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CP-violating Dashen phase transition in the two-flavor Schwinger model: a study with matrix product states

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We numerically study the Hamiltonian lattice formulation of the Schwinger model with two fermion flavors using matrix product states. Keeping the mass of the first flavor at a fixed positive value, we tune the mass of the second flavor through a range of negative values, thus exploring a regime where conventional Monte Carlo methods suffer from the sign problem. Our results show signatures of a phase transition at the point where the absolute values of both masses are equal. Moreover, we observe the formation of a condensate, thus indicating that the observed transition is the analog of the CP-violating Dashen phase transition in QCD.

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