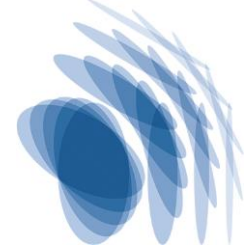


# Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter



IMPRS UFAST Call for PhD applications 2023/2024

TH3 & FK4-Creating “materials” made of light



<b>Title of PhD Project</b>	<b>Creating “materials” made of light</b>
<b>Type</b>	Experimental
<b>Supervisor(s)</b>	Prof. Tobias Herr, Prof. Franz Kärtner
<b>Affiliation(s):</b>	DESY
<b>Number of positions:</b>	1
<b>Abstract:</b>	<p>Through nonlinear optical self-organization stable femtosecond laser pulses can form inside a ring-like microresonator. When multiple pulses are created, they can interact through attractive and repulsive optical forces and, like atoms, can form “molecules” or “crystals”. In this project, we will explore the fundamental classical and quantum properties of these novel light-based “materials”. For their synthesis, we will leverage techniques equivalent to those in cold atom physics, such as lattice-trapping and laser cooling. The generated insights will advance our understanding of intriguing nonlinear optical phenomena and immediately impact emerging applications in ultrafast optical sensing, photonic computing, and mobile navigation.</p> <p>The thesis will leverage experimental, numerical, and analytical techniques at the forefront of integrated photonic technology, ultrafast lasers and nonlinear optics. It includes the design of advanced chip-integrated laser systems as well as experiments in our state-of-the-art laboratory (<a href="https://ump.cfel.de/">https://ump.cfel.de/</a>). It combines exploration of unknown physics with the development of immediately relevant and meaningful optical technologies. We present our work frequently at international conferences and work closely with other research groups across scientific disciplines.</p> <p><b>References:</b> Herr et al., Nature Photonics 8, 145 (2014) Brasch et al., Science 351, 6271 (2016) Weng et al., Nature Communications 11, 2402 (2020)</p>
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