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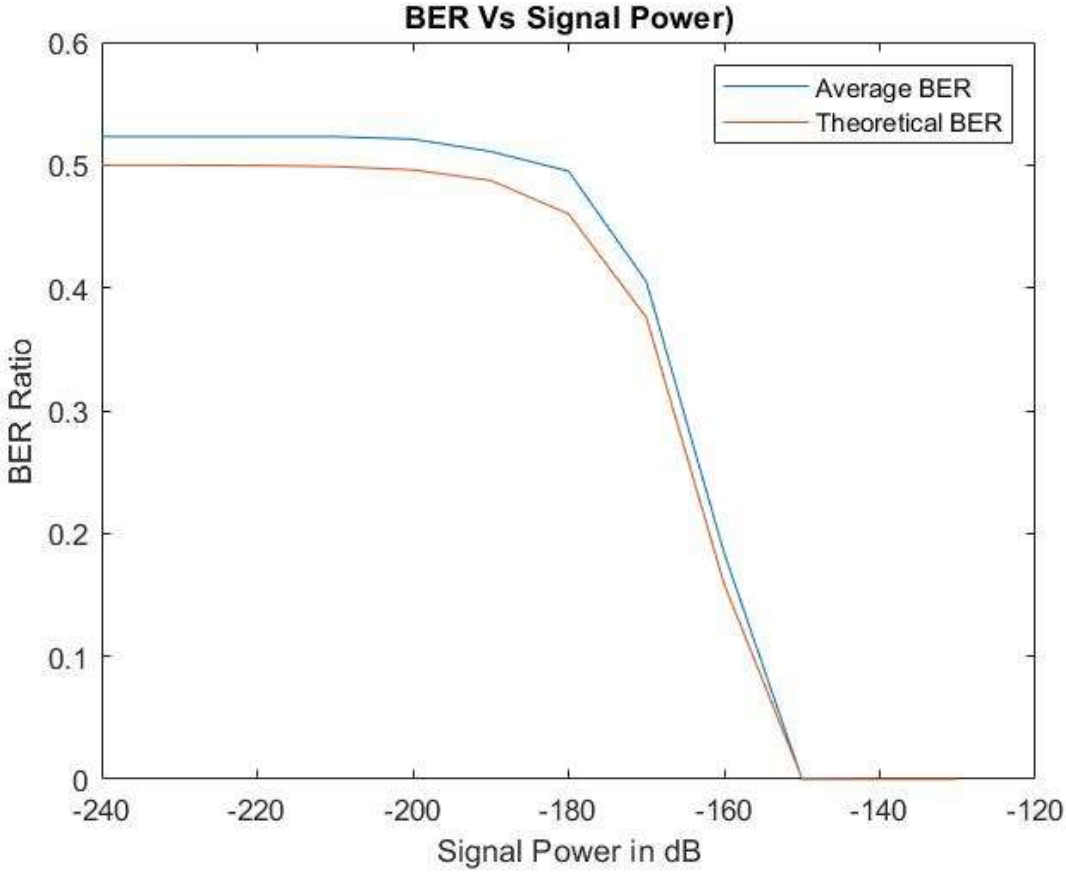
SECTION - 1

