Metallic phase of the quantum Hall effect in four-dimensional space
Jonathan M. Edge, J. Tworzydlo, C. W. J. Beenakker
Instituut-Lorentz, Universiteit Leiden, P.O. Box 9506, 2300 RA Leiden, The Netherlands
Institute of Theoretical Physics, Faculty of Physics, University of Warsaw, Hoza 69, 00–681 Warsaw, Poland

We study the phase diagram of the quantum Hall effect in four-dimensional (4D) space [1]. Unlike in 2D, in 4D there exists a metallic as well as an insulating phase, depending on the disorder strength. The critical exponent $\nu \approx 1.2$ of the diverging localization length at the quantum Hall insulator-to-metal transition differs from the semiclassical value $\nu = 1$ of 4D Anderson transitions in the presence of time-reversal symmetry. Our numerical analysis is based on a mapping of the 4D Hamiltonian onto a 1D dynamical system, providing a route towards the experimental realization of the 4D quantum Hall effect.