Advanced Topics In Telecommunication Systems

Homework 2 Report

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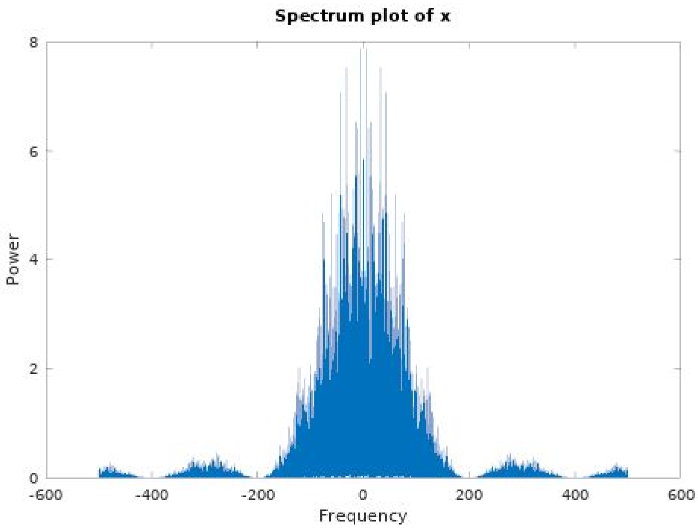
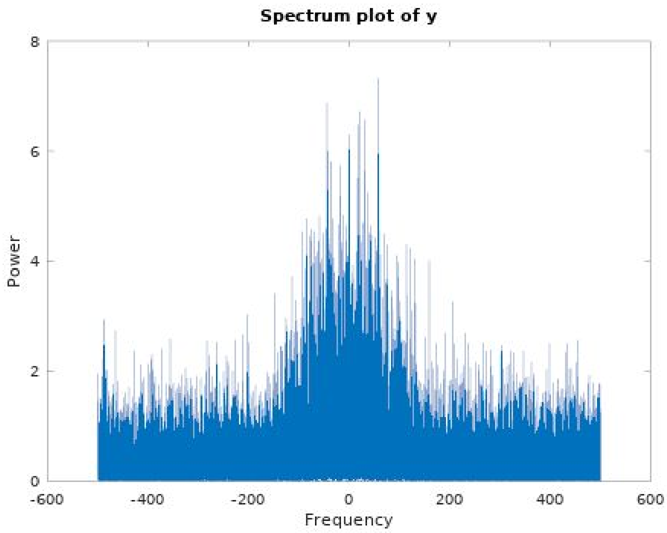
AEM: 2169

A)

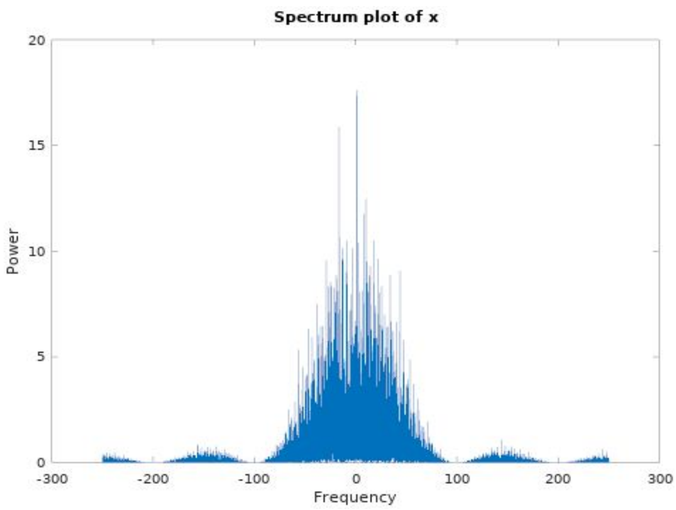
The following plots depict the spectrum plots of signals x and y (in y=x*h+w) for BPSK and QPSK. In order to create these plots we had: Rb =1000 bps, Number of bits = 5000, os = 5, SNRdB = 8 and Tchannel = 1 sec.

