

Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Absence of an interaction driven Chern insulating phase on the honeycomb lattice JOHANNES MOTRUK, ADOLFO G. GRUSHIN, FRANK POLLMANN, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany — Mean field calculations in the literature have suggested the existence of an interaction-induced Chern insulator (CI) phase in a tight-binding model of spinless fermions on a honeycomb lattice with nearest- and next-nearest-neighbor interactions. The CI phase is an example of a state that breaks time-reversal symmetry spontaneously and possesses a quantized Hall conductance. However, it has been proven elusive in exact diagonalization (ED) studies of this system. Since ED is limited to small system sizes, the fate of this phase in the thermodynamic limit still remains unclear. Using the infinite density matrix renormalization group (iDMRG) algorithm we reach system sizes exceeding those accessible in ED calculations while keeping track of quantum fluctuations neglected in mean field studies. We map out the phase diagram as a function of both nearest- and next-nearest-neighbor interaction strengths for an infinite cylinder geometry and find different charge-ordered phases but no sign of the interaction driven Chern insulator phase.

Johannes Motruk
Max Planck Institute for the Physics of Complex Systems, Dresden, Germany

Date submitted: 14 Nov 2014

Electronic form version 1.4