Synthesis of Microwave Filters and Directional Couplers

E.M.T. Jones has considered the general synthesis of transmission line filters consisting of short-circuited, quarter-wave stubs spaced a quarter-wavelength apart on sections of transmission line, each of undetermined characteristic impedance. He has shown that the insertion loss function, P_L, of a symmetrical filter of this type will take the form $P_L = 1 + Q^2_{n+1}(w)/(1+w^2)^n$, where $Q_{n+1}(w)$ is an even or odd polynomial of degree, $n + 1$, in w with real coefficients, and n is the number of quarter-wavelength series-sections of transmission line. He has also pointed out how equiripple performance can be achieved for arbitrary bandwidth and tolerance by means of an ingenious potential analogy suggested by V.H. Grinich. The Grinich transformation is rather involved, with the result that Jones limited his calculations to the coefficients of $Q_{n+1}(w)$ for only a single bandwidth.

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