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Localization Protection and Symmetry Breaking in One-dimensional Potts Chains[1] AARON FRIEDMAN, University of California, Irvine, ROMAIN VASSEUR, University of California, Berkeley Lawrence Berkeley National Lab, ANDREW POTTER, University of Texas, Austin, SIDDHARTH PARAMESWARAN, University of California, Irvine — Recent work on the 3-state Potts and Z_3 clock models has demonstrated that their ordered phases are connected by duality to a phase that hosts topologically protected parafermionic zero modes at the system's boundary. The analogy with Kitaev's example of the one-dimensional Majorana chain (similarly related by duality to the Ising model) suggests that such zero modes may also be stabilized in highly excited statesby many-body localization (MBL). However, the Potts model has a non-Abelian S_3 symmetry believed to be incompatible with MBL; hence any MBL state must spontaneously break this symmetry, either completely or into one of its abelian subgroups (Z_2 or Z_3), with the topological phase corresponding to broken Z_3 symmetry. We therefore study the excited state phase structure of random three-state Potts and clock models in one dimension using exact diagonalization and real-space renormalization group techniques. We also investigate the interesting possibility of a direct excited-state transition between MBL phases that break either Z_3 or Z_2 symmetry, forbidden within Landau theory.

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