I. NOVEL APPLICATIONS OF A SHAPE SENSITIVE DETECTOR

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We report our recent developments of Chirped Pulse Fourier Transform Microwave (CP-FTMW) techniques that we have used to perform rotational spectroscopy. Unlike in conventional Balle-Flygare type cavity spectrometer [a], our CP-FTMW spectrometer has the ability to collect 11 GHz of a rotational spectrum in a single shot so that one can obtain an average spectrum of a molecule of interest in about 30 minutes. A 5 GHz one microsecond bandwidth chirped pulse (linear frequency sweep) is generated from an arbitrary waveform generator and the desired frequency range (8-18 GHz) is obtained using either a frequency multiplier (x4) or a 13 GHz oscillator. This phase coherent pulse is amplified with a 200 W TWT and directed to the chamber where it polarizes the molecules over the full 11 GHz bandwidth. The spectrometer utilizes double ridge waveguide horns to excite and to detect the rotational FID molecular signal. The time domain molecular signal is processed using a 40 Gs per second digital oscilloscope which can collect 800,000 data points in 20 microseconds. The S/N is improved by signal averaging in the time domain; with Balle-Flygare (BF) equivalent S/N after 10000 averages (30 minutes). The current spectrometer system is also designed to perform high resolution laser experiments and Balle-Flygare (BF) type cavity microwave experiments. We will present the advantages of utilizing a dual BF-CPFTMW spectrometer with applications to ultraviolet-microwave double resonance techniques

[a] T. J. Balle and W. H. Flygare Rev. Sci. Instrum. 52, 33-44, (1981)