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Near-field interaction between domain walls in adjacent permalloy nanowires LIAM O'BRIEN, Imperial College London, D. PETIT, H. T. ZENG, D. READ, E. R. LEWIS, R. P. COWBURN — Proposed data storage schemes based on ferromagnetic nanowires rely on the controlled propagation of domain walls (DWs) along nanoscale shift registers [Allwood *et al.* Science 309, 1688 (2005)]. To make technologically relevant devices, these nanowires must be fabricated to within a wire width of one another. However, the effect of magnetostatic interactions between DWs on their propagation through closely spaced nanowires has not been well studied. Using MOKE magnetometry we have experimentally observed the interaction between two DWs of opposite charge travelling in adjacent permalloy nanowires (8nm thick, 100 nm wide), with inter-wire separation between 125 and 13nm. For the smallest separations, depinning fields (H_D) as high as 93 Oe were measured. Considering the energy landscape experienced by the two DWs under the approximation they are isolated and rigid and accounting for finite temperature we can completely reproduce the experimental dependence of H_D on the inter-wire spacing. Our results suggest that the interaction causes little perturbation to the DW shape. Pinning resulting from localised stray fields is of interest for studying the fundamental properties of DWs as it occurs without modification of the DW or nanowire shape. Our results suggest propagation could be compromised by DW-DW interactions unless careful DW control is used.

Liam O'Brien
Imperial College London

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