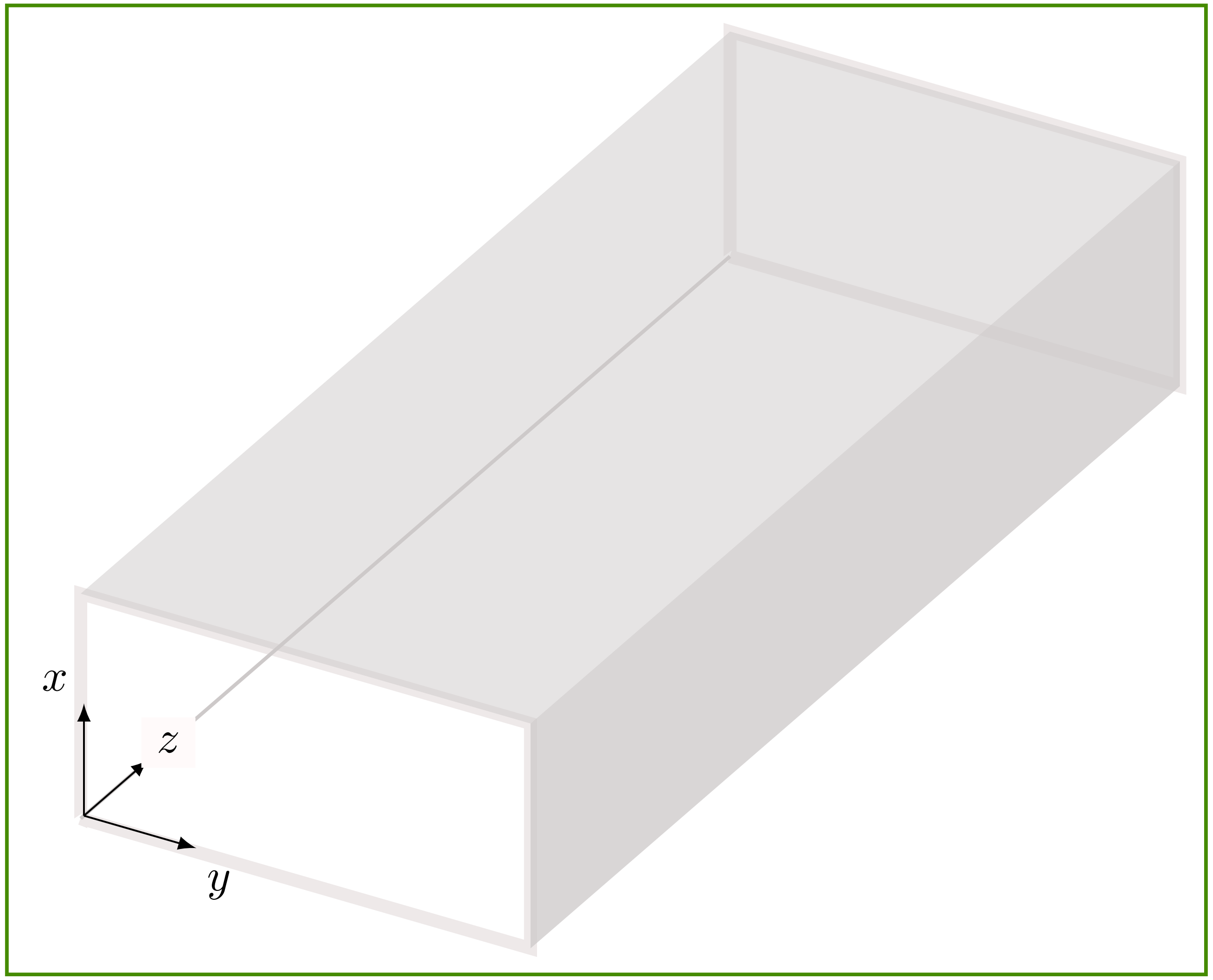
Eletromagnetismo Avançado

2º ciclo
Aula de 13 outubro

Guias de ondas

$\mathbf{E}_{\parallel} = 0$

$B_{\perp} = 0$



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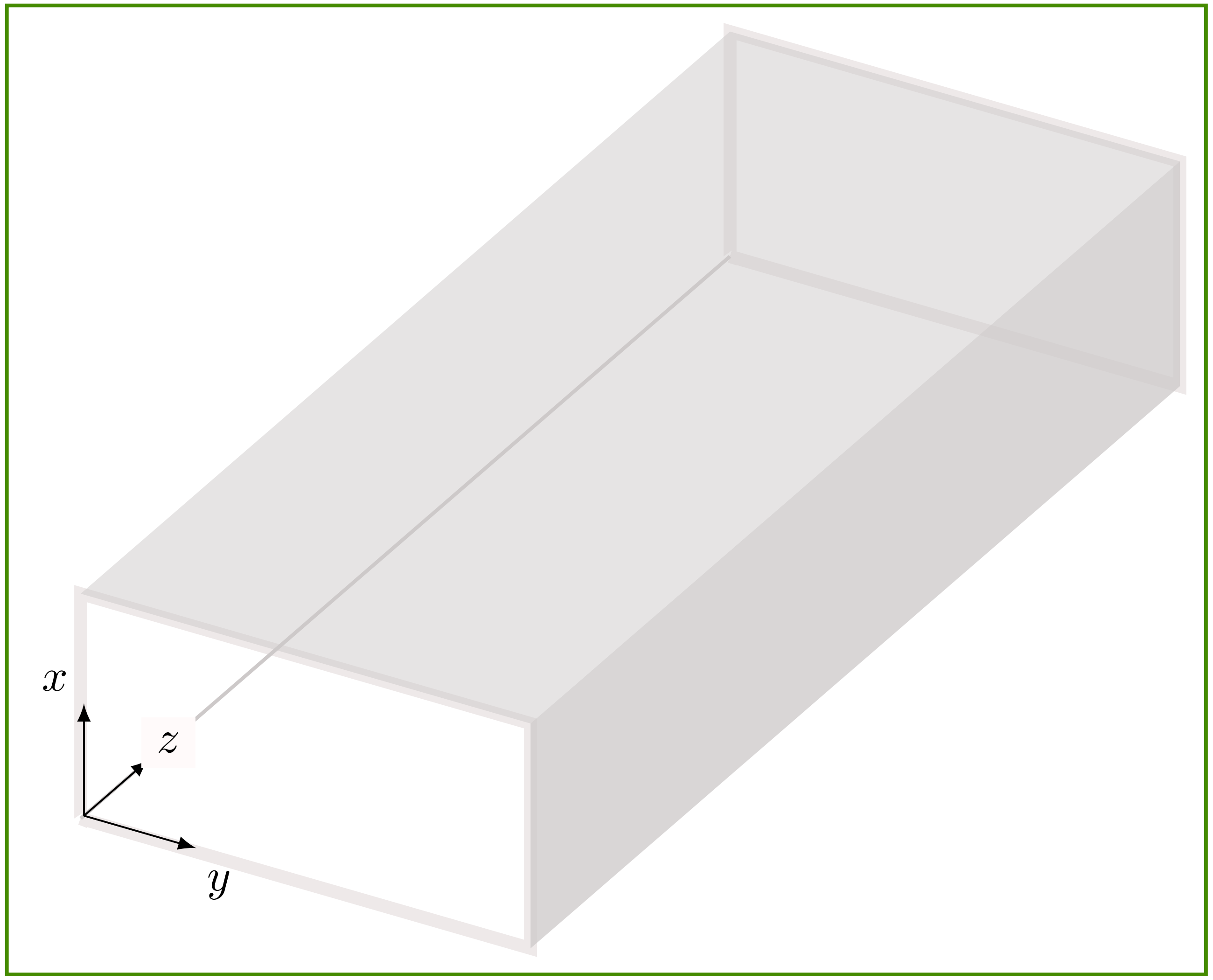
$$\tilde{\mathbf{B}} = \tilde{\mathbf{B}}_0(x,y)e^{ikz-\omega t}$$

