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Imaging Spin-Polarized Scattering of Topological Surface States[1]
WONHEE KO, KENJIRO K. GOMES, WARREN MAR, YULIN CHEN, ZHI-XUN SHEN, HARI C. MANOHARAN, Department of Physics and SIMES, Stanford University — Surface states of topological insulators are comprised of Dirac fermions protected from backscattering due to alignment of spin and momentum, a property characteristic of relativistic particles. We realize topological states on the surface of pure antimony, a fundamental parent matrix of various topological insulator compounds. With low-temperature scanning tunneling microscopy (STM), we directly visualize spin-polarized scattering of surface state electrons with subatomic precision around surface and subsurface defects. These results link closely to angle-resolved photoemission spectroscopy (ARPES) studies on the same materials, unambiguously measure the spin-protection of topologically ordered states, and access a striking transition to a single unpaired Dirac species.

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