SEMI-CONFOCAL CAVITY AND OTHER EXPERIMENTS IN BROADBAND FOURIER TRANSFORM MICROWAVE (FTMW) SPECTROSCOPY

GORDON G. BROWN, KEVIN O. DOUGLASS, BRIAN C. DIAN, SCOTT M. GEYER, and BROOKS H. PATE, *Department of Chemistry, University of Virginia, McCormick Rd., P.O. Box 400319, Charlottesville, VA 22904.*.

Development of short microwave pulses and a broadband cavity FTMW spectrometer are explored. A semi-confocal MW cavity was implemented to allow for broad cavity resonances (100 - 500 MHz FWHM) in FTMW measurements. Short MW pulses (1 - 100 ns) are generated by mixing continuous wave microwaves with short, shaped pulses from an arbitrary waveform generator. The bandwidth of the MW cavity resonance is matched to the appropriate transform limited bandwidth of the MW pulse. The importance of shaping short MW pulses will be explored. A second experimental design presented involves a cavity-free FTMW spectrometer. In this design, two MW horns are implemented to broadcast and receive the MW signals. In this case, the MW frequencies are no longer limited by the cavity resonance and are entirely dependent on the MW pulse. Therefore, broader excitation bandwidths (11 GHz) are achieved. The most efficient broadband excitation scheme uses linear frequency sweep (fast passage[a]). Experiments generating the frequency sweep with a voltage controlled oscillator will be described.

[a] J. C. McGurk, T. G. Schmalz, and W. H. Flygare, *J. Chem. Phys.*, **60**, 4181 (1974).