TRR 142
Tailored Nonlinear Photonics

TRR Guest Scientist Lecture / Seminar

Date/Time: 27.05.2021 / 15:00 o'clock
Location: Online - Zoom

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Phonon effects on non-classical light generation in solid-state cavity-QED systems

Abstract:

Quantum dots (QDs) provide an excellent platform for emulating atomic physics in solid state systems with the additional benefits of high brightness, easy handling, and the possibility of designing and tuning their electronic and optical properties. Due to their strong light-matter coupling, QDs embedded in photonic structures like optical single-mode microcavities can reach the cavity-QED regime, where the quantization of photons plays an important role. In this regime, external driving of QDs with laser pulses according to different protocols can be used to generate various non-classical photonic states, such single photon states, entangled photon pairs, higher-order Fock states, or quantum optical Schrödinger cat states.
However, in contrast to free atoms, QDs interact with their local solid-state environment giving rise to dephasing and dissipation. The strong and superohmic QD-phonon coupling often leads to significant non-Markovian effects, the build-up of long-lasting polaronic system-environment correlation, and important contributions from multi-phonon processes.
Here, I present insights from the analysis of phonon-effects on non-classical light generation in solid-state cavity-QED systems obtained by a numerically exact path-integral theory, such as the identification of regimes where QD-phonon interactions can be utilized to enhance the functionality of quantum devices.

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