Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

The anisotropic Harper-Hofstadter-Mott model: supersolid, striped superfluid, and symmetry protected topological groundstates DARIO HÜGEL, Ludwig Maximilian University Munich, HUGO U. R. STRAND, PHILIPP WERNER, University of Fribourg, LODE POLLET, Ludwig Maximilian University Munich — We derive the reciprocal cluster mean-field method to study the strongly-interacting bosonic Harper-Hofstadter-Mott model. In terms of the hopping anisotropy and the chemical potential, the system exhibits a rich ground-state phase diagram featuring band insulating, striped superfluid, and supersolid phases. At finite anisotropy we additionally observe incompressible symmetry protected topological (SPT) phases, which are analyzed by a newly introduced measure for non-trivial many-body topological properties. The SPT phases at fillings $\nu = 1, 3$ exhibit the same symmetries and band fillings as the integer quantum Hall effect, in analog to non-interacting fermions. We further observe a new SPT phase at $\nu = 2$, which has no fermionic counterpart, and belongs to the same symmetry class as the quantum spin Hall effect due to particle-hole symmetry. Incompressible metastable states at fractional filling are also observed, indicating competing fractional quantum Hall phases. The observed SPT phases are promising candidates for realizing strongly correlated topological phases using cold atoms.

Dario Huegel
Ludwig Maximilian University Munich

Date submitted: 06 Nov 2016 Electronic form version 1.4