Dimensional crossover in Anderson localization of light

Sébastien Lucas*[1]

[1]Laboratoire de physique et modélisation des milieux condensés – Université Grenoble Alpes, Centre National de la Recherche Scientifique - CNRS – France

Abstract

In dense ensembles of atoms, coupling via the electromagnetic field hybridizes individual atomic states into collective modes. These collective resonances can be strongly detuned from the single-atom resonance and exhibit either enhanced decay rates (superradiant states), strongly suppressed decay (subradiant states), or even Anderson localization. We numerically study the collective modes of atomic ensembles randomly distributed in a lowdimensional cavities supporting only a single propagating mode. The atomic interaction follows the expected low-dimensional scalar coupling, with an additional near-field dipole–dipole term that reflects the residual 3D vectorial character of the system. This allows to tune the effective dimensionality of the problem with the density of scatterers, giving rise to a localization transition.

*Speaker