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Phase diagram and unusual magnetic excitations in distorted triangular lattice antiferromagnet α-$CaCr_20_4$[1] SAMUEL DUCATMAN, NATALIA PERKINS, Department of Physics, UW Madison — While it is well known that the ground state of the isotropic Heisenberg model on a triangular lattice is the so called 120° structure, its appearance on the distorted triangular lattice is rather unusual. This case has been recently observed in the distorted triangular lattice antiferromagnet α-$CaCr_2O_4$ [S. Toth et al, PRB 84, 054452 (2011)] which shows the onset of the 120° long-range magnetic order below $T_N = 42.6K$. Recent neutron scattering experiments also revealed that this compound has unusual magnetic excitations with a dispersion with roton-like minima at momenta different from those corresponding to its 120°-magnetic order [S. Toth et al, PRL 109, 127203 (2012)]. Motivated by these experimental findings, we calculate a magnetic phase diagram and excitation spectrum of anisotropic Heisenberg Hamiltonian on triangular lattice. We showed that at the parameters characterizing α-$CaCr_2O_4$ compound, the ground state is indeed the 120°-structure, however, other possible magnetic orderings are very close in energy. We compute the dispersion of magnetic excitations to order 1/S and compare it with the neutron scattering data.

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