Contribution ID: **223** Type: **Parallel Talk**

Digital Quantum Simulation for the Spectroscopy of Schwinger Model

Thursday, 3 August 2023 13:30 (20 minutes)

This talk will discuss a method for computing the energy spectra of quantum field theory utilizing digital quantum simulation. A quantum algorithm called coherent imaging spectroscopy quenches the vacuum with a time-oscillating perturbation and reads off the excited energy levels from the loss in the vacuum-to-vacuum probability following the quench. As a demonstration, we apply this algorithm to the (1+1)-dimensional quantum electrodynamics with a topological term known as the Schwinger model, where the conventional Monte Carlo approach is practically inaccessible. In particular, on a classical simulator, we prepare the vacuum of the Schwinger model on a lattice by adiabatic state preparation and then apply various types of quenches to the approximate vacuum through Suzuki-Trotter time evolution. We compare the simulation result with exact diagonalization and the continuum limit expectation. We discuss its dependence on the types of quenches as well. Furthermore, we estimate the computational complexity required to obtain physically reasonable results and conclude that the method is likely efficient in the coming era of early fault-tolerant quantum computers.

Topical area

Quantum Computing and Quantum Information

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