**Lab 3 Audio UART – ECE 5780**

Nate Sheffield

A02268057

Nathan Critchfield

A02283426

**Objective**

The purpose of this lab is to implement a program using FreeRTOS to produce 8 different notes from 220 Hz to 440 Hz when an LED is activated by a button push on our STM32 Nucleo Board. These will be produced as sine waves that are then put through an audio amplifier circuit and an 8-ohm speaker to produce the sound of the sine wave.

**Procedure**

**Results**

For our lab to produce the desired results we had to modify our existing Lab 1 code, assemble an audio amplifier circuit and connect it all together to an 8 ohm speaker. Starting from our Lab 1 code that toggles LED an LED with a button press we had to enable an interrupt based on Timer 4 and then to send an output of a 440 Hz Sine Wave from a lookup table through the DAC at each interrupt to the audio amplifier circuit. While implementing the modifications to the code we had some issues getting all of the correct initialization set up correctly for Timer 4 and for the DAC. Initially, when we ran the code we were not getting output to DAC so the audio amplifier circuit did nothing. We found that Timer 4 was not triggering the interrupt because we did not have all of setting that we needed initialized. After updating our code we were able to trigger interrupts, however, our amplifier circuit still did not do anything.

After this we figured that we had a wiring issue within our circuit. We returned to look at the example circuit in the LM386 datasheet and compared it to our circuit and we found that two of our wires were not connected on the right line so it was not getting through the circuit to the speaker. After moving these wires we were able to produce the 440 Hz Sine Wave sound. After this we did some minor adjustments because our sine wave was clipping a little bit on the bottom. After adjusting our lookup table we were able to get a consistent sine wave without clipping.

A circuit board with wires connected to it

Description automatically generated

**Figure 1. Audio Amplifier Circuit connected to our STM32 Nucleo Board**

**Figure 2. Oscilloscope Screenshot showing our 440 Hz Sine Wave**

**Conclusion**

In conclusion,

**Appendix**

***Main.c code***