Eletromagnetismo Avançado

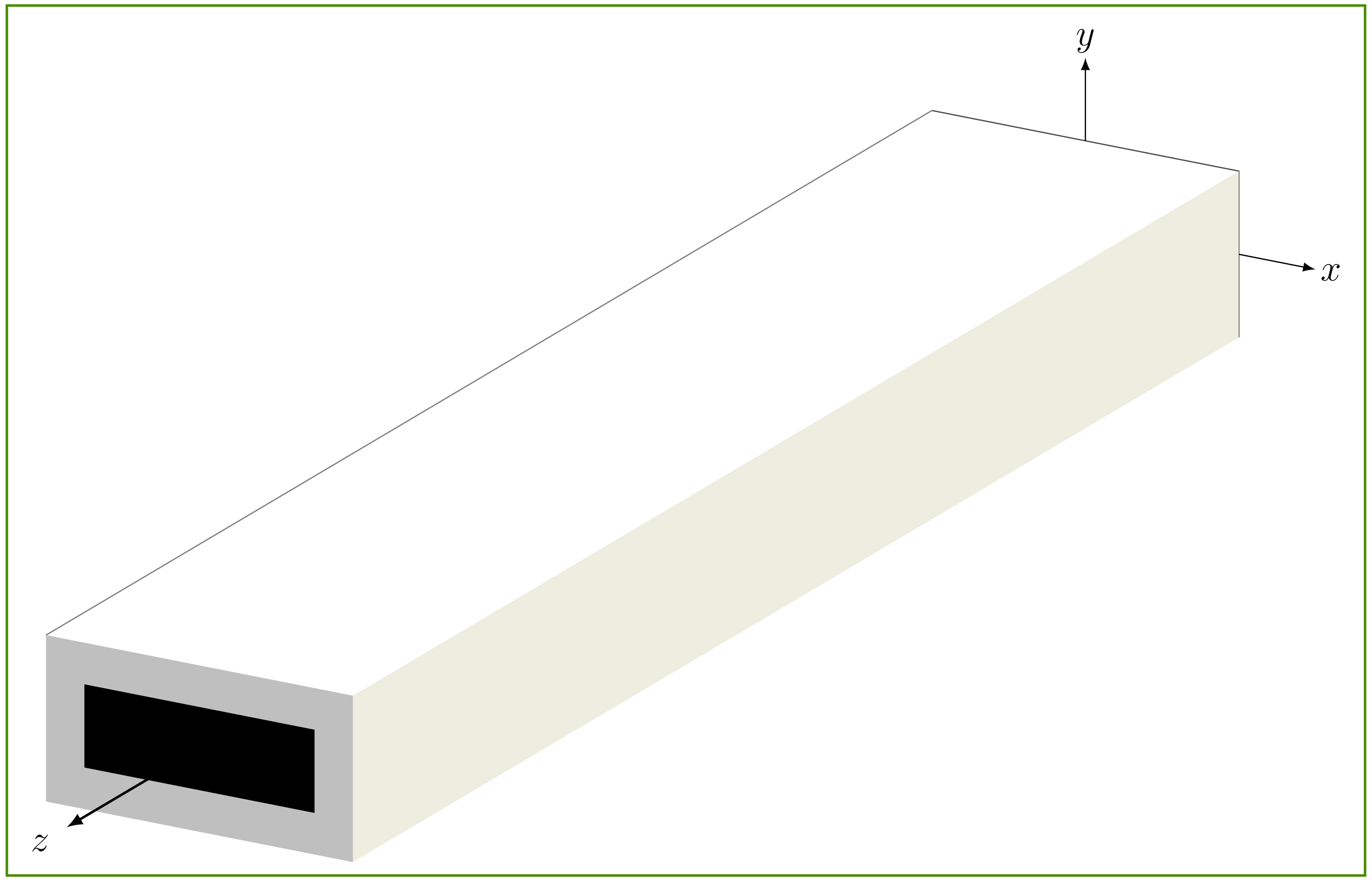
29 de setembro

Ondas Eletromagnéticas

Propagação em guias de onda

$$\vec{\mathbf{E}}_{\parallel} = \vec{\mathbf{B}}_{\perp} = 0$$

$$\vec{\mathbf{E}} = \vec{\mathbf{E}}_0(x, y)e^{i(kz-\omega t)}$$



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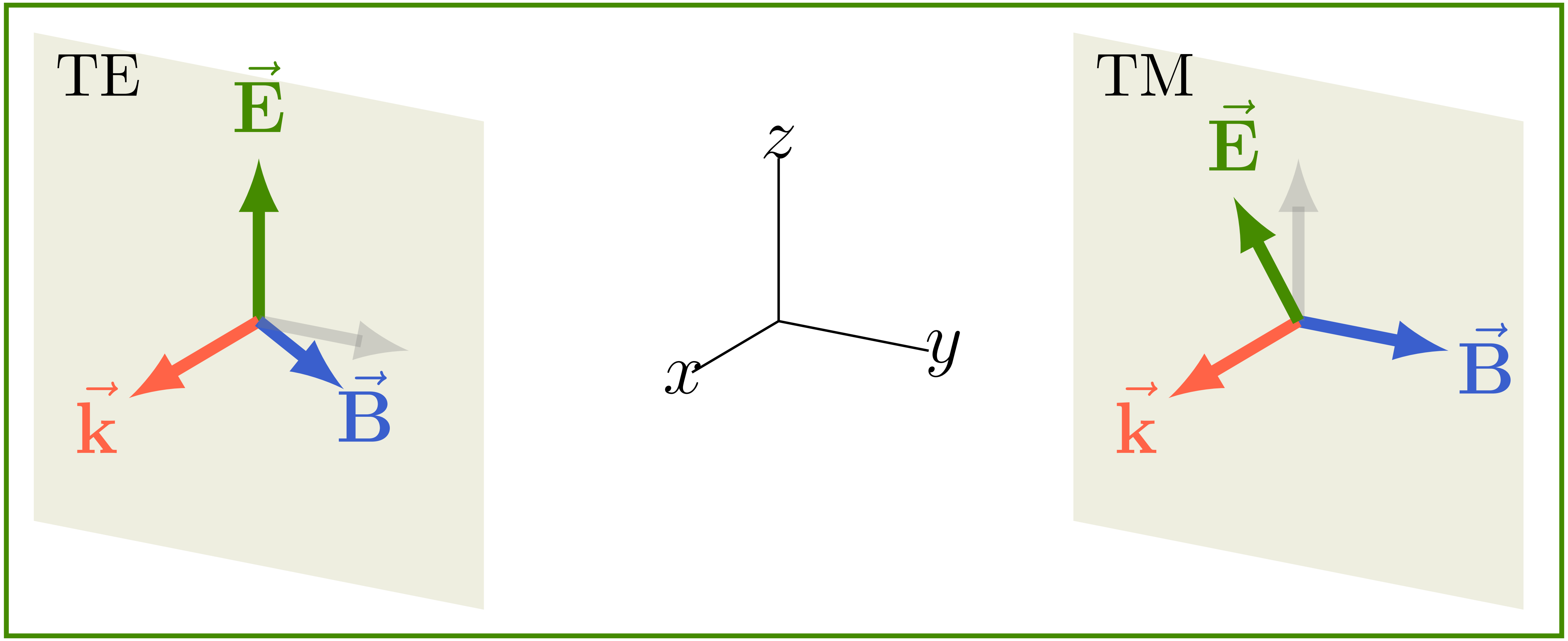

Propagação em guias de onda

$$\vec{\mathbf{E}} = \vec{\mathbf{E}}_0(x, y)e^{i(kz-\omega t)}$$

$$\vec{\mathbf{B}} = \vec{\mathbf{B}}_0(x, y)e^{i(kz-\omega t)}$$

$$E_x = \frac{i}{(\frac{\omega}{c})^2 - k^2}\left(k\partial_x E_z + \omega \partial_y B_z\right)$$

$$E_y = \frac{i}{(\frac{\omega}{c})^2 - k^2}\left(k\partial_y E_z - \omega \partial_x B_z\right)$$

$$B_x = \frac{i}{(\frac{\omega}{c})^2 - k^2}\left(k\partial_x B_z - \frac{\omega}{c^2}\partial_y E_z\right)$$

