**UCR PEMS Conference Presentation Abstract: HORIBA’s Micro Smart Emissions Measurement System**

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Modern PEMS devices provide vehicle manufacturers with tools for developing vehicle emissions performance and regulating agencies with tools to validate emissions compliance under real-world operating conditions. The idea of smaller and lighter versions of PEMS has been emerging over the past several years. This is being driven by desire to reduce testing time and effort on one hand, and improve test coverage by increasing the pool of available vehicle emission data on the other. Various prototype and commercial systems have been introduced, attempting to strike the right balance of cost, capability and ease-of-use.

A Smart Emission Measurement System (SEMS) has been under development by TNO since 2012. This simple, easy-to-use, sensor-based emission monitoring solution includes an analysis toolbox that has been continuously developed and validated through numerous measurements of emissions from light-duty, heavy-duty and non-road vehicles. HORIBA and TNO are now collaborating on industrialization and deployment of this SEMS solution.

The HORIBA SEMS device can be equipped with standard automotive sensors in the vehicle tailpipe to measure concentrations of emission components such as O2, NOx, NH3, and potential others as well. The collected data can be stored locally in the device or be broadcasted over cellular data networks to a cloud server where a dedicated SEMS software suite is deployed. The measured signals are combined with signals from the vehicle onboard diagnostic system to calculate common emission factors. Several evaluation methods are under development including various binning and mapping techniques, as well as moving average window techniques. Results can be calculated on distance, mass and CO2/fuel specific bases.

The HORIBA SEMS software is being developed based on STARS ENTERPRISE. ENTERPRISE is a cloud-based platform developed by HORIBA for accomplishing various process automation and data management activities. ENTERPRISE uses a universal, flexible and scalable modern software solution. Therefore, the SEMS cloud-based software suite provides users with the powerful data storage, management, analysis and reporting capability necessary to manage large test fleets.

In the cloud server, incoming data is aligned and processed before being stored into the database by the backend software. The frontend software can be invoked remotely using conventional PC web browsers. Through the builtin functions, diverse features of the emissions data can be flexibly displayed and analyzed using powerful charting and maping tools. Additionally, summary reports can be automatically generated using corresponding interactive maps and chart illustrations.

HORIBA’s presentation will start with an introduction of the SEMS system to address setup, hardware and software development. The presentation will include comparisons of SEMS and laboratory test results. A detailed introduction to the software functional features will then give a concrete overview of the available data management and analysis features.

Note: SEMS hardware and demonstration of the ENTERPRISE cloud-based software will be available at the HORIBA display.