Minutes (draft)

24th Meeting of the GRPE Informal Working Group on VIAQ

Date	May 24th 2022
Venue	Online, Teams
Chairs	Chair: Dr. Andrey Kozlov (Russia) Co-Chair: Ms. Inji Park (Korea) Secretary: Mr. Jean-Marc Prigent + Dr. Andreas Wehrmeier (OICA)

1. Welcome remarks

Dr. Kozlov welcomed the participants to the online meeting (attendance list in Annex).

1.1. Review the minutes of the 23rd meeting (VIAQ-23-12)

Dr. Wehrmeier presented the minutes of the 23rd meeting. The group approved the minutes without changes.

1.2. Progress report (VIAQ-24-03)

Dr. Kozlov summarized the activities of the group in the progress report.

He showed the milestones of the activities and introduced to the work plan of the current meeting.

2. Working items

2.1. Influence of the Cabin Air Filter Age on the Pressure Loss and the Indoor Air Quality (VIAQ-24-04)

Mr.Stahl presented his investigation on pressure loss of cabin air filter at different mileages of test vehicles. He concluded that the pressure loss can highly increase (up to 100% at 20000km), but old filters can still show very good performance. The different behavior of the filters is probably due to different

usage and outside air conditions. Very small particles seem to block the filter more than particles with bigger diameter. Water can have a significant effect.
The group thanked Mr. Stahl for sharing the results with the group.

2.2. The bubble: a dedicated platform for car cabin air pollution measurements (VIAQ-24-05)

Mr. Nadir Hafs (ESTACA) presented the validation results for tightness and particle distribution in his newly build chamber for vehicle outside air simulation. After that he presented first measurement results for particle infiltration in vehicle cabin air as well as simulation results for outside air in a driving vehicle.
The group thanked Mr. HAFS for sharing his results.

2.3. Statement of ACEA and CLEPA on CEN WS 103 draft document (VIAQ-24-06)

Dr. Michael on behalf of CLEPA and Dr. Wehrmeier on behalf of ACEA presented the CLEPA/ACEA statement to the No 34 Draft of CEN WS 103. CLEPA and ACEA will not sign the document, because the results in the round robin test of the current methods do not show comparable results especially for PM 2.5. Both associations think that the CEN WS 103 activities give a good start to develop a method and would recommend to further develop it in the UN VIAQ group.

2.4. Working item discussion regarding to test methodology, conditions, equipment (VIAQ-24-07)

Dr. Kozlov summarized the feedback of the different parties (CEN, KATRI, CLEPA, UTAC/ESTACA and CabinAir) in a consolidated way and the group agreed on the following parameters

Vehicle category: 1-1

Excluding criteria for vehicle test:

- Does the vehicle not have a full-service history?
- Is there a Malfunction Indication Light showing on the vehicle instrument panel?
- Has the vehicle had unauthorised vehicle repairs?
- Has any part of the vehicle’s heating and ventilation system replaced with non-original parts?

- Through visual inspection of the vehicle, are there any damaged ventilation system relevant components?
- Are there any obstructions to the vehicle air intake or outlet path?
- Is the vehicle not in overall safe operating condition?
- Is there any damage to the body of the vehicle, including but not limited to doors, windows and the rear?

Vehicle age/milage: more than one month / 3000-15000 km

Meteorological conditions: temperature +5 to +25°C, humidity 40-80%, atmospheric pressure: 85…110 kPa

Test conditions:

- The test must be primarily conducted on city roads and urban locations
- Road condition: Paved streets
- Windows, doors, sunroof or convertible soft top must be closed at all times. Heated or cooled seats should not be used.
- The vehicle shall have been driven at least 50 km in the seven days prior to the start of the test, to ensure that the vehicle has been in regularly use prior to the test and not left unused for a long period.
- When cleaning the vehicle prior to testing, only a damp cloth should be used. Fragrances and air fresheners should be avoided.
- There should the driver and one passenger present in the vehicle for the duration of the test. All outer clothing of the driver should be made of polyester to minimize particle generation from the driver. Clothing should cover both arms and legs.
- The occupants should avoid applying any fragrances or make-up prior to or during the test. Further, occupants should not have smoked for at least 24 hours before a test.

Task: Test conditions for urban and urban motorway driving must be clearly defined. Dr. Kozlov will make a proposal in next meeting.

Sampling points/sampling lines:

- The interior sampling point should be a head-height between the front headrests
- The sampling lines to the analyser that is designed to minimize particle losses from 10 nm to 2.5 mm. The sampling lines should be constructed of materials

to minimize electrostatic particle losses (for example, conductive materials) and sized to minimize inertial and/or diffusional particle losses. Length of sampling line should be as short as possible (best length to be investigated).

