Condensed Matter > Statistical Mechanics

Exact results for the criticality of quench dynamics in quantum Ising models

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Based on the obtained exact results we systematically study the quench dynamics of a one-dimensional spin-1/2 transverse field Ising model with zero- and finite-temperature initial states. We focus on the magnetization of the system after a sudden change of the external field and a coherent time-evolution process. With a zero-temperature initial state, the quench magnetic susceptibility as a function of the initial field strength exhibits strongly similar scaling behaviors to those of the static magnetic susceptibility, and the quench magnetic susceptibility as a function of the final field strength shows a discontinuity at the quantum critical point. This discontinuity remains robust and always occurs at the quantum critical point even for the case of finite-temperature initial systems, which indicates a great advantage of employing quench dynamics to study quantum phase transitions.

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