Density of scattering resonances in a disordered system

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Reflection of particles from a disordered or chaotic medium is characterized by a scattering matrix that can be represented as a superposition of resonances. Each resonance corresponds to an eigenstate inside the medium and has a width related to the decay time of this eigenstate. We develop a general approach to study the distribution function of these resonance widths based on the nonlinear sigma model. We derive an integral representation of the distribution function that works equally well for systems of any symmetry and for any type of coupling to the measuring device. From this integral representation we find explicit analytic expressions for the distribution function in the case of disordered metallic grains. We also compare the analytic results to large-scale numerical simulations and observe their perfect agreement.

References

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