[2] $\tilde{E}_y' = \tilde{E}_{0I}\left(e^{ik_1x} + \rho e^{-ik_1x}\right)e^{-i\omega t} = \tilde{E}_{0I}\left(e^{i(k_1x-\omega t)} + \rho e^{-i(k_1x+\omega t)}\right)$

$$\mathrm{Re}(\tilde{E}_y') = E_{0I}\left(\cos(k_1x-\omega t) + \rho\cos(k_1x+\omega t)\right)$$

$$= E_{0I}\cos(\omega t - k_1x) + \rho E_{0I}\cos(\omega t + k_1x)$$

$$= a\cos(\omega t + \theta_a') + b\cos(\omega t + \theta_b')$$

$$= a\sin(\omega t + \theta_a) + b\sin(\omega t + \theta_b)$$

$a = E_{0I}$ $\qquad \theta_a = -k_1x + \frac{\pi}{2}$

$b = \rho E_{0I}$ $\qquad \theta_b = k_1x + \frac{\pi}{2}$

$$= c\sin(\omega t + \phi)$$

$$c^2 = a^2 + b^2 + 2ab\cos(\theta_a - \theta_b)$$

$$\tan\phi = \frac{a\sin\theta_a + b\sin\theta_b}{a\cos\theta_a + b\cos\theta_b}$$

$$c^2 = E_{0I}^2 + \rho^2 E_{0I}^2 + 2\rho E_{0I}^2\cos\left(-k_1x + \cancel{\tfrac{\pi}{2}} - k_1x - \cancel{\tfrac{\pi}{2}}\right)$$

$$c^2 = E_{0I}^2\left(1 + \rho^2 + 2\rho\cos(2k_1x)\right)$$

$$\boxed{c = E_{0I}\left(1 + \rho^2 + 2\rho\cos(2k_1x)\right)^{\frac{1}{2}}}$$

$$\tan\phi = \frac{\cancel{E_{0I}}\sin(-k_1x+\frac{\pi}{2}) + \rho\cancel{E_{0I}}\sin(k_1x+\frac{\pi}{2})}{\cancel{E_{0I}}\cos(-k_1x+\frac{\pi}{2}) + \rho\cancel{E_{0I}}\cos(k_1x+\frac{\pi}{2})}$$

$$= \frac{\cos(k_1x) + \rho\cos(k_1x)}{\sin(k_1x) - \rho\sin(k_1x)} = \frac{\cos(k_1x)}{\sin(k_1x)}\,\frac{1+\rho}{1-\rho}$$

$$= \cot(k_1x)\,\frac{1+\frac{1-\beta}{1+\beta}}{1-\frac{1-\beta}{1+\beta}} = \cot(k_1x)\,\frac{1+\cancel{\beta}+1-\cancel{\beta}}{\cancel{1}+\beta-\cancel{1}+\beta}$$

$$= \cot(k_1x)\,\frac{2}{2\beta} = \frac{1}{\beta}\cot(k_1x)$$

$$\phi = \arctan\left[\cot(k_1x)\frac{1}{\beta}\right]$$

$$\boxed{E_y' = E_{0I}\left(1+\rho^2+2\rho\cos(2k_1x)\right)^{\frac{1}{2}}\sin\left[\omega t + \arctan\left(\frac{1}{\beta}\cot(k_1x)\right)\right]}$$

Max amplitude: $\boxed{A_{max} = E_{0I}\left(1+\rho^2+2\rho\right)^{\frac{1}{2}}}$

Min amplitude: $\boxed{A_{min} = E_{0I}\left(1+\rho^2\right)^{\frac{1}{2}}}$