

Luca Magazzù, University of Regensburg (SiUCs) - Transmission spectra of a strongly driven, dissipative Rabi model in the USC regime

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We present theoretical transmission spectra of a strongly driven, damped flux qubit coupled to a dissipative resonator in the ultrastrong-coupling regime. Such a qubit-oscillator system, described within a dissipative Rabi model, constitutes the building block of superconducting circuit QED platforms. The addition of a strong drive allows one to characterize the system properties and study novel phenomena, leading to a better understanding and control of the qubit-oscillator system. In this work, the calculated transmission of a weak probe field quantifies the response of the qubit, in frequency domain, under the influence of the quantized resonator and of the strong microwave drive. We find distinctive features of the entangled driven qubit-resonator spectrum, namely resonant features and avoided crossings, modified by the presence of the dissipative environment. The magnitude, positions, and broadening of these features are determined by the interplay among qubit-oscillator detuning, the strength of their coupling, the driving amplitude, and the interaction with the heat bath. This work establishes the theoretical basis for future experiments in the driven ultrastrong-coupling regime.