EE352 – Communication Systems I Laboratory

Lab 7 Report

Frequency Modulation/Demodulation

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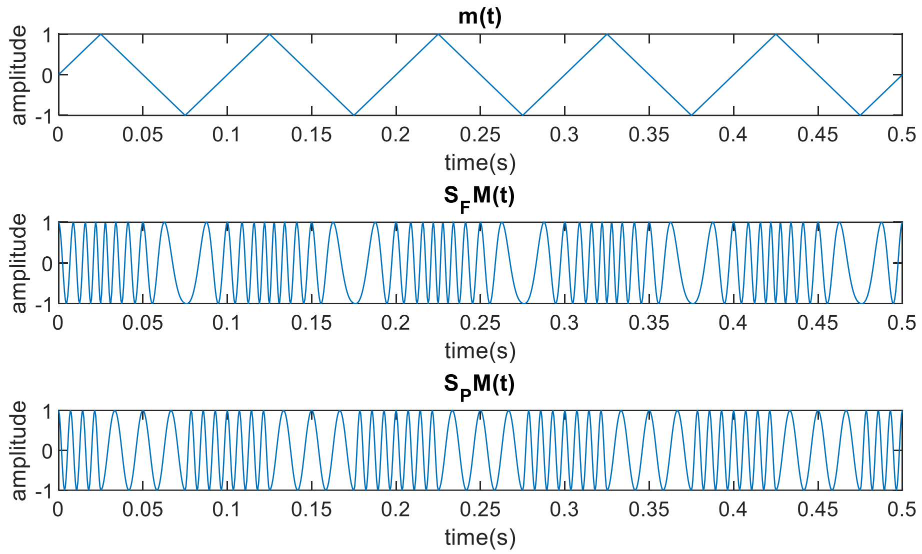
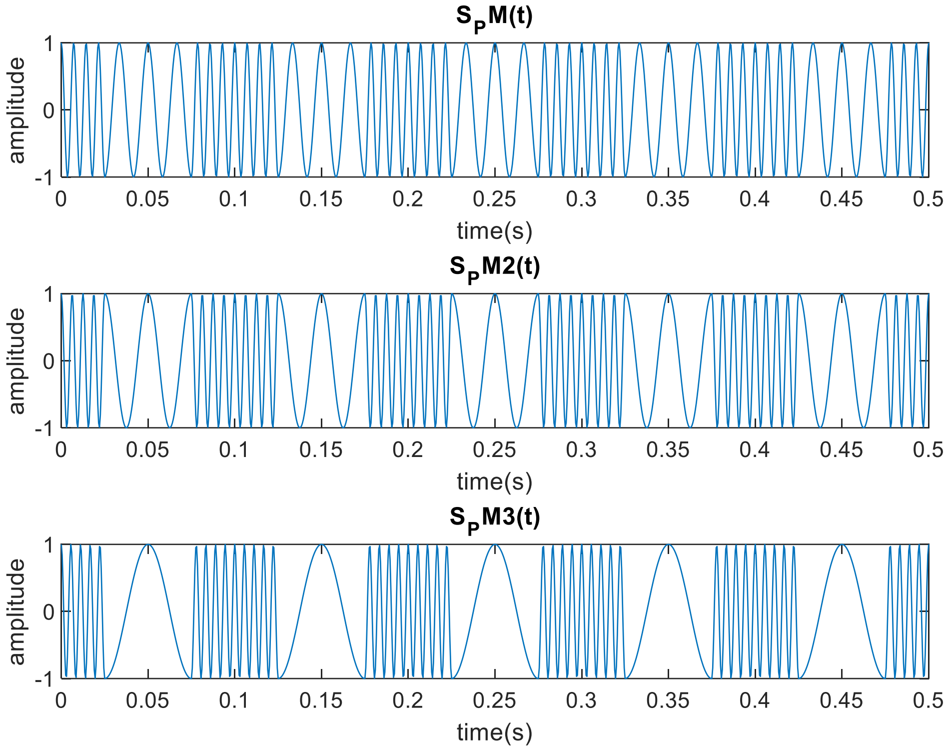
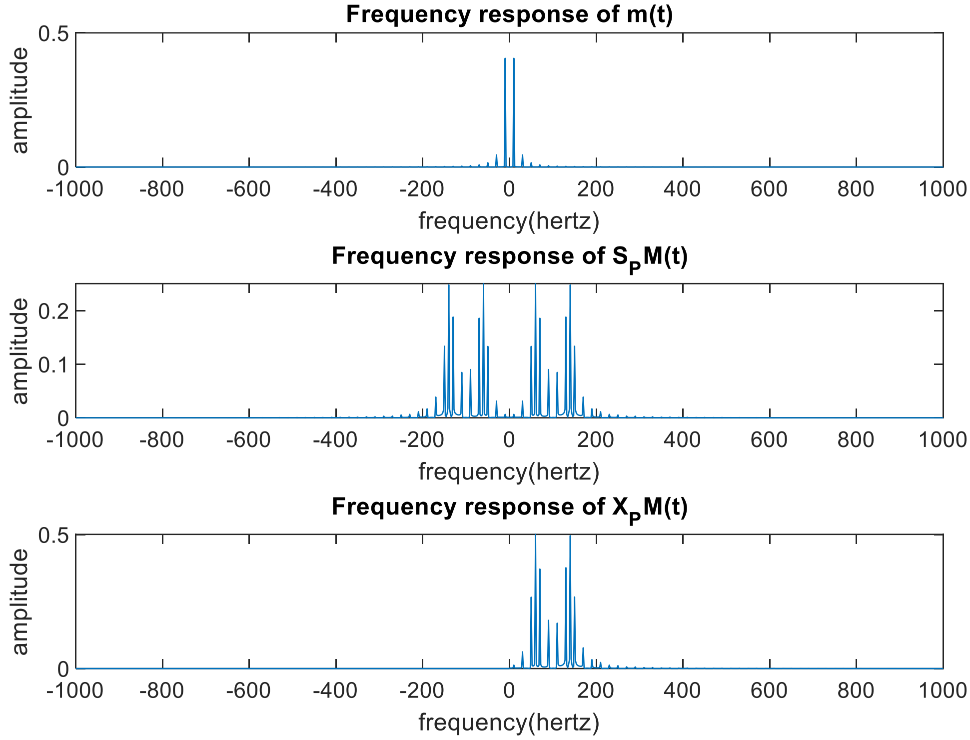


