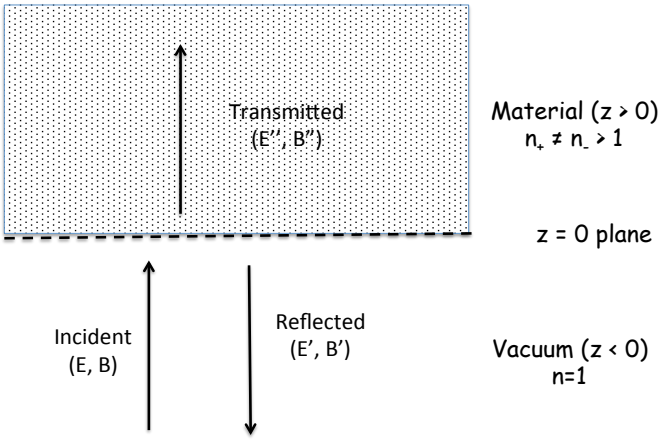
Section B. Electricity and Magnetism

1. **Faraday Effect Polarizer**



In the figure, the region $z > 0$ is filled with a non-conducting ($\sigma = 0$) magnetically non-permeable ($\mu = 1$) material and the region $z < 0$ is vacuum. The material has different real indices of refraction $n_+(n_-)$ for right(left)-circularly polarized electromagnetic waves propagating in the z-direction. This 'Faraday effect', $n_+ \neq n_-$, can be arranged (in an appropriate material) by applying a magnetic field that points in the z-direction.

A linearly polarized plane wave is normally incident on the material from the vacuum. The resulting reflected and transmitted waves may be assumed to propagate, like the incident wave, in the z-direction. Calculate the ratio of the reflected to the incident intensity and quantitatively characterize the polarization of the reflected wave.