TUNING INTO MNM

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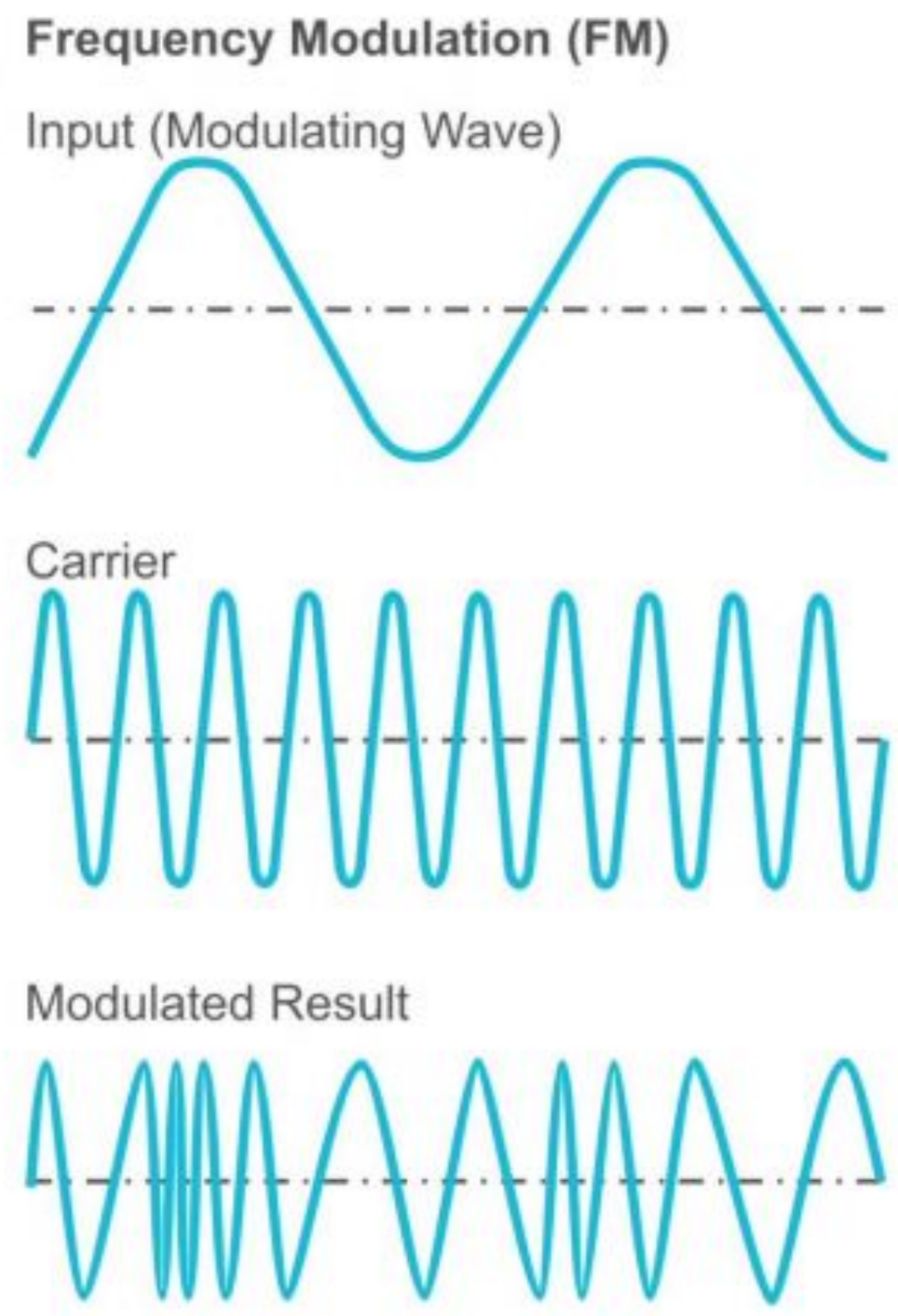
FM Radio Basics

- Low frequency audio signal superimposed with a high frequency carrier wave
- ‘Remove’ the carrier wave component (i.e demodulate it) to listen to the audio