In this figure, we can see our message signal m(t), frequency modulated signal $S_{FM}(t)$ and phase modulated signal $S_{PM}(t)$. We can say we get desired m(t).We can say to get frequency modulated signal, first we took the Integral of the message signal and then passed it through the phase modulatur. So that we observed that in positive fields frequency is high and in negative field frequency is low in our $S_{FM}(t)$ signal. Also we can say to get phase modulated signal, first we took derivative of message signal and then passed it through the frequency modulator. So that we observed that when message signal is increasing we see higher frequency and when message signal is decreasing we see lower frequency. As we know $f_i(t) = f_c + k_f * m(t)$ for FM and , $\theta_i(t) = 2*\pi*f_c*t + k_p * m(t)$ and $f_i(t) = (1/2\pi) * (d\theta i(t)/dt)$ for PM.



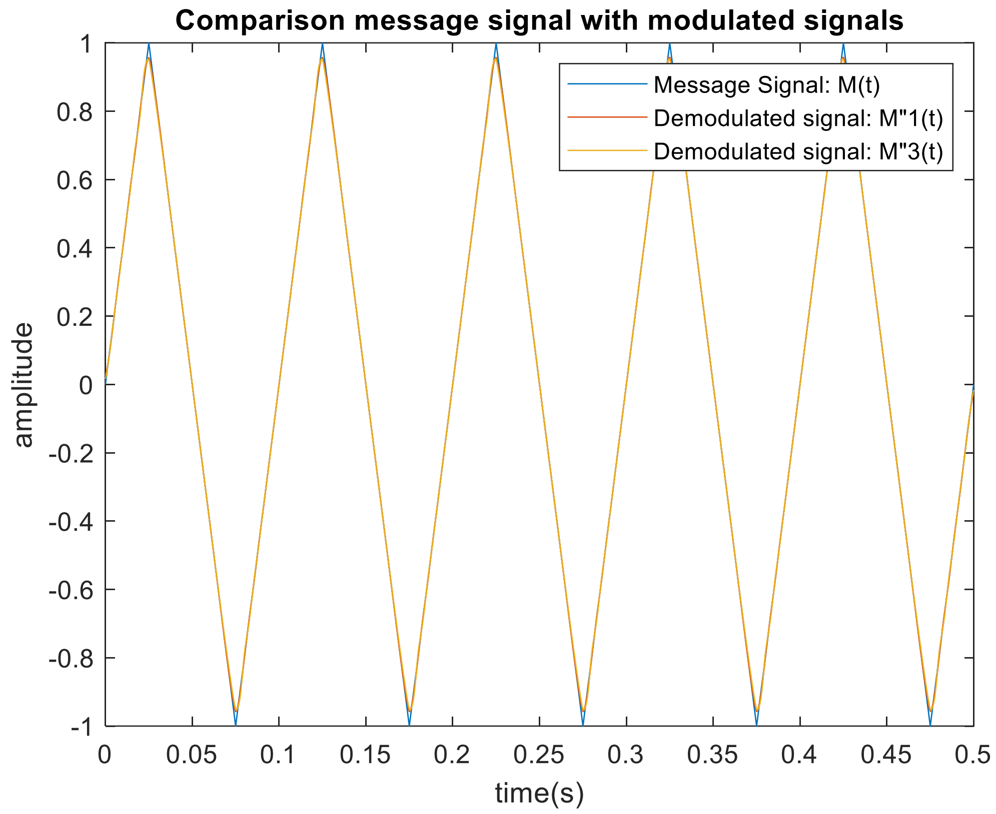
In this figure, we can see our phase modulated signals for different phase sensivitiy (Kp=2π, 3π, 4π). According to this grap we can say when phase sensivity is increasing phase deviation will increase. So that, as we can see on the graph, in higher frequency values when phase sensitivity increasing high frequency value is increasing and meaning of that we have higher frequency and in lower frequency values when phase sensitivity increasing we have lower frequency. We can define that on the graph, when phase sensitivity increasing in high frequency range we have more cycle and in low frequency range we have less cycle.



In this figure, on the top of the figure we can see frequency response of message signal. We can say we get lower than 0.5 amplitude at -+10 hertz. We wait that because our Am is equal to 1 but, because of the fourier transfrom of triangular wave we get lower than 0.5 amptliude. We get amplitude at -+10Hertz because as we see we see 5 full wave in 0-0.5s so that our period is 0.1s and we have 10hertz Fm value.

On the middle of the figure, we can see frequency response of phase modulated signal $S_{PM}(t)$ for phase sensitivity $k_p = 2\pi$ rad/V. We have amplitudes around the -+100 Hz because our carrier frequency value is 100 Hertz.

On the bottom of the figure, we can see frequency response of analytic signal $X_{PM}(t)$ which is obtained using the Hilbert Transform of $S_{PM}(t)$. We lost negative side compenents and we get 2 times amplitudes at the same frequencies because of Hilbert Transform.



According to this graph, we can see comparison our message signal with our demodulated signal for different frequency sensivity factor Kf values(respectively 2π rad/V, 4π rad/V). We can say we get so close signals but we have to say for Kf value equal to 2π rad/V we get so closer result to our our message signal. We have some distortions on the top and bottom points.