Mechanism of vortex polarity switching in 2D easy-plane ferromagnet.

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9.7 cm

As it is known, topological defect (vortex) in easy-plane Heisenberg ferromagnet in the case of weak anisotropy possesses an asymmetric structure: It can have total z-magnetization either positive or negative (polarity ± 1). However it might be important for experimental purposes that the vortex polarity can change its sign by means of external circular magnetic field. Considering a small spin plaquette we study the mechanism of the vortex flip under the action of circular pumping and investigate some momentous points. Firstly the direction of this change is uniquely determined by the direction of the field rotation and whence the process becomes unidirectional. Such a configuration of the field brings about a quite unusual manner for activation of the magnon modes, namely activation of the lowest symmetric mode via the higher inhomogeneous modes. In addition the field with the different direction of rotation interacts with different inhomogeneous modes which causes a frequency asymmetry. We found out two possible scenarios which could produce the vortex flip: Parametrical excitation at the combinational frequencies and direct resonance at the frequencies of first azimuthal modes. All the results show a good agreement with the data of direct micromagnetic simulations.

13.4 cm

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