A NEW U-BAND (40 - 60 GHz) FOURIER TRANSFORM MICROWAVE SPECTROMETER

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A new U-band (40 - 60 GHz) system have been constructed for cavity Fourier transform microwave (FTMW) spectroscopy and used for molecular measurements. Cavity FTMW spectrometers typically operate between 0.5 and 40 GHz, relying on coaxial components and quarter-wave antennas to inject microwave radiation into the Fabry-Perot cavity. Above 40 GHz, these components become inefficient. The new system, implemented as a higher frequency band on the current Ziurys group spectrometer, utilizes waveguide for radiation propagation and commercial doublers to achieve continuous operation from 40 - 60 GHz. Also, the cavity has been modified for this range, and now consists of 170 mm diameter mirrors with a radius of curvature of 840 mm and a separation of 700 mm. The Q factor of the system is around 75,000. This spectrometer has been used for measurements of the N = 4 $\rightarrow$ 3 and 5 $\rightarrow$ 4 transitions of YC_2 near 46 and 57 GHz, and the N = 3 $\rightarrow$ 2 line of ScC_2 near 47 GHz.