Campos Transversales y Longitudinales

November 30, 2020

1 MODO $\mathbf{TE}_{10}$

1.1 Arriba de la frecuencia de corte:

$$E_x^{\pm}(x,y,z,t) = 0 \tag{1}$$

$$E_y^{\pm}(x,y,z,t) = E_{y,0}^{\pm} \sin\left(\frac{\pi x}{0.00625}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (5.03 * 10^2)z\right) \tag{2}$$

$$H_x^{\pm}(x,y,z,t) = H_{x,0}^{\pm} \sin\left(\frac{\pi x}{0.00625}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (5.03 * 10^2)z\right) \tag{3}$$

$$H_y^{\pm}(x,y,z,t) = 0 \tag{4}$$

$$H_z^{\pm}(x,y,z,t) = H_{z,0}^{\pm} \cos\left(\frac{\pi x}{0.00625}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (5.03 * 10^2)z\right) \tag{5}$$

1.2 Debajo de la frecuencia de corte:

$$E_x^{\pm}(x,y,z,t) = 0 \tag{6}$$

$$E_y^{\pm}(x,y,z,t) = E_{y,0}^{\pm} e^{\alpha_0 z} \sin\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 1.8 * 10^{-8})t\right) \tag{7}$$

$$H_x^{\pm}(x,y,z,t) = H_{x,0}^{\pm} e^{\alpha_0 z} \sin\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 1.8 * 10^{-8})t\right) \tag{8}$$

$$H_y^{\pm}(x,y,z,t) = 0 \tag{9}$$

$$H_z^{\pm}(x,y,z,t) = H_{z,0}^{\pm} e^{\alpha_0 z} \cos\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 1.8 * 10^{-8})t\right) \tag{10}$$

2 MODO $\mathbf{TM}_{11}$

2.1 Arriba de la frecuencia de corte:

$$E_x^{\pm}(x,y,z,t) = E_{x,1}^{\pm} \cos\left(\frac{\pi x}{0.008838}\right) \sin\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{11}$$

$$E_y^{\pm}(x,y,z,t) = E_{y,1}^{\pm} \sin\left(\frac{\pi x}{0.008838}\right) \cos\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{12}$$

$$E_z^{\pm}(x,y,z,t) = E_{z,1}^{\pm} \sin\left(\frac{\pi x}{0.008838}\right) \sin\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{13}$$

$$H_x^{\pm}(x,y,z,t) = H_{x,1}^{\pm} \sin\left(\frac{\pi x}{0.008838}\right) \cos\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{14}$$

$$H_y^{\pm}(x,y,z,t) = H_{y,1}^{\pm} \cos\left(\frac{\pi x}{0.008838}\right) \sin\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{15}$$

2.2 Debajo de la frecuencia de corte:

$$E_x^{\pm}(x,y,z,t) = E_{x,1}^{\pm} \cos\left(\frac{\pi x}{0.008838}\right) \sin\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 1.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{16}$$

$$E_y^{\pm}(x,y,z,t) = E_{y,1}^{\pm} \sin\left(\frac{\pi x}{0.008838}\right) \cos\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 1.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{17}$$

$$E_z^{\pm}(x,y,z,t) = E_{z,1}^{\pm} \sin\left(\frac{\pi x}{0.008838}\right) \sin\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 1.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{18}$$

$$H_x^{\pm}(x,y,z,t) = H_{x,1}^{\pm} \sin\left(\frac{\pi x}{0.008838}\right) \cos\left(\frac{\pi x}{0.008838}\right) \cos\left((2\pi 1.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{19}$$

$$H_y^{\pm}(x,y,z,t) = H_{y,1}^{\pm} \cos\left(\frac{m\pi x}{0.008838}\right) \sin\left(\frac{n\pi x}{0.008838}\right) \cos\left((2\pi 1.8 * 10^{-8})t \mp (7.11 * 10^2)z\right) \tag{20}$$

3 MODO TE_{21}

3.1 Arriba de la frecuencia de corte:

Propagación:

$$E_x^{\pm}(x,y,z,t) = E_{x,2}^{\pm} \cos\left(\frac{2\pi x}{0.03125}\right) \sin\left(\frac{\pi x}{0.03125}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (5.03 * 10^2)z\right) \tag{21}$$

$$E_y^{\pm}(x,y,z,t) = E_{y,2}^{\pm} \sin\left(\frac{2\pi x}{0.03125}\right) \cos\left(\frac{\pi x}{0.03125}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (5.03 * 10^2)z\right) \tag{22}$$

$$H_x^{\pm}(x,y,z,t) = H_{x,2}^{\pm} \sin\left(\frac{2\pi x}{0.03125}\right) \cos\left(\frac{n\pi x}{0.03125}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (5.03 * 10^2)z\right) \tag{23}$$

$$H_y^{\pm}(x,y,z,t) = H_{y,2}^{\pm} \sin\left(\frac{m\pi x}{0.03125}\right) \cos\left(\frac{n\pi x}{0.03125}\right) \sin\left((2\pi 2.8 * 10^{-8})t \mp (5.03 * 10^2)z\right) \tag{24}$$

$$H_z^{\pm}(x,y,z,t) = H_{z,2}^{\pm} \cos\left(\frac{2\pi x}{0.03125}\right) \cos\left(\frac{\pi x}{0.03125}\right) \cos\left((2\pi 2.8 * 10^{-8})t \mp (5.03 * 10^2)z\right) \tag{25}$$

3.2 Debajo de la frecuencia de corte:

$$E_x^{\pm}(x,y,z,t) = E_{x,2}^{\pm} e^{\alpha_2 z} \cos\left(\frac{2\pi x}{0.03125}\right) \sin\left(\frac{\pi x}{0.03125}\right) \cos\left((2\pi 1.8 * 10^{-8})t\right) \quad (26)$$

$$E_y^{\pm}(x,y,z,t) = E_{y,2}^{\pm} e^{\alpha_2 z} \sin\left(\frac{2\pi x}{0.03125}\right) \cos\left(\frac{\pi x}{0.03125}\right) \cos\left((2\pi 1.8 * 10^{-8})t\right) \quad (27)$$

$$H_x^{\pm}(x,y,z,t) = H_{x,2}^{\pm} e^{\alpha_2 z} \sin\left(\frac{2\pi x}{0.03125}\right) \cos\left(\frac{\pi x}{0.03125}\right) \cos\left((2\pi 1.8 * 10^{-8})t\right) \quad (28)$$

$$H_y^{\pm}(x,y,z,t) = H_{y,2}^{\pm} e^{\alpha_2 z} \cos\left(\frac{2\pi x}{0.03125}\right) \sin\left(\frac{\pi x}{0.03125}\right) \cos\left((2\pi 1.8 * 10^{-8})t\right) \quad (29)$$

$$H_z^{\pm}(x,y,z,t) = H_{z,2}^{\pm} e^{\alpha_2 z} \cos\left(\frac{2\pi x}{0.03125}\right) \cos\left(\frac{\pi x}{0.03125}\right) \cos\left((2\pi 1.8 * 10^{-8})t\right) \quad (30)$$