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Spectral properties and scattering in chaotic billiards and nuclei*

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Sufficiently flat microwave resonators ("microwave billiards") are well suited to study the quntum mechanical behavior of classically chaotic systems because of the formal equivalence of the respective wave equations, i.e. the Helmholtz and the Schroedinger equation. Using a superconducting 2-dimensional chaotic billiard ("stadium") as an example, it is shown that its spectral properties display universal features which are also evident in real mesoscopic systems of different scales, i.e. hadrons, nuclei, atoms, molecules and clusters. Furthermore, since such microwave resonators can be viewed as open quantum systems, measurements of the reflected and transmitted amplitudes provide generic information on chaotic quantum scattering like observed in compound nucleus reactions. This process is discussed for time reversal invariant and non-invariant systems.

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