Superconducting Circuit Microwave Photonics

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Quantum circuits represent a unique platform for studying new regimes of light-matter interaction. An excellent impedance match between photonic degrees of freedom and artificial atoms (superconducting qubits) allows reaching very strong couplings [1], while preserving broadband tunability. Inspired by these possibilities, and supported by numerical tools based on Matrix Product States, we are studying the Ohmic spin-boson model [2], focusing not only on the dissipative dynamics of qubits, but also on their effects on the photonic field, few photon scattering and strongly correlated phenomena [3]. I will report on such results, including additional theoretical efforts [4] to model these strongly interacting light-matter systems at low dimensions. Finally, I will connect our results with ongoing experimental work of our collaborators at the group of Prof. R. Gross (WMI, Garching)

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