Abstracts

Waveguides Containing Moving Dispersive Media

H. Gruenberg and P. Daly. "Waveguides Containing Moving Dispersive Media." 1967 Transactions on Microwave Theory and Techniques 15.11 (Nov. 1967 [T-MTT]): 636-642.

Perturbation formulas are derived for the changes in the dispersion curves and phase velocity for the modes in an arbitrary composite waveguide structure containing dispersive media in relative motion. The formulas are also valid when the media are fluids with arbitrary velocity distributions. It is shown that the relativistic transformation laws for the frequency and wave vector of uniform plane waves are also valid for waveguide modes provided that all moving media that make up the guide move with the same velocity. There are also difficulties when the moving media are dispersive. In general, one most therefore obtain the dispersion relation directly from the field equations or from the perturbation formulas. An example involving a simple surface wave along the interface of a moving plasma and a dielectric is worked out by both methods. As an interesting side result, it is found that plane waves in an unbounded isotropic plasma have phase velocities independent of the motion of the plasma.

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