Communications Lab

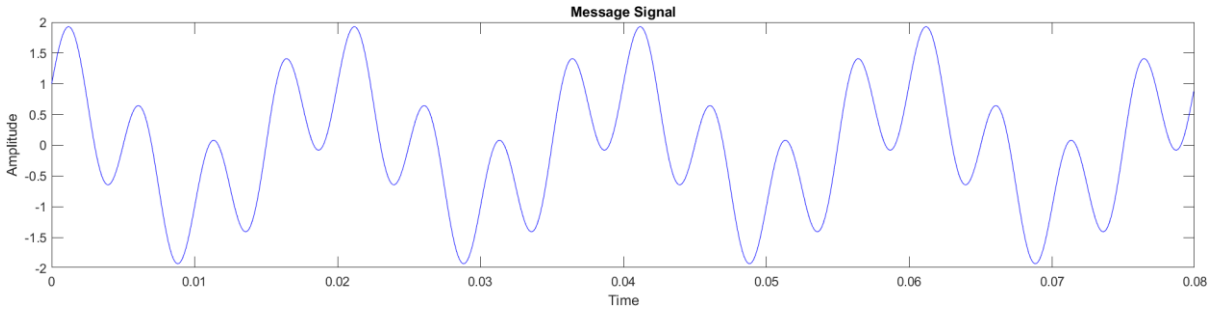
Experiment 1

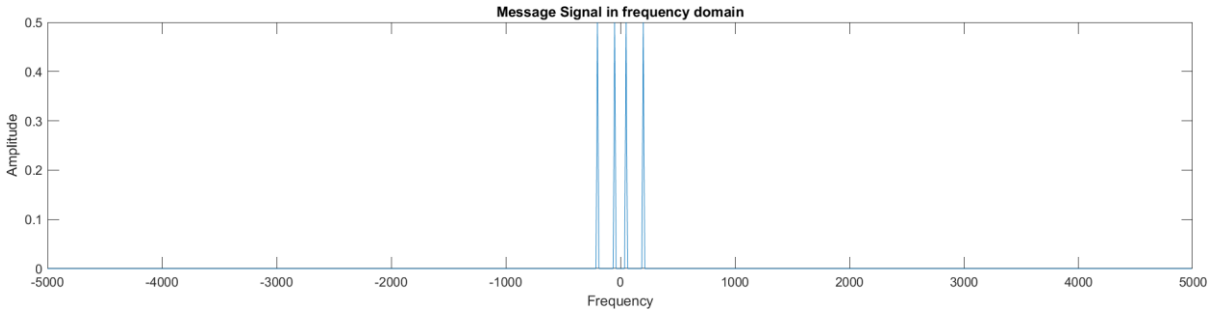
Message Signal:

The message signal is generated as (it remains same for all 3 modulation schemes):

