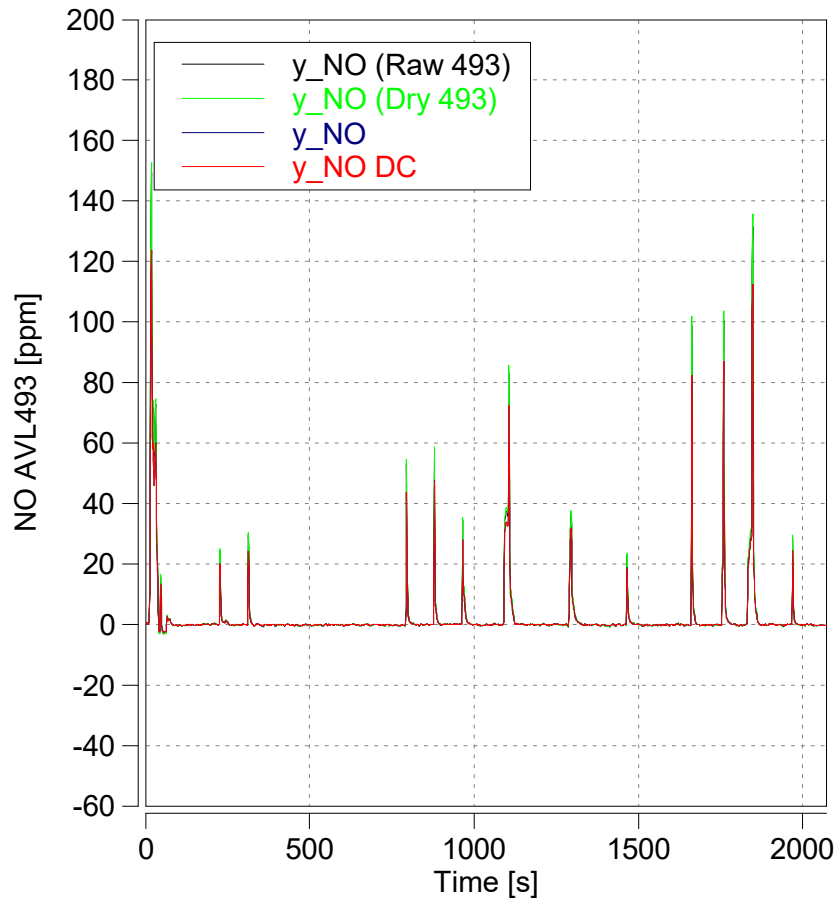




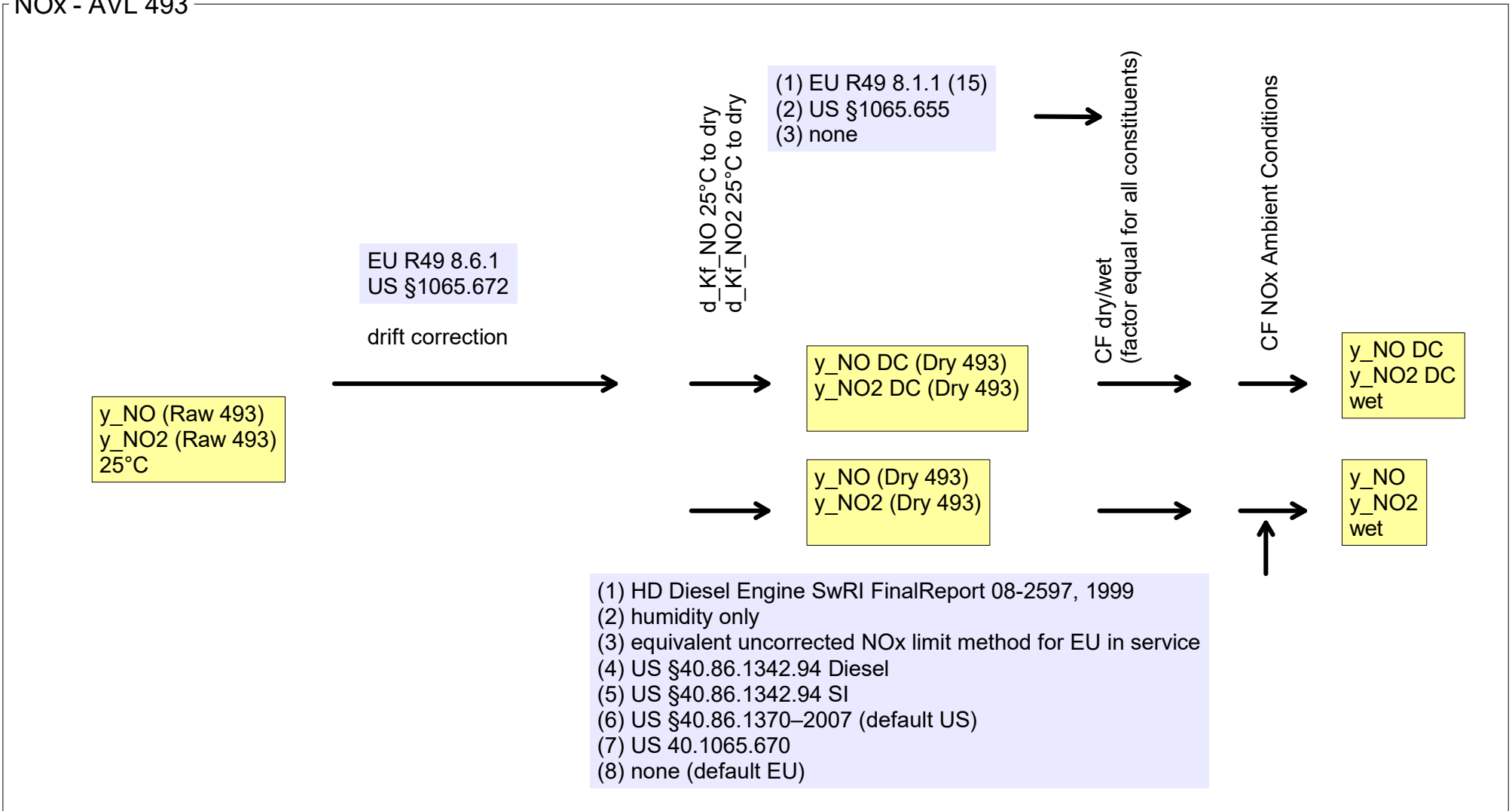


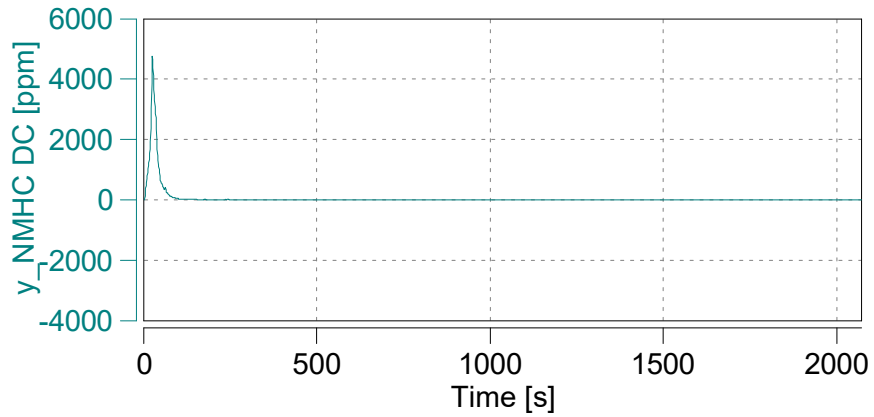
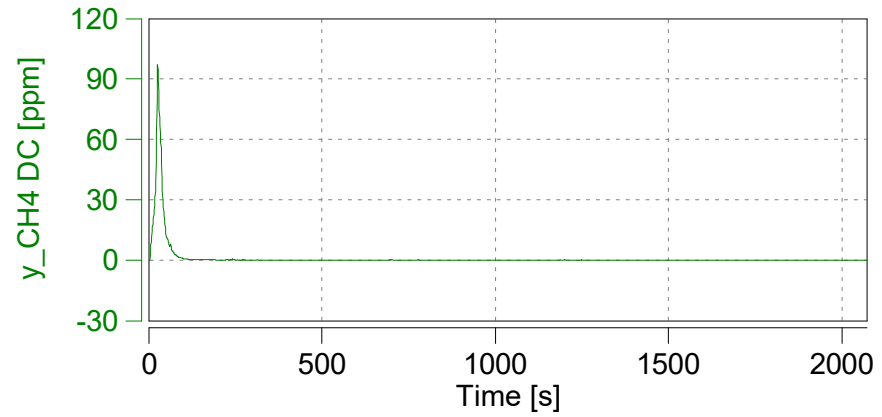
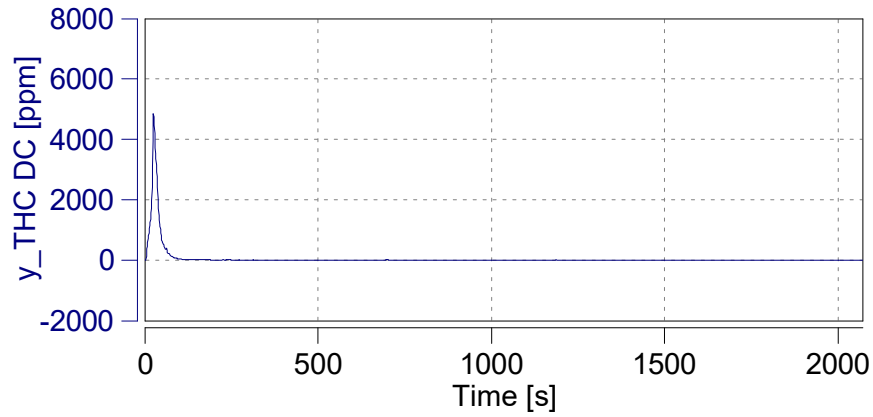


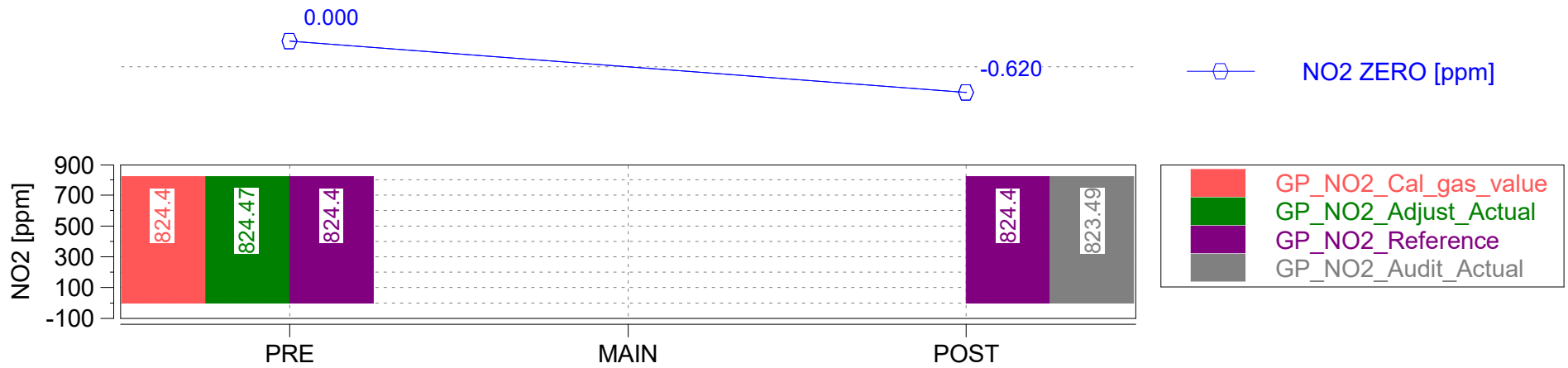
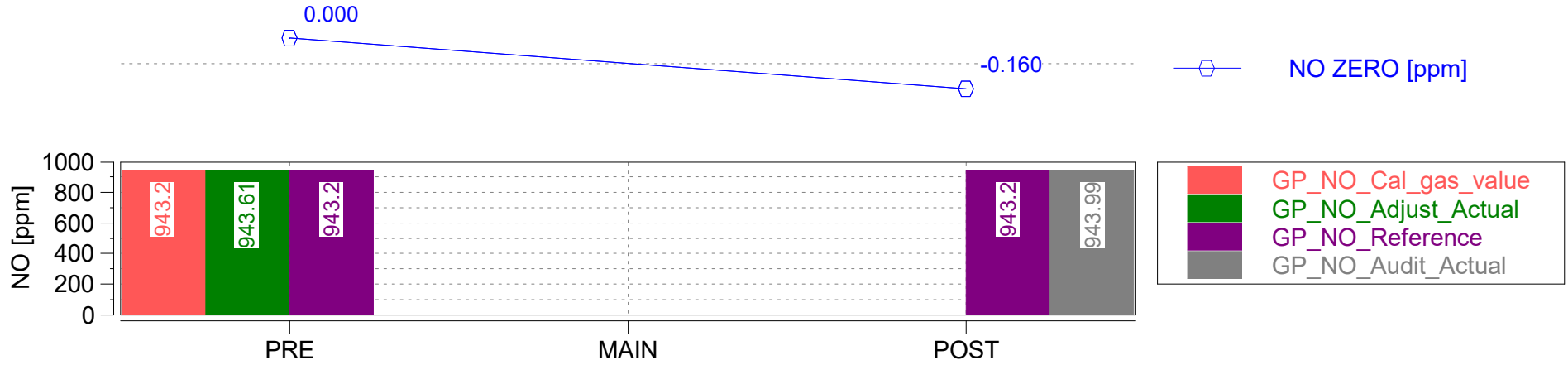


