

Linear spin chains in paramagnetic and in ordered bulk magnets

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It is shown that magnons are not specific to the magnetically ordered state. Magnons near zone boundary exhibit nearly no anomaly at the magnetic ordering transition and persist into the paramagnetic phase. As we have shown earlier, in the ordered state, spin dynamics is controlled by coherent boson fields instead by magnons. The field bosons are essentially magnetic dipole radiation emitted by the precessing spins. Since emission is by stimulated emission, the basic field resembles the radiation field of a LASER. One-dimensional boson fields are the origin of the perfect collinear spin structure within each domain. Three-dimensional dynamics results by some vector coupling of the one-dimensional basis fields. Here we discuss examples of perfectly one-dimensional magnon modes in magnets with high lattice symmetry. Magnon propagation is along domain axis and is as for the linear spin chain. In contrast to the one-dimensional boson fields of the differently oriented domains that can couple to an isotropic global field, magnons are confined to the volume of the domain and remain one-dimensional also in magnets with isotropic global dynamics.