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Thermal Steady States in Fermionic Dissipative Floquet Systems[1]

KARTHIK SEETHARAM, CHARLES-EDOUARD BARDYN, California Institute of Technology, MARK RUDNER, University of Copenhagen, NETANEL LINDNER, Technion - Israel Institute of Technology, GIL REFAEL, California Institute of Technology — The possibility to drive quantum systems periodically in time offers unique ways to deeply modify their fundamental properties, as exemplified by Floquet topological insulators. It also opens the door to a variety of non-equilibrium effects. Resonant driving fields, in particular, lead to excitations which can expose the system to heating. Inspired by existing studies of photoexcited semiconductors, we demonstrate that the analog of thermal states can be achieved in a fermionic Floquet system including carrier-carrier interactions, phonon scattering, and spontaneous emission. We show that inelastic "Floquet-Umklapp" processes are responsible for non-thermal heating effects, and identify practical conditions under which they are suppressed. We propose to use suitably engineered external reservoirs of carriers to further stabilize thermal features and control the effective chemical potential of the resulting Floquet distributions.

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