

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



ME3-Theory of hidden phases close to the Mott transition

Title of PhD Project	Theory of hidden phases close to the Mott transition
Type	Theory
Supervisor(s)	Prof. Martin Eckstein
Affiliation(s):	UHH
Number of positions:	1
Abstract:	<p>Mott insulators provide a unique platform to achieve light-induced control over functionalities in complex materials on ultrafast timescales. A particularly elusive goal is the understanding of “hidden phases”, i.e., non-equilibrium states that are long lived or even metastable, but nevertheless can be reached only with ultrashort excitations. A promising regime to search for interesting hidden states is the vicinity of the Mott transition, where exotic phases such as unconventional superconductivity can emerge from the interaction of (photo-)doped electrons with local spin and orbital moments. In many materials, the Mott transition is concomitant with a lattice distortion. This fact, which is rarely taken into account in the theoretical modelling of the out of equilibrium dynamics, can potentially lead to metastability. In this project, we aim to combine a theoretical treatment of correlated electrons based on non-equilibrium dynamical mean field theory with a description of the lattice dynamics, to explore non-thermal free energy landscapes of paradigmatic correlated systems (such as Cr-doped V2O3), and thus potentially reveal pathways for the switching to metastable states.</p>
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