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Operation of a Single Electron Transistor Placed on Stacked Integer Quantum Hall Layers as a Magnetometer[1] HAILING CHENG, YU JIN, Physics Dept., Univ. of Michigan, RACHEL GOLDMAN, Dept. of Materials Science and Engineering, Univ. of Michigan, CAGLIYAN KURDAK, Physics Dept., Univ. of Michigan — A single electron transistor (SET) placed on an integer quantum Hall liquid (IQHL) can detect small time varying magnetic fields in the presence of a large constant magnetic field. To enhance the sensitivity, we placed a SET made out of Al/AlOx/Al tunnel junctions on top of a GaAs/AlGaAs heterostructure with 25 identical quantum well structures. By monitoring the conductance of the SET following a small change in magnetic field, we studied the equilibration processes in IQHLs. The equilibration times associated with small changes in magnetic field are found to be strongly dependent on the magnetic field and became unmeasurably long (many days) as we got closer to the center of the quantum Hall plateaus. We have also characterized the SET magnetometer by an ac technique where we applied 170 nT ac magnetic field and measured the response of the SET using a double lock-in technique. At T=20 mK, the SET magnetometer worked at filling fractions up to n=12 and was most sensitive at the filling fraction n=6.

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