

Probing higher-order transitions through scattering of microwave photons in the ultrastrong-coupling regime of circuit QED

Guan-Ting Chen¹

¹*Department of Physics, National Cheng Kung University, Tainan 70101, Taiwan*

Higher-order transitions can occur in the ultrastrong-coupling regime of circuit QED through virtual processes governed by the counter-rotating interactions. We propose a feasible way to probe higher-order transitions through the scattering of propagating microwave photons incident on the hybrid qubit-cavity system. The lineshapes in the scattering spectra can indicate the coherent interaction between the qubits and the cavity, and the higher-order transitions can be identified in the population spectra. We further find that if the coupling strengths between the two qubits and the cavity are tuned to be asymmetric, the dark antisymmetric state with the Fano-lineshape can also be detected from the variations in the scattering spectra.

-
- [1] G.-T. Chen, P.-C. Kuo, H.-Y. Ku, G.-Y. Chen, and Y.-N. Chen *Probing higher-order transitions through scattering of microwave photons in the ultrastrong-coupling regime of circuit QED*, arXiv:1805.08445 (2018).