Abstract Submitted
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Spin transfer and coherence in coupled quantum wells[1] M. POGGIO, G.M. STEEVES, R.C. MYERS, N.P. STERN, A.C. GOSSARD, D.D. AWSCHALOM, Center for Spintronics and Quantum Computation, University of California, Santa Barbara, CA 93106 — The possibility of developing spin-based electronic devices has focused recent interest on the study of carrier spin dynamics in semiconductor nanostructures. The accessibility of various excitonic states with the application of an external electric field make coupled quantum well (CQW) systems attractive for the study of both individual carrier and exciton spin dynamics. Spin dynamics of optically excited electrons confined in asymmetric $Al_{.33}Ga_{.67}As$/GaAs coupled quantum wells are investigated through time-resolved Faraday rotation experiments. The inter-well coupling is shown to depend on applied electric field and barrier thickness. We observe three coupling regimes: independent spin precession in isolated quantum wells, incoherent spin transfer between single-well states, and coherent spin transfer in a highly coupled system. Relative values of the inter-well tunneling time τ, the inhomogeneous transverse electron spin lifetime T_2^*, and the Larmor precession period $1/\nu_L$ appear to govern this behavior [2].

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[2]M. Poggio, G. M. Steeves, R. C. Myers, N. P. Stern, A. C. Gossard, and D. D. Awschalom, Phys. Rev. B 70, 121305(R) (2004)

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