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# ECE 3770 - Lab 4 - Generation of FM Signals and FM Spectrum

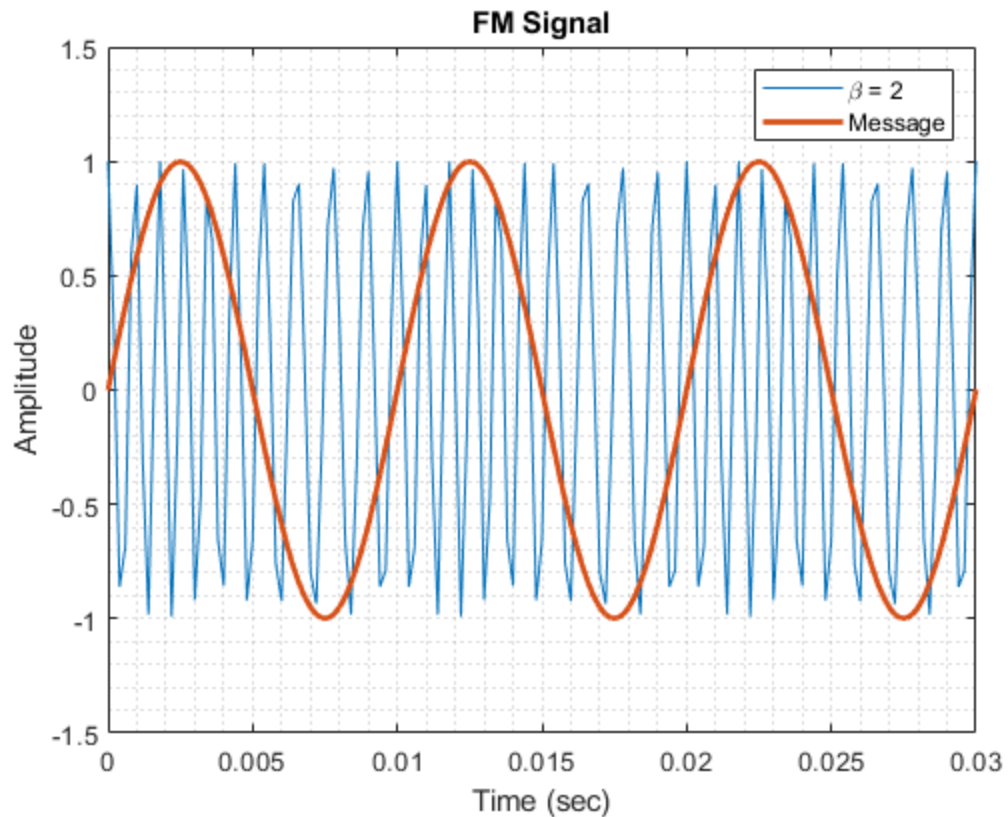
G.Davis  
3/8/21

```
clc; clear; close all; clear sound; % clear screen, variables,  
functions, close figures
```

