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Dissipative dynamics in ultracold atoms

Corinna Kollath

Theoretical Quantum Physics group, University of Bonn, Germany

Atomic gases cooled to Nanokelvin temperatures are a new exciting tool to study a broad range of quantum phenomena. In particular, an outstanding and rapid control over the fundamental parameters, such as interaction strength, spin composition, and dimensionality allows to realize and observe many different situations far from equilibrium. Long-standing questions such as the coupling to an environment can be investigated. In my talk, I will address the question of the influence of a coupling to an environment on the system dynamics in bosonic optical lattice gases. The interplay between the interaction, the kinetic energy and the coupling to the environment causes a critical dynamics with algebraic decaying observable or a glass-like dynamics. If the gas is insight an optical cavity a dynamical gauge field can be engineered which leads to the stabilization of chiral phases by the dissipation.