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Mapping the conductivity tensor of disordered topological insulators in the presence of magnetic fields[1] EMIL PRODAN, YU XUE, Department of Physics, Yeshiva University — Transport measurements on topological insulators revealed extremely interesting effects and generated data that contain extremely valuable information. It is now possible to control the carriers' concentration using finely tuned gate voltages and to do the transport measurements under controlled applied magnetic fields. As such, accurate maps of the conductivity tensor are now available, as function of the Fermi level and the magnetic field strength. To extract useful information, we need a quantitative theory of charge transport for aperiodic systems in presence of magnetic fields. Such theory has been developed in the past using C*-Algebras and Non-Commutative calculus, the result being closed and exact formulas for the conductivity tensor. In this talk we explain how to manipulate the algebras and how to implement the non-commutative calculus on a computer, in order to compute the conductivity tensor of topological insulating materials in the presence of disorder and magnetic fields. Quantitative simulations of the transport experiments on 2D (and possibly 3D) topological insulators will be presented. Since the methodology can treat disorder and magnetic fields in the same time, it enable us to reproduce, for example, the quantization and the plateaus of the Hall conductance.

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