DEPARTMENT OF ELECTRONIC AND TELECOMMUNICATION

BIOMEDICAL ENGINEERING

UNIVERSITY OF MORATUWA

EN2110-ELECTRONIC III

ELECTRONIC STETHOSCOPE

GROUP-06

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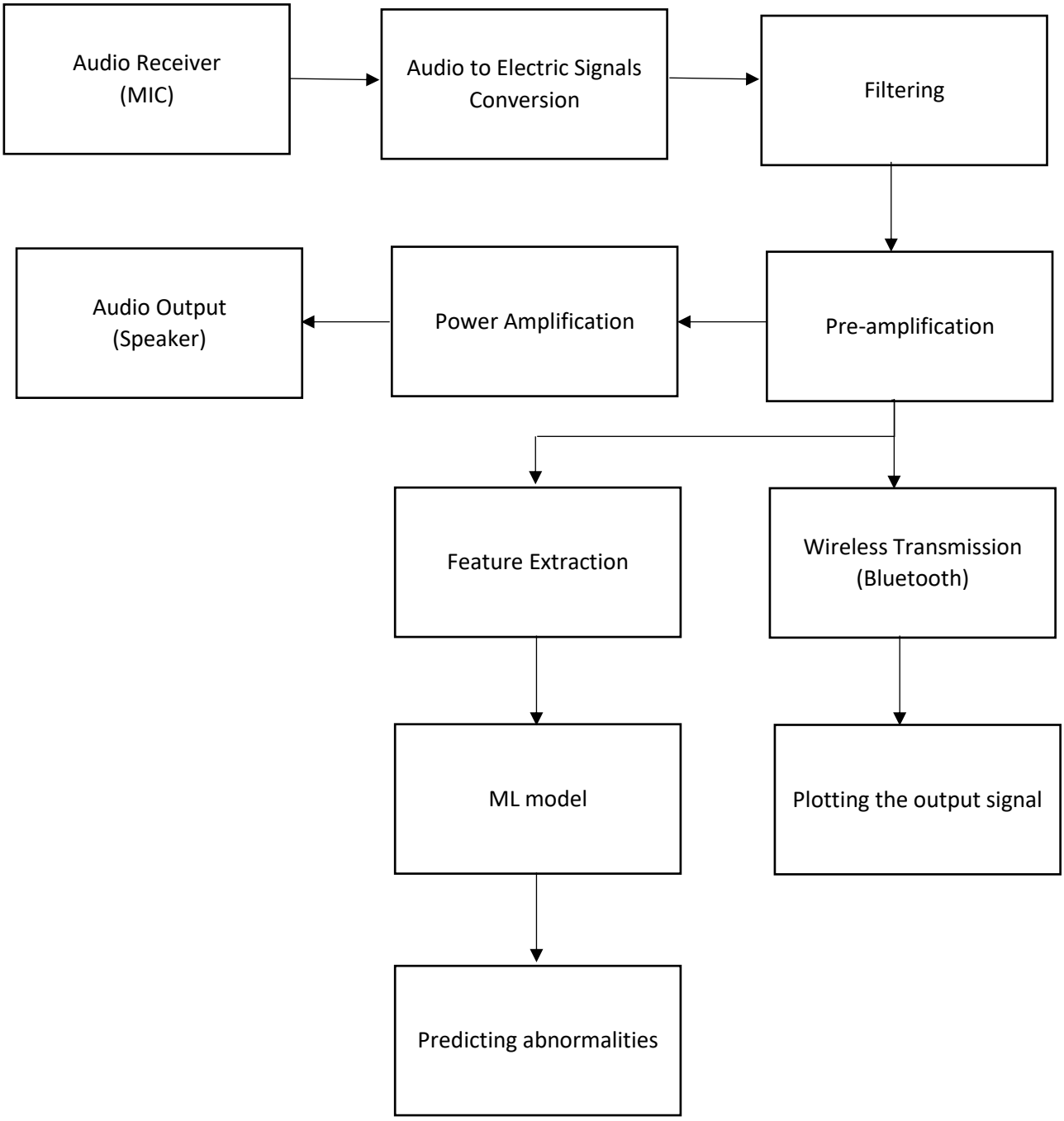
INTRODUCTION

Heart diseases is the leading cause of death in most countries in the world. Many heart diseases can be identified by monitoring heart sounds. Heart auscultation, defined as listening to the heart sound, this has been an important for early diagnosis for cardiac dysfunction. Traditional auscultation requires clinical experience and good listening skills. An electronic stethoscope would pave a new way towards computer aided heart auscultations. Aim of electronic stethoscope is to be able to perform auscultation more effectively and to convert acoustic sounds into electrical signals. It amplifies these for optimal listening and reduces background noises. Electronic stethoscope would provide a great support to doctors when it comes to diagnosing and for doctors with less experience in the field.

The sensed acoustic signal as electrical signal, will undergo and signal processing algorithm and then the signal will be plotted. We will be getting data from different types of people with different sound and use that data to train our machine learning model. We could predict abnormalities in the heart sounds using the trained model.

