

Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Femtosecond XUV Transient Absorption of Strong-Field Induced Vibrational Wavepackets in Molecular Bromine ERIK HOSLER, STEPHEN LEONE, University of California, Berkeley — The development of table-top extreme ultraviolet (XUV) transient absorption spectroscopy has allowed for the investigation of chemical dynamics with both elemental specificity and chemical environment sensitivity on the femtosecond and even attosecond timescales in real-time. In this experiment, vibrational wavepackets in molecular bromine are simultaneously prepared by high field ionization on the neutral and ionized ground state potentials via an 800 nm ($2.0 \times 10^{14} \text{W/cm}^2$) pump. High harmonic generation from a semi-infinite gas cell source is then employed to probe the wavepacket evolutions via the core level transient absorption of the bromine 3d electrons at 65 – 72 eV with 20 fs, 200 meV spectral resolution. By monitoring the molecular bromine neutral depletion and ion absorption transitions, recurrences are observed in the transient absorption signal amplitude, with 105 fs and 92 fs periods, respectively, which are indicative of the creation of vibrational coherences in both states. The subsequent dissociative ionization of atomic bromine is also observed through the Br $^2\text{P}_{3/2} - ^2\text{D}_{5/2}$, $^2\text{P}_{1/2} - ^2\text{D}_{3/2}$, $^2\text{P}_{3/2} - ^2\text{D}_{3/2}$, and $^2\text{P}_{3/2} - ^2\text{D}_{5/2}$ transitions. Probing of the vibrational coherences via core level excitation allows for state selective investigation of the strong-field ionization dynamics from an elemental perspective. Extension of this work to polyatomics should allow for site and state selective investigation of both vibrational and electronic coherences.

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Date submitted: 27 Jan 2012

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