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Manipulating surface states in topological insulator nanostructures FAXIAN XIU, LIANG HE, KANG L. WANG, University of California Los Angeles — Topological insulators show unique properties resulting from massless, Dirac-like surface states that are protected by time-reversal symmetry. Theory predicts that the surface states exhibit quantum spin Hall effect that allows for spins to transport without scattering. However, to date, the direct manipulation of these states with external means remains a significant challenge owing to the predominance of bulk carriers. Here we show the first experimental evidence of surface-state modulation through the observation of voltage-controlled quantum oscillations in Bi2Te3 nanostructures. The surface conduction can be dramatically enhanced with external gate bias. Up to 51 percent of the total conductance is attributed to the surface states. The ability to manipulate the surface states mark an important milestone in the development of TI materials and may further open up exciting and novel applications in nanoelectronics and spintronics.

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