

# **Update on the project: (Determining the dimensions of Sensor)**

## **Aim:**

To Observe the sensitivity of Graphite on paper sensor of various lengths and determine the dimensions of the sensor for our utility.

## **Required materials:**

- HB pencil
- A4 sheet paper
- Arduino Uno
- Resistor (560k ohms or above 1M ohms)
- Multimeter

## **Procedure:**

- Draw a rectangle with pencil of dimensions of 5cm\*1cm, 5cm\*0.5cm, 5cm\*0.3cm as shown in figure 1.1.
- Give connections as shown in figure 1.2 for the Arduino Uno.
- Take the readings of resistance of the sensor using the Arduino code. Convert the readings to graphs using excel.
- Tabulate the resistance values of the various length and capture the graphs .
- According to the graphs determine the suitable length for sensor.

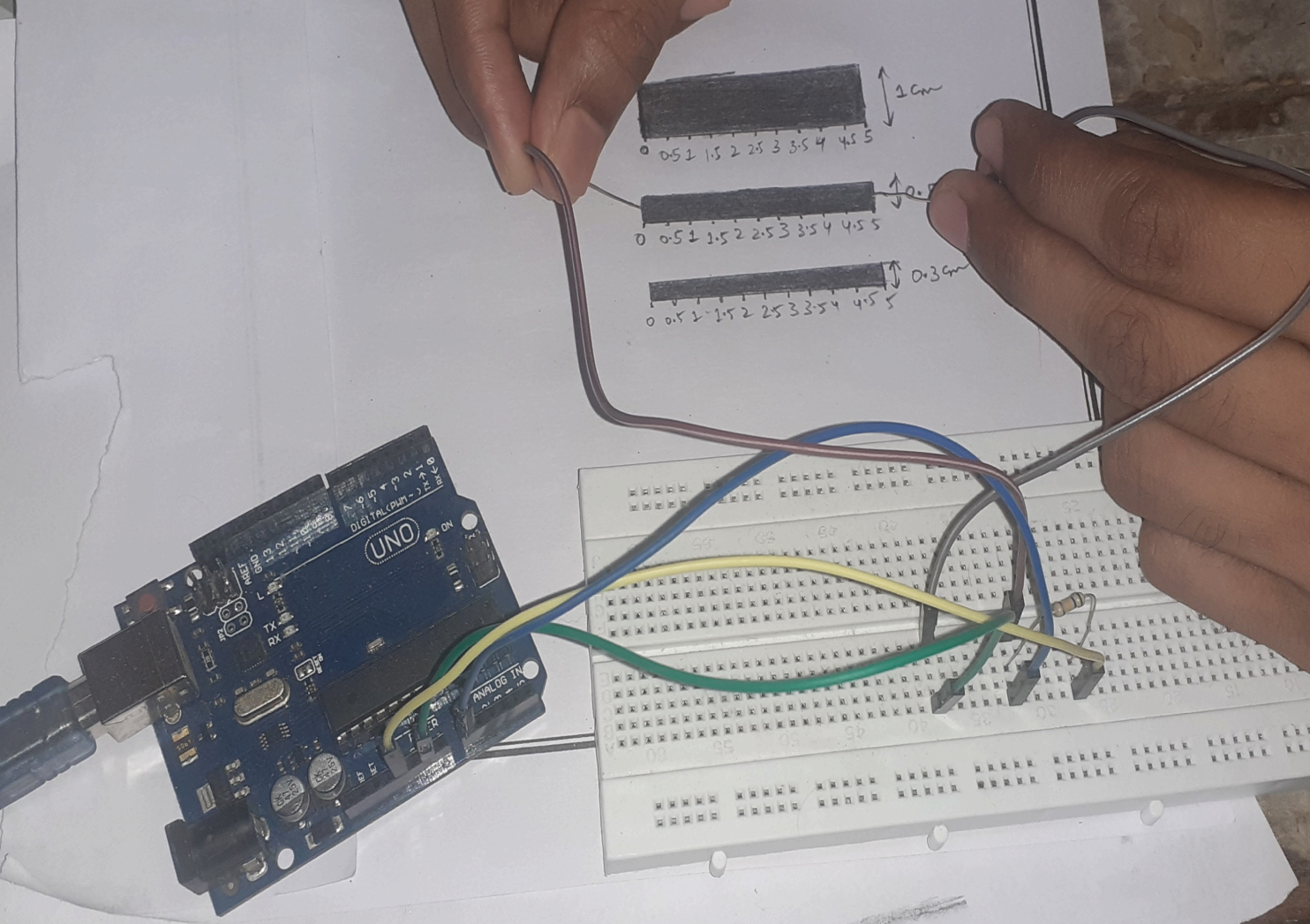


Figure 1.2

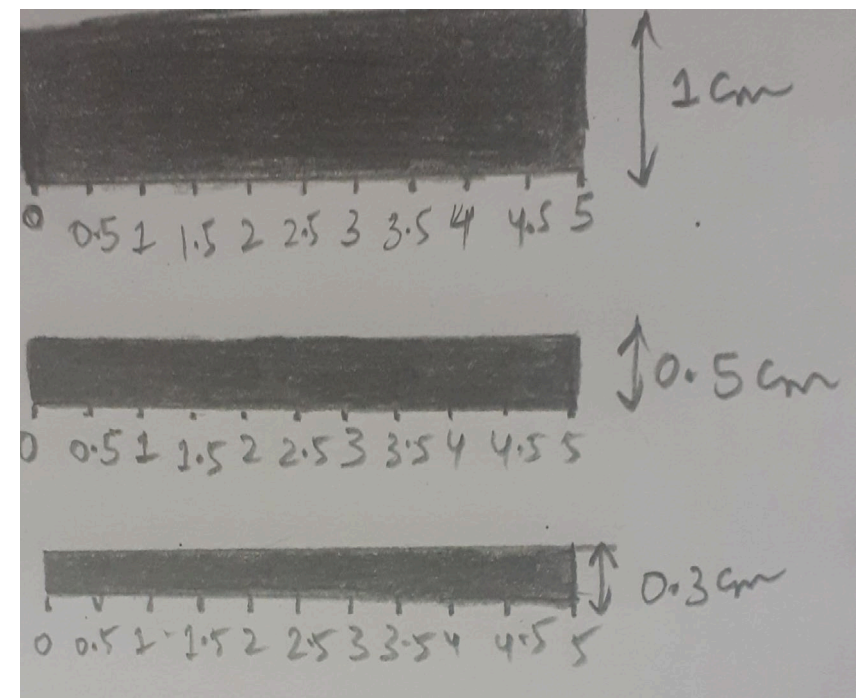


Figure 1.1

## Arduino code to observe the resistance of sensor

```
const int sensorPin = A0; // Analog input pin that senses Vout
int sensorValue = 0;      // sensorPin default value
float Vin = 5;            // Input voltage
float Vout = 0;           // Vout default value
float Rref = 560000;       // Reference resistor's value in ohms (you can give this value in kilohms or megaohms - the resistance
of the tested resistor will be given in the same units)
float R = 0;
void setup ()
{
  Serial.begin(9600);      // Initialize serial communications at 9600 bps
}
void loop ()
{
  sensorValue = analogRead(sensorPin); // Read Vout on analog input pin A0 (Arduino can sense from 0-1023, 1023 is 5V)
  Vout = (Vin * sensorValue) / 1023;   // Convert Vout to volts
  R = Rref * (1 / ((Vin / Vout) - 1)); // Formula to calculate tested resistor's value
  Serial.print("R: ");
  Serial.println(R);
  //Serial.print("Vout: ");
  //Serial.println(Vout); // Give calculated resistance in Serial Monitor
  delay(1000); // Delay in milliseconds between readings
}
```

