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Correlated phases of bosons in tilted, frustrated lattices SUSANNE
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partment, Harvard University, Cambridge, MA 02138, USA — The search for cor-
related quantum phases of cold atoms in optical lattices has focused mainly on
entangling the spin degrees of freedom on different lattice sites. We show that there
are also rich possibilities for correlated phases in the density sector, and these are
likely to be readily accessible by tilting Mott insulators into metastable states. It
has been previously shown that a Mott insulator in a potential gradient undergoes
an Ising quantum phase transition when the potential drop per lattice spacing is
close to the repulsive interaction energy [1]. Here we theoretically study bosons in
tilted, frustrated, two-dimensional lattices. The phases we find include phases with
charge density order, a sliding Luttinger liquid phase, and a liquid-like ground state
with no broken lattice symmetry.

[1] S. Sachdev, K. Sengupta, and S. M. Girvin, Phys. Rev. B 66, 075128 (2002).

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