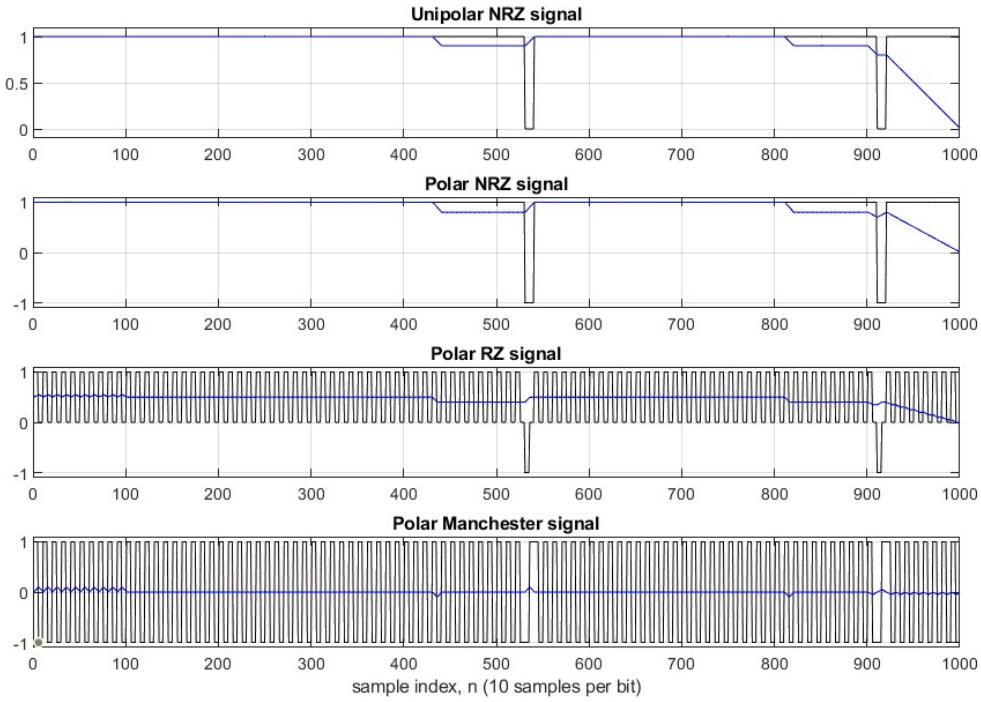
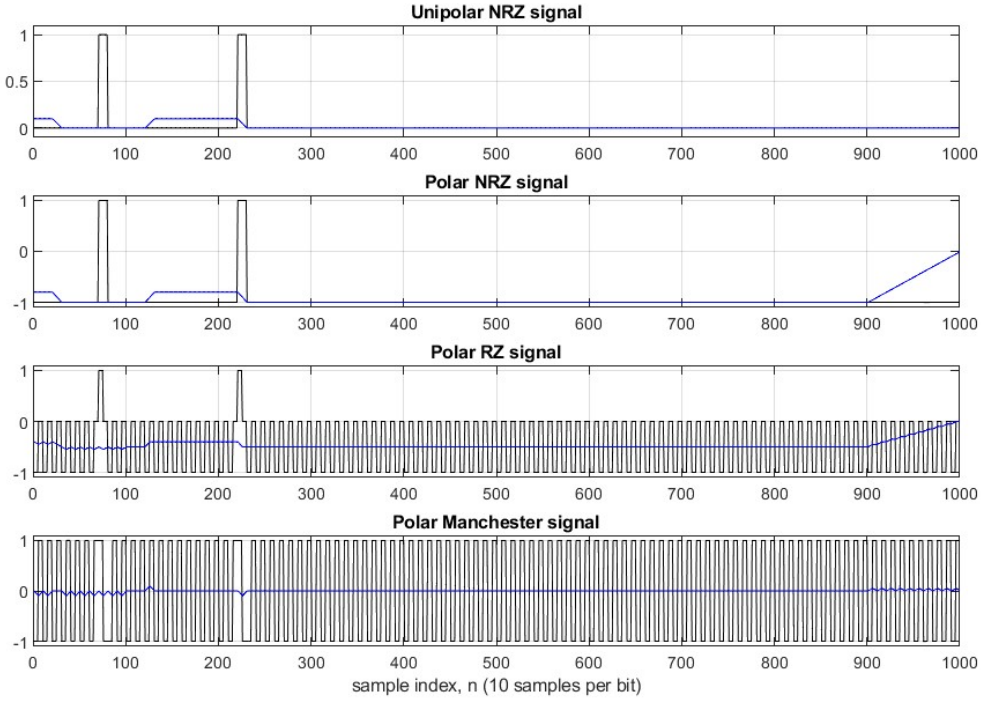
# Solution of Homework # 8

