

Corrugated YIG films as basic elements for 3D magnonics

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In this work, we consider corrugated magnetic films (with the corrugation depth exceeding film thickness) which can be used as one of the possible basic elements for 3D arrangement of magnonic devices [1-3]. Both experimentally and theoretically, we explore propagation of spin waves (SW) in corrugated yttrium-iron garnet (YIG) films deposited by ion-beam sputtering on gadolinium gallium garnet substrates with periodical arrays of etched grooves. Effects of SW spectrum quantization, Bragg diffraction and discrete diffraction were found out to develop in the studied samples. It was shown that consideration of the corrugated YIG films according to the model of effective medium can give the dispersion of surface SW in the long-wavelength region and the position of long-wavelength boundary frequency having good agreement with the experiment.

Size reduction of magnonic elements for the aim of miniaturization leads to the decrease of SW wavelength, thus, resulting in necessity to use exchange-dominated SW (EDSW). We demonstrate experimentally and by modelling that EDSW can be generated at a thickness step under microwave uniform pumping or pumping through the surface SW propagating across the step [4].

References:

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