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Localization of interacting fermions at high temperature VADIM OGANESYAN, Yale University, DAVID HUSE, Princeton University — We suggest that if a localized phase at nonzero temperature $T > 0$ exists for strongly disordered and weakly interacting electrons, as recently argued, it will also occur when both disorder and interactions are strong and T is very high. We show that in this high-T regime the localization transition may be studied numerically through exact diagonalization of small systems. We obtain spectra for one-dimensional lattice models of interacting spinless fermions in a random potential. As expected, the spectral statistics of finite-size samples cross over from those of orthogonal random matrices in the diffusive regime at weak random potential to Poisson statistics in the localized regime at strong randomness. However, these data show deviations from simple one-parameter finite-size scaling: the apparent mobility edge "drifts" as the system's size is increased. Based on spectral statistics alone, we have thus been unable to make a strong numerical case for the presence of a many-body localized phase at nonzero T.

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