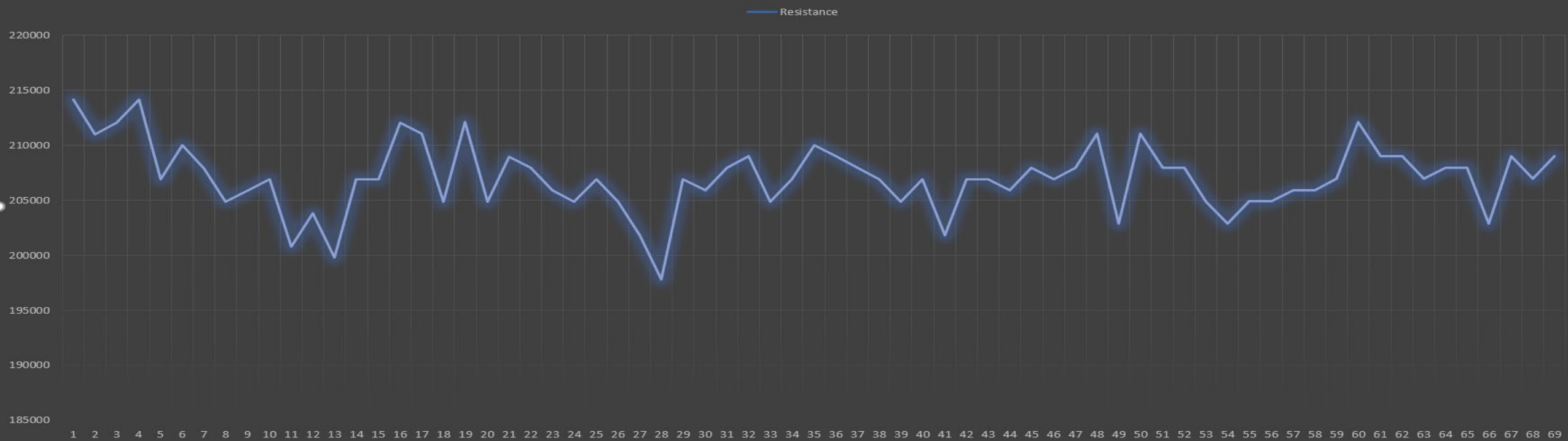
# Readings from Arduino Uno

Resistance values are the product of row*column(ohms)	1cm	0.5cm	0.3cm
5cm	200k-215k	300k-314k	250k-1400k
4.5cm	250k-265k	299k-320k	200k-250k
4cm	227k-242k	281k-300k	240k-180k
3.5cm	285k-315k	239k-250k	208k-200k
3cm	255k-275k	150k-165k	245k-255k
2.5cm	240k-280k	134k-140k	156k-160k
2cm	450k-500k	140k-160k	114k-120k
1.5cm	265k-287k	100k-120k	85k-89k
1cm	255k-275k	80k-92k	62k-66k
0.5cm	180k-200k	62k-71k	35k-40k

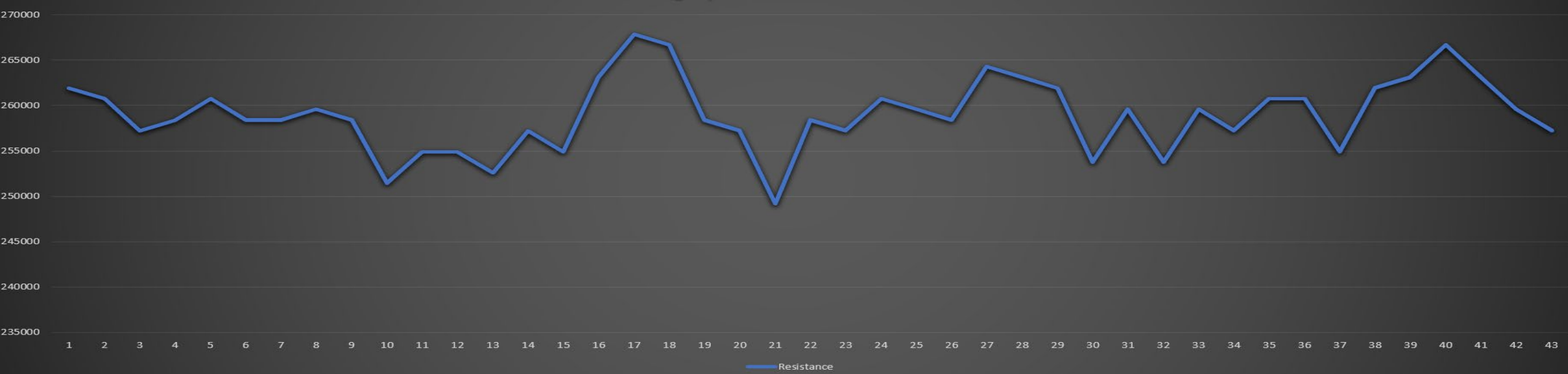
# Multimeter Readings

Resistance	1cm	0.5cm	0.3cm
5cm	140k	144k	260k
4.5cm	99k	106k	222k
4cm	82k	98k	204k
3.5cm	75k	86k	190k
3cm	72k	80k	177k
2.5cm	120k	72k	150k
2cm	62k	55k	135k
1.5cm	46k	34k	107k
1cm	55k	26k	68k
0.5cm	40k	20k	43k

