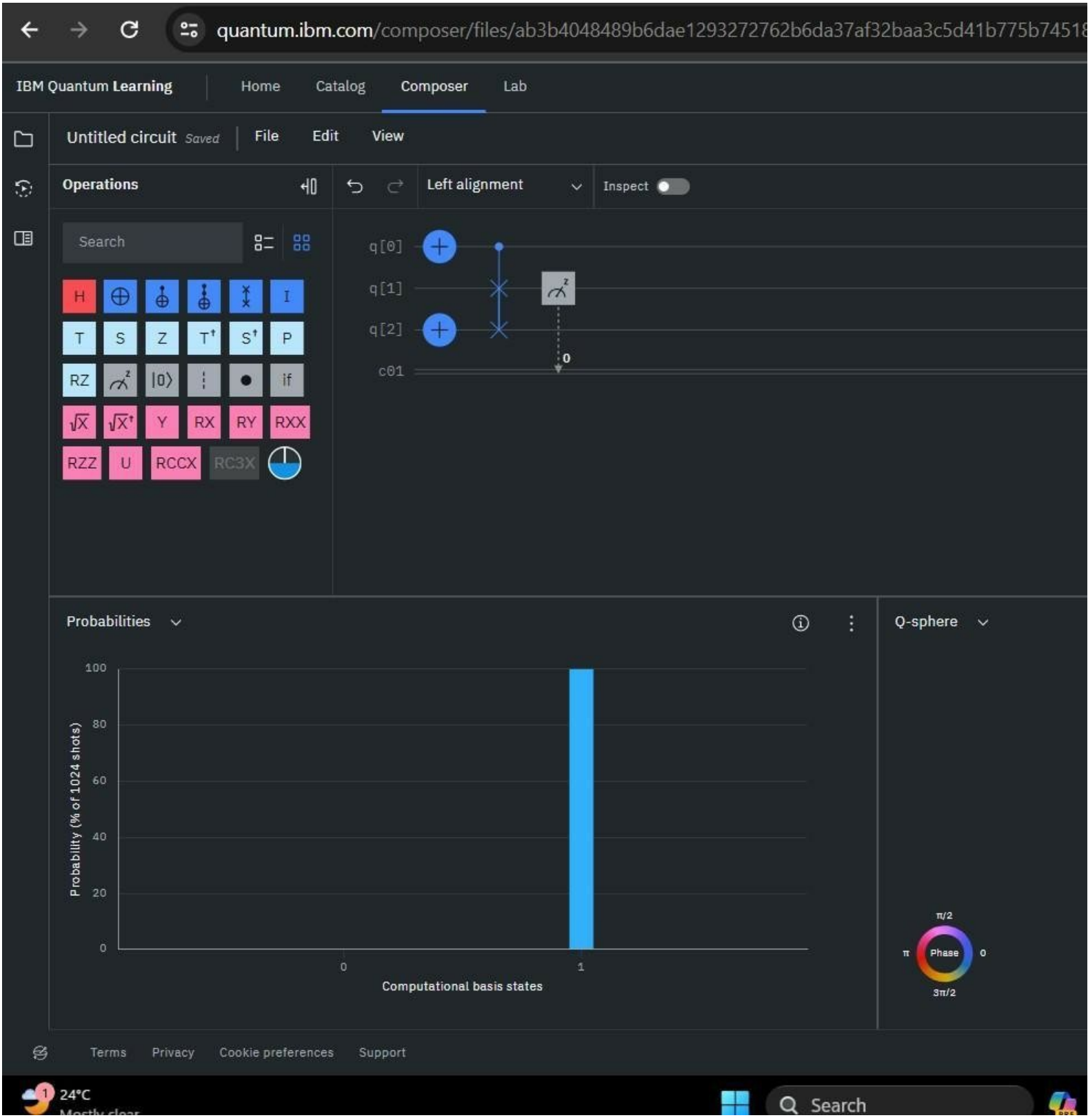
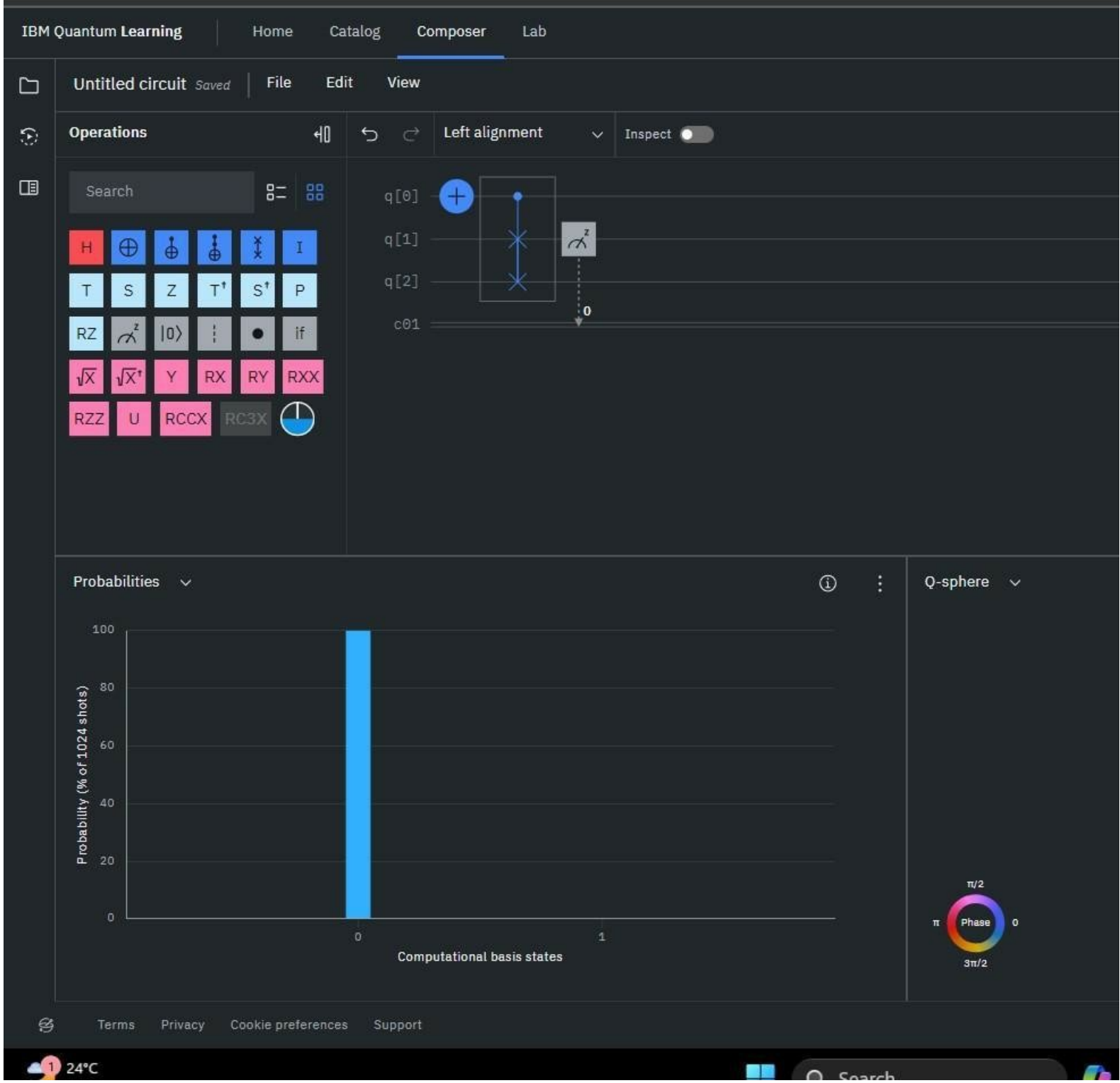
