Abstracts

Theoretical Analysis of the Operation of the Field-Displacement Ferrite Isolator

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A theoretical analysis of the resistance-sheet isolator is carried out, and numerical solutions are obtained for the forward and reverse propagation constants of the distorted dominant mode in a rectangular waveguide containing a transversely magnetized thick ferrite slab displaced slightly from the side wall. The microwave electric field patterns within the waveguide are plotted for several values of the physical design parameters of the isolator for which experimental performance data have been reported. Field patterns are used to describe the principles of the isolator and to select the optimum values of slab thickness, internal dc magnetic field, ferrite magnetization, and location of the slab in the waveguide for the idealized isolator. Evidence is presented to show that it is necessary to use a comparatively thick ferrite slab located in a very small usable range of distances from the side wall. The appropriate value of internal dc magnetic field is simply related to the magnetization of the ferrite and to the frequency. It has not been necessary to take into account the perturbing effects of the resistance card or matching techniques in order to explain the basic design principles.

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