2007/08 2º S. **Teste 3** **versão A** MEQuim + MEMeio

a) $-|k|(\vec{u}\cdot\vec{n}) = +|k|\left(\frac{1}{\sqrt{5}}x + \frac{2}{\sqrt{5}}y + \alpha z\right)$

$u_x = -\frac{1}{\sqrt{5}}$ $\quad |\vec{u}| = 1$

$u_y = -\frac{2}{\sqrt{5}}$ $\quad \frac{1}{5} + \frac{4}{5} + \alpha^2 = 1$ $\quad \alpha = 0$

$u_z = -\alpha$

$$\vec{u} = -\frac{1}{\sqrt{5}}\vec{e}_x - \frac{2}{\sqrt{5}}\vec{e}_y$$

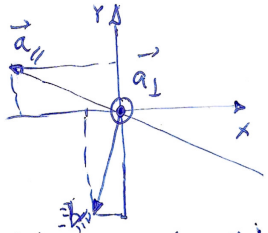
b) $(\vec{H}\cdot\vec{u}) = 0$

$$\left[-z_0 E_0 \cos(\;)\left(-\frac{1}{\sqrt{5}}\right)\right] + H_y\left(-\frac{2}{\sqrt{5}}\right) = 0$$

$$H_y = +\frac{1}{2} z_0 E_0 \cos\left[\omega t - |k|\left(\frac{1}{\sqrt{5}}x + \frac{2}{\sqrt{5}}y\right)\right]$$

c) $(\vec{E}\cdot\vec{u}) = 0 \rightarrow E_0 \operatorname{sen}(\;)\left(-\frac{1}{\sqrt{5}}\right) + \beta E_0 \operatorname{sen}(\;)\left(-\frac{2}{\sqrt{5}}\right) = 0$

$$\beta = -\frac{1}{2}$$

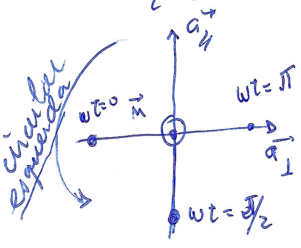


$$\vec{a}_{//} = -\frac{2}{\sqrt{5}}\vec{e}_x + \frac{1}{\sqrt{5}}\vec{e}_y$$

$$\vec{E} = -\frac{\sqrt{5}}{2}E_0 \operatorname{sen}(\;)\left(-\frac{2}{\sqrt{5}}\vec{e}_x\right) - \frac{\sqrt{5}}{2}E_0 \operatorname{sen}(\;)\left(\frac{1}{\sqrt{5}}\vec{e}_y\right) + \gamma E_0 \cos(\;)\vec{e}_z$$

$$\vec{E} = -\frac{\sqrt{5}}{2}E_0 \operatorname{sen}(\;)\left[-\frac{2}{\sqrt{5}}\vec{e}_x + \frac{1}{\sqrt{5}}\vec{e}_y\right] + \gamma E_0 \cos(\;)\vec{e}_z$$

$$\vec{E} = -\frac{\sqrt{5}}{2}E_0 \operatorname{sen}(\;)\vec{a}_{//} + \gamma E_0 \cos(\;)\vec{a}_\perp$$



ao ponto $x = 0$ $\quad y = 0$ $\quad z = 0$

$\omega t = 0$	$\omega t = \frac{\pi}{2}$	$\omega t = \pi$
$E_{//} = 0$	$E_{//} = -\frac{\sqrt{5}}{2}E_0$	$E_{//} = 0$
$E_\perp = \gamma E_0$	$E_\perp = 0$	$E_\perp = -\gamma E_0$

$$\gamma = -\frac{\sqrt{5}}{2}$$

d) $I = 0{,}5\ \mu W\,cm^{-2} = \frac{0{,}5 \times 10^{-12}}{10^{-4}}\ W\,m^{-2} = 0{,}5 \times 10^{-8}\ W\,m^{-2}$

$$I = \langle|\vec{S}|\rangle = \left\langle \frac{1}{z_0}E^2 \right\rangle = \frac{1}{z_0}\left\langle \frac{5}{4}E_0^2 \operatorname{sen}^2(\;) + \frac{5}{4}E_0^2 \cos^2(\;) \right\rangle$$

$$I = \frac{1}{z_0}\frac{5}{4}E_0^2 \qquad E_0 = \sqrt{\frac{4}{5} I z_0}$$

$$E_0 = 1{,}2\ mV\,m^{-1}$$