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Bias Dependent Spin Relaxation in a [110]-InAs/AlSb Two Dimensional Electron System J. HICKS, A. KOCBAY, K. HALL[1], K. GUNDOGDU, T. BOGGESS, University of Iowa, Iowa City, IA, K. HOLABIRD, A. HUNTER, J. ZINCK, HRL Laboratories, Malibu, CA — Manipulation of electron spin is a critical component of many proposed semiconductor spintronic devices. One promising approach utilizes the Rashba effect by which an applied electric field can be used to reduce the spin lifetime or rotate spin orientation through spin-orbit interaction. The large spin-orbit interaction needed for this technique to be effective typically leads to fast spin relaxation through precessional decay, which may severely limit device architectures and functionalities. An exception arises in [110]-oriented heterostructures where the crystal magnetic field associated with bulk inversion asymmetry lies along the growth direction and in which case spins oriented along the growth direction do not precess. These considerations have led to a recent proposal of a spin-FET that incorporates a [110]-oriented, gate-controlled InAs quantum well channel [1]. We report measurements of the electron spin lifetime as a function of applied electric field in a [110]-InAs 2DES. Measurements made using an ultrafast, mid-IR pump-probe technique indicate that the spin lifetime can be reduced from its maximum to minimum value over a range of less than 0.2V per quantum well at room temperature. This work is supported by DARPA, NSERC and the NSF grant ECS - 0322021. [1] K. C. Hall, W. H. Lau, K. Gundogdu, M. E. Flatte, and T. F. Boggess, Appl. Phys. Lett. 83, 2937 (2003).

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