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

$\mu = \mu_0 \rightarrow \mu_r = 1$

a. $\lambda = 2 \cdot 12,5 = 25\ cm = 0,25\ m$

$\beta = \frac{2\pi}{\lambda} = \frac{2\pi f}{c}\sqrt{\mu_r \varepsilon_r}$

$\frac{1}{0,25} = \frac{3\times10^8}{3\times10^8}\sqrt{1 \cdot \varepsilon_r}$

$\sqrt{\varepsilon_r} = 4$

$\varepsilon_r = 16$

b. $\beta = \frac{2\pi}{\lambda} = \frac{2\pi}{0,25} = 8\pi$

Agar $\vec{H} = 0$ maka $\cos(\beta z) = 0$

$\cos(8\pi z) = 0$

$\cos(8\pi z) = \cos\left(\frac{\pi}{2} + n\pi\right)$

$8\pi z = \frac{\pi}{2} + n\pi \rightarrow$ ambil $n = 0$

$8\pi z = \frac{\pi}{2} + 0$

$z = \frac{1}{16}\ m = 0,0625\ m$

c. $E_0 = 3,77\ V/m$

$E = 2E_0 \sin \beta z \sin \omega t$

$E = 2 \cdot 3,77 \sin(8\pi z) \sin(2\pi \cdot 3\times10^9 t) = 7,54 \sin(8\pi z) \sin(6\pi \cdot 10^9 t)\ V/m$

d. $\eta = 377\sqrt{\frac{\mu_r}{\varepsilon_r}} = 377\sqrt{\frac{1}{16}} = 94{,}25\ \Omega$

$$H = \frac{2F_0}{\eta}\cos(\beta z)\cos(\omega t)$$

$$= \frac{2.3{,}77}{94{,}25}\cos(8\pi z)\cos(2\pi.3\times10^9 t)$$

$$= 0{,}08\cos(8\pi z)\cos(6\pi.10^9 t)\ A/m$$