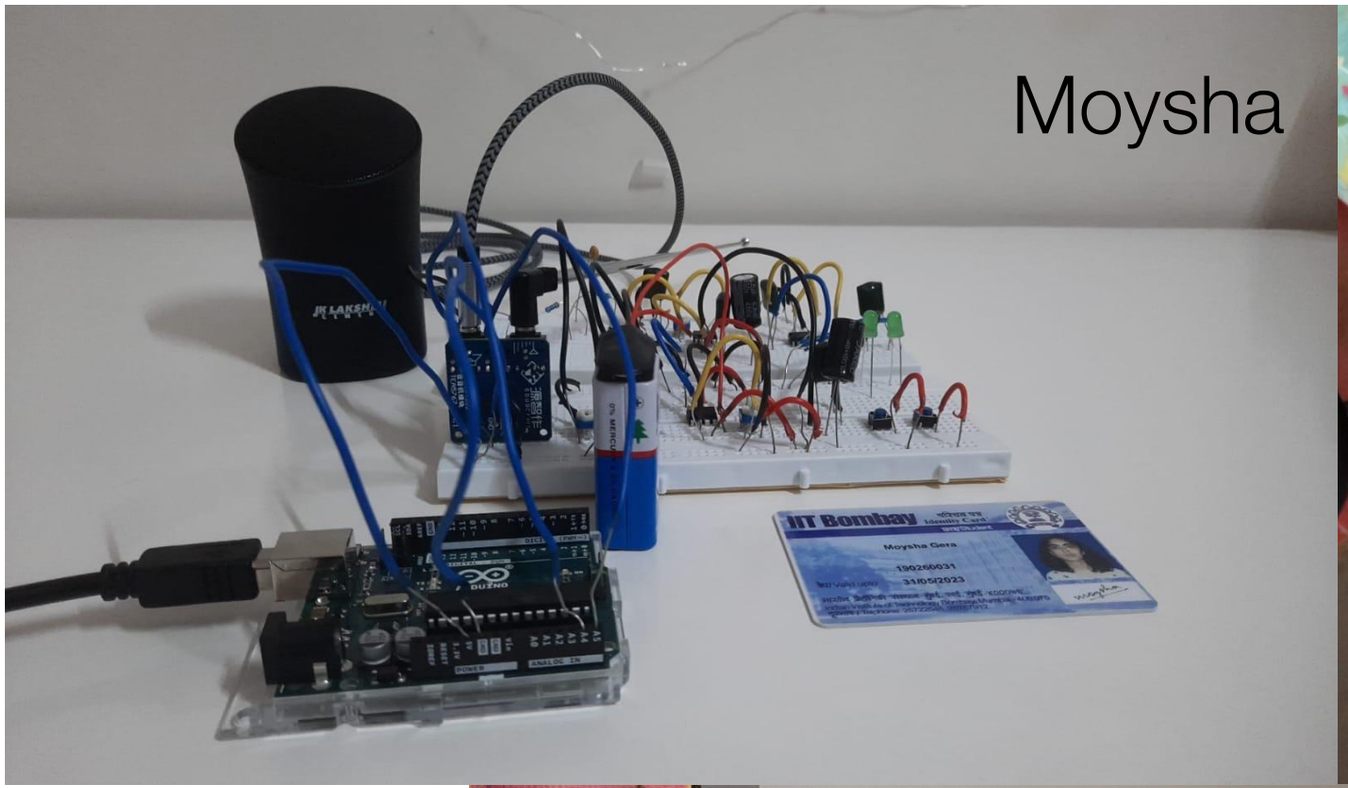


Tuning into MnM

- Radio receiver built using TEA5767 Radio Module (just a receiver with an antenna)

- Features:
    1) Volume Control (by twisting a knob)
    2) Channel Tuning (by twisting a knob)
    3) Channel Tuning without the static white noise
    4) Seeking between stations (by pressing a button)

