

RADIATION DETECTOR

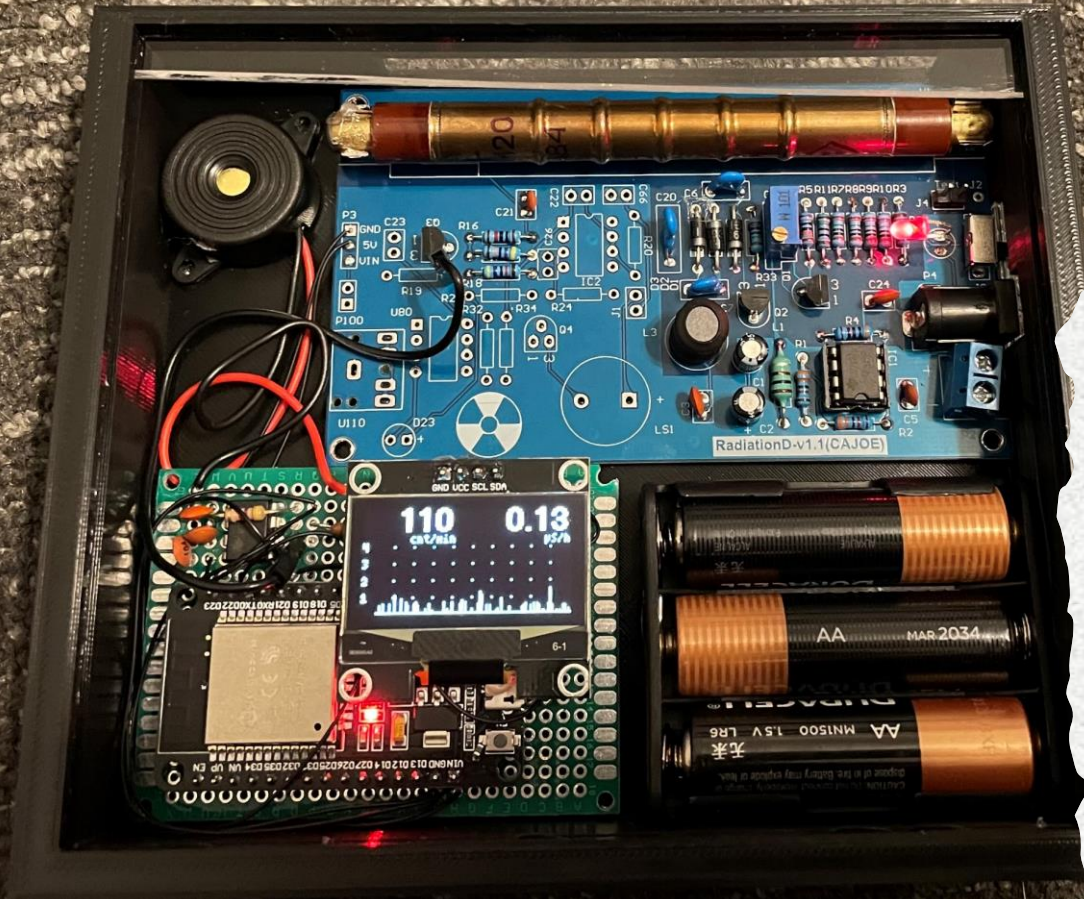
“Geiger Counter with LCD and MCU”

ENGR 3501 Section 02, Fall 2022

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Materials Used to make the Geiger Counter:

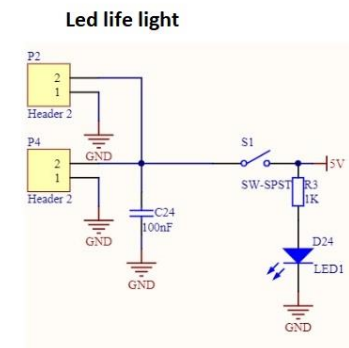
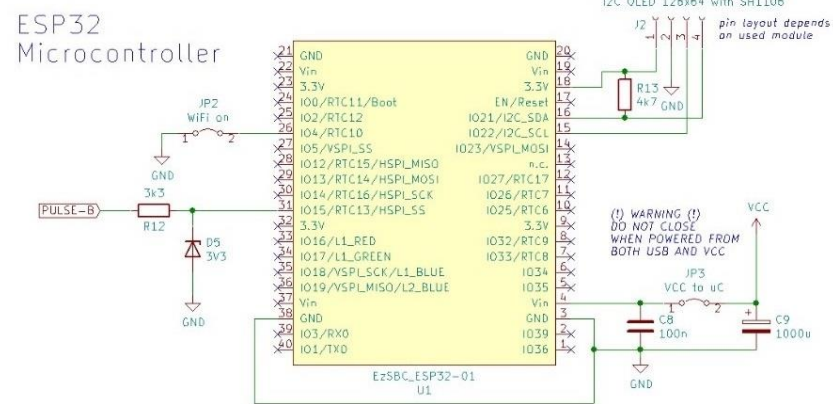
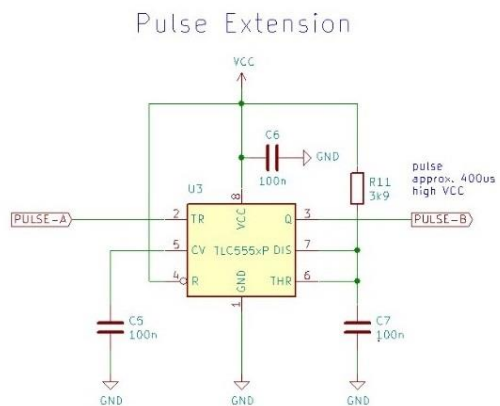
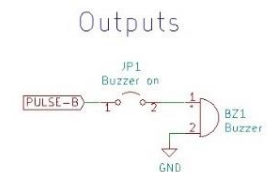
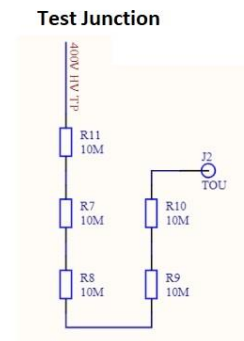
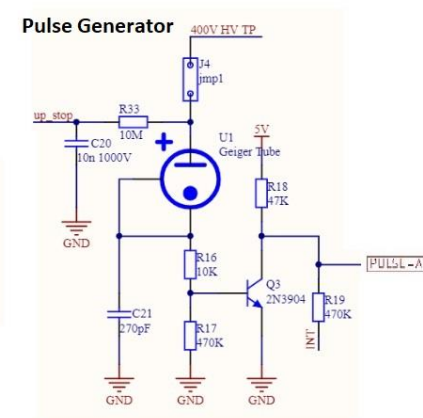
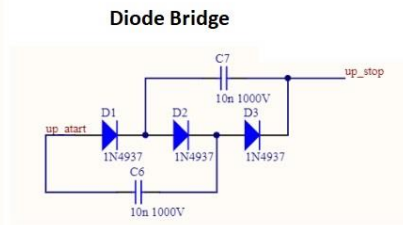
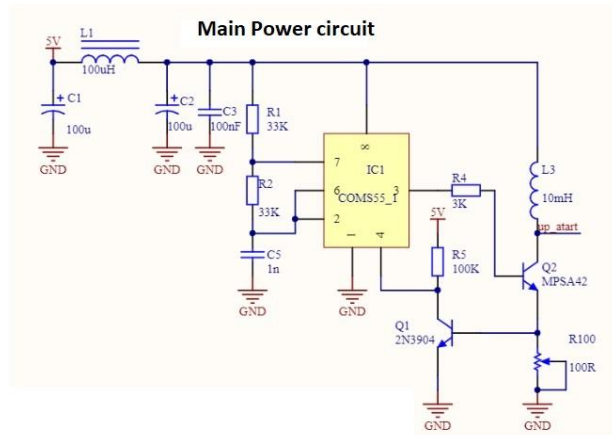
- 1 - Mueller tube specifically SBM-20
- 2 - 555 timers
- 2 - Inductor
- 12 - Capacitors
- 16 - Resistors
- 4 – Diodes
- 3 – Transistors
- 1 – ESP32 MCU
- 1 – LCD Screen
- 1 – Buzzer modified to be a speaker
- 1 – Battery Holder



Circuitry Specs:

- Voltage to Mueller Tube is Roughly 400V
- Voltage for everything else is 5V
- Used a 555 Timer to make the 400V by chopping the waveform and using a diode bridge.
- Made a separate pulse circuit to run with the MCU to be able to show onto the lcd and sound the speaker.
- The LCD Displays the current counts per minute (CPM), and estimated dose equivalent rate in micro-Sievert per hour ($\mu\text{S/h}$) with a 10 min history and 5 second resolution as a bar graph on the LCD.

Schematics for circuits used:



Testing and Iterations:

- This project went through 2 iterations for testing
 - The first iteration didn't have a battery pack and was too small.
 - The second iteration now fits a battery pack and has an on off switch,
- Both iterations worked great however the second iteration is more usable than the first. Pictures of both will be attached.
- Dr. Farfan and I have tested the Geiger Counter in the Nuclear Lab with a few different Source Materials. The CPM and micro-Sievert per hour ($\mu\text{S/h}$) work great as well for detection and dosage rates.

