

# Audio Amplifier Report

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# Acknowledgments

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# Abstract

An audio power amplifier (or power amp) is an electronic amplifier that amplifies low-power electronic audio signals to a level that is high enough for driving loudspeakers or headphones. It is the final electronic stage in a typical audio playback chain before the signal is sent to the loudspeakers.

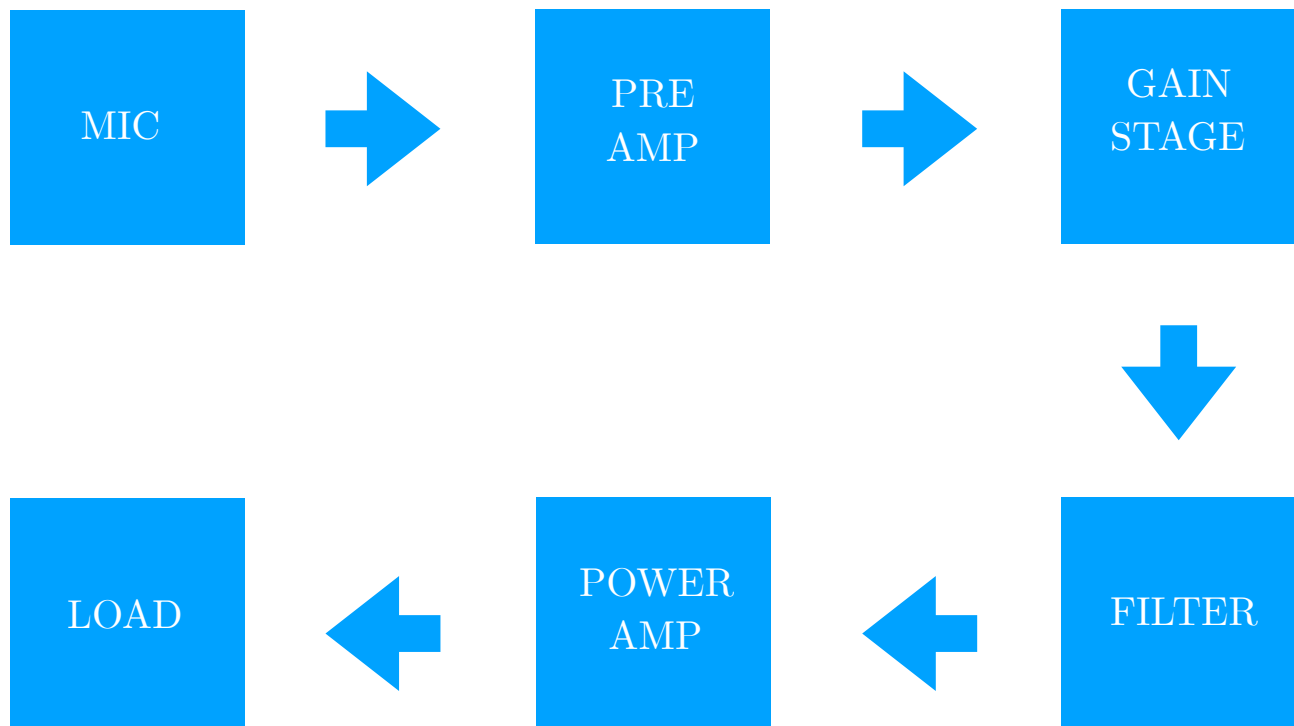
# Aim

The aim of the project is to construct an Audio Amplifier capable of amplifying sound signals by a factor of 500 while minimising noise picked up by the microphone.¶

# Introduction

Amplifier is a basic component of all the music systems available in market. The need of this intermediate circuitry exists so that we can hear crystal clear music from the music systems.

In this project, we attempt to successfully make an audio amplifier without using specialised ICs. The following flow chart indicates the building blocks of the audio amplifier.



# PRE - Amplifier

An audio preamplifier is designed in a way to amplify very weak signals before feeding them to further gain stages and cancel the irrelevant noise.

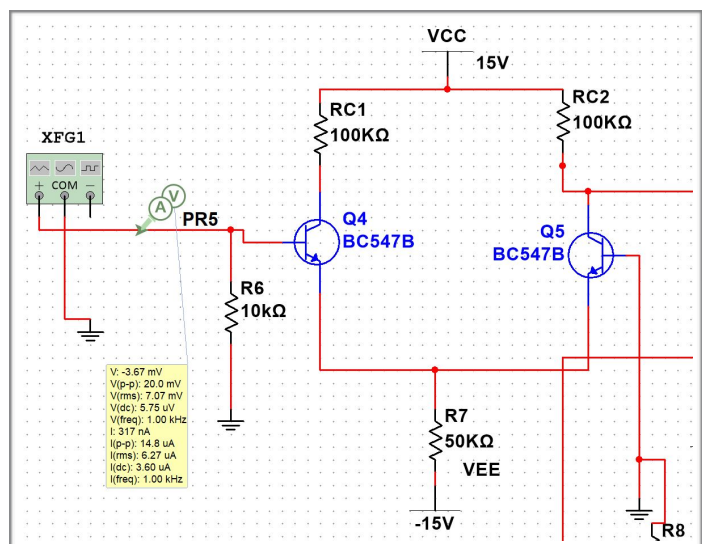
To achieve this, we will be using BJT based differential amplifiers as they cancel the common noise which is coming as well as it can amplify the weak signals a bit so that it can be sent to next stage for getting a better gain.

