Abstracts

Design of Wide-Band (and Narrow-Band) Band-Pass Microwave Filters on the Insertion Loss Basis

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A method for design of band-pass microwave filters is described that combines the image and insertion-loss points of view to give an approximate design method having simplicity, but also high precision. This method is applicable for filter designs ranging from narrow to very wide bandwidths (2 to 1 or more). The desired insertion loss characteristic is obtained by use of a lumped-element, Tchebycheff, or maximally flat (or other) low-pass prototype. With the aid of the concept of impedance inverters, the prototype is converted into a cascade of symmetrical (but differing) sections. The image properties of symmetrical sections of the band-pass microwave filter structure are then related to those of corresponding sections of the prototype. Straightforward design equations are given for filters using short-circuited or open-circuited stubs, and also for filters using parallel-coupled lines. Mapping functions are derived that permit accurate prediction of the microwave filter cutoff characteristic from that of the prototype. The responses of a number of filter designs were computed, and a Tchebycheff filter with a 2.2 to 1 band-width was built and tested. The reponses of all of the filter designs were in close agreement with the prescribed characteristics, and the accuracy of the mapping functions was verified.

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