Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

**NMR relaxation in spin ice at low temperature due to diffusing emergent monopoles**[1] CHRISTOPHER L. HENLEY, Cornell University — At low temperatures, spin dynamics in ideal spin ice is due mainly to dilute, thermally excited magnetic "monopole" excitations. I consider how these will affect the longitudinal (T1) and dephasing (T2) relaxation functions of a nuclear spin in the spin-ice pyrochlore Dy2Ti2O4. Up to the time scale for nearby monopoles to be rearranged, a stretched-exponential form of the relaxation functions is expected, due to averaging over nuclei that have different local environments. ror the dephasing (T2) relaxation, the power of time in the stretched exponential is 3/2 in the case of diffusing monopoles, but 1/2 in the case of fixed, fluctuating magnetic impurities. The flip rate and density of fluctuating spins (whatever their nature) can be extracted from the measured relaxation times $T_1$ and $T_2$, and from known parameters. However, the actual experimental relaxation measured by Kitagawa and Takigawa becomes temperature independent in the very low T limit, and the T2 has a power $t^{1/2}$ in the exponential, neither of which can be explained by monopoles. I suggest the very low T behavior could be due to magnetic impurities on the (normally nonmagnetic) Ti sites.

[1]Supported by NSF grant DMR-1005466.

Christopher L. Henley
Cornell University

Date submitted: 04 Dec 2012 Electronic form version 1.4