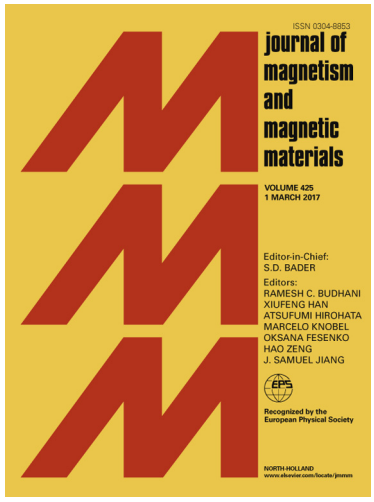

Vortex Precession in Thin Elliptical Ferromagnetic Nanodisks

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Vortex Precession in Thin Elliptical Ferromagnetic Nanodisks

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The magnetostatic energy is calculated for a magnetic vortex in a noncircular elliptical nanodisk. It is well-known that the energy of a vortex in the circular disk is minimized though an ansatz that eliminates the magnetostatic charge at the disk edge. Beginning with this ansatz for the circular disk, a conformal mapping of a circle interior onto the interior of an ellipse results in the magnetization of the elliptical disk.This magnetization in the interior of an ellipse also has no magnetostatic charge at the disk edge also minimizing the magnetostatic energy. As expected the energy has a quadratic dependence on the displacement of the vortex core from the ellipse center, but reflecting the lower symmetry of the ellipse. Through numerical integration of the magnetostatic integral a general expression for the energy is obtained for ellipticity values from 1.0 to about 0.3. Finally a general expression for the gyrotropic frequency as described by the Thiele equation is obtained.

Key Words: Magnetic vortex, Gyrotropic precession

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