The Detectors

Presents:

The EMF Detector

Special Thanks to Dr. Kim
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Background

WHAT IS HAVANA SYNDROME?

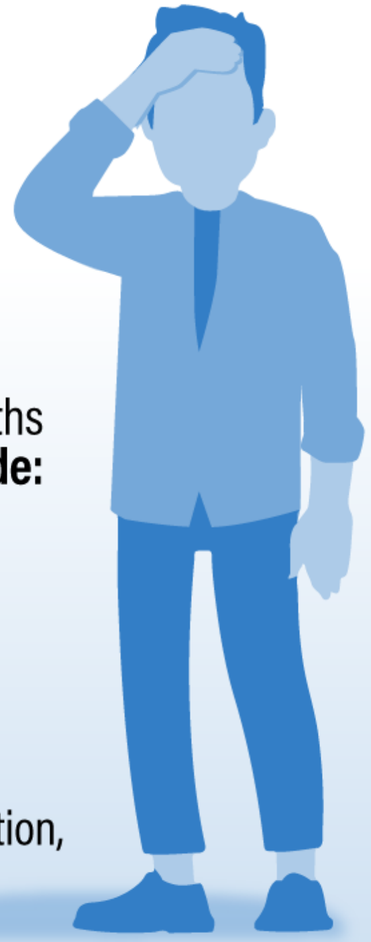
No definitive cause has been found, but scientific studies have noted many of the acute symptoms are consistent with exposure to directed radio frequency energy

Acute symptoms (often ocurring suddeny) **may include:**

- Pain in one or both ears
- Tinnitus, hearing loss
- Intense pressure or vibration inside the head
- Difficulty with memory or concentration
- Nausea
- Visual disturbances
- Unsteady gait, loss of balance, vertigo/dizziness

Chronic symptoms (can last weeks, months or longer) **may include:**

- Headace
- Insomnia
- Depression
- Impaired balance
- Impaired concentration, memory loss



Source: National Academy of Sciences

What Do We Want?

- A device that can detect **Radio Frequencys / RF devices**
- A device that can give clear readings.
- **Keep the safety of others from harmful radiation.**
- Give users a device that is handheld for everyday use.

