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## Carbon dioxide detection using NIR diode laser based wavelength modulation photoacoustic spectroscopy

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### Keywords

photoacoustic spectroscopy, NIR diode laser, wavelength modulation, CO<sub>2</sub> detection

### Abstract

A photoacoustic sensor using a laser diode emitting near 1573 nm in combination with a dual-microphone resonant photoacoustic cell has been developed for carbon dioxide trace gas analysis at atmospheric pressure. Wavelength-modulation scheme and  $1f$  detection for CO<sub>2</sub> concentration measurements in Ar are demonstrated. The noise equivalent absorption sensitivity of NEAS( $1\sigma$ ) =  $1.01 \times 10^{-8}$  Wcm<sup>-1</sup>/Hz<sup>1/2</sup>, corresponding to a detection limit of 30 parts in 10<sup>6</sup> by volume (ppmv) for a 100 s integration time and 4.5 mW average laser power. The photoacoustic response of CO<sub>2</sub> dependence on the buffer gases with different mixture ratio of Ar and N<sub>2</sub> was investigated. Finally, the possibility to make use of the sensor for measurements of ambient CO<sub>2</sub> is also presented.



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