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Fraunhofer pattern arising from an edge-stepped topological surface Josephson current distribution JAE HYEONG LEE, GIL-HO LEE¹, JANGHEE LEE, JOONBUM PARK, SEUNG-GEOL NAM², YUN-SOK SHIN³, JUN SUNG KIM, HU-JONG LEE, Pohang Univ of Sci & Tech — We report a surface-dominant Josephson effect in superconductor-topological insulator-superconductor (S-TI-S) devices, where a $\text{Bi}_{1.5}\text{Sb}_{0.5}\text{Te}_{1.7}\text{Se}_{1.3}$ (BSTS) crystal flake was adopted as an intervening TI between Al superconducting electrodes. We observed a Fraunhofer critical current modulation in a perpendicular magnetic field in an Al-TI-Al junction for both local and nonlocal current biasing. For the local biasing, the Fraunhofer signal was highly robust to the magnetic field up to the critical field of the Al electrodes, corresponding to the edge-stepped nonuniform supercurrent distribution arising from the top and rough side surfaces of the BSTS flake. A Fraunhofer-like pattern was also observed in a neighboring Au-TI-Au normal junction when it was nonlocally biased by the Al-TI-Al junction. All these strongly suggest Josephson coupling established via topologically robust conducting channels present on the surface of the 3D topological insulator.

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