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Fabrication and Characterisation of Superconducting Coplanar Waveguide Resonators for Circuit QED Applications MARTIN GÖPPL, Department of Physics, ETH Zurich, ROB SCHOELKOPF, Department of Applied Physics and Physics, Yale University, ANDREAS WALLRAFF, Department of Physics, ETH Zurich, ETH QUANTUM DEVICE TEAM, YALE CIRCUIT QED TEAM — Superconducting thin film microwave cavities have gained great interest in recent years for studying qubit-photon or qubit-photon-qubit interactions in circuit quantum electrodynamics (QED) experiments [1, 2]. Thin film cavities made by using standard optical lithography and microfabrication techniques have the potential for enabling quantum computing applications such as coupling several qubits via a quantum bus [2]. In order to specifically design circuit QED systems the cavity parameters such as resonance frequency and quality factor, determined by the input and output coupling strength need to be precisely controlled. We have fabricated niobium and aluminum resonators on Si, Si/SiO_x and Al_2O_3 substrates. Resonators with quality factors up to several hundred thousands have been characterized. Furthermore, the effect of external parameters such as temperature and drive power have been investigated. The measured frequency dependent transmission of the cavities is found to be in good agreement with analytical circuit models.
[1] A. Wallraff et al, Nature **431**, 162 (2004).
[2] J. Majer et al, Nature **449**, 443 (2007).

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