①

$\Phi(B)=0$
$\Phi(E)=\frac{q}{\epsilon_0}$] → leggi Gauss

$\oint \vec{E}\, dl = \frac{-\Delta\Phi(B)}{\Delta t}$

pres. nel filo I_S (quota dielettrico) tra piastre condens. e lo allinea con dir. corrente)

$\oint \vec{B}\, dl = \mu_0 \cdot \sum I \text{ conc.} \;/\; \mu_0\left(I_c + \epsilon_0 \cdot \frac{\Delta\Phi(E)}{\Delta t}\right)$

$F_L = q \cdot v \cdot B \qquad F_{cen} = \frac{mv^2}{R} \qquad F_{cen} = F_L \Rightarrow q \cdot v \cdot B = \frac{mv^2}{R} \Rightarrow q \cdot B = \frac{m \cdot v}{R}$

Nello spettrometro di massa si selez. cariche dove $F_{ce} = F_L$ (ris. è 0)

$q \cdot E = q \cdot v \cdot B \Rightarrow E = v \cdot B \qquad v = \frac{E}{B} \qquad v = \frac{q \cdot B \cdot z}{m} \to F_L = F_{cen}$

Se F_L agisce solo su comp. perpendicolare $\Rightarrow q \cdot B = \frac{m \cdot v_\perp}{R} \Rightarrow R = \frac{m \cdot v_\perp}{q \cdot B}$

Il passo della particella è elicoidale $\left(v_x = \frac{2\pi z}{v_y}\right)$

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

SPIRA $\Rightarrow B = \frac{\mu_0 \cdot I}{2 d \text{ (raggio)}}$

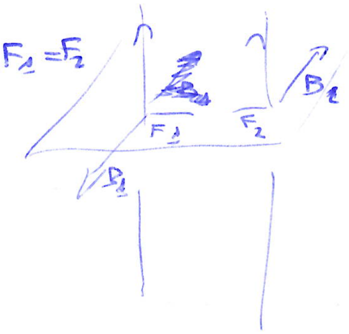
bobina cilindrica
SOLENOIDE $\Rightarrow B = \mu_0 \frac{N}{\ell} \cdot I$

] → leggi Biot - Savart (calcolo campo magnetico generato da I in filo/spira/solenoide)

F_L nella sezione di un filo $= q_1 v B + q_2 v B + q_3 v B + \dots q_n v B$

$F_{L\,TOT} = vB \cdot \sum_i q \qquad v = \frac{\Delta\ell}{t} \Rightarrow \ell \cdot B \cdot \frac{\sum q}{\Delta t} \Rightarrow \ell \cdot \underset{\text{vett.}}{B \cdot I} \,(B \cdot I \cdot \sin\alpha)$

su 2 fili: $F_{L_1} = I \cdot \ell \cdot \frac{\mu_0 I_1}{2\pi d} \qquad F_{L_2} = \ell\, I \cdot \frac{\mu_0 I_2}{2\pi d} \Rightarrow F_1 = F_2$

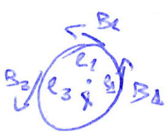


$\frac{F}{\ell} = (\mu_0 \cdot I_1 \cdot I_2)/2\pi d \Rightarrow \frac{2\cancel{\cdot 4\pi} \cdot 10^{-7} \cdot I_1 \cdot I_2}{\cancel{2\pi}\, d}$

1A produce forza per unità di lunghezza di $2 \cdot 10^{-7} \frac{N}{m}$

$\oint \vec{E} = 0 =$

$\oint B\, dl = B \cdot \ell \Rightarrow \sum B \cdot \Delta\ell_i$



x = entrante
· = uscente

$\oint B\, dl = \cancel{2\pi d} \cdot \frac{\mu_0 I}{\cancel{2\pi d}} = \mu_0 \cdot (\text{somm. alg. } I)$

$I > 0$ se verso = a comp. magn
$I < 0$ se verso opp. a comp. magn

Solo le correnti concatenate contribuiscono

$$AB = \vec{B} \times \vec{l} = 0 \left(\cos \frac{\pi}{2}\right) = CD = 0$$

(scalare)

$$\oint \vec{B}\, d\vec{l} = AB + BC + CD + DA = 0 + \frac{\mu_0 I}{2\pi R} \cdot \pi R + 0 + \frac{\mu_0 I}{2\pi z} \cdot \pi z = 0$$