Resistance of Graphite sensor with area 5cm\*1cm



Resistance of graphite sensor of area 4.5cm\*1cm





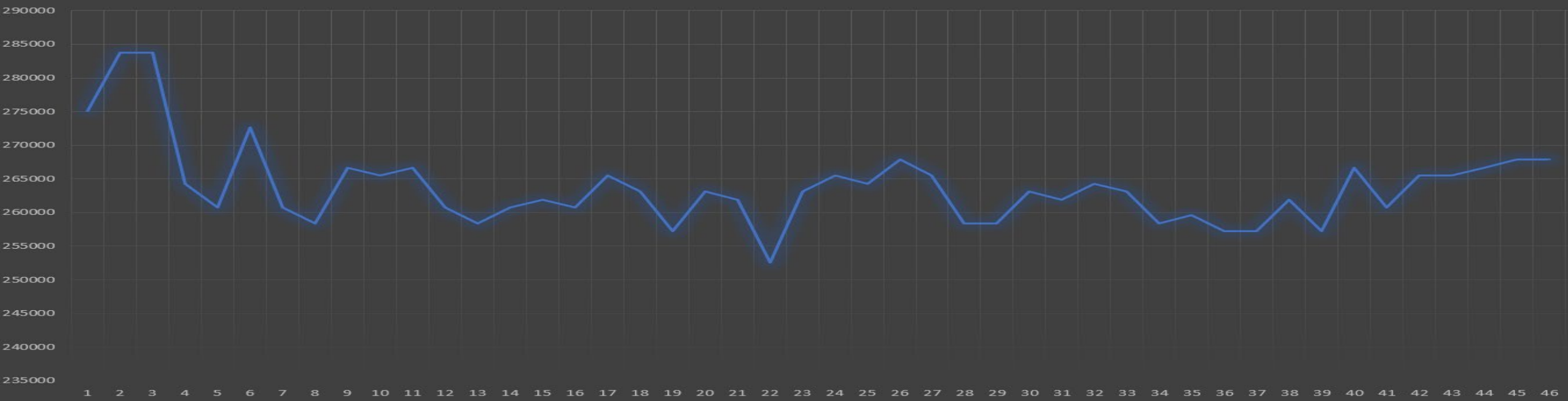
Resistance of Graphite sensor of area 4cm\*1cm



Resistance of Graphite sensor of area 3.5cm\*1cm



Resistance of graphie sensor with area 3cm\*1cm



Resistance(2.5cm\*1cm)









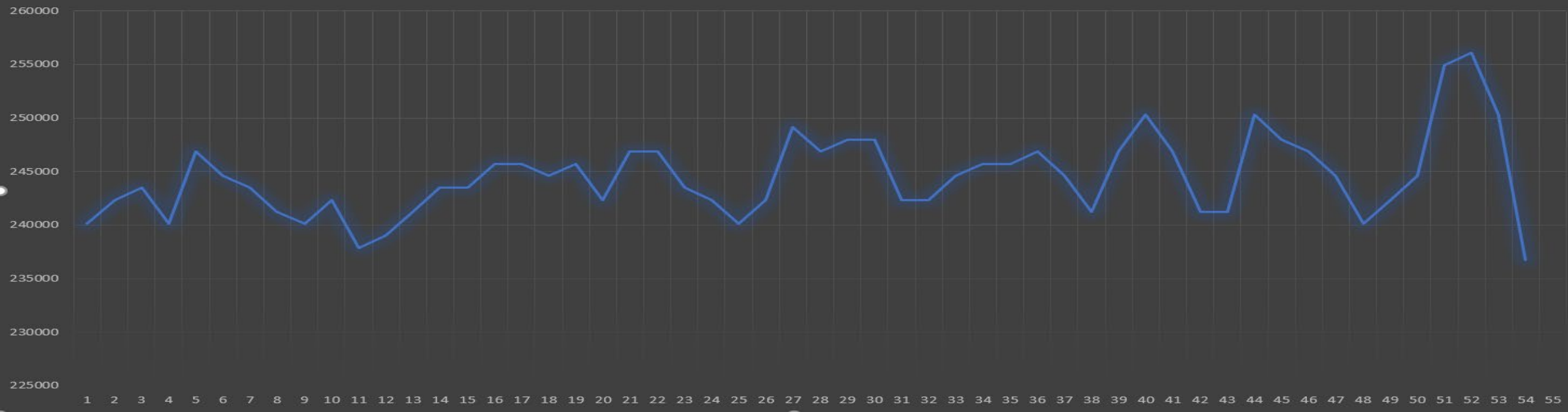
Resistance(5cm\*0.5cm)



