

Abstract Submitted
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Josephson current signatures of the Majorana flat bands on the surface of time-reversal-invariant Weyl and Dirac semimetals¹ ANFFANY CHEN, Department of Physics and Astronomy Quantum Matter Institute of Univ of British Columbia, DMITRY I. PIKULIN, Department of Physics and Astronomy Quantum Matter Institute of Univ of British Columbia, Station Q of Microsoft Research, MARCEL FRANZ, Department of Physics and Astronomy Quantum Matter Institute of Univ of British Columbia — A linear Josephson junction mediated by the surface states of a time-reversal-invariant Weyl or Dirac semimetal localizes Majorana flat bands protected by the time-reversal symmetry. We show that as a result, the Josephson current exhibits a discontinuous jump at π phase difference which can serve as an experimental signature of the Majorana bands. The magnitude of the jump scales proportionally to the junction length and the momentum space distance between the Weyl nodes projected onto the junction. It also exhibits a characteristic dependence on the junction orientation. We demonstrate that the jump is robust against the effects of non-zero temperature and weak non-magnetic disorder.

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