Task: External sampling position must be further defined. Sampling lines maximal length and minimal diameter must be defined

Background air pollution level:

- PM 2.5: >15µg/m³ (WHO 24h average mean)

Task: The group need to set background levels to all measured components

Cabin air filter:

- New, OEM-approved
- OEM-approved filter used for 3000 km
- If a vehicle is not installed with a filter by the OEM, the vehicle to be tested with no filter present.

Task: Make a round robin test to see influence on filter age and define milage diapason

Components to be measured:

Mandatory: $PM_{2.5}$; CO_2, NO_2; NO

Optional: PN, small fraction PM (0.1-1 µm); tVOC; CO; PAH; NH_3; O_3

Tasks:

1. Substantiate inclusion of PN to list of measured components taking into account modern tendences to ambient and interior air quality requirements

2. Investigate the influence of fluctuation of external concentration of CO_2 in ambient air to interior concentration of CO_2 (do we need to measure external CO_2 simultaneously with internal)

Measurement measures:

PM: optical particle counter

CO_2: Non-dispersive infra-red

NO and NO_2: Non-dispersive UV chemiluminescent detector

Test equipment requirement:

PM 2.5: 0-0,5 mg/m³

CO_2: 0-5000 ppm

NO and NO_2: 0-0,5 ppm

Time resolution: <2 s

Task: Further check realistic values for measured concentration diapason and time resolution

Gas analyser calibration:

Calibration and linearisation of the equipment shall be performed according to manufacturer recommendations prior to the commencement of measurements. After the equipment is installed in the vehicle, a dynamic calibration shall be performed. The dynamic calibration ensures that the paired instruments are measuring the same concentrations. The dynamic calibration should be run each time there is a new or changes to an existing test equipment installation on a vehicle. For the purposes of this calibration test, a stainless steel Y-piece should be used to split the air from the exterior sample probe equally between the interior and exterior measurement instruments. At the end of the calibration, the Y-piece should be removed and the installation returned to the test configuration. The dynamic calibration test should be run for at least 30 minutes and expose the vehicle to concentrations in the range defined in item 7. The Pearson correlation coefficient between the data points from each matched pair of measurement devices shall be calculated. For a valid calibration, the r2 on all devices should be at least 0.98. The drift of the zero response of the particle number instruments, defined as the mean response to HEPA filtered air at the inlet of the sampling line during a time interval of at least 30 seconds, shall be tested prior to each test and shall be less than 2000 #/cm3 . The drift of the zero response of the carbon dioxide instruments, defined as the mean response to ambient air at the inlet of the sampling line during a time interval of at least 30 seconds, shall be tested prior to each test and shall be 413 ppm ±20 ppm. Annual calibration following supplier recommendation.

Test Modes:

- Real driving conditions in urban and urban motorway
- Laboratory test

Task: Investigate the necessity and validity of laboratory test inclusion to test procedure

HVAC Modes:

HVAC system settings:

- For Automatic mode: temperature 22˚C,
  if possible adjust manually: fan speed 50%/medium
- For manual mode: fan speed 50%/medium,
  temperature 50%/medium, fresh air mode
- Air conditioning switched OFF
- Ventilation flaps fully open and directed straight ahead
- If a vehicle has manufacturer-installed air quality sensors, these should be left in the predominant mode

Task: Investigate the influence of fan speed to measurements results and necessity to set not fan handle position, but air flow value through HVAC (e.g. 200 m^3/h)

Test procedure:

Task: To write draft test procedure and discuss in the next meetings

Test protocol:

The protocol contains:

- Vehicle information (type, variant, version, manufacturer, mileage, engine type, fuel type, filter type and date of installation…)
- Test condition information (testing date, test locations, test time, test equipment…)
- Reporting of test results (inside and outside concentrations measurement results, ventilation mode, ambient conditions, mean vehicle speed, test distance, altitude, filtering efficiency…)

Task: This item must further be updated, when test procedure is finalized.

3 Any other update of interior material emissions

No additional items

4 Proposed agenda/topics for the next VIAQ IWG meeting

Task: Test methods, results and influences concerning PN should be presented in next meeting.

5 Any other business

None

6 Next meeting schedule

25th Meeting is planned in October 2022 in Paris. Possible location can be at ESTACA.

26th Meeting can take place in January 2023 in Geneva.

7 Closing remarks

Dr. Kozlov thanked all presenters and participants for their contribution. Many thanks to Dr. Kozlov for organizing and preparing the meeting.