## Results at Pre-Amp stage

Input Voltage :  $20\text{mV}_{\text{pp}}$

Output Voltage :  $1.0\text{V}_{\text{pp}}$

Calculated Gain : 50



**FIG1. PRE-AMP IN MULTISIM**

# Gain Stage

In this stage our motive will be to get as much voltage gain as possible.

We will then amplify the weak signals by a considerable amount to get a large gain (approx. 500), so that it becomes a strong signal which may not attenuate easily.

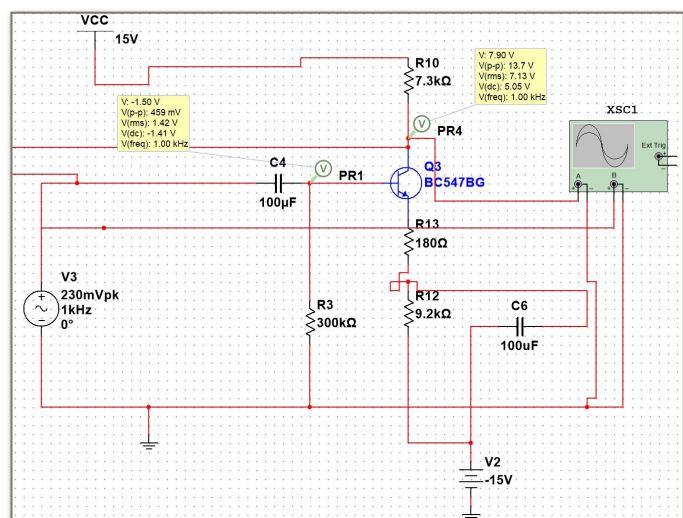
So we use common emitter amplifier here which can amplify the weak signals with a huge gain.

## Result after Gain Stage

Input Voltage :  $20\text{mV}_{\text{pp}}$

Output Voltage :  $10.4\text{V}_{\text{pp}}$

Calculated Gain : 520



**FIG2. GAIN STAGE IN MULTISIM**

# Filter

An audio filter circuit consists of a bandpass filter for the audio frequency band, and it filters the unwanted noise signals.

We use an active filter instead of a passive filter because an active amplifier has a high input impedance due to which our signal can not be destroyed.

Using an active amplifier gives us the flexibility of choosing different values for gain and other specifications using different op-amps.

Also passive filters consume the energy of the signal without giving any power gain, but in the case of active filters, we get a power gain.

We can use a high pass filter in combination with a low pass filter to make a bandpass filter.

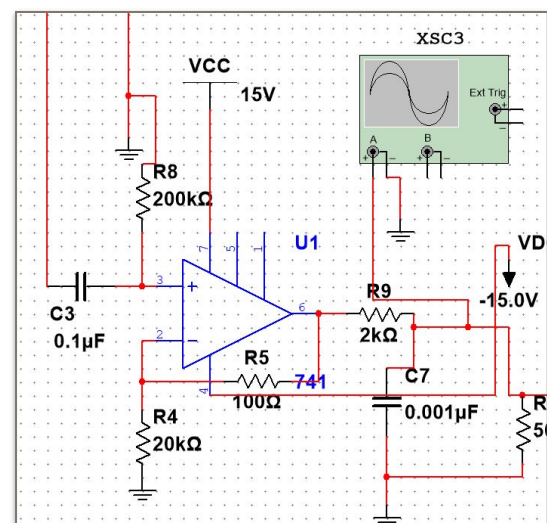
## Result after Filter Stage

Input Voltage :  $20\text{mV}_{\text{pp}}$

Output Voltage :  $10.26\text{V}_{\text{pp}}$

Calculated Gain : 513

Filter Range : 20Hz - 20kHz



**FIG3. FILTER IN MULTISIM**

# Power Amplifier

A power amplifier is designed to increase the power of a signal which should be sufficient enough to drive loads.

As we have been amplifying voltage till now but as load is of  $8\Omega$  only so collector current will not provide the high load current leading to loading effect . Thus we use Power amplifier.

We are using AB type power amplifier to get distortion free as A type and high efficiency as B type . Also we use BJT instead of resistor to reduce power and for temperature ineffective.

