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Transition to a fractional Chern insulator state in a realistic cold atom model JOHANNES MOTRUK, FRANK POLLMANN, Max Planck Institute for the Physics of Complex Systems — The engineering of topological band structures in optical lattices for ultracold atoms hosts the possibility of creating exotic states of matter. A promising experimental setup has been presented by Aidelsburger et al. [Nat. Phys. 11, 162 (2015)] where the behavior of bosonic atoms in an optical lattice is governed by the Harper-Hofstadter Hamiltonian and the Chern number of the lowest band has experimentally been determined to be unity. This model harbors the possibility of hosting a fractional Chern insulator (FCI) state for a partially filled band and interacting particles. However, in order to tune the system into this phase, it is of crucial importance to know the characteristics of the transition from a non-topological phase into the FCI when crossing over from a trivial to a topological band structure. Using the density matrix renormalization group, we investigate this transition at filling factor $\nu = 1/2$ of the lowest band and show that the FCI state is stable over an extended parameter region.

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