Abstracts

A joint field/circuit model of line-to-ring coupling structures and its application to the design of microstrip dual-mode filters and ring resonator circuits

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A joint field/circuit model is proposed in this paper to characterize a class of line-to-ring coupling structures for design and optimization of microstrip dual-mode filters and ring resonator circuits. The generic model is derived from field theory and presented in terms of circuit elements by applying a newly developed numerical deembedding technique called "short-open calibration" in a deterministic method-of-moments scheme. It provides a new design strategy for characterizing and optimizing electrical performance of the line-to-ring coupling structures. Such three-port topologies are explicitly formulated by using an equivalent network having circuit elements calculated by the proposed joint field/circuit model. Three microstrip tightly coupling geometries and their related ring resonators are studied with the extracted J-inverter susceptance parameters. Experiments are performed to validate the joint model and also show coupling characteristics of the three types of line-to-ring circuit for the design of ring resonators and dual-mode filters. With this new technique, an optimized microstrip dual-mode filter is successfully designed and the prediction agrees well with our measurements.

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