Abstract for an Invited Paper
for the MAR09 Meeting of
The American Physical Society

Effects of polarizer dynamics on current-induced behaviors in magnetic multilayer nanopillars[1]

SERGEI URAZHDIN, West Virginia University

Magnetic nanodevices usually include two magnetic layers - a polarizing "fixed" layer, and a "free" layer, whose roles are determined by their relative thicknesses. I will describe our measurements of spin transfer in nanopillars with similar thicknesses of the "polarizer" and the "free" layer. In the first sample type, both layers were patterned into similar lateral dimensions. Spectroscopic measurements of current-induced dynamics showed incoherent bipolar excitations. Thermally-activated reversal statistics exhibited dependencies on magnetic field and applied current dramatically different from the "standard" samples with a thick polarizing layer. I will also discuss our results for samples in which only the free layer was patterned into a nanopillar, while the polarizing layer was left extended with dimensions of several micrometers. These samples exhibit coherent precession of only the extended layer, only the polarizer, or both, depending on the relative thicknesses of the two layers. The transition between the "free"-like and "fixed"-like behaviors of each layer occured over a small range of thickness. I will show that current-induced behaviors of our samples can be understood in terms of the dynamical coupling between ferromagnets induced by spin transfer. This coupling can result suppression of the current-induced precession, incoherent dynamics, or for certain geometries in enhancement of current-induced dynamics in magnetic bilayers.

[1]Supported by NSF DMR-0747609 and a Cottrell Scholar Award from the Research Corporation