

Abstract Submitted
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Spin Control of Drifting Electrons using Local Nuclear Polarization in Ferromagnet-Semiconductor Heterostructures¹ M.E. NOWAKOWSKI, G.D. FUCHS, S. MACK, D.D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, CA 93106, N. SAMARTH, Department of Physics and Materials Research Institute, The Pennsylvania State University, University Park, PA 16802 — We demonstrate a spatially-confined magnetic field gate to modulate the Larmor frequency of an optically-injected spin ensemble drifting down a GaAs channel [1]. The gate is activated either optically or electrically and polarizes GaAs nuclear spins at the interface between a lithographically-defined MnAs island and the channel via the ferromagnetic proximity polarization effect. We measure the rotation angle of the spin ensemble as it emerges from the polarized region using time-resolved Kerr rotation. The ensemble's spin rotation angle can be tuned by up to 5π radians as the spins travel over $30\ \mu\text{m}$ by controlling the nuclear field strength and adjusting the drift velocity.

[1] M.E. Nowakowski, et. al., Phys. Rev. Lett. 105, 137206 (2010)

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