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Probing the lowest Landau level energy of the light hole subband in wide quantum wells SUKRET HASDEMIR, YANG LIU, MANSOUR SHAYEGAN, Dept. Electrical Engineering, Princeton University, ROLAND WINKLER, Department of Physics, Northern Illinois University, LOREN PFEIFFER, KEN WEST, KIRK BALDWIN, Dept. Electrical Engineering, Princeton University — In two-dimensional hole systems (2DHSs) with finite thickness, the degeneracies of the heavy hole (HH) and light hole (LH) states are lifted. The HH-LH anticrossing and mixing lead to non-parabolic 2D dispersion relations, especially for the LH subbands, invalidating the simple effective-mass approximation for 2DHSs. We study the magneto-resistance of 2DHSs confined to symmetric, wide GaAs quantum wells, where the second subband (LH1) is occupied. From the magnetic field (B) and densities where the lowest Landau level of the LH1 subband crosses the Landau levels of HH1 subband, we can extrapolate the cyclotron energy of the LH1 subband, which decreases with increasing B at low fields, and increases at high field. This peculiar behavior reveals that the cyclotron mass for the LH1 subband is negative at small magnetic fields, but becomes positive at high magnetic field, consistent with theoretical simulations.

Yang Liu
Dept. Electrical Engineering, Princeton University

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