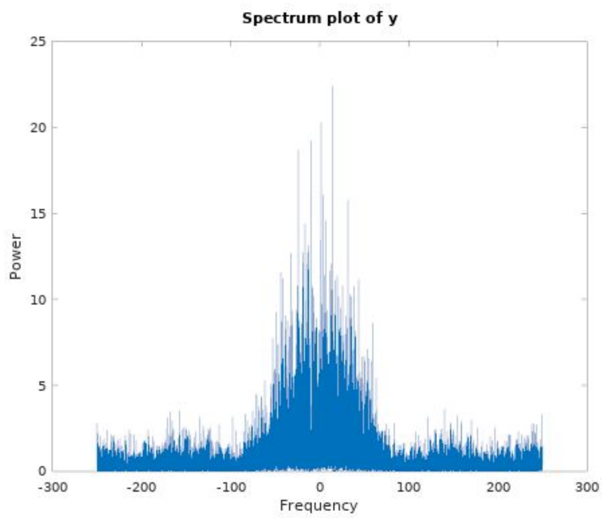
i) BPSK spectrum plots





ii) QPSK spectrum plots

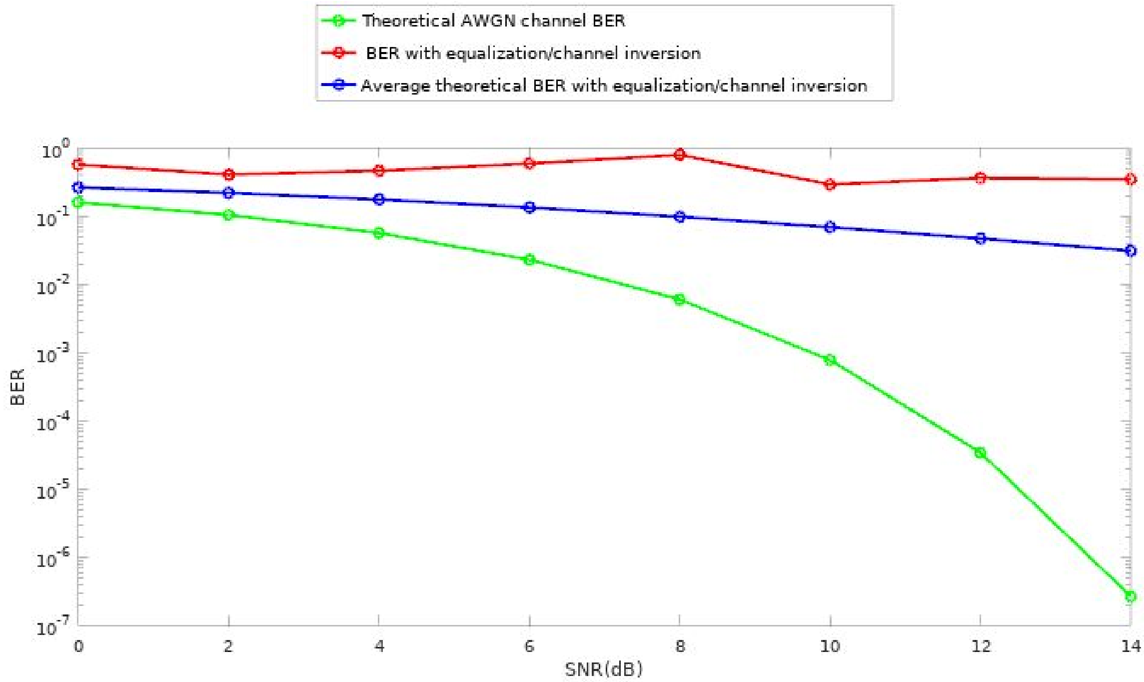




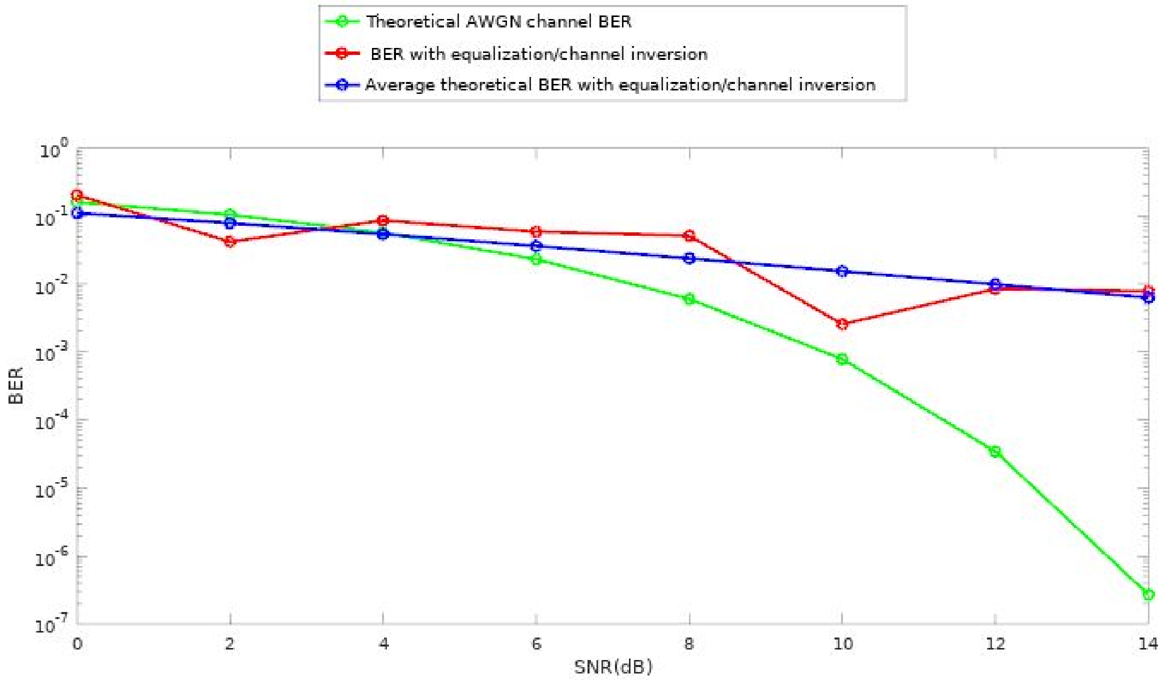
B)
For the BER plots we use for the simulation the following values for the constants: Rb =1000 bps, Number of bits = 9000, os = 1 and Tchannel = 1 sec.

The BER plots for the different SNR values are:

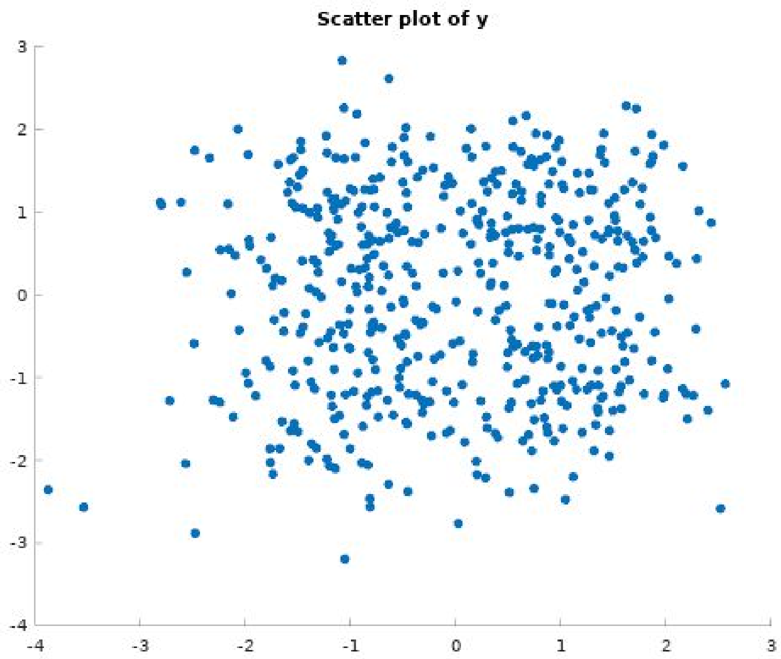
i) Without equalization



ii) With equalization

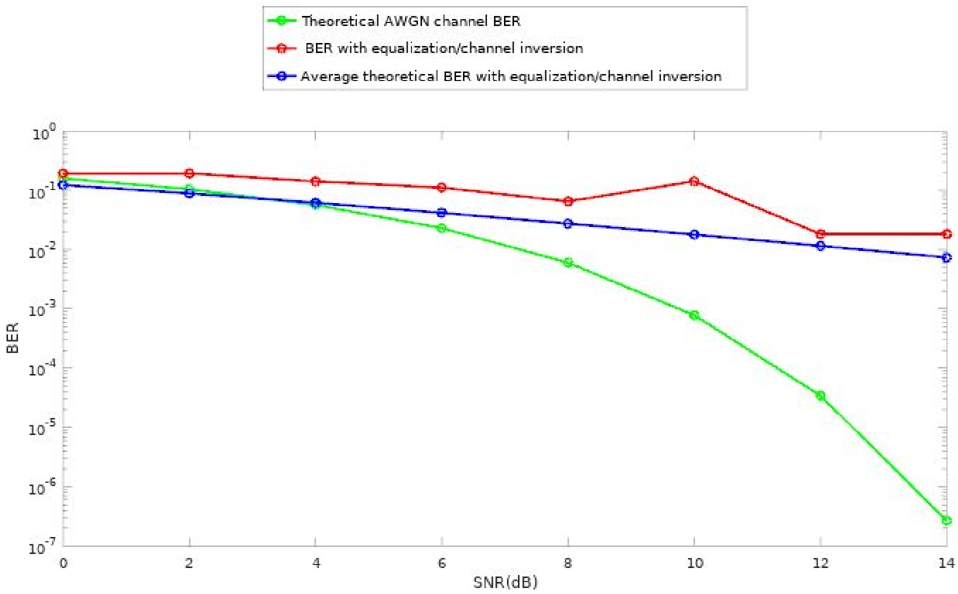


iii) Scatter plot of y for SNRdb =12 and Number of bits = 1000 in BPSK:

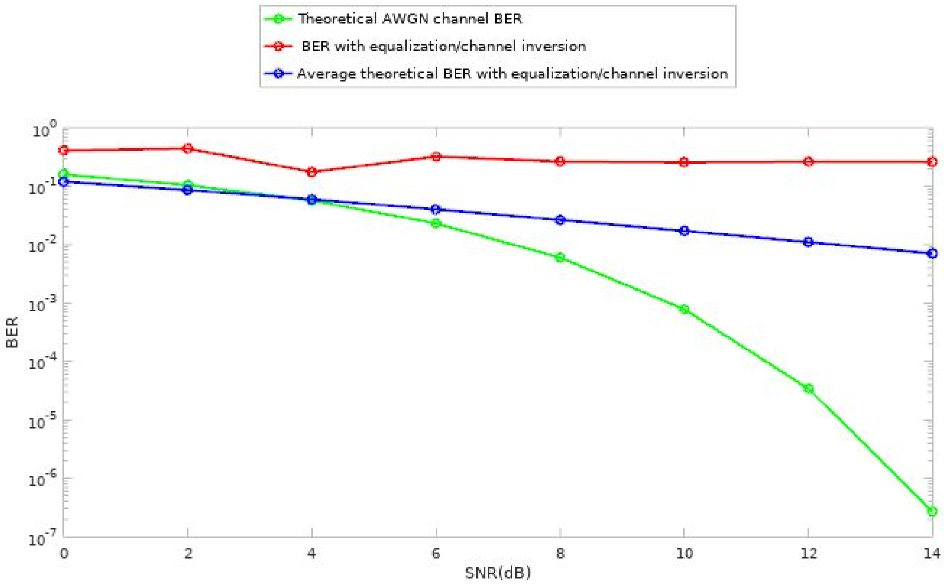


C) BER plots for different values of C (from h' = h+C in the receiver's side)

