Abstracts

On Plane and Quasi-Optical Wave Propagation in Gyromagnetic Media

N. Eberhardt, V.V. Horvath and R.H. Knerr. "On Plane and Quasi-Optical Wave Propagation in Gyromagnetic Media." 1970 Transactions on Microwave Theory and Techniques 18.9 (Sep. 1970 [T-MTT]): 554-565.

To promote the development and understanding of microwave magnetic devices, especially in the millimeter and submillimeter range utilizing quasi-optical techniques, a discussion of propagation and polarization of plane waves and narrow rays in gyromagnetic media in an arbitrary direction is considered. It is assumed that the medium can be described by a permeability tensor of the Polder type. The approach is structured after classical crystal optics but yields significantly different results since each of the two permitted rays is elliptically polarized. The ellipticities are derived. The phase surfaces are discussed for the lossless case. There are no optical axes but ranges of forbidden directions exist for one or both rays. D, B, and the wave vector n form an orthogonal set at all times. H is confined to the B, n plane; it gyrates along an ellipse such that the Poynting vector traces in time an elliptical cone which contains the wave vector as one mantle line. Therefore, a narrow ray can be understood to proceed along a helical path.

❑ Return to main document.