Science at FELs
2014 at Paul Scherrer Institute
PAUL SCHERRER INSTITUT PSI

Contribution ID: **61** Type: **Contributed Talk**

Dichroism in the two-color multi-photon ionization of helium

Wednesday, 17 September 2014 12:10 (25 minutes)

The combination of intense femtosecond X-ray and NIR pulses produced by Free Electron Lasers (FEL) and synchronized optical lasers, respectively, offers various opportunities to gain detailed insight into atomic photoionization dynamics. After an early study on the linear dichroism in the two-color photoionization of helium at FLASH [1], we have now taken advantage of the availability of circularly polarized XUV radiation at FERMI to explore the circular dichroism and its influence on the photoionization dynamics [2]. The combined XUV and optical fields give rise to the formation of so-called sidebands in the photoelectron spectrum. The variation of the intensity of these sidebands, when switching the helicity of one of the light fields, is defined as circular dichroism in the photoionization and provides unique information on the partial photoionization cross sections, i.e. on the relative importance of the angular momentum of the outgoing electrons. In addition, the comparison of the experimental data with the results of theoretical models describing the two-color photoionization process eenables us to determine the degree of circular polarization of the FEL beam as well as the sign of the helicity, i.e. parameters, which are generally difficult to extract by other means. Possibilities for future applications, including resonant phenomena, will be outlined and discussed.
[1] M. Meyer et al., Phys. Rev. Lett. 101, 193002 (2008)
[2] T. Mazza et al . Nat.Comm. 5, 3648 (2014)

Primary author: Dr MEYER, Michael (European XFEL)

Co-authors: Prof. GRUM-GRHZIMAILO, Alexei (Lomonosov Moscow State University); Prof. KAZANSKY, Andrej (Donostia International Physics Center); Dr CALLEGARI, Carlo (Elettra); Dr GRYZLOVA, Elena (Lomonosov Moscow State University); Prof. COSTELLO, John (Dublin City University); Dr PRINCE, Kevin (Elettra); Prof. UEDA, Kiyoshi (Tohoku University); Prof. AVALDI, Lorenzo (CNR IMIP); Dr CORENO, Marcello (Elettra); Dr ILCHEN, Markus (European XFEL); Prof. KABACHNIK, Nikolay (European XFEL); Dr PLEKAN, Oksana (Elettra); Dr BOLOGNESI, Paola (CNR IMIP); Dr FINETTI, Paola (Elettra); Dr O'KEEFFE, Patrick (CNR IMIP); Dr RICHTER, Robert (Elettra); Dr MAZZA, Tommaso (European XFEL)

Presenter: Dr MEYER, Michael (European XFEL)

Session Classification: Atomic Molecular Systems

Track Classification: Atomic, Molecular-Systems