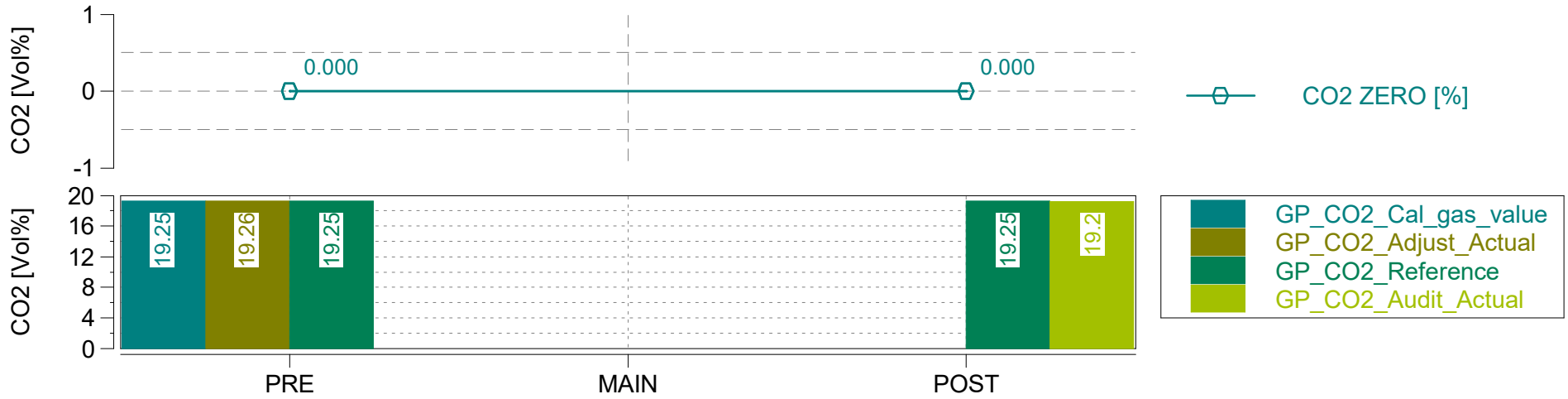
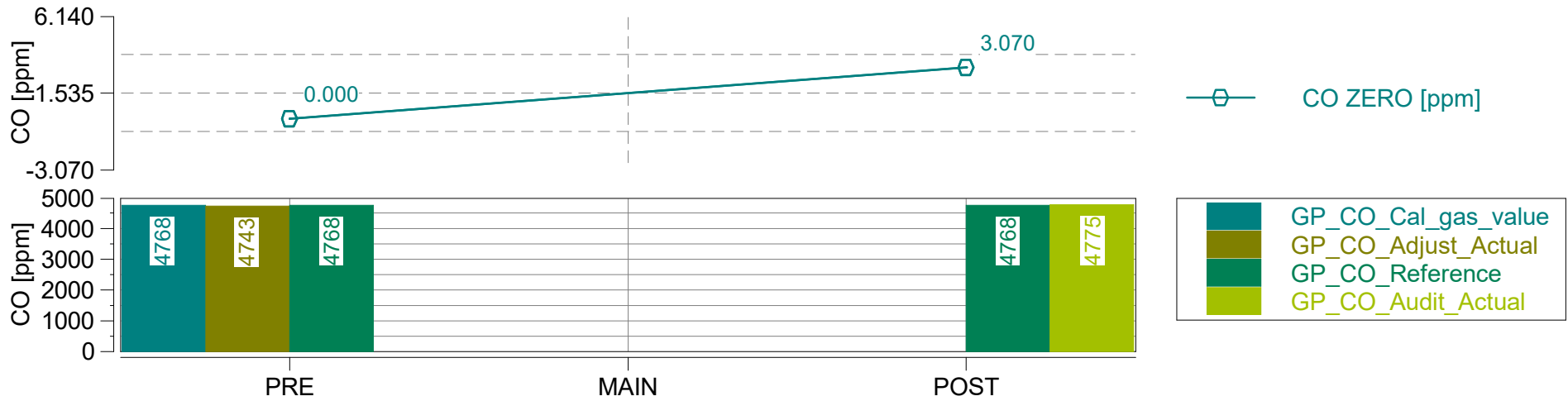


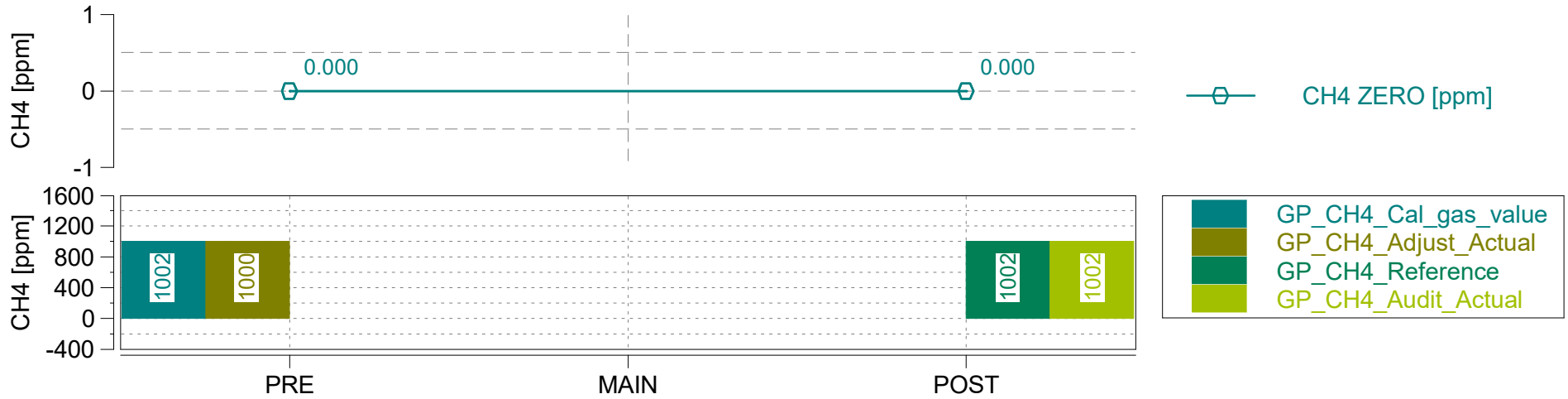
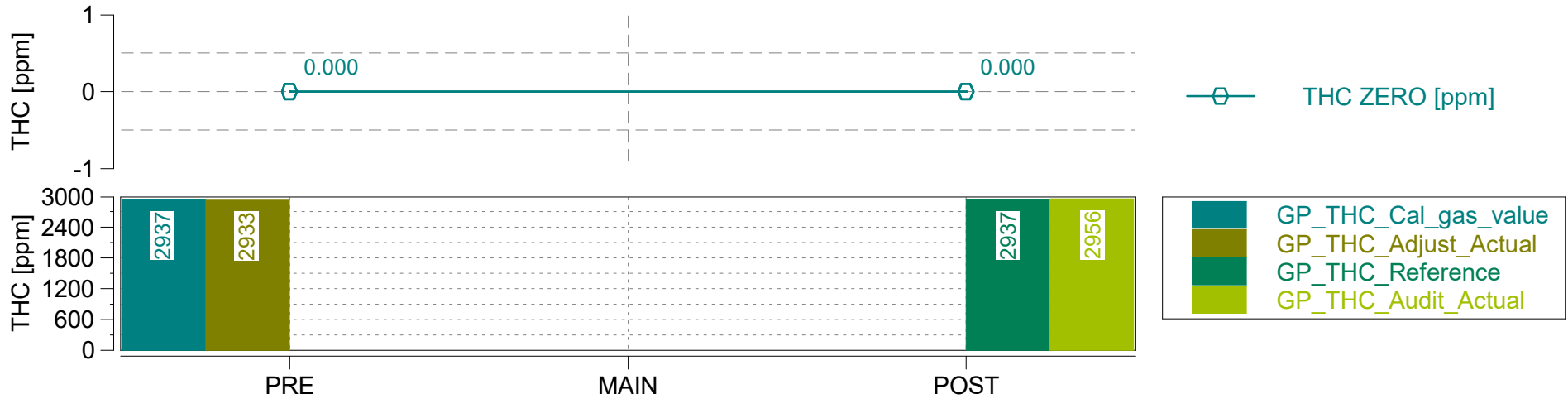
NOx - AVL 493













| § | criterium | condition | value | unit | pass/fail |
|-----------------------|--|--------------------------|-------------|------------|-------------|
| GAS Leak Check | The leakage rate on the vacuum side shall not exceed 0.5 per cent of the in-use flow rate for the portion of the system being checked. | The leakage rate <= 0.5% | 0.10 | % | pass |
| PN Leak Check | n/a | n/a | n/a | n/a | n/a |
| PM Leak Check | n/a | n/a | n/a | n/a | n/a |

GAS PEMS Devices

| | |
|-----------------------|------------|
| Device ID | AVL492 |
| Serial Number | 0182 |
| Firmware Version | V1.17 |
| Main Test Date | 2022-03-07 |
| Leak Check Age [days] | 0 |

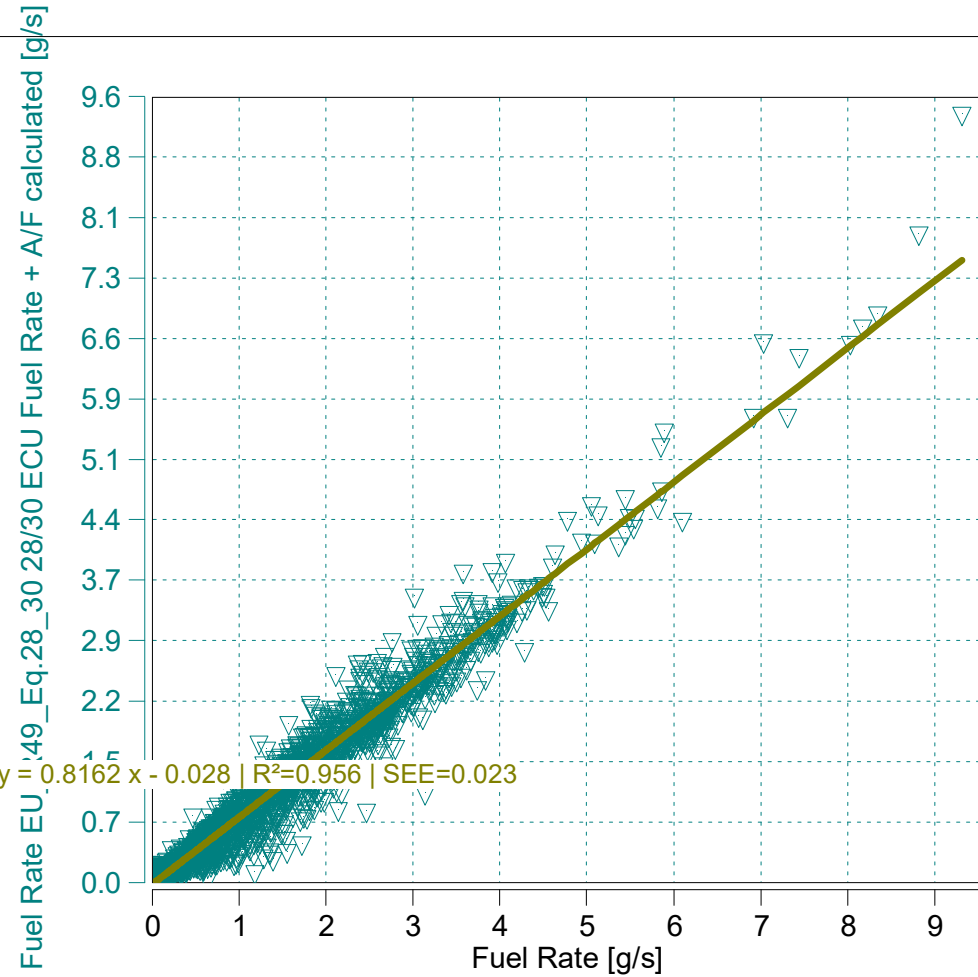
| | |
|------------------|-----------|
| Device ID | AVL4925iS |
| Serial Number | 202 |
| Firmware Version | 1.22.0.4 |

EFM

| | |
|--------------------|--------|
| Device ID | AVL495 |
| Serial Number | 00915 |
| Serial Number Tube | 01115 |
| Firmware Version | V1.16 |

System Control

| | |
|------------------|----------|
| SC Version | V2.9_237 |
| SC Serial Number | 60300923 |



EU 582/2011/Appendix I/3.2.1 | Fuel Rate ECU and calculated

$y = 0.8162x - 0.028$ | $R^2 = 0.956$ | $SEE = 0.023$
 $m = 0.82$ (0.9 - 1.1 recommended)
 $R^2 = 0.96$ (min 0.9 mandatory)

Data from - to [% of Maximum]

0

100



| | | |
|-------------------------------|--------------|--------|
| Trip Duration | 3267.00 | s |
| Trip Duration (a) | 3267.00 | s |
| Trip Distance | 15.94 | mi |
| Trip Distance (a) | 15.94 | mi |
| Trip Fuel Cons. (b) | 2.63 | kg |
| Trip Fuel Cons. (ab) | 2.63 | kg |
| Trip Fuel Cons. EU (ac) | 2.14 | kg |
| Trip Fuel Cons. US (ac) | 2.12 | kg |
| Trip Fuel Economy (b) | 17.17 | mpg_US |
| Trip Fuel Economy (ab) | 17.17 | mpg_US |
| Trip Fuel Economy EU (ac) | 21.10 | mpg_US |
| Trip Fuel Economy US (ac) | 21.24 | mpg_US |
| Trip Fuel Economy GGE (b) | 17.17 | mpg_US |
| Trip Fuel Economy GGE (ab) | 17.17 | mpg_US |
| Trip Fuel Economy EU GGE (ac) | 21.10 | mpg_US |
| Trip Fuel Economy US GGE (ac) | 21.24 | mpg_US |
| Trip Av. Eng. Speed | 1047.42 | rpm |
| Trip Av. Torque | 44.35 | lbft |
| Trip Av. Power | 14.33 | hp |
| Trip Work | | |
| Trip Work (a) | 13.01 | hphr |
| Trip Exhaust Mass | 32.76 | kg |
| Trip Exhaust Mass EU (ac) | 40.67 | kg |
| Trip Exhaust Mass US (ac) | 41.01 | kg |
| Trip Av. Amb. Temperature | 75.50 | deg_F |
| Trip Av. Humidity | 41.14 | % |
| Trip Av. GPS Altitude | 70.32 | m |
| Fuel Type | Petrol (E10) | |

| | | |
|-----------------------------------|------------|------------|
| ave THC | 1.23175 | ppm |
| ave NMHC | 1.20711 | ppm |
| ave CH4 | 0.02463 | ppm |
| ave CO | 225.72961 | ppm |
| ave CO2 | 9.57540 | % |
| ave NOx | 1.88657 | ppm |
| ave PM | n/a | mg/m3 |
| ave Soot meas | n/a | mg/m3 |
| ave Soot | n/a | mg/m3 |
| ave PN | n/a | #/cm3 |
| tot THC | 0.00904 | g |
| tot NMHC | 0.00836 | g |
| tot CH4 | 0.00020 | g |
| tot CO | 11.23097 | g |
| tot CO2 | 6447.56644 | g |
| tot NO (d) | 0.09625 | g |
| tot NO2 | 0.01258 | g |
| tot NOx | 0.10674 | g |
| tot Soot | n/a | g |
| tot Soot meas | n/a | g |
| tot PM | n/a | g |
| tot PN | n/a | # |
| PM measurement type | 0.00000 | - |
| tot Soot on PM filter (estim.) | 0.00000 | mg |
| Soot --> PM simple scaling factor | 1.00000 | - |
| Trip Av. Veh. Speed | 17.56709 | mi/hr |
| Trip Distance Share Urban | 71.74704 | % distance |
| Trip Distance Share Rural | 20.29750 | % distance |
| Trip Distance Share Motorway | 7.95545 | % distance |

