

Low-lying spin excitations due to Next-Nearest Neighbour interactions in Ferromagnetic lattices

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Spin excitations due to next-nearest neighbour (NNN) interactions are considered in a simple cubic (SC) and body-centered cubic (BCC) ferromagnetic lattices. Using the three dimensional Heisenberg model, the spin wave dispersions are calculated at low temperatures wherein the system is near the ground state. Threshold ratios between the NNN and NN interactions are found for both lattices that induces two degenerate states with spin wave energies lower than the ground state for wave vectors $0 \leq q \leq 2\pi/a$, where a is the lattice constant.

Hence NNN interactions can influence many-body phenomena due to fluctuations in the system's magnetic ordering such as transport of spins and high-temperature superconductivity.