



SFB1242

Nichtgleichgewichtsdynamik kondensierter
Materie in der Zeitdomäne

UNIVERSITÄT
DUISBURG
ESSEN

Open-Minded

**17.05.2022 / 10 Uhr c.t., Raum MG 272
Campus Duisburg**

Seeing Atoms and Electrons in Space and Time

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The fundamental reason behind almost any light-matter interaction are atomic and electronic motion in space and time. In order to provide a movie-like access to such dynamics, we unify electron microscopy with attosecond laser technology. In this way, we combine the awesome spatial resolution of modern electron beams with the spectacular time resolution that is offered by the cycle period of light [1]. Selected results will be reported on the electric fields within metamaterials [2-3], the Einstein-de-Haas effect on atomic dimensions [4], the reaction path of phase transitions [5] and the formation of free-electron qubit states [6]. Many breakthroughs in science and technology have been achieved by disruptive imaging techniques, and our 4D electron microscopy may play this role for light-matter interaction on atomic dimensions.

- [1] C. Kealhofer, W. Schneider, D. Ehberger, A. Ryabov, F. Krausz, P. Baum, "All-optical control and metrology of electron pulses", *Science* **352**, 429 (2016).
- [2] A. Ryabov and P. Baum, "Electron microscopy of electromagnetic waveforms", *Science* **353**, 374 (2016).
- [3] K. J. Mohler, D. Ehberger, I. Gronwald, C. Lange, R. Huber, P. Baum, "Ultrafast electron diffraction from nanophotonic waveforms via dynamical Aharonov-Bohm phases", *Science Advances* (2020).
- [4] S. R. Tauchert, M. Volkov, D. Ehberger, D. Kazenwadel, M. Evers, H. Lange, A. Donges, A. Book, W. Kreuzpaintner, U. Nowak, P. Baum, "Polarized phonons carry angular momentum in femtosecond demagnetization", *Nature* **602**, 73 (2022).
- [5] P. Baum, Ding-Shyue Yang, A. H. Zewail, "4D Visualization of Transitional Structures in Phase Transformations by Electron Diffraction", *Science* **318**, 788 (2007).
- [6] M. Tsarev, A. Ryabov, P. Baum, "Free-Electron Qubits and Maximum-Contrast Attosecond Pulses via Temporal Talbot Revivals", *Phys. Rev. Res.* **3**, 043033 (2021).

Für diese Zeit steht eine Kinderbetreuung nach vorheriger Anmeldung zur Verfügung.

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