

## Numerical Simulation Solution of the BCS Pairing Problem

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(Received: 2004-11-22; Revised: )

**Abstract:** We propose a new simulation computational method to solve the reduced BCS Hamiltonian based on spin analogy and submatrix diagonalization. Then we further apply this method to solve superconducting energy gap and the results are well consistent with those obtained by Bogoliubov transformation method. The exponential problem of  $2^N$ -dimensional matrix is reduced to the polynomial problem of  $N$ -dimensional matrix. It is essential to validate this method on a real quantum computer and is helpful to understanding the many-body quantum theory.

PACS: 74.20.Fg, 03.67.Lx

Key words: BCS theory, quantum simulation

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