18 Dec **Saturday** **1:30 – 2:15** **Chair: GAO Weibo (高炜博)**

Towards Universal Quantum Computation with Bosonic Qubits

Professor GAO, Yvonne (高媛), National University of Singapore, Singapore

Professor GAO, Yvonne is a Principal Investigator in the Centre for Quantum Technologies and a Presidential Young Professor in the Department of Physics, National University of Singapore. Her team works on building robust quantum hardware using superconducting microwave circuits. Their devices provide useful avenues to develop novel techniques for quantum information processing as well as to explore interesting effects in quantum physics. Yvonne is a recipient of the Singapore National Research Foundation (NRF) Fellowship and MIT Tech Review's Innovator's Under 35 (Asia-Pacific) award.

Abstract:

The realisation of robust universal quantum computation with any platform ultimately requires both the coherent storage of quantum information and (at least) one entangling operation between individual elements. The use of multiphoton states encoded in superconducting microwave cavities as logical qubits is a promising route to preserve the coherence of quantum information against naturally-occurring errors. However, operations between such encoded qubits can be challenging due to the lack of intrinsic coupling between them.

In this talk, I will discuss the recent experimental work on engineering a coherent and tunable bilinear coupling between two otherwise isolated microwave quantum memories in a three-dimensional circuit QED architecture. Building upon this coupling, we also demonstrate programmable interference between stationary quantum modes and realise robust entangling operations between two encoded qubits. Our results provide a crucial primitive for universal quantum computation using bosonic modes.