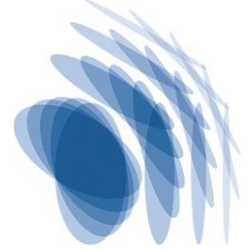


# Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter



IMPRS UFAST Call for PhD applications 2023/2024



**MM1- Sub-femtosecond optical pulse generation, characterization and application**

|   |   |
|---|---|
| <b>Title of PhD Project</b>                                       | <b>Sub-femtosecond optical pulse generation, characterization and application</b>   |
| <b>Type</b>   | Experimental  |
| <b>Supervisor(s)</b>  | Dr. Michael Meyer<br><br>Dr. Terry Mullins  |
| <b>Affiliation(s):</b>  | European XFEL   |
| <b>Number of positions:</b>                                       | 1   |
| <b>Abstract:</b>  | High energy, ultra-short optical laser pulses with durations of $\sim <1$ femtosecond will be needed in the future at the European X-ray Free Electron Laser to push the temporal resolution for time-resolved experiments from the femtosecond to the attosecond regime, enabling us to address ultra-fast electron dynamics. State-of-the-art techniques, utilizing soliton dynamics in gas-filled hollow core fibres, have demonstrated the feasibility of generating spectra, both in a specific UV band and also from the full supercontinuum, that support ultrashort pulses down to the sub-femtosecond regime when pumped with pulses of $<10$ fs duration. The project is aiming to realize such a novel and unique device for attosecond pump-probe experiments at the EuXFEL. The ideal parameters to reach this temporal regime will be determined initially by simulations, then by their experimental implementation. The design and experimental realisation of a characterisation device to verify the temporal sub-cycle properties of the pulses will follow. It is foreseen that the candidate will be strongly involved in attosecond-resolved dynamical studies, which will be performed on atomic and molecular samples at the Small Quantum Systems (SQS) scientific instrument at the European XFEL during the course of the project. |
| <b>Contact person for scientific questions about the project:</b> | Dr. Michael Meyer: <a href="mailto:michael.meyer@xfel.eu">michael.meyer@xfel.eu</a><br>Dr. Terry Mullins: <a href="mailto:terry.mullins@xfel.eu">terry.mullins@xfel.eu</a>  |

