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Micromagnetic Study of Spin Transfer Induced Switching of an In-Plane Magnetized Layer with a Tilted Spin Polarization GABRIEL CHAVES-O'FLYNN, DANIELE PINNA, GEORG WOLF, ANDREW KENT, New York University — Spin transfer torque switching can be enhanced by the addition of a spin-polarizing layer magnetized perpendicular to an in-plane magnetized free and reference layer. We present the results of zero temperature micromagnetic simulations of elliptical nanomagnets for which the spin current polarization is at an angle out of the free layer plane, between its easy and hard axis axes. We simulate the response of the free layer to a current pulse and record the relaxed state after the current is turned off. We show that, in agreement with a macrospin model, the presence of the polarizer enhances the reversal speed of the free layer, requiring lower current amplitude for switching to occur at a given time. However, for polarization tilts larger than a certain critical angle (θ_{crit}), related to the free layer's shape, the magnetization starts to precess about the hard axis, which can lead a final state that is very sensitive to pulse conditions. We do a side-by-side comparison of our micromagnetics results with macrospin simulations. For small aspect ratios the simulations are consistent with the macrospin case. In larger ellipses the simulations show that out-of-plane precession is suppressed, we associate this with the excitation of non-uniform modes.

[1] Pinna et al PRB 2013

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