Prelab 5 Basic Filters and Frequency Response

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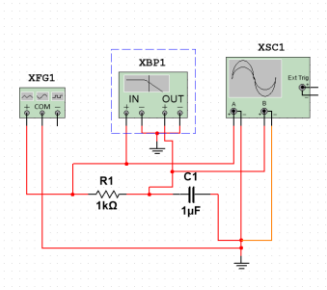


Circuit 1: Low Pass Filter

Part 1 – Low Pass Filter

Let R = 1kΩ, C = 1 µF, varying frequency, V_{IN} = 4Vpp sinusoidal

1. Fill up a table similar to the one given below.

	Simulated	
f (Hz)	Gain (dB)	Phase Angle (°)
25	0.158651	9
50	-0.32627	17
75	-0.83987	25
100	-1.57562	32
150	-3.03537	44
200	-4.45033	52
300	-6.72919	65
500	-10.6056	71

600	-11.7654	75
700	-12.7498	77
800	-13.8601	79
900	-14.688	80
1000	-15.6031	81

Table 1: Low Pass Filter Frequency, Gain, Phase Angle

2. Plot gain in dB vs. frequency.

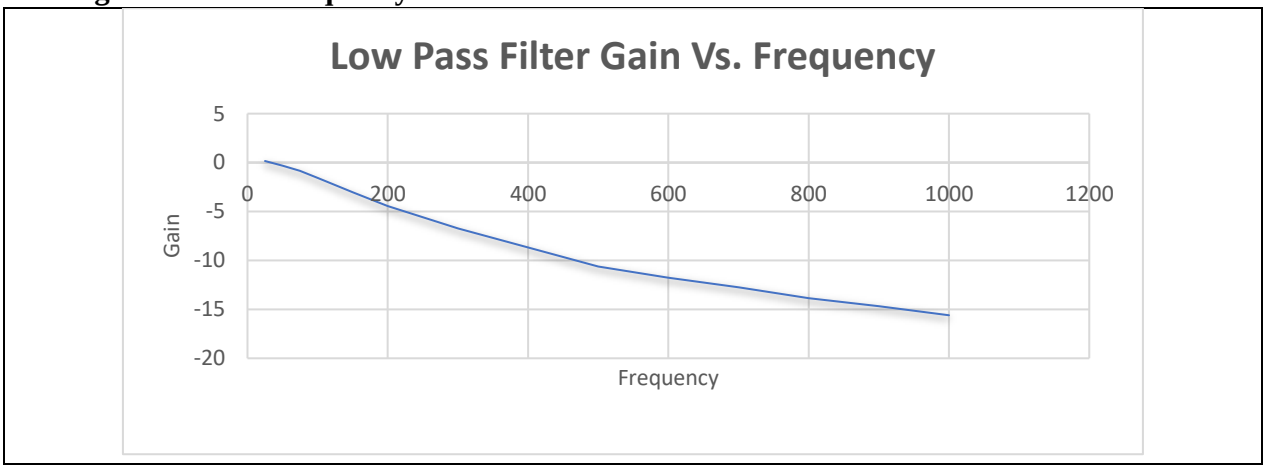


Figure 1: Low Pass Filter Gain vs Frequency

3. Plot phase vs. frequency.

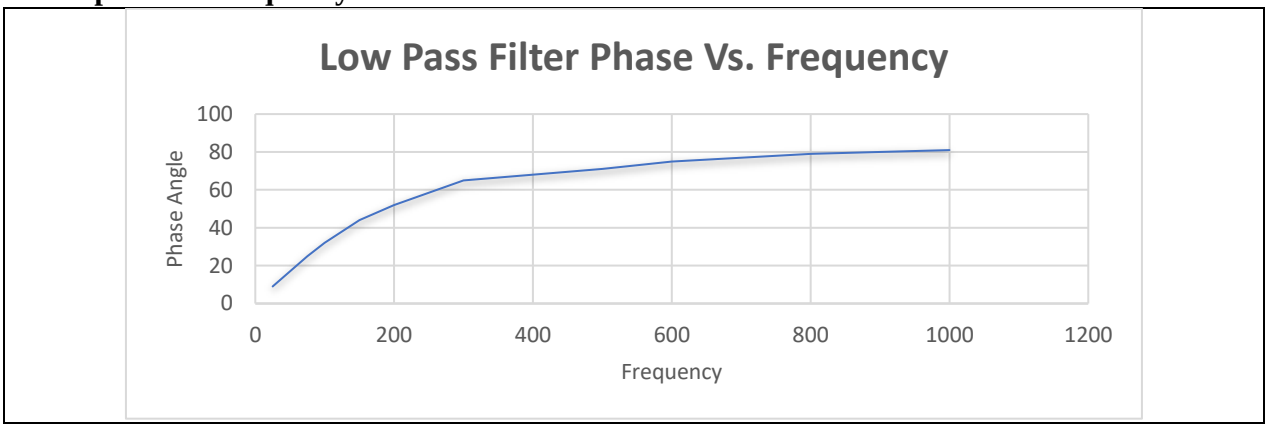
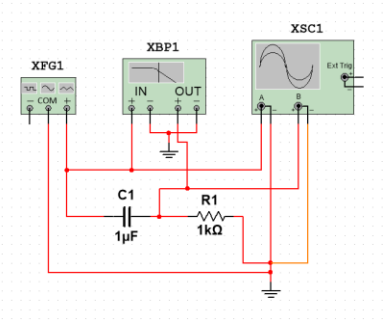