CAMPOS $\vec{E}_0$ E $\vec{B}_0$ NÃO PODEM SER CONSTANTES, PORQUE TÊM DE SATISFAZER ÀS CONDIÇÕES DE CONTORNO



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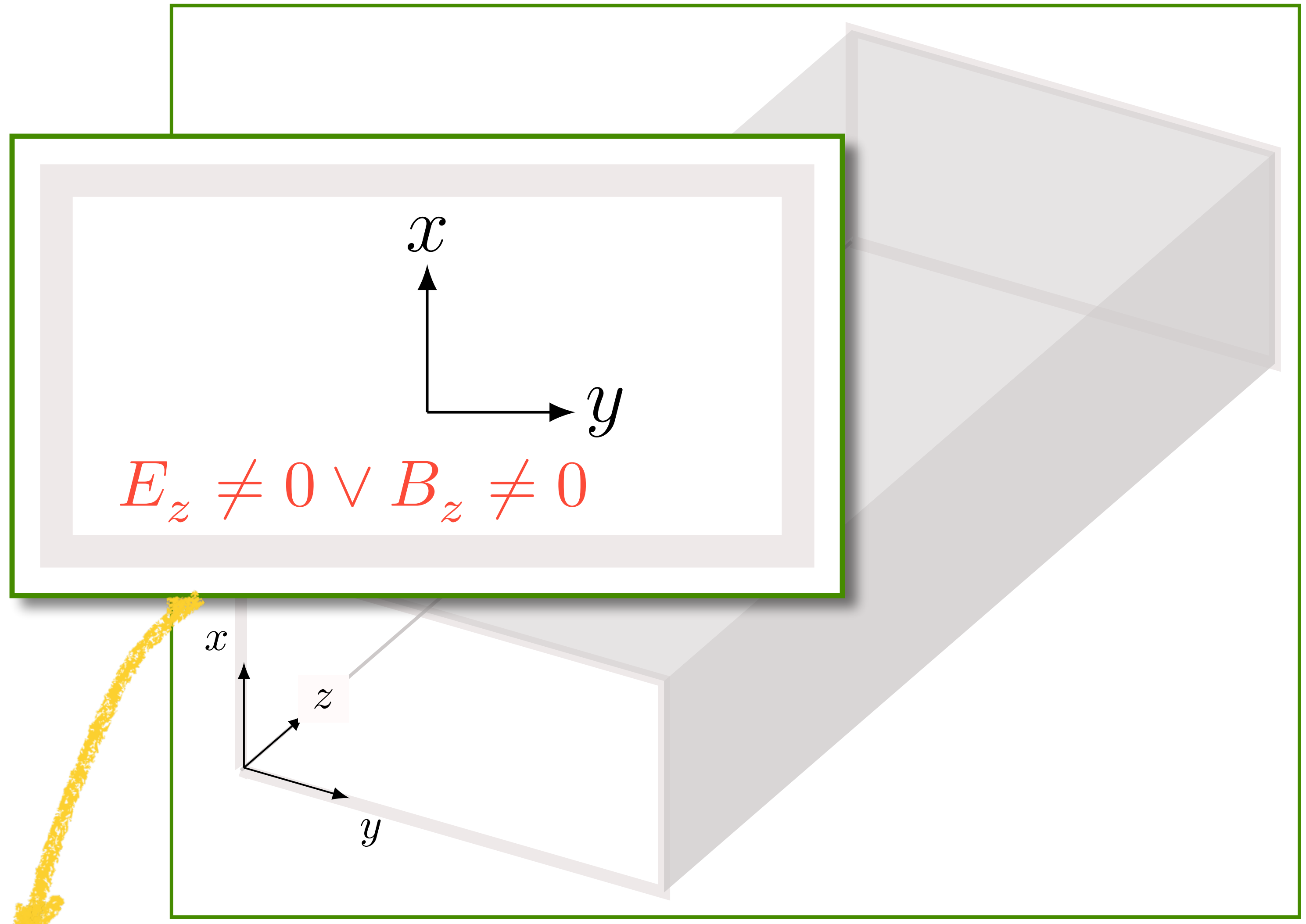

$$\tilde{\mathbf{E}}_0 = E_x\hat{x} + E_y\hat{y} + E_z\hat{z}$$

$$\tilde{\mathbf{B}}_0 = B_x\hat{x} + B_y\hat{y} + B_z\hat{z}$$

AO MENOS UM DOS CAMPOS $\tilde{E}_0$ E $\tilde{B}_0$ TEM COMPONENTE EM $\hat{z}$

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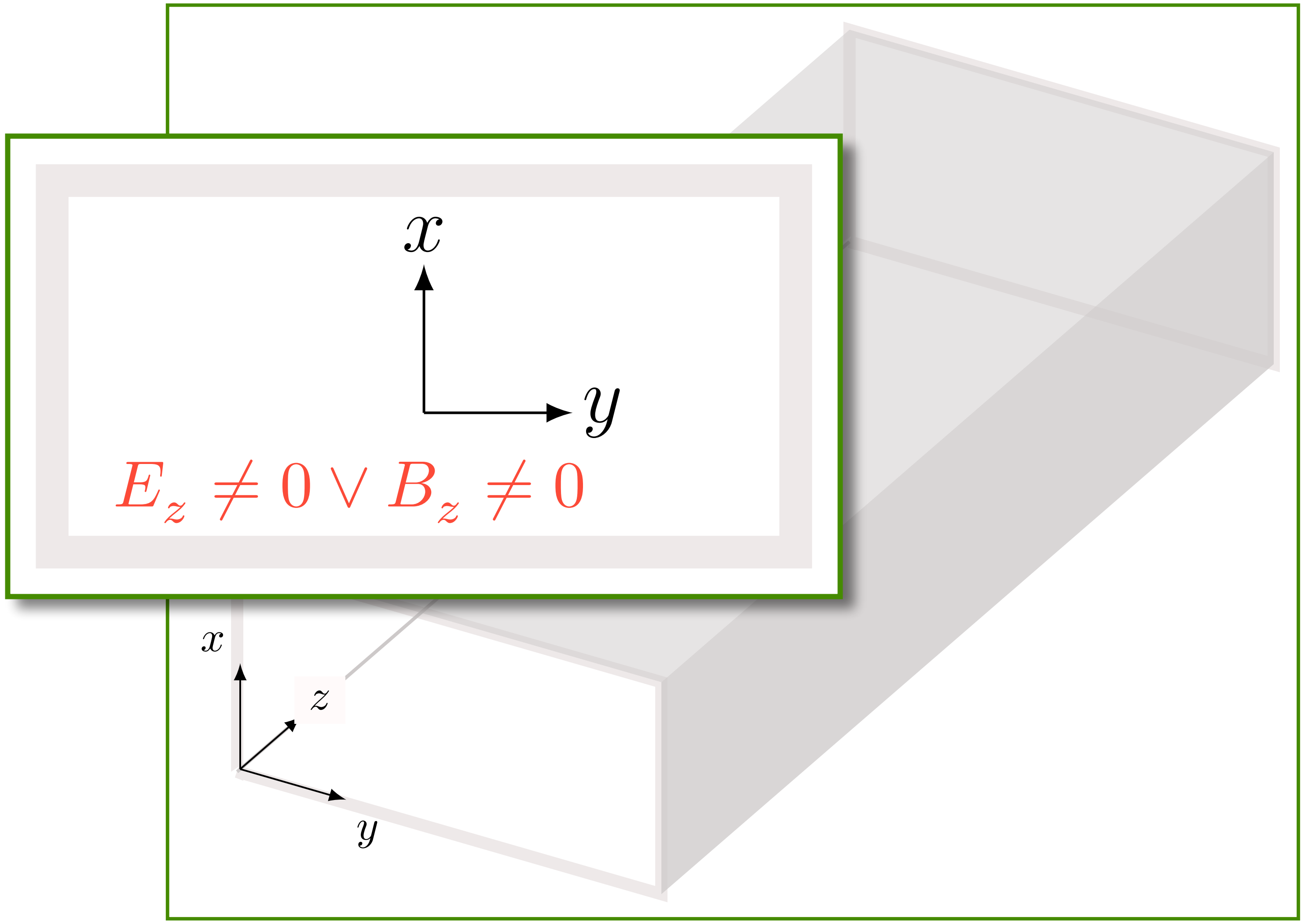