| | | |
|--------------|------------|--------|
| BS CO2 | 495.66794 | g/hphr |
| BS CO | 0.86340 | g/hphr |
| BS THC | 0.00069 | g/hphr |
| BS NMHC | 0.00064 | g/hphr |
| BS CH4 | 0.00002 | g/hphr |
| BS NO (d) | 0.00740 | g/hphr |
| BS NO2 | 0.00097 | g/hphr |
| BS NOx | 0.00821 | g/hphr |
| BS Soot | n/a | g/hphr |
| BS Soot meas | n/a | g/hphr |
| BS PM | n/a | g/hphr |
| BS PN | n/a | #/hpr |
| DS CO2 | 404.43563 | g/mi |
| DS CO | 0.70448 | g/mi |
| DS THC | 0.00057 | g/mi |
| DS NMHC | 0.00052 | g/mi |
| DS CH4 | 0.00001 | g/mi |
| DS NO (d) | 0.00604 | g/mi |
| DS NO2 | 0.00079 | g/mi |
| DS NOx | 0.00670 | g/mi |
| DS Soot | n/a | g/mi |
| DS Soot meas | n/a | g/mi |
| DS PM | n/a | g/mi |
| DS PN | n/a | #/mi |
| FS CO2 | 2453.92387 | g/kg |
| FS CO | 4.27447 | g/kg |
| FS THC | 0.00344 | g/kg |
| FS NMHC | 0.00318 | g/kg |
| FS CH4 | 0.00008 | g/kg |
| FS NO (d) | 0.03663 | g/kg |
| FS NO2 | 0.00479 | g/kg |
| FS NOx | 0.04062 | g/kg |
| FS Soot | n/a | g/kg |
| FS Soot meas | n/a | g/kg |
| FS PM | n/a | g/kg |
| FS PN | n/a | #/kg |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents



| | | |
|-------------------------------|--------------|--------|
| Trip Duration | 3267.00 | s |
| Trip Duration (a) | 3267.00 | s |
| Trip Distance | 15.94 | mi |
| Trip Distance (a) | 15.94 | mi |
| Trip Fuel Cons. (b) | 2.63 | kg |
| Trip Fuel Cons. (ab) | 2.63 | kg |
| Trip Fuel Cons. EU (ac) | 2.14 | kg |
| Trip Fuel Cons. US (ac) | 2.12 | kg |
| Trip Fuel Economy (b) | 17.17 | mpg_US |
| Trip Fuel Economy (ab) | 17.17 | mpg_US |
| Trip Fuel Economy EU (ac) | 21.10 | mpg_US |
| Trip Fuel Economy US (ac) | 21.24 | mpg_US |
| Trip Fuel Economy GGE (b) | 17.17 | mpg_US |
| Trip Fuel Economy GGE (ab) | 17.17 | mpg_US |
| Trip Fuel Economy EU GGE (ac) | 21.10 | mpg_US |
| Trip Fuel Economy US GGE (ac) | 21.24 | mpg_US |
| Trip Av. Eng. Speed | 1047.42 | rpm |
| Trip Av. Torque | 44.35 | lbft |
| Trip Av. Power | 14.33 | hp |
| Trip Work | | |
| Trip Work (a) | 13.01 | hphr |
| Trip Exhaust Mass | 32.76 | kg |
| Trip Exhaust Mass EU (ac) | 40.67 | kg |
| Trip Exhaust Mass US (ac) | 41.01 | kg |
| Trip Av. Amb. Temperature | 75.50 | deg_F |
| Trip Av. Humidity | 41.14 | % |
| Trip Av. GPS Altitude | 70.32 | m |
| Fuel Type | Petrol (E10) | |

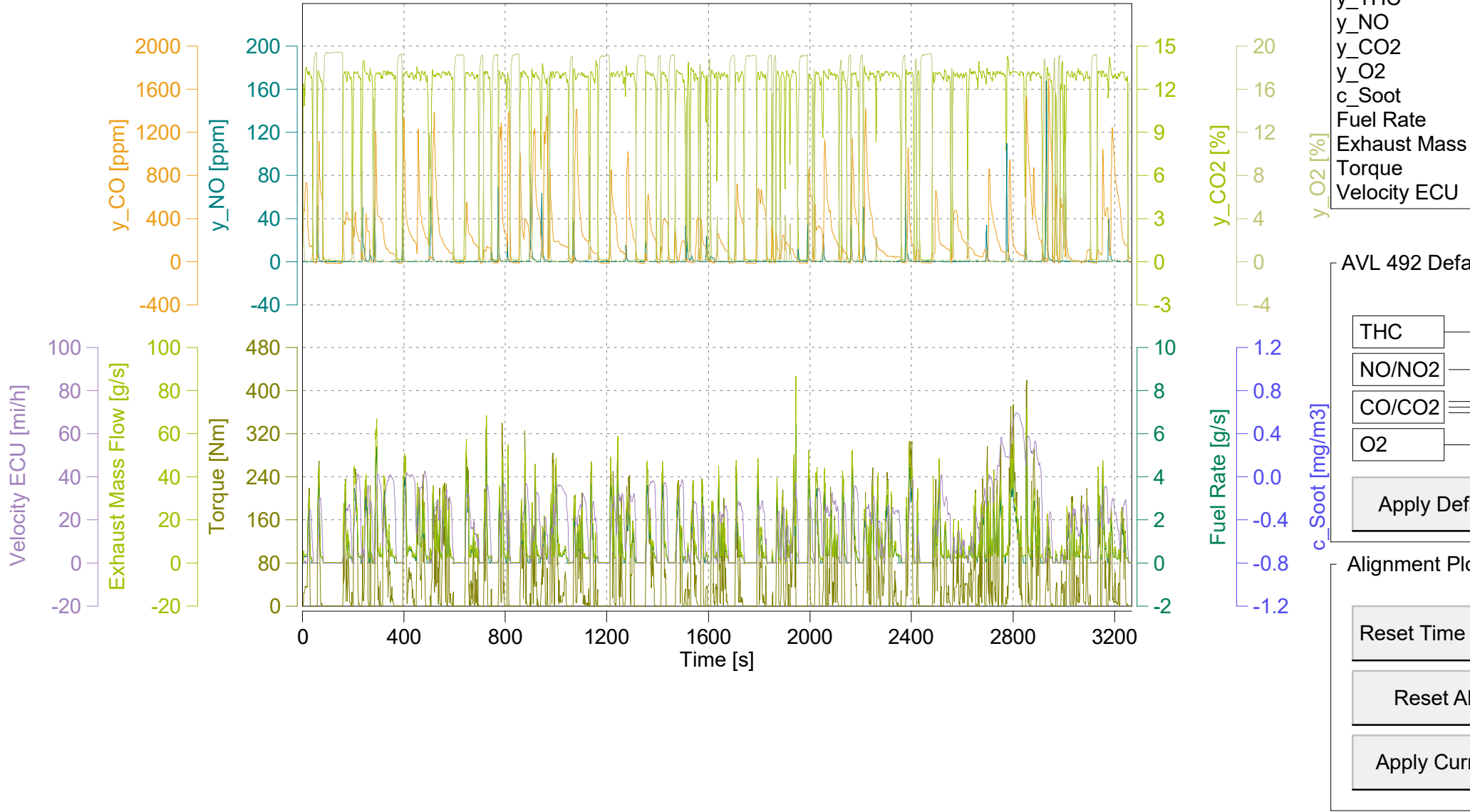
| | | |
|-----------------------------------|------------|------------|
| ave THC DC | 1.22857 | ppm |
| ave NMHC DC | 1.20400 | ppm |
| ave CH4 DC | 0.02457 | ppm |
| ave CO DC | 226.14153 | ppm |
| ave CO2 DC | 9.57540 | % |
| ave NOx DC | 1.88665 | ppm |
| ave PM | n/a | mg/m3 |
| ave Soot meas | n/a | mg/m3 |
| ave Soot | n/a | mg/m3 |
| ave PN DC | | |
| tot THC DC | 0.00901 | g |
| tot NMHC DC | 0.00834 | g |
| tot CH4 DC | 0.00020 | g |
| tot CO DC | 11.25147 | g |
| tot CO2 DC | 6447.56644 | g |
| tot NO DC (d) | 0.09625 | g |
| tot NO2 DC | 0.01259 | g |
| tot NOx DC | 0.10674 | g |
| tot Soot | n/a | g |
| tot Soot meas | n/a | g |
| tot PM | n/a | g |
| tot PN DC | | |
| PM measurement type | 0.00000 | - |
| tot Soot on PM filter (estim.) | 0.00000 | mg |
| Soot --> PM simple scaling factor | 1.00000 | - |
| Trip Av. Veh. Speed | 17.56709 | mi/hr |
| Trip Distance Share Urban | 71.74704 | % distance |
| Trip Distance Share Rural | 20.29750 | % distance |
| Trip Distance Share Motorway | 7.95545 | % distance |

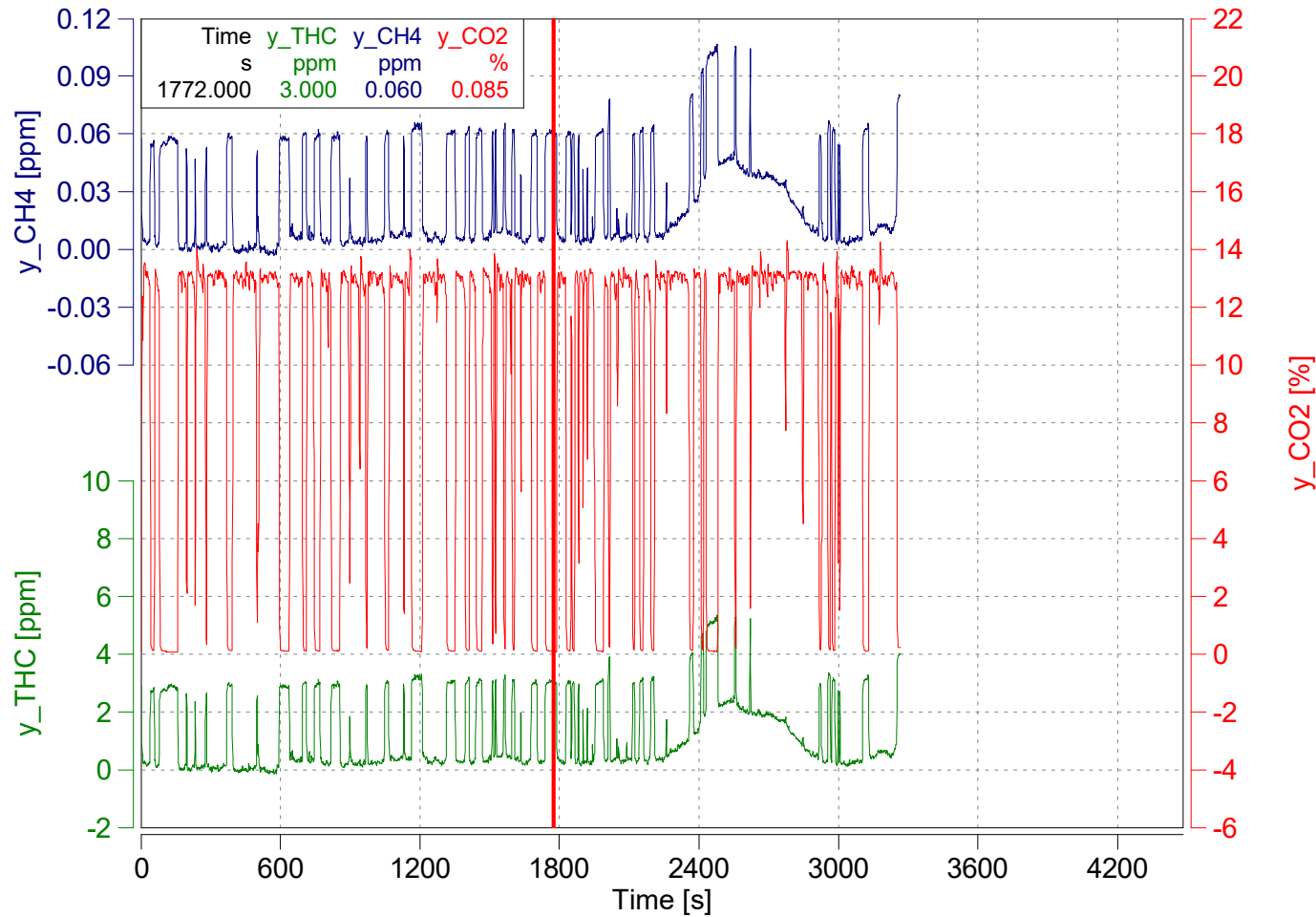
| | | |
|--------------|------------|--------|
| BS CO2 DC | 495.66794 | g/hphr |
| BS CO DC | 0.86498 | g/hphr |
| BS THC DC | 0.00069 | g/hphr |
| BS NMHC DC | 0.00064 | g/hphr |
| BS CH4 DC | 0.00002 | g/hphr |
| BS NO DC (d) | 0.00740 | g/hphr |
| BS NO2 DC | 0.00097 | g/hphr |
| BS NOx DC | 0.00821 | g/hphr |
| BS Soot | n/a | g/hphr |
| BS Soot meas | n/a | g/hphr |
| BS PM | n/a | g/hphr |
| BS PN DC | | |
| DS CO2 DC | 404.43563 | g/mi |
| DS CO DC | 0.70577 | g/mi |
| DS THC DC | 0.00057 | g/mi |
| DS NMHC DC | 0.00052 | g/mi |
| DS CH4 DC | 0.00001 | g/mi |
| DS NO DC (d) | 0.00604 | g/mi |
| DS NO2 DC | 0.00079 | g/mi |
| DS NOx DC | 0.00670 | g/mi |
| DS Soot | n/a | g/mi |
| DS Soot meas | n/a | g/mi |
| DS PM | n/a | g/mi |
| DS PN DC | | |
| FS CO2 DC | 2453.92387 | g/kg |
| FS CO DC | 4.28227 | g/kg |
| FS THC DC | 0.00343 | g/kg |
| FS NMHC DC | 0.00317 | g/kg |
| FS CH4 DC | 0.00008 | g/kg |
| FS NO DC (d) | 0.03663 | g/kg |
| FS NO2 DC | 0.00479 | g/kg |
| FS NOx DC | 0.04062 | g/kg |
| FS Soot | n/a | g/kg |
| FS Soot meas | n/a | g/kg |
| FS PM | n/a | g/kg |
| FS PN DC | | |

