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Vortex-in-nanodot potential energy GARY WYSIN, Kansas State University — Vortex states in a thin circular magnetic nanodot are studied using auxilary constraining fields as a way to map out the potential energy space of the vortex, while avoiding a rigid vortex approximation. In the model, isotropic Heisenberg exchange competes with the demagnetization field caused both by surface and volume magnetization charge density. The system energy is minimized while applying a constraint on the vortex core position, using Lagrange's method of undetermined multipliers. The undetermined multiplier is seen to be the external field needed to hold the vortex core in place at any desired radial distance r from the dot center. This auxilary field is applied only in the core region of the vortex. For a uniform nanodot, the potential energy is found to be very close to parabolic with r, as in the rigid vortex approximation, while the constraining field increases linearly with r. Effects of nonmagnetic holes in the medium can also be estimated and compared with alternative descriptions. Especially, the local depth of the potential well produced by a hole can be found.

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