Our radios


Moysha
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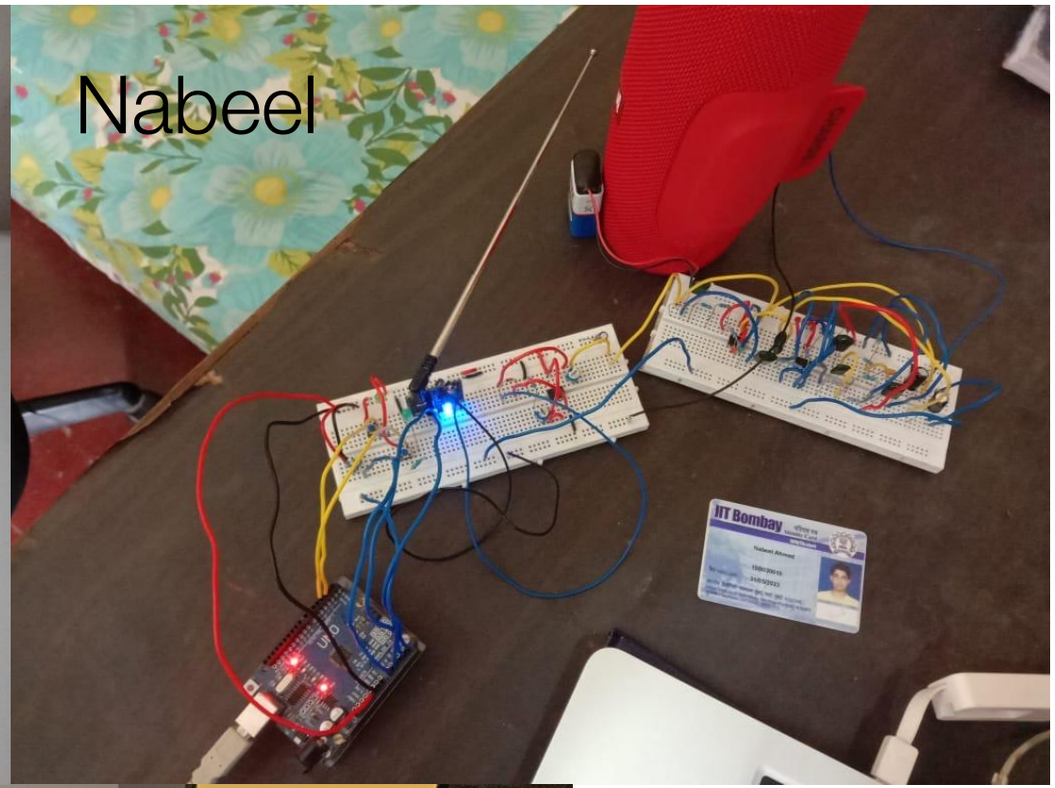
Nabeel
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