Chirality switching and ultra-fast vortex domain wall motion in ferromagnetic nanotubes

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We propose that the injection either of electric currents or magnetic field pulses, can be used to control vortex-like domain walls in metallic ferromagnetic nanotubes. We show that proper interplay between the tube geometry, and magnitude and duration of a current/field pulse, can be used to manipulate the position, velocity and chirality of vortex domain walls. Our calculations suggest that domain wall velocities greater than 1 km/s can be achieved for tube diameters of the order of 30 nm and increasing with it. We also find that the transition from steady to precessional domain wall motion occurs for very high electric current densities, of the order of 10^13 A/m^2. Furthermore, the great stability displayed by such chiral magnetic configurations, and the reduced Ohmic loses provided by the current pulses, lead to highly reproducible and efficient domain wall reversal mechanisms.