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Spin torque and charge resistance of ferromagnetic semiconductor 2π and π domain walls E.A. GOLOVATSKI, M.E. FLATTÉ, OSTC and Dept. of Physics and Astronomy, University of Iowa — Charge resistance and spin torque are generated by coherent carrier transport through ferromagnetic 2π domain walls, but with qualitatively different trends than for π walls. We calculate charge and spin transport and torque for π and 2π domain walls in a ferromagnetic semiconductor. Under coherent transport conditions, analytic solutions for spin-dependent transmission and reflection coefficients are possible [1,2]. The 2π wall resistance has a maximum at an intermediate wall width; the π wall resistance monotonically decreases with width. The spin torque on a π wall is highly nonlinear and insensitive to width, except for very thin walls. In 2π walls, large nonlinear spin torque is generated over a range of intermediate wall widths, but vanishes for very thin and very thick walls. We find the peak domain wall velocity is larger for a 2π wall than a π wall, suggesting unexpected nonlinearities in magnetoelectronic devices incorporating domain wall motion.

[1] P. Levy and S. Zhang, PRL 79, 5110 (1997)
[2] G. Vignale and M. E. Flatté, PRL 89, 098302 (2002)

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