Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Unusual magnetic phases in the strong interaction limit of two-dimensional topological band insulators in transition metal oxides[1]
MEHDI KARGARIAN, The University of Texas at Austin, ABDOLLAH LANGARI, Sharif University of Technology, GREGORY A. FIETE, The University of Texas at Austin — The expected phenomenology of non-interacting topological band insulators (TBI) is now largely theoretically understood. However, the fate of TBIs in the presence of interactions remains an active area of research with novel, interaction-driven topological states possible, as well as new exotic magnetic states. In this work we study the magnetic phases of an exchange Hamiltonian arising in the strong interaction limit of a Hubbard model on the honeycomb lattice whose non-interacting limit is a two-dimensional TBI recently proposed for the layered heavy transition metal oxide compound, $(Li,Na)_2IrO_3$. By a combination of analytical methods and exact diagonalization studies on finite size clusters, we map out the magnetic phase diagram of the model. We find that strong spin-orbit coupling can lead to a phase transition from an antiferromagnetic Neél state to a spiral or stripy ordered state. We also discuss the conditions under which a quantum spin liquid may appear in our model, and we compare our results with the different but related Kitaev-Heisenberg-J_2-J_3 model which has recently been studied in a similar context.

[1]We gratefully acknowledge financial support from ARO Grant No. W911NF-09-1-0527 and NSF Grant No. DMR-0955778

Mehdi Kargarian
The University of Texas at Austin

Date submitted: 08 Nov 2012 Electronic form version 1.4