Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Improved coherence of a quasi-linear spin-torque nano-oscillator OUKJAE LEE, VLAD PRIBIAG, DAN RALPH, ROBERT BUHRMAN, Cornell University, CORNELL UNIVERSITY TEAM —

We have fabricated tapered nanopillar spin-valve devices, $\sim$ 50 x 145 nm2, from a Py(5)/Cu(12)/Py(20) multilayer (thickness in nm) for spin torque nano-oscillator (STNO) studies. When biased with electron flow from the thick layer to the thin layer multiple, high power, but broad (Δf >50 MHz), spin torque excitation modes are obtained at hard-axis fields Hy < 500 Oe. For Hy $\sim$ 700 Oe we obtain much more coherent ST oscillations, Δf < 10 MHz, close to that predicted for a linear STNO at 300 K. A macrospin model successfully explains the optimum field bias as being where the amplitude-dependent red shift effect due to the demagnetization field is closely balanced by the blue shift effect due to the in-plane anisotropy field. We have also modeled the internal field within the free layer as a function of Hy and conclude that the multiple modes at lower fields originate from the relatively broad spatial distribution of the internal field, or equivalently from the broad natural frequency distribution of the individual magnetic elements. Our results suggest pathways for further enhancements in STNO performance.

OukJae Lee
Cornell University

Date submitted: 11 Nov 2011 Electronic form version 1.4