(a) GAS PEMS measurement state only, (b) based on fuel rate input (ECU, Fuel Meter), (c) Based on A/F ratio (eq 28-32 - R49)
(d) NO calculated using molecular weight of NO2, GGE=Gasoline Gallon Equivalents



Concerto Absolute Time



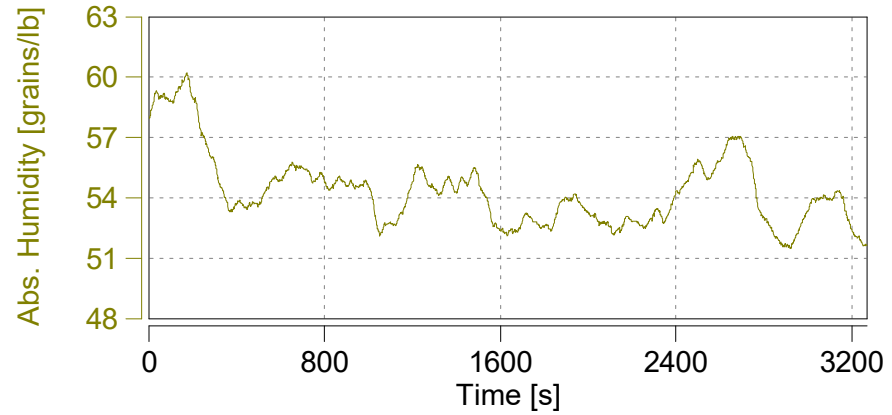
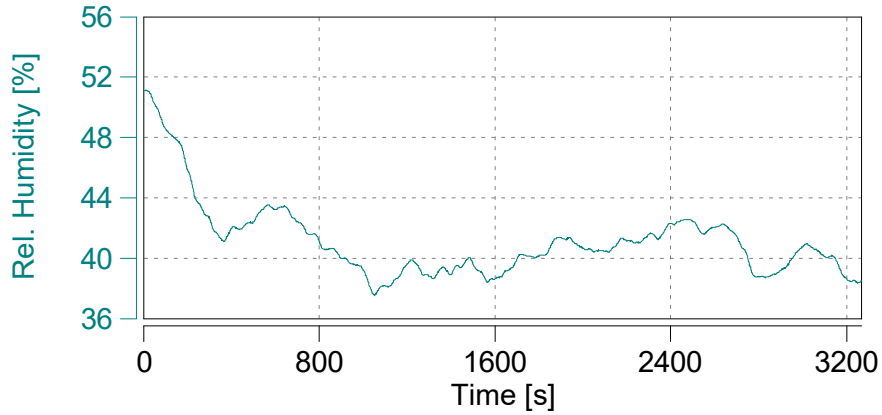
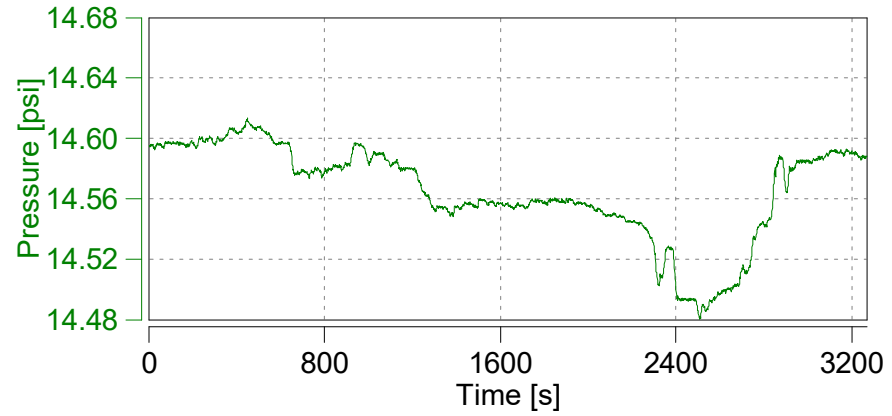
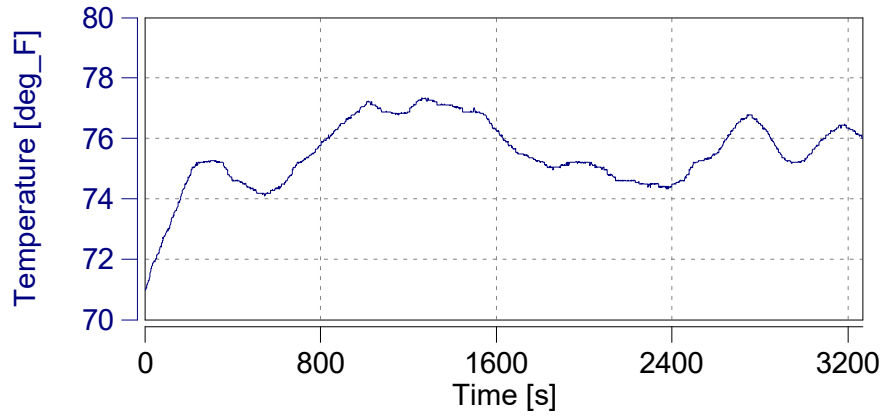


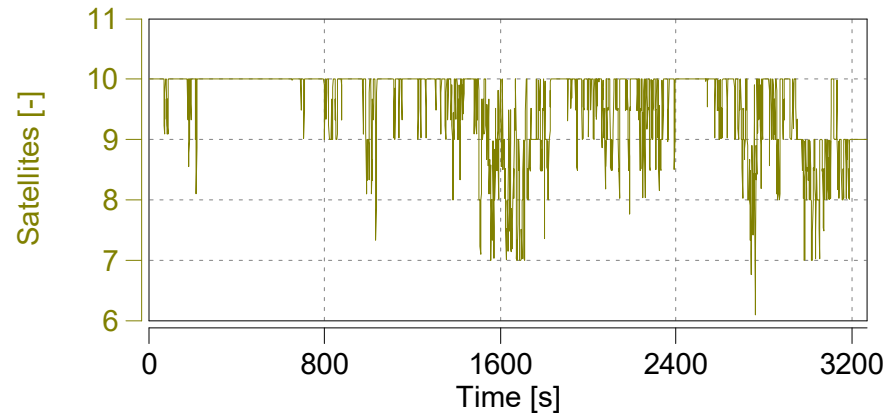
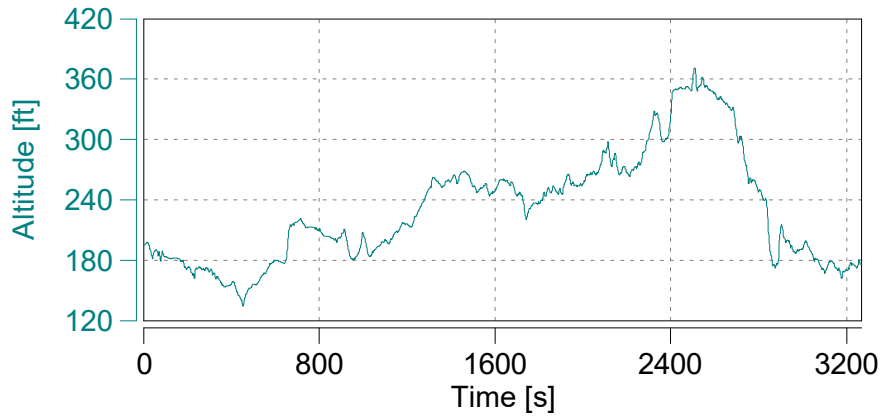
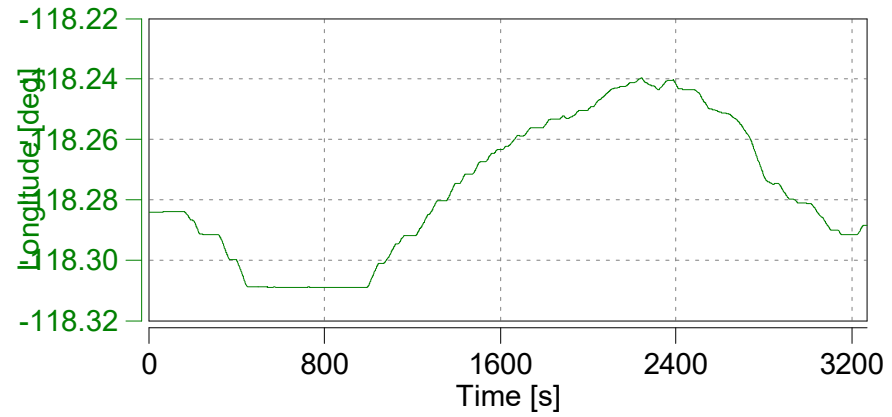
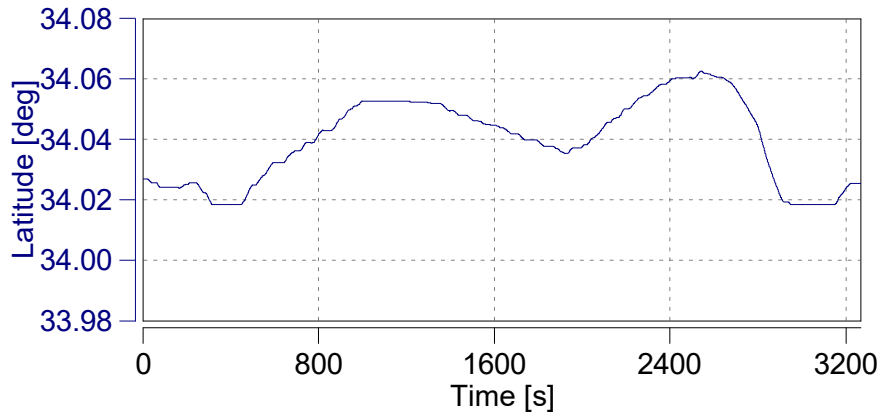
Absolute Time Shifts

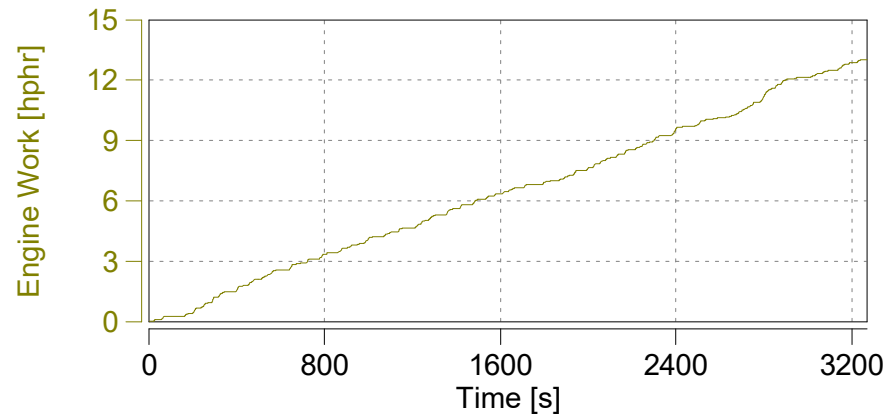
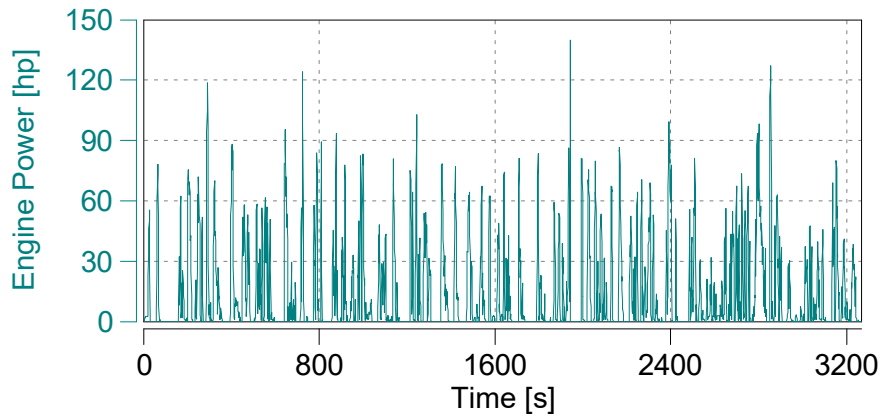
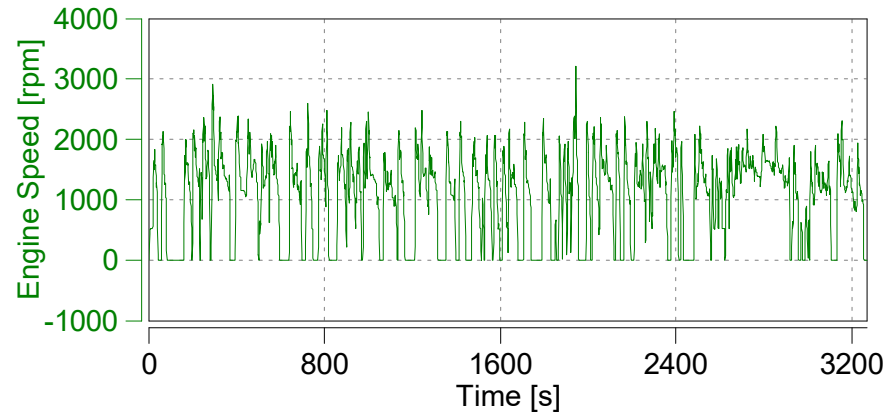
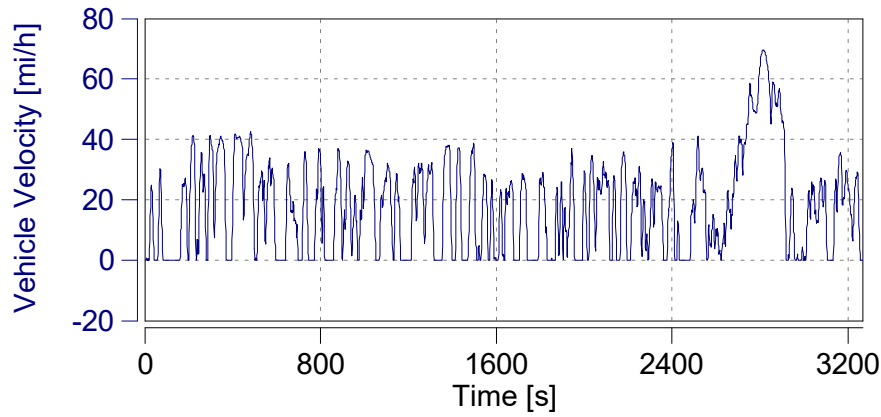
| | | |
|-------|---|------|
| y_THC | s | -4.3 |
| y_CH4 | s | -6.3 |

