Midterm

7//2022

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Observations for Full and Half Wave rectifier

In both cases they only let in the positive half waves from the AC signal. For the half wave the Vout was about 70 v and for the full wave it was 63. There is no filter on either one which probably would've helped the output look better. The full wave has more of a point to each hill of its waveform because it has two diodes and the second diode is filling in some of the space between hills that you see with the half wave rectifier.

Observations & Notes for Band Pass Filter

Vin was 1.41 volts. The range of frequencies found with the bode plotter was 87 – 390 Hz with the center frequency around 200 Hz. This can be seen where gain rises and then stays stead at about -8 until it starts dropping again at 500 Hz. The center frequency can be seen by the data collected where at 200 Hz the frequency was at its highest and on either side of that is where it starts to drop.

For phase calculations, the component values on the left were used with the low pass equation and the values on the right were used with the high pass equation. Then, low and high was added together and converted to degrees from radians. A snippet of the full calculated values in excel are shown in Figure 10. I'm not entirely sure about the phase calculations, while running the simulation though at about 200 Hz is when the waveforms were in phase, at other frequencies it was slightly out of phase.

Half Wave

Circuit

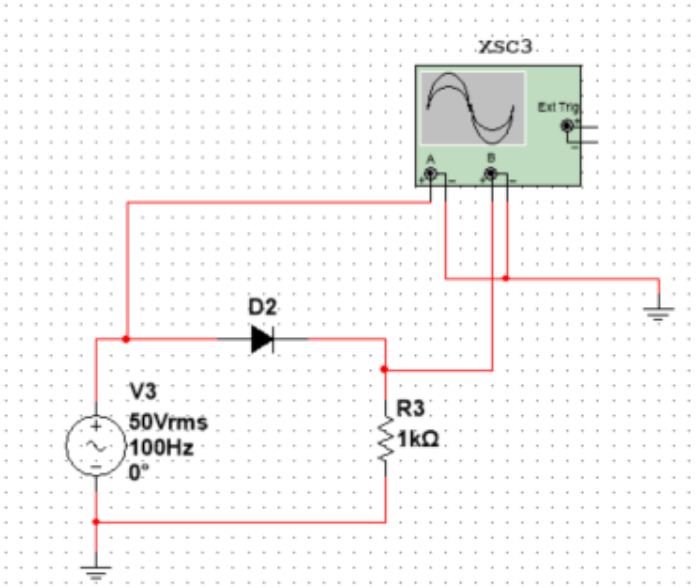

Figure 1. Half Wave Rectifier

Waveforms

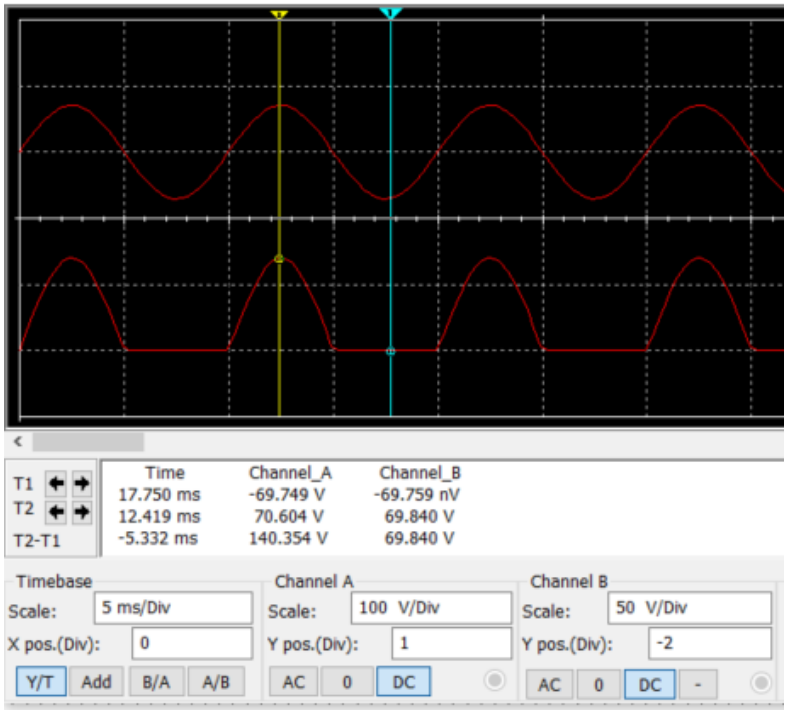

Figure 2. Input and Output Waveforms

Full Wave

Circuit

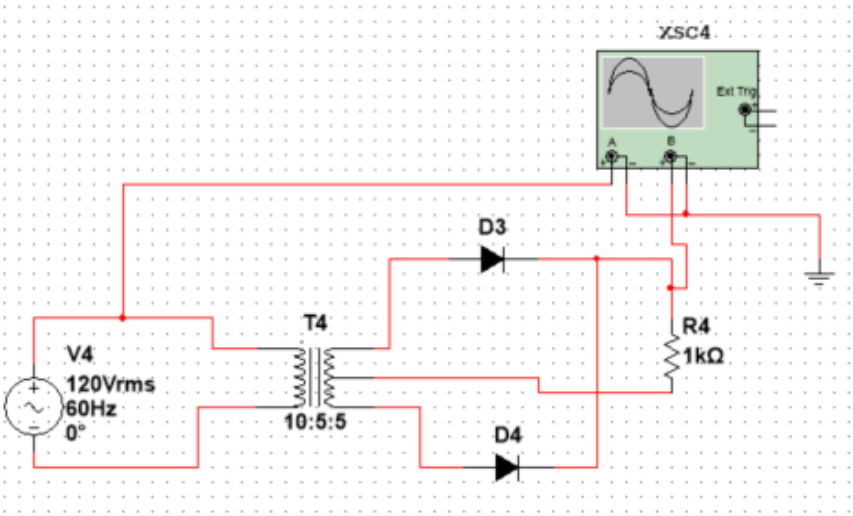

Figure 3. Full Wave Rectifier

Waveform

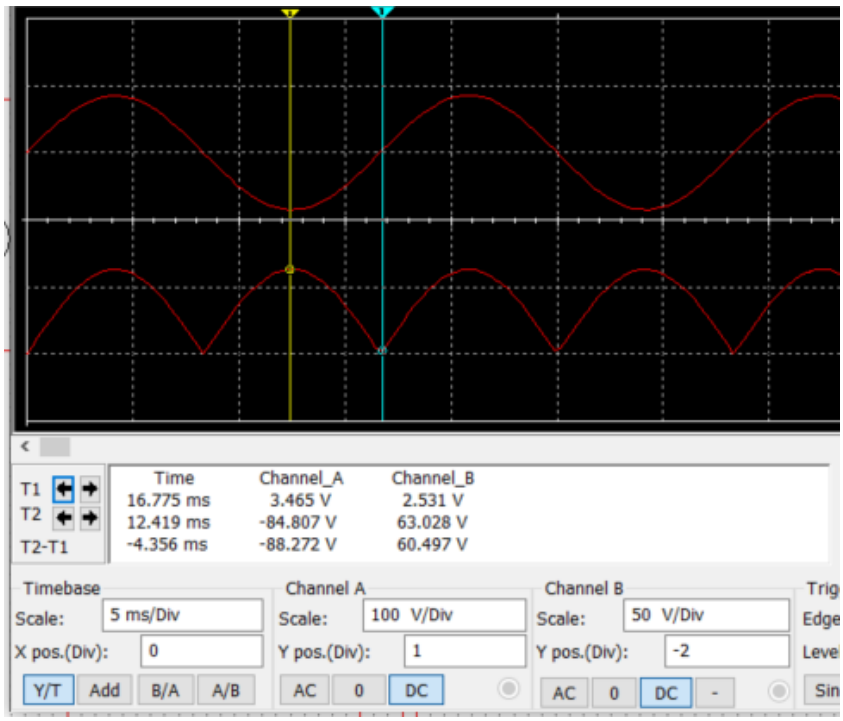

Figure 4. Input and Output Waveforms

Band Pass Filter

Table

	Band Pass Filter		
F(HZ)	Vout	Gain(db)	Phase Angle(deg)
25	0.285	-13.8875	119
50	0.426	-10.3962	56
75	0.48	-9.35956	33
100	0.51	-8.83298	21
150	0.523	-8.61435	6.3
200	0.528	-8.5317	-2.2
300	0.517	-8.71457	-16
500	0.471	-9.52396	-38
600	0.421	-10.4987	-49
700	0.419	-10.5401	-58
800	0.393	-11.0965	-67
900	0.351	-12.0782	-77
1000	0.331	-12.5878	-86

