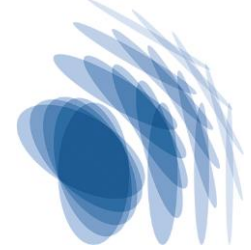


# Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter



IMPRS UFAST Call for PhD applications 2022/2023

HC2- Quantum X-ray optics



<b>Title of PhD Project</b>	<b>Quantum X-ray optics: imaging via intensity correlations</b>
<b>Type</b>	Experimental
<b>Supervisor(s)</b>	Prof. Henry Chapman
<b>Affiliation(s):</b>	UHH, DESY
<b>Number of positions:</b>	1
<b>Abstract:</b>	<p>We recently demonstrated the possibility to image microstructures from the correlations of X-ray fluorescence photons emitted by those structures. This is possible if measurements can be made within the coherence time of the emission, which is about 1 fs for K-shell fluorescence from most elements. This is made possible using short-duration pulses from an X-ray free-electron laser and an integrating pixel-array detector. Many thousands of frames are collected per second and correlations of detected counts are averaged instead of averaging the counts themselves. The method has been used to quickly measure the XFEL pulse duration or focus distribution. This project will use the spatially-patterned XFEL-generated fluorescence of a foil as a source for diffraction imaging via correlations. In particular, the spatially-structured incoherent source (a thermal emitter) will diffract from an object such as a crystal. The analysis of triple correlations of detected intensities will be developed and applied to extract both the amplitude and phase of the diffracting beams, which can be used to solve the crystal structure. Experiments will be designed for and carried out at the European XFEL.</p>
<b>Contact person for scientific questions about the project:</b>	Henry Chapman, <a href="mailto:henry.chapman@desy.de">henry.chapman@desy.de</a>

