CFEL SCIENCE

SEMINAR

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CFEL-bldg. 99, seminar room I

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Scaling and gating attosecond pulse generation

During the last decades, high-order harmonic and attosecond sources have become indispensable tools for many different applications, especially within femto- and attosecond spectroscopy. While the generation of trains of attosecond pulses, i.e. high-order harmonics of the driving laser frequency, does not present any difficulty with present ultrafast laser technology, the efficient generation of isolated attosecond pulses (IAPs) is still one of the key issues in attosecond science. Aside from the challenges of implementing an efficient gate, a major limitation for many applications arises due to the limited average power available from state-of-the-art attosecond sources. Both aspects are addressed in this talk.

We discuss how pulse energy and repetition rate of high-harmonic and attoseocnd sources can be scaled over many orders of magnitude without changing spatial or temporal characteristics of the generated extreme ultraviolet pulses. The presented scaling model has recently enabled to build an attosecond source, which boosts the average power of high-repetition rate sources dramatically over earlier reported results.

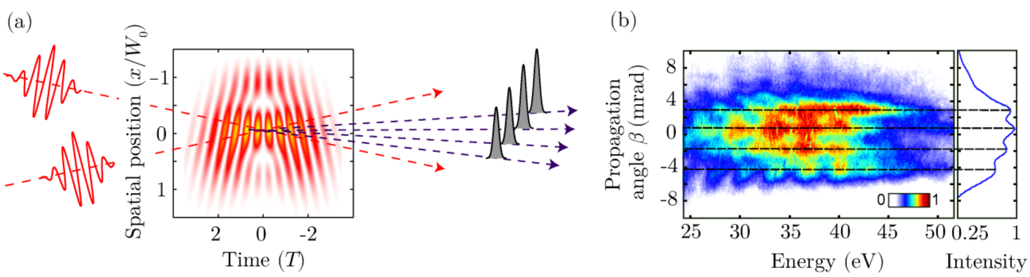

Figure: Principle of noncollinear optical gating: driving the HHG process with two identical noncollinearly superimposed and temporally delayed laser pulses results in an angularly dispersed attosecond pulse train. Multiple spectral continua can be detected with a XUV spectrometer. In (a) a simulation of the laser field is shown, (b) displays a measured XUV spectrum indicating the emission of angularly separated IAPs.

We further present a novel attosecond pulse gating approach based on noncollinear high-order wave mixing which promises to be applicable for the generation of isolated attosecond pulses inside an enhancement cavity. Such a scheme could provide isolated attoseocnd pulses at unprecedented repetition rates and power levels as well as new tools for frequency comb spectroscopy in the extreme ultraviolet.

Host: Franz X. Kärtner, CFEL UX seminar