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Demonstration of a scalable single-qubit gate architecture for neutral atoms KRISH KOTRU, JONATHAN KING, BRIAN LESTER, COLM RYAN, PETER BATTALIGNO, ROBIN COXE, STANIMIR KONDOV, MICKEY MCDONALD, REMY NOTERMANS, ALEXANDER PAPAGEORGE, PRASAHNT SIVARAJAH, BENJAMIN BLOOM, Atom Computing, Inc, ATOM COMPUTING, INC. TEAM — Development of neutral-atom qubit platforms has progressed at a breakneck pace over the past several years, including improvements to quantum non-demolition readout fidelity, control over Rydberg interactions, and spatial manipulation of large atom arrays. However, many prior demonstrations of gates with neutral atoms have used global addressing of the atom array, which forces gate operations to be serialized. We present a method for single-qubit gates in strontium that affords single-site addressability as well as amplitude, phase, and frequency control for each qubit. Additionally, our approach capitalizes on the long coherence times of nuclear-spin states and leverages RF techniques developed by the superconducting josephson-junction community. We aim to scale this gate to large qubit arrays in a parallelizable, hardware-efficient manner.

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