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Photoemission studies on the 3D Dirac semiemtal state in Na_3Bi[1]
SUYANG XU, LIU CHANG, SATYA K. KUSHWAHA, Princeton University, RAMAN SANKAR, National Taiwan University, JASON W. KRIZAN[2], ILYA BELOPOLSKI, MADHAB NEUPANE, GUANG BIAN, NASSER ALIDOUST, Princeton University, TAY-RONG CHANG, HORNG-TAY JENG, National Tsing Hua University, CHENG-YI HUANG, WEI-FENG TSAI, National Sun Yat-Sen University, HSIN LIN, National University of Singapore, PAVEL P. SHIBAYEV, Princeton University, FANGCHENG CHOU, National Taiwan University, ROBERT J. CAVA, M. ZAHID HASAN, Princeton University — A three-dimensional Dirac semimetal is a novel state of matter that has recently attracted interest in condensed matter physics and materials science. We present electronic structure measurements on the (100) surface of a recently discovered Dirac semimetal material Na_3Bi. Our experimental data, for the first time, reveal a Lifshitz transition between the two bulk Dirac cones in the bulk band structure of Na_3Bi. These results identify the first example of a band structure singularity in 3D Dirac materials. This is in contrast to its 2D analogs such as in twisted bilayer graphene or the surface states of topological crystalline insulators, which have been studied extensively. The observation of multiple bulk Dirac nodes along the rotational crystal axis away from the Kramers point also serve as a signature for the symmetry-protected nature of the Dirac semimetal state in Na_3Bi as elaborated in recent theories.

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