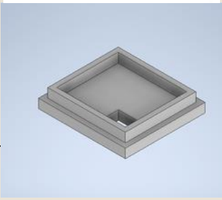
Design Specifications

An antenna with a specific frequency range

PCB Solderable Breadboards

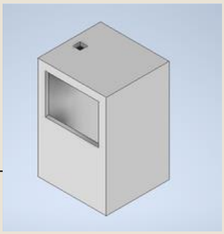
Arduino Microcontroller

1.8" LCD display screen



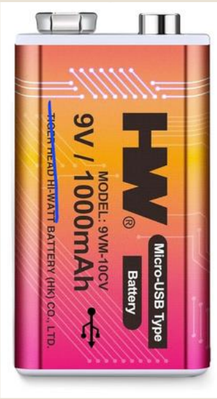
6-24V to 5V 1.5A Regulator

A rectangular plastic case



9V battery 2 pin connector

9V lithium-ion battery

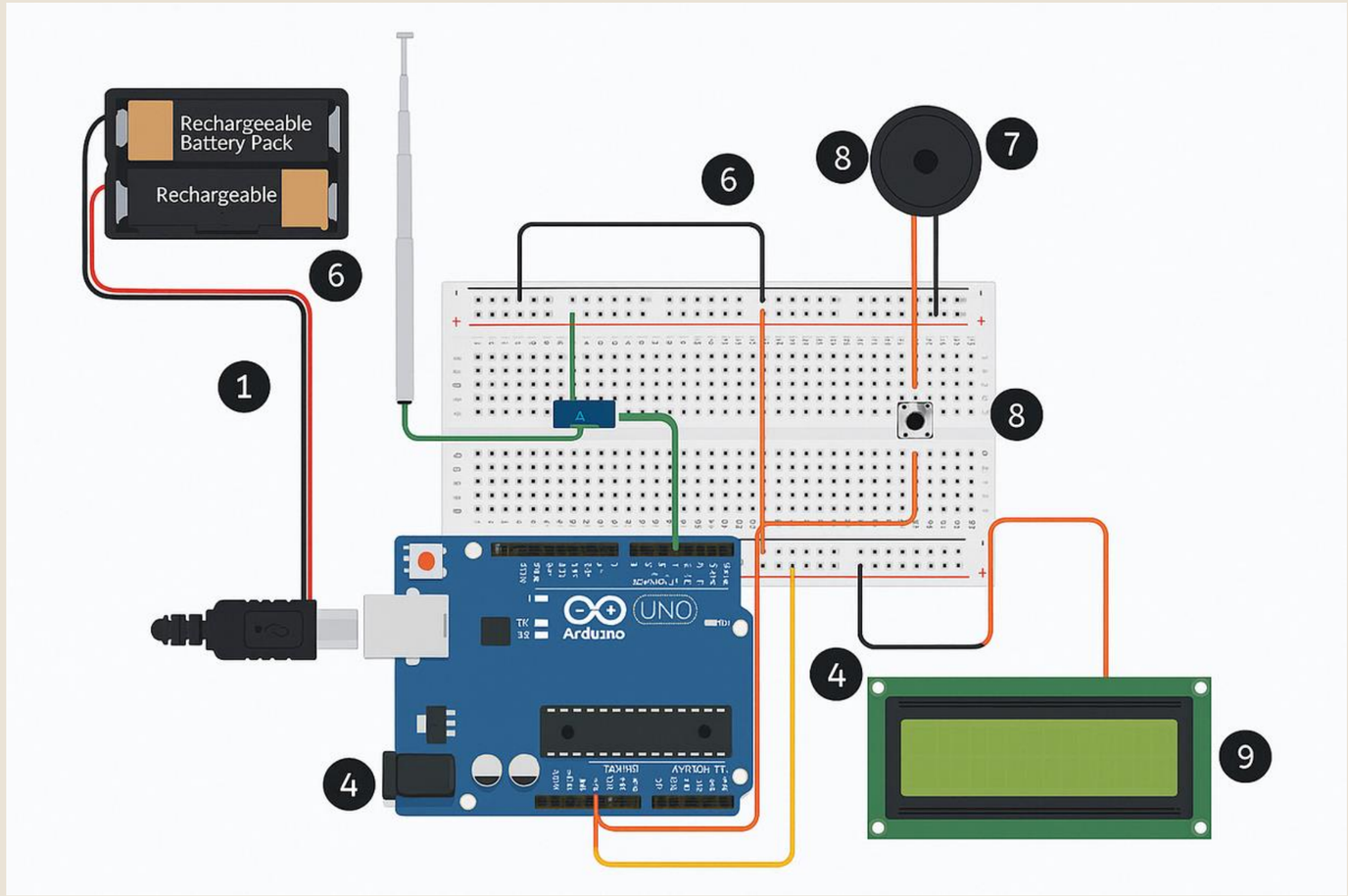


Constraints, Rules, and Regulation

Enviromental Constraints	Socio-Cultural Constraints	Rules, Regulations, and Standards
The detector must be powered by a chargeable battery to reduce footprint. The detector will comply with energy efficiency.	Will have sleek appearance in order to have clients comfortable to its use.	Part 15 of the FCC regulations requires that if the detector becomes a unintentional radiator must still comply with the emission limits specified.

Solution Design

1. Power (rechargeable battery)
2. Power bus (wiring)
3. CPU (Arduino board)
4. Slide Switch (power switch)
5. Antenna
6. Buzzer
7. LCD (connection to display)

