No. Jum'at

Date : 26 September 2025

Medan magnet

Medan listrik

(1)

E ⟵ muatan diskrit → $\vec{E} = \frac{1}{4\pi\varepsilon_0} \frac{q}{r^2} \hat{r}_0$

muatan kontinu → $\vec{E} = \frac{1}{4\pi\varepsilon_0} \frac{\lambda\, dl}{r^2}$ → q → garis

Hukum coulomb ⟵ $\vec{E} = \frac{1}{4\pi\varepsilon_0} \frac{\sigma\, da}{r^2}$ → q → lurus

Hukum gauss ⟵ $\vec{E} = \frac{1}{4\pi\varepsilon_0} \frac{\rho\, db}{r^2}$ → q → volume

dimesi tinggi

Medan magnet ($\vec{B}$)

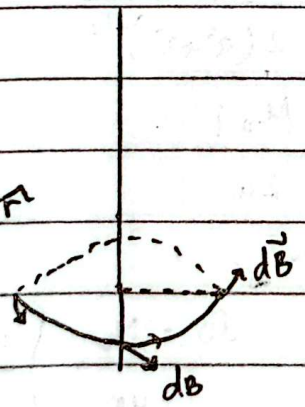
⊙

$q_+ \longrightarrow \vec{v}$

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

$\vec{B} = \frac{\mu_0}{4\pi} \frac{qv}{r^2} \times \hat{r}$

$= \frac{\mu_0}{4\pi} \frac{qv}{r^2}$

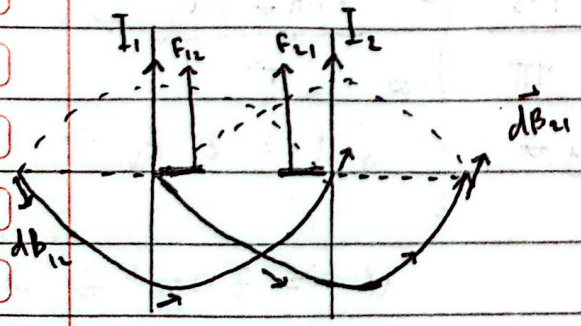


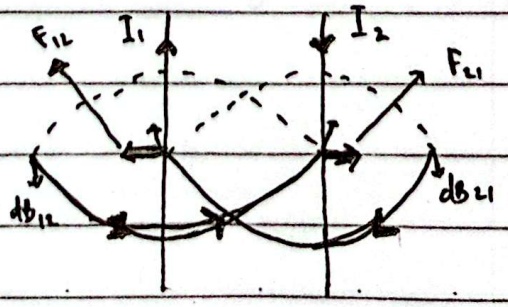
$d\vec{B} = \frac{\mu_0}{4\pi} \frac{i d\vec{r} \times \hat{r}_0}{r^2}$

$\vec{B} = \frac{\mu_0}{4\pi} \int \frac{i d\vec{r} \times \hat{r}_0}{r^2}$ → arus pada garis

$\vec{B} = \frac{\mu_0}{4\pi} \iint \frac{i d\vec{a} \times \hat{r}_0}{r^2}$ → luasan

$\vec{B} = \frac{\mu_0}{4\pi} \iiint \frac{i db \times \hat{r}_0}{r^2}$ → volume





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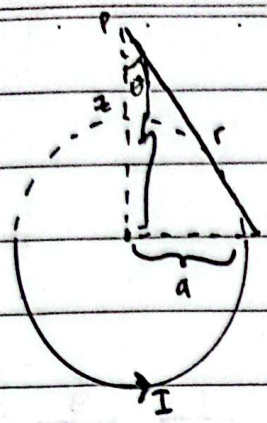


$$\vec{B} = \frac{\mu_0}{4\pi} \int \frac{i\, d\vec{l} \times \hat{r}_0}{r^2}$$

$$= \frac{\mu_0}{4\pi} \int_0^{2\pi a} \frac{i \sin\theta \, dl}{r^2}$$

$$= \frac{\mu_0}{4\pi} \int_0^{2\pi a} \frac{ia}{r^3} \, dl$$

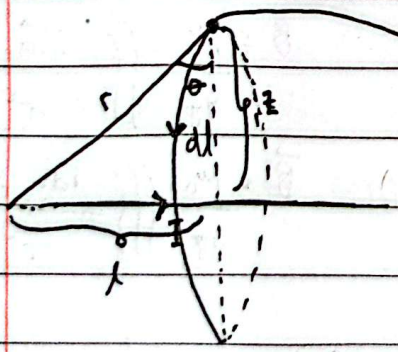
$$= \frac{\mu_0}{4\pi} \int_0^{2\pi a} \frac{ia}{(a^2+z^2)^{3/2}} \, dl$$

$$= \frac{\mu_0}{4\pi} \frac{ia}{(a^2+z^2)^{3/2}} \int_0^{2\pi a} dl$$

$$= \frac{\mu_0}{4\pi} \frac{ia}{(a^2+z^2)^{3/2}} (4\pi)$$

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

$$= \frac{\mu_0 i}{2a}$$



$$d\vec{B} = \frac{\mu_0}{4\pi} \int \frac{i\, d\vec{l} \times \hat{r}_0}{r^2}$$

resamping

$$= \frac{\mu_0}{4\pi} \int_{-\infty}^{\infty} \frac{i \sin\theta \, dl}{r^2}$$

$$\tan\theta = \frac{l}{z} \rightarrow l = z \tan\theta$$

$$dl = z \sec^2\theta \, d\theta$$

$$\cos\theta = \frac{z}{r} \rightarrow r = \frac{z}{\cos\theta} = z \sec\theta$$

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$$\vec{B} = \frac{\mu_0 i}{4\pi} \int_{-2\pi}^{2\pi} \frac{\sin\theta \; z \sec^2\theta \, d\theta}{z^2 \sec^2\theta}$$

$$= \frac{\mu_0 i}{4\pi} \int_{-2\pi}^{2\pi} \frac{\sin\theta \, d\theta}{z}$$

$$= \frac{\mu_0 i}{4\pi z} \int_{-2\pi}^{2\pi} \sin\theta \, d\theta$$

$$= \frac{\mu_0 i}{2\pi z}$$