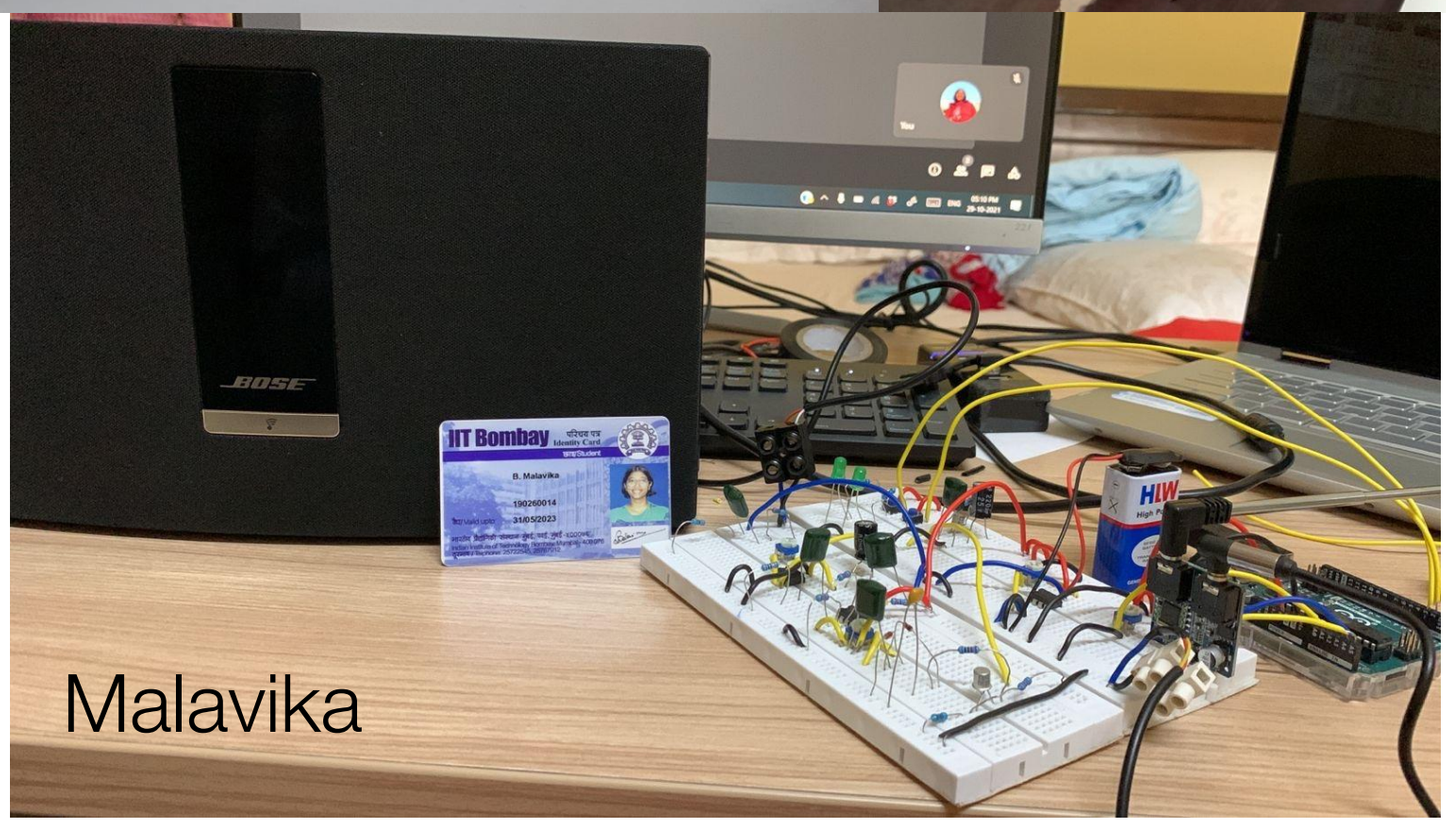
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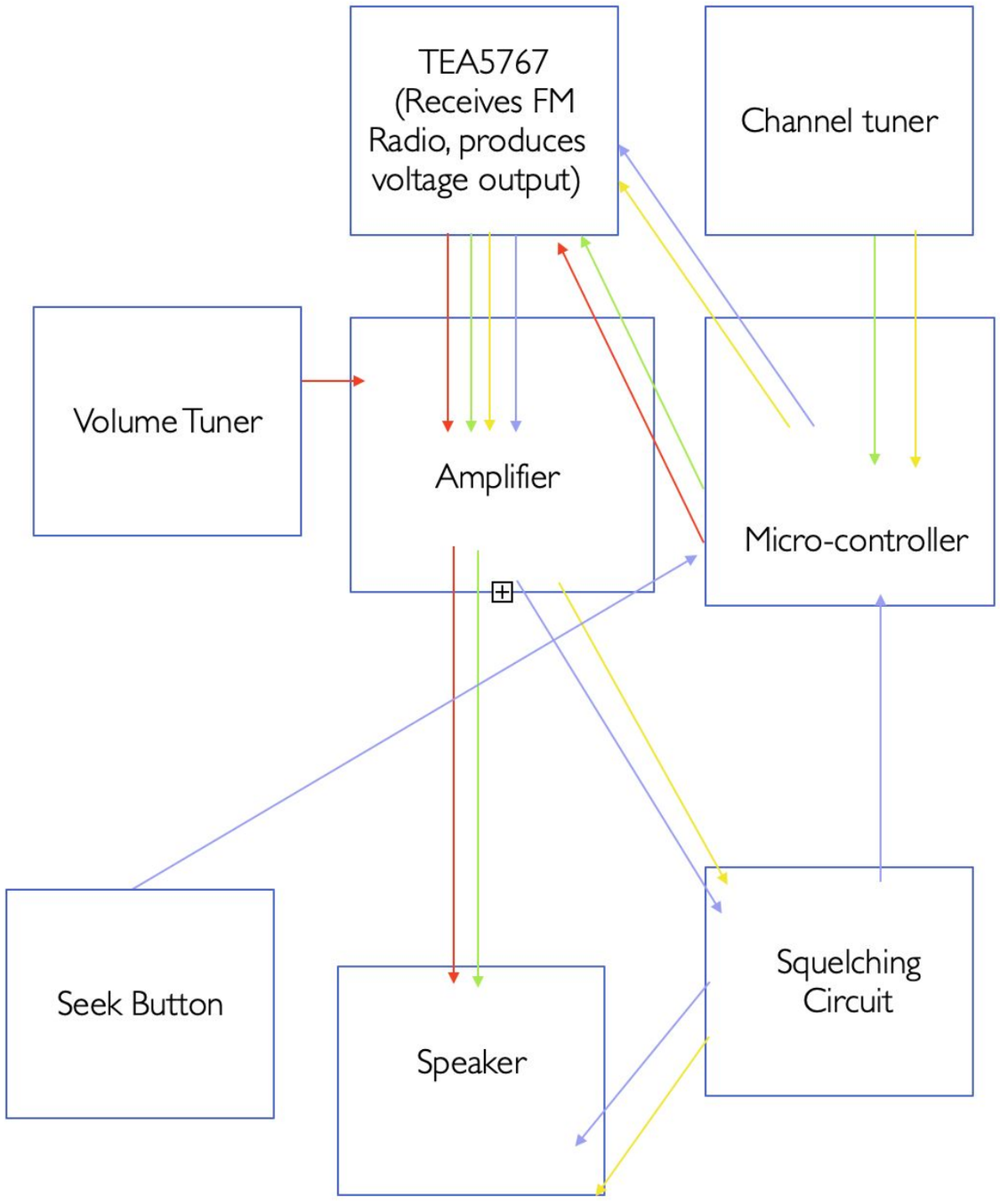
Design features

