

Topics: Fresnel Relations

Total Marks: 40

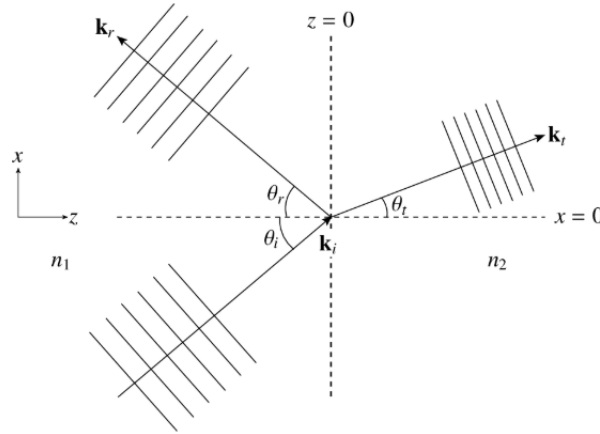
Date: 11th Apr, 2025

Due: 20th Apr, 2025 (EoD)

Problem

[40]

Consider a polarised EMW, travelling in a medium with refractive index n_1 incidents on a medium interface at $z = 0$ at angle θ_i as shown in the image. Some fraction of the EMW get reflected back to the same medium but some fraction get refracted into a medium of refractive index n_2 . ($n_2 > n_1$)



Consider the polarization state in which the electric components of the incident, reflected, and refracted waves are all parallel to the interface.

1. Write down the governing Maxwell's equation for the given polarization state.
2. Assume possible solutions and using the boundary condition at the interface, derive the Fresnel relations for the polarization in which the electric field is parallel to the interface.
3. Using any graphing calculator draw the reflection and transmission coefficient for incident angle running from 0° to 90° .
4. Discuss the total internal reflection in details when $n_1 > n_2$ and incident angle is more than critical angle for the same state of polarised light.