SFB/TRR 21 - Seminar

9. Juli 2015, Ulm

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Coherent quantum feedback in the few photon limit

Device operating point stabilization of semiconductor lasers via a classical self-feedback setup is adequately described with the well known Lang-Kobayashi model. However, this model is no longer valid in the few photon and emitter excitations, i.e. in the quantum limit. This regime of coherent quantum feedback is of particular interest for on-going fundamental research and applications for example in semiconductor quantum optics, involving the manipulation of single qubits, non-classical states or the shaping of traveling single photon pulses. It is therefore necessary to develop analytical and numerical schemes in order to address photon feedback in the true quantum limit, but with the possibility of reproducing the Lang-Kobayashi limit. In this presentation an analytical model for stabilizing QED Rabi-oscillations by destructive interference of in- and outgoing photon population will be discussed, and serves as a benchmark for an operator based description of feedback in the Heisenberg picture. Here, the time-delayed differential equations are expanded in a hierarchy of time correlated expectation values.

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