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Quantum transport in topological insulator nanowires and thin films

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Topological insulators have an insulating bulk but a metallic surface. In the simplest case, the surface electronic structure of a 3D topological insulator is described by a single 2D Dirac cone. The transport properties of such a surface state are of considerable current interest; they have some similarities with graphene, which also realizes Dirac fermions, but have several unique features in their response to magnetic fields. In this talk, I give an overview of some of the main quantum transport properties of topological insulator surfaces. I focus on the efforts to use quantum interference phenomena, such as weak anti-localization and the Aharonov-Bohm effect, to verify in a transport experiment the Dirac nature of the surface state and its defining properties.