Abstract Submitted
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Particle-hole symmetry, many-body localization, and topological edge modes[1] ROMAIN VASSEUR, UC Berkeley and Lawrence Berkeley National Laboratory, AARON J. FRIEDMAN, S.A. PARAMESWARAN, University of California, Irvine, ANDREW C. POTTER, UC Berkeley — We study the excited states of interacting fermions in one dimension with particle-hole symmetric disorder (equivalently, random-bond XXZ chains) using a combination of renormalization group methods and exact diagonalization. Absent interactions, the entire many-body spectrum exhibits infinite-randomness quantum critical behavior with highly degenerate excited states. We show that though interactions are an irrelevant perturbation in the ground state, they drastically affect the structure of excited states: even arbitrarily weak interactions split the degeneracies in favor of thermalization (weak disorder) or spontaneously broken particle-hole symmetry, driving the system into a many-body localized spin glass phase (strong disorder). In both cases, the quantum critical properties of the non-interacting model are destroyed, either by thermal decoherence or spontaneous symmetry breaking. This system then has the interesting and counterintuitive property that edges of the many-body spectrum are *less* localized than the center of the spectrum. We argue that our results rule out the existence of certain excited state symmetry-protected topological orders.

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