

# PMP – Particle Measurement Program Informal Working Group Task Force 2– Brake Dust Sampling and Measurement

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Meeting #33 – Thursday 03 JUNE 2021 15:00 – 16:00 CEST

## Minutes of Meeting – Final Version

**1. Participants:** As in the file “*33rd TF2 Meeting Attendance*” uploaded in TEAMS.

**2. Background:** This is the 2<sup>nd</sup> meeting related to the PN measurement approach followed by the TF2 members. One more meeting on this topic is expected. The PM specifications have been reviewed and a new version has been submitted. TG asked for the final comments until THU 10 June. Afterwards, the final version of the document will be submitted.

**3. PN measurement Discussion:** RV and AJ presented LINK’s experience with brake PN measurement. A sketch with the physical arrangement of the dyno was analyzed and particular attention was paid to the different instruments (APC, EEPS, CPC). RV highlighted the need for locating the sampling plane (at least) 8 hydraulic diameters after the enclosure following the specifications of EPA Method 1A. The importance of using flexible hoses – with very smooth or practically no bends – for transferring small particles to the CPC was discussed. Slide 8 of the attached presentation shows the high transfer efficiency of the LINK system. Actual brake emissions tests transfer efficiency is comparable to the results of simulation studies as well as prototype tests with Arizona dust. Real test results from the CARB project were discussed. Most brake systems exhibit multimodal particle size distributions with peaks lying at approximately 10 nm, 50-100 nm, and 500 nm. All brakes exhibit an additional peak at approximately 1.5-2.0  $\mu\text{m}$ ; however, this peak is not considered crucial for the actual PN concentration. A follow-up discussion on this topic led to a consensus that such big particles shall not be considered for the PN measurement as they might create problems to the measurement systems. RV highlighted the need to take also the friction coefficient into account when looking at the stabilization of the brake systems’ emissions behavior. Finally, it was demonstrated that translation of PM results to PN is not straightforward and shall be avoided. A set of recommendations is summarized in Slide 15 of the attached presentation.

A follow-up discussion regarding the feasibility of total PN vs. Solid PN took place. AJ showed a preliminary slide from an on-going analysis which demonstrates that volatiles do not come in high concentrations even in more aggressive cycles compared to the WLTP-Brake Cycle. CA highlighted that PN results given in Slides 13-14 come from both the WLTP-Brake and the CBDC cycle confirming that the difference in the temperature profile of the two cycles does not affect PN emissions. RV explained that background concentrations were very low; therefore, the measured PN levels are accurate. A discussion on the “relatively high” PN emissions of the Prius compared to the other vehicles followed. Finally, clarifications regarding the transfer efficiency provided in Slide 8 were given.

**4. Next Meetings:** The next meeting will take place on Thursday 10.06.2021. JARI and Ford will provide their point of views on the PN measurement.