Mapping of Equipotential Lines and Electric Fields Lines

Object: To map equipotential lines and electric field lines produced by two oppositely charged point charges and by two oppositely charged lines of charge.

Apparatus: Conducting Paper, mounting board, 1.5 V battery, voltmeter, alligator clips, and graph paper.

Introduction: In this experiment, you are going to map the electrical territory between two opposite electrical charges. First connect the battery to the terminals on the mounting board. Insert the conducting paper with the two point charges into the mounting board. Connect one of the voltmeter probes to a terminal of the mounting block using the alligator clips. This setup allows one to measure the electrical potential (similar the gravitational potential energy) between points on the conducting paper. In particular, you will determine where equipotential lines are located and thus be able to determine the direction of the electric field lines.

Procedure: Using the voltmeter probe that is free, measure the electric potential at all the points on the grid. In particular, lightly press the probe in the center of each square, where the corners are made of silver dots. You may either record the values directly into Excel or on the graph paper made available by your instructor. When you have completed this for the conducting sheet of the two point charges, please repeat the process using the conducting paper with two lines of charge.

Analysis: Once you have collected the data, please plot it using the surface plot on Excel. Play around with the settings until the figure does a good job of conveying the data. Below is an example of what the plot might look like.

The Laboratory Report: The report of this lab will simply be two figures. One figure will present your findings when you experimented with the two point charges. The second figure will present your findings when you experimented with the two lines of charge. Make sure to include electric field lines in your plots. The easiest way to add electric field lines would be with a black marker after you have printed out the equipotential lines. Remember, electric field lines have direction. Also, don’t forget about labeling the axes, including a title, having a legend with units and uncertainty, and keeping everything as neat as possible.