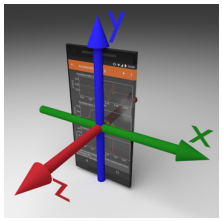
1. Smartphones use hall effect based magnetometer to measure the magnetic field in the vicinity. The magnetometer measures the magnetic field in x, y, z directions. Figure below shows the directions employed in the problem.



Note that the origin shown in the diagram does not necessarily depict the location of the magnetometer in the phone.

The magnetometer sensor is located on the circuit board of the phone and not visible from outside.

(a) Click on Expt-1.1.html. You are given a magnet (shown by red/blue box) and a smartphone lying on the floor. The panel also displays the values of the x and y components of the magnetic field as the magnet is moved.

screenshot of the screen

Obtain the location of the magnetometer on the phone.

(b) Move the magnet along the x axis and note down the magnetic field (B_x) for each distance x from the magnetometer. Write B_x and corresponding x values in the table below.

screenshot of the screen

Plot a suitable graph and obtain the dipole moment of the magnet from the graph. **3 column table goes here**.

(c) Click on Expt-1.2.html. Along with the smartphone and the magnet from the previous parts, a hollow pipe (opened at both the ends) is also given to you. All three equipments are movable and can be rotated in the plane. The pipe has three parts; one part is purely made of copper, another part is purely made of aluminium and the third part is made of wood. Materials are not necessariliy in this order. Magnet can be dropped in the pipe by drag and released using the mouse.

screenshot of the screen

something about the eddy current in the pipe, equation of motion of the pipe with a resistive term.

Write the values of B_x for different time t as magnet moves in the pipe. Plot a suitable graph and obtain the velocity of the magnet, and lengths of each part in the pipe from the graph.

** four column table goes here**