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 2025/2026

JM1 - MHz Dynamics at molecular length scales using a new detector system

Title of PhD Project	**MHz Dynamics at molecular length scales using a new detector system**
Type	Experimental
Supervisor(s)	Johannes Möller (EuXFEL) Prof. Giulio Monaco (U Padova) J. Correa (DESY) F. Lehmkühler (DESY)
Affiliation(s):	European XFEL
Number of positions:	1
Abstract:	The origin of the glass transition remains one of the most enduring and fundamental open questions in condensed matter physics. Advancing our understanding of this phenomenon requires direct access to molecular-scale dynamics as materials approach the glassy state. Coherent X-ray scattering techniques, such as MHz X-ray photon correlation spectroscopy (XPCS) at the European XFEL, provide a powerful tool for probing these dynamics, offering sub-microsecond temporal resolution and the potential for atomic-scale spatial sensitivity. However, previous XPCS experiments have been limited by technical constraints, which this project aims to overcome. We plan to do so by utilizing the new Timepix4-based TEMPUS detector prototype, currently under development at DESY. This detector offers several advantages over existing systems and is expected to provide unique insights into the microscopic dynamics of glass-forming materials. The detector's event-based readout demands novel approaches to both experimental design and data analysis. Consequently, the project encompasses advanced data analysis using high-performance computing infrastructure, development in X-ray detector technology, and the design and execution of experiments at the European XFEL.
Contact person for scientific questions about the project:	Johannes Möller: johannes.moeller@xfel.eu
Research Group Website:	https://www.xfel.eu/facility/instruments/mid/index_eng.html