Lezione #15

7/5/2024

Data seconda prova in itinere:

⇒ 29/5/2024 orario da fissare

- CAMPO MAGNETICO -

↳ $\vec{B}$

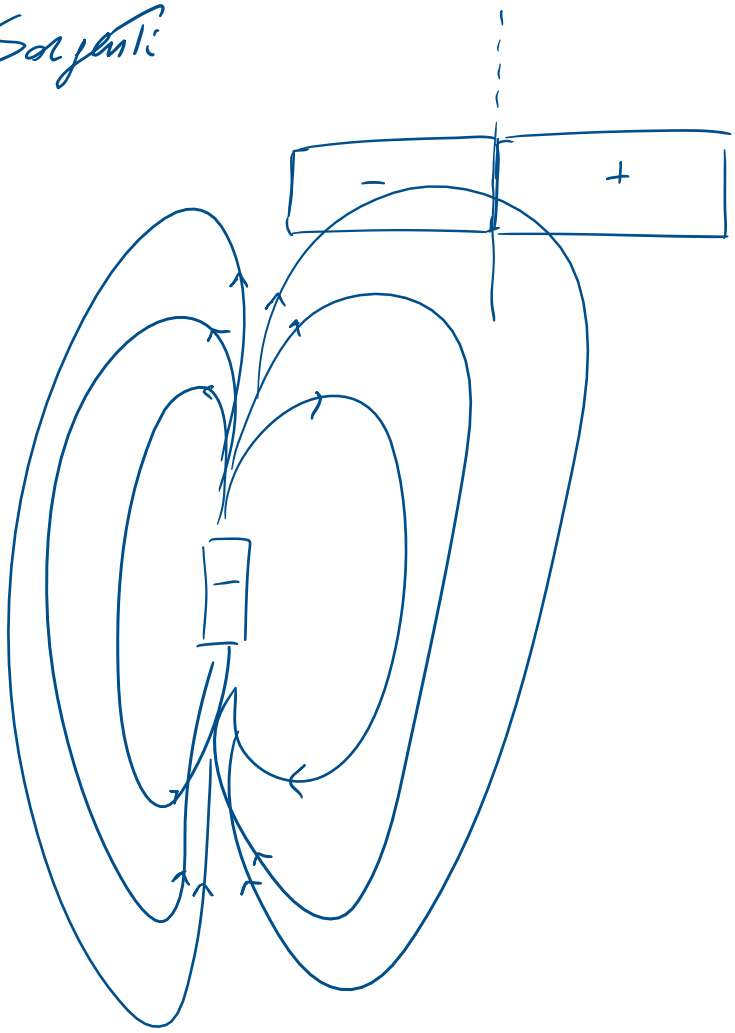
$[B]$ = Tesla = T

Sorgenti di $\vec{B}$ → Magneti permanenti (calamite etc...)

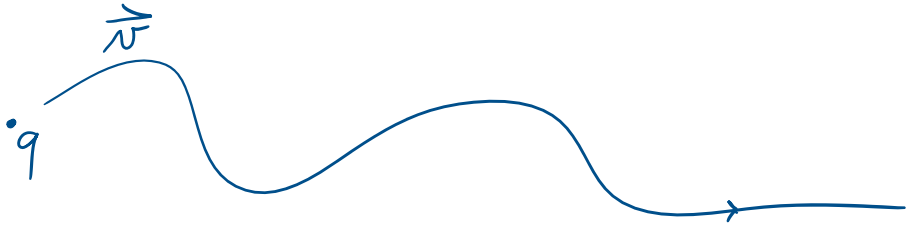
→ q $\vec{v} \neq \vec{0}$

$\vec{E} \leftrightarrow \vec{B}$

Sorgenti



Come ci accorgiamo che $\vec{B} \neq \vec{0}$?



