Lab EC-6 Pre-Lab Instructions

Problem EC-6a

1. Read the lab up to and including PREDICTION. Make sure you understand what the orientations are. On page 2 is an illustration of the board with the magnets in Orientation 1 and also showing what is meant by the “equidistant line” where the “equidistant field” is defined. It is a line halfway between the magnet centers and perpendicular to the line connecting the centers. Note that on lab manual page EC-6-5, Orientations 3 and 4 are also illustrated. In the book, each magnet is shown as two magnets, one N and one S next to each other, but the pair act as a single magnet.

2. Read through, but DON”T ANSWER the METHOD QUESTIONS (unless you want to). Try to understand what it is they're trying to get across. There are basically several ways of sketching what the combined magnetic field map for two dipoles (magnets) will look like. Keep in mind, you don't have to only use points where field lines cross. You can estimate the direction and relative strength of the field (i.e. - the vector) at places between the field lines.

3. Use the Magnetic Dipole Magnetic Field Map on page 3 as a model for the field map for each magnet and estimate how the field vectors from each magnet add up to answer the questions below. You will be adding vectors at points on the equidistant line only, so you'll need to estimate the field vector direction and strength from each magnet at points between the flux lines.

   1. For Orientation 1, at each point, A, B, and C, sketch the magnetic field vectors from each magnet and the resultant total magnetic field vector. Don't get too sophisticated – you can use four different vector lengths, zero, weak, medium and strong for the individual magnets and then estimate the resultant's length and direction. Remember that a weak vector added to a strong vector will tend to be a bit longer than the strong one and pulled a bit toward the weaker one's direction.

   2. Do the same for Orientation 2, 3, and 4. Make the length of the vectors on all four maps consistent with each other so you can answer the last question:

   3. Which configuration gives you the strongest field and at which point, A, B or C?

Problem EC-6b

1. Read the lab and answer the METHOD QUESTIONS as written and then make your PREDICTIONS. Remember that “weight” is the force on a mass due to gravity at the earth's surface. Also keep in mind that you will be passing current through a horizontal wire that runs through a horizontal magnetic field that is perpendicular to the current. So, the direction of the force will be up or down. This is why we are talking about changes in weight (force of gravity).
Equidistant Line

\[ \text{5 cm} \]

\[ \text{5 cm} \]
Magnetic Dipole Magnetic Field Map (solid lines)

This is the field map for an electric dipole from Fig. 16.10(b) with a bar magnet replacing the pair of opposite charges. The magnetic dipole magnetic field pattern is very much like that of the electric dipole except in the vicinity of the dipole itself. Ignore the dashed lines, which are equipotential lines corresponding to the electric dipole field.