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Magnetoelastic spin liquid in Tb2Ti2O7?

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In the rare earth pyrochlore $Tb_2Ti_2O_7$, a three-fold puzzle exists - the mechanism by which $Tb_2Ti_2O_7$ escapes both magnetic order and/or a structural distortion, and furthermore, the nature of the spin liquid which exists instead, are long standing questions in the field of frustrated magnetism. Recent theories propose that classical spin order is suppressed by virtual crystal field excitations which renormalize the antiferromagnetic exchange, making $Tb_2Ti_2O_7$ into a type of quantum spin ice [1]; or that an undetected structural distortion leads to a spin-liquid state built of singlets [2]. Using polarized neutron scattering, we have recently shown that, at low temperature, $Tb_2Ti_2O_7$ has power-law spion correlations, manifested by pinch point scattering, somewhat similar to a spin ice [3]. We have also discovered that an acoustic phonon is coupled to an excited crystal field state, producing a sharp, dispersive mode with both magnetic and phononic character [4]. I will show that the overall structure of the low temperature state of $Tb_2Ti_2O_7$ should therefore be viewed as a Coulomb phase with propagating spin excitations [4,5].

[1] Molavian et al., PRL 98, 157204 (2007);
[2] Petit et al., PRB 86, 174403 (2012);
[3] Fennell et al., PRL 109, 017201 (2012);
[4] Fennell et al., arXiv:1305.5405;
[5] Guitteney et al., PRL 111, 087201 (2013)