final Lab

Audio Equalizer

Command-Line Version

DSP

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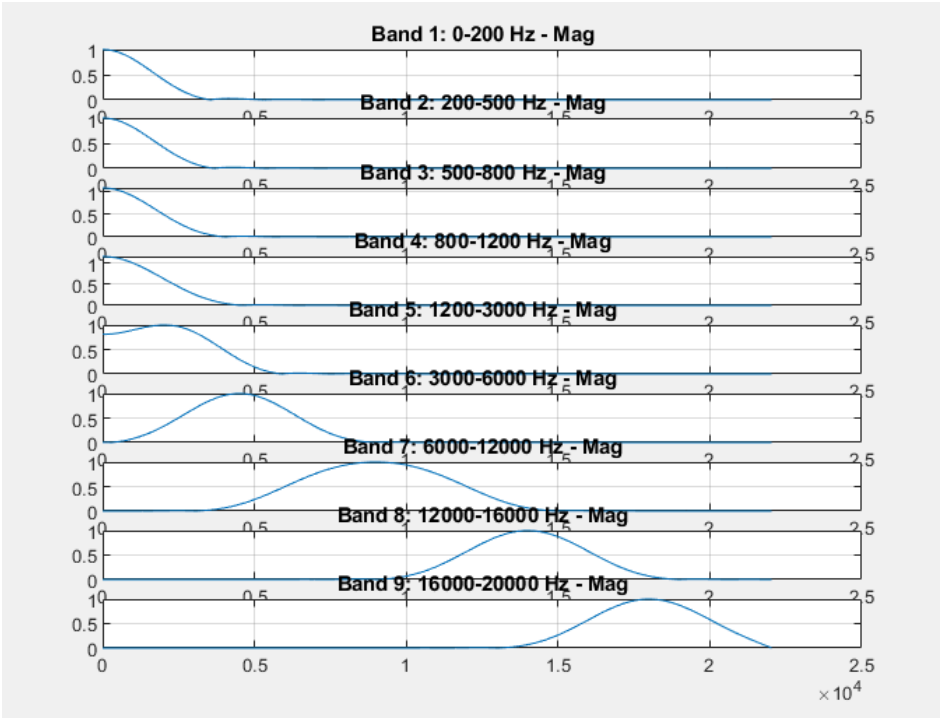
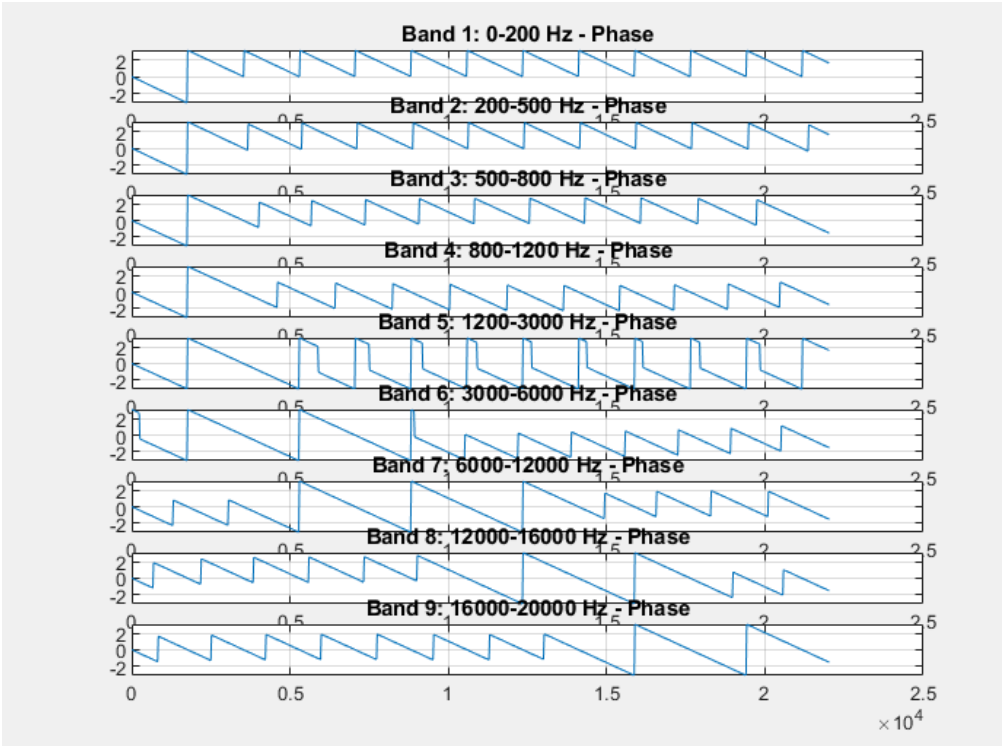
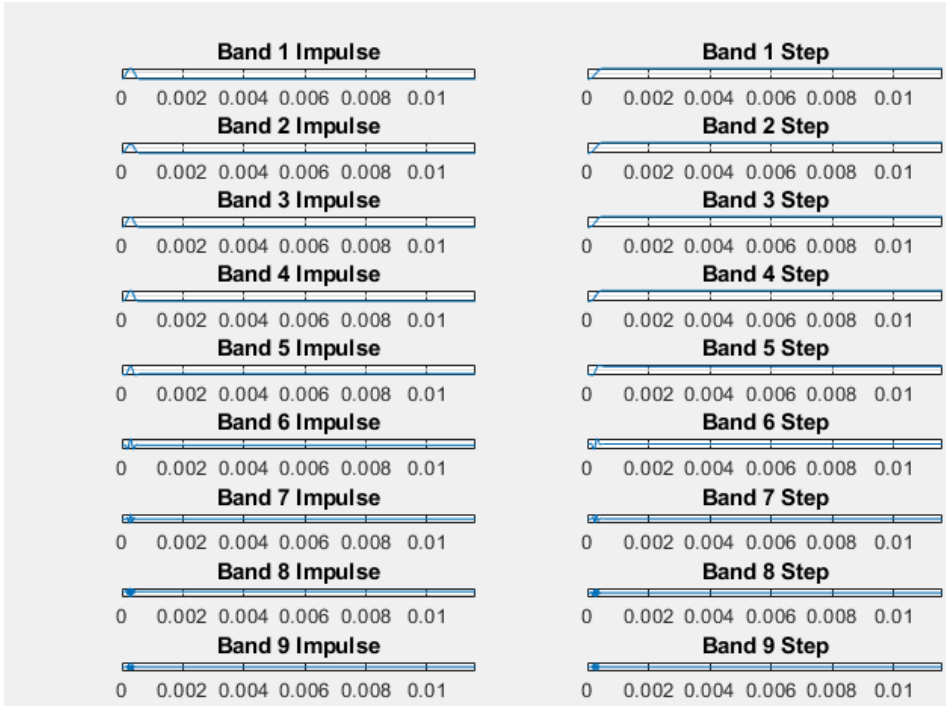
Habiba Abdelhameed **8633**