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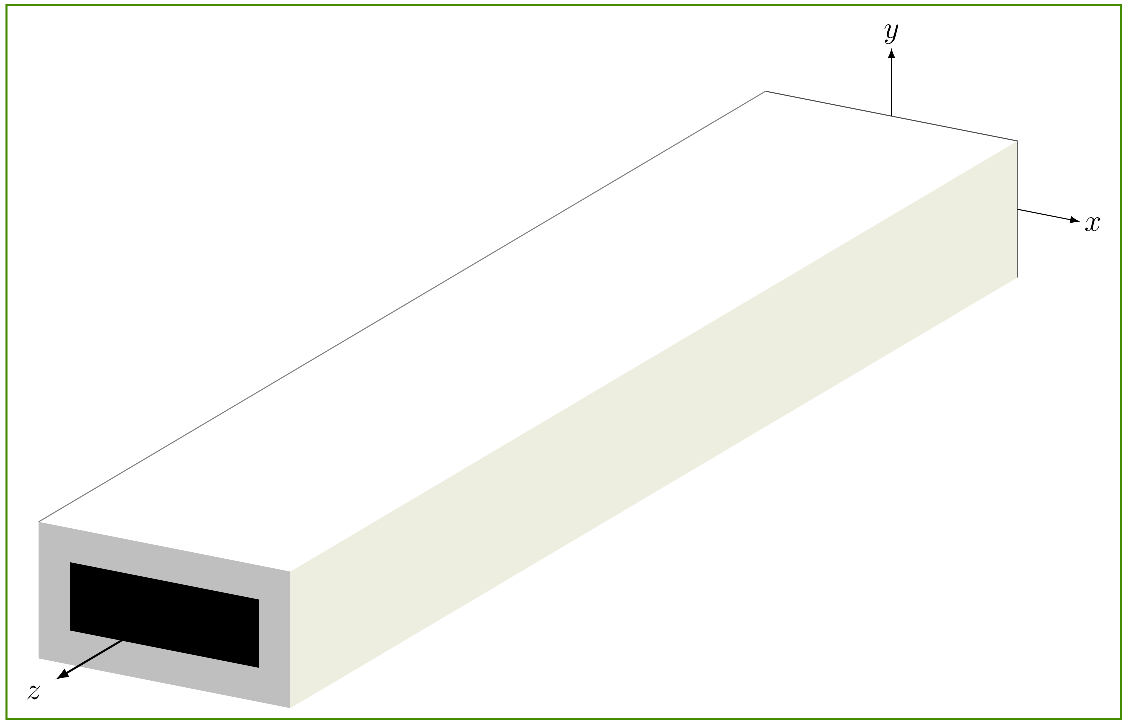

$$\vec{\mathbf{E}} = \vec{\mathbf{E}}_0(x, y)e^{i(kz-\omega t)}$$
$$\vec{\mathbf{B}} = \vec{\mathbf{B}}_0(x, y)e^{i(kz-\omega t)}$$

