AN E-BAND CHIRPED PULSE SPECTROMETER FOR MEASUREMENTS OF COLLISIONAL SYSTEMS

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The E-band (60-90 GHz) is a useful spectral region for studying molecules that are highly reactive. These species are particularly interesting as many products from chemical reactions fall within this range. Chirped pulse spectroscopy allows for these products to be detected at fast timescales compatible with reaction kinetics measurements. To accomplish this, we have constructed a new chirped pulse Fourier transform millimeter wave spectrometer operating within the E-band. The spectrometer uses a 300 mW high power broadband amplifier as well as a low noise receiver protected by a fast switch. The system has been tested with a range of stable molecules both at low pressures and in the presence of rare gas colliders to simulate the experimental environment for reaction kinetics studies. The effects of collisions on spectra have been examined, with particular attention being given to pressure broadening and quenching of the free induction decay. The description of this spectrometer as well as results from pressure broadening tests will be presented and applications towards detecting products of chemical reactions will be discussed.