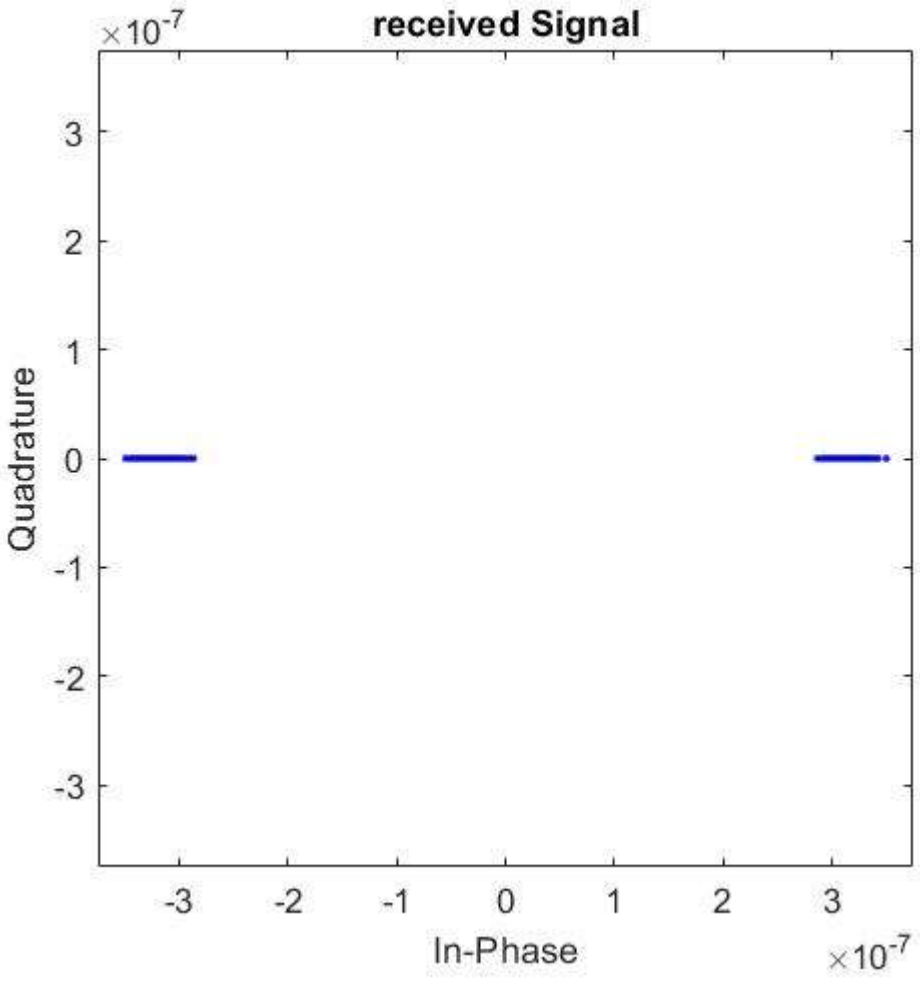
TASK-1

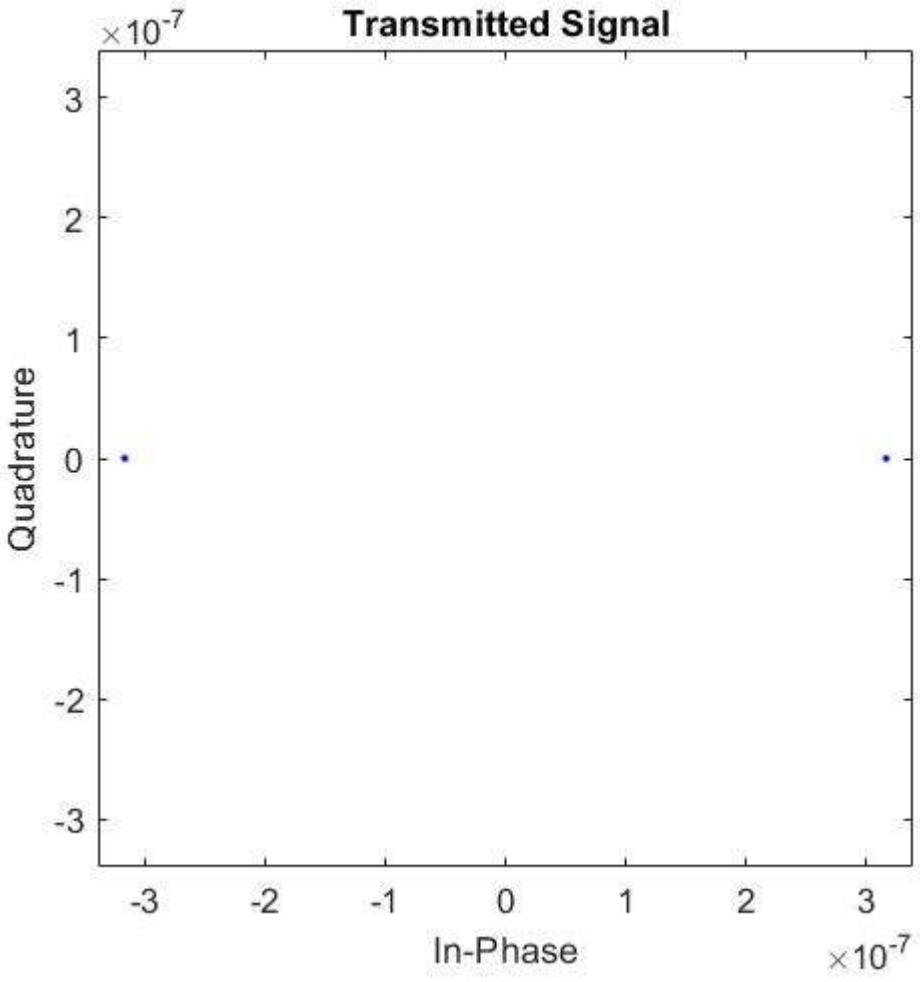
```
clc
clear all
close all

N = 10^6;
data = randi([0 1],1,N);
data_transmission = 2*data - 1;
data_received = zeros(1,N);
Noise_db = -150;
BW = 100;
noise_power = 10^((Noise_db/10)-3)*BW;
Noise_standard_deviation = sqrt(noise_power);
Noise = Noise_standard_deviation*randn(size(data));
%Noise = Noise';
P = 1e-24;
signal_power = [];
ber_function = [];
bit_error = [];
while P <= 1e-12
 transmission = sqrt(P)*data_transmission;
 received = transmission + Noise;
 for i = 1:N
 if received(i)>=0
 data_received(i) = 1;
 else
 data_received(i) = 0;
 end
 end
 [dummy,ratio] = biterr(data_received,data);
 bit_error = [bit_error ratio];
 signal_power = [signal_power 10*log10(P)];
```

```
 ber_function = [ber_function
qfunc(sqrt(P/noise_power))];
 P = P*10;
end
scatterplot(transmission,[],[]);
title('Transmitted Signal')
scatterplot(received,[],[]);
title('received Signal')
figure(3)
plot(signal_power,bit_error)
hold on
plot(signal_power,ber_function)
legend('Average BER','Theoretical BER')
xlabel('Signal Power in dB')
ylabel('BER Ratio')
title('BER Vs Signal Power)');
```


BER Vs Signal Power)
Average BER
Theoretical BER
BER Ratio
Signal Power in dB
0.6
0.5
0.4
0.3
0.2
0.1
0
-240
-220
-200
-180
-160
-140
-120


received Signal
×10^-7
3
2
1
0
-1
-2
-3
Quadrature
-3
-2
-1
0
1
2
3
In-Phase
×10^-7

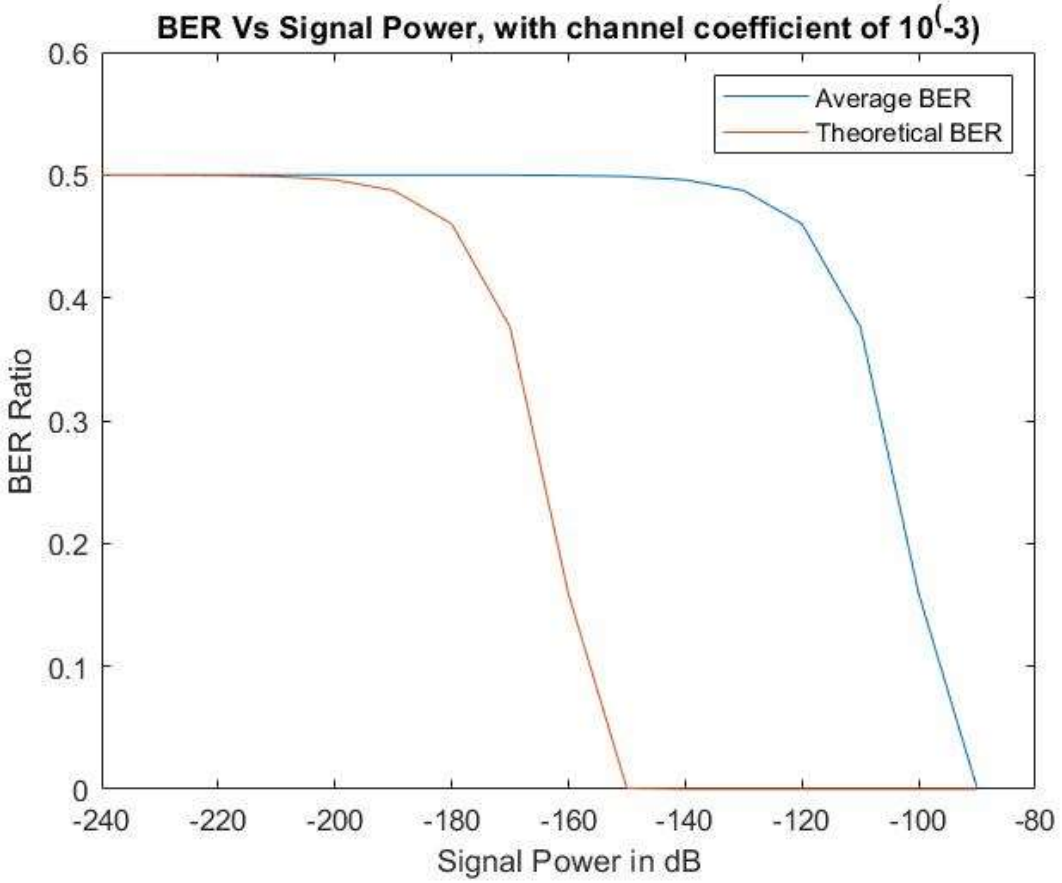

Transmitted Signal
×10^-7
3
2
1
0
-1
-2
-3
Quadrature
-3
-2
-1
0
1
2
3
In-Phase
×10^-7