$\oint B$ non è conservativa $(\neq 0)$

MATERIALE → FERROMAGNETICO (attratto da magneti)
→ DIAMAGNETICO (debolmente respinto)
PARAMAGNETICO (debolmente attratto)

Henry e Faraday studiano generazione I da variazione $\Phi(B)$

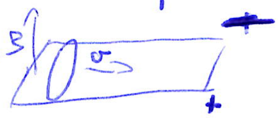
$\Phi(B)$ aumenta → si genera I con verso opposto

$\Phi(B)$ diminuisce → si genera I con verso concorde

$$f.e.m. = \frac{-\Delta\Phi(B)}{\Delta t} = \frac{-B \times S}{\Delta t} = \frac{-B \cdot S \cdot \cos\alpha}{\Delta t}$$

varia B → correnti parassite (rallentano ogg., es. tapis roulant magn., freni treni)

varia S →

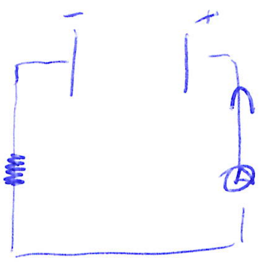


$v = \frac{s}{t}$ $\quad l = v \cdot t \quad S = l_1 \cdot v \cdot t \quad f.e.m. = \frac{-B \cdot l \cdot v \cdot t}{t}$

si genera diff. potenziale (Hall $\Delta V = B \cdot l \cdot v$) → $E_{Hall} \, l = \Delta V_{Hall}$

($E = B\,v$)

CARICA CONDENSATORE



$V_0 - V_C - RI = 0 \qquad I = \frac{q}{t} \qquad V_C = \frac{q}{C}$

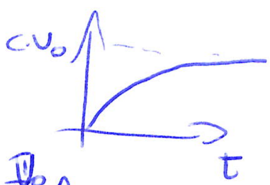
$\to I = q'$

$V_0 - \frac{q}{C} - Rq' = 0$

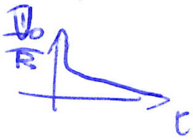
$q(t) = C \cdot V_0 \left(1 - e^{-t/\tau}\right) \qquad \tau = R \cdot C \Rightarrow \frac{V}{A} \cdot \frac{Cou}{V} \Rightarrow \frac{Cou}{A}$

$\frac{Cou}{Cou} \cdot s \Rightarrow [\tau] = s$

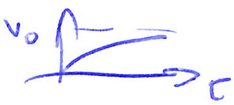
$t \to +\infty \Rightarrow 1 - e^{-\infty/\tau} = 1 - 0$



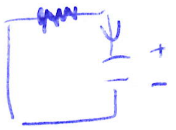
$I(t) = \frac{V_0}{R} \cdot e^{-t/\tau}$



$V(t) = V_0 \left(1 - e^{-t/\tau}\right)$



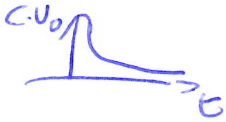
SCARICA CONDENSATORE



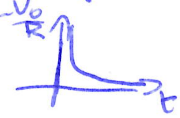
isolato → $[V_0] - V_C - RI = 0 \Rightarrow -V_C - RI = 0 \qquad -\frac{q}{C} - R\dot{q} = 0$

$I_{nt} = \frac{P}{S} = \frac{\mathcal{E}_{mm}}{t \cdot S} = \frac{w \cdot V}{t \cdot S} = \frac{u \cdot S \cdot ct}{S \cdot t}$

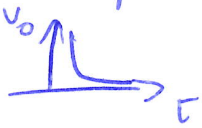
$q(t) = C \cdot V_0 (e^{-t/\tau})$



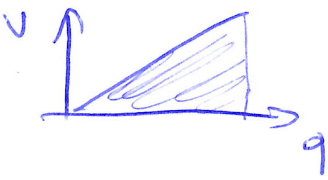
$I(t) = \frac{-V_0}{R} \cdot e^{-t/\tau}$



