

Statistical physics insight into photonics: light amplification and propagation in complex and random media

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In recent years a valuable description of the properties of waves in random media by means of the tools of statistical mechanics has led to a deeper understanding and a wider range of predictions on the behavior of complex photonic systems. These are systems where disorder, non-linearity and wave interference all play significant, non-perturbative, roles possibly causing the onset of a collective behavior of light modes. After giving a concise account of the formal translation of the dynamics of the electromagnetic field of light into a statistical mechanical description we report on recent ideas and results on random lasers, in particular on those compounds displaying glassy behavior, and on the transmission of light waves through complicated, disordered media.