



81st UNECE GRPE session

PMP IWG Progress Report



UNITED NATIONS

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Webconf, 9th -11th June 2020

PMP meetings in 2020

2020-01-13:	PMP 52 nd (GRPE Geneva summary)
2020-04-02	PMP Webconference on exhaust emissions
2020-05-11	PMP Webconference on exhaust emissions
2020-05-20	PMP Webconference on non-exhaust emissions

NEXT F-2-F MEETING: tbd

EXHAUST PARTICLE EMISSIONS

Summary of the IWG activity

- Proposal for a sub-23 nm particle measurement methodology finalized
- Experimental activities on LD and HD
- 3 informal documents submitted
 - i. Proposal for a sub-23 particle measurement methodology
 - ii. Explanatory note on sub-23 particle measurement
 - iii. Revised ToR

Proposal for a sub-23 nm particle measurement

- Informal documents **GRPE-81-10** and **GRPE-81-11**
- The new proposal:
 - a) Modifies the existing solid PN measurement methodology having a 50% cut-off size at 23 nm (SPN23) in order to allow the use of catalyzed volatile particle remover (VPR) and introduce minor improvements
 - b) Includes as a second option a solid PN measurement methodology with a 65% cut-off size at 10 nm (SPN10).
- The explanatory note describes the main changes to SPN23 and the main elements of SPN10

Proposal for a sub-23 nm particle measurement

Subject	GTR 15, Annex 5 – Original requirements	Proposed changes for SPN23	Proposed changes for SPN10	Reasoning
PNC efficiency	50±12 % @ 23 nm, >90% @ 41nm	None	65±15 % @ 10 nm, >90% @ 15nm	Typical PNC-efficiency, well tested in the field.
Maximum VPR-loss requirement	@ 30nm 30% and @ 50 nm 20% higher than @ 100 nm	None	Addition @15 nm 100 % higher than at 100 nm	No additional requirement below 15 nm since generation of particles < 15 nm challenging, uncertainties high
Polydisperse validation of VPR	a polydisperse 50 nm aerosol may be used for validation	None	Removed	Uncertainties @ 15 nm or below high → test serves no purpose

Proposal for a sub-23 nm particle measurement

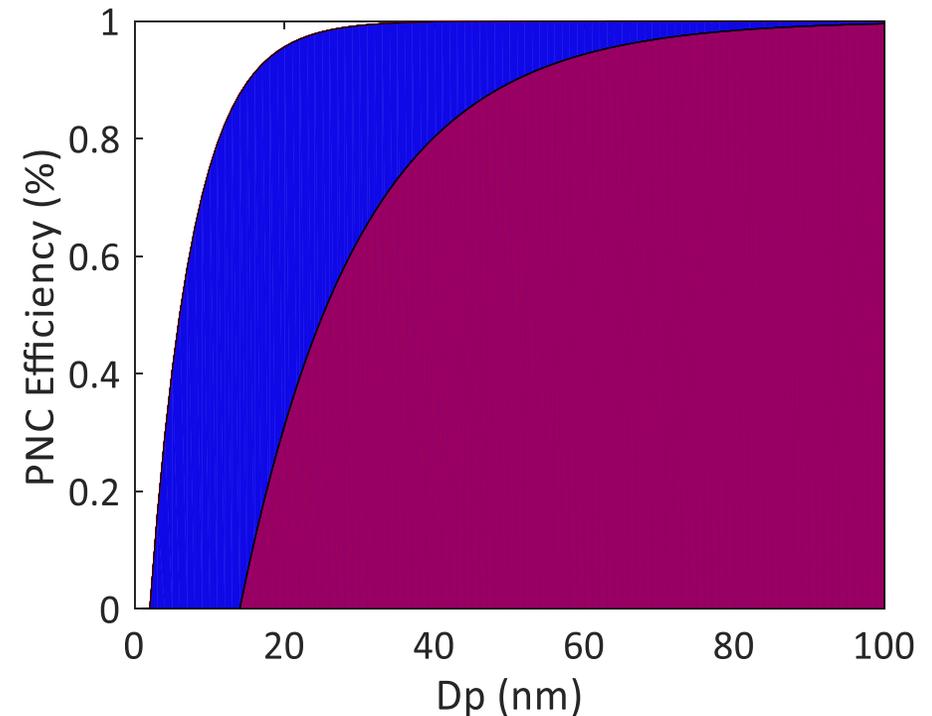
Subject	GTR 15, Annex 5 – Original requirements	Proposed changes for SPN23	Proposed changes for SPN10	Reasoning
VPR validation	> 99.0 % vaporization of 30 nm tetracontane particles, with an inlet concentration of $\geq 10,000$ per cm^3 (Monodisperse)	None	> 99.9 % removal efficiency of tetracontane particles with count median diameter > 50 nm and mass > 1 mg/m^3 . (Polydisperse)	Secure the functioning of VPR also for PNC with 65 ± 15 % @ 10 nm, >90% @ 15nm
Volatile Particle Remover (VPR)	All parts (of SPN-system) -- shall not react with exhaust gas components	- VPR may be catalyzed (both heated evaporation tube and catalytic stripper allowed)	- the VPR shall be catalyzed (use of catalytic stripper only)	Minimize the risk of artefacts for SPN10. Comparability of PNC10 and PNC23 and possibility of using new sampling systems with CS also for SPN23 by fitting a PNC with a D50 @ 23 nm.

