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Visualizing Strong Scattering of Topological Surface States from Magnetic Impurities in Bi_2Te_3[1] HAIM BEIDENKOPF, PEDRAM ROUSHAN, JUNGPIL SEO, LINDSAY GORMAN, Y.S. HOR, R.J. CAVA, ALI YAZDANI, Physics Department, Princeton University — Bi_2Te_3 is a topological insulator with a single Dirac cone in the band structure of its helical surface states. The associated spin texture protected by time reversal symmetry (TRS) is thought to suppress scattering off non-magnetic defects. We tested this using scanning tunneling microscopy and spectroscopy. At high energies, far above the Dirac point, backscattering off non-magnetic defects, such as step-edges, is facilitated by quasi-nesting conditions brought about by the hexagonal warped surface band. At lower energies at which the surface dispersion is linear backscattering is highly suppressed by the helical spin texture protected by TRS. In contrast, in Mn-doped Bi_2Te_3 the measured quasiparticle interference pattern shows the onset of strong scattering both in the warped region as well as in the conic one. The scattering processes involved are affected both by the spin texture as well as by the geometry of the scattering potential. Furthermore, close to the Dirac point the increased scattering in Mn-doped Bi_2Te_3 seems to promote localization of the surface states.

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