

Efficient Quantum Circuit for the Block Encoding of a Pairing Hamiltonian (25+5)

Monday, January 13, 2025 12:00 PM (30 minutes)

We present an efficient quantum circuit for block encoding a pairing Hamiltonian often studied in nuclear physics. Our block encoding scheme does not require mapping the creation and annihilation operators to the Pauli operators and representing the Hamiltonian as a linear combination of unitaries. Instead, we show how to encode the Hamiltonian directly using controlled swap operations. We analyze the gate complexity of the block encoding circuit and show that it scales polynomially with respect to the number of qubits required to represent a quantum state associated with the pairing Hamiltonian. The techniques presented can be extended to encode more general second-quantized Hamiltonians.

Primary author: YANG, Chao (Lawrence Berkeley National Laboratory)

Presenter: YANG, Chao (Lawrence Berkeley National Laboratory)

Session Classification: Session 1