$$A_m\,[\cos(2\pi f_m t) + \sin(8\pi f_m t)]$$

$$f_m = 50\ Hz\ \&\ A_m = 1$$

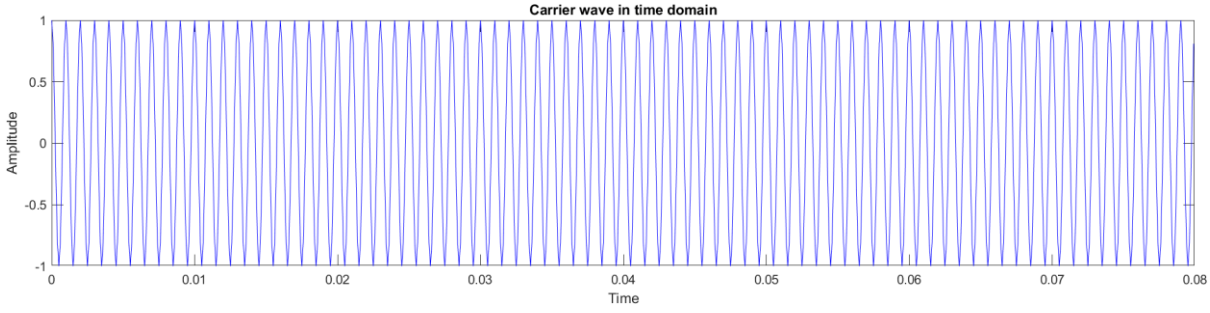


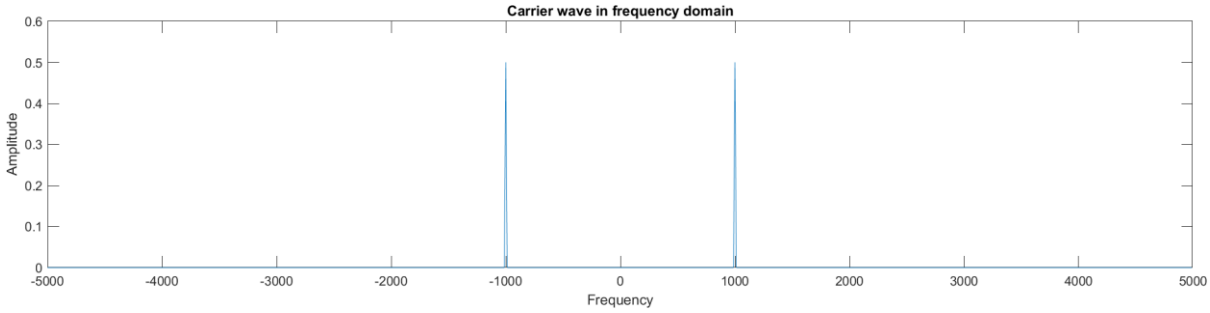


Conventional Amplitude Modulation (AM):

The carrier wave used was the following:

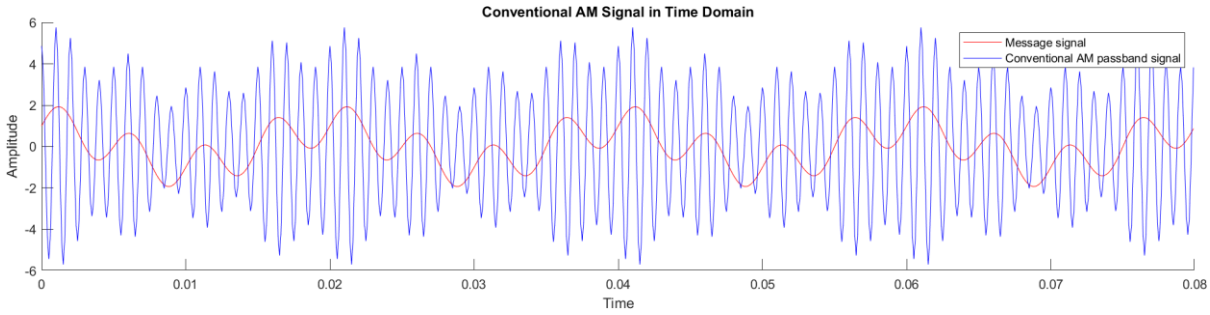
$$\cos(2\pi f_c t) \qquad where, f_c = 1000\ Hz$$

