
Laser light in random media: speckle formation and the Gaussian conjecture

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Abstract

A widely accepted conjecture in the physical literature states that classical wave-fields propagating in random media over large distances eventually follow a complex circular Gaussian distribution. In this limit, the wave intensity becomes exponentially distributed, which corroborates the speckle patterns of, e.g., laser light observed in experiments. This talk reports on a recent result settling the conjecture in the weak-coupling, paraxial regime of wave propagation, which is accurate and routinely used in the application of laser light propagation in turbulent atmospheres. The limiting macroscopic Gaussian wave-field is fully characterized by a correlation function that satisfies an unusual diffusion equation. Numerical simulations illustrate the theoretical findings. This is joint work with Anjali Nair.

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