

Qiskit Lab Manual

QAMP Fall 21 – Final Showcase

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Lab 1 Completed

Lab on Single Qubit Gates has now been published on the Qiskit (Quantum Computing Labs) web page and is available for the users to consume.

The lab enables the learners to understand the effects of single qubit gates like Pauli gates and Phase gate (S) on the eigenvectors of X, Y and Z.

The lab also provides a visual depiction of the circuit along with the plot on BlochSphere, QSphere and the input and output/state probability as Statevector.

Qiskit Overview

Browse all content Miss the old version of the textbook? Access it [here](#)

Quantum Computing Labs Reading time: ~20 min

Lab 2 Single Qubit Gates

Prerequisite
Ch.1.3 Representing Qubit States
Ch.1.4 Single Qubit Gates

Other relevant materials
[Grokking the Bloch Sphere](#)

```
import numpy as np
```

Quantum Computing Labs

- Lab 1 Quantum Circuits
- Lab 2 Single Qubit Gates

Part 1 - Effect of Single-Qubit Gates on state $|0\rangle$
Goal

Part 2 - Effect of Single-Qubit Gates on state $|1\rangle$
Goal

Part 3 - Effect of Single-Qubit Gates on state $|+\rangle$
Goal

Part 4 - Effect of Single-Qubit Gates on state $|-\rangle$
Goal

Part 5 - Effect of Single-Qubit Gates on state $|i\rangle$
Goal

[Hide index](#)

[Back to textbook home](#)

Effect on Qubit on application of Gate	Statevector	QSphere Plot	Statevector (Post Measurement)
Input State = $(1 + 0j \ 0 + 0j)$			
Before measurement, - qubit state = $(0 + 0j \ 1 + 0j)$ - qubit has probability 1 of being in state '1'			

qubit 0 $|0\rangle$
qubit 1 $|0\rangle$
qubit 2 $|0\rangle$
qubit 3 $|0\rangle$

z
x y
|1>
|1>
|1>
|1>

Amplitude
Computational basis states

Lab 2 Completed



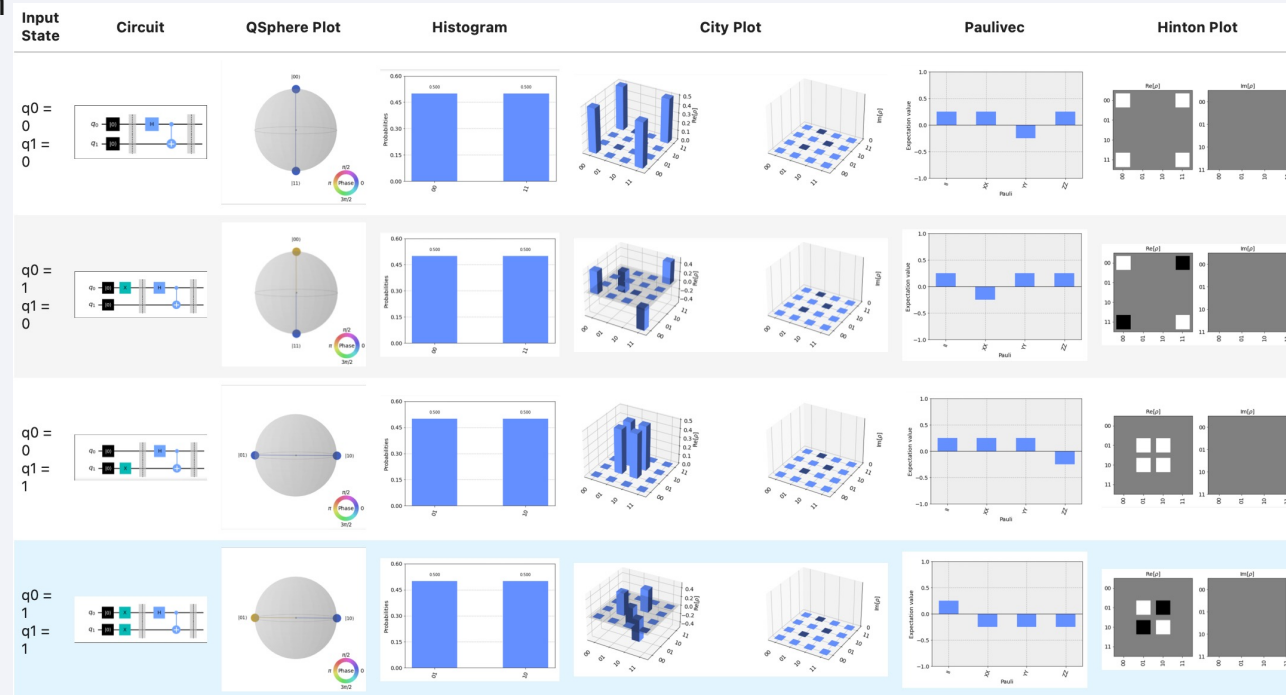
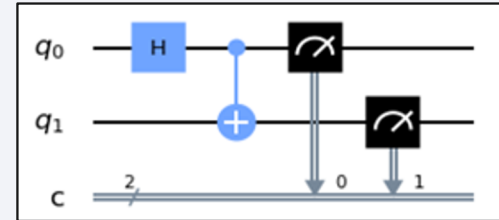
Lab 2 was developed with a focus on Bell States

A basic bell circuit using CNOT gate to look closely at the representation of superposition states on:

- QSphere
- Histogram
- City Plot
- Paulivec
- Hinton Plot

Next Steps:

- Publish on Qiskit Lab



Lab 3 Completed



Lab 3 was developed to understand the GHZ circuit taking 3-qubit and 5-qubit circuits as examples

Representation of all the 8 superposition states of a 3-qubit GHZ circuit on:

- QSphere
- Histogram
- City Plot
- Paulivec
- Hinton Plot

Next Steps:

- Publish on Qiskit Lab

