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Spin diffusion in GaAs quantum wells C.P. WEBER, N. GEDIK, J.E. MOORE, J. ORENSTEIN , UC Berkeley and LBNL, J. STEPHENS, D.D. AWSCHALOM, UC Santa Barbara — The diffusion coefficient of spin in semiconductors is often estimated using the Einstein relation,$D = \chi^{-1}\mu$, relating diffusion and mobility. However, direct measurements of spin diffusion coefficient D_s and the mobility μ in an n-GaAs quantum well sample with carrier density $n = 7\times10^{11}\mathrm{cm}^{-2}$ have revealed that spin diffusion is substantially suppressed [1] relative to $\chi^{-1}\mu$ because of the "spin-Coulomb drag" effect [2]. In this talk we present data that illustrate the behavior of D_s, μ, and the spin relaxation time as n is lowered towards the metal to insulator transition. Spin transport is characterized by the transient spin grating technique [3], which is based on optical injection of an electron-spin polarization wave with variable wavevector. Spin relaxation is measured by polarization-resolved transient absorption and μ is obtained from 4-contact transport measurements. We discuss the evolution of spin Coulomb drag and D'yakanov-Perel spin relaxation from the degenerate to nondegenerate regimes. [1] J. Orenstein, APS invited talk, this session. [2] I. D'Amico and G. Vignale, Phys. Rev. B 62, 4853 (2000). [3] A.R. Cameron, et al., Phys. Rev. Lett., 4793 (1996).

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