## Result after Power Amplifier

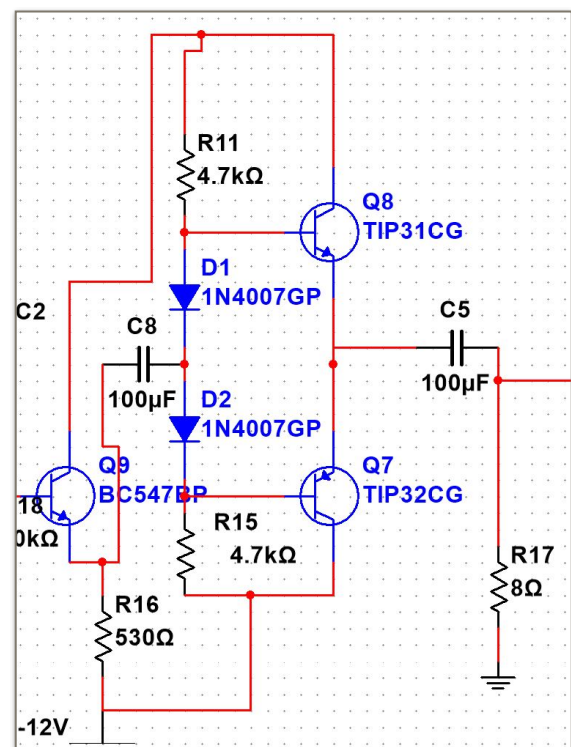
Input Voltage :  $20\text{mV}_{\text{pp}}$

Output Voltage :  $10.13\text{V}_{\text{pp}}$

Calculated Gain : 506.5

$V_{\text{RMS}}$  : 2.2V

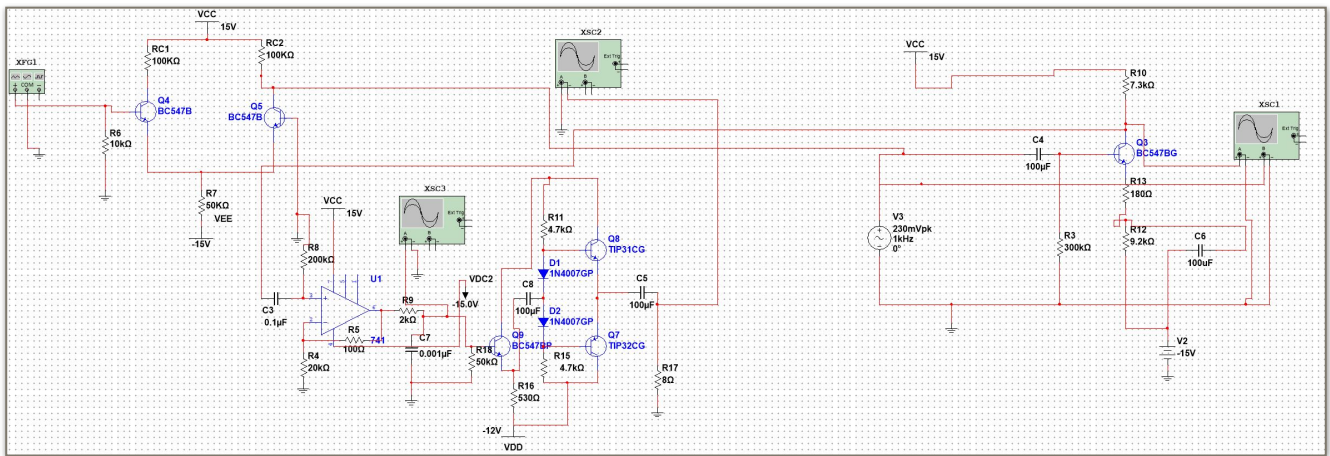
Current in Speaker : 80mA



**FIG4. POWER AMPLIFIER IN MULTISIM**



# Complete Audio Amplifier



**FIG6. COMPLETE AUDIO AMPLIFIER IN MULTISIM**

## Conclusion

The audio power amplifier is designed in four stages: pre-amplification unit, gain cell unit, active filter unit and power amplification unit. For the pre-amplification unit, BC547, NPN transistor is used to achieve the gain; gain cell is designed to get a voltage gain; active filter is designed to achieve amplification for band of voices only; for the power amplifier unit, TIP31 and TIP32 transistors are used. In addition, the measured results show the output current 80-100mA and voltage of around 2.2V. Judging from all kinds of results, this designed audio power amplifier can meet the aim of the project topic.

# Future Scope

The project can be extended to include the latest advancements in audio technologies. Adjustments to audio signals such as bass and treble control are possible addition that can be made to the project. Furthermore, adding bluetooth compatibility will benefit the project by future proofing it. Moreover, the quality of the speaker diaphragm can be made better by experimenting it with different materials to produce a cleaner and punchier sound.

Integrating noise cancelling technologies with headphones (which also an audio amplifier based device) will be a Wonderful addition to the circuit.

# References

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- Wikipedia : [https://en.wikipedia.org/wiki/Audio\\_power\\_amplifier](https://en.wikipedia.org/wiki/Audio_power_amplifier)
- LearnAboutElectronics : <https://www.learnabout-electronics.org/>
- Simulation : Multisim 14 by National Instruments