Dynamics of excitations of a quantum dot in a microcavity

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We study the dynamics of a quantum dot (QD) embedded in a pillar microcavity in the strong coupling regime in which the QD exciton has an energy close to the frequency of a cavity mode. The system is excited by injecting electrons and holes. Each pair can recombine by spontaneous emission through either a leaky mode or a cavity mode that subsequently emitted out of the cavity with a great efficiency. The numerical integration of a master equation including all these effects give us the time evolution of the density matrix. By using the quantum regression theorem, we can compute the first and second order coherence functions required to compare with any experimental information.

Our main result is the determination of a range of parameters in which a state of cavity modes with Poissonian (coherent state) or sub-Poissonian (squeezed state) statistics can be built up within the microcavity. Moreover, we compute the emission spectrum of our system and analyze the effect of the different mechanisms producing coherence/decoherence of such light emission.

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