Test 5: Spy Hunter Qubit (09/13/2021)

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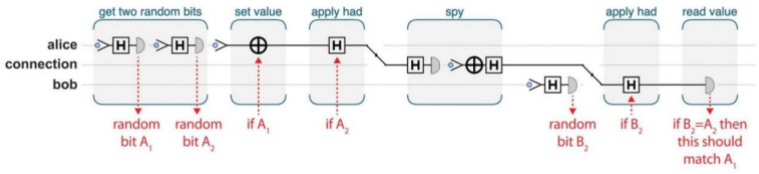
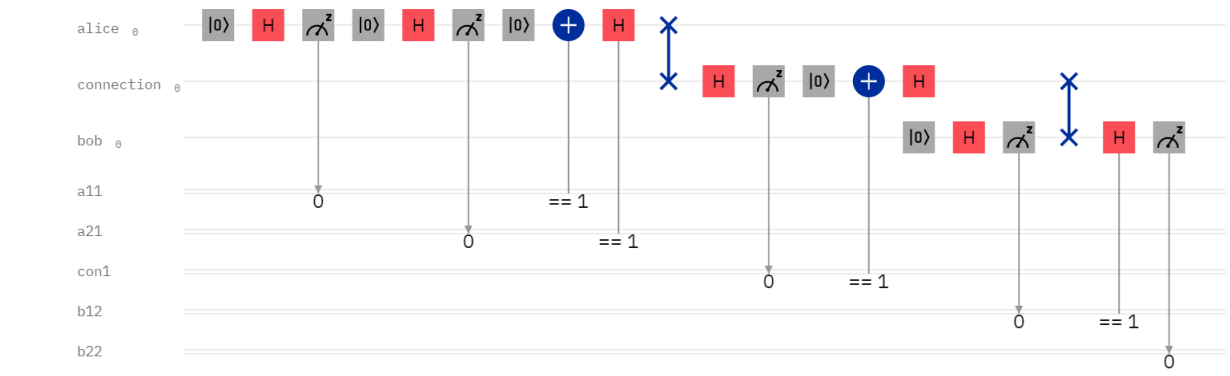


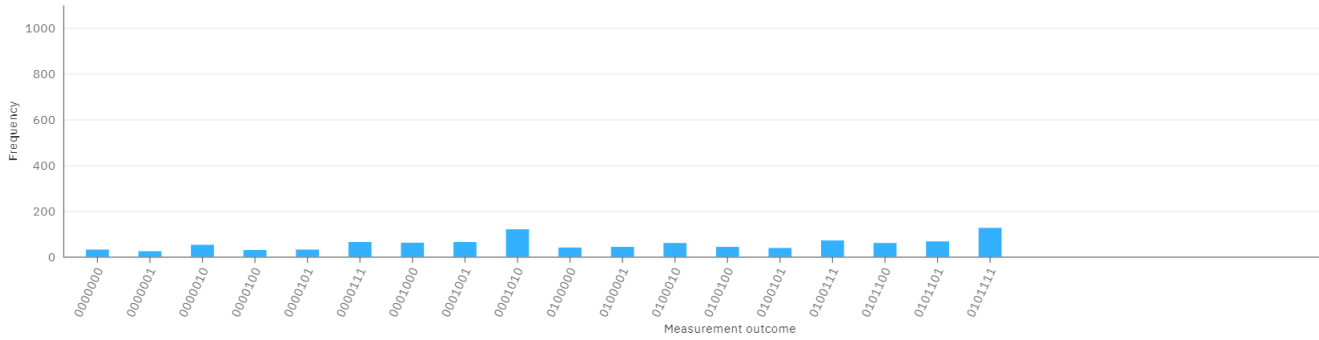
1 Have a spy

```
OPENQASM 2.0;
include "qelib1.inc";
//init bit and q-bit
qreg alice[1];
qreg connection[1];
qreg bob[1];
creg a1[1];
creg a2[1];
creg con[1];
creg b1[2];
creg b2[2];

//Alice
//Get two random bits
reset alice[0];
h alice[0];
measure alice[0] -> a1[0];
reset alice[0];
h alice[0];
measure alice[0] -> a2[0];
reset alice[0];
//set value
if(a1==1) x alice[0];
//apply hadamard
if(a2==1) h alice[0];

//spy
swap  alice[0], connection[0];
h connection[0];
measure connection[0] -> con[0];
reset connection[0];
if (con==1) x connection[0];
```

```
33      h connection[0];
34
35      //Bob
36      //random B1
37      reset bob[0];
38      h bob[0];
39      measure bob[0] -> b1[0];
40
41      //read q-bit
42      swap connection[0], bob[0];
43      if(b1==1) h bob[0];
44      measure bob[0] -> b2[0];
45
46
```

