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New insights into ultrafast phenomena of solids by time-resolved spectroscopy with fs-XUV laboratory light sources

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In condensed matter, the complex interactions between the subsystems spin, charge and lattice are responsible for (almost) all properties of solids. These interactions can lead to the formation of new phases of matter and determine the predominant energy and momentum relaxation mechanism of optically excited carriers in solids.
In this regard, time-resolved (tr) pump-probe spectroscopy is an ideal tool to monitor the ultrafast dynamics of optically generated carriers and to correlate their relaxation pathway to the band structure of the solid. Recently, latest developments in fs-XUV light sources based on high-harmonic generation [1] have paved the way towards novel experimental capabilities.
Here, I will discuss novel possibilities to study the ultrafast electronic and magnetic properties of solids by tr-absorption spectroscopy in reflection geometry and tr-and momentum resolved photoemission with fs-XUV radiation. These examples will show that these approaches can yield a novel comprehensive view onto ultrafast phenomena in solids.
[1] Popmintchev et al., Nat. Photon. 4, 822 (2010)

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