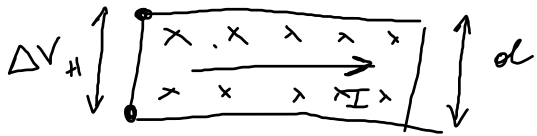
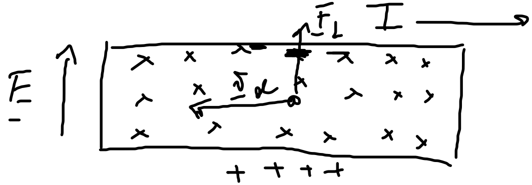
Effetto Hall





Se $\underline{B} \neq 0$

$$\underline{F}_L = \overbrace{-e}^{\text{carica el.}}(\underline{v}_d \times \underline{B})$$

$$\underline{F}_E = -e\underline{E}$$

$$-\cancel{e}\,\underline{E} - \cancel{e}(\underline{v}_d \times \underline{B}) = 0 \,; \quad \underline{E} = -(\underline{v}_d \times \underline{B})$$

$$|\underline{E}| = v_d B \sin 90^\circ = v_d B$$

$$\Delta V_H = E d = v_d B d$$

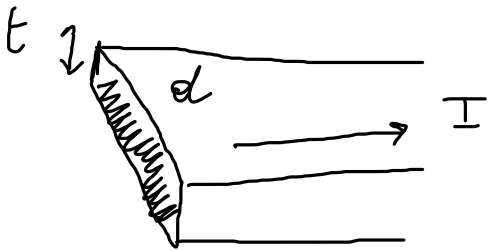
E uniforme

$$\Delta V_H = v_d B d$$

$$j = n v_d e$$

$$I = j \cdot S = j t d \; ; \; j = \frac{I}{td}$$

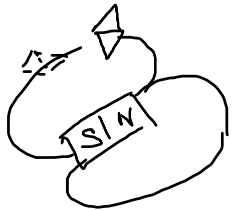
sezione attraversata

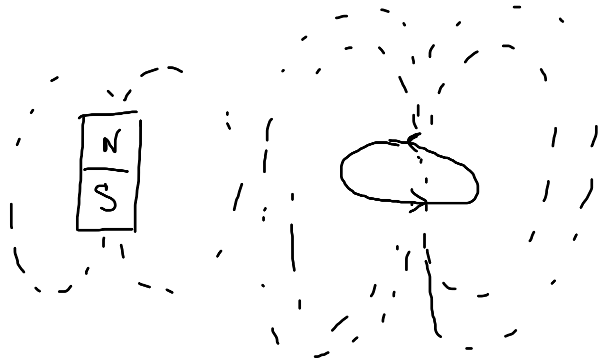


$$v_d = \frac{j}{ne} = \frac{I}{netd}$$

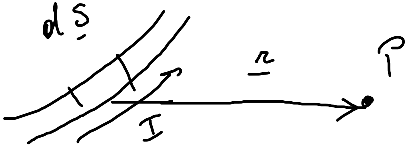
$$\Delta V_H = \frac{I}{net\cancel{d}} B \cancel{d} = \frac{I}{net} B$$

Esperimento di Oersted





$\|\hat{\underline{r}}\| = 1$

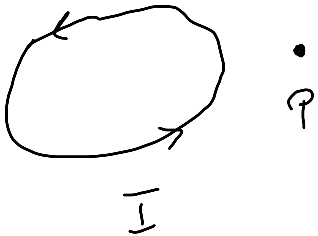


$$d\underline{B} = \frac{\mu_0}{4\pi} I \frac{d\underline{s} \times \hat{\underline{r}}}{r^2}$$

μ_0 : permittività magnetica del vuoto

$$[\mu_0] = 4\pi \cdot 10^{-7} \frac{Tm}{A}$$

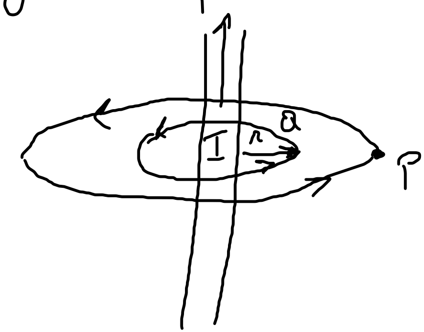
Circuito con I



$$\underline{B}(P) = \sum_{\text{circuito}} d\underline{B}(P)$$

$$= \frac{\mu_0}{4\pi} I \int_{\text{Circuito}} \frac{d\underline{s} \times \hat{\underline{r}}}{r^2}$$