Forza di Lorentz:

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

$$[F_L] = N \; !!!!!$$

$l_L = q v \times B$

"vettori"

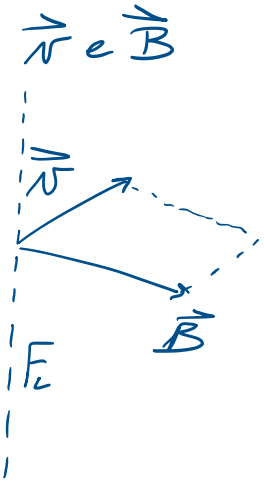
$\times$: prodotto vettoriale

$\left(\vec{M} = \vec{r} \times \vec{F}\right)$ analogamente: $\vec{v} \times \vec{B}$

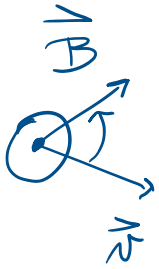
$\vec{F}_L$ = vettore $= q\left(\vec{v} \times \vec{B}\right)$

Modulo: $F_L = q v B \sin\theta$

Direzione: $\perp$ al piano che formano $\vec{v}$ e $\vec{B}$



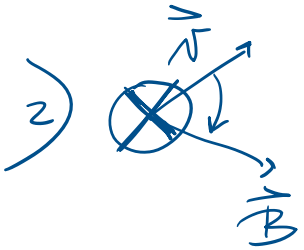
Verso: 1)



$\vec{v}$ ⟳ $\vec{B}$ senso antiorario

$\odot$ $\vec{F}_L$

$\vec{v}$ ⟲ $\vec{B}$ senso orario

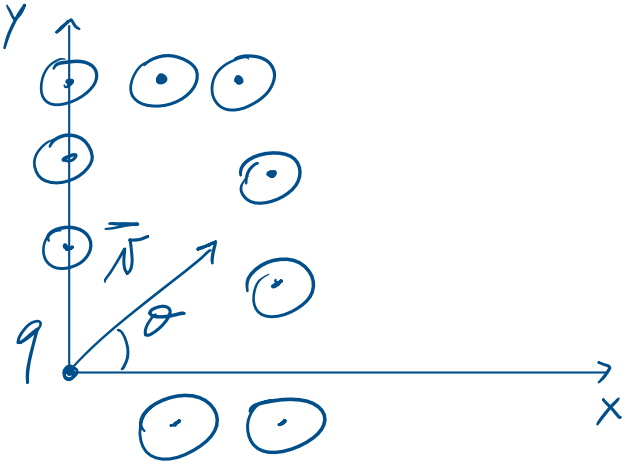


$\vec{v} \cap \vec{B}$ senso orario

$\otimes$ F_L

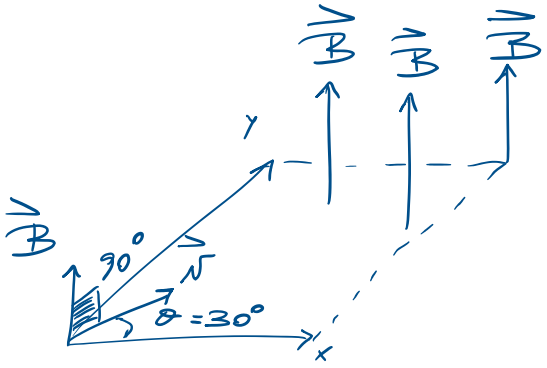
Esercizio:

Sia data una carica $q = 1{,}6\,10^{-19}$ C che si muove con una velocità $v = 2 \cdot 10^6$ m/s con $\vartheta = 30°$. Calcolare la forza di Lorentz agente su q se questa fosse immersa in un campo mag. $B = 3$ T orientato come in figura:

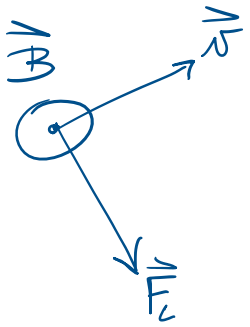


$F_L = ?$

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



$$F_L = qvB\sin(90°) = 9{,}6\,10^{-13}\,N$$



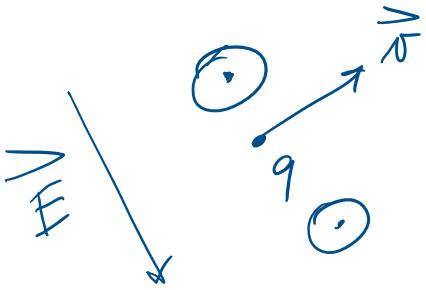
Mano sinistra:

indice $\Rightarrow \vec{B}$

medio $\Rightarrow \vec{v}$

pollice $\Rightarrow \vec{F}_L$

- SOVRAPPOSIZIONE $\vec{E} + \vec{B}$?



