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 2026/2027

AC3 - Investigating the magnetic properties of Light Induced Superconductors

Title of PhD Project	**Investigating the magnetic properties of Light Induced Superconductors**
Type	Experimental
Supervisor(s)	Andrea Cavalleri
Affiliation(s):	Max Planck Institute for the Structure and Dynamics of Matter
Number of positions:	1
Abstract:	Ultrashort light pulses can drive materials out of equilibrium on femtosecond timescales, unlocking exotic phases of matter. Recently, this group discovered that intense mid-infrared excitation drives some unconventional superconductors into a superconducting-like state that survives up to room temperature. So far, this out-of-equilibrium state has been probed only by optical spectroscopy, revealing signatures of perfect conductivity—the first hallmark of superconductivity. The second hallmark is the Meißner effect: the expulsion of magnetic flux from a material's volume. To test whether the light-induced state also meets this criterion, this group has developed a novel optical magnetometry technique that tracks subtle magnetic-field changes on sub-picosecond timescales. As a PhD student on this project, you will push this magnetometry technique further, designing and building cutting-edge pump–probe setups that use intense mid-infrared pulses to drive unconventional superconductors out of equilibrium. Your experiments will target the Meißner effect and flux quantisation in these transient states—probing whether light-induced superconductivity can support discrete flux states, a defining manifestation of macroscopic quantum coherence. On these ultrafast timescales, your work will reveal whether the light-induced superconducting state truly mirrors equilibrium superconductivity—or is something entirely new.
Contact person for scientific questions about the project:	Andrea Cavalleri: andrea.cavalleri@mpsd.mpg.de Michele Buzzi: michele.buzzi@mpsd.mpg.de
Research Group Website:	https://qcmd.mpsd.mpg.de/