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Electromagnetic wave propagation through a dielectric–chiral interface and through a chiral slab

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Abstract

The reflection from and transmission through a semi-infinite chiral medium are analyzed by obtaining the Fresnel equations in terms of parallel- and perpendicular-polarized modes, and a comparison is made with results reported previously. The chiral medium is described electromagnetically by the constitutive relations $\mathbf{D} = \epsilon\mathbf{E} + i\gamma\mathbf{B}$ and $\mathbf{H} = i\gamma\mathbf{E} + (1/\mu)\mathbf{B}$. The constants ϵ, μ, and γ are real and have values that are fixed by the size, the shape, and the spatial distribution of the elements that collectively compose the medium. The conditions are obtained for the total internal reflection of the incident wave from the interface and for the existence of the Brewster angle. The effects of the chirality on the polarization and the intensity of the reflected wave from the chiral half-space are discussed and illustrated by using the Stokes parameters. The propagation of electromagnetic waves through an infinite slab of chiral medium is formulated for oblique incidence and solved analytically for the case of normal incidence.

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Corrections

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Field equations, Huygens's principle, integral equations, and theorems for radiation and scattering of electromagnetic waves in isotropic chiral media
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Eigensolutions for the reflection problem of the interface of two chiral half-spaces
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Transmission through a moving chiral slab
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Propagation and radiation of electromagnetic waves in a lossless, reciprocal, chiral medium is studied in this thesis. Such a medium is described electromagnetically by the constitutive relations D = εE + iγB and H = iγE + (1/μ)B. The constants ε, μ, γ are real and have values that are fixed by the size, shape, and the spatial distribution of the elements that collectively compose the medium. The plane wave propagation in an unbounded chiral medium is considered. The problem of reflection from, and transmission through a semi-infinite chiral medium is solved by obtaining the Fresnel equations. The conditions for the total internal reflection of the incident wave from the interface, and the existance of the Brewster angle are obtained. Electromagnetic wave propagation through two lossless dielectrics. Ask Question. Asked 7 years, 3 months ago. In Elements of Electromagnetics (Sadiku, 3rd edition, Section 10.8), the author says to consider two lossless dielectric materials joined at an interface $z = 0$. Here two lossless dielectric materials can be translated to mean that the conductivity of medium 1 (located to the left of $z = 0$, i.e. for $z < 0$) is equal to the conductivity of medium. ABSTRACT: Electromagnetic wave propagation is first analyzed in a composite material mde of chiral nano-inclusions embedded in a dielectric, with the help of Maxwell-Garnett formula for permittivity and permeability and its reciprocal for chirality. Then, this composite material appears as an homo-geneous isotropic chiral medium which may be described by the Post constitutive relations. We analyze the propagation of an harmonic plane wave in such a medium and we show that two different modes can propagate. We also discuss harmonic plane wave scattering on a semi-infinite chiral composite mediu