Electronic Design Innovation Conference
电子设计创新会议 2013

ENGLISH VERSION

March 12-14, 2013 2013年3 月 12日至14日
Beijing International Convention Center
北京国际会议中心
Beijing, China
中国北京

会议指南
CONFERENCE GUIDE

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EDI CON Electronic Design Innovation Conference 电子设计创新会议 2013

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Details in this booklet were correct at the time of going to press. They are subject to change. For up-to-date information visit our website at www.ediconchina.com

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- Wen Yu, 2Comu
- Xianfu Sun, Focus Microwaves
- Yusuke Tajima, Auriga Microwave
- Shu Li, CST

Track 3: System Engineering

Co-chairs: *Deng Jie, ZTE, Adams An Yi, Rohde & Schwarz and Ding Hai-Qiang, ANSYS*

- Bai Ying, Agilent
- Dr. Min Zhang, CST
- Josh Moore, AWR
- Miao Qian Jun, Secretary General of CAGL
- Jin Bains, NI
- Ian Wong, NI
- David Hall, NI
- Denver Fu, NI
- Kang Chen, Spirent

Conference Matrix

Tuesday, March 12, 2013: Main Conference Room

10:00 - 13:00	**On-Site Registration Opens**	
13:00 - 15:00	**Opening Plenary Session**	**Exhibition Hours (12:00-17:00)**
	Welcome Remarks EDI CON 2013 Honorary Chair Song Junde, Beijing University Posts and Telecommunications: **The Present and Future of RF/Microwave and High-Speed Digital Devices and Systems**	
	Guy Séné, President Electronic Measurement Group, Agilent Technologies (Platinum Sponsor): **Nurturing Design Innovation for China's Future**	
	Bertram Arbesser-Rastburg, Head of the Electromagnetics and Space Environment Division of the European Space Agency **Microwaves in Space: A European Perspective**	
	Guang Yang, Senior Analyst Mobile Communications Market, Strategy Analytics **Mobile Broadband Network in China and the Enlightenment from Global Trend**	
15:00 - 15:30	**Tea Break**	
15:30 - 17:00	**Design Innovation Session**	
	Dr. Guangyi Liu, Chief Engineer China, Mobile Research Institute: **Microwave Technology – Opportunity for Mobile Communication from Backhaul to Access**	
	Deng Jie, General Manager, ZTE Microwave Products Group: **Building a Commercial Microwave Ecosystem in China**	
	Feng Keming, General Director, Beijing Institute of Radio Metrology and Measurements: **Progress of Microwave Time and Frequency Metrology at the BIRMM**	
17:00 - 18:00	**Reception**	
18:00 - 21:00		