1. Baseline wander

(a) i. $P[B = 0] = 0.03$:



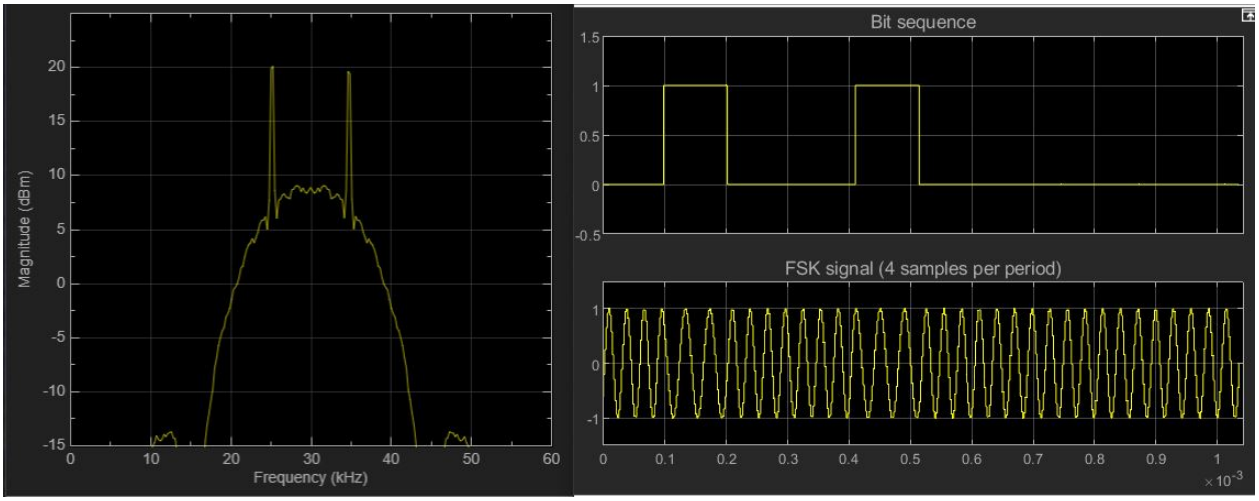

ii. $P[B = 0] = 0.97$:



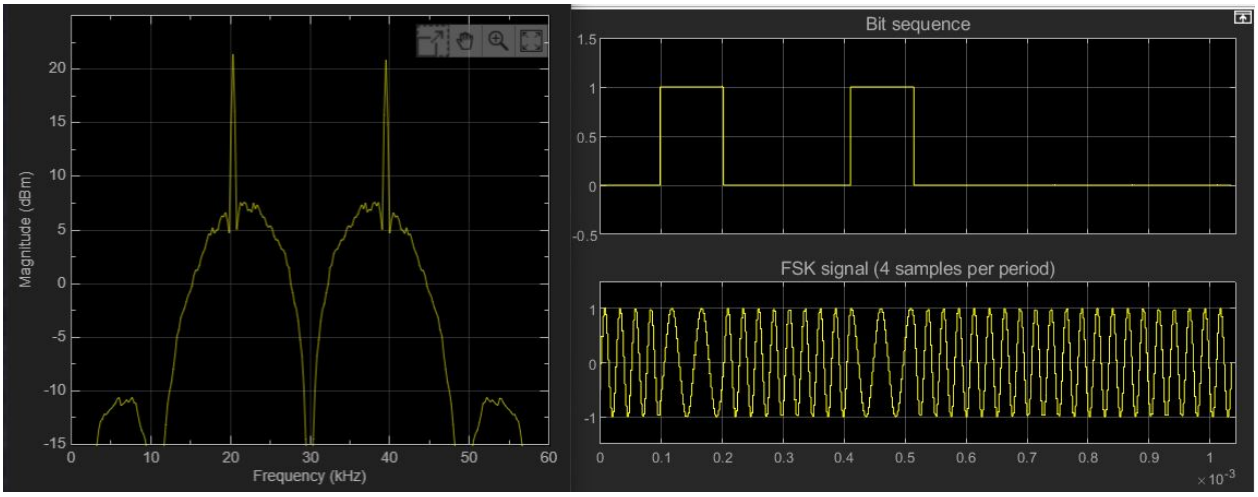
(b) The baseline wander is computed in the script as the running average over 10 bits with 10 samples per bit and shown as the lines in blue color in the figures above. Manchester signaling has the lowest values among the schemes simulated, regardless of the probabilities of zeroes and ones.

