NONLINEAR DYNAMICS OF SPIN WAVES IN PLANAR MAGNETIC-CRYSTAL MICROSTRUCTURES

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Magnon waveguides formed from thin magnetic films with a low linear attenuation coefficient are a functional unit of any complex integrated magnon network [1,2], since it is possible to create interconnects and transmission lines between the functional nodes of information processing on their basis signal [3]. A theoretical, numerical and experimental study of the spatial-frequency selection of the spectrum of magnetostatic surface waves (MSSW) in a two-dimensional tangent magnetized magnon crystal lattice, which is a film of yttrium iron garnet (YIG), with a two-dimensional array of grooves on the surface. The possibility of the formation of transverse-limited beams of surface magnetostatic waves in the case when the frequencies of the input microwave signal coincide with the frequencies of the Bragg band gaps in the magnon-crystal lattice is shown. The features are investigated and the mechanisms of spatial-frequency selection are revealed during the propagation of MSSW in the magnon-crystalline structure. The results can be used to organize a spatially distributed information signal processing system based on magnon networks, as well as an element for spatial-frequency filtering of signals in the microwave range of radio waves [4]. In this work, we present the results of a numerical study of the linear and nonlinear properties of a structure consisting of two two-dimensional magnon crystals, each of which is formed by creating a groove structure on the surfaces that is periodic in two directions. Two films are placed so that the rows of grooves are arranged one above the other, forming a multilayer irregular periodic structure. Based on the micromagnetic simulation of two coupled two-dimensional magnon-crystal lattices, the optimal parameters for the effective excitation and propagation of spin waves are determined, and the frequency selective properties of such a structure will be determined. A model of a multiplexer based on a system of two two-dimensional magnon crystals has been developed, which can be used to develop a real device, which, in turn, can be used to develop telecommunication networks. The possibility of frequency-spatial selectivity and the formation of waveguide channels is shown. in the investigated three-dimensional structure. The formation of adjacent waveguide channels for spin waves is possible when the frequency of the input signal falls into the frequency range of the Bragg band gap of the MC.

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This work was supported by a grant from the Russian Foundation for Basic Research (19-37-90079)