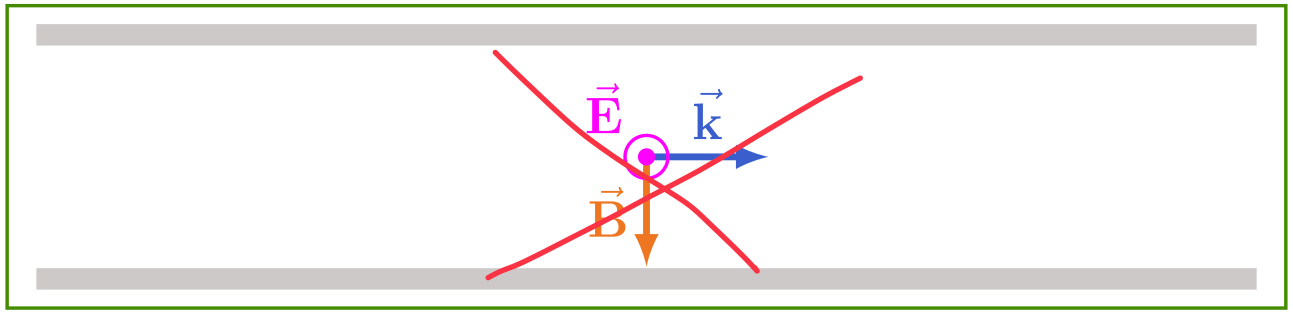

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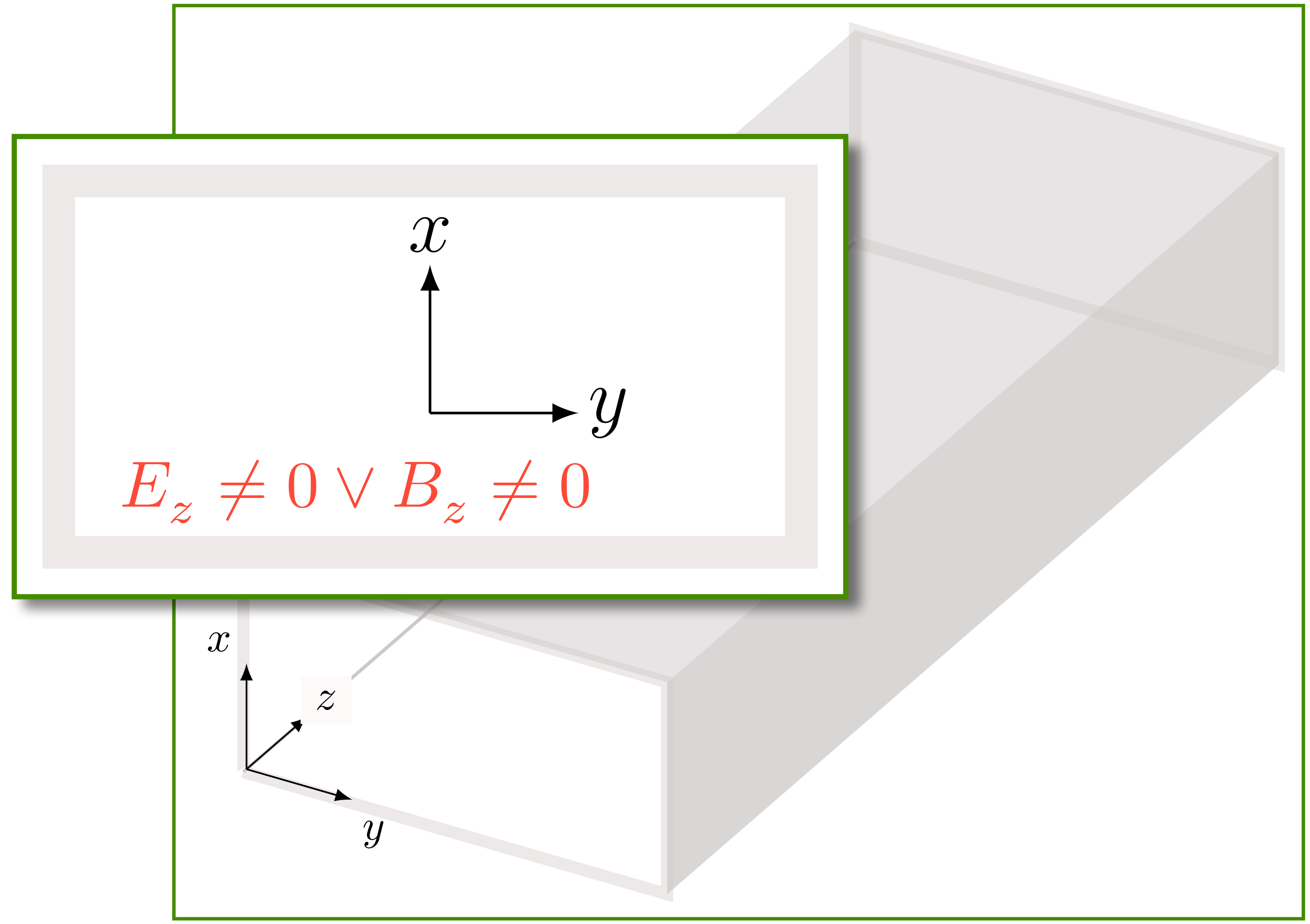

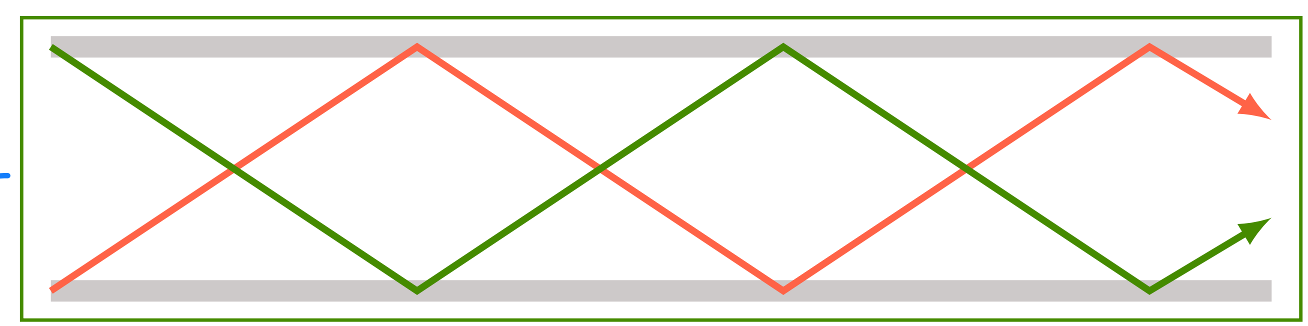

CAMPOS COMBINAM DUAS ONDAS OBLÍQUAS.
SOMA SE PROPAGA EM $\hat{z}$.

