



CRC 1227
Designed Quantum States of Matter



GASTVORTRAG

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Leibniz Universität Hannover
Welfengarten 1, 30167 Hannover
Hauptgebäude (1101),
Seminarraum am Institut für Quantenoptik
Raum D326

Vortragender:

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(Guest of Dr. Hendrik Weimer)

Thema: Interacting and driven topological states of ultracold lattice gases

The last years have witnessed dramatic progress in experimental control and theoretical modeling of quantum simulations based on ultracold atoms. Major recent developments include synthetic gauge fields for neutral atoms, induced by time-periodic driving, which allow the simulation of topologically nontrivial phases of matter with strong interactions. After a general introduction, I will discuss two specific examples:

I will consider a spinful and time-reversal invariant version of the Hofstadter-Harper problem, which has been realized with ultracold atoms, including an additional staggered potential and spin-orbit coupling. Using real-space dynamical mean-field theory (DMFT), we investigate the stability of the Quantum Spin Hall state in the presence of strong interactions. To test the bulk-boundary correspondence between edge mode parity and bulk Chern index of the interacting system, we calculate an effective topological Hamiltonian based on the local self-energy of DMFT.

I will furthermore present a systematic study of spectral functions of a time-periodically driven Falicov-Kimball Hamiltonian. In the high-frequency limit, this system can be effectively described as a Harper-Hofstadter-Falicov-Kimball model. Using real-space Floquet dynamical mean-field theory (DMFT), we take into account interaction effects and contributions from higher Floquet bands in a non-perturbative way. Our calculations show a high degree of similarity between spectral properties of the interacting driven system and its effective static counterpart. We also demonstrate the possibility of using real-space Floquet DMFT to study edge states on a cylinder geometry.

**Zu dieser Veranstaltung sind alle DQ-mat-Mitglieder
und alle Interessierten herzlich eingeladen.**