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Vortex Gyrotropic Motion in patterned Ferromagnetic Dots[1]
JUNJIA DING, PAVEL LAPA, TRUPTI CHAIR, CHRYSTIAN POSADA, AXEL HOFFMANN, VALENTINE NOVOSAD, Argonne Natl Lab — A vortex state consists of a large region of in-plane curling magnetization and a small core region with out-of-plane magnetization. The gyrotropic oscillation frequency of the vortex core is known to be weakly dependent to the core position (which is adjustable by changing the applied field) and can only be efficiently tuned by changing the dimension of the dots. Here, we demonstrated that the vortex gyrotropic frequency can be stepwise tuned by introducing a vortex barrier to a regular ferromagnetic dot. Systematical investigations of the dynamic response of the engineered dots have been performed as a function of the outer dot diameter, barrier diameter and the barrier profile using both microwave absorption spectroscopy and micromagnetic simulation. We found that the vortex frequency is mostly dependent on the outer diameter of the dot when the core is outside the barrier, while it is more rely on the dimension of the barrier when the core is inside the barrier. This approach certainly gives several additional freedoms to adjust the vortex gyrotopic frequency and opens extra perspectives for spintronic applications.

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