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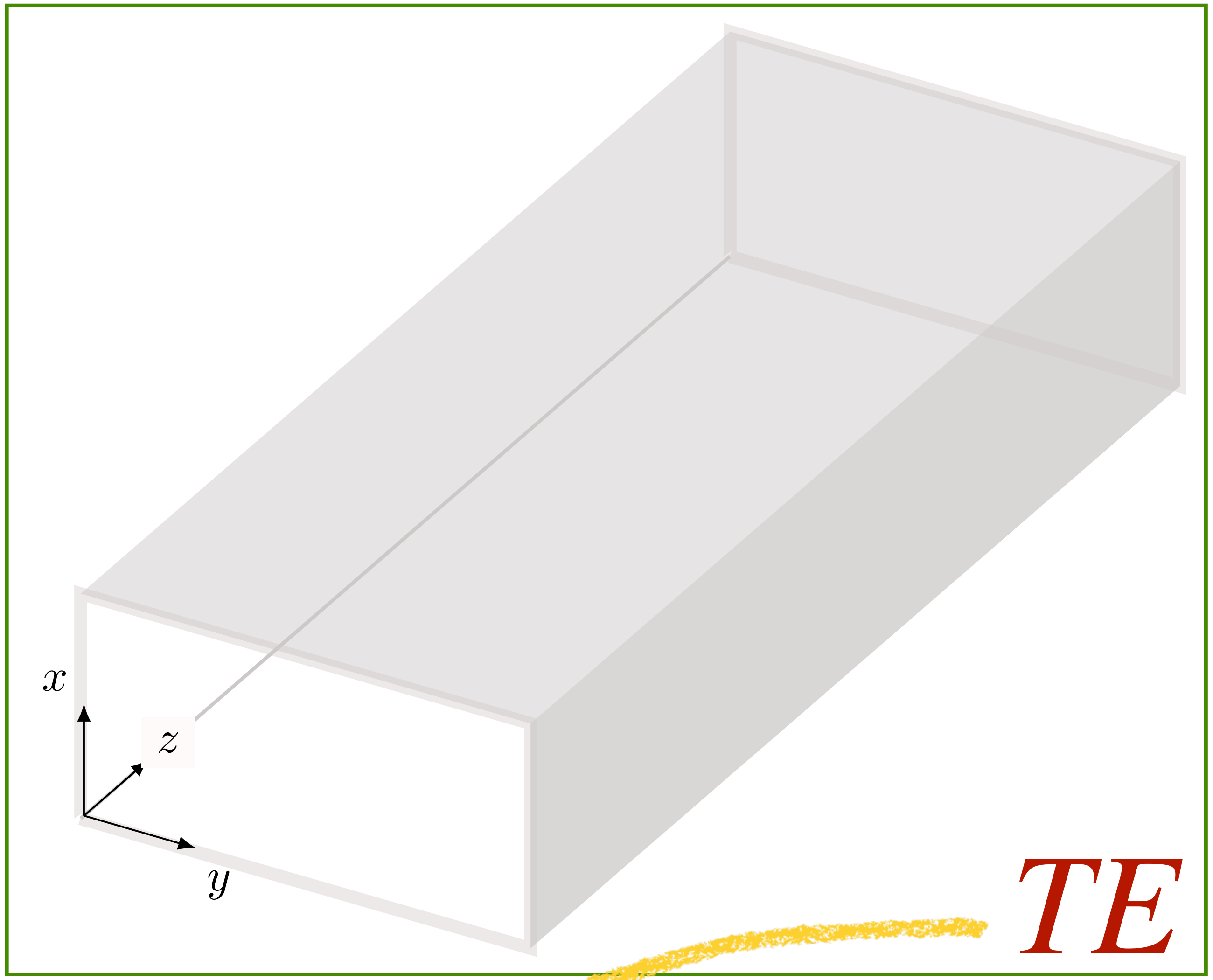
$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}\right)\tilde{B}_z = \frac{1}{c^2}\frac{\partial^2 \tilde{B}_z}{\partial t^2}$$



TE

$E_z = 0$

$B_z \neq 0$

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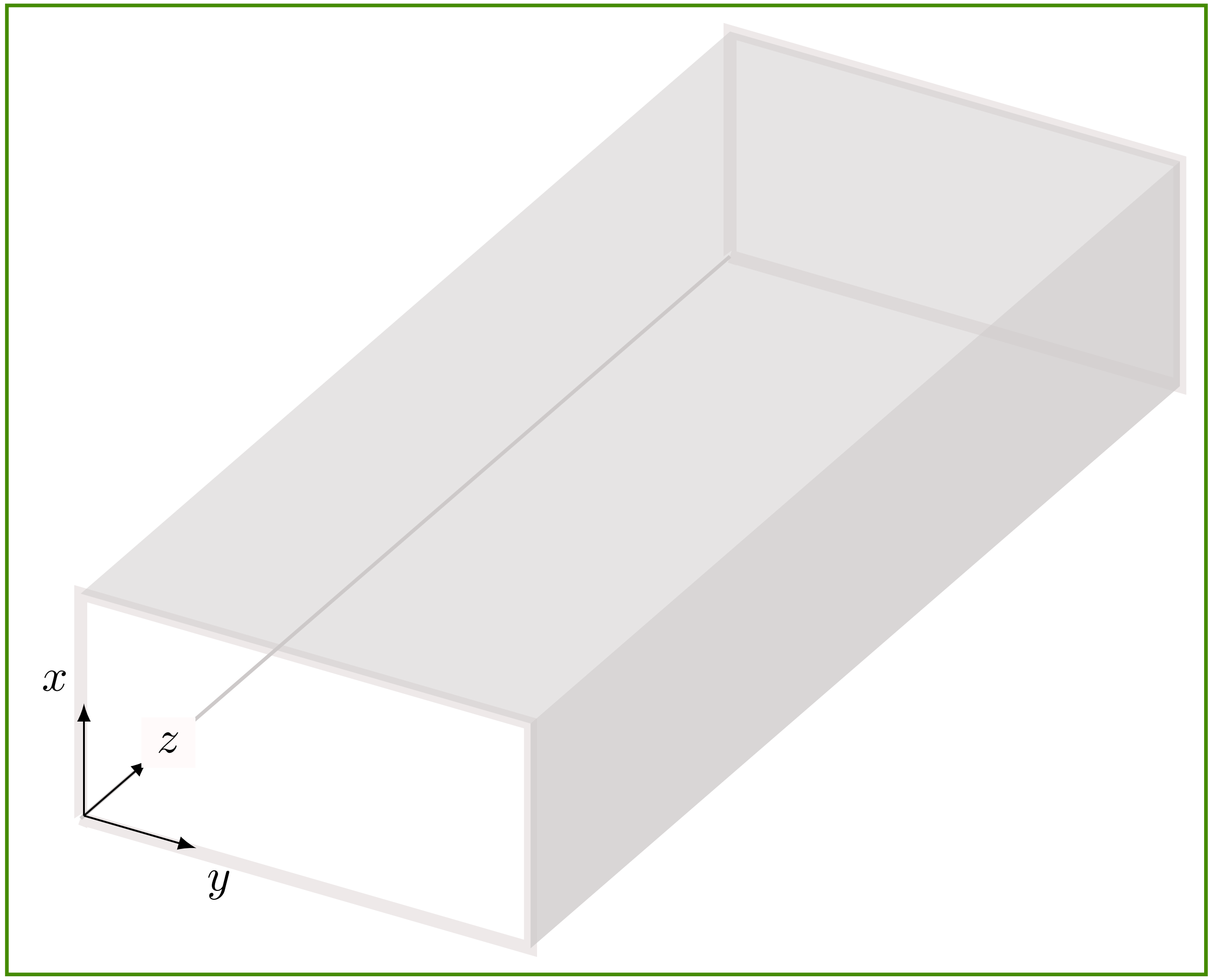

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$$\tilde{\mathbf{B}}_0 = B_x\hat{x} + B_y\hat{y} + B_z\hat{z}$$

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} - k^2 + \left(\frac{\omega}{c}\right)^2\right) B_z = 0 \qquad B_z = X(x)Y(y)$$

$$\hookrightarrow Y\frac{d^2X}{dx^2} + X\frac{d^2Y}{dy^2} = \left[k^2 - \left(\frac{\omega}{c}\right)^2\right]XY \Rightarrow \frac{1}{X}\frac{d^2X}{dx^2} + \frac{1}{Y}\frac{d^2Y}{dy^2} = k^2 - \left(\frac{\omega}{c}\right)^2$$

