MEASUREMENT OF THE ROTATIONAL SPECTRUM OF LASER-PREPARED VIBRATIONALLY EXCITED STATES USING FTMW SPECTROSCOPY

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We have combined FTMW spectroscopy with pulsed infrared laser excitation to measure the rotational spectrum of vibrationally excited states. Initial measurements of propyne are used to demonstrate this technique using a slightly modified spectrometer based on the design by NIST. A pulsed IR laser prepares the molecules a few centimeters above the cavity beam waist. The laser uses a single-mode optical parametric oscillator (OPO) to produce pulses with high spectral resolution (linewidth of 600 MHz). The laser is used to prepare a single rotation-vibration level in the acetylenic C-H stretch spectrum of propyne in the interaction region. After the molecules are vibrationally excited they drift into the cavity region and the FTMW spectrometer is used to observe the rotational transition in the excited state. The spectrometer design is described. Important features of the design including timing of the laser and FTMW polarization pulse, source design, and the effects of collisions will be emphasized.