電磁波與天線導論 HW4

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1

(a)

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

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

$$\lambda = \frac{u_p}{f} = 0.0625(m)$$

$$k = \frac{2\pi}{\lambda} = 100.53(rad/m)$$

$$\eta = \frac{\mu_0}{\epsilon_r * \epsilon_0} = \frac{4\pi * 10^{-7}}{\sqrt{2.56 * 10^{-9}/36\pi}} = 235.62$$

(b)

$$H(z,t) = \hat{y}\frac{E(z,t)}{\eta} = \hat{y}0.021cos(6\pi * 10^9 t - 100.53z)$$

2

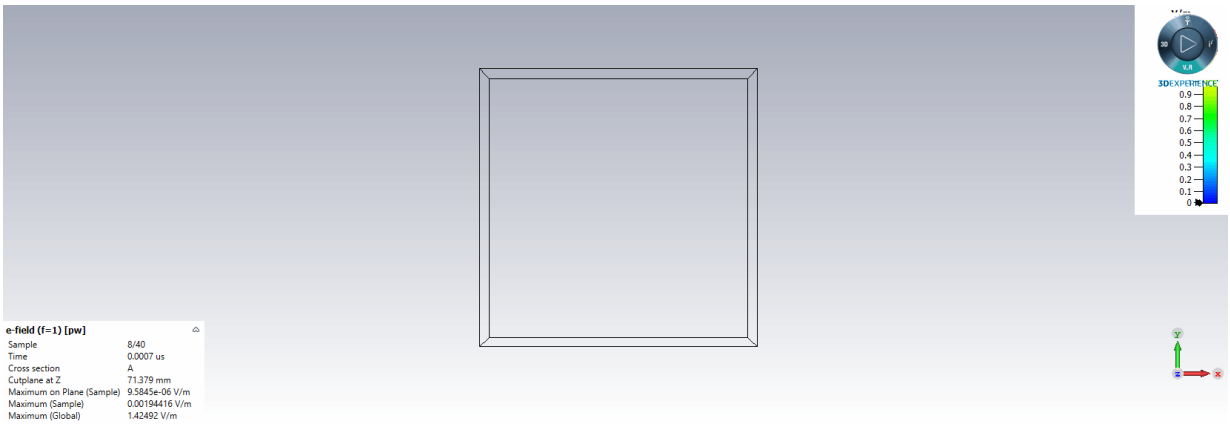
(a)

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

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

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

(b)



Q2.gif

3

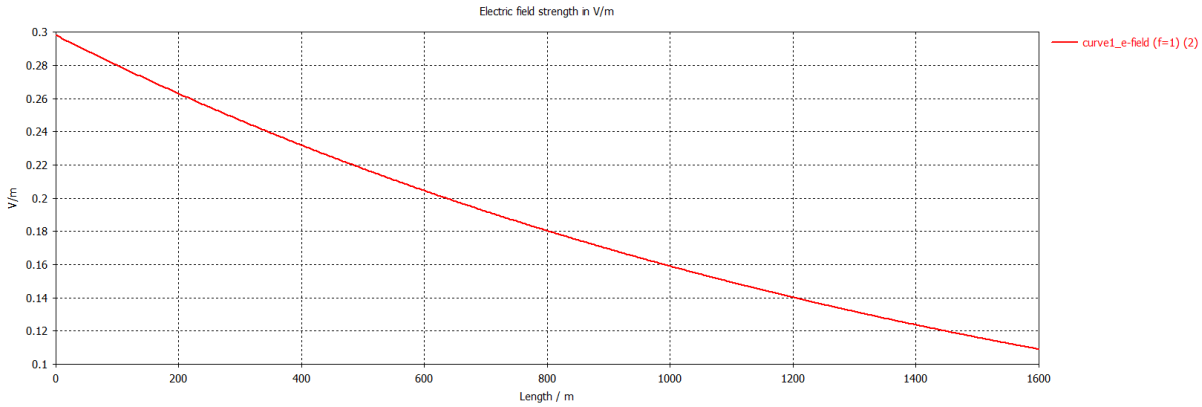
$$\alpha = \beta = \sqrt{\pi f \mu \sigma} = 6.28 * 10^{-4}$$

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

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

$$\eta_c = (1+j)\frac{\alpha}{\sigma} = 6.28 * (1+j)(\Omega)$$

$$Skin \quad depth \quad \delta_s = \frac{1}{\alpha} = 1591.55$$



$By \quad the \quad data \quad in \quad Q3.txt, \quad we \quad can \quad compute \quad skin \quad depth = E^{-1}(E(0)/e) = 1591.2$

Q3.txt