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Probing the excited subband dispersion of holes confined to GaAs wide quantum wells[1] INSUN JO, YANG LIU, H. DENG, M. SHAYEGAN, L. N. PFEIFFER, K. W. WEST, K. W. BALDWIN, Dept. of Electrical Engineering, Princeton University, Princeton, NJ08544, USA, R. WINKLER, Dept. of Physics, Northern Illinois University, Dekalb, IL 60115, USA — Owing to the strong spin-orbit coupling and their large effective mass, the two-dimensional (2D) holes in modulation-doped GaAs quantum wells provide a fertile test bed to study the rich physics of low-dimensional systems. In a wide quantum well, even at moderate 2D densities, the holes start to occupy the excited subband, a subband whose dispersion is very unusual and has a non-monotonic dependence on the wave vector. Here, we study a 2D hole system confined to a 40-nm-thick (001) GaAs quantum well and demonstrate that, via the application of both front and back gates, the density can be tuned in a wide range, between ˜1 and 2 10^{11} cm^{-2}. Using Fourier analysis of the low-field Shubnikov-de Haas oscillations, we investigate the population of holes and the spin-orbit interaction induced spin-splitting in different subbands. We discuss the results in light of self-consistent quantum calculations of magneto-oscillations.

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