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Waves in Random Media: Anderson Localization

Localization by disorder, first discussed by P.W. Anderson in the context of electron transport, is inherently a wave interference phenomenon and may therefore occur for both classical and quantum mechanical waves. It refers to a disorder-induced transition in the wave transport properties, for which finding convincing evidence has been a constant challenge for experimental physicists working with waves in random media. There has been great interest in photon localization because of the noninteracting nature of photons, available tunable coherent light sources, and potential for a variety of optical applications. However, the very possibility of observing photon localization in random media has been called into question by the difficulties of achieving strong scattering and of unambiguously detecting electromagnetic localization. In this talk, we reflect on the history of photon localization and discuss possible ways to its ultimate realization.