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Quantization Rules for Topological Surface States[1] JUNGPIL SEO, Department of Physics, Princeton University, PEDRAM ROUSHAN, HAIM BEIDENKOPF, Y. S. HOR, R. CAVA, ALI YAZDANI, Princeton University — Recently, a new class of chiral electronic states on the surface of insulators with strong spin-orbit interaction has been discovered [1,2]. One of the unusual properties of this material is the elimination of the possibility of backscattering between states of orthogonal spins [3]. An unexplored aspect of these materials is the question of how the absence of backscattering affects the energy quantization in a confined geometry. We have studied the variations in the local density of states in the regions confined between adjacent atomic step edges on Sb(111) using a low temperature scanning tunneling microscopy. We have found a remarkably Dirac-like quantization with $E_n = nE_0$ (n=integer) for the confined surface states of Sb over a wide range of energies. Our experiments also demonstrate the absence of confinement and quantization in the regime where backscattering cannot occur. [1] L. Fu, C. L. Kane, and E. J. Mele, Phys. Rev. Lett. 98, 106803 (2007) [2] D. Hsieh *et al.*, Nature 452, 970 (2008) [3] P. Roushan et al., Nature 460, 1106 (2009)

[1]ARO, MRSEC through PCCM

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