Title:

Quantum sustainability phenomenon in optical systems and its applications

Abstract:

We use the quantum-statistical density operator approach to illustrate that sustainability is a universal quantum phenomenon, which emerges during propagation of electromagnetic waves inside different media, such as waveguides, metamaterials or biological tissues. For illustrative purposes, we show two examples, of both natural and human-controlled systems, where this phenomenon occurs. First is the environment-assisted excitonic energy transfer in photobiological complexes, such as photosynthetic reaction centers or centers of melanogenesis inside living organisms or organelles. As a second example, we demonstrate how this phenomenon of sustainability can manifest itself in a large class of human-controlled EMW systems, such as optical couplers and amplifiers. An introductory reading: K. G. Zloshchastiev, Phys. Rev. B 94, 115136 (2016); Ann. Phys. (Berlin) 529, 1600185 (2017).

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