Technical Sessions

Wednesday, March 13, 2013

	Design Track: Room A	Measurement & Modeling Track: Room B	System Engineering Track: Room C	Commercial Resources Track: Room D	
08:30 - 08:50	**VCOs/PLLs/Sources IA** Implementation of Digitally-Controlled Oscillator for Jitter Cleanup *Yin-Chen Lu and Rob Reist, SiTime*	**Noise Measurements IA** Improvements in mm-wave Noise Figure Measurement Accuracy *Jon Martens, Anritsu*	**Software Defined Radio IA** Welch Periodogram Detector for QPSK Based AWGN Baseband and Passband Cognitive Radio System, *M. Tahir Mushtaq, Institute of Communication Networks and Satellite Communication (IKS)*	**High Performance Materials IA** Diamond Rf Resistives: The Answer to High Power and Low Capacitance, *Kai Loh, EMC/Florida RF Labs*	
08:50 - 09:10	**Filters IA** Reconfigurable Multiband SAW Filters for LTE Applications, *Xiaoming Lu, National University of Singapore; Jeffery Galipeau, Koen Mouthaan, Emmanuelle Henry Briot, and Benjamin Abbott, TriQuint Semiconductor*	**Noise Measurements IB** Noise Figure Measurement of Non-Frequency Converting and Frequency Converting Devices Using a VNA *Steffen Neidhardt and Volker Herrmann, Rohde & Schwarz*	**Software Defined Radio IB** Spectrum Re-Use Through Real-Time Signal Processing *Trang D. Nguyen and Chris Chiccone, National Instruments*	**High Performance Materials IB** Impact of Conductor Roughness on Insertion Loss & Propagation Constant of High Speed Signals *Allen Horn, Rogers Corp.*	
09:00					**Press Tour of Exhibition**
09:15 - 09:35	**Antenna Design IA** Design of a Novel Multi-Slot Antenna *Chun-Hsien Lien, AWR Corp.*	**Active Device Modeling IA** Modeling of GaN HEMT Devices *Yusuke Tajima, Auriga Microwave*	**System Track IA** Impact of Wideband I/Q Vector Impairments on 802.11ac *Stephen Dark and Chris Behnke, National Instruments*	**Agilent Education Forum** RF Concepts for High Speed Digital Design, *Li Kai, Agilent Technologies*; Design of Equalization Circuit to Improve Performance at > 5 GHz Data Rate, *Qiujie Lu, Agilent Technologies*	
09:35 - 09:55	**Antenna Design IB** Ten Element 4G Antenna Array for Tablets *Corbit Rowell and Edmund Lam, ASTRI*	**Active Device Modeling IB** Practical Considerations for High-Power X-Parameter Measurements of a 130 W LDMOS Power Transistor *Di Liu, Agilent Technologies*	**System Track IB** Queueing Behavior Over a Gilbert-Elliott Packet Erasure Channel (802.11 Wireless Communication System) *Yi Cai, National Instruments*		
09:55 - 10:30	**Tea/Coffee Break**				**Exhibition Hours (10:00-18:00)**
10:35 - 10:55	**RF Power Amplifiers IA** Wide Dynamic Range Multi-Nested Envelope Tracking Power Amplifier for LTE Application *Zhancang Wang, Nokia Siemens Networks*	**Interconnect Modeling IA** Simulating FPGA Power Integrity Using S-Parameter Model, *Colin Warwick, Hany Fahmy, J. Carrel, and R. Anderson, Agilent; H. Fu and R. Mayder, Xilinx*	**SATCOM IA** GNSS and Their Wide Range of Applications *Markus Loerner, Rohde & Schwarz*	**Signal Analysis IA** Dynamic Measurements in Radar and Electromagnetic Spectrum (EMS) Warfare *Walt Schulte, Agilent Technologies*	
10:55 - 11:15	**RF Power Amplifiers IB** A High-Efficiency, Small-Size GaN Doherty Amplifier for LTE Micro-Cell and Active Antenna System Applications, *Yu Xia and Milos Jankovic, TriQuint Semiconductor*	**Interconnect Modeling IB** Methods of Improving Time/Frequency Domain Measurements Suited for 3D-EM Simulation *Alfred Neves, Wild River Technology LLC*	**SATCOM IB** 'Design to Test' Platform Solution for Direct-Sequence Spread Spectrum (DSSS) Communication System for LEO SATCOM, *Lei Yue, Agilent Technologies*	**Signal Analysis IB** Next Generation Arbitrary Waveform Generator Meets Complex Wideband Signal Generation Challenges *Zhang Peng, Tektronix*	
11:20 - 11:40	**MMICs/RFICs IA** A 60 GHz Four Channel CMOS Receiver with 7 GHz Ultra-Wide Bandwidth for IEEE 802.15.3c Standard, *Chunyuan Zhou, Lei Zhang, Hongrui Wang and He Qian, Tsinghua University*	**EMC/EMI IA** - 3D EMC Simulation of Automotive Multimedia Systems *Ralf Kakerow, Continental Automotive GmbH*	**TD-LTE IA** Optimizing TD-LTE Performance from RF to Subscriber QoE *Simon Wang, Spirent Communications*	**Product Testing** Accelerating USB 3.0 Protocol Development *Don Schoenecker, Agilent Technologies*	
11:40 - 12:00	**MMICs/RFICs IB** Simulation, Modeling and Design Enablement of Integrated Passive Devices in CMOS Technologies *Brian Chen, Filip Demuynck and Georg Estep, Agilent Technologies*	**EMC/EMI IB** - Time-Domain Based Measurements and the Related Speed Improvements for EMI Testing, *Volker Janssen, Rohde & Schwarz*	**TD-LTE IB** System-Level Design of an LTE TDD Tri-Band Receiver *Xin-Dong Xue, Agilent Technologies*	**Product Testing** RFID Product Life Cycle Testing Techniques *Zhihua Zhang, HWA-Tech*	
12:00 - 13:30	**Lunch Break**				

