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Fluctuations, dissipation, and switching in tunneling spin-transfer devices YAROSLAW BAZALIY, IBM Almaden Research Center, 650 Harry Rd., San Jose, CA, KONSTANTIN MATVEEV, Materials Science Division, Argonne National Laboratory, 9700 S. Cass Ave., Argonne IL — We propose a theory of tunneling spin-transfer devices which treats quantum-mechanically not only the spins of itinerant electrons, but also the magnetic moment of the free layer. A Fokker-Plank equation, describing an open spin-transfer system at finite temperatures and currents, is derived. It consistently accounts for both thermal and current-related fluctuations, and for bulk and contact contributions to the Gilbert damping constant. In the presence of fluctuations, switching is shown to be governed by current-dependent effective energy barriers. Our approach provides a unified treatment of escape probabilities from static and precession states of the device.

Yaroslaw Bazaliy
IBM

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