TUNABLE ENVIRONMENT WITH NORMAL-METAL COMPONONENTS FOR CIRCUIT QUANTUM ELECTRODYNAMICS

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Circuit quantum electrodynamics (cQED) is one of the most promising approaches for building a large-scale quantum computer [1–3]. However, further development steps are needed to obtain this goal. Especially, fast initialization of qubits is beneficial for various error correction codes.

In the framework of cQED, we experimentally investigate a tunable environment for a qubit. Our system shown in the figure below can be used for qubit initialization as theoretically studied in Ref. [4]. Essentially, our system consists of two coupled resonators: one with a high quality factor, and the other with a low quality factor and a tunable resonance frequency achieved with a superconducting quantum interference device (SQUID). An on-chip resistor determines the low quality factor and hence the mode temperature of the corresponding resonator.

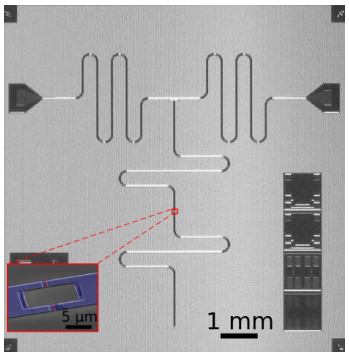

Figure: The structure of the sample. The large optical image shows the two coupled resonators. The horizontal resonator is capacitively coupled to the vertical one. The SQUID is in the middle of the vertical resonator, and its structure is shown in the false color scanning electron microscope image. The vertical resonator is terminated with a resistor.

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