DC AHP-9

Name :C.P.Sindhu

SRN: PES1UG21EC071

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Section: 'B'

Code:

```
% This program simulates BER for BPSK signaling and compares it with the
% theoretical formula derived

clearvars;
close all;
clc;

N=1e6;                                  % Number of transmited bits
EbNodB= 0:1:10;                         % EbNo for simulation
EbNolin=10.^(EbNodB/10);                % EbNo in linear scale
No = 1;                                 % Two-sided noise variance is unity

% Generate BPSK constellation points and count the number of bits in error
BER_sim = zeros(1,length(EbNolin));     % Initialize BER
bpone = ones(1,N);                      % Denotes +1 symbols (bit 1)
bmone = -ones(1,N);                     % Denotes -1 symbols (bit 0)
for k = 1:length(EbNolin)
    n = sqrt(No/2)*randn(1,N);          % AWGN 0 mean and variance No/2
    Rxpone = sqrt(EbNolin(k))*bpone+n;  % Recived signal given +1
    Rxmone = sqrt(EbNolin(k))*bmone+n;  % Recived signal given -1
    err1 = Rxpone <= 0;                 % Thresholding decision for +1
    err2 = Rxmone > 0;                  % Thresholding decision for -1
    count1 = sum(err1)./N;              % Type I error
    count2 = sum(err2)./N;              % Type II error
    BER_sim(k) = 0.5*count1+0.5*count2; % Count and get the simulated BER
end

% Calculate the theoretical BER based on the derivation
BER_theo = qfunc(sqrt(2*EbNolin));      % Theoretical BER

% Plot theoretical and simulated BER in the same graph
figure();
semilogy(EbNodB, BER_theo,'r-');        % Plot the theoretical BER
hold on
semilogy(EbNodB, BER_sim,'bs');         % Plot the simulated BER
xlabel('Eb/N0 (dB)');
ylabel('Bit Error Rate for BPSK');
legend('Theoretical', 'Simulated');
title(['Name (SRN)']);
grid on;
hold off;
```

Output:

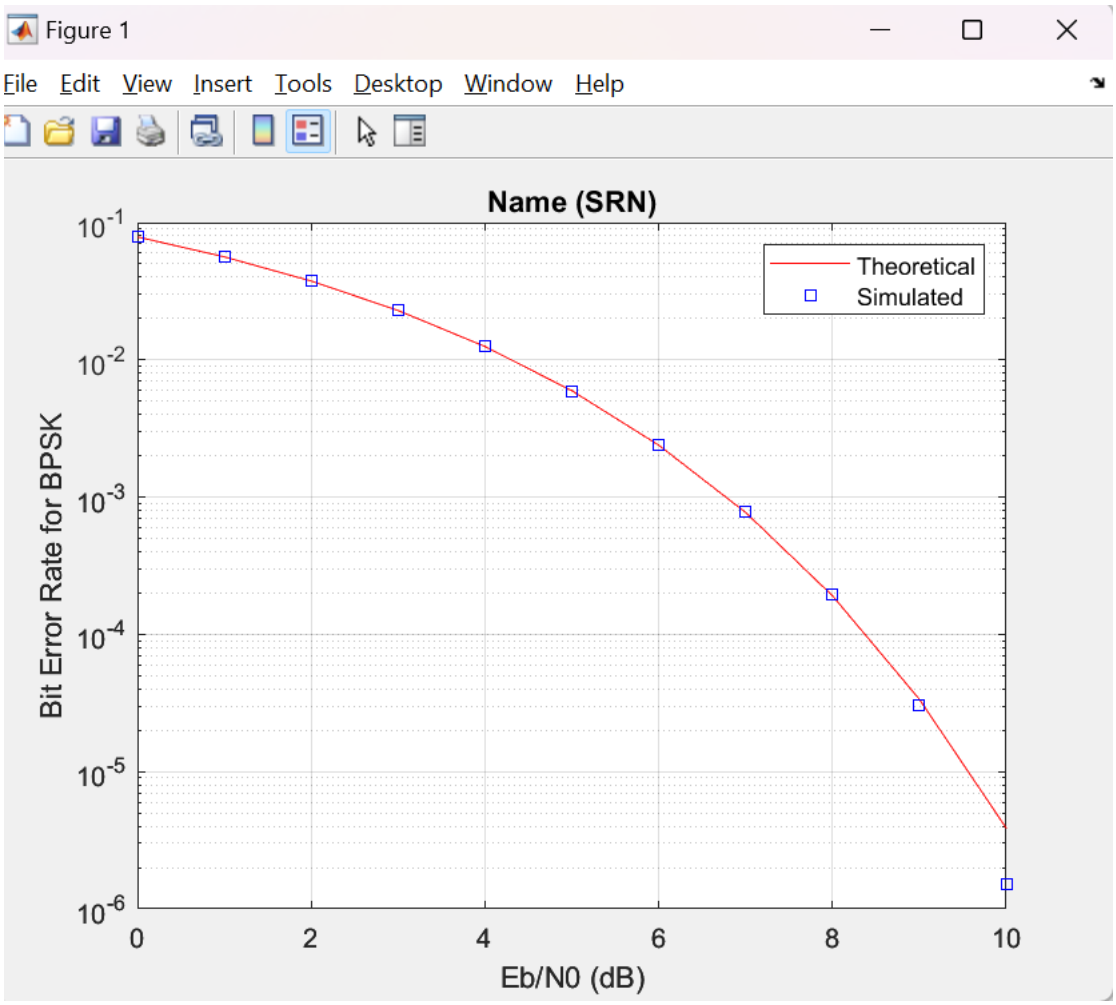
Figure 1
File Edit View Insert Tools Desktop Window Help
Name (SRN)
Theoretical
Simulated
Bit Error Rate for BPSK
Eb/N0 (dB)
10^-1
10^-2
10^-3
10^-4
10^-5
10^-6
0
2
4
6
8
10