Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Magnetic Orders Proximal to the Kitaev Limit in Frustrated Triangular Systems: Application to $Ba_3IrTi_2O_9$ ANDREI CATUNEANU, Department of Physics and Center for Quantum Materials, University of Toronto, JEFFREY RAU, Department of Physics and Astronomy, University of Waterloo, HEUNG-SIK KIM, HAE-YOUNG KEE, Department of Physics and Center for Quantum Materials, University of Toronto — Frustrated transition metal compounds in which spin-orbit coupling (SOC) and electron correlation work together have attracted much attention recently. In the case of $5d$ transition metals, where SOC is large, $j_{eff} = 1/2$ bands near the Fermi level are thought to encompass the essential physics of the material, potentially leading to a concrete realization of exotic magnetic phases such as the Kitaev spin liquid. We derive a spin model on a triangular lattice based on $j_{eff} = 1/2$ pseudo-spins that interact via antiferromagnetic Heisenberg (J) and Kitaev (K) exchanges, and crucially, an anisotropic (Γ) exchange. Our classical analysis of the spin model reveals that, in addition to small regions of 120°, Z_2 / dual-Z_2 vortex crystal and nematic phases, the stripy and ferromagnetic phases dominate the J-K-Γ phase diagram. We apply our model to the $5d$ transition metal compound, $Ba_3IrTi_2O_9$, in which the Ir^{4+} ions form layered two-dimensional triangular lattices. By combining our ab-initio and classical analyses, we predict that $Ba_3IrTi_2O_9$ has a stripy ordered magnetic ground state.

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Date submitted: 02 Nov 2015 Electronic form version 1.4