TRACE GAS DETECTION WITH C. W. CAVITY RING-DOWN LASER ABSORPTION SPECTROSCOPY

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We are developing a technique to measure trace concentrations of gases in the near infrared region using continuous wave excitation of a cavity ring down spectroscopy cell (CW-CRDS). This will allow the use of modest power, single mode diode lasers that are becoming available at modest cost, are easily transportable, and do not require cryogenic systems for either laser or photon detector. The near-IR contains both vibrational overtone transitions and forbidden electronic transitions of many atmospherically important free radicals. Earlier work in our laboratory had used the technique of optical locking to efficiently couple radiation into the ring down cavity, but this proved too unstable for routine spectroscopic use, even in the laboratory. We are now using both a Faraday isolator and an Acoustic Optical Modulator (AOM) to optically isolate the laser and ring down cavity. The linewidth of the diode laser is reduced by the use of a weak reflection from an external mirror. Either the laser or the ring-down cavity length can be scanned into resonance, and then the input radiation abruptly stopped (compared to the cavity ring down time) with the AOM. This follows the method used earlier by Anderson, Frisch, and Masser to determine mirror reflectivity by the ring down cavity technique. More recently, Rommanini *et al.* have used a similar technique in the visible spectral region.