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Persistent current and φ-junction induced by Topological Insulator XIN LIU, XIONG-JUN LIU, JAIRO SINOVA, Department of Physics, Texas A&M University, College Station, TX 77843-4242, USA — We predict the persistent current and the anomalous current-phase relation of the Josephson current in the superconductor/two dimensional Topological Insulator/superconductor (S/TI/S) junction. Both of these two effects originate from breaking the Fermion doubling. We find that the exchange field can induce a persistent current in the edge of the topological insulator which usually only happen as the flux effect. The persistent current is linearly dependent on the exchange field. On the other hand, in a S/TI/S junction, the phase shift φ is controlled linearly by either an exchange field or a magnetic field which are perpendicular to the surface of the two-dimensional topological insulator. An experiment based on the radio-frequency (rf) method is proposed to realize our theory.

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