Abstracts

Modal S-Matrix Design of Metal Finned Waveguide Components and its Application to Transformers and Filters

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Optimized all-metal E-plane finned waveguide components are designed with the rigorous method of modal field expansion into the ridged eigenmodes, which includes both the higher order mode interaction between the step discontinuities and the finite thickness of the fins. The design which combines the advantage of constant fin thickness with that of the optimum matching potential of different waveguide inner cross-section dimensions and fin heights achieves very broad-band transformers and evanescent-mode filters with improved performance. Computer optimized data demonstrate the efficiency of the method by typical design examples: Compact transformers for WR112, WR42, WR15, and WR12 input waveguides to E-plane finned waveguides achieving return losses of more than 33 dB, or 20 dB, respectively, for the whole waveguide bands; corrugated lowpass filters designed for a cutoff frequency in the waveguide Ku- (12-18 GHz) and U-band (40-60 GHz) with return losses of better than 20 dB together with a stopband attenuation of more than 60 dB; and an evanescent-mode bandpass filter with unequal fin heights achieving 33 dB return loss for about 2% bandwidth at 56.5 GHz. The theory is verified by available measurements.

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