Dispersion management of the 2D magnonic crystal structure

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In recent years, the investigations of the magnonic crystals (MC) are of great interest. These periodical structures are formed on the basis of magnetic materials in which the magnetostatic waves can propagate. The properties and wave dynamics of MC are, as yet, studied insufficiently. The waveguiding properties and possibility of soliton propagation in the nonlinear periodic ferromagnetic structures are interesting subjects of intensive exploration during past several years. In this work the processes of the electromagnetic wave propagation in the nonlinear MC was studied. The dispersion characteristics of the linear and nonlinear systems was numerically estimated. In media with a periodic modulation of parameters the dispersion characteristic consists of allowed bands separated by gaps where electromagnetic wave propagation is forbidden. The dispersion of the ferromagnetic periodic system can be obtained from the well-known dispersion relation of the unbounded in transverse section periodical structure. Taking into account the dispersion of the surface magnetostatic waves in homogeneous films the band structure for the MC can be constructed. The cut-off frequencies (on the boundaries of the band gap range) of periodical structure can be approximately estimated by this method.

Subject category :
3. Magnetic Structure and Dynamics

Presentation mode :
poster

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