

Abstract Submitted
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Spin and Charge Transport on the Surface of a Topological Insulator ANTON BURKOV, DAVID HAWTHORN, University of Waterloo — We derive diffusion equations, which describe spin-charge coupled transport on the helical metal surface of a three-dimensional topological insulator. The main feature of these equations is a large magnitude of the spin-charge coupling, which leads to interesting and observable effects. In particular, we predict a new magnetoresistance effect, which manifests in a nonohmic correction to a voltage drop between a ferromagnetic spin-polarized electrode and a nonmagnetic electrode, placed on top of the helical metal. This correction is proportional to the cross-product of the spin polarization of the ferromagnetic electrode and the charge current between the two electrodes. We also demonstrate tunability of this effect by applying a gate voltage, which makes it possible to operate the proposed device as a transistor.

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