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Ambipolar magnetotransport of topological insulator thin film in the extreme quantum limit ROSS MCDONALD, LANL, ZUOCHENG ZHANG, LANL/Tsinghua University, ZENGWEI ZHU, LANL, XIAO FENG, YANG FENG, Tsinghua University, YUNBO OU, institute of physics, CAS, MINGHUA GUO, Tsinghua University, KANG LI, KE HE, XUCUN MA, institute of physics, CAS, QIKUN XUE, YAYU WANG, Tsinghua University — Topological insulators (TIs) are quantum materials with insulating bulk and topologically protected metallic surfaces. An outstanding challenge in the field of TIs is to reveal the intrinsic quantum transport properties of the topological surface states. Here, we investigate the transport properties of $(Bi_{1-x}Sb_x)_2Te_3$ TI thin film in 60 T pulsed magnetic fields. A complex and systematic evolution of magnetoresistance (MR) is observed when the Fermi level is tuned across the Dirac point by gate voltage. In particular, an unusual negative MR prevails at the charge neutral point and gradually becomes positive at higher band filling. This intriguing phenomenon is related to the exotic property of surface states that is only shown in the extreme quantum limit. Our results approach the regime necessary to access the half quantum Hall effect in gated topological insulators.

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