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FAKULTÄT FÜR PHYSIK
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Seminar

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Attosecond Electron Dynamics in Solids Probed by Transient Reflectivity Spectroscopy

A prerequisite for achieving control over the electrical properties of matter with ultrashort laser pulses is understanding the related light-induced physical processes. The typical time scale for the interaction of charge carriers with optical fields ranges from tens of femtoseconds down to a few attoseconds. Thus, attosecond light pulses, usually in the extreme ultraviolet spectral region, can be employed to unveil these phenomena in pump-probe experiments [1]. Among the available experimental techniques, attosecond transient reflectivity spectroscopy, which monitors pump-induced changes in the reflectivity of a solid-state sample, has recently demonstrated its ability to disclose electron dynamics in solids with extreme temporal resolution. Complemented with a simultaneous attosecond streaking measurement, it allowed the unravelling of the dual, atomic- and bulk-like nature of core excitons in MgF2 [2]. When supported by state-of-the-art theoretical tools, it disclosed the strong-field charge photoinjection mechanism in a prototypical, application-relevant semiconductor as germanium [3]. In this talk, I will first introduce attosecond transient reflectivity spectroscopy and its implementation in a novel two-foci beamline [4]. Then, I will discuss two recent experiments we performed in MgF2 and Ge with this technique.

[1] Borrego-Varillas, R. et al, Reports Prog. Phys. 85, 066401 (2022)
[2] Lucchini, M. et al, Nat. Commun. 12, 1021 (2021)
[3] Inzani, G. et al, arXiv:2212.02157 (2022).
[4] Lucarelli, G. D. et al, Rev. Sci. Instrum. 91, 053002 (2020).

Host: Rupert Huber