



IMPRS UFAST Call for PhD applications 2024/2025



AC3 - Nonlinear Terahertz Spectroscopies of High-Temperature Superconductors

Title of PhD Project	Nonlinear Terahertz Spectroscopies of High-Temperature Superconductors
Type	Experimental
Supervisor(s)	Prof. Andrea Cavalleri
Affiliation(s):	Max Planck Institute for the Structure and Dynamics of Matter
Number of positions:	1
Abstract:	<p>Nonlinear terahertz (THz) spectroscopy has emerged as a powerful new tool for studying the microscopic properties of complex solids. It is particularly sensitive to the symmetry of low-energy degrees of freedom and complements existing nonlinear optical probes.</p> <p>A prominent example is THz third harmonic generation, which was recently used to study materials where charge-stripe order and superconductivity coexist. These charge stripes do not couple to light at the linear order but still contribute to higher-order responses. Similarly, other techniques, such as electric-field-induced second harmonic generation and THz emission spectroscopy, have demonstrated sensitivity to the nonlinear Josephson physics of superconducting cuprates. They have also proven capable of revealing the spatial arrangement of the superconducting state and its interaction with charge order.</p> <p>Here, we propose a PhD project to further develop these methods, integrating them into pump-probe experimental schemes and potentially combining them with external magnetic fields and high pressures. The ultimate goal will be to use the nonlinear THz response to thoroughly understand and characterize recently discovered photoinduced superconducting states in high-TC cuprates and organic superconductors.</p>
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