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SIMULATION OF UNIDIRECTIONAL SPIN-WAVES GENERATED BY THE CHERENKOV EFFECT IN A FERROMAGNET/SUPERCONDUCTOR HYBRID

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A magnetic profile propagating in space can be a source of spin waves in magnetic materials [1]. Using type II superconductors, in which the magnetic vortices can be moved by a flowing current, we can practically realize this idea. In a ferromagnet/superconductor (F/S) hybrid system composed of the ferromagnetic layer and the type II S layer (placed near F), the magnetic field of the moving vortices generates the spin waves [2]. While the velocity of the moving vortices is comparable or even higher than the phase velocity of the spin waves, the Cherenkov effect of the spin waves can be observed [3].

The aim of this work is to perform the numerical simulation of spin-wave propagation (and spin-wave Cherenkov) in the F/S hybrid system. We assumed a specific shape of the field generated by the vortex [4] and observed the induced spin waves for a given value of the vortex velocity. We performed micromagnetic simulations using MuMax3 solver and the output data were post-processed using Python codes.

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References:

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