Contribution ID: **68** Type: **Invited oral (Laser)**

[L] Complete temporal characterization and tailoring of attosecond pulses at FERMI

Wednesday, 27 June 2018 09:00 (30 minutes)

The generation of intense, multicolor fields in the extreme ultraviolet spectral range at Free Electron Lasers (FELs) opens new perspectives for the characterization and control of nonlinear processes in atoms and molecules. These sources can deliver pulses with the high peak intensities enabling the observation of nonlinear processes. These pulses can also be implemented in XUV-pump-XUV-probe experiments by using suitable delay lines. The seeded FEL FERMI (Trieste, Italy) offers the possibility to synthetize multicolor coherent fields, whose amplitudes and relative phases can be independently controlled. The first
experimental demonstration of the coherent control in the XUV spectral region was reported by combining two harmonics with adjustable relative phase and by measuring the photoelectron angular distribution generated by the single and two-photonionisation process [1]. In the temporal domain, the coherent superposition of two or more coherent harmonics determine a temporal beating, whose characteristics can be adjusted by manipulating he relative phases between the harmonics.
I will present novel results about the complete temporal reconstruction of trains of attosecond pulses composed of several harmonics in the XUV and X-ray spectral
range using FELs. The relative phase between the different harmonics can be indipendently controlled giving the possibility to control with attosecond precision the temporal structure of the attosecond pulse train.

[1] K. Prince et al. Nature Photonics 10, 176-179 (2016).

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Session Classification: Atomic and Molecular Physics