Figure 2: Low Pass Filter Phase vs. Frequency

5. Determine the cutoff frequency from your tabulated data you made in step 1. Compare it with the theoretical value. Mark the cutoff frequency on your magnitude plot.

f_c (theoretical cut off) = ½*pi*R*C = $1/(6.28*10^{3}*10^{-6})$ = **157 Hz**
f_c (simulated cut off) ≈ 147 Hz



Circuit 2: High Pass Filter

Part 2 – High Pass Filter

Let R = 1kΩ, C = 1 µF, varying frequency, V_{IN} = 4Vpp sinusoidal

1. Fill up a table similar to the one given below.

	Simulated	
f (Hz)	Gain (dB)	Phase Angle (°)
25	-13.8601	81
50	-9.11292	72
75	-6.64277	65
100	-4.79099	58
150	-2.8112	46
200	-1.96827	38
300	-1.19996	28
500	-0.49412	18
600	-0.49412	15

700	-0.49412	14
800	-0.32627	11
900	-0.24355	10
1000	-0.1616	9

Table 2: High Pass Filter Frequency, Gain, Phase Angle

2. Plot gain in dB vs. frequency.

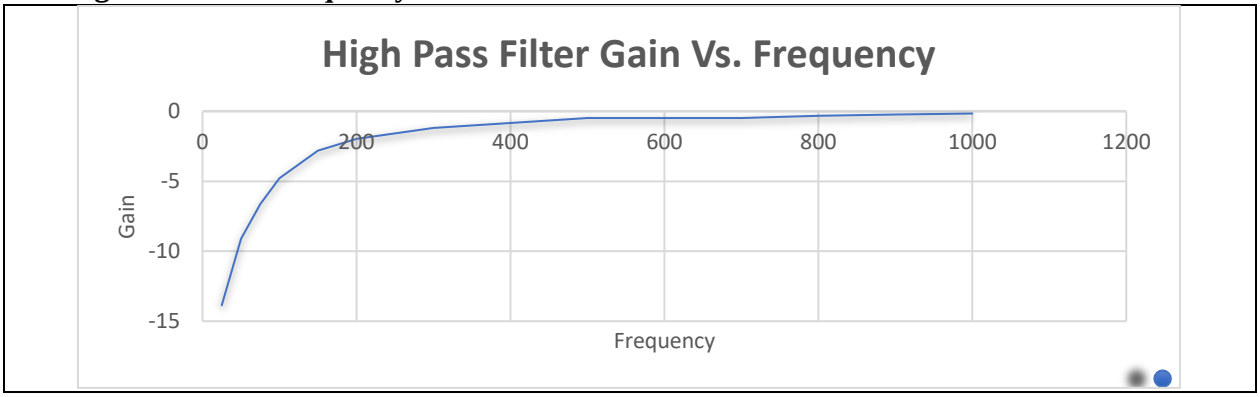


Figure 3: High Pass Filter Gain vs Frequency

3. Plot phase vs. frequency.

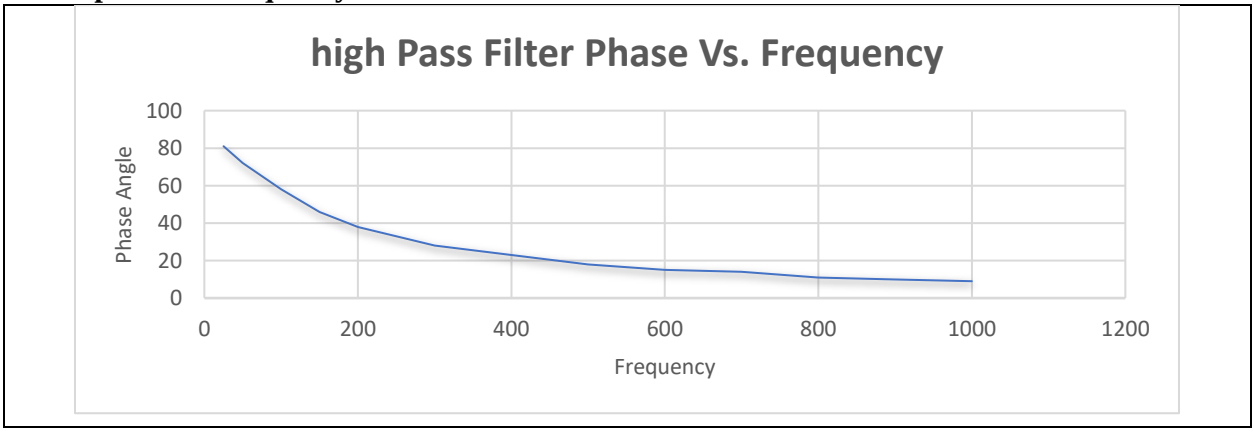
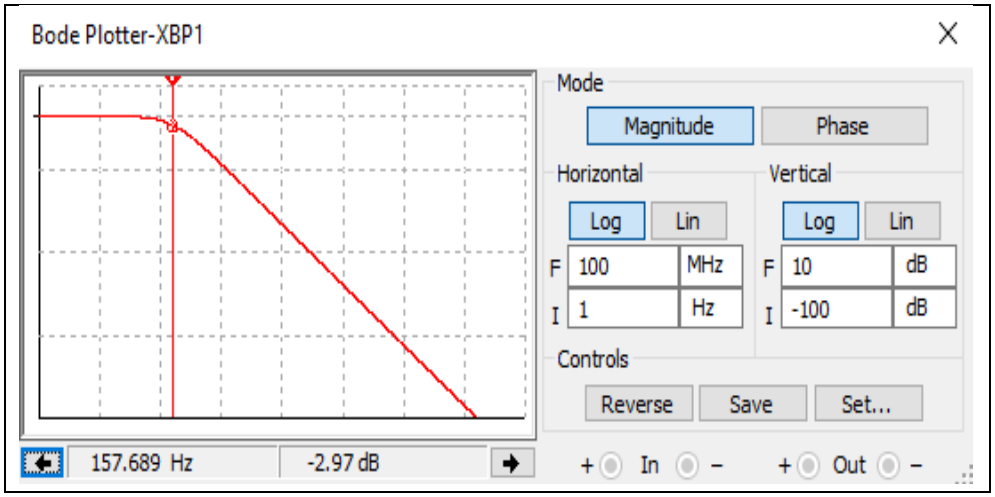


Figure 4: High Pass Filter Phase vs. Frequency

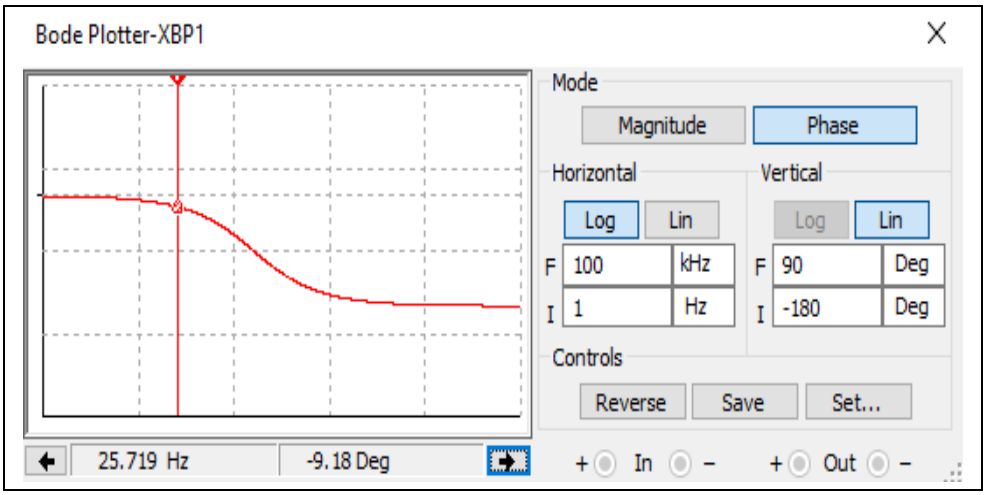
5. Determine the cutoff frequency from your tabulated data you made in step 1. Compare it with the theoretical value. Mark the cutoff frequency on your magnitude plot.

