tele

May 5, 2021

[158]:
```
import numpy as np
# Importing standard Qiskit libraries
from qiskit import QuantumCircuit, assemble, transpile, Aer, IBMQ
from qiskit.tools.jupyter import *
from qiskit.visualization import *
from ibm_quantum_widgets import *

import numpy as np
from qiskit import QuantumCircuit, transpile, QuantumRegister, ClassicalRegister
from qiskit.providers.aer import QasmSimulator
from qiskit.visualization import plot_histogram
from qiskit import BasicAer, execute
from qiskit.visualization import plot_state_city, plot_bloch_multivector
from qiskit.visualization import plot_state_paulivec, plot_state_hinton
from qiskit.visualization import plot_state_qsphere

# Loading your IBM Q account(s)
provider = IBMQ.load_account()
simulator = QasmSimulator()
```

```
ibmqfactory.load_account:WARNING:2021-05-05 18:27:11,432: Credentials are
already in use. The existing account in the session will be replaced.
```

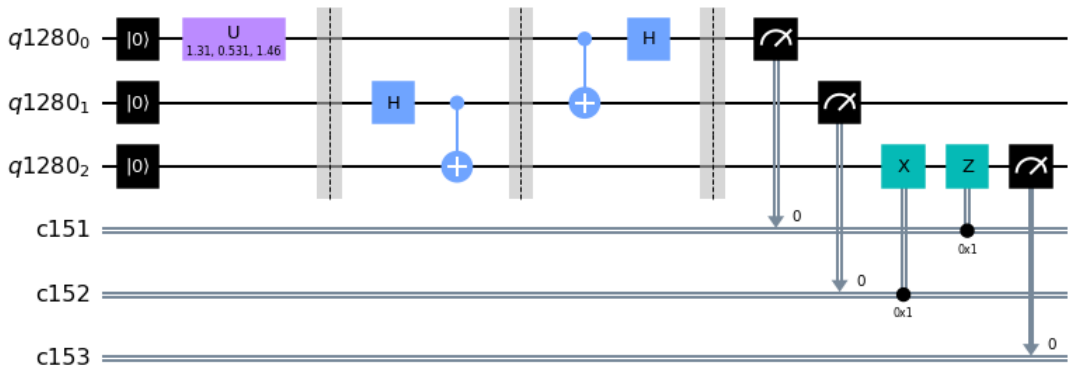
[188]:
```
nshots = 5000
i = np.random.uniform(low=0. , high = np.pi, size = 3)  # initial_state
i
```

[188]:
```
array([1.30632311, 0.5310732 , 1.4619714 ])
```

[246]:
```
qr = QuantumRegister(3)
'''
qubit 0 -> the qubit Alice sends to Bob
qubit 1 -> the qubit Alice owns
qubit 1 -> the qubit Bob owns
'''
cr1 = ClassicalRegister(1)
cr2 = ClassicalRegister(1)
cr3 = ClassicalRegister(1)
```

```
qc = QuantumCircuit(qr,cr1,cr2,cr3)

# reset all qubits
qc.reset(0)
qc.reset(1)
qc.reset(2)


# generate a random initial state
qc.u(i[0],i[1],i[2],0)
qc.barrier()

# create a bell pair
qc.h(1)
qc.cx(1,2)
qc.barrier()

# prepare the qubit Alice sends to Bob
qc.cx(0,1)
qc.h(0)
qc.barrier()



# store measurements info into classical bits
qc.measure(0,0)
qc.measure(1,1)

# operate the qubic Bob owns based on classical bits
qc.x(2).c_if(cr2,1)
qc.z(2).c_if(cr1,1)

#qc.cx(1, 2)
#qc.cz(0, 2)
qc.measure(2,2)

qc.draw()
```

