Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Many Body Localization in Incommensurate Potentials SHANKAR IYER, California Institute of Technology, DAVID HUSE, Princeton University, GIL REFAEL, California Institute of Technology — A long-standing problem concerns the survival of Anderson localization in a many body system with interparticle interactions. In recent years, this problem has resurfaced due to work by Basko, Aleiner, and Altshuler, who have argued that highly excited states of an interacting, many body system can be localized in Fock space. Consequently, a dynamical quantum phase transition may separate such a many body localized phase from a delocalized, ergodic phase, and there is now numerical evidence for the existence of such a transition in disordered 1D systems. Meanwhile, 1D lattice models that lack genuine disorder, but which instead contain a periodic potential that is incommensurate with the lattice spacing, are known to have a localization transition even in the absence of interactions. Here, we numerically investigate whether this transition survives the introduction of interactions and, if so, how it is modified. These questions are increasingly experimentally relevant, because ultracold atom experiments sometimes use incommensurate potentials in place of true disorder to probe localization physics.

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Date submitted: 11 Nov 2011 Electronic form version 1.4