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Spin wave modes in a cylindrical nanowire in crossover dipolar-exchange regime

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The confinement in magnetic structure is responsible not only for the quantization of spin wave modes due to geometrical constraints but also determines the dipolar interactions. Although the magnetic wires were already [1] broadly investigated, some of their dynamical properties, like: (anti)crossing between the spin wave modes and the impact of the magnetic field on the spin wave spectrum, still need to be explored. In our studies [2] we identify the dispersion brunches and their (anti)crossing in crossover dipolar-exchange regime by plotting the spatial profiles of spin wave amplitudes and magnetostatic potential. We also check how we can tune the spectrum of the modes by application of the external magnetic field and how it affects the modes and their dominating type of interaction. We use two approaches for solving the Landau-Lifshitz equation to investigate the spin wave dynamics: semi-analytical calculations and numerical computations based on the finite element method.
[1] R. Arias and D. Mills, Phys. Rev. B 70, 094414 (2004)
[2] J. Rychły, V. S. Tkachenko, J. W. Kłos, A. Kuchko, and M Krawczyk, J. Phys. D: Appl. Phys. 52, 075003R (2018).

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Summary

Topic

1. Phonons, plasmons, magnons and polaritons

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