# Using Spectral Averaging and Signal Processing to Leverage Existing Short-term Fence Line UV Spectroscopic Data to Retrieve Accurate, Long-term Gas Concentrations to Meet New Monitoring Goals

Oral Presentation

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## ABSTRACT

In the near future, a rule proposed by the U.S EPA could require refining operations to conduct fence line monitoring for benzene. Some facilities have existing Ultra Violet Differential Optical Absorption Spectroscopes (UV DOAS) to perform fence line leak detection. The rule will require a lower limit of detection (LOD) of 1.0 parts-per-billion (ppb) benzene. The proposed timescale for one proposed method (passive samplers) is 14 days. Currently, the UV DOAS fence line systems are configured to sample every 5 minutes for leak detection. When utilizing the shorter timescale, low ppb LODs can be achieved, though not necessarily the proposed LOD of 1.0 ppb benzene. Theoretically, the LOD decreases as a function of the square root of the number of spectra averaged (sample time). This theory predicts that a 50 minute sample would have a LOD of less than 1/3 that of a 5 minute sample. Preliminary tests have shown a decrease of absorbance equivalent noise (AED) of 55% by increasing averaging time from 5 minutes to 40 minutes. With advanced signal processing to deal with changes in pressure (e.g., oxygen in the beam path) and signal strength changes over time, existing systems should be able to provide the existing leak detection capabilities while also providing chronic exposure information meeting or exceeding the requirements of the proposed rule. The 1.0 ppb benzene LOD should be achievable by averaging and processing only a few hours of data. This would allow for a much better temporal resolution than the proposed 14 day timescale making it possible to better use wind data to trace sources. In addition, the UV DOAS instruments are already configured to monitor for multiple compounds, so the same technique can be applied to get chronic exposures information for other gases such as toluene, p-xylene, sulfur dioxide, and carbon disulfide.

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The 2015 summer Forum on Laboratory Accreditation occurred in Chicago, IL from July 13-17, 2015. This meeting was the ninth combined meeting of the Forum with the National Environmental Monitoring Conference (NEMC). The technical presentations from the NEMC meeting can be found at www.nemc.us.