Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Many-Body Localization and Quantum Nonergodicity in a Model with a Single-Particle Mobility Edge[1] XIAOPENG LI, SRIRAM GANESHAN, J.H. PIXLEY, Univ of Maryland-College Park — We investigate many-body localization in the presence of a single-particle mobility edge. By considering an interacting deterministic model with an incommensurate potential in one dimension we find that the single-particle mobility edge in the noninteracting system leads to a many-body mobility edge in the corresponding interacting system for certain parameter regimes. Using exact diagonalization, we probe the mobility edge via energy resolved entanglement entropy (EE) and study the energy resolved applicability (or failure) of the eigenstate thermalization hypothesis (ETH). Our numerical results indicate that the transition separating area and volume law scaling of the EE does not coincide with the nonthermal to thermal transition. Consequently, there exists an extended nonergodic phase for an intermediate energy window where the many-body eigenstates violate the ETH while manifesting volume law EE scaling. We also establish that the model possesses an infinite temperature many-body localization transition despite the existence of a single-particle mobility edge. We propose a practical scheme to test our predictions in atomic optical lattice experiments which can directly probe the effects of the mobility edge.

[1]JQI-NSF-PFC, AROAtomtronics- MURI, and LPS-CMTC, UMD supercomputing resources

Xiaopeng Li
Univ of Maryland-College Park

Date submitted: 29 Oct 2015 Electronic form version 1.4