Abstracts

Efficient analysis of microwave passive structures using 3-D envelope-finite element (EVFE)

Hsiao-Ping Tsai, Yuanxun Wang and T. Itoh. "Efficient analysis of microwave passive structures using 3-D envelope-finite element (EVFE)." 2002 Transactions on Microwave Theory and Techniques 50.12 (Dec. 2002 [T-MTT] (Special Issue on 2002 International Microwave Symposium)): 2721-2727.

A three-dimensional envelope-finite element (EVFE) technique is proposed to solve the transient responses of general microwave passive structures. EVFE simulates the signal envelope rather than the original signal waveform by de-embedding the carrier from the time-domain wave equation. The sampling rate of the time-domain waveform is only governed by the Nyquist rate of the envelope, rather than that of the carrier in traditional time-domain simulators. Compared to traditional finite-element time-domain (FETD) methods, the computational cost can be dramatically reduced when the signal envelope-to-carrier ratio is very small. It also provides much higher computational efficiency than frequency-domain finite-element methods for simulating frequency responses over certain bandwidth. This technique is applied to solve a waveguide structure with a dielectric post discontinuity and a microstrip patch antenna. The accuracy and efficiency is demonstrated and compared with traditional unconditionally stable FETD methods.

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