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Signatures of Majorana Fermions in Topological Insulator Josephson Junction Devices BENJAMIN WIEDER, FAN ZHANG, CHARLES KANE, University of Pennsylvania Department of Physics and Astronomy — We study theoretically the electrical current and low-frequency noise for a linear Josephson junction structure on a topological insulator, in which the superconductor forms a closed ring, and currents are injected from normal regions inside and outside the ring. We find that this geometry offers a unique signature for the presence of gapless 1D Majorana fermion modes that are predicted to exist in the channel when the phase difference ϕ, controlled by the magnetic flux through the ring, is π. We show that for low temperature, the linear conductance jumps by $2e^2/h$ when ϕ passes through π, accompanied by non-local correlations between the currents from the leads inside and outside of the ring. We compute the dependence of these features on temperature, voltage, and linear dimensions, and discuss the implications for experiments.

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