i) C=0.1

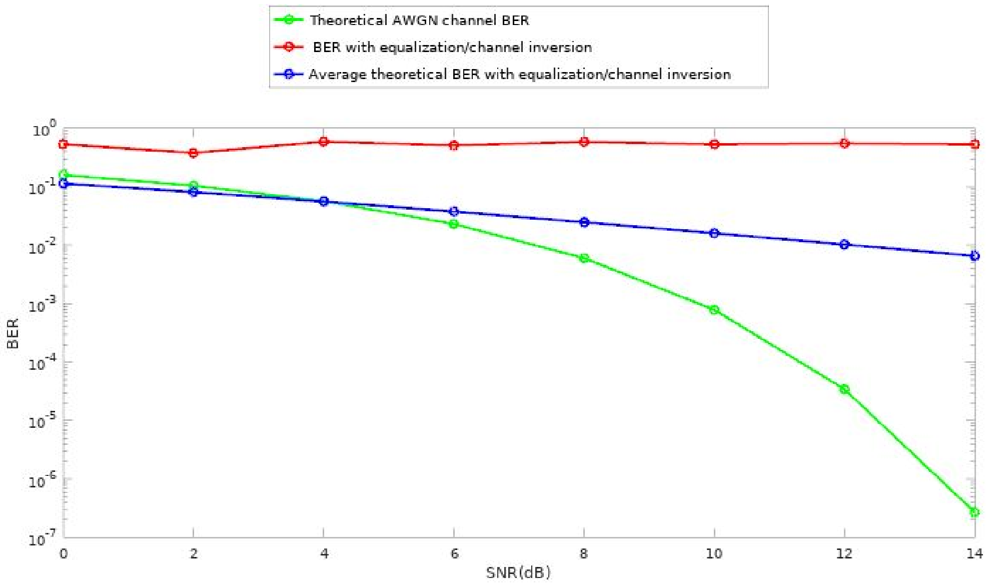


ii) C=1



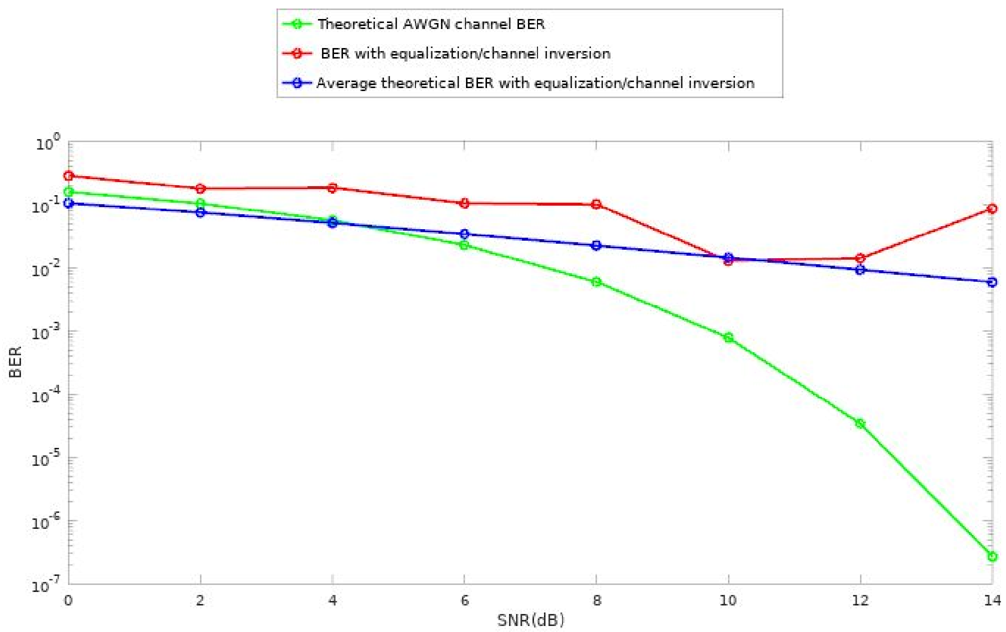
Theoretical AWGN channel BER
BER with equalization/channel inversion
Average theoretical BER with equalization/channel inversion
BER
SNR(dB)

iii) C= 10



Theoretical AWGN channel BER
BER with equalization/channel inversion
Average theoretical BER with equalization/channel inversion
BER
SNR(dB)

iv) We know that our channel h is gaussian with mean=0. A new h' = h+C is given to the receiver. We need to estimate the value of C in order for the receiver to obtain an estimation the real value of h. So we have: E[h'] = E[h+C] . C is a constant value so, E[h'] = E[h]+C. We know for our channel h, that mean=0 so E[h] = 0.
Finaly we get E[h'] = C = mean of values of h'. In order to obtain an estimation for h, we substract the value C for every value of h'. A plot for C=10 using our method gives us the following BER plot:



D) For the specific plot of MRC simulation, we used 2 diversity branches, Tchannel = 1, Rb=1Kbps, Number of bits(N) = 15000, os=5 and QPSK modulation.