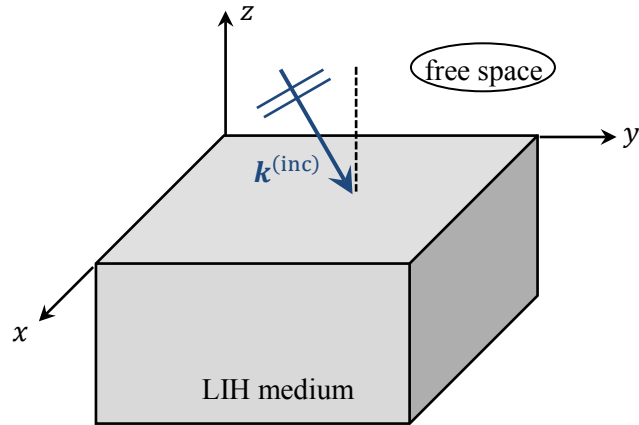


PhD Qualifying Exam, Summer 2023

Opti 501, Day 1

System of units: SI (or MKSA)

Suppose a homogeneous plane-wave (i.e., one whose k -vector is real) arrives from the free space onto the flat and polished surface of a linear, isotropic, and homogeneous (LIH) medium, as shown. Let the interface between the LIH medium and the medium of incidence (i.e., free space in the present case) be the xy -plane at $z = 0$. Using brief but precise statements, define the following properties of the optical material, characteristics of the plane-wave, and specific features of the optical system.



- When is an optical medium considered to be linear, isotropic, and homogeneous (LIH)?
 - What is the plane of incidence? Does this definition hold for a normally-incident plane-wave?
 - When is the incident plane-wave said to be p -polarized? When is it said to be s -polarized?
 - Denoting the components of the incident E -field by $E_p = |E_p|e^{i\varphi_p}$ and $E_s = |E_s|e^{i\varphi_s}$, describe conditions under which the incident plane-wave can be said to be linearly polarized, or circularly polarized, or elliptically polarized.
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