Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Strong Spin Hall effect in PtMn YONGXI OU, SHENGJIE SHI, DANIEL RALPH, ROBERT BUHRMAN, Cornell Univ — Recent reports indicate that certain metallic antiferromagnets (AFM) can exhibit a significant spin Hall effect. Here we report a large damping-like spin torque efficiency (ξ_{DL}) in PtMn/ferromagnet(FM) bilayer structures, determined from both FM-thickness-dependent spin-torque ferromagnetic resonance (ST-FMR), and harmonic response (HR) measurements of layers with perpendicular magnetic anisotropy (PMA). We find that ξ_{DL} can vary from <0.1 to >0.15, depending on the thickness of PtMn, the stacking order of the samples, and the choice of the FM material. The field-like spin torque efficiency (ξ_{FL}) is also quite variable, $0<|\xi_{FL}|<0.5$. The large broadening of the ST-FMR linewidth suggests extra spin attenuation at the AFM/FM interface that is possibly due to intermixing. The PtMn/FeCoB/MgO structures that exhibit PMA have a comparatively low switching current density and an unusual asymmetric switching phase diagram. These results indicate that AFM PtMn has significant potential both for advancing the understanding the physics of the spin Hall effect in Pt alloys, and for enabling new spintronics functionality.

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Date submitted: 06 Nov 2015 Electronic form version 1.4