Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Resonant Spin-Transfer-Driven Switching of Magnetic Spin Valves Assisted by Microwave Current Pulses YONG-TAO CUI, JACK C. SANKEY, CHEN WANG, KIRAN V. THADANI, ZHI-PAN LI, ROBERT A. BUHRMAN, DANIEL C. RALPH, Cornell University — Spin transfer torque from an electrical current can reverse the magnetization in a nanomagnet. We show experimentally that applying a microwave-frequency current pulse in addition to a DC pulse can improve switching characteristics at low temperature by exciting a nanomagnet resonantly at its precession frequency. We study spin valve nanopillars with the structure IrMn(8 nm)/permalloy(4 nm)/Cu(8 nm)/permalloy(4 nm) where exchange bias causes an initial offset angle of $\sim$45 degrees between the permalloy magnetizations. We apply nanosecond-scale microwave-frequency current pulses prior to completing the switching with a DC current pulse. We find that the probability of successful switching has a resonant dependence on frequency, and it also depends on the phase of the microwaves at the moment when the DC pulse is applied. With a microwave pulse, the DC pulse length required for switching is shorter and has a narrower distribution compared to switching driven by a DC pulse alone.

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Date submitted: 27 Nov 2007 Electronic form version 1.4