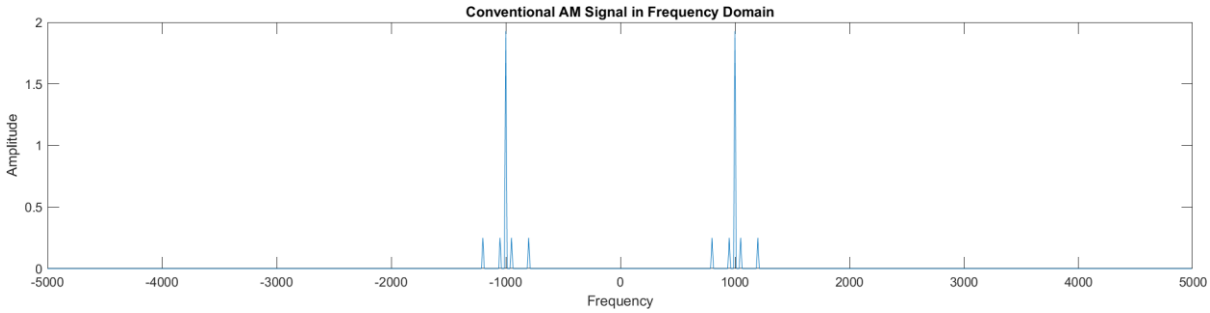




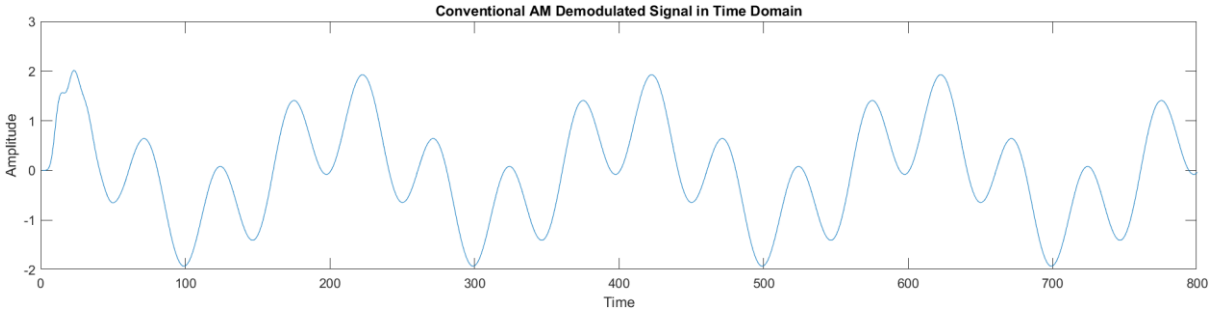
The modulation index used is => $a_{mod} = 0.5$

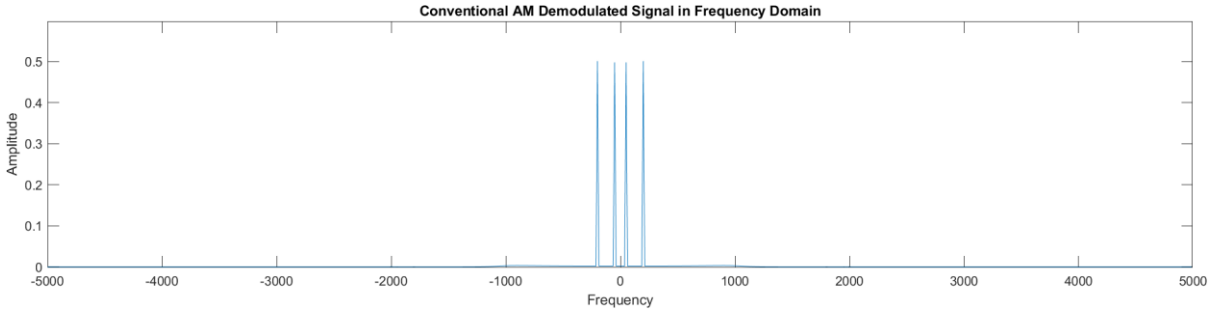
The modulated signal looks like the following:





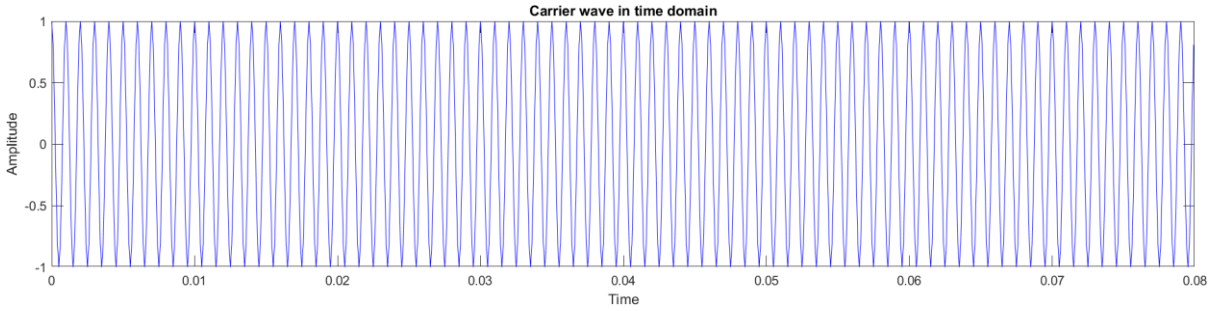
The demodulated signal looks like the following:

