Electronic Transport in Quantum-Chaotic Nanostructures

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In the exploration of **mesoscopic** two-dimensional (2D) nanostructures, we employ Landauer-Büttiker approach to gain insights into and control over the electrical properties of chaotic quantum transport systems [1,2]. On the classical side, it is widely acknowledged that dynamics is difficult to predict due to chaos, for instance stemming from impurities in a nanostructure. However, in mesoscopic systems, we can push the limit further by employing quantum coherence for our benefit. A striking visual manifestation of quantum mechanical suppression of classical chaos is a **Quantum Scar** [3], where the probability density of an eigenstate condensates in the vicinity of an unstable classical periodic orbit. Our transport setup consists of a 2D quantum dot of an arbitrary shape [4], strongly coupled to finite-width leads [2]. The system is also exposed to an external uniform magnetic field. The computational framework enables calculations of transmission, conductivity, and currents in multi-terminal 2D transport devices. Additional tools facilitate the computation of the local density of states, showcasing possibilities to exploit quantum scars, for example, the so-called bouncing-ball states [5], in the **control of quantum transport**. This approach enables a multitude of applications in quantum electronics.

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