GRPE Working Group on VIAQ – Evaluation of test procedure "Draft Part IV of the Mutual Resolution (M.R.3) on Vehicle Interior Air Quality„

Measurements and recommendations by OICA.

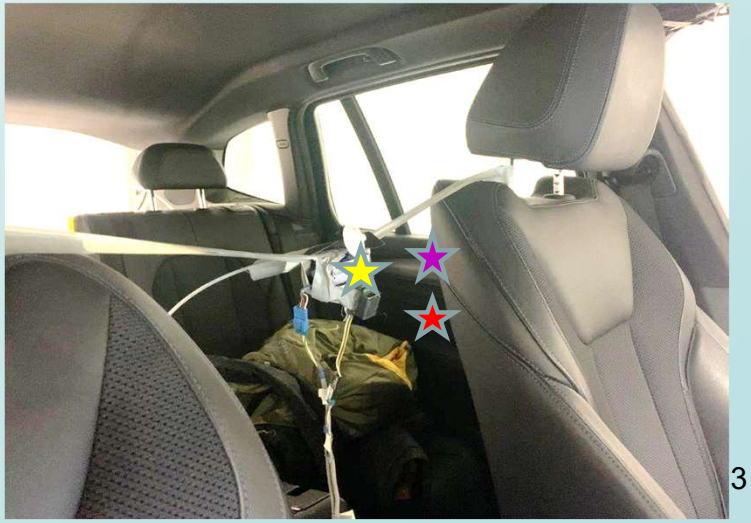
May, 25th, 2023

BACKGROUND

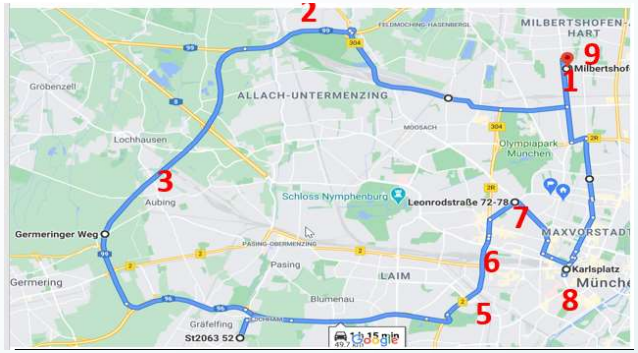
- Draft test procedure was tested during several measurements on public roads near Munich, Germany.
- The equipment for the measurement of PM, NOx and CO2 was placed in a 2018 BMW X3 vehicle.
- PM 2.5 sensors with measurement interval 5 sec.
- CO2 sensors with measurement range up to 10.000 ppm, measurement interval 5 sec.
- NOx analyzers with measurement range up to 10.000 ppb, measurement interval 5 sec.
- Precision GPS sensor with recording interval of 5 sec.
- Two employees performed the measurements.

MEASURING SETUP

- 5 * CO2-sensor
- 1 * GPS-sensor
- 2 * PM 2.5-sensor
- 2 * NOx-analyzer inlets
- 1 * humidity / temperature



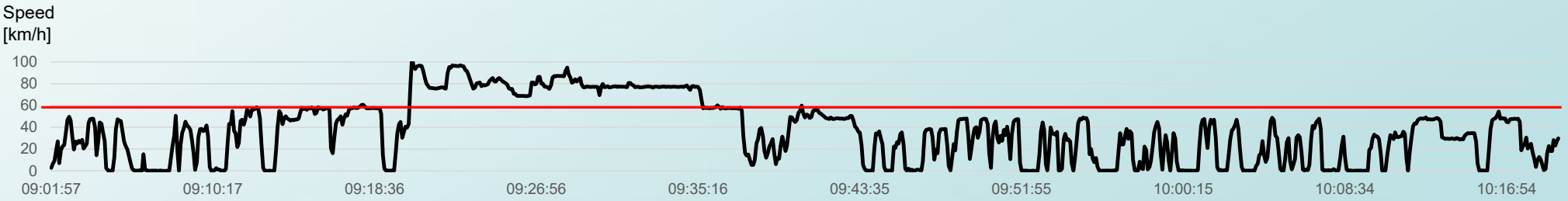
RESULTS: CONDITIONS



Place	Time in	Time out	odometer (km)	date
1 Start	09:02:00		69008	01.02.2023
2 Tunnel	09:21:11	09:22:11		
3 Tunnel	09:25:38	09:27:28		
5 Tunnel	09:41:40	09:41:55		
6 Public environmental measurement	09:43:17			
7 Public environmental measurement	09:49:36			
8 Public environmental measurement	09:56:30			
9 End	10:17:30		69058	

