Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Intrinsic Gilbert Damping in Metallic Ferromagnets in Ballistic Regime and the Effect of Inelastic Electron Scattering from Magnetic Moments: A Time Dependent Keldysh Green Function Approach FARZAD MAHFOUZI, NICHOLAS KIOUSSIS, California State University, Northridge — Gilbert damping in metallic ferromagnets is mainly governed by the exchange coupling between the electrons and the magnetic degree of freedom, where the time dependent evolution of the magnetization leads to the excitation of electrons and loss of energy as a result of flow of spin and charge currents. However, it turns out that when the magnetization evolves slowly in time, in the presence of spin-orbit interaction (SOI), the resonant electronic excitations has a major contribution to the damping which leads to infinite result in ballistic regime. In this work we consider the inelastic spin-flip scattering of electrons from the magnetic moments and show that in the presence of SOI it leads to the relaxation of the excited electrons. We show that in the case of clean crystal systems such scattering leads to a linear dependence of the Gilbert on the SOI strength and in the limit of diffusive systems we get the Gilbert damping expression obtained from Kambersky's Fermi breathing approach. This research was supported by NSF-PREM Grant No. DMR-1205734

Farzad Mahfouzi
California State University, Northridge

Date submitted: 05 Nov 2015 Electronic form version 1.4