Abstracts

Computer Analysis of Microwave Propagation in a Ferrite Loaded Circular Waveguide--Optimization of Phase-Shifter Longitudinal Field Sections

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A theoretical analysis of the microwave propagation in a circular TE/sub 11/ waveguide partially or completely loaded with an axially magnetized ferrite rod is presented. This study is based upon an exact analytical treatment of the Maxwell's equations, together with an original numerical method of solving transcendental equations with a complex variable. The introduction of the complex propagation constant Gamma = alpha + j beta, taking in account the losses in the filling medium, had never been attempted because of the mathematical difficulties involved making essential the use of a large capacity computer. The developed program not only supplies all the propagation characteristics for a given structure but also enables us to optimize a phase-shift section in accordance with the user's requirements. This study is a first step towards the theoretical optimization of two types of reciprocal phasers: the dual mode phaser (DMP) and the polarization insensitive phaser (PIP), both widely used in array antenna systems. The computed results obtained for the basic section of such phasers operating at a central frequency of 9.5 GHz are given. Obviously, this work is still incomplete since it does not include the optimization of all the components of a practical phase shifter, for example, the polarizers. Moreover, we have assumed the ferrite partially magnetized by a continuously variable bias field, although the PIP and the DMP are normally operated in a latching configuration; we presently complete our study according to these practical considerations.

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