Abstract Submitted
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Probing spin correlations with phonons in the strongly frustrated magnet $ZnCr_2O_4$[1] HOWARD DREW, ANDREI SUSHKOV, MRSEC, University of Maryland, OLEG TCHERNYSHYOV, The Johns Hopkins University, WILLIAM RATCLIFF, SANG-WOOK CHEONG, Rutgers University — Geometrically frustrated magnets can resist magnetic ordering and remain in a strongly correlated paramagnetic state well below the Curie-Weiss temperature. The spin-lattice coupling can play an important role in relieving the frustration in these system. In $ZnCr_2O_4$, an excellent realization of the Heisenberg antiferromagnet on the "pyrochlore" network, a lattice distortion relieves the geometrical frustration through a spin-Peierls-like phase transition at $T_c = 12.5$ K. Conversely, spin correlations strongly influence the elastic properties of a frustrated magnet. By using infrared spectroscopy and published data on magnetic specific heat, we demonstrate that the frequency of an optical phonon triplet in $ZnCr_2O_4$ tracks the nearest-neighbor spin correlations above T_c. Below T_c, the phonon triplet splits into a singlet and a doublet, separated by 11 cm^{-1}. This splitting is directly proportional to the spin-Peierls order parameter. We also observed a number of weak absorption bands, arising below T_c, which indicates doubling of the Brillouin zone at the structural/magnetic phase transition.

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