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Chiral Bosonic Mott Insulator on the Frustrated Triangular Lattice[1] SIDDHARTH PARAMESWARAN, UC Berkeley and UC Irvine, MICHAEL ZALETEL, UC Berkeley, ANDREAS RÜEGG, UC Berkeley and ETH Zurich, EHUD ALTMAN, UC Berkeley and Weizmann Institute of Science — We study the superfluid and insulating phases of interacting bosons on the triangular lattice with an inverted dispersion, corresponding to frustrated hopping between sites. The resulting single-particle dispersion has multiple minima at nonzero wavevectors in momentum space, in contrast to the unique zero-wavevector minimum of the unfrustrated problem. As a consequence, the superfluid phase is unstable against developing additional chiral order that breaks time reversal (T) and parity (P) symmetries by forming a condensate at nonzero wavevector. We demonstrate that the loss of superfluidity can lead to an even more exotic phase, the chiral Mott insulator, with nontrivial current order that breaks T, P. These results are obtained via variational estimates, as well as a combination of bosonization and DMRG of triangular ladders, which taken together permit a fairly complete characterization of the phase diagram. We discuss the relevance of these phases to optical lattice experiments, as well as signatures of chiral symmetry breaking in time-of-flight images.

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