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High-field charge transport on the surface of Bi_2Se_3 M.Q. WENG, M.W. WU, University of Science and Technology of China — We present a theoretical study on the high-field charge transport on the surface of Bi_2Se_3 and reproduce all the main features of the recent experimental results, i.e., the incomplete current saturation and the finite residual conductance in the high applied field regime [Costache *et al.*, Phys. Rev. Lett. **112**, 086601 (2014)]. Due to the hot-electron effect, the conductance decreases and the current shows a tendency of saturation with the increase of the applied electric field. Moreover, the electric field can excite carriers within the surface bands through interband precession and leads to a higher conductance. As a joint effect of the hot-electron transport and the carrier excitation, the conductance approaches a finite residual value in the high-field regime and the current saturation becomes incomplete. We thus demonstrate that, contrary to the conjecture in the literature, the observed transport phenomena can be understood qualitatively in the framework of surface transport alone. Furthermore, if a constant bulk conductance which is insensitive to the field is introduced, one can obtain a good quantitative agreement between the theoretical results and the experimental data [M. Q. Weng and M. W. Wu, Phys. B **90**, 125306, (2014)].

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