Abstract Submitted
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Landau quantization and quasiparticle interference of Dirac fermions on a topologically protected Fermi surface[1] ANJAN SOUMYANARAYANAN, MICHAEL YEE, YANG HE, Harvard University, DILLON GARDNER, YOUNG LEE, Massachusetts Institute of Technology, JENNIFER HOFFMAN, Harvard University — The discovery of topological materials hosting spin-polarized Dirac fermion surface states has been driven by the use of surface-sensitive spectroscopic tools. Scanning tunneling microscopy and spectroscopy (STM/STS) can, in principle, access the surface state band structure across a range of energies on the nanometer length scale through a combination of one particle (Landau quantization) and two-particle (quasiparticle scattering) techniques. However, the equivalence of these two STS techniques has yet to be established. Here we report the surprising simultaneous observation of Landau quantization and quasiparticle interference on the Fermi surface of the topological metal Sb(111). We establish the equivalence of the two momentum-resolved STS techniques, and use them to quantitatively reconstruct the multi-component surface state band structure, which would be inaccessible via either of these techniques alone. We further use these techniques to probe the local effects of single atom impurities on the surface states.

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