Listing 1: Have a spy

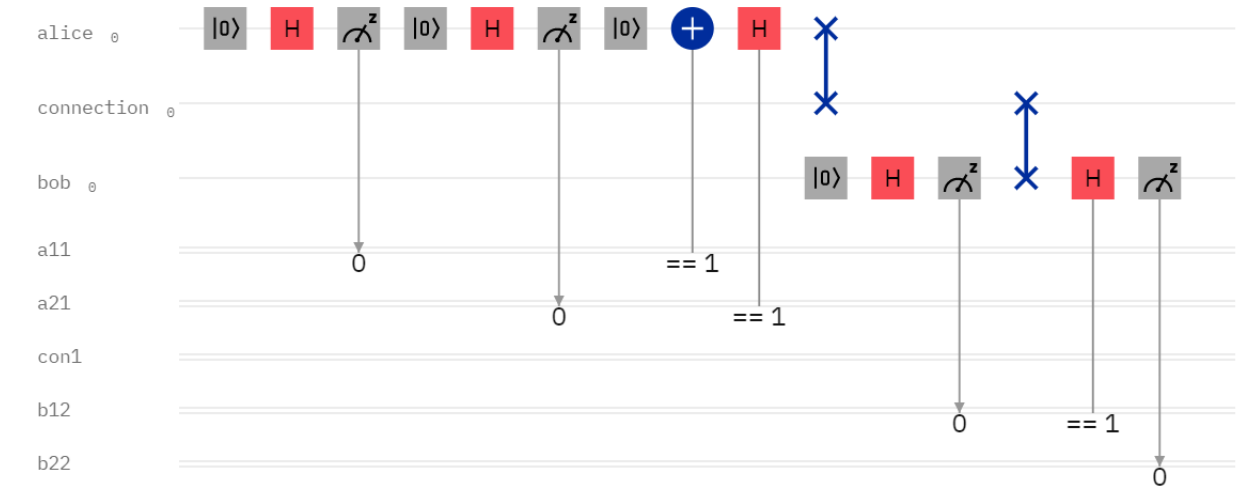


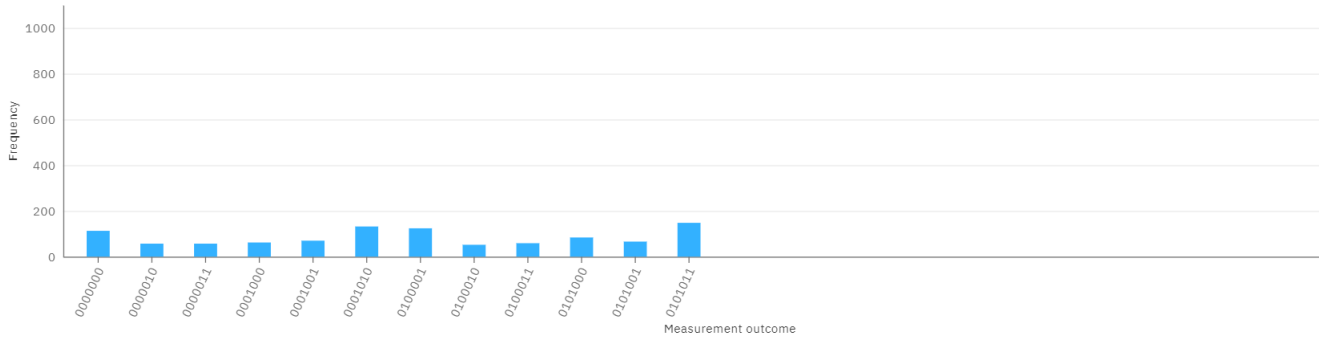


2 No spy

```
OPENQASM 2.0;
include "qelib1.inc";
//init bit and q-bit
qreg alice[1];
qreg connection[1];
qreg bob[1];
creg a1[1];
creg a2[1];
creg con[1];
creg b1[2];
creg b2[2];

//Alice
//add random bit
reset alice[0];
h alice[0];
measure alice[0] -> a1[0];
reset alice[0];
h alice[0];
measure alice[0] -> a2[0];
reset alice[0];

//set value
if (a1==1) x alice[0];
//apply hadamard
if (a2==1) h alice[0];
swap alice[0],connection[0];

//Bob
reset bob[0];
h bob[0];
measure bob[0] -> b1[0];
swap connection[0],bob[0];
if (b1==1) h bob[0];
measure bob[0] -> b2[0];

```

Listing 2: No spy


alice 0
connection 0
bob 0
a11
a21
con1
b12
b22
|0⟩
H
0
== 1
0
== 1
|0⟩
H
0
H
== 1
0


Frequency
1000
800
600
400
200
0
0000000
0000010
0000011
0001000
0001001
0001010
0100001
0100010
0100011
0101000
0101001
0101011
Measurement outcome