Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Theory of Intrinsic Spin Torque Due to Interface Spin-Orbit Coupling[1] ALAN KALITSOV, MINT Center and Department of Physics, University of Alabama, Tuscaloosa, AL 35487-0209, USA, MAIRBEK CHSHIEV, SPINTEC, CEA/CNRS/UJF-Grenoble, 38054 Grenoble, France, WILLIAM BUTLER, OLEG MRYASOV, MINT Center and Department of Physics, University of Alabama, Tuscaloosa, AL 35487-0209, USA — The effect of intrinsic spin torque due to spin-orbit coupling (SOC) at the interface between thin ferromagnetic film and non-magnetic metal has attracted significant fundamental and applied research interest [1]. We report quantum theory of SOC driven spin torque (SOT) within the Rashba model of SOC and two-band tight binding (TB) Hamiltonian including s-d exchange interactions (J). We employ the non-equilibrium Green Function formalism and find that SOT to the first order in SOC has symmetry consistent with the earlier quasi-classical diffusive theory [2]. An obvious benefit of the proposed approach is the expression for the SOT given in terms of TB parameters which enables a physically transparent analysis of the dependencies of SOT on material specific parameters such as Rashba SOC constant, hopping integral, Fermi level and J. On the basis of analytical and numerical results we discuss trends in strength of SOT and its correlation with the Spin Hall conductivity.

[1] I. M. Miron *et al.*, Nature **476**, 189 (2011).
[2] A. Manchon and S. Zhang, Phys. Rev. B **78**, 212405 (2008).

[1]This work was supported in part by C-SPIN, STARnet, a Semiconductor Research Corporation program, sponsored by MARCO and DARPA.

Alan Kalitsov
Univ of Alabama - Tuscaloosa

Date submitted: 15 Nov 2013 Electronic form version 1.4