Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Toward Femtosecond Time-Resolved Studies of Solvent-Solute Energy Transfer in Doped Helium Nanodroplets C. BACELLAR, M.P. ZIEMKIEWICZ, S.R. LEONE, D.M. NEUMARK, O. GESSNER, Lawrence Berkeley National Laboratory — Superfluid helium nanodroplets provide a unique cryogenic matrix for high resolution spectroscopy and ultracold chemistry applications. With increasing photon energy and, in particular, in the increasingly important Extreme Ultraviolet (EUV) regime, the droplets become optically dense and, therefore, participate in the EUV-induced dynamics. Energy- and charge-transfer mechanisms between the host droplets and dopant atoms, however, are poorly understood. Static energy domain measurements of helium droplets doped with noble gas atoms (Xe, Kr) indicate that Penning ionization due to energy transfer from the excited droplet to dopant atoms may be a significant relaxation channel. We have set up a femtosecond time-resolved photoelectron imaging experiment to probe these dynamics directly in the time-domain. Droplets containing 10^4 to 10^6 helium atoms and a small percentage ($<10^{-4}$) of dopant atoms (Xe, Kr, Ne) are excited to the 1s2p Rydberg band by 21.6 eV photons produced by high harmonic generation (HHG). Transiently populated states are probed by 1.6 eV photons, generating time-dependent photoelectron kinetic energy distributions, which are monitored by velocity map imaging (VMI). The results will provide new information about the dynamic timescales and the different relaxation channels, giving access to a more complete physical picture of solvent-solute interactions in the superfluid environment. Prospects and challenges of the novel experiment as well as preliminary experimental results will be discussed.

Camila Bacellar C. Silveira
Univ of California - Berkeley

Date submitted: 26 Jan 2015 Electronic form version 1.4