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1. $E(z,t) = 100 \cos(\omega t - \beta z) a_x$ V/m

$f = 1\ GHz = 10^9$ Hz

$\beta = \frac{\omega}{c} = \frac{2\pi f}{c} = \frac{2\pi \cdot 10^9}{3 \times 10^8} = 20,94$

$v = c = 3 \times 10^8$ m/s

2. $f = 300\ MHz = 3 \times 10^8$ Hz

$\vec{E} = 5 \sin(2\pi f t - 12\pi y)\ \vec{a}_z$ V/m

Lossless + non-feromagnetik = free space

$H = \frac{E}{120\pi} = \frac{5}{377} = 0,013$ A/m

3.

Medan listrik	Medan magnet
- Terbentuk dari muatan diam atau bergerak	- Terbentuk dari muatan yang bergerak atau arus listrik pada suatu penghantar
- Ada transfer energi antara medan dan muatan	- Tidak ada trasfer energi

4. $f = 300\ MHz = 3 \times 10^8$ Hz

$\vec{E} = 10 \cos(2\pi f t - 4\pi z)\ \vec{a}_y$

Lossless + non-feromagnetik = free space

$\vec{E} \times \vec{H} = \vec{P}$

$\vec{a}_y \times \vec{H} = \vec{a}_z$

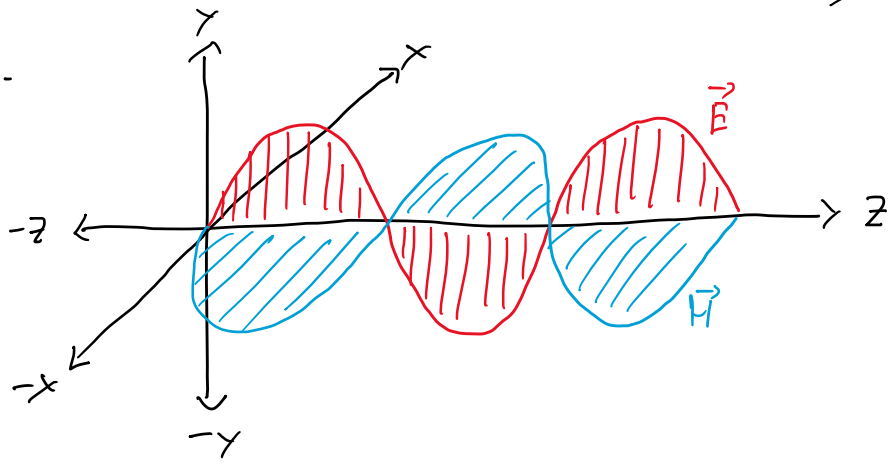
$\vec{H} = -\vec{a}_x$

$$\vec{H} = \frac{E_0}{120\pi} \cos(\omega t - \beta z)(-\vec{a}_x)$$

$$\vec{H} = \frac{10}{377} \cos(2\pi f t - 4\pi z)(-\vec{a}_x)$$

$$\vec{H} = -0{,}026 \cos(2\pi f t - 4\pi z)\,\vec{a}_x \ A/m$$

5.



$$\vec{P} = \vec{E} \times \vec{H}$$

$$\vec{P} = 10 \cos(2\pi f t - 4\pi z)\vec{a}_y \times -0{,}026 \cos(2\pi f t - 4\pi z)\vec{a}_x$$

$$\vec{P} = [10 \cos(2\pi f t - 4\pi z) \cdot 0{,}026 \cos(2\pi f t - 4\pi z)] \cdot (\vec{a}_y \times -\vec{a}_x)$$

$$\vec{P} = 0{,}26 \cos^2(2\pi f t - 4\pi z)\,\vec{a}_z$$

6. $\vec{E} = 5 \cos(4\pi 10^9 t + \beta x)\,\vec{a}_y \ V/m$

$\varepsilon_r = 4 \ F/m \qquad \mu_r = 1$

a. Arah rambat gelombang : $-x$

b. $\beta = \frac{\omega}{c}\sqrt{\mu_r \varepsilon_r} = \frac{4\pi \times 10^9}{3 \times 10^8}\sqrt{1 \cdot 4} = \frac{80\pi}{3} = 83{,}78$

c. $v = \frac{c}{\sqrt{\mu_r \cdot \varepsilon_r}} = \frac{3 \times 10^8}{\sqrt{1 \cdot 4}} = 1{,}5 \times 10^8 \ m/s$

d. $\eta = 120\pi\sqrt{\frac{\mu_r}{\varepsilon_r}} = 120\pi\sqrt{\frac{1}{4}} = 60\pi = 188{,}5 \ \Omega$

e. $\vec{E} \times \vec{H} = \vec{P}$

$\vec{a}_y \times \vec{H} = \vec{a}_x$

$\vec{H} = \vec{a}_z$

$$\vec{H} = \frac{E_0}{\eta} \cos(4\pi.10^9 t + \beta x)\, \vec{a}_z$$

$$\vec{H} = 0{,}026 \cos(4\pi.10^9 + \beta x)\, \vec{a}_z \quad A/m$$

5. $$P_{z,av} = \frac{E_0^2}{240\pi} \sqrt{\frac{\varepsilon_r}{\mu_r}}$$

$$P_{z,av} = \frac{5^2}{240\pi} \sqrt{\frac{4}{1}}$$

$$P_{z,av} = 0{,}066 \quad Watt/m^2$$