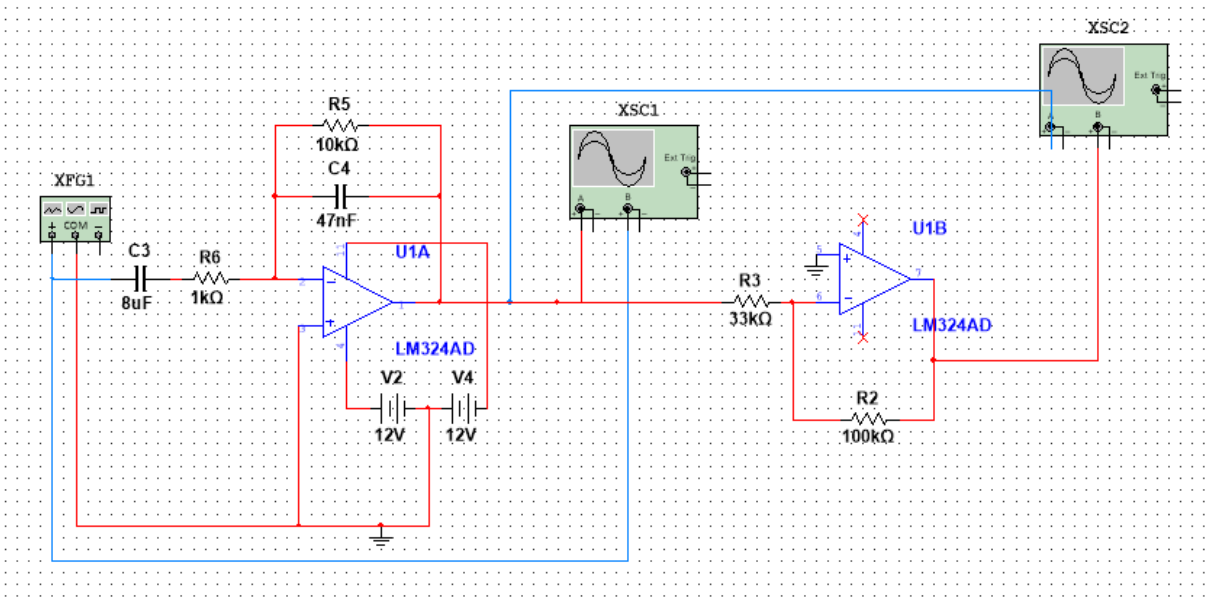
BLOCK DIAGRAM

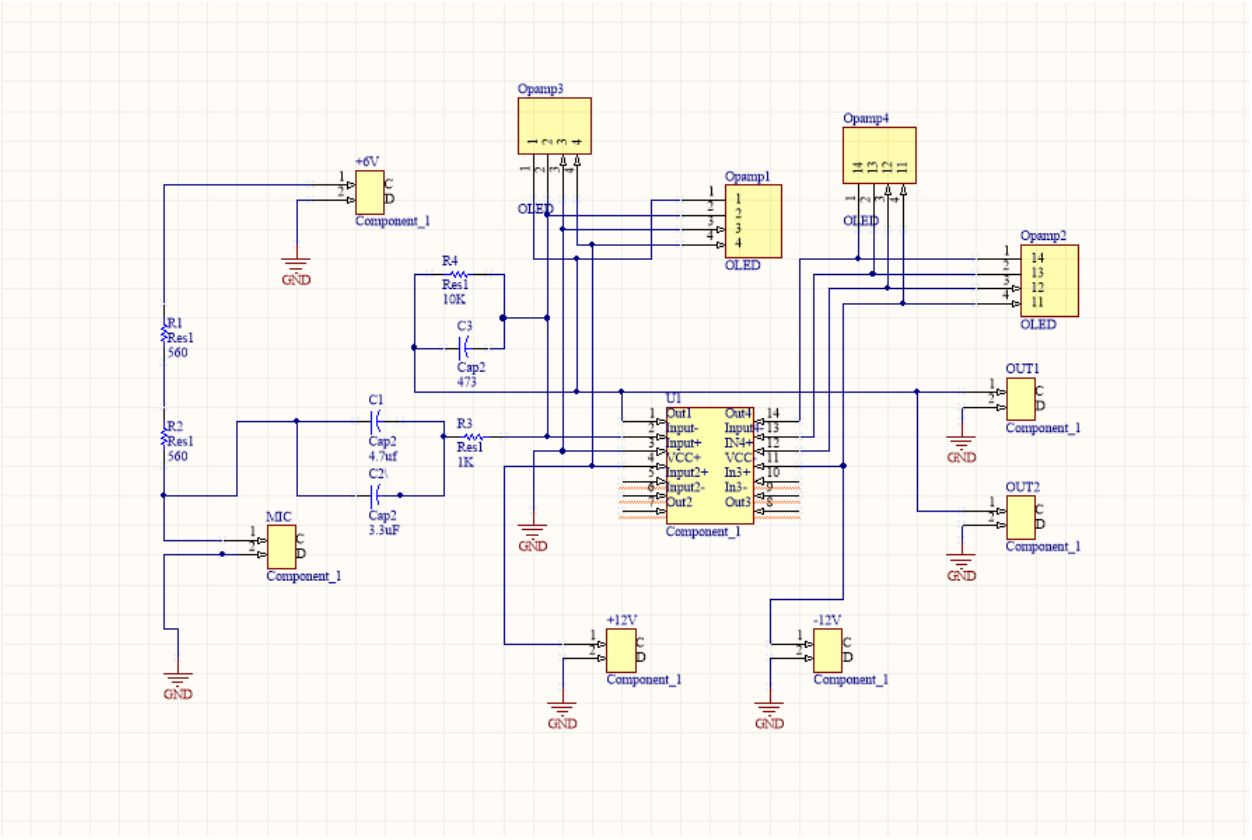


FILTERING AND PRE-AMPLIFICATION

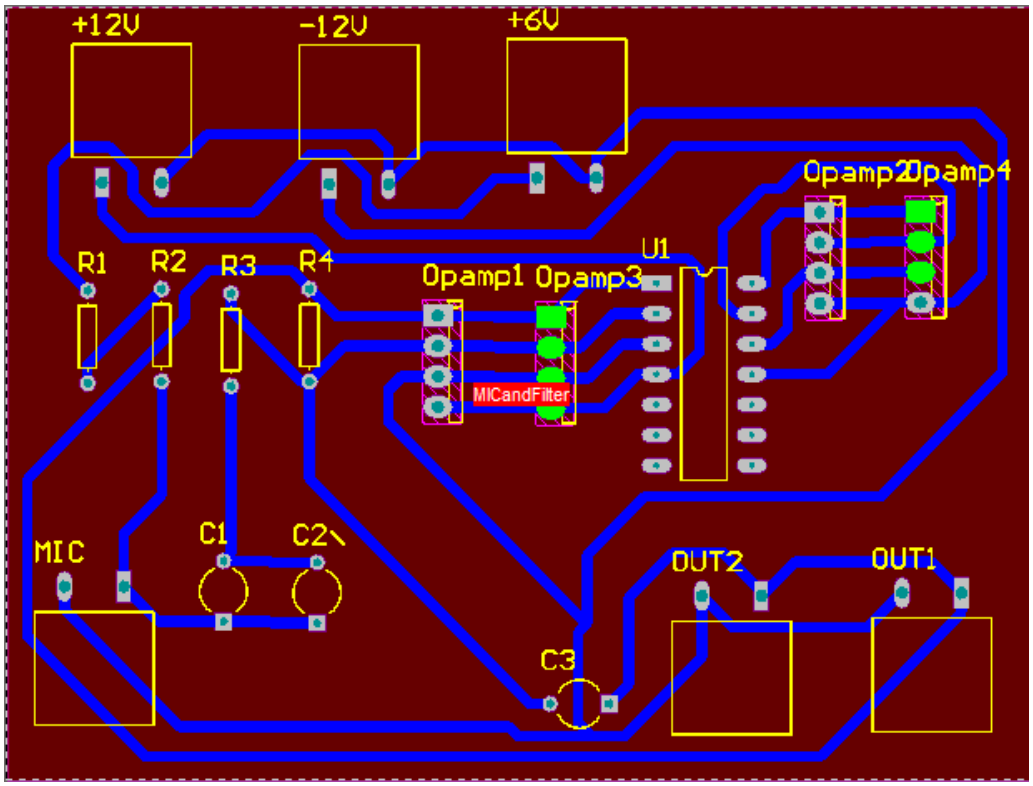
The output of Mic is filtered by our filter circuit. Since the frequency range of Heartbeat is 20Hz-300Hz. Other frequencies should be filtered, if not environment noise will be higher than heart sound.

