



OPTRA Inc. Awarded Phase I U.S. Environmental Protection Agency SBIR Contract for Fourier Transform Infrared Phase Shift Cavity Ring Down Spectrometer

Topsfield, MA (April 11, 2011) - OPTRA Inc. was awarded a \$80,000 Small Business Innovation Research (SBIR) Phase I research grant by the U.S. Environmental Protection Agency to develop a Fourier transform infrared phase shift cavity ring down spectrometer (FTIR-PS-CRDS). The instrument will be capable of detecting and discriminating a broad range of air toxic compounds at sub parts-per-billion concentration levels.

Our approach measures the phase-shift of amplitude modulated IR energy resonant with a spherical mirror cavity. This phase shift is proportional to the ring down time of the cavity which in turn is (inversely) proportional to the losses of the cavity including losses due to the presence of absorbing molecular species. This technique can therefore be used to measure molecular concentration via IR absorption spectroscopy. Owing to the very long effective path on account of the resonance, this technique offers extremely high sensitivity for detecting very low concentration levels. The use of a broadband (incoherent) IR light source coupled with the FTIR spectrometer supports simultaneous measurement of a broad range of air toxic compounds which exhibit spectral resonance in the longwave infrared. This system will be able to resolve the 7 to 14 μm spectral range to 4 cm^{-1} , thereby enabling accurate discrimination between the broad range of air toxic compounds. Our unique approach to FTIR-PS-CRDS also enables fast collection time (sub-second) in contrast to previous attempts which employed an electro optic modulator to impose the amplitude modulation. Our overall solution will offer an unprecedented combination of sensitivity, selectivity, inclusivity, and measurement bandwidth for a host of air monitoring applications. Example applications include ambient monitoring, in stack stationary source monitoring, large area source measurements (from a mobile platform), and plume measurements for source apportionment and plume monitoring. This technology may also have homeland security applications in low volatility chemical agent, biological agent, and explosives detection.

The Phase I effort will produce a breadboard demonstration of the proposed approach.

OPTRA has a long history of spectrometer development and is the sole supplier of IR spectrometer modules to the JSLSCAD program, a field rated chemical agent detection system. OPTRA provides laser detection and exposure sensors and laser beamsteering for optical communication, industrial processing, and collision avoidance. OPTRA is a supplier of ultra precision measurement solutions using state-of-the-art electro-optical technology. OPTRA markets the NanoGrid®, NanoScale®, and NanoGage® nanometer resolution grid and linear encoder products to the semiconductor, disk drive, and general research industries.

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