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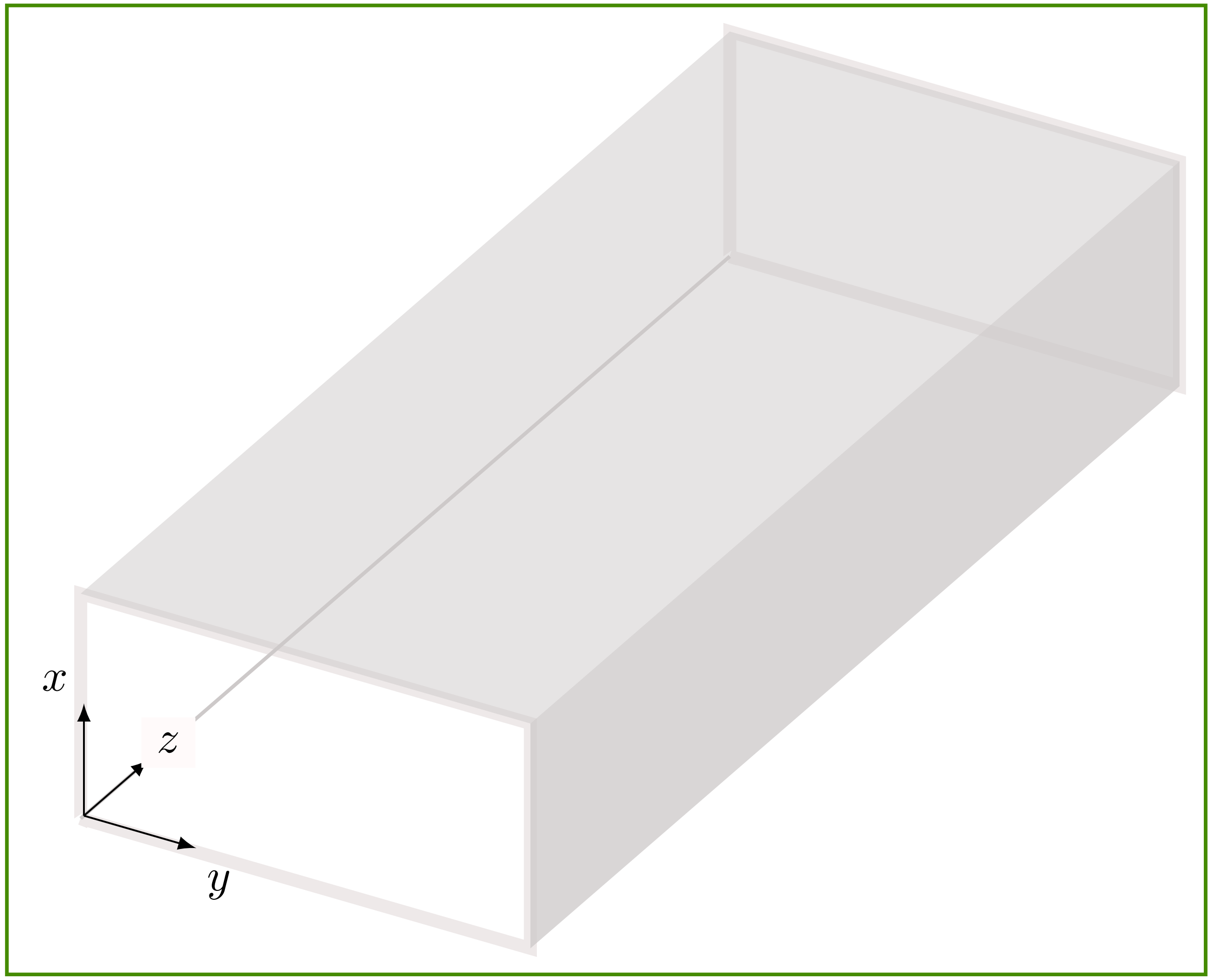

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$$B_z = X(x)Y(y)$$

$$X(x) = A\cos(k_x x) + B\sin(k_x x)$$

$$k^2 - \left(\frac{\omega}{c}\right)^2 = k_x^2 + k_y^2$$

Guias de ondas

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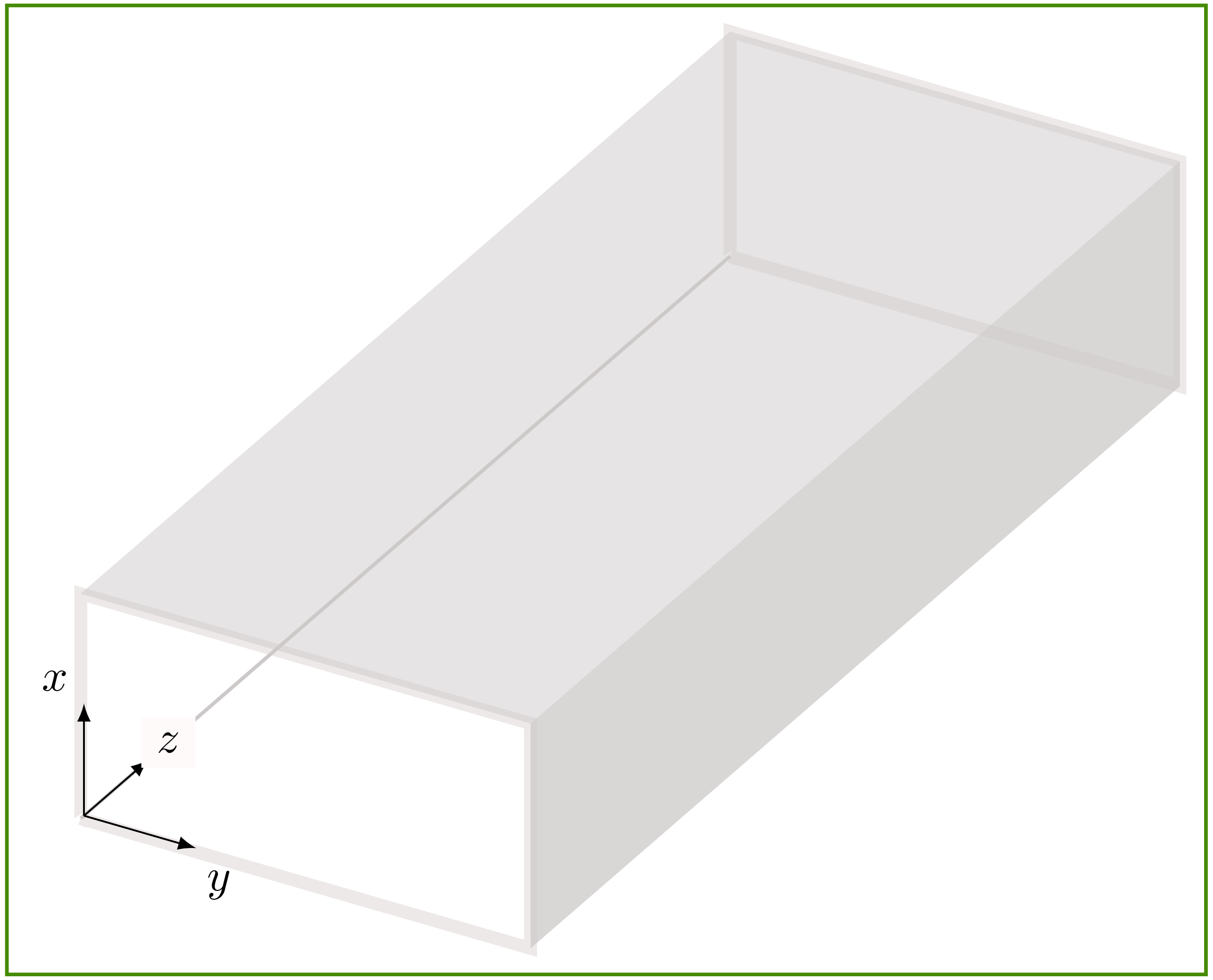

