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Area and perimeter dependence of tunneling in a bilayer 2D electron system in the $\nu_T = 1$ quantum Hall state A.D.K. FINCK, A.R. CHAMPAGNE, J.P. EISENSTEIN, California Institute of Technology, L.N. PFEIFFER, K.W. WEST, Bell Labs — When interlayer interactions between electrons in two parallel 2D electron systems become comparable to intralayer interactions, a quantum Hall state can occur at total filling factor $\nu_T = 1$. In this state, the 2D-2D tunneling conductance at zero bias is greatly enhanced. In some theoretical models, tunneling is expected to occur primarily along the edge of the system. In large regions the tunneling conductance would therefore be proportional to the perimeter of the sample. To test this idea, we use electrostatic top gates of various sizes and shapes to locally define a $\nu_T = 1$ state. By subtracting out background tunneling originating from ungated regions of the sample, we can measure the tunneling conductance of individual gated regions. Our data show that the tunneling conductance at $\nu_T = 1$ is approximately proportional to area. This implies that tunneling at $\nu_T = 1$ is a bulk phenomenon in our samples. How this result is connected with the inevitable disorder in the sample will be discussed. This work is supported by the NSF under grant DMR-0552270.

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