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# Coherent and collective quantum optical effects in mesoscopic systems

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**Abstract**

A review of coherent and collective quantum optical effects like superradiance and coherent population trapping in mesoscopic systems is presented. Various new physical realizations of these phenomena are discussed, with a focus on their role for electronic transport and quantum dissipation in coupled nano-scale systems like quantum dots. A number of theoretical tools such as Master equations, polaron transformations, correlation functions, or level statistics are used to describe recent work on dissipative charge qubits (double quantum dots), the Dicke effect, phonon cavities, single oscillators, dark states and adiabatic control in quantum transport, and large spin-boson models. The review attempts to establish connections between concepts from Mesoscopics (quantum transport, coherent scattering, quantum chaos), Quantum Optics (such as superradiance, dark states, boson cavities), and (in its last part) Quantum Information Theory.


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## Contents



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