

EVIDENCED / CURRENT • CONTROLLED SIMULATION

Keelo Quantum Simulation Defensible Test Report

QGP 01 | Quantum derived candidates and execution authority enforcement

Document control	Record
Proof identifier	QGP-01-QUANTUM-SIMULATION
Report version and date	1.0 9 October 2026
Record owner	Urbyte Pty Ltd
Run window	9 October 2026, 08:02:10–08:02:39 AEDT 8 October 2026, 21:02:10–21:02:39 UTC
Evidence base	[REDACTED source reference]
Classification	PASS within the defined controlled test scope

Executive finding

Keelo enforced current execution authority over candidates produced by an ideal quantum circuit simulation. All 40 normal control cases passed. Permission withdrawal blocked all 32 affected requests before a receiving effect. The eight permitted requests executed once each. All 40 completed requests retained their outcomes across fresh process replay without another connector call.

CONTROLLING CONCLUSION
The evidence demonstrates permission enforcement and completed replay for one control family using quantum simulated inputs. It does not establish quantum hardware execution, quantum speed advantage or customer production deployment.

Results at a glance

Measure	Recorded result
Normal cases passed	40 / 40
Withdrawn permission effective executions	0 / 32
Permitted effective executions	8 / 8, one each
Completed fresh process replays	40, with 0 connector calls
Deliberate bypass control	1 injected effect detected, outside normal cases

Quantum simulation method

The simulation models a three workload partitioning problem. Each workload is assigned to one of two groups. The objective rewards separating linked workloads, using link weights of 3, 2 and 1. This is a toy weighted MaxCut problem, with no customer allocation data or measured savings.

Component	Implemented method
Quantum algorithm	Quantum Approximate Optimisation Algorithm, one layer, QAOA p=1
Circuit size	3 qubits and 8 possible measurement outcomes
State preparation	Hadamard gates prepare superposition
Cost and mixer layers	RZZ rotations encode weighted links; RX rotations mix candidate states
Parameter selection	Classical grid search over 48×24 parameter pairs, 1,152 circuit evaluations
Selected angles	Gamma 4.581489286485115; beta 2.4870941840919194 radians
Measurement sampling	4,096 samples from calculated quantum probabilities; seed [REDACTED seed]
Keelo input selection	First 40 measurements in order, without filtering for the best score

Measured optimisation record

Metric	Result
Calculated expected objective score	4.39346405323128
Uniform distribution expected score	3
Exact optimum from classical enumeration	5
Optimum score measurements	2,719 / 4,096, approximately 66.38%
Probability normalisation	1.0000000000000009
Reference maximum probability discrepancy	$1.6653345369377348 \times 10^{-16}$

What the seed controls

The seed makes measurement sampling repeatable. It does not provide the circuit with the optimum or supply expected pass outcomes to Keelo. The circuit probabilities determine sampling. The checker evaluates outcomes separately. Classical enumeration establishes the reporting benchmark, and the classical parameter search selects circuit angles.

NUMERICAL VALIDATION

A separate NumPy calculation uses the direct cost Hamiltonian and a tensor product mixer rather than the simulator gate functions. It agrees within the 10^{-12} threshold. Deliberately corrupted probability evidence was rejected. This is independent calculation within the proof, not third party assurance.

Execution control findings

Test sequence

Step	Observed test operation
01 Generate	Simulate the circuit and record amplitudes, probabilities and measurements.
02 Bind	Attach the measurement index and source job SHA-256 digest to each action request.
03 Wait	Record a pending execution obligation before releasing the authority check.
04 Change authority	Withdraw permission for 32 cases; retain it for eight comparison cases.
05 Enforce	Release the gate and observe connector calls, receiving effects, receipts and audit events.
06 Replay	Reconstruct the gateway in a fresh process and resubmit each completed request.

Outcome reconciliation

Control group	Expected	Observed
Permission withdrawn, 32 cases	0 effects	0 effects; 0 connector calls
Permission retained, 8 cases	8 effects	8 effects; one per request
Completed replay, 40 cases	No repeat effect	0 connector calls; unchanged receipts
Normal case checker	All pass	40 passed; 0 failed
Deliberate bypass outside Keelo	Checker rejects effect	1 injected effect; checker FAIL as intended

Withdrawn requests retained denied outcome receipts with FAILED status and ESCALATE remediation, plus an EXECUTION_DENIED audit event. The software status FAILED records a denied action. It is an expected successful control outcome in this test. Permitted requests retained SUCCEEDED receipts, verified against receiving file records by action identity and hash.

