Experiment 9
Frequency Response of Low Pass Filter

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1 Objective

1. To determine the low pass filter frequency response of an RC circuit.
2. To measure the cut off frequency and observe the attenuation rate.
3. To compare the graph of simulation data and practical data.

2 Apparatus

1. Resistors
2. Capacitors
3. Oscilloscope
4. Breadboard
5. Wires
6. Function Generator
7. DC Power Supply
8. Multimeter

3 Circuit Diagram

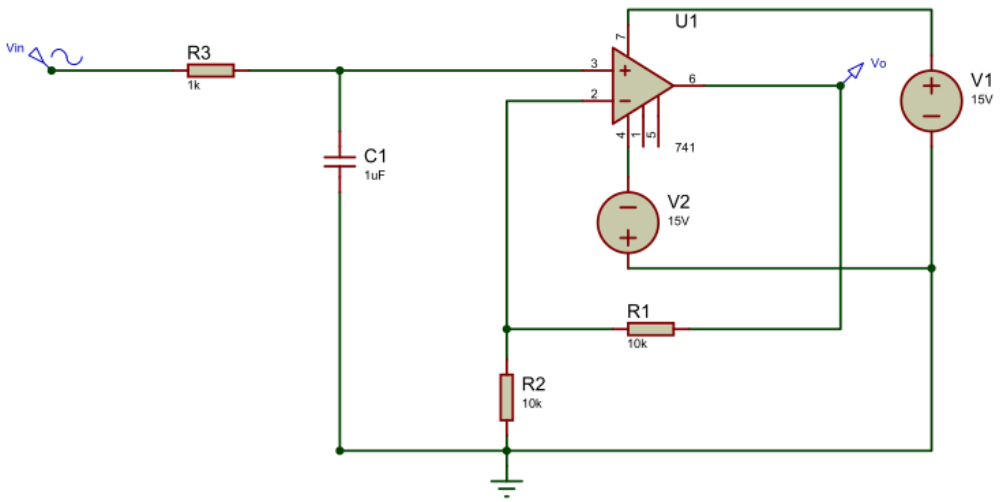

Figure 1: Low Pass Filter Circuit

4 Result Analysis

4.1 Data Table

The low pass RC circuit allows low-frequency signals to pass while attenuating high-frequency signals. The detailed data is shown in Table 1. The cutoff frequency is observed at the point where the output voltage drops to 70.7% of the input voltage. The attenuation rate is -20dB/decade beyond the cutoff frequency

Table 1: Practical and Simulated Data of Low Pass Filter

Vin (V)	Frequency (Hz)	Practical Data Av (dB)	Simulated Data Av (dB)
1	0.1	4.959465	4.959465
1	1.0	5.249022	4.959465
1	1.5	5.057061	4.860761
1	2.0	5.343435	4.810985
1	2.5	5.436832	4.959465
1	3.0	5.620667	4.910253
1	3.5	5.666025	5.057061
1	4.0	6.277344	5.153571
1	4.5	6.648769	5.249022
1	5.0	6.808882	5.249022
1	5.5	7.158697	5.296356
1	6.0	7.421357	5.483157
1	7.0	7.889034	5.620667
1	8.0	8.198662	5.666025
1	10.0	6.107027	5.800692
1	50.0	6.887845	5.845121
1	100.0	7.004960	5.933304
1	110.0	7.272240	5.977062
1	150.0	6.769130	6.063921
1	200.0	5.390259	6.063921
1	250.0	4.243752	6.149921
1	300.0	3.167250	6.235077
1	350.0	2.076074	6.063921
1	400.0	1.437640	0.827854
1	450.0	0.668475	0.984360
1	500.0	0.086427	0.086427
1	600.0	-1.012200	-1.411621
1	700.0	-1.830300	-1.514414
1	900.0	-3.223018	-3.609121
1	1000.0	-3.876401	-3.741733
1	1500.0	-5.848596	-4.582960
1	2000.0	-7.130946	-6.375175
1	3000.0	-8.404328	-7.744323
1	4000.0	-9.118639	-8.873950
1	5000.0	-9.370422	-9.118639
1	10000.0	-9.118639	-9.118639
1	50000.0	-9.370422	-9.118639

4.2 Graph

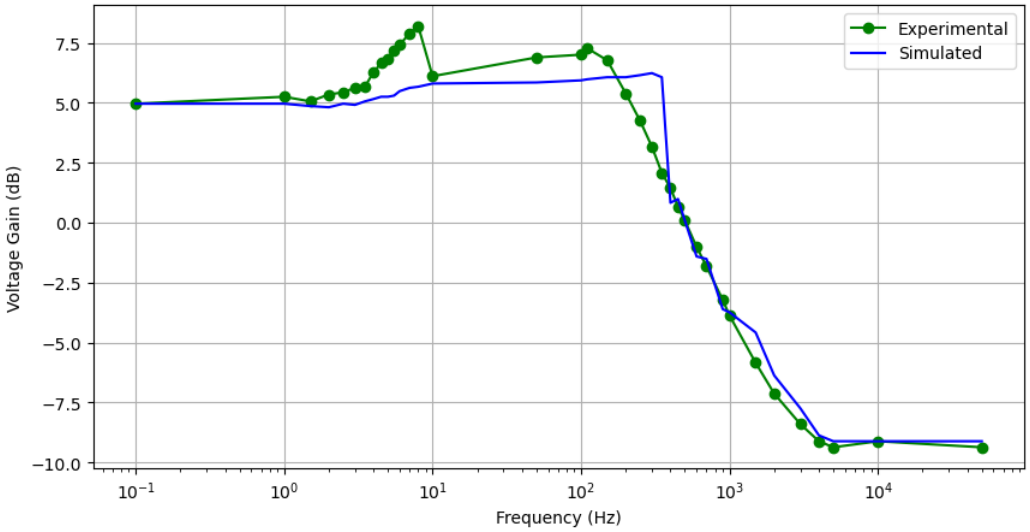

Figure 2: Frequency Response of Low Pass Filter

In this graph, the x-axis represents the frequency in Hz and the y-axis represents the gain in dB. The graph shows that the low pass filter blocks the lower frequency and passes the higher frequency. The cutoff frequency is observed at 500Hz where the output voltage drops to 70.7% of the input voltage. The attenuation rate is -20dB/decade beyond the cutoff frequency.

5 Discussion

The low pass filter is a circuit that allows low-frequency signals to pass while attenuating high-frequency signals. The cutoff frequency is the point where the output voltage drops to 70.7% of the input voltage. The attenuation rate is -20dB/decade beyond the cutoff frequency. The practical and simulated data of the low pass filter are shown in Table 1. The graph of the frequency response of the low pass filter is shown in Figure 1. The graph shows that the low pass filter blocks the lower frequency and passes the higher frequency.