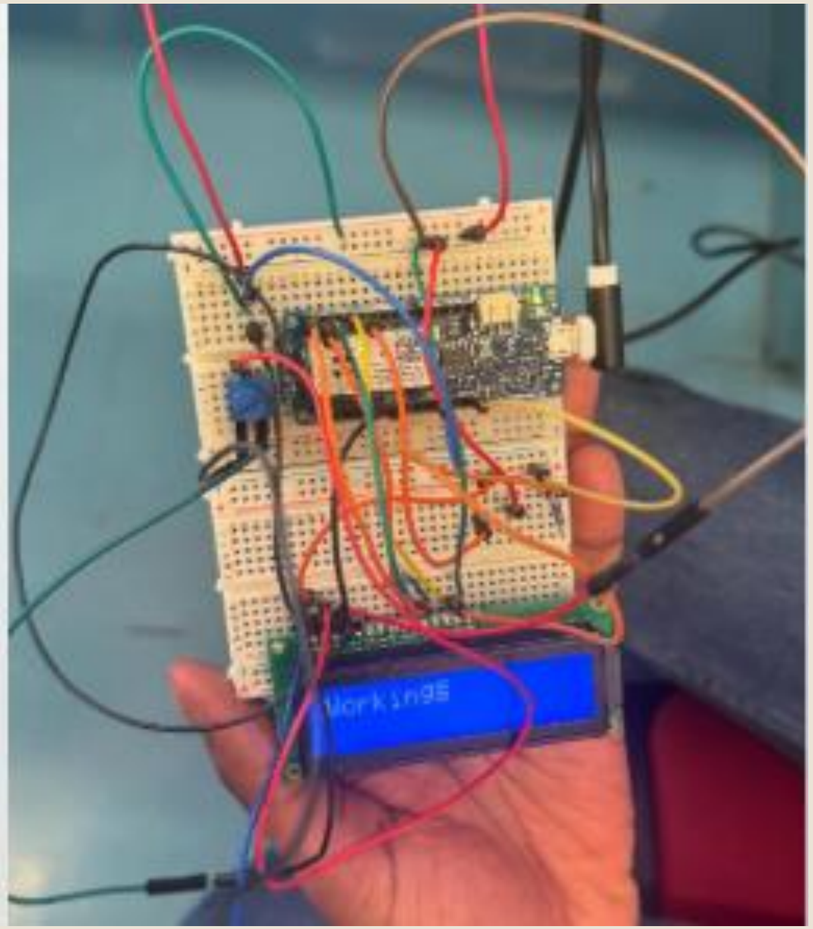


Sprint 1

Create the sensing function of the product, make sure the buzzer works properly, and set a "danger" level for the sensor.

Week 1	Week 2	Week 3
Set up the antenna to make sure it works properly	Set up the buzzer that reacts to the antenna's readings	Decide on a proper level for the buzzer to sound off.

Increment Demonstration




```
double kBoltz = 1.380649*pow(10, -23);
double planck = 6.62607015*pow(10, -34);

// initialize the library by associating any needed LCD interface pin
// with the arduino pin number it is connected to
const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);

void setup() {
  // put your setup code here, to run once:
  pinMode(tempSensor, INPUT);
  pinMode(buzzer, OUTPUT);
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  // initialize the serial communications:
  Serial.begin(9600);
}

void loop() {
  // put your main code here, to run repeatedly:
  int sensorValue = analogRead(tempSensor); // read sensor value
  double voltage = sensorValue * (5.0 / 1023.0); // convert sensor value to voltage (assuming 5V reference)
  double temperatureF = (voltage - 0.5) * 100; // convert voltage to temperature in Farenheit (assuming LMP36 calibration)
  double temperatureC = (temperatureF - 32.0) * (5.0/9.0);
  double temperatureK = temperatureC + 273.15;
  lcd.print("Temp in K: ");
  lcd.print(temperatureK);
  //double f = (temperatureK*kBoltz)/planck;
  if(temperatureK > 290)
  {
    tone(1, 1000);
    delay(2000);
    noTone(1);
  }
  delay(3000);
  lcd.clear();///
}
```

Sprint 2

Set up the LCD to give a value to the inputted electrical readings.

