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Visualizing spin-vortex evolution of a topological insulator[1] YIHUA WANG, DAVID HSIEH, DAN PILON, MIT, LIANG FU, Harvard, DILLON GARDNER, YOUNG LEE, NUH GEDIK, MIT — Charge carriers on the surface of a topological insulator are predicted to form a spin-vortex in momentum space with the direction of spin rotation determined by whether the carriers are electron-like or hole-like. We show that the angular momentum of photon is extremely sensitive to the spin of carriers by performing time-of-flight based angle-resolved-photoelectron spectroscopy (TOF-ARPES) with photons of different helicity. We demonstrate the first reciprocal space volumetric mapping of the vectorial spin-texture of the surface states of Bi_2Se_3 and directly observe spin-vortex evolution from electron-like to hole-like states and the departure from perpendicular momentum-spin locking.

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