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Development and Implementation of an Ultrafast Vacuum-UV (8eV) Light Source for use in UV-VUV Pump Probe Experiments of Neutral Excited State Dynamics YUSONG LIU, SPENCER HORTON, State Univ of NY- Stony Brook, SPIRIDOULA MATSIKA, Temple University, THOMAS WEINACHT, State Univ of NY- Stony Brook — Probing neutral excited state dynamics in polyatomic molecules with ultrafast laser systems enables us to study phenomena such as internal conversion, isomerization, intersystem crossing, and dissociation. Using the third harmonic (260nm) and the fifth harmonic (156nm) of our laser system we have developed an apparatus to perform pump-probe experiments for the study neutral excited state dynamics in various polyatomic molecules. The fifth harmonic of our laser system is generated through the four-wave-mixing process of $\overrightarrow{k}_{5\omega} = 2\overrightarrow{k}_{3\omega} - \overrightarrow{k}_{\omega}$ performed with a non-collinear geometry in an argon gas cell. In several polyatomic molecular systems of interest a photon with 8eV of energy gives us the unique ability to ionize from essentially anywhere along the excited state potential, but does not produce any ionization yield from the ground state. This enables us to measure excited state lifetimes without the photon energy becoming too low to ionize while the nuclear wave-packet is traveling on the excited state potential. We also have the advantage of working in the perturbative weak-field ionization regime. These experiments can also be directly compare to strong-field ionization experiments conducted with a UV-pump and an IR-probe conducted on the same molecules.

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