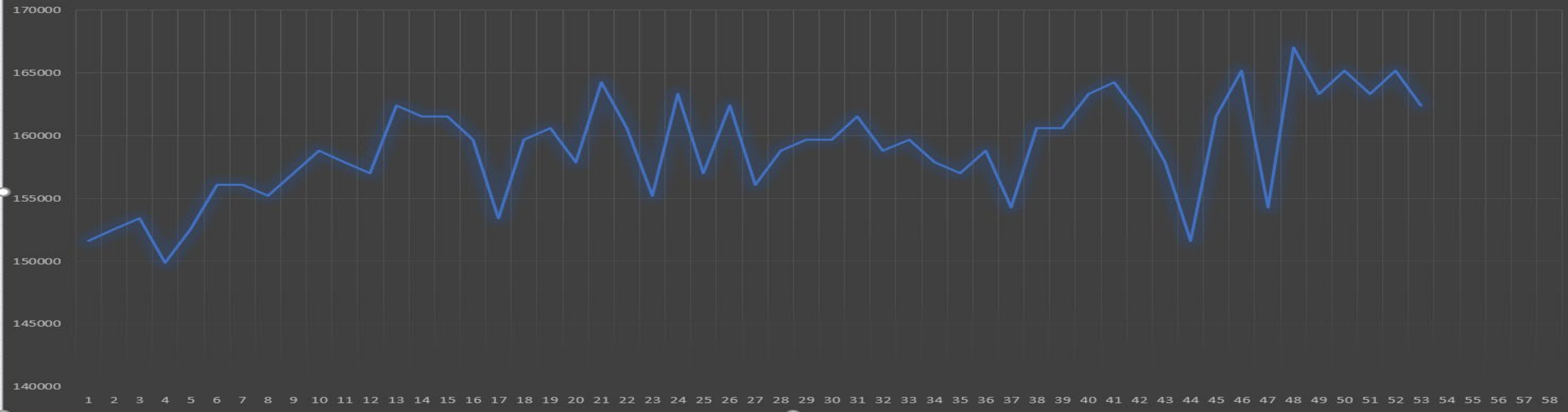
Resistance(4.5cm\*0.5cm)



Resistance(3.5cm\*0.5cm)

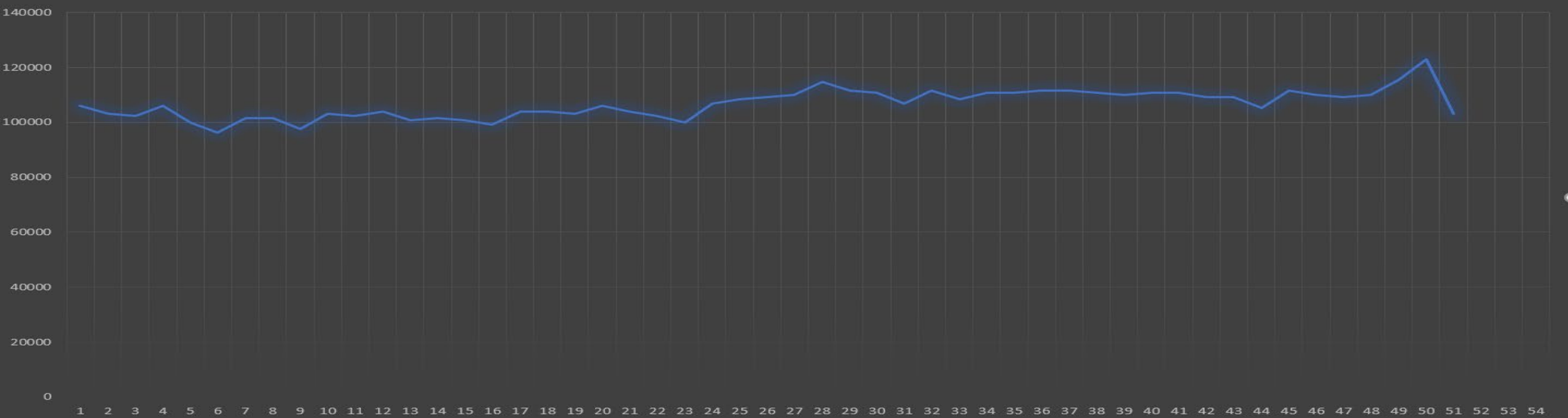


Resistance(3cm\*0.5cm)

