Abstract Submitted
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Degeneracy and Effective Mass in the Valence Band of Two-Dimensional (100)-GaAs Quantum Well Systems[1] VINICIO TARQUINI, TALBOT KNIGHTON, ZHE WU, JIAN HUANG, Wayne State University, LOREN PFEIFER, KEN WEST, Princeton University — Quantum Hall measurement of two-dimensional high-mobility ($\mu \sim 2\times\ 10^6$ cm^2/(V·s)) hole systems confined in a 20 nm wide (100)-GaAs quantum well have been performed for charge densities between $4 - 5\times\ 10^{10}$ cm^{-2} in a temperature range of 10-160 mK. The Fourier analysis of the Shubnikov-de Haas (SdH) oscillations of the magnetoresistance vs. the inverse of the magnetic field $1/B_\perp$ reveals a single peak, indicating a degenerate heavy hole (HH) band. The corresponding hole density $p = (e/h) \cdot f$ agrees with the Hall measurement result within 3%. The HH degeneracy is understood through the diminishing Rashba spin-orbit interaction due to the low charge density and the nearly symmetric confinement. SdH oscillations fitted for 0.1 T $\leq B_\perp \leq$ 0.25 T to the Dingle parameters yield an effective mass (m^*) between 0.39 m_e and 0.51 m_e that increases moderately with increasing magnetic field and charge density, in very good agreement with previous cyclotron resonance measurements.

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