CFEL SCIENCE

SEMINAR

13th October, 2014 - 13:00

bldg. 99, seminar room IV (O1.111)

Federico Furch

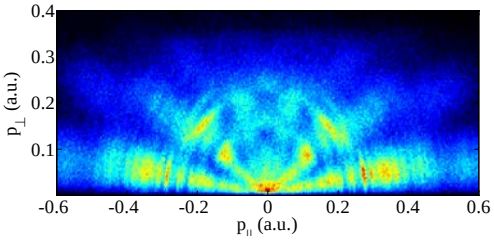
Max Born Institute, Berlin

Few cycle pulses at high repetition rates: applications in attosecond physics

In the last decade several experiments in the field of attosecond molecular science have shown that multi-electron correlations and strong coupling between electronic and nuclear degrees of freedom play a key role during and after ultrafast photoionization. The high degree of complexity of these systems calls for multi-dimensional detection techniques. Reaction microscopes (or COLTRIMS) are one of the most powerful answers to this call. They can measure the 3D-momentum vector of electrons and ions in coincidence after photoionization. However, detection of electrons and ions in coincidence requires one ionization event per laser shot, demanding a high repetition rate source.

We have developed a high repetition rate non-collinear parametric amplifier capable of delivering carrier-envelope phase-stable few-cycle pulses with 5 µJ of energy, at a repetition rate of 400 kHz. We have combined this source with a home-built reaction microscope to perform strong field ionization studies of atoms and molecules with electron-ion coincidence detection. I will discuss the current status of our system, the first experimental results in strong field ionization and the plans for the near future.

Bonus track: I will also discuss briefly the development of high energy Yb:YAG amplifiers for pumping plasma-based EUV lasers.



Photoelectron momentum distribution corresponding to singly ionized Argon with few-cycle pulses. The coincidence detection allows discriminating electrons that come from Ar^+ from Ar^{++}, Ar_2^+, etc.

Host: Franz X. Kärtner, CFEL-UX Seminar