$V(t) = V_0 e^{-t/\tau}$



$C = \frac{q}{V} \qquad V = \frac{q}{C}$



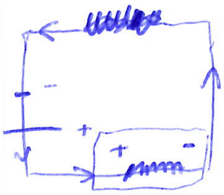
$Area = q \cdot V \cdot \frac{1}{2} \Rightarrow \frac{1}{2} \frac{q^2}{C} = \mathcal{E}_{imm}$

$u_E = \frac{\mathcal{E}_{imm}}{Volume} = \left[\frac{1}{2}\frac{q^2}{C}\right] : [d \cdot S] \Rightarrow \frac{1}{2} \frac{q^2 \cdot d}{\varepsilon_0 \cdot S} \cdot \frac{1}{S d} = \frac{1}{2} \left(\frac{q^2}{S^2}\right) : \varepsilon_0 = \frac{1}{2} \frac{\sigma^2}{\varepsilon_0^2} \cdot \varepsilon_0$

σ^2 (dens. sup. carica)

$w_E = \frac{1}{2} E^2 \varepsilon_0$

INDUTTORE

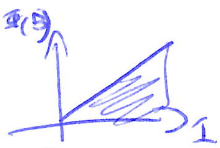


$B_S = \mu_0 \cdot I \cdot \frac{N}{\ell}$ (si oppone a variaz. I)

$f.em = N \cdot \frac{-\Delta\Phi(B)}{\Delta t} = N \cdot \frac{B_S \cdot S}{\Delta t} = N \cdot \frac{\mu_0 \, I \cdot \frac{N}{\ell} \cdot S}{\Delta t} = \mu_0 \cdot \frac{N^2}{\ell} S \cdot \frac{\Delta I}{\Delta t}$

↓ INDUTTANZA [H]

$f.em = -L \cdot \frac{\Delta I}{\Delta t}$ ($\Delta\Phi(B)$)



$\Delta\Phi(B) = L \cdot I$

$Area = I \cdot \Phi(B) \cdot \frac{1}{2} \Rightarrow L I^2 \qquad L = \mu_0 \frac{N^2}{\ell} \cdot S \cdot I^2 \; (\mathcal{E}_{acc})$

$u_B = \frac{\mathcal{E}_{acc}}{Volume} = \frac{\frac{1}{2}\mu_0 \frac{N^2}{\ell} S \cdot I^2}{S \cdot \ell} = \mu_0 \cdot \frac{N^2 \cdot I^2}{\ell^2} = \left[\frac{\mu_0^2 \cdot N^2 \cdot I^2}{\ell^2}\right] \cdot \frac{1}{2\mu_0} = \frac{B^2}{2\mu_0}$

$S \cdot \ell$ → cilindro

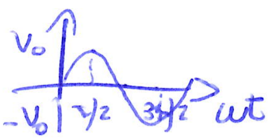
CORRENTE ALTERNATA

È prodotta da alternatore (entra E mecc, esce E elettrica)

$f.em = -N \cdot B \cdot S \cdot \frac{\Delta \cos\alpha}{\Delta t} \qquad \alpha = \omega t$ (pulsazione) $\qquad \frac{\Delta \cos \omega t}{\Delta t} = -\omega \sin \omega t$

$f.em = N \cdot B \cdot S \cdot \omega \cdot \sin \omega t$

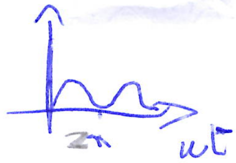
$N \cdot B \cdot S \cdot \omega = V_0$ → c. fisse; $\sin \omega t$ → variabile (rapida)



$\pi/2$ e $3\pi/2$ sono picchi AC ($\pm V_0$)

$\bar{P} = 0 \quad (R \bar{I}^2) \Rightarrow$ FALSO

$\bar{I}^2 = I_0^2 \sin \omega t^2 \qquad \sin(\omega t)^2 = \frac{1 - \cos 2\omega t}{2} = \frac{1}{2} - \frac{1}{2} \cos 2\omega t$



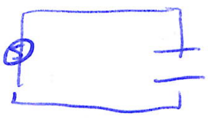
$\bar{I} = \frac{1}{2} \Rightarrow \bar{P} = \frac{1}{2} I_0^2 R$

