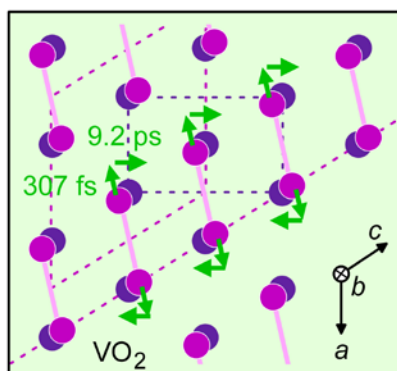
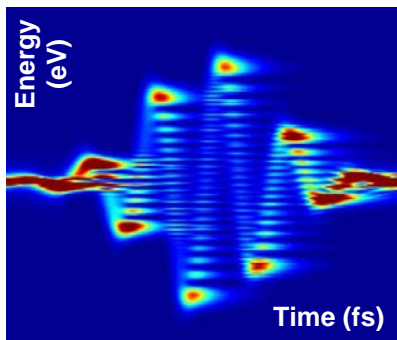
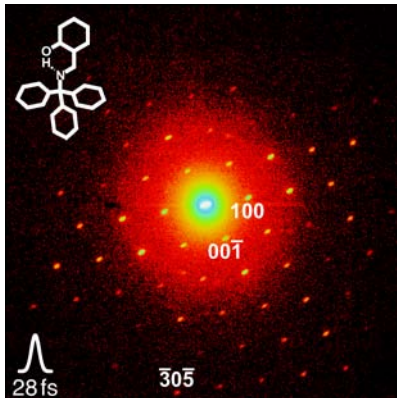


LMU München / MPI Quantenoptik /
Munich-Centre for Advanced Photonics (MAP)

Doktorarbeit / PhD Thesis

“Seeing Atoms and Electrons in Motion”



All matter around us essentially consists of atoms and electrons; their structure determines its properties on a fundamental level. However, our world is not static. Any reaction or process is essentially defined by movement paths on a (sub-)atomic level.

Our research group aims at a direct visualization of this motion and the associated phenomena with picometer (10^{-12} m) resolution and on attosecond (10^{-18} s) timescales. Our visualization approach uses femtosecond lasers and ultrashort electron pulses with only picometer de Broglie wavelengths. A sequence of diffraction patterns or electron microscopy images provides a “movie” of atoms/electrons in motion. Infrared or THz pulses, generated via nonlinear laser optics, initiate the transitions and control the electron beam.

We offer several opportunities for a PhD study:

- Generation of few-cycle carrier-envelope-phase-stable mid-infrared pulses via nonlinear optics for driving electrons in single-layer materials such as graphene.
- Compressing single-electron wavepackets with laser fields for reaching attosecond+picometer resolution in electron diffraction.
- Electron microscopy/spectroscopy of electromagnetic resonances and quantum interferences at plasmonic sub-wavelength structures.

Our research is located at the Max-Planck-Institute of Quantum Optics (www.attoworld.de) and LMU in Garching. We are also part of the excellence cluster MAP (www.map.lmu.de). The team is small, enthusiastic, and supported in part through a prestigious ERC consolidator grant (www.ultrafast-electron-imaging.de).

We require excellent degrees and enthusiasm for experiments and working with lasers. Please contact us! (CV + reports with marks; gerne auch auf deutsch)

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