2. FSK

(a) $\Delta f = 9600$ Hz: ("Totoro" spectrum)

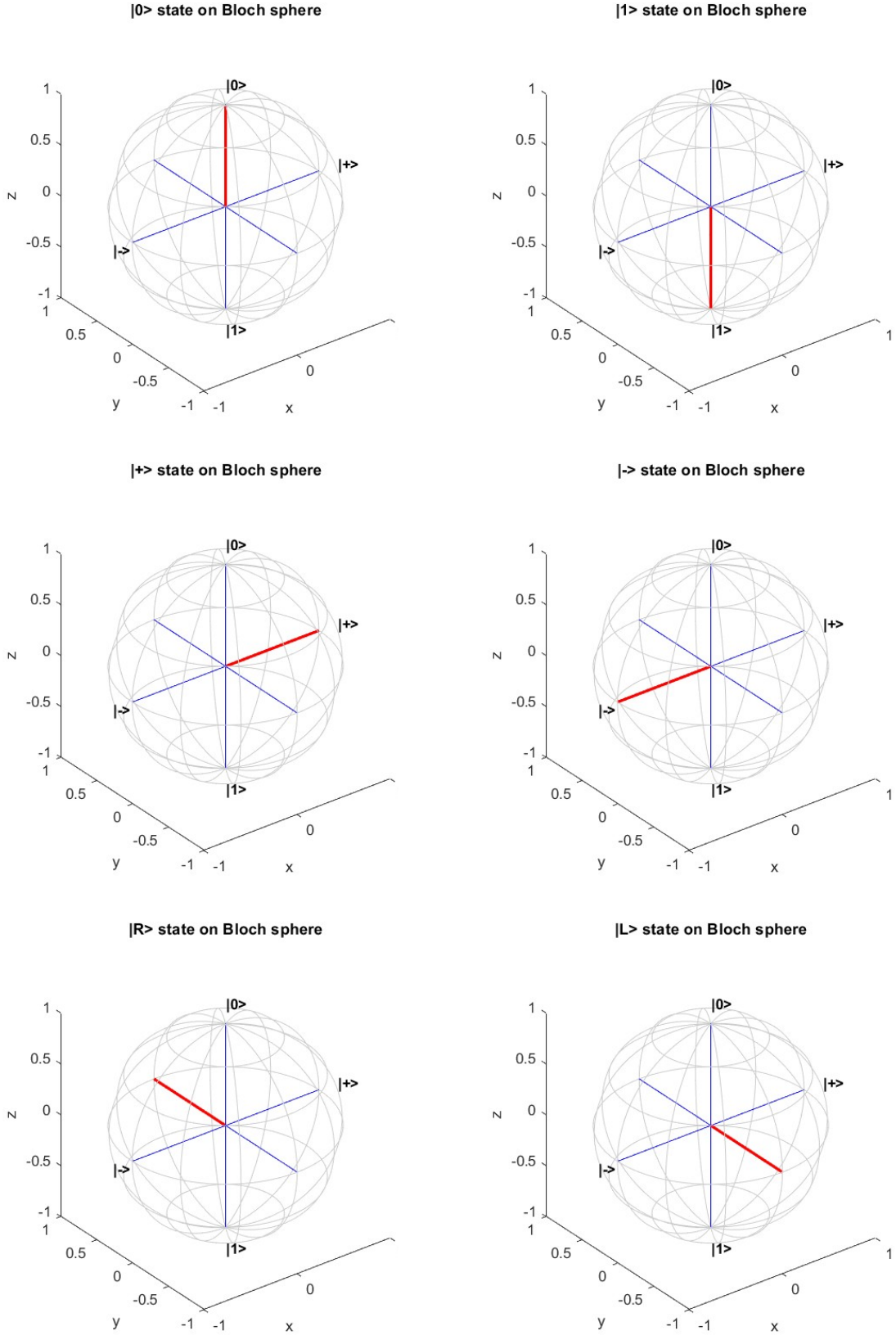



(b) $\Delta f = 19200$ Hz:

