

Abstract Submitted
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Phase Diagram of A Multi-connected Superconducting Jaynes-Cummings Lattice at Commensurate and Incommensurate Fillings¹

KANGJUN SEO, LIN TIAN, School of Natural Sciences, University of California, Merced, CA 95343, USA — A multi-connected superconducting Jaynes-Cummings lattice can be constructed with alternatively-connected superconducting qubits and resonators. In a one-dimensional configuration, this model bears an intrinsic symmetry between the left and the right qubit-resonator couplings. Here we study the quantum phase transition of this model using the exact diagonalization method. At commensurate fillings, the off-diagonal long range order of the single-particle density matrix and the energy gap are calculated. We obtain the phase diagram of this model, which demonstrates a symmetry between the couplings and a reentry to the Mott insulator phase. For a system with given chemical potential, the density of the excitations contains integer-valued plateaus between critical chemical potentials that define the boundaries of different many-body phases and indicate the phase transition. We also discuss the implementation of this model with superconducting devices, including the state preparation and detection schemes.

[1] K. Seo and L. Tian, eprint arXiv:1408.2304.

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