$$(\partial_x^2 + \partial_y^2 + \frac{\omega^2}{c^2} - k^2)E_z = 0$$

$$(\partial_x^2 + \partial_y^2 + \frac{\omega^2}{c^2} - k^2)B_z = 0$$

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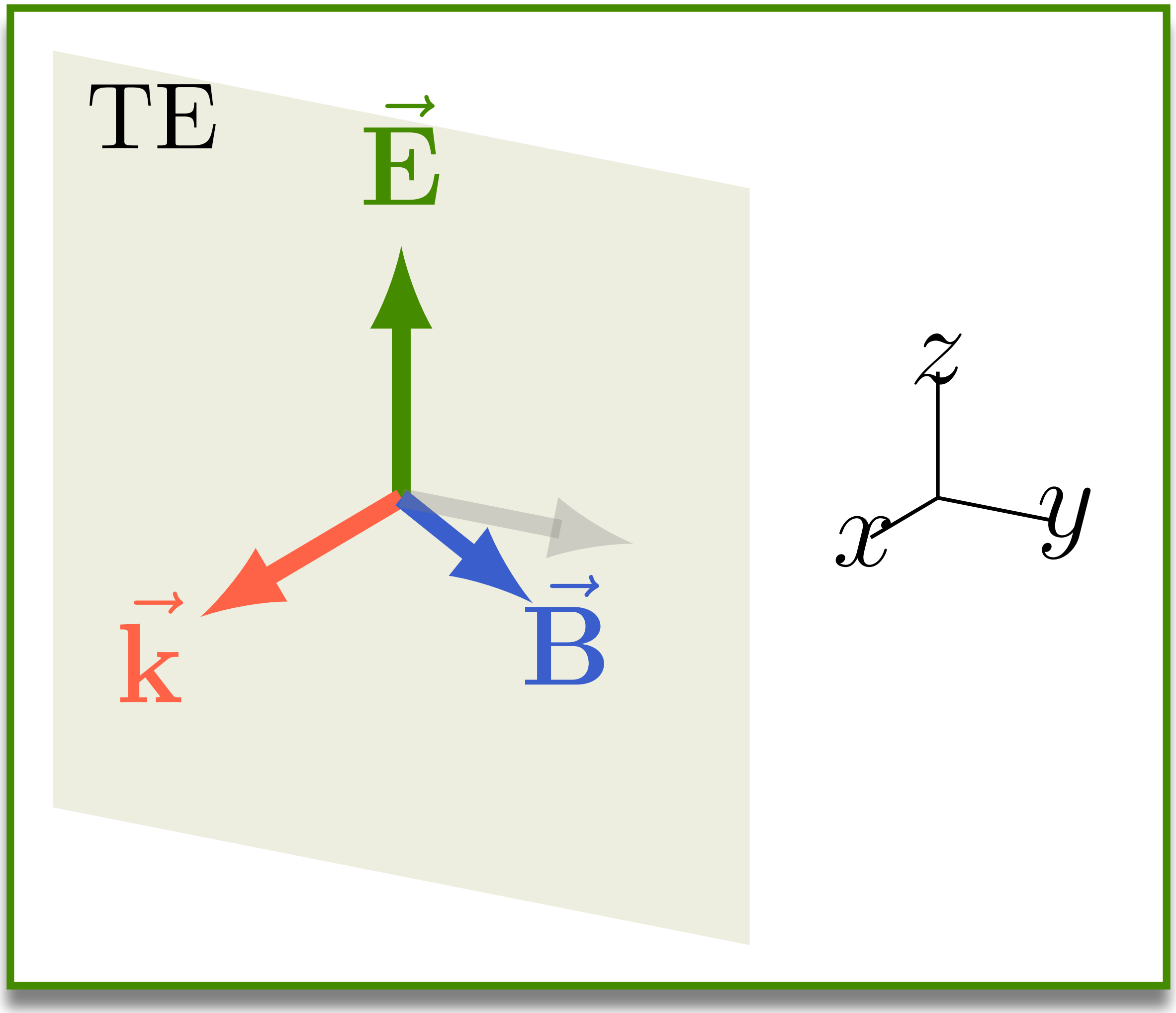

