

PHYS 102 Experiment 5. Charged Particle in a Magnetic Field

Preliminary work:

Study “Section 27.4 Motion of Charged Particles in a Magnetic Field” of the textbook.

Online Experiment Link:

<https://ophysics.com/>

Procedure:

1. Open the website given under the “Online Experiment Link”. From the top menu choose the menu item “E&M”, and from the appearing drop-down menu choose the experiment “Charged Particle in a Magnetic Field”.
2. Read the description given at the bottom of the page.

PART A

3. Set the “Mass” parameter to $5 \times 10^{-25} \text{ kg}$, “Charge” parameter to $2 \times 10^{-16} \text{ C}$, and the “Magnetic Field Strength” parameter to 10 T . Check the box “Show Radius”. By varying the “Velocity” parameter and noting the value of the radius R of the track, complete the table below.

$v(10^6 \text{ m/s})$	5	6	7	8	9	10
$R(10^{-3} \text{ m})$						

4. Plot R (on the vertical axis) versus v (on the horizontal axis) on a graph paper. You should have a straight line.
5. Measure the slope of the straight line from the plot.
6. Use the value of the slope you found to calculate the q/m ratio of the particle, and compare it with the value given in the simulation.

PART B

7. Set the “Mass” parameter to $5 \times 10^{-25} \text{ kg}$, “Velocity” parameter to $10 \times 10^6 \text{ m/s}$, and the “Charge” parameter to $2 \times 10^{-16} \text{ C}$. Check the box “Show Radius”. By varying the “Magnetic

Field Strength” parameter and noting the value of the radius R of the track, complete the table below.

$B(T)$	-1	-2	-3	-4	-5	-6	-7	-8	-9	-10
$R(10^{-3}m)$										
$1/B(T^{-1})$										

8. Plot R (on the vertical axis) versus $|1/B|$ (on the horizontal axis) on a graph paper. You should have a straight line.

9. Measure the slope of the straight line from the plot.

10. Use the value of the slope you found to calculate the q/m ratio of the particle, and compare it with the value found in Part A.

11. Write a properly formatted report of your results, convert it into a PDF file and upload it to MOODLE. Deadline for submission is Monday, 17 August 2020 at 07:59 (am). Late submissions will result in deduction of 10 points for each day late.