波导管 rectangular waveguide

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E_x &= A_1 \cos(\frac{m\pi}{a}x)\sin(\frac{n\pi}{b}y)e^{ik_z z} \\
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\end{aligned}
\qquad (3)
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$$\frac{m\pi}{a}A_1 + \frac{n\pi}{b}A_2 - ik_z A_3 = 0 \qquad (4)$$

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$$\vec{H} = -\frac{i}{\omega\mu}\begin{vmatrix} \hat{e}_x & \hat{e}_y & \hat{e}_z \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ E_x & E_y & E_z \end{vmatrix} \quad (7)$$

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同样， $H_z = 0$ 时， $E_z \neq 0$ 所以，在波导管中只能传播横电波或横磁波，

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同样， $H_z = 0$ 时， $E_z \neq 0$ 所以，在波导管中只能传播横电波或横磁波，不能传播横电磁波。

4.截止频率（cutoff frequency）

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当$k^2 = k_x^2 + k_y^2$时,$k_z^2 = 0$,当$k^2 < k_x^2 + k_y^2$时，$k_z^2 < 0$，传播因子就变成衰减因子。

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$$k^2 = k_x^2 + k_y^2 = (\frac{m\pi}{a})^2 + (\frac{n\pi}{b})^2 \quad (10)$$

$$\omega_{mn} = \frac{1}{\sqrt{\mu\varepsilon}}\sqrt{(\frac{m\pi}{a})^2 + (\frac{n\pi}{b})^2} \quad (11)$$

4.截止频率（cutoff frequency）

$$k^2 = k_x^2 + k_y^2 + k_z^2 = (\frac{m\pi}{a})^2 + (\frac{n\pi}{b})^2 + k_z^2 \quad (9)$$

当 $k^2 = k_x^2 + k_y^2$ 时，$k_z^2 = 0$，当 $k^2 < k_x^2 + k_y^2$ 时，$k_z^2 < 0$，传播因子就变成衰减因子。所以最小的频率为

$$k^2 = k_x^2 + k_y^2 = (\frac{m\pi}{a})^2 + (\frac{n\pi}{b})^2 \quad (10)$$

$$\omega_{mn} = \frac{1}{\sqrt{\mu\varepsilon}} \sqrt{(\frac{m\pi}{a})^2 + (\frac{n\pi}{b})^2} \quad (11)$$

4. bE_{10} wave electromagnetic field

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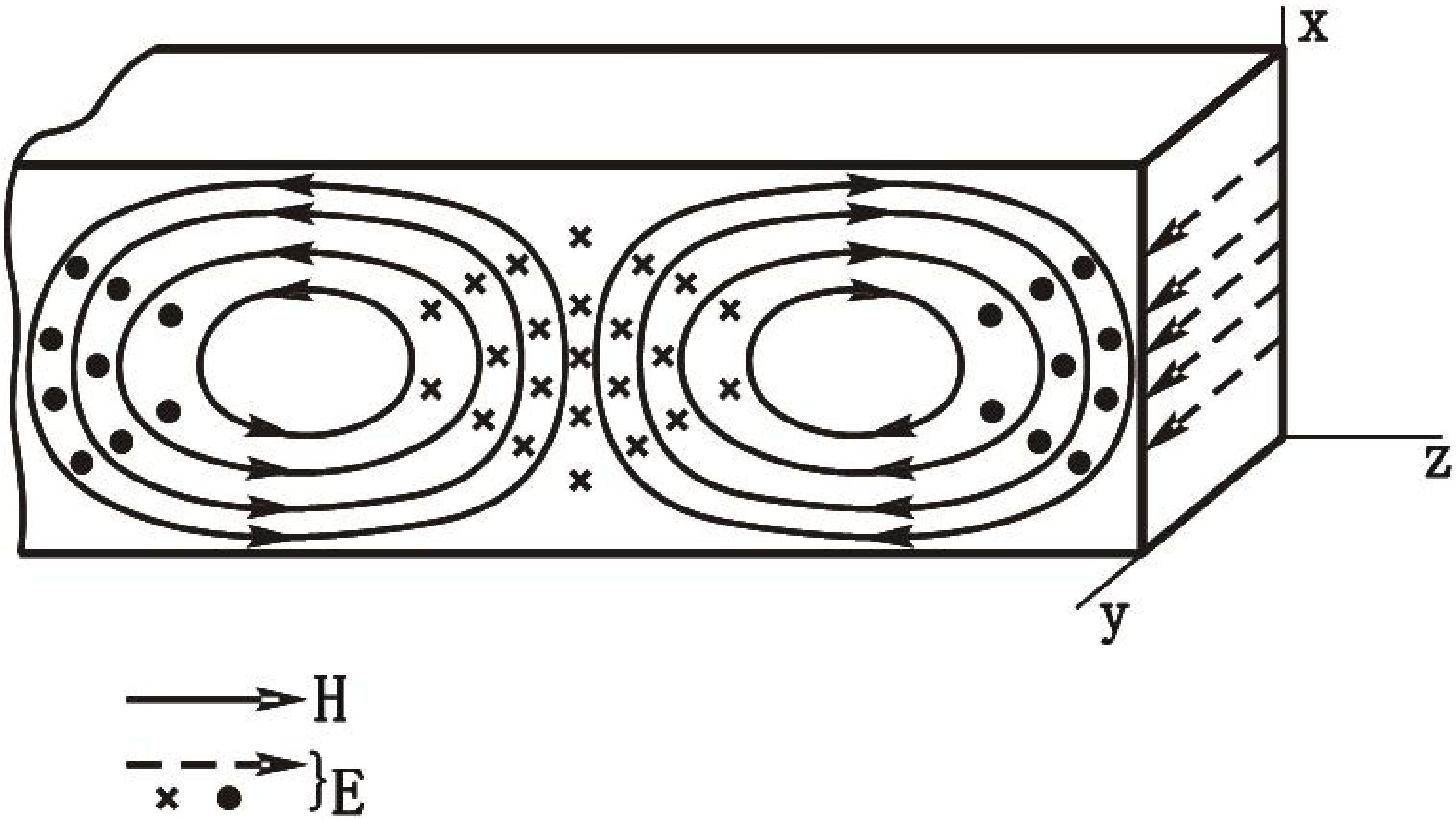
4. bE_{10} wave electromagnetic field