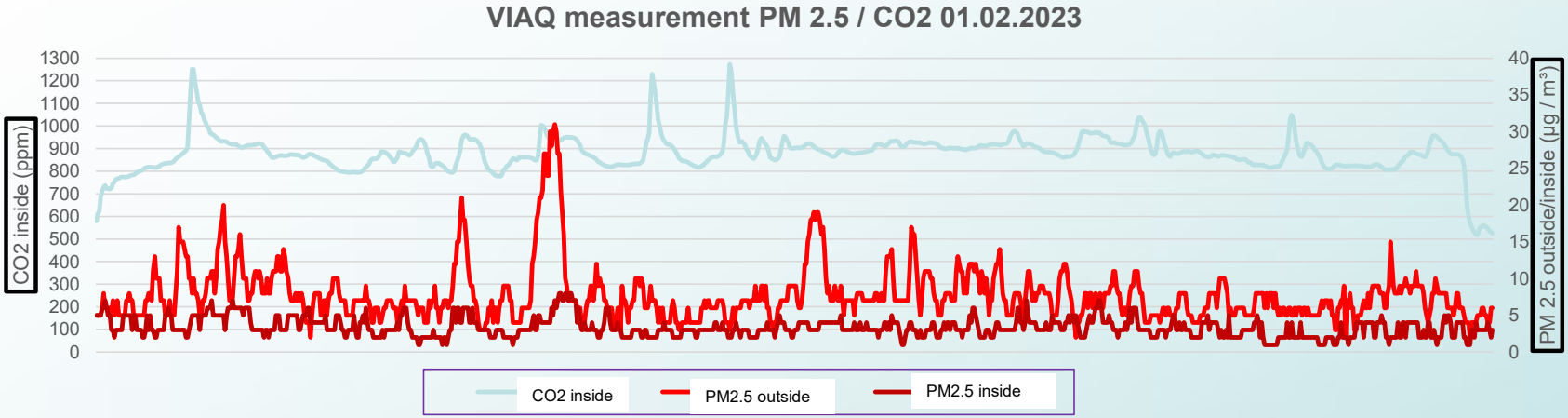
Weather: very windy, **dry,** temperature: **+ 6° C,** humidity: **60 %**
atmospheric pressure: **96.2 kPa**, Test track length: 49.3 km
55% +-10% urban traffic percentage < 60 km/h: → **80.36 %**
45% +-10% outside city traffic percentage > 60km/h … < 100km/h: → **19.64 %**
measurement time (30 – 60 mins): **01:15 h**

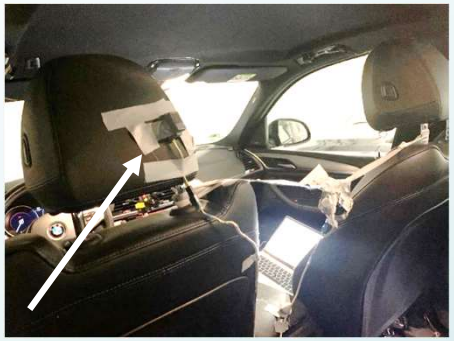
legend: **green: requirements fulfilled**
red: requirements not fulfilled

