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Many body localization in a quantum Ising model: A numerical study JONAS KJALL, JENS BARDARSON, FRANK POLLMANN, Max-Planck-Institut für Physik komplexer Systeme — Closed correlated quantum systems with disorder can experience many-body localization. These systems do not thermalize and the properties of the individual finite energy eigenstates become important. Recently, Huse et. al. concluded that eigenstates with broken symmetry order the quantum system, even at energy densities where the corresponding thermal system is disordered. We perform a detailed exact diagonalization study of a random Ising chain with a short ranged interaction between the excitations. We find signatures of the three predicted localized phases. One is paramagnetic and the two others have a broken Z2 symmetry with spin-glass order. These last two can further be distinguished by spectral properties.

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