Stark many-body localization in spin-chains with single-ion anisotropy

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Abstract

The interesting phenomena of many-body localization (MBL) has attracted a great deal of attention in condensed matter physics. This phenomenon results from the intricate role of disorder in the dynamics of quantum states in closed quantum systems. One physical consequence of localization induced by disorder is that if the system is initially in some non-equilibrium quantum state, it does not thermalize upon time evolution. Under this situation the system is said to be localized, and the predicted phenomenon has been observed in a variety of systems. It has been shown that localization can be obtained even without disorder. Indeed, a nearly linear potential across an interacting quantum system can also induce localization. This phenomenon is termed Stark man-body localization (SMBL). Recently we have studied SMBL in a spin 1/2 Heisenberg chain with first and second nearest-neighbor couplings J_1 and J_2 [1]. We have shown that SMBL is very robust by inclusion of J2. More interestingly, there are windows in the parameter space J_1-J_2 within which SMBL is actually enhanced. Here we study SBML in a spin 3/2 Heisenberg model in the presence of single ion anisotropy. Our results show interesting effects of the anisotropy in the dynamics of the system in the localized regime.

References

[1] E. Vernek, Phys. Rev. B **105**, 075124 (2022).