



## IMPRS UFAST Call for PhD applications 2023/2024

### FK1-Understanding Phonon Dynamics in Perovskites via Ultrafast Electron Diffraction

<b>Title of PhD Project</b>	<b>Understanding Phonon Dynamics in Perovskites via Ultrafast Electron Diffraction</b>
<b>Type</b>	Experimental
<b>Supervisor(s)</b>	Prof. Franz X. Kärtner
<b>Affiliation(s):</b>	DESY
<b>Number of positions:</b>	1
<b>Abstract:</b>	<p>We are developing high energy Terahertz (THz) sources with milli-Joule pulse energies based on cascaded optical rectification of high energy optical laser pulses. The nonlinear optical materials used for optical rectification are perovskites such as Lithium Niobate, Lithium Tantalate and Potassium Niobate. However, their material properties are limiting the ultimate performance for optical to THz conversion. We have recently constructed a unique ultrafast electron diffractometer (UED) that can be used to understand the dynamics of the relevant phonons involved in THz generation on the 10 fs time scale. In this project we want to use UED to understand the limitations due to the phonon dynamics in these materials and eventually how to overcome it. We seek candidates with a background/experience in at least one of the following fields ultrafast and/or nonlinear optics, solid-state physics, vacuum technology, programming/numerical skills (Matlab, C++, LabView) are highly advantageous. The successful candidate should be highly motivated and will work in a team with PhD students and other postdocs in a first-class scientific environment on cutting-edge topics at the current frontiers of ultrafast science. Research is performed within international collaborations, with groups at MIT, Arizona State University, and Uppsala University.</p> <p>D. Zhang et al., "Segmented THz electron accelerator and manipulator (STEAM)," Nat. Photonics 12: (6) 336 (2018).</p> <p>S. W. Jolly et al., "Spectral phase control of interfering chirped pulses for high-energy narrowband terahertz generation," Nature Communications 10, pp. 872-877 (2019).</p> <p>D. Zhang, et al., "THz-Enhanced DC Ultrafast Electron Diffractometer," Ultrafast Science (2021); DOI: 10.34133/2021/9848526</p>
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