

Abstract Submitted
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Magnetotransport

in topological insulator-ferromagnetic insulator heterostructure devices¹

ABHINAV KANDALA, ANTHONY RICHARDELLA, DAVID RENCH, DUMING ZHANG, THOMAS FLANAGAN, NITIN SAMARTH, Penn State University — Topological surface states modified by the presence of magnetism are predicted to play host to a number of exotic phenomena and are of great fundamental as well as applied interest. Interfacing topological insulators with magnetic insulators offers a unique opportunity to access these effects by transport, without affecting the bulk band structure. We demonstrate the integration of MBE grown thin films of Bi₂Se₃ with the insulating ferromagnet GdN. SQUID measurements of the heterostructure reveal an in-plane easy axis with a ferromagnetic Curie temperature $T_c \sim 13$ K. The fabrication of hall devices with bare and GdN-capped channels enables direct comparison of magneto-transport properties. While the bare channel displays conventional weak anti-localization (WAL), the capped channel reveals a weakened WAL and a superimposed negative magnetoresistance (MR) associated with weak localization. These observations are discussed in the context of gap-opening in the Dirac surface state. Finally, we discuss the observation of hysteresis in the MR of the capped channel below 2 K.

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