Experiment 12
Experiment on Band Pass Filter

Turja Roy
ID: 2108052

1 Objective

1. To determine the Band 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

1. Wires
2. Function Generator
3. DC Power Supply
4. Multimeter

3 Circuit Diagram

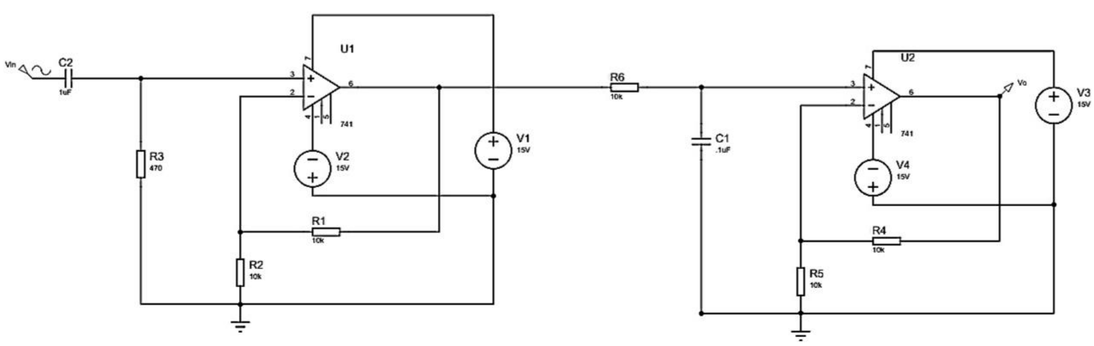

Figure 1: Band Pass Filter RC Circuit

4 Result Analysis

The circuit configuration on Figure 1 entails an active band pass filter where an active high-pass filter(HPF) and an active low-pass filter (LPF) are connected in series via a resistor R6. This arrangement facilitates the transmission of signals within a specified frequency range while attenuating both low and highfrequency components. The resistor R6 acts as a coupling element, regulating the flow of signals between the filters.

4.1 Data Table

Table 1 represents the experimental output data. The input and output voltage Vout are in volts. The voltage gain is calculated in decibel(dB) using the equation

$$A_v = 20 \log \left(\frac{V_{out}}{V_{in}} \right)$$

Table 1: Practical Data of Band Pass Filter

Vin	Vout	frequency	Av
1	0.045	0.1	-26.935750
1	0.063	5.0	-24.013189
1	0.072	6.0	-22.853350
1	0.082	7.0	-21.723723
1	0.098	8.0	-20.175478
1	0.104	9.0	-19.659333
1	0.117	10.0	-18.636283
1	0.127	11.0	-17.923926
1	0.130	12.0	-17.721133
1	0.133	13.0	-17.522967
1	0.145	14.0	-16.772640
1	0.166	15.0	-15.597838
1	0.187	16.0	-14.563168
1	0.187	17.0	-14.563168
1	0.187	18.0	-14.563168
1	0.187	19.0	-14.563168
1	0.192	20.0	-14.333975
1	0.182	21.0	-14.798572
1	0.182	22.0	-14.798572
1	0.182	23.0	-14.798572
1	0.179	24.0	-14.942939
1	0.176	25.0	-15.089747
1	0.176	26.0	-15.089747
1	0.176	27.0	-15.089747
1	0.175	30.0	-15.139239
1	0.175	35.0	-15.139239
1	0.160	60.0	-15.917600
1	0.159	80.0	-15.972058
1	0.152	150.0	-16.363128
1	0.062	400.0	-24.152166
1	0.045	550.0	-26.935750

4.2 Graph

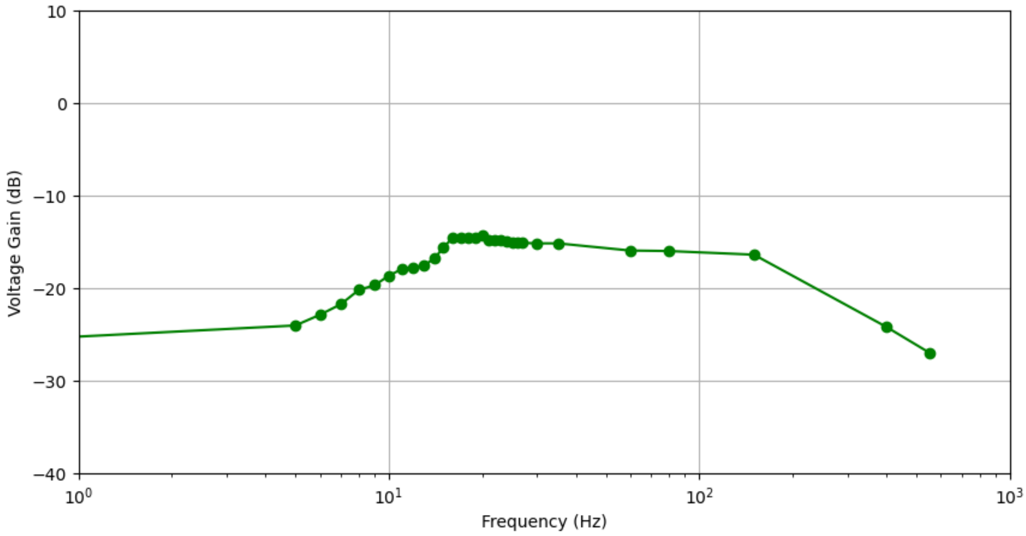

Figure 2: Frequency Response of Band Pass Filter

The graph in Figure 2 shows the frequency response of the band pass filter. The gain is highest at a mid-range frequency. The filter blocks higher frequencies and passes lower frequencies. The filter looks like a high pass filter after increasing the frequency and a low pass filter after decreasing the frequency. The condition of the band pass filter is observed.

5 Discussion

In this experiment, the band pass filter frequency response of an RC circuit is determined. The cut off frequency is observed at 15 Hz. The attenuation rate is observed to be -20 dB/decade. The graph of simulation data and practical data is compared. The graph shows the frequency response of the band pass filter. The gain is highest at a mid-range frequency. The filter blocks higher frequencies and passes lower frequencies. The filter looks like a high pass filter after increasing the frequency and a low pass filter after decreasing the frequency. The condition of the band pass filter is observed.