- TEA5767 just demodulates the radio signal, we need to perform all functions on the demodulated output using hardware.

- Channel Tuning and Seeking are ideally done by a micro controller

- 4 parts - amplifier, channel tuning ,squelching circuit, and seeking control

Block Diagram



Why use a micro controller?

- If we did not use a micro controller, we would have to use variable resistors and capacitors, and that would require extremely precise tuning capabilities

- We can utilise the inherent analog to digital conversion done by a micro controller to select specific frequencies, and can communicate exact frequency values digitally

- Even if we had extremely precise equipment (and hands), seeking requires memory and for that a micro controller is ideal

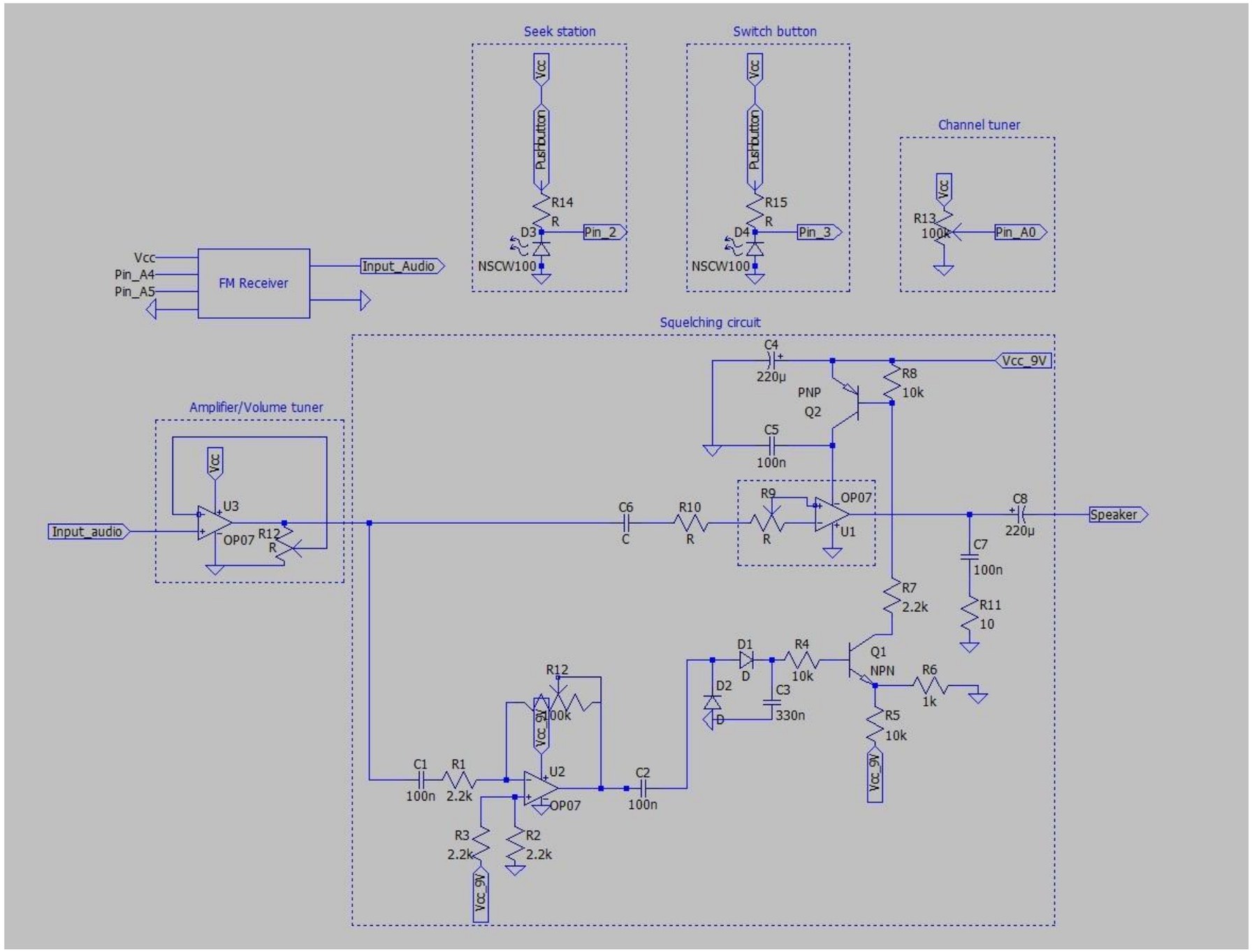
PART 1: Amplifier (Volume Control)

