Abstracts

CAD applying the finite-element method for dielectric-resonator filters

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The progress of numerical techniques now permit us to analyze rigorously complex devices such as dual-mode cavity multipole filters or planar passive elements for coplanar monolithic microwave integrated circuits (MMICs). In this paper, we describe a rigorous design of dielectric resonator (DR) filters applying the finite-element method (FEM). We first present a dual mode coupling technique which replaces classical DRs, coupling, and tuning screws, which are commonly used in dual-mode filters, by slotted DRs. Next, a new theoretical analysis based on the contribution to the dual-mode filter response of the first DR hybrid mode and of higher order modes is described. This analysis can be applied to any type of microwave dual-mode filter. It allows us to define a procedure which explains the presence and controls the position of the two transmission zeros in the filter responses. In this paper, this procedure has been applied to improve filtering performances of a dual-mode DR filter. Finally, a synthesis method is developed to rigorously design for the first time, a four- and an eight-pole slotted DR elliptic filters. The experimental results were obtained with no tuning and the theoretical ones show good agreement.

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