Density of S-matrix poles in quantum chaotic scattering

Hans-Jürgen Sommers und Yan Fyodorov

Essen, Germany

Abstract

Assuming the validity of random matrix theory for describing the statistics of a *closed* chaotic quantum system, we study analytically the statistics of S-matrix poles characterizing scattering in its *open* counterpart. By using the supersymmetry method we derive an explicit expression for the density of S-matrix poles (resonances) in the complex energy plane. When all scattering channels are considered to be equivalent our expression describes a crossover from the χ^2 distribution of resonance widths (regime of isolated resonances) to a broad power-like distribution typical for the regime of overlapping resonances. The first moment is found to reproduce exactly the Moldauer-Simonius relation between the mean resonance width and the transmission coefficient. We consider the cases of broken and conserved time reversal invariance. In the latter case a new supersymmetric parametrisation has to be introduced.