

MAR15-2014-020819

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Shortcuts to Adiabaticity in Quantum Many-Body Systems

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The nonadiabatic dynamics of a many-body system driven through a quantum critical point leads unavoidably to the formation of excitations, in agreement with the Kibble-Zurek mechanism. A way out of this scenario relies on the use of shortcuts to adiabaticity, where the formation of excitations is suppressed by assisting the dynamics with auxiliary multiple-body nonlocal interactions. We propose an alternative scheme which circumvents practical challenges to realize shortcuts to adiabaticity in mesoscopic systems by tailoring the functional form of the auxiliary counterdiabatic interactions. A driving scheme resorting in few-body short-range interactions is shown to generate an effectively adiabatic dynamics.

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