CAVITY RINGDOWN SPECTROSCOPY WITH A CW CO_2-LASER,MICROWAVE-MODULATED SIDEBAND SYSTEM

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This work reports the first observation of a ringdown decay from an empty resonator using a < 0.5 MHz linewidth, cw, carbon dioxide laser with $\sim$ 1 mW of microwave sidebands separated 8 GHz to 18 GHz from the CO_2 carrier frequency. The resonator consists of a Fabry-Perot interferometer with two highly reflective mirrors (R$\sim$99.5%) separated by 1.2 m providing an optical pathlength for absorption of 420 m and a theoretical ringdown time of 800 ns. At present, the lack of availability of highly reflective mid-infrared mirrors places an upper limit on the ringdown time. One of the benefits of using an extremely high resolution laser is that a single mode of the cavity can be selectively monitored. Future investigations with the experimental system include saturation spectroscopy of unstable chemical species, such as ozone, for accurate concentration determination.