Abstract Submitted
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Fibonacci Optical Lattices[1] KEVIN SINGH, ZACHARY GEIGER, RUWAN SENARATNE, SHANKARI RAJAGOPAL, KURT FUJIWARA, DAVID WELD, Physics Department, University of California, Santa Barbara, WELD GROUP TEAM — Quasiperiodicity is intimately involved in quantum phenomena from localization to the quantum Hall effect. Recent experimental investigation of quasiperiodic quantum effects in photonic and electronic systems have revealed intriguing connections to topological phenomena. However, such experiments have been limited by the absence of techniques for creating tunable quasiperiodic structures. We propose a new type of quasiperiodic optical lattice, constructed by intersecting a Gaussian beam with a 2D square lattice at an angle with an irrational tangent. The resulting potential, a generalization of the Fibonacci lattice, is a physical realization of the mathematical "cut-and-project" construction which underlies all quasiperiodic structures. Calculation of the energies and wavefunctions of atoms loaded into the proposed quasiperiodic lattice demonstrate a fractal energy spectrum and the existence of edge states.

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