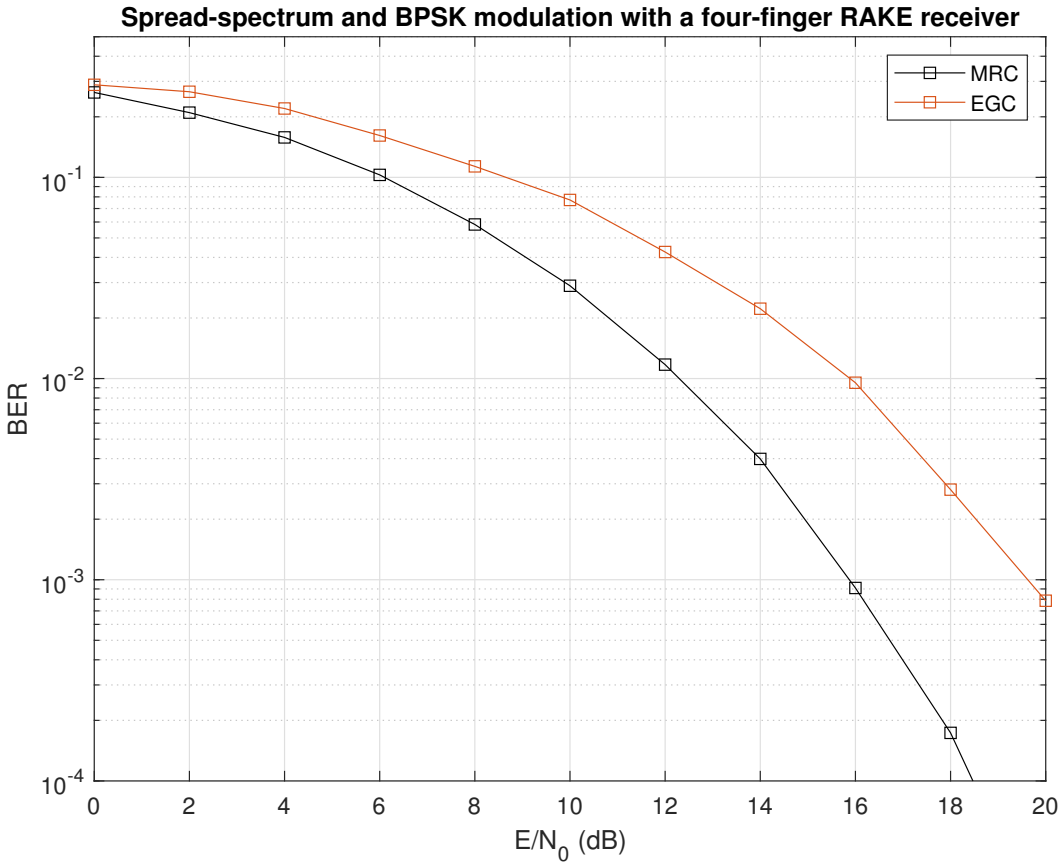
Solution of Homework # 9

1. Four-finger RAKE demodulator over a four-path channel under Rayleigh fading



(c) i. MRC has better performance.

ii. There is approximately a 3.9 dB gain of MRC over EGC in required average power to achieve a BER equal to 10^{-3}

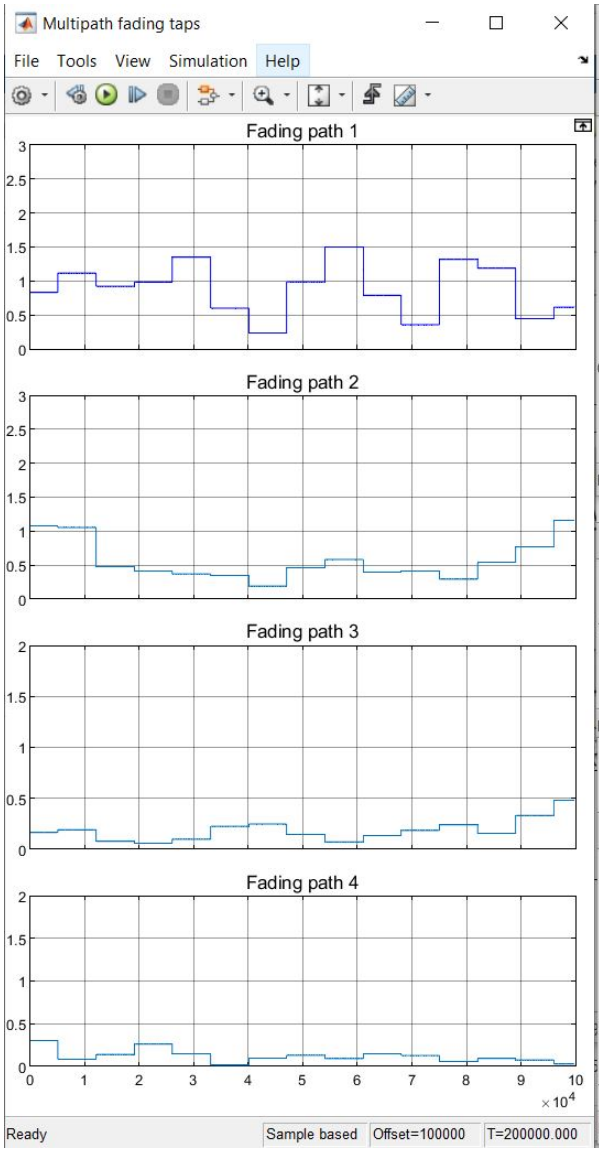
2. Nine-tap adaptive equalizer for BPSK over a four-path channel