We have built a passband filter with lower band limit of 20Hz and upper band limit of 300Hz. For this purpose, we have used active filter circuit.

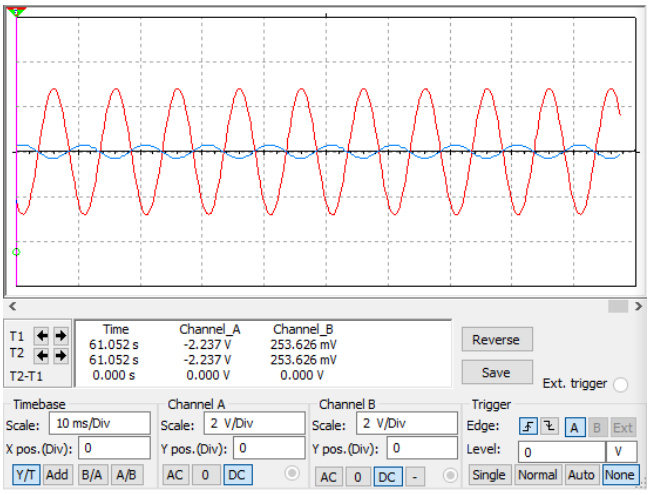




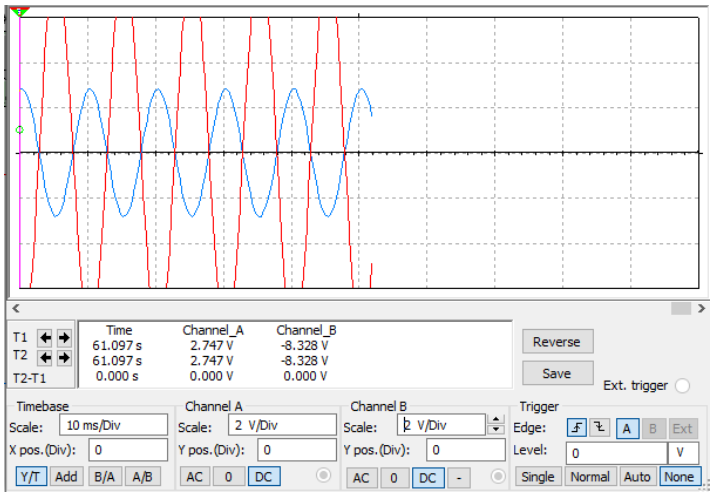
Header pins are used for the placement of resistor required for pre-amplification. We have used 100k and 33k resistors, where the amplification is 3 times greater than the filter output.



Filter output (frequency =100Hz)

