Abstracts

Envelope-finite-element (EVFE) technique - a more efficient time-domain scheme

A novel technique, called the envelope-finite element (EVFE) method, is proposed as a more efficient full-wave time-domain modeling scheme of electromagnetic waves. The EVFE method simulates the signal envelope rather than the original signal waveform by de-embedding the signal carrier from the time-domain wave equation. The de-embedded equation is then solved in the time domain using finite-element methods based on Newmark-Beta time stepping. Compared to traditional time-domain simulation techniques such as finite difference time-domain or finite element time-domain methods, only the signal envelope needs to be sampled in EVFE simulation. This method can reduce computation time when signal envelope/carrier ratios are very small. The purpose of this paper is to introduce this new concept, by presenting the two-dimensional EVFE formulations, stability conditions, and some supporting numerical examples.

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