

1. Plot the constellation diagram for QPSK. (figure 1)
2. For each of the four constellation symbols of QPSK, plot the vector representation of 100 received samples distorted at $E_b/N_0 = 5\text{dB}$ on the constellation diagram. (Use different color for the original constellation symbol and the distorted samples.) (figure 2)
3. For each of the four constellation symbols of QPSK, plot the vector representation of 100 received samples distorted at $E_b/N_0 = 12\text{dB}$ on the constellation diagram. (Use different color for the original constellation symbol and the distorted samples.) (figure 3).

Sample Matlab code for plotting constellation diagram:

```
% each constellation symbol can be represented as a complex number.  
s(k) = Es*exp(j*2*pi*k/M); % you need to define the value of Es, k, M
```

```
% plot the constellation symbol as a red point with size 15.  
plot(s(k), 'r.', 'markersize', 15);  
axis([-2, 2, -2, 2])
```

```
% generate both inphase noise and quadrature noise  
noise = sqrt(noise_var)*(randn(1)+j*randn(1));
```

```
% distorted sample  
r(k) = s(k) + noise;
```

```
% plot the distorted sample as a blue point with size 15  
plot(s(k), 'b.', 'markersize', 15);
```