Max-Planck-Institut für
Struktur und Dynamik der Materie
Max Planck Institute for the Structure and Dynamics of Matter

IMPRS UFAST Call for PhD applications 2022/2023

AC2- Multi-Dimensional Terahertz Spectroscopy of Quantum Materi

Title of PhD Project	**Multi-Dimensional Terahertz Spectroscopy of Quantum Materials**
Type	Experimental
Supervisor(s)	Prof. Andrea Cavalleri
Affiliation(s):	Max Planck Institute for the Structure and Dynamics of Matter
Number of positions:	1
Abstract:	The physics of quantum materials such as high-T_C superconductors and correlated complex oxides is often determined by fundamental excitations at terahertz frequencies. Recently, the development of high-intensity, coherent radiation sources in this frequency range has enabled spectroscopic probes of these excitations at their fundamental energy scales. However, experiments thus far have primarily been limited to conventional pump-probe spectroscopies. We seek to push the technological limits of ultrafast spectroscopies by developing a terahertz analogue of nuclear magnetic resonance, termed multi-dimensional terahertz spectroscopy (MDTS). This technique provides unique insight into the physics of quantum materials by unfolding their nonlinear optical response into a multi-dimensional spectrum. An exemplary system of interest is high-T_C cuprate superconductors, in which MDTS can answer fundamental questions concerning, for example, the mechanisms underlying competing/intertwined orders and the role of disorder in their phase transitions. We offer a PhD position in this project, giving you the chance to setup and perform these state-of-the-art experiments while contributing to our understanding of quantum materials.
Contact person for scientific questions about the project:	Andrea Cavalleri andrea.cavalleri@mpsd.mpg.de Michael Först michael.foerst@mpsd.mpg.de