HIGH SENSITIVITY INTRA-CAVITY LASER ABSORPTION SPECTROSCOPY WITH VERTICAL EXTERNAL CAVITY SURFACE EMITTING SEMICONDUCTOR LASERS

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We report the demonstration of high sensitivity Intra-Cavity-Laser-Absorption-Spectroscopy (ICLAS) employing Multiple-Quantum-Well Vertical-External-Cavity Surface-Emitting semiconductor Lasers (VECSEL's). A detection limit of 10^{-10} cm^{-1} has been achieved. The spectro-temporal dynamics of a broadband VECSEL in the 1000 nm wavelength range has been studied in order to determine the sensitivity limit of the new class of the laser materials suitable for ICLAS. The laser was operating CW at room-temperature, with a baseline signal to noise ratio as high as 400. The laser was diode pumped with a threshold as low as 110 mW and broadly tunable over a spectral range of about 76 nm. In the nearest future this should allow developing very compact transportable ICLAS instruments, suitable for *in situ* measurements. VECSEL systems offer very wide operating range in the near- and mid-Infrared from 0.7 μm to 2.5 μm.