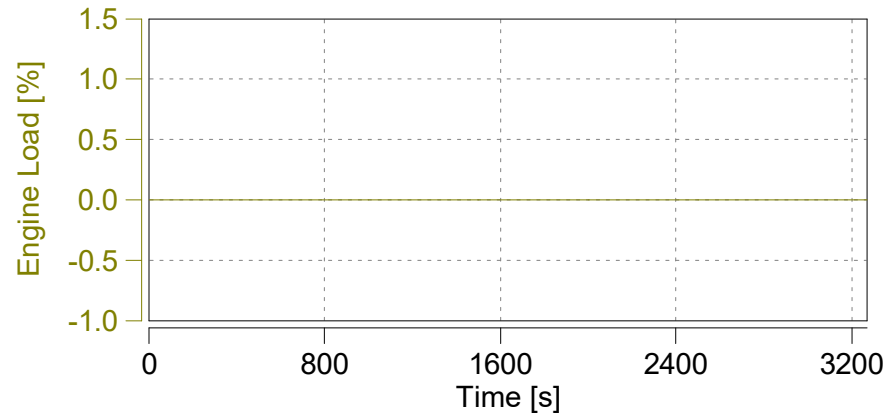
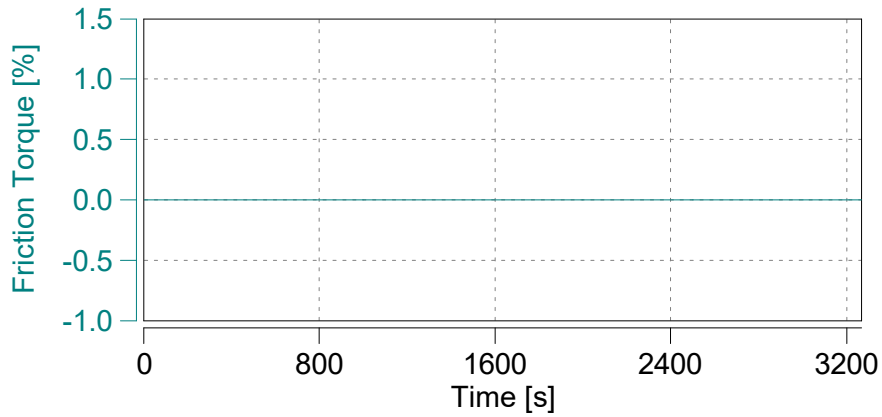
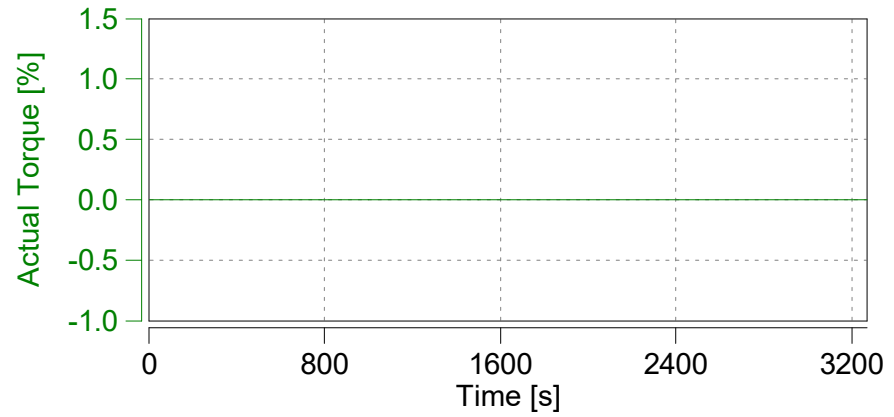
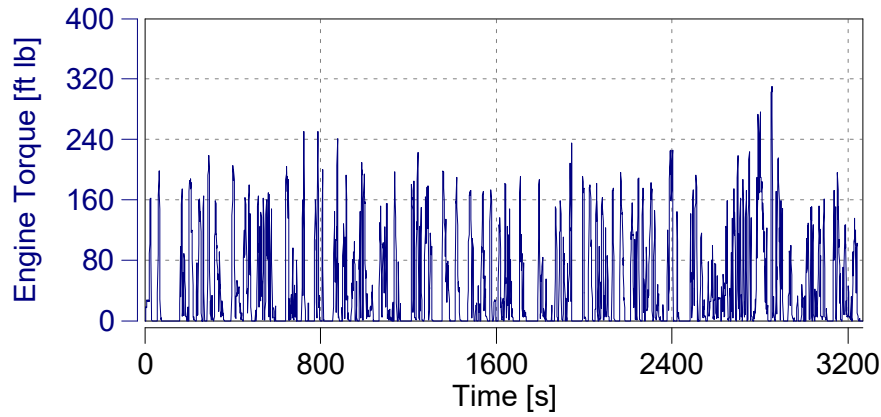
Reset Time Shifts in Plot

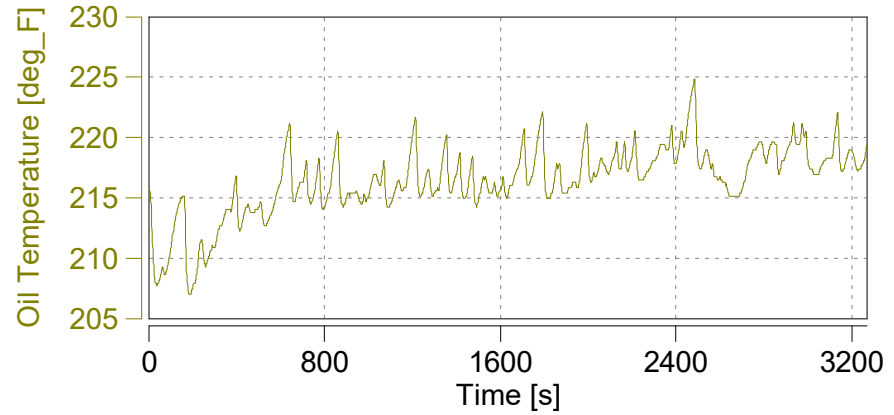
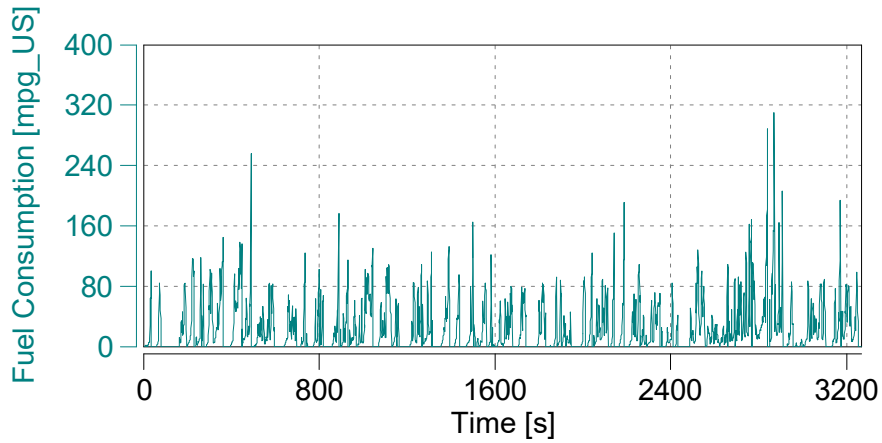
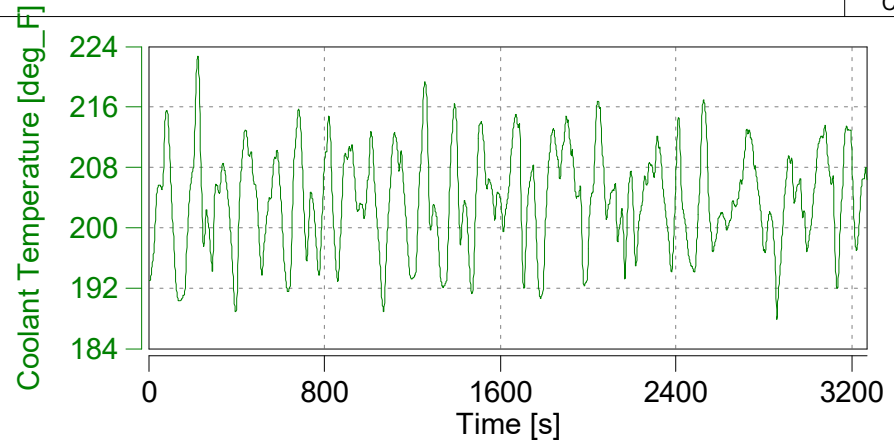
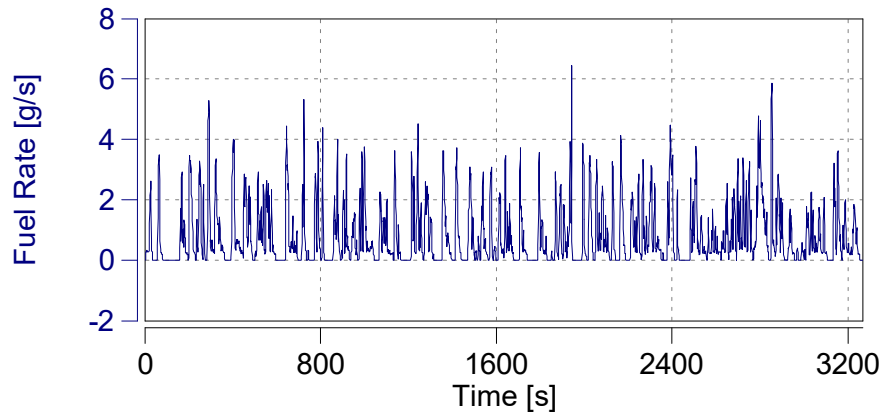
Apply Current Values

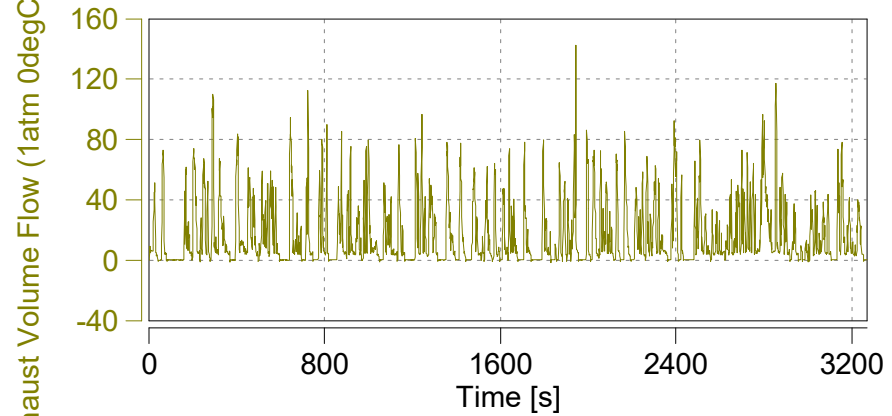
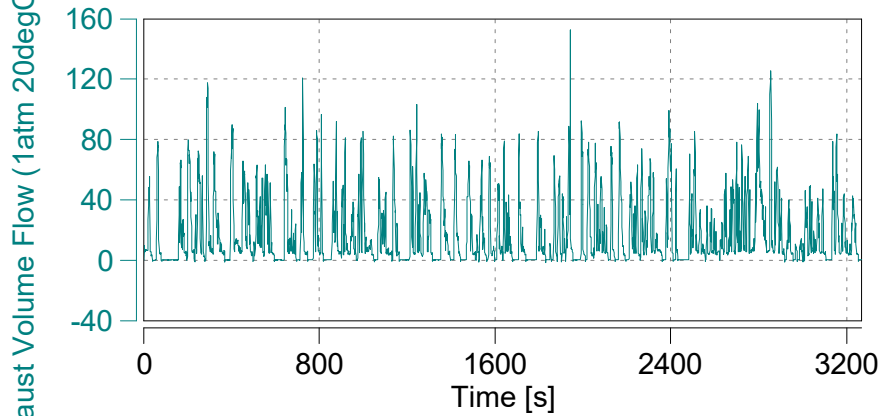
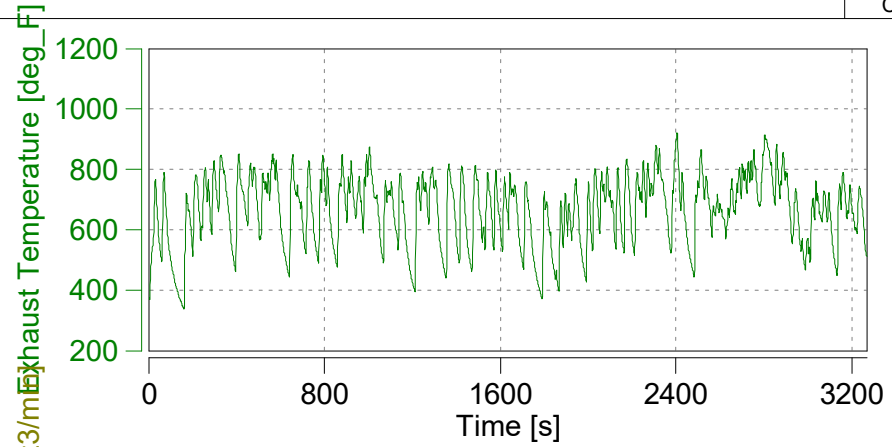
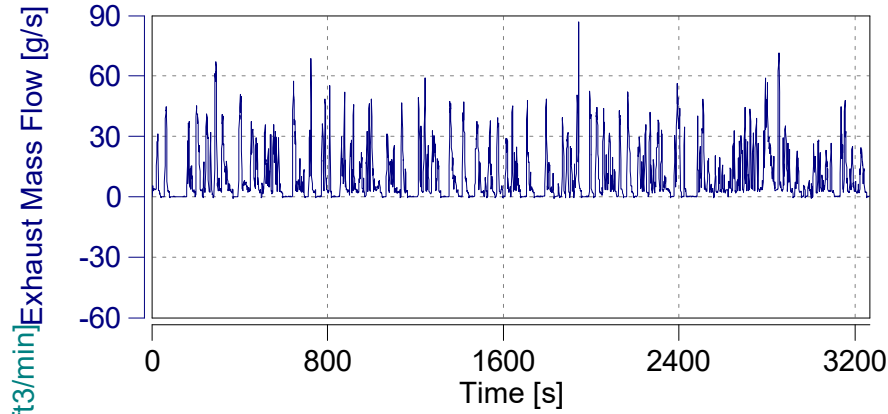