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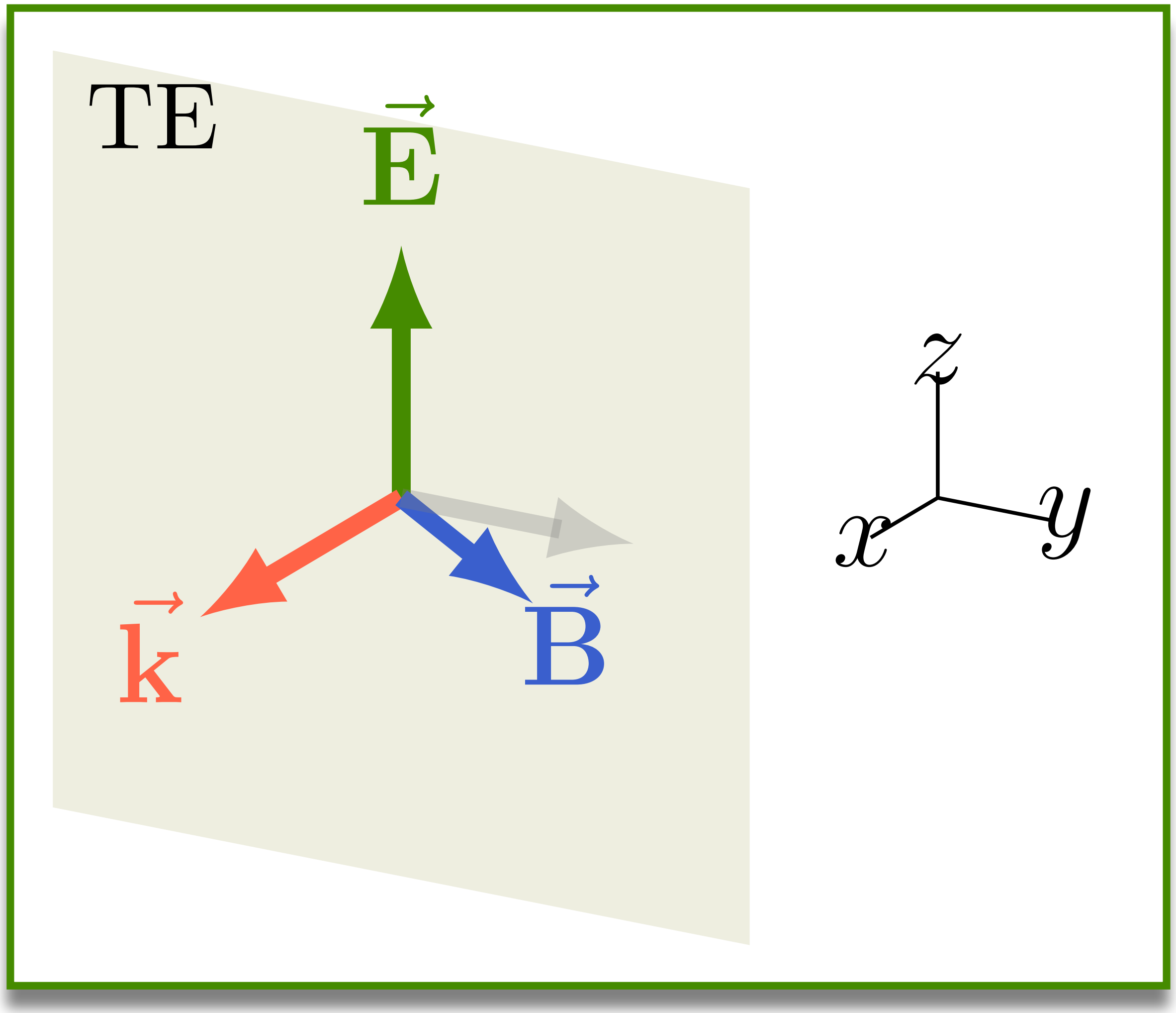

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↪ Método da separação de variáveis

