



IMPRS UFAST Call for PhD applications 2020/2021



Nonlinear control of Josephson Plasma Waves

A. Cavalleri-2

Title of PhD Project	Nonlinear control of Josephson Plasma Waves
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>Josephson Plasma Waves are electromagnetic modes that propagate along the copper-oxygen planes of high-T_c superconducting cuprates, sustained by interlayer tunneling supercurrents. Recently, it has been experimentally demonstrated that high-amplitude terahertz fields can be used to drive these waves nonlinearly, thus inducing a broad variety of intriguing phenomena, such as electromagnetic-induced transparency, soliton formation, parametric amplification, as well as high-harmonic generation.</p> <p>Aiming at investigating and controlling these nonlinear Josephson physics, the PhD candidate will first focus on the development of pulsed terahertz sources using advanced ultrafast optics techniques. They will then design and realize state-of-the-art pump-probe setups, in possible combination with high magnetic fields. Experiments on different high-T_c cuprates will be performed, and the results will be analyzed with support of numerical simulations based on the nonlinear sine-Gordon equation.</p> <p>Optical control of Josephson waves may lead to novel applications in terahertz-frequency plasmonics, in information storage and transport and, more generally, in the manipulation of high-T_c superconductivity.</p>
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