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Direct measurement of the pulse duration and frequency chirp of seeded XUV free electron laser pulses

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We report on a direct time-domain measurement of the temporal properties of a seeded free-electron laser pulse in the extreme ultraviolet spectral range. Utilizing the oscillating electromagnetic field of terahertz radiation, a single-shot THz streak-camera was applied for measuring the duration as well as spectral chirp of the generated intense XUV pulses in a fully parasitic way. The experiment was conducted at the seeding experiment of FLASH, the free electron laser user facility at DESY in Hamburg, Germany. The reported diagnostic capability is a prerequisite to tailor amplitude, phase and frequency distributions of XUV FEL beams on demand. In particular, it opens up a new window of opportunities for advanced coherent spectroscopic studies making use of the high degree of temporal coherence expected from a seeded FEL pulse.

Primary authors: AZIMA, Armin; Dr BOEDEWADT, Joern (former DESY Hamburg); Mr BECKER, Oliver (University of Hamburg); Dr DÜSTERER, Stefan (Deutsches Elektronen Synchrotron - DESY); Dr EKANAYAKE, Nagitha (former DESY Hamburg); IVANOV, Rosen (Deutsches Elektronen Synchrotron - DESY, Notkestr. 85, Hamburg, Germany); Dr KAZEMI, Mehdi (DESY Hamburg); Mr LAZZARION, Leslie Lamberto (University of Hamburg, Institute for experimental physics); Dr LECHNER, Christoph (University of Hamburg, Institute of experimental physics); Dr MALTEZOPOULOS, Theophilos (XFEL GmbH); Dr MANSCHWETUS, Bastian (DESY Hamburg); Dr MILTCHEV, Velizar (University of Hamburg, Institute of experimental physics); Dr MÜLLER, Jost (DESY Hamburg); Dr PLATH, Tim (former TU Dortmund); Dr PRZYSTAWIK, Andreas (DESY Hamburg); Prof. ROSBACH, Jörg (University of Hamburg, Institute for experimental physics); Prof. WURTH, Wilfried (University of Hamburg, Institute of experimental physics); Prof. DRESCHER, Markus (University of Hamburg, Institute of experimental physics)

Presenter: AZIMA, Armin

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