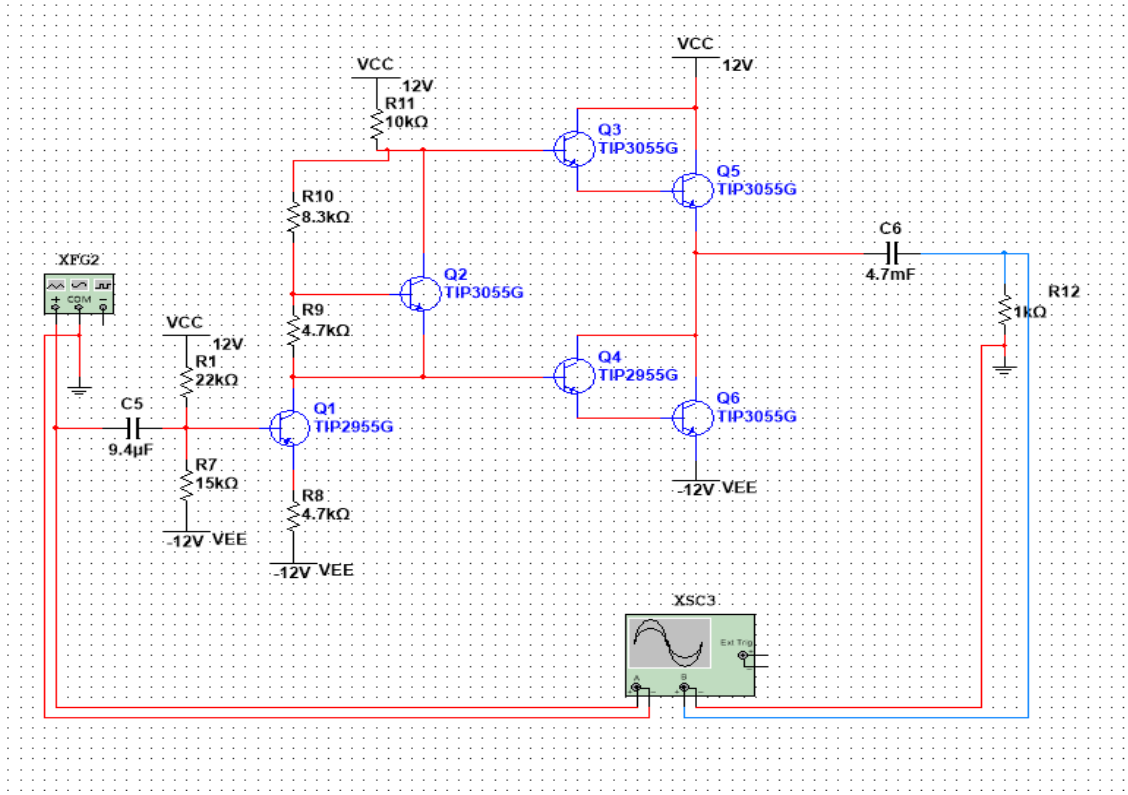


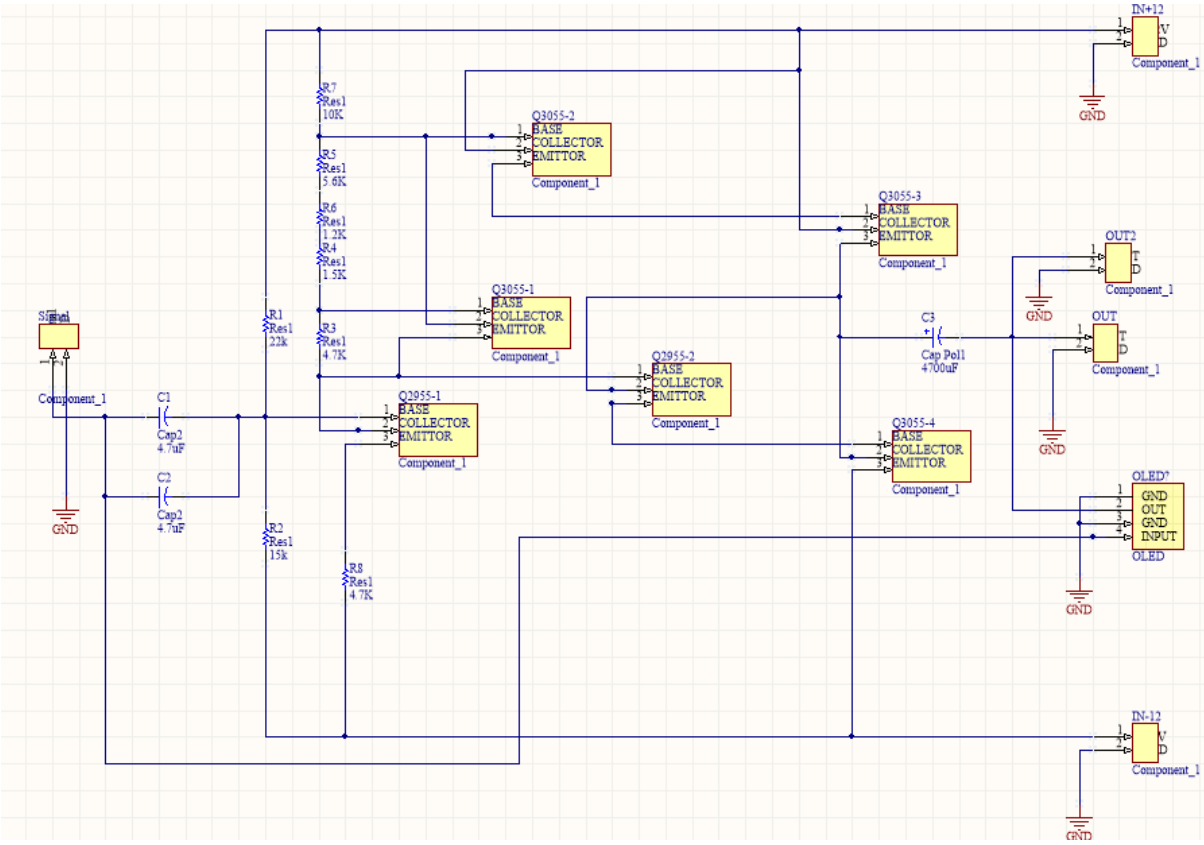
Pre-amplification output

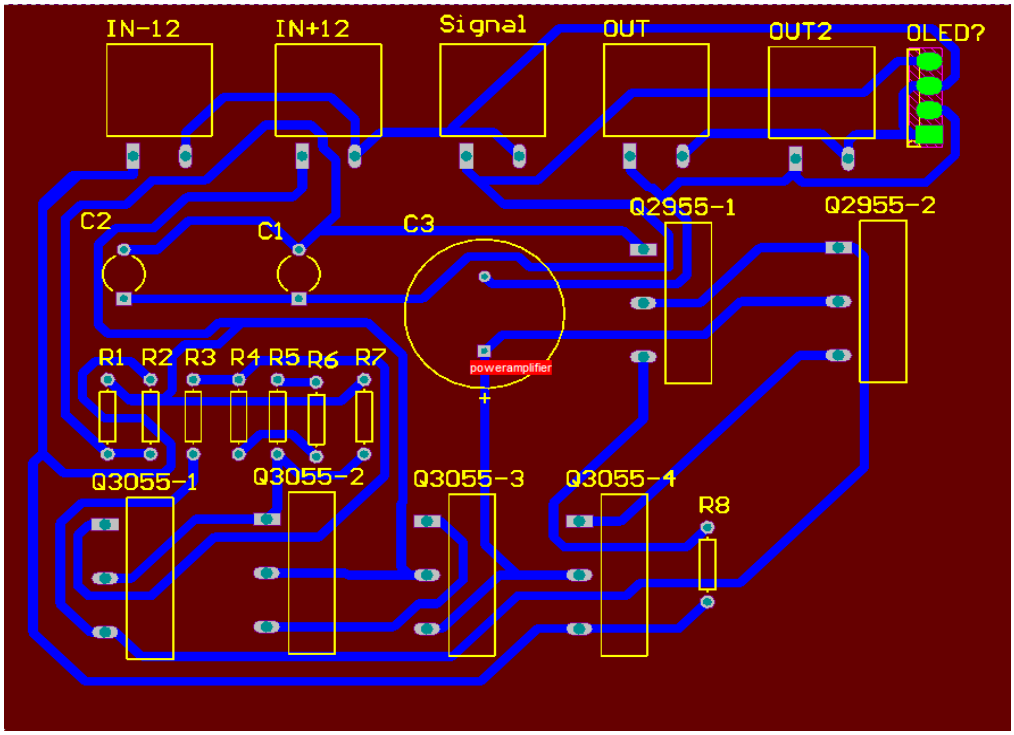


POWER AMPLICATION

We've used Class AB amplifier for power amplification, because distortion of class AB amplifier is least, and sound quality is very high.

