CFEL SCIENCE

Max Planck Research Department for Structural Dynamics

SEMINAR

August 27th, 2012 - 15:15 pm

Seminar Room 108, DESY Bldg. 49

Jacob Burgess

University of Alberta, Canada

The energetic landscape of a magnetic vortex in a disk

Significant interest has been shown in the interaction of topological defects such as domain walls and magnetic vortices with defects or fabricated pinning sites. With that motivation, the work presented here applies highly sensitive nanomechanical torsional magnetometry in conjunction with magneto-optical techniques and simulation, to develop a robust analytical description of a pinned vortex in a thin magnetic disk. Nanomechanical torsional resonators allow detection of minute magnetization changes as the vortex shifts through pinning potentials. Moreover, the fast acquisition time of the technique permits observation of low speed (~few ms) thermally activated dynamics as the vortex hops from site to site. Description of these results necessitates improvement in analytical modeling of the vortex. Aided by simulation and magneto-optical Kerr susceptometry measurements, a robust model that accurately describes the pinned vortex position and the overall disk magnetization was developed. The model enables description of the thermal dynamics and quantitative extraction of the pinning potential. The technological relevance of torsional magnetometry combined with pinning is then demonstrated by the addition of artificial pinning sites, forming a proof of principle magneto-mechanical logic device.

UHH

Host: Sebastian Loth, MPSD-DNES, CFEL