Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Sorting Category: 6.3 (T)

Bose Hubbard Model in a Synthetic Magnetic Field: Novel Chiral Mott Insulator State ARUN PARAMEKANTI, University of Toronto, MAHESWAR MAJI, Indian Institute of Science, Bangalore, ARYA DHAR, Indian Institute of Astrophysics, Bangalore, TAPAN MISHRA, International Center for Theoretical Sciences, Bangalore, RAMESH PAI, Goa University, SUBROTO MUKERJEE, Indian Institute of Science, Bangalore — Motivated by recent developments in realizing synthetic gauge fields for ultracold atoms, we study the Bose Hubbard model in the presence of half a magnetic flux quantum per lattice plaquette. We show, using density matrix renormalization group calculations and Monte Carlo simulations, that this "fully frustrated" Bose Hubbard model supports a novel Chiral Mott insulator phase with staggered loop currents for intermediate Hubbard repulsion on a two-leg ladder. This Chiral Mott insulator is flanked by a superfluid with staggered currents at weak repulsion, and an ordinary Mott insulator at strong repulsion. We discuss physical pictures for the Chiral Mott insulator as a vortex supersolid or an exciton condensate, and present a variational wavefunction which captures its essential correlations. We discuss observables, such as the gap, the momentum distribution, and loop current order across the phase diagram and propose interference measurements to detect the Chiral Mott state.

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[X] Prefer Oral Session
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Date submitted: 13 Apr 2012 Electronic form version 1.4