ECE343 Spring 2025

Objective 7.1:

Biot Savart



SCHEDULE

Lesson	Topics	Reading	Notes
24	BVP (Capacitor, Coax), Electric Potential	5.16	LO 5.3
25	Electric Boundary Conditions	5.18-5.22	LO 5.4
26	BC's/Capacitance	5.23-5.24	
27	Electrostatic Lab	Lab packet	
Chapter 6: Steady Current & Conductivity			
28	Current density, Conductivity, Resistance	Ch. 6	
Chapter 7: Magnetostatics			
29	Magnetic Fields, Gauss' Law for Magnetism	7.1-7.3	LO 7.1-7.2 **GR 2**
30	Ampere's Law	7.4-7.5, 7.9	LO 7.3
31	Ampere's Law Applied	7.6-7.8	LO 7.3
32	Magnetic Boundary Conditions	7.10-7.14	LO 7.4
33	Magnetostatics Lab	Lab packet	
Chapter 8: Time-Varying Fields			
34	Faraday's Law, Displacement Current, Maxwell Eqns	8.3, 8.8, 8.9	LO 8.1
35	Faraday's Law, Displacement Current, Maxwell Eqns	8.3, 8.8, 8.9	LO 8.2-8.3
Chapter 9: Plane Waves in Lossless Media			
36	Maxwell's Equations in lossless, source-free region	9.1-9.2	LO 9.1
37	Maxwell's Equations in lossless, source-free region	9.1-9.2	LO 9.1
38	Uniform Plane Waves & Polarization	9.4-9.6	LO 9.2-9.3
39	Normal Incidence	Vol 2, 5.6-5.7	LO 9.4-9.5
40	Oblique Incidence	Vol 2, 5.6-5.7	LO 9.5
41	Oblique Incidence	Vol 2, 5.6-5.7	LO 9.5
42	Incidence Lab	TBD	LO 9.5

Ch 7 Learning Objectives

7.1 I can use the Biot-Savart law to simple magnetostatic systems to find the magnetic field at an observation point.

7.2 I can articulate the meaning of both the integral form and point form of Gauss' Law for magnetism.

7.3 I can use Ampere's Law to calculate the magnetic field at an observation point for simple magnetostatic systems.

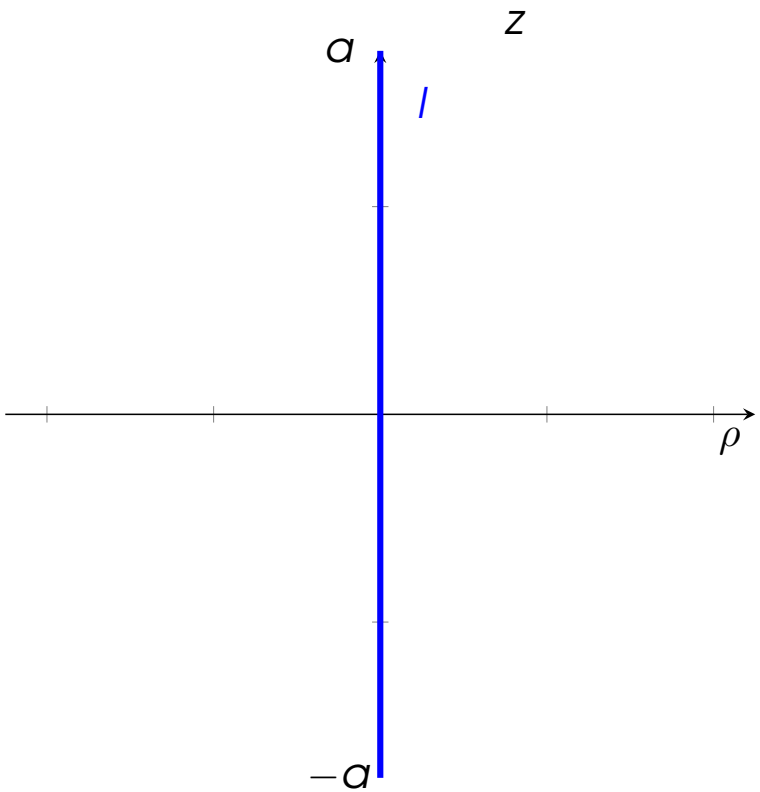
7.4 I can apply the magnetic field boundary conditions to calculate magnetic fields on both sides of a material boundary.

