Investigation of dissipative Rashba nanowire

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Abstract

Condensed matter systems are continuously subjected to dissipation and seem to affect the system adversely. In this context, our study focuses on the impact of dissipation on a superconducting Rashba nanowire. We reveal that the system can still host Majorana zero-modes (MZMs) with a finite lifetime in the presence of dissipation. Interestingly, we can generate two kinds of boundary states via dissipation- four robust zero-modes (RZMs) and two MZMs, depending upon the amplitude of the dissipation. The RZMs are not associated with any bulk states and possess no winding number, but we can relate the generation of the RZMs to exceptional points. Meanwhile, the MZMs appear in the system via bulk gap closing and can be topologically characterized by a winding number. We investigate the stability of the RZMs and MZMs in the presence of onsite random disorder. Our study paves the way for stabilizing and realizing MZMs in an experimental setup.

Figures

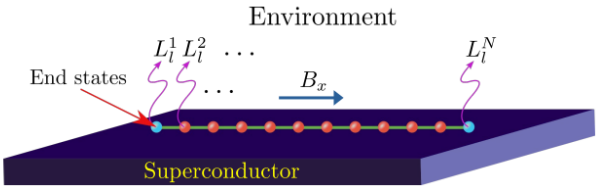

Figure 1: We demonstrate the schematic representation of our setup encompassing a one-dimensional Rashba nanowire in close proximity to a bulk s-wave superconductor. The system is coupled to the environment via dissipation.