FM SPECTROSCOPY USING PULSE-AMPLIFIED LASERS

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We have explored techniques for sensitive FM absorption spectroscopy with nanosecond laser pulses, both in a simple absorption cell and in a resonant enhancement cavity. In both cases, intense transform-limited pulses of frequency-modulated light are produced by pulsed amplification of an FM modulated cw laser.

In our first experiments, performed in collaboration with Robert Field and Jonathan Bloch from MIT, [a] we measured FM absorption in the γ band of NO. To produce the required 214 nm radiation, pulsed FM light was frequency-tripled using KDP and BBO crystals. A fractional sensitivity of 10^{-4} was achieved in single-pass absorption.

More recently we have extended the pulsed FM technique by adding a resonant cavity. Transform limited pulses of frequency modulated light are injected into a locked, single mode cavity of moderate finesse, matched to the sideband spacing. Preliminary results on iodine demonstrate an absorption sensitivity of roughly 1×10^{-9} per cm, showing promise for future applications in far UV spectroscopy, Doppler-free saturation spectroscopy, and multiphoton absorption spectroscopy.

[a] E.E. Eyler, S. Gangopadhyay, N. Melikechi, J.C. Bloch, and R.W. Field, Opt. Lett. 21, 225 (1996)