Abstract Submitted
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Degenerate versus semi-degenerate transport in a correlated 2D hole system[1] RICHARD L.J. QIU, XUAN P.A. GAO, Dept. of Physics, Case Western Reserve University, LOREN N. PFEIFFER, KEN W. WEST, Dept. of Electrical Engineering, Princeton University — It has been puzzling that the resistivity of high mobility two-dimensional (2D) carrier systems in semiconductors with low carrier density often exhibits a large increase followed by a decrease when the temperature (T) is raised above a characteristic temperature comparable with the Fermi temperature (T_F). We find that the metallic 2D hole system (2DHS) in GaAs quantum well (QW) has a linear density (p) dependent conductivity, $\sigma \approx e\mu^*(p-p_0)$, in both the degenerate ($T << T_F$) and semi-degenerate ($T \sim T_F$) regimes. The T-dependence of $\sigma(p)$ suggests that the metallic conduction ($d\sigma/dT < 0$) at low T is associated with the increase in μ^*, the effective mobility of itinerant carriers. However, the resistivity decrease in the semi-degenerate regime ($T > T_F$) is originated from the reduced p_0, the density of immobile carriers in a two-phase picture. Quantum oscillations in the magneto-resistivity are also found to persist into the semi-degenerate regime in our strongly correlated 2DHS.

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