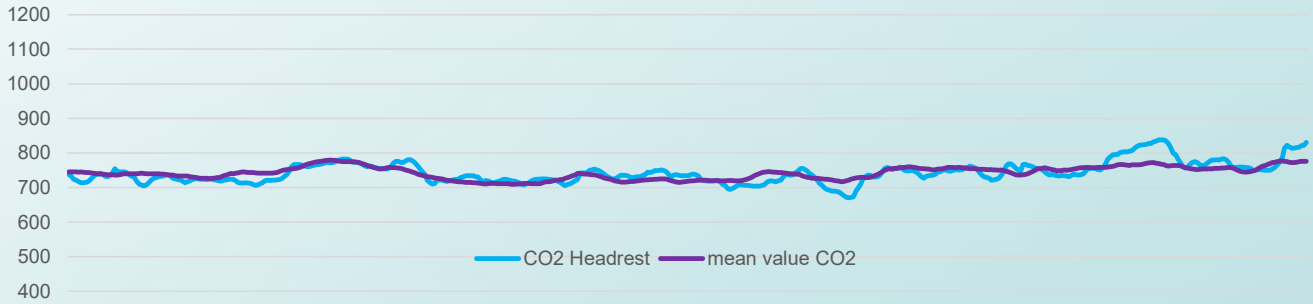


→ Urban traffic percentage limit exceeded, measurement time limit exceeded

RESULTS: CO2, PM 2.5

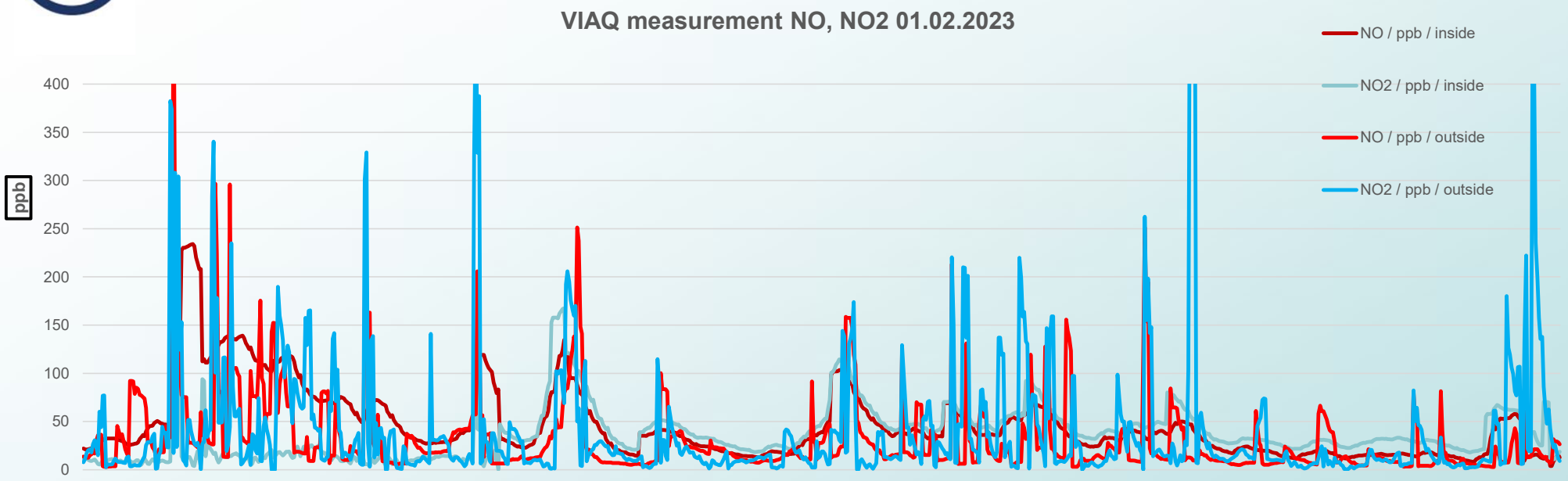






→ several CO2 peaks @ between headrest sensor, probably from exhalation.
→ Average of 4 CO2 sensors without signifikant peaks
→ outside PM 2.5 usually < 30 µg/m³

RESULTS: NOX



→ **NO2 and NO outside mean around 30 ppb, peaks behind truck/old cars up to 500 ppb**

NOTICES AND RECOMMENDATIONS

- CO2-Sensor between headrests may be affected by breath of the driver or passenger → position behind driver headrest recommended
- Wind speed will influence outside conditions → maximum wind speed limit should be determined (e.g. 5 m/s)
- NOx measuring equipment often needs to be placed in trunk → sampling line lenght > 1 m necessary
- PM 2.5 concentration of > 30 µg/m³ usually not present in most areas → reduction to e.g. 10 µg/m³ (new WHO guideline)
- High speed of 60-100 km/h for 35-55% of test cycle in 1h is difficult to achieve, when you start track in cities → reduce high speed contribution to 10-20%
- Definition of urban speed should be changed to v < 50 km/h (50 km/h city speed limit)
- Change measurement interval to 5 sec