Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Topological characterization and dynamics of a fermionic fractional Chern insulator FRANK POLLMANN, ADOLFO GRUSHIN, JOHANNES MOTRUK, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany, MICHAEL ZALETEL, Stanford University, US — Using the density matrix renormalization group (DMRG) method on a cylinder geometry, we characterize the fractional Chern insulator (FCI) state in the Haldane honeycomb lattice model at $\nu = 1/3$ filling of the lowest band and check its stability. We investigate the chiral and topological properties of this state through (i) its Hall conductivity, (ii) the topological entanglement entropy, (iii) the U(1) charge spectral flow of the many body entanglement spectrum, and (iv) the charge of the anyons. As the interaction strength is lowered, we observe a direct transition from the FCI into a metallic phase and find indications for the transition to be of first order. Since our approach does not rely on any band or subspace projection, we are able to prove the stability of the fractional state in the presence of interactions exceeding the band gap, as has been suggested in the literature. Additionally, we investigate the characteristic dynamics of the FCI phase using time dependent DMRG.

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Date submitted: 14 Nov 2014 Electronic form version 1.4