RIKEN QUANTUM COMPUTING

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28th RQC Colloquium

Quantum systems and devices built of ultracold atoms and light

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November 6, 2024(Wed) 16:00–17:00(JST)

This colloquium will be held in **HYBRID** format.

On-site Venue: Wako C00 HQ 2F Large Meeting Room

Online Venue: Zoom. To receive the link, register in advance at https://krs2.riken.jp/m/rqc_registration_form

By placing ultracold atoms within an optical cavity, we couple a many-body quantum system with a single mode of light. This light serves a dual role, both as ‘‘force carrier’’ that drives the atoms coherently, and also as an information carrier that by which we can measure the quantum system, potentially in vivo. I will discuss experiments performed on optical cavities containing either large atomic ensembles or mesoscopic atomic systems constructed atom-by-atom using optical tweezer arrays. Within this setting, we realize fast high-fidelity measurements on single atoms, a prelude to quantum error correction within a quantum information processor. We explore autonomous feedback stabilization of quantum systems. Lastly, we explore the collective coupling of a mesoscopic atom array to cavity light, observing a symmetry-breaking phase transition and hallmarks of mesoscopic physics. I will conclude with a few words describing the Challenge Institute for Quantum Computation, one of the academic quantum centers established as part of the US National Quantum Initiative.