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RPTU

Functional Spintronic Nanomaterials
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Gigahertz gyrotropic dynamics in thick magnetic nanodots

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Movement towards the 3rd dimension allows obtaining spintronic nanodevices with much richer functionality, compared to traditional realizations in planar 2D magnetic structures. In this work we extend a common two dimensional magnetic vortex structures, known for producing an efficient dynamical response to external stimuli without bias magnetic field, into the 3rd dimension. This extension leads to a drastic vortex frequency increase, up to 5 GHz, contrasted with typical sub-GHz range reported for planar vortex oscillators. A systematic study reveals a complex pattern of vortex excitation modes, which provides explanations for the fall of the thickness-homogenous oscillation mode frequency, vortex mode intensities inversion, and nontrivial spatial distribution of the vortex dynamical magnetization reported in earlier works [1-3]. The observed phenomena allow for optimization of both oscillation frequency and frequency reproducibility (by minimizing the effect of uncontrolled size uncertainties) of such magnetic devices.

Reference list

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