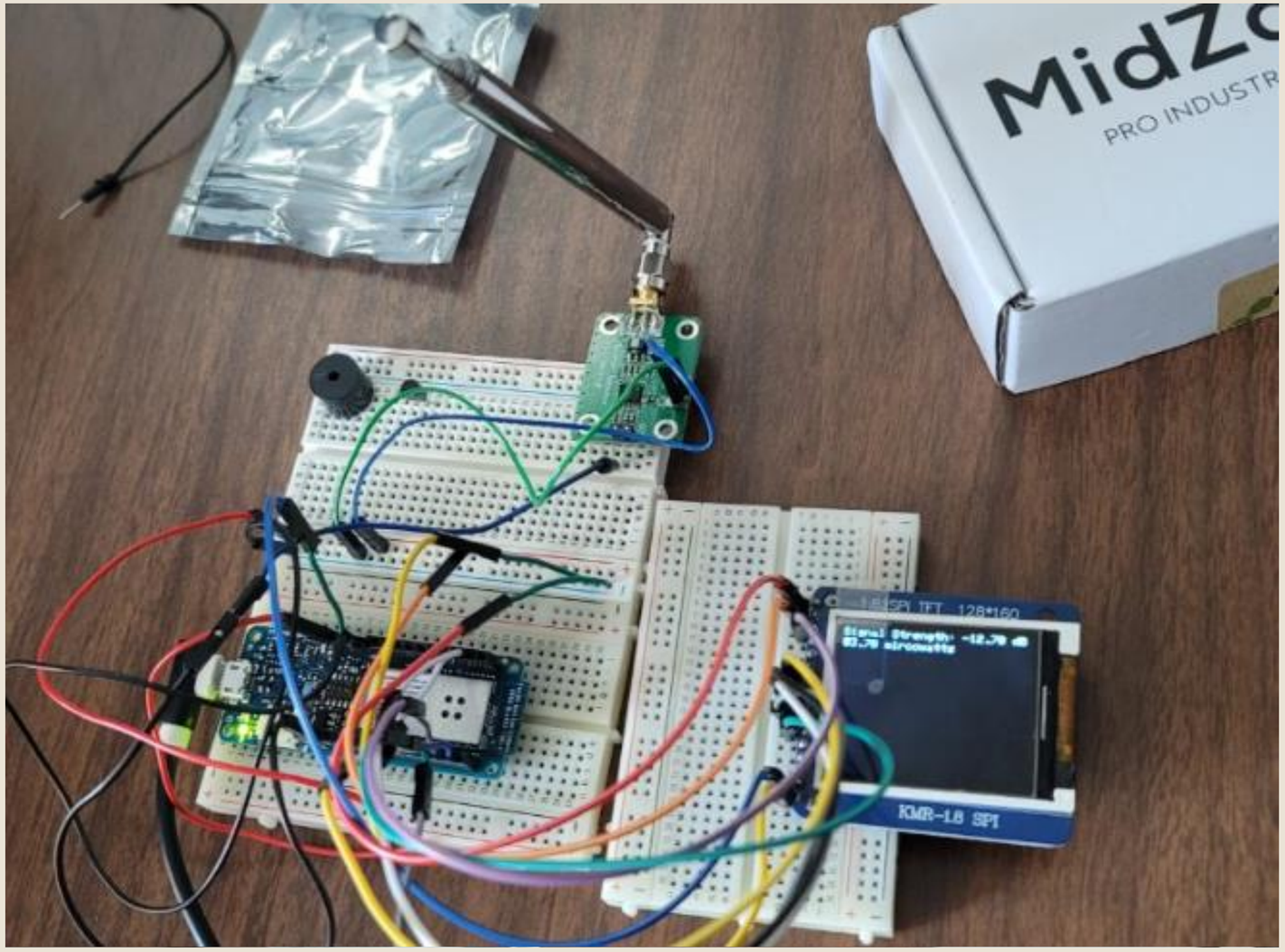
Week 1	Week 2	Week 3
Install the antenna and RF module system and gain readings from it.	Work on LCD system and check for functionality	Combine the two systems together and have the LCD read inputted values from the RF module.

