Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Observation of intracluster Coulombic decay of Rydberg-like states triggered by intense near-infrared pulses BERND SCHÜTTE[1], Imperial College London, MATHIAS ARBEITER, THOMAS FENNEL, Universität Rostock, Germany, GHAZAL JABBARI, KIRILL GOKHBERG, ALEXANDER I. KULEFF, Universität Heidelberg, Germany, MARC J.J. VRAKKING, ARNAUD ROUZÉE, Max-Born-Institut Berlin, Germany — Interatomic Coulombic decay (ICD) describes a process, where an excited atom relaxes by transferring its energy to an atom in the environment that gets ionized. So far, ICD has been observed following XUV ionization or excitation of clusters. Here we present novel results of an intracluster Coulombic decay mechanism induced by intense NIR pulses and following Rydberg atom formation in the generated nanoplasma. When a highly-excited Rydberg atom relaxes to its ground state by transferring its excess energy to a weakly bound electron in the environment, electrons with kinetic energies close to the atomic ionization potential are emitted. We show evidence for such an intracluster Coulombic decay process that leaves clear signatures in the electron kinetic energy spectra. ICD is time-resolved in a pump-probe experiment, where a weak probe pulse depopulates the excited states, leading to a quenching of the ICD signal. We find a decay time of 87 ps, which is siginificantly longer than for previous ICD observations, where inner-shell holes were created by XUV pulses. Intracluster Coulombic decay is found to be a generic process that takes places in atomic and molecular clusters and at different wavelengths. It may play an important role in biological systems and in astronomical plasmas.

[1]Previous affiliation: Max-Born-Institut, Berlin, Germany

Bernd Schütte
Imperial College London

Date submitted: 29 Jan 2015 Electronic form version 1.4