DOMAIN WALL PROPAGATION IN ARTIFICIALLY STRUCTURED NANOWIRES

R. Cowburn
Imperial College London, Blackett Physics Laboratory, Prince Consort Road London SW7 2BW, UK

Nanometre scale planar magnetic nanowires can exhibit a special magnetic property known as domain wall (DW) conduit behaviour in which DWs can be transmitted along the nanowire by the application of weak magnetic fields or electrical currents. Topographical changes such as corners, junctions, constrictions and protrusions in otherwise straight magnetic nanowires allow control of the DWs within these conduits as they create changes in the energy landscape which modify their local propagation field. This opens up the possibility of integrated circuits containing complex networks of nanowires in which information is carried, stored and processed by DWs flowing along nanowire conduits. In this talk I describe the main features of how artificial structures such as constrictions, side arms and crossed wires modify the energy landscape of a moving DW and explain the key role that the chirality of the transverse component of the DW plays in understanding how DWs interact with artificial structures. I explain the concept of a chirality coherence length and how that coherence length can be extended by artificial structuring. Finally, I present a high efficiency domain wall gate in which a DW can be blocked or transmitted according to the magnetic state of a third magnetic input.