



THE CHINESE UNIVERSITY OF HONG KONG
Department of Physics
SEMINAR

Quantum Sensing, Simulation and Memory with Cavity-Mediated Interactions

by

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Time: 2:45 - 3:45 pm

Place: Rm G25, Science Centre North Block, CUHK

ALL INTERESTED ARE WELCOME

Abstract

Large ensembles of atoms coupled to resonators are powerful platforms for quantum sensing, simulation and networking. In this seminar, I will first present my Ph.D. research which focused on a system with cold atom coupled to an optical cavity. In this system, I have explored various tools in which novel cavity-mediated interactions between matter waves can be utilized to enhance the capability of quantum sensing and simulations. These tools include the first entanglement-enhanced matter-wave interferometer, a novel momentum-exchange interactions in a Bragg atom interferometer that suppresses Doppler dephasing, the first demonstration of the long-sought two-axis counter-twisting dynamics and the realization of unique three and four-body interactions for the first time. During my postdoctoral research, I have been working on cavity-QED in a solid-state system with rare-earth ions doped crystals coupled to a microwave resonator. Inspired by my Ph.D. work, we demonstrated all-to-all spin-exchange interaction in a solid-state platform for the first time. With the emerging many-body energy gap, we realized an on-demand coherence-protected spin memory, paving the way for future long-lived microwave spin memories for superconducting qubits.