EE352 – Communication Systems I Laboratory

Lab 5 Report

Single Sideband Modulation & Demodulation

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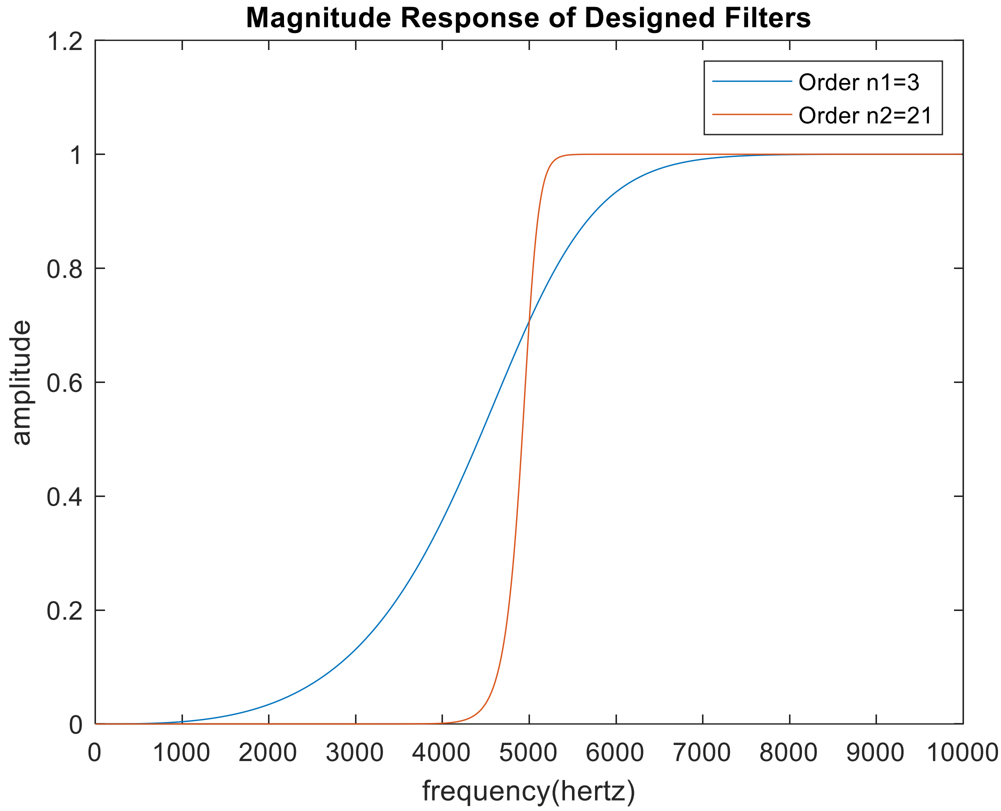
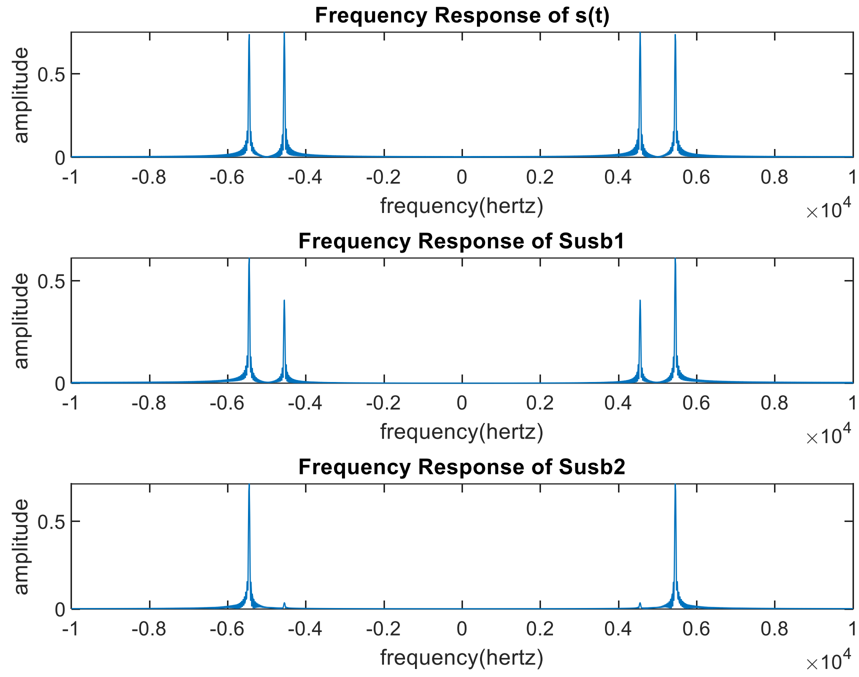
Submission Date: 08/04/2021



