

Reading suggestions

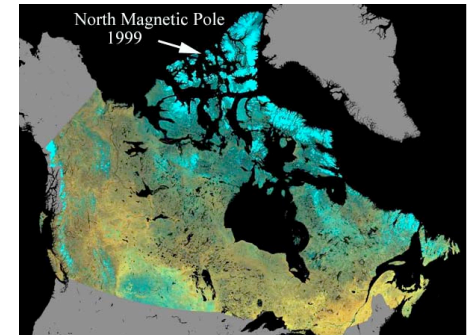
- Fri/Today: 27.1 - 27.5
- Wed: 28.1 - 28.3
- Fri: 28.4 - 28.6

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Compass

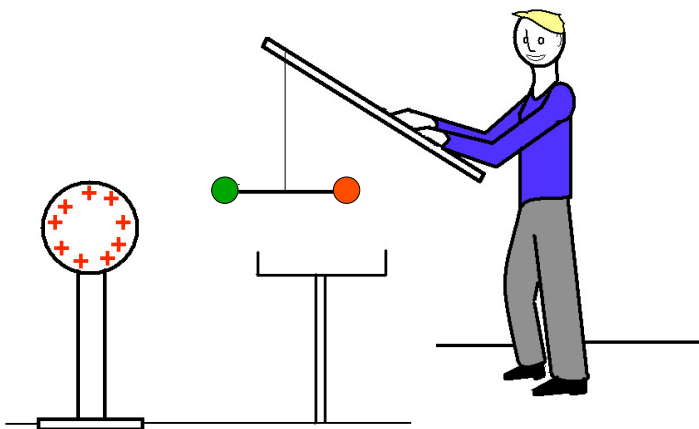
- Freely rotating magnets point towards earth's (magnetic) north pole



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Reminder: Electric Dipole in Electric Field

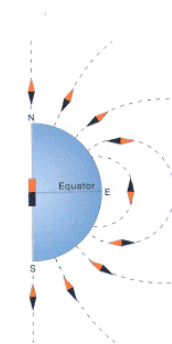


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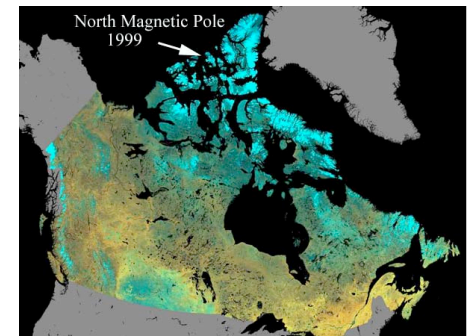
Compass

- Freely rotating magnets point towards earth's (magnetic) north pole

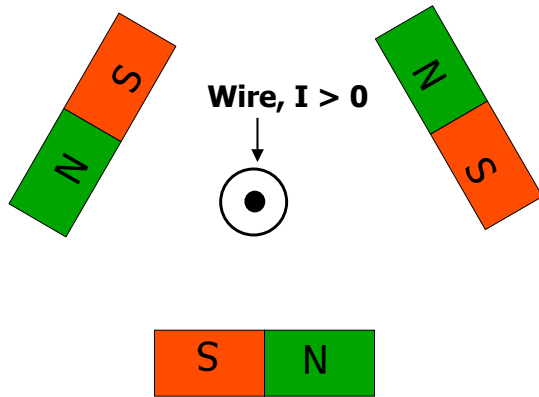


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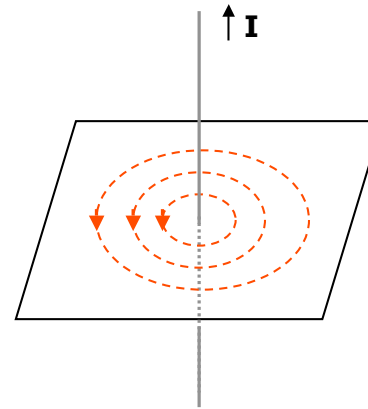
Currents and Magnetic Field



