

Joint CQSE and CASTS Seminar

2018
Nov. 2, Friday

TIME Nov. 2, 2018, 14:30 ~ 15:30
TITLE Quantum computing and quantum optics with superconducting circuits
SPEAKER Prof. Io-Chun Hoi
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PLACE Rm716, CCMS & New Physics Building, NTU

Abstract

In this talk, I will address quantum computing and quantum optics with superconducting circuits. In the first part of the talk, I will introduce the basic concepts of quantum computing, recent developments, decoherence and how to construct simple quantum algorithm with superconducting circuits. In the second part of the talk, I will address quantum optics with superconducting artificial atom. In particular, we embed a transmon at a distance from the end (mirror) of a transmission line [1]. By tuning the wavelength of the atom, we effectively change the normalized distance between atom and mirror, allowing us to effectively move the atom from a node to an antinode of the vacuum fluctuations. We probe the strength of vacuum fluctuations by measuring spontaneous emission rate of the atom. In the next experiments, we strongly couple a transmon to the field in a semi-infinite waveguide. When driving the qubit strongly on resonance such that a Mollow triplet appears, we observe a few percent amplitude gain for a weak probe at frequencies in between the triplet [2]. This amplification is not due to population inversion, but instead results from a four-photon process that converts energy from the strong drive to the weak probe.

[1] I.-C. Hoi et al. Nature Physics 11, 1045 (2015)

[2] P. Y. Wen et al. Physical Review Letters 120, 063603 (2018)

