Strongly driven multi-photon processes in artificial and real systems

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A ***graph-theoretical formalism*** is presented to study the generic circuit quantum electrodynamics systems consisting of an ***artificial atom*** coupled with a multi-mode resonator. This method is used to reveal the mechanism of the experimental observation of two distinct quantum interference patterns in the absorption spectra when a transom superconducting qubit is subject to a bichromatic microwave field with same Rabi frequencies (figure). A ***Bohmian mechanics*** approach is introduced to study the quantum electron trajectory of ***realistic atoms and molecules*** under intense laser fields. This method is used to explore the sub-cycle multiphoton ionization dynamics of hydrogen atom, the mechanism of the multiple plateau generation and the cutoff extension, as the characteristic features of high order harmonic generation spectrum from atomic systems, as well as the below-threshold even-harmonic generation of the H^{2+} molecular ion.

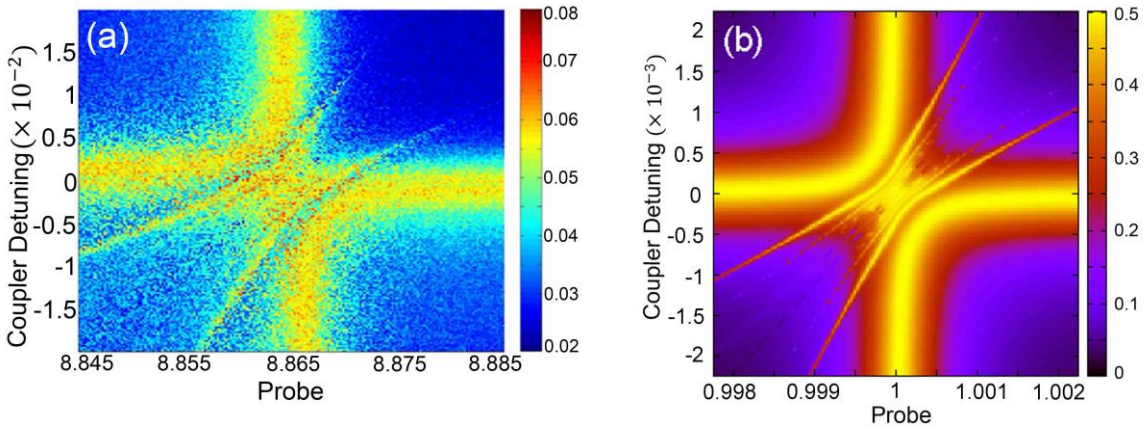

Figure: (a) Experimental measurement of the single-photon transitions in a Transmon superconducting qubit. **(b)** Two-mode Floquet result of the transverse coupling of a two-level system with the bichromatic external field.