Domain wall dynamics under short current pulses: spin-transfer torque and other effects

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We have experimentally investigated the effect of the spin-transfer torque on magnetic domain walls in patterned nanostrips by high resolution magnetic force microscopy, and compared it to the micromagnetic description of the phenomena.
Experiments involve short current pulses (1 ns) applied to NiFe nanostrips. They reveal that the current pulse can also lead to a transformation of the domain wall structure, especially when the nucleated structure is metastable [1]. This transformation leads to a large domain wall displacement, called automotion. From an analytical calculation, supported by micromagnetic simulations, we also proved that, in the absence of a domain wall transformation and with no blocking of automotion, the domain wall displacement after a current pulse is directly proportional to the non-adiabaticity parameter. Finally, the role of thermal effects will be discussed [2].

1: *Magnetic domain walls displacement: automotion versus spin-transfer torque*, J.-Y. Chauleau, A. Thiaville, R. Weil, J. Miltat, Phys. Rev. B 82, 214414(7) (2010).
2: *Track heating study for current-induced domain wall motion experiments*, J. Curiale, A. Lemaître, G. Faini, and V. Jeudy, Appl. Phys. Lett. 97, 243505 (2010).