

Multi Channel Wave Transfer in Sparsely Connected Systems

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Wave transport in finite systems connected through multiple channels is strongly influenced by inter channel correlations. Such correlations are induced by scattering and restrictions in the complex medium in which the waves propagate. Examples can be found in electron conduction in mesoscopic systems with multiple leads [1] and in electromagnetic wave transfer in multi-antenna wireless communication [2]. The influence of the correlations on the overall wave transport can be uncovered by analyzing the eigenvalue distributions of the transfer matrix between the ingoing and outgoing channels.

A model system is studied experimentally in the microwave region where the correlation between sets of transmitting and receiving antennas are induced by connecting complex cavities through a limited number of leads. The eigenvalue distribution of this correlated multi channel system is described using random matrix theory.

Keywords: Random matrix modeling, Eigenvalue distribution, Classical wave transport, Coupled chaotic systems.

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[2] A. Tulino and S. Verdú, Random Matrix Theory and Wireless Communications, Found. Trends Commun. Inf. Theory, 1:1, 2004.