AUTOMATIC RF TECHNIQUES GROUP

CONFERENCE NEWSLETTER

SPRING 1999 NUMBER 21

The 53rd Conference Nonlinearity Characterization

OVERVIEW

Anaheim California provided a sunny and pleasant setting for the 1999 MTT-S International Microwave Symposium (IMS) at the Anaheim Convention Center. The Symposium was held from June 13 to 18 with events for the 53rd ARFTG conference scheduled throughout the week. The large conference registration of over 200 pleased conference chair Gary Simpson who also served as ARFTG Liaison to the MTT-S IMS Steering Committee for this symposium.

The 53rd ARFTG conference included: a IMS Workshop on June 13 titled "Measurement for Wireless Front End Technologies"; a IMS/ARFTG joint session titled "Automated Characterization Techniques" on June 17 and a full one-day technical program on June 18. Complete copies of each presentation is available in the conference digest. Digests for this and previous conferences are available from the Executive Secretary, Jim Taylor at jtaylor@blitz-it.net or (913)-888-7933. Additional conference information is available on our website at www.arftg.org.

TECHNICAL SESSIONS

The full one-day technical program covered the conference theme as well as a number of other diverse subjects of common interest to the test and measurement community. Technical Program Chair Don DeGroot brought together a program consisting of 2 invited, 18 presented and 10 interactive papers. The main topics included: Nonlinear Device Modeling, Measurements for Nonlinear Devices, Vectorial Nonlinear Network Measurements & Device Modeling, and Measurement Techniques.

Selected by the attendees: the Best Technical Paper was "Measuring the Characteristics of Modulated Non-Linear Devices", presented by Yves Rolain; and the Best Interactive Paper was "Automating the Importation of Load Pull Data into a Non-Linear CAD Simulator", presented by David Anderson.

EXHIBITS

The exhibits area at ARFTG Conferences provides attendees an opportunity to have in-depth discussions with suppliers about their test and measurement needs. Attendees selected Maury Microwave as the Best Exhibitor. For additional information or to exhibit at the 54th ARFTG Conference to be held in Atlanta, Georgia on December 2-3, 1999 please contact Exhibits Chair Leonard Hayden at leonard @cmicro.com

PRESIDENT'S MESSAGE

Y2K is upon us. E-commerce is the hottest commodity in the business world. For the RF/microwave industry, more tough challenges are expected. Ever faster technological changes will be the norm. ARFTG too is making changes.

At every conference, we ask our members to complete a survey to help us serve them better. Based on their responses, we have started many programs that will benefit both our members and the RF/microwave industry. We have just selected the recipient of the first ARFTG Student Fellowship Award. We established a closer technical program relationship with MTT-S/IEEE. We expanded our participation at the International Microwave Symposium to include workshops and joint technical sessions. The fall conference will have special topic sessions that will cover the more traditional microwave measurements and metrology techniques. We are working with IEEE to have the ARFTG digest included on the annual MTT-S Transaction CD-ROM. Our WEB site has been expanded and improved. Authors

now submit their papers electronically to speed up the acceptance and publications process. We are updating our microwave Network Analyzer Measurement Comparison Program. Other educational programs are also being considered and will be implemented when feasible.
Many dedicated volunteers made these programs possible. My special thanks go to: Dr. Larry Dunleavy and Dr. Jeff Jargon for setting up the ARFTG Student Fellowship Program, Dr. Roger Marks - ARFTG/MTT-S liaison, Dr. Dylan Williams - Technical Committee Chair, Dr. Ed Godshalk - Publications Chair, Brian Pugh - E-COMM Committee Chair, and John Cable - Standard Committee Chair.

The 54th ARFTG Conference will be on Dec. 2-3 in the Westin Peachtree Plaza Hotel, Atlanta, Georgia. The theme is "Characterization of Broadband Access Technologies". Many thanks to Dr. Larry Dunleavy, Dr. Joy Laskar and Mike Harris for putting this conference together.

Prior to the main conference, ARFTG, in cooperation with the National Institute of Standards and Technology (NIST), will offer a 2 day short course on microwave measurement fundamentals, and basics that relate to the conference theme. David Walker has done a wonderful job of organizing this short course.

I am looking forward to seeing you and your colleagues at the ARFTG 54th Conference and Microwave Short Course. Please visit our website www.arftg.org to get the latest happenings.

Sincerely, Ken Wong President - ARFTG

MICROWAVE MEASUREMENT STUDENT FELLOWSHIP

ARFTG has established a Microwave Measurement Student Fellowship. The purpose of this fellowship is to recognize and provide financial assistance to graduate students who show promise and interest in pursuing research related to improvement of radio frequency and microwave measurement techniques. One or more awards up to $7500 may be granted each year.

This year marked the first award for the newly formed Fellowship. Five excellent proposals were received and Uwe Arz, a graduate student at the University of Hannover, was chosen. His topic is "Investigation of the High-Frequency Behavior of Coupled Interconnects Built on Silicon Substrates" and his ARFTG sponsor was Dylan Williams of NIST.

The deadline for the next competition is October 1, 1999. If you know of someone who is eligible to apply, we encourage you to let them know about this fellowship. In order to be eligible, applicants must have a bachelor's degree in engineering, physics, or computer science, and must be enrolled as a full-time student in a graduate degree program at a suitably qualified institution of higher learning. Applicants must be carrying out research as part of the degree program, rather than just taking course work. The proposed research project must clearly involve RF/microwave measurements, and be supervised by a full-time faculty member. The faculty advisor or supervisor must be an ARFTG member, or the proposal must be sponsored by an ARFTG member.

For more information visit our website at www.arftg.org/fellow.html or contact Jeffrey Jargon at jjargon@nist.gov.

THANKS FOR MANY YEARS OF VALUABLE SERVICE

For the last eight years, Henry Burger has been the Executive Secretary to the ARFTG Executive Committee. It is not always easy to work for a committee, and it is not always easy for a committee to listen to its Executive Secretary. However, in those years, he helped ARFTG through some major changes as the entire industry itself was undergoing a transition. We all wish Henry well in his future endeavors.

NEW EXECUTIVE SECRETARY

The Executive Committee wishes to welcome Jim Taylor as the new ARFTG Executive Secretary. Jim has been involved with ARFTG since its inception in the early 1970s. He has served in every major office including President and he will continue to serve ARFTG in this position.

FUTURE CONFERENCES

6th NIST/ARFTG Short Course

The 6th annual NIST/ARFTG Microwave Measurements Short Course will be given on November 30th and December 1st, 1999 at the Westin Peachtree Hotel in Atlanta, GA. The course material includes: microwave measurements overview; circuit theory; VNA; interconnects, IC test fixtures, probing, and RF connectors; on-wafer measurements; power; noise temperature; phase noise; load pull; digital modulation; timedomain; twisted-pair cable; wideband radio link modeling, simulation, and measurement. For information see the web site (www.arftg.org) or contact the Short Course Coordinator, David Walker of NIST (dwalker@boulder.nist.gov or (303)-497-5490).

54th ARFTG Conference

The 54th ARFTG Conference will be held on December 2-3, 1999 at the Westin Peachtree Hotel in Atlanta, GA. The main conference theme is "Characterization of Broadband Access Technologies". For information see the web site (www.arftg.org) or contact the conference chair Larry Dunleavy of University of South Florida (dunleavy @eng.usf.edu or (813)-974-2574), or the technical program

chair Joy Laskar of Georgia Institute of Technology (joy.laskar@ee.gatech.edu or (404)-894-5268).

55th ARFTG Conference

The 55th ARFTG Conference will be held on June 16, 2000 in Boston, MA. information see the web site (www.arftg.org) or contact the conference chair Mike Fennelly of Roos Instruments (m.fennelly@ieee.org or (978)-258-4101).

IMS/ARFTG Joint Session

Automated Characterization Techniques

On-Wafer Load Pull Characterization of W-Band InP HEMT Unit Cells for CPW MMIC Medium Power Amplifiers
D. W. Baker, R. S. Robertson, R. T. Kihm, M. Matloubian, M. Yu and R. Bowen, Raytheon

CAD Oriented Design Methods of Frequency Multipliers. Application to a Millimeter Wave MMIC PHEMT Tripler and a Microwave HBT Doubler
B. Thibaud, D. Barataud, M. Campovecchio, J. M. Nebus, S. Tranchant, P. Quentin, and D. Floriot, IRCOM and Thomson

Wideband Propagation Measurements and Doppler Analysis
S. Guillouard, G. El Zein and J. Citerene, L/C.S.T.-UPRESA CNRS

A New Open-Resonator Technique at 60 GHz for Permittivity and Loss-Tangent Measurements of Low-Loss Materials
M. N. Afsar, H. Ding, and K. Tourshan, Tufts University

Microwave Characterization of Integrated and Multilayered Directional Couplers for Wireless Communication Applications
F. Fortin, B. Flechet, F. Grandjean and G. Angenieux, University of Savoie

Automated Phase Noise Measurement of Ku-Band MMIC VCO on Wafer
J. M. Yang, D. C. Yang, P. G. Cheng and J. M. Dickson, TRW

ARFTG CONFERENCE

Keynote Address:

Measurements and Nonlinear Modeling
Stephen Maas, Nonlinear Technologies

Nonlinear Device Modeling

Three-Port Modeling for Large Signal Devices
William Davis, Virginia Tech

Frequency-Dependent Distortion Mechanism in a Broadband Amplifier
Jodi Steel and Anthony Parker, Macquarie University

A Easy to Use PSPICE Model for Power Transistors in RF Switching Operation and Including Voltage Dependent Output Capacitance
Arturo Mediano, Pilar Molina and Jesus Navarro, University of Zaragoza

Distributed Nonlinear Effects in Planar Transmission Lines
James Booth, J. A. Beall, L. R. Vale and R. H. Ono, National Institute of Standards and Technology

Measurements of Nonlinear Devices

High Power Intermodulation Measurements up to 30W of High Temperature Superconducting Filters
Charles Wilker, Charles Carter III and Zhi-Yuan Shen, DuPont Superconductivity

A Novel Technique for Characterizing the Absolute Group Delay and Delay Linearity of Frequency Translation Devices
Michael Knox, Hewlett-Packard

Active Device Characterization & Evaluation Using a Functional Representation of Measured Load Pull Data
Joe Staudinger and Tim Driver, Motorola

A New Method for Test and Design Multistage Power Amplifiers Using Load Pull Data
C. Tsironis, Bing Li, D. Dubouil and A. Henin, Focus Microwave

Vectorial Nonlinear Network Measurements & Device Modeling

The Three Musketeers of Large Signal RF and Microwave Design: Measurement, Modeling and CAE
Marc Vanden Bossche, Frans Verbeyst and Jan Verspecht, Hewlett-Packard, EEsof

Data-Driven Modeling of Non-Linear Microwave Devices
Bernd Schoner and Neil Gershenfeld, MIT

IM3 Suppression Using a Technology Independent Method Based on Vectorial Large-Signal Measurements
D. Scheurs, T. Visan, S. Vandenberge, H. van Meer, K. van der Zanden, B. Nauwelaers and R. Bosisio, ESAT-TELEMIC, Polygrames Research Center and IMEC

Measuring the Characteristics of Modulated Non-Linear Devices
Yves Rolain, Wendy van Moer and Philip Vael, Vrije Universiteit Brussels

Calibration of a Wideband IF Nonlinear Vectorial Network Analyzer

Wendy Van Moer and Yves Rolain, Vrije Universiteit Brussels

Measurement Techniques

Simple Techniques for Source Reflection Coefficient Measurement while Characterizing Active Devices
Andrea Ferrero and Gian Luigi Madonna, Politecnico di Torino

Pre-Carrier Channel Isolation Measurement of a Broadband Wireless Communication System
Thomas Wang, Illinois Institute of Technology

Development of Pulsed RF Measurement Techniques from 50-110 GHz
Edward Gebara, D. Heo, Joy Laskar, Jennifer Zhang and Jane Huynh, Georgia Tech and Hewlett-Packard

Calibration of Injection-Locked Phase Noise Measurements
Alberto Rodriguez, Ali Boudiaf and Lawrence Dunleavy, University of South Florida and ATN Microwave

VNA Calset Port Augmentation for Impedance Matching Probe Calibration
Leonard Hayden, Cascade Microtech

Characterization of Surface Mount Components at Microwave Frequencies using Wafer Probes
Ed Godshalk and Garth Sundberg, Maxim Integrated Products and Oregon State University

Interactive Forum:

Modeling of Highly-Nonlinear HBT Characteristics using a Distributed Thermal Subcircuit Derived from Pulsed Measurements
Shawn Hsu, Donald Sawdai and Dimitris Pavlidis, University of Michigan

Device Performance Trade-Offs Easily Explored Using New Software and Measurement Methodology
Tim Driver, Motorola

Automating the Importation of Load Pull Data into a Non-Linear CAD Simulator
David Anderson, Maury Microwave

Procedure of Nonparametric Characterization of Nonlinear Devices Based on Expansion of Multidimensional Transfer Functions on Simple Functions
Vasilly Snournitsin, Novosibirsk State Technical University

Automated RF Measurements of L-Band Saw Filters and 20-W Linearized Power Amplifiers
J. I. Upshur, R. K. Gupta, A. E. Williams and R. T. Kroll, COMSAT Laboratories

Test Confidence
Christopher Jones, AMP MA/COM

Synthesizer Phase Noise Requirements for Microwave Radios
M. C. Tsai, A. Olsen, D. Blumberg, G. Cipriano, R. Mignard, World Access

A Universal Circuit for Microwave and Millimeterwave Oscillator Applications
Oliver Pertz, Bernd Roth, Dominique Schreurs and Adalbert Beyer, Gerhard-Mercator Universitat Duisburg

S-Parameter Measurement Based Equivalent Circuit Models for Slotline and NRD Resonators
D. Schreurs, O. Pertz, W. Philibert, A. Beyer and B. Nauwelaers, ESAT-TELEMIC and Gerhard-Mercator Universitat Duisburg

Explicit Determination of Complex Permittivity and Permeability Using a Partial Two-Port Calibration
Changhua Wan and Ahmad Hoorfar, Villanova University

Additions/Corrections

Every effort has been made to publish correct information. Problems should be reported to the undersigned. Corrections will be made in the final copy of the Newsletters found in the Digest.

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