**Answer on question #69089 – Physics / Electromagnetism**

A sinusoidal plane electromagnetic wave propagates from water (nw =1.33) to glass (ng = 1.5). Calculate the reflection and transmission coefficients for this wave at the interface of the two media. Show that when an electromagnetic wave enters from one dielectric medium to the other, its frequency remains unchanged.

**Solution**

By definition the reflection and transmission coefficients are

$$r = \frac{n_1 - n_2}{n_1 + n_2}, t = \frac{2n_2}{n_1 + n_2}$$

Using these formulas we get

$$r = \frac{1.5 - 1.33}{1.5 + 1.33} = 0.06$$

$$t = \frac{2 * 1.33}{1.5 + 1.33} = 0.94$$

Let we have two electromagnetic waves from to two sides of the interface. Their energies are $E_1 = \frac{h}{2\pi}\omega_1$ and $E_2 = \frac{h}{2\pi}\omega_2$. Due to conservation energy law we have $E_1 = E_2$, hence $\omega_1 = \omega_2$.

**Answer** reflection coefficient $r = 0.06$, transmission coefficient $t = 0.94$.

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