

The Identification and Quantification of Greenhouse Gas Point Source Emissions Using Cavity Ring-down Spectroscopy, Complementary to Other Techniques

G. Leggett¹, T. Gardiner² and R. Robinson²

¹Tiger Optics LLC, 250 Titus Avenue, Warrington, PA 18976-2426; +447715676751, E-mail: gleggett@tigeroptics.com

²National Physical Laboratory, Teddington, Middlesex, United Kingdom

The provision of robust, accurate, stable, and mobile instrumentation for the determination of key greenhouse gases (GHGs) in ambient air is essential for assessing the emissions of these species from anthropogenic sources such as landfill sites, industrial processes, and agricultural facilities, for the purpose of process optimisation and carbon accounting activities. We report the details of a study where a commercial Cavity Ring-Down Spectroscopy (CRDS) based analyser (Tiger Optics Tiger-I 2000) has been developed to complement the measurement of point source emissions of GHGs using more established techniques such as open-path Fourier Transform Infrared Spectroscopy and Differential Absorption LIDAR. We give an introduction to the CRDS technique, its application to GHG measurements, and wider applications of the technique relevant to the environmental sector. We demonstrate that CRDS provides a reliable, fast response, calibration-free, relatively low-cost option for the identification of point sources and the subsequent quantification of emitted GHGs. We show how the technology provides the appropriate sensitivity in order to determine the output of gases at some distance from the emission source, and also the dynamic range to allow effective measurements of localised sources within the site of interest.

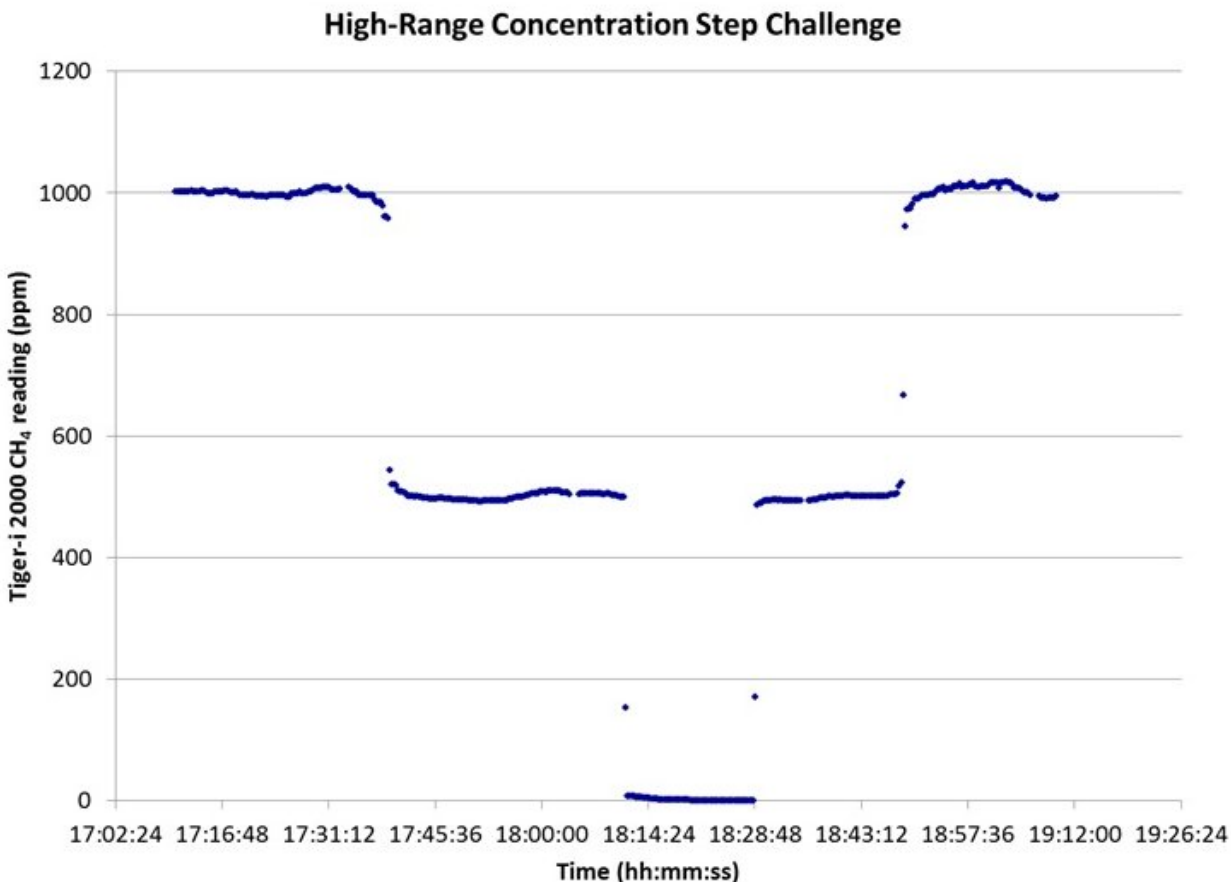


Figure 1. Tiger-I 2000 response to high concentration CH₄ intrusion.