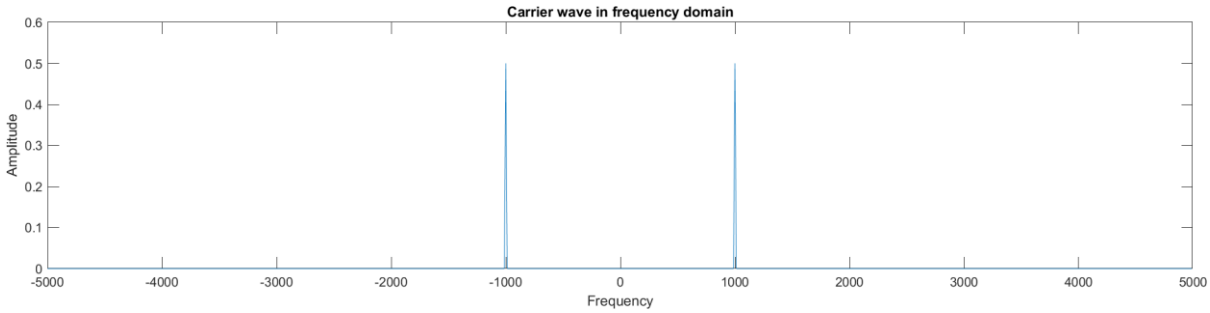




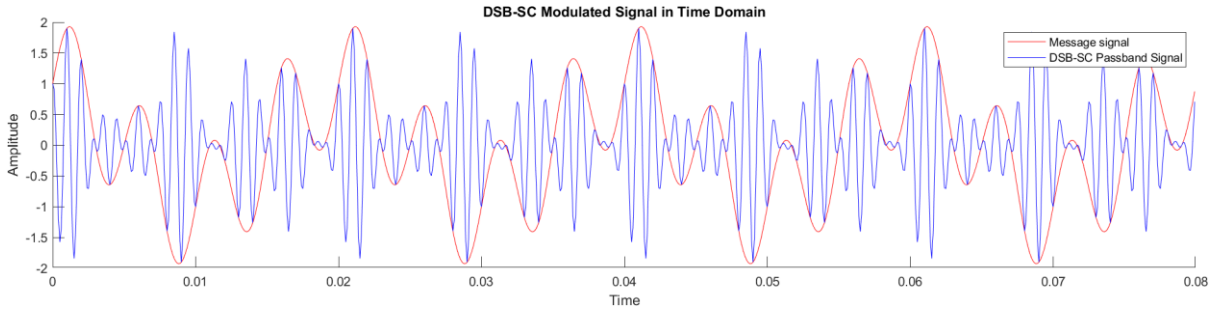
DSB-SC Amplitude Modulation:

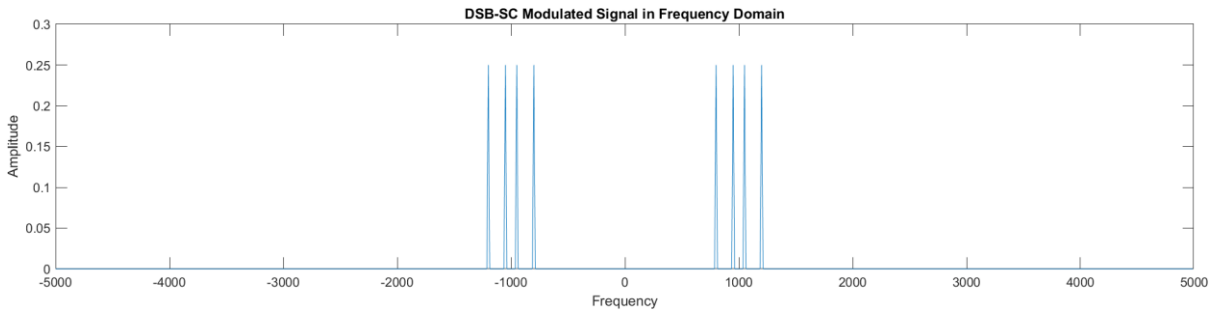
The carrier wave used was same as above:



