THz Spectroscopy and Spectroscopic Database for Astrophysics

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Abstract

Molecule specific astronomical observations rely on precisely determined laboratory molecular data for interpretation. The Herschel Heterodyne Instrument for Far Infrared, a suite of SOFIA instruments and ALMA are each well placed to expose the limitations of available molecular physics data and spectral line catalogs. Herschel and SOFIA will observe in high spectral resolution over the entire far infrared range. Accurate data to previously unimagined frequencies including infrared rovibrational and ro-torsional bands will be required for interpretation of the observations. Planned ALMA observations with a very small beam will reveal weaker emission features requiring accurate knowledge of higher quantum numbers and additional vibrational states. Historically, laboratory spectroscopy has been at the front of submillimeter technology development, but now astronomical receivers have an enormous capability advantage. Additionally, rotational spectroscopy is a relatively mature field attracting little interest from students and funding agencies. Molecular data base maintenance is tedious and difficult to justify as research. This severely limits funding opportunities even though data bases require a similar level of expertise. We report the application of some relatively new receiver technology into a simple solid state THz spectrometer that has the performance required to collect the laboratory data required by astronomical observations. Further detail on the lack of preparation for upcoming missions by the JPL spectral line catalog is given.

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