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Electronic Transport in Mesoscopic Systems

A continuing trend in physics, material science and electrical engineering is the investigation and fabrication of smaller and smaller electronic systems and devices. This has lead to increasing interest in the mesoscopic regime, which lies between the macroscopic and microscopic regimes.

It is characterized by length scales smaller than the phase breaking length. This means electrons can traverse the sample without losing their phase coherence due to inelastic scattering.

The classical Drude model describing electronic transport is therefore unsuitable to deal with mesoscopic systems. Instead, one uses the Landauer formalism to investigate the transport properties in terms of the scattering behavior of the system.

In this talk, I will give an introduction to the mesoscopic regime and the Landauer formalism. Furthermore, I will explain two mesoscopic effects, the quantization of the conductance of quantum point contacts and the Quantum Hall effect.