THE MILLIMETER- AND SUBMILLIMETER-WAVE SPECTRUM OF DIETHYL ETHER ($C_2H_5OC_2H_5$)

I. MEDVEDEV, M. WINNEWISSER, F. C. DE LUCIA, E. HERBST, *Department of Physics, The Ohio State University, Columbus, OH 43210*; Ye Enyi, R. P. A. BETTENS, *Department of Chemistry, National University of Singapore, Singapore 117543*.

Although most organic molecules found in interstellar clouds are unsaturated in nature, saturated and near-saturated molecules are detected in so-called "hot-core" sources near the sites of high-mass star formation. One such molecule of high abundance is dimethyl ether. Based on this large abundance, interstellar searches have been conducted for the next most complex ethers — ethylmethyl ether and diethyl ether — and tentative detections made despite the lack of data at all but the lowest frequency regions. Clearly, millimeter-wave and submillimeter-wave spectral data are necessary for the unambiguous detection of these molecules. We have recently studied the rotational-torsional spectrum of ethyl methyl ether at frequencies up to 350 GHz. In this talk, we report a new study of the rotational spectrum of diethyl ether from 75 GHz through 400 GHz recorded with the OSU "FASSST" spectrometer and with the MMW spectrometer (frequency range 75 to 110 GHz) located at NUS. Unlike dimethyl ether and ethylmethyl ether, the anti-anti conformer (old notation: trans-trans or TT conformer) of diethyl ether is a semi-rigid molecule, the spectrum of which can be fitted with a standard A-reduced asymmetric top Hamiltonian. Based on our results, detailed interstellar searches for this species can now be undertaken.