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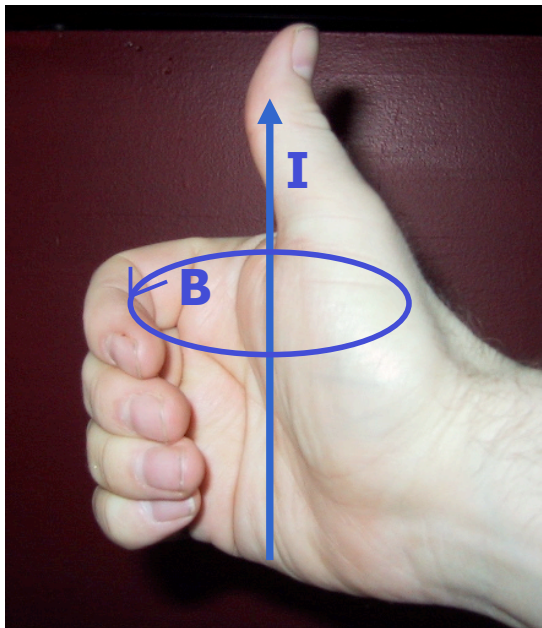
Currents and B-Field



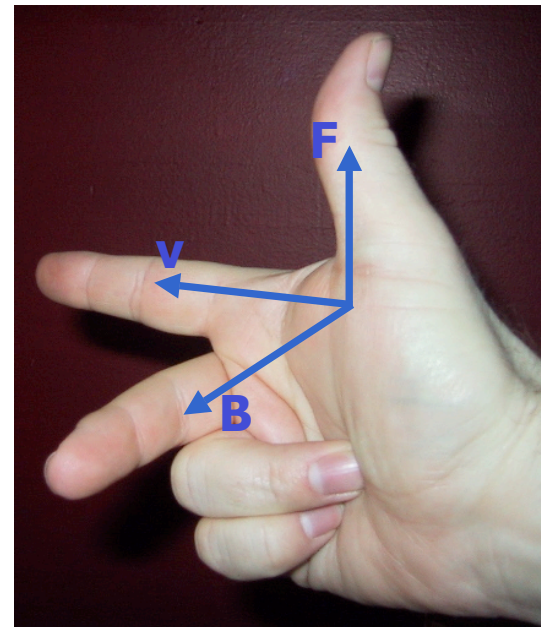
- Current as Source of B
- Magnetic Field lines are always closed
 - no Magnetic Charge (Monopole)
- Right Hand Rule

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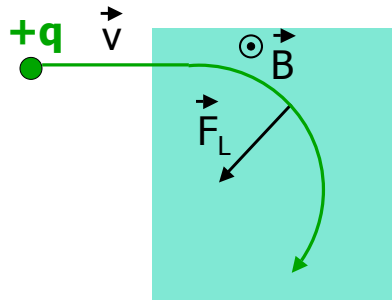
Corkscrew-Rule



$$\vec{F} = q \vec{v} \times \vec{B}$$

Right-Hand Rule

Free Charges and Magnetic Field



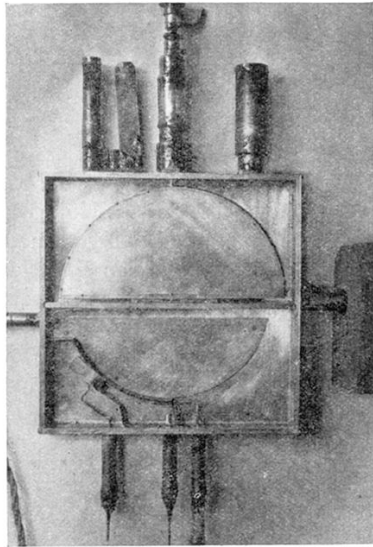
$$\vec{F}_L = q (\vec{E} + \vec{v} \times \vec{B})$$

Lorentz Force

$[B] = N/(A \cdot m) = T$ (Tesla)

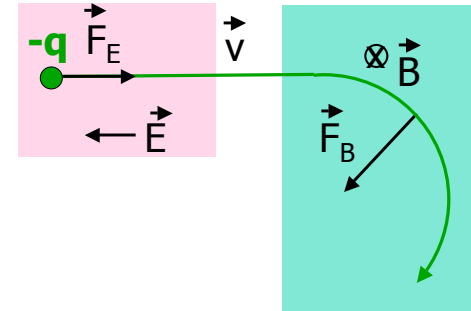
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Ma Fig. 3. Tube for the multiple acceleration of light ions—with cover removed.

