

Photonic Quantum Sensing SEMINAR

Towards photonic cluster state generation at the telecom wavelength

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Date

Mon. November 10, 2025

Time

14:00-15:30

Hybrid

A1-313, Katsura campus/ Zoom

Registration

<https://x.gd/mWcut>

**Deadline:
Nov. 6**

In recent years, it has been demonstrated that semiconductor quantum dots can act as deterministic sources of quantum light. An advanced demonstration is the generation of polarization-entangled photonic cluster states, a useful resource for quantum computing [1,2]. While this demonstration used an emission wavelength in the 900 nm range, many practical applications require a longer wavelength. For example, applications that involve silicon photonic quantum integrated circuits or optical fibers to minimize losses. For both, the wavelength of 1550 nm is well suitable.

In this talk, I will present our recent progress towards demonstrating a cluster state generation protocol using telecom-emitting quantum dots. In particular, we use an InAs/InAlGaAs quantum dot incorporated in a circular Bragg grating ('Bullseye') microcavity. We will present spin initialization and readout experiments based on a confined hole, and describe the pulse sequence needed to implement cluster state generation. Finally, we will share recent three-photon correlation results on the path to obtaining a full tomography of the process.

- [1] I. Schwartz, D. Cogan, E. R. Schmidgall, Y. Don, L. Gantz, O. Kenneth, N. H. Lindner, and D. Gershoni, Deterministic generation of a cluster state of entangled photons, *Science* 354, 434 (2016).
[2] D. Cogan, Z.-E. Su, O. Kenneth, and D. Gershoni, Deterministic generation of indistinguishable photons in a cluster state, *Nat. Photon.* 17, 324 (2023).

Organizer: Photonic Quantum Sensing Science and Engineering Center

Co-organizer: ERATO Takeuchi, QLEAP, WISE Program "Innovation of Advanced Photonic and Electronic Devices", Kyoto University

Chair: Shigeki Takeuchi (Department of Electronic Science and Engineering, Kyoto University)

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