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Scanning SQUID Measurements of Superconducting Proximity Effect in Bi2Se3-Nb Heterojunctions PHILIP KRATZ, ILYA SOCHNIKOV, PHILLIP WU, JUNG HO YU, Stanford University, KRISTIE KOSKI, Brown University, YI CUI, ROBERT HAMMOND, MALCOLM R. BEASLEY, JOHN R. KIRTLEY, KATHRYN A. MOLER, Stanford University — In superconductivity induced on the surface of a 3D topological insulator, in contrast to conventional s-wave superconductivity, each vortex core theoretically carries a nondegenerate zero energy state with the properties of a Majorana fermion. The local superfluid density and its characteristic magnetic field penetration depth, critical current and temperature are sensitive metrics for placing limits on the relative contributions of the bulk and surface to a proximitized supercurrent in a topological insulator. Using a scanning SQUID microscope integrated with a quartz tuning fork sensor in a force-sensitive phase-locked loop for simultaneous topography characterization, we study the local superfluid density in Sb-doped Bi2Se3-Nb heterojunctions, prepared by Nb growth through molecular beam epitaxy on solvothermally synthesized Bi2Se3 nanoplates. We observe a suppression of the superconducting diamagnetic susceptibility, consistent with a superconducting proximity effect. We also explore the dependence of the local superfluid density on back gate voltage and temperature.

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