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基于量子计算的 SU(2) 规范理论中的手性不平衡研究

We implement a variational quantum algorithm to investigate the chiral condensate in a 1+1 dimensional SU(2) non-Abelian gauge theory. The algorithm is evaluated using a proposed Monte Carlo sampling method, which allows the extension to large qubit systems. The obtained results through quantum simulations on classical and actual quantum hardware are in good agreement with exact diagonalization of the lattice Hamiltonian, revealing the phenomena of chiral symmetry breaking and restoration as functions of both temperature and chemical potential. Our findings underscore the potential of near-term quantum computing for exploring QCD systems at finite temperature and density in non-Abelian gauge theories.

Primary authors: 张, 国丰 (South China Normal University); 郭, 星雨; 王, 恩科; 邢, 宏喜

Presenter: 张, 国丰 (South China Normal University)

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