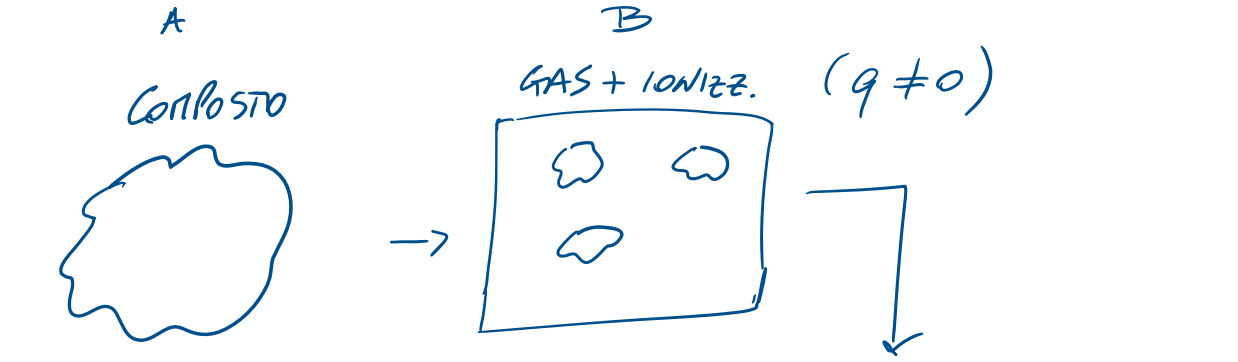
1) SPETTROMETRIA DI MASSA

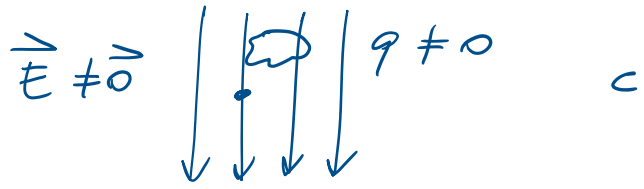
↳ Tecnica di analisi di composti chimici per rivelarne la struttura/composizione

↳ $m/z \rightarrow m/$

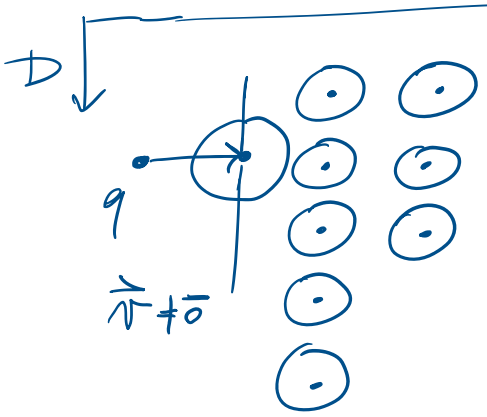
↳ $m, z \rightarrow m/z$

- Tecnica invasiva ↳ campione viene distrutto (RMN diffente)

