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Josephson currents induced by the Witten effect JEROEN VAN DEN BRINK, Leibniz Institute for Solid State and Materials Research, IFW Dresden, ZOHAR NUSSINOV, Dept. of Physics, Washington University, FLAVIO NOGUEIRA, Leibniz Institute for Solid State and Materials Research, IFW Dresden and Inst. for Theor. Physics III, Ruhr University Bochum — We reveal the existence of a new type of topological Josephson effect involving type II superconductors and three-dimensional topological insulators as tunnel junctions. We predict that vortex lines induce a variant of the Witten effect that is the consequence of the axion electromagnetic response of the topological insulator: at the interface of the junction each flux quantum attains a fractional electrical charge of $e/4$. As a consequence, if an external magnetic field is applied perpendicular to the junction, the Witten effect induces an AC Josephson effect in absence of any external voltage. We derive a number of further experimental consequences and propose potential setups where these quantized, flux induced, Witten effects may be observed.

F. S. Nogueira, Z. Nussinov, and J. van den Brink, *Phys. Rev. Lett.* **117**, 167002 (2016).

F. S. Nogueira, Z. Nussinov, and J. van den Brink, *Phys. Rev. D* **94**, 085003 (2016).

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