Propagação em guias de onda

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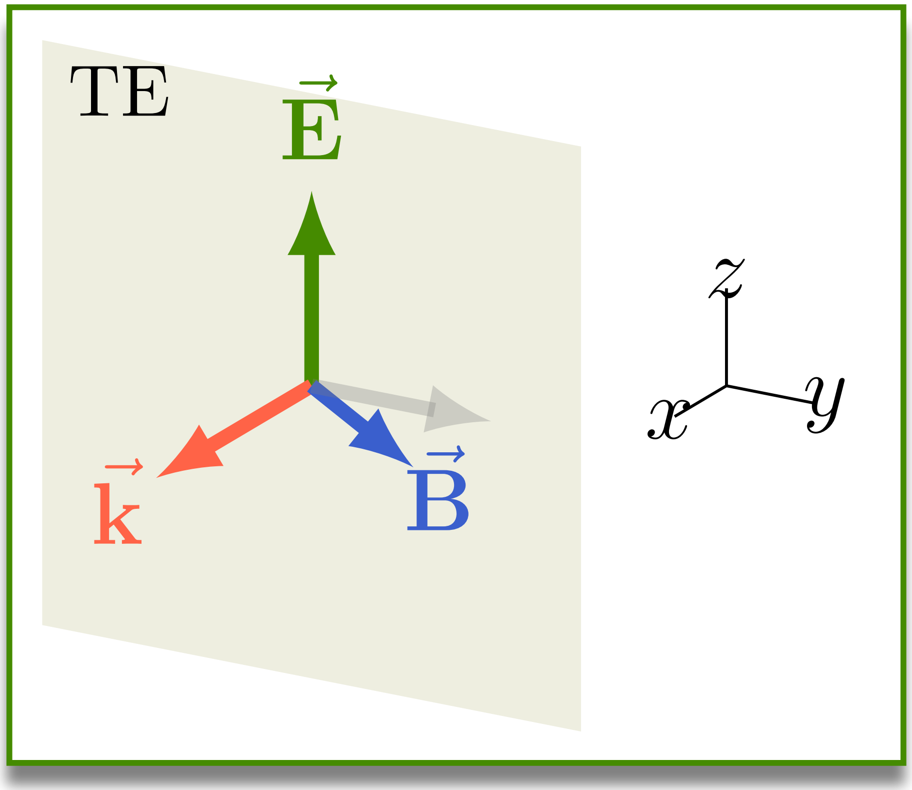

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$$(\partial_x^2 + \partial_y^2 + \frac{\omega^2}{c^2} - k^2)B_z = 0$$

$$B_z = B_0 \cos\left(\frac{m\pi}{a}\right)\cos\left(\frac{n\pi}{b}\right)e^{i(kz-\omega t)}$$

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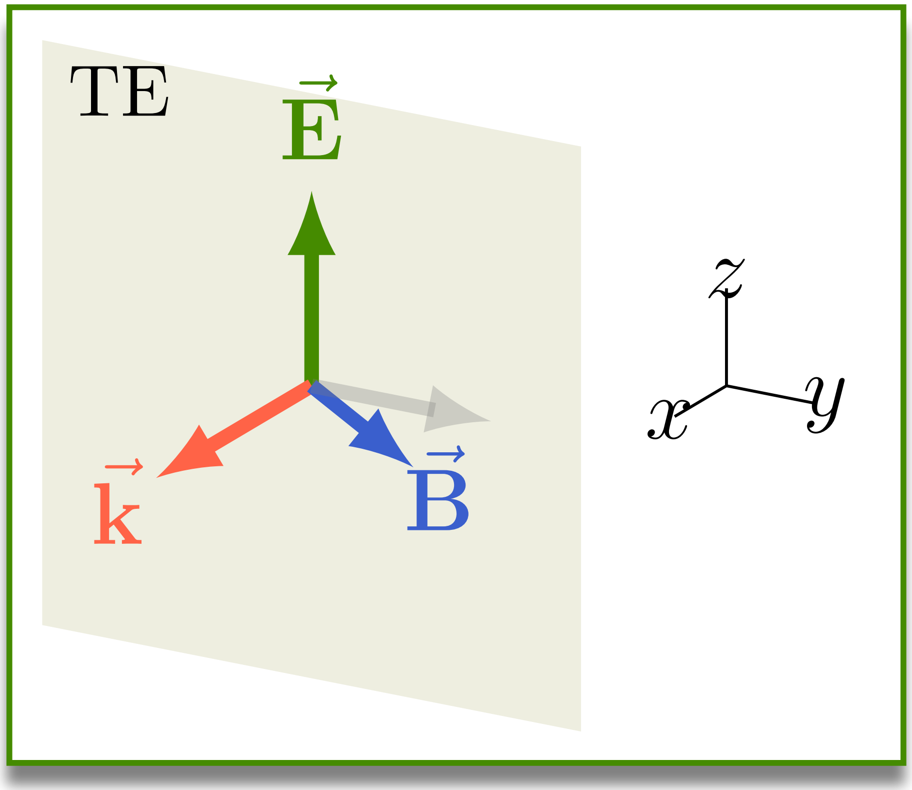