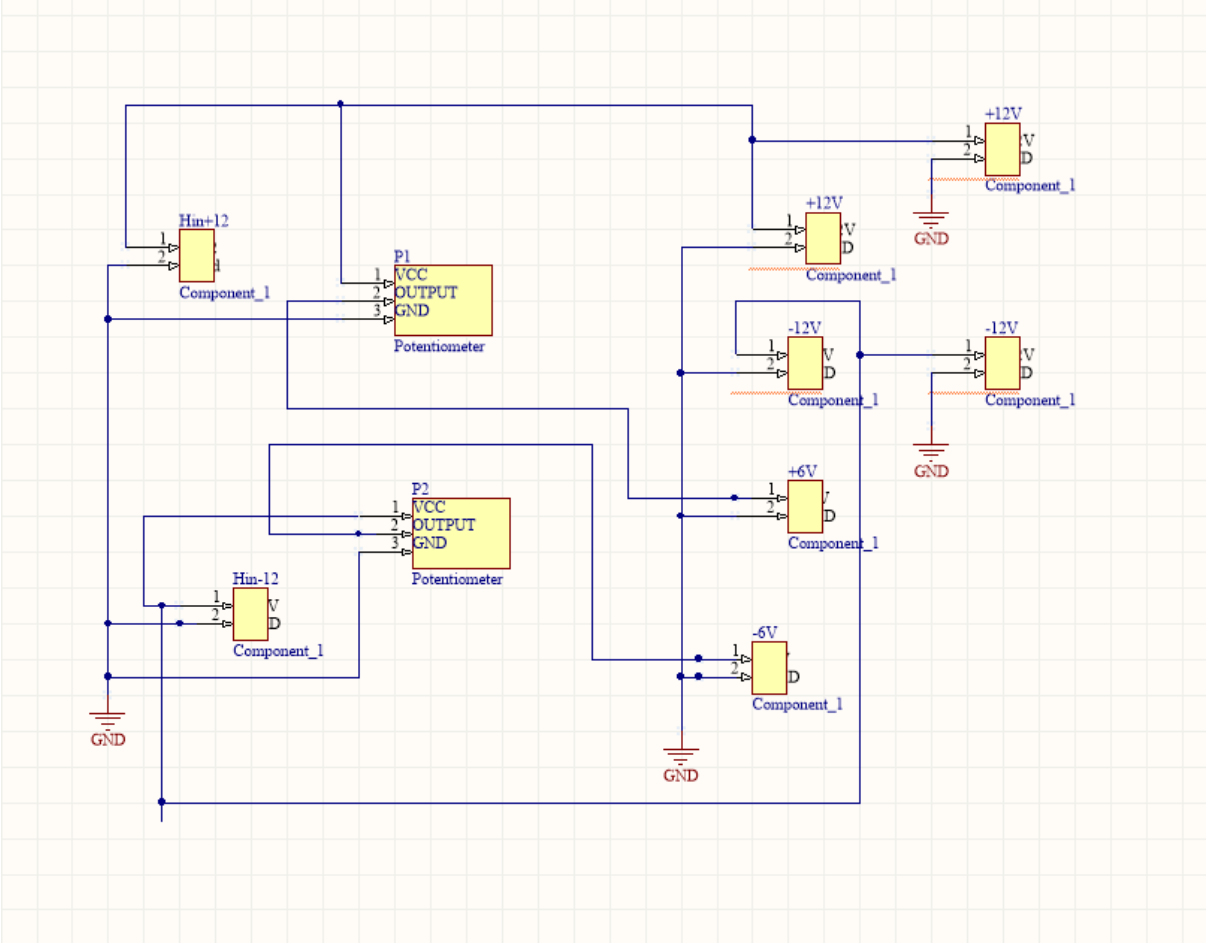


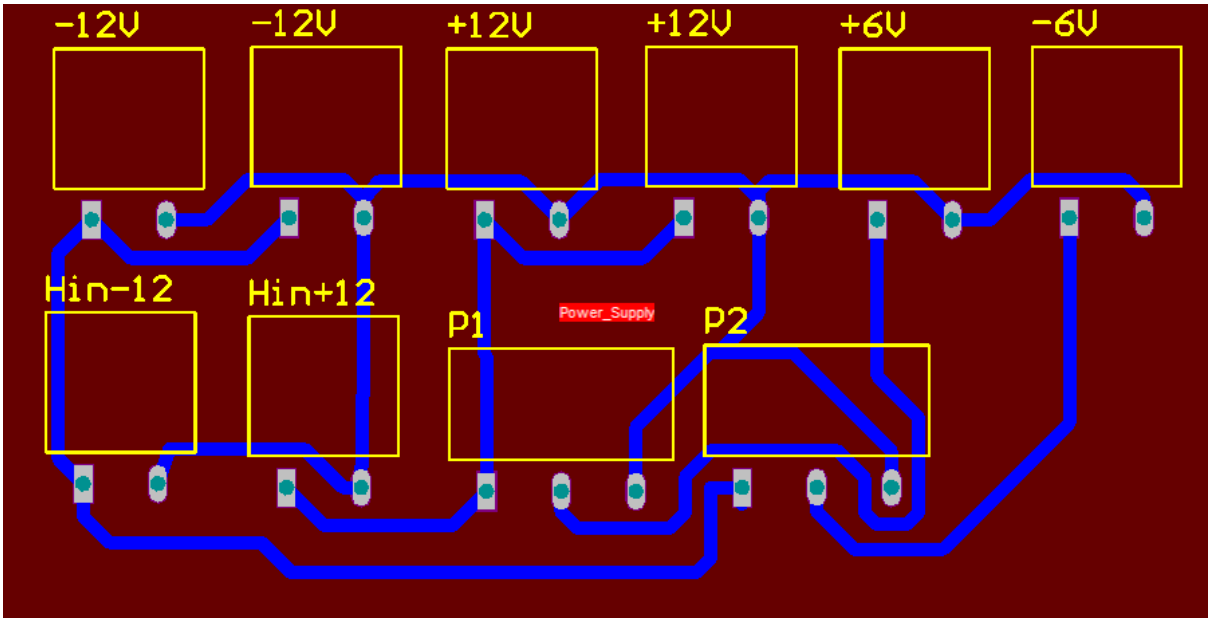



IN-12
IN+12
Signal
OUT
OUT2
OLED?
C2
C1
C3
Q2955-1
Q2955-2
R1
R2
R3
R4
R5
R6
R7
poweramplifier
+
Q3055-1
Q3055-2
Q3055-3
Q3055-4
R8

POWER SUPPLY

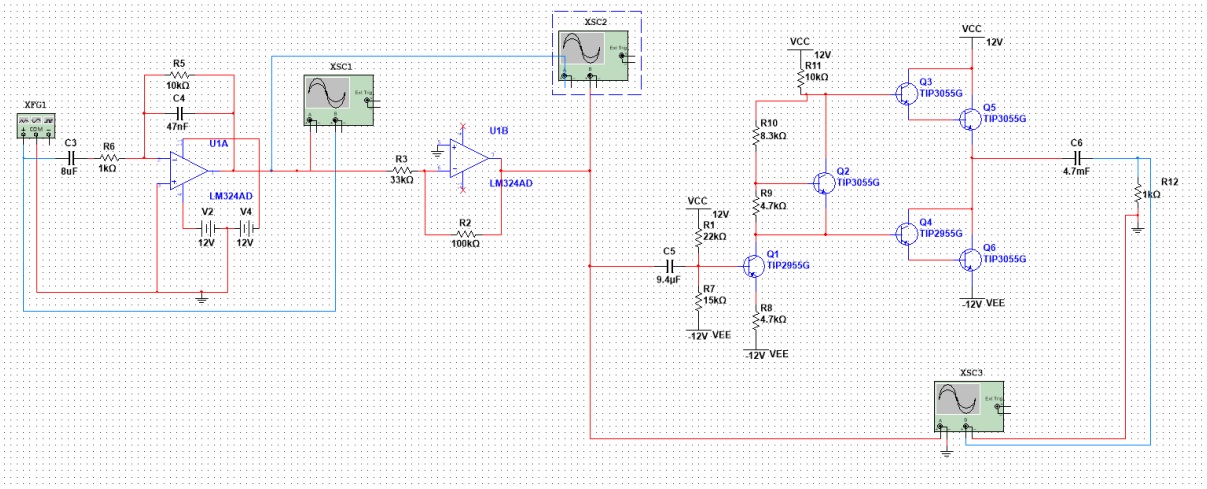
