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Impact of Step Defect on Surface States of Topological Insulators

DEGANG ZHANG, C.S. TING, Texas Center for Superconductivity and Department of Physics, University of Houston, Houston, TX 77204 — Recent topological insulators have attracted much attention in the condensed matter community due to the existence of surface states. The Dirac-cone topological surface states, which preserve time-reversal symmetry, are produced by strong spin-orbit coupling. In recent STM experiments, the modulations of local density of states (LDOS) induced by a step defect were observed. In this work, we investigate electron tunneling in the presence of $\delta(x)$ or $\delta(y)$ potential on the surface of topological insulators in the framework of quantum mechanics and calculate the LDOS near the δ potential. The STM experiments could be interpreted by an additional spin torque term in the wave function. We also figure out the oscillatory features of the LDOS produced by the $\delta(x)$ and $\delta(y)$ potentials, respectively.

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