Circuit

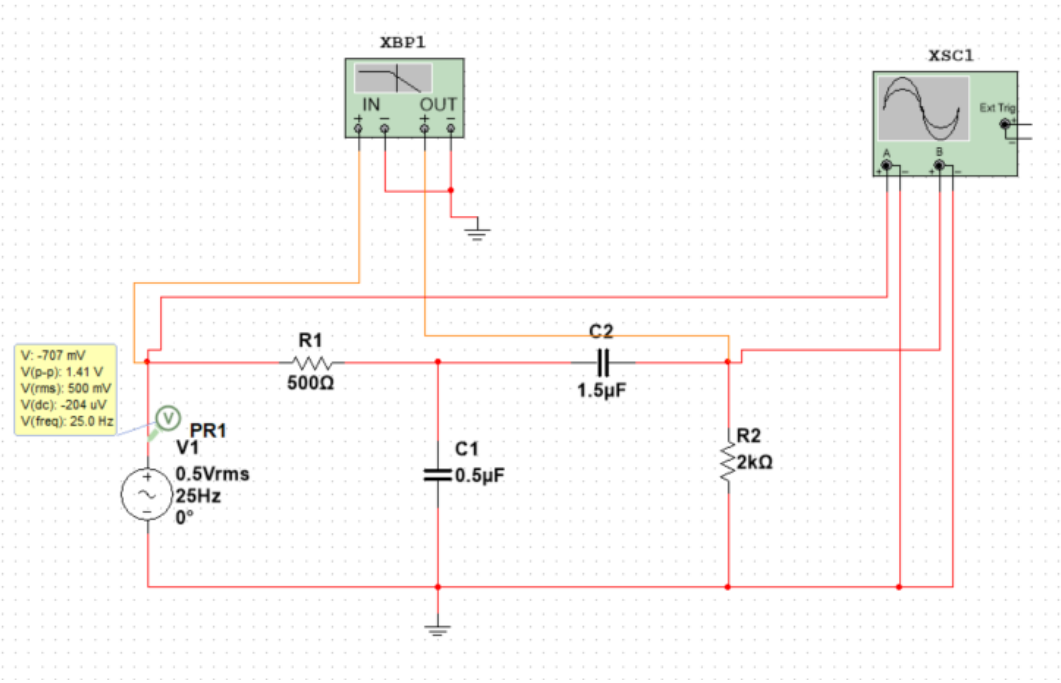

Figure 5. Band Pass Filter

Outputs and Plots

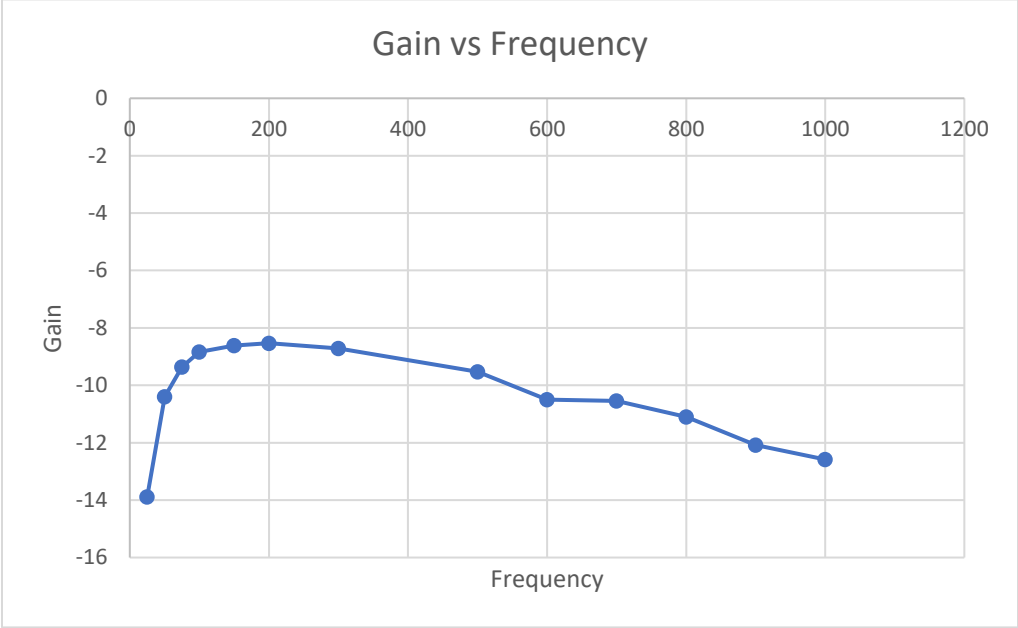

Figure 6. Gain vs Frequency of Band Pass Filter

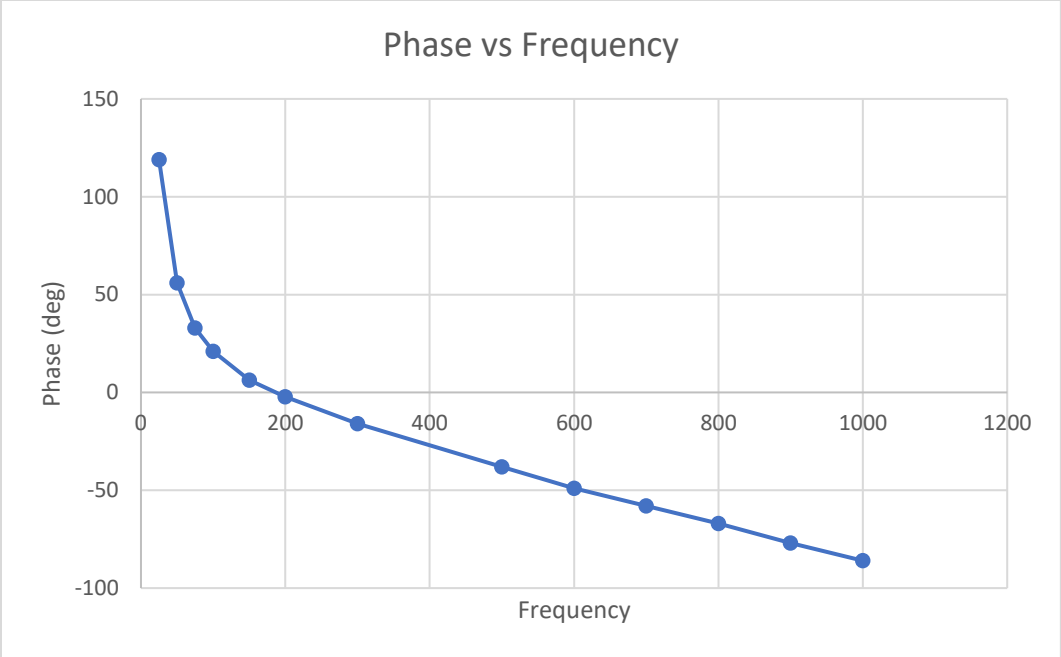

Figure 7. Phase Angle vs Frequency of Band Pass Filter

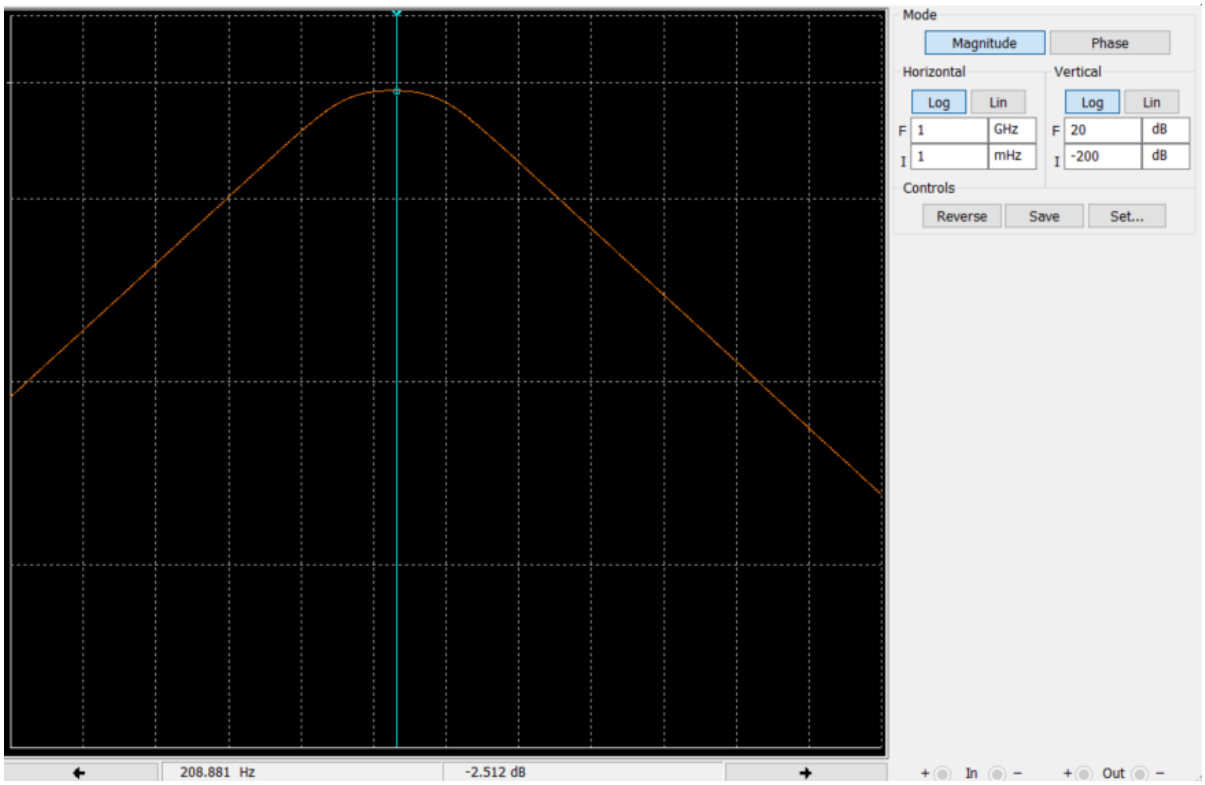

