Abstracts

Optimum Field Theory Design of Broad-Band E-Plane Branch Guide Phase Shifters and 180° Couplers

F. Arndt, T. Sieverding and P. Anders. "Optimum Field Theory Design of Broad-Band E-Plane Branch Guide Phase Shifters and 180° Couplers." 1990 Transactions on Microwave Theory and Techniques 38.12 (Dec. 1990 [T-MTT] (1990 Symposium Issue)): 1854-1861.

Optimum rectangular waveguide E-plane branch guide phase shifters and 180° branch guide couplers are designed with the rigorous method of field expansion into normalized eigenmodes. The design includes both the higher order mode interaction between the step discontinuities and the finite step and branch heights. The phase shifter design applies the Schiffman principle to branch guide couplers where two ports are short-circuited. The 180° coupler design combines the advantage of the broad-band potential of multiple-branch couplers with the low-insertion-loss qualities of E-plane stub-loaded phase shifters. A computer-optimized phase shifter prototype for the waveguide Ku-band (12-18 GHz) shows a 90° ± 1° differential phase shift with reference to an empty waveguide within about 23% bandwidth. Five-branch three-stub coupler prototypes, designed for 3 ± 0.2 dB coupling, for the waveguide Ku- and Ka-bands (26-40 GHz) achieve a 180° ± 1° differential phase shift at the output ports within about 19% bandwidth, as well as more than 30 dB isolation and return loss. The theory is verified by measured results.

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