Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

**Current Induced Damping Rate of Quantum Magnetic Moments in the Presence of the Spin-Orbit Interaction**[1] FARZAD MAHFOUZI, NICHOLAS KIOUSSIS, Department of Physics Astronomy, California State University, Northridge — We have developed a novel formalism based on the framework of Keldysh Green function approach to investigate the effect of bias voltage on the damping rate of the metallic ferromagnets (FMs) in the presence of the spin-orbit interaction (SOI). In contrast to previous classical ferromagnetic model approaches this formalism takes into account the quantum mechanical nature of the magnetic moments at the atomic scale and allows us to consider the magnetization dynamics in different regimes, namely; (i) precessional and (ii) local spin flip dynamics. The former is associated with the rotation of the magnetic order parameter while the latter one describes the damping rate of the amplitude of the magnetic order parameter. We show that due to the SOI the bias voltage can lead to large changes of the damping rate of the magnetization and even sign reversal due to the energy transfer between excited itinerant electrons and the local moments. Unlike classical FMs coupled to itinerant electrons, this approach leads to a finite amplitude for the damping rate in ballistic regime of the electronic transport. The results suggest that the anti-damping rate efficiency is peaked with opposite signs when the transport is driven by only particle-like or hole-like carriers.

[1]This work was supported by NSF PREM Grant No. 1205734.

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Date submitted: 09 Nov 2016 Electronic form version 1.4