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Numerical study of conductance and noise in a chaotic cavity in the presence of a magnetic field

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Brief abstract:

We have performed a numerical simulation of conductance and shot noise in chaotic mesoscopic cavities, in the presence of a magnetic field orthogonal to the plane containing the cavity.

We observe that, as the magnetic field is increased, conductance quantization through the cavity is recovered, due to the formation of edge states crawling along the walls, and the consequent disappearance of the chaotic behavior. This has an effect also on the noise power spectral density, which, in the case of a symmetric cavity, drops below the theoretical value corresponding to 1/4 of the full shot noise, and vanishes for a sufficiently large magnetic field.

We compare our numerical results with the experimental data and the simplified model presented by Oberholzer et al. (Nature, v. 415, 765 (2002)), pointing out some possible disagreement with respect to their interpretation, and we discuss semiclassical approaches for the estimate of the magnetic field intensity beyond which significant effects on the noise spectral power density should be observable.