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Many-body mobility edge due to symmetry-constrained dynamics and strong interactions IAN MONDRAGON-SHEM, Univ of Illinois - Urbana, ARIJEET PAL, Harvard University, CHRIS LAUMANN, University of Washington, TAYLOR HUGHES, Univ of Illinois - Urbana — Many-body localization at a finite energy density inhibits thermalization and opens the possibility to study macroscopic quantum phenomena in highly excited states. The system transitions from an ergodic to a nonergodic phase at a critical energy density defined to be the many-body mobility edge. We present a mechanism for the formation of a many-body mobility edge in disordered systems with strong interactions, that satisfy conservation laws. The strong interaction spectrally differentiates eigenstates at positive temperature from those at negative temperature based on correlations, whose quantum dynamics differ dramatically due to the conservation laws. Upon introducing disorder, this difference in the dynamics can lead to an energy-dependent onset of many-body localization, thus leading to the formation of a many-body mobility edge. We exemplify this mechanism in the strongly anisotropic spin-1/2 XXZ model in a random field, whose dynamics is constrained by the conservation of total spin projection. We compute a set of diagnostic quantities that verify the presence of a mobility edge in this model. Furthermore, we discuss how introducing correlated disorder in the model can enhance this effect and stabilize the mobility edge itself.

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