

Fractal Classical Conductance Fluctuations

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The coherent conductance through mesoscopic structures is well known to show reproducible fluctuations with the variation of an external parameter (e.g. a magnetic field). These fluctuations are caused by interference effects and can be described semiclassically. In systems with mixed (regular and chaotic) classical dynamics *fractal* conductance curves are found [1]. Experiments that study the transition from coherent to incoherent transport showing a change of the fractal dimension with the coherence-length [2], however, seemed to contradict the semiclassical theory of the fractal scaling.

We show that there is no contradiction but that the classical dynamics itself already leads to fractal conductance curves explaining the experimental observations. Moreover, we predict fractal classical conductance fluctuations not only in systems with mixed phase space but in purely chaotic systems.

[1] R. Ketzmerick, *Phys. Rev. B* **54**, 10841 (1996).

[2] A.P. Micolich et al., *Phys. Rev. Lett.* **87**, 036802 (2001).