WWU MÜNSTER

Physikalisches Institut — Institut für Festkörpertheorie

Integriertes Seminar

Aktuelle Probleme dimensionsreduzierter Festkörper

Sondertermin

Ort: Seminarraum 718 (Wilhelm-Klemm-Straße 10)

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Extreme ultraviolet high harmonic generation and spectroscopy of condensed matter

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Attosecond science, studies of electron dynamics in their natural time scale, stems from the development of mostly extreme ultraviolet sources through high-order harmonic generation in gas-phase systems. Recently, being ignited by the researches done in Stanford, high-order harmonic generation in solids has been discovered and been actively investigated. The coherent, extreme ultraviolet radiation from solids can be utilized not only as a new source for technical applications but it also offers a great tool to study electronic properties of solids. In this talk, we briefly review the developments in this emerging field and we report our newest results. In details, we demonstrate the first polarimetry measurement of high-order harmonic generation from solids and use it to uncover the non-vanishing Berry curvature underlying the generation of even harmonics in quartz, in orthogonal polarization with respect to the linearly incident electric field. First ab initio calculation of Berry curvature of quartz has been carried out and it shows a high degree of agreement to the experimentally retrieved Berry curvature which concludes an important spectroscopic application. Furthermore, we extend high-order harmonic generation in condensed matter by reporting on the unambiguous, systematic, experimental investigations of the high-order harmonic generation in liquids, the third phase of matter. By utilizing a liquid flat-jet as a target for light-matter interaction, coherent, intense extreme ultraviolet radiation is recorded in the form of multiple odd-order harmonics reaching up to 27 order and extending beyond 20 electron Volt. The intensity scaling and the ellipticity measurement show the non-perturbative, solid-like nature of the radiation. Highest cut-off energy photons were obtained using ethanol by comparison to water and other liquids. Our investigation serves as a promising first step in utilizing the new source of coherent extreme ultraviolet radiation as well as exploring electron dynamics in liquid-phase of matter.

Einladender: Tilmann Kuhn