



## IMPRS UFAST Call for PhD applications 2024/2025

### AC2 - Ultrafast On-Chip Transport in Quantum Materials



<b>Title of PhD Project</b>	<b>Ultrafast On-Chip Transport in Quantum Materials</b>
<b>Type</b>	Experimental
<b>Supervisor(s)</b>	Prof. Andrea Cavalleri
<b>Affiliation(s):</b>	Max Planck Institute for the Structure and Dynamics of Matter
<b>Number of positions:</b>	1
<b>Abstract:</b>	<p>Ultrafast dynamic control of quantum matter has been shown to induce a number of transient phases, including magnetism, topology, and superconductivity. These emergent non-equilibrium phenomena arise on femtosecond to picosecond timescales, which are intrinsic to the microscopic interactions between electrons, spins, and lattices, and provide possibilities to achieve faster electronics on-chip. Despite extensive characterization of these transient phases using optical, scattering, scanning, and photoemission techniques, their transport properties, i.e. their reaction to voltage and current signals, which directly impact electronic circuit performance—remain largely unexplored.</p> <p>This project aims to address this gap by launching and detecting sub-picosecond current pulses on-chip, utilizing THz waveguides and photoconductive switches. This approach will enable probing the electrical characteristics of various transient quantum phases, including the critical current in superconductors, linear/nonlinear Hall signals in topological states, and anomalous Hall signals in magnetic states.</p> <p>We offer a PhD position in this project, giving you the opportunity to combine advanced device fabrication processes in a cleanroom, with cutting-edge optical techniques to explore the electrical dynamics of optically driven quantum materials.</p>
<b>Contact person for scientific questions about the project:</b>	Prof. Andrea Cavalleri: <a href="mailto:andrea.cavalleri@mpsd.mpg.de">andrea.cavalleri@mpsd.mpg.de</a>  Dr. Eryin Wang: <a href="mailto:eryin.wang@mpsd.mpg.de">eryin.wang@mpsd.mpg.de</a>
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