SPIN-WAVE TRANSPORT IN LATERAL ARRAYS OF MAGNONIC STRUCTURES

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The traditional approach in semiconductor microelectronics is based on the use of a charge of current carriers, at the same time, the use of elementary quanta of magnetic excitations and spin waves as carriers of information signals allows the creation of a new generation of electronic devices - magnonics, reducing the magnitude of thermal fission and size, as well as increasing their functionality [1]. Magnonics devices have advanced capabilities due to the control of the properties of spin waves through various influences (for example, changes in the external magnetic field, electric field, heating, etc.), in contrast to vacuum and semiconductor microwave devices. It should be noted that magnon devices can easily be combined with a sufficiently large number of semiconductor integrated technologies. The use of multilayer magnetic microstructures based on films of yttrium iron garnet having a record low damping of spin waves seems to be important for the development of basic elements of magnonics and their formation in the so-called "magnonic networks" [2-3].

Using numerical studies based on the finite element method and micromagnetic simulation, we studied the propagation dynamics of surface magneto-static waves in a system of lateral YIG waveguides.

Structure is consisting of parallel-oriented magnetic stripes obtained using the laser scribing method from a YIG film 10 μm thick located on a gallium-gadolinium garnet substrate. The distance between magnetic microwaves is 40 μm. The length along the long side of the waveguides was 8 mm. Spin waves were excited using a microstrip antenna 1 μm thick and 30 μm wide. The structure is placed in an external static magnetic field, $H = 1200$ Oe, changing at an angle ϕ.

To demonstrate the control modes of the intensity of the spin-wave signal with a change in the magnetization angle, a numerical simulation was performed based on the solution of the Landau – Lifshitz equation.

References:

[1] A.V. Sadovnikov, A.A. Grachev, S.E. Sheshukova, Yu.P. Sharaevskii, A.A. Serdobintsev, D.M. Mitin, S A. Nikitov,Physical Review Lettetrs **120**, (2018)

[2] A.V. Sadovnikov, A.A. Grachev, E.N. Beginin, S.E. Sheshukova, Yu.P. Sharaevskii, and S.A. Nikitov, Physical Review Applied **7**, (2017)

[3] A.V. Sadovnikov, A.A. Grachev, E.N. Beginin, S.E. Sheshukova, Yu.P. Sharaevskii, A.A. Serdobintsev, D.M. Mitin, S.A. Nikitov, IEEE Transactions on Magnetics **53**, (2017)

This work was supported by the Russian Foundation for Basic Research Grant (19-37-90145)