Bright sources for quantum microwaves by dc-biased superconducting circuits

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Creating quantum microwaves is key to several quantum communication technologies. However, in contrast to optical light, they are rather difficult to produce and they are rather difficult to detect. In the last years in extending set-ups of circuit quantum electrodynamics (cQED), devices combining Josephson junctions and microwave cavities have turned out as versatile, remarkably simple, and very bright sources for various sorts of non-classical radiation (Josephson Photonics). This includes anti-bunched [1, 2] and bi-partite entangled microwave photons [3, 4] and, very recently, the emission of photon multiplets with up to six photons [5]. Crucial for this progress is the tailoring of the effective fine structure constant of quantum electrodynamics in the circuits to be of order 1. In this talk, I will provide an overview about the theoretical framework and then discuss specific examples including quantum synchronization [6].

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