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Quantized Hall effect from the surface states of topological insulator thin films in a strong magnetic field ANNA PERTSOVA, CARLO M. CANALI, Linnaeus University, ALLAN H. MACDONALD, University of Texas at Austin — Topological insulators (TIs) is a new class of quantum matter characterized by insulating bulk and topologically protected edge or surface states with peculiar properties. Although simple low-energy models based on the Dirac Hamiltonian are widely used to describe topological surface states, more accurate microscopic models are needed to capture Landau level spectra [1,2] and gate-voltage responses [3] in 3D TIs. In particular, inter-surface hybridization [1] and the inevitability of different electrostatic environments [2] on the opposite surfaces lead to a complex Landau level structure in 3D TIs. In addition, the presence of metallic states on the side surfaces of finite-thickness 3D TI thin films has a significant effect on quantum Hall effect measurements [2]. In this work, we use a microscopic approach to study the properties of topological surface and edge states under a strong quantizing magnetic field in thin films of Bi2Se3 3D TI arranged in a Hall bar geometry, and to predict transport properties in the quantum Hall regime. Our approach is based on magnetic bandstructure calculations for a multi-band tight-binding model of Bi2Se3.

[1] Yang and Han PRB 83,045415(2011); Pertsova et al. arXiv:1411.0831;
[2] Brüne et al.PRL 106,126803(2011);
[3] Baum et al.PRB 89,245136(2014)

Anna Pertsova
Linnaeus University

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