Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Spin Orbit Torque in TbCo Films with Bulk Perpendicular Magnetic Anisotropy KOHEI UEDA, MAXWELL MANN, AIK-JUN TAN, GEOFFREY. S. D. BEACH, MIT — Spin-orbit torque (SOT) has generated considerable interest for manipulating magnetization in spintronic devices with ultra-low dissipation. Recent research has demonstrated that highly efficient magnetization control can be driven by current-induced SOT in ferromagnet/heavy metals bilayers with strong spin orbit coupling. However, most work on SOT has focused on ultra-thin magnetic films with interfacial perpendicular magnetic anisotropy (PMA), whereas future devices will require bulk PMA for sufficient thermal stability. Recently, Zhao et al reported SOT induced magnetization switching in a bulk PMA material; however, the films examined were still rather thin. Here we examine spin orbit torques in TbCo alloy films with bulk PMA, sandwiched between top and bottom Ta layers. By performing conventional harmonic and current-induced switching measurements, we quantified the current-induced effective fields generated by damping-like (DL) and field-like (FL) torques. The DL torque is much larger than FL torque, and corresponds to an effective spin Hall angle consistent with that of Ta. Owing to the relatively small saturation magnetized of these ferrimagnetic materials, the current-induced effective field is comparable to that observed in nm-thick Co films, despite the much larger film thicknesses used here. These results demonstrate ferromagnetic alloys with bulk PMA can be engineered to simultaneously provide thermal stability and efficient SOT switching.

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Date submitted: 06 Nov 2015 Electronic form version 1.4