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$$B_z = X(x)Y(y)$$

CONDIÇÕES DE CONTORNO

$$B_z(x,y) = B_0 \cos\left(n\frac{\pi x}{a}\right)\cos\left(m\frac{\pi y}{b}\right) \qquad (m,n = 0,1,2,\dots)$$

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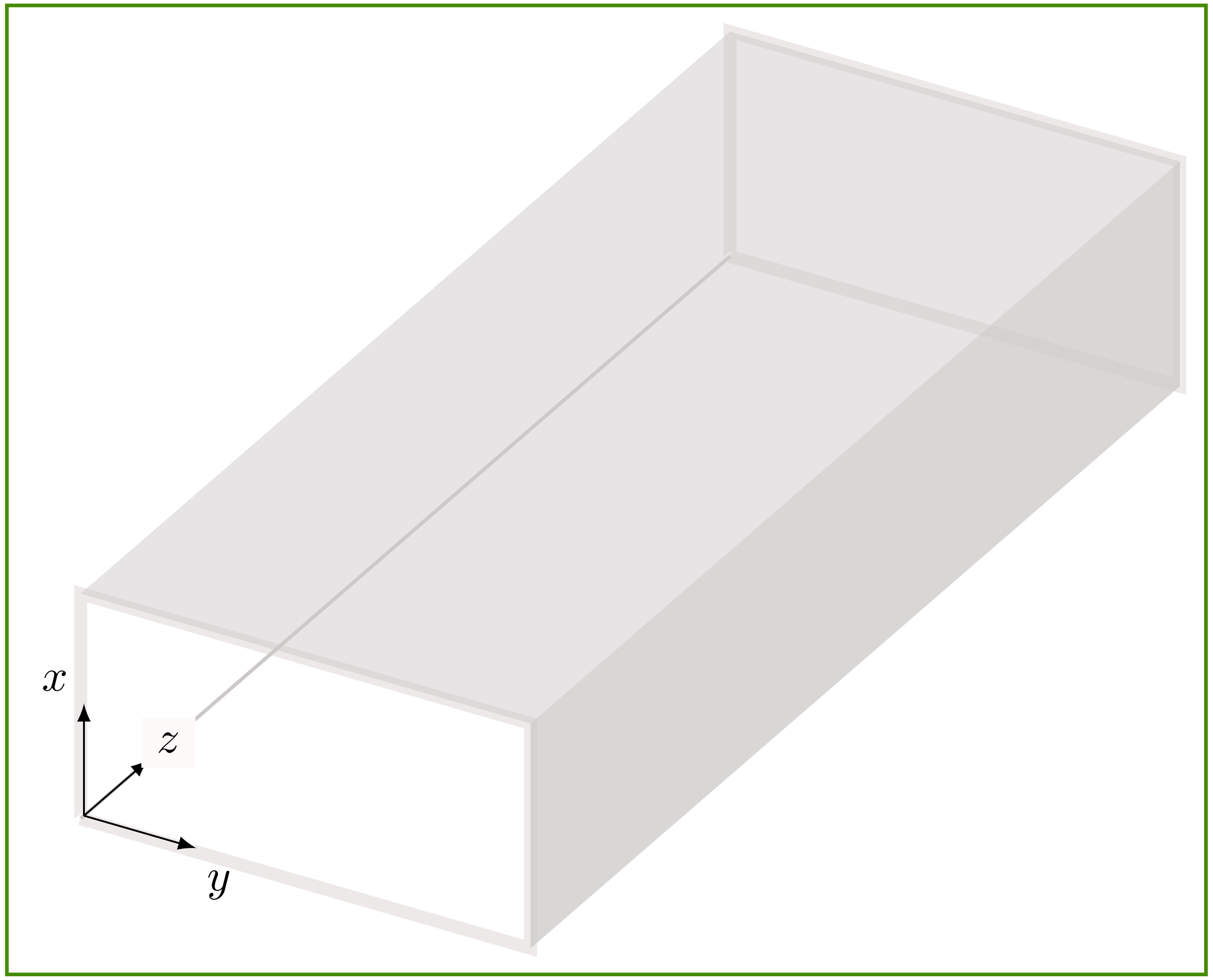

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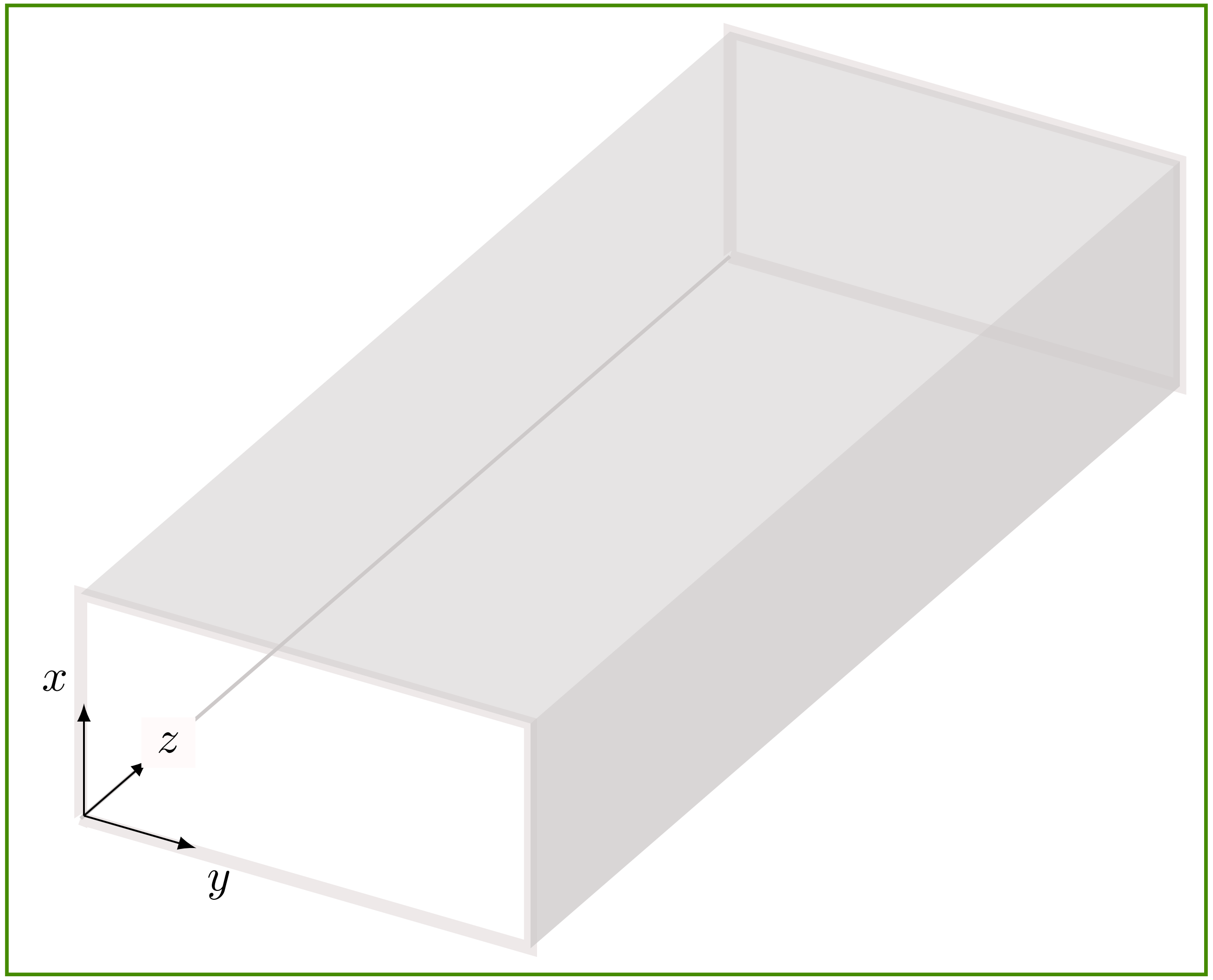

$$\omega_{mn}^2 = c^2\left(\left(\frac{\pi m}{b}\right)^2+\left(\frac{\pi n}{a}\right)^2\right) \quad \Rightarrow \quad \omega > \omega_{mn}$$

