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Ferronematic order in a spin-1 Heisenberg antiferromagnet KEOLA WIERSCHEM, PINAKI SENGUPTA, Nanyang Technological University, Singapore, CRISTIAN BATISTA, Theoretical Division, Los Alamos National Lab —
We study the field-induced ground-state phase transition of a spin-1 Heisenberg antiferromagnet with large easy-axis single-ion anisotropy D. Direct spin-wave treatment predicts a single first-order phase transition from an antiferromagnetic Néel phase at low magnetic fields to a fully polarized state at high magnetic fields. Mean field arguments, based on an effective spin-1/2 model that is exact in the $D \to \infty$ limit, show that this transition is preempted by an intermediate phase with double-spin-flip correlations. We call this phase the *ferronematic* phase, as the effective spin model for large (negative) D is a spin-1/2 XXZ model with *ferromagnetic* transverse exchange. Using exact diagonalization and quantum Monte Carlo, we confirm the presence of the ferronematic phase. Long range order is observed in the equal-time Green's function $\langle S_i^+ S_i^+ S_j^- S_j^- + H.c.\rangle$, which is the correlation function for ferronematic order. We also show the rapid convergence to the effective model for large values of D.

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