

## Extracting Net Current from an Upstream Neutral Mode in the Fractional Quantum Hall Regime

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Upstream neutral modes, counter propagating to charge modes and carrying energy without net charge, had been predicted to exist in some of the fractional quantum Hall states and were recently observed via noise measurements. Understanding such modes will assist in identifying the wavefunction of these states, as well as shedding light on the role of Coulomb interactions within edge modes. In this work, performed mainly in the  $\nu = 2/3$  state, we placed a quantum dot a few micrometers upstream of an ohmic contact, which served as a ‘neutral modes source’. We showed the neutral modes heat the input of the dot, causing a net thermo-electric current to go through it. Heating of the electrons led to a decay of the neutral mode, manifested in the vanishing of the thermo-electric current at  $T > 110\text{mK}$ . This setup provides a straightforward method to investigate upstream neutral modes without turning to the more cumbersome noise measurements.