



Quantum computing simulation benchmarks

Summer student “lightning” talks

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PENNY
LANE



Qiskit



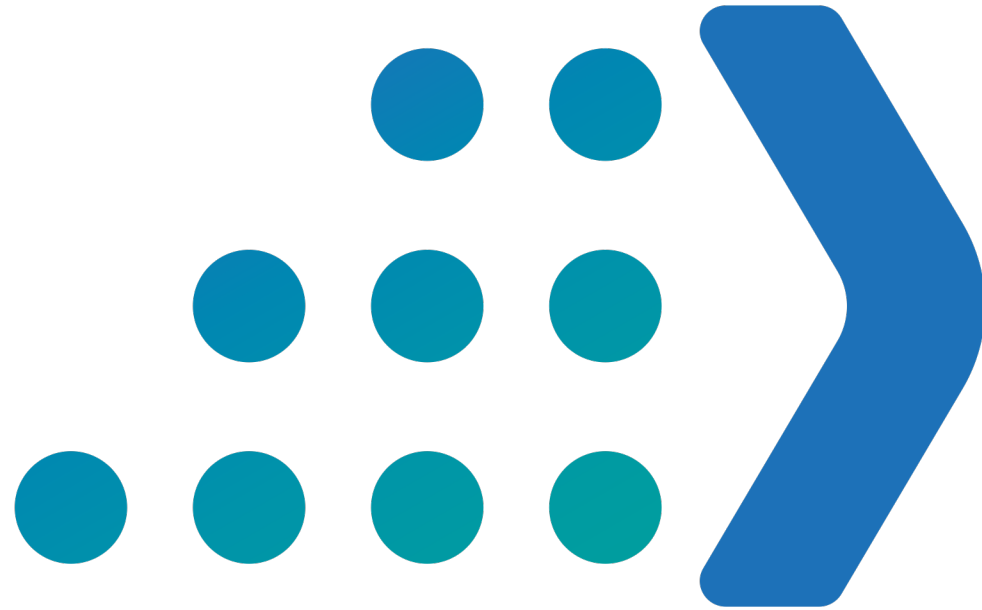
Cirq

Informative results

Framework
benchmarks

Hardware
benchmarks

Easy-to-extend foundation



ABAQUS

```
graph LR; A[ABAQUS Python package] --> B[Results Stored as CSV]; B --> C[Web app]; C --> D[ ]; style D fill:none,stroke:none
```

ABAQUS
Python package

Results
Stored as CSV

Web app

```
import abaqus.benchmarking.all  
abaqus.benchmarking.all.run_all()
```



Settings

Tests

- Random circuit
- Single-qubit gates
- Two-qubit gates
- QFT

Number of qubits

- 8 qubits
- 16 qubits

Frameworks

- Use recent logs (12 months)
- Pick specific versions

Qiskit Statevector

- 0.29

Pennylane

- 0.15
- 0.16

Cirq Simulator

- 0.11
- 0.12

Qiskit Statevector (GPU)

- 0.29

Devices

Minimum score:

Maximum score:

Framework benchmarks

	Framework	Score	σ
	Qiskit Statevector (GPU) v0.29	81.5	3.2 %
	Cirq Simulator v0.11	66.3	3.7 %
	Qiskit Statevector v0.29	53.9	4.3 %
	Pennylane v0.15	27.8	15.7 %



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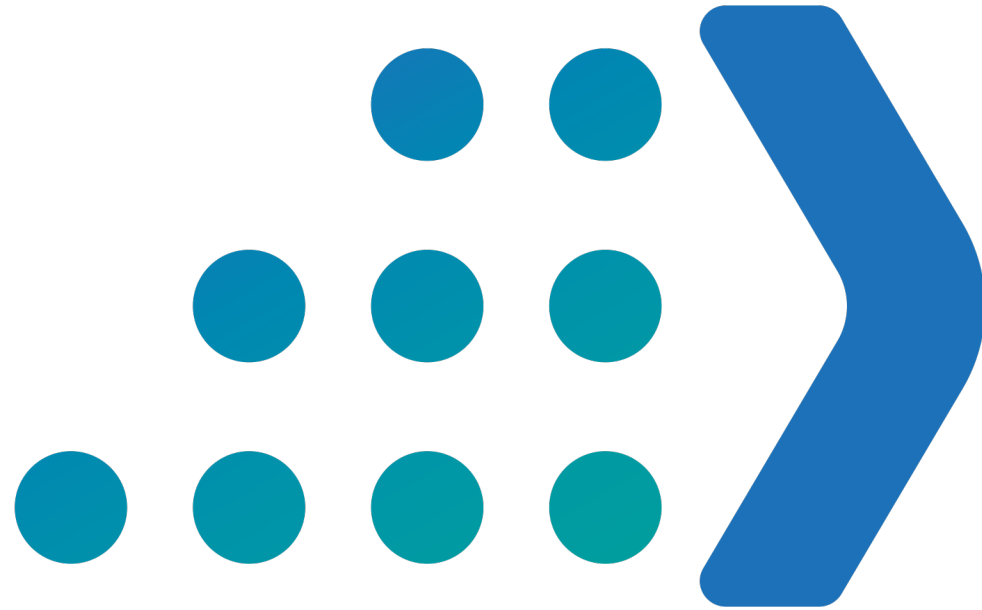
Hardware benchmarks

Framework	Score	σ
olqti-gpu-01.cern.ch (0)	100.0	4.5 %
dev1.sgc.ink (0)	68.8	34.4 %

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Qiskit GPU

One test: any framework.



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