Figure 8. Bode Plot of Magnitude

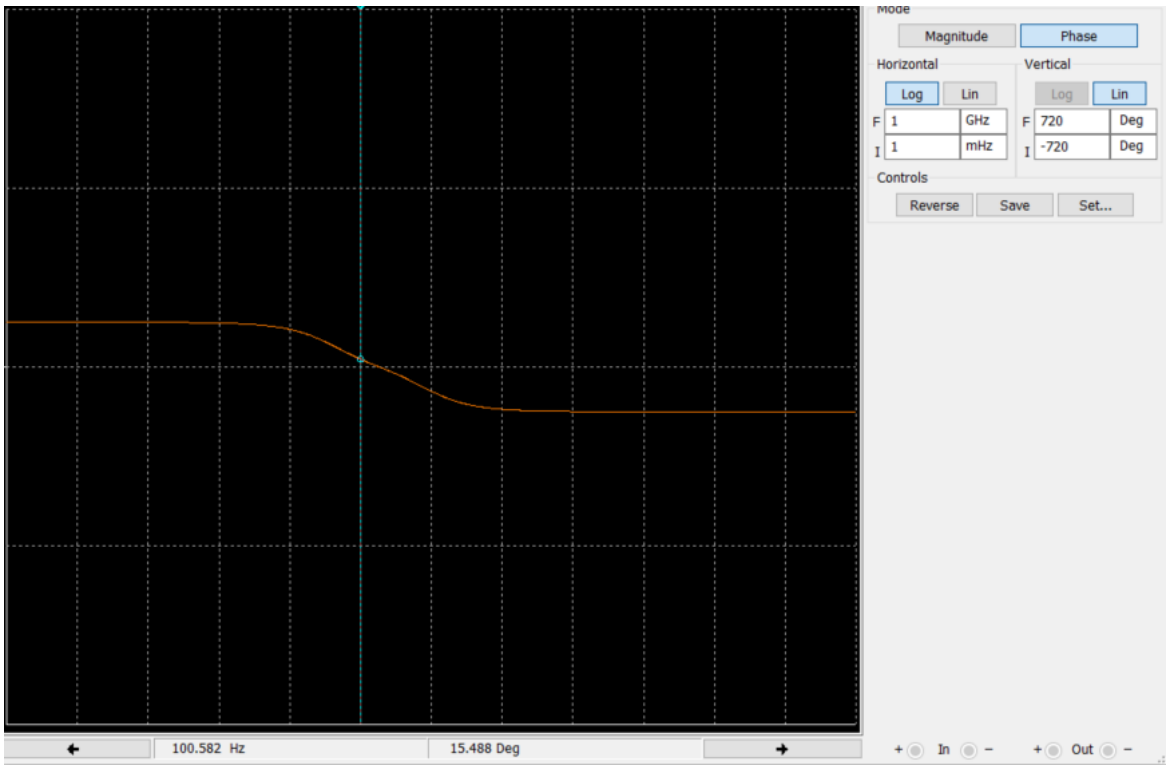

Figure 9. Bode Plot of Phase angle

Low	High	Sum(rad)	Degrees	pi	R1	C1	C2	R2
-0.03925	2.123142	2.083892	119	2.14	500	5E-07	1.5E-06	2000
-0.0785	1.061571	0.983071	56					
-0.11775	0.707714	0.589964	33					
-0.157	0.530786	0.373786	21					
-0.2355	0.353857	0.118357	6.3					
-0.314	0.265393	-0.04861	-2.2					
-0.471	0.176929	-0.29407	-16					
-0.785	0.106157	-0.67884	-38					
-0.942	0.088464	-0.85354	-49					
-1.099	0.075827	-1.02317	-58					
-1.256	0.066348	-1.18965	-67					
-1.413	0.058976	-1.35402	-77					
-1.57	0.053079	-1.51692	-86					

Figure 10. Calculations for Phase angle