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Infrared – Submillimeter Wave Double Resonance Experiments and Extension of Technique to Atmospheric Pressure Spectroscopy DANE J. PHILLIPS, Kratos Defense and Security Solutions, HENRY O. EVERITT, Army Aviation and Missile Research, Development, and Engineering Center, FRANK C. DE LUCIA, Dept. of Physics, Ohio State University — Double resonance spectroscopy involves the excitation of a system into a state of non-thermal equilibrium population distribution and the subsequent probing of that non thermal equilibrium for the analysis of energy pathways of the molecule interactions. In infrared – submillimeter (IR/SMM-THz) double resonance this involves the excitation of rotational-vibrational levels of a molecule producing a non-thermal rotational energy level distribution in an excited vibrational state. The extension of this double resonance technique into the higher pressures involves understanding the collisional physics in a new pressure regime and the subsequent, collision partner dependent, interactions of these collisions with various energy manifolds. The spectroscopic signature provided by probing the excited systems rotational energy distribution provides a greatly enhance specificity to that achieved with analysis traditional SMM/THz spectroscopy. Preliminary experimental results on time resolved collisional data of atmospheric constituent gases with prototypical analyte molecules will be presented in the context of double resonance techniques in atmospheric pressures.

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