Thermal Effects on Precessional States in Nanomagnets Driven by DC Spin-Transfer Torques

JACK SANKEY, SERGEY KISELEV, ILYA KRIVOROTOV, NATHAN EMLEY, PATRICK BRAGANCA, KIRAN THADANI, ROBERT BUHRMAN, DANIEL RALPH, Cornell University — A DC current passing through a nanoscale magnetic multilayer can excite steady-state microwave-frequency magnetization precession by transferring spin angular momentum from one layer to the other [1-3]. In frequency-domain measurements, the spectra generated by such excitations consist of peaks with a non-zero width in frequency, $\Delta f$, indicating that the oscillatory signal produced by the precessing magnet is not perfectly periodic. Here we measure the temperature ($T$) dependence of $\Delta f$. We argue that at least two mechanisms contribute to $\Delta f$: thermal deflections of the magnetic moment within a precessional orbit (for which $\Delta f \sim T^{1/2}$) and thermally-activated transitions between different dynamical states (for which $\ln(\Delta f) \sim 1/T$).


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