Contents

1 Notes

$$E_{\text{TM}}(z) = A_T^+ e^{-jk_z z} + A_T^- e^{jk_z z}$$
$$H_{\text{TM}}(z) = \frac{1}{\eta_{\text{TM}}}\left[A_T^+ e^{-jk_z z} - A_T^- e^{jk_z z}\right] \tag{7.2.9}$$
$$E_{\text{TE}}(z) = B_T^+ e^{-jk_z z} + B_T^- e^{jk_z z}$$
$$H_{\text{TE}}(z) = \frac{1}{\eta_{\text{TE}}}\left[B_T^+ e^{-jk_z z} - B_T^- e^{jk_z z}\right] \tag{7.2.10}$$

For TM, we have $P_z = \frac{\text{Re}[E_x H_y^*]}{2}$ and for TE, $P_z = -\frac{\text{Re}[E_y H_x^*]}{2}$.

$$P_z = \frac{1}{2\eta_T}\left(|E_T^+|^2 - |E_T^-|^2\right) \tag{7.3.17}$$

For oblique incidence, the absorption is

$$A = \frac{\omega}{2}\epsilon_0 n''\left[\frac{|E_{film}^f|^2(1-e^{-2k''d})}{2k''} + \frac{|E_{film}^b|^2(e^{2k''d}-1)}{2k''} + \frac{\text{Re}(E_{film}^f(E_{film}^b)^*)\sin(2k'd)}{k'}\right] \tag{1.1}$$

For TM, I only have the transverse electric field. Thus, I need to use

$$A = \frac{\omega}{2\cos^2\theta}\epsilon_0 n''\left[\frac{|E_{film}^f|^2(1-e^{-2k''d})}{2k''} + \frac{|E_{film}^b|^2(e^{2k''d}-1)}{2k''} + \frac{\text{Re}(E_{film}^f(E_{film}^b)^*)\sin(2k'd)}{k'}\right] \tag{1.2}$$

To normalize the absorption,

$$A = k_0 n''\left[\frac{|E_{film}^f|^2(1-e^{-2k''d})}{2k''} + \frac{|E_{film}^b|^2(e^{2k''d}-1)}{2k''} + \frac{\text{Re}(E_{film}^f(E_{film}^b)^*)\sin(2k'd)}{k'}\right] \tag{1.3}$$

Within a given layer, absorption is an analytical function:

$$a(z) = A_1 e^{2z\,\text{Im}(k_z)} + A_2 e^{-2z\,\text{Im}(k_z)} + A_3 e^{2iz\,\text{Re}(k_z)} + A_3^* e^{-2iz\,\text{Re}(k_z)} \tag{1.4}$$

$$\int_0^d a(z)\,dz = \frac{A_1}{2\,\text{Im}(k_z)}\left(e^{2d\,\text{Im}(k_z)} - 1\right) + \frac{A_2}{-2\,\text{Im}(k_z)}\left(e^{-2d\,\text{Im}(k_z)} - 1\right) \tag{1.5}$$
$$+\frac{A_3}{2i\,\text{Re}(k_z)}\left(e^{2id\,\text{Re}(k_z)} - 1\right) + \frac{A_3^*}{-2i\,\text{Re}(k_z)}\left(e^{-2id\,\text{Re}(k_z)} - 1\right). \tag{1.6}$$