PSEUDO-RANDOM AMPLITUDE OR TONE BURST MODULATION COMBINED WITH CAVITY-ENHANCED DETECTION

CHRIS HOVDE, *Southwest Sciences Ohio Operations, Cincinnati OH 45244* ; STEVE M. MASSICK and DAVID S. BOMSE, *Southwest Sciences, Santa Fe NM 87505*.

Combining pseudo random-modulation techniques with cavity enhanced spectroscopy allows the estimation of both optical path length and absorption while using a cw diode laser as the light source. Two pseudo-random modulation approaches are described, in each case combined with an off-axis cavity consisting of two cylindrical mirrors oriented to produce a dense pattern of cavity modes. In one approach, the amplitude of the laser is modulated; deconvolution results in an exponential ring-down decay curve. In the second approach, tone bursts that modulate the laser frequency are switched on and off with a pseudo-random code. Deconvolution yields the first derivative of an exponential whose amplitude is proportional to absorbance. With either approach the dynamic range of the transmitted intensity is much smaller than for a ring-down experiment, allowing high gain before the signal is digitized. Initial experimental results measuring carbon monoxide are presented, and the dependence of detection sensitivity on experimental parameters such as pseudo-random clock rate is discussed.