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Quantum Hall effect at a tunably sharp cleaved-edge potential CHUANLE ZHOU, M. GRAYSON, EECS Dept., Northwestern University, L. STEINKE, E. UCCELLI, G. KOBLMUELLER, M. BICHLER, G. ABSTREITER, Walter Schottky Institute, Tech. Univ. Munich, S. SCHMULT, W. DIETSCHE, MPI-Stuttgart — We study magnetotransport in the quantum Hall (QH) regime of a two-dimensional electron system with an epitaxially overgrown sharp cleaved-edge. A thick insulating barrier is overgrown at the cleaved-edge followed by a doped layer, serving as a side gate which can control depletion or accumulation at the sharp edge, hence can convert a sharp edge into a soft edge by changing the gate bias. This geometry leads to a tunable edge potential with either the standard incompressible strips in the "soft edge" limit, or thin or vanishing incompressible strips in the "sharp edge" limit. DC magnetotransport measurements show evidence of a longitudinal resistance minimum whose width depends on the current direction. This experimental result is consistent with recent theory on the role of edge potentials in defining the QH in small samples [1]. Size effect and gate bias dependence are studied. We also report an unexplained magnetic field hysteresis at the high field side of filling factors $\nu = 1, 2, 3, 4$ in the limit of negative side-gate bias.

[1] A. Siddiki, Euro. Phys. Lett. 87, 17008(2009)

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