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Robert W. Field

Massachusetts Institute of Technology – Department of Chemistry

**Chirped pulse mm-wave spectroscopy:
 the ultimate weapon for molecules behaving badly**

Chirped Pulse millimeter-Wave (CPmmW) spectroscopy, in the form pioneered by the Brooks Pate research group, offers previously unimaginable classes of spectroscopic and dynamical experiments. In a single pulse or in a series of >10,000 phase-coherent pulses, one can search a 10 GHz spectral region at sub-MHz resolution. Species and vibrational level populations are trivially derivable from transition intensities. In order to take full advantage of the sensitivity of CPMW, it is necessary to eliminate skimmers and focused laser beams from the standard pulsed supersonic jet apparatus in order to make the region, where molecules, lasers, and microwaves interact, as large as possible (increased from 0.1 to 100 cm³). Examples for discussion will be drawn from recent experiments at MIT: photoablation jet, photolysis jet, pyrolysis jet, millimeter-wave detected Rydberg-Rydberg electronic transitions with kilo-Debye transition moments, PUMP-DUMP-mm-wave PROBE pure-rotation transitions in highly excited vibrational levels, phase measurements of the Free Induction Decay in optically thin and thick media, and mmW photon echoes. This research is supported by grants from the National Science Foundation (CHE 0749821 and 1058709) and the Department of Energy (DE-FG0287ER13671).

