Project Milestone 5
Physics 5017
Maxine Khumalo
Lang Liu
Joe Evans
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5.1

REFLECTION COEFFICIENT

REFLECTED TIME AVERAGE POYNTING VECTOR

$$R = \left| \frac{\langle S_R \rangle \cdot \hat{n}}{\langle S_I \rangle \cdot \hat{n}} \right|$$

INCIDENT TIME AVERAGE OF POYNTING VECTOR

} ZANGWILL 17.40

$$\langle S \rangle = \frac{1}{2\eta} |E|^2 \hat{k}$$

} ZANGWILL 17.41

WHERE $\eta = \sqrt{\frac{\mu}{\varepsilon}}$

THE REFLECTED AND INCIDENT WAVES ARE IN THE SAME MEDIUM. THEREFORE, $\eta_R = \eta_I = \eta_1$

$$R = \frac{\frac{1}{2\eta} |E_R \hat{n} \cos(0)|^2}{\frac{1}{2\eta} |E_I \hat{n} \cos(0)|}$$

$$R = \left| \frac{E_R}{E_I} \right|^2 = |r|^2 = \left(\frac{\eta_2 - \eta_1}{\eta_2 + \eta_1} \right)^2$$

} ZANGWILL 17.37 AND 17.42

$$R = \left(\frac{\eta_2 - \eta_1}{\eta_2 + \eta_1} \right)^2$$

ZANGWILL 17.44

TRANSMISSION COEFFICIENT

$$T = \left| \frac{\langle S_T \rangle \cdot \hat{n}'}{\langle S_I \rangle \cdot \hat{n}'} \right|$$

NORMAL

ZANGWILL 17.45

THE TRANSMITTED WAVE IS IN A DIFFERENT MEDIUM THAN THE REFLECTED WAVE. SO, $\eta_T = \eta_2$ & $\eta_R = \eta_1$.

$$T = \frac{\frac{1}{2\eta_2}\left|E_T\right|^2}{\frac{1}{2\eta_1}\left|E_I\right|^2} = \frac{\eta_1}{\eta_2}(t)^2$$

$$T = \frac{\eta_1}{\eta_2}\left(\frac{2\eta_2}{\eta_1 + \eta_2} \right)^2$$

ZANGWILL 17.45 AND 17.37

$$T = \frac{4\eta_1\eta_2}{(\eta_1 + \eta_2)^2}$$

ZANGWILL 17.47