Workshops & Panels

Wednesday, March 13, 2013

	Room A	Room B	Room C	Room D	
13:30 - 14:10	**RF CMOS Foundry Workshop** Addressing RFIC Reliability with a Programmable Electrical Rule Checker *Ofer Tamir, TowerJazz*	**Agilent PA Workshop** A Doherty Power Amplifier with Envelope Tracking Design, *Cheng-Cheng Xie, Agilent Technologies*	**Amplifier Characterization Workshop** Single Connection Amplifier Characterization Workshop *Fabricio Dourado, Rohde & Schwarz*	**Time Domain Materials Modeling Workshop** Time Domain Modeling of Drude and Lorentz Dielectrics with VSim *Chuandong Zhou, Tech-X*	**Exhibition Hours (10:00-18:00)**
14:15 - 14:55	**UltraCMOS Workshop** UltraCMOS® Technology Enables Today's High-Performance RF & Microwave Designs *Jian Zhou, Peregrine Semiconductor*	**Doherty Power Amplifier Workshop** Doherty Power Amplifier Theory and Design for Cellular Infrastructure *Damon Holmes, Freescale Semiconductor*	**High Speed Measurement Workshop** Which is More Important: Oscilloscope Noise or Bits of Resolution? *Caren Johnson, Agilent Technologies* How to Use VNA to Analyze High-Speed Backplane and Cable, *Shaohua Lian, Agilent Technologies*	**Antenna Workshop** Antenna Design Platform Integration *Matthew Commens, ANSYS*	
14:55 - 15:30	**Tea/Coffee Break**				
15:30 - 16:10	**GaN Panel** Featured Panelists: *Freescale, M/A-COM Technology Solutions, Microsemi, Nitronex, TriQuint and Scintera*	**MMIC Design Workshop** Design Methodology for GaAs MMIC, 1 W, X-Band PA *John Dunn, AWR*	**High-Speed Interconnect Workshop** Overcoming High-Speed Interconnect Challenges *Bob Buxton, Anritsu*	**CST MWS Workshop** Integrated Antenna Design for a GSM Tracking Device *Dr. Klaus Krohne, CST*	
16:15 - 17:00		**ATE Test Solutions Workshop** Smart Portable Test Equipment for ATE Applications *Chi Man Shum, Mini-Circuits*	**Connectivity Workshop** Applications of Fiber Optic Links in RF and Microwave Systems *Howard Hausman, MITEQ (Sanetronic)*	**Beamforming Workshop** MIMO Beamforming in All Its Forms – Maximizing Efficiency in Limited Spectrum *Kang Chen, Spirent Communications*	
17:00 - 18:00	**Exhibitors Social**				

