Experiment 7

Analyzing the frequency response of a single tuned amplifier to investigate the low pass frequency and high pass frequency.

Turja Roy
ID: 2108052

1 Objective

1. To draw and analyze the frequency response of a single tuned amplifier.
2. To investigate the low pass frequency and high pass frequency by analyzing the frequency response graphs.
3. Establish a comprehensive understanding of the correlation between simulation and experimental data for the frequency response of a single tuned amplifier.

2 Circuit Diagram

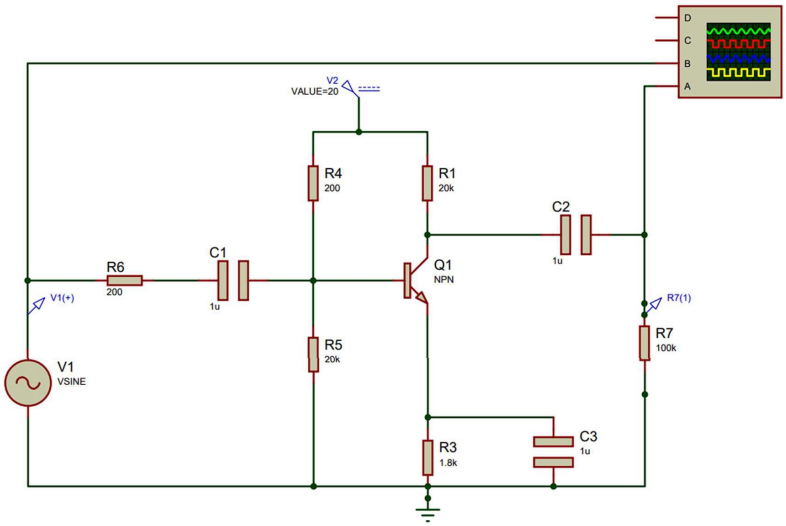

Figure 1: Circuit Diagram for Determining Frequency Response.png

A voltage divider bias circuit was constructed using an NPN transistor and four resistors. The circuit included a bypass capacitor, C2. A DC voltage source was connected to the collector of the transistor. The input voltage,V1, was applied, and the output voltage was obtained from the load Resistor, R7. Figure 1 represents the circuit diagram.

3 Result Analysis

3.1 Data Table

Table 1: Experimental Data

Vin (mV)	Frequency	Logarithmic Frequency	Vout (mV)	Av	Gain (dB)
100	50	1.69897	2600	26	28.299467
100	100	2.00000	5000	50	33.979400
100	200	2.30103	9100	91	39.180828
100	500	2.69897	15000	150	43.521825
100	1000	3.00000	17000	170	44.608978
100	2000	3.30103	17800	178	45.008400
100	5000	3.69897	18000	180	45.105450
100	10000	4.00000	18000	180	45.105450
100	20000	4.30103	18000	180	45.105450
100	50000	4.69897	18000	180	45.105450
100	100000	5.00000	18000	180	45.105450
100	200000	5.30103	18000	180	45.105450
100	500000	5.69897	18000	180	45.105450
100	1000000	6.00000	18000	180	45.105450
100	2000000	6.30103	18000	180	45.105450
100	5000000	6.69897	16000	160	44.082400
100	10000000	7.00000	12000	120	41.583625
100	20000000	7.30103	7500	75	37.501225
100	40000000	7.60206	4000	40	32.041200

Table 2: Simulation Data

Vin (mV)	Frequency	Logarithmic Frequency	Vout (mV)	Av	Gain (dB)
100	50	1.69897	380	3.8	11.595672
100	100	2.00000	600	6.0	15.563025
100	200	2.30103	1100	11.0	20.827854
100	500	2.69897	2600	26.0	28.299467
100	1000	3.00000	5000	50.0	33.979400
100	2000	3.30103	9100	91.0	39.180828
100	5000	3.69897	15200	152.0	43.636872
100	10000	4.00000	17400	174.0	44.810985
100	20000	4.30103	18200	182.0	45.201428
100	50000	4.69897	18200	182.0	45.201428
100	100000	5.00000	18200	182.0	45.201428
100	200000	5.30103	18200	182.0	45.201428
100	500000	5.69897	18200	182.0	45.201428
100	1000000	6.00000	18200	182.0	45.201428
100	2000000	6.30103	18200	182.0	45.201428
100	5000000	6.69897	15800	158.0	43.973142
100	10000000	7.00000	11600	116.0	41.289160
100	20000000	7.30103	7500	75.0	37.501225
100	40000000	7.60206	4000	40.0	32.041200

3.2 Graph

The comparison between two graphs of the frequency of the single tuned ampilifier which had been obtained from experimental and simulation data are given below.

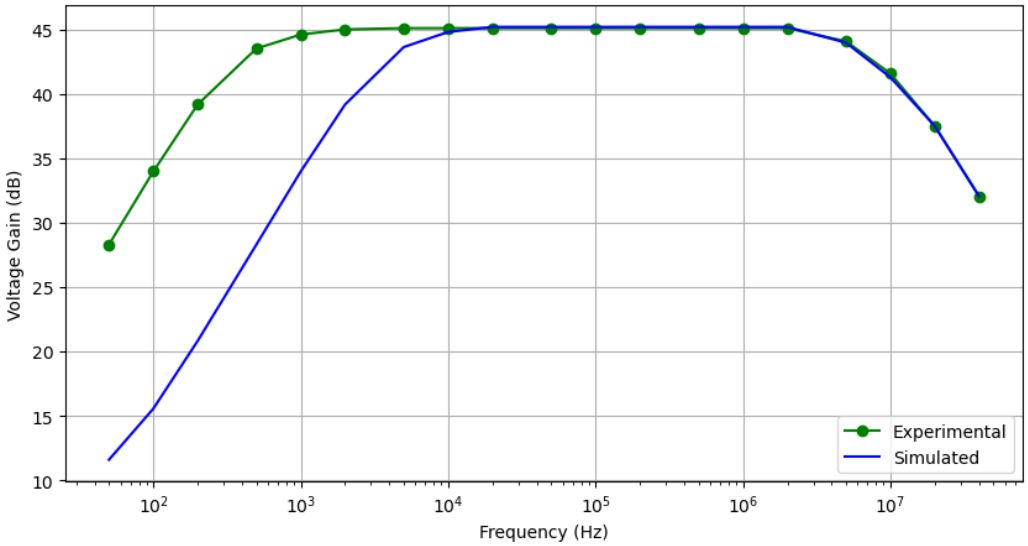

Figure 2: Plot of Frequency Response

4 Discussion

The experiment focused on analyzing the frequency response of a single-tuned amplifier. The output voltage varied significantly across different frequencies despite a constant input voltage, reflecting typical amplifier behavior. Notably, the experimental and simulated gain values showed discrepancies, likely due to real-world factors like parasitic elements and component tolerances. However, both sets of data exhibited similar overall frequency response curves, indicating a strong correlation between experimental and simulated results. This correlation validates the experimental approach and confirms the theoretical predictions of frequency response for single-tuned amplifiers. The experiment thus successfully demonstrated the amplifier's performance characteristics across a wide frequency range.