

TM波 $E_x = i \frac{m\pi}{a} \frac{k_y}{k_z} E_0 \cos\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) e^{i(k_y z - \omega t)}$

$$E_y = -i \frac{n\pi}{b} \frac{k_x}{k_z} E_0 \sin\left(\frac{m\pi x}{a}\right) \cos\left(\frac{n\pi y}{b}\right) e^{i(k_y z - \omega t)}$$

$$E_z = E_0 \sin\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) e^{i(k_y z - \omega t)}$$

$$B_x = -i \frac{n\pi}{b} \frac{k_0}{ck_z} E_0 \sin\left(\frac{m\pi x}{a}\right) \cos\left(\frac{n\pi y}{b}\right) e^{i(k_y z - \omega t)}$$

$$B_y = i \frac{m\pi}{a} \frac{k_0}{ck_z} E_0 \cos\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) e^{i(k_y z - \omega t)}$$

$k_z > 0$

反射TM波 $E_x' = -i \frac{m\pi}{a} \frac{k_y}{k_z} E_0' \cos\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) e^{-i k_y z} e^{-i\omega t}$

$$E_y' = -i \frac{n\pi}{b} \frac{k_x}{k_z} E_0' \sin\left(\frac{m\pi x}{a}\right) \cos\left(\frac{n\pi y}{b}\right) e^{-i k_y z} e^{-i\omega t}$$

$$E_z' = E_0' \sin\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) e^{-i k_y z} e^{-i\omega t}$$

$$B_x' = -i \frac{n\pi}{b} \frac{k_0}{ck_z} E_0' \sin\left(\frac{m\pi x}{a}\right) \cos\left(\frac{n\pi y}{b}\right) e^{-i k_y z} e^{-i\omega t}$$

$$B_y' = i \frac{m\pi}{a} \frac{k_0}{ck_z} E_0' \cos\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) e^{-i k_y z} e^{-i\omega t}$$

$k_z > 0$

在 $z=0$ 与 $z=d$ 处 $\begin{cases} E_x + E_x' = 0 \\ E_y + E_y' = 0 \end{cases} \Rightarrow \begin{cases} E_0' = E_0 \\ k_y = \frac{p\pi}{d} \end{cases}$

$$E_x + E_x' = i \frac{m\pi}{a} \frac{k_y}{k_z} E_0 \cos\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) \cdot 2i \sin\left(\frac{p\pi z}{d}\right) e^{-i\omega t}$$

$$= -2 E_0 \cdot \frac{m\pi}{a} \cdot \frac{k_y}{k_z} \cos\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) \sin\left(\frac{p\pi z}{d}\right) e^{-i\omega t}$$

$$E_y + E_y' = -2 E_0 \cdot \frac{n\pi}{b} \cdot \frac{k_x}{k_z} \sin\left(\frac{m\pi x}{a}\right) \cos\left(\frac{n\pi y}{b}\right) \sin\left(\frac{p\pi z}{d}\right) e^{-i\omega t}$$

$$E_z + E_z' = 2 E_0 \sin\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) \cos\left(\frac{p\pi z}{d}\right) e^{-i\omega t}$$

$$B_x + B_x' = -2i E_0 \cdot \frac{n\pi}{b} \cdot \frac{k_0}{ck_z} \sin\left(\frac{m\pi x}{a}\right) \cos\left(\frac{n\pi y}{b}\right) \cos\left(\frac{p\pi z}{d}\right) e^{-i\omega t}$$

$$B_y + B_y' = 2i E_0 \cdot \frac{m\pi}{a} \cdot \frac{k_0}{ck_z} \cos\left(\frac{m\pi x}{a}\right) \sin\left(\frac{n\pi y}{b}\right) \cos\left(\frac{p\pi z}{d}\right) e^{-i\omega t}$$

$$B_z + B_z' = 0$$

对z对称, $a=b=d$:

$$\omega = \frac{c\pi}{a} \sqrt{m^2 + n^2 + p^2}$$

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