Abstracts

Computer-Aided Design of Three-Port Waveguide Junction Circulators

J.B. Castillo, Jr. and L.E. Davis. "Computer-Aided Design of Three-Port Waveguide Junction Circulators." 1970 Transactions on Microwave Theory and Techniques 18.1 (Jan. 1970 [T-MTT]): 25-34.

The complete performance of a lossless three-port H-plane waveguide junction loaded coaxially with various inhomogeneous ferrite cylanders has been evaluated over the waveguide bandwidth and compared with experiment. Qualitative agreement between the predicted and measured performance was generally good using only the first three modes, n=0±1. It has been shown theoretically and verified experimentally that if the 4 pi M/sub s/ of a homogeneous rod or the internal field is increased, the circulation frequency f/sub 0/ increases; conversely, if the pemittivity is increased, f/sub 0/ decreases. These conflicting effects are modified when the magnetization 4 pi M/sub s/ and permittivity epsilon are inhomogeneous. For example, if the 4piM/sub s/(gamma) is small at the outer surface of the rod (with permittivity held constant), the effect on f/sub 0/ is very small; but if 4piM/sub s/(gamma) approaches zero for gamma small, then f/sub 0/ may decrease significantly. On the other hand, if epsilon/sub gamma/(gamma) approaches unity near the outer surface of the rod, f/sub 0/ may increase significantly; but if epsilon/sub gamma/(gamma) approaches unity near the center of the rod, f/sub 0/ is affected relatively little. The inhomogeneous structure has also shown that decreasing the ferrite volume may improve the performance, and high-power applications are suggested. With a conducting pin down the center of the ferrite, relative bandwidths of 40-50 percent are predicted.

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