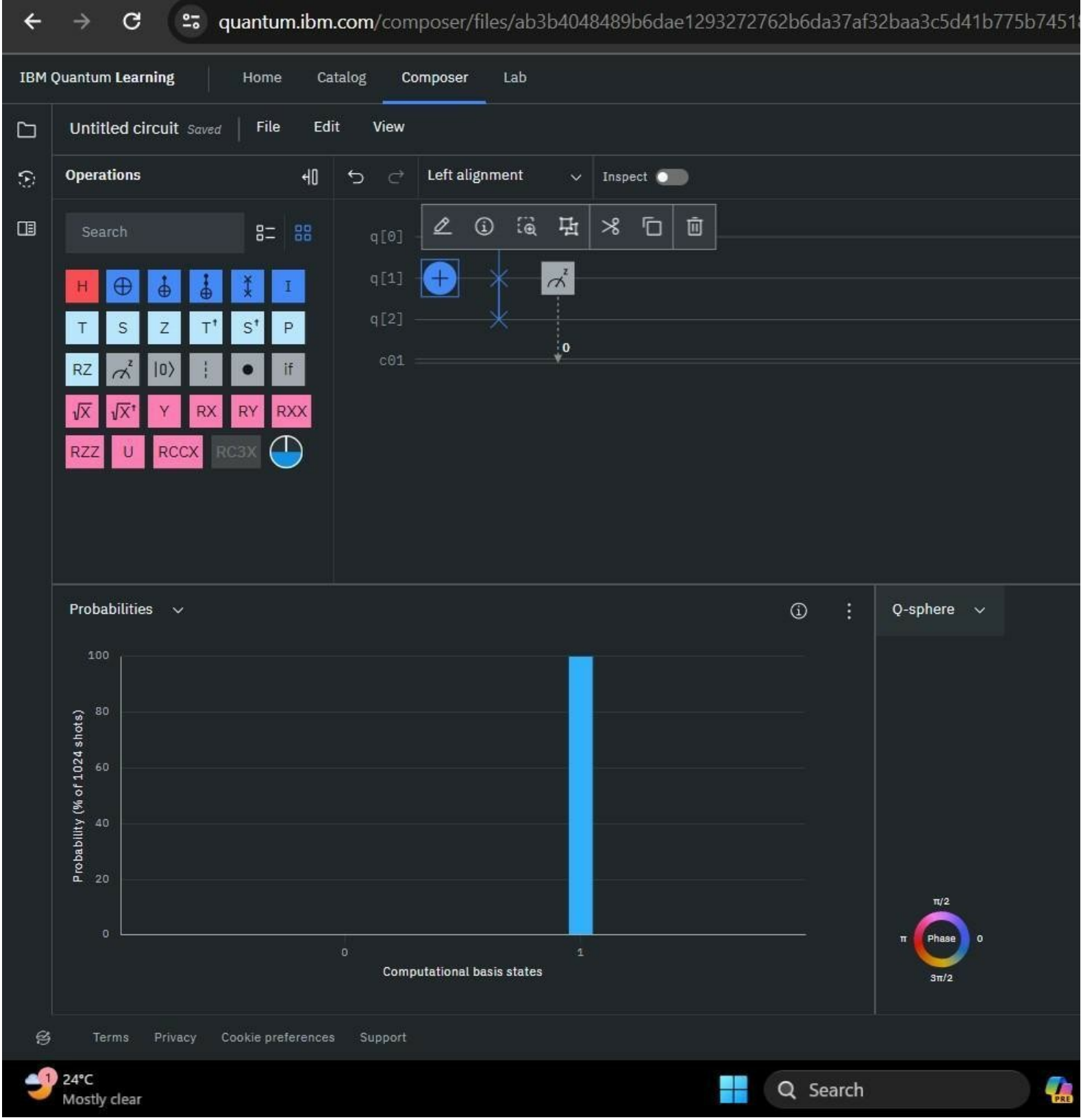
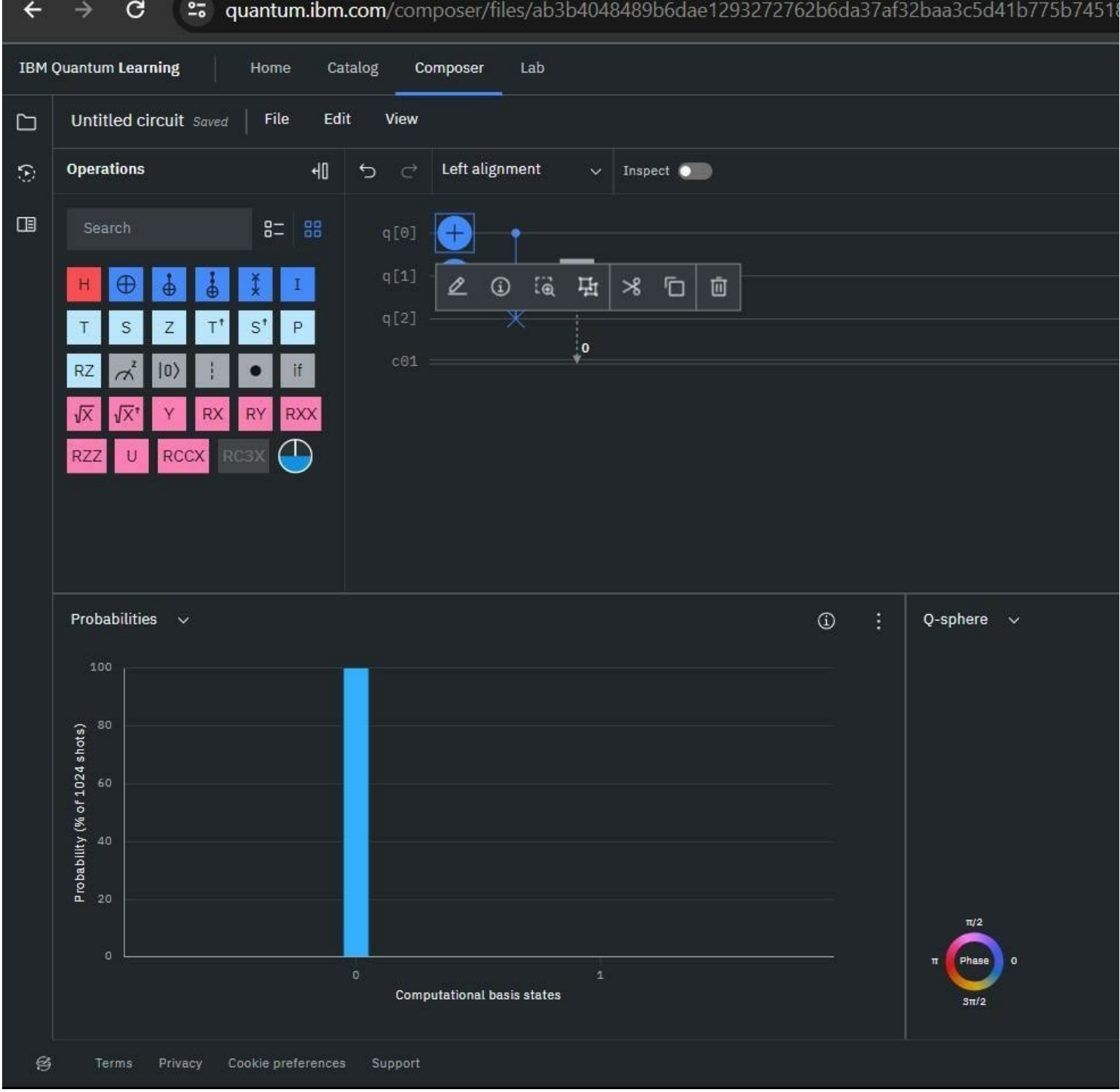
Section 1:


quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b74518
IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
P
RZ
|0⟩
If
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
q[1]
q[2]
c01
Probabilities
Q-sphere
Probability (% of 1024 shots)
100
80
60
40
20
0
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support
24°C
Search


IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
T†
S†
P
RZ
|0⟩
if
√X
√X†
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
q[1]
q[2]
c01
0
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (% of 1024 shots)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support
24°C
Search


quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b7451
IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
P
RZ
|0⟩
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
q[1]
q[2]
c01
Probabilities
Q-sphere
Probability (% of 1024 shots)
Computational basis states
Phase
Terms
Privacy
Cookie preferences
Support
24°C
Mostly clear
Search

Section 2


quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b7451
IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
T†
S†
P
RZ
|0⟩
if
√X
√X†
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
q[1]
q[2]
c01
0
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (% of 1024 shots)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

Section 3:

quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b7451

IBM Quantum Learning | Home | Catalog | Composer | Lab

Untitled circuit *Saved* | File | Edit | View

Operations | Left alignment | Inspect

Search

H ⊕ ⊕ ⊕ ✕ I

T S Z T† S† P

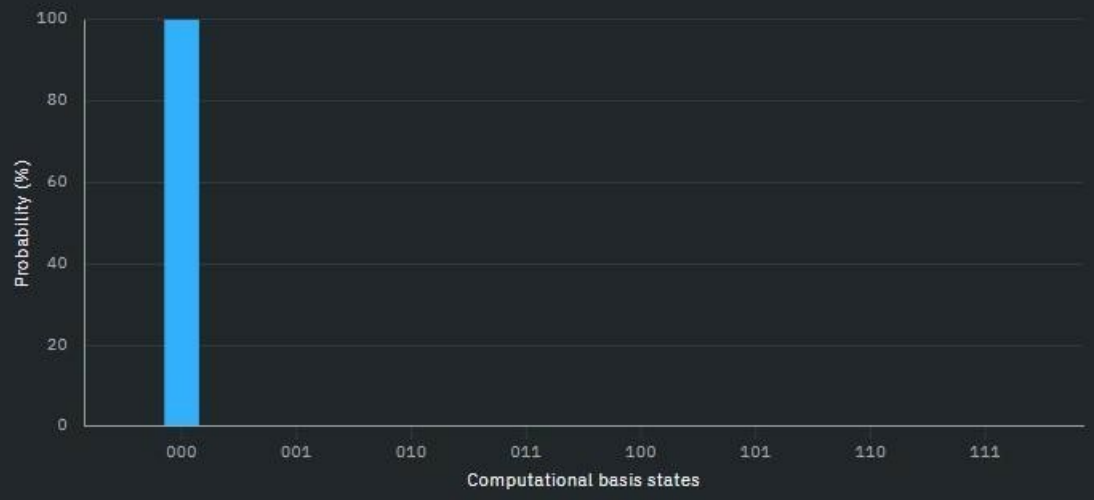
RZ ↗z |0⟩ ┆ ● if

√X √X† Y RX RY RXX

RZZ U RCCX RC3X

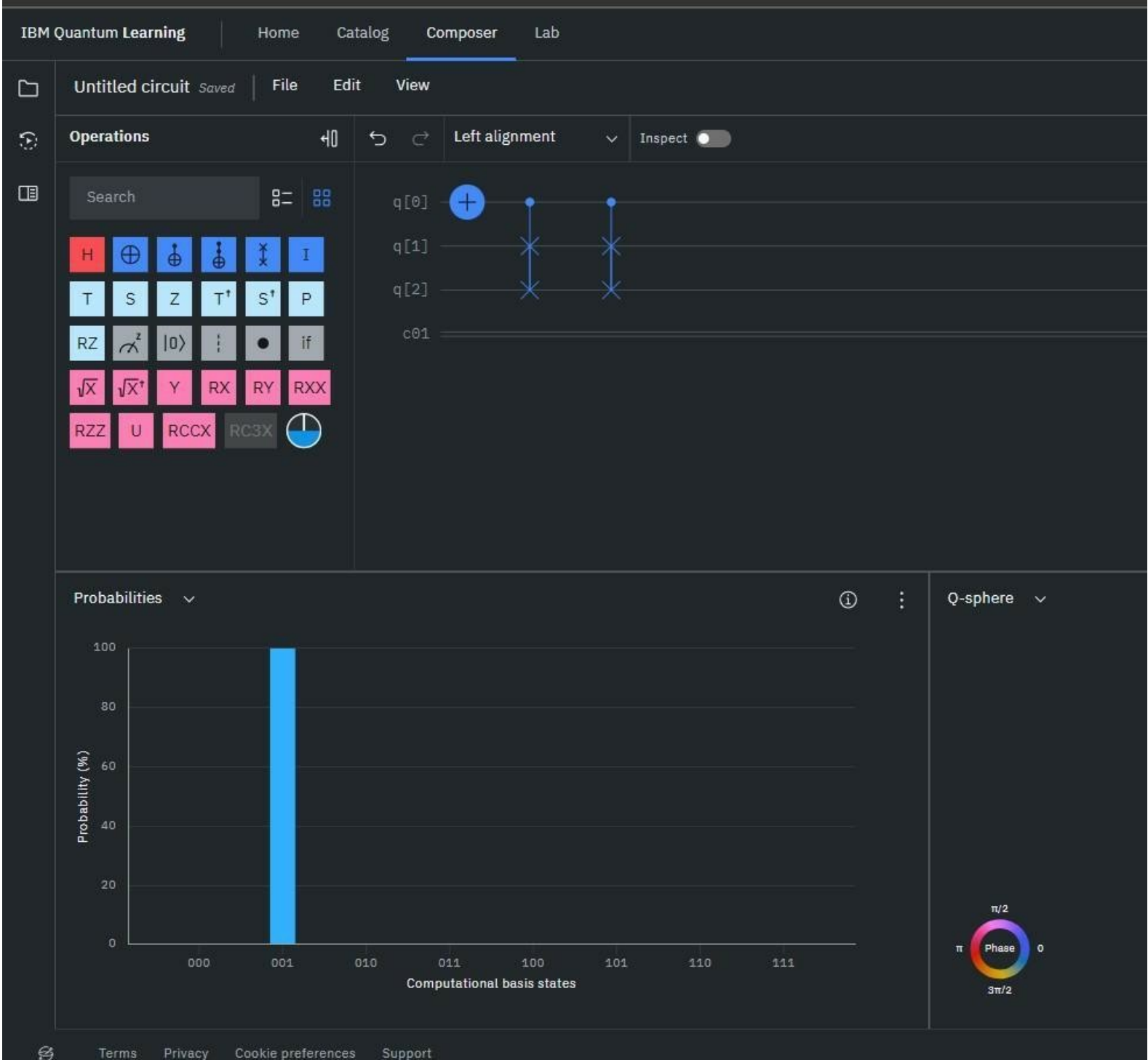
q[0]
q[1]
q[2]
c01

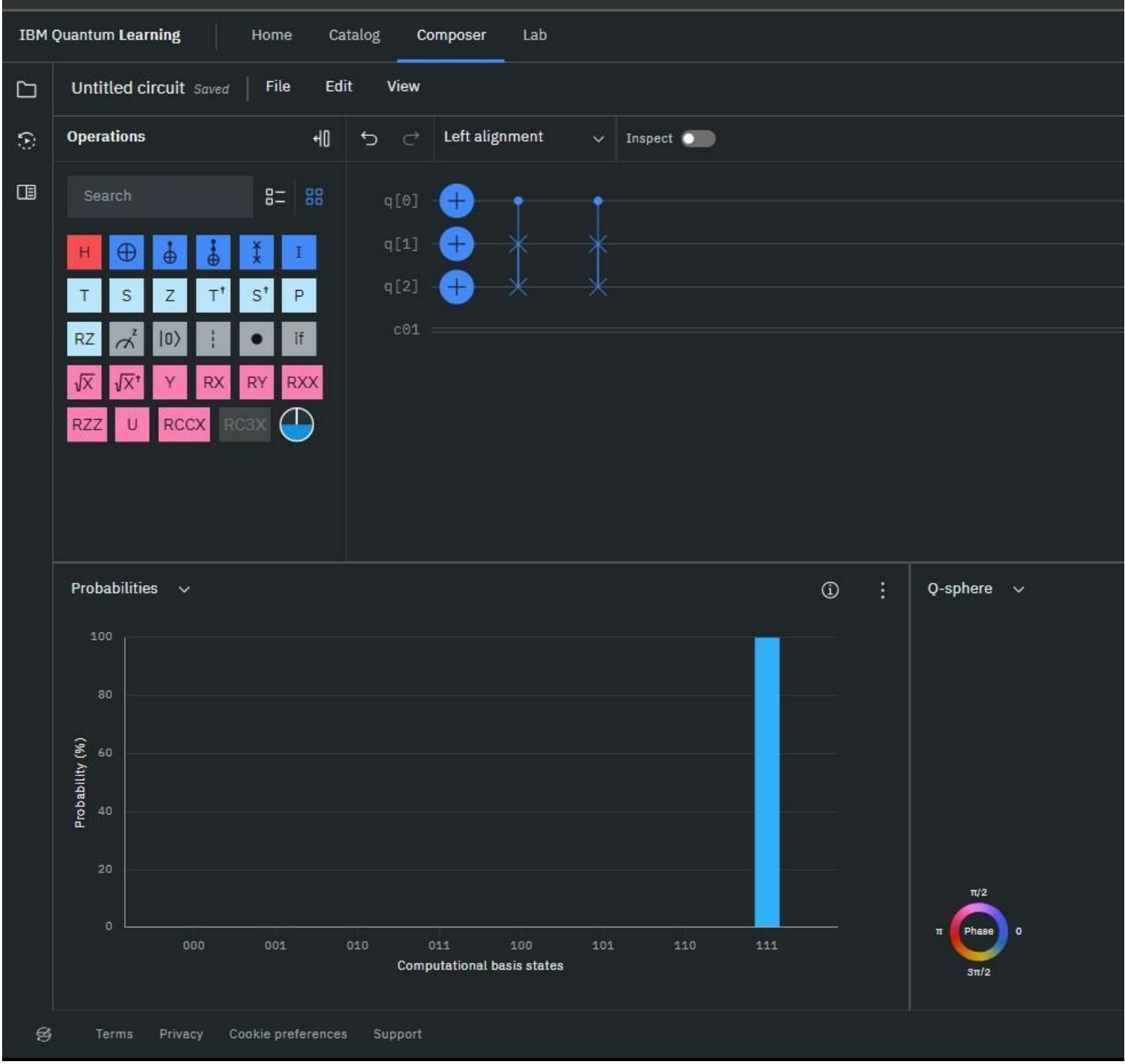
Probabilities



Q-sphere

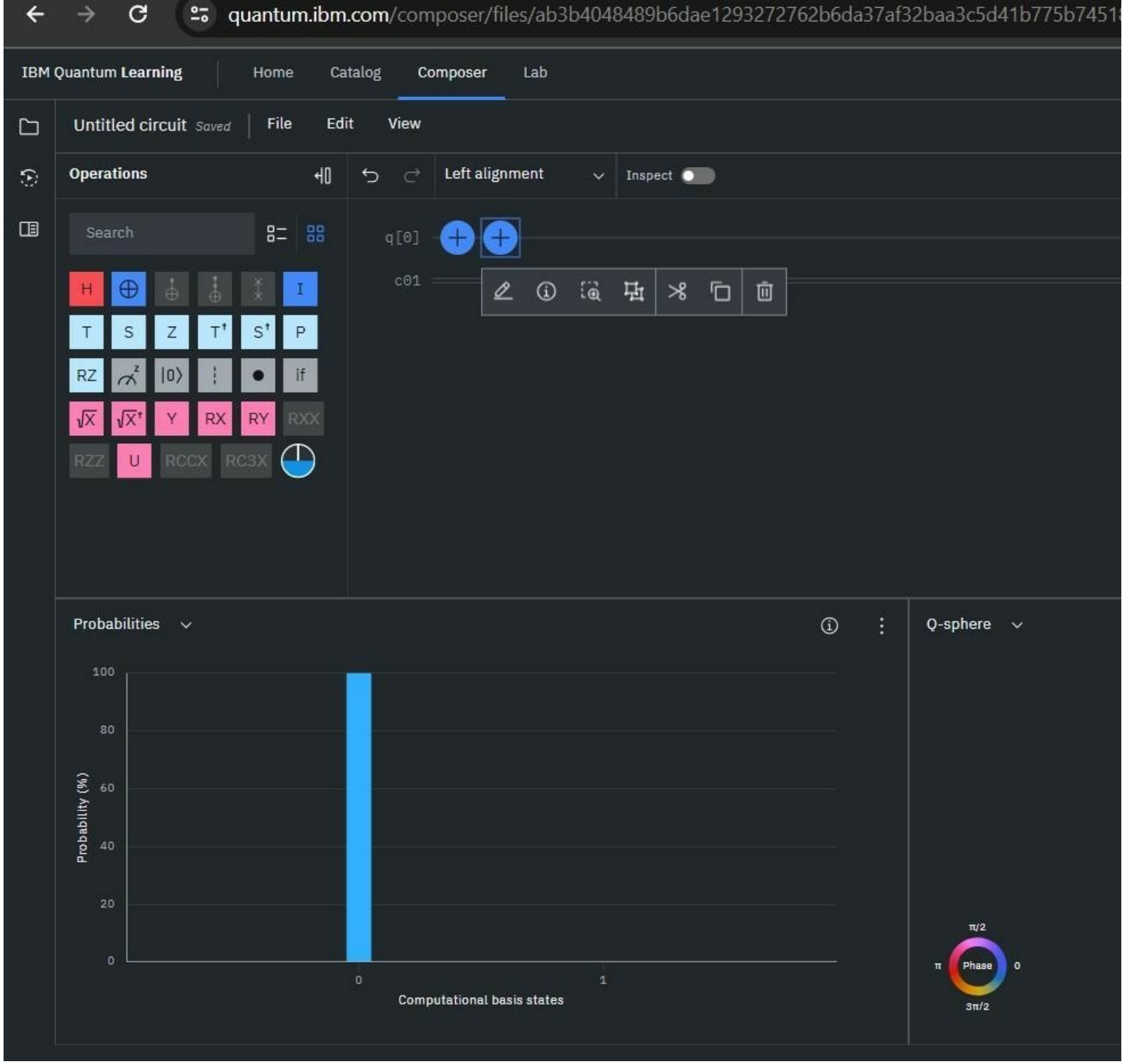
Terms | Privacy | Cookie preferences | Support