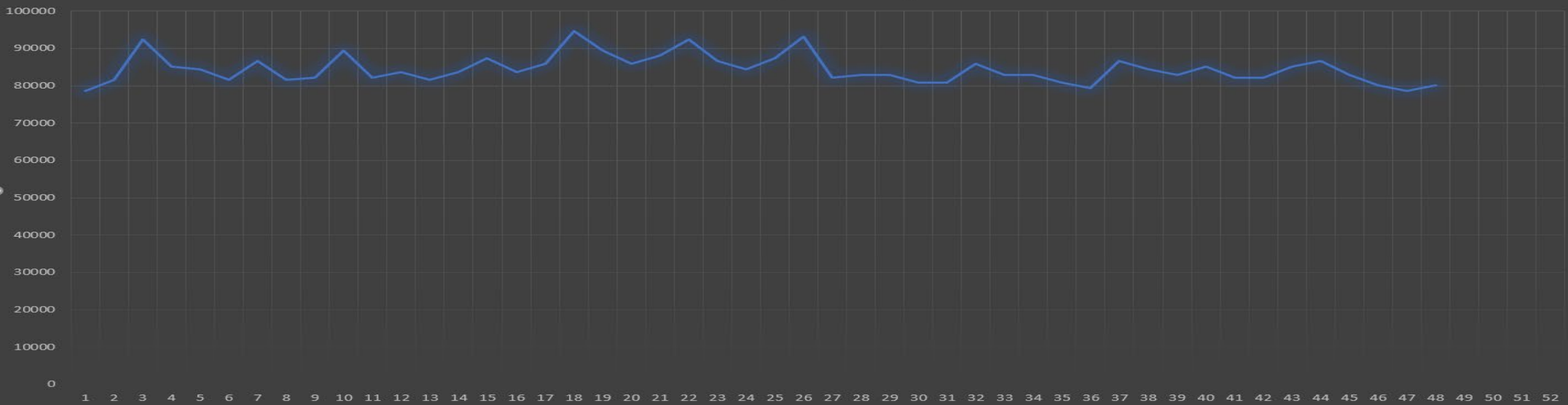




Resistance(1.5cm\*0.5cm)



Resistance(1cm\*0.5cm)







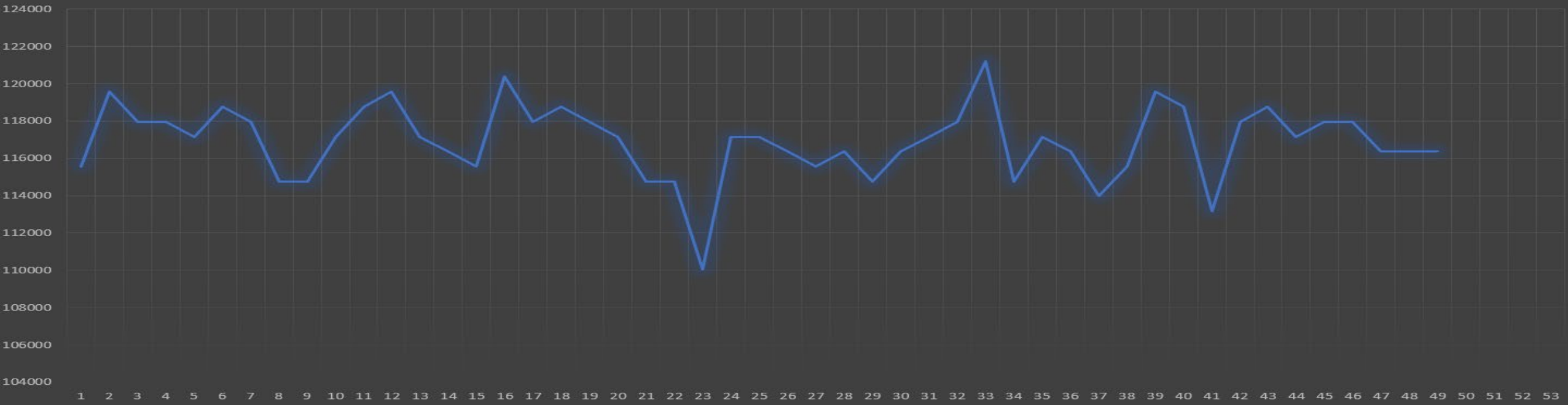




Resistance(2.5cm\*0.3cm)

