Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Local nature of impurity induced spin-orbit torques SERGEY NIKOLAEV, SPINTEC, Grenoble, France, ALAN KALITSOV, MINT Center, University of Alabama, AL, USA, MAIRBEC CHSHIEV, SPINTEC, Grenoble, France, OLEG MRYASOV, MINT Center, University of Alabama, AL, USA — Spin-orbit torques are of a great interest due to their potential applications for spin electronics. Generally, it originates from strong spin orbit coupling of heavy 4d/5d elements and its mechanism is usually attributed either to the Spin Hall effect or Rashba spin-orbit coupling. We have developed a quantum-mechanical approach based on the non-equilibrium Green's function formalism and tight binding Hamiltonian model to study spin-orbit torques and extended our theory for the case of extrinsic spin-orbit coupling induced by impurities. For the sake of simplicity, we consider a magnetic material on a two dimensional lattice with a single non-magnetic impurity. However, our model can be easily extended for three dimensional layered heterostructures. Based on our calculations, we present the detailed analysis of the origin of local spin-orbit torques and persistent charge currents around the impurity, that give rise to spin-orbit torques even in equilibrium and explain the existence of anisotropy.

Sergey Nikolaev
SPINTEC, Grenoble

Date submitted: 06 Nov 2015 Electronic form version 1.4