Communication Systems
Lab – 7

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Submission Date: 29/04/2021

Figure 1

In this figure, we observe different affects of message signals on FM and PM modulation. FM and PM are using different strategies, that is why we see different graphs. At the second graph, we see directly proportion between the value of message signal and the frequency of the modulated signal. However, at the last graph, we see directly proportion between derivative of the graph and the frequency of the modulated signal. In conclusion, the only difference between FM and PM is differentiator or integrator, If we apply FM modulator to both of them.

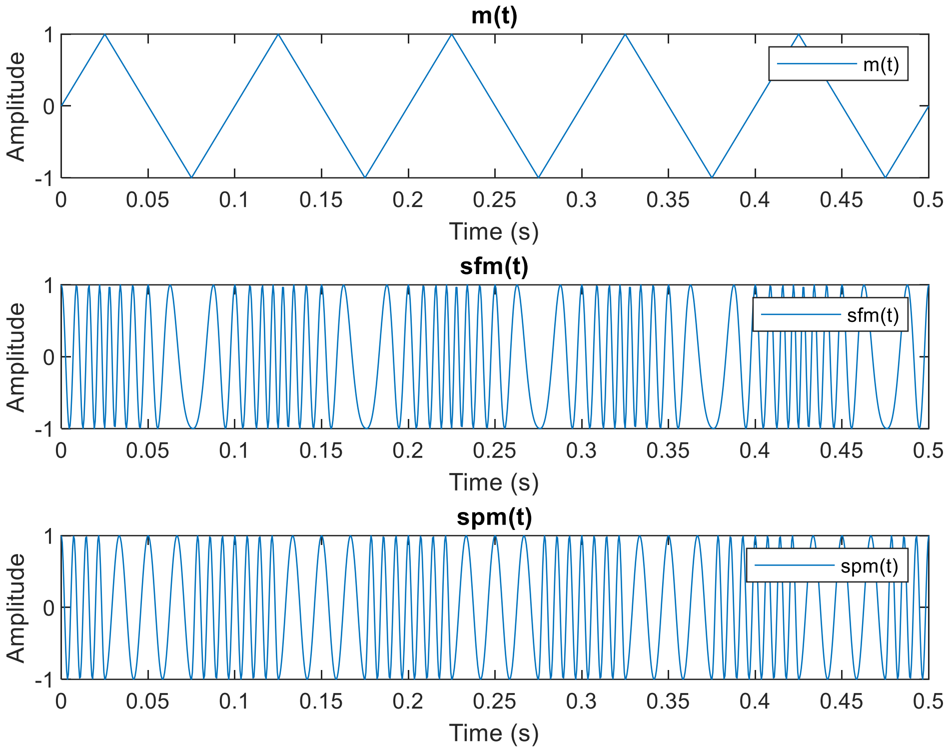

Figure 2

In this figure, we see that influence of different phase sensitivity on the modulated signal. Just like FM, in PM, change in phase sensitivity changes the phase deviation.

$$\Delta\phi = k_p * A_m$$

When there is greater phase deviation, the difference between maximum and minimum frequencies increases or the deviation increase. Therefore, we observe lesser minimum frequency at the third graph, greater minimum frequency at the first graph.

