Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Engineering damping in insulating magnet-metal bilayers using ultrathin spacer layers SRIHARSHA V. ARADHYA, COLIN L. JERMAIN, HANJONG PAIK, JOHN T. HERON, DARRELL G. SCHLOM, DANIEL C. RALPH, ROBERT A. BUHRMAN, Cornell University — Insulating magnetic materials, particularly yttrium iron garnet (YIG), are of significant interest for fundamental research as well as technological applications. Thus far copper spacer layers of ∼10 nm - 1 μm thickness sandwiched between YIG and heavy metal films have been shown to modulate the damping of the magnetic layer either higher or lower. We report on the effect of ultrathin nonmagnetic spacer layers on the damping of YIG with different heavy metal overlayers. We start with YIG films grown by oxide molecular beam epitaxy with thicknesses below 20 nm and Gilbert damping as low as 0.0005. We observe that a spacer layer can increase the damping by 50% in YIG/spacer/Ta samples compared to YIG/Ta, and the increase can be as large 500% for YIG/spacer/Pt compared to YIG/Pt. These observations suggest a significant increase in the effective spin mixing conductance at the YIG-heavy metal interface that might be used to improve the efficiency of the spin torque produced by the spin Hall effect.

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Date submitted: 14 Nov 2014 Electronic form version 1.4