LIGHT FIELD DRIVEN STREAK-CAMERA: TOWARDS A SINGLE PULSE TIME STRUCTURE MEASUREMENT AT FLASH

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Abstract

The Free-Electron Laser in Hamburg (FLASH) produces short intense XUV light pulses using Self-Amplified Spontaneous Emission (SASE). Because the lasing in a SASE-FEL starts from shot noise energy, wavelength and time-structure fluctuate from shot to shot. Thus, a single shot measurement of the FLASH temporal profile is of significant interest. For this purpose, the XUV pulses from FLASH are superimposed with far infrared (FIR) light pulses, that are generated by the same electron bunch in a second undulator* and therefore are expected to be intrinsically synchronized to the XUV pulse. In contrast to a conventional streak camera, the solid state photocathode is substituted by free noble gas atoms, which are ionized by the XUV pulses. The created photoelectrons are accelerated by the time-dependent electric field of the infrared light pulse, where the momentum gain depends on the FIR electric field at the ionization time. By measuring the photoelectron momenta we are able to sample the FIR light field. Moreover, single-shot spectra have been obtained that deliver information on the temporal profile of individual XUV pulses.

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