Abstracts

TE and TM Modes in Cylindrical Metallic Structures Filled with Bianisotropic Material

R.D. Graglia, M.S. Sarto and P.L.E. Uslenghi. "TE and TM Modes in Cylindrical Metallic Structures Filled with Bianisotropic Material." 1996 Transactions on Microwave Theory and Techniques 44.8 (Aug. 1996 [T-MTT]): 1470-1477.

Modal propagation is studied for metallic circular waveguides, coaxial cables and sectoral waveguides filled with linear bianisotropic material. By representing the material constitutive tensors in cylindrical coordinates, the conditions under which TE and TM modal decoupling occurs are obtained, and second-order differential equations for the longitudinal field components are derived. Though the TE and TM longitudinal field components are expressible in terms of hypergeometric functions, a complete numerical solution scheme is, in general, more convenient. Conventional application of finite elements renders the differential problem numerically equivalent to a generalized eigenvalue matrix problem, whose solution yields the dispersion relation and cutoff frequencies of the waveguides together with the eigenfields expression. The effects one can obtain by varying the various coefficients of the constitutive tensors are illustrated by several numerical results.

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