Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Spin-Orbit Caloritronics AURELIEN MANCHON, PAPA BIRAME NDIAYE, King Abdullah University of Science and Technology (KAUST), Physical Science and Engineering Division, Thuwal 23955-6900, Saudi Arabia., JUNG-HWAN MOON, Department of Materials Science and Engineering, Korea University, Seoul 136-701, Korea., HYUN-WOO LEE, PCTP and Department of Physics, Pohang University of Science and Technology, Kyungbuk 790-784, Korea., KYUNG-JIN LEE, Department of Materials Science and Engineering, Korea University, Seoul 136-701, Korea. — Utilizing spin-orbit coupling to enable the electrical manipulation of ferromagnets has recently attracted a considerable amount of interest. This spin-orbit torque [1] appears in magnetic systems displaying inversion symmetry breaking. Another adjacent emerging topic, spin caloritronics [2], aims at exploiting magnonic spin currents driven by temperature gradients, allowing for the transmission of information and the control of magnetic domain walls. In this work, we demonstrate that a magnon flow generates torques on the local magnetization when subjected to Dzyaloshinskii-Moriya interaction (DMI) just as an electron flow generates torques when submitted to Rashba interaction [3]. A direct consequence is the capability to control the magnetization direction of a homogeneous ferromagnet by applying a temperature gradient or local RF excitations. Merging the spin-orbit torques with spin caloritronics is rendered possible by the emergence of DMI in magnetic materials and opens promising avenues in the development of chargeless information technology. [1] Miron et. al, Nature Materials 9, 230 (2010); [2] Bauer, et al. Nat. Mater. 11, 391 (2012); [3] A. Manchon and S. Zhang, Phys. Rev. B 78, 212405 (2008).

Aurelien Manchon
King Abdullah University of Science and Technology (KAUST),
Physical Science and Engineering Division

Date submitted: 14 Nov 2013 Electronic form version 1.4