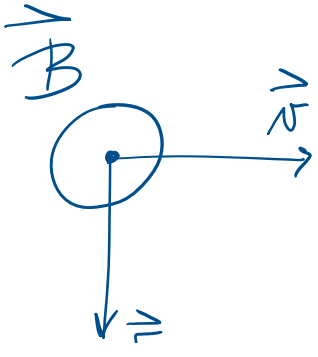




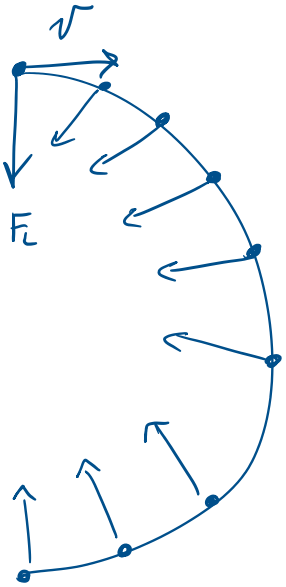
$\vec{F_c} = q\vec{E}$



$\vec{B} \neq \vec{0}$



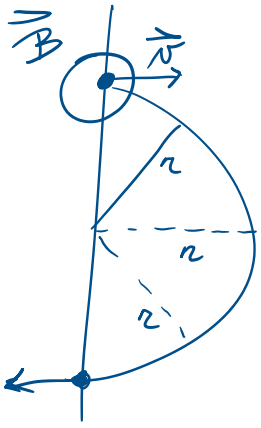
da su q agisce una F_c



Si muove su un arco di circonferenza

$$\vec{F} = m\vec{a}$$

essendo una F centripeta $\boxed{a = \frac{v^2}{r}}$



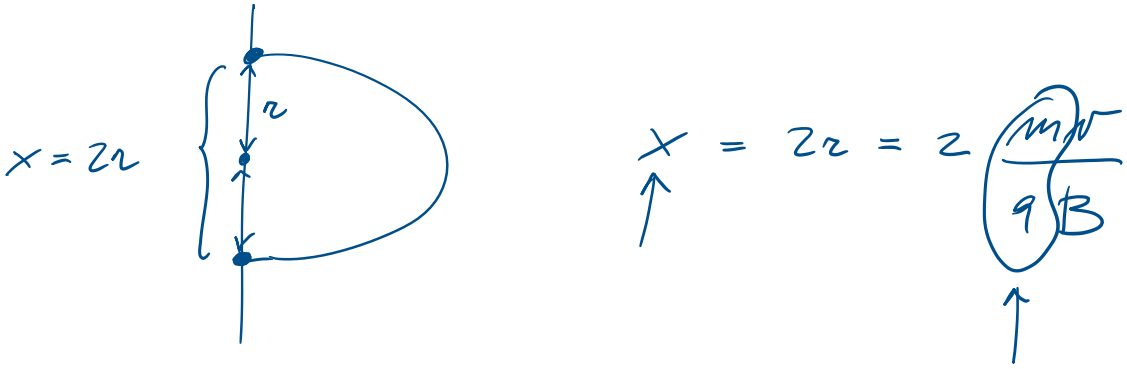
$$F = ma = m\frac{v^2}{r} = F_L = qvB\sin\vartheta \quad (\vartheta = 90°)$$