FREQUÊNCIA DE CORTE: $\omega < \omega_{mn} \Rightarrow$ CAMPO $\sim e^{-Kz}$ (DECAI)

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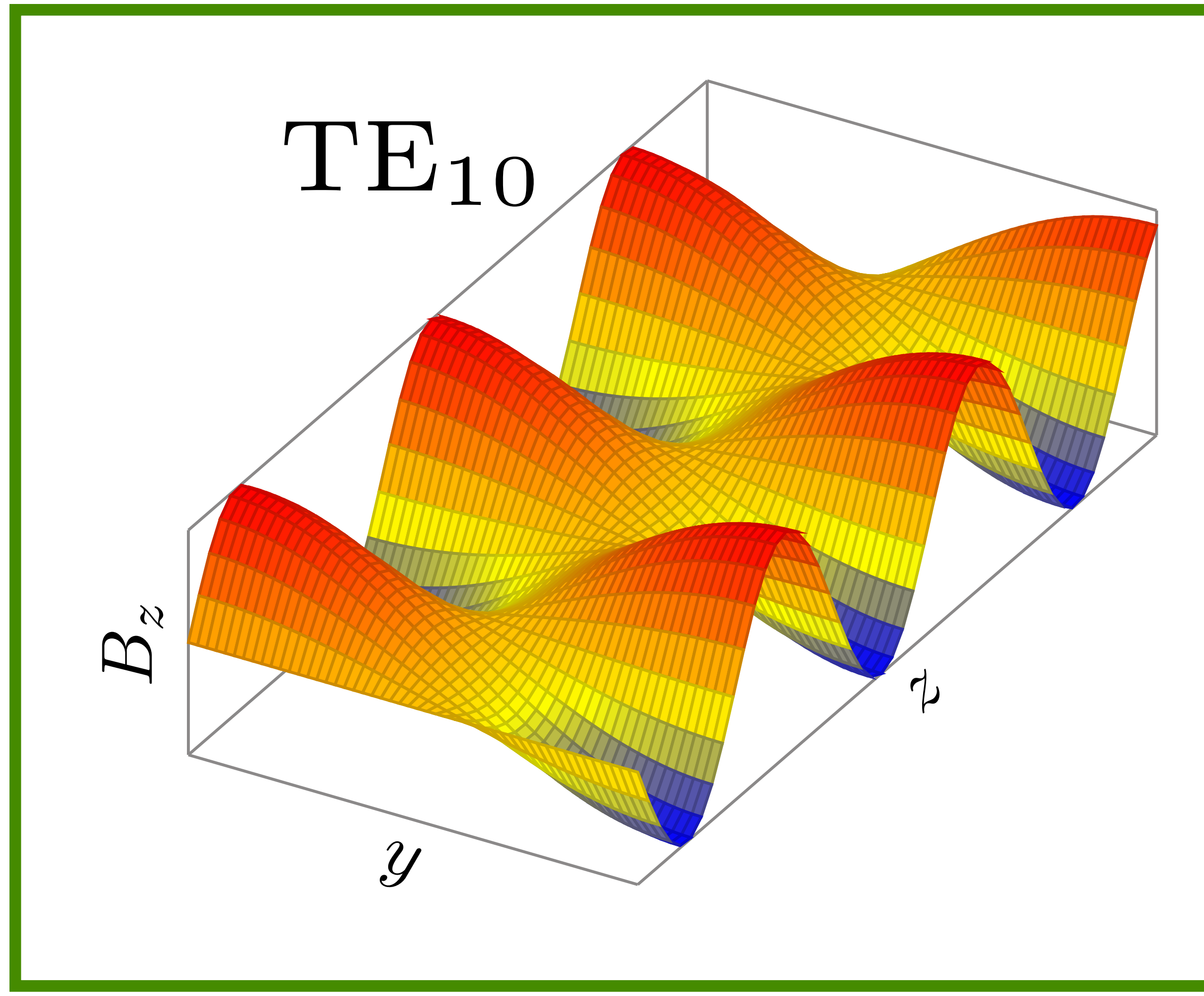

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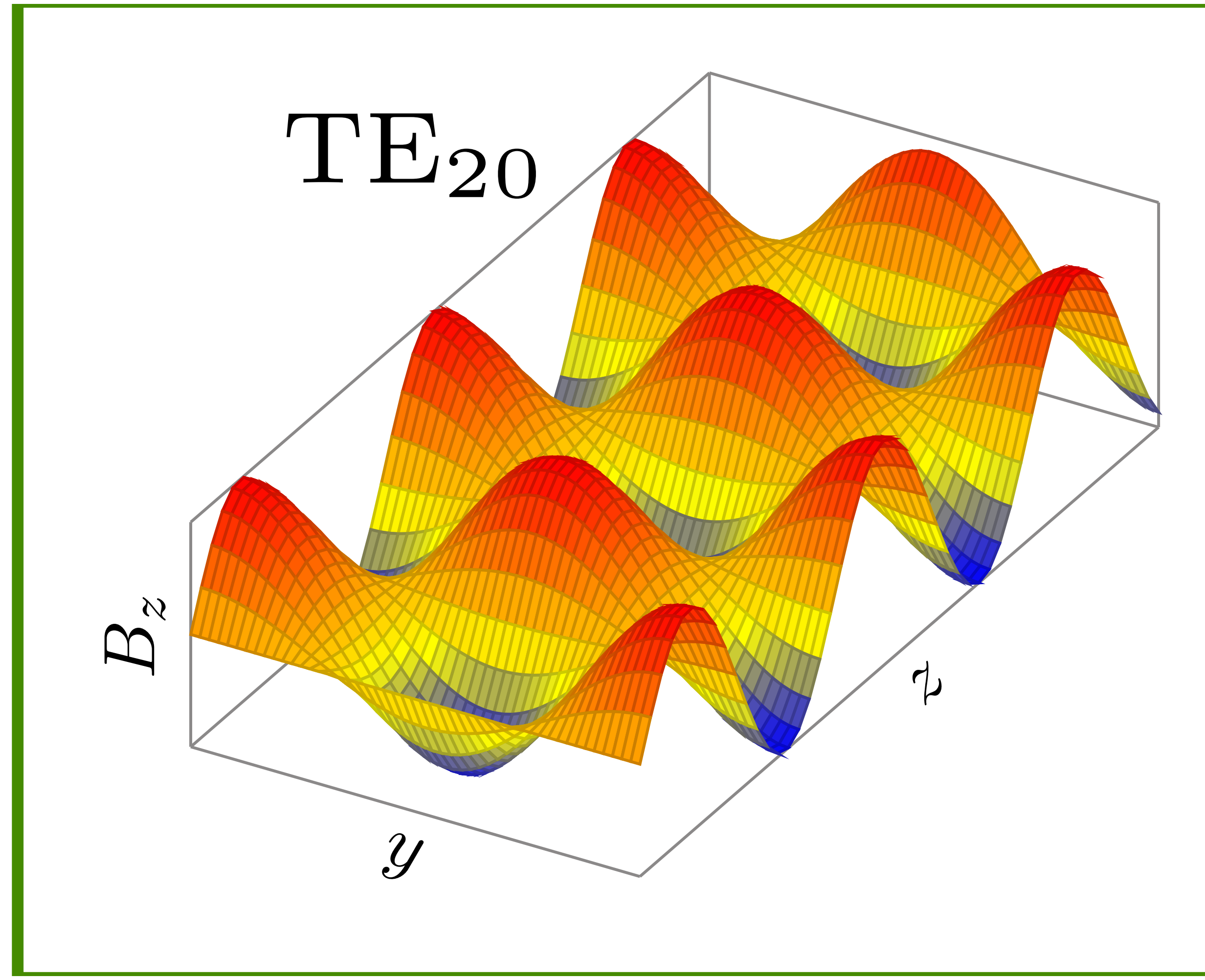

