Contribution ID: **4** Type: **Oral**

Time-resolved pump-probe experiment at PO4 with synchrotron and laser

Tuesday 23 February 2016 15:30 (30 minutes)

We combined narrow-bandwidth soft X-ray radiation, with an optical femtosecond laser (515nm, 2.4eV), to study the Auger cascade of core-excited atomic Ne in a time-resolved fashion. An X-ray pulse of 100ps duration and energy near 867eV stimulates the Ne1s->3p excitation. This core-excited state decays within its lifetime of ~2.4fs, almost instantaneous for every synchrotron and for most existing light sources. Most of the Ne1s-13p decays occur via emission of a fast Auger electron into a Ne+ ion, predominantly with 2 valence vacancies and one electron occupying a higher-lying valence orbital. These Ne+ products can undergo further Auger decay, emitting a "2nd-step"Auger electron in the energy range up to ~35eV.
Unlike the almost instantaneous Auger decay of the core-excited state, the 2nd-step decay can occur on a very broad time-range spanning up to several ns. During this time interval we fire a laser pulse into the interaction region probed by the X-ray, and we monitor the Auger electron spectra for the 2nd step decay while scanning the laser delay. If the laser precedes the X-ray it has no influence on the spectra, because Ne cannot be energetically accessed. If the laser arrives too long after the X-ray it also has no influence because all the Ne+ produced by the Auger cascade have already decayed further. But if the laser delay is comparable with the Ne+ lifetimes, in the ns regime, the laser pulse can alter the population distribution of the various Ne+ states, which is naturally mapped into a change of the 2nd-step Auger spectra.
We monitor the Auger electron spectra and control the relative delay between the X-ray and laser pulses as well as laser wavelength and intensity. From these delay-resolved Auger spectra we can extract dynamic information concerning the Ne+ involved in the cascade. Lifetimes are extracted and compared with theoretical calculations.

Primary author: Dr ALBERTO, De Fanis (European XFEL)

Co-authors: ZHANG, Haiou (XFEL); VIEFHAUS, Jens (DESY); RAFIPOOR, Jones (XFEL); ANWAR, Mamuna (Univ. of Hamburg); Dr WIELAND, Marek (Univ. of Hamburg); DRESCHER, Markus (Univ. of Hamburg); MEYER, Michael (XFEL); WESSELS, Philipp (Univ. of Hamburg); BEERWERTH, Randolph (Uniersity Jena); DEINERT, Sascha (DESY); FRITSZCHE, Stephan (Uniersity Jena); MAZZA, Tommaso (XFEL)

Presenter: Dr ALBERTO, De Fanis (European XFEL)

Session Classification: User reports