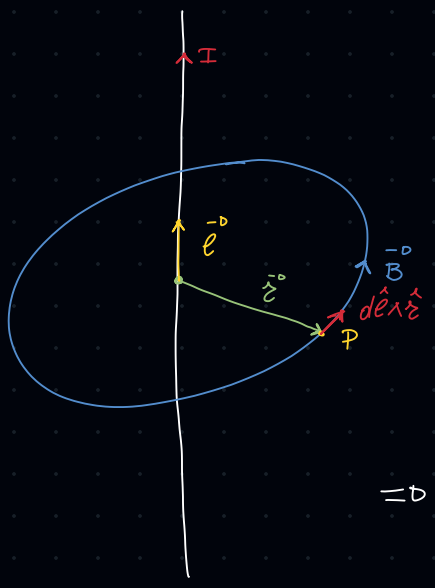
TROVARE IL CAMPO $\vec{B}$ DI UN FILO PERCORSO DA CORRENTE



Sperimentalmente $|\vec{B}| = K \cdot \frac{I}{r}$

dove $K = \frac{\mu_0}{2\pi}$ $\rightarrow$ $|\vec{B}| = \frac{\mu_0}{2\pi}\cdot\frac{I}{r}$

$\vec{B}$ ha una direzione e verso particolari

$$\hat{B} = \hat{e}\wedge\hat{r} = \frac{\hat{e}\wedge\vec{r}}{r}$$

$$\Rightarrow \vec{B} = \frac{\mu_0}{2\pi}\cdot\frac{I}{r}\cdot\frac{\hat{e}\wedge\vec{r}}{r} = \boxed{\frac{\mu_0}{2\pi}\cdot\frac{I}{r^2}\cdot\hat{e}\wedge\vec{r}}$$

Valida per un filo infinito

Inoltre $\hat{e}\wedge\hat{r} = \hat{\tau} \Rightarrow \vec{B} = \frac{\mu_0}{2\pi}\cdot\frac{I}{r}\hat{\tau}$

Prima formula di Laplace

Se consideriamo $\vec{F}_m = \frac{\mu_0}{4\pi}\cdot\frac{q_m\cdot q_m'}{r^2}\hat{r} \Rightarrow \vec{B} = \frac{\vec{F}_m}{q_m} = \frac{\mu_0}{4\pi}\frac{q_m}{r^2}\hat{r}$

Schema con cariche magnetiche

$\Rightarrow \boxed{\vec{F} = q_m\cdot\vec{B}}$ dalla II° formula di Laplace

$F_L = q\cdot\vec{v}\wedge\vec{B} \rightarrow dF = dq\cdot\frac{d\vec{e}}{dt}\wedge\vec{B} \Rightarrow \underline{d\vec{F} = I\cdot d\vec{e}\wedge\vec{B}}$

Schema con cariche elettriche

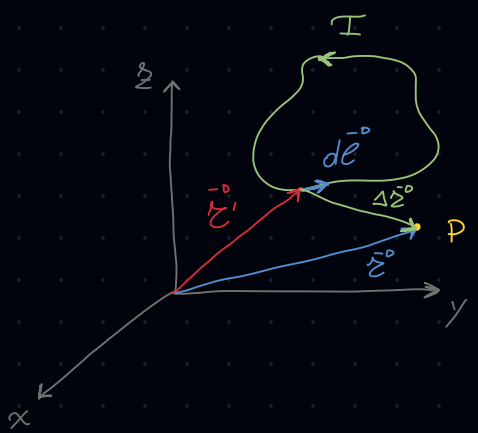
$\Rightarrow dF = d\,q_m\cdot\vec{B} = I\cdot d\vec{e}\wedge\vec{B} \Rightarrow \underline{q_m = I\,d\vec{e}}$

Siccome $\vec{B}_m = \frac{\vec{F}_c}{q} = \frac{\mu_0}{4\pi}\frac{q_m}{r^2}\hat{\tau}$ ma $\hat{\tau} = \frac{d\vec{e}\wedge\vec{r}}{r}$

$$\Rightarrow d\vec{B} = \frac{\mu_0}{4\pi}\cdot\frac{I\,d\vec{e}\wedge\hat{r}}{r^2} = \boxed{\frac{\mu_0}{4\pi}\frac{I\,d\vec{e}\wedge\vec{r}}{r^3}}$$

Valida per una qualsiasi porzione di filo

CASO GENERALE



In questo schema $r \rightarrow \Delta\vec{r}$

$$d\vec{B} = \frac{\mu_0}{4\pi}I\cdot\frac{d\vec{e}\wedge\Delta\vec{r}}{|\Delta\vec{r}|^3}$$

$$\rightarrow B = \frac{\mu_0}{4\pi}\oint I\cdot\frac{d\vec{e}\wedge\Delta\vec{r}}{|\Delta\vec{r}|^3}$$

PRIMA FORMULA DI LAPLACE