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Electronic Transport in presence of Majorana bound states in a quantum dot device coupled with a superconductor zigzag chain.

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Abstract:

We investigate theoretically, through the recursive Green's function approach, the electron transport through the T-shaped quantum dot (QD) with a single level ε_d and spinless, connected to a zigzag chain and coupled to a p-wave superconductor [1]. This model (see Figure 1) is an extension of the Kitaev chain for a network triangular of finite-size with for three to eight sites. We find that the Majorana zero modes can be tuned through the coupling parameters of the device. Furthermore, the G-V differential conductance and I-V curves present characteristics typical of usual electronic devices besides to preserving the two Majorana bound states (MBS) in the topological phase. This more realistic model allows the detection of MBS through of the control of the parameters governing the electronic tunneling and can be helpful for relevant experiments.

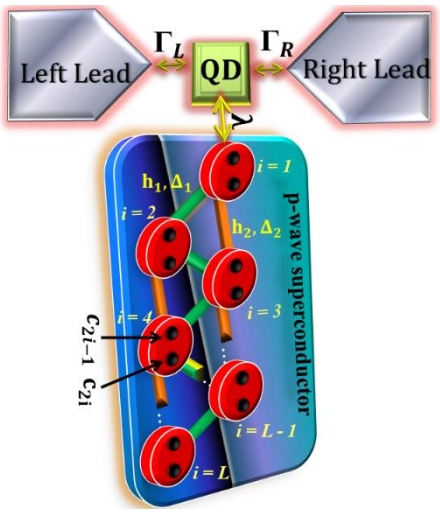

Figure 1. Model: consists of two leads in contact with a single level quantum dot (QD), coupled to a nanowire of zigzag atoms above a topological superconductor (TS) with *p*-wave pairing. In addition, c_{2i-1} e c_{2i} are Majorana modes that are in each site. The internal coupling constants in jail are given by h_α,Δ_α, called hopping and Cooper parameter, respectively.

References:

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[2] H.U Baranger *et al*., *Phys. Rev. B* **84**, 2011. Doi: 10.1103/PhysRevB.84.201308.