TRANSIENT FREQUENCY-MODULATION DIODE LASER SPECTROSCOPY OF METHYLENE

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Transient frequency-modulation (FM) techniques have been combined with diode laser absorption to acquire high resolution spectra of the methylene (CH_2) $\tilde{b}^1B_1 \leftarrow \tilde{a}^1A_1$ electronic transition in the vicinity of $10000\mathrm{cm}^{-1}$-$10600\mathrm{cm}^{-1}$. These spectra represent the first application of transient FM techniques using a simple and inexpensive diode laser source to high resolution spectroscopy. By comparison with previous data obtained using a dual-beam absorption setup, the improvement in signal-to-noise ratio is dramatic. A sensitivity ($\Delta I/I$) for raw signals of 1.1×10^{-4} in 0.6 μsec is now routinely achieved for 0.4 mW laser power at the detector. The integrated absorption signals have even larger signal-to-noise ratios. This can be compared with the shot noise limit for absorption of 2.9×10^{-5} for these parameters. This talk will concentrate on details of the experimental design.

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