18373038 钱思远

3-25

解：$a = 2.5cm$.

① $(\lambda_c)_{H_{11}^0} = 3.41a = 8.525\ cm$

$(\lambda_c)_{H_{01}^0} = 1.64a = \frac{4.1}{6.55}\ cm$

$(\lambda_c)_{E_{01}^0} = 2.62a = 6.55\ cm$

$(\lambda_c)_{E_{11}^0} = 1.64a = \frac{6.55}{4.1}\ cm$

② $\lambda_0 = 7cm$： H_{11}^0

$\lambda_0 = 6cm$： H_{11}^0、E_{01}^0

$\lambda_0 = 3cm$： H_{11}^0、H_{01}^0、E_{01}^0、E_{11}^0、H_{21}^0

③ $\lambda_0 = 7cm$： H_{11}^0

$$\lambda_g = \frac{\lambda_0}{G} = \frac{\lambda_0}{\sqrt{1-(\frac{\lambda_0}{\lambda_c})^2}} = 12.26\ cm.$$

3-26

解：① $\lambda_0 = \frac{c}{f_0} = 3cm$. ~~$\lambda_g$~~ $\lambda_c = 3.33\ cm$.

$$\lambda_g = \frac{\lambda_0}{G} = \frac{\lambda_0}{\sqrt{1-(0.9)^2}} = 6.87\ cm.$$

$$\beta = \frac{2\pi}{\lambda_g} = 0.91\ rad/cm$$

② $(\lambda_c)_{H_{11}^0} = 3.41a$ $a = 0.977\ cm$.

$a' = 2a \approx 1.953cm$.

$(\lambda_c)'_{11}{}^0 = 6.66\ cm$.

$$\lambda_g' = \frac{\lambda_0}{\sqrt{1-(0.45)^2}} = 3.36\ cm.$$

$$\beta' = \frac{2\pi}{\lambda_g'} = 1.87\ rad/cm.$$

还可能存在 H_{01}^0、H_{21}^0、E_{01}^0、E_{11}^0 模式

3-27

解：主模 H_{11}^0

$(\lambda_c)_{H_{11}^0} = 3.41a = 3.41 \times 2.5 = 8.525mm$

$\lambda_0 < (\lambda_c)_{H_{11}^0}$ 截止

$$\alpha = \frac{2\pi}{\lambda_0}\sqrt{(\frac{\lambda_0}{\lambda_c})^2 - 1} = 7.26\ Np/cm.$$

$e^{-2\alpha L} = 10^{-6}$.

$2\alpha L = 6\ln 10$.

得 $L = 0.95cm$.

3-28

解：

H_{11}^0、E_{01}^0、H_{21}^0、E_{11}^0、H_{01}^0、H_{31}^0、E_{21}^0

H_{41}^0、H_{12}^0、E_{02}^0

单模传输：

$2.62a < \lambda_0 < 3.41a$

$0.88cm < a < 1.145\ cm$

3-29.

解：~~① 过渡到 TE_{01}^{0} 模~~

~~矩形波导中.~~

~~λ_0 = 矩形波导中.~~

$\lambda_0 = 8\ mm$. 单模传输 H_{10}.

$$(\lambda_c)_{H_{10}} = 2a = 14.224\ mm.$$

$$(\lambda_g)_{H_{10}} = \frac{\lambda_0}{\sqrt{1-\left[\frac{\lambda_0}{(\lambda_c)_{H_{10}}}\right]^2}} \approx$$

① 过渡到 TE_{01}^{0}

$$(\lambda_c)_{H_{01}^{0}} = (\lambda_c)_{H_{10}} \approx$$

$$1.64a' = 2a$$

$$d = 2a' = 17.36\ mm.$$

② 过渡到 TE_{11}^{0}

$$3.41a' = 2a.$$

$$d = 2a' = 8.34\ mm$$