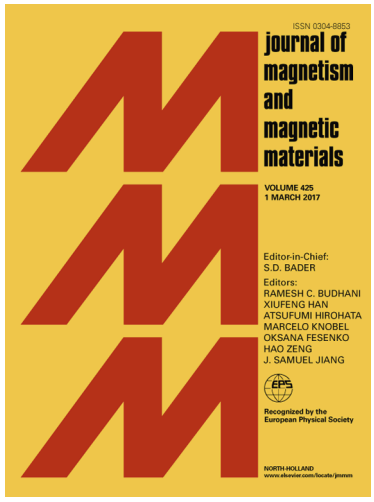

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Spin wave propagation in perpendicularly magnetized nm-thick yttrium iron garnet films

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Abstract

Magnonics offers a new way for information transport that uses spin waves (SWs) and is free of charge currents. Unlike Damon-Eshbach SWs, the magnetostatic forward volume SWs offer the reciprocity configuration suitable for SW logic devices with low power consumption. Here, we study forward volume SW propagation in yttrium iron garnet (YIG) thin films with an ultra-low damping constant $\alpha = 8 \times 10^{-5}$. We design different integrated microwave antenna with different k-vector excitation distributions on YIG thin films. Using a vector network analyzer, we measured SW transmission with the films magnetized in perpendicular orientation. Based on the experimental results, we extract the group velocity as well as the dispersion relation of SWs and directly compare the power efficiency of SW propagation in YIG using coplanar waveguide and micro stripline for SW excitation and detection.

Keywords: Magnonics, Spin waves, Antenna design, Yttrium iron garnet

1. Introduction

Spin waves (SWs) offer a promising new way to transport information without involving charge currents. This property could lead to a new paradigm in the area of computing, allowing to create smaller low-power devices compared to common CMOS-technology [1, 2, 3, 4, 5, 6, 7, 8]. An essential part in the development of such circuits is the ability to locally control the SW amplitude.

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