Abstracts

Exact Theory of Interdigital Band-Pass Filters and Related Coupled Band-Pass Structures

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An exact theory of interdigital line networks and related coupled structures is presented. The theory of parallel-coupled line arrays is reviewed briefly, and the derivation of exact equivalent circuits from the impedance matrix using modem network synthesis techniques is discussed. A simplified theory of equivalent coupled structures is introduced in order to avoid the lengthy analysis required when using the impedance matrix approach. Equivalent networks for the interdigital line are obtained by inspection, using a transformed capacitance matrix associated with the two-dimensional geometry of the conductors and ground planes. The techniques presented are simple to apply and allow a given transmission response to be obtained in a variety of line configurations. A practical design example and experimental results are given to illustrate the simplicity of the approach, along with general criteria for the design of practical filter networks with optimum transmission characteristics. The paper is directed toward the design of interdigital band-pass filters; however, the techniques presented can be used to analyze and design a much broader class of microwave networks. The relationship of the exact theory to existing approximate theory is discussed.

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