Computer Exercise 4

Tangia Zhou

Using the cosine rolloff formula and plugging in the original time vector, t = (0:T/64:8*T) - 4T, we can factor out the T which cancels out with the Ts in the denominator of the formula to get the formula of the pulse below: pulse = (sin(pi*t).*cos(a*pi*t)) ./ ((pi*t).*(1-(2*a*t).^2));

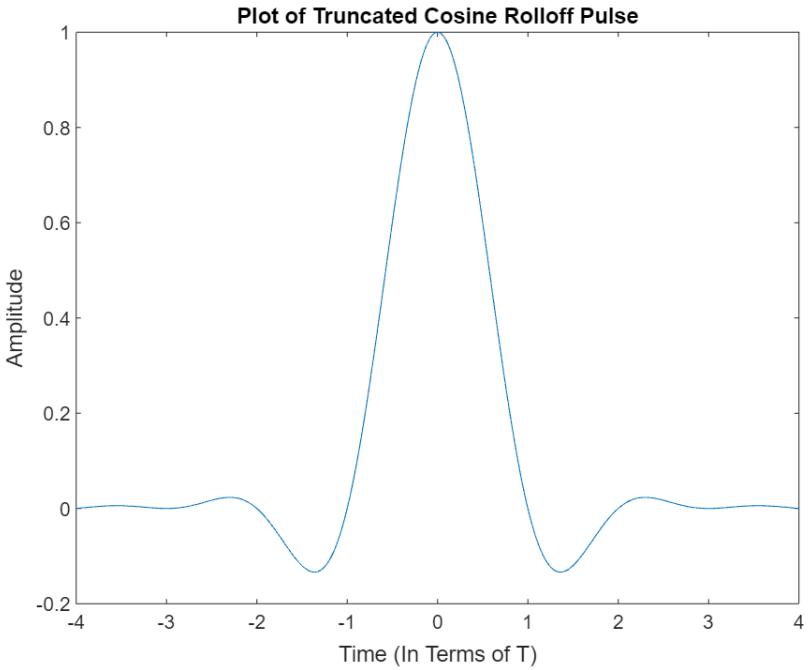

Figure 1: Truncated Cosine Rolloff Pulse

After calculating the total number of samples for the transmitted signal, we can move each pulse to their corresponding location, sum them up, and multiply them by their carriers. The in-phase and quadrature message signals are shown below:

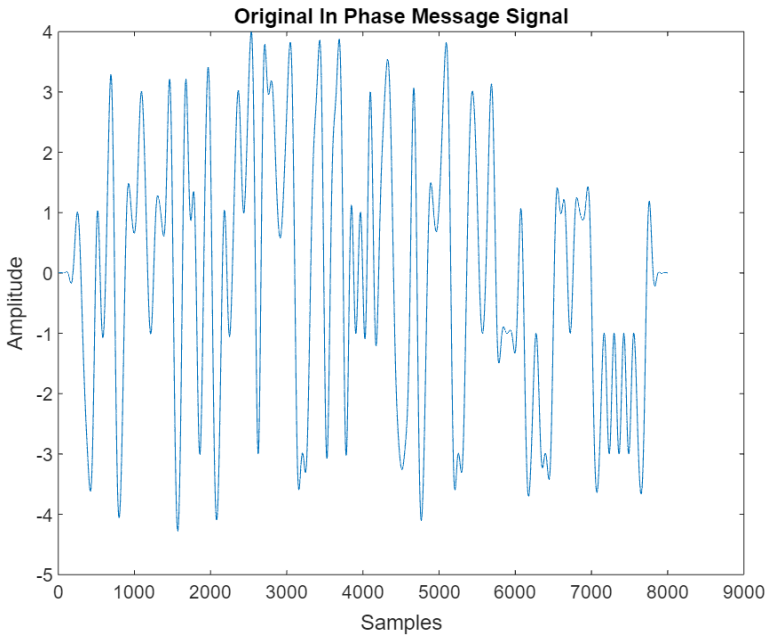

Figure 2: In Phase Message Signal

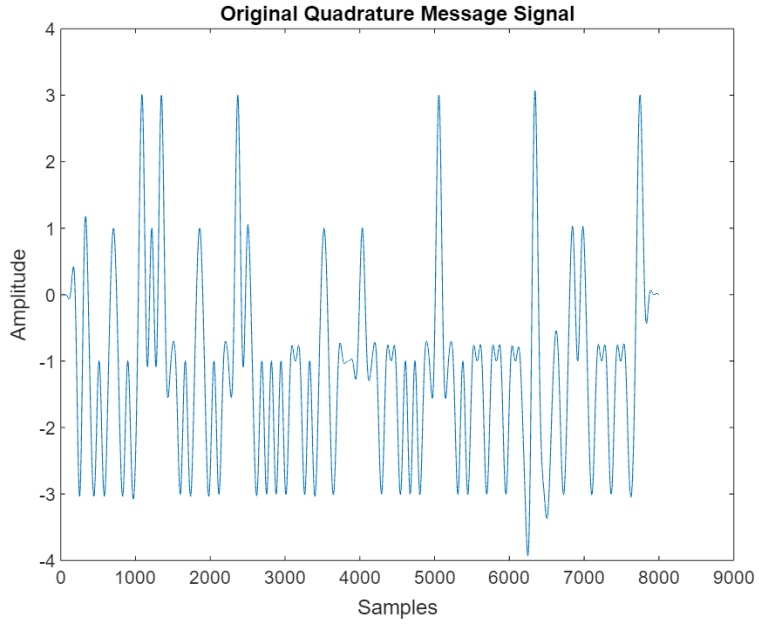

Figure 3: Quadrature Message Signal

After multiplying the message signals by their corresponding carriers, we have the QAM signal below:

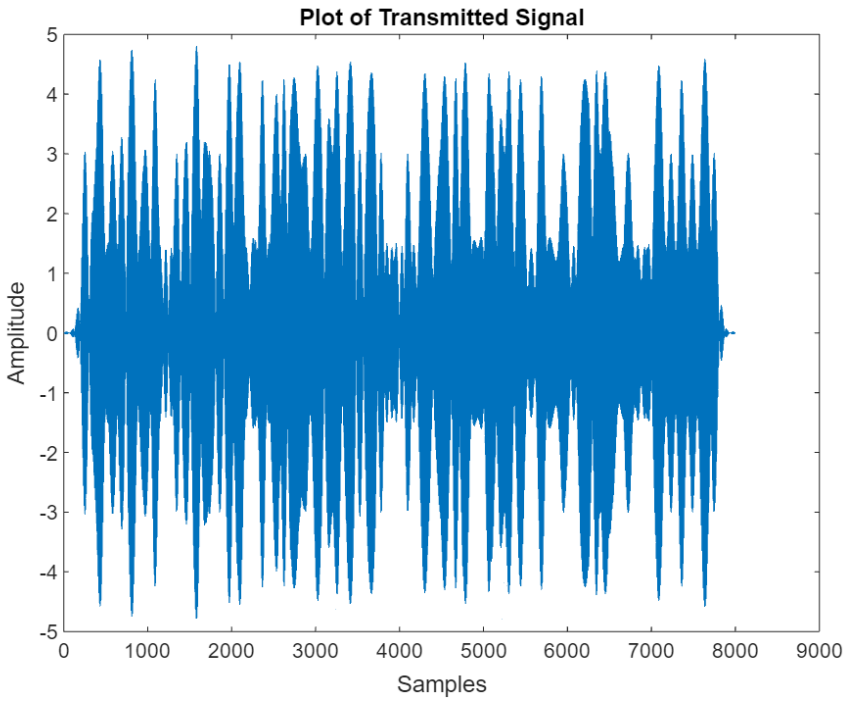

Figure 4: QAM Modulated Signal

After demodulating the signal and putting it through a filter that keeps the bandwidth of the cosine rolloff pulse, we have the following:

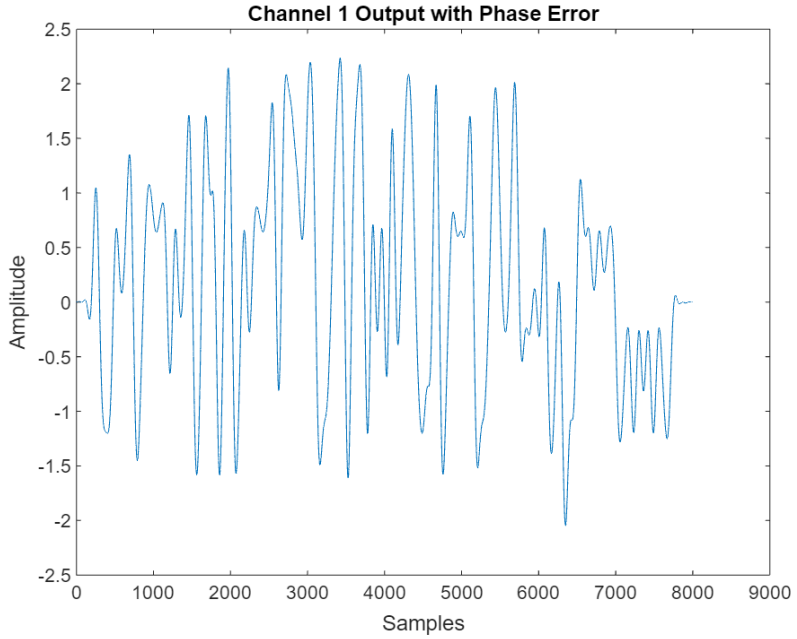

Figure 5: Channel 1 Output with Phase Error

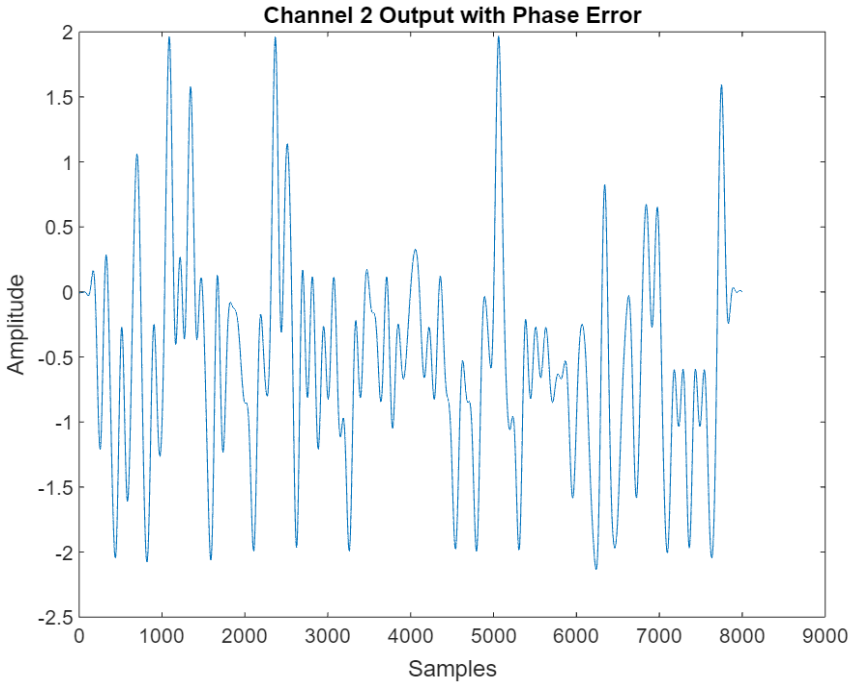

Figure 6: Channel 2 Output with Phase Error

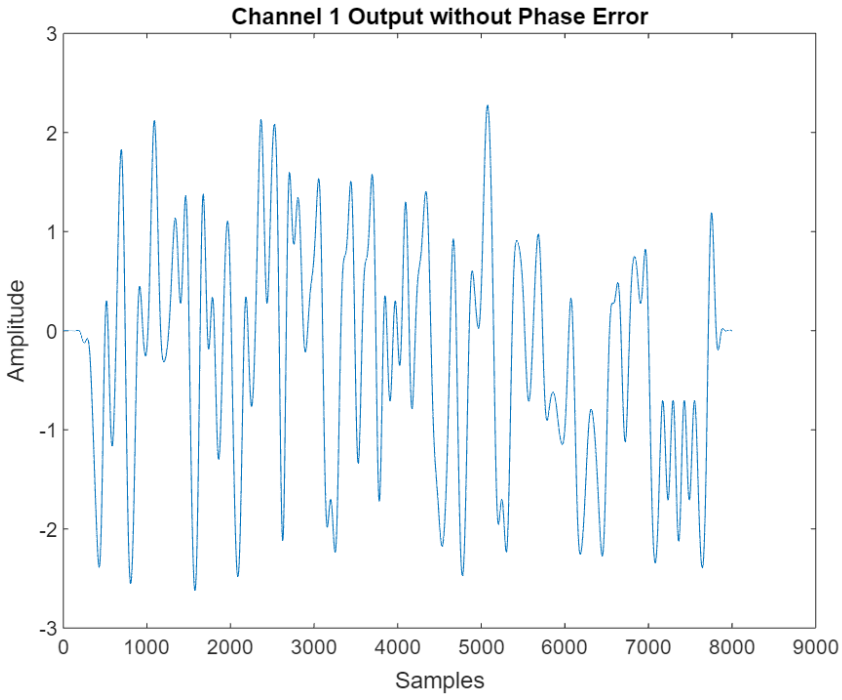

Figure 7: Channel 1 Output without Phase Error

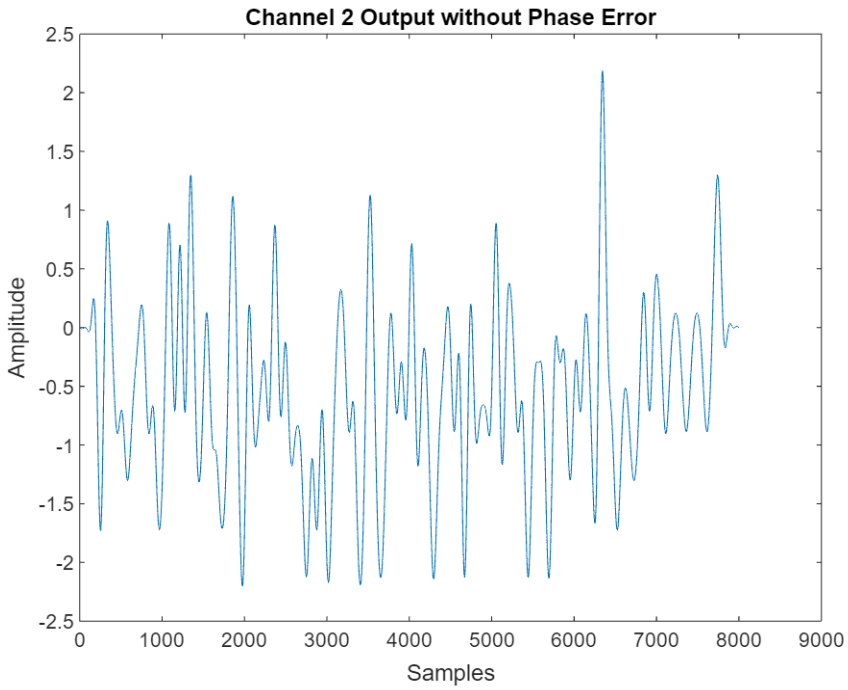

Figure 8: Channel 2 Output without Phase Error

Compared to the original in-phase and quadrature message signals, channel 1 without phase error is almost identical to the original in phase signal with a slight DC shift. The output of channel 2 is slightly different, but the output with phase error is almost identical with a slight DC shift.