

Problem 8.33 Show that the reflection coefficient Γ_{\perp} can be written in the following form:

$$\Gamma_{\perp} = \frac{\sin(\theta_t - \theta_i)}{\sin(\theta_t + \theta_i)}$$

Solution: From Eq. (8.58a),

$$\Gamma_{\perp} = \frac{\eta_2 \cos \theta_i - \eta_1 \cos \theta_t}{\eta_2 \cos \theta_i + \eta_1 \cos \theta_t} = \frac{(\eta_2/\eta_1) \cos \theta_i - \cos \theta_t}{(\eta_2/\eta_1) \cos \theta_i + \cos \theta_t}.$$

Using Snell's law for refraction given by Eq. (8.31), we have

$$\frac{\eta_2}{\eta_1} = \frac{\sin \theta_t}{\sin \theta_i},$$

we have

$$\Gamma_{\perp} = \frac{\sin \theta_t \cos \theta_i - \cos \theta_t \sin \theta_i}{\sin \theta_t \cos \theta_i + \cos \theta_t \sin \theta_i} = \frac{\sin(\theta_t - \theta_i)}{\sin(\theta_t + \theta_i)}.$$