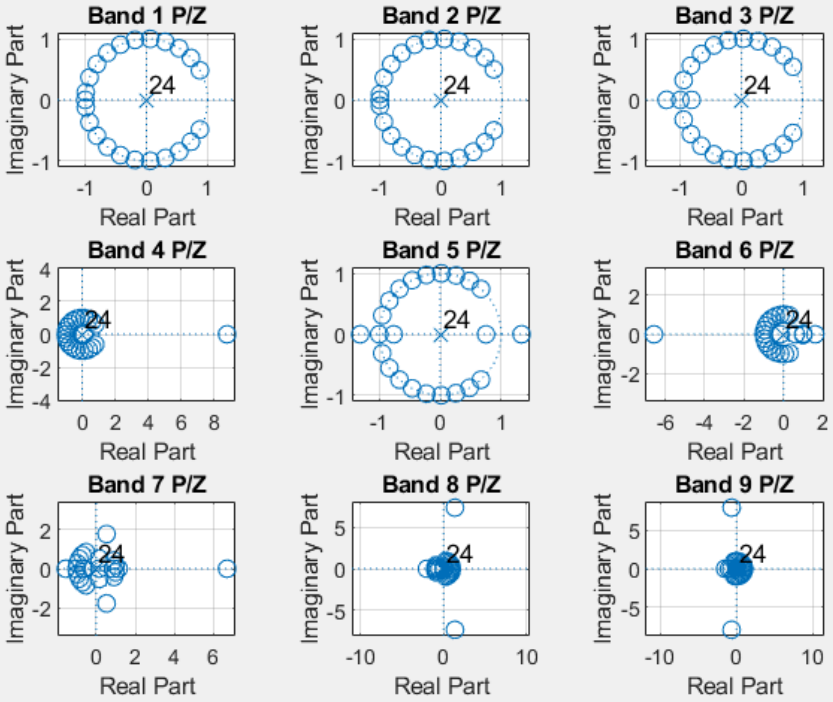
FIR

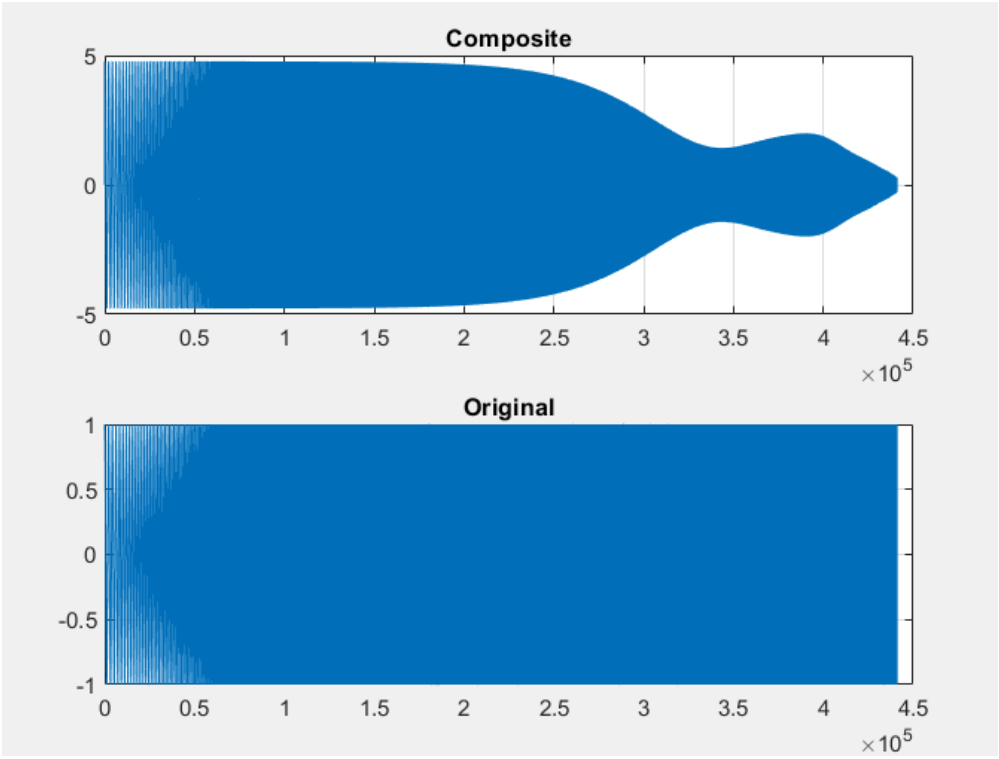
```
*** WELCOME TO AUDIO EQUALIZER ***
Gain for band 1 in dB: -6
Gain for band 2 in dB: 0
Gain for band 3 in dB: +3
Gain for band 4 in dB: 0
Gain for band 5 in dB: -3
Gain for band 6 in dB: 0
Gain for band 7 in dB: +6
Gain for band 8 in dB: 0
Gain for band 9 in dB: -6
Enter FIR filter order (default 25):
Enter output sample rate (Hz): 44100
Analysis data saved to filter_analysis.mat
Equalized audio saved to equalized_output.wav
*** THANK YOU ***
```

