### ELEC 5705 RF Systems Design: Assignment #5

Due December 8th, 2016

In this assignment you will need to create a band pass transmit waveform. The waveform will be a simple form of OFDM modulation. The OFDM modulation will use four subcarriers each with 16QAM modulation on them. The Bandwidth of the system will be 1MHz at base band and the transmit frequency will be 100MHz. The waveform should have basically no adjacent channel power and if demodulated the received symbols should be almost a perfect copy of the transmitted symbols.

Some useful hints:

In order to create an OFDM waveform you must first create symbols which are complex numbers. Normally the DC subcarrier is left empty and the ifft function in matlab can be used to construct the time domain I and Q values. For instance:

ifft([0 sym1 sym2 0 0 0 0 0 sym3 sym4]);

will create a complex number with a zero at the DC subcarrier sym1 and sym2 will occupy the positive frequency first two subcarriers and sym3 and sym4 will be the first two negative frequency subcarriers. Five “dummy” subcarriers will be created to help keep any adjacent channel noise to a minimum.

Passing the signal through a channel where the gain or phase shift may be different for different subcarriers will create EVM problems if not fixed. Thus it is best to send a training sequence of known bits first and use these to find the complex gain experience by each OFDM subcarrier (likely each one will experience a different gain) and then correct for the gain mismatch at the receiver.