Abstracts

The Stepped Digital Elliptic Filter

J.D. Rhodes. "The Stepped Digital Elliptic Filter." 1969 Transactions on Microwave Theory and Techniques 17.4 (Apr. 1969 [T-MTT]): 178-184.

The design and synthesis of various types of microwave elliptic function filters has been accomplished by a number of authors. However, one problem in this field which remains is the realization of compact narrow-band bandpass elliptic function filters. In this paper, a procedure is presented which enables this class of filters to be constricted in a compact digital form. Since the physical realization is in the form of an n-wire line, one-quarter of a wavelength Iong at the center frequency of the passband, where the impedance levels are stepped along the center of the coupled lines, the filter has been termed the stepped digital elliptic filter. The absence of awkward interconnections in the filter due to the stepped digital structure inherently implies that reasonable insertion loss characteristics may be achieved in the X-band region and above, and also simplifies the mechanical construction. It is shown that the resonant elements in the filter, due to the design procedure adopted, are relatively insensitive to the absolute bandwidth of the filter, and consequently fractional bandwidths of approximately 30 percent and below may be readily achieved while the normalized impedance values of the elements in the network remain of the order of unity. This latter result is similar to that obtainable from conventional interdigital filters but in the case of narrow bandwidths the stepped digital filter is considerably smaller in physical size. A systematic procedure is also formulated for the inclusion of the parasitic lumped end effect capacitances into the overall design procedure in order to maintain the equiripple passband and stopband responses. Experimental results are presented for a five-element, 11 percent bandwidth filter and are shown to be in good agreement with theoretical predictions.

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