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Attosecond Science at FELs

Friday 23 August 2024 11:30 (30 minutes)

The development of trains and isolated attosecond pulses in the extreme ultraviolet (XUV) and soft X-ray range at free-electron lasers (FELs) has opened up new avenues for attosecond science [1,2]. These pulses possess notable characteristics such as energy tunability, high peak intensities and, in the case of seeded FELs, precise phase and amplitude control.
In this presentation, I will show how attosecond metrology approaches initially developed for high-harmonic generation (HHG)-based attosecond sources have been successfully applied for the temporal characterisation of pulse trains as well as isolated attosecond pulses at FELs. Similarly, attosecond spectropy techniques used to elucidate the occurrence of attosecond time delays in photoionisation using HHG sources are currently employed for the investigation of similar effects using FELs in the soft X-ray spectral region. Furthermore, I will demonstrate how FELs can deliver attosecond radiation with unique properties (amplitude and phase control) that outperform the current capability offered by HHG-based sources [3].

Footnotes

[1] P.K. Maroju et al Nature 578, 386 (2020).
[2] J. Duris et al. 2020 Nat. Photon. 14, 30 (2020).
[3] P.K. Maroju et al. Nat. Photon. 17, 200 (2023).

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