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Batch:L7

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Code:

```
clc;
clear all;
close all;

N = 10^5;

input = rand(1, N) > 0.5;
input_bpsk = (2 .* input) - 1;

SNRdb = 0:50;
SNR = 10.^(SNRdb / 10);

BER_theoretical = 0.5 .* (1-sqrt(SNR ./ (SNR+2)));

figure;
semilogy(SNRdb, BER_theoretical, 'b', 'LineWidth', 2);
title("BER vs SNR for Rayleigh Fading Wireless Channel using BPSK");
xlabel("SNR (dB)");
ylabel("Bit Error Rate");
grid on;
hold on;
err = zeros(1, length(SNR));

for z = 1:length(SNR)
   noise = (randn(1, N) + 1i * randn(1, N));
   h = (randn(1, N)+1i*randn(1,N))/sqrt(2);
   y = (h .* input_bpsk) + (noise ./ sqrt(SNR(z)));
```

```
    y_eq = y ./ h;
    rec_op = real(y_eq) > 0;
    err(z) = sum(input ~= rec_op);
end

BER_simulated = err ./ N;
semilogy(SNRdb, BER_simulated, 'r-', 'LineWidth', 2);
SNR_specific = 10;
BER_final = 0.5 * (1 - sqrt(SNR_specific / (SNR_specific + 2)));
disp(['BER at SNR = 10 dB: ', num2str(BER_final)]);
legend('Theoretical BER', 'Simulated BER');
```

Output: