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Majorana Fermion Induced Non-local Current Correlations in Spin-orbit Coupled Superconducting Wires JIE LIU, Hong Kong Univ of Sci & Tech, FU-CHUN ZHANG, The University of Hong Kong, K.T. LAW, Hong Kong Univ of Sci & Tech — The observation of zero bias conductance peaks in semiconductor wire-superconductor heterostructures has generated great interest, and there is a hot debate on whether the observation is associated with Majorana Fermions (MFs) or other effects which enhance local Andreev reflections. In this work, we study the transport of a normal lead/semiconductor wire-superconductor heterostructure /normal lead junction. We show that when MF end states from the two ends of the wire are strongly coupled, the MF end states can suppress local Andreev reflections and strongly enhance crossed Andreev reflections (CARs), in which an electron from one lead is reflected as a hole in a different lead. In the CAR dominated regime, the current-current correlations between the two leads are strongly enhanced. Moreover, the Fano factor of a normal lead, which is the ratio of the shot noise to the average current, is reduced from $2e$ to e . Since the CAR associated effects are non-local effects and they cannot be induced by processes which enhance local Andreev reflections, therefore, the measurement of Fano factors and current-current correlations of the normal leads can be used to identify MFs.

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