Question addressed by PMP IWG

Could the PN10 emission measurement cover also PN23 emission measurement in regulatory measurements?

If the vehicle passes the possible future PN10 limits could it be considered to pass also PN23-limit, although PN10 limits may not be valid in the region?

The aim is to avoid double measurements



Briefly about the experimental Exercises

- LD Sub23nm
 - Europe done
 - Equipment returning from Asia, exercise interrupted due to Covid-19
- HD Tailpipe (Investigate the possibility of using direct sampling from raw exhaust and PN10)
 - Europe done
 - Equipment now in Asia

Revised ToR

- Include on-road PN measurements (PN-PEMS) in the scope of the PMP IWG (request from RDE IWG)
- Tasks:
 - Submissions of an informal proposal for HD raw exhaust PN sampling and extension of sub-23 nm procedure to HD engines: January 2021
 - Submissions of an informal proposal for LD PN-PEMS 10 nm specifications : June 2021

Procedural issue

Submissions of an informal proposal for HD raw exhaust PN sampling and extension of sub-23 nm procedure to HD engines

For LD the PN measurement method was both in Reg. 83 and GTR 15. So it was decided to amend GTR 15.

The PN measurement method for HD is described in UNECE Reg. 49 and not in GTR 4.

What approach?

NON-EXHAUST PARTICLE EMISSIONS

Brake Emissions – Task Force 1

What were the main activities of TF1 during the last months?

- ✓ TF1 submitted the Informal Document GRPE-81-XX entitled "***Non-Exhaust Brake Emissions — Laboratory testing — Part 1: Inertia Dynamometer Protocol to Measure and Characterise Brake Emissions Using the WLTP-Brake Cycle***"
- ✓ The document is the first part of the overall protocol (*PMP Brake Protocol*) and addresses items related to the novel WLTP-Brake Cycle and the inertia dynamometer test itself.

