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Proximity induced superconductivity in the 3D topological insulator HgTe probed with scanning SQUID microscope ILYA SOCHNIKOV, JOHN R. KIRTLEY, KATHRYN A. MOLER, Stanford University, Stanford, CA 94305, USA, LUIS MAIER, CHRISTOPH BRUENE, HARTMUT BUHMANN, LAURENS W. MOLENKAMP, Physikalisches Institut (EP3), University of Würzburg, Am Hubland, D-97074 Würzburg, Germany — Inducing superconductivity on the surface of a 3D topological insulator is important for novel broken symmetry phases. However, it is difficult to assess the existence of the surface superconductivity with a single experimental technique. We have used a scanning SQUID microscope to characterize the magnetic properties of hybrid structures made of the 3D topological insulator HgTe and superconducting Nb. The magnetic response of superconducting rings with exotic Josephson junctions reveals the current-phase relation, while measurements of bilayer HgTe/Nb disks reveal the total superfluid density of the hybrid structure. We analyze the degree of skew in the current-phase relation to determine the relative contribution of surface states, and discuss other contributions to the current-phase relation. This work sets an agenda for discussion of the prospects for detection of new broken symmetry phases in 3D topological insulators.

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