Resonances in wave reflection from a disordered medium: nonlinear sigma-model approach

Yan V Fyodorov
King's College London

Abstract

Using the framework of supersymmetric non-linear sigma-model we develop a general non-perturbative characterization of universal features of the density of S-matrix poles (resonances) in the complex energy plane for the model of waves incident on and reflected from a disordered medium via a single M-channel waveguide/lead. Explicit expressions for the pole density are derived, in particular, in weakly localized/diffusive regime as well as in the regime of strong localization in (quasi-)1D geometry. The latter geometry can be modelled by a finite-rank non-Hermitian deformation of random banded matrices. We identify several salient features of the pole density, with statistics of poles with small imaginary part reflecting exponential localization and the rest reflecting decaying states located in the vicinity of the attached waveguide. For multimode waveguides an intermediate powerlaw asymptotics is shown to emerge, reflecting diffusive nature of semiclassical decay.The presentation will be mainly based on arXiv:2211.03376, which is the joint work with M. Skvortsov and K. Tikhonov.