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Exact mobility edge in one dimensional quasiperiodic lattices[1]
SRIRAM GANESHAN, University of Maryland, College Park — We present localization properties of a family of nearest neighbor tight binding models with quasiperiodic onsite modulation. We prove that this family is self-dual under a generalized transformation. The self-dual condition for this general model turns out to be a closed form function of model parameters and energy. We numerically verify that this self-dual line is a mobility edge separating the localized and extended states. Our model is a first of its kind example of a nearest neighbor tight binding model with duality symmetry manifesting mobility edge. Our model provides analytical insight into the mobility edge physics of Anderson localization, a feature occurring in three or more dimensions. Quasiperiodic 1D lattices have been realized in ultracold atoms by a standing wave arrangement of two laser beam with mutually incommensurate wave vector. The quasiperiodic potentials we considered in this work can be systematically engineered by a controlled application of series of standing wave laser beams. We present a concrete schematic to realize our results in optical lattices and photonic waveguides.

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