We have given 6V supply for the mic. Potentiometer has been used for this purpose.





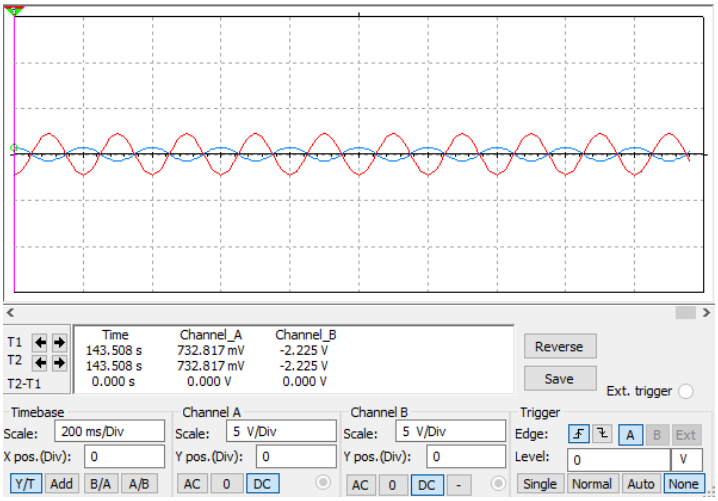
SIMULATIONS

Different frequencies of sine wave used as input of the circuit, and the variation of output observed.

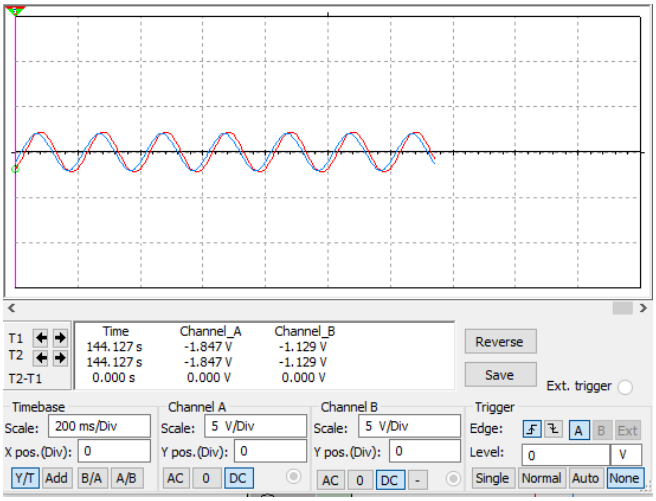


Input frequency – 5Hz

1. Filtered and pre-amplified output

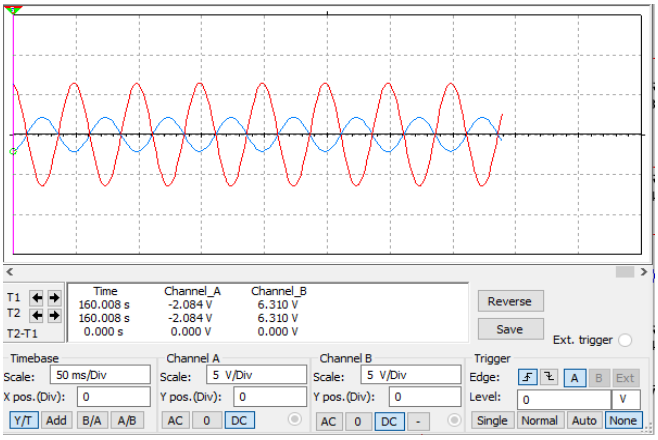


2. Power Amplification output

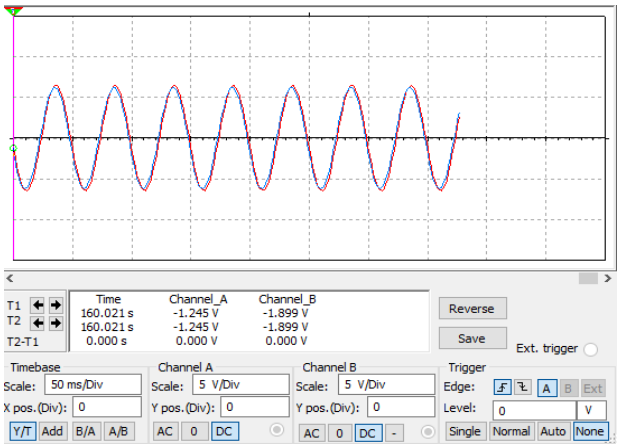


Input frequency-20Hz

1. Filtered and pre-amplified output

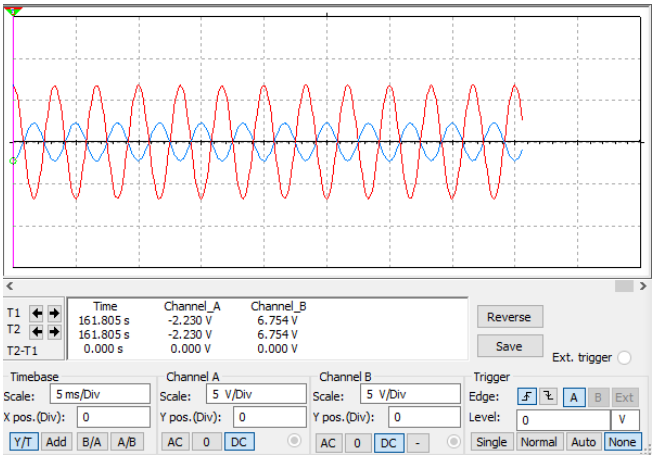


2. Power Amplification output

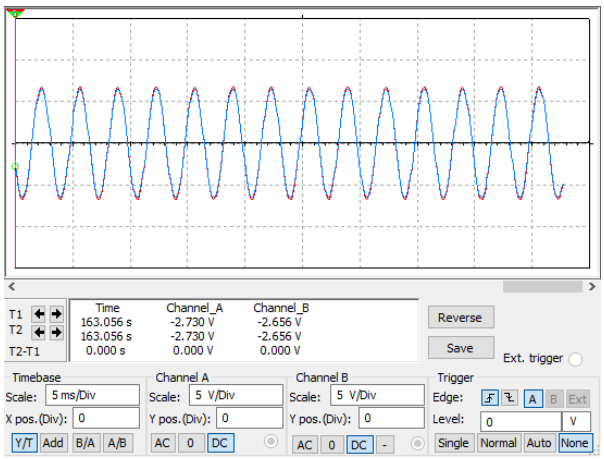


Input frequency-300Hz

1. Filtered and pre-amplified output

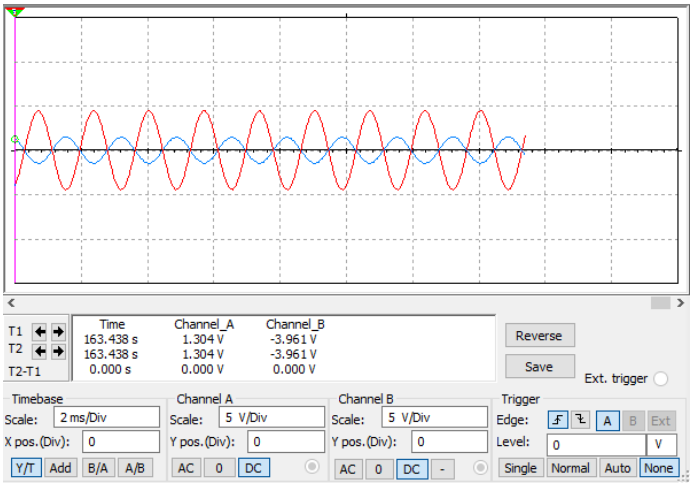


2. Power Amplification output

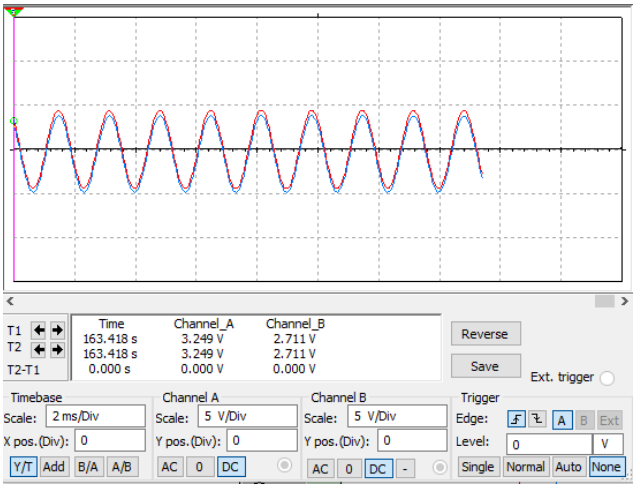