$\frac{1}{2} I_0^2 = I_{eff}^2 \qquad I_{eff}$ = corrente in DC $\quad I_{eff} = \frac{I_0}{\sqrt{2}} \quad (\simeq 70\% \cdot I_0)$

$\bar{P} = R \cdot I_{eff}^2$

$V_{eff} = R \cdot I_{eff}$

CIRCUITO CAPACITIVO

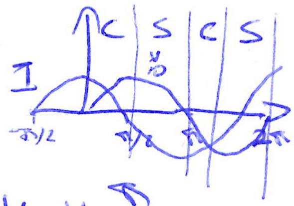


$V = V_0 \sin \omega t$

$q(t) = C \cdot V_0 \cdot \sin \omega t$

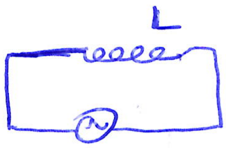
$I(t) = C \cdot V_0 \cdot \omega \cos \omega t$

$I(t) = C \cdot V_0 \cdot \omega \left(\sin\left(\omega t + \frac{\pi}{2}\right)\right) \Rightarrow I$ ant su V_0 di $\frac{\pi}{2}$



$C \cdot \omega = \frac{1}{R_C} \qquad R_C = \frac{1}{C\omega}$ (reatt. capacitiva)

CIRCUITO INDUTTIVO



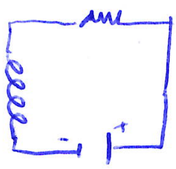
$f.em = L \cdot \frac{\Delta I}{\Delta t} \qquad L \cdot I' = V \qquad I(t) = \frac{-V}{L} \cos \omega t$

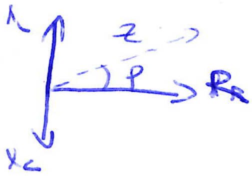
$V = V_0 \sin \omega t \qquad I(t) = \frac{-V}{\omega} \sin\left(\omega t - \frac{\pi}{2}\right)$ rit risp. V

$X_L = \omega L$ (reatt. induttiva)

CIRCUITI RLC

FASORE = grand. fisica che assume connotazione vettoriale pur non essendolo





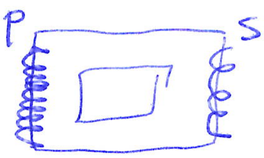
Z = IMPEDENZA $\left(\sqrt{R^2 + (X_L - X_C)^2}\right)$

se $Z = R \Rightarrow X_L = X_C$ (freq. risonanza onde radio)

se $\varphi > 0 \Rightarrow X_L > X_C \qquad \bar{P} = \underbrace{Z \cos\varphi}_{R} \cdot I^2$

se $\varphi < 0 \Rightarrow X_C > X_L$

TRASFORMATORE



$\frac{N_p}{N_s} = \frac{V_p}{V_s}$ * $\qquad P_{erog} = P_{diss}$ (idealmente) $\Rightarrow V_p \cdot I_p = V_s I_s \left(\frac{V_p}{I_s} = \frac{V_s}{I_p}\right)$

se $V_p > V_s \Rightarrow$ TRASF. IN DISCESA

se $V_p < V_s \Rightarrow$ TRASF. IN SALITA

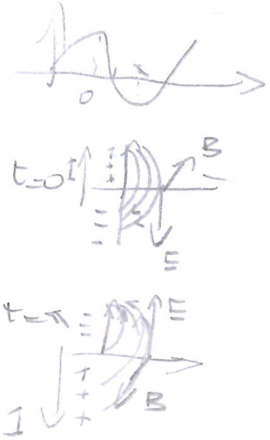
* f.em erog = f em diss

$N_p \frac{\Delta \Phi(B)}{\Delta t} = N_s \cdot \frac{\Delta \Phi(B)}{\Delta t}$

ONDE ELETTROMAGNETICHE

. Onde create da part [in movimento] accelerate con comp. elettrica e magnetica

$E = v \cdot B \Rightarrow E = c \cdot B$ (nel vuoto)



$\oint B\, dl = \mu_0 \cdot \sum I$ (paradosso risolto da Maxwell)

