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# Title: Active standoff detection of $CH_4$ and $N_2O$ leaks using hard-target backscattered light using an open-path quantum cascade laser sensor

Type of Presentation: __X___ Poster
_____ Oral

Short Abstract:

Fugitive gas emissions from agricultural or industrial plants and gas pipelines are an important environmental concern as they contribute to the global increase of greenhouse gas concentrations. Moreover, they are also a security and safety concern because of possible risk of fire/explosion or toxicity. This study presents standoff detection of $CH_4$ and $N_2O$ leaks using a quantum cascade laser open-path system that retrieves path-averaged concentrations by collecting the backscattered light from a remote hard target. It is a true standoff system and differs from other open-path systems that are deployed as point samplers or long-path transmission systems that use retroreflectors. The measured absorption spectra are obtained using a thermal intra-pulse frequency chirped DFB quantum cascade laser at ~7.7 μm wavelength range with ~200 ns pulse width. Making fast time resolved observations, the system simultaneously realizes high spectral resolution and range to the target, resulting in path-averaged concentration retrieval. The system performs measurements at high speed ~15 Hz and sufficient range (up to 45 m, ~148 feet) achieving a normalized sensitivity of 3.3 ppm m $Hz^{-1/2}$ for $N_2O$ and 30 ppm m $Hz^{-1/2}$ for $CH_4$ with a 0.31 mW average power QCL. Given these characteristics, this system is promising for mobile or multidirectional search and remote detection of gas leaks.

# Active Stand-Off Detection of Gas Leaks Using an Open-Path Quantum Cascade Laser Sensor in a Backscatter Configuration