Heterostructure of a Topological Insulator and a Ferromagnetic Insulator bi-layer\textsuperscript{1} VALERIA LAUTER, Oak Ridge National Laboratory, FERHAT KATMIS, Francis Bitter Magnet Lab, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA, BADIH ASSAF, Department of Physics, Northeastern University, Boston, Massachusetts 02115, USA, JAGADEESH MOODERA, Francis Bitter Magnet Lab, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139, USA, SNS COLLABORATION, MIT COLLABORATION, SNSMIT COLLABORATION — The short-range nature of magnetic proximity coupling with a ferromagnetic insulator (FI) induces ferromagnetic interactions in the TI surface state with the symmetry breaking right at the interface. Here we investigate Bi\textsubscript{2}Se\textsubscript{3}/EuS heterostructures and the mechanism to induce ferromagnetic order at the surface of Bi\textsubscript{2}Se\textsubscript{3} thin films by using the FI EuS. SQUID measurements demonstrated excessive magnetic moment for the EuS film alone, thus indicating that EuS might induce a magnetization in Bi\textsubscript{2}Se\textsubscript{3}. Using PNR we reveal that EuS induces a significant magnetic moment in the Bi\textsubscript{2}Se\textsubscript{3} films. Thus, it creates broken time-reversal symmetry and should appear as magnetic signatures in electrical transport. The ferromagnetism of EuS and the coupling between EuS and Bi\textsubscript{2}Se\textsubscript{3} have to be strong to signify surface magnetization effect. These findings may be used to investigate interesting emergent phenomena, because the local time-reversal symmetry breaking is essential for inducing a quantized topological magnetoelectric response.

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