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Spontaneous Strains in the Ground State of the Frustrated Pyrochlore $Tb_2Ti_2O_7$ JACOB RUFF, KIRRILY RULE, PATRICK CLANCY, JOHN PAUL CASTELLAN, JOSE RODRIGUEZ, BRUCE GAULIN, McMaster University — The geometrically frustrated pyrochlore antiferromagnet $Tb_2Ti_2O_7$ has been the focus of much recent attention due to the spin liquid physics it displays at low temperatures. We have carried out high resolution x-ray scattering measurements of the principal Bragg peaks of $Tb_2Ti_2O_7$ which show substantial longitudinal broadening below approximately 20 K. Measurements on the non-magnetic pyrochlore $Y_2Ti_2O_7$ show no such broadening, suggesting this effect is driven by strong magnetoelastic coupling, as had been concluded from earlier anomolous low temperature Young's modulus measurements [Mamsurova et.al,JETP Letters,1986]. We compare our x-ray scattering results to similar measurements in $TbVO_4$, which undergoes a cooperative Jahn-Teller phase transition near 34 K, and conclude that the longitundinal broadening is due to cubic-tetragonal fluctuations near a zero temperature phase transition, which acts to relieve the magnetic frustration.

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