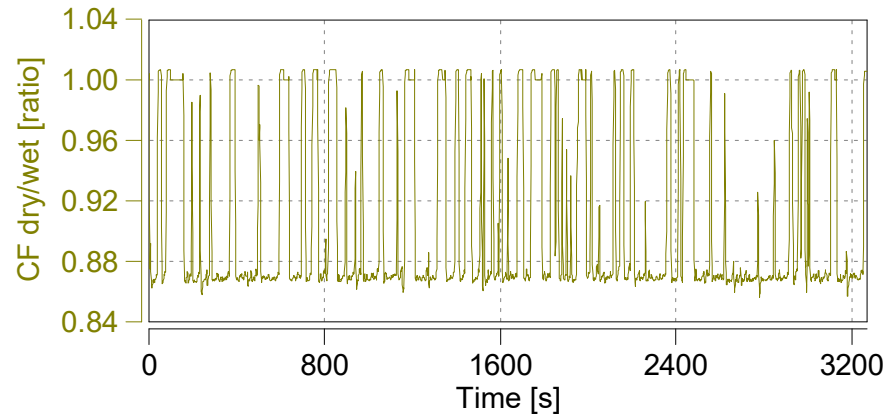
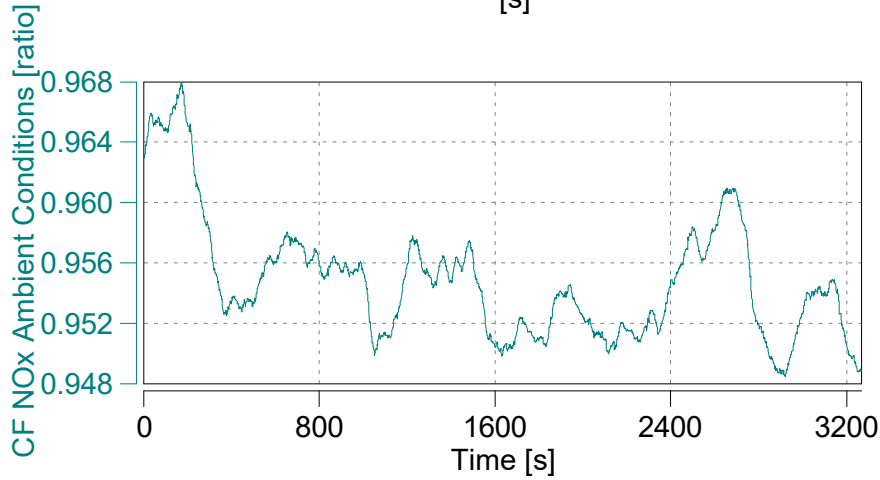
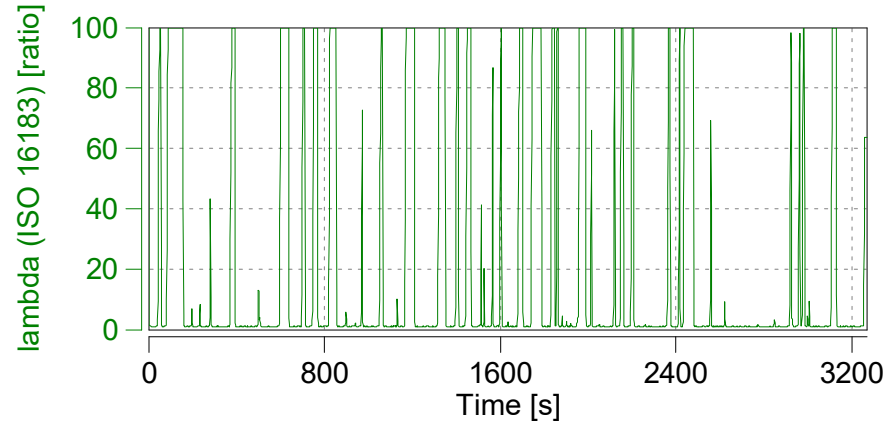
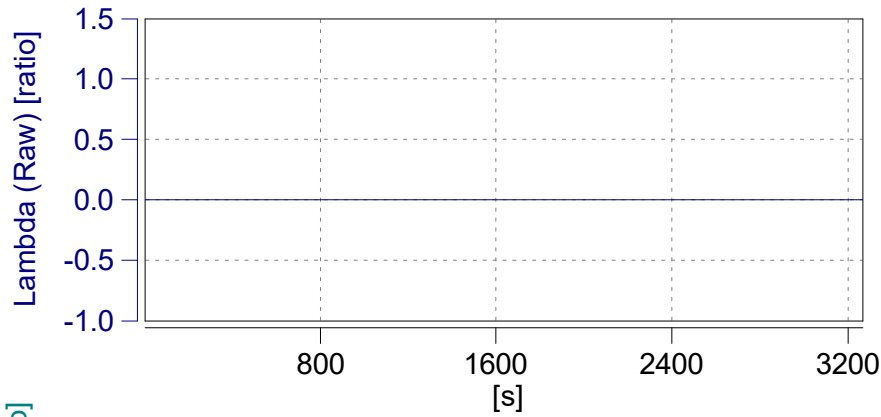


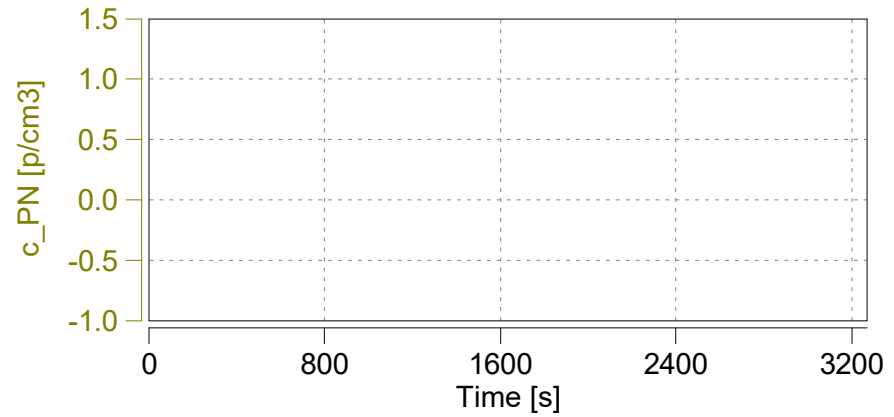
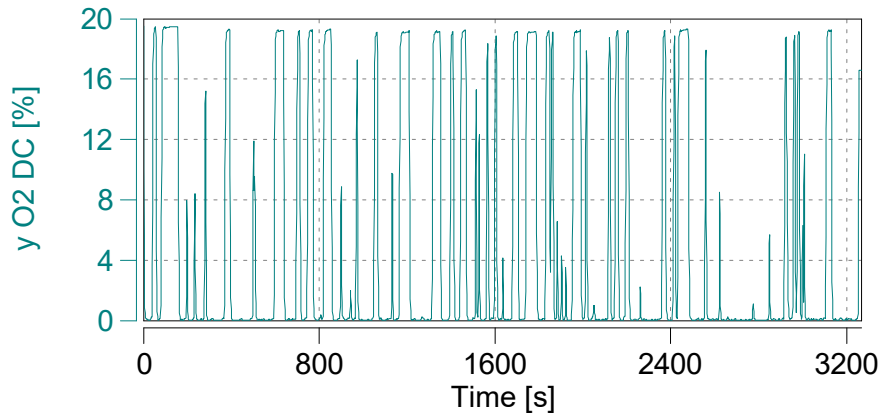
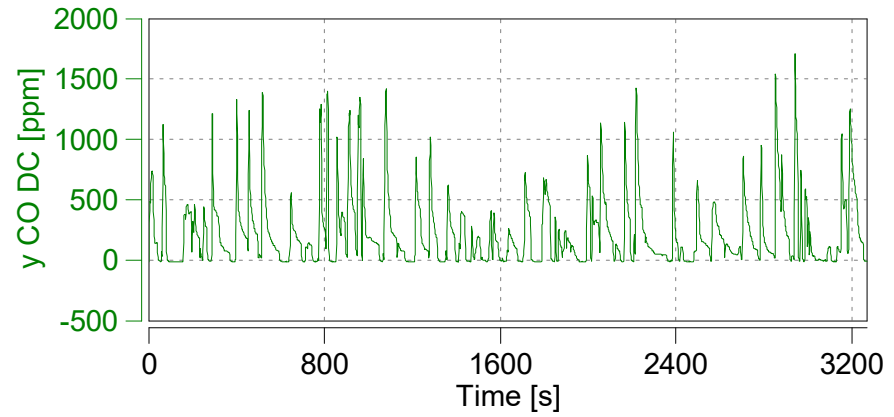
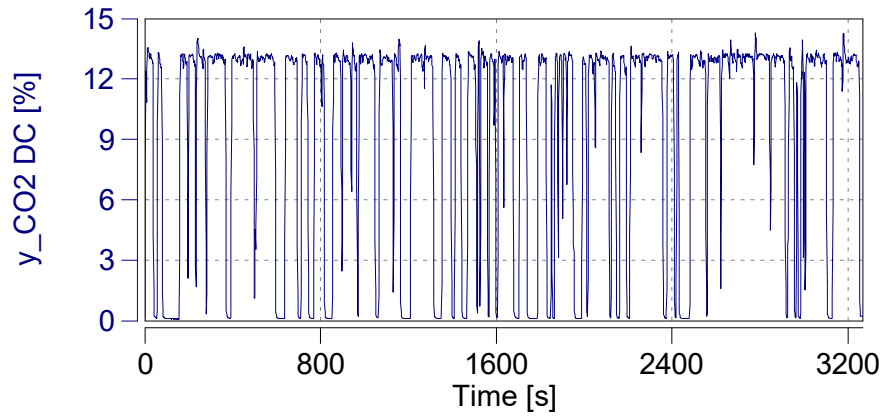


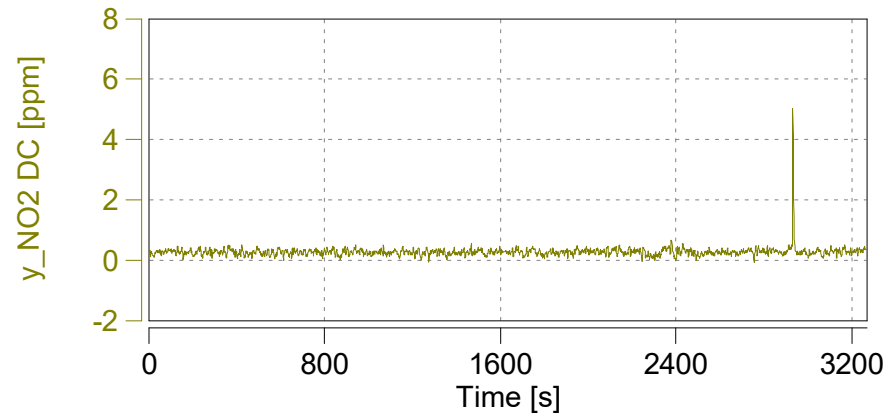
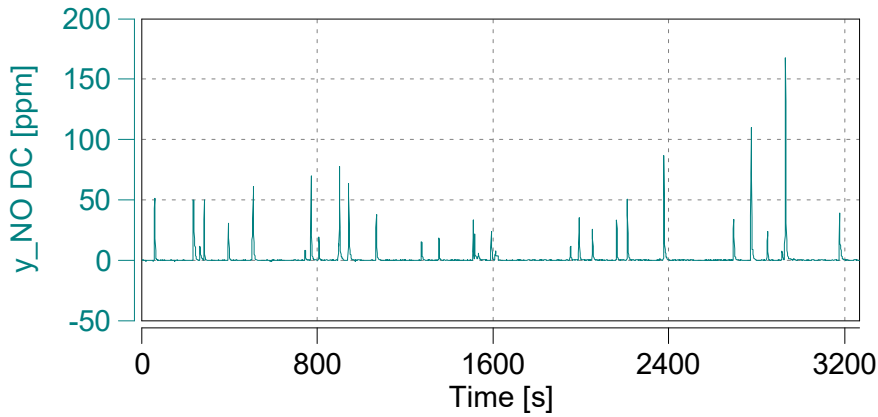
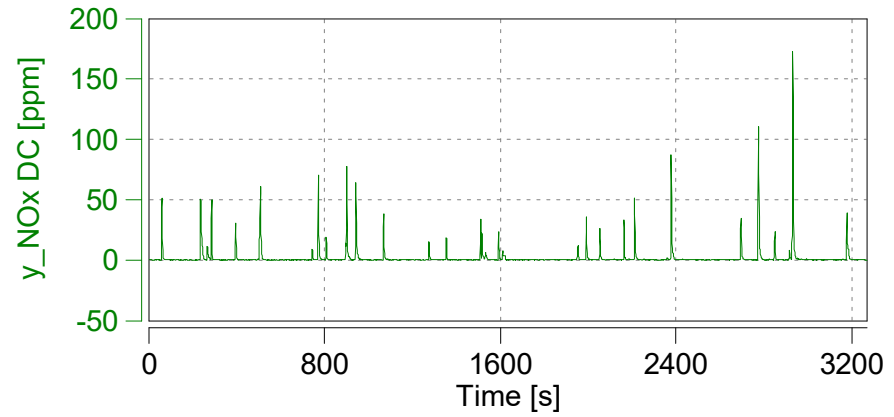
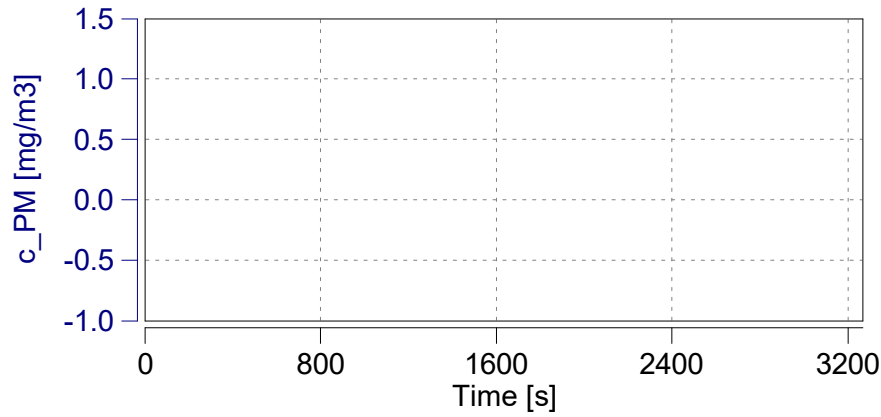


