

# Bose-Einstein Condensation of Photons in a Four-Site Quantum Ring

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Thermalization of radiation by contact to matter is a well-known concept, but the application of thermodynamic methods to complex quantum states of light remains a challenge. Here we observe Bose-Einstein condensation of photons in the hybridized ground state of a four-site ring-shaped potential with coherent tunnel couplings [1]. In our experiment, the periodically-closed ring lattice superimposed by a weak harmonic trap for photons is realized inside a spatially structured dye-filled microcavity. Photons thermalize to room temperature, and above a critical photon number macroscopically occupy the symmetric linear combination of the site eigenstates with zero phase winding, which constitutes the ground state of the system. The mutual phase coherence of photons at different lattice sites is verified by optical interferometry.

## References

- [1] A Redmann, C Kurtscheid, N Wolf, F Vewinger, J Schmitt and M Weitz, arXiv:2312.14741 (2023)