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Evidence for a common origin of spin-orbit torque and the Dzyaloshinskii-Moriya interaction at a Py/Pt interface ANDREW BERGER, ERIC EDWARDS, NIST, HANS NEMBACH, JUSTIN SHAW, Quantum Electromagnetics Division, NIST, Boulder , ALEXY KARENOWSKA, Department of Physics, University of Oxford, Oxford, UK , MATHIAS WEILER, Walther-Meissner- Institut, Bayerische Akademie der Wissenschaften, Garching, Germany , TOM SILVA, Quantum Electromagnetics Division, NIST, Boulder — Spin-orbit coupling (SOC) can drive non-equilibrium spin-charge conversion through the reciprocal processes of current-driven spin torque and spin precession-driven current in ferromagnet/heavy metal (FM/HM) bilayers. Both damping-like and field-like spin-orbit torques (SOT) have been observed in the forward process of current-driven SOT, but details of the underlying physics are still debated. SOC also underlies the equilibrium antisymmetric exchange coupling, a.k.a. the interfacial Dzyaloshinskii-Moriya interaction (DMI). It was recently proposed that a Rashba Hamiltonian at FM/HM interfaces serves as a common origin for both SOT and DMI, with a simple quantitative relation between the two. Here, we verify this relation by comparing inverse SOT (iSOT) measurements with previous characterization of DMI via spin wave spectroscopy. To perform the iSOT measurements, we have developed a technique for quantitative vector network analyzer ferromagnetic resonance to inductively detect the AC charge currents produced by spin-charge conversion processes in FM/HM bilayers. Our findings reveal that Py/Pt bilayers exhibit both damping-like and field-like iSOT, consistent with the presence of inverse spin Hall effect and Rashba-Edelstein effect, respectively.

Andrew Berger
NIST

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