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New paradigm for edge reconstruction of hole-conjugate fractional states

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Abstract:

In this presentation we provide evidence of a new model for hole-conjugate fractional states $\nu = 2/3$. While the present accepted model [1,2] postulates of a single ‘downstream’ charge channel with conductance $2/3 e^2/h$ and an ‘upstream’ neutral channel, we show that the current is carried by two downstream edge modes, each with conductance $1/3 e^2/h$. We find that if the two channels are driven out of equilibrium, inter-mode equilibration takes place; leading the two channels to behave as a single mode with conductance $2/3 e^2/h$. This unexpected edge reconstruction suggests a non-trivial interplay between charge and neutral modes that could be a major decoherence source. We therefore have investigated the transmission of these neutral modes through a quantum point contact and show that the neutral mode signal is mainly attached to the inner edge channel, in agreement with the latest theoretical models developed [3].

References

[1] MacDonald, A. H., Phys. Rev. Lett. 64, 220 (1990).

[2] Kane, C. L., Fisher, M. P. A. & Polchinski, J., Phys. Rev. Lett. 72, 4129-4132 (1994).

[3] Wang, J., Meir, Y. & Gefen, Y., Phys. Rev. Lett. 111, 246803 (2013).