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Magnetotransport in Zener Tunneling Regime in a High-Mobility Two-Dimensional Hole System YANHUA DAI, ZHUOQUAN YUAN, CHANGLI YANG, R.R. DU, Rice University, M. J. MANFRA, L. N. PFEIFFER, K. W. WEST, Bell Laboratories, Alcatel-Lucent — Magnetotransport in two-dimensional electron systems (2DES) under a DC-current bias has recently revealed a number of interesting phenomena, including current-induced Zener oscillations [1] and current-induced spin-polarization in Rashba 2DES. We have measured the DC-current induced magnetotransport in high-mobility 2D holes in a C-doped (100) $GaAs/Al_{0.4}Ga_{0.6}As$ quantum well (QW). The QW has a width of 15 nm and a carrier density p $\sim$ 2 x $10^{11}/cm^2$and a mobility μ= 7 x 10^5 cm^2/Vs at T = 300 mK. We observe sharp features in the differential resistance, which we interpret as the Zener tunneling peak and valley associated with commensuration transition of Landau orbits. In a gated Hall bar we are able to tune the carrier density to p $>$ 2.6 x $10^{11}/cm^2$, and observe strong positive magnetoresistance, which can be attributed to the inter-subband scattering with light holes. We will discuss the roles that electron - electron scattering plays in the Zener oscillations observed in electron and hole systems. The work at Rice was supported by NSF DMR-0706634. [1] C. L. Yang et al, Phys. Rev. Lett. 89, 076801 (2002).

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