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Macrospin model of incubation delay due to field-like spin transfer torque SAMIR GARZON, YAROSLAW BAZALIY, RICHARD A. WEBB, University of South Carolina, MARK COVINGTON, SHEHZAAD KAKA, Seagate Research, THOMAS M. CRAWFORD, University of South Carolina — While extensive measurements have tested the validity and limitations of the macrospin model with Slonczewski's spin transfer torque in metallic spin valves, recent experiments with magnetic tunnel junctions (MTJ's) have reported an additional "field-like" or "perpendicular" spin torque. The observed field-like torques generally agree with theoretical predictions, but some controversies remain: frequency domain measurements at low voltages and switching current measurements at large voltages report contradictory signs for the field-like term. Here we show that the absence of pre-switching oscillations ("incubation delay") reported in magnetic tunnel junctions can be explained within the macrospin model by a sizable field-like component of the spin-transfer torque. Furthermore, we propose that measurements of the voltage dependence of the tunnel junction switching time in the presence of external easy axis magnetic fields can be used to determine the magnitude and voltage dependence of the field-like torque over a broad range of voltages.

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