Force on moving charge



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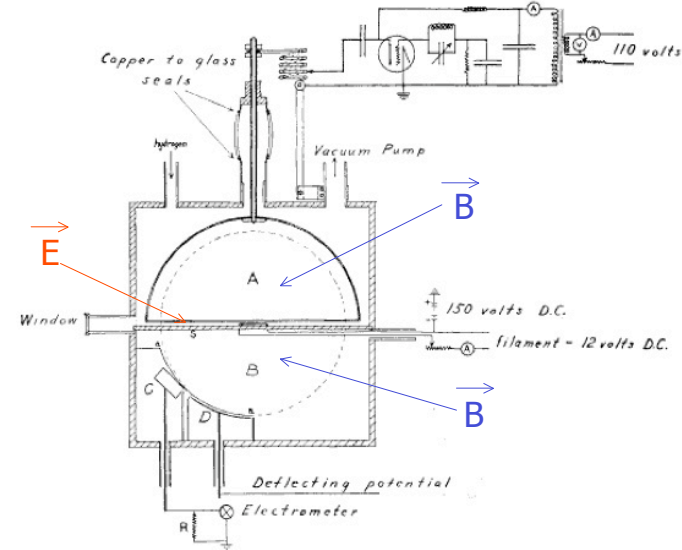


Fig. 2. Diagram of apparatus for the multiple acceleration of ions.

Example of a Cyclotron

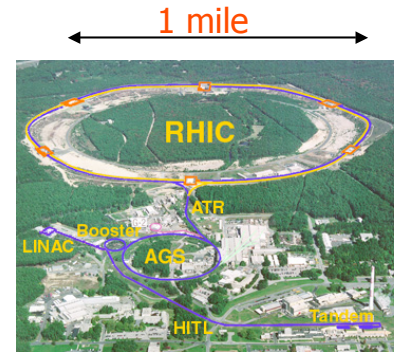


LEP (Large Electron Positron Collider)

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Another example



- Why so big?

$$R = m v / (q B)$$

Momentum \vec{p}

- Large $p \rightarrow$ Large R
- $B \sim 10\text{T}$ (very big!)
- Max. B in Lab around 40 T

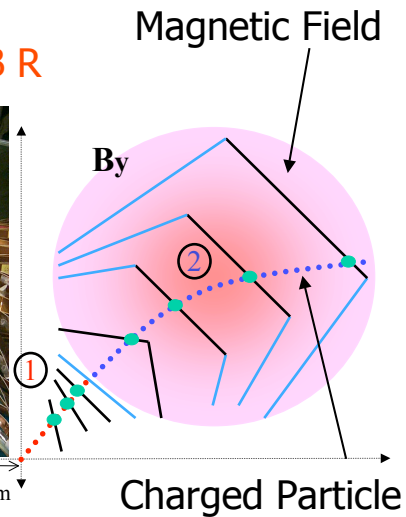
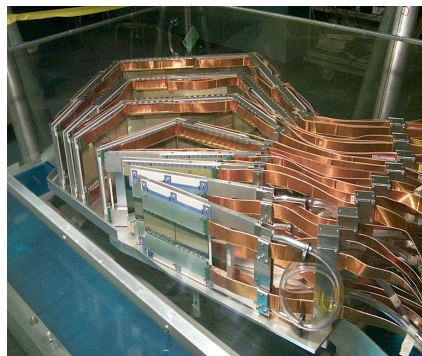
Relativistic Heavy Ion Collider

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Magnetic Spectrometer

$$R = m v / (q B) \rightarrow p = q B R$$



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