Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Spin Liquid Regimes at Nonzero Temperature in Quantum Spin Ice: Extension to Finite Temperature of the Phase Diagram of Pyrochlore Magnets LUCILE SAVARY, University of California, Santa Barbara, LEON BALENTS, Kavli Institute for Theoretical Physics, University of California, Santa Barbara — Many quantum spin liquid theories described so far have not yet benefitted of much attention as regards how they should be interpreted at finite temperature. With growing interest in quantum spin liquid phases and increasingly many material candidates, it is becoming all the more imperative to tackle this matter. Here, we address the finite temperature properties of quantum spin ices, for which quantum spin liquid regimes have been predicted. In particular, we extend to finite temperature the two-dimensional phase diagram found in [PRL 108, 037202 (2012)] using an extension of the gauge mean field theory first introduced in the aforementioned paper. We find that the *quantum* spin liquid features of the $U(1)$ QSL and Coulomb Ferromagnet survive at nonzero temperature and that a first order transition to an entropy-dominated classical spin liquid regime, similar to the classical spin ice liquid, occurs at temperatures lower than a naïve scaling with the strength of the interactions might predict. We discuss our results in light of recent experiments on $Yb_2Ti_2O_7$, where features reminiscent of the well-known classical spin ice phase were reported.

Lucile Savary
University of California, Santa Barbara

Date submitted: 08 Nov 2012 Electronic form version 1.4