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Zero energy bound state at an interface between s-wave superconductor and disordered normal metal with repulsive electron-electron interaction CHRISTOPHER REEG, DMITRII MASLOV, Univ of Florida - Gainesville — In recent years there has been a renewed interest in the proximity effect due to its role in the realization of topological superconductivity. In particular, we study a superconductor-normal metal proximity system with a repulsive interaction between electrons in the normal layer. Due to the change in sign of the superconducting pair potential, a zero energy bound state is trapped at the interface [Fauchère et al., Phys. Rev. Lett., **82**, 3336 (1999)]. Using the quasiclassical theory of superconductivity we investigate the behavior of this zero energy state in the presence of finite disorder and an interfacial barrier. We find that as the mean free path is decreased, the peak in the local density of states is broadened and shifted away from zero energy. In the ballistic limit the presence of this bound state eliminates the mini-gap seen in a non-interacting normal layer and a distinct peak is observed. When the mean free path becomes comparable to the normal layer width the low energy peak is strongly suppressed and the mini-gap begins to develop. In the diffusive limit the mini-gap is fully restored and all signatures of the bound state are eliminated.

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