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TE_{mn}

Propagação em guias de onda

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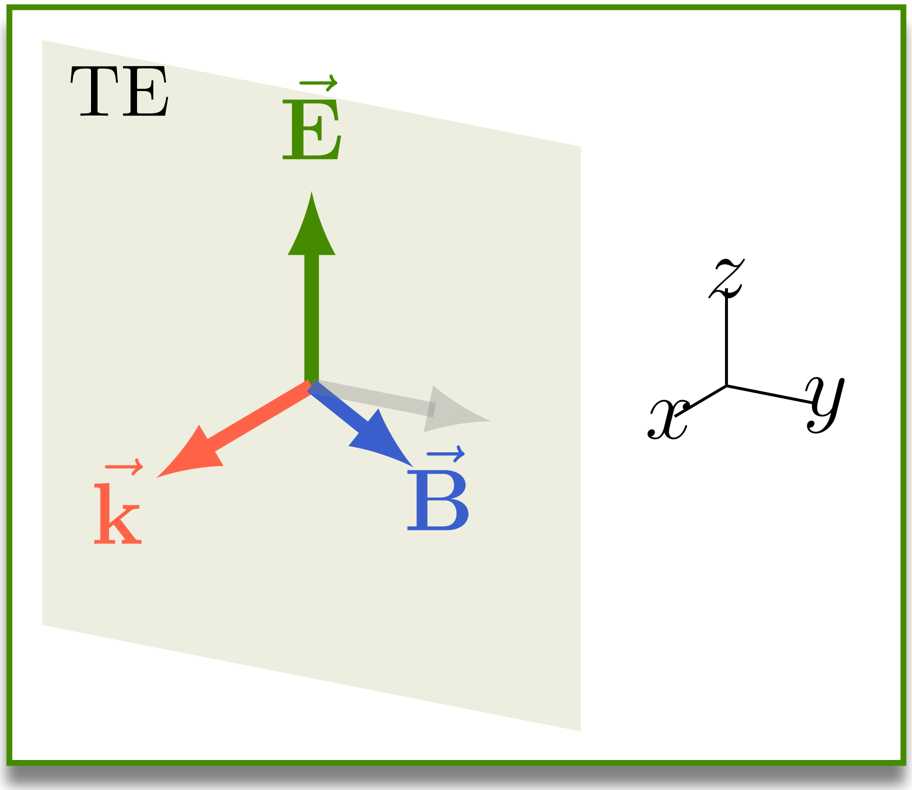
$$\omega^2 = c^2\left(k^2 + \pi^2\left(\frac{m^2}{a^2}+\frac{n^2}{b^2}\right)\right)$$

$$k = \sqrt{\frac{\omega^2}{c^2} - \pi^2\left(\frac{m^2}{a^2}+\frac{n^2}{b^2}\right)}$$



