Abstracts

Narrowband Lumped-Element Microstrip Filters Using Capacitively-Loaded Inductors (Dec. 1995, Part II [T-MTT])

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Coupling between microstrip resonators decreases very slowly as a function of the resonator separation. Therefore, it is difficult to realize narrowband filters (e.g. <0.1% fractional bandwidth) in reasonably sized microstrip form due to the very weak coupling values required. In this paper, we report a class of lumped-element filters that uses capacitively-loaded inductors to give frequency-dependent inductance values. A novel frequency-transformation technique is used in the design process. Using this approach, filter bandwidth is determined by the inductance slope of frequency-dependent inductors, dL over d omega. Large coupling capacitance, thus small coupling element separations, can still be used in narrowband microstrip filters to keep the filter layout compact. We present a 5-pole, 0.27% bandwidth YBa/sub 2/ Cu/sub 3/O/sub 7/ high-temperature superconducting thin film microstrip prototype filter at 900 MHz, which has 1.2 dB insertion loss and 20 dB return loss. It was designed with the coupling capacitors of a 1% bandwidth filter, and then transformed to a 0.27% fractional bandwidth using an appropriate inductance slope parameter, dL over d omega. Measurement showed good agreement with theory.

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