Abstracts

Global modeling of microwave applications by combining the FDTD method and a general semiconductor device and circuit simulator

This paper presents the coupling of two commercially available simulation codes: DESSIS-ISE, a multidimensional semiconductor device and circuit simulator, and EMLAB-ISE, an electromagnetic-field solver based on the finite-difference time-domain (FDTD) method. Full-wave electromagnetics and nonlinear devices are simulated in a coupled self-consistent way using the lumped-element approach. The active region of the device is represented as a lumped element within the FDTD grid, while the packaging and waveguiding structures are modeled in their physical dimensions. For the nonlinear device, multidimensional semiconductor device simulation, as well as standard SPICE models, may be applied. Several examples show the capability of comprehensive analysis of microwave applications and the versatility in the simulation of the active elements. The coupling formalism is explained in detail, including time-step adjustment and biasing of active devices.

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