

Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Magnetic domain wall shift registers for data storage applications

DAN READ, Imperial College London, L. O'BRIEN, H.T. ZENG, E.R. LEWIS, D. PETIT, J. SAMPAIO, L. THEVENARD, R.P. COWBURN — Data storage devices based on magnetic domain walls (DWs) propagating through permalloy (Py) nanowires have been proposed [Allwood et al. *Science* 309, 1688 (2005), S. S. Parkin, US Patent 6,834,005 (2004)] and have attracted a great deal of attention. We experimentally demonstrate such a device using shift registers constructed from magnetic NOT gates used in combination with a globally applied rotating magnetic field. We have demonstrated data writing, propagation, and readout in individually addressable Py nanowires 90 nm wide and 10 nm thick. Electrical data writing is achieved using the Oersted field due to current pulses in gold stripes (4 μm wide, 150 nm thick), patterned on top of and perpendicular to the nanowires. The conduit-like properties of the nanowires allow the propagation of data sequences over distances greater than 100 μm . Using spatially resolved magneto-optical Kerr effect (MOKE) measurements we can directly detect the propagation of single DWs in individual nanostructures without requiring data averaging. Electrical readout was demonstrated by detecting the presence of DWs at deliberately introduced pinning sites in the wire.

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Date submitted: 21 Nov 2008

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