Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Collapse of the $\nu = 1$ quantum Hall effect near a Landau level crossing[1] SUKRET HASDEMIR, YANG LIU, M.A. MUEED, LOREN PFEIFFER, KEN WEST, KIRK BALDWIN, MANSOUR SHAYEGAN, Princeton University — We report magneto-resistance measurements of 2D hole systems (density 2.1×10^{11} cm^{-2}) confined to a 40-nm-wide GaAs quantum well as a function of tilted magnetic fields. We observe a strong $\nu = 1$ quantum Hall effect (QHE) at zero parallel field ($B_{||}$). The $\nu = 1$ QHE disappears at $B_{||} \simeq 4.8\,\mathrm{T}$, where we expect a crossing between the lowest two Landau levels. Near this crossing, the energy gap for the $\nu = 1$ QHE collapses from 6 K to zero in a very small $B_{||}$ range of 0.3 T. The $\nu = 1$ QHE comes back at $B_{||} \simeq 8.1\,\mathrm{T}$ and eventually disappears at $B_{||} > 17\,\mathrm{T}$ where the system becomes bilayer-like. The sudden collapse of the $\nu = 1$ QHE and the fact that it comes back after a large $B_{||}$ range of 3.3 T is intriguing and suggests a pinning of the Landau levels near the crossing.

[1]We acknowledge support through the NSF (DMR-1305691, DMR-1310199 and MRSEC DMR-0819860), the DOE BES (DE-FG02-00-ER45841), the Gordon and Betty Moore Foundation (Grant GBMF4420), and the Keck Foundation.

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Date submitted: 07 Nov 2014 Electronic form version 1.4