Abstract Submitted
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Chiral Bosonic Phases on the Haldane Honeycomb Lattice IVANA VASIC, Institut fuer Theoretische Physik, Goethe-Universitaet, 60438 Frankfurt/Main, Germany, ALEXANDRU PETRESCU, Department of Physics, Yale University, New Haven, CT 06520, USA and Centre de Physique Theorique, Ecole Polytechnique, CNRS, 91128 Palaiseau, France, KARYN LE HUR, Centre de Physique Theorique, Ecole Polytechnique, CNRS, 91128 Palaiseau Cedex, France, WALTER HOFSTETTER, Institut fuer Theoretische Physik, Goethe-Universitaet, 60438 Frankfurt/Main, Germany — Motivated by its recent realization in an ultracold atom experiment [1], we investigate the honeycomb lattice tight-binding model introduced by Haldane [2], for bosons with local interactions at the average filling of one boson per site [3]. We uncover in the ground state phase diagram three phases: a uniform superfluid (SF), a chiral superfluid (CSF) and a plaquette Mott insulator with local current loops (PMI). Nearest-neighbor and next-nearest neighbor currents distinguish CSF from SF, and the phase transition between them is first order. We apply bosonic dynamical mean field theory and exact diagonalization to obtain the zero temperature phase diagram, complementing numerics with calculations of excitation spectra in strong and weak coupling perturbation theory. Furthermore, we explore the possibility of chiral Mott insulating phases at the average filling of one boson every two sites. The characteristic density fluctuations, current correlation functions, and excitation spectra are measurable in ultracold atom experiments. [1] G. Jotzu et al., arXiv:1406.7874 [2] F. D. M. Haldane, Phys. Rev. Lett. 61, 2015 (1988). [3] Ivana Vasic, Alexandru Petrescu, Karyn Le Hur, Walter Hofstetter, arXiv:1408.1411

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