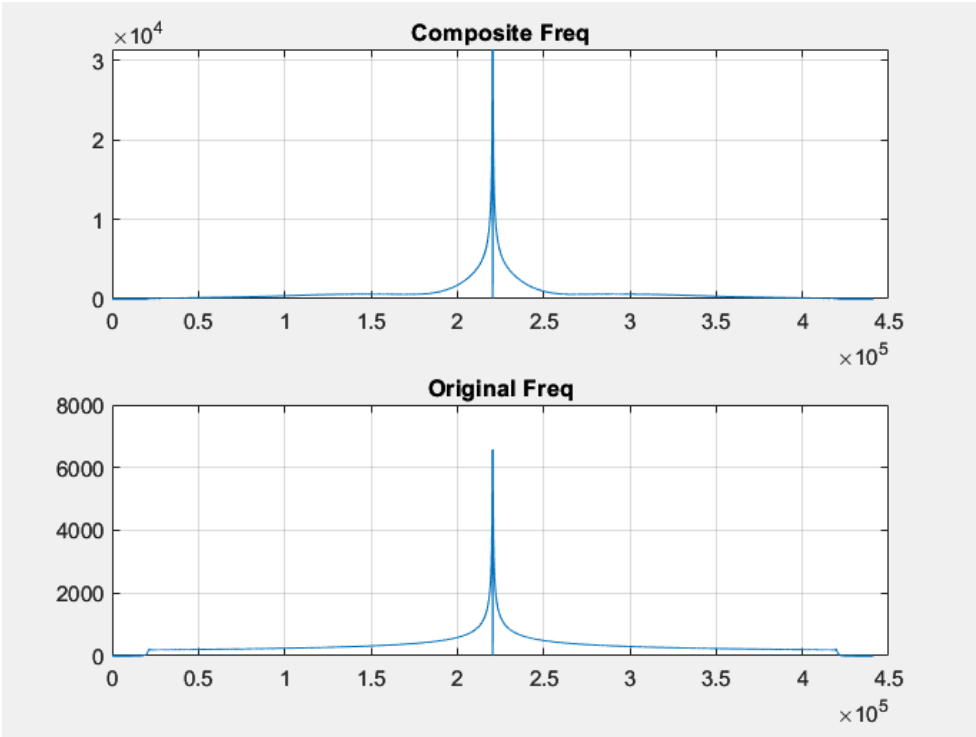

Band 1: 0-200 Hz - Mag
Band 2: 200-500 Hz - Mag
Band 3: 500-800 Hz - Mag
Band 4: 800-1200 Hz - Mag
Band 5: 1200-3000 Hz - Mag
Band 6: 3000-6000 Hz - Mag
Band 7: 6000-12000 Hz - Mag
Band 8: 12000-16000 Hz - Mag
Band 9: 16000-20000 Hz - Mag
0 0.5 1 1.5 2 2.5
×10^4


Band 1: 0-200 Hz - Phase
Band 2: 200-500 Hz - Phase
Band 3: 500-800 Hz - Phase
Band 4: 800-1200 Hz - Phase
Band 5: 1200-3000 Hz - Phase
Band 6: 3000-6000 Hz - Phase
Band 7: 6000-12000 Hz - Phase
Band 8: 12000-16000 Hz - Phase
Band 9: 16000-20000 Hz - Phase
0 0.5 1 1.5 2 2.5
×10^4


Band 1 Impulse
Band 1 Step
Band 2 Impulse
Band 2 Step
Band 3 Impulse
Band 3 Step
Band 4 Impulse
Band 4 Step
Band 5 Impulse
Band 5 Step
Band 6 Impulse
Band 6 Step
Band 7 Impulse
Band 7 Step
Band 8 Impulse
Band 8 Step
Band 9 Impulse
Band 9 Step
0 0.002 0.004 0.006 0.008 0.01

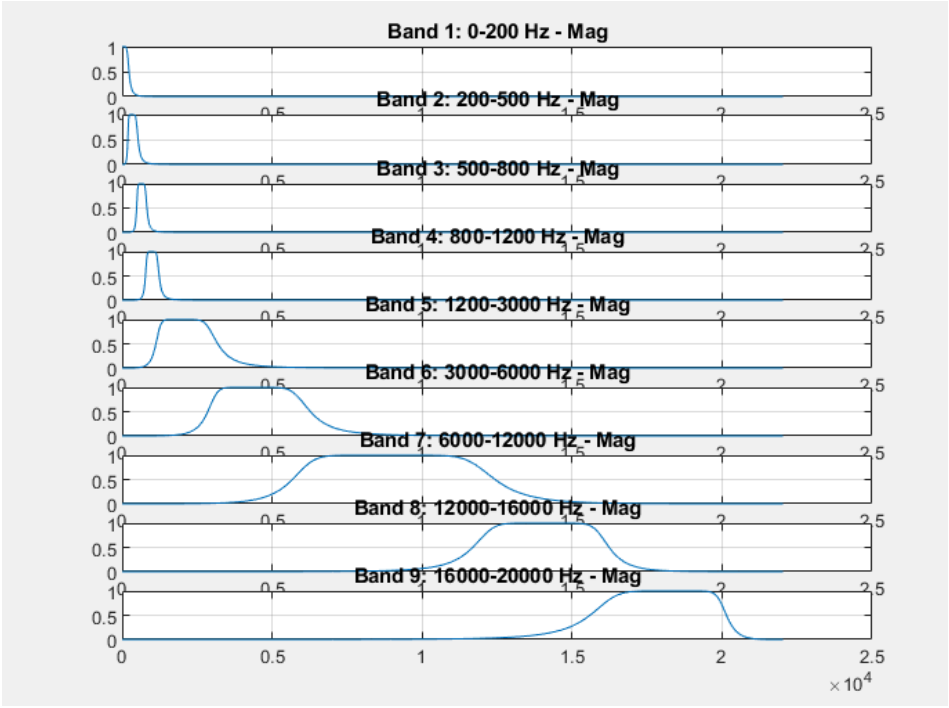

Band 1 P/Z
Band 2 P/Z
Band 3 P/Z
Band 4 P/Z
Band 5 P/Z
Band 6 P/Z
Band 7 P/Z
Band 8 P/Z
Band 9 P/Z
Imaginary Part
Real Part
24

