Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Femtosecond time-resolved EUV photoionization studies of ultrafast dynamics in helium nanodroplets OLIVER GESSNER, OLEG KORNILOV, OLIVER BUENERMANN, Lawrence Berkeley National Laboratory, STEPHEN LEONE, DANIEL NEUMARK, University of California Berkeley — By combining a femtosecond high harmonic generation (HHG) light source with state-of-the art photoelectron and ion imaging techniques, a new set of tools has been created to probe electronic and nuclear dynamics in EUV excited atoms, molecules and clusters in real-time. The new technique has been applied to the study of electronic and nuclear dynamics of electronically excited helium nanodroplets (He_N, $<N>\sim 2x10^6$). Femtosecond time-resolved photoelectron imaging experiments reveal two relaxation timescales, 280 fs and 2.8 ps, that we associate with an intraband transition and relaxation between two separate electronic bands, respectively. Rapid emission of Rydberg atoms is indicated by transient photoelectron spectra and preliminary results from femtosecond time-resolved ion imaging experiments. Mass- and momentum-resolved transient ion spectra reveal complex dynamics in the production of electronically excited cluster fragments. The observations are compared with first results of ab-initio calculations on the electronically excited states of the parent cluster and ionization dynamics of cluster fragments.

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Date submitted: 21 Jan 2010 Electronic form version 1.4