
Interactions and charge fractionalization in an electronic Hong-Ou-Mandel interferometer

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Résumé

We consider an electronic analog of the Hong-Ou-Mandel (HOM) interferometer, where two single electrons travel along opposite chiral edge states and collide at a Quantum Point Contact. Studying the current noise, we show that because of interactions between co-propagating edge states, the degree of indistinguishability between the two electron wavepackets is dramatically reduced, leading to reduced contrast for the HOM signal. This decoherence phenomenon strongly depends on the energy resolution of the packets. Insofar as interactions cause charge fractionalization, we show that charge and neutral modes interfere with each other, leading to satellite dips or peaks in the current noise. Our calculations explain recent experimental results where an electronic HOM signal with reduced contrast was observed.

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