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Anomalous Edge Transport in the Quantum Anomalous Hall State[1] SHOU-CHENG ZHANG, JING WANG, BIAO LIAN, HAIJUN ZHANG, Department of Physics, Stanford University, CA 94305-4045, USA — We predict by first-principles calculations that thin films of a Cr-doped (Bi,Sb)2Te3 magnetic topological insulator have gapless nonchiral edge states coexisting with the chiral edge state. Such gapless nonchiral states are not immune to backscattering, which would explain dissipative transport in the quantum anomalous Hall (QAH) state observed in this system experimentally. Here, we study the edge transport with both chiral and nonchiral states by the Landauer-Buttiker formalism and find that the longitudinal resistance is nonzero, whereas Hall resistance is quantized to h/e^2. In particular, the longitudinal resistance can be greatly reduced by adding an extra floating probe even if it is not used, while the Hall resistance remains at the quantized value. We propose several transport experiments to detect the dissipative nonchiral edge channels. These results will facilitate the realization of pure dissipationless transport of QAH states in magnetic topological insulators.

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