

3200103514 叶奕含

P2.1

AM: 垂直方向

FM: 圆极化, 各个方向

TV: 水平方向, 与地面平行

P2.2

$$(a) \vec{V} = 6e^{i\frac{\pi}{4}}$$

$$(b) I(t) = -8\sin(\omega t) = 8\sin(-\omega t) = 8\cos(-\omega t - \frac{\pi}{2}) = 8\cos(\omega t + \frac{\pi}{2})$$

$$\Rightarrow \vec{I} = 8e^{i\frac{\pi}{2}} = 8i$$

$$(c) A(t) = -3\cos(\omega t + \frac{\pi}{2}) - 2\cos(\omega t)$$

$$\therefore \vec{A} = -3i - 2$$

$$(d) \vec{C} = 6 \exp(-\frac{\pi}{2}i) = -6i$$

(e). (f) 无法化成相量形式

P2.3

$$(a) \vec{E} = \hat{x} 2\cos(kz - \omega t + \frac{\pi}{2}) + \hat{y} \cos(kz - \omega t + \frac{\pi}{4})$$

$$\hat{x}: 2\cos(kz - \omega t + \frac{\pi}{2}) = -2\sin(kz - \omega t)$$

$$\hat{y}: \frac{\sqrt{2}}{2}\cos(kz - \omega t) - \frac{\sqrt{2}}{2}\sin(kz - \omega t)$$

$$\therefore \frac{x^2}{2} + 2y^2 - \sqrt{2}xy = 1$$

为椭圆极化.

$$(b) \vec{E} = \hat{x} \cos(kz - \omega t)$$

$$= \frac{1}{2}[\hat{x} \cos(kz - \omega t) + \hat{y} \sin(kz - \omega t)] + \frac{1}{2}[\hat{x} \cos(kz - \omega t) - \hat{y} \sin(kz - \omega t)]$$

$$(c) \vec{E} = \hat{x} \cos(kz - \omega t + \frac{\pi}{4}) + \hat{y} \cos(kz - \omega t - \frac{\pi}{4})$$

$\hat{x} \cos(kz - \omega t + \frac{\pi}{4})$ 和 $\hat{y} \cos(kz - \omega t - \frac{\pi}{4})$ 分别为两线极化波.

P2.4

$$\lambda = \frac{1}{100} = 0.01 \text{ m}$$

$$\vec{E}(z=0, t) = E_0 [\hat{x} \cos(\omega t) - \hat{y} \sin(\omega t)] \quad \therefore \text{左旋圆极化波}$$

$$\text{螺距 } p = \lambda = 0.01 \text{ m}$$

P2.5

$$(a) \quad t = 150 \times 10^9 / (3 \times 10^8) = 500 \text{ s}$$

$$(b) \quad P = 1.5 \text{ kW/m}^2 \times (\pi \times 6.4 \times 10^6)^2 = 1.93 \times 10^{14} \text{ kW}$$

$$(c) \quad t = \frac{mc^2 \cdot 1\%}{S \cdot 4\pi D^2} - \frac{2 \times 10^{30} \times (3 \times 10^8)^2 \times 1\%}{1.5 \times 10^3 \times 4\pi \times (150 \times 10^9)^2} = 4.2 \times 10^{18} \text{ s}$$

$$(d) \quad S = 10^{-20} \text{ Wm}^2 \text{Hz}^{-1} \times 1 \times 10^9 \text{ Hz} = 10^{-11} \text{ W/m}^2$$

$$E = \sqrt{2\eta S} = 8.68 \times 10^{-5} \text{ V/m}$$

P1.2.3

$$\textcircled{1} \quad \lambda = \frac{1}{100} = 0.01 \text{ m}$$

$$f = c/\lambda = 3 \times 10^{10} \text{ Hz}$$

$$\textcircled{2} \quad \lambda = 0.6328 \times 10^{-3} \text{ m} \quad \therefore k = \frac{1}{\lambda} k_0 = 1.58 \times 10^6 k_0$$

$$\textcircled{3} \quad f = 2.4 \times 10^9 \text{ Hz} \quad \therefore k = f/c \quad k_0 = 8 k_0$$

P1.2.6

同上 P2.3