CO.CO.MAT

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Non-equilibrium Transport in Dissipative Optical Lattices

Open many-body quantum systems have recently gained renewed interest in the context of quantum information science and quantum transport with biological clusters and ultracold atomic gases. Based on our recent mini-review [1], we present a series of results in diverse setups of ultracold bosons in a one-dimensional lattice. We rely on a master equation approach to describe the dissipative many-body quantum dynamics. We investigate the impact of opening a many-body quantum system on its dynamical evolution. We see how dissipation together with strong interparticle interaction can be used to actively create stable and coherent many-body structures. Furthermore, we study simple models for the non-equilibrium transport of interacting bosons across quantum-dot like potentials. Driven by the experimental advance in the implementation of such systems with ultracold atoms [2], we show how noise and coupling to lead-like channels can lead to complex particle transport.
[1] G. Kordas, D. Witthaut, and S. Wimberger, Non-equilibrium dynamics in dissipative Bose-Hubbard chains, Ann. Phys. (2015), DOI: 10.1002/andp.201400189, invited contribution to upcoming Special Issue on Complex Quantum Systems [2] R. Labouvie, B. Santra, S. Heun, S. Wimberger, and H. Ott, Negative differential conductivity in an interacting quantum gas, arXiv:1411.5632

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