

Author's Accepted Manuscript

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PII: S0021-8502(18)30159-9
DOI: <https://doi.org/10.1016/j.jaerosci.2018.06.014>
Reference: AS5310

To appear in: *Journal of Aerosol Science*

Received date: 20 April 2018
Revised date: 8 June 2018
Accepted date: 25 June 2018

Cite this article as: Barouch Giechaskiel, Matthias Schwelberger, Christophe Delacroix, Marchetti Massimo, Marc Feijen, Klaus Prieger, Sven Andersson and Hua Lu Karlsson, Experimental assessment of solid particle number Portable Emissions Measurement Systems (PEMS) for heavy-duty vehicles applications, *Journal of Aerosol Science*, <https://doi.org/10.1016/j.jaerosci.2018.06.014>

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Experimental assessment of solid particle number Portable Emissions Measurement Systems (PEMS) for heavy-duty vehicles applications

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Abstract

Heavy-duty engines are type approved on engine dynamometers. However, the in-service conformity or in-use compliance is conducted on the road over ~~normal~~ driving patterns, conditions and payloads defined in the regulation using Portable Emissions Measurement Systems (PEMS). In Europe PEMS testing is currently applicable to gaseous emissions only, but the introduction of solid particle number (SPN) PEMS is under discussion for heavy-duty vehicles. Although SPN PEMS testing is required for light-duty vehicles, the robustness and the accuracy of the systems for the different conditions of heavy duty vehicles (e.g. higher exhaust gas temperatures, high content of bio-fuels, CNG engines) needs further investigation. This paper describes the experimental assessment of four SPN PEMS models by comparing them to reference regulated laboratory systems. One of the SPN PEMS was circulated to ~~all~~ most laboratories. The tests were conducted by heavy-duty vehicle manufacturers in Europe. The results showed that the PEMS measure within 40-65% of the laboratory standards with only minor robustness issues. Thus, they can be included in the in-service conformity regulation taking into account their measurement uncertainty.

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