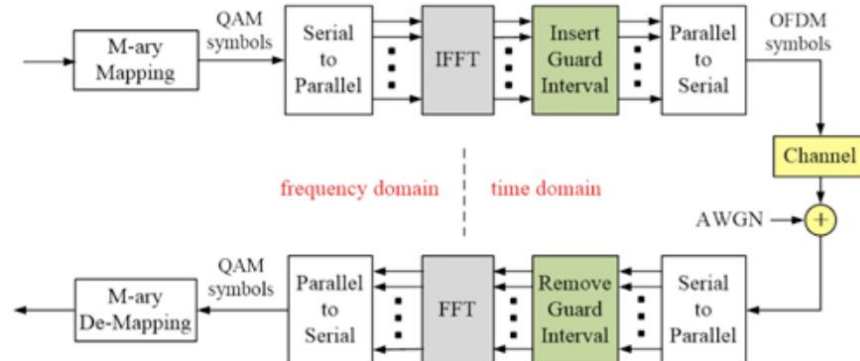


Homework 2 Digital Communication Integrated Circuits (10/17)

due:11/11 13:20

Using Matlab to design an OFDM transmission system.



1. Generate an OFDM system with 60 GHz carrier frequency for the following specifications.
Baseband bandwidth: 2.5GHz, FFT (N): 512 point, signaling scheme: 64-QAM, Guard Interval: 128 point, assuming total channel effect is AWGN channel.
Input data stream is generated with a uniformly distributed random binary sequence and at least 10^6 bit for BER and PAPR calculating
 - 1) (30%) Assuming perfect symbol timing is obtained, simulate the BER with AWGN for SNR 5,10,20,25 dB
 - 2) (15%) Using Cyclic-Prefix for GI, with symbol boundary error estimation of 3/5 length of total CP, discuss the result (constellation variation).
 - 3) (15%) Repeat (2) with zero-padding for GI.
 - 4) (20%) Adding both **root raised cosine** pulse shaping filter at Tx and Rx with roll-off factor 0.3(truncate the impulse response after the amplitude damping is less than 1%), discuss the result (constellation variation).
 - 5) (20%) Calculate the PAPR (each symbol) and plot the complementary cumulative distribution function (CCDF).

$$PAPR(x_L[n]) = \frac{\max_{0 \leq n \leq NL-1} [|x_L[n]|^2]}{E\{|x_L[n]|^2\}}$$

here

where L is the oversampling ratio and be treated as 1

*Bonus(20%): Introduce the effect of +20ppm (total 40 ppm) oscillator frequency offset (CFO&SCO, respectively) into the system and discuss the result (constellation variation).