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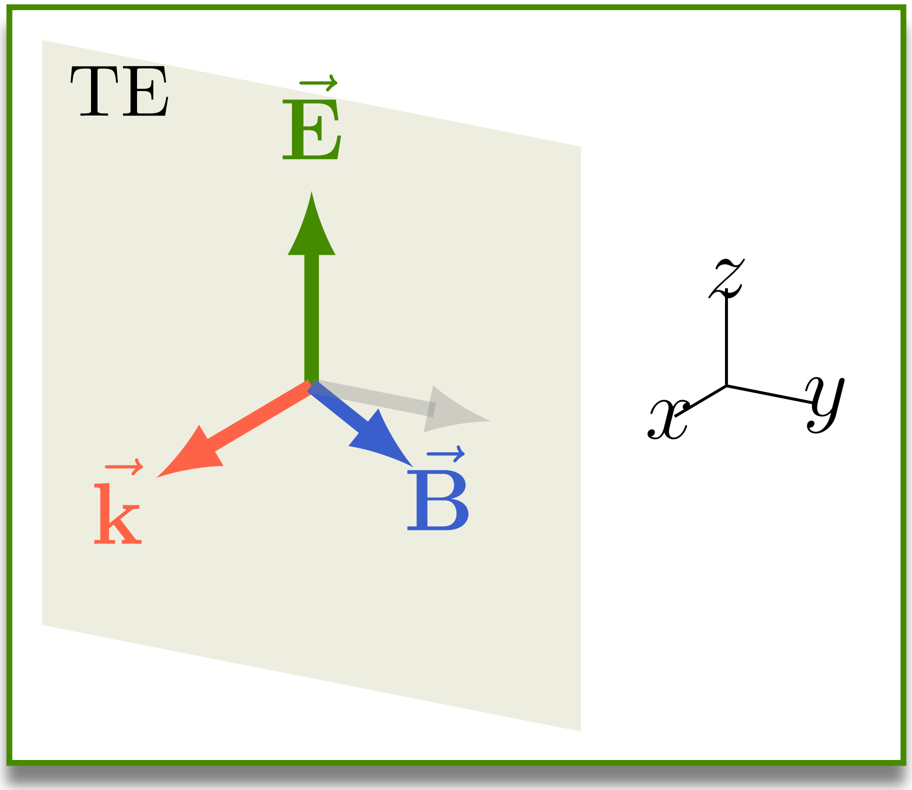
$$\omega_{mn} \equiv \pi c\sqrt{\frac{m^2}{a^2} + \frac{n^2}{b^2}}$$



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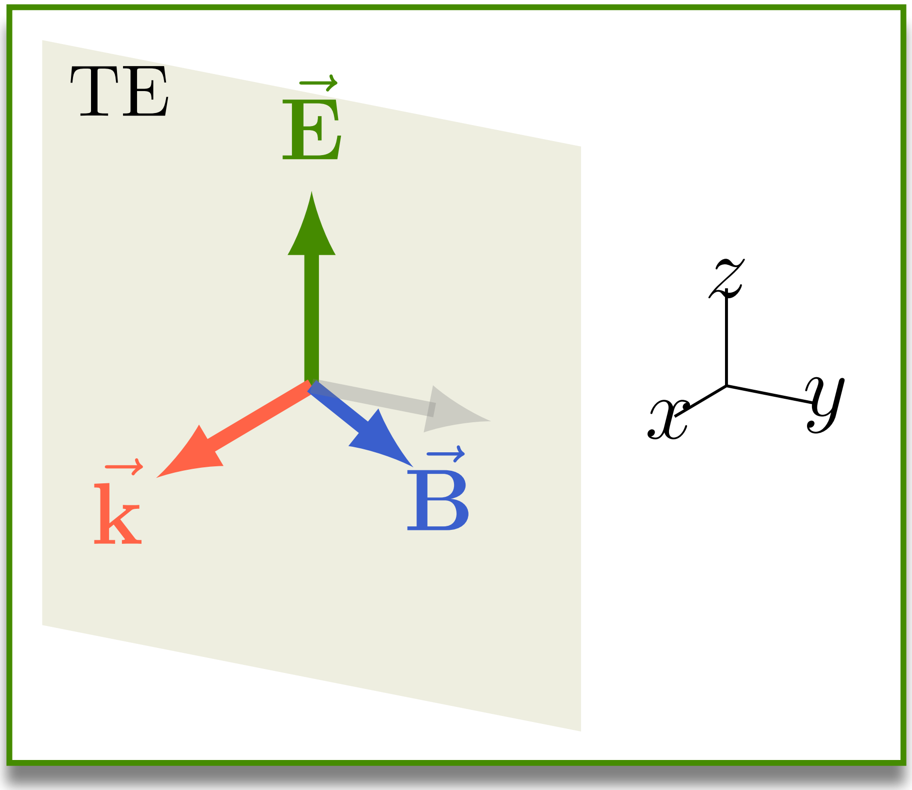

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