TECHNOLOGY

Engineering Thermalization and Chemical Potential for Photons

OVERVIEW

Background:
Due to the lack of photon number conservation, in thermodynamics of photons, the chemical potential is absent. However, having a non-zero chemical potential is crucial in understanding a wide variety of single and many-body effects, from transport in conductors and semi-conductors to phase transitions in electronic and atomic systems.

Innovation:
Researchers at the University of Maryland have developed a method to solve the issue of chemical potential and thermalization in photonic systems. By using a direct modification of the system-bath coupling via parametric oscillation, researchers have created an effective chemical potential for photons even in the thermodynamic limit. This approach allows one to build from well-established theoretical tools for non-equilibrium problems with chemical potential imbalances, like the ones that occur in circuits and cold atom systems, rather than the thornier problems associated with driven steady-state systems more typical to the quantum optical domain.

APPLICATIONS

· Quantum simulation
· Quantum state and bath engineering
· Electron-like circuits with light

ADVANTAGES

· Feasible using current technology: circuit-QED and optomechanics

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Additional Information

INSTITUTION

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PATENT STATUS

Pending

CATEGORIES

- Engineering

- Chemical

EXTERNAL RESOURCES

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