Meaning of replay

The replay returns the stored completed outcome. It does not grant permission for a new action or reassess a completed decision. The retained receipts were unchanged, authority checks were zero and unresolved execution counts were zero for these completed cases. This establishes completed replay, not recovery from a crash during an unfinished action.

RECEIVING BOUNDARY

Effective execution means a recorded effect in the controlled local file receiver. The negative control deliberately bypasses Keelo and demonstrates checker sensitivity to that injected effect. It does not prove that Keelo prevents every route outside its execution boundary.

Claim boundaries and next proving work

Maturity	Defensible statement
Evidenced/Current	Ideal gate level quantum simulation feeds measured candidates into Keelo. One authority withdrawal control family passes 40 cases. Completed replay preserves outcomes without repeated connector calls.
Next Proving Work	Recover and reconcile the original QG-01 to QG-22 definitions. Extend to changed conditions, uncertain outcomes, interruptions during execution, concurrent requests and unseen seeds. Broaden numerical comparisons and add noise only where required by the next claim.
Destination Case	Connect a real quantum service with retained provider job evidence. Prove scoped customer integration and operational behaviour before asserting production quantum capability.

Explicit limits

Boundary	Disclosure
Coverage	One control family. QG-01 remains a provisional local mapping. No claim that all 22 planned cases passed.
Environment	Ideal noiseless simulation and controlled file receiver. No QPU or customer infrastructure connection.
Optimisation	Toy three workload problem with classical parameter search. No quantum speedup or commercial savings conclusion.
Failure recovery	Fresh process replay of completed requests. No mid-execution crash or concurrent process proof in this run.
Assurance	Numerical reference and local checker, without independent third party validation.
Other test programmes	Rogue Fleet, mobility and data centre outcomes are separate evidence and are not quantum test results.

Evidence correction

The earlier [REDACTED source reference] contains ordinary synthetic candidates. It is a control baseline, not quantum simulation evidence. This report applies to [REDACTED source reference], which contains the gate level circuit simulator, quantum job record and numerical reference.

External disclosure statement

DEFENSIBLE EXTERNAL WORDING

In a controlled test, Keelo enforced execution authority over candidates from a three qubit QAOA simulation. All 40 normal cases passed. All 32 permission withdrawn requests produced zero effective executions, eight permitted requests executed once each, and 40 completed fresh process replays made no connector calls. The test used ideal simulation and a controlled file receiver.

Source and Status Register

Source	Supports	Status
[REDACTED source reference]	Run scope, timings, counts, result and limits	Captured run record
[REDACTED source reference]	Circuit, angles, amplitudes, probabilities, all measurements	Reproduced from supplied simulator
[REDACTED source reference]	Numerical agreement and corrupt evidence rejection	Reference rerun passed
[REDACTED evidence location] through case-39	Requests, authority, timeline, effects, audits, receipts and replay	All 40 result records checked
[REDACTED evidence location]	Injected bypass effect and checker rejection	Checker rerun detected effect
[REDACTED source reference]	Gate implementation, parameter search and sampling	Source hash matched
[REDACTED source reference] and [REDACTED source reference]	Keelo calls, authority gate, replay process and expected outcome checks	Source hashes matched
[REDACTED source reference]	Boundary check, strict typecheck and 764 tests across 85 files	Captured repository verification
[REDACTED source reference]	Scope correction, limitations and reproduction instructions	Bundle explanatory record

Verification provenance

The captured repository run reports 764 tests passed across 85 files, including six quantum gate and measurement checks. Boundary and strict type checks passed. Firestore integration tests were not rerun for the script only change. Core and runtime sources were reported unchanged. These repository checks are retained run evidence; the complete repository suite was not rerun for this report.

Report preparation reproduced the quantum job exactly, reran the NumPy reference, reran the case checker across all 40 saved results and the negative control, checked measurement and digest linkage, and matched five supplied source files to their recorded hashes. Core and runtime source hashes are retained in the bundle, without a fresh source comparison here.

Integrity identifiers

Tested base commit

[REDACTED integrity identifier]

Quantum job SHA-256

[REDACTED integrity identifier]

Evidence archive SHA-256

[REDACTED integrity identifier]

Reproduction requirement

[REDACTED internal reproduction instructions]