Adiabatic Dynamics of A Quantum Critical System Coupled to An Environment

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The study of the adiabatic passage through a critical point is important in a number of different problems ranging from adiabatic quantum computation to defect formation. We analyzed the dynamics of open quantum many-body systems driven across a critical point by quenching an Hamiltonian parameter at a certain velocity. General scaling laws are derived for the density of excitations and energy produced during the quench as a function of quench velocity and bath temperature. The scaling laws and their regimes of validity are verified for the XY spin chain locally coupled to bosonic baths. A detailed derivation and analysis of the kinetic equation of the problem is presented.

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