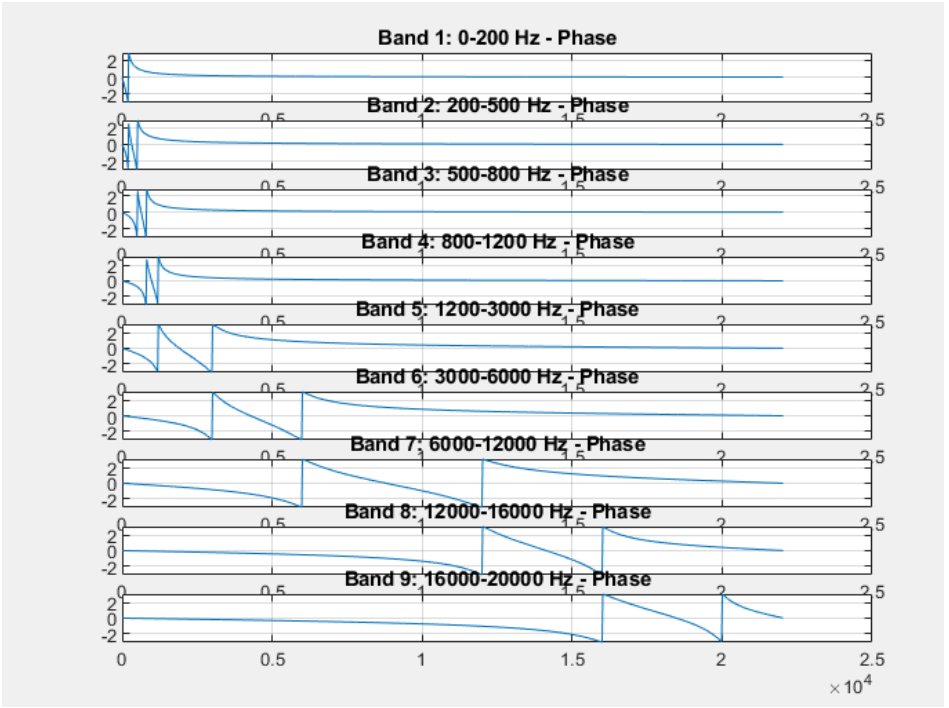

Composite
5
0
-5
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^5
Original
1
0.5
0
-0.5
-1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^5

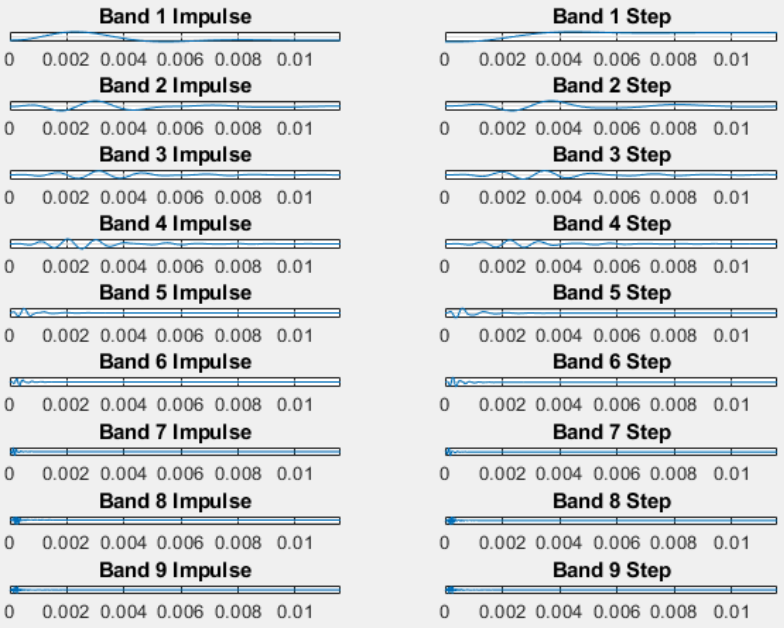

×10^4
Composite Freq
3
2
1
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^5
Original Freq
8000
6000
4000
2000
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^5

