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.

