THE DEVELOPMENT OF A NEW L-SHAPED FTMW SPECTROMETER WITH CAVITY AND CHIRPED PULSE SETUPS FOR SPECTROSCOPIC AND REACTION DYNAMICS/KINETICS INVESTIGATIONS

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We are reporting the progress in developing a new molecular beam Fourier transform microwave (FTMW) spectrometer at Tennessee Tech University. The spectrometer uses an L-shaped vacuum chamber to house Cavity and Chirped pulse FTMW setups. This configuration allows faster switching between narrowband and broadband modes without interference from one to the other. The Fabry-Perot cavity is established using two 7.5 in. diameter and 30 cm radius of curvature Aluminum mirrors. The chamber for the chirped pulse setup is built using a polycarbonate tube, following the design of the CPUF Spectrometer from the Suits Group[a]. This microwave transparent polycarbonate chamber enables mounting the horn antennas outside of the vacuum chamber for easier adjustment of their positions with respect to the supersonic expansion, which is a particularly useful feature for using FTMW spectroscopic detection with uniform supersonic flows. The initial setup will be used for recording high-resolution and broadband rotational spectra of supersonically cooled molecular systems in the 8 - 18 GHz frequency range.

[a]Oldham, James M., Chamara Abeysekera, Baptiste Joalland, Lindsay N. Zack, Kirill Prozument, Ian R. Sims, G. Barratt Park, Robert W. Field, and Arthur G. Suits. 2014. 'A Chirped-Pulse Fourier-Transform Microwave/Pulsed Uniform Flow Spectrometer. I. the Low-Temperature Flow System'. Journal of Chemical Physics 141(15).