<u>Filo indefinito percorso da I</u>

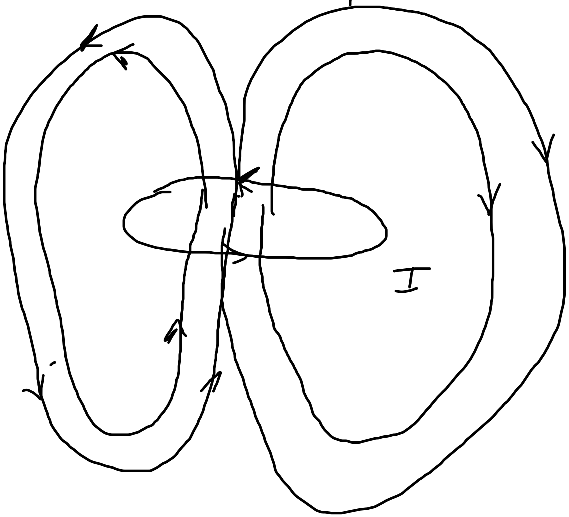


Linee di campo: circonferenze centrate nel filo

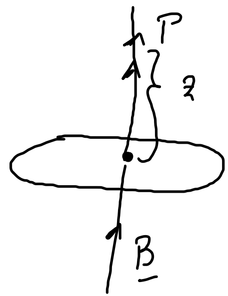
$$B(r) = \frac{\mu_0}{2\pi} I/r$$

r: distanza del punto dal filo

Spira circolare percorsa da I



Sull'asse della spira



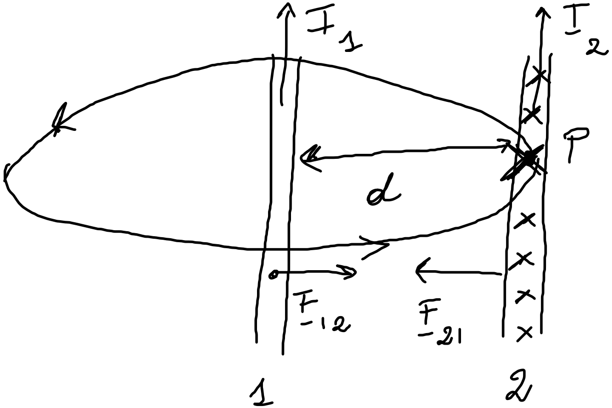
$$B(z) = \frac{\mu_0 I a^2}{2(a^2+z^2)^{3/2}}$$

a: raggio della spira

Se $z \gg a$

$$B(z) \approx \frac{\mu_0 I a^2}{2(z^2)^{3/2}} \propto \frac{1}{z^3}$$

Forza tra fili percorsi da corrente



Oss: i fili si attraggono

In P il filo 1 produce
un $\underline{B}$ entrante

In tutti i pti del filo 2
il filo 1 produce un $\underline{B}$ entrante
e uniforme

$$B = \frac{\mu_0}{2\pi}\frac{I}{d}$$

$$\exists\ \underline{F}_{21} = I_2\, \underline{L}_2 \times \underline{B}_1$$

$\underline{F}_{21}$ è attrattiva (se I_1 e I_2 sono equiversi)

Se I_1 e I_2 sono in verso opposto, $\underline{F}_{21}$ è repulsiva

$$|\underline{F}_{21}| = I_2 L_2 B_1 = I_2 L_2 \frac{\mu_0}{2\pi} \frac{I_1}{d} = \frac{\mu_0}{2\pi} \frac{I_1 I_2 L_2}{d}$$

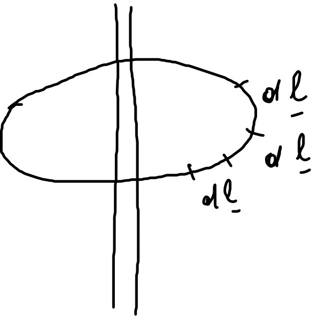
Suppongo $d = 1\ m$ L abbastanza grande

$L >> d$

Supponiamo che $I_1 = I_2 = 1\ A$;

$$\frac{|F_{21}|}{L_2} = \frac{\overbrace{4\pi \cdot 10^{-7}}^{\mu_0}}{2\pi} \cdot \frac{1}{1} = \underline{\underline{2 \cdot 10^{-7}}}\ N$$

Circuito geometrico

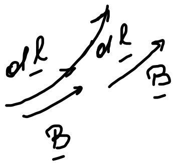


$$\sum \underline{B}\cdot d\underline{l} \rightarrow \oint_C \underline{B}\cdot d\underline{l}$$

Circuitazione di $\underline{B}$ lungo il circuito C

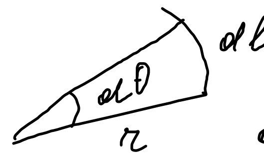
Calcolo se: $\underline{B}$ prodotto dal filo indef.

C : circonf. di raggio r



$\underline{B} \parallel d\underline{l}$ lungo la circonf.

dl : piccolo elemento di arco



$$\underline{B}\cdot d\underline{l} = B\,dl =$$

$$= B\,r\,d\theta$$

$$= \frac{\mu_0}{2\pi}\frac{I}{\cancel{r}}\cancel{r}\,d\theta = \frac{\mu_0 I}{2\pi}\,d\theta$$

$$dl = r\,d\theta$$

$$\oint_C \underline{B}\cdot d\underline{l} = \int \frac{\mu_0}{2\pi} I \, d\theta = \frac{\mu_0}{2\pi} I \int_0^{2\pi} d\theta = \mu_0 I$$

$$\oint_C \underline{B}\cdot d\underline{l} = \mu_0 I_{conc}$$

I_{conc} : I racchiusa da C