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Quasiparticle interference on the surfaces of the of the layered topological superlattice Bi_4Se_3 DANIEL WALKUP, ILIJA ZELJKOVIC, Department of Physics, Boston College, HSIN LIN, Department of Physics, Northeastern University, WENWEN ZHOU, Department of Physics, Boston College, MADHAB NEUPANE, Department of Physics, Princeton University, RAMAN SANKAR, National Taiwan University, KANE SCIPIONI, Department of Physics, Boston College, ARUN BANSIL, Department of Physics, Northeastern University, FANGCHENG CHOU, National Taiwan University, M. ZAHID HASAN, Department of Physics, Princeton University, VIDYA MADHAVAN, Department of Physics, Boston College — Three-dimensional topological insulators (TIs) host robust surface states with massless Dirac-like dispersion and helical spin texture. The possibility of layering TIs with other materials in a superlattice is especially intriguing, as exotic phenomena are predicted to occur at their boundary. Here, we present scanning tunneling microscopy and spectroscopy (STM/STS) results on one of the simplest such superlattices, Bi_4Se_3, which consists of alternating layers of a three-dimensional TI, Bi_2Se_3, and a two-dimensional TI, Bi_2. STM topographs reveal two distinct, alternating surfaces, each of which harbors dispersing surface states. By using Fourier-transform STS, we characterize the dispersion of these states, which is considerably more complex than that of the single Dirac cone found in prototypical three-dimensional TIs. In addition, we show that the surface states of Bi_4Se_3 are strongly influenced by proximity to atomic defects.

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