AIR Allow Independent Road-testing

EMISSIONS ANALYTICS

Update on method validation

Results of further testing

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VIAQ-22-06

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Technical sub-committee – Work packages

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- WP1 – Perform additional testing for PN ingress, CO_2 build up (and NO_2)
- WP2 – Assess robustness of method for calculating cabin air quality index
- WP3 – Review proposed boundary conditions
- WP4 – Review and expand proposed equipment specifications

➢ Group chaired by Nick Molden, work led by Heejung Jung and David Booker

Overview of progress

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- Continued testing to validate method proposed based on SAE paper
- Sampling set-up and calibration method further refined
- Two sets of equipment auditioned, to cover particle mass, number and distribution
- Additions to draft CEN Workshop Agreement document proposed and circulated
- Further phase of testing required to validate reproducibility with round robin
- Further testing on CO_2 build-up required

WP1 – Equipment

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- Big thank you to…

GRIMM AEROSOL TECHNIK

NAQTS

WP1 – Sampling method

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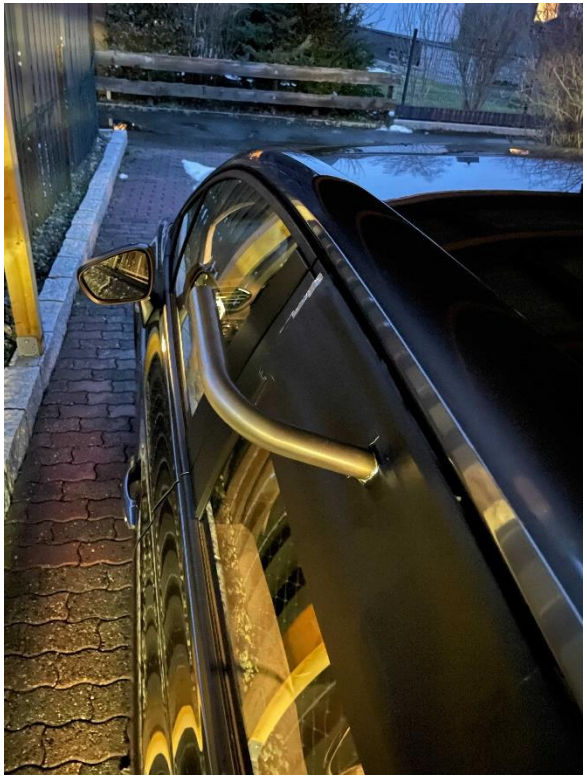
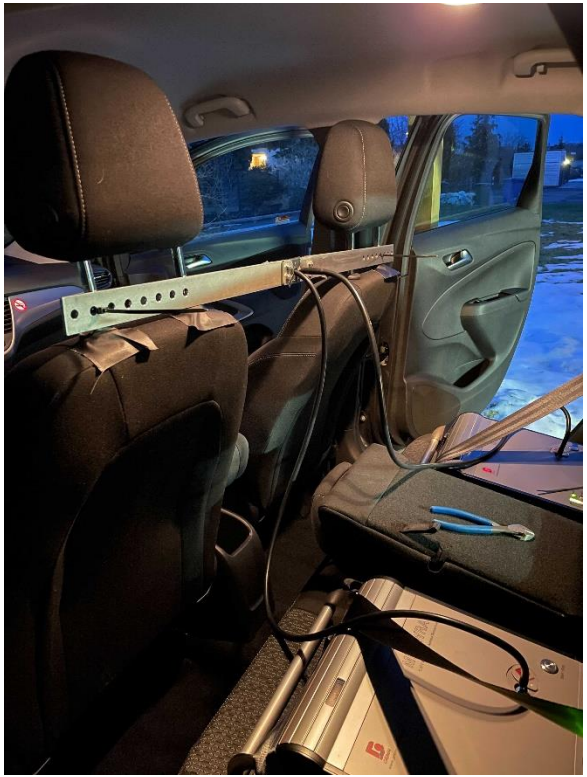
- Stainless steel
- Smooth curves
- Conductive tubing

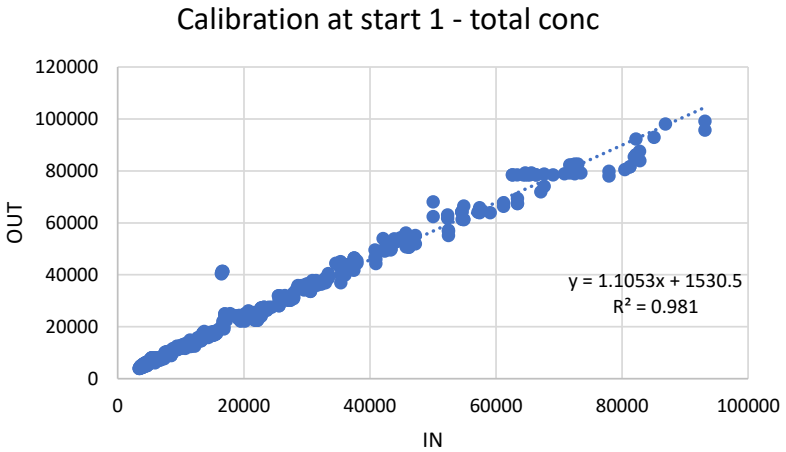
➢ 1” diameter satisfies isokinetic sampling up to 2µm at 80km/h

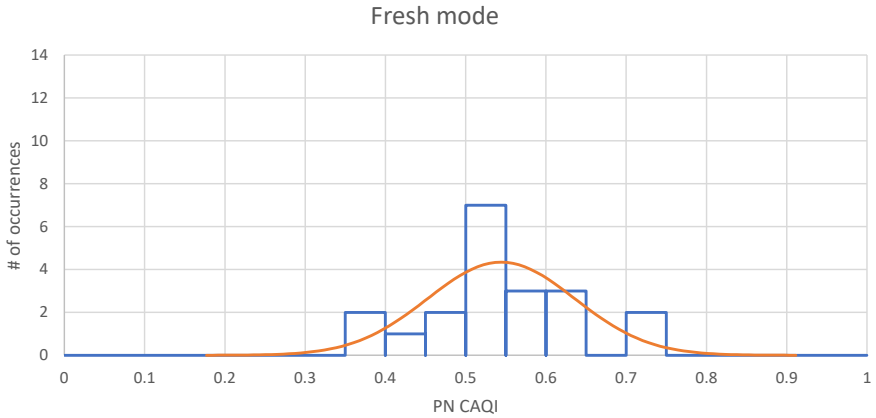


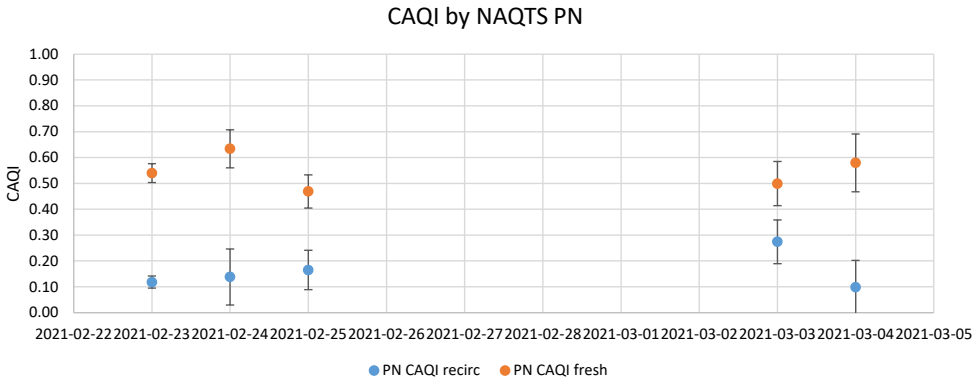


WP2 – Calibration and repeatability – PN (15nm lower size cut-off)

- Mean: 0.54
- Standard deviation: 0.09

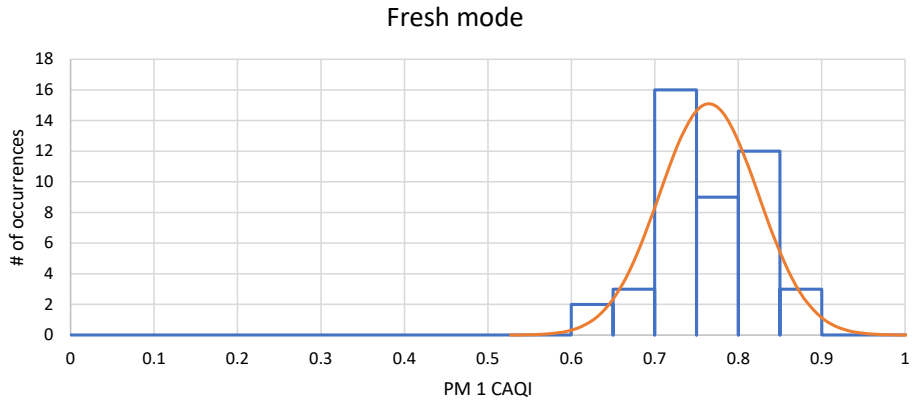


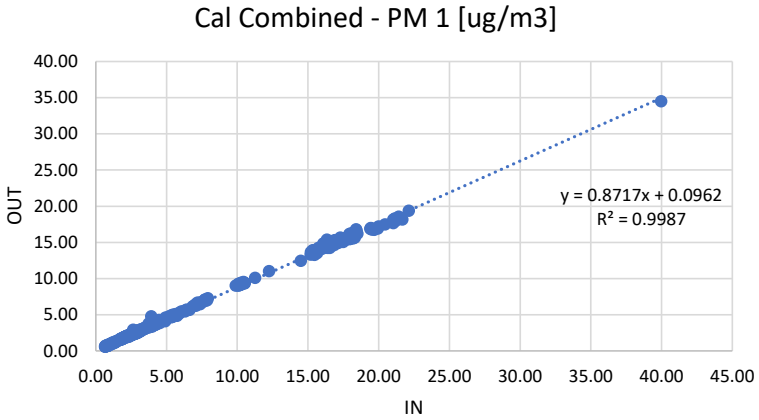


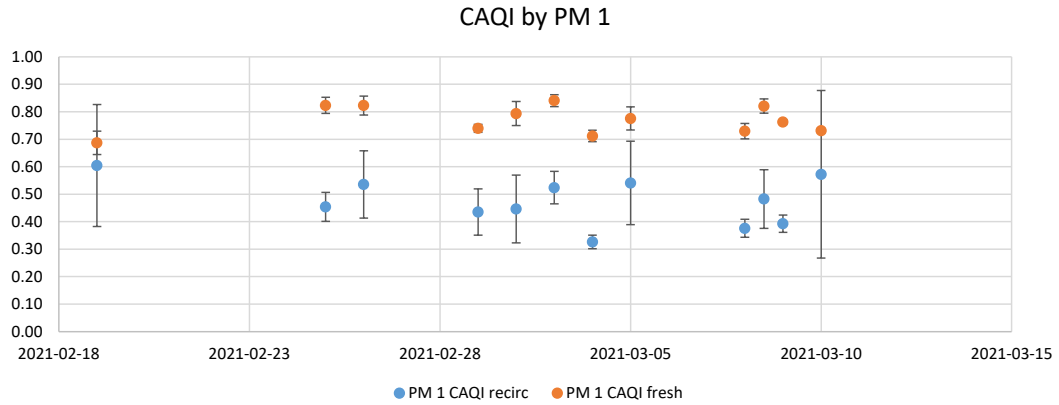


WP2 – Calibration and repeatability – PM1

- Mean: 0.76
- Standard deviation: 0.06

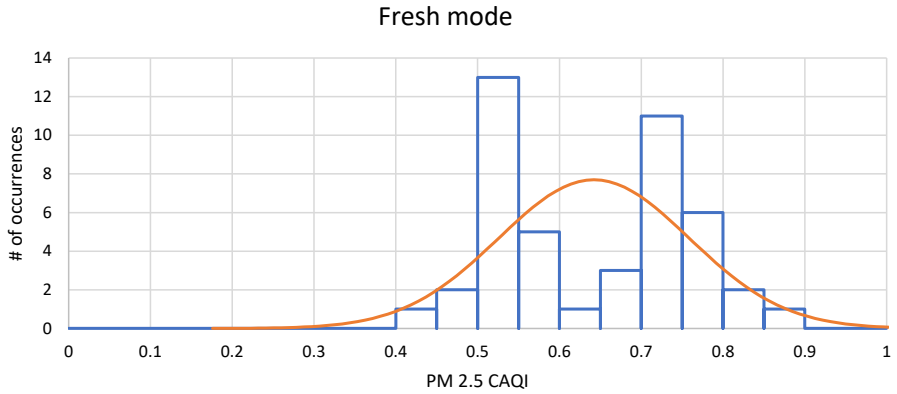


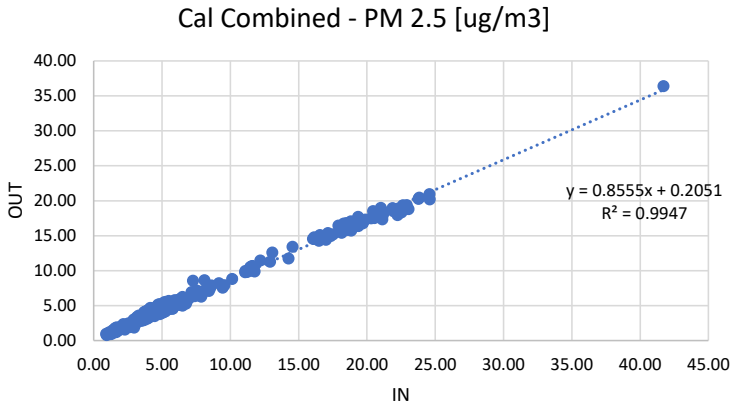


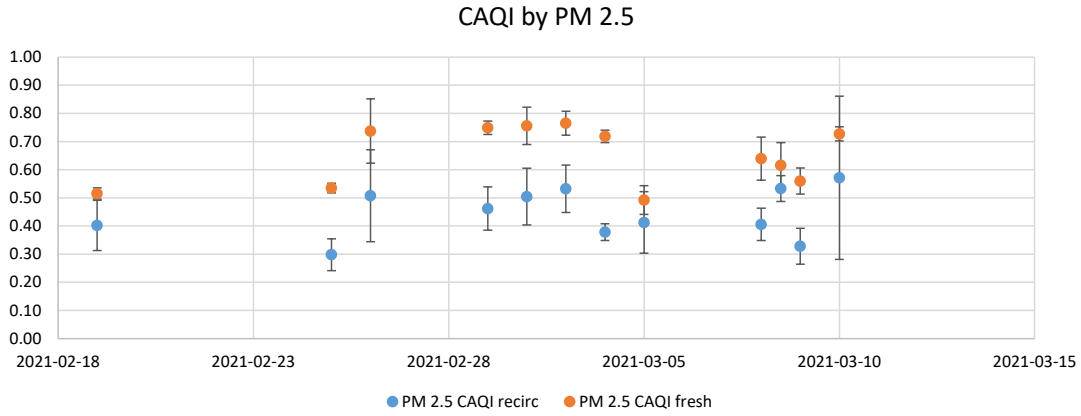


WP2 – Calibration and repeatability – PM2.5

- Mean: 0.64
- Standard deviation: 0.12
- Bimodal – probably an artefact







WP3 – Results summary

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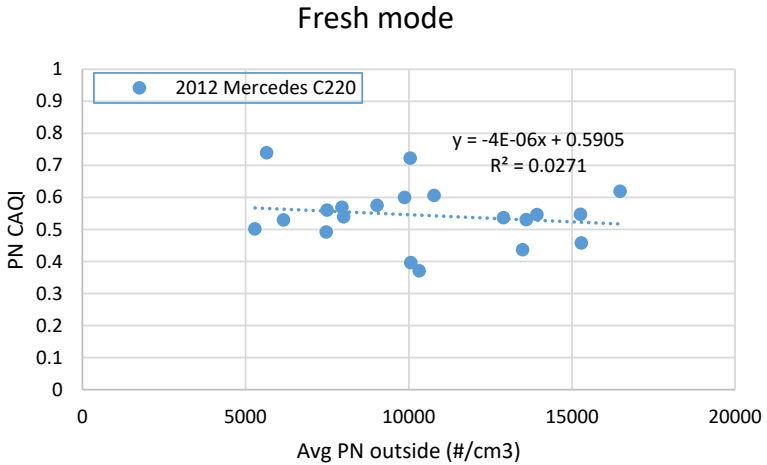
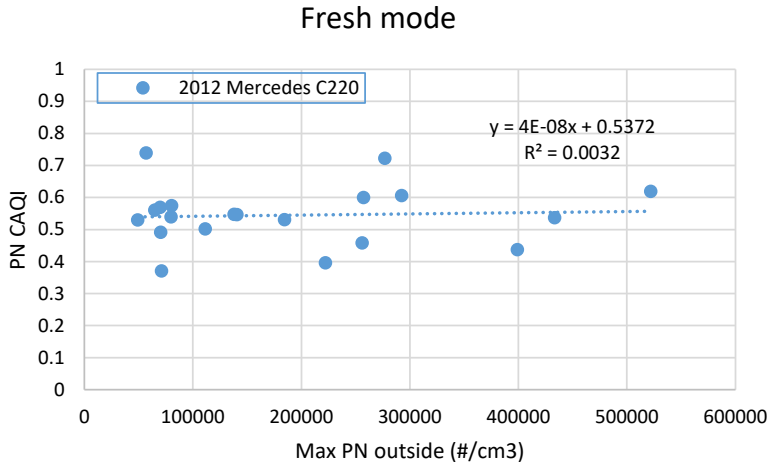
Vehicle	Particle definition	Median CAQI
1	PN	0.58
2	PM1	0.77
2	PM2.5	0.64

- Fresh air mode; lower value means better filtration
- For vehicle 2, PM1 worse because MPPD is more dominant

WP3 – Boundary conditions (1)

- Weak or zero dependency between CAQI and on-road ambient particle concentrations
- Suggests additional boundaries conditions may not be needed
- May not hold for extremely high ambient concentrations – potential future work





WP3 – Boundary conditions (2)

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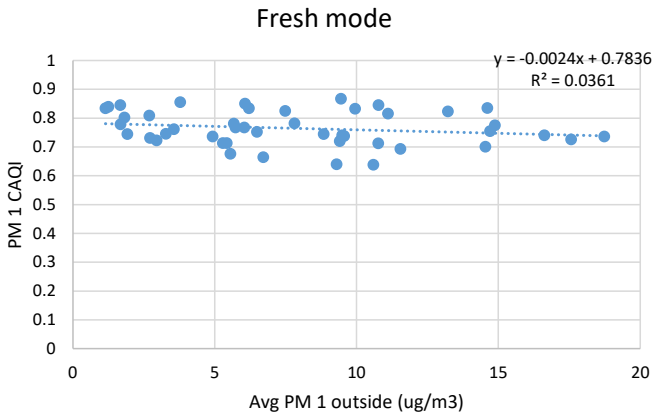

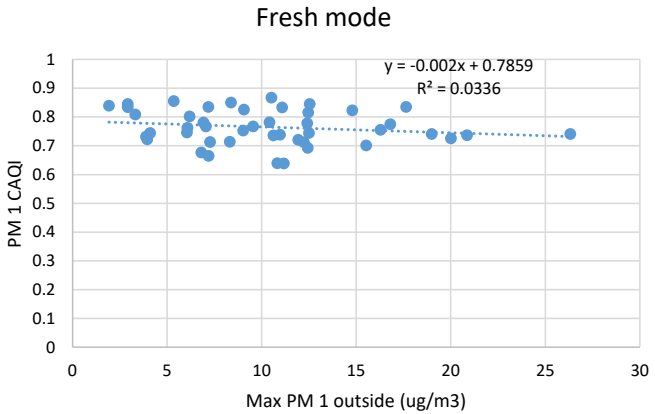

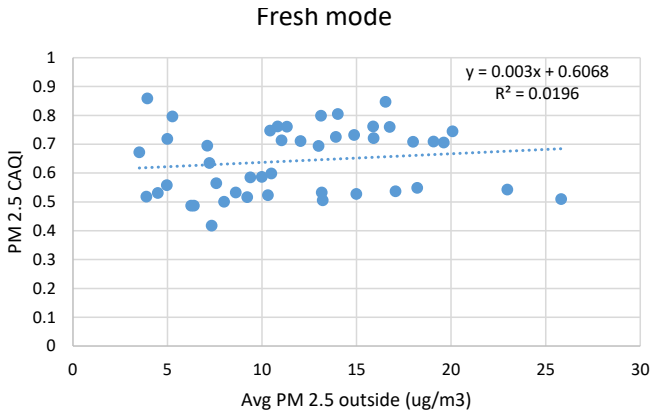

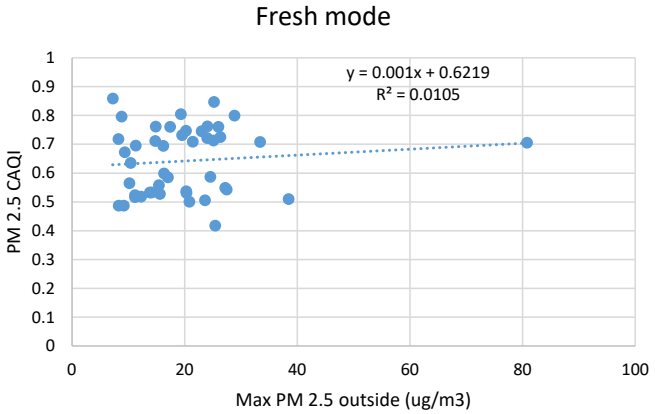

WP4 – Equipment specifications

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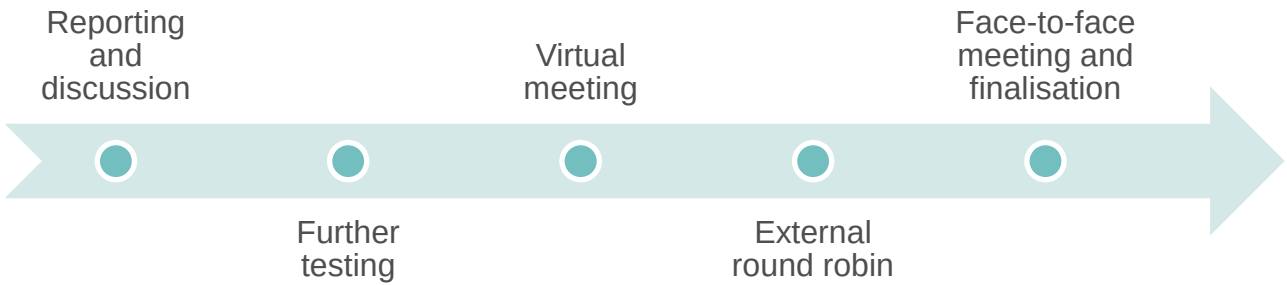
- NAQTS v2000 unit better performing for PN
- Grimm miniWRAS better for PM; offers high sensitivity and size distribution
- NAQTS PM2.5 sensor, AE51 microAeth and TSI AM520 ruled out at previous stage due to poor sensitivity

➢ Specifications incorporated in draft CWA document

Next steps

- Further testing – internal round robin, April-May 2021
- External round robin in Q3 2021
- Discussion and refinement of draft CWA
- Aim to finalise in Q4 2021



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