

## Benchmark Report

# Benchmarking of NQCH's

November 8, 2025

## 1. Report of Changes

**Platform:** sinq20  
**Calibration-id:** N/A  
**Calibration date:** Unknown  
**Calibration note:** N/A  
  
**Experiment-id:** 20251108115234  
**Experiment date:** Unknown  
**Experiment note:** N/A

**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.

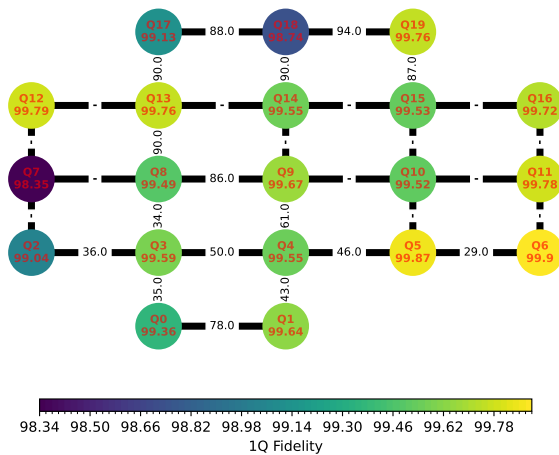
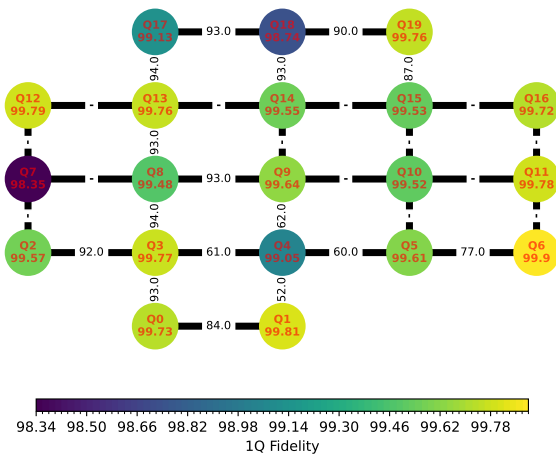
## 2. Version Comparison

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		

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## 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

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## 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
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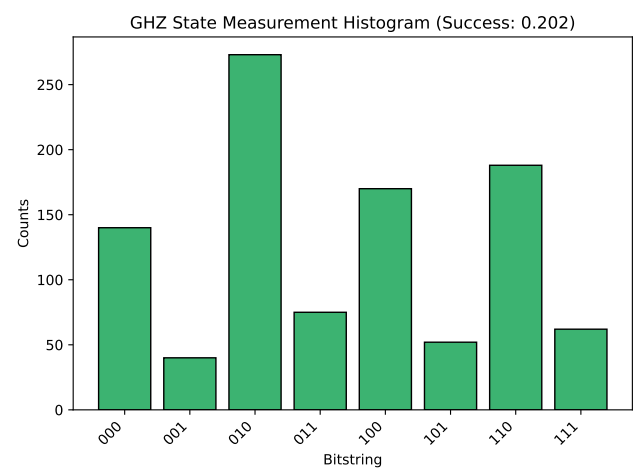
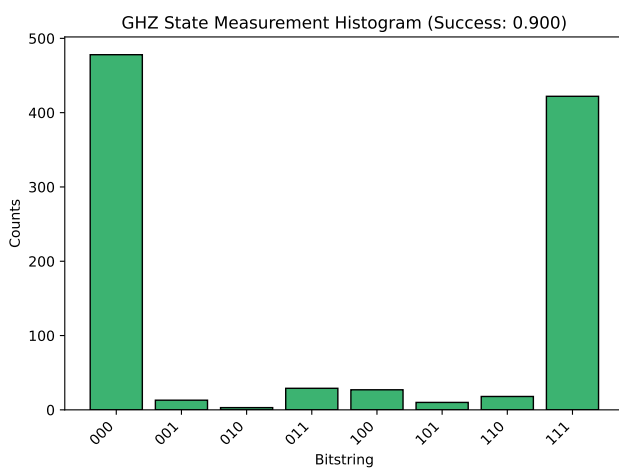
Qubit n	Fidelity	Error Bars
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## 7. GHZ state preparation

GHZ circuit with 3 qubits executed on `siqc20` backend with 1000 shots.