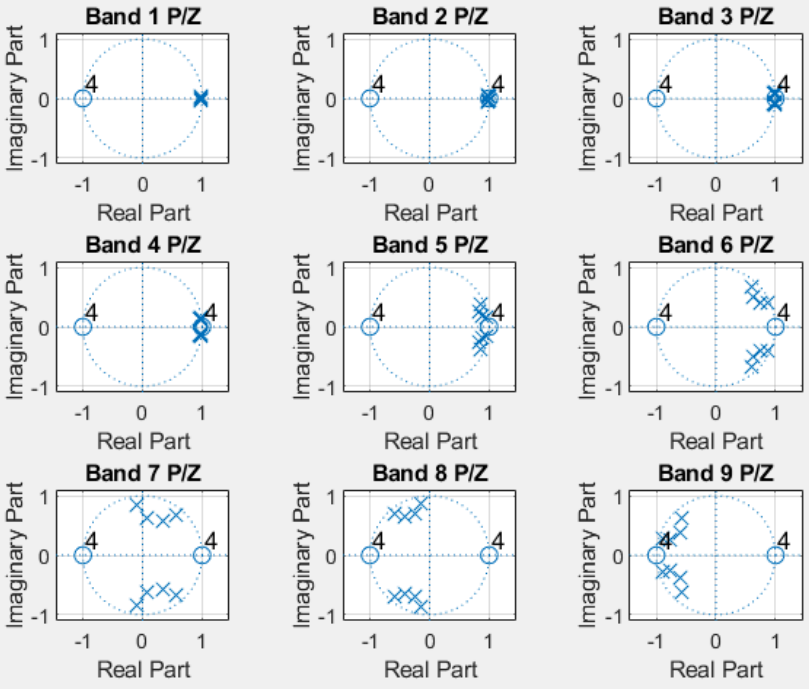
IIR

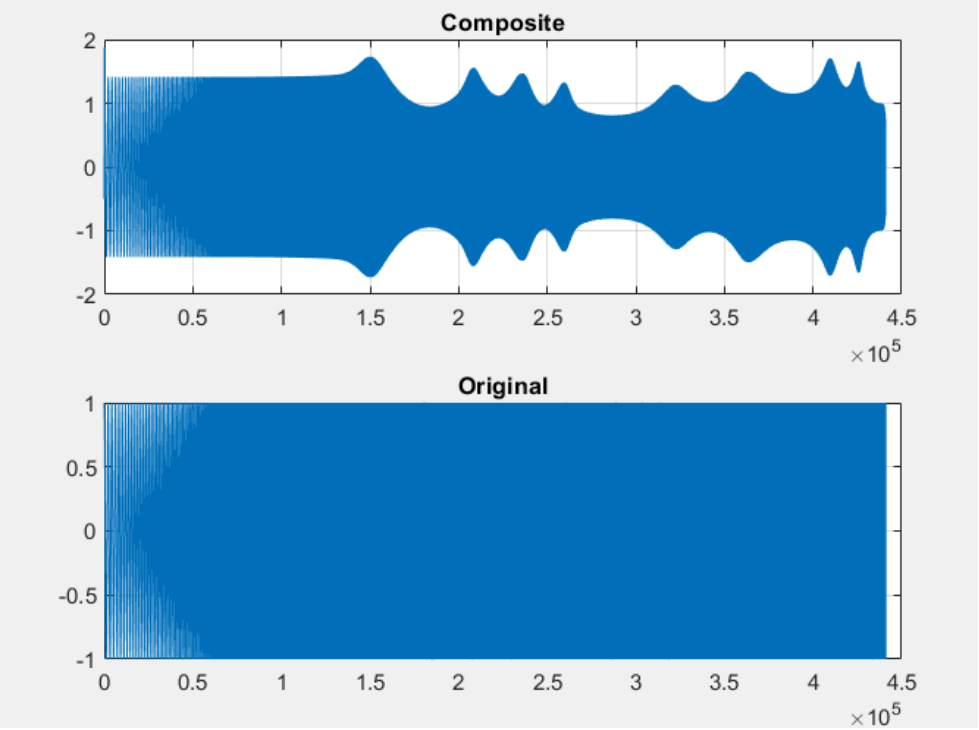
```
*** WELCOME TO AUDIO EQUALIZER***
Gain for band 1 in dB: 3
Gain for band 2 in dB: 0
Gain for band 3 in dB: 1
Gain for band 4 in dB: 0
Gain for band 5 in dB: -2
Gain for band 6 in dB: 0
Gain for band 7 in dB: 1
Gain for band 8 in dB: 02
Gain for band 9 in dB: 0
Enter IIR filter order (default 4): 4
Enter output sample rate (Hz): 44100
Analysis data saved to filter_analysis.mat
Equalized audio saved to equalized_output.wav
*** THANK YOU ***
```

