IR/THZ DOUBLE RESONANCE SPECTROSCOPY OF METHYL FLUORIDE AND COLLISION PARTNERS SELF, N_2, Ar, He, CO_2, AND AIR

DANE J. PHILLIPS, *Kratos Defense and Security Solutions Digital Fusion, 4904 Research Dr., Huntsville, Al, 35805*; FRANK C. DE LUCIA, *Department of Physics, 191 Woodruff Ave. Ohio State University, Columbus, OH 43210*; HENRY O. EVERITT, *Army Aviation and Missile RD&E Center, Weapon Sciences Directorate, Redstone Arsenal, AL, 35898*.

Time resolved IR/THz double resonance (DR) spectroscopy has been performed with a Q-switched CO_2 laser and heterodyne detection. The effect of various collision partners; self, N_2, Ar, He, CO_2, and air on the temporal response of the strength of multiple rotational lines is analyzed. A rate equation model is implemented to solve for the rates of population exiting the directly pumped states. These collision partner dependent rates are then utilized to ascertain the potential for IR/THz DR spectroscopy for chemical detection at atmospheric pressures. Preliminary results indicate pumped state relaxation occurs at rates approximating gas kinetic collisions for collisions between CH_3F and N_2 , Ar, and He, while rates of collisions between CH_3F and CO_2 are faster. Additionally the rates between CH_3F and Air appear to follow those of N_2 as expected.