

Abstract Submitted
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A Midscale Quantum Computer Based on Trapped Ions¹ MARKO CETINA, LAIRD EGAN, ANDREW RISINGER, DAIWEI ZHU, DEBOPRIYO BISWAS, CRYSTAL NOEL, Joint Quantum Institute, University of Maryland Department of Physics, CHRISTOPHER MONROE, Joint Quantum Institute, University of Maryland Department of Physics and IonQ, Inc. — In collaboration between universities and industrial partners, we have constructed a trapped ion-based quantum computer with the goal of realizing an error-corrected quantum bit and alternatively algorithms that do not need error correction. We report on the performance of our system, including fidelities of single-qubit and two-qubit gates and its operation with long and mixed-species ion chains. We present the building blocks of a logical qubit in our system, including qubit encoding, operation of logical gates, and stabilizer measurements, and discuss the progress towards implementing the full error correction algorithm as well as other applications.

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