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High-Resolution Tunneling Spectroscopy of 2D Holes in the Quantum Hall Regime B. HUNT, Dept. of Physics, MIT, O.E. DIAL, Dept. of Physics, Harvard, R.C. ASHOORI, Dept. of Physics, MIT, L.N. PFEIFFER, K.W. WEST, Department of Electrical Engineering, Princeton — We use Time-Domain Capacitance Spectroscopy (TDCS)[1], a method for extracting precise, high-resolution tunneling spectra, to determine the single-particle spectrum of the 2D hole system (2DHS) in the presence of high magnetic fields. The 2DHS has a variable density from zero to $3 \times 10^{11}\,\mathrm{cm}^{-2}$ and $T = 100\,\mathrm{mK}$. Owing to the heavy mass of holes in GaAs quantum wells, much higher values of r_s are attainable compared to 2D electron systems(2DES). Basic structure in the spectra appear very different from those observed in the 2DES[1]. For instance, a magnetic-field-induced Coulomb gap [1] appearing about the Fermi energy has a strong dependence on electron density (with a larger gap at low densities) that is not present for the 2DES. In addition, structure created by the exchange enhancement of spin splittings has an entirely different appearance from that seen in the 2DES. Ultimately, at lower temperatures, a high-resolution TDCS study of the 2DHS may show features related to the 2D metal-insulator transition.

[1] O.E. Dial et al, Nature 448, 176-179 (2007).

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