MICROWAVE AND MILLIMETERWAVE SPECTRUM OF ACETIC ACID

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Acetic acid is of astrophysical interest, since several of its rotational transitions have been detected in interestellar space. It is also of theoretical interest as a relatively low barrier near-oblate internal rotor molecule with the methyl top axis approximately perpendicular to the near symmetric top axis. Preliminary experimental and fitting results on the acetic acid spectrum were presented last year at this meeting. Since that time the data set has been augmented at NIST by jet-cooled Fourier transform and millimeterwave measurements. The millimeterwave experiments were carried out using a rapid scan spectrometer based on the FAAST design of Petkie et al. [a] in which rapid scans (10 GHz/sec) were employed to survey the spectrum, followed by high resolution measurements using conventional step-scanned BWO's phase locked to lower-frequency synthesizers. The ultimate reference frequency for all measured transitions was a 10 MHz signal from a LORAN-C receiver which is accurate to 1 part in 10^{11}. Approximately 39 transitions in the region from 10 to 24 GHz, involving levels with J $\leq$ 6, $K_a \leq 5$ and $K_c \leq 4$, and v_t= 0, where v_t is the torsional quantum number, were carried out with the Fourier transform spectrometer. Approximately 1500 measurements in the 78-118 GHz region and 1000 measurements in the 300-365 GHz region were carried out with the BWO based spectrometer. At present, global fits of 700 transitions to 57 parameters give weighted standard deviations of approximately 2.0. In particular, the model can fit the 39 Fourier transform lines to a root-mean-square (rms) error of 10 KHz, and 200 of the 78-118 GHz NIST measurements to a rms error of 100 kHz. However, the 300 GHz lines cannot yet be included in the fit without seriously degrading the standard deviation. Work is continuing and it is hoped that more definite results will be available by the time of the meeting.

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[a] Petkie, et al, *Rev.Sci.Instrum*, **68** 1675 (1997)