

# **Comparative Analysis of Methods for Measuring Ultra-Low Levels of Diesel PM Mass Emissions**

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## **Abstract**

To meet more stringent regulations, engine manufacturers have been implementing diesel particulate filter technologies in order to reduce the emission levels of particulate matters. Currently, the majority of world-wide regulatory methods for measuring engine particulate emissions are gravimetrically based. As modern engines considerably reduce particulate mass emissions, these methods become less stable and begin to display higher levels of measurement uncertainty.

The goal of the present study was to characterize PM mass emissions from heavy-duty diesel engines, with a range of particulate emission levels, and to gain a better understanding of the variability and uncertainty associated with common mass measurement methods, as well as how well these methods compare with each other. Gravimetric mass measurement methods, chemically reconstructed method, and particle size integrated method were analyzed as part of the present study. The results have shown that each of the mass measurement methods analyzed compare well at higher emission levels, but show significant disparity at the ultra-low emission levels commonly seen from modern diesel engines. Additionally, at ultra-low emissions, the uncertainty in the measurement becomes large, thus reducing confidence in the accuracy of the measurement. Therefore, it may be more appropriate to perform a reconstruction of the particulate mass due to a lower susceptibility to measurement error when a DPF is used.