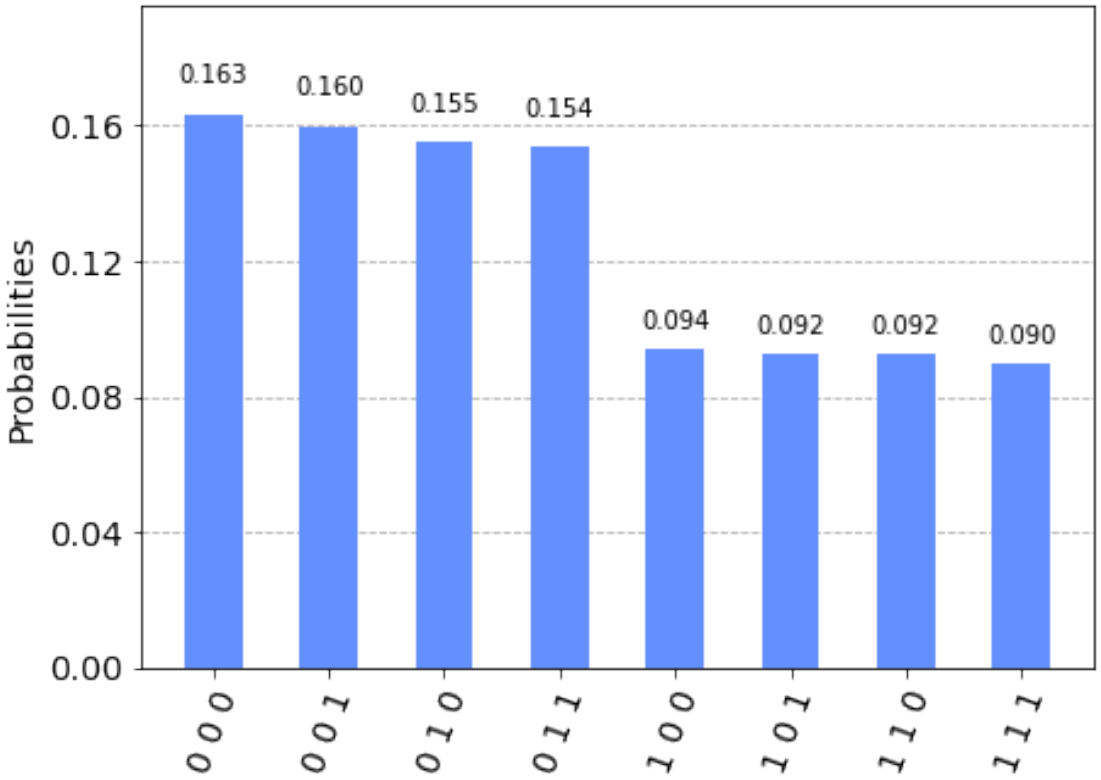
[246]:



[247]:
```
# use Aer's simulator to transpile
compiled_telecircuit = transpile(qc, simulator)
tele_result = simulator.run(compiled_telecircuit, shots=nshots).result()

# Returns counts
tele_counts = tele_result.get_counts(qc)
print("\nTotal count for 0 and 1 are:",tele_counts)
plot_histogram(tele_result.get_counts())
```

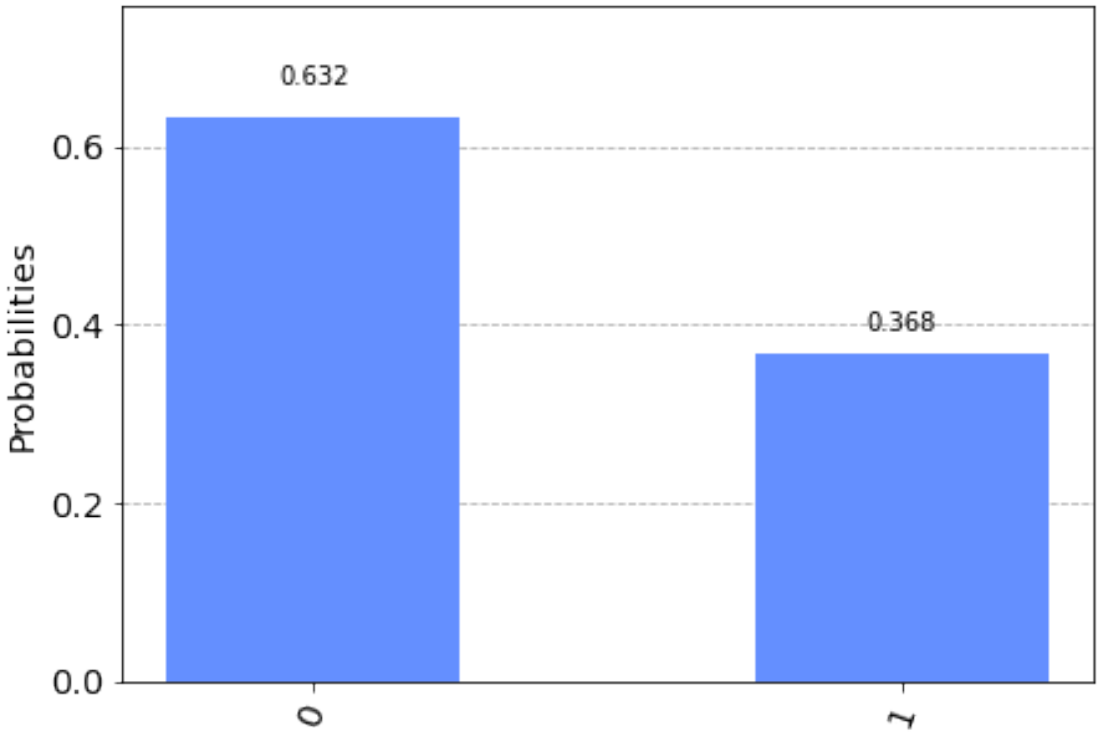
```
Total count for 0 and 1 are: {'1 0 1': 462, '0 0 1': 798, '0 1 0': 775, '0 0 0':
816, '1 1 1': 448, '0 1 1': 769, '1 1 0': 462, '1 0 0': 470}
```

