



SFB/TRR 21 - Colloquium

8. November 2013, Stuttgart

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Quantum optics with semiconductor quantum dots in optical microcavities

Quantum dots are often considered as the active material for the next generation of semiconductor lasers. By placing the quantum dots in optical microcavities with three-dimensional mode confinement, the emission properties of the active material can be tailored. With a single quantum dot emitter in a high-quality cavity, the ultimate limit of miniaturization is reached. The system shows interesting similarities but also important differences in comparison to current experiments on quantum optics with trapped atoms. The quantum-mechanical interaction processes for quantum dots in optical microcavities are discussed. We review the use of these devices as non-classical light sources. Results for the emission of single photons, polarization-entangled photon pairs, as well as stimulated emission in the strong-coupling regime are presented. We also discuss the physics of carrier scattering and dephasing processes as well as their microscopic modeling.

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