Abstract

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Nano Research & Applications

2021
Vol.7 No. S6

Probing Majorana Bound States in a Quantum Dot-Topological Superconducting Nanowire Ring System

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Abstract

We theoretically study quantum transport through a system composed from a quantum dot connected to two Majorana bound states which are located at the ends of a topological superconductor nanowire threaded by a tunable magnetic flux. The current is determined within the nonequilibrium Green's function technique and the relevant Green's functions are calculated by using the equation of motion method. We found that the linear conductance shows a 2π periodicity in magnetic flux phase when the two Majorana bound states degenerate. The 2π periodicity of the linear conductance does not depend on the energy of quantum dot or the finite values of quantum dot-Majorana couplings. In contrast, the linear conductance periodicity changes to 4π when the Majorana bound states hybridize at finite dot energy level. The differential conductance also suffers a transition in its periodicity between 2π to 4π when the Majorana bound states hybridize. The spectral function of the dot exhibits the expected Majorana bound states signatures. Our results provide insight into Majorana-induced transport signatures in quantum dot-based systems which can help designing platforms for quantum computation.

Acknowledgments. L. M. and D. S. were supported by a grant of the Ministry of Research, Innovation and Digitalization, CNCS/CCCDI – UEFISCDI, under project number PN-III-P1-1.1-TE-2019- 0423, within PNCDI III.

Biography

Levente Máthé has completed his BSc and MSc at Babeș-Bolyai University from Cluj-Napoca, Romania and is currently PhD student at the same university. He is working as Scientific Researcher at National Institute for Research and Development of Isotopic and Molecular Technologies, Cluj-Napoca. His research area is focused on quantum transport in mesoscopic systems, based on quantum dots, graphene and Majorana.