LONG TERM STABILITY IN CW-CRDS EXPERIMENTS

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Allan variance can be used to characterize the slow drift of CW cavity ring-down spectroscopy (CW-CRDS) system, caused by the instability of experimental environments. By including the differential measurement of on- and off-peak decay rates in the system, the drifting of both decay rates can cancel out greatly. A sensitivity of 5.6×10^{-12} cm^{-1} during an optimum integration time of 15.4 minutes has been obtained with our CW-CRDS system. This sensitivity corresponds a 3σ methane detection limit of 0.3 parts per billion by volume (ppbv) in N_2 at 20 torr or 37 parts per trillion by volume (pptv) in N_2 at 760 torr measurement pressure, near 1.65 μm laser wavelength.