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Coexisting massive and massless Dirac fermions in quasi-freestanding bilayer graphene KEUN SU KIM, ANDREW L. WALTER, LUCA MORESCHINI, Lawrence Berkeley National Laboratory, THOMAS SEYLLER, University of Erlangen-Nurnberg, KARSTEN HORN, Fritz-Haber-Institut der Max-Planck-Gesellschaft, ELI ROTENBERG, AARON BOSTWICK, Lawrence Berkeley National Laboratory — The most widely accepted theoretical model to describe charge carriers in bilayer graphene is "massive Dirac fermions", characterized by a nearly parabolic band pair touching each other at the Dirac energy. This electronic structure of bilayer graphene is widely believed to be unstable towards symmetry breaking either by structural distortions, such as twist and strain, or electronic interactions. In this work, we investigate quasi-freestanding bilayer graphene by angle-resolved photoemission spectroscopy, which shows an unexpected electronic spectrum, consisting of both massive and massless Dirac fermions. The latter has a unique band topology with a chiral pseudospin texture, and its origin will be discussed in terms of symmetry breaking induced by a native imperfection of bilayer graphene.

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