Benchmark Report

Benchmarking of NQCH's

November 8, 2025

1. Report of Changes

Platform: sinq20
Calibration-id: *2447f0fad33dfea493b4e7bc4143c8bd2e28d979*
Calibration date: *2025-11-05 08:58:37*
Calibration note: chore(sinq20): Retune CZ for Q5-Q6 and Q17-Q18

Experiment-id: *20251108115234*
Experiment date: *2025-11-08 11:54:43*
Experiment note: *First execution after malfunctioning of cables.*

Platform: sinq20
Calibration-id: *fdb93a3978fe6356741e31b98c93c68837767080*
Calibration date: *2025-09-19 10:30:45*
Calibration note: chore(sinq20): 1q tuneup, q11, q12, q18...

Experiment-id: *df31a65089fe*
Experiment date: *2025-10-20 10:30:45*
Experiment note: *Default scheduled run for sinq20.*

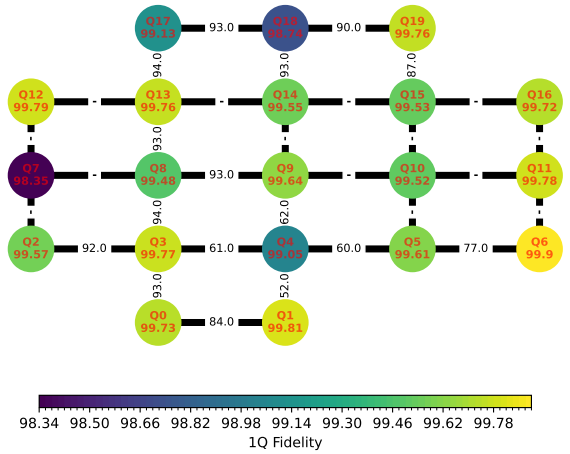
2. Version Comparison

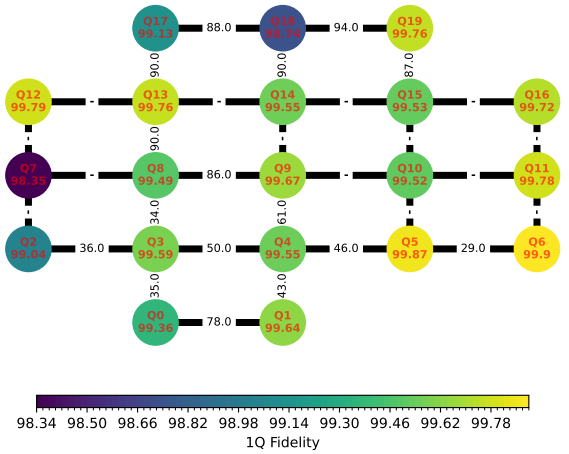
Library	Version	Library	Version
qibo	0.2.19	numpy	2.2.6
qibolab	0.2.9	qibocal	0.2.3
matplotlib	3.10.3	scipy	1.15.3
scikit-learn	1.6.1	pandas	2.2.3
networkx	3.4.2	sympy	1.14.0
torch	2.7.0		

Library	Version	Library	Version
qibo	0.2.19	numpy	2.2.6
qibolab	0.2.9	qibocal	0.2.3
matplotlib	3.10.3	scipy	1.15.3
scikit-learn	1.6.1	pandas	2.2.3
networkx	3.4.2	sympy	1.14.0
torch	2.7.0		

3. One and two qubit fidelities

The single qubit fidelity is obtained via Randomized-Benchmarking. The two-qubit fidelity is the "Bell-state fidelity".





4. Statistics

	Average	Median	Min	Max
T1 (ns)	1.28e+04	1.23e+04	646	3.65e+04
T2 (ns)	2.36e+25	4.11e+03	125	9.43e+26
Fidelity	None	None	None	None
RO fidelity	0.794	0.777	0.777	0.927

	Average	Median	Min	Max
T1 (ns)	1.28e+04	1.23e+04	646	3.65e+04
T2 (ns)	2.36e+25	4.11e+03	125	9.43e+26
Fidelity	None	None	None	None
RO Fidelity	0.794	0.777	0.777	0.927

5. Best Qubits Selection

k-qubits	Best Qubits	Fidelity
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A

k-qubits	Best Qubits	Fidelity
2	18, 19	0.940
3	14, 18, 19	0.922
4	17, 14, 18, 19	0.908
5	13, 17, 14, 18, 19	0.907

