ADVANCES IN CW CAVITY RING-DOWN SPECTROSOCPY

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Stable continuous wave (cw) Nd:YAG and external cavity diode lasers, servo-locked to ring cavities enhance the performance of cavity ring-down spectroscopy (CRDS). Low-noise cw light that is not coupled into the long-lived cavity mode can be used as the local oscillator in heterodyne detection. This technique reduces the impact of electronic noise and facilitates shot-noise-limited sensitivity even with vanishingly small ring-down signals. Two variations have been demonstrated: frequency-switched and polarization-selective optical heterodyne detection. Spectra of CO_2 at 1.06 μm were obtained signal-to-noise ratios above 40 dB, limited only by digitization error.