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Dynamics of entanglement generation in a many-body localized system using the local integrals of motion

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Abstract

The study of many-body quantum systems, that fail to thermalize in the presence of disorder, has recently attracted lots of interests. This is due to the appearance of the many-body localized phase and breakdown of eigenstate thermalization hypothesis in such systems which can be described by the local integrals of motion. In this paper, we consider a disordered spin chain in the many-body localized phase and try to study the dynamics of entanglement generation in this system using the local integrals of motion. To this end, we, first, solve the non-interacting system analytically to describe the mechanism of entanglement generation for different kinds of initial states, exactly. Then, we generalize this approach to the interacting system to learn the dynamics of entanglement generation. Finally, we discuss the physical meaning of different behaviors in the dynamics of entanglement generation in the presence and absence of interaction.

keywords: many-body localization, Anderson model, entanglement entropy, local integrals of motion

For full article, refer to the Persian section