**Investigating measurement uncertainties related to the use of miniature PEMS for direct tailpipe emissions under controlled laboratory conditions**

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Five current technology “miniature” PEMS (m-PEMS) were investigated to evaluate their ability to be used as “low-cost”, light weight, easy-to-use compact screening tools for emissions measurements. Under fixed laboratory conditions, the m-PEMS were evaluated against a suite of bench scale instruments used for research and development purposes along with other instruments commonly used for certification. The m-PEMS were equipped on two development level vehicles (gasoline and diesel) and operated on various chassis dynamometer drive cycles to cover a broad range of operating conditions. In addition, to better understand some of the measurement uncertainty observed during the drive cycles, steady state bench scale studies were added to supplement the chassis dynamometer tests.

The results of the study indicate m-PEMS systems are designed with a level of sensitivity appropriate to be utilized as a screening tool and not as a low cost means of directly replicating laboratory grade equipment. However, despite having various degrees of measurement uncertainty, the compact PEMS units were found to be effective means of gaining valuable emissions information directly from the tailpipe when applied appropriately. Findings of this investigation will be presented.