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Quantum Hall Line Junctions as Tunable One-Dimensional Electron Systems EMILIANO PAPA, ALLAN MACDONALD, University of Texas at Austin — Incompressible quantum Hall states can be partitioned when a sufficiently large voltage is applied to a narrow metallic gate that crosses the sample, creating a line junction with counterpropogating edge states. This work is motivated by experiments of Roddaro et al. which demonstrate the occurrance of low-bias low-temperature edge state transport anomalies in line junction systems, even in the case of $\nu = 1$ bulk quantum Hall states. The sense of the transport anomalies changes from enhanced tunneling to suppressed transmission through the line junction as the gate voltage is increased. We [PRL 04] have previously emphasized that interactions across line junctions are always important and that transport properties are not universal. Here we show that the presence of metallic gates strongly influences these interactions. We find that the interaction strength between edges on oposite sides of the gate changes sign from repulsive at small distances (lower V_g) to attractive at larger distances (higher V_g), in agreement with experiment. The magnitude of the attraction implied by this estimate appears to be weaker than suggested by experiment, however, although stronger than the effect of phonons studied in earlier work. We propose a number of alternate experimental possibilities for detecting the presence of attractive effective interactions, including real-time detection of partial Andreev scattering and studies of the edge magnetoplasmon excitation spectrum of the partitioned system.

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