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Nature of magnetic structure in a geometrically frustrated manganite spinel KAZUYA KAMAZAWA, ZHE ZHANG, DESPINA LOUCA, Dept. of Physics, University of Virginia — Unlike the pyrochlore geometrically frustrated magnets, several normal spinels such as $ZnCr_2O_4$ and ZnV_2O_4 undergo magnetic long-range order as well as cubic to tetragonal structural transitions at low temperatures. By comparison, $ZnMn_2O_4$, although tetragonal at room temperature, does not undergo a magnetic transition in spite of the rather large Curie-Weiss temperature of $\sim$ -800K indicative of strong antiferromagnetic fluctuations. The absence of an antiferromagnetic transition is surprising considering the nature of the Mn^{3+} ion that is Jahn-Teller active and its effect on the ground state degeneracy. With the orbital degree of freedom active and a crystal anisotropy created by the Jahn-Teller octahedral distortions the system is tetragonally distorted just as in the vanadates where the V ion is orbitally active, but no magnetic transition is observed. Using neutron scattering we investigated how the magnetic structure changes as a function of temperature. We observed the presence of incommensurate magnetic peaks close to nuclear Bragg peaks that exhibit a first order phase transition. The FWHM of the magnetic peaks is much wider than that of nuclear peaks that indicates that the magnetic order is short range. Considering the 1-dimensional Boner-Fisher like behavior of the bulk susceptibility, it is proposed that the spin structure is helical and one-dimensional.

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