2007/08 2ª S | Tema 5 | Versão B | MEQuim + MEBio

a) $-|\vec{k}|(\vec{n}\cdot\vec{r}) = -|\vec{k}|\left(\frac{1}{\sqrt{3}}x + \sqrt{\frac{2}{3}}y + \alpha z\right)$

$\begin{cases} n_x = \frac{1}{\sqrt{3}} \\ n_y = \sqrt{\frac{2}{3}} \\ n_z = \alpha \end{cases}$ $\quad |\vec{n}| = 1$

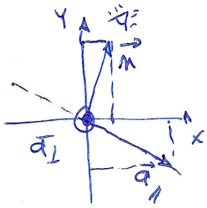
$\frac{1}{3} + \frac{2}{3} + \alpha^2 = 1 \quad \boxed{\alpha = 0}$

$\boxed{\vec{n} = \frac{1}{\sqrt{3}}\vec{e}_x + \sqrt{\frac{2}{3}}\vec{e}_y}$

b) $(\vec{H}\cdot\vec{n}) = 0 \quad \left[-z_0 E_0 \operatorname{sen}(\,)\right]\left[\frac{1}{\sqrt{3}}\right] + H_y\left[\sqrt{\frac{2}{3}}\right] = 0$

$H_y = \frac{1}{\sqrt{2}} z_0 E_0 \operatorname{sen}\left[\omega t - |\vec{k}|\left(\frac{1}{\sqrt{3}}x + \sqrt{\frac{2}{3}}y\right)\right]$

c) $(\vec{E}\cdot\vec{n}) = 0 \quad \left[E_0\cos(\,)\right]\left[\frac{1}{\sqrt{3}}\right] + \beta E_0\cos(\,)\left[\sqrt{\frac{2}{3}}\right] = 0 \quad \boxed{\beta = -\frac{1}{\sqrt{2}}}$

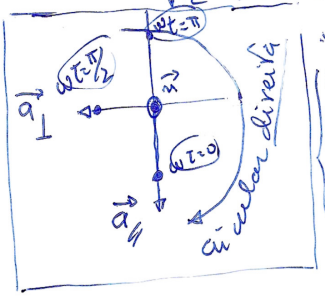


$\vec{a}_{//} = +\sqrt{\frac{2}{3}}\vec{e}_x - \frac{1}{\sqrt{3}}\vec{e}_y \qquad \vec{a}_\perp = \vec{e}_z$

$\vec{E} = \sqrt{\frac{3}{2}}E_0\cos(\,)\left(\sqrt{\frac{2}{3}}\vec{e}_x - \frac{1}{\sqrt{2}}\left(\sqrt{\frac{1}{3}}\right)E_0\cos(\,)\left(\frac{1}{\sqrt{3}}\vec{e}_y\right) + \gamma E_0\operatorname{sen}(\,)\vec{e}_z\right.$

$\vec{E} = \sqrt{\frac{3}{2}}E_0\cos(\,)\left[\sqrt{\frac{2}{3}}\vec{e}_x - \frac{1}{\sqrt{3}}\vec{e}_y\right] + \gamma E_0\operatorname{sen}(\,)\vec{e}_z$

$\vec{E} = \sqrt{\frac{3}{2}}E_0\cos(\,)\vec{a}_{//} + \gamma E_0\operatorname{sen}(\,)\vec{a}_\perp$



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

$\begin{cases} \omega t = 0 \\ E_{//} = \sqrt{\frac{3}{2}}E_0 \\ E_\perp = 0 \end{cases}$ $\quad \begin{cases} \omega t = \pi/2 \\ E_{//} = 0 \\ E_\perp = \gamma E_0 \end{cases}$ $\quad \begin{cases} \omega t = \pi \\ E_{//} = -\sqrt{\frac{3}{2}}E_0 \\ E_\perp = 0 \end{cases}$

$\boxed{\gamma = \sqrt{\frac{3}{2}}}$

d) $I = \frac{10^{-12}\,W}{10^{-4}\,m^2} = 10^{-8}\,W\,m^{-2}$

$I = \langle|\vec{S}|\rangle = \frac{1}{z_0}\langle E^2\rangle = \frac{1}{z_0}\left\langle\left|\frac{3}{2}E_0^2\cos^2(\,) + \frac{3}{2}E_0^2\operatorname{sen}^2(\,)\right|\right\rangle$

$I = \frac{1}{z_0}\frac{3}{2}E_0^2 \qquad E_0 = \sqrt{\frac{2}{3}\,I\,z_0}$

$\boxed{E_0 = 1{,}6\,mV\,m^{-1}}$