

Quantization of charge transport: equivalence of scattering and Chern number approaches

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Abstract: This talk is about mesoscopic devices, which are driven slowly and periodically in time, and about the resulting charge transport across them. Two descriptions are available: one by Büttiker et al. in terms of scattering matrices, the other by Thouless in terms of a Chern number. In the first approach the system is viewed as consisting of a finite device connected to infinite leads. It allows for scattering states at Fermi energy and is hence gapless. In the second one the device is idealized as being of infinite extent. It is supposed to have a gap containing the Fermi energy at all times, on which the Chern number crucially depends. We show how to relate the two seemingly disjoint approaches. We prove that they then yield the same transported charge.