Formler fys1120

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Innhold

1 Elektrisk felt

$$\vec{F} = \frac{Qq}{4\pi\epsilon_0}\frac{\hat{\mathbf{R}}}{R^2} = \frac{Qq}{4\pi\epsilon_0}\frac{\vec{R}}{R^3}$$

$$\vec{E} = \frac{\vec{F}}{q} = \frac{Q}{4\pi\epsilon_0}\frac{\hat{\mathbf{R}}}{R^2}$$

$$\mathrm{d}\vec{E} = \frac{\mathrm{d}q}{4\pi\epsilon_0}\frac{\hat{\mathbf{R}}}{R^2}$$

$$\rho_l = \frac{Q}{L}$$

$$V(\vec{r}) = \int_{\vec{r}}^{ref} \vec{E}\cdot \mathrm{d}\vec{l}$$

$$\oint_C \vec{E}\cdot\vec{l} = 0 \Leftrightarrow \iint_S \nabla \times E \cdot \mathrm{d}S = 0$$

2 Elekrisk potensial

$$E = -\nabla V$$

$$E = \int_V \rho \frac{\mathrm{d}v}{4\pi\epsilon_0}\frac{\hat{\mathbf{R}}}{R^2}$$

$$V = \int \frac{\rho \mathrm{d}V}{4\pi\epsilon_0 R}$$

$$V(\vec{r}) = \frac{\vec{P}\cdot\hat{\mathbf{r}}}{4\pi\epsilon_0 r^2}$$

3 Gauss lov og dielektriske materialer

$$\Delta v = \Delta s d\cos(\theta)$$

Antall dipoler i Δv

$$Nv\Delta v = Nv\Delta s\vec{d}\cdot\hat{\mathbf{n}}$$

Hvor mye ladning

$$\begin{aligned}\Delta Q_b &= -Q \cdot Nv\Delta s\vec{d} \cdot \hat{\mathbf{n}} \\ &= -Q \cdot Nv\vec{d} \cdot \Delta\vec{s} \\ &= -Nv\left(Q\vec{d}\right) \cdot \Delta\vec{s} \\ &= -Nv\vec{P} \cdot \Delta\vec{s} \\ &= -\frac{N\vec{P}}{v} \cdot \Delta\vec{s} \\ &= -\vec{P} \cdot \Delta\vec{s}\end{aligned}$$

$$Q_b = -\oint_S \vec{P} \cdot \mathrm{d}\vec{s}$$

Bundet volum-ladningstethet

$$\begin{aligned}Q_b = \int_v \rho_{v,b}\mathrm{d}v = -\oint_s \vec{P} \cdot \mathrm{d}\vec{s} \\ = -\oint_S \vec{P} \cdot \mathrm{d}\vec{s} \\ = -\int_v \nabla \cdot \vec{P}\mathrm{d}v\end{aligned}$$

$$\boxed{\begin{aligned}\rho_{v,b} &= -\nabla \cdot \vec{P} \\ \rho_{s,b} &= \vec{P} \cdot \hat{\mathbf{n}}\end{aligned}}$$

Grensebetingelser

$$\begin{aligned}E_{1,t} &= E_{2,t} \\ D_{1,n} - D_{2,n} &= \rho_{fri,s}\end{aligned}$$