

ABSTRACT

This work presents a suitable formulation to the analysis of electromagnetic waveguide, covering the spectrum of the microwave to optics. In regions from the ultraviolet, the wavelengths are equivalent to atomic dimensions and the design needs a quantum approach, which is not considered in this study. The formulation is based on the magnetic vector and the finite element methods (FEM), in non-homogeneous, anisotropic and non-dissipative dielectric materials, while the dissipation can be easily introduced in the analysis. Preference was given to the formulation with the magnetic field, because the magnetic field ignores electrical discontinuities. It is continuous in regions of homogeneous permeability, property of all dielectric materials ($\mu=\mu_0$), independent of the permittiveness of respective regions, while electric fields are discontinuous between regions of different permittivities.

Keywords: Galerkin method. Finite elements. Dispersion curves. Wave equation. Non-homogeneous and anisotropic dielectric materials.