Pictures of
the different
iterations
and testing
in the lab:

Iteration #1



Iteration #2



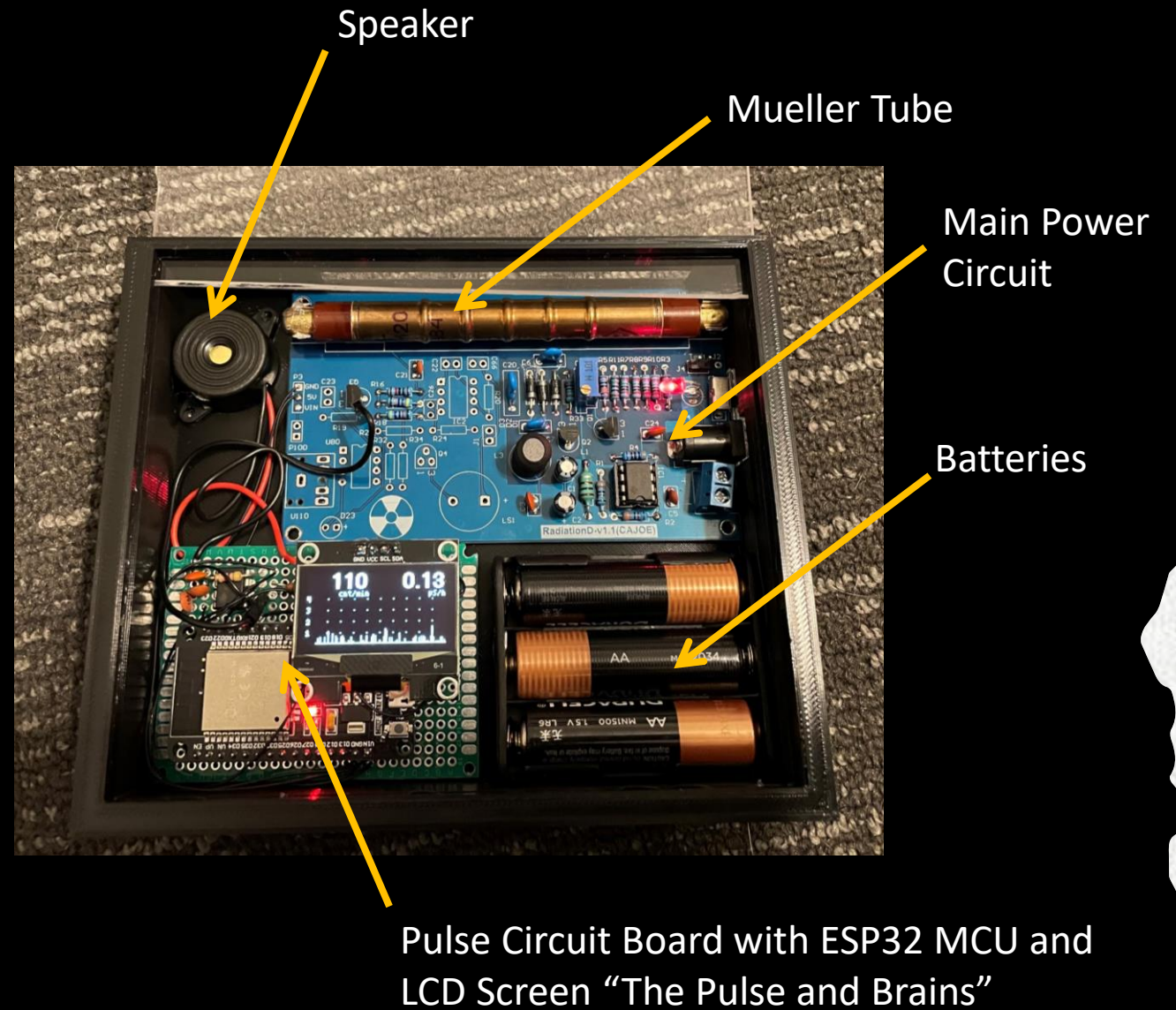
Testing in the Lab



Issues that I have overcame:

- Proper adjustment of the voltage for the Mueller Tube was required for making the tube work so a potentiometer was placed in the circuit to help stabilize the voltage and get it to a voltage that was usable.
- Batteries when dying would cause the Geiger Counter to stop working efficiently and read very high number. The only fix would be to change the batteries.
- The wires I was using were not easy to maneuver through the custom pulse circuit. I fixed this by using Kynar wire.

Specific Parts on the Geiger Counter:



Small Video of the Geiger Counter working:



Thank you for your time and watching my presentation of my Geiger Counter