6. Benchmark Results

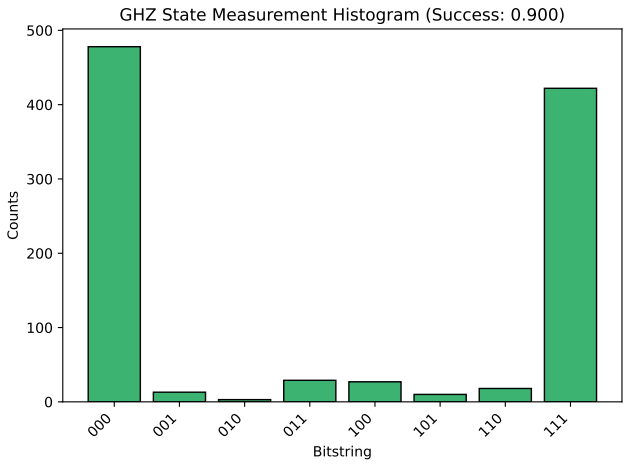
Qubit n	Fidelity	Error Bars

Qubit n	Fidelity	Error Bars

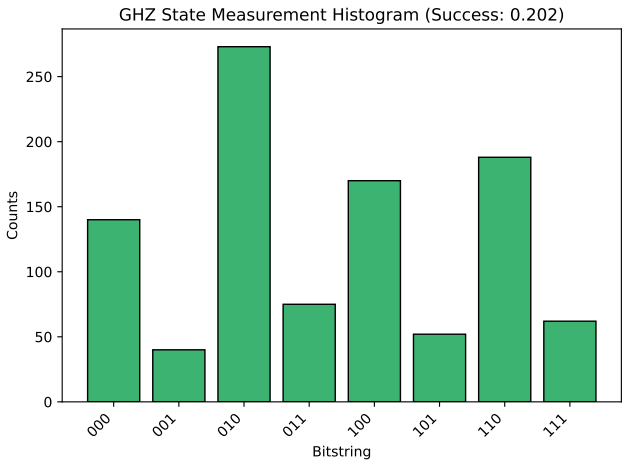
7. GHZ state preparation

GHZ circuit with 3 qubits executed on sinq20 backend with 1000 shots.

- **Runtime:** 4.32 seconds.
- **Qubits used:** [13, 17, 18]



- **Runtime:** 9.71 seconds.
- **Qubits used:** [13, 14, 17]

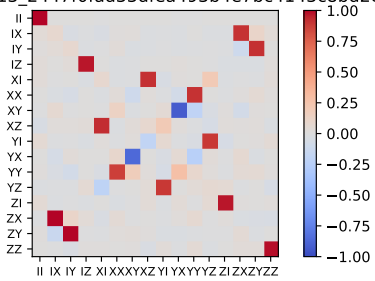


8. Process Tomography state preparation

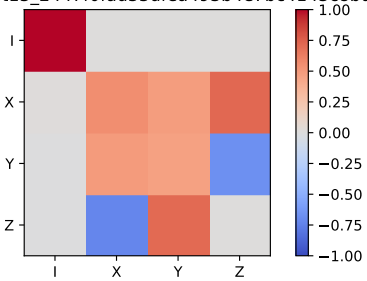
Process tomography involves preparing a circuit particular set of states, appending a gate (process) to the circuit, and measuring the circuit in the Pauli basis. The data is processed to get the Pauli Liouville representation of a process (gate). - Single qubit process tomography executed on qubits: [13, 17] - Two qubit process tomography on coupled qubits: [[17, 13]]

- **Runtime:** 705.76 seconds.
- **Qubits used:**

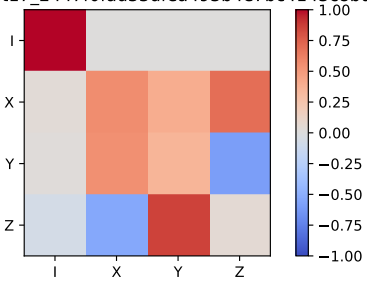
cz_[]_qubits17_13_2447f0fad33dfea493b4e7bc4143c8bd2e28d979



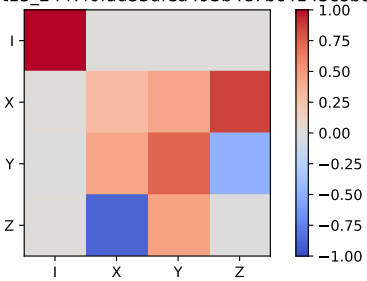
gpi2_[0.7854]_qubit13_2447f0fad33dfea493b4e7bc4143c8bd2e28d979



