Weak and strong coupling to photonic modes in nanoscale disordered media

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Abstract

The interplay between multiple scattering, near-field interactions and material resonances in disordered media leads to substantial changes in the photonic properties, compare to that of bulk materials. Changes in the local density of optical states (LDOS) influence spontaneous emission as well as absorption of light (weak coupling regime or Purcell effect). LDOS statistics can be used to probe the photonic modes from the inside, and reveals the substantial role of near-field interactions [1-3]. In the regime of Anderson localization in quasi-1D and 2D geometries, strong coupling can be reached [4,5]. We analyze the strong coupling regime based on exact numerical simulation, in perfect agreement with a coupled-mode theory. The theory shows how concepts from cavity QED and from transport theory can be connected, providing simple tools to guide and analyze experiments.

References

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