

HW 2

problem 1

$$E = x e_x \cos(kz - wt + \psi_x) + y e_y \cos(kz - wt + \psi_y)$$

(a):

$$\begin{aligned} e_x &= 2, e_y = 1, \psi_x = \frac{\pi}{2}, \psi_y = \frac{\pi}{4} \\ \Rightarrow E &= x 2 \cos(kz - wt + \frac{\pi}{2}) + y \cos(kz - wt + \frac{\pi}{4}) \\ E_x &= -2 \cos(kz - wt) \\ E_y &= \frac{1}{2^{0.5}} [\cos(kz - wt) - \sin(kz - wt)] \\ &\text{由于 } E_x, E_y \text{ 组成图形为椭圆} \\ E &\text{是 elliptically polarization} \end{aligned}$$

(b):

$$\begin{aligned} e_x &= 1, e_y = \psi_x = 0 \\ E_x &= \cos(kz - wt) \\ E_y &= 0 \\ E &= \frac{1}{2} [\cos(kz - wt) + \sin(kz - wt)] + \frac{1}{2} [\cos(kz - wt) - \sin(kz - wt)] \end{aligned}$$

(c):

$$\begin{aligned} e_x &= 1, \psi_x = \frac{\pi}{4}, \psi_y = -\frac{\pi}{4}, e_y = 1 \\ E_x &= \cos(kz - wt + \frac{\pi}{4}) \\ &= \frac{1}{2^{0.5}} [\cos(kz - wt) - \sin(kz - wt)] \\ E_y &= \cos(kz - wt - \frac{\pi}{4}) \\ &= \frac{1}{2^{0.5}} [\cos(kz - wt) + \sin(kz - wt)] \\ E &= 2^{0.5} \cos(kz - wt) - 2^{0.5} \sin(kz - wt) \end{aligned}$$

problem 2

$$\lambda = \frac{2\pi}{k} = 0.01m$$

由于 $E_x = E_y$, 这是 circular polarization, 由于随着 t 增加, y 方向分量减小, E 是右旋的

$t=0$ 时, $E(r, t=0) = E_0 [x \cos(kz) + y \sin(kz)]$, 是 left-handed helix, $p = \lambda = 0.01m$