$E_{lam} = \frac{\sigma}{2\varepsilon_0}$ (per lastra condens) $\rightarrow E_{TOT} = \frac{\sigma}{\varepsilon_0} = \frac{q}{S \cdot \varepsilon_0}$

$\frac{\Delta \Phi(E)}{\Delta t} = \frac{\Delta (E \cdot S \cdot \cos\alpha)}{\Delta t} = \frac{\Delta E}{\Delta t} \underbrace{S \cos\alpha}_{} \rightarrow 1 \,(\parallel) = \frac{\Delta E}{\Delta t} \cdot S$

$\Delta E = \frac{q}{S \cdot \varepsilon_0} \Rightarrow \frac{q}{S \varepsilon_0} \cdot \frac{1}{\Delta t} \cdot S \Rightarrow \boxed{\frac{q}{t}}_{I_s} \cdot \frac{1}{\varepsilon_0} \Rightarrow \frac{\Delta \Phi(E)}{\Delta t} = \frac{I_s}{\varepsilon_0}$

$E_{TOT} = \frac{\sigma}{\varepsilon_0} = \frac{q}{S \cdot \varepsilon_0}$

$I_s = \varepsilon_0 \cdot \frac{\Delta \Phi(E)}{\Delta t}$ (corrente spostamento)

$\Delta \Phi E = \frac{\Delta E \cdot S}{\Delta t} = \frac{q}{S \varepsilon_0} \cdot \frac{S}{\Delta t} = \frac{I_s}{\varepsilon_0}$

$\oint B\, dl = \mu_0 \left(I_c + \varepsilon_0 \cdot \frac{\Delta \Phi(E)}{\Delta t} \right)$

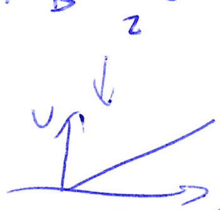
$[\varepsilon_0] = \frac{C^2}{N \cdot m^2}$ $\quad [\mu_0] = \frac{N}{A^2}$ $\quad [\varepsilon_0 \cdot \mu_0] = \frac{C^2}{N \cdot m^2} \cdot \frac{N}{A^2}$ $\quad \varepsilon_0 = \frac{C^2}{N\, m^2}$ $\quad \mu_0 = \frac{N}{A^2}$

$\frac{C^2}{m^2} \cdot \frac{s^2}{C^2} = \left(\frac{m}{s} \right)^{-2}$ $\qquad \frac{1}{\sqrt{\mu_0 \varepsilon_0}} = v \; (c)$

$v_{mezzo} = \frac{1}{\sqrt{\varepsilon_0 \varepsilon_r \mu_0 \mu_r}} = \frac{1}{\sqrt{\varepsilon_0 \mu_0}} \cdot \frac{1}{\sqrt{\varepsilon_r \mu_r}} = \frac{c}{\sqrt{\varepsilon_r \mu_r}} = \frac{c}{n_{mezzo}}$

$\sqrt{\varepsilon_r \mu_r} = n_{mezzo}$

$u_{ET} = u_E + u_B = \frac{1}{2} \varepsilon_0 E^2 + \frac{B^2}{2\mu_0}$



$A_B = \frac{1}{2} I^2 \cdot L$

$u_B = \frac{A_B}{Volume} = \frac{I^2 \cdot \mu_0 \cdot \frac{N^2}{\ell} \cdot S}{2 S \cdot \ell}$

$V = \frac{q}{C}$ $\quad A_E = \frac{1}{2} \frac{q^2}{C}$ $\quad u_E = \frac{A_E}{S \cdot d} =$

$\frac{q^2 \cdot d}{2 \varepsilon_0 \cdot S \cdot S \cdot d} = \frac{1}{2} \frac{\sigma^2}{\varepsilon_0} = \frac{1}{2} E^2 \cdot \varepsilon_0$

$u_B = \frac{1}{2} \mu_0 \cdot \frac{N^2}{\ell^2} \cdot I^2 = \frac{B^2}{2\mu_0}$

$E = c \cdot B$ $\quad u_{TOT} = \varepsilon_0 E^2 \;\vee\; u_{TOT} = \frac{B^2}{\mu_0}$ (vedendo $c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$)