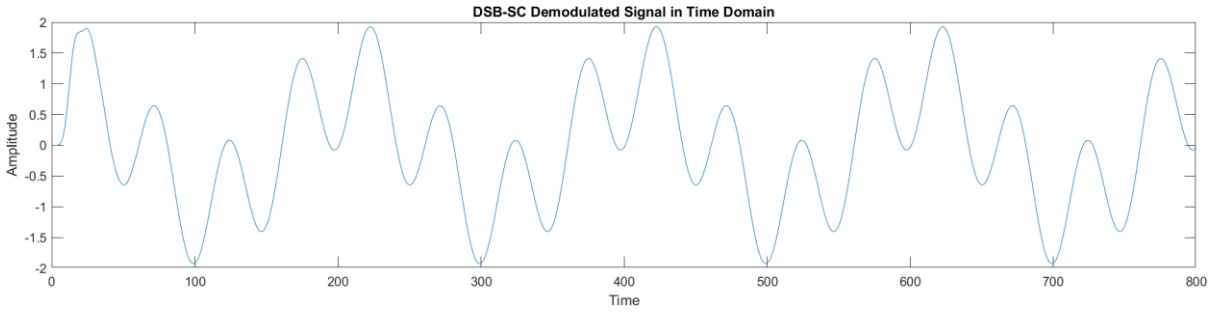


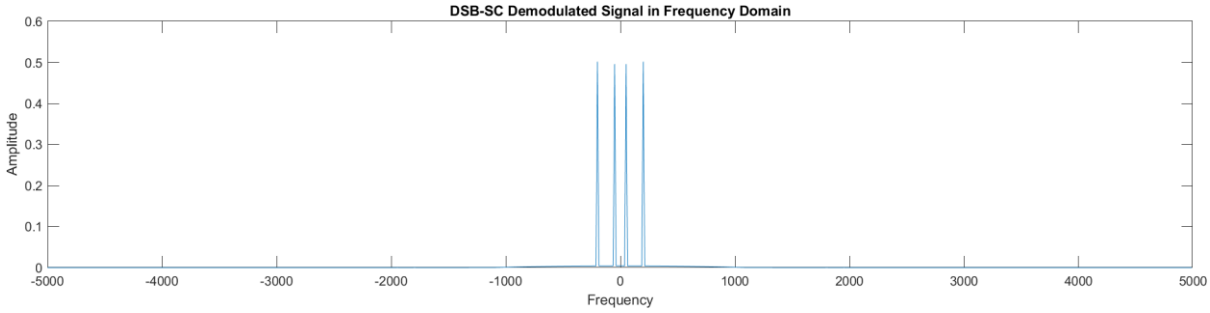
The modulated signal looks like the following:





The demodulated signal looks like the following:



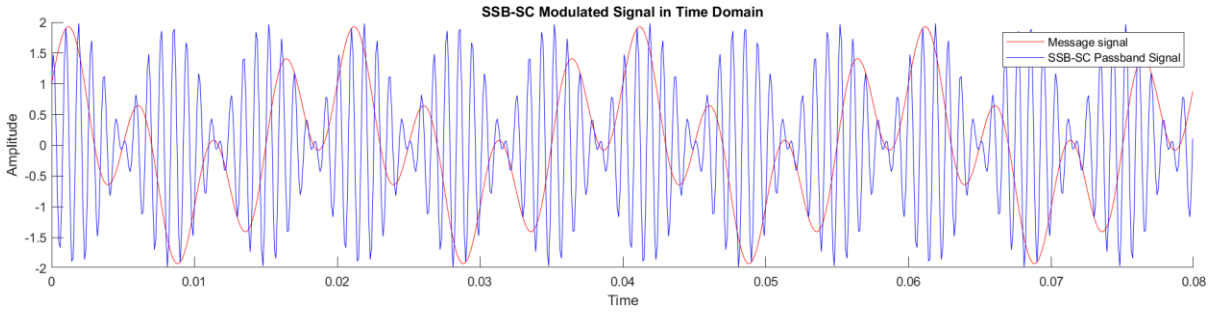


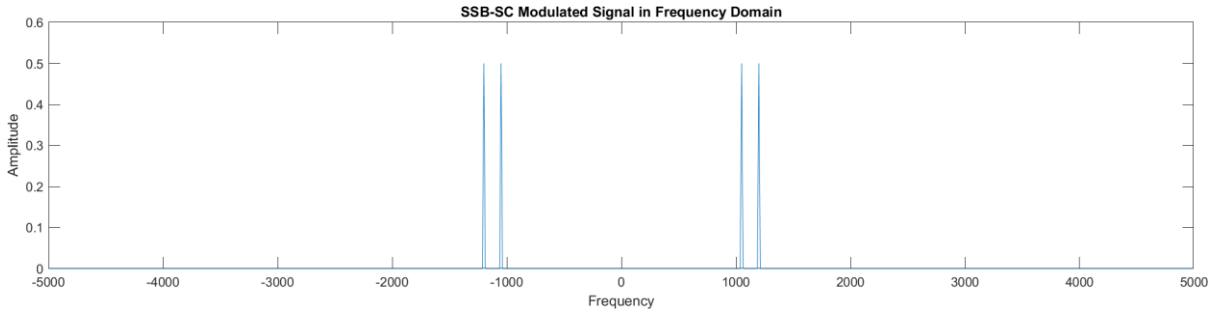
SSB-SC Amplitude Modulation:

We use upper sideband (USB) to carry information and remove the lower sideband (LSB) using the Hilbert transform of the message signal. The vice versa can also be used. Two carrier waves with a phase difference of $\pi/2$ have been used so as to carry the in-phase and quadrature components.

$$Inphase\ carrier = \cos(2\pi f_c t)$$
$$Quadrature\ carrier = \sin(2\pi f_c t)$$

The modulated signal looks like the following:





The demodulated signal looks like the following: