GOETHE UNIVERSITÄT FRANKFURT AM MAIN

Fachbereich Physik
Institut für Theoretische Physik

CONDENSED MATTER THEORY SEMINAR

Subject: **Probing Floquet topological invariants with ultracold atoms**

Speaker: **Prof. Dr. André Eckardt (TU Berlin)**

Date & time: **Friday, January 29th, 2021 at 3:15 p.m.**

Venue: **Online Seminar**

The classification of topological Floquet systems with time-periodic Hamiltonians transcends that of static systems. For example, spinless fermions in periodically driven two-dimensional lattices are not completely characterized by the Chern numbers of the quasienergy bands, but rather by a set of spatio-temporal winding numbers associated with the quasienergy gaps [Rudner et al. PRX 3, 031005 (2013)]. I will present two schemes for probing these winding numbers in experiments with ultracold atoms in driven optical lattices. The first one relies on the tomography of band-touching singularities occurring when adiabatically connecting the driven system to a trivial high-frequency regime [1]. A variant of this approach has recently been implemented experimentally [2]. The second scheme is based on observing the far-from-equilibrium micromotion of the driven system over two driving periods after a sudden quench into the target Hamiltonian [3]. It relies on the identification of the winding numbers with an Hopf invariant characterizing the micromotion operator.

[1] How to Directly Measure Floquet Topological Invariants in Optical Lattices, FN Ünal, B Seradjeh, A Eckardt, Phys. Rev. Lett. 122, 253601 (2019).

[2] Realization of an anomalous Floquet topological system with ultracold atoms, K Wintersperger, C Braun, FN Ünal, A Eckardt, M Di Liberto, N Goldman, I Bloch, M Aidelsburger, Nat. Phys. 16, 1058 (2020).

[3] Hopf characterization of two-dimensional Floquet topological insulators, FN Ünal, A Eckardt, RJ Slager, Phys. Rev. Research 1, 022003(R) (2019).