Input frequency-600Hz

1. Filtered and pre-amplified output

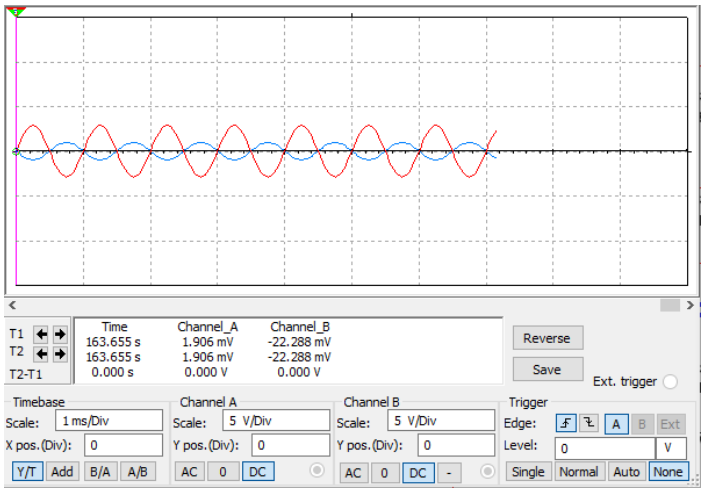


2. Power Amplification output

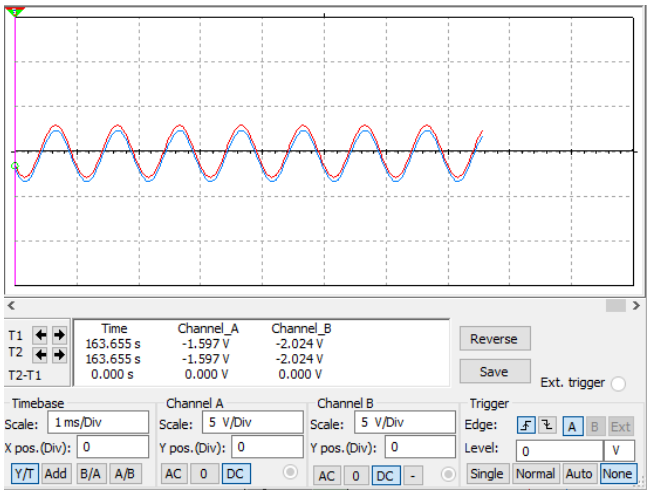


Input frequency-1kHz

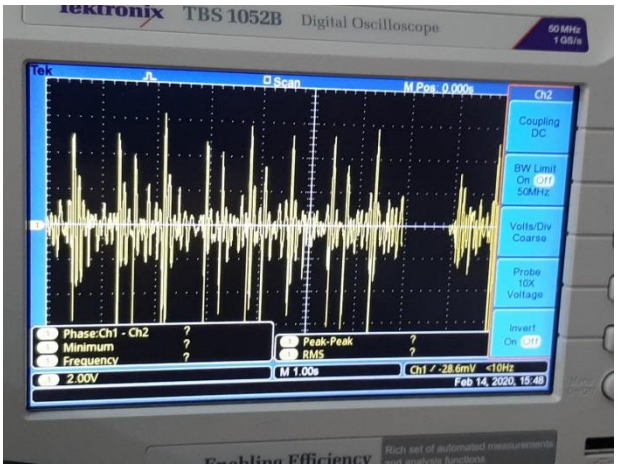
1. Filtered and pre-amplified output



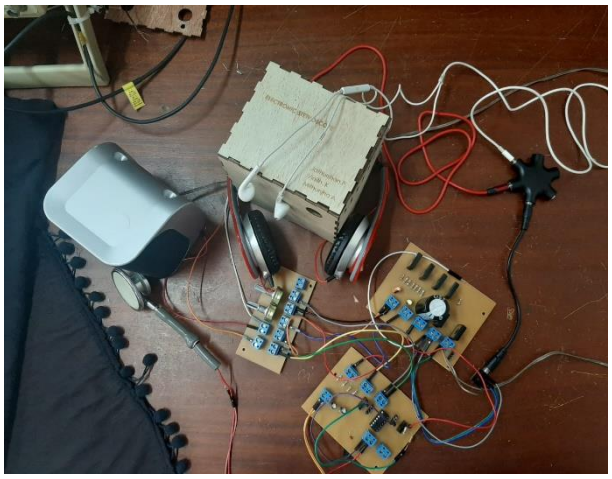
2. Power Amplification output



ANNEX

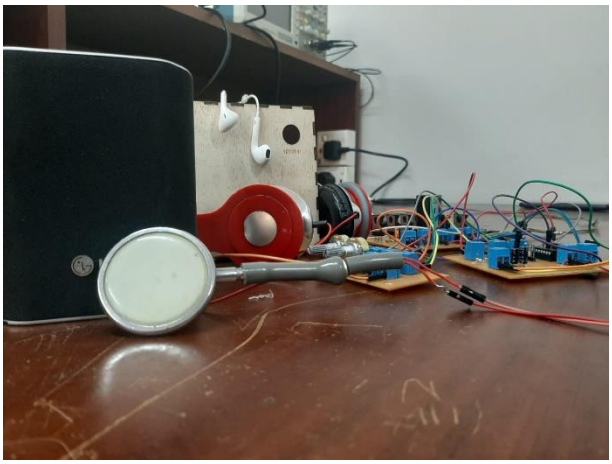


Power amplified signal viewed from oscilloscope.



Prototype

Mobile App



Heart sound can be listening through speaker, headset and headphone.