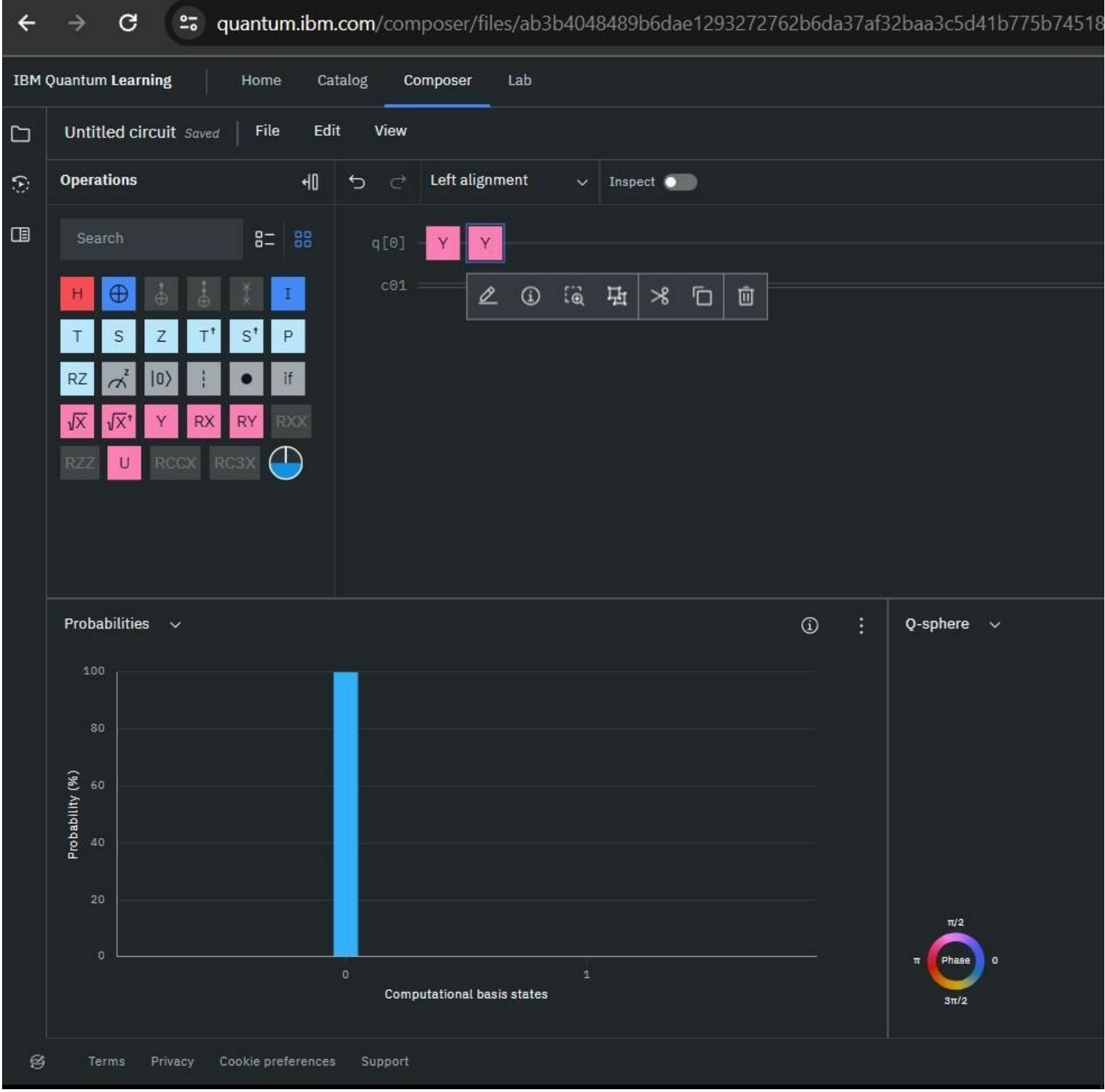

IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
T†
S†
P
RZ
|0⟩
if
√X
√X†
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
q[1]
q[2]
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
000
001
010
011
100
101
110
111
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

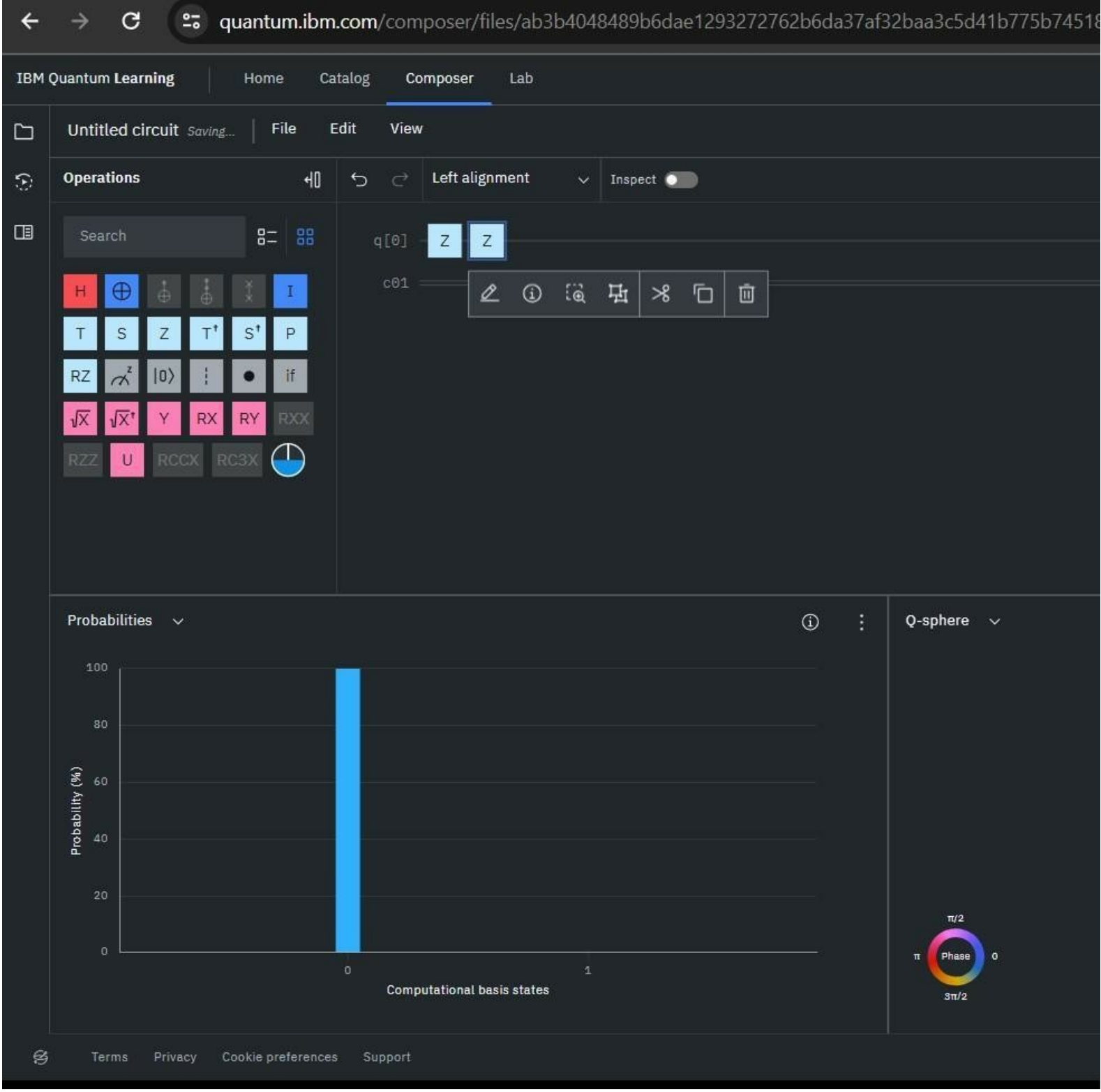

IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit
Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
P
RZ
|0⟩
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
q[1]
q[2]
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
000
001
010
011
100
101
110
111
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

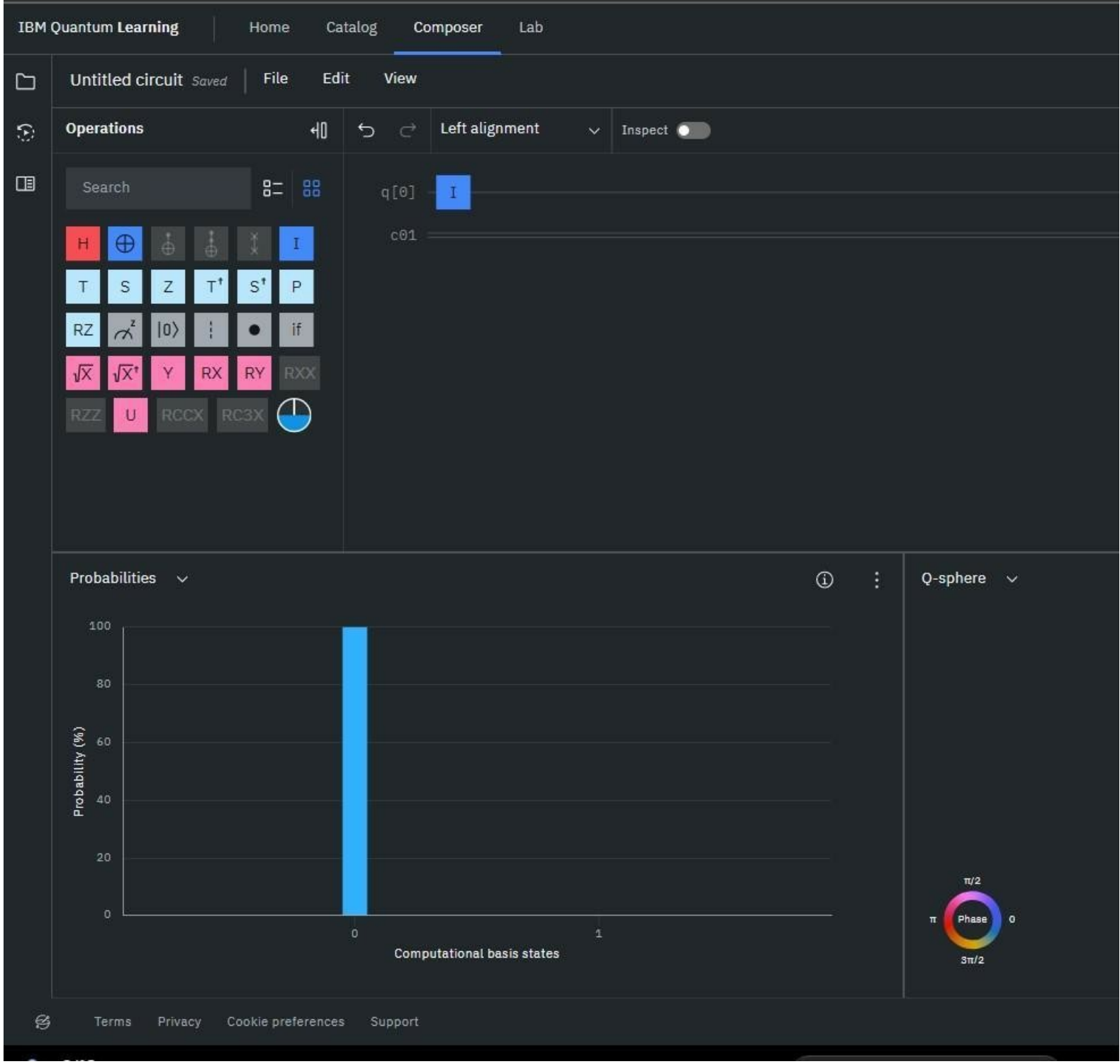
Section 4:

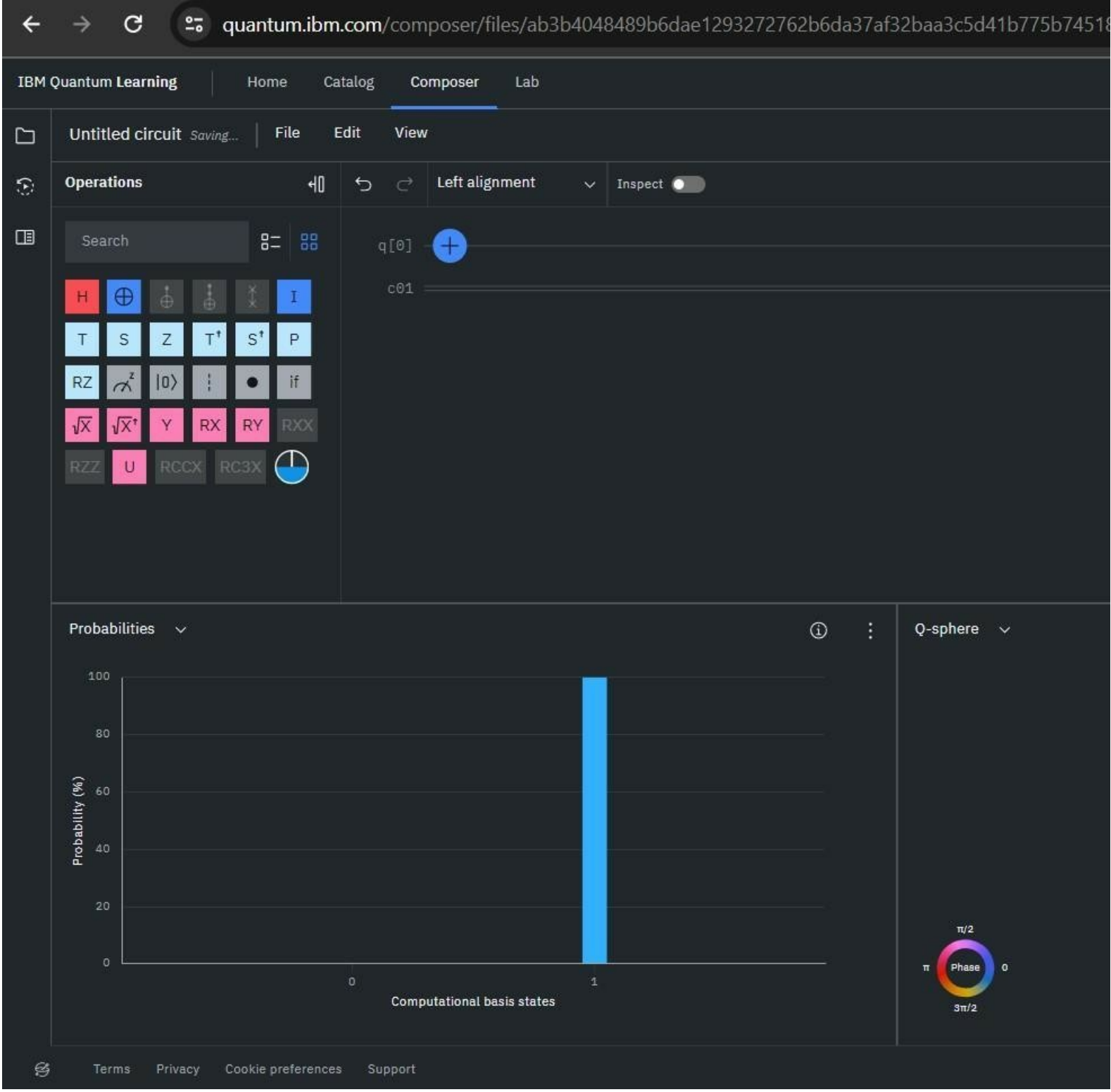
1)


quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b7451
IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit
Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
P
RZ
|0⟩
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2

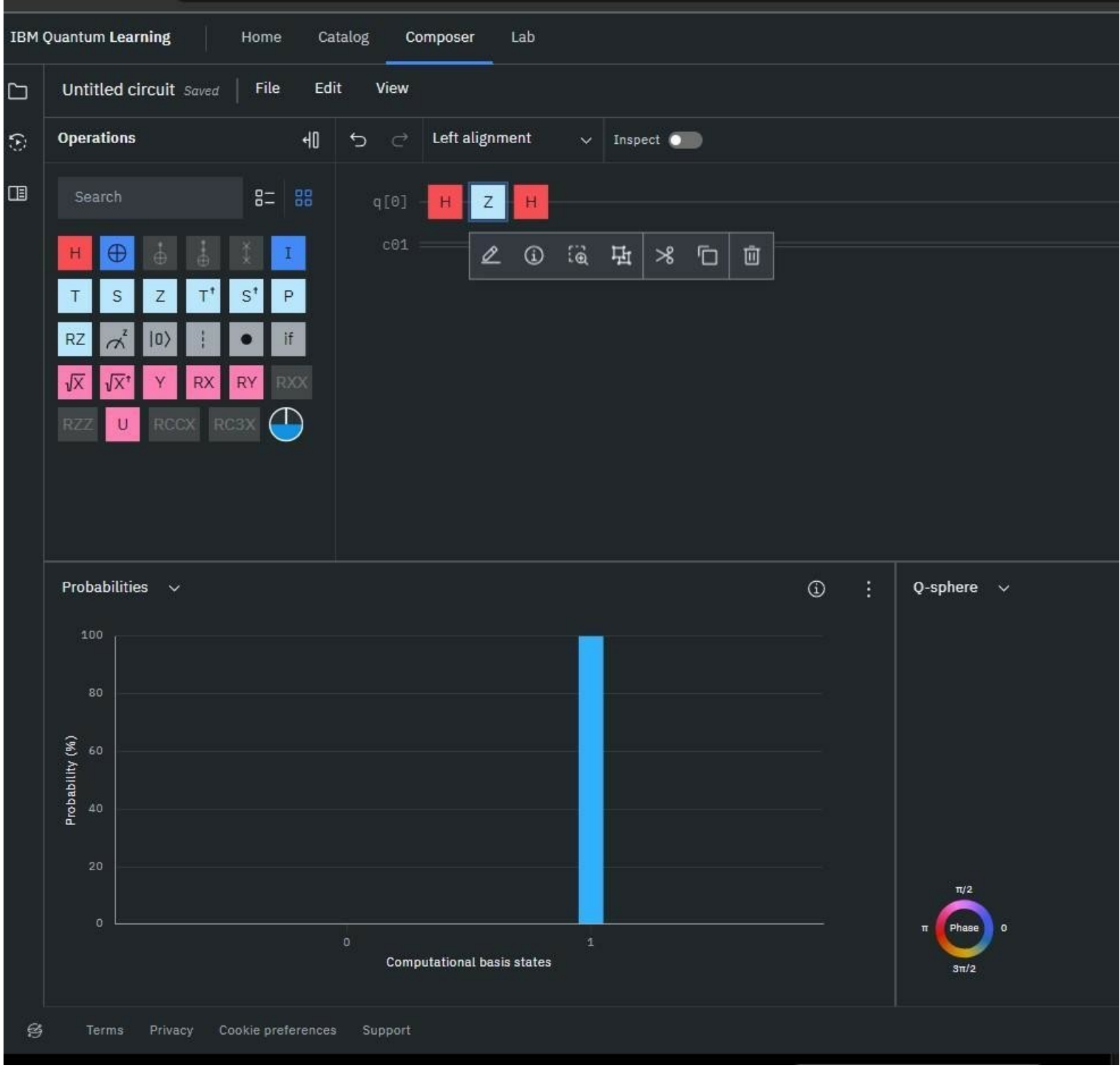

quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b74518
IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit
Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
P
RZ
|0⟩
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
Y
Y
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

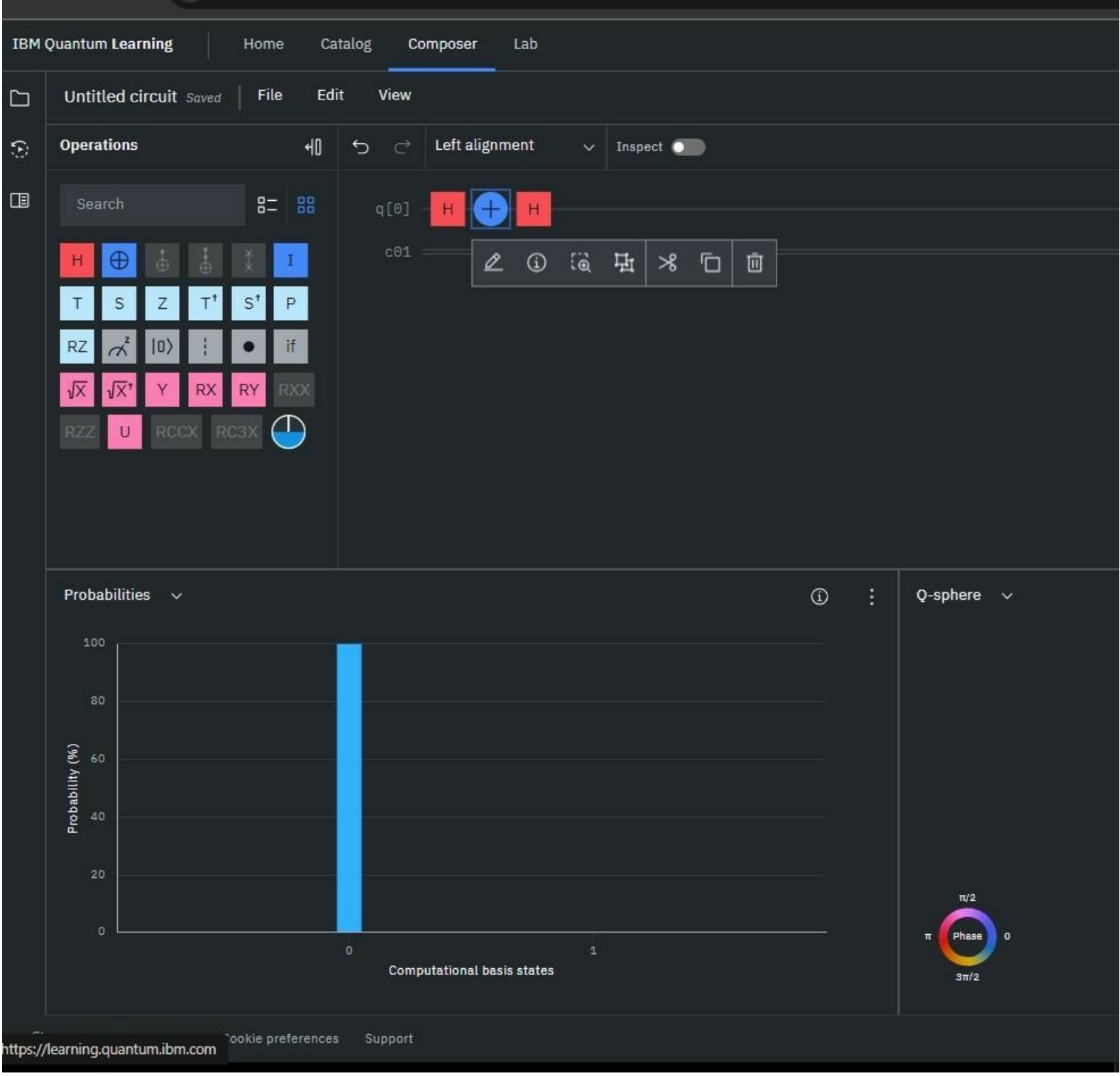

quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b74518
IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit
Saving...
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
P
RZ
|0⟩
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support


IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit
Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
q[0]
I
c01
H
I
T
S
Z
P
RZ
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

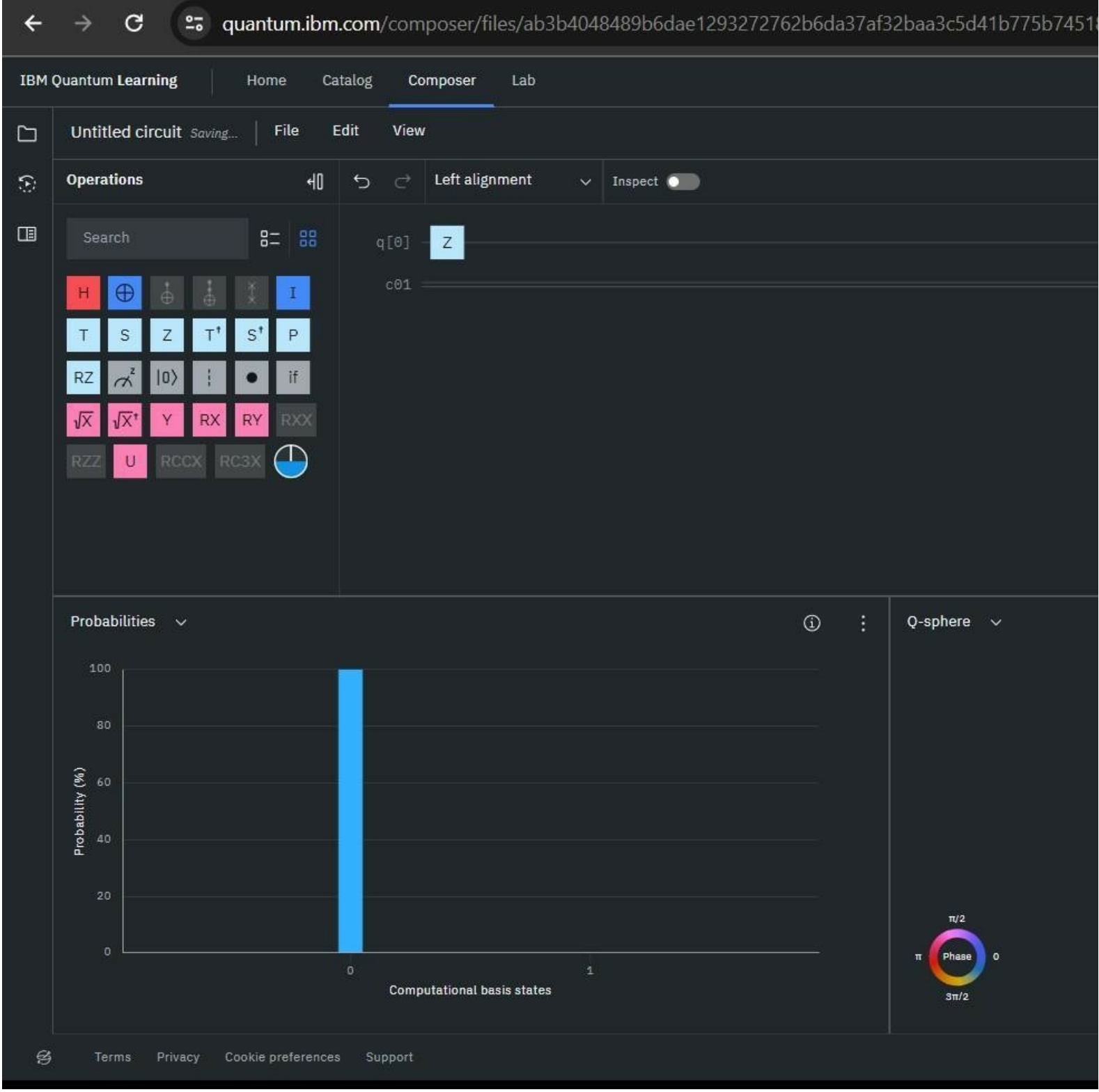

quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b7451
IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit
Saving...
File
Edit
View
Operations
Left alignment
Inspect
Search
q[0]
c01
H
I
T
S
Z
T†
S†
P
RZ
|0⟩
if
√X
√X†
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

2)


IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
P
RZ
|0⟩
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support


IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
q[0]
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Cookie preferences
Support
https://learning.quantum.ibm.com

3)


quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b7451
IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saving...
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
T†
S†
P
RZ
|0⟩
if
√X
√X†
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
Z
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

4)

quantum.ibm.com/composer/files/ab3b4048489b6dae1293272762b6da37af32baa3c5d41b775b74518

IBM Quantum Learning | Home | Catalog | Composer | Lab

Untitled circuit *Saving...* | File | Edit | View

Operations

Search

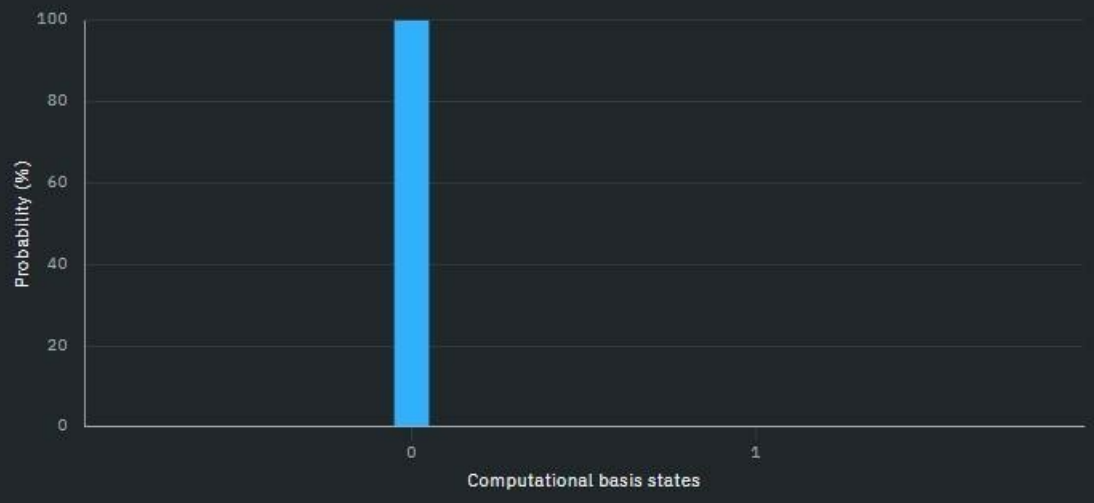
H ⊕ I
T S Z T† S† P
RZ |0⟩ if
√X √X† Y RX RY RXX
RZZ U RCCX RC3X

