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Real time evolution of a SU(2) pure gauge lattice theory on a IBM quantum hardware

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Quantum computers have the potential to expand the utility of lattice gauge theory to investigate non-perturbative particle physics phenomena that cannot be accessed using a standard Monte Carlo method due to the sign problem. Thanks to the qubit, quantum computers can store Hilbert space in a more efficient way compared to classical computers. This allows the Hamiltonian approach to be computationally feasible, leading to absolute freedom from the sign-problem. But what the current noisy intermediate scale quantum hardware can achieve is under investigation. Therefore, in this talk we report the use of a IBM gate-based quantum hardware to perform the time evolution of a SU(2) pure gauge lattice theory in its Hamiltonian formulation. The quantum computer results agree with the exact classical results thanks to the use of various simple error mitigation techniques, like mitigation of measurement error, randomized compiling, zero noise extrapolation and our technique called Self-mitigation. The talk will be based on https://arxiv.org/abs/2205.09247.

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