$I_{nt} = u \cdot c$

$I_{nt} = \frac{P}{S} \Rightarrow P = \frac{\mathcal{E}_{imm}}{t} \Rightarrow \frac{\mathcal{E}_{imm}}{t\, S}$ $\quad \mathcal{E}_{imm} = u \cdot V \Rightarrow \frac{u \cdot S \cdot \Delta t \cdot v}{S \cdot \Delta t}$

$I = \frac{P}{S} \Rightarrow \boxed{P = \frac{\mathcal{E}}{\Delta t}} \Rightarrow I = \frac{\mathcal{E}}{\Delta t \cdot S} = \boxed{\mathcal{E} = u \cdot Volume} \Rightarrow I = \frac{u \cdot V}{\Delta t \cdot S} = \frac{u \cdot S \cdot \Delta v \, \Delta t}{\Delta t \, S}$

$v = \lambda \cdot f \qquad c = \lambda \cdot f$

POLARIZZATORE = strum. che rende un'onda polarizzata con E // all'asse di trasmiss.

ONDA POLARIZZATA

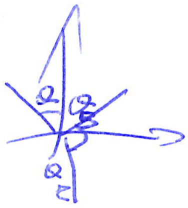
$E' = E_0 \cos\alpha \qquad I_{nt} = c \cdot u \qquad I_{nt} = \varepsilon_0 E^2 \cdot c$

$I' = \varepsilon_0 E_0^2 \cos^2\alpha \cdot c \qquad I = \varepsilon_0 E_0^2 \cdot c \qquad I' = I \cos^2\alpha$

ONDA NON POLARIZZATA

$I' = \frac{1}{2} I_0 \qquad$ (val medio $\cos^2\alpha = \frac{1}{2}$)

ANGOLO BREWSTER cong dove θ_B' e θ_E sono $\perp$ (polarizzazione orizzontale)



per Snell

$n_1 \sin\theta_B = n_2 \sin\theta_2 \qquad \frac{n_1}{n_2} = \frac{\sin\theta_2}{\sin\theta_B}$

$\theta_2 = 90 - \theta_c$

$\frac{n_1}{n_2} = \frac{\sin(90 - \theta_c)}{\sin\theta_B} = \frac{n_1}{n_2} = \frac{1}{\tan\theta_B} \qquad \tan\theta_B = \frac{n_2}{n_1}$

LEGGI DI MAXWELL

$$\Phi(E) = \frac{Q}{\varepsilon_0}$$

$$\Phi(B) = 0$$

$\oint \vec{B}\, dl = \mu_0 \cdot \sum I \Rightarrow$ MAXWELL $[\mu_0 \cdot (I_C + I_S)]$

$$\oint E\, dl = \frac{-\Delta\Phi(B)}{\Delta t}$$

$\oint B\, dl$ è paradosso con $\mu_0 \cdot \sum I$ (non ha E)

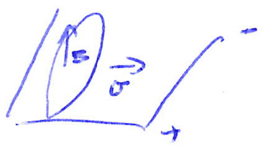
$\Delta\Phi(E) = E \cdot S \cdot \cos\alpha$ carica condens (su 1 arm) $\frac{\sigma}{2\varepsilon_0} \Rightarrow E_{TOT} = \frac{\sigma}{\varepsilon_0}$

$\frac{\Delta E}{\Delta t} = \frac{\sigma}{\varepsilon_0} \cdot \frac{1}{\Delta t} \cdot S \cdot \cos\alpha$ $\sigma = \frac{Q}{S} \Rightarrow \frac{Q \cdot \cancel{S} \cdot \cos\alpha}{\cancel{S} \cdot \varepsilon_0 \cdot \Delta t} = \frac{I}{\varepsilon_0} = \frac{\Delta\Phi(E)}{\Delta t}$ ($\cos\alpha \to 1$, $\frac{Q}{\Delta t} = I$)

I_S (di spost, grazie il dielettrico) $= \varepsilon_0 \cdot \frac{\Delta\Phi(E)}{\Delta t}$

FARADAY-NEUMANN-LENZ $= \frac{-\Delta\Phi(B)}{\Delta t}$ $\Phi(B) = B \cdot S \cdot \cos\alpha$

se varia S $\rightarrow$



$S = l \cdot s$ $s = v \cdot \Delta t \Rightarrow S = l \cdot v \cdot \Delta t$

$$f_{em} = \frac{B \cdot l \cdot v \cdot \cancel{\Delta t}}{\cancel{\Delta t}} = B \cdot l \cdot v$$

