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Chiral electrical DW injection and single shot detection for ultra-high density data storage L. O'BRIEN, Imperial College London, D.E. READ, D. PETIT, A.-V. JAUSOVEC, E.R. LEWIS, H.T. ZENG, R.P. COWBURN — Ultra high density data storage devices based on magnetic domain walls (DWs) propagating through Permalloy (Py) nanowires have recently been proposed [Cowburn et al., Science 2005]. Controlling the chirality (defined as the sense of rotation of the magnetic moments within the DW) of the DW is of vital importance for proper functioning of these devices. Chiral DW injection can be achieved using global magnetic fields; however, technological applications require this to be carried out using independent, localised fields in multiple wires simultaneously. Using the Oersted field from pulsed electrical currents passing through gold wires ($\sim 4\mu$m wide, $\sim$200nm thick) fabricated at an angle over Py nanowires (100nm wide, 10nm thick) we inject transverse DWs. The chirality of the DWs is probed using spatially resolved MOKE measurements of their chirality dependent interaction with a cross-shaped trap. The results are consistent with chirally controlled DW injection. In addition, we are able to individually address four parallel wires and detect DW propagation using single shot MOKE measurements. Electrical readout was separately demonstrated by detecting the presence of single DWs at the end of a wire using Anisotropic Magnetoresistance (AMR) measurements.

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