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Quantum Hall Effect and Field Dependent Valley Splitting on High Mobility Silicon-(111) Surfaces TOMASZ M. KOTT, ROBERT N. MCFARLAND, LUYAN SUN, BRUCE E. KANE, Laboratory for Physical Sciences, University of Maryland, College Park, KEVIN ENG, Sandia National Laboratories — We have developed a method for fabricating field effect transistors, using vacuum as the dielectric, in order to study electron transport on a clean, flat, chemically prepared hydrogen-terminated surface. Resulting devices display high mobilities (110,000 cm^2/V s at 70 mK), enabling us to probe field dependent transport dynamics of this six-fold valley degenerate surface. I will present evidence that a low oxygen environment during sample preparation is necessary to achieve high mobilities. To support the correlations between surface chemistry and electronic properties, I will show AFM images of the surface for various preparation techniques. Finally, I will describe high field magneto-transport measurements (up to 12 T) that indicate field-dependent valley splitting. In particular, we find easily resolvable filling factors of, amongst others, 3, 5, and 7; an indication that the six-fold degeneracy is possibly broken by many-body effects. I will also show preliminary data with hints of the FQHE at $\nu = \frac{4}{3}$ and $\frac{8}{5}$.

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