中央大學物理學系

Department of Physics, National Central University

Colloquium

New platforms for quantum technology: Towards hybrid atom-nanophotonics and superradiant optical atomic clocks

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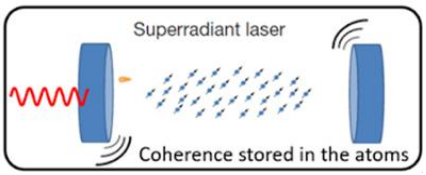

Date: 2026/03/17 (Tue)
Venue: S4-625
Time: 14:00

Abstract :

Harnessing the coherence of cold ytterbium atom qubits together with long-range, photon-mediated interactions enabled by cavities or nanophotonics opens promising new frontiers for quantum technology. In this talk, I will describe two platforms that we are developing at IAMS.

The first is a hybrid atom-nanophotonic system that unites three core ingredients. First, the exceptional coherence and “native” telecom-band transitions of neutral ytterbium qubits. Second, a lattice - tweezer architecture that could enable the creation and control of large-scale, defect-free atomic qubit arrays with subwavelength geometries. Third, a simple optical nanofiber “bus” that can mediate strong, tunable, effectively infinite-range interactions between distant atoms along a nanofiber or remotely. I will highlight both the challenges and opportunities offered by this hybrid approach and discuss its potential for advancing distributed quantum information technology.

Quantum sensors based on superradiant optical clocks have been proposed not just as next generation transportable time and frequency standards but also as high bandwidth precision quantum sensors. I will introduce a new platform that we are developing that aims to demonstrate the world’s first continuous superradiant optical atomic clock, a superradiant laser operating on the ytterbium millihertz transition.