



SFB/TRR 21 - Colloquium

13. Januar 2017, Stuttgart

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Controlling spontaneous emission from semiconductor nanostructures

Spontaneous emission (SE) in nanophotonic cavities forms the basis for efficient single-photon sources and plays a key role in nanolasers. Despite the high SE rate enhancements which have been demonstrated in photonic crystal (PhC) and plasmonic cavities, the control of the emitter-field coupling at the nanoscale is still challenging and presently limits the performance and yield of nanophotonic devices. In this talk several approaches to the active control of SE in semiconductor nanocavities will be presented. Firstly, the problem of spectral tuning of emitter and cavity will be discussed. The combination of nano-electro-mechanical actuation and Stark tuning will be shown to provide fully-tuneable, cavity-enhanced single-photon sources for application in integrated quantum photonic circuits. Secondly, the possibility of mechanically controlling other properties of the cavity, such as the quality factor and the field distribution, will be explored, together with its application to emitter-phonon coupling. Finally, the concept of dynamic control of SE will be introduced, and two approaches, based on fast emitter tuning and on ultrafast vacuum field modulation, will be discussed.

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