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QFT at real time with today's NISQ quantum computers[1] YANNICK MEURICE, ERIK GUSTAFSON, Univ of Iowa, PATRICK DREHER, North Carolina State University — Using quantum computers to perform ab-initio calculations of the real-time evolution of quarks and gluons with lattice quantum chromodynamics is a long-term goal with potentially high impact on the interpretation of particle collider experiments. Currently available NISQ machines only allow us to study the real-time evolution for very simple quantum field theory models such as the quantum spin or gauge Ising models in small spatial volumes. We discuss how the successful roadmap starting with these simple models and leading to lattice QCD calculations of masses and form factors using Euclidean time and importance sampling can be adapted to the problem of real-time evolution. We report on recent quantum computations of real-time evolution for a quantum Ising model on three different IBMQ computers. We show that a metric that we proposed demonstrates significant progress for the most recent machines. We discuss a new method to estimate phase shifts from the early stage of a scattering process. We report on our most recent results with NISQ quantum computers at the time of the conference.

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