Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Ultrafast electronic dynamics in Helium nanodroplets studied by femtosecond time-resolved EUV photoelectron imaging OLIVER GESSNER, OLEG KORNILOV, CHIA WANG, MATHEW LEONARD, ANDREW HEALY, Lawrence Berkeley National Laboratory, STEPHEN LEONE, DANIEL NEUMARK, University of California Berkeley & Lawrence Berkeley National Laboratory — Helium nanodroplets constitute a unique cryogenic matrix for the creation, isolation and spectroscopy of regular and exotic species, such as free radicals and molecules in high-spin states. The droplets readily pick up atoms and molecules but interact only very weakly with the respective dopants due to their superfluid nature. Despite the remarkable number of experimental and theoretical studies that have been performed on this new type of matter, neither the electronic structure nor the electron dynamics after EUV excitation are even remotely understood. We have performed the first femtosecond EUV-pump, IR-probe experiment to study the photoionization dynamics of pure Helium nanodroplets below the atomic Helium IP (24.6 eV) in real-time. Using Velocity-Map Imaging (VMI) photoelectron spectroscopy we were able to discern processes with associated timescales ranging from tens of femtoseconds to tens of picoseconds. The results will be discussed in the light of complementary energy-domain studies and theoretical models of the droplet's electronic and nuclear dynamics.

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Date submitted: 23 Jan 2009 Electronic form version 1.4