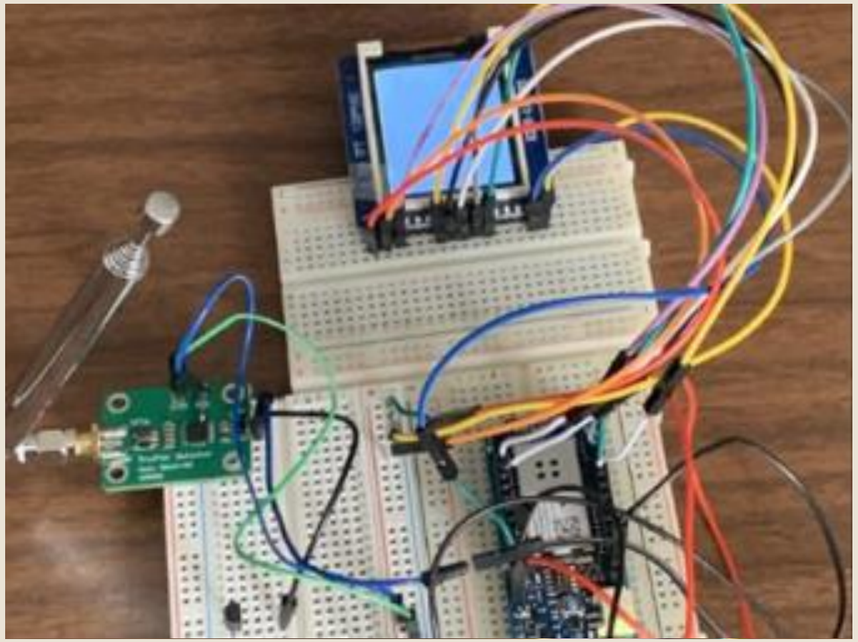
Increment Demonstration

```
#include <cmath>
#include <Adafruit_GFX.h>    // Core graphics library
#include <Adafruit_ST7735.h> // Hardware-specific library for ST7735
#include <SPI.h>

#define antenna1 A0
#define TFT_CS   1
#define TFT_DC   2
#define TFT_RST  4

Adafruit_ST7735 tft = Adafruit_ST7735(TFT_CS, TFT_DC, TFT_RST);

void setup() {
  // put your setup code here, to run once:
  Serial.begin(9600);
  pinMode(antenna1, INPUT);

  tft.initR(INITR_BLACKTAB); // Initialize the display
  tft.setRotation(1);        // Set screen rotation (0-3)
  tft.fillScreen(ST77XX_BLACK); // Clear the screen with a black background

  // Set text properties
  tft.setTextSize(1);        // Set text size (1 is default, 2 is double size, etc.)
  tft.setTextColor(ST77XX_WHITE); // Set text color to white
}

void loop() {
  // put your main code here, to run repeatedly:
  tft.fillScreen(ST77XX_BLACK);
  float v_out = analogRead(antenna1); // mV
  int gain = 50; // mv/dB

  Serial.println(v_out);

  float ssi = v_out * (1.0/gain) + 30 - 52;
  float power = pow(10, ssi/10.0)*1000;
```

```
37
38      tft.setCursor(0, 0);      // Set cursor position (x, y)
39        // Display "Hello, World!"
40      tft.print("Signal Strength: ");
41      tft.print(ssi);
42      tft.println(" dBm");
43
44      tft.setCursor(0, 10);
45      tft.print(power);
46      tft.println(" mircowatts");
47
48      delay(3000);
49    }
```

Increment Demonstration





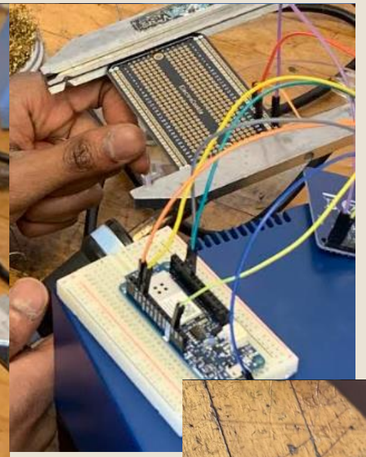
Sprint 3

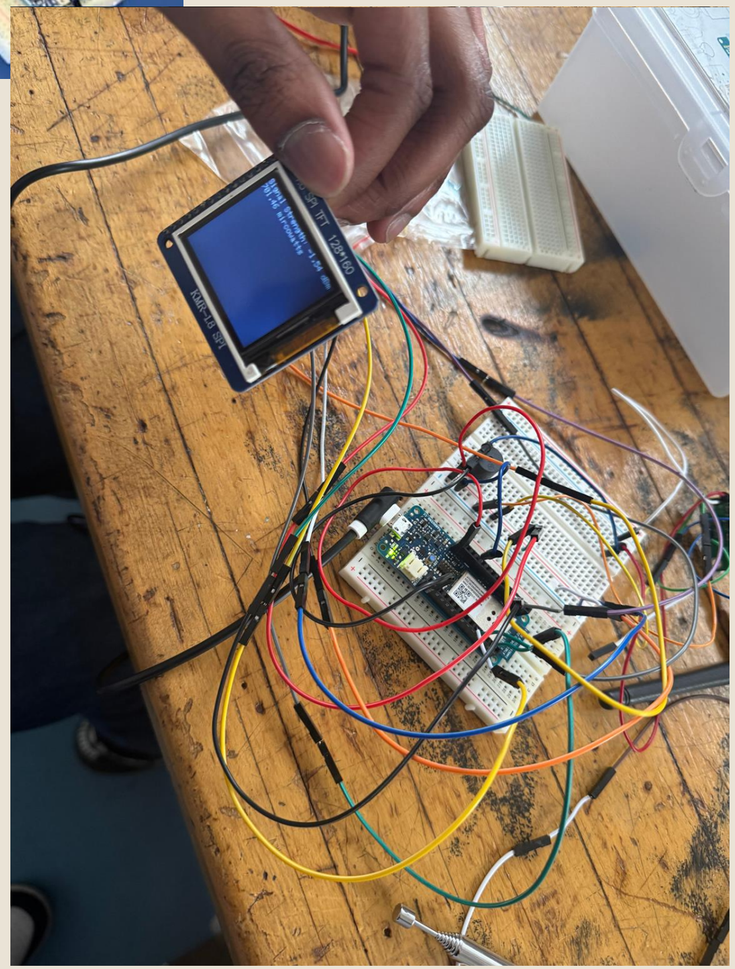
Create the box for the device and set up the battery power for it.

