Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Control of spin-orbit torques through crystal symmetry in WTe2/ferromagnet bilayers. GREGORY M. STIEHL, DAVID MACNEILL, MARCOS H. D. GUIMARAES, ROBERT A. BUHRMAN, JIWOONG PARK, DANIEL C. RALPH, Cornell University — In experiments performed to date, spin-orbit torques have an important limitation – the component of torque that can compensate magnetic damping is required by symmetry to lie within the device plane. This means that spin-orbit torques can drive the most current-efficient type of magnetic reversal (antidamping switching) only for magnetic devices with in-plane anisotropy, not the devices with perpendicular magnetic anisotropy that are needed for high-density applications. Here we show experimentally that one can change the allowed symmetries of spin-orbit torques in spin-source/ferromagnet bilayer devices by using a spin-source material with low crystalline symmetry, such as the transition-metal dichalcogenide WTe2. Consistent with the symmetries of the WTe2 surface, we generate an out-of-plane antidamping torque when current is applied along a low-symmetry axis of WTe2/Permalloy bilayers, but not when current is applied along a high-symmetry axis [1]. Controlling spin-orbit torques by crystal symmetries in multilayer samples provides a new strategy for optimizing future magnetic technologies. [1] D. MacNeill et al., Nat. Phys. (2016), doi:10.1038/nphys3933.

Gregory M. Stiehl
Cornell University

Date submitted: 11 Nov 2016 Electronic form version 1.4