Technical Sessions

Thursday, March 14, 2013

	Design Track: Room A	Measurement & Modeling Track: Room B	System Engineering Track: Room C	Commercial Resources Track: Room D	
08:30 - 08:50	**RF Power Amplifiers IIA** Device Characterization Methods for Advanced RF/Microwave Design *AWR*	**High Speed IA** - Signal Lines to Power Plane Coupling Caused by Common Mode Current in High Speed SerDes Interconnect Design, *Lian Kheng Teoh, H.Y. Lee, eASIC; C.T. Chiang, K. Krohne and A. Ciccomancini Scogna, CST*	**Near-Field Communications IA** Bluetooth-Based Room Localization Research Based on NB and SVM Approach *Pengming Wang and Qing Chen, East China Jiaotong University*	**Power Sensing Techniques** Error Analysis of Equivalent Source Reflection Measurements *Igor Chirkov, VNIIFTRI; Vladislav Chuiko, MIET; and Dr. Alexey Pivak, Rohde & Schwarz*	
08:50 - 09:10	**RF Power Amplifiers IIB** High Efficiency Inverse Class-F Amplifier Design for Envelope Tracking Line-up Driver *Zhancang Wang, Li Wang, Rui Ma and S. Lanfranco, Nokia Network Systems*	**High Speed IB** Using Microwave Switches in Testing Multi-Lane MIPI D-PHY and M-PHY Interfaces *Min Jie Chong, Agilent Technologies*	**Near Field Communications IB** Analysis of UHF RFID SD Tag Antennas *Md. Abdul Karim, Technischi Universität Darmstadt (TUD)*	**RF/mW Sources** Modeling Magnetron Sources with VSim *Chuandong Zhou, Tech-X*	
09:15 - 09:35	**VCOs/PLLs/Sources IIA** PLL Frequency Synthesizers Based on the DDS in Feedback Loop *Andrew Polyakov, Peter Bobkovich and Andrew Kuzmenkov, Advantex*	**Communication System Test IA** Memory Polynomial Digital Pre-Distortion Measurement and Implementation *Jinbiao Xu, Agilent Technologies*	**Communications IIA** Digital Up Conversion VS IQ Modulation Using a Wideband Arbitrary Waveform Generator *Beate Hoehne, Agilent Technologies*	**Power Devices IIA** GaN HEMTs for Telecommunications *David Dai, Sanetronic for Cree*	
09:35 - 09:55	**VCOs/PLLs/Sources IIB** High-Stability Controlled Oscillators for Low-Bandwidth PLLs *Sassan Tabatabaei, SiTime, Presented by: David Zhao, SiTime*	**Communication System Test IB** Carrier Aggregation Performance Testing: Challenges and Opportunities *Erik Org, Azimuth Systems*	**Communications IIB** Correlation Between RF Receiver Architecture and RF Measurement *Nikhil Ayer and Brian Avenell, National Instruments*	**Power Devices IIB** Linearizing GaN Microwave Power Amplifiers Using RF Pre-Distortion *Mendy Ouzillou, Scintera*	
09:55 - 10:30	**Tea/Coffee Break**				**Exhibition Hours (10:00-17:00)**
10:35 - 10:55	**Passive Components** 3 dB Branch Line Coupler with Bandpass Filter Function of Sharp Skirt Selectivity *Werner Arriola and I.S. Kim, Kyung Hee University*	**Time/Mixed Domain Measurements** Accurate Test of 28 Gb/s High-Speed Data Electrical Interface *Haiyang Hu, Agilent Technologies*	**Receivers IA** Novel Architecture for QR Decomposition *Yong Rao and Ian Wong, National Instruments*	**Power Devices** Simulating an NXP Doherty Power Amplifier with Digital Pre-Distortion *Dr. John Dunn, AWR*	
10:55 - 11:15	**Passive Components** Edge-Coupled Microstrip and Stripline Bandpass Filters with Stepped or Mitered Bend, *By Changhua Wan, Mentor Graphics, Presented by: Peng Shao, Mentor Graphics*	**Time/Mixed-Domain Measurements** Comparison and Contrast of State-of-the-Art Time Domain Reflectometry Measurement Instrument, *Takuya Hirato, Agilent Technologies*	**Receivers IB** Design and Implementation of FPGA-Based 4 GHz Bandwidth Digital IFM *Megha S. Badad and S.B. Shruti, K S Institute of Technology*	**Power Devices** Optimizing the Design and Verification of 4G RF Power Amplifiers *Peter Xu, National Instruments*	
11:20 - 11:40	**Detectors & Rectifiers IA** A Square-Law Microwave Transistor Detector with Extended Dynamic Range *Alexander Lavrov, Sergey Ivanov and Yuriy Matveev, St. Petersburg State Polytechnical University*	**RF, MW & HSD Measurements** Wafer-Level S-Parameter Calibration: How to Choose the Optimal Strategy for Your Application? *Andrej Rumiantsev, Cascade Microtech*	**Antenna Modeling** Modeling of Antennas and Arrays Using Domain Decomposition Method *Kezhong Zhao and Nancy Lambert, ANSYS*	**Power Devices** Technological Advances of Gallium Nitride *Bruce Green, Freescale Semiconductor*	
11:40 - 12:00	**Detectors & Rectifiers IB** New Design of a 5.8 GHz Microwave Rectifier Circuit *Yu Chengyang, Changjun Liu, Zhang Biao and Tan Feifei, Electronic Information Institute of Sichuan University*	**RF, MW & HSD Measurements** Characterizing Crosstalk/ Noise of Multi-Lane High-Speed Interconnect *Weidong Hu, Teledyne LeCroy*	**Antenna Modeling** Equivalent Current Reconstruction Applications *Francois Chauvet, L.J. Foged, L. Scialacqua, F. Saccardi and G. Vecch, Microwave Vision Group*	**Power Devices** Challenges in the Design and Selection of Power Broadband Amplifiers *Wolfram Titze, Rohde & Schwarz*	
12:00 - 13:30	**Lunch Break**				