Left alignment | Inspect

q[0] S

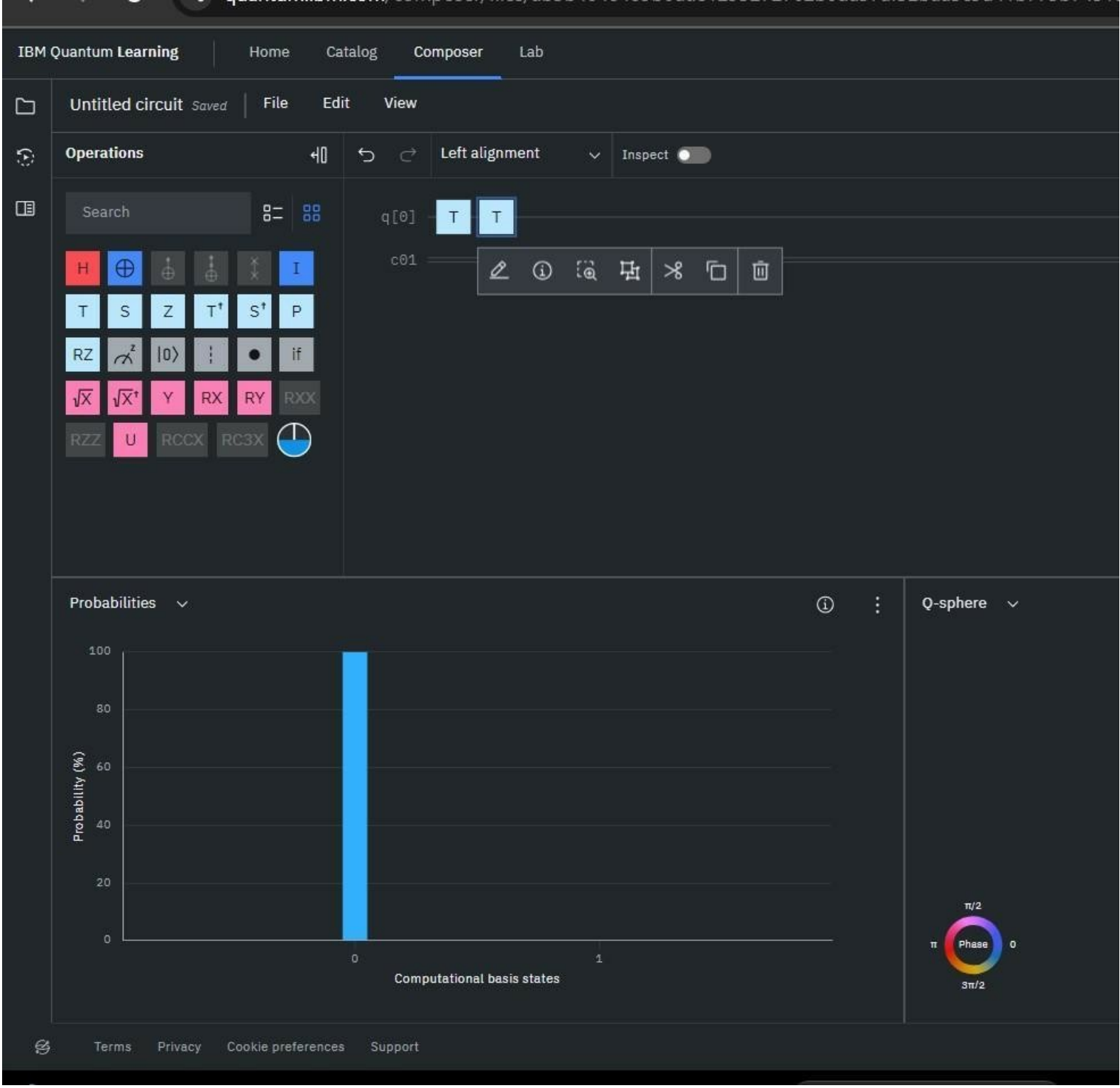
c01

Probabilities

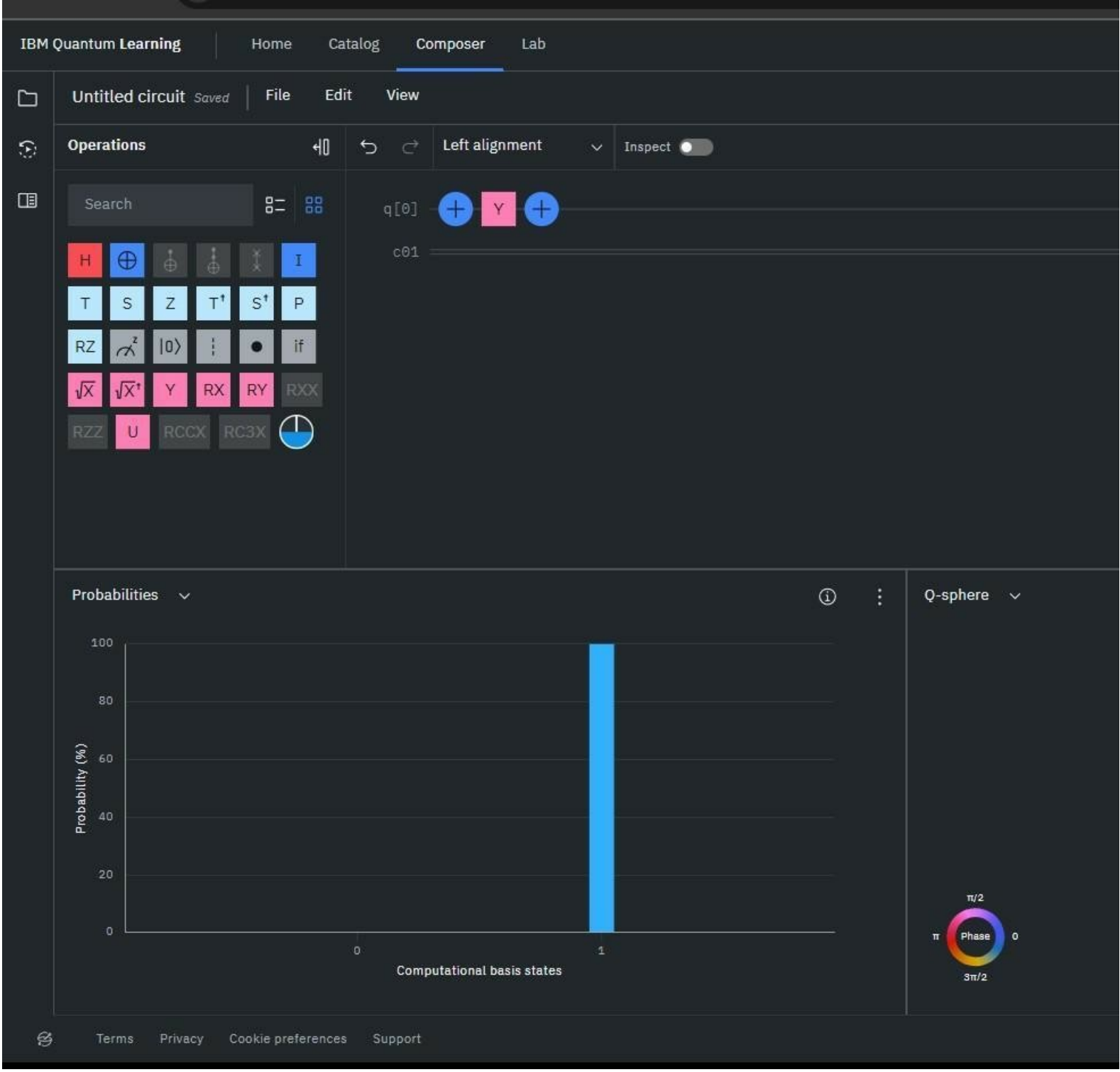


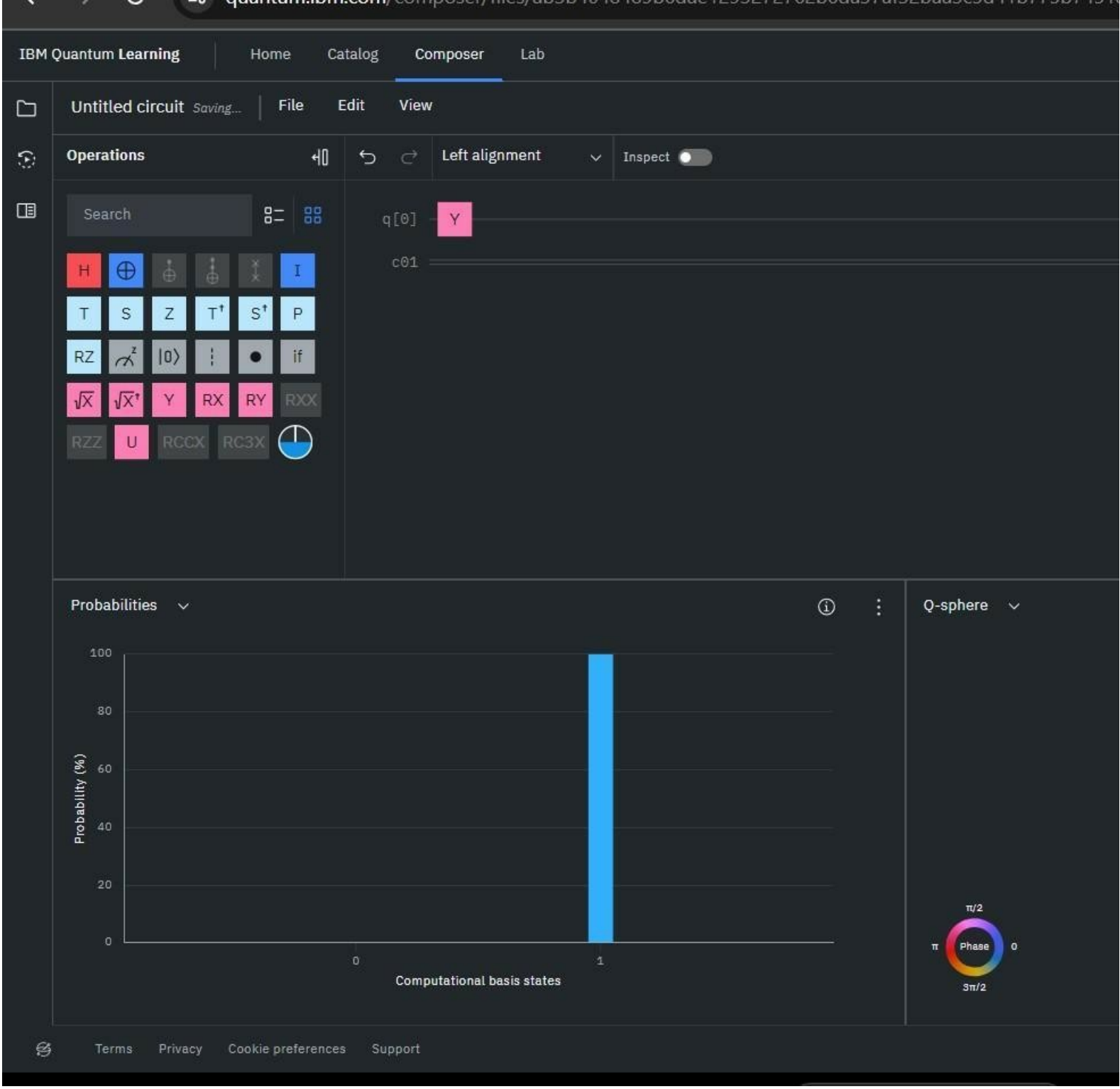
Q-sphere

Terms Privacy Cookie preferences Support


IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit
Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
S†
P
RZ
|0⟩
if
√X
√X†
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

5)


IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit Saved
File
Edit
View
Operations
Left alignment
Inspect
Search
H
I
T
S
Z
P
RZ
|0⟩
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
q[0]
c01
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support


IBM Quantum Learning
Home
Catalog
Composer
Lab
Untitled circuit
Saving...
File
Edit
View
Operations
Left alignment
Inspect
Search
q[0]
Y
c01
H
I
T
S
Z
P
RZ
|0⟩
if
Y
RX
RY
RXX
RZZ
U
RCCX
RC3X
Probabilities
Q-sphere
100
80
60
40
20
0
Probability (%)
0
1
Computational basis states
π/2
π
Phase
0
3π/2
Terms
Privacy
Cookie preferences
Support

Section 5)

IBM Quantum **Learning** | Home | Catalog | Composer | Lab

New file +

Filter files by name

Lab files /

Name	Last Modified
qiskit-tutorials	29 minutes ago
tutorials	29 minutes ago
Untitled.ipynb	seconds ago

File Edit View Run Kernel Ta

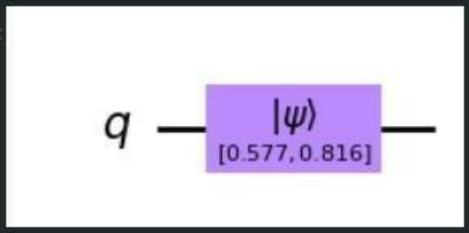
Untitled.ipynb

Code

[2]:
```
from qiskit import QuantumCircuit , as
from qiskit.visualization import plot_
from math import sqrt , pi
import numpy as np
```