Week 1	Week 2	Week 3
Set the battery for the device. (It may or not be rechargable)	Make a good box or plastic casing.	Craft the box for the device to fix properly. Make sure everything works in casing.

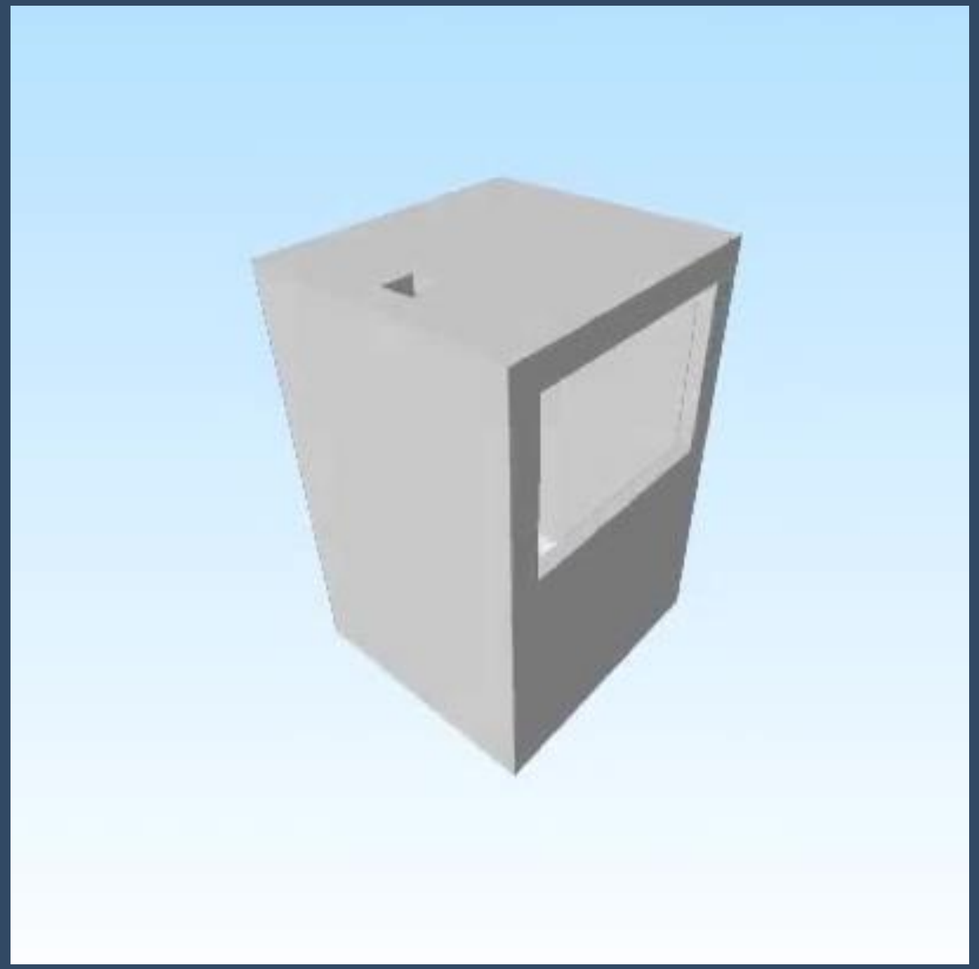

PRO SOLDERER
TEMP

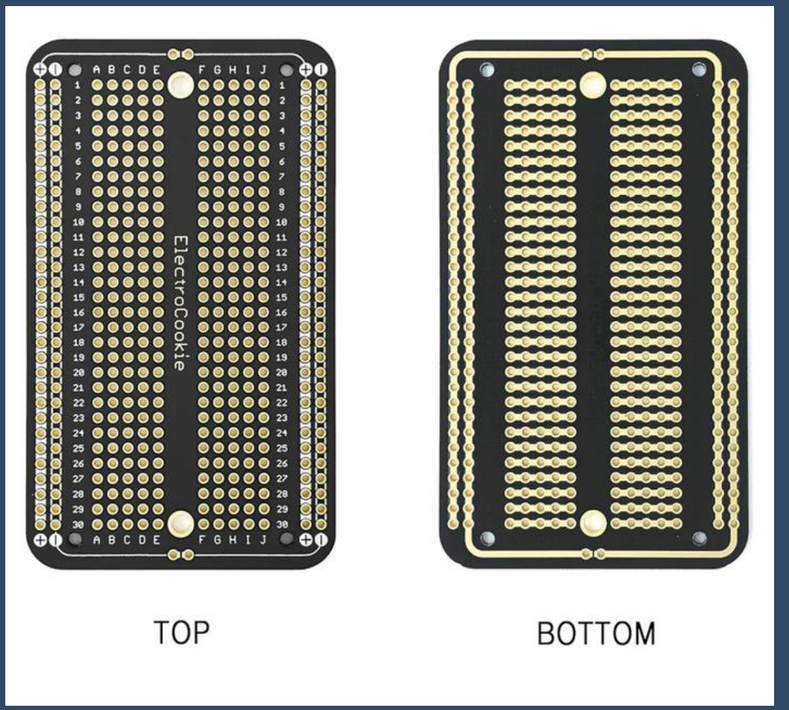

PRO SOLDERER
TEMP
CAL



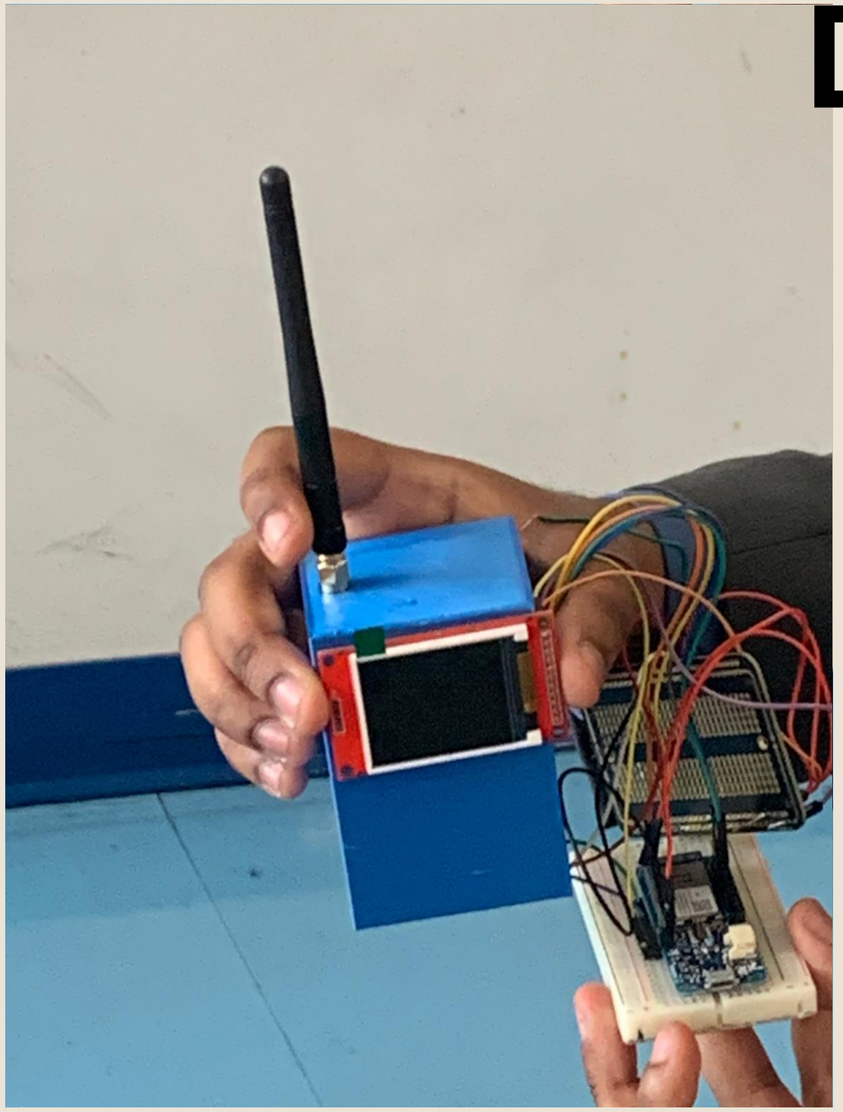


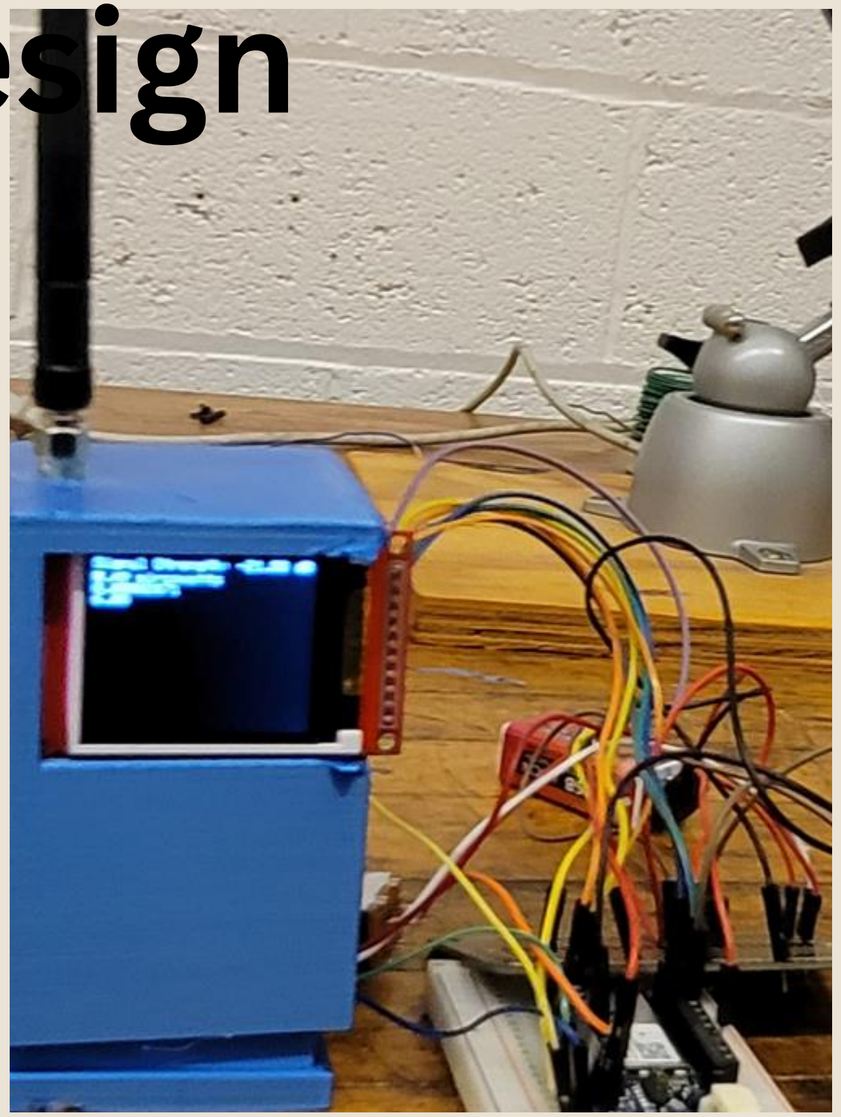

HW
Micro-USB Type
Battery
9V / 1000mAh
MODEL: 9VM-10CV
TIGER HEAD HI-WATT BATTERY (HK) CO., LTD.
USB
LI-ION
RECHARGEABLE BATTERY




ElectroCookie
TOP
BOTTOM

Final System Design





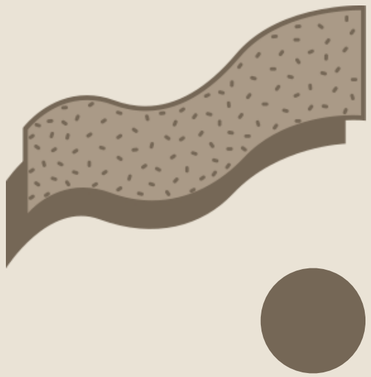
Conclusion

Functional Portable Device

Uses common WiFi brand (2.4GHz)

Can report the signal strength and density

Can be used to figure out the location of a source.



Thank you!