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Progress towards experimental realization of 5-fold two-dimensional quasicrystals of ultracold atoms[1] JAHNAVEE MITTAL, THEODORE A. CORCOVILOS, Dept. of Physics, Duquesne University, Pittsburgh, PA 15282 — Quasicrystals are nonperiodic arrangements of atoms having no translational symmetry but nonetheless possessing long-range order. The material properties of quasicrystals, particularly their low-temperature behavior, defy easy theoretical description – they are a chimera of ordered and disordered behavior. We present our progress in constructing an experiment to investigate the low temperature phases of quasicrystals by building an analogous system of ultracold Rb-87 atoms in a 2d optical potential. Our compact optical setup for creating quasicrystal optical potentials with 5-fold symmetry uses interference of nearly co-propagating beams rather than the more common method having the optical lattice beams in a plane. We discuss the optical design through numerical simulations and a characterize a prototype system, and describe how our setup can generate phason excitations and quantized transport. We also present our vacuum, optical, and electronic design and report on the construction progress.

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