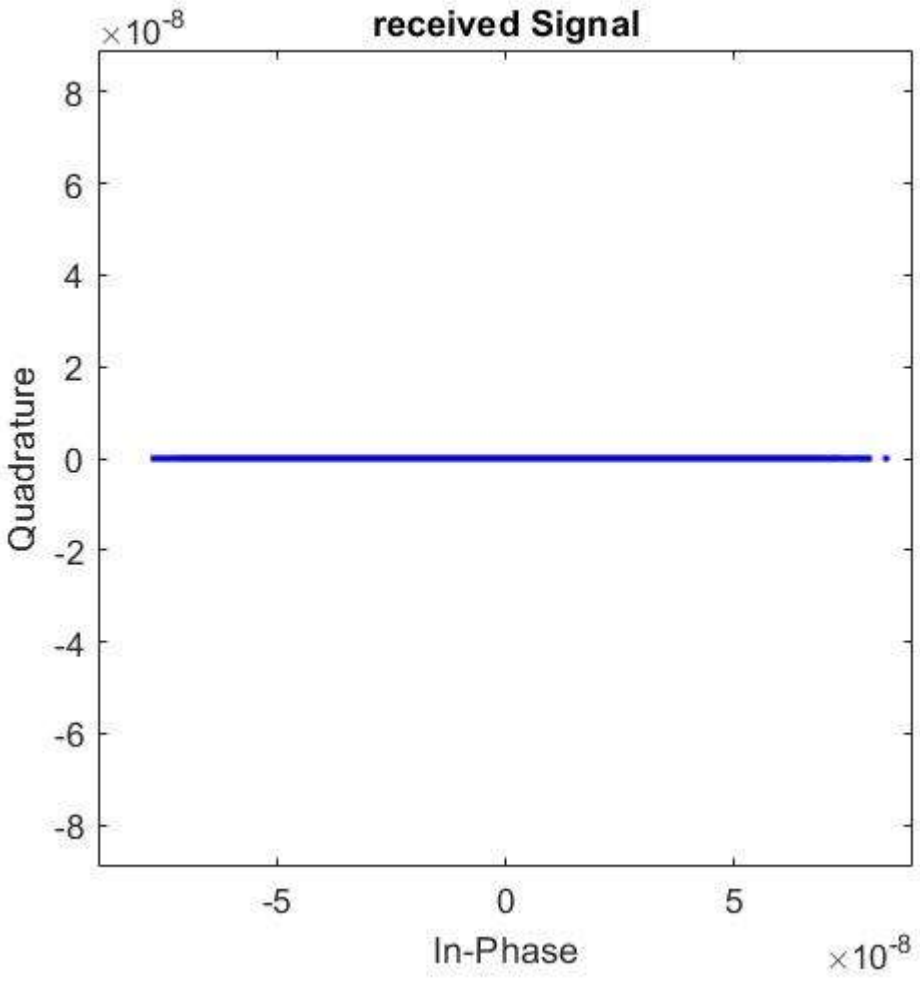
Task-2

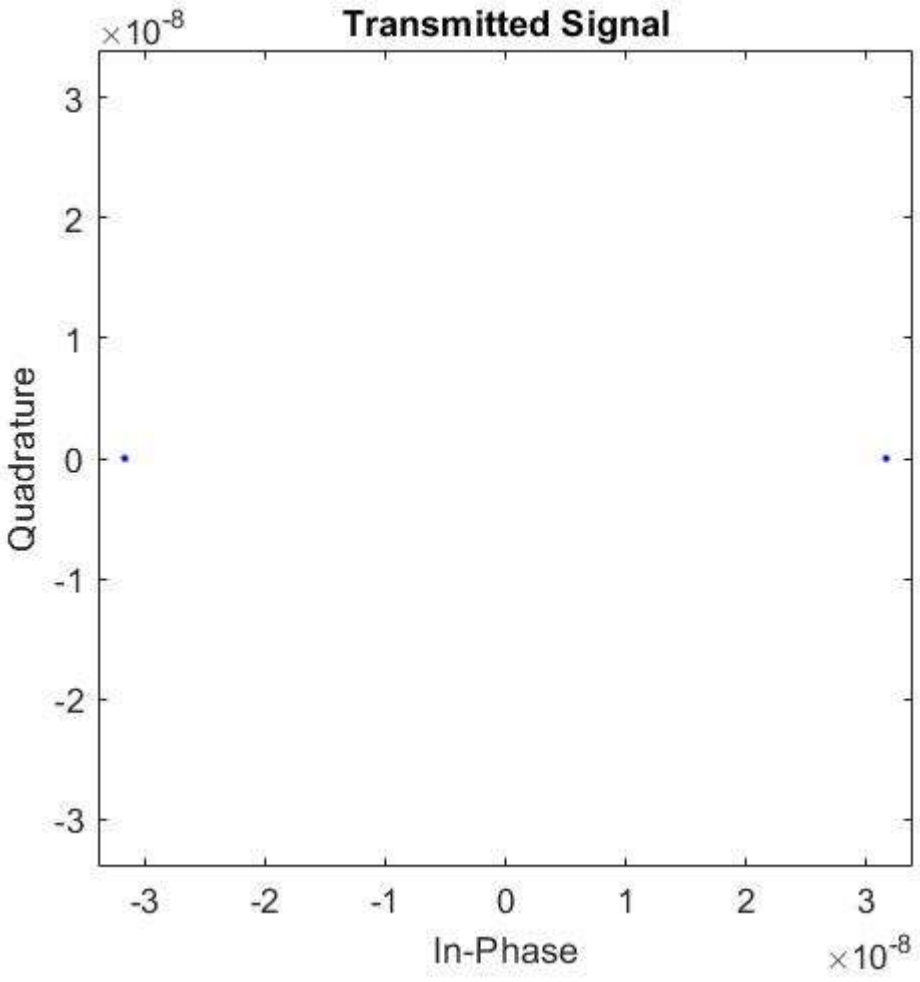
```
clc
clear all
close all

N=10^6;
alpha = 1e-3;
data = randi([0 1],1,N);
data_transmission = 2*data - 1;
data_received = zeros(1,N);
Noise_db = -150;
BW = 100;
noise_power = 10^((Noise_db/10)-3)*BW;
Noise_standard_deviation = sqrt(noise_power);
Noise = Noise_standard_deviation*randn(size(data));
%Noise = Noise';
P = 1e-24;
signal_power = [];
ber_function = [];
bit_error = [];
while P <= 1e-8
 transmission = alpha*sqrt(P)*data_transmission;
 received = transmission + Noise;
 for i = 1:N
 if received(i)>=0
 data_received(i) = 1;
 else
 data_received(i) = 0;
 end
 end
 [dummy,ratio] = biterr(data_received,data);
 bit_error = [bit_error ratio];
 signal_power = [signal_power 10*log10(P)];
 ber_function = [ber_function
qfunc(sqrt(P/noise_power))];
 P = P*10;
end
scatterplot(transmission,[],[]);
title('Transmitted Signal')
scatterplot(received,[],[]);
title('received Signal')
```

```
figure(3)
plot(signal_power,bit_error)
hold on
plot(signal_power,ber_function)
legend('Average BER','Theoretical BER')
xlabel('Signal Power in dB')
ylabel('BER Ratio')
title('BER Vs Signal Power, with channel coefficient of
10^(-3)');
```


BER Vs Signal Power, with channel coefficient of 10^(-3)
Average BER
Theoretical BER
BER Ratio
Signal Power in dB
0.6
0.5
0.4
0.3
0.2
0.1
0
-240
-220
-200
-180
-160
-140
-120
-100
-80


received Signal
×10-8
8
6
4
2
0
-2
-4
-6
-8
Quadrature
-5
0
5
In-Phase
×10-8


Transmitted Signal
×10^-8
3
2
1
0
-1
-2
-3
Quadrature
-3
-2
-1
0
1
2
3
In-Phase
×10^-8