Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Antiferromagnetic Spin Ice Correlations at (1/2,1/2,1/2) in the Ground State of the Pyrochlore Magnet $Tb_2Ti_2O_7$ K. FRITSCH, Dept. of Physics and Astronomy, McMaster Univ., K.A. ROSS, McMaster Univ., now Johns Hopkins Univ. and NCNR NIST, Y. QIU, J.R.D. COPLEY, NCNR NIST, T. GUIDI, R.I. BEWLEY, ISIS, H.A. DABKOWSKA, Brockhouse Institute for Materials Research, B.D. GAULIN, Dept. of Physics and Astronomy, McMaster Univ., and Brockhouse Institute for Materials Research — The ground state of the candidate spin liquid pyrochlore magnet $Tb_2Ti_2O_7$ (TTO) has been long debated. Despite theoretical expectations of magnetic order below 1K based on classical Ising-like Tb spins, muSR and neutron scattering experiments show no long range order down to 50mK. Two theoretical scenarios have been put forward to account for this: the quantum spin ice scenario and a non-magnetic singlet ground state, but no clear consensus has been reached. We present neutron scattering measurements on TTO at 70mK that reveal elastic scattering intensity at (1/2,1/2,1/2) positions in reciprocal space[1]. The corresponding spin configuration can be modeled as a short-range antiferromagnetically ordered spin ice, in which spins obey a variant of the ice rules in each unit cell, and flip directions between adjacent cells. At low temperatures, this elastic scattering is separated from low-lying magnetic inelastic scattering by $\sim$0.05meV. The elastic signal disappears under the application of small magnetic fields and upon elevating temperature. Pinch-point-like elastic diffuse scattering is observed, which together with the elastic spin ice correlations strongly supports the quantum spin ice picture for TTO. [1] K. Fritsch et al., arXiv:1210.1242[cond-mat.str-el]

K. Fritsch
Dept. of Physics and Astronomy, McMaster University

Date submitted: 09 Nov 2012 Electronic form version 1.4