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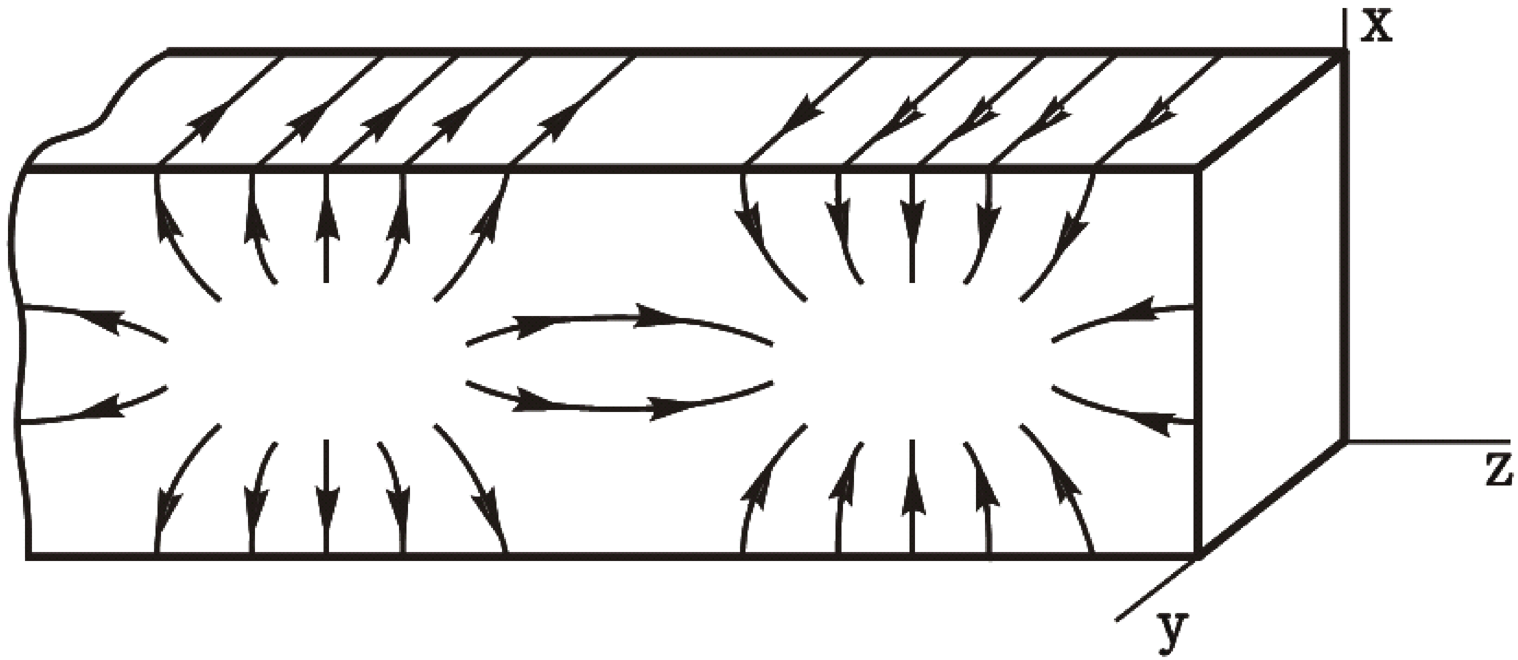
4. $\mathbf{E}_{10}$ wave electromagnetic field



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