Workshops & Panels

Thursday, March 14, 2013

	Room A	Room B	Room C	Room D	
13:30 - 14:10	**RF Signal Analysis Workshop** CETC 41	**RFIC Workshop** RFIC Advances in RF Simulation for Transceiver Designs *Xu Wang and Nebabie Kebebew, Cadence*	**MW and MM Solutions Workshop** VNA, SpA, SG, Frequency Converters *Christoph Wagner, Rohde & Schwarz*	**TD-LTE and TD-LTE-Advanced Solutions Workshop** It's time for TD-LTE *Qin Zhang, Agilent Technologies*	**Exhibition Hours (10:00-17:00)**
14:15 - 15:15	**Compound Semiconductor Workshop** HBT Technology for Multi-Mode, Multi-Band RF Power Amplifier Design *Chen-Kuo Lin, Win Semiconductors*; W-Band Chip-Set for Microwave Imaging, *Marc Rocchi, OMMIC*	**Nonlinear/Load Pull Workshop** An Update on Passive, Active, Hybrid-Active, Mixed-Signal Active, Harmonic, Pulsed, NVNA/ Time-Domain Load Pull and Modeling Techniques, *Zhang Niamin, Maury Microwave*; Load Pull System Common Test Problems and Solutions, *Zacharia Ouardirhi, Focus Microwaves*	**High Frequency Measurement/Calibration Workshops** How to Remove the Effect of Fixtures and Probes in High Speed Test, *Yong Zhao, Agilent Technologies*; De-embedding via Time Domain Gating *Weidong Hu, Teledyne LeCroy*	**RF and Wireless Test Workshop** Redefining RF and Wireless Test *Yuan Yao, National Instruments China*	
15:15 - 15:45	**Tea/Coffee Break**				
15:45 - 16:45	**Connectivity Workshop featuring** *Mitron, Insulated Wire, Southwest Microwave, Times Microwave and Maury Microwave*	**EDA Design Flow Workshop and Panel** Industry Best Practices for a High-Speed Digital Design Workflow *Colin Warwick, Agilent Technologies*; Fully Integrating 3D Electromagnetic (EM) Simulation into Circuit Simulation *Dr. John Dunn, AWR*; Integrating EDA Design with Best-in-Class Analysis Tools *Dr. Matt Commens, ANSYS*	**RF Front-End Workshop** Efficient Design Methodology for Wideband Digital Radio *Lei Xu, Altera* RF Front-End Solutions for High-Speed Designs *Aiguo Leng, Texas Instruments*	**MIMO OTA Workshop** MIMO-OTA Testing Methodologies: Reverb vs. Anechoic, *Kang Chen, Spirent Communications*; MIMO OTA Measurement with Anechoic Chamber Method SATIMO, *Francois Chauvet, L.J. Foged, L. Scialacqua, F. Saccardi and G. Vecchi, SATIMO;* Two-Stage MIMO OTA Research for Differentiated MIMO Device Radiation Performance Evaluation, *Ya Jing, Agilent Technologies*	
16:45 - 17:15				**MIMO OTA Panel featuring** The Changing Face of Testing: Moving from Conducted to OTA *Simon Wang, Spirent Communications;* An Introduction to Over-the-Air Performance Testing of Wireless Devices *Yulong Tang, ETS-Lindgren;* MIMO Over-the-Air Testing with the Blue Test Reverberation Test System *Klas Arvidsson, Bluetest;* Validation of the MIMO OTA Channel Model and the Methods at the TMC *Lin Guo, The China Academy of Telecommunications Research*	
17:15 - 18:00	**Connectivity Panel featuring** *Mitron, Insulated Wire, Southwest Microwave, Maury Microwave and Times Microwave*	**EDA Design Panel featuring** *Agilent, AWR, ANSYS, CST and Cadence*	**RF Front-End and DPD Technology Panel Session featuring** invited speakers from *Altera, TI, AWR and Agilent*		
18:00	**Closing Event**				

Plenary Session

Keynotes
Tuesday, March 12, 2013
13:00 – 15:00
Main Conference Room
Welcome Remarks

EDICON
HONORARY CHAIR

The Present and Future of RF/Microwave and High-Speed Digital Devices and Systems

Professor Song Junde, Beijing University Posts and Telecommunications

Abstract

Recent years have witnessed the surge and remarkable growth of microwave technology, which have emerged as an important technique for communication systems for such applications as wireless paging, mobile technology and broadcast video. This presentation will first focus on the architectural aspects of such communication systems. Next, we will derive a set of features and support expected from the tremendous advances in cost-efficient manufacturing capabilities of microwave and RF products. Finally, we will compare and contrast these requirements with the features and support available in current generation systems and outline the opportunities and challenges for microwave technologies.

Biography

As one of China's leading telecom experts, Professor Song has won numerous awards including first prize (Ministry of Science and Technology Progress Award) from the State Education Commission for national scientific and technological progress in electronics and has been recognized by the National Natural Science Foundation for his science and technology research and international cooperation. Song has published over a dozen books and teaching material along with nearly 200 technical papers in English and Chinese on mobile communications and the Internet, the future of communications, CTI/CRM and VLSI CAD field. His current research focus is on the next generation of wireless mobile Internet theory and technology (3G, B3G, 4G, WiFi, WiMAX) and other aspects of research. His research interests also include next-generation telecommunications network and its supporting systems and related services, heterogeneous networks. Dr. Song has visited the United States and more than 30 countries in support of his scientific research and teaching.

Professor Song Junde, PhD supervisor, Electronic Engineering, Beijing University of Posts and Telecommunications is currently the Academic Council Director, Chairman of China Communications Standards Association, CMIS, honorary Doctor of the Moscow Institute of Electronic Engineering, the State Council Academic Degree Committee disciplinary assessment team members, the State Ministry of Personnel postdoctoral accreditation experts, the international information Federation of IFIP TC7 Chinese President, Information Ministry of Communications Science and Technology Industry Committee members and the satellite and radio consultants, China Communications Standards Association Expert Advisory Committee of experts, China Computer Federation and the data communication network, deputy director of the Committee. Ministry of Information Industry and ministerial key laboratories PCN & CAD Center and CTI Research Centre, Beijing served as the Chairman of the Committee of Posts and Telecommunications large school degree, graduate school dean and other staff.

Plenary Session

Keynotes
Tuesday, March 12, 2013
13:00 – 15:00
Main Conference Room
Welcome Remarks

PLATINUM SPONSOR

Nurturing Design Innovation for China's Future

Guy Séné, President Electronic Measurement Group, Agilent Technologies

Abstract

China has undergone great change in the last decade and now stands as the world's second largest economy. Continuing this growth will require innovation in a broad range of markets. Design innovation, in particular, will be critical to China's ongoing industrial and economic development. Sometimes, however, innovation requires help. That's what the Electronic Design Innovation Conference (EDI CON) hopes to accomplish with its debut and it's what we at Agilent Technologies do on a daily basis—provide the solutions and technology necessary to nurture and encourage design innovation and development. It's this desire to inspire innovation through its focus on applications, emerging technologies and practical engineering solutions that makes Agilent proud and honored to serve as EDI CON's Platinum sponsor in its inaugural year.

Biography

Guy Séné is president of Agilent's Electronic Measurement Group (EMG). In this capacity, he oversees business operations of the company's Electronic Measurement and Semiconductor & Board Test segments. Séné was previously vice president and general manager of Agilent's Microwave & Communications Division (MCD). Séné has held a broad variety of positions in sales, marketing and support in Europe and Asia for Hewlett Packard Co. He was promoted in 1999 to vice president and general manager of the Asian Field Operations, Agilent Technologies Inc. based in Singapore. In 2003 he was named vice president of the Signal Sources Division and moved to Santa Rosa, California. He became the vice president and general manager of the Signal Analysis Division in October 2006. Séné holds a diploma in electronic engineering, an MBA from Institut d'Administration des Entreprises, Paris, and an Executive MBA from Michigan Business School.

Plenary Session

Keynotes
Tuesday, March 12, 2013
13:00 – 15:00
Main Conference Room
Global Focus

EDI CON
INVITED SPEAKER

Microwaves in Space: A European Perspective

Bertram R. Arbesser-Rastburg, Head of the Electromagnetics and Space Environment Division of the European Space Agency

Abstract
Microwaves play a vital role in all space endeavours - from controlling spacecraft to bringing information back to ground. Europe has been engaged in developing space infrastructure for more than 40 years, spanning from telecommunications satellites to launchers. In 1975 the European Space Agency was created to pursue a coordinated space programme in Europe. Today this programme covers the fields of space science, telecommunications, earth observation, navigation, manned space and launchers. In addition, a dedicated technology programme is developing critical technologies needed for space missions.

The presentation is giving examples for advanced microwave technology used in Earth observation, telecommunications and navigation. In Earth observation microwave instruments are used for active remote sensing (like synthetic aperture radars, cloud radars and altimeters) and for passive observations (radiometers and profilers extending up to hundreds of GHz). In telecommunications the challenge is to maximize the capacity of the existing frequency allocations, requiring multi-beam antennas operating at high power levels. In satellite navigation the stability of the navigation signals is one of the challenges.

In addition to providing an overview of the ongoing missions, the presentation will touch on the possibility of collaboration between Europe and China on meteorological satellites.

Biography
Bertram R. Arbesser-Rastburg is head of the Electromagnetics and Space Environment Division of the European Space Agency. He worked as a research assistant at the Technical University of Graz (Austria) and as propagation engineer at INTELSAT in Washington, D.C. In 1988 he joined the European Space Agency where he was responsible for the planning and implementation of wave propagation studies for all aspects of satellite communication and navigation. Currently his responsibilities include the planning and management of R&D activities in the fields of spacecraft antennas systems sub-mm instruments and technologies, wave propagation studies, wave interaction modeling for remote sensing, EMC modeling and engineering, and analysis of space environments.

Since 2007 he is also chairman of ITU-R Study Group 3, responsible for internationally recognized recommendations on propagation. He serves as member of the editorial boards of the "International Journal of Satellite Communications and Networking" and as member of the Scientific Advisory Board of "Annals of Telecommunications." He is a member of the board of directors of EurAAP and chairman of the Netherlands URSI Commission F. He is senior member of IEEE and member of Eu*M*A, URSI, IEICE and ION.

Plenary Session

Keynotes
Tuesday, March 12, 2013
13:00 – 15:00
Main Conference Room
Market Research

EDICON
INVITED SPEAKER

Mobile Broadband Network in China and the Enlightenment from Global Trend

Guang Yang, Senior Analyst Mobile Communications Market, Strategy Analytics

Abstract
Service providers face an increasingly competitive environment. The status quo is being disrupted by convergence, new players, emerging technologies and new business models. As traditional offerings become commoditized, service providers must find ways to reduce operating costs, expand into new markets, and improve profitability even as traditional offerings become commoditized. For example, the deployment of LTE and the broad adoption of WiFi will open a new stage of mobile broadband development in China in 2013/2014. The perspective of mobile broadband market in China and the global mobile broadband network trend will be discussed in this talk by Strategy Analytics Senior Analyst, Guang Yang. