Majorana modes and transport across junctions of superconductors and normal metals[1] DIPTIMAN SEN, MANISHA THAKURATHI, OINDRILA DEB, Indian Institute of Science, Bengaluru, India — We study Majorana modes and transport in one-dimensional systems with junctions of p-wave superconductors (SCs) and normal metal (NM) leads. For a system with a SC lying between two NM leads, it is known that there is a Majorana mode at the junction between the SC and each NM. If an impurity is present or the p-wave pairing amplitude changes sign at some point in the superconductor, two additional Majorana modes appear near that point. We study the effects of all these modes on the normal and Cooper pair conductances. The main effect is to shift the conductance peaks away from zero bias due to hybridization between the Majoranas; the shift oscillates and also decays exponentially as the length of the SC is increased. Using bosonization and the renormalization group (RG) method, we study the effect of interactions between the electrons on the Majorana modes and the conductances. We then consider a system with a junction of three SC regions connected to NM leads. The junction is parameterized by a scattering matrix. Depending on the relative signs of the pairing amplitudes in the three SCs, there may be one or three Majorana modes at the junction. We study the effect of interactions on these modes using an RG analysis which is valid for weak interactions.

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