Abu Dhabi University

Electromagnetics and Waves

Lab Report 1 : Electric Field

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Abstract

In this lab we create an electric field by applying a potential difference to two capacitive plates. We study the equation E = v/d This is achieved by measuring electric field varying when voltage is varied, distance is varied and finally the material is varied.

1 Introduction

An Electric Field can be produced in various ways. To create a uniform electric field we need to set up two parallel plated being applied with a potential difference across them. This change in voltage will means there is an excess of electrons in one of the plate and shortage of electrons in the other plate. This results in one of the plate being positively charged and the other being negatively charged which develops attraction force between the plates creating a region of uniform electric field.

1.1 Electric field and Distance

When we keep the voltage same and try to vary the distance by moving the plates apart, we will find a drop in the strength of electric field. When we decrease the distance between the plates there will be an increase in the strength of electric field.

1.2 Electric Field and Voltage

Increasing the potential difference keeping the distance same should increase the strength of electric field while decreasing the potential difference should decrease the strength of electric field.

1.3 Electric Field and Material

The better the permittivity the higher should be the electric field detected, and lower the permittivity the weaker should be the permittivity detected.

2 List of Equipment Used

The equipment the we used were as follows:.

- Electric Field Sensor
- Parallel plates
- DC power source
- Plastic Ruler
- Plastic or Wooden Sheets and tin foil sheet
- Bridge Diode
- Capacitor
- 10 M ohms Resistor

3 Experiment Setup

To carry out this experiment we had to first build the electric field sensor from the given list of equipment. The electric field sensor was already provided to us by Lab Assistant Eng Ahmed Swelehs. In order to have a two parallel plates facing each other we arranged a small rectangular box so that we can place the plates on top of it. Then we connected the plates to dc power supply.

4 Procedure

4.1 Electric field and Voltage

We get the box to act as a platform and insert two capacitive plates on either end. We connect the red side of the plate to the live wire in DC part and ground to the black part . It's now ready to power up. We connect the Multimeter to the bridge circuit to measure the voltage. We also connect a voltmeter to the power supply frame. Now we turn on the supply and compare the supply voltage and sensing voltage, make a table. We keep the distance 24 cm.

4.2 Electric field and Distance

Now we change the distance and we bring the plate closer to 8.5 cm and note the change in sensing voltage.

4.3 Electric field and Material

This time we think of changing the material and we introduce tissue and other materials in between.

5 Results and Discussion

5.1 Electric field and Voltage

Voltage (Volts)	Sensing Circuit Voltage (mV)	Electrical Field (E) (E= v/d) (m)
0	0	0
25	0.3	3.5
50	0.6	7.1
75	1.2	14.1
100	1.9	22.4
125	2.7	31.8
150	3.8	44.7
175	4.7	55.3
200	6.0	70.6
225	7.3	85.9
250	8.8	103.5

Table 1: Electric field and Voltage

5.2 Electric Field and Distance

Distance (cm)	Voltage (mV)	Electric Field (m(v/m)) 25.5
10	39.2	
8.5	1.5	17.65

Table 2: Electric Field and Distance

5.3 Electric field and Material

Material	Voltage (mV)	Electric Field (m(v/m))
Foil	8.5	100
Tissue	14.2	167

Table 3: Electric field and Material

6 Conclusion

An electric field is a concept based on electrostatics. It states that whenever there is any difference in potential there is attraction and hence electric field. We noticed that a uniform electric field follows the following expression: E =k v/d The observation in our experiment reinforces the idea that varying the following parameters; voltage, distance and material we can ultimately change the strength of electric field.

References

7 Appendix

List of Figures

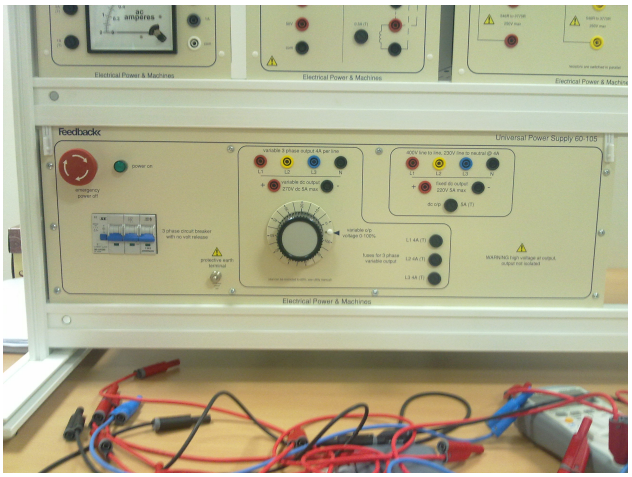

Figure 1: Universal Power Supply