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Systematic Size-Dependence of Electrical Resistivity Profiles in $\mathbf{Bi_{0.9}Sb_{0.1}}$ Crystals[1] DONGXIA QU, J.G. CHECKELSKY, Department of Physics, Princeton University, Y.S. HOR, R.J. CAVA, Department of Chemistry, Princeton University, N.P. ONG, Department of Physics, Princeton University — Recently, Fu and Kane[1] predicted that surface states with a odd-Z_2 topopological signature exist in the alloy $Bi_{1-x}Sb_x$ over a broad rangeof x. Hsieh *et al.* [2] have confirmed by ARPES that, in $Bi_{0.9}Sb_{0.1}$, an odd number of surface states cross the chemical potential. To investigate the surface-state transport properties, we have examined how the resistivity-temperature (ρ-T) profiles change as the transverse widths of crystals are varied from 20 to 1000 μm. In large crystals, the bulk conductance dominates, whereas in the small sample limit, surface conductance may be observable. Measurements on a large number of crystals reveal a reproducible systematic change in the ρ-T profiles. We find that the conductance at 4 K converges to a well-defined value when expressed as sheet conductance per square$G$. The value is roughly 1000 times the quantum of conductance e^2/h. We discuss the interpretation of these results in the context of surface state conduction. 1. L. Fu and C. L. Kane, Phys. Rev. B 76, 045302 (2007). 2. D. Hsieh et al., Nature 452, 970 (2008).

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