Similarities to Electrostatics

Electrostatics	**Magnetostatics**
$\vec{E}$ (V/m)	
$\vec{D}$ (C/m^2)	
$\vec{D} = \varepsilon \vec{E}$	
$\vec{E} = \int \frac{dQ}{4\pi\varepsilon \lvert R \rvert^3} \vec{R}$	
$\iint \vec{E} \cdot \vec{dS} = \frac{Q_{\text{encls}}}{\varepsilon}$	

Biot-Savart: Line Charge

Find $\vec{H}$ at a distance b from the LC.



1. Draw a picture
2. Biot-Savart: $\vec{H} =$
3. $\vec{R} =$

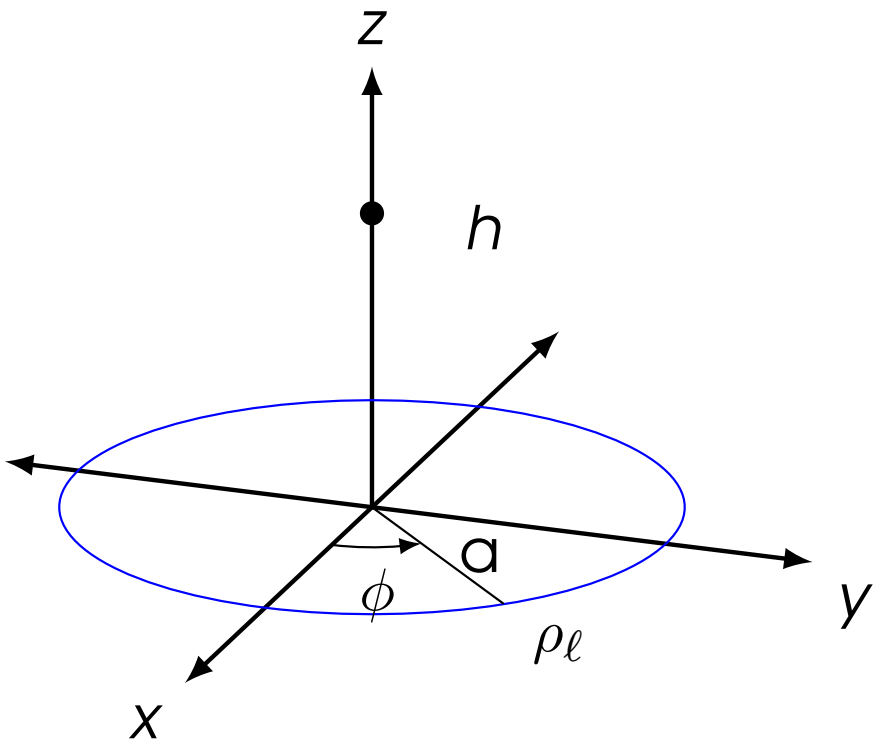
   $|R| =$
4. $\vec{d\ell} =$
5. $\vec{d\ell} \times \vec{R} =$

Biot Savart: Line Charge

6. Integrate! for "infinite" wire $\Longrightarrow a >> b$

Biot-Savart: Wire Loop

Find $\vec{H}$ at $z = h$.



1. Draw a picture
2. Biot-Savart:
3. $\vec{R} =$
4. $|R| =$
5. $\vec{d\ell} =$
6. $\vec{d\ell} \times \vec{R} =$

Biot-Savart: Wire Loop

