# Speckle intensity statistics of single transmission channels


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The transmission channels of a multiple scattering medium are the building blocks for light transport in the medium and lie therefore at the heart of mesoscopic phenomena. For samples of low dimensionless conductance, only few channels contribute to light transport. This is reflected in the speckle intensity statistics, which deviate from a negative exponential law. The deviation is stronger when the incident wave couples to fewer transmission channels, as has been theoretically predicted [1,2] and observed in microwave and optical experiments [3-6]. Since every channel of the transmission operator (TO) of a medium is orthogonal by definition to the other channels, this raises the research question as to what occurs to the dimensionless conductance when an incident field couples to a single channel of the medium, analogous to an Anderson-localized system that supports only one mode [6]. To be able to answer such a question experimentally, the channels of the measured transmission matrix (TM), which is necessarily a partial representation of the TO [7], must be an accurate representation of the channels of the TO. It is therefore crucial that the largest possible fraction of the TM must be measured precisely and accurately without inducing spurious correlations from the optical system or the sampling method [8].

Here, we explore the statistics of individual channels by measuring the transmission matrices of scattering media in the diffusive regime, where the transport mean free path is comparable to the wavelength of the incident light field. We observe indications of a deviation from exponential statistics in the speckle intensity of single channels.

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