[247]:



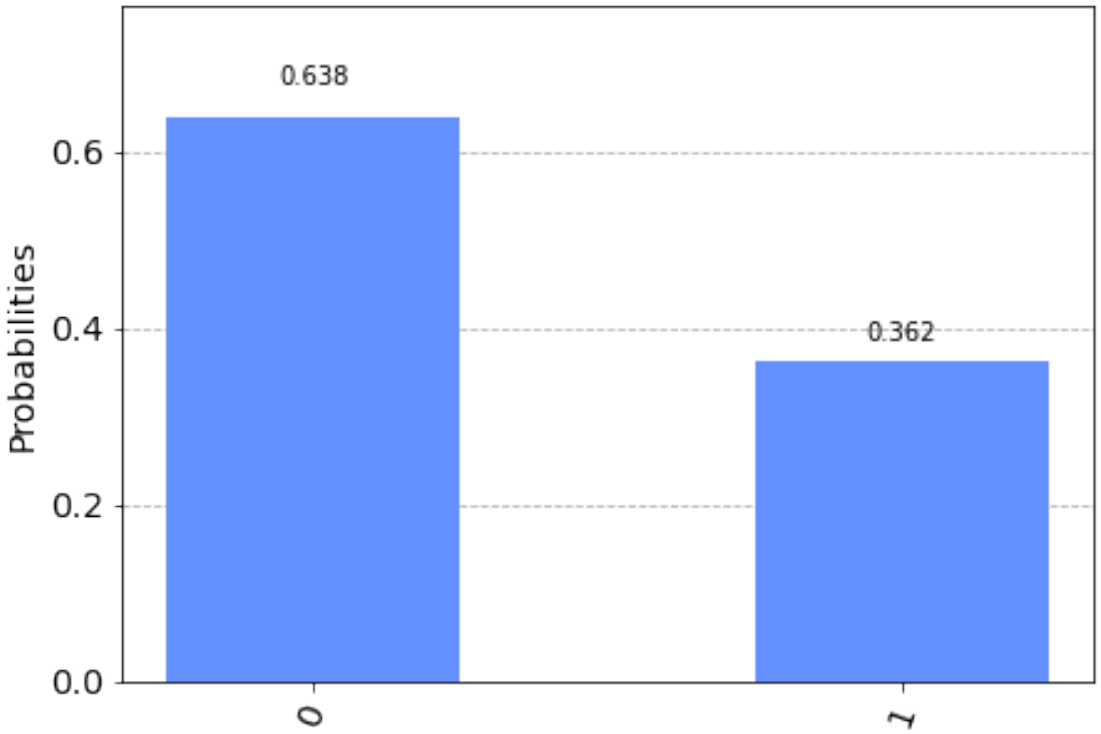
[248]:
```
plot_histogram({'0' : tele_result.get_counts()['0 0 0'] +\
tele_result.get_counts()['0 0 1'] +\
tele_result.get_counts()['0 1 0'] +\
tele_result.get_counts()['0 1 1'] ,
'1' : tele_result.get_counts()['1 0 0'] +\
tele_result.get_counts()['1 0 1'] +\
tele_result.get_counts()['1 1 0'] +\
tele_result.get_counts()['1 1 1']})
#plot_histogram(tele_result.get_counts())
```

[248]:



