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Detection of electromotive force induced by domain wall motion[1]

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A magnetic domain wall can be displaced by current via the transfer of spin angular momentum from conduction electrons to the local magnetization. The capacity of spin-transfer torque to drive domain wall motion is now well established experimentally and theoretically [1], and is a central topic in the growing field of spintronics. This talk will describe the first experimental evidence [2] that the coupling between spin and charge also works in reverse; namely, that a domain wall driven by a field through a stationary electron gas generates an experimentally-detectible voltage. This new spintronic effect [3] was measured by precisely controlling the motion of a single domain wall in a Permalloy nanowire and isolated from other sources using a field modulation scheme to differentiate between the small domain wall-induced voltage and conventional inductive voltages. The domain wall-induced voltage was found to scale in proportion to the driving field magnitude, and its sign depends only on the direction of domain wall motion. These results are consistent with theoretical predictions [2, 4, 5], and will be discussed in terms of a generalized two-dimensional topological framework [2] capable of treating vortex DWs.

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