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Sujet

Design, Optimization and Diagnosis of Microwave Cascaded Filters and Patch Antennas using Coupling Matrix and DGS Techniques

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Abstract

Coupled resonator circuits are the basis for the design of two-port bandpass microwave filters. The design approach is based on synthesis of coupling matrix for multiple coupled resonators using Cauchy method and space mapping optimization. This behavior is achieved through the use of filters made up of resonant structures, which have resonators with electromagnetic coupling among them. Antennas present also an integral part of the microwave systems employed to transmit and receive electromagnetic waves for a multitude of purposes; they serve as a transducer that converts guided waves into free-space waves in the transmitting mode, or vice-versa in the receiving mode.

In this view, the present research work describes analytical problems of microwave cascaded filters and patch antennas and explains their physical behaviors with particular emphasis on major optimization challenges facing the device structure complexity. The different microwave devices are optimized using advanced computer aided tuning (CAT) techniques including coupling matrix, Defected Ground Structure (DGS) and Artificial Neural Networks (ANN) to vary the device geometry and maximize its performance with a high accuracy for the selective band of frequencies.

Key words: Coupled Resonator Filter, Space mapping, Cauchy method, Patch Antennas, Coupling Matrix, DGS, ANN Optimization.
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