COLLECTIVE SPIN FLUCTUATIONS IN NONCOLLINEAR FERROMAGNET

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9.7 cm

In Mn based III-V and II-VI diluted magnetic semiconductors the impurity spins,in a ferromagnetic phase, are noncollinear [1,2]. They constitute the noncollinear ferromagnet (NF). In NF the problem of coexistance of a noncollinear spin's alignment with an effective ferromagnetic long range order arises. Because of the spin's noncollinearity NF is not invariant with respect to the local rotations about an axis directed along a spontaneous moment, unlike in a ferromagnet. The change of the ground state symmetry of NF, compare to a ferromagnet, results in essential changes in NF dynamics and requires new methods of descriptions. The relevant 'order parameter' for NF is a rotation matrix that describes a rotation of spin space.
We propose a phenomenological description of NF, which respects a symmetry of that phase. A dynamically induced magnetic moment, anisotropies(nonuniform also) and an external magnetic field as well as dissipative processes are included in the presented description. We shall derive a phenomenological Hamiltonian of NF. The dissipative processes are described by a dissipative function. The spin dynamics of NF is studied by means of equations of motion in Liouville's form. The well defined three branches of spin waves(ferrimagnetic like) are found. The dynamical susceptibility and correlation functions of magnetic moment components are evaluated.
[1] J.Schliemann, A.H.MacDonald, Phys.Rev.Lett.88,137201(2002)
[2] G. Zarand, B. Janko, Phys. Rev. Lett. 89, 047201 (2002)

13.4 cm

Subject category :
6. Theory of Magnetism

Presentation mode :
poster

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