

Quantum Scientific Computing Open User Testbed (QSCOUT)

Now Accepting Collaboration Proposals

April 2021

Please see website: https://www.sandia.gov/quantum/Projects/QSCOUT_Call2021.html

Proposals due **June 18, 2021**, at 11 pm MDT (UTC-6)

Experiments expected to start **August 2021**. There is no guarantee that the system is available at that time.

The Quantum Scientific Computing Open User Testbed (QSCOUT) is a 5 year DOE program to build a quantum testbed based on trapped ions that is available to the research community. As an open platform, it will not only provide full specifications and control for the realization of all gate-level quantum and classical processes, it will also enable researchers to investigate, alter, and optimize the pulse level gate implementations of the testbed and evaluate more advanced gate implementations of quantum operations.

QSCOUT will be made operational in stages, with each stage adding more ion qubits, greater classical control, and improved fidelities. We are excited to collaborate with the broad quantum computing community.

Who can be a QSCOUT User – Individuals and teams from industry, academia, and government institutions from around the world are invited to submit proposals to use the QSCOUT testbed. As a DOE funded testbed, QSCOUT provides access to its staff and quantum computing resources at no fee to approved users for non-proprietary quantum information processing research.

What will be available – The QSCOUT testbed is based on hyperfine clock-state qubits stored in trapped ytterbium-171 ions. A quantum register is realized by a chain of ions trapped in a microfabricated surface ion trap. Single and two-qubit gates are realized using individually addressing Raman beams.

Specifications:

- Yet unspecified number of qubits (between 5 and 11)
- Single qubit gates, both individual and parallel addressing possible (expected 10 μ s, 99.5% fidelity)
- Sequential two-qubit Mølmer-Sørensen gates (expected 100 μ s, 98% fidelity)
- Two-qubit gates can be between any pair of ions (fully connected)
- Beginning of circuit: all ions prepared in the $|0\rangle$ state of the z-basis

- End of circuit: all ions measured in the z-basis

More details:

- 80 hours of runtime per user
- Users shall program their circuits in Jaqal (Just Another Quantum Assembly Language), available here: https://www.sandia.gov/quantum/Projects/QSCOUT_Jaqal.html and may write custom pulse-level gates using [JaqalPaw \(Pulses and Waveforms\)](#)
- Transpilers from other quantum languages to Jaqal are available [here](#)

Scientific expertise at Sandia – Use of the QSCOUT system will be in collaboration with Sandia Scientists who will help users implement their quantum computation, advise on the optimization of quantum programs for the QSCOUT system, and collaborate with users to understand the performance of the testbed system.

How to apply – Access to QSCOUT is obtained by submitting a QSCOUT collaboration proposal. These proposals are a concise statement of research that you desire to perform in collaboration with Sandia scientists using the QSCOUT platform. Potential users are encouraged to contact qscout@sandia.gov at any time during the proposal process to discuss requirements, collaborative efforts, and capabilities of the testbed system.

Proposal contents – Proposals must use the provided template and contain:

- A cover page stating title of proposal as well as name, affiliation, and contact information of the proposer
- A description of the proposed work containing (maximum 3 pages, letter sized, 11pt font, 1” margins on all sides):
 - A statement of the scientific question being addressed in this collaboration proposal.
 - A brief description of the state of research in this area and how the proposed work is advancing the field.
 - Required capabilities and a reason why the QSCOUT testbed is the best system to conduct the proposed research.
 - A statement of the expected impact of the proposed work.
 - Figures supporting the description of proposed work.
- References (maximum 1 page)

A template for proposals is available in [MS Word](#) and [Latex](#)

Proposal selection – Proposals will be internally screened for feasibility to realize the proposed work on the testbed system and prioritized by a review panel based upon scientific merit and suitability of the proposed research for QSCOUT. The review panel will consist of scientists external to the QSCOUT project. Collaborative proposals with QSCOUT scientists are encouraged. Approved proposals will receive up to 80 hours of execution time on the testbed. An executed user agreement between Sandia National Laboratories and the user institution(s) must be in place prior to starting the approved project. Sample user agreement templates are available

for [Private Companies](#), [Universities](#), and [National Labs](#). *Please make sure your institution can sign them as is.* The project results should be published in peer-reviewed technical publications acknowledging use of the QSCOUT testbed. Joint publications with Sandia scientists are encouraged. Proposers not selected for access will be given brief feedback. Users will get a period of exclusive access to data produces for their projects, after which all QSCOUT user data will be made publicly available, if possible.

User proposal submissions – Please send your proposal for user access in Portable Document Format (pdf) to qscout@sandia.gov by the submission deadline, June 18 at 11pm MDT (UTC-6). For questions please email qscout@sandia.gov.

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