Influence of the demagnetizing field on spin wave spectra of planar two-dimensional magnonic crystals

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9.7 cm

Investigation of spin wave spectra in nanoscale magnetic materials has recently attracted significant attention because the possibility of miniaturization of the present microelectronic devices. Materials with periodic modulation of one or more structural parameters are promising for applications. The fundamental feature of periodic structures is the presence of forbidden frequency gaps ("band gaps") in their spectrum, in which no propagation is allowed. There are plenty of methods that describe multilayered structures. A popular analytical method for investigating the spin-wave spectrum of such kind of systems is the plane-wave method.

One of the challenges during spin wave spectra calculations is to consider the dipolar field. So far, only the dynamic magnetostatic field was included in the plane wave method. In this work we extend our previous calculations to the case of two-dimensional magnonic crystals with finite thickness and nonuniform static dipolar field inside. Different calculation results of spin wave profiles in dependence on the static demagnetizing field are shown. Varying the geometrical and material parameters of the considered structures one can achieve different profiles of the static demagnetizing field and thereby control the spectra.

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