APPENDIX A

Matrix method for the determination of reflection coefficient

Various layers are assumed to be stacked along z-axis.

The tangential fields at the first boundary are related to the final boundary by:

\[
\begin{bmatrix}
U_1 \\
V_1
\end{bmatrix} = M \begin{bmatrix}
U_{N-1} \\
V_{N-1}
\end{bmatrix}
\]

Where \( U_1 \) and \( V_1 \), respectively are tangential components of electric and magnetic field at the boundary of first layer. \( U_{N-1} \) and \( V_{N-1} \) are the corresponding fields at the boundary of \( N^{th} \) layer. \( M \) is characteristics matrix of the combined structure and is given as,

\[
M = \begin{bmatrix}
M_{11} & M_{12} \\
M_{21} & M_{22}
\end{bmatrix}
\]

\[
M_k = \begin{bmatrix}
\cos \beta_k & (-i \sin \beta_k)/q_k \\
-i q_k \sin \beta_k & \cos \beta_k
\end{bmatrix}
\]

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Where,

\[ q_k = \left( \frac{\mu_k}{\varepsilon_k} \right)^{1/2}, \quad \cos \theta_k = \frac{(\varepsilon_k - n_i^2 \sin^2 \theta_1) \varepsilon_k}{\varepsilon_k} \]

\[ \beta_k = \frac{2\pi}{\lambda} n_k \cos \theta_k (z_k - z_{k-1}) = \frac{2\pi d_k}{\lambda} (\varepsilon_k - n_i^2 \sin^2 \theta_1)^{1/2} \]

The amplitude reflection coefficient for p-polarized incident wave is:

\[ r_p = \frac{(M_{11} + M_{12}q_N)q_1 - (M_{21} + M_{22}q_N)}{(M_{11} + M_{12}q_N)q_1 + (M_{21} + M_{22}q_N)} \]

Finally the intensity reflection coefficient for p-polarized light is:

\[ R_p = |r_p|^2 \]