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

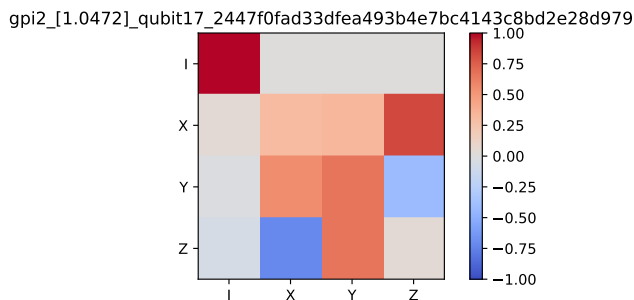
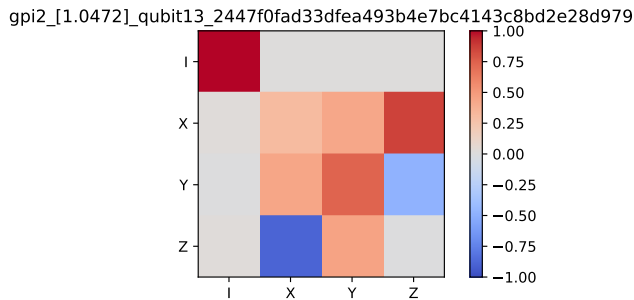
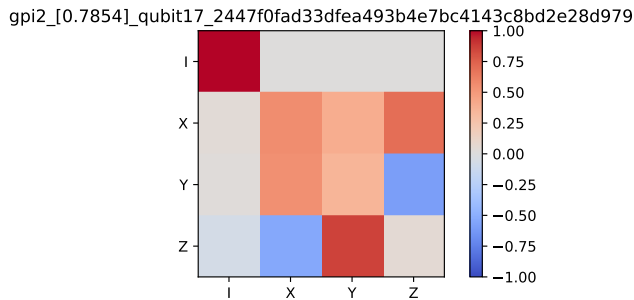
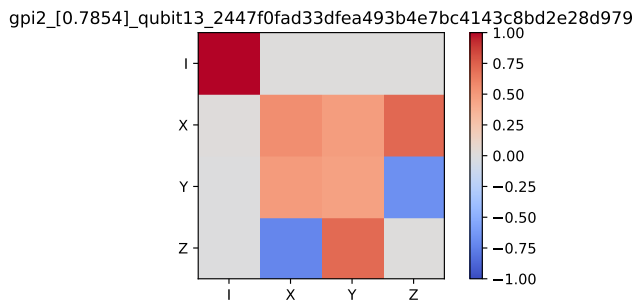
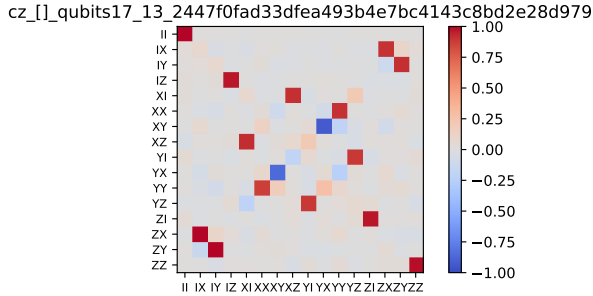
- **Runtime:** 9.71 seconds.
- **Qubits used:** [13, 14, 17]



