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Micromagnetic Study of Vortex Core Motion driven by Thermal Spin Transfer Torque[1] TIM MEWES, JACLYN SCHILLINGER, CLAUDIA MEWES, MINT Center / Department of Physics and Astronomy, University of Alabama, Tuscaloosa, Alabama 35487, USA, MICHAEL VOGEL, CHRISTIAN BACK, Institut fr Experimentelle und Angewandte Physik, Universitt Regensburg, Universittsstrae 31, 93053 Regensburg, Germany — We report on micromagnetic investigations of the magnetization dynamics for vortex core structures within a thin square film of permalloy, using our finite element code M3. We have studied the dependence of the vortex motion on the temperature gradient, lateral sample dimensions and thicknesses, as well as the influence of the Landau-Lifshitz-Gilbert damping parameter on the resulting vortex motion. To further analyze our numerical results of the gyrotropic motion we use an analytic solution of the Thiele equation, which has been expanded by Thiaville et al. to include a spin polarized current density. We show that the final core deflection depends on the Landau Lifshitz Gilbert damping parameter only in second and higher orders. However, the eigenfrequency of the free vortex motion is in leading order proportional to this parameter, which becomes important for vortex motions driven by a series of heat pulses. Our results indicate that materials with a low Gilbert damping parameter will lead to a larger amplitude vortex core motion in case one utilizes heat pulses to generate spin torque to resonantly excite it.

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