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Spin-torque-driven ballistic switching with $<$ 50ps pulses OUKJAE LEE, DAN RALPH, ROBERT BUHRMAN, Cornell University — Spin-torque-driven ballistic switching is a fast, energy-efficient, non-thermal operation in which the magnetization of a nanomagnet rotates from one equilibrium state to the other without any preceding small-angle precession. This reversal scheme can be implemented with a non-collinear structure in which the magnetic free layer is located between an out-of-plane spin polarizer and an in-plane polarizer. Both for achieving better fundamental understanding of magnetic dynamics and for realizing technological advances, it is desirable to demonstrate experimentally that the free layer can be reliably reversed with a current pulse as short as possible. Moreover it is necessary to achieve an asymmetrical response as the function of both the initial state and the pulse current polarity in order to obtain the desired final state with a simple unipolar pulse. We will discuss experimental results that show that the interval of pulse widths giving reliable switching is strongly dependent on the initial magnetic state and on the current. We will also discuss strategies to further improve ballistic switching operations.

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