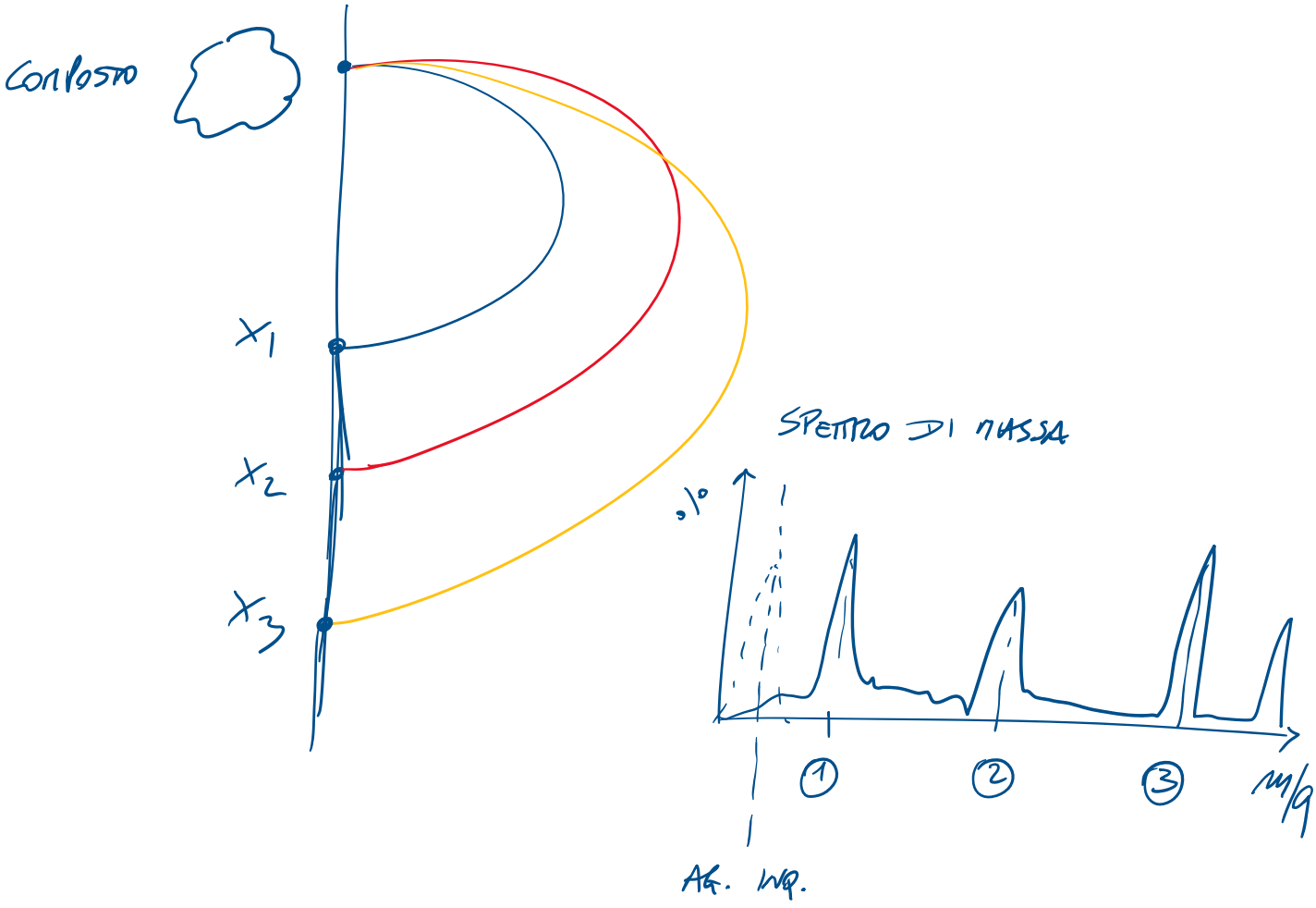
$$m\frac{v^2}{r} = qvB$$

$$\boxed{r = \frac{mv}{qB}}$$

v, B li fisso io

Se ho stesso r $\Rightarrow$ quanto vale m/q !