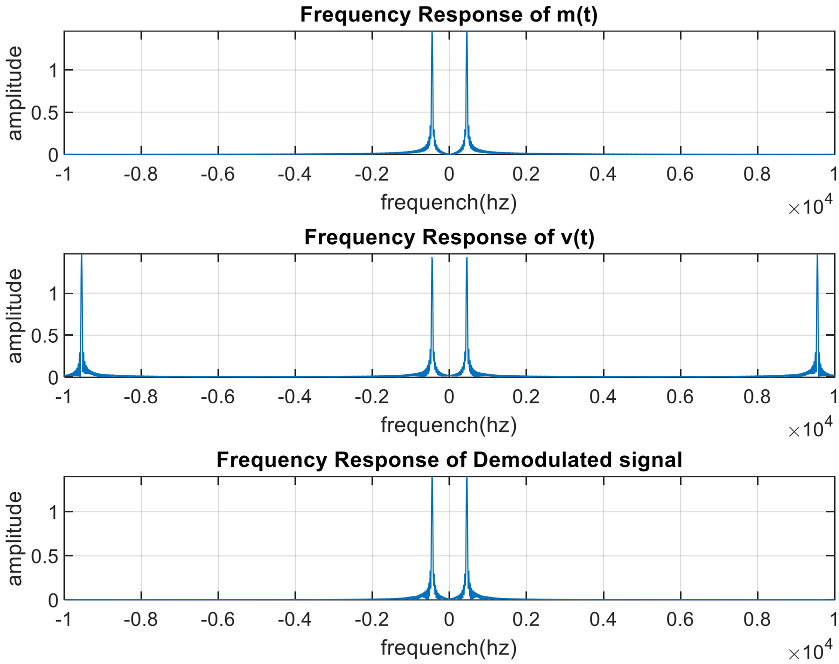
In this figure, we can see magnitude response of our high pass nonideal filters. We can say when order=3 our transmission band is so large because of that our filter give permission to pass so much undesired amplitude of frequency values. Also, for order=21 we can say we have sharper transition so that if we compare it with order=3, we can say our transmission band is smaller so that we have fewer undesired values. Also we have more desired amplitude of frequnecy values. We can say, when order is increasing our filter closer to ideal filter but we can never reach ideal because, for ideal filter order goes to infinite. We choose cut of frequency is 5000Hertz because our fc is 5000Hertz and our signal will occur here.



According to this figure, in the top of the figure for frequency response of modulated signal(s(t)), we can say we have 0.75 magnitude at -+5450 Hertz(fc+fm,-fc-fm).Also we have 0.75 amplitude at +-4550 Hertz(fm-fc,-fm+fc). We get these amplitudes result of product of message signal and c(t).Our message signal amplitude is 3, because of trigonometric sum-product formulas our amplitude is equal to 3*(1/2) and because of fourier transform of cos our amplitude is equal to 3*(1/2)*(1/2)=0.75. We have to say we have frequency resolution because our sampling point is so small and sampling frequency is so big so that to prevent big errors we take 3 times of sampling point but we still have some little errors.

For middle of the figure we can say for Susb1(result of filter ordeer=3) we have close magnitude of s(t) which is equal to 0.61 at -+5450Hertz(fc+fm,-fc-fm) and we have almost half of magnitude of s(t) which is 0.4 at -+4550 Hertz(fm-fc,-fm+fc)because our order is so few because of that we get so much undesired values and we do not get some desired values because our transmisson band is large.

For bottom of the figure we can say for Susb2(result of filter ordeer=21) we have almost same magnitude of s(t) which is 0.72 at -+5450 Hertz(fc+fm,-fc-fm) and we do not have any amplitude 4550 Hertz(fm-fc,-fm+fc).Because our filter order is bigger so that we get more desired amplitudes but our filter still nonideal so that we miss some of desired values and we do not get undesired values as possible as. We get these values because we select upper sideband. Finally we can say when filter order is increasing, filter closer to ideal but never we reach to ideal. We have to choose Susb2 because it is include more desired value and less undesired value for us.



