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Topological p-n Junction JING WANG, SHOU-CHENG ZHANG, Department of Physics, Stanford University — $(Bi_{1-x}Sb_x)_2Te_3$ is an ideal topological insulator with truly insulating bulk and tunable surface state across the Dirac point. We consider a junction between surface p-type and surface n-type on these ideal topological insulators in which carrier type and density in two adjacent regions are locally controlled by electrostatic gating or planar grade doping. Such junction setting on topological insulators are fundamental to device development. We find a gapless chiral edge state localized at the p-n interface arises when applying a magnetic field, which can be detected by scanning tunneling microscopy. The two-terminal conductance of such p-n junction in the quantum Hall regime will be 1/4 times the quantum of conductance e^2/h, which signifies the half-quantum Hall effect of a topological insulator surface.

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