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QSCOUT: An Open Quantum Computing Testbed with Low-Level Access to the Hardware and Software (Part I)

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At Sandia National Laboratories, QSCOUT (the Quantum Scientific Computing Open User Testbed) is an open quantum computing testbed based on Yb-171 trapped ions. Distinct from most commercial platforms, we offer users flexible and transparent control over the qubits as well as the ability to craft gates at the fundamental pulse level. To do this, we use our custom-developed programming language Jaqal (Just Another Quantum Assembly Language), consisting of a package of schedulable native operations that includes the full parameterization of single qubit rotation gates and the two-qubit Mølmer-Sørensen (MS) gate. Here, we discuss how we employ both the QSCOUT hardware and the Jaqal software to offer users unique low-level access to the experiment for their quantum computing applications. We present current capabilities offered on the system as well as future integrations and developments.

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