



AUTOMATIC RF TECHNIQUES GROUP

NEWSLETTER

WINTER 2007

NUMBER 38

Fall 2007 ARFTG Microwave Measurement Symposium: “High Power RF Measurement Techniques”

OVERVIEW



*The Tempe Mission Palms Hotel, Tempe, venue for the
Fall 2007 ARFTG Symposium*

The Fall 2007 ARFTG Microwave Measurement Symposium took place at the Tempe Mission Palms Hotel, Tempe, Arizona, over four days from Tuesday, November 27th, to Friday, November 30th. With speakers from 12 countries from around the world, this symposium was a truly international experience. The symposium ‘main event’ was the ARFTG Microwave Measurement Conference, which took place on Thursday, and Friday morning. However, this was accompanied by four other key events: an RF Power Amplifier Design Short Course (held on Tuesday, and Wednesday morning), a Nonlinear Measurement

Workshop (on Wednesday afternoon), the NVNA Users’ Forum (on Wednesday evening) and a High Speed Digital Signal Integrity Workshop (on Friday afternoon). Taken together, this amounted to four days of exciting activities for RF and microwave technologists.

This newsletter gives reviews of these activities. There are also brief accounts of other events of interest to the ARFTG community. To obtain more information on ARFTG and its activities, including details of conferences past, present and future, visit the ARFTG website at www.arftg.org.

SHORT COURSE

The Fall 2007 ARFTG Microwave Measurement Symposium featured a ‘new’ event: an RF Power Amplifier (PA) Design Short Course. This course was given by Dr Steve Cripps, Hywave Associates, and was attended by more than 40 people.

The subjects covered by this course included: a review of amplifier modes – Class A, AB, B, C, E, F and J; Doherty amplifier design; waveform measurement and verification techniques; RF PA nonlinearities; linearization techniques; feedback and feedforward basics; pre-distortion basics; and, digital pre-distortion (DPD) techniques. By all accounts, the course was a great success and may be run again in the future.

For information on ARFTG courses, visit www.arftg.org or contact the ARFTG Education Chair, Dominique Schreurs (dominique.schreurs@ieee.org).

NONLINEAR MEASUREMENT WORKSHOP

This year's ARFTG Nonlinear Measurement Workshop was organized by Peter Aaen and John Wood, Freescale Semiconductor Inc, and was held immediately after the RF PA Design Short Course. The workshop contained talks on the following topics: pulse measurement techniques; LSNA measurements for PA characterization; characterization of high power RF transistors – waveform measurement and engineering; active closed-loop harmonic source- and load-pull systems; and, digital pre-distortion characterization for RF PA evaluation.

The workshop was attended by almost 100 people and was a great success. It is planned to hold further workshops on nonlinear measurement related topics at future fall ARFTG events. Thanks are due to all those that were involved in the workshop – especially Peter Aaen and John Wood who did an excellent job as workshop organizers. A CD containing the presentation material used during the workshop has been issued and may be made available for purchase.

Suggestions for future workshop topics should be sent to the ARFTG Workshops Chair, Jean-Pierre Teyssier (teyssier@brive.unilim.fr).

NVNA USERS' FORUM - US

The ARFTG NVNA (Nonlinear Vector Network Analyzer) Users' Forum held a meeting immediately after the Nonlinear Measurement Workshop. On this occasion, over 30 people attended the informal discussion group. Paul Tasker, Cardiff University, and Don Kimball, University of California, San Diego, led a discussion on methods and uses of envelope domain measurements. The meeting also included a Technology Demonstration of the NVNA application on the PNA-X, given by Loren Betts and Chad Gillese of Agilent Technologies. The meeting also included presentation and discussion on the Ph.D. research of Chin Hsia from UC San Diego on his Drain Modulation/Envelope Tracking work, as well as a research update from Patrick Roblin of Ohio State University on recent LSNA work in his lab. The Forum organizers were Kate Remley, Dominique Schreurs and John Wood. A summary of this meeting will be made available at www.arftg.org.

CONFERENCE TECHNICAL SESSIONS

The 70th ARFTG Microwave Measurement Conference began with an introduction by Mohamed Sayed, the

Conference Chair. Mohamed then handed the proceedings over to John Wood, the Technical Program Chair. Both Mohamed and John are to be congratulated on putting together a really first-rate conference program packed with very interesting papers, with the overall theme "High Power RF Measurement Techniques". The conference received sponsorship from several organizations: the 'gold' sponsors were RFMD and Freescale Semiconductor; the 'silver' sponsors were Cascade Microtech, Intel, Rohde & Schwarz and Tektronix.

The conference consisted of seven sessions one of which was an interactive session featuring papers given as poster presentations. The other sessions consisted of papers given as oral presentations. All papers have been published in the conference digest CD (copies of which can be ordered from www.arftg.org). On this occasion, over 100 people attended the conference.

Voted by the conference attendees as the best oral paper presentation was, "A simple method for extreme impedances measurement" by Martin Randus and Karel Hoffmann (Czech Technical University, Prague). The best interactive forum paper presentation was "An investigation on the modified cold-FET method for determining gate resistance and inductance of the packaged GaN and SiC transistors" by Andrés Zárate-de Landa, J E Zúñiga-Juárez, J A Reynoso-Hernández, M C Maya-Sánchez, Juan Luis del Valle-Padilla and José Raúl Loo-Yau (CICESE, Mexico). The best exhibitor was voted as Agilent Technologies.

CONFERENCE EXHIBITS

The exhibits area gave conference attendees an excellent opportunity to see the latest range of products available from some of the leading suppliers in the microwave measurements industry.



Conference attendees are given ample opportunity to visit the conference exhibits area

The following companies chose to exhibit at this conference: Agilent Technologies, Auriga Measurement Systems, Cascade Microtech, Inter-Continental Microwave, Keithley Instruments, Maury Microwave Corporation, OML, Rohde & Schwarz, Sonnet Software, Southwest Microwave, Suss MicroTec, Tegam, and Tektronix. To exhibit at future conferences, please contact the ARFTG Exhibits Chair at exhibits@arftg.org.

CONFERENCE AWARDS

ARFTG President, John Gregory Burns, presided over the awards banquet, which took place on the evening of November 29th, 2007. Certificates of appreciation were presented to the organizers of the conference, namely: Mohamed Sayed, Conference Chair; Gayle Collins, Conference Host; John Wood, Technical Program Chair; Basim Noori, Short Course Director; Peter Aaen and John Wood, Nonlinear Measurement Workshop organizers; Tom Ruttan, High-Speed Digital Signal Integrity Workshop organizer; Joe Tauritz, the ARFTG Exhibits Chair; and, the Session Chairs – Steve Cripps, Jean-Pierre Teyssier, Gary Simpson, Nick Ridler, Dave Blackham, Heidi Barnes and Daniel Chan.

Awards were also given for the best oral paper, best interactive forum paper and best exhibitor from the previous (69th) conference (held in Honolulu, Hawaii).

The following three special awards were also given: the ARFTG Technology Award, to John Wood and David Root, *for contributions to nonlinear RF and microwave device measurements and behavioral modeling*; and, the ARFTG Career Award, to Harmon Banning, *in recognition of his contribution and devotion to the advancement of RF and microwave cable and connector technology and standards*.



John Wood receiving the ARFTG Technology Award from ARFTG President, John Gregory Burns



David Root receiving the ARFTG Technology Award



Harmon Banning receiving the ARFTG Career Award

ANNUAL BUSINESS MEETING

The annual ARFTG Business Meeting was held during the 70th conference. A significant part of this meeting consisted of electing five members to the ARFTG Executive Committee (ExCom). Biographies for the candidates were distributed prior to voting. The outcome of the voting was the re-election of two existing members of ExCom, Leonard Hayden and Mohamed Sayed, and the election of three new members of ExCom, Dave Blackham, John Wood and Jean-Pierre Teyssier. ARFTG thanks John Gregory Burns, Brian Pugh and William Eisenstadt, who are now no longer members of ExCom, for their valuable contributions to ARFTG whilst members of ExCom.

HIGH SPEED DIGITAL SIGNAL INTEGRITY WORKSHOP

The 70th ARFTG symposium concluded with a workshop on the Friday afternoon, immediately after the ARFTG conference. This workshop focused on high-

speed digital signal integrity and was organized by Tom Ruttan, Intel Corp. The workshop contained talks on the following topics: building bridges between today's digital and microwave technologies; measurement-based modeling for high speed semiconductor test interface boards; removing fixture effects with de-embedding and TRL; packaging a supercomputer in a PCI express form factor; and, why do we need multi-port VNAs for signal integrity.

The workshop was attended by over 30 people and was a great success. Thanks are due to all those that were involved, especially Tom Ruttan who did an excellent job as workshop organizer.

OTHER RECENT EVENTS: NVNA USERS' FORUM - EUROPE

The NVNA Users' Forum – Europe meeting took place during European Microwave Week 2007. This meeting was co-sponsored by the TARGET European Network of Excellence (www.target-net.org). 25 participants from industry and the academic world attended the Forum on October 8th. The topics discussed included: waveform de-embedding, phase detrending, interference minimization, large-signal measurement intercomparison, and multi-envelope nonlinear analysis. Current research updates from those working in this field were also given. The Forum organizers were Dominique Schreurs, John Wood and Kate Remley. A summary of the meeting will be available at www.arftg.org.

FUTURE EVENTS

Summer 2008 ARFTG activities

Microwave Measurement Conference

The 71st ARFTG Microwave Measurement Conference will be held on June 20th, 2008, in Atlanta, Georgia, as part of Microwave Week 2008, which also includes the IEEE MTT-S International Microwave Symposium (www.ims2008.org) and the Radio Frequency Integrated Circuits symposium (www.rfic2008.org). The theme for the ARFTG conference is "Network Analysis – 50 years on". For more information, contact the Conference Chair, Nick Ridler, (nick.ridler@ieee.org), or the Technical Program Chair, Roger Pollard, (r.pollard@ieee.org). Alternatively, for up-to-date information on the conference (including dates for submissions of papers, exhibits information, etc), visit www.arftg.org.

NVNA Users' Forum – International

The ARFTG NVNA Users' Forum will also hold a meeting during Microwave Week 2008. For more

information, please contact the organizers: Dominique Schreurs (dominique.schreurs@ieee.org), Kate Remley (remley@boulder.nist.gov) or John Wood (john.wood@freescale.com).



The Omni Hotel at CNN Center, venue for the 71st ARFTG Microwave Measurement Conference

Joint ARFTG/IMS Workshops

ARFTG has chosen to co-sponsor two workshops during Microwave Week 2008. These are: "High Speed Signal Integrity Workshop – Emphasis on Jitter", being organized by Tom Ruttan and Mike Resso; and, "Applications and Misapplications of Measurement Uncertainty", being organized by Andrej Arumiantsev, Daniel Pasquet and Nick Ridler. For up-to-date information on these workshops, contact Jean-Pierre Teyssier (teyssier@brive.unilim.fr), the ARFTG Workshops Chair.

NVNA Users' Forum - Europe

It is planned to hold a meeting of the ARFTG NVNA Users' Forum during European Microwave Week 2008, which takes place from October 27th to 31th, in Amsterdam, the Netherlands. More information on European Microwave Week 2008 can be found at: www.eumweek.com.

Fall 2008 ARFTG Symposium

The 72nd ARFTG symposium will be held in early December 2008 in Portland, Oregon. It is also planned to hold a Short Course and a Nonlinear Measurement Workshop alongside this conference. There will also be a meeting of the ARFTG NVNA Users' Forum. For more information, contact the Conference Chair, Tom Ruttan (Thomas.g.ruttan@intel.com), or the Technical Program Chair, Leonard Hayden (leonard.hayden@ieee.org). Alternatively, information will also be available at www.arftg.org.