Energy storage of vortex magnetic field

Can a vortex core polarization be used as a data storage method?
The application of small bursts of an oscillating magnetic field can be used to reverse controllably the gyration direction of a vortex core structure,and hence switch the direction of the out-of-plane vortex core polarization. This raises the possibilityof using this core switching scheme as a means of magnetic data storage.

What are magnetic vortices?
Magnetic vortices are topological objects found in magnetic thin films and microstructures. The study of vortices has attracted much attention for their fundamental beauty and because vortices could be constituents of non-volatile storage and sensing devices as well as of radiofrequency and neuro-inspired devices.

What is a magnetic vortex structure?
The magnetic vortex structure can be described as a soliton,exhibiting a curling spin structure in the plane of the magnetization around a central region where magnetic moments are pointing out of plane to avoid creating a singularity.

How does an external magnetic field affect a vortex core?
Fundamentally,the application of an external magnetic field permits a level of control on the restoring potential generated by the Oersted field of the dc current passing perpendicularly through the layers of the device,which in turn allows the trajectoryof the vortex core to be controlled. 3.2. Mutual synchronization of STVOs

Could ferromagnetic disks have a magnetic vortex core?
Researchers have also theoretically predicted the remarkable reduction of the required magnetic switching field for a topological magnetic vortex core at a temperature closely below the Curie point (36) and the possibility of all-optical switching of a magnetic vortex core (37) in ferromagnetic disks.

How does a vortex structure react with an alternating magnetic field?
The vortex structure is excitedwith an alternating magnetic field (frequency 250 MHz,amplitude 0.1 mT). Two sequences (phase steps 90°) of images show the dynamic response of the vortex structure before and after a 4 ns 'single period' burst (amplitude 1.5 mT).

Crucially, the ability to control magnetic order with electric fields has the potential to vastly reduce the energy require-ments compared to magnetic field or spin polarized current control. At quasistatic time scales the manipulation of magnetic domains by the application of strain in the soft magnetostrictive material Galfenol (Fe81Ga19) has ...

Numerical verification is presented of Davidson"s theoretical proposal that the angular momentum parallel to the magnetic field of a single vortex is conserved whereas the perpendicular angular momentum decays

exponentially during a free-decay evolution. Theoretical scaling laws for the linear process and the nonlinear process of a single MHD vortex decay are ...

2. Problem formulation2.1. Physical description of the problem and computational domain. A shell-and-tube latent heat thermal energy storage (LHTES) device of height H = 1 m under the influence of electrohydrodynamic flow induced by charge injection is considered. The diameters of the shell and tube are D S = 36 mm and D T = 12 mm, respectively.The ...

This paper investigates the effects of confined magnetic fields on the flow and thermal properties of nanofluids using the alternating direction implicit approach. The dimensionless version of the partial differential equation is computed by using the stream-vorticity formulation. Unlike most earlier investigations, we do not make the more reasonable ...

As a topological magnetic structure in the ground state, magnetic vortex usually exists in soft ferromagnetic micro- or nano-disks, and its formation depends on the result of competition between magnetic anisotropy energy, exchange energy and demagnetization energy [[1], [2], [3]].The magnetic vortex can be characterized by the circulation of the in-plane curling ...

The RLC circuit of magnetic stimulation mainly consists of the energy-storage capacitor C, circuit equivalent resistor R, and coil inductor ... the excitation of the vortex magnetic field by a changing electric field. Full size image. Fig. 8.3. Example of propagation of electromagnetic oscillations in space. Full size image. 1.3 Electromagnetic ...

In this study, we investigate the thermal pinning and depinning behaviors of vortex domain walls (VDWs) in constricted magnetic nanowires, with a focus on potential applications in storage memory nanodevices. Using micromagnetic simulations and spin transfer torque, we examine the impacts of device temperature on VDW transformation into a ...