Abstracts

Operating Dynamics and Performance Limitations of Ferrite Digital Phase Shifters (Dec. 1967 [T-MTT])

G.P. Rodrigue, J.L. Allen, L.J. Lavedan and D.R. Taft. "Operating Dynamics and Performance Limitations of Ferrite Digital Phase Shifters (Dec. 1967 [T-MTT])." 1967 Transactions on Microwave Theory and Techniques 15.12 (Dec. 1967 [T-MTT]): 709-713.

Performance capabilities and limitations of nonreciprocal waveguide ferrite digital phase shifters are discussed. A computer-aided solution of the boundary value problem facilitates the optimization of both device geometry and material properties. Experimental results are in excellent agreement with predicted loss and phase shift values. Maximum figures of merit of the order of 1000 deg/dB have been realized. When high peak powers must be accommodated, some sacrifice in low-power performance is necessary. Operating peak power levels can be increased by lowering the saturation magnetization of the ferrite or by raising its spinwave linewidth. Peak power levels above 150 kW at X band and 350 kW at C and S bands have been attained in laboratory models with less than 1 dB loss for a 360 degree differential phase shift. When high-average power levels must be handled, various material and geometric considerations can be incorporated to minimize loss per unit length and to increase heat dissipation capabilities. Units have been successfully operated at S-band frequencies with only a five percent decrease in phase shift when carrying 900 watts average power. The various tradeoffs necessary to achieve high peak and average power performance are discussed.

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