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Herschel and SOFIA Observations, Interpretations and the Laboratory Data Required

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The Herschel Space Observatory and the Stratospheric Observatory for Infrared Astronomy are allowing the far infrared region of the spectrum to be exploited completely for the first time. Interpreting the wealth of new data from these missions which perform photometry in many colors, moderate resolution spectroscopy and high resolution spectroscopy spanning 3 to 680 microns poses an enormous challenge to astronomers, modelers, databases and laboratory astrophysics. Large differences in instrument capability, beam sizes and the regions that can be studied as a function of wavelength place a premium on supporting data for accurate interpretation. The supporting data must include line frequencies, line strengths, transition degeneracy, and energy for assignments and local dynamics, collisional cross sections and strengths of allowed transitions for excitation, and chemical formation and destruction rates for local chemistry. Even for understanding the continuum the properties and nature of the solid state as well as the contribution of gas phase lines is important.