Abstracts

Global coupled EM-electrical-thermal simulation and experimental validation for a spatial power combining MMIC array (Dec. 2002 [T-MTT])

W. Batty, C.E. Christoffersen, A.B. Yakovlev, J.F. Whitaker, A. Mortazawi, A. Al-Zayed, M. Ozkar, S.C. Ortiz, R.M. Reano, K. Yang, L.P.B. Katehi, C.M. Snowden and M.B. Steer. "Global coupled EM-electrical-thermal simulation and experimental validation for a spatial power combining MMIC array (Dec. 2002 [T-MTT])." 2002 Transactions on Microwave Theory and Techniques 50.12 (Dec. 2002 [T-MTT] (Special Issue on 2002 International Microwave Symposium)): 2820-2833.

A unique electromagnetic (EM)-electrothermal global simulation tool based on a universal error concept is presented. The advantages of this electrothermal model are illustrated by comparison with a commercial electrothermal circuit simulator. The first description of a fully physical, electrothermal, microwave circuit simulation, based on coupling of the Leeds Physical Model of MESFETs and high electron-mobility transistors, to a microwave circuit simulator, fREEDA (NCSU), is presented. The modeling effort is supported by parallel developments in electrooptic and thermal measurement. The first fully coupled EM-electrothermal global simulation of a large microwave subsystem, here a whole spatial power combining monolithic-microwave integrated-circuit (MMIC) array, is described. The simulation is partially validated by measurements of MMIC array temperature rise and temperature dependent S-parameters. Electrothermal issues for spatial power combiner operation and modeling are discussed. The computer-aided-design tools and experimental characterization described, provide a unique capability for the design of quasi-optical systems and for the exploration of the fundamental physics of spatial power combining devices.

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