

Abstract Submitted
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The Integer and Fractional Quantum Hall Effect in the Lowest Landau Level of Valley Degenerate 2D Electrons on Hydrogen Terminated Si(111) TOMASZ M. KOTT, BINHUI HU, S.H. BROWN, B.E. KANE, University of Maryland, College Park — We report low temperature magnetotransport measurements on a high mobility ($\mu = 325\,000\text{ cm}^2/\text{V sec}$) 2D electron system on a H-terminated Si(111) surface. In Si(111), there are six degenerate, anisotropic valleys which can affect the magnetotransport in unexpected ways. While low magnetic field data indeed show a six-fold valley degenerate system, we observe the integral quantum Hall effect at all filling factors $\nu \leq 6$, indicating a magnetic-field-induced breaking of the valley degeneracy. Additionally, we find that $\nu = 2$ develops in an unusually narrow temperature range, which might indicate the existence of a novel broken-symmetry valley phase. Finally, we observe an extended, exclusively even numerator, fractional quantum Hall hierarchy surrounding $\nu = 3/2$ with denominators up to 15. This hierarchy is consistent with two-fold valley-degenerate composite fermions. We determine activation energies and provide the first estimate the composite fermion mass in a multi-valley system.

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