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# Optical-Feedback Cavity-Enhanced Absorption Spectroscopy using an Interband Cascade Laser

Lucile Richard, Irène Ventrillard, and Daniele Romanini

Laboratoire Interdisciplinaire de Physique (LIPhy), Université Grenoble Alpes, Grenoble, France
(lucile.richard@univ-grenoble-alpes.fr)

The coupling of Interband Cascade Lasers (ICL) with high sensitivity absorption spectroscopy, in particular Cavity Enhanced Absorption Spectroscopy (CEAS) opens new perspectives in trace detection and isotope analysis. In fact ICLs cover a mid-infrared spectral window (3-4$\mu$m) in between GaSb diode lasers and Quantum Cascade Lasers (QCL), where strong molecular transitions can be found, e.g. for the CH stretch fundamental transitions like in CH4 and H2CO. While ICLs have lower emission power than QCLs, they require much lower supply current and voltage which makes their implementation as easy as that of telecom diode lasers. We present here a first OF-CEAS implementation of an ICL, where Optical Feedback (OF) allows a strong transient frequency-locking of the laser to successive cavity modes during a laser frequency scan. A noise equivalent absorption of 8E-9/cm for the baseline of an OF-CEAS spectrum (80ms) is obtained using a moderate finesse cavity (F$\sim$8000). This translates in a normalized figure of merit of 2.2E-9/cm/sqrt(Hz), in line with typical CEAS performances in the near or mid infrared spectrum. One notable advantage of ICLs is the broad tuning range they allow by a direct injection current scan, about 3-4 times wider than allowed when using QCL or even telecom or GaSb diode lasers.