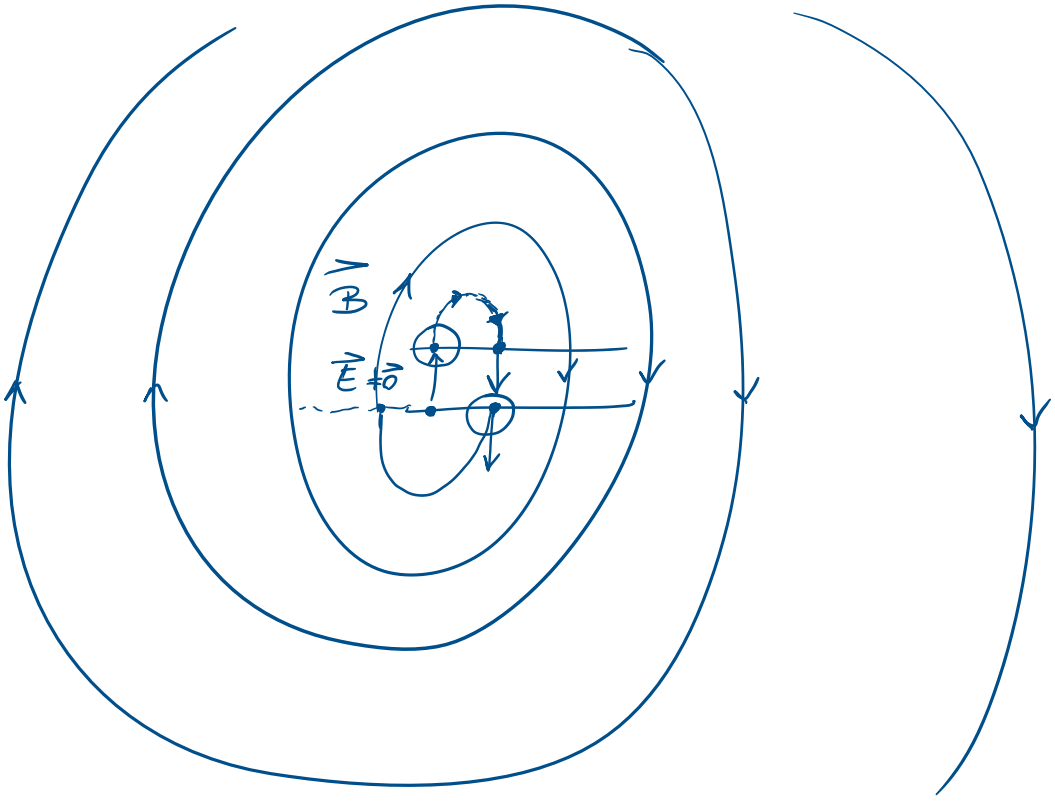




2) CICLOTRONE (SINCROTRONE)

Accelerare una particella carica

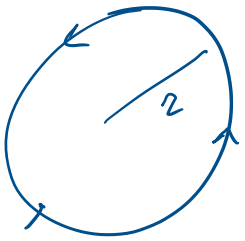
$(\vec{E} + \vec{B})$



Traiettoria a spirale, ad ogni passaggio si inverte $\vec{E}$ e la particella acquista energia. Quando ha raggiunto l'energia necessaria viene deviata
- → esperimento di Fisica nucleare
- → radioterapia

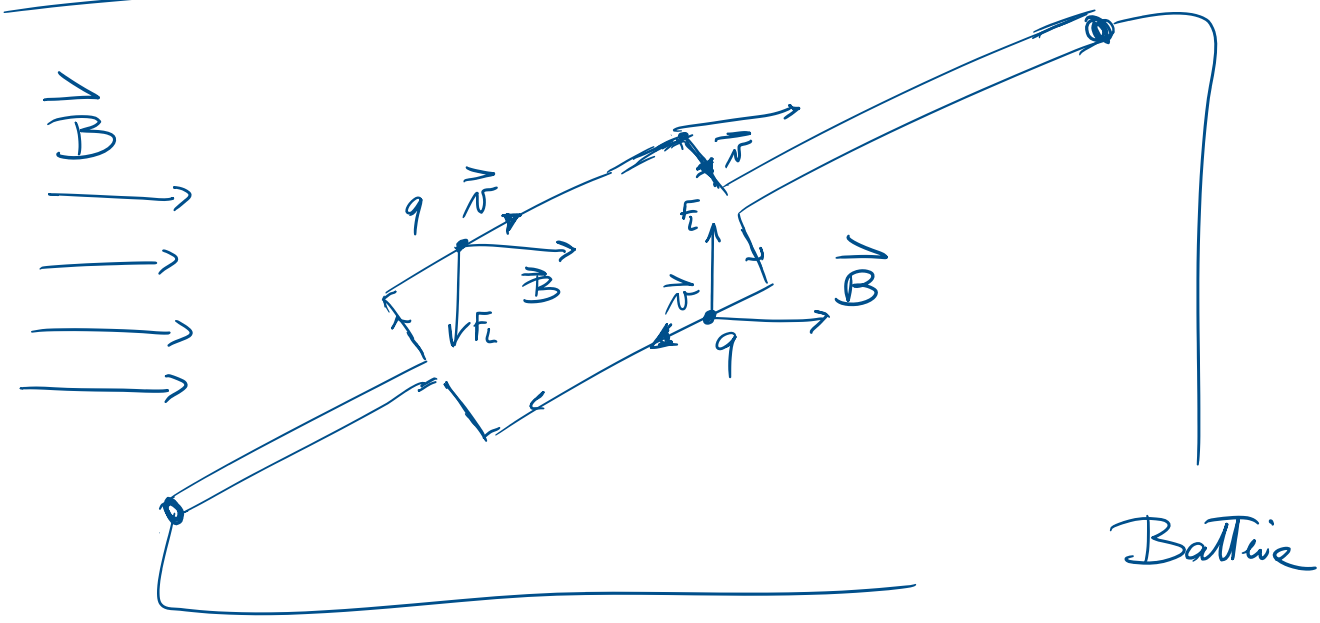
- SINCROTRONE → stesso meccanismo ma ad ogni passaggio la particella viene spinta di nuovo sulla stessa traiettoria →

