

電磁波與天線導論 HW4

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1

(a)

$$f = w/2\pi = 3 * 10^9 (Hz)$$

$$u_p = \frac{c}{\sqrt{\epsilon_r}} = 1.875 * 10^8 (m/s)$$

$$\lambda = \frac{u_p}{f} = 0.03125 (m)$$

$$k = \frac{2\pi}{\lambda} = 201.06 (rad/m)$$

$$\eta = \frac{\eta_0}{\epsilon_r} = \frac{377}{\sqrt{2.56}} = 235.625$$

(b)

$$H(z, t) = \hat{y} \frac{E(z, t)}{\eta} = \hat{y} 0.021 \cos(6\pi * 10^9 t - 201.06 z)$$

2

$$E(z, t) = \hat{x} \sqrt{2} \cos(\omega t + kz) - \hat{y} \sqrt{2} \sin(\omega t + kz), \quad \text{where}$$

$$k = \frac{2\pi}{\lambda} = \frac{2\pi}{0.03} = 209.44 (rad/m)$$

$$\omega = kc = 6.28 * 10^9 (rad/s)$$

3

$$\alpha = \beta = \sqrt{\pi f \mu \sigma} = 6.28 * 10^{-4}$$

$$u_p = \sqrt{4\pi f \mu \sigma} = 10^7(m/s)$$

$$\lambda = u_p/f = 10^4(m)$$

$$\eta_c = (1 + j)^{\frac{\alpha}{\sigma}}$$