Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Schwinger-boson approach to spin-liquid and Higgs phases in quantum spin ice: $Yb_2Ti_2O_7$ and $Pr_2Zr_2O_7$ SHIGEKI ONODA, Condensed Matter Theory Laboratory, RIKEN — The most generic pseudospin-1/2 quantum spin ice model for rare-earth magnetic pyrochlore oxides, that include $Yb_2Ti_2O_7$ and $Pr_2TM_2O_7$ (TM=Sn, Zr, Hf, and Ir), is studied by means of a Schwinger-boson approach. From a projective symmetry group and a mean-field analysis on this magnetically anisotropic model, we classify and analyze quantum spin liquid phases in the space of four coupling constants, including both U(1) and Z_2 spin liquids that are characterized by power-law decaying and exponentially decaying spin correlations, respectively, as well as Higgs phases showing long-range orders. We apply the analysis to cases of the model parameters extracted from both microscopic arguments and the fitting to neutron-scattering experiments of some of the above materials and clarify the dynamical magnetic excitation spectra that take the continuum form due to the deconfined monopolar spinons. The relevance to recent experimental results is discussed.

Shigeki Onoda
Condensed Matter Theory Laboratory, RIKEN

Date submitted: 20 Nov 2011 Electronic form version 1.4