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Weyl semimetal state in TaP: experimental discovery[1] PAVEL SHIBAYEV, SU-YANG XU, ILYA BELOPOLSKI, DANIEL S. SANCHEZ, Princeton University, SHUANG JIA, Peking University, HSIN LIN, National University of Singapore, M. ZAHID HASAN, Princeton University, HASAN RESEARCH GROUP TEAM[2] — Despite their extreme rareness in nature, Weyl semimetals provide the first realization of Weyl fermions. After families of tantalum-based (TaAs, TaP) and niobium-based (NbAs, NbP) compounds were recently predicted as Weyl semimetal candidates, our group experimentally realized the Weyl semimetal state in TaP. Angle-resolved photoemission spectroscopy (ARPES) was used to probe the surface features of TaP. Weyl fermion cones and nodes were directly observed in the bulk, and Fermi arcs were observed on the surface. The surface states were found to possess a rich structure, containing topological Fermi arcs and topologically trivial closed contours in the neighborhood of Weyl points. This finding opens up possibilities to study the relationship between trivial and topological surface states on the surface of a Weyl semimetal. By determining the number of chiral edge modes on a closed path enclosing the Weyl node, bulk-boundary correspondence was demonstrated, leading to the establishment of a topologically nontrivial nature of the Weyl semimetal state in TaP.

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