## Part 1

Generate an FM wave with  $\beta=2$  for 1 second

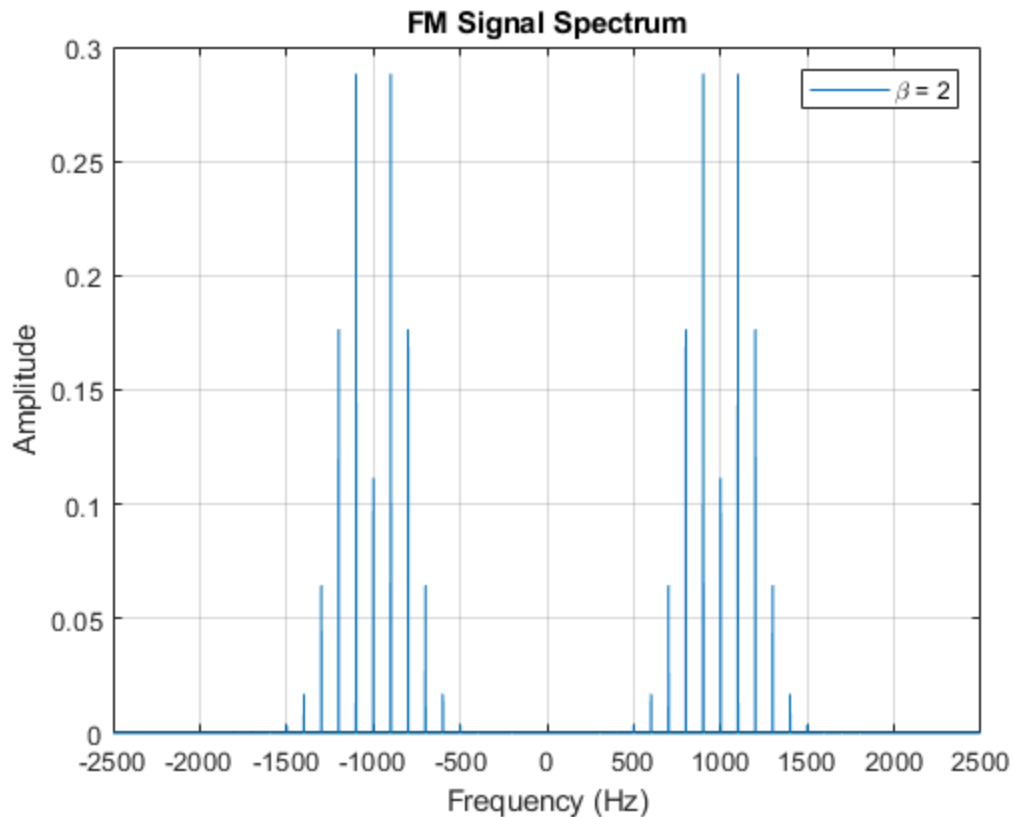
```
% Generate a 100 Hz sinusoidal message  
fs = 5000;  
fm = 100;  
fc = 1000;  
beta = 2;  
  
T = 1/fs;  
t = 0:T:1-T;  
  
msg = sin(2*pi*fm*t);  
  
% Modulate with carrier fc=1kHz beta = 2  
mfm = modulate(msg,fc,fs,'fm',2*pi*beta*fm/fs);  
  
figure(1)  
plot(t,mfm); grid minor  
hold on  
plot(t,msg,'LineWidth',2)  
hold off  
title('FM Signal')  
xlabel('Time (sec)')  
ylabel('Amplitude')  
xlim([0 0.03])  
ylim([-1.5 1.5])  
legend('\beta = 2','Message')
```



## Part 2

Compute the spectrum of the signal and display with proper labels.

```
G = fft(mfm);  
n = length(G);  
G = fftshift(G);  
  
df = fs/n;  
F = fs/2;  
f = -F:df:F-df; % Ensuring frequency label is accurate  
G = G./n;  
GM = abs(G);  
  
figure(2)  
plot(f, GM); grid  
title('FM Signal Spectrum')  
xlabel('Frequency (Hz)')  
ylabel('Amplitude')  
legend('\beta = 2')
```



