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A possible non-ergodic metallic phase in a system with single-particle mobility edge XIAO LI, XIAOPENG LI, Condensed matter theory center, University of Maryland — Signatures of many-body localization have been recently demonstrated in cold-atom experiments using a one-dimensional incommensurate lattice potential. It is often believed that such a system is well captured by the 1D fermionic Aubry-Andre model. However, there is a marked difference between these two models: the incommensurate lattice model is known to have a single-particle mobility edge, while the Aubry-Andre model does not. In this work we derive an effective tight-binding model for atoms in a one-dimensional incommensurate lattice potential, and show that the corrections to the Aubry-Andre model are vital to capture the existence of a single-particle mobility edge. We further demonstrate that in a small system the single-particle mobility edge survives electron-electron interactions, giving rise to a possible non-ergodic metallic phase.

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