59. Title: Weeding the Cosmos - FIR synchrotron spectroscopy of methanol at the Canadian Light Source

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Abstract: New astronomical facilities such as HIFI on the Herschel Space Observatory, the ALMA sub-mm telescope array and the SOFIA airborne infrared (IR) telescope will yield spectra from interstellar and protostellar sources with vastly increased sensitivity, resolution and frequency coverage. This creates the need for major enhancements to laboratory databases for the particularly abundant and widespread molecular species known as interstellar "weeds" in order to model and account for their lines in observed spectra in the search for new and more exotic interstellar molecular "flowers". With its large-amplitude internal torsional motion, methanol has particularly rich spectra throughout the THz and far-infrared regions and, being widely distributed throughout the galaxy, is perhaps the most notorious interstellar weed. We have recorded new spectra for CH3OH on the high-resolution Fourier transform spectrometer on the Far-IR beamline at the Canadian Light Source synchrotron facility. New sub-band assignments for CH3OH are reported at high rotational and/or torsional quantum number, allowing term values for a number of new torsion-rotation substates to be determined. The aim of the program is to extend quantum number coverage of the data, improve our understanding of the energy level structure, and provide the astronomical community with better databases and models of the spectral patterns with greater predictive power for a range of astrophysical conditions. 