FORZA DI LORENTZ = f su un ogg. elettricamente carico immerso in camp. magnetico

$F_L = q \cdot v \cdot B$ $F_L = F_c$ (nel selettore di velocità) $\Rightarrow q \cdot v \cdot B = \frac{mv^2}{R}$ ② (F_{centr})

$\Rightarrow \cancel{q} \cdot v \cdot B = \cancel{q} \cdot E$ ① ($F_{coulomb}$)

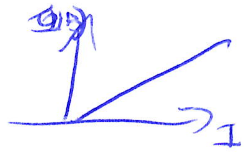
EFFETTO HALL = creazione di d.d.p in un conduttore percorso da I e sottoposto a B perpendicolare

$f.em = B \cdot l \cdot v$ $B \cdot v = E$ $V_{Hall} = E_{Hall} \cdot l$

E ACCUMULATA INDUTTORE (oppone a variazione $\Phi(B)$)

$E_{acc} = \Phi(B) \cdot I$

$f.em = \frac{\Delta\Phi(B)}{\Delta t}$ $\Phi(B) = L \cdot I$ $E_{acc} = LI^2$



$$u_B = \frac{1}{2}\frac{LI^2}{V} = \mu_0 \cdot \frac{N^2}{l} \cdot \cancel{S} \cdot \frac{1}{2} \cdot I^2 \cdot \frac{1}{\cancel{S} \cdot l} = \frac{B^2}{2\mu_0}$$

$V_{eff} = V$ in DC (70% V in AC)

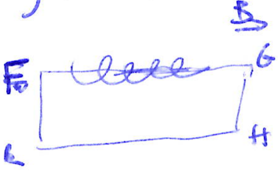
Le onde elettromagnetiche sono generate da cariche accelerate

$\varepsilon_0 \cdot \mu_0 \Rightarrow [\varepsilon_0] = \frac{C^2}{N \cdot m^2}$ $\quad [\mu_0] = \frac{N}{A^2}$ $\quad \varepsilon_0 \cdot \mu_0 = \frac{C^2}{N \cdot m} \cdot \frac{N}{A^2} = \frac{C^2}{A^2 \cdot m^2} =$

$\oint \vec{B}\, dl = AB + BC + CD + DA \quad AB = DC = 0 \left(\cos \frac{\pi}{2}\right)$

$BC = \frac{\mu_0 I}{2\pi R} \cdot \pi R \cdot \cos 0 = \frac{\mu_0 I}{2} \quad DA = \frac{\mu_0 I}{2\pi r} \cdot \pi r \cdot {-1} = \frac{-\mu_0 I}{2}$

$\oint \vec{B}\, dl = 0$



$\oint \vec{B}\, dl = \mu_0 \cdot (n \cdot HK) \cdot I$ (dentro solenoide) → corr. concatenate

(dens. lineare spire)

$B \cdot GF + 0 + 0 + 0$ ~~(fuori solenoide)~~ → circuitazione (solo della bobina)

$B \cdot GF = \mu_0 (n \cdot HK) \cdot I \quad HK = GF \Rightarrow B = \mu_0 \cdot n \cdot I$

EFFETTO HALL: $q \cdot E = q \cdot v \cdot B \Rightarrow E = v \cdot B \quad \left(v = \frac{E}{B}\right)$

$u_T = \frac{1}{2} E^2 \varepsilon_0 + \frac{1}{2}\frac{B^2}{\mu_0}$

$E = cB \quad \frac{1}{2} c^2 B^2 \varepsilon_0 + \frac{B^2}{2\mu_0} = \frac{1}{2\varepsilon_0\mu_0} B^2 \varepsilon_0 + \frac{B^2}{2\mu_0} = \frac{B^2}{\mu_0}$

$\frac{1}{2} E^2 \varepsilon_0 + \frac{E^2}{2c^2\mu_0} = \frac{1}{2} E^2 \varepsilon_0 + \frac{E^2 \mu_0 \varepsilon_0}{2\mu_0} = E^2 \varepsilon_0$