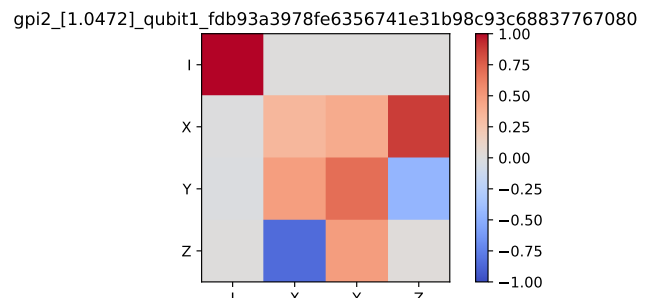
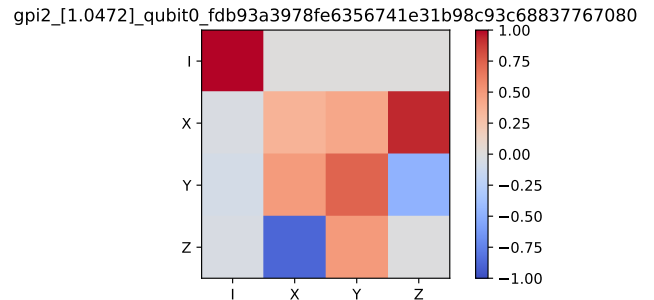
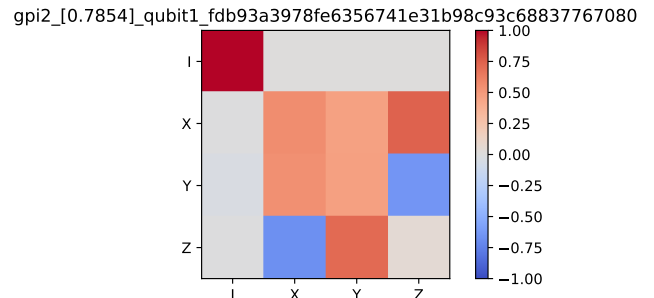
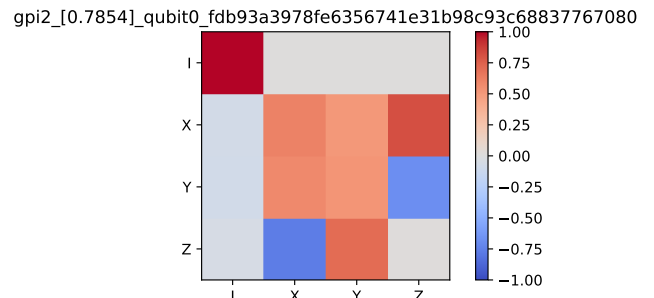
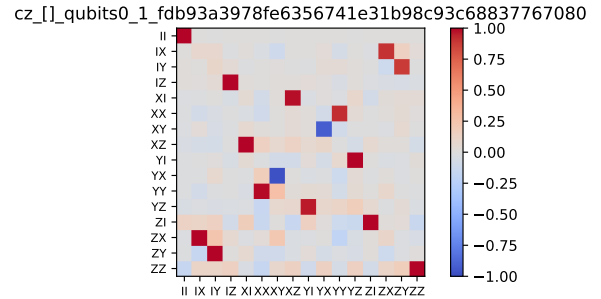
## 8. Process Tomography state preparation

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:**



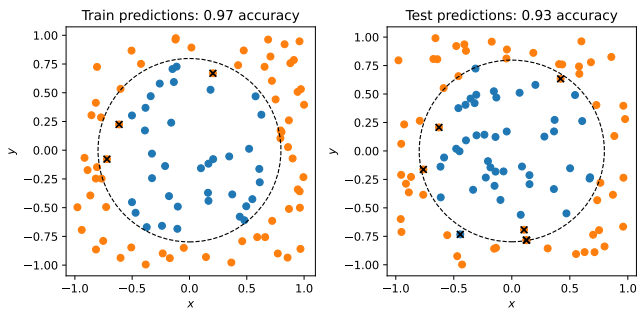
- **Runtime:** — No runtime provided. —
- **Qubits used:**



## 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. —

