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

AC1 - Coherent control of ferroic phenomena

Title of PhD Project	**Coherent control of ferroic phenomena**
Type	Experimental
Supervisor(s)	Prof. Andrea Cavalleri
Affiliation(s):	Max Planck Institute for the Structure and Dynamics of Matter
Number of positions:	1
Abstract:	A ferroic order is a long-range ordering in solids in which an order parameter—such as electric polarization or magnetization—develops a uniform, spontaneous arrangement. These phenomena are both scientifically intriguing and highly functional, making them essential to cutting-edge research and modern technological applications. Conventionally, such order is switched using static fields—electric, magnetic, or mechanical—but these methods are often slow and energy-intensive. This project proposes new approaches to coherently control such materials using tailored light fields in the mid-infrared and terahertz frequency ranges. Specifically, we will investigate ultrafast, energy-efficient switching by coherently driving optical phonons and exploiting their anharmonic coupling to the ferroic order parameter. This PhD position offers a rare opportunity to push the boundaries of ultrafast coherent control through state-of-the-art experiments—advancing fundamental understanding of ferroic materials while laying the groundwork for next-generation technologies.
Contact person for scientific questions about the project:	Prof. Andrea Cavalleri: andrea.cavalleri@mpsd.mpg.de Dr. Michael Först: michael.foerst@mpsd.mpg.de Dr. Michael Fechner: michael.fechner@mpsd.mpg.de
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