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Anomalous diffusion of light in complex media ROXANA REZVANI NARAGHI, CREOL and Department of Physics, University of Central Florida, MARIELENA BURDGE, ARISTIDE DOGARIU, CREOL, University of Central Florida — Light propagation in random materials is often modeled by a diffusion approximation to the radiation transfer equation. This approach inherently ignores interference effects and describes only the energy propagation. When the interaction is strong, however, the scattering events become correlated and wave interferences can cause the diffusion to be slow down. One result of this process is the appearance of localized modes, whereby the energy inside the material is confined to small spatial regions due to constructive interferences. This anomalous, sub-diffusive character of energy propagation could be justified within the scaling theory of localization where the optical diffusion coefficient is size dependent. Moreover, when the concentration of scatterers increases, the near-field interactions between scatterers placed in close proximity of each lead to a new transport regime. In these conditions, the energy spread is not only diffusive but it also evolves through evanescent coupling between individual scatterers. Based on measurements of photon path-length distributions, we report the observation of such distinct regimes of energy transport.

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