f_c (theoretical cut off) = ½*pi*R*C = $1/(6.28*10^{3}*10^{-6})$ = **157 Hz**
f_c (simulated cut off) ≈ 147 Hz

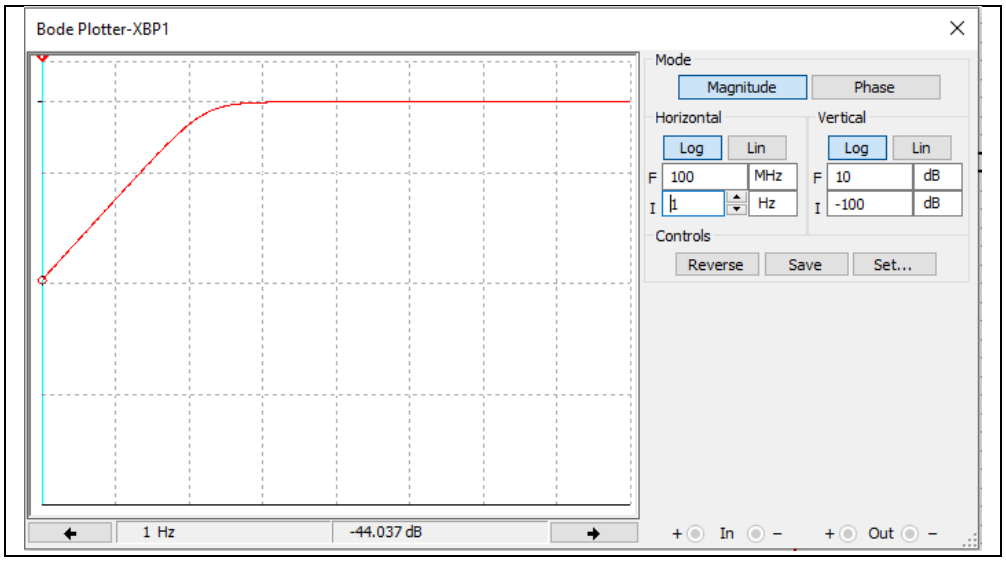
Appendix



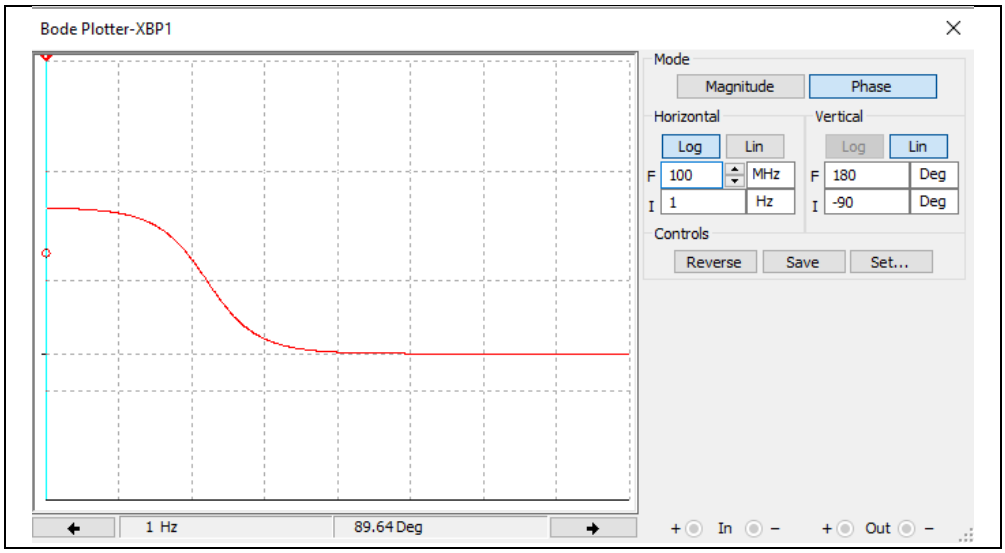
A1 – Low Pass Filter Gain Bode Plotter



A2 – Low Pass Filter Phase Bode Plotter



A3 – High Pass Filter Gain Bode Plotter



A4 – High Pass Filter Phase Bode Plotter