

Oblique Incidence Reflection

Reading assignment

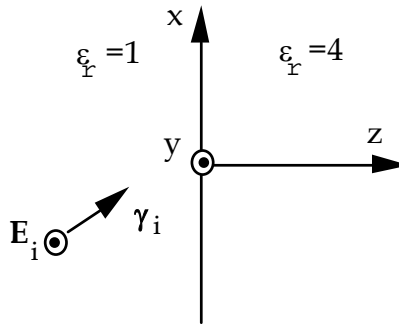
Ulaby, 8-2, 8-4, 8-5

Connor and Salon, Unit X (On Waves & Materials)

Problem 1 - oblique incidence

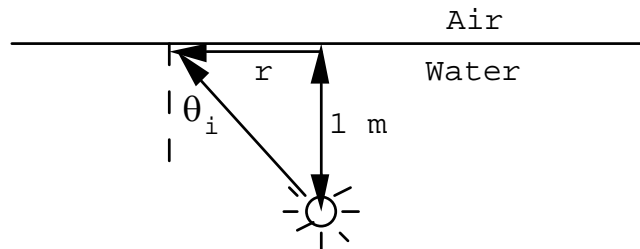
A plane wave described by $\mathbf{E}_i = 100 \cos(\omega t - \pi x - 1.73\pi z)\mathbf{a}_y$ V/m is incident upon a dielectric material with $\epsilon_r = 4$.

- Write \mathbf{E} in phasor form.
- What are γ_i and θ_i ?
- What are θ_t and γ_t ?
- What are the reflection and transmission coefficients?
- Write the total electric field phasors in both regions.
- Confirm your results by running polariz.m

**Problem 2 - Snell's law, critical angle**

For visible light, the index of refraction for water is $n = 1.33$. If we put a light source 1 meter under water and observe it from above the surface of the water, what is the largest θ_i for which light will be transmitted?

How large will the circle of illumination be?

**Problem 3 - polarization**

Consider the same material properties and incident angle as Problem 1, but assume the opposite polarization.

- What are the reflection and transmission coefficients?
Which polarization has a lower reflection coefficient (magnitude) ?

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- b. Now allow θ_i to vary. At what value of θ_i is the wave completely transmitted?
(i.e. What's the Brewster angle?)