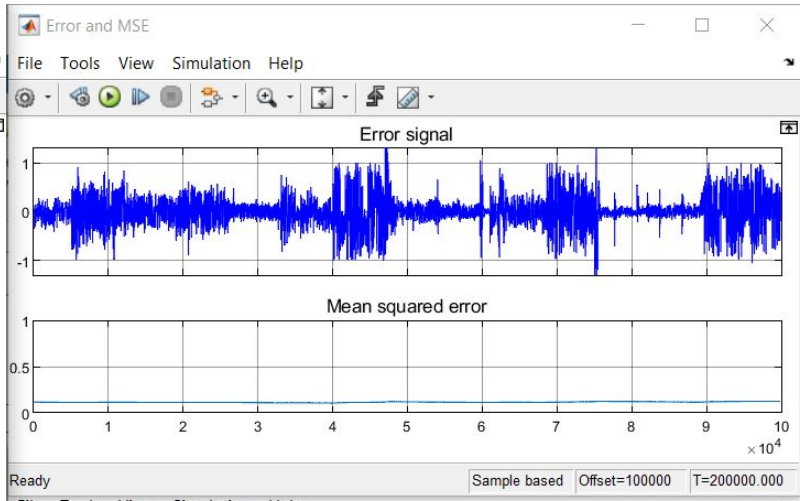
(a) A simulation sample is shown in the figure below. For $\Delta = 0.007$: BER $= 0.02966$

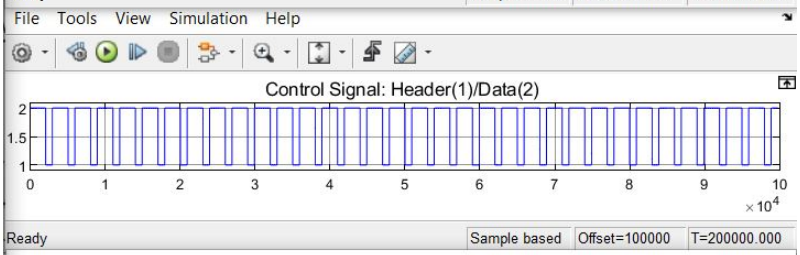
(b) For $\Delta = 0.0007$: BER $= 0.07348$

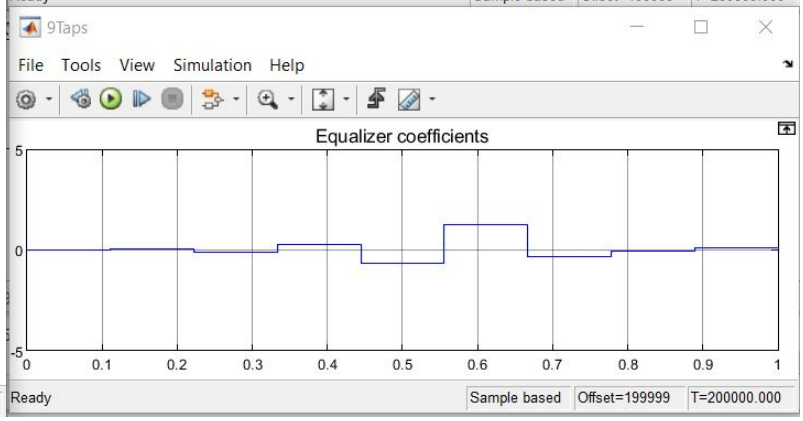
(c) For $\Delta = 0.04$: BER $= 0.1327$

(d) The BER value is very sensitive to the Equalizer step size Δ. When the channel is highly frequency selective, the equalizer is unable to remove ISI.


Multipath fading taps
File Tools View Simulation Help
Fading path 1
Fading path 2
Fading path 3
Fading path 4
Ready
Sample based
Offset=100000
T=200000.000


Error and MSE
File Tools View Simulation Help
Error signal
Mean squared error
Ready
Sample based
Offset=100000
T=200000.000


File Tools View Simulation Help
Control Signal: Header(1)/Data(2)
Ready
Sample based
Offset=100000
T=200000.000


9Taps
File Tools View Simulation Help
Equalizer coefficients
Ready
Sample based
Offset=199999
T=200000.000