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Magneto-transport properties of the ternary topological insulator ($Bi_{0.5}Sb_{0.5})_2Te_3$ in the presence of electrostatic gating and magnetic impurity LIUQI YU, JORGE BARREDA, LONGQIAN HU, P. XIONG, Florida State University, TONG GUAN, XIAOYUE HE, K. WU, Y. LI, Institute of Physics, Chinese Academy of Sciences — A three-dimensional ternary topological insulator, $(Bi_{0.5}Sb_{0.5})_2Te_3$, is used to characterize the unique electronic properties of the spin helical conducting surface state. Epitaxial films are grown via MBE on (111) $SrTiO_3$ substrate, which serves as the gate dielectric. Magnetoresistance (MR) and Hall effect measurements have been performed in a broad range of back gate voltages. Ambipolar field effect has been observed, enabling effective tuning of the Fermi level across the band gap and identification of the surface transport in the topological transport regime. Weak antilocalization effect is identified and used to differentiate the surface state. The Hikami-Larkin-Nagaoka (HLN) equation is used to analyze the MR data and the results show the top and bottom surfaces become decoupled when the Fermi level is in the bulk band gap. We also examine the effects of paramagnetic impurity (MI), which introduces time reversal symmetry breaking scattering on the TI surface states. Taking advantage of the unique capability of *in situ* deposition of Cr atoms in a customized dilution refrigerator, MI was incrementally quench-condensed onto the sample surface and transport measurements were performed at each MI density. Pronounced changes in the weak antilocalization effect and the sample carrier density with increasing MI concentration were observed. Possible origins of these observations will be discussed.

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