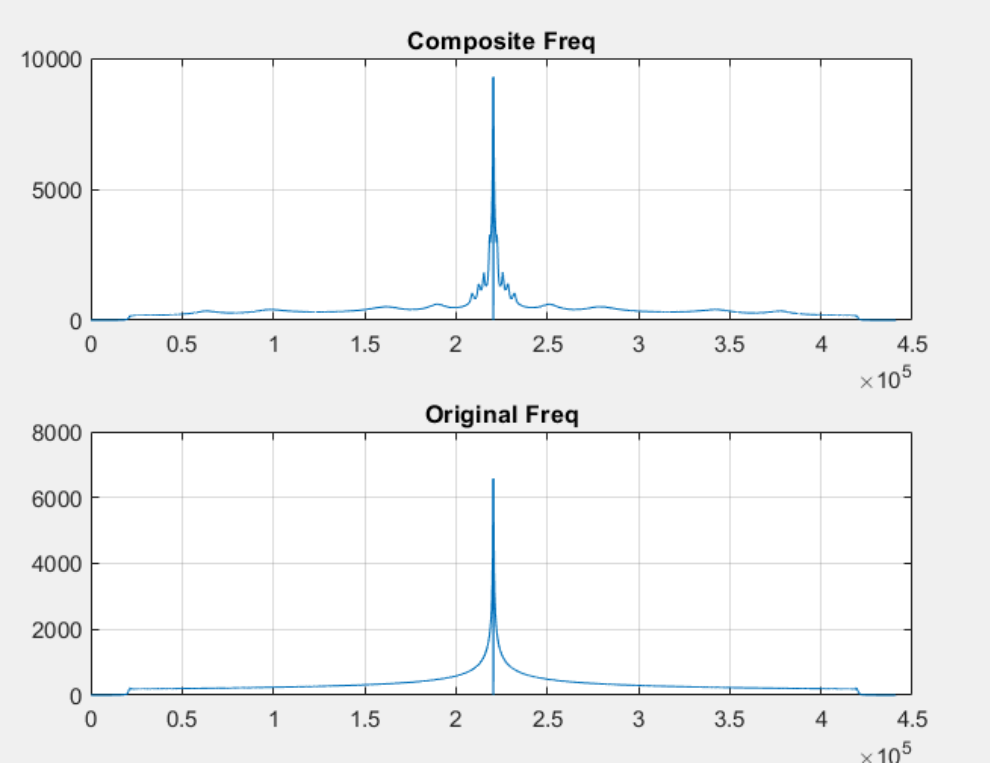

Band 1: 0-200 Hz - Mag
Band 2: 200-500 Hz - Mag
Band 3: 500-800 Hz - Mag
Band 4: 800-1200 Hz - Mag
Band 5: 1200-3000 Hz - Mag
Band 6: 3000-6000 Hz - Mag
Band 7: 6000-12000 Hz - Mag
Band 8: 12000-16000 Hz - Mag
Band 9: 16000-20000 Hz - Mag
0 0.5 1 1.5 2 2.5
×10^4


Band 1: 0-200 Hz - Phase
Band 2: 200-500 Hz - Phase
Band 3: 500-800 Hz - Phase
Band 4: 800-1200 Hz - Phase
Band 5: 1200-3000 Hz - Phase
Band 6: 3000-6000 Hz - Phase
Band 7: 6000-12000 Hz - Phase
Band 8: 12000-16000 Hz - Phase
Band 9: 16000-20000 Hz - Phase
0 0.5 1 1.5 2 2.5
×10^4


Band 1 Impulse
Band 1 Step
Band 2 Impulse
Band 2 Step
Band 3 Impulse
Band 3 Step
Band 4 Impulse
Band 4 Step
Band 5 Impulse
Band 5 Step
Band 6 Impulse
Band 6 Step
Band 7 Impulse
Band 7 Step
Band 8 Impulse
Band 8 Step
Band 9 Impulse
Band 9 Step
0 0.002 0.004 0.006 0.008 0.01

