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Gate-tunable supercurrent in S-TI-S structures[1] VLADIMIR ORLYANCHIK, MARTIN STEHNO, CHRISTOPHER NUGROHO, DALE VAN HARLINGEN, University of Illinois at Urbana-Champaign, MATTHEW BRAHLEK, NAMRATA BANSAL, NIKESH KOIRALA, SEONGSHIK OH, Rutgers, the State University of New Jersey — Theoretical proposals for observation of the zero energy excitations (Majorana modes) involve coupling between the surface states of 3-D topological insulators (TI) and s-wave superconductors (SC). A prerequisite for such experiments is a highly tunable topological surface which is decoupled from bulk charge carriers and non-topological surface states. Here we report on measurements performed using high-quality MBE-grown thin films of Bi2Se3 patterned to create planar Josephson devices with Nb leads and a metallic top gate. We present the dependence of the conductance and proximity-induced supercurrent on the junction geometry, temperature, and the gate voltage. By analyzing the gate voltage dependence, we deduce that there are contributions to the supercurrent from two channels - topological surface states and a topologically-trivial surface accumulation layer.

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