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Signatures of Majorana assisted tunneling in 1D Josephson junction rings. ROSA RODRIGUEZ MOTA, McGill University, SMITHA VISHVESHWARA, University of Illinois at Urbana-Champaign, TAMI PEREG-BARNEA, McGill University — Majorana zero modes in condensed matter settings have drawn immense attention recently and the search for unequivocal signatures of Majorana modes is underway. In this respect the presence of 4π periodic tunneling between topological superconductors, which is assisted by the Majorana modes is a promising candidate. In this work, we study how the inclusion of Majorana assisted tunneling modifies physics in a ring of Josephson junction coupled islands. In addition, we study parity breaking processes in a controlled manner by coupling the ring to a two-level electronic system, such as found in quantum dots. For the ring alone, we find that the effects of the 2π periodic terms are suppressed by increasing the number of islands in the ring. This allows a clearer distinction of the 4π periodicity. In the combined system, we find that the periodicity can be tuned by controlling the occupation energy of the two level system. We also discuss the signatures of Majoranas that remain after parity breaking effects restore the 2π periodicity.

Rosa Rodriguez Mota
McGill University

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