

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

PM4 - Dynamic Heat transport measurements in novel quantum conditions



Title of PhD Project	Dynamic Heat transport measurements in novel quantum conditions
Type	Experimental
Supervisor(s)	Prof. Philip Moll Dr. Chunyu Guo
Affiliation(s):	Max Planck Institute for the Structure and Dynamics of Matter
Number of positions:	1
Abstract:	<p>In 1853, two German physicists, Gustav Wiedemann and Rudolf Franz, found that electric and thermal conductivity is directly proportional in metals. This relation is later named Wiedemann-Franz (WF) law after them. Despite its simple form, it has become one of the most important guiding principles in condensed matter physics research. However, the empirical application of WF law is challenged by the recent emergence of quantum materials, where quantum mechanics manifest their properties strongly and, therefore, lead to an exotic matter of state beyond trivial band description.</p> <p>The central goal of this project is to justify the utilization regime of WF law and establish a more empirical link between heat and charge transfer among the novel quantum materials. This will help us to establish a desperately needed basis for exploring exotic heat/electricity conversion due to non-trivial band topology and/or strong electronic correlations.</p> <p>This project provides an exceptional opportunity to develop a unique approach for simultaneous heat and charge transport measurements in microstructured quantum materials. It is achievable by combining state-of-the-art experimental capabilities in the microstructuring of quantum matter and heat propagation analysis based on finite element simulations.</p>
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