

# Research elucidates the effect of disorder on magnetic vortex gyration

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Much of the world's information is stored in memories consisting of magnetic domains, and researchers continue to develop new domain arrangements to enable smaller and faster such memories.

Vortices in magnetic disks are one example of magnetic structures that have generated a lot of interest lately for these applications.

To better understand the results of recent CNST research on magnetic vortices in prototype information storage devices, Hongki Min of CNST and the University of Maryland, Mark Stiles and Robert McMichael of the CNST, and Jacques Miltat of the University of Paris-South have investigated how disorder might confound measurements of the rate of energy loss in magnetic disks.

In thin disks of magnetic material, the magnetization finds its ground state configuration to be a vortex; i.e., the magnetization is parallel to the edges of the disc rotating around a central core. When the magnetization is excited, the core of the vortex gyrates around the center of the disk.

Since this motion is relatively easy to measure, it has been the subject of substantial recent attention; in particular, recent measurements have studied the effect of disorder in the disk on this motion.

As described in their recent publication in *Physical Review B*, the CNST researchers find only small disorder-induced changes in the effective damping in vortex gyration and then only for small amplitude precession

when the vortex core is pinned by the disorder potential.

This result is an important contribution to understanding how to correctly interpret measurements on magnetic materials and devices being considered for future high-density information storage applications.

**More information:** Effects of disorder on magnetic vortex gyration, H. Min, R. D. McMichael, J. Miltat, and M. D. Stiles, Physical Review B 83, 064411 (2011). [prb.aps.org/abstract/PRB/v83/i6/e064411](http://prb.aps.org/abstract/PRB/v83/i6/e064411)

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