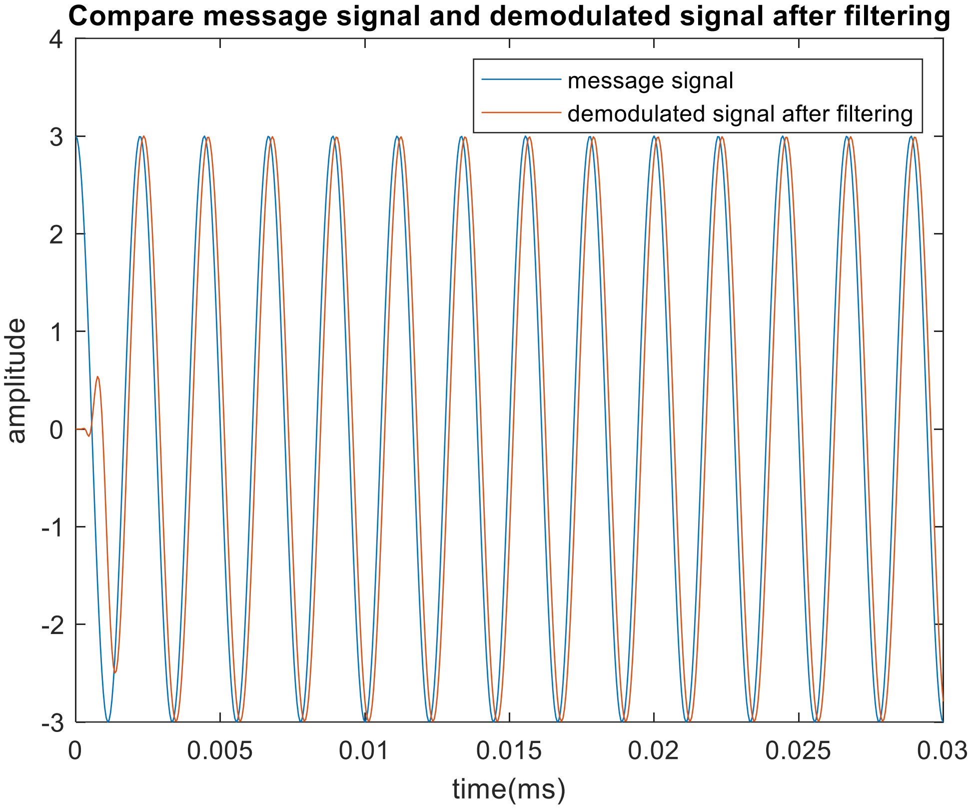
According to this figure, in the top of the figure for frequency response of m(t), we can say we have amplitude at -+450Hz because our fm value is given 450 Hz. Also our magnitude at -+450Hz is 1.5 because m(t)=3*cos(2*pi*fm*t) so magnitude is 3 but because of fourier transform of cosine our magnitude is 3*(1/2)=1.5

In the middle of the figure for frequency response of v(t) we can v(t) is result of product of ssb modulated signal and local oscillator so that as we can see we have 4 four components. Also our magnitude is 1.5 at these frequency values because of fourier transform of cos. Also we have to say our Acprime value must be 4 because of fix to ¼ which come from product-sumformula and fourier transform (1/2)*(1/2)=1/4 and theta is equal to zero.

➔ Demodulated signal= (Ac'/4)*m(t)*cos(Theta)+ (Ac'/4)*m^(t)sin(theta)

Also we have 1.5 magnitude at -+455 Hertz because of our message signal frequency value but little difference because of frequency resolution. We have frequency resolution because our sampling point is so small and sampling frequency is so big so that to prevent big errors we take 3 times of sampling point but we still have some little errors.

In to bottom of the figure for frequency response of Demodulated signal we have to say after filtering we have 1.35 amplitude as like as message signal at +-443Hz and we do not pass undesired values as soon as possible thanks to designed low pass filter. We can say in frequency domain, our demodulated signal and message signal close to each other.Our little bit difference can be because of our filter is not ideal and frequency resolution. Also we should say our filter cut off frequency is 1100 hertz because of our v(t) have amplitude af 1066 hertz frequency but we have transmission band so that we can choose 1100 hertz. Also we should choose filter order which minimum order give us result without ripple or distortion.



According to this graph, we can say in time domain, our message signal and demodulated signal almost same but we have phase reversal because our filter is not ideal. Also we have some distortion at the beginning of filter because of our cut frequencies are not sharp because of nonideal.