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Monitoring the Motion of Charge Carriers in the Integer Quantum Hall Bulk with a Single Electron Transistor LEE FARINA, ÇAGLIYAN KURDAK, Physics Department, University of Michigan, Ann Arbor, MI, MANSOUR SHAYEGAN, Department of Electrical Engineering, Princeton University, Princeton, NJ — Using an Al/AlO_x/Al single electron transistor on top of an antidot etched into a GaAs/AlGaAs heterostructure containing a two-dimensional electron gas, we studied the quantum Hall system in the middle of the ν=2 plateau. In this highly insulating regime, oscillations in single electron transistor resistance indicate that the charges in the system adjust slowly ($\sim$ 1 hour) to changes in the back gate voltage or magnetic field. We find that after a small increase in magnetic field an excess of electrons leave the bulk. Moreover, the presence of the etched antidot under the SET creates a small but clear discrepancy between behavior after a change in magnetic field and change in back gate voltage indicating charging of the antidot after a change in magnetic field. When the antidot is accounted for we find the expected ratio of 2 electrons/flux quanta at ν=2. We also present the time dependence of the charge equilibration for 18 mK to 280 mK. Bulk conductivities in the range of 10^{-18}-10^{-18} /Ω are obtained from this measurement and compared to conductivies obtained from lock-in measurements at high temperatures (1-10 K).

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