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Local interaction of magnetic impurities and topological surface states[1] WARREN MAR, KENJIRO K. GOMES, WONHEE KO, HARI C. MANOHARAN, Stanford University — Topological insulators have garnered much attention as a vehicle to explore exotic Dirac physics through the projection of unpaired Dirac cones into conducting surface states wrapping a spin-orbit twisted bulk band structure. We use an ultrahigh-vacuum low-temperature scanning tunneling microscope (STM) to gain access to and manipulate the chiral Dirac particles present on the Sb(111) surface. Understanding the interplay between local spins and Dirac fermions represents a key foundation to the development of new spintronic applications. Magnetic moments break time-reversal symmetry and provide an additional local quantum degree of freedom to engineer topological states. By dosing magnetic impurities of varying concentration and species, we show how STM can atomically manipulate individual magnetic adatoms on topological surfaces, and in the process gain insight into the physical bonding arrangement of magnetic impurities on top of and embedded inside the host crystal lattice. Using scanning tunneling spectroscopy, we map in real and momentum space how local spins interact with the chiral surface Dirac carriers.

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