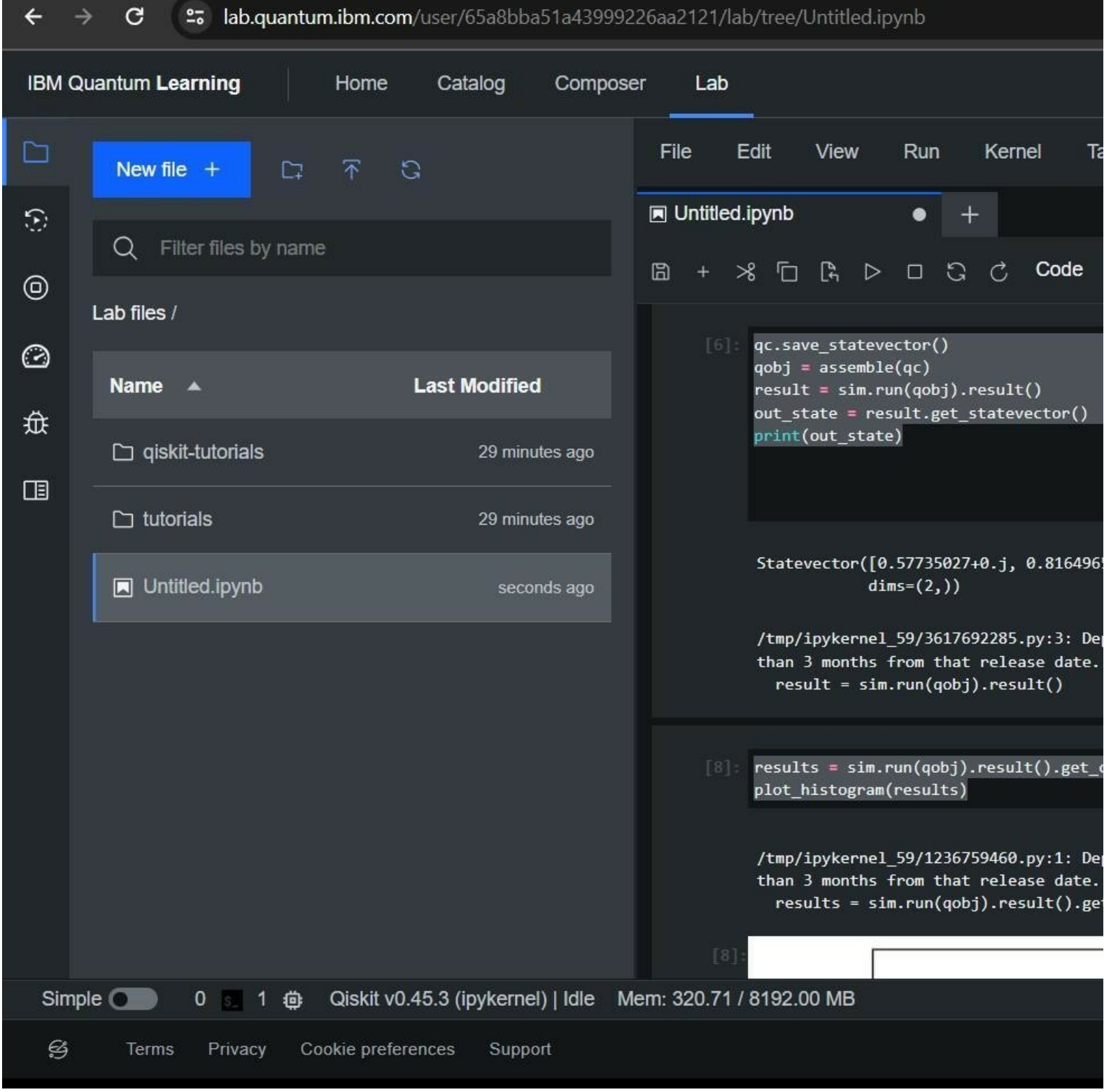
[5]:
```
sim = Aer.get_backend('aer_simulator')
qc = QuantumCircuit(1)
initial_state = [sqrt(1/3),sqrt(1 - 1/
qc.initialize(initial_state,0)
qc.draw()
```

[5]:



Simple 0 1 Qiskit v0.45.3 (ipykernel) | Idle Mem: 320.71 / 8192.00 MB

Terms Privacy Cookie preferences Support

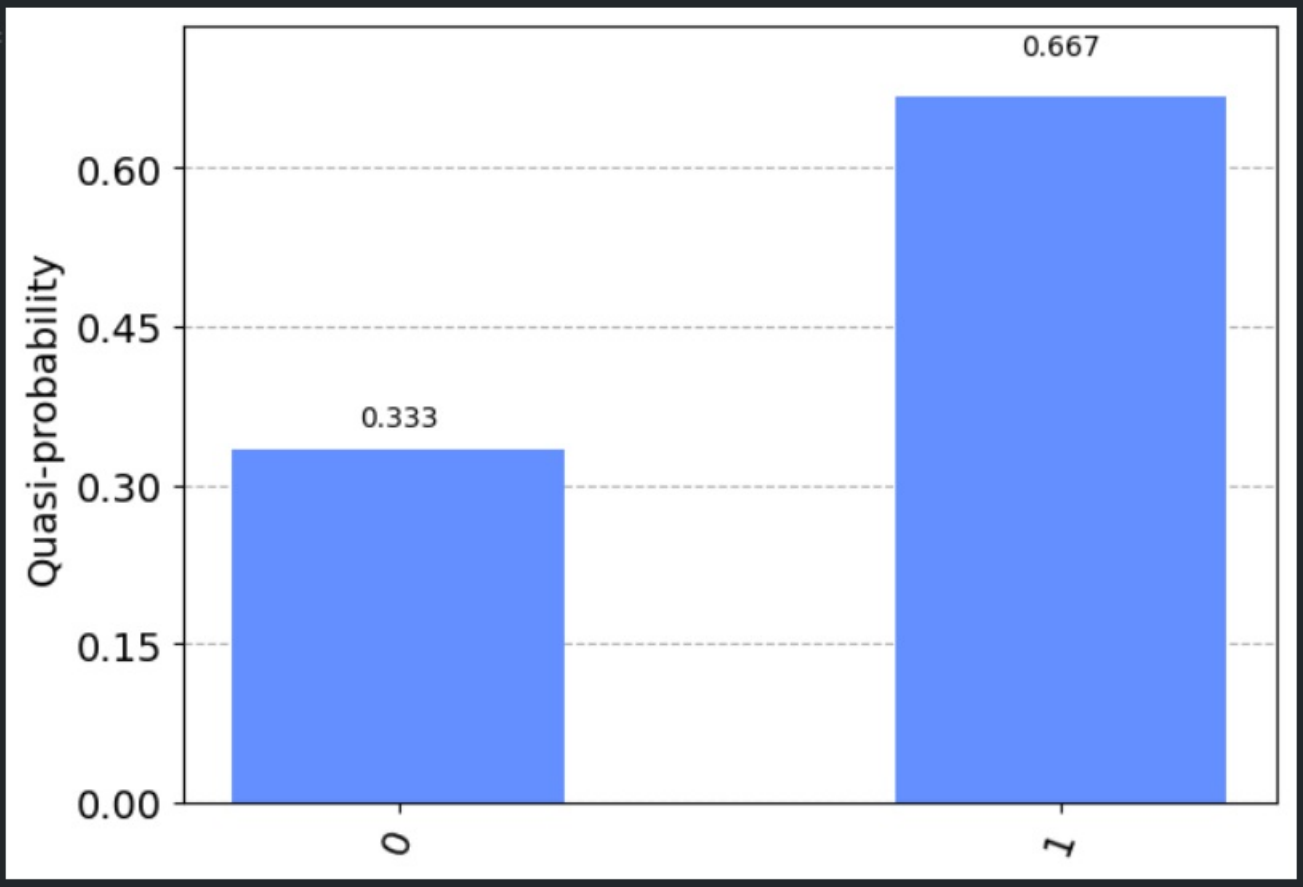

lab.quantum.ibm.com/user/65a8bba51a43999226aa2121/lab/tree/Untitled.ipynb
IBM Quantum Learning
Home
Catalog
Composer
Lab
New file +
Filter files by name
Lab files /
Name
Last Modified
qiskit-tutorials
29 minutes ago
tutorials
29 minutes ago
Untitled.ipynb
seconds ago
File
Edit
View
Run
Kernel
Untitled.ipynb
Code
[6]:
qc.save_statevector()
qobj = assemble(qc)
result = sim.run(qobj).result()
out_state = result.get_statevector()
print(out_state)
Statevector([0.57735027+0.j, 0.816496
dims=(2,))
/tmp/ipykernel_59/3617692285.py:3: De
than 3 months from that release date.
result = sim.run(qobj).result()
[8]:
results = sim.run(qobj).result().get_
plot_histogram(results)
/tmp/ipykernel_59/1236759460.py:1: De
than 3 months from that release date.
results = sim.run(qobj).result().ge
[8]:
Simple
0
1
Qiskit v0.45.3 (ipykernel) | Idle
Mem: 320.71 / 8192.00 MB
Terms
Privacy
Cookie preferences
Support

Untitled.ipynb

Code

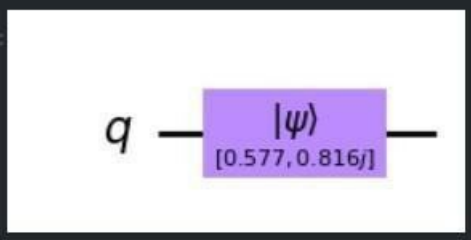
```
results = sim.run(qobj).result().get_counts()
```

[8]:



[10]:
```
qc2 = QuantumCircuit(1)
initial_state = [sqrt(1/3), 1j * np.sqrt(2/3)]
qc2.initialize(initial_state,0)
qc2.draw()
```

[10]:



[11]:
```
qc2.save_statevector()
qobj2 = assemble(qc2)
result = sim.run(qobj2).result()
out_state = result.get_statevector()
print(out_state)
```

```
Statevector([0.57735027+0.j        , 0.        +0.81649658j],
            dims=(2,))
```

```
/tmp/ipykernel_59/29683373.py:3: DeprecationWarning: Using a qobj for run() is deprecated as of qiskit-aer
an 3 months from that release date. Transpiled circuits should now be passed directly using `backend.run(c
  result = sim.run(qobj2).result()
```



```
results2 = sim.run(qobj2).result().get_counts()
```

[12]: