Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Fractional Chern Insulators beyond Laughlin states CECILE REPELLIN, TIANHAN LIU, Laboratoire Pierre Aigrain, ENS and CNRS, 24 rue Lhomond, 75005 Paris, France, B. ANDREI BERNEVIG, Department of Physics, Princeton University, Princeton, NJ 08544, NICOLAS REGNAULT, Laboratoire Pierre Aigrain, ENS and CNRS, 24 rue Lhomond, 75005 Paris, France and Department of Physics, Princeton University, Princeton, NJ 08544 — We report the first numerical observation of composite fermion (CF) states in fractional Chern insulators (FCI) using exact diagonalization. The ruby lattice Chern insulator model for both fermions and bosons exhibits a clear signature of CF states at filling factors 2/5 and 3/7 (2/3 and 3/4 for bosons). The topological properties of these states are studied through several approaches. Quasihole and quasielectron excitations in FCI display similar features as their fractional quantum hall (FQH) counterparts. The entanglement spectrum of FCI groundstates shows an identical fingerprint to its FQH partner. We show that the correspondence between FCI and FQH obeys the emergent symmetry already established, proving the validity of this approach beyond the clustered states. We investigate other Chern insulator models and find similar signatures of CF states. However, some of these systems exhibit strong finite size effects.

Cecile Repellin
Laboratoire Pierre Aigrain, ENS and CNRS,
24 rue Lhomond, 75005 Paris, France

Date submitted: 27 Nov 2012 Electronic form version 1.4