

Abstract Submitted
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Variational study of bosonic phases in two dimensions: fractional Chern insulator, Mott insulator and superfluid BRYAN CLARK, HASSAN SHAPOURIAN, University of Illinois at Urbana Champaign — We numerically study the model wave functions for a system of hard core bosons at half filling on a square lattice. The candidate wave functions are based on the projective construction approach [1] where a boson is decomposed into two (slave) fermions, each described by a Chern insulator model. Our results confirm that the wave functions demonstrate the following phases: the superfluid, the Mott insulator and the fractional Chern insulator. In addition, we find that the wave functions can be continuously tuned from one phase to another by varying the parameters of slave particles. We further propose a microscopic Hamiltonian with a rich phase diagram which supports all the aforementioned phases in different regimes of parameters. The critical behavior across the phase boundaries is investigated and the critical exponents are computed. [1] M. Barkeshli and J. McGreevy, Phys. Rev. B 89, 235116 (2014).

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