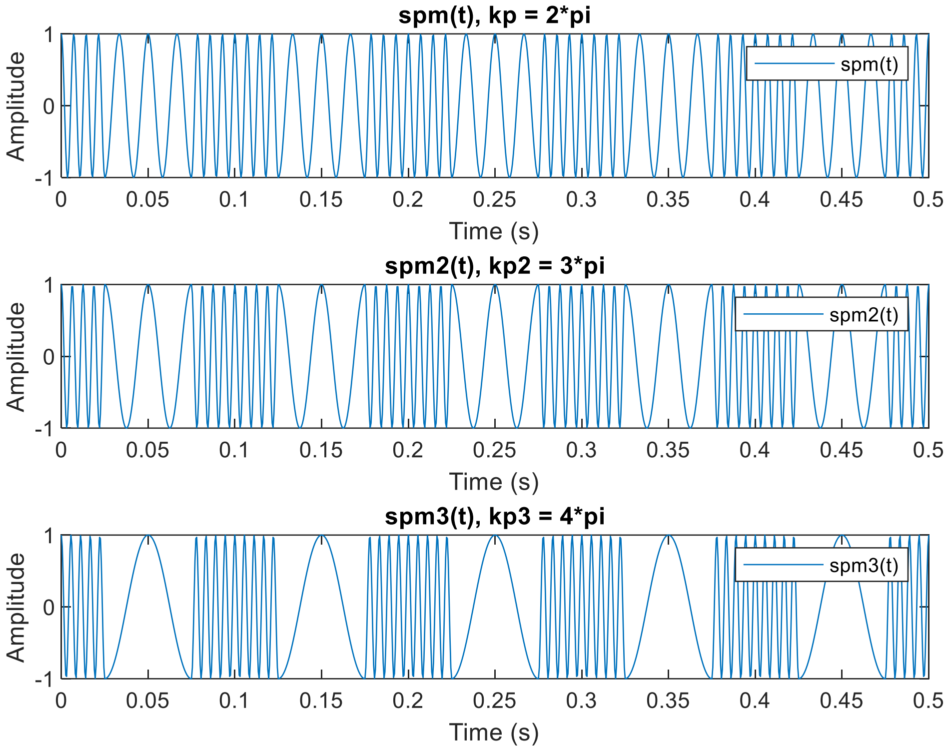

Figure 3

At the first graph, we observe typical frequency response a triangular waveform. At the second graph, we see the frequency response of the modulated signal which is wideband signal and that peaks occurs because of Bessel function. At the last graph, we see Hilbert transform of the modulated signal which is like that because Hilbert creates the same imaginary signal with pi/2 phase difference and if we add them up, we obtain the last graph because of the frequency response of cosine and sinus functions. That is why there is no left-hand side and amplitude of the signal is doubled.

$$\cos(2\pi f t) \ \ Fourier => \frac{1}{2}[\delta(-f) + \delta(f)]$$

$$\sin(2\pi f t) \ \ Fourier => \frac{1}{2}[-\delta(-f) + \delta(f)]$$

$$If\ we\ add\ them\ up => [\delta(f)]$$

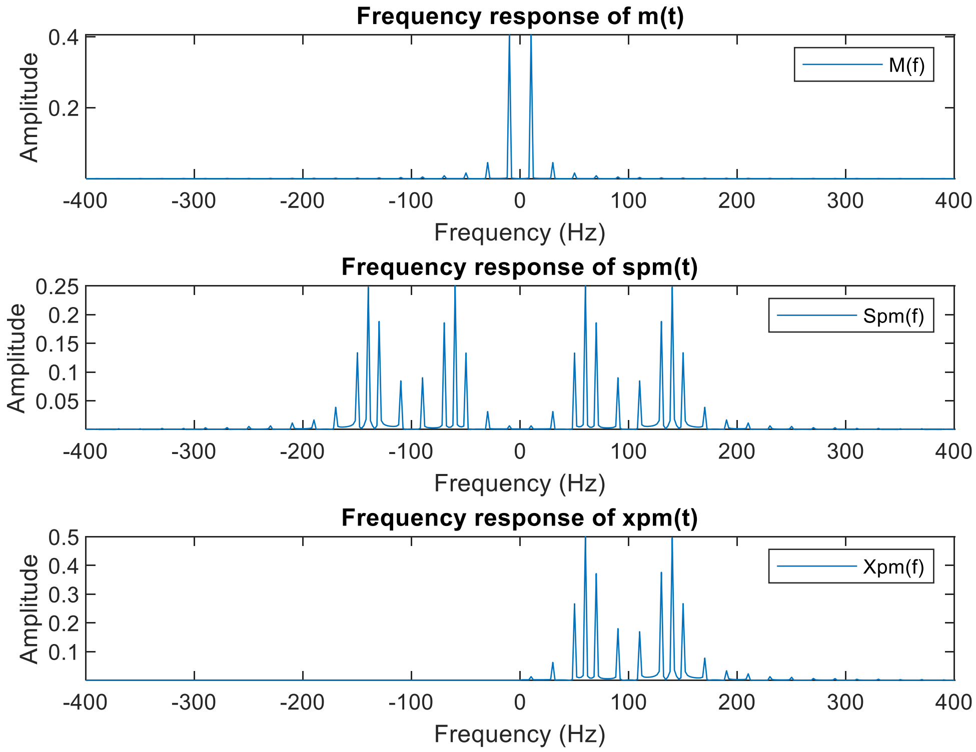

Figure 4

At the last figure, we see that the demodulation process works quiet well. However, there is slightly differences between original signal and demodulated signals at the sharpest points. Also, we observe that greater phase sensitivity result in worse demodulation. Because greater phase sensitivity makes the modulated signal wider in frequency spectrum due to the phase deviation which makes some peaks to be intersect and loose some information at demodulation.