

Comments from Germany on the draft of UN GTR on brake particulate emissions based on document GRPE-86-46

Note:

We thank GRPE and PMP IWG for the effort that was put into the development of this important GTR for brake particulate emissions over the past couple of years. We would like to ask the PMP IWG to consider the comments by the German delegation attached.

For Germany a quick completion of the GTR and the adoption of the GTR in the 87th GRPE in January 2023 is very important. From our perspective the time to review missing aspects that are crucial for the GTR, like the testing requirements for brakes considering regenerative braking and the definition of brake families is already very short and it will be very challenging to establish the German position for GRPE. We ask to avoid any further delays.

In order to facilitate the definition of emission limits / compliance requirements for upcoming legislation, we ask the PMP IWG to provide improved information about the accuracy of the testing methodology considering the improvements that were implemented after inter laboratory study beyond the data presented by the JRC in PMP session on March 29th 2022.

topic	comment ID/ draft GTR sect.	comment	comment type (General/ Editorial/ Technical)	timeline	
				before adoption	after adoption
Family concept	OICA-2/ 5.2	<p>current status: concept/definition should be ready for mid Oct. 2022 WD-revision of the draft GTR. It remains unclear what the "worst-case" scenario will be based on, e.g.:</p> <ul style="list-style-type: none"> - most critical brake system for each vehicle type, consider different disc/pad-combinations? - most critical vehicle for each brake type - most critical (theoretically) front/rear axle combination <p><u>before adoption:</u> German proposal is to first add a preliminary concept of brake and/or vehicle clusters.</p> <p><u>after adoption:</u> monitor and adjust the preliminary concept</p>	G	x	x
Regenerative braking	OICA-9/ 3.1	<p>current status: method im implementation to be developed by TF4 from 10/2022 until 12/2022.</p> <p><u>before adoption:</u> German proposal for Dec. 2022 is to have a draft containing some minimum requirements to have the method future ready (Euro 7): e.g., boundary conditions, test environment, settings, bedding analogous to ICE without special recuperation parameters.</p> <p><u>after adoption,</u> in further course if necessary: Develop a method to account for recuperation during Emission Measurement Section (MES) as simple as possible to lower complexity, e.g. only distinguish between recuperation YES/NO and allow low recuperation power for all reg. brakes of each electrification level -> will be overestimating for many reg. brakes, but still with significant reduction vs. ICE brakes.</p> <p><u>Far future:</u> Consider SOC and variability of setting options in vehicles (sailing mode vs. one-pedal)</p>	G	x	x
Cooling adjustment section	UBA-13/ 6; 10	<p>current status: number of cooling adjustment sections (CAS) is not defined. Emissions decrease during the run-in of the friction couple. Thus, a variation in CAS-repetitions may induce variation in the GTR target PM and PN parameters.</p> <p><u>before adoption:</u> German proposal is to at least report the number of CAS repetitions in the Test Report File (section 13.4)</p>	T	x	
Bedding section	OICA-11/ 9.2.2	<p>current status: The bedding section is defined by performing five WLTP brake cycles. Few PMP-stakeholders requested a "less time-consuming bedding procedure". The run-in during the bedding section is very important (especially for coated discs and with regen. braking) inspite there is only one WLTP brake cycle for the emission measurement. There is no defined criterion for the final run-in condition of the friction couple.</p> <p><u>after adoption:</u> German proposal is to define a final run-in condition/state and check before emission mearement.</p> <ul style="list-style-type: none"> - e. g., by defining a max. deviation in friction value between 2nd last and final WLTP-braking cycle - e. g., by measuring the friction value for each bedding WLTP brake cycle and defining an abort criterion in relation to the target value of the brake system. <p>AND/OR go back to three WLTP brake cycle during emission measurement sections and calculate mean value.</p>	T		x
Emission measurement section	UBA-2/ 6.	<p>current status: The number of WLTP brake cycle repetitions during the emission measurement section was reduced from the ILS to the draft GTR from three to one. The UBA/TU Ilmenau (TUI) comment why the number is reduced and how a decreasing trend and variations in the cycle test data would be accounted for was answered during the PMP-internal commenting loop that there is no difference between the first, second, and third measurements during the vast majority of the ILS-exercise.</p> <p><u>after adoption:</u> German proposal is to strive for and validate the stability of the emission measurement test results in a future ILS since TUI observed a decreasing trend or other variations during the three WLTP brake cycle repetitions for emission measurement during the ILS which may lead to over-/underestimation of the emissions.</p>	T		x

