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Direct observation of current driven domain wall distortions, transitions, and propagation in ferromagnetic wires. W. CASEY UHLIG, JOHN UNGURIS, National Institute of Standards and Technology, Gaithersburg, MD 20899-8412 — Spin transfer torque induced domain wall distortions, transitions between vortex and transverse wall states, and defect-to-defect hopping of domain walls were all observed while flowing current through narrow ferromagnetic wires. Domain walls in 100 nm, 300 nm, and 1 um wide stripes fabricated from 12 nm and 24 nm thick NiFe films were directly imaged using scanning electron microscopy with polarization analysis (SEMPA). SEMPA images revealed that small current densities initially distort the domain walls which are fixed at random pinning defects along the wires. If the current density is increased above $5x10^{11}$ A/m^2, the wall is usually swept from the wire, but at smaller currents, the domain wall simply jumps a short distance to the next pinning site before stopping. For vortex type domain walls, the vortex core moves towards the stripe edge, perpendicular to the wall propagation direction. If the core reaches the edge, it is annihilated, thereby converting the vortex into a transverse wall. The direction of the vortex core motion and thus the chirality of the resulting transverse wall are dependent on the applied current direction. The observed domain wall distortions, transitions, and interactions with defects are all expected to play a significant role in spin torque driven magneto-electronics. Work supported in part by the Office of Naval Research.

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