BENEMÉRITA UNIVERSIDAD AUTÓNOMA DE PUEBLA

INSTITUTO DE FÍSICA
"LUIS RIVERA TERRAZAS"

SEMINARIO
"DR. JESUS REYES CORONA"

"Nearest Level Spacing Statistics in Open Chaotic Systems"

Dr. Charles Poli
Instituto de Física
Benemérita Universidad Autónoma de Puebla.

It is by now well established that classical chaos manifests itself in generic statistical properties of the corresponding quantum or wave systems. In the ideal case of closed systems, i.e. those whose coupling to the environment can be neglected, the spectral and spatial statistics are currently well described through Random Matrix Theory (RMT). The statistics of chaotic wave systems coincide with the Gaussian Orthogonal Ensemble if time-reversal symmetry (TRS) holds, with the Gaussian Symplectic Ensemble for TRS systems with spin-1/2 interactions, and with the Gaussian Unitary Ensemble if TRS is broken. Among all the statistical quantities used to analyze the spectral properties of closed systems, the nearest level spacing distribution P(s) is certainly the most referred one.
On the other hand, very few studies have been dedicated to analyze the spacings distributions in the realistic case of systems coupled to the environment i.e. open chaotic systems. Applying RMT to the S-matrix formalism, we are able to obtain analytical expressions of the spacings distributions for the 3 universal ensembles in the particular case of one open channel. Using those results, we extend the expressions to the case of any number of channels. The proposed spacing distributions are successfully compared with numerical simulations of non-Hermitian random matrices and also with experimental data from an open microwave cavity.

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