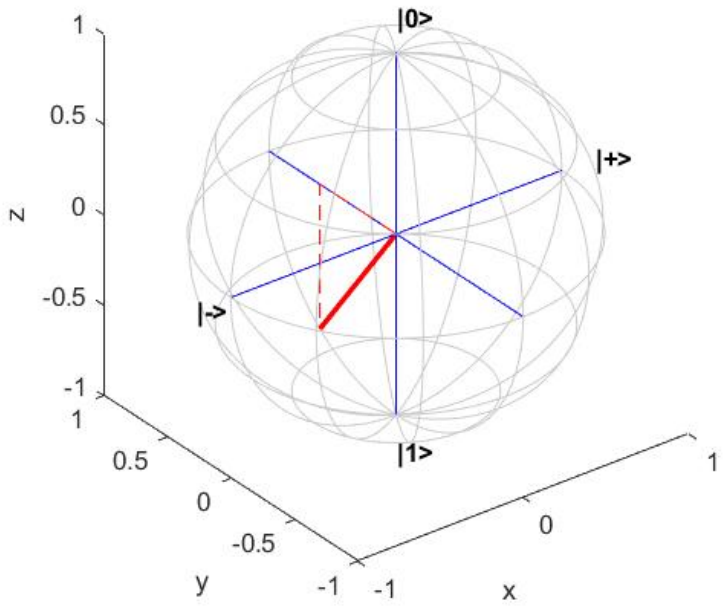


3. Bloch sphere representation of quantum states

(a) Six states of a qubit represented in a Bloch sphere:



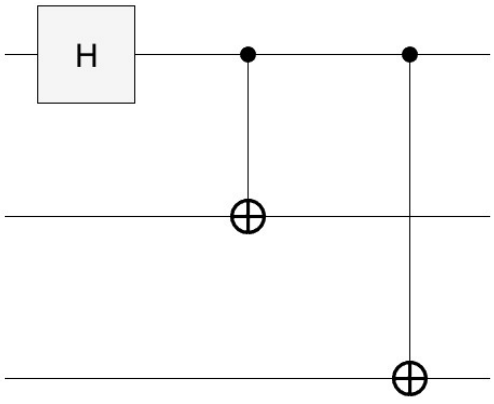
(b) Bloch sphere representation of quantum state $|\psi> = \frac{1}{\sqrt{10}}\,|0> + \frac{3}{\sqrt{10}}\,i\,|1>$

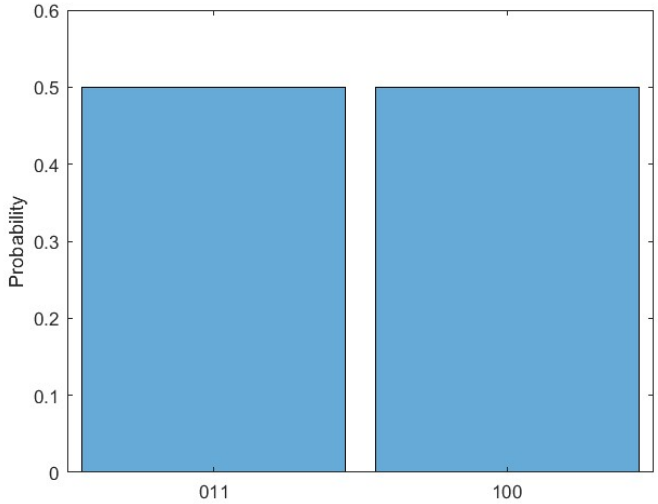



MATLAB script: `plotBlochSphere([1/sqrt(10); (3/sqrt(10))*i])`

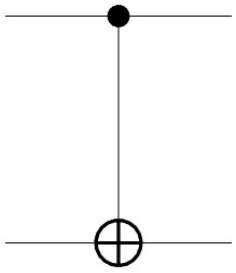
4. Local Quantum State Simulation

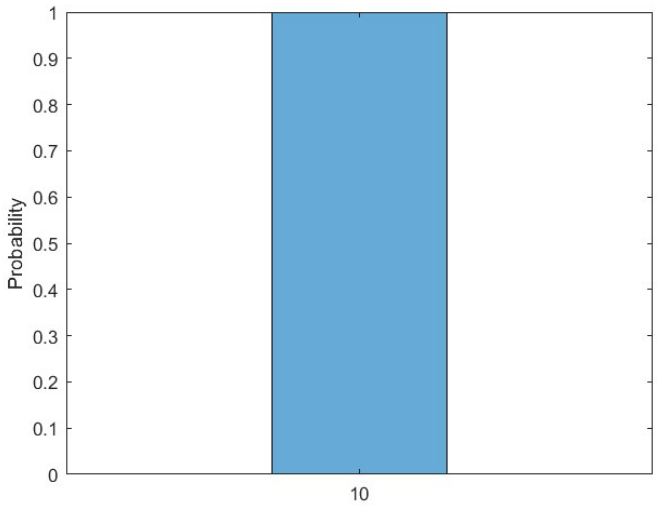
(a) Results:



(b) CNOT gate with initial state `11`: The only (with probability one) possible state is `10` as shown in the histogram below.






MATLAB script:

```
gates = [cxGate(1,2)];

C = quantumCircuit(gates);
figure(1), plot(C)

S = simulate(C,"11")
figure(2), histogram(S)
```