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Temporal photon diagnostics at the European XFEL

Thursday, 7 November 2024 10:00 (30 minutes)

Pump and probe techniques utilizing high peak brightness X-ray free electron lasers (XFELs) are powerful tools for studying X-ray nonlinear optics, ultrafast X-ray matter interactions and subsequent ultrafast dynamics. Owning to the stochastical properties of the SASE X-ray pulses, ultrafast pump and probe experiment normally requires a precise characterization of the temporal properties of X-ray pulses, i.e., X-ray pulse duration, and profile, and its arrival time relative to external optical laser pulses, preferably on a shot-to-shot basis.

In this presentation we will give an overview of X-ray temporal diagnostic techniques and introduce the photon arrival time measurement campaigns at the European XFEL based on X-ray/optical cross-correlation and x-ray induced secondary source emission that reliably operates at repetition rate up to 1.13 MHz with fs measurement accuracy. In addition, we will present the current and future plans towards complete characterization of attosecond x-ray pulses that have been demonstrated at both the soft and hard X-ray beamlines at the European XFEL.

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