Abstracts

Efficient FDTD modeling of irises/slots in microwave structures and its application to the design of combline filters

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A new methodology is proposed for the computationally efficient, numerically stable, and accurate finite difference time-domain (FDTD) simulation of microwave structures with electrically thin irises and slots. The proposed method is based on the hybridization of Yee's standard FDTD scheme with Pade approximations of the electromagnetic properties of the irises/slots. Through the use of rigorous modal expansions for the description of the fields in the waveguide sections formed by the irises and slots, highly accurate rational function approximations of their transmission and reflection properties are obtained. These transfer functions are then incorporated directly in the FDTD algorithm through their corresponding z-transform expressions. Combined with the matrix valued multivariate Pade approximation, the proposed method provides a suitable design tool for combline filters and manifold multiplexes for satellite and wireless communication systems. Results are presented to demonstrate the validity and accuracy of the proposed methodology.

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