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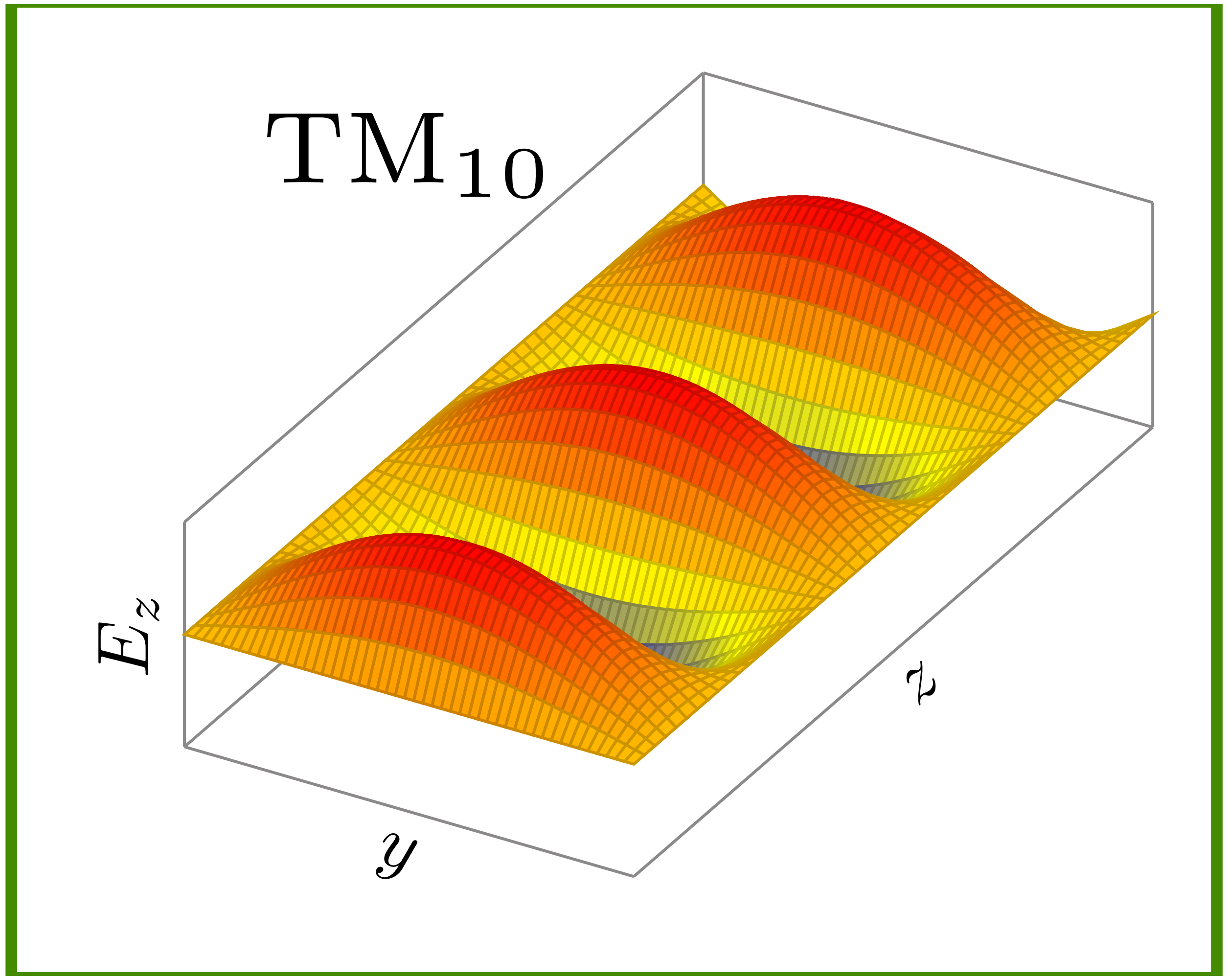

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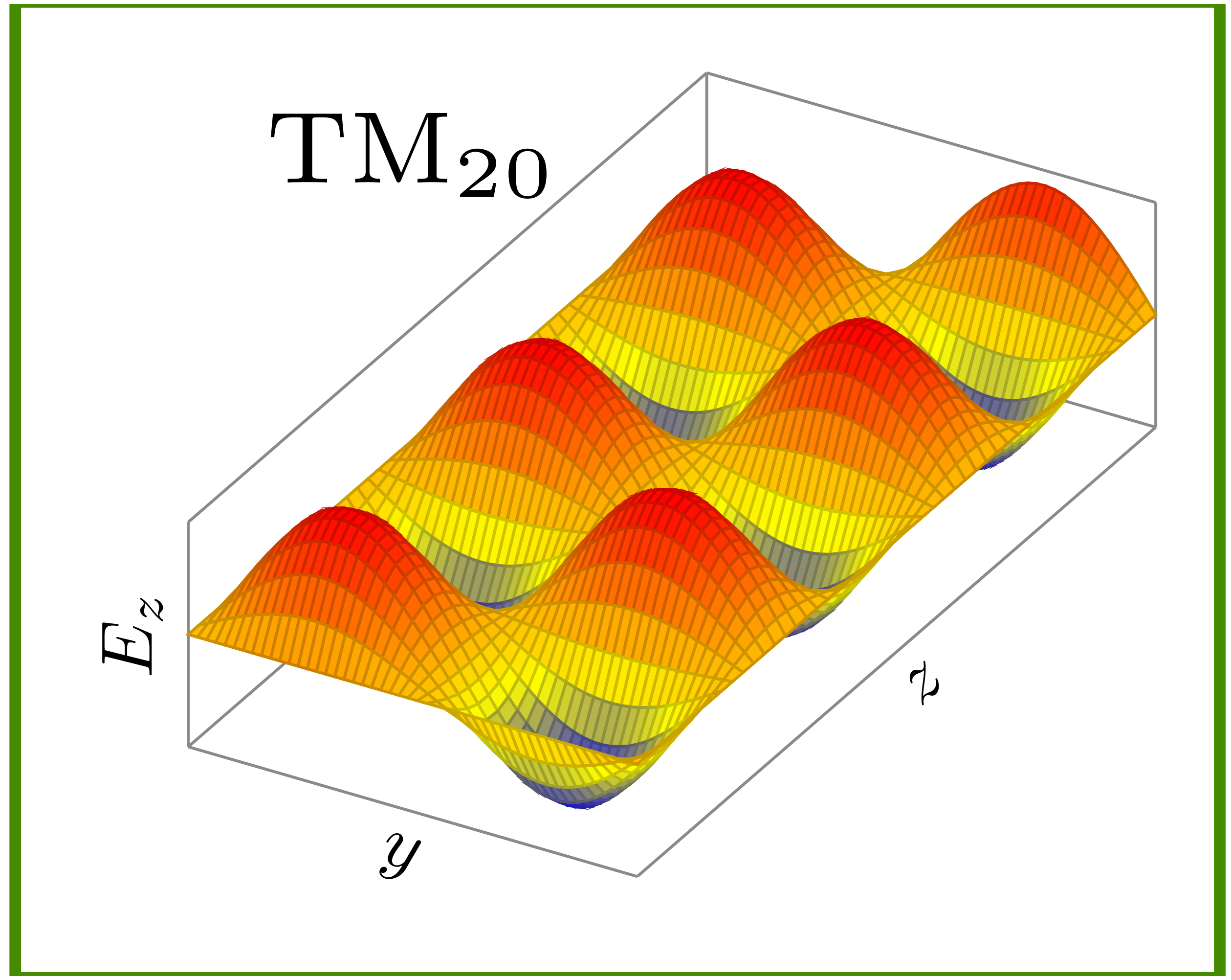

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