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Visibility recovery by strong interaction in an electronic Mach-Zehnder interferometer SOO-YONG LEE, HYUN-WOO LEE, POSTECH, HEUNG-SUN SIM, KAIST — We study the evolution of a single-electron packet of Lorentzian shape along an edge of the integer quantum Hall regime or in a Mach-Zehnder interferometer, considering a capacitive Coulomb interaction and using a bosonization approach. When the packet propagates along a chiral quantum Hall edge, we find that its electron density profile becomes more distorted from Lorentzian due to the generation of electron-hole excitations, as the interaction strength increases yet stays in a weak interaction regime. However, as the interaction strength becomes larger and enters a strong interaction regime, the distortion becomes weaker and eventually the Lorentzian packet shape is recovered. The recovery of the packet shape leads to an interesting feature of the interference visibility of the symmetric Mach-Zehnder interferometer whose two arms have the same interaction strength. As the interaction strength increases, the visibility decreases from the maximum value in the weak interaction regime, and then increases to the maximum value in the strong interaction regime. We argue that this counter-intuitive result also occurs under other types of interactions.

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