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Quantum Phase Transitions in Rotating Lattices BRANDON PEDEN, RAJIV BHAT, JILA, NIST, and Department of Physics, CU Boulder, LINCOLN CARR, Physics Department, Colorado School of Mines, MURRAY HOLLAND, JILA, NIST, and Department of Physics, CU Boulder — Two of the most important themes in the developing area of quantum fluids and ultracold gases include the role of strong interactions and highly correlated effects. We study a novel and interesting problem combining these two key areas by looking at the experimentally relevant area of ultracold atoms in rotating optical lattices. This merges the effects of strong interactions generated by the lattice with the intriguing quantum effects present in the analogy of the quantum Hall effect at high rotation rate. Hardcore bosons in a 2D rotating square lattice are investigated via a modified Bose-Hubbard Hamiltonian. Our results show quantum phase transitions between circulation values in which the symmetry of the ground state changes structure abruptly as a function of rotation.

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