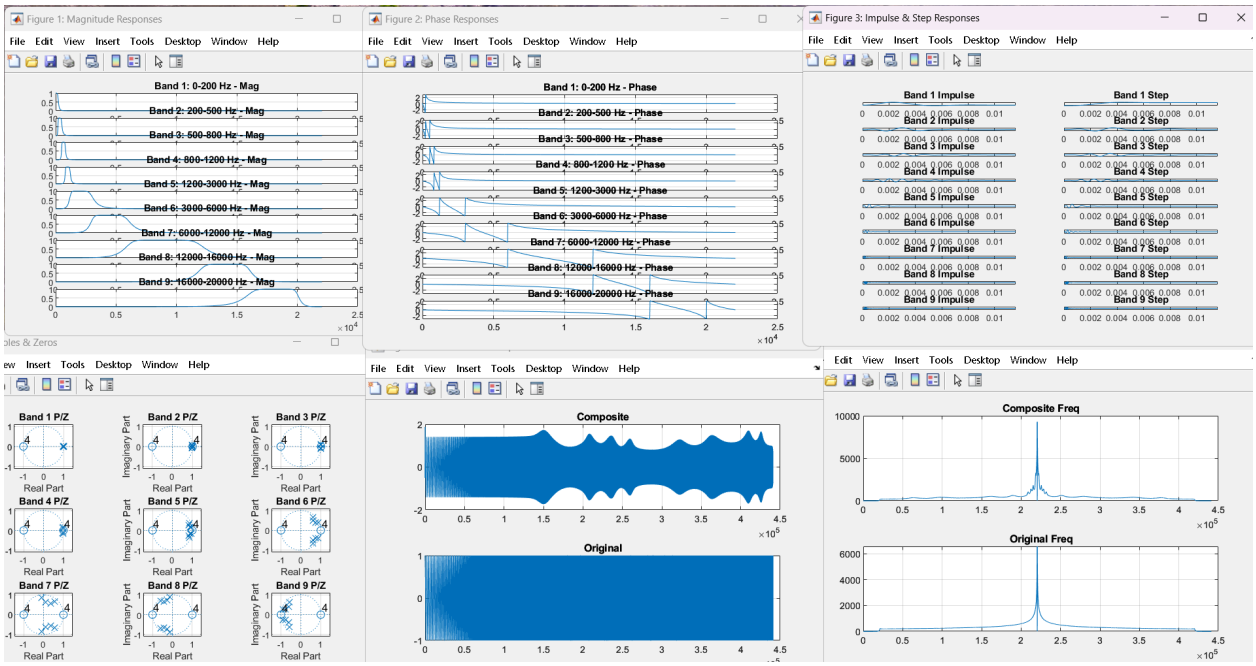

Band 1 P/Z
Band 2 P/Z
Band 3 P/Z
Band 4 P/Z
Band 5 P/Z
Band 6 P/Z
Band 7 P/Z
Band 8 P/Z
Band 9 P/Z
Imaginary Part
Real Part
1
0
-1
4


Composite
2
1
0
-1
-2
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^5
Original
1
0.5
0
-0.5
-1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^5


Composite Freq
10000
5000
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^5
Original Freq
8000
6000
4000
2000
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
×10^5

Sample rate is multiplied by four

```
*** WELCOME TO AUDIO EQUALIZER***
Gain for band 1 in dB: 3
Gain for band 2 in dB: 0
Gain for band 3 in dB: 1
Gain for band 4 in dB: 0
Gain for band 5 in dB: -2
Gain for band 6 in dB: 0
Gain for band 7 in dB: 1
Gain for band 8 in dB: 2
Gain for band 9 in dB: 0
Enter IIR filter order (default 4):
Enter output sample rate (Hz): 44100
Analysis data saved to filter_analysis.mat
Equalized audio saved to equalized_output.wav
*** THANK YOU ***
```



Decreasing it to half

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*** WELCOME TO AUDIO EQUALIZER***
Gain for band 1 in dB: 3
Gain for band 2 in dB: 0
Gain for band 3 in dB: 1
Gain for band 4 in dB: 0
Gain for band 5 in dB: -2
Gain for band 6 in dB: 0
Gain for band 7 in dB: 1
Gain for band 8 in dB: 0
Gain for band 9 in dB: 2
Enter IIR filter order (default 4):
Enter output sample rate (Hz): 22050
Analysis data saved to filter_analysis.mat
```