Chapter 1	Chapter 2	Chapter 3	Chapter 4	Chapter 5	Chapter 6	Chapter 7	Chapter 8	Chapter 9
Purpose	Scope	Normative References	Terms and Definitions	Symbols and abbreviations	General dyno requirements	Adjustment of cooling air	Test Sequence	Test Reports
Describes the purpose of the submitted ID	Describes the scope of the submitted ID	An overview of the documents referenced in the document	An overview of terms related to brake emission measurement	A Table with all symbols and abbreviations in the protocol	Set of minimum requirements that a dyno should meet to run BE tests	Describes how to set cooling air speed in different dynos plus examples	Gives a general overview of the WLTP-Brake cycle	Describes the 2 main outputs of brake dyno tests

Brake Emissions – Task Force 2

Preparation Phase

✓ Included the decision on the test method approach at the PMP level (brake dynamometer) as well as the merging of sampling and measurement discussion to a common group --- **Completed**

Understanding Phase

✓ Included the presentation and discussion on existing and state-of-the-art configurations for brake particles sampling and measurement --- **Completed**

Development Phase

✓ Define a set of *min requirements* for measuring brake particle emissions. Apply requirements in a RR exercise and come up with final technical specs --- On-going (**Expected to be finalized by end Q3/2020**)

Parameter 1	Parameter 2	Parameter 3	Parameter 4	Parameter 5	Parameter 6	Parameter 7	Parameter 8	Parameter 9
WLTP-Brake Cycle	Background Concentration	Dynamometer Climatics	Temperature Measurement	Bedding-in Procedure	Enclosure Design	PM Measurement	PN Measurement	Other Topics
✓	✓	✓	✓	✓	✓	✗	✗	✗

Brake Emissions – Task Force 2 – Next Steps

Testing Phase

- ✓ A RR campaign will take place in the next months. PMP members able to follow the specified requirements can participate. The campaign will start in Q4 2020 and finish by the end of Q1 2021.
 - Assess and further extend the defined minimum technical requirements for emissions testing
 - Evaluate the repeatability and reproducibility of brake emissions tests under specified conditions
 - Use the "lessons learnt" to finalize the methodology for measuring brake particle emissions

Assessment Phase

- ✓ This phase will include the assessment of the RR results. TF2 will develop the final specifications for the brake emissions measurement method. This task is expected to be completed by Q3 2021

Reporting Phase

- ✓ Parts 2 "Minimum Requirements and Guidelines for Sampling and Measurement of Brake Emissions for Particle Number and Particle Mass" and 3 "Reporting Test Results from Brake Emissions Testing" of the PMP Brake Protocol will be published at Q4 2021

Summary of the activity – Future Outlook

- ✓ One ID submitted: *"Non-Exhaust Brake Emissions — Laboratory testing — Part 1: Inertia Dynamometer Protocol to Measure and Characterise Brake Emissions Using the WLTP-Brake Cycle"*
- ✓ Two more to submit: *"Minimum Requirements and Guidelines for Sampling and Measurement of Brake Emissions for Particle Number and Particle Mass"* and *"Reporting Test Results from Brake Emissions Testing"*
- ✓ Next F2F PMP Meeting to introduce the discussion for possible adjustments of the method to include other technologies (i.e. regenerative braking) and vehicle categories (i.e. vehicles >3.5t) to the general methodology
- ✓ Proposal: Organize a PMP-Brake workshop in January 2021 in Geneva during the GRPE week with the purpose of discussing with experts and contracting parties the way towards a method for regulatory purpose

Tyre Emissions – Summary

H2020 Project

✓ The LC-MG-1-14-2020 call aims in addressing the issue of **particle emissions** and noise from tyres. It is a 2-stage call and the winning consortium(a) will work among others on the following topics.

- Assessment and characterization of the amounts of tyre particles emitted under different driving conditions both in the laboratory and on-road
- Provide recommendations for the development of reliable and repeatable methodologies for the assessment of tyre emissions and tyre abrasion rate
- Particles tracing and quantification in different environmental compartments with focus on microplastics emissions

Abrasion Rate

✓ ETRMA has completed the feasibility assessment regarding the development of a tyre abrasion methodology. ETRMA has committed to present their proposal at the next F2F PMP Meeting.

✓ PMP's target remains to explore the possible correlation of tyre abrasion rate with PM₁₀ and PM_{2.5} emissions as soon as the method becomes available

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Thank you



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