Train of Majorana bound states in a topological Josephson junction under a magnetic field

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Abstract

We theoretically study a Josephson junction, which is formed by two finite-size superconductors on a topological insulator under a magnetic field where the integer number of flux quanta is piercing inside of the junction. A train of Majorana bound states, spatially well separated from each other, can emerge along the junction, in addition to a chiral Majorana mode surrounding the two superconductors. We find that the state composed of the Majorana bound states can be manipulated and controlled by a bias voltage across the superconductors, and that the non-Abelian braiding statistics of the Majorana bound states can be detected by measuring the Josephson current.

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