Título del trabajo

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Introduction

Spin waves (SWs) in magnetic nanotubes have shown interesting nonreciprocal properties in their dispersion relation, group velocity, frequency linewidth and attenuation lengths. The reported chiral effects are similar to those induced by the Dzyaloshinskii-Moriya interaction, but originating from the dipole-dipole interaction. Here we show, that the isotropic-exchange interaction can also induce chiral effects in the SW transport; the so-called Berry phase of SWs. We demonstrate that with the application of magnetic fields, the nonreciprocity of the different SW modes can be tuned between the fully dipolar governed and the fully exchange governed cases, as they are directly related to the underlaying equilibrium state. In the helical state, due to the combined action of the two effects every single sign combination of the azimuthal and axial wave vectors leads to different dispersion, allowing for a very sophisticated tuning of the SW transport. A disentanglement of the dipole-dipole and exchange contributions so far was not reported for the SW transport in nanotubes. Furthermore, we propose a device based on coplanar waveguides that would allow to selectively measure the exchange or dipole induced SW nonreciprocities. In the context of magnonic applications, our results might encourage further developments in the emerging field of 3D magnonic devices using curved magnetic membranes.

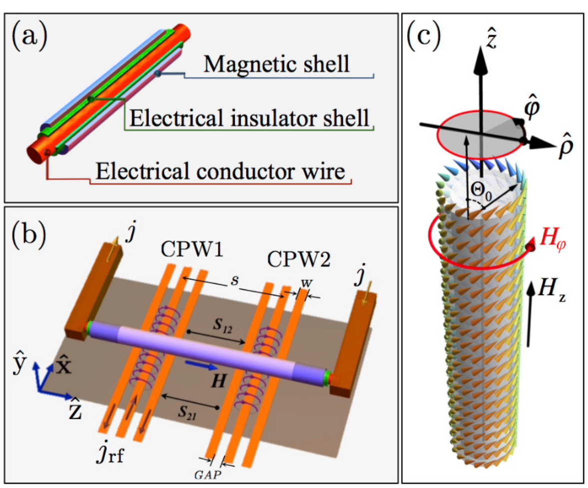

Figure 1:(a) Magnonic component comprised of core-shell MNT made of an internal conductor wire, electrical insulator layer and outer magnetic shell. (b) The MNT is placed on top of two identical and parallel coplanar wave guides, CPW1 and CPW2. The ground and signal lines are sepa-rated by a gap GAP. The geometrical dimensions of the CPWs are w = GAP = 250 nm and a separation of s = 5 μm between the two CPW centers. The internal conductor wire is connected to two electrical terminals for the injection of a DC electric current j, which creates a circular magnetic field H_φ in the magnetic shell. The signal will be measured via the transmission coefficients S_{12}

and S_{21}. c) The nanotube in a helical equilibrium configuration described by the angle Θ_0. [1]

Referencies

[1] M.M. Salazar-Cardona *et al.*, Appl. Phys. Lett 118,. **262411**, (2022).