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Simulation of the 1D lattice Schwinger model on a trapped-ion quantum computer NHUNG HONG NGUYEN, Joint Quantum Institute, Department of Physics,University of Maryland, College Park, MD 20742, USA, ANDREW SHAW, Maryland Center for Fundamental Physics and Department of Physics,University of Maryland, College Park, MD 20742, USA, YINGYUE ZHU, CINTHIA HUERTA ALDERETE, Joint Quantum Institute, Department of Physics,University of Maryland, College Park, MD 20742, USA, ZOHREH DAVOUDI, Maryland Center for Fundamental Physics and Department of Physics, University of Maryland, College Park, MD 20742, USA, NORBERT LINKE, Joint Quantum Institute, Department of Physics,University of Maryland, College Park, MD 20742, USA — Simulating lattice gauge theories is a promising application of quantum computers. The Schwinger model (1+1D QED) is a simple but insightful lattice gauge model that can be used as a testbed for different quantum hardware. By taking advantage of long-range interactions and the high level of control offered by trapped ion systems, the bosonic gauge degree of freedom can be mapped to spin-spin interactions, allowing the simulation of the full Hilbert space of the Schwinger model. In this talk, we introduce our trapped ion quantum computer and present recent results from simulating the dynamics of one, two and three spatial sites for this model using a fully digital approach. The dynamics of the system are studied by probing the vacuum persistent amplitude, the particle density and the electric field density. We discuss the effect of term ordering in Trotter expansion of the time evolution operator and noise mitigation used for the experiment.

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