Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Interaction-driven phase instabilities in two-dimensional quadratic band touching systems[1] JAMES MURRAY, National High Magnetic Field Laboratory, Tallahassee, KELLY PAWLAK, University of California, Santa Barbara, OSKAR VAFEK, National High Magnetic Field Laboratory and Florida State University — Quadratic band touching (QBT) systems, in which an upward-dispersing and a downward-dispersing energy band meet at a single point in momentum space, have emerged as an attractive arena in which to study multicriticality and intertwined orders driven by electron interactions. Analogous to the two-valley QBT occurring in bilayer graphene, single-valley QBTs such as those arising on checkerboard and kagome lattices exhibit phase instabilties in multiple channels even for arbitrarily weak interactions. Using a Wilsonian renormalization group procedure, we show - without requiring spin-orbit coupling or special values of the interaction - that the leading instabilities in the half-filled system are toward quantum anomalous Hall or quantum spin Hall phases. Upon doping away from half-filling, the repulsive interactions lead to superconductivity in s-wave or d-wave channels.

[1]This work was supported by the NSF CAREER award under Grant No. DMR-0955561 (OV), NSF Cooperative Agreement No. DMR-0654118, NSF Graduate Research Fellowship under Grant No. DGE 1144085 (KP), and the State of Florida (OV,JM).

James Murray
National High Magnetic Field Laboratory, Tallahassee

Date submitted: 13 Nov 2014 Electronic form version 1.4