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Anomalous transport and thermalization in Heisenberg spin chains PETER PRELOVSEK, JACEK HERBRYCH, Jozef Stefan Institute, SI-1000, Ljubljana, Slovenia, ROBIN STEINIGEWEG, Institute for Theoretical Physics, Technical University of Braunschweig, D-38106 Braunschweig, Germany
— In spite of long history 1D spin systems still offer challenging open questions, mostly regarding finite-temperature spin and heat transport as well as the relevance for recent experiments on spin-chain materials. In the talk some recent findings regarding properties of anisotropic spin-1/2 Heisenberg chains, both integrable and nonintegrable, will be presented. Within the Ising-type regime we show that the integrable XXZ model unveils the coexistence of anomalous and normal diffusion resolving in this way conflicting conclusions on Mott insulators. In the gapless regime numerical results in the hydrodynamic regime, consistent with the normal spin diffusion for a nonintegrable model, reveal vanishing current decay rate in the integrable case. The behavior is closely related to the thermalization phenomena in spin-chain systems so that diagonal matrix elements for integrable models show evident deviations from the eigenstate thermal hypothesis. In a weakly perturbed integrable system the finite-size scaling reveals that the crossover between anomalous and normal regime is given by a scale related to the scattering length. The theory of thermal conductivity in spin chains and the relation to recent experiments will be also discussed.

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