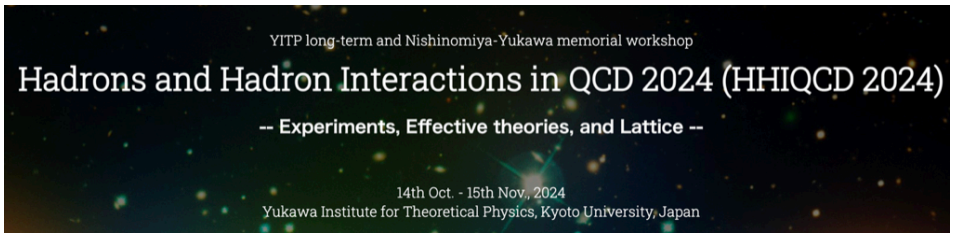

Contribution ID: **59** Type: **5th week (Formal developments and other frontiers in lattice QCD)**

Simulating Floquet scrambling circuits on trapped-ion quantum computers

Thursday, November 14, 2024 12:30 PM (30 minutes)

Complex quantum many-body dynamics spread initially localized quantum information across the entire system. Information scrambling refers to such a process, whose simulation is one of the promising applications of quantum computing. We demonstrate the Hayden-Preskill recovery protocol and the interferometric protocol for calculating out-of-time-ordered correlators to study the scrambling property of a one-dimensional kicked-Ising model on 20-qubit trapped-ion quantum processors. The simulated quantum circuits have a geometrically local structure that exhibits the ballistic growth of entanglement, resulting in the circuit depth being linear in the number of qubits for the entire state to be scrambled. We experimentally confirm the growth of signals in the Hayden-Preskill recovery protocol and the decay of out-of-time-ordered correlators at late times. As an application of the created scrambling circuits, we also experimentally demonstrate the calculation of the microcanonical expectation values of local operators adopting the idea of thermal pure quantum states.

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Session Classification: 1-day workshop (5th week)