Abstracts

On Guided Waves in Moving Anisotropic Media

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Based upon the Maxwell-Minkowski theory, the equations governing the propagation of electromagnetic waves in a cylindrical waveguide of an arbitrary cross section filled with a moving anisotropic medium are derived. The governing equations are reducible to a pair of coupled wave equations in the axial components of the electric and magnetic fields, which in turn can be solved through the solution of a single second order scalar homogeneous Hehnholtz equation. For a general anisotropic medium no pure TM or TE modes can exist in the waveguide. However, if the moving medium is uniaxially anisotropic, TM and TE modes are possible. It is interesting to note that the cutoff frequencies are always lowered by a factor which depends upon the velocity of the medium and is independent of the guide geometry. The formulas for the characteristic wave impedance and power flow in a waveguide for a moving uniaxial medium, if expressed in terms of the new cutoff frequency, have the same forms as those for a moving isotropic medium. The propagation characteristics of waveguides of rectangular and circular cross sections filled with a moving uniaxial gyroelectric medium are discussed.

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