Lab 1: Electric Fields

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This lab is meant to investigate the electric fields around some objects that are charged, which in our case was paint and were to describe the details shown through either a heat map or similar works. In this experiment a multi-meter, a cork board, between six and eight thumb tacks/push pins, conductive paint, alligator clips/ cables, and some source of controlled battery. The data was meant to show the travel directions of the electric fields in reaction to the conductive paint.

FIG. 1. Alligator clips / cables
[**?**]

INTRODUCTION

Electric fields are the area around a positively or negatively charged particle that creates a field around the particle and causes forces around the charges in which we can do calculations with. Generally when deciding on which the charges go towards or away from a chosen point we would decide that positive charges would point away from the desired point and negative charges going towards the desired point. A couple of equations we could use for electric field would be the coulombs force equation and the equation here quoted here:

Equations

$$F = (k * q_1 * q_2)/r^2 \tag{1}$$

$$E = F/q \tag{2}$$

$$k = 1/(4 * \pi * \epsilon_0) \tag{3}$$

$$E = \int dE * cos(\theta) \tag{4}$$

With force being in terms of Newtons, and with the electric field being in newtons per coulomb or volts per meter

EXPERIMENT

The experiment method we used was measuring one section and layered it over the y-axis in order to find the

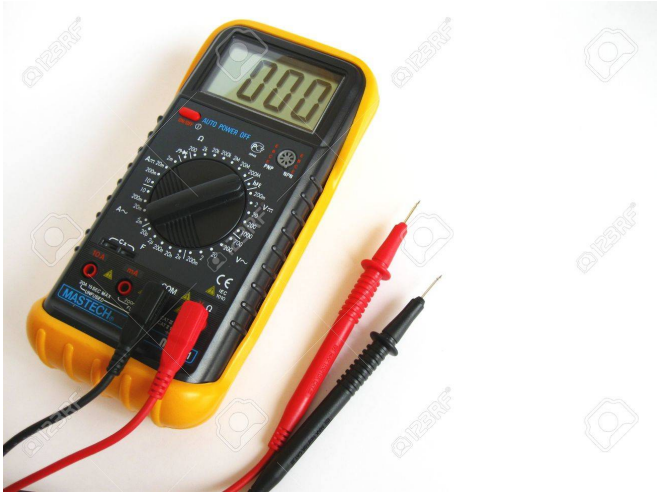
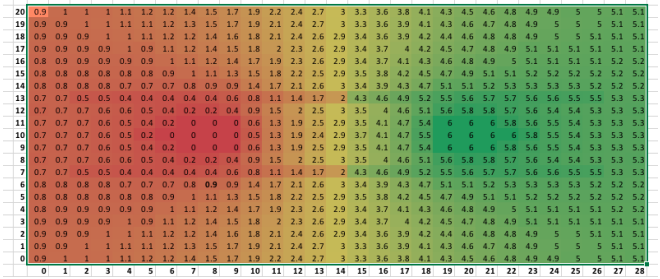


FIG. 2. Multi-meter
[?]

FIG. 3. Push pins / Thumb tacks
[?]

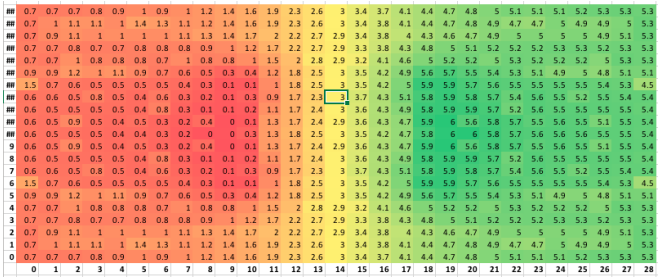
full map due to the detail being already very mixed. This would make the heat-maps we decided to make a little off.

Heat Map 1



This first heat map is about the first set-up we used was two circle based systems and as it shows the electric fields move around the the circle and create a cone around it leading to the pattern where it is lighter around the outside of the cone and more dense on the inside. One fact is that one the circle and all the other examples it seems that the charged paint will always be a full charge and the base will be practically at nothing.

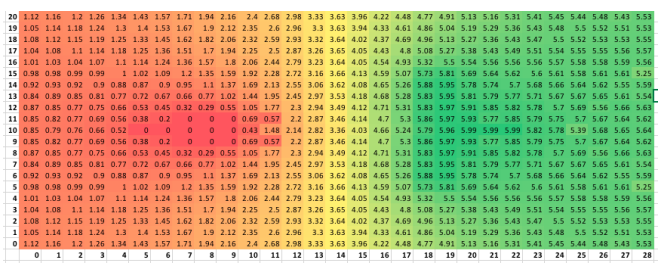
Heat Map 2



This second heat map is about the second type of set-up in which we used two T-Shaped bars in which caused a different heat map in which it caused different set-ups shown by how the bar is wider with less lighter room on the sides due to it covering more area in front.

These numbers are based on six volts that we put in and the electric field lines here come back in more on the back half as they curve around the short front in the end

Heat Map 3



Finally this third heat map is showing both the circle and T-shaped bar facing each other and as shown here it mixes both of the prior electric field lines and shows a little more variation in the center of the graph.

With the set up here we can see that we used the circle as the base so it would show zero on our graph. Compared to the other graphs we have more in between values towards the center of the graph which is because the way the two different shaped paints cause a different interaction than if it was not the same.

DATA AND ANALYSIS

As all of the tables do not use calculations or equations to show the answer but rather the graph showing the data wanted. So no equations we used in the analysis of the graphs but rather the fields lines shown due to them.

The first figure using the two circles creates more of a conical electric field around the back of the circle and continually goes inward gradually rather than extremely brunt-like.

Unlike the first figure the second one using both T-shaped is much wider due to the shape and allows room for the electric field to curve back in to the end of the shape.

Finally the last figure which was a combination of the both was quite similar to either one before but in this situation the electric field lines of the T-shaped was much larger than before but it is most likely due to it being affected by the the circle paint differently.

Discussion of Results and Conclusion

In the end the same error can be assumed for the entire experiment. Since we used a method which involved flipping the numbers across the graph can lead to extremely inconsistent results. Another thing that could lead to error would be the angle of the electro-meter as it shifts slightly in our experiment and switching people using it would mean that the angle would be different. Similarly, if a the person who was measuring the fields did not push down hard enough, the measurements would change.e As well as the fact that this experiment was not done multiple times it can be said that this data is not perfect in itself. [**?**]

Though due to these issues it can be said that these are marginally small due to not much difference in materials we can use it is decently reliable data in the end. It can be improved with better materials and more time for the experiment.

LIST OF FIGURES