- Built using an opamp
- Twist a potentiometer to alter the gain, and thereby control the loudness

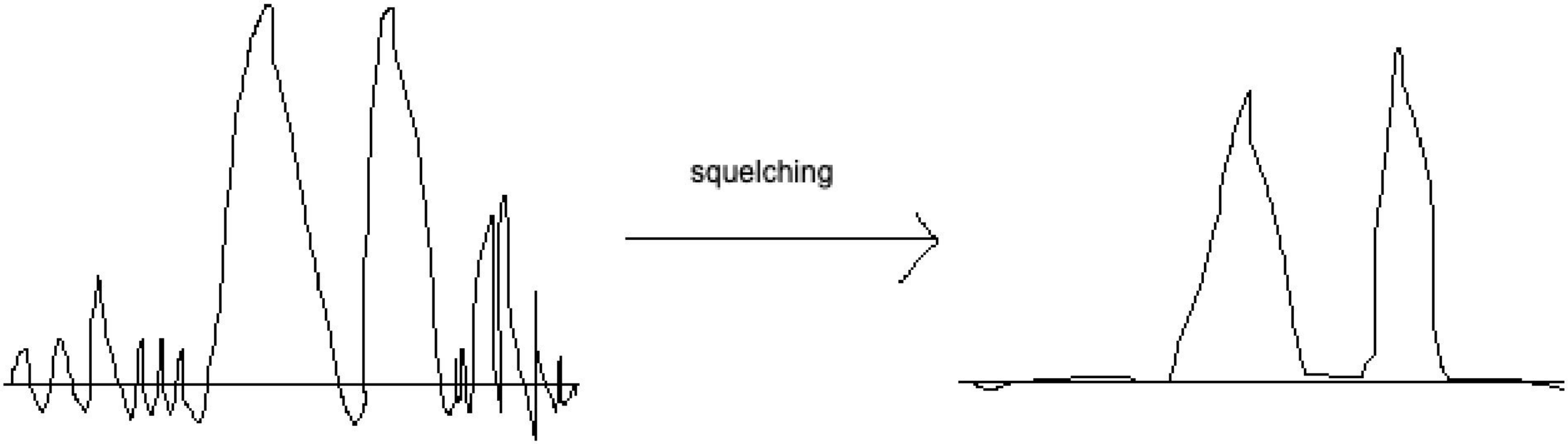
PART 2: Channel Tuning

- Potentiometer -> Micro controller -> Speaker
- Twist the potentiometer to select a channel
- Drawbacks: Need steady hands, and it is very difficult to zero in on a channel
- Extremely noisy

PART 3: Squelching



PART 3: Squelching



PART 4: Seeking, or the Advantages of Squelching

- We have separated the channels from the noise
- Thus we can feed the squelched output back into the micro controller to seek to the nearest non-zero channel

Video Demo

What we learnt

- The importance of calibration: Ideal calibration is one that is not subjective. However, it was difficult to create a one-size-fits all machine given the limited equipment available.

- Tuning into a channel is not an easy task, requires lots of ingenious and non-trivial hardware and software implementations (historical aside: tuning used to be so difficult that being a radio operator was an actual full-time job during the late1800s and early 1900s)

- Audio - Voltage relationship is not straightforward, we had a lot of issues with AUX cables.

Our thoughts on the project

- There is something inherently romantic about sweeping through a range of static and then suddenly finding music in between

- Hearing a human voice at 2 am makes you feel connected to the world in these isolating times

- Listening to the world, and the desire to listen and communicate is something that is an essential part of being human, so radios will never go out of fashion

“Radio, someone still loves you!”

- Radio GaGa, Queen, 1984