

Digital Quantum Simulation of the Schwinger Model with Theta Term via Adiabatic State Preparation

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We perform a digital quantum simulation of the Schwinger model with the theta term, which is practically inaccessible by standard lattice Monte Carlo simulations. We construct the true vacuum state of a lattice Schwinger model using adiabatic state preparation which, in turn, allows us to compute an expectation value of the fermion mass operator with respect to the vacuum. Upon taking a continuum limit we find that our result in massless case agrees with the known exact result. In massive case, we find an agreement with mass perturbation theory in small mass regime and deviations in large mass regime. We estimate computational costs required to take a reasonable continuum limit.

Primary author: HONDA, Masazumi (Yukawa Institute for Theoretical Physics)

Co-authors: CHAKRABORTY, Bipasha; KIKUCHI, Yuta; IZUBUCHI, Taku; TOMIYA, Akio

Presenter: HONDA, Masazumi (Yukawa Institute for Theoretical Physics)

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