

## 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  $5.6 \times 10^{-12} \text{ cm}^{-1}$  during an optimum integration time of 15.4 minutes has been obtained with our CW-CRDS system. This sensitivity corresponds a  $3\sigma$  methane detection limit of 0.3 parts per billion by volume (ppbv) in  $\text{N}_2$  at 20 torr or 37 parts per trillion by volume (pptv) in  $\text{N}_2$  at 760 torr measurement pressure, near  $1.65 \mu\text{m}$  laser wavelength.