Abstract Submitted
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Thermally-assisted magnetization reversal in nanomagnets with spin-transfer torque: diffusive energy space dynamics[1] DANIELE PINNA, A.D. KENT, Department of Physics, New York University, New York, NY 10003, D.L. STEIN, Department of Physics, New York University, New York, NY 10003 and Courant Institute of Mathematical Sciences, New York University, New York, NY 10012 — A direct current applied to a nanomagnet produces a spin-transfer torque that drives the magnetization out of equilibrium.[2] In this talk, scalings between switching time and current for a macrospin under the effects of both spin-torque and thermal noise are explored analytically by focusing on its diffusive energy space dynamics. The procedure allows us to characterize the full dynamics with a one dimensional stochastic differential equation.[3] We establish the limits of this reduction and elucidate the nature of the limit cycle stabilities observed in nanomagnet reversal experiments. We further proceed to show that the thermally activated dynamics in the presence of a tilt between easy and spin-polarization axes differ only by a rescaling of the threshold current as long as easy, hard and spin-polarization axes all lie in the same plane. Our analytics are verified by employing modern GPU computational techniques to massively parallelize the Langevin equations and probing the long time switching behavior.

[1]NSF-DMR-100657, PHY0965015
[2]J. C. Slonczewski, JMMM. 159, L1 (1996); L. Berger, Phys. Rev. B 54, 9353(1996).
[3]D. Pinna, D. L. Stein, A. D. Kent, arXiv:1210.7675, arXiv:1205.6509 (2012).

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