Abstract Submitted
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Realization of space-time inversion-invariant topological semimetal-bands in superconducting quantum circuits.[1] Y. YU, X. TAN, Q. LIU, G. XUE, H. YU, Nanjing University, China, Y. ZHAO, Max-Planck-Institute for Solid State Research, Germany, Z. WANG, The University of Hong Kong — Topological band theory has attracted much attention since several types of topological metals and semimetals have been explored. These robustness of nodal band structures are symmetry-protected, whose topological features have deepened and widened the understandings of condensed matter physics. Meanwhile, as artificial quantum systems superconducting circuits possess high controllability, supplying a powerful approach to investigate topological properties of condensed matter systems. We realize a Hamiltonian with space-time (PT) symmetry by mapping momentum space of nodal band structure to parameter space in a superconducting quantum circuit. By measuring energy spectrum of the system, we observe the gapless band structure of topological semimetals, shown as Dirac points in momentum space. The phase transition from topological semimetal to topological insulator can be realized by continuously tuning the parameter in Hamiltonian. We add perturbation to broken time reversal symmetry. As long as the combined PT symmetry is preserved, the Dirac points of the topological semimetal are still observable, suggesting the robustness of the topological protection of the gapless energy band. Our work open a platform to simulate the relation between the symmetry and topological stability in condensed matter systems.

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