[249]:
```
# we check if it's the correct message the ALice wants to send
qtest = QuantumCircuit(QuantumRegister(1),ClassicalRegister(1))
qtest.u(i[0],i[1],i[2],0)
qtest.measure(0,0)
compiled_test = transpile(qtest, simulator)
test_result = simulator.run(compiled_test, shots=nshots).result()

# Returns counts
test_counts = test_result.get_counts(qtest)
plot_histogram(test_result.get_counts())
```

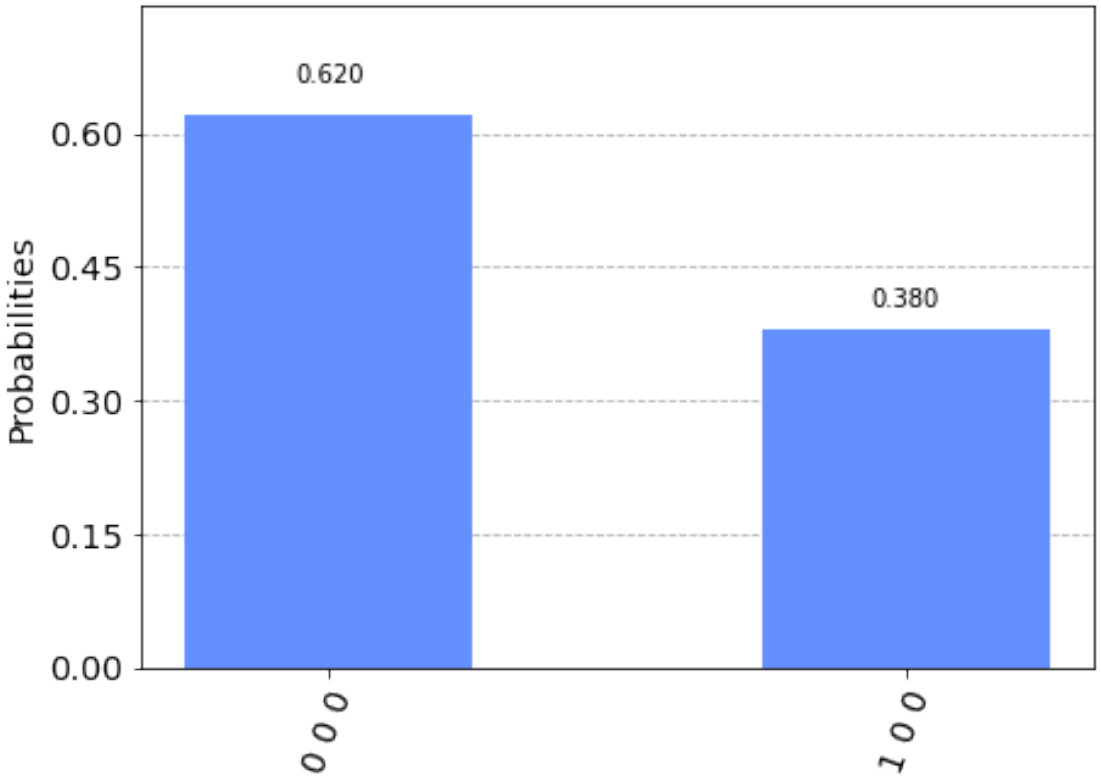
[249]:



[222]:
```
#from qiskit import IBMQ
from qiskit.providers.ibmq import least_busy
backend = least_busy(provider.backends(filters=lambda x: x.configuration().
 ↪n_qubits >= 3
                                       and not x.configuration().simulator
                                        and x.status().operational==True))


IBMQ.
 ↪save_account('01afe7b8b11e422c87f1319311516aed65a115363d59f6a33a8c9ed2302115e5cec9ccbb00992
IBMQ.load_account()
provider = IBMQ.get_provider('ibm-q')
#qcomp = provider.get_backend('ibmq_santiago') # check which one has 0 jobs on␣
 ↪queue
job = execute(qc, backend=backend)
q_result = job.result()
plot_histogram(q_result.get_counts(qc))
```

```
configrc.store_credentials:WARNING:2021-05-05 18:50:24,204: Credentials already
present. Set overwrite=True to overwrite.
ibmqfactory.load_account:WARNING:2021-05-05 18:50:24,340: Credentials are
already in use. The existing account in the session will be replaced.
```

[222]:


0.620
0.380
0.60
0.45
0.30
0.15
0.00
Probabilities
0 0 0
1 0 0

[ ]: