



UNIVERSITÄT
DES
SAARLANDES

Fakultät 7
Physik und
Mechatronik

Gerd Schön

Karlsruhe Institute of Technology

“Lasing and transport in circuit QED“

**Thursday, November 24th, 2011, 4:15 p.m.
Building C6 3, Lecture Hall II**

Circuit quantum electrodynamics (cQED) setups, where superconducting qubits are coupled to an electromagnetic circuit demonstrate many effects known from quantum optics, some of them with unprecedented quality. Moreover, the new parameter regime, characterized by strong coupling, low temperature, and a single or few qubits rather than many atoms, reveals qualitatively novel behavior. In this talk I will discuss several examples. A specific example is lasing with a single superconducting qubit, where for strong coupling to the resonator, quantum noise influences the linewidth of the emission spectrum in a characteristic way [1].

Recently we proposed a cQED setup, where a semiconductor double quantum dot is coupled to a high-Q (superconducting) resonator [2]. By driving a current through the dot system a population inversion in the dot levels can be created which leads, within a narrow resonance window, to a lasing state in the resonator. In this semiconductor setup the lasing state correlates with the transport properties. On one hand, it allows probing the lasing state via a current measurement, which may be easier to perform in an experiment. On the other hand, the resulting narrow current peak opens perspective for applications of the setup for high resolution measurements.

[1] Single-qubit lasing in the strong-coupling regime, S. André, P. Q. Jin, V. Brosco, J. H. Cole, A. Shnirman, and G. Schön, Phys. Rev. A 82, 053802 (2010)

[2] Lasing and transport in a quantum dot-resonator circuit, P. Q. Jin, M. Marthaler, J. H. Cole, A. Shnirman, and G. Schön, Phys. Rev. B 84, 035322 (2011)

Frank Wilhelm-Mauch (3960) takes care of the guest

Interested people are cordially invited

Coffee at 4:00 p.m. in front of the Lecture Hall

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