Formation and structure of 360 and 540 degree domain walls in thin magnetic stripes

MARK MASCARO, YOUNGMAN JANG, Massachusetts Institute of Technology, S.R. BOWDEN, J. UNGURIS, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, C.A. ROSS, Massachusetts Institute of Technology — A method is presented for forming a 360° domain wall (DW) and more complex structures such as a 540° DW in a wire attached to an injection pad by applying an alternating in-plane field perpendicular to the wire. SEMPA, MFM measurements and OOMMF micromagnetic simulations give a consistent picture of the magnetic structure and stray field distribution of the 360° DW. Equilibrium 360° DWs in wires have a well-defined structure and size, persist over a wide field range, and can be distinguished from configurations consisting of two 180° DWs pinned near each other. The formation and stability of these complex walls has implications in memory and logic devices based on field- or current-induced DW motion, where impingement of adjacent 180° DWs can produce composite DWs whose behavior and stray field distribution differ significantly from that of a 180°DW, and these structures could also be used to examine intriguing resonant behavior as predicted by modeling. [Phys. Rev. B 82, 214411; Phys. Rev. B 82, 134411]

1Support of the National Science Foundation and the INDEX Center is gratefully acknowledged.
2Present address: Samsung Advanced Institute of Technology (SAIT), Gyeonggi-Do 446-712, Republic of Korea

C. A. Ross

caross@mit.edu
Massachusetts Institute of Technology