Abstracts

Integrated Physics-Oriented Statistical Modeling, Simulation and Optimization

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We contribute herein to the effective utilization of physics-, geometry- and process-related parameters for yield-driven microwave device modeling and circuit design. We address physics-based modeling of MESFETs from the point of view of efficient simulation, accurate behavior prediction and robust parameter extraction. We present a novel integration of a large-signal physics-based model into the harmonic balance equations for simulation of nonlinear circuits, involving an efficient Newton update. We exploit this integration in gradient-based FAST (Feasible Adjoint Sensitivity Technique) circuit optimization. For the purpose of yield-driven circuit design we present a relevant physics-based statistical modeling methodology. Our statistical implementations use models originated by Ladbrooke and Khatibzadeh and Trew. We embed these physics based device models in the yield optimization process for MMICs using appropriate multidimensional statistical distributions. Quadratic approximation of responses and gradients suitable for yield optimization is discussed. We verify our theoretical contributions and exemplify our computational results using built-in and user-programmable modeling capabilities of the CAE systems 0SA90/hope™ and HarPE™. In this context, we report on results of device modeling using a field-theoretic nonlinear device simulator.

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