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Competing coherent and dissipative dynamics close to quantum criticality

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We investigate the competition of coherent and dissipative dynamics in many-body systems at continuous quantum transitions. We consider dissipative mechanisms that can be effectively described by Lindblad equations for the density matrix of the system. The interplay between the critical coherent dynamics and dissipation is addressed within a dynamic finite-size scaling framework, which allows us to identify the regime where they develop a nontrivial competition. We analyze protocols that start from critical many-body ground states, and put forward general dynamic scaling behaviors involving the Hamiltonian parameters and the coupling associated with the dissipation. This scaling scenario is supported by a numerical study of the dynamic behavior of a one-dimensional lattice fermion gas undergoing a quantum Ising transition, in the presence of dissipative mechanisms such as local pumping, decaying and dephasing.

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