Stesse traiettorie $\rightarrow$ traiettorie circolari fisse

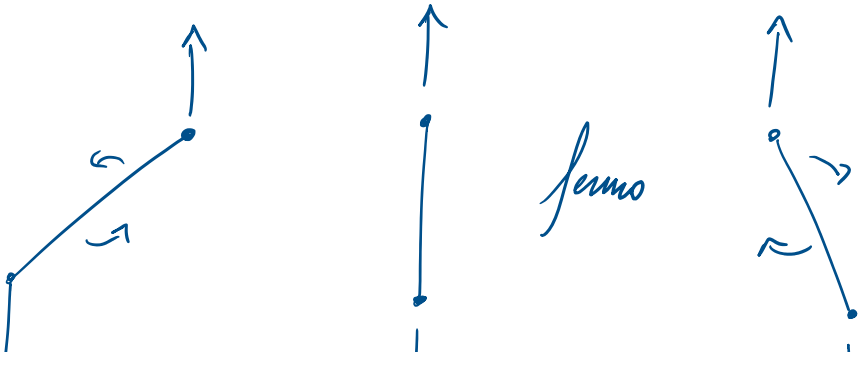


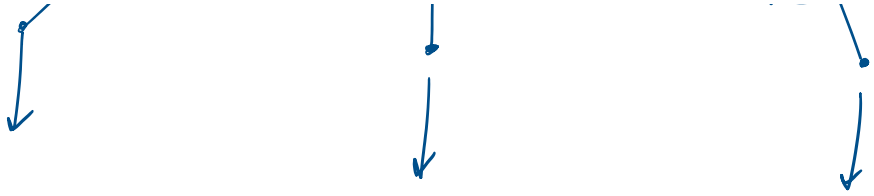
2 fisso

MOTORE ELETTRICO



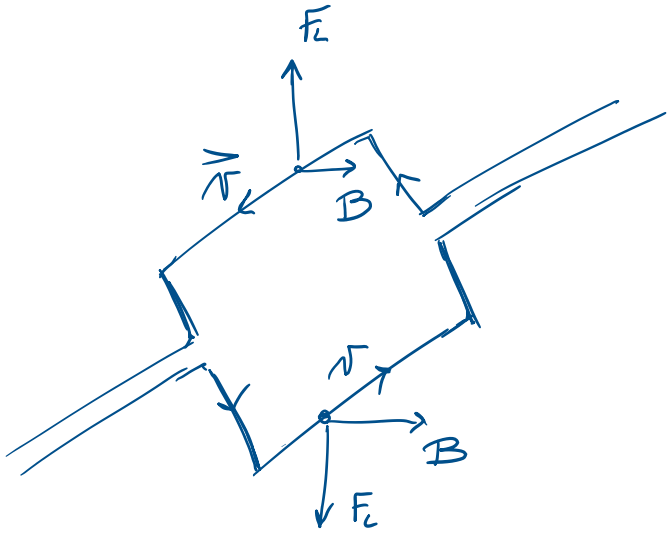
In questo modo ruota per un giro ma poi si ferma



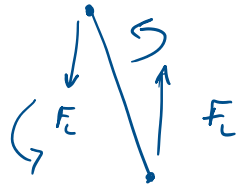


equilibrio

Per continuare a girare si inverte la corrente!



$\Rightarrow$



Stesso identico meccanismo è alla base della RMN