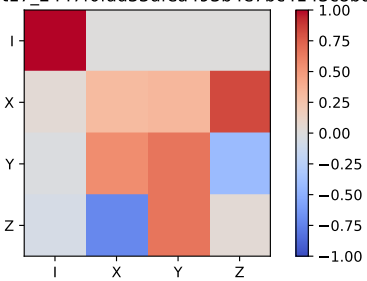
gpi2_[0.7854]_qubit17_2447f0fad33dfea493b4e7bc4143c8bd2e28d979



gpi2_[1.0472]_qubit13_2447f0fad33dfea493b4e7bc4143c8bd2e28d979

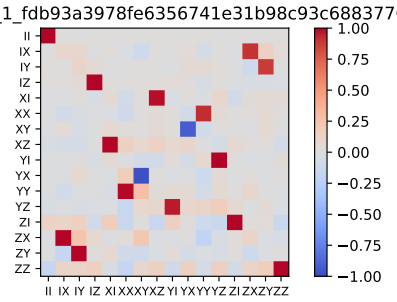


gpi2_[1.0472]_qubit17_2447f0fad33dfea493b4e7bc4143c8bd2e28d979

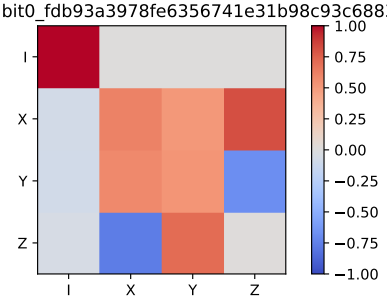


- **Runtime:** — No runtime provided. —
- **Qubits used:**

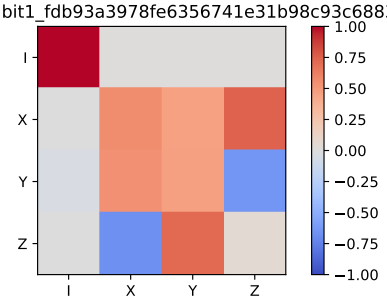
cz_[]_qubits0_1_fdb93a3978fe6356741e31b98c93c68837767080



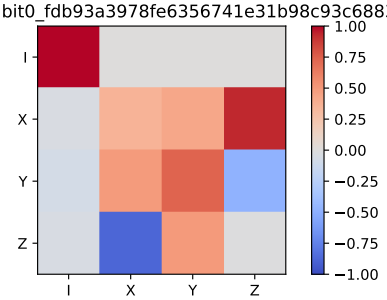
gpi2_[0.7854]_qubit0_fdb93a3978fe6356741e31b98c93c68837767080



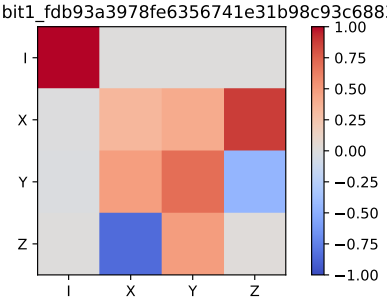
gpi2_[0.7854]_qubit1_fdb93a3978fe6356741e31b98c93c68837767080



gpi2_[1.0472]_qubit0_fdb93a3978fe6356741e31b98c93c68837767080



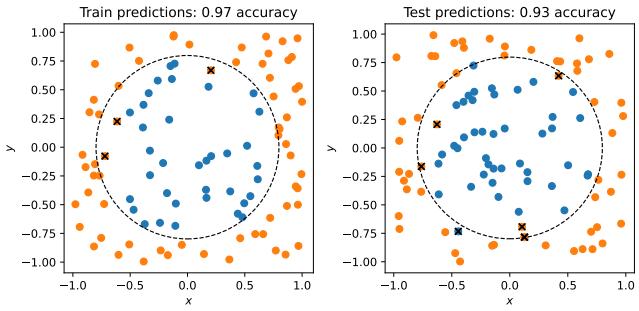
gpi2_[1.0472]_qubit1_fdb93a3978fe6356741e31b98c93c68837767080



9. Reuploading Classifier

Reuploading classifier with 1 qubits, 10 layers, depth of 20, 500 shots.

- **Runtime:** None
- **Qubits used:** — No “qubits_used” provided. —



- **Runtime:** None
- **Qubits used:** — No “qubits_used” provided. —