

Quantum quenches in the anisotropic spin-1/2 Heisenberg chain

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We study the unitary time evolution of antiferromagnetic order in anisotropic Heisenberg chains that are initially prepared in a pure quantum state far from equilibrium. Our analysis indicates that the antiferromagnetic order imprinted in the initial state vanishes exponentially. Depending on the anisotropy parameter, oscillatory or nonoscillatory relaxation dynamics is observed. Furthermore, the corresponding relaxation time exhibits a minimum at the critical point, in contrast to the usual notion of critical slowing down, from which a maximum is expected.

[1] Relaxation of antiferromagnetic order in spin-1/2 chains following a quantum quench, Peter Barmettler, Matthias Punk, Vladimir Gritsev, Eugene Demler and Ehud Altman, Phys. Rev. Lett. 102, 130603 (2009).

[2] Quantum quenches in the anisotropic spin-1/2 Heisenberg chain: different approaches to many-body dynamics far from equilibrium, Peter Barmettler, Matthias Punk, Vladimir Gritsev, Eugene Demler and Ehud Altman, New J. Phys. 12 055017 (2010).

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