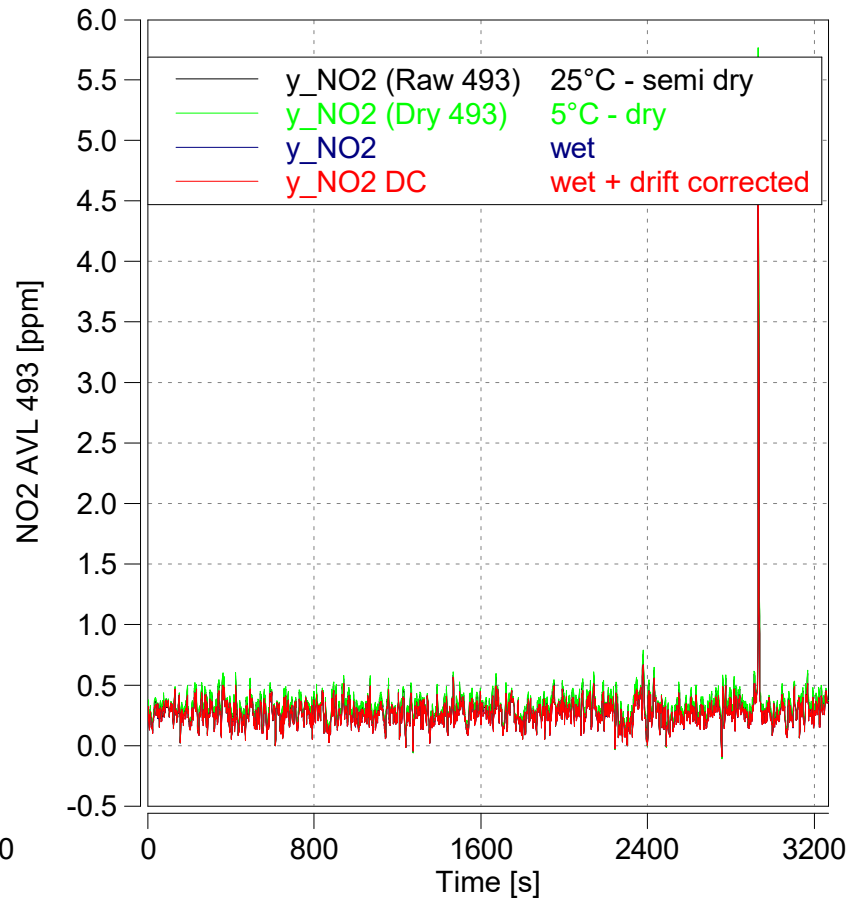
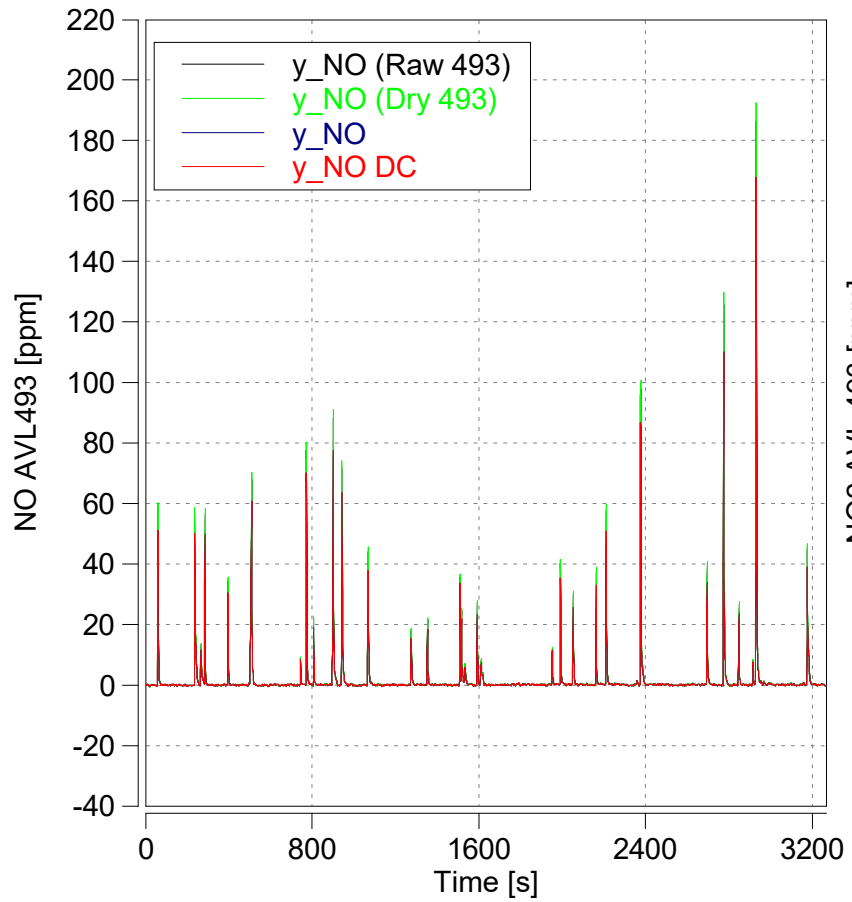




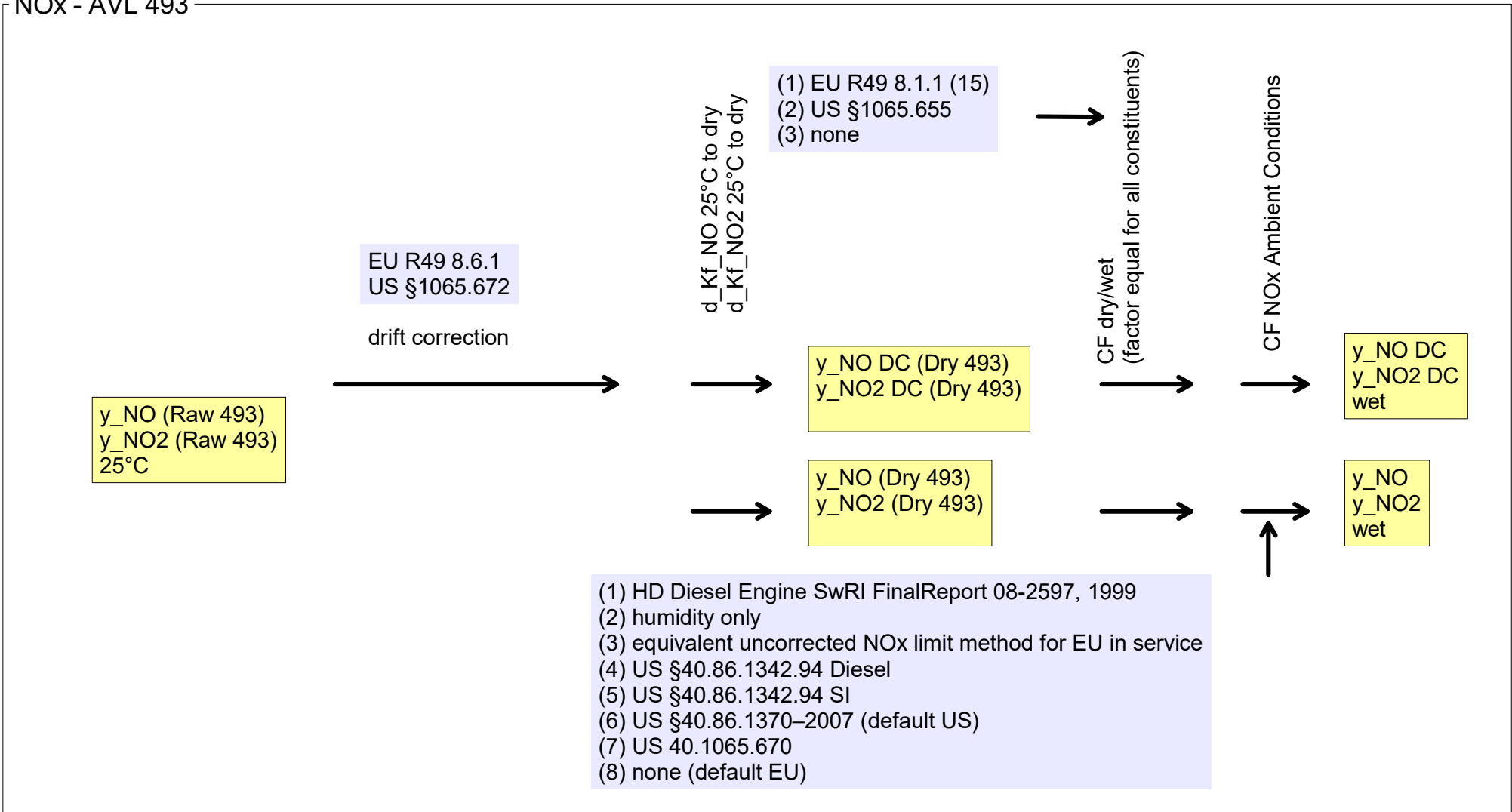


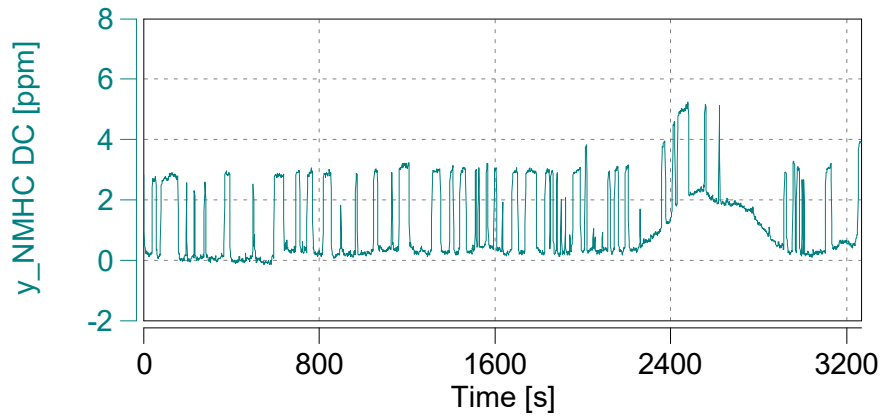
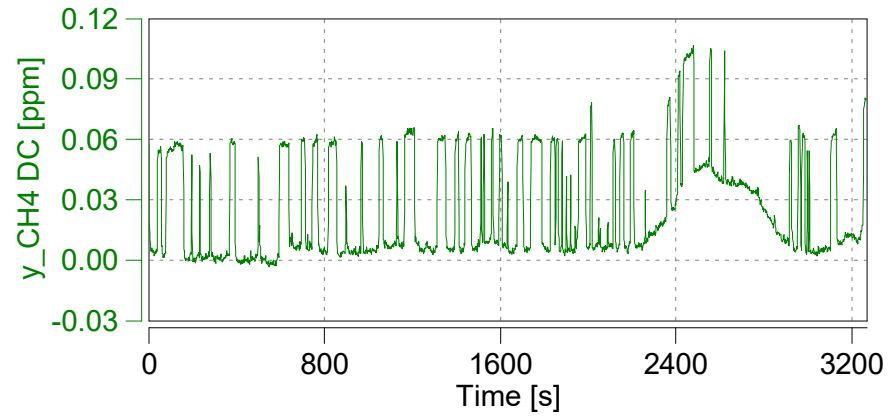
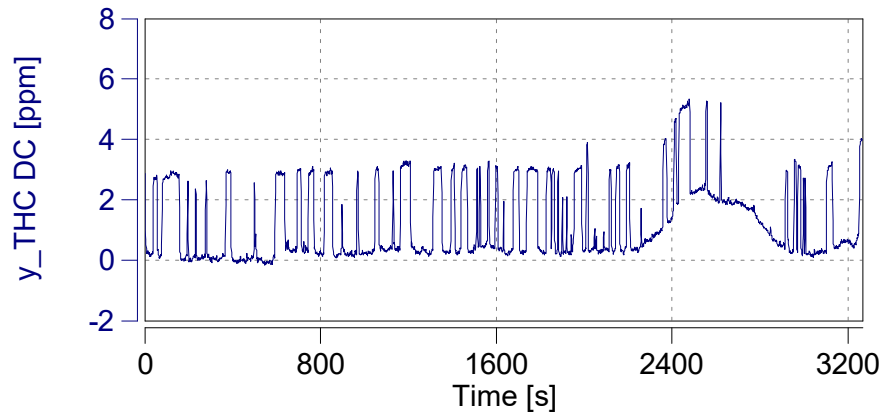


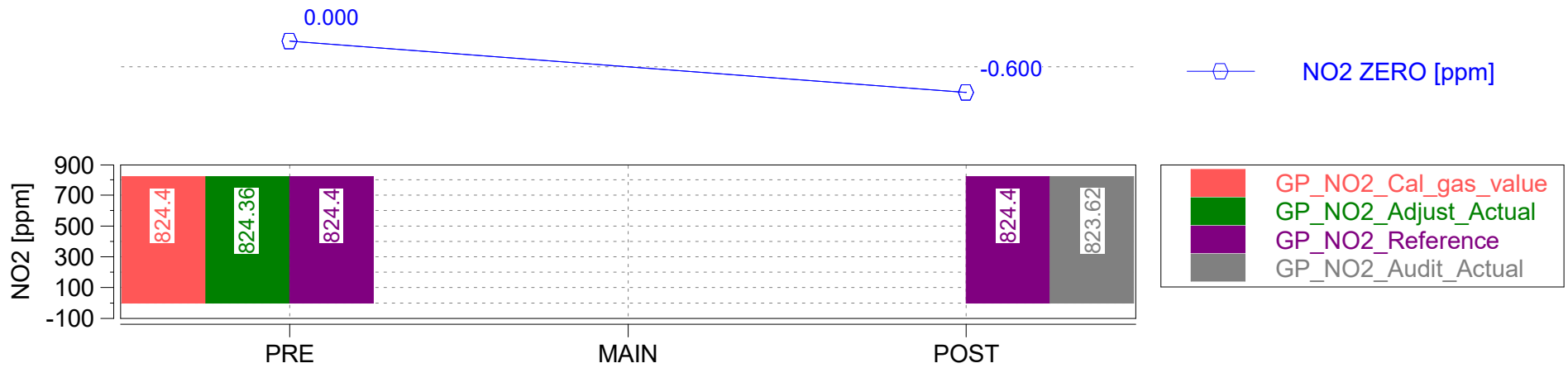
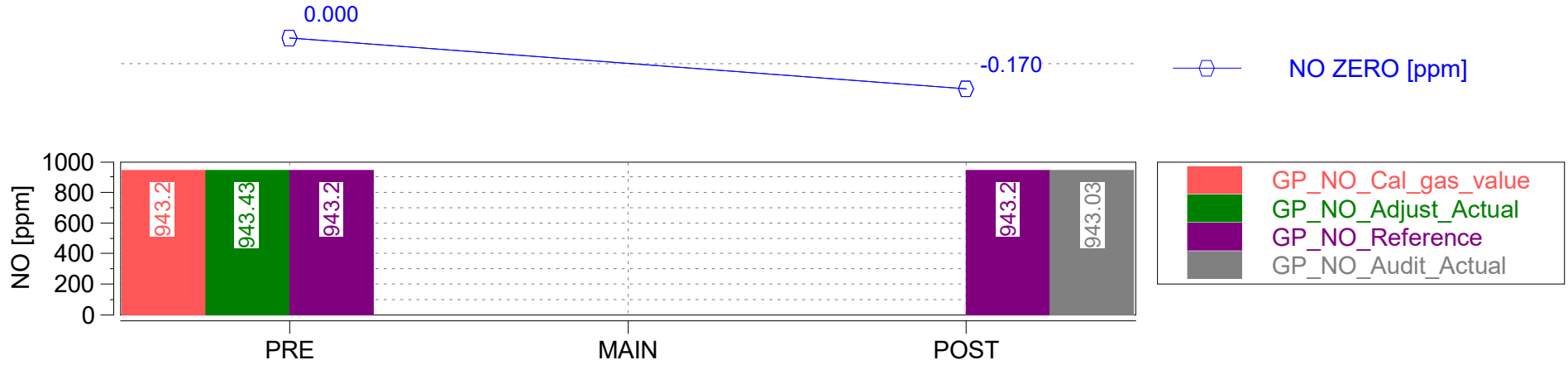


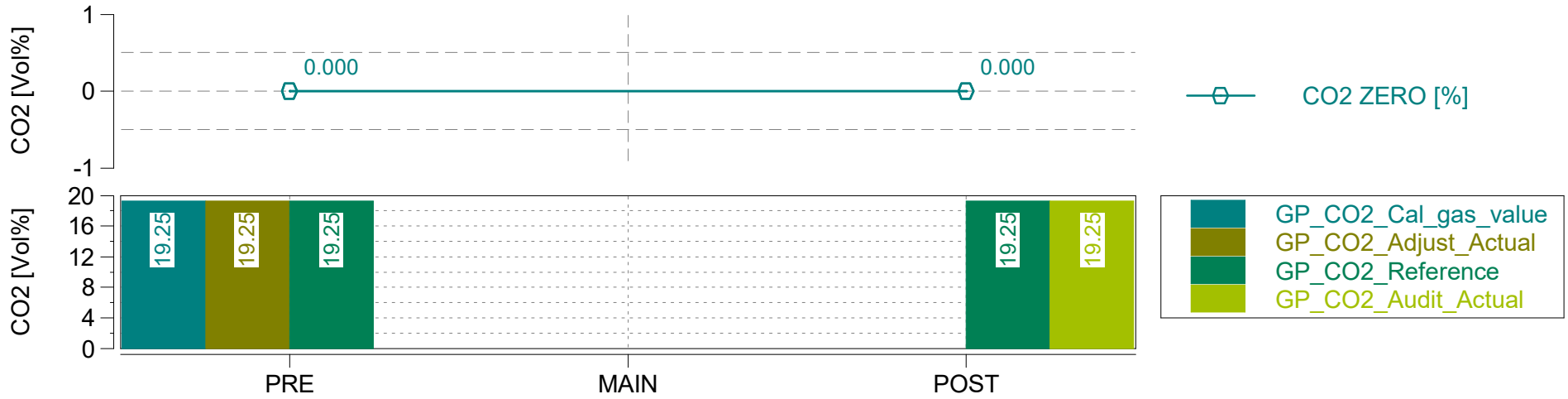
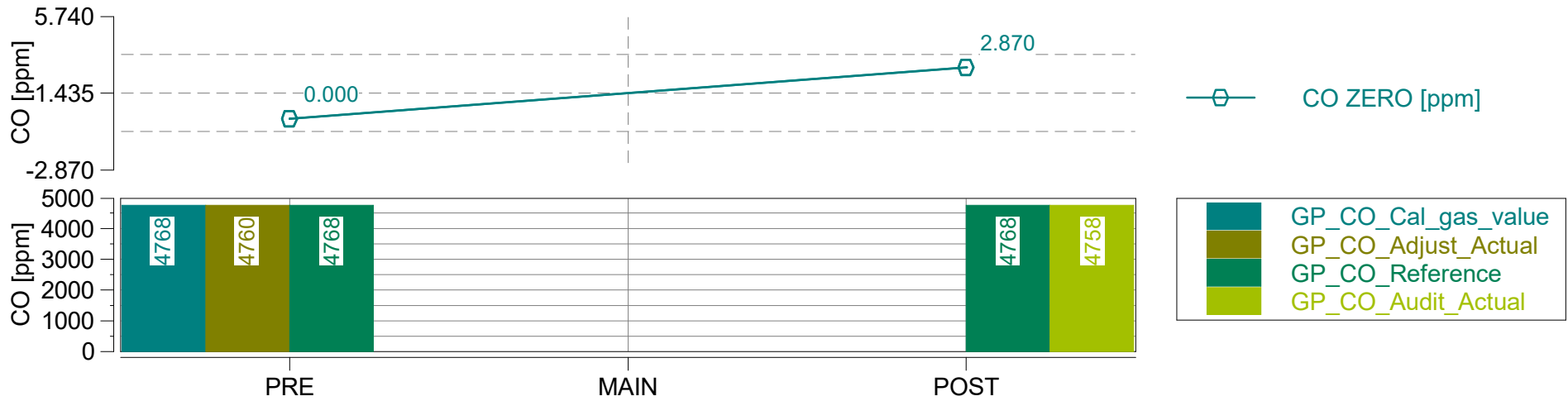


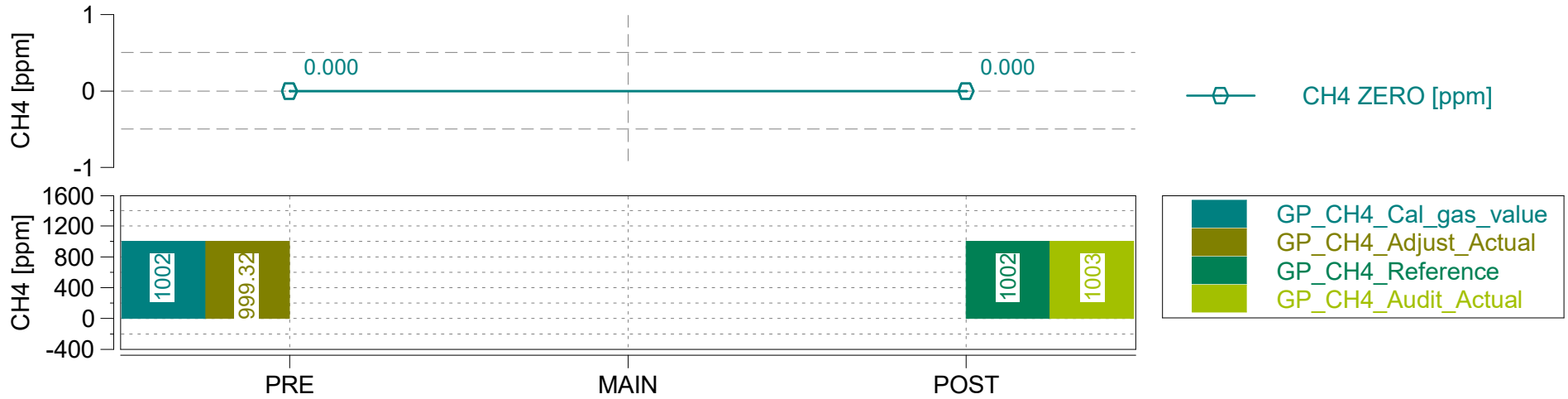
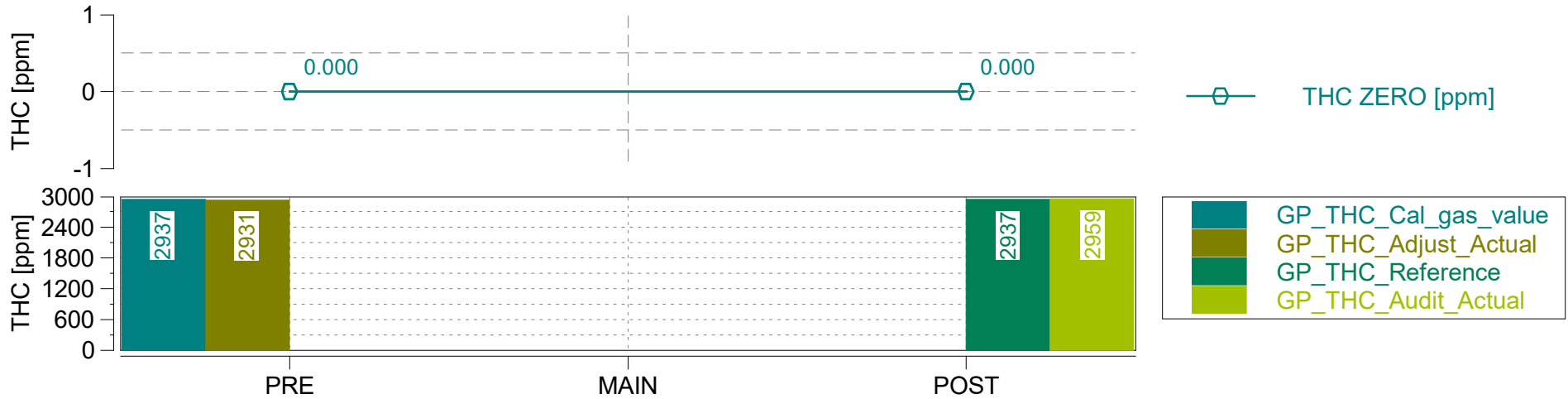
NOx - AVL 493













| § | criterium | condition | value | unit | pass/fail |
|-----------------------|--|--------------------------|-------------|------------|-------------|
| GAS Leak Check | The leakage rate on the vacuum side shall not exceed 0.5 per cent of the in-use flow rate for the portion of the system being checked. | The leakage rate <= 0.5% | 0.11 | % | pass |
| PN Leak Check | n/a | n/a | n/a | n/a | n/a |
| PM Leak Check | n/a | n/a | n/a | n/a | n/a |

GAS PEMS Devices

| | |
|-----------------------|------------|
| Device ID | AVL492 |
| Serial Number | 0182 |
| Firmware Version | V1.17 |
| Main Test Date | 2022-03-03 |
| Leak Check Age [days] | 0 |

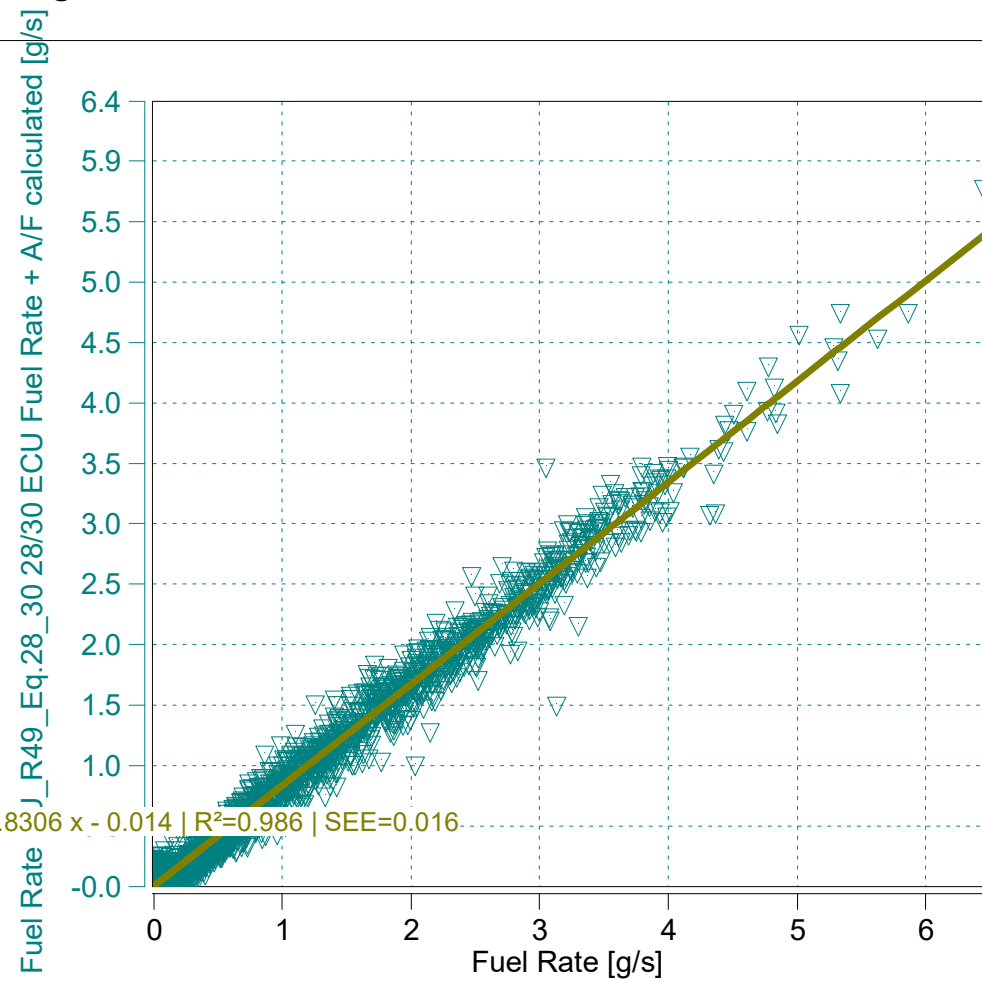
| | |
|------------------|-----------|
| Device ID | AVL4925iS |
| Serial Number | 202 |
| Firmware Version | 1.22.0.4 |

EFM

| | |
|--------------------|--------|
| Device ID | AVL495 |
| Serial Number | 00915 |
| Serial Number Tube | 01115 |
| Firmware Version | V1.16 |

System Control

| | |
|------------------|----------|
| SC Version | V2.9_237 |
| SC Serial Number | 60300923 |



EU 582/2011/Appendix I/3.2.1 | Fuel Rate ECU and calculated

$y = 0.8306 x - 0.014 \mid R^2=0.986 \mid SEE=0.016$
 $m = 0.83$ (0.9 - 1.1 recommended)
 $R^2 = 0.99$ (min 0.9 mandatory)

Data from - to [% of Maximum]

0

100