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Quantum Chaotic Scattering in Microwave Resonators

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(Submitted on 24 Nov 2009 (v1), last revised 24 Feb 2010 (this version, v2))

In a frequency range where a microwave resonator simulates a chaotic quantum billiard, we have measured moduli and phases of reflection and transmission amplitudes in the regimes of both isolated and of weakly overlapping resonances and for resonators with and without time-reversal invariance. Statistical measures for S-matrix fluctuations were determined from the data and compared with extant and/or newly derived theoretical results obtained from the random-matrix approach to quantum chaotic scattering. The latter contained a small number of fit parameters. The large data sets taken made it possible to test the theoretical expressions with unprecedented accuracy. The theory is confirmed by both, a goodness-of-fit-test and the agreement of predicted values for those statistical measures that were not used for the fits, with the data.

Subjects: **Chaotic Dynamics (nlin.CD)**
Cite as: **arXiv:0911.4716v2 [nlin.CD]**

Submission history

From: Barbara Dietz [view email]
[v1] Tue, 24 Nov 2009 20:49:54 GMT (880kb)
[v2] Wed, 24 Feb 2010 14:55:45 GMT (764kb)

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