Coherence properties of two-level-systems in superconducting phase qubits

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Over the past decade, it became possible to operate superconducting electrical circuits in the coherent quantum regime, and these circuits show great promise to be used as quantum bits (qubits) in a solid-state quantum computer.
In this talk, the so-called phase qubit will be introduced. It is based on an inductively shunted Josephson junction, and thus forms a nonlinear quantum LC - resonator.
A main topic of the talk will be two-level systems (TLS), which are defects in the amorphous cristal structure of the Josephson junction's tunnel barrier. TLS form nanometer-sized electrical dipoles which may couple strongly to state of the macroscopic (~ 100 µm) superconducting qubit. This coupling allows one to use the phase qubit as a microscope to study the coherence properties of individual TLS.