Brake force distribution (FA/RA)	UBA-8/ 8.1.1 b)	<p>current status: "The brake force distribution per the default method on UN Regulation No. 90 for decelerations below 0.65 g shall be applied only whenever the vehicle manufacturer's specific value is not available."</p> <p>If vehicle manufacturer's specific value is not required, UNR 90 will be used whenever it will lead to a lower emission level. UNR 90 might be critical for regen. braking.</p> <p>The assumption from R90 (see 8.1.1 b) ii): Category 1-1: 77% VA/32% HA, Category 2: 66% VA/39% HA leads to rather an over estimation of FA and underestimation of RA for large & heavy cars that often use 60..70/40..30.</p> <p><u>after adoption</u>: German proposal is to monitor and if necessary to adjust so that RA is not underestimated and further adjustments are made if needed for regen. braking.</p>	T		x
FA/RA	UBA-11/ 10.1.2 b)	<p>current status: "For rear brake systems of M1 and N1 vehicle categories the nominal (or set) cooling airflow defined for the corresponding front brake application (i.e. same vehicle data) shall be applied."</p> <p>There is a risk that rear brakes run cooler during testing when applying FA cooling air flows, which induces the risk of underestimation of TPN and PM 2.5 values.</p> <p><u>after adoption</u>: monitor this issue and reopen when more data is available.</p>	T		x
Mass loss	BOSCH-4/ 12.3	<p>current status: Some stake holder commented that brake pads may draw moisture when entering an air conditioned environment and thus, become heavier. This may alter the mass loss measurement that must be reported (12.3). Thereby, the correlation of PM emissions and mass loss may be subject to fluctuations. Answer to the comment was that brake particles during ILS were dry and solid. To us, the answer does not address the comment properly. The humidity of the emitted particles does not necessarily reflect the additional weight of the humidity that is possibly adding up to the dry weight of the brake pads when brought to an air conditioned environment. Different conditions for mass loss measurement before and after the emission test could indeed alter the difference in mass.</p> <p><u>after adoption</u>: German proposal is to monitor and adjust if necessary. To us this phenomenon could be easily avoided by implementing storage regulations (e.g., climatic chamber).</p>	T		x
Background verification	UBA-6/ 7.2.2.2; 7.2.2.2.1	<p>current status: Although the draft GTR specifies in section 7.2.2.2 that "the testing facility shall measure the particle background using the same instrumentation used for the PN emissions measurements.", it does not further specify the nozzle size in section 7.2.2.1, leaving to the testing site to choose "a single nozzle size for sampling TPN10 and SPN10 during the system background verification when applying different airflow settings."</p> <p><u>after adoption</u>: German proposal is to specify the nozzle size analogously to 12.1.1.3 & 12.2.1.3 (regarding the IR from 0.6 to 1.5) to use for the three air flow settings since the background verification nozzle remains fully unspecified to us so far. Although no large particles are expected during background verification, this test can indicate whether the housing should be cleaned before the test, as deposited particles can remobilized. Furthermore, the different airflow settings should be reported in section 13.4 as m³/h, since the setting ranges (min/max) of different laboratories may differ. This allows high differences in background TPN10 & SPN10 from min/max airflow setting to be better understood.</p>	T		x
Definitions	AVL-2/ section 3.5.17	<p>The draft says 293.15K instead of 273.15K (3.5.17).</p> <p>Proposal: "273.15 K"</p>	E	x	
General Overview	section 6, Fig. 6.1	<p>The very right panel of the "Emission Measurement Section" is missing a paragraph number.</p> <p>Proposal: "Paragraph 12"</p>	E	x	