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**Distinctive features of transport in topological insulators** VINCENT SACKSTEDER, Nanyang Tech Univ, QUANSHENG WU, Institute of Applied Physics and Computational Mathematics, Beijing, KRISTIN ARNARDOTTIR, IVAN SHELYKH, Nanyang Tech Univ, STEFAN KETTEMANN, Jacobs University Bremen — The surface states of a topological insulator in a fine-tuned magnetic field are ideal candidates for realizing a topological metal which is protected against disorder. Its signatures are (1) a conductance plateau in long wires and (2) a conductivity which always increases with sample size. We numerically show that the bulk substantially accelerates the conductance plateaus's decay in a magnetic field. It also reduces the effects of surface disorder and causes the magnitude of the surface conductivity and the magnetoconductivity to depend systematically on sample details such as doping and disorder strength. In addition, we predict a new signature of the topological state: at low temperatures the magnetoresistance will deviate strongly from the Hikami-Larkin-Nagaoka (HLN) formula. In this regime the magnetoresistance is dominated by scattering processes which wrap around the TI sample. The HLN formula's shoulder is replaced by a feature with a larger critical field magnetic strength that is caused by wrapping. Inside the wrapping regime the magnetoconductance will lose its dependence on temperature. This new topological signature should be visible in the same samples and temperatures where the Altshuler-Aronov-Spivak (AAS) effect has already been observed.

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