Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Magnetic Damping in Individual Cobalt Nanoparticles[1] WENCHAO JIANG, Georgia Tech, FELIPE TIJIWA BIRK, DRAGOMIR DAVIDOVIC
— Magnetization precession in ferromagnets is subject to damping by means of coupling between the magnetization and the environment. In a ferromagnetic metallic particle, the damping changes in a fundamental way when the electron-in-a-box level spacing becomes larger than the magnetization precession energy. Damping has crucial significance in magnetic storage technology, so understanding its size dependence is important for the miniaturization of electronics. Here, we present an electron tunneling technique to study damping in single Cobalt nanoparticles tunnel coupled to non-magnetic leads. Injecting a tunnel current into the particle raises its magnon temperature and induces magnetization dynamics. Tunnel currents as low as a few pA are able to excite or even reverse the particle's magnetization. Using the magnetic switching field as a magnon thermometer, we obtain very low values (10^{-8}) for the dimensionless damping parameter, α, indicating weak dissipative coupling to the environment.

[1]This work has been supported by the Department of Energy (DE-FG02-06ER46281).

Wenchao Jiang
Georgia Tech

Date submitted: 07 Dec 2010 Electronic form version 1.4