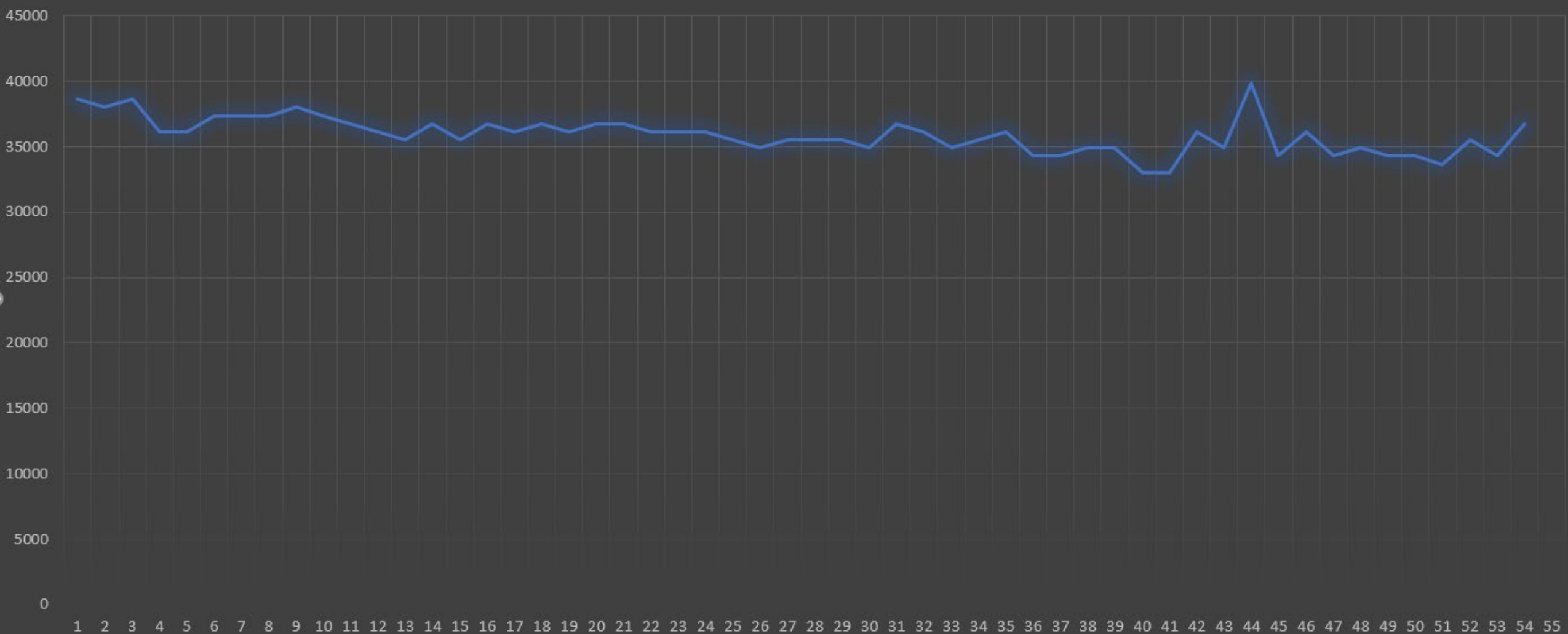


Resistance(2cm\*0.3cm)





Resistance(0.5cm\*0.3cm)





## **Result:**

- **From the experiments, we can conclude that:**
- **As area occupied by the sensor increases, the variations in resistance also increases.**
- **As the width of the sensor increases with length constant then resistance decreases.**
- **As length of the sensor increases with constant width, the resistance increases.**
- **Sensor's length must be atleast double the width to avoid variation in resistance.**
- **The suitable dimensions of the sensor:**
  - **1cm\*0.5cm**
  - **1cm\*0.3cm**