## Part 3

Repeat parts 2 and 3 for  $\beta = 5$

```
beta = 5;
mfm = modulate(msg,fc,fs,'fm',2*pi*beta*fm/fs);

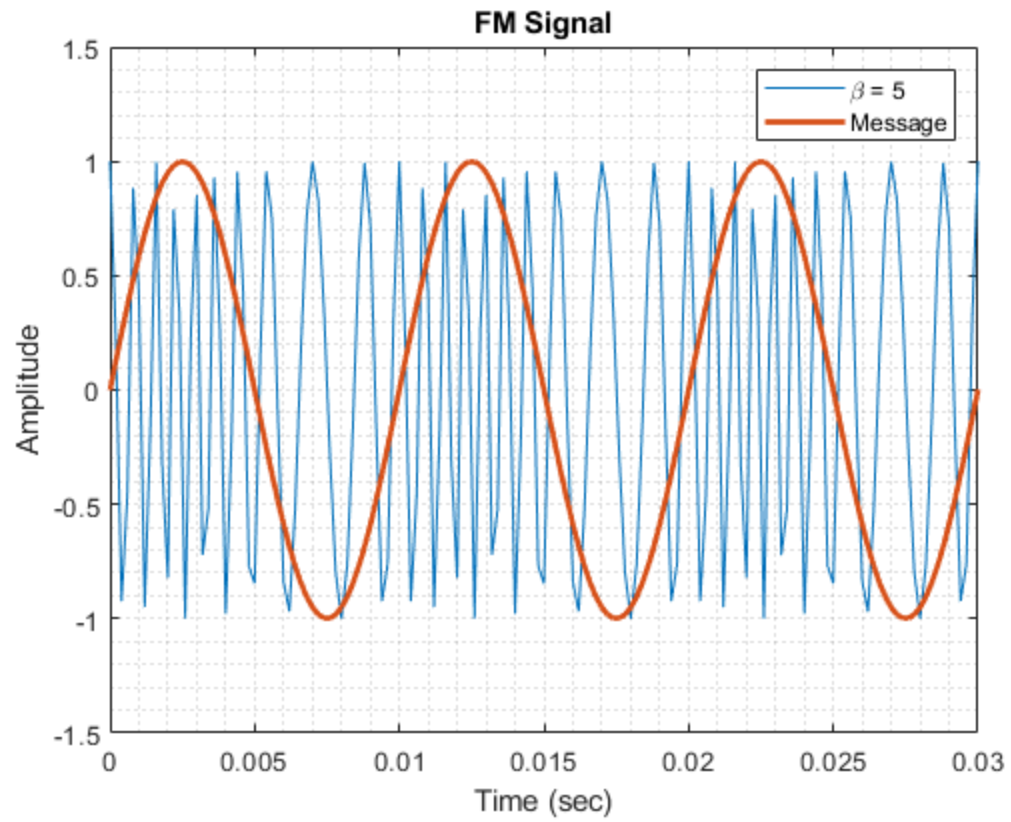
figure(3)
plot(t,mfm); grid minor
hold on
plot(t,msg,'LineWidth',2)
hold off
title('FM Signal')
xlabel('Time (sec)')
ylabel('Amplitude')
xlim([0 0.03])
ylim([-1.5 1.5])
legend('\beta = 5','Message')

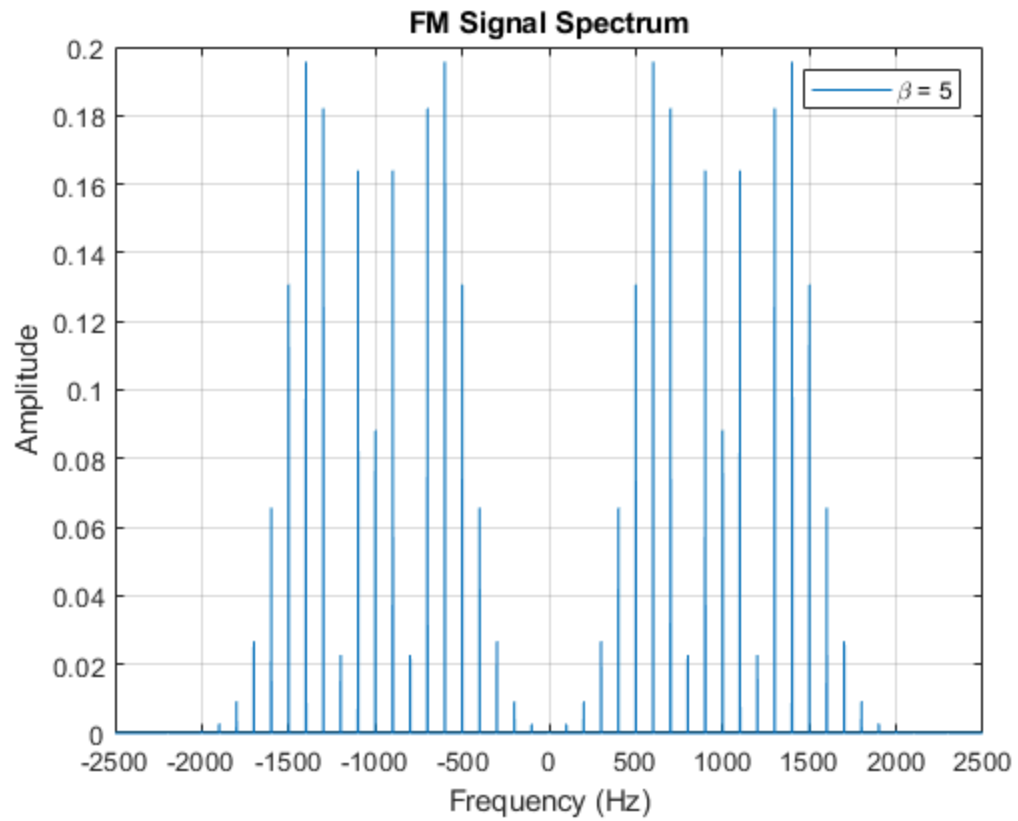
G = fft(mfm);
n = length(G);
G = fftshift(G);
G = G./n;
GM = abs(G);

figure(4)
```

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```
plot(f, GM); grid
title('FM Signal Spectrum')
xlabel('Frequency (Hz)')
ylabel('Amplitude')
legend('\beta = 5')
```





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