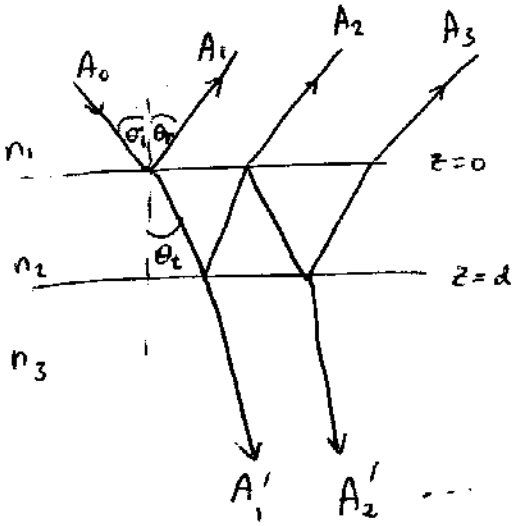
Physics 721 HW 11 Solutions

[1] Jackson 7.2



$n_1 \to n_2$: r_1, t_1

$n_2 \to n_1$: r_1', t_1'

$n_2 \to n_3$: r_2, t_2

$n_3 \to n_2$: r_2', t_2'

$$\frac{\omega}{|\vec{k}|_i} = \frac{1}{n_i}$$

$$\vec{k}_i \cdot \vec{x} - \omega t = |\vec{k}_i|\left(|\vec{x}|\cos\theta - \frac{1}{n_i}t\right) = \frac{|\vec{k}|}{n_i}\left(n_i|\vec{x}|\cos\theta - t\right)$$

Reflection:

$$A_1 = r_1 A_0$$

$$A_2 = r_2 t_1 t_1' A_0 e^{i\delta}$$

$$A_3 = r_2^2 t_1 r_1' t_1' A_0 e^{i2\delta}$$

$$A_4 = r_2^3 t_1 r_1'^2 t_1' A_0 e^{i3\delta}$$

$$\vdots$$

$$\delta = k_2 \frac{2d}{\cos\theta_t} = k_1 \frac{2d}{\cos\theta_t}\frac{n_2}{n_1}$$

or

$$\boxed{\delta = \frac{\omega n_2 2d}{\cos\theta_t}}$$

$$A_r = A_1 + A_2 + \cdots$$

$$= r_1 A_0 + r_2 t_1 t_1' A_0 e^{i\delta} \sum_{n=0}^{\infty} r_2^n (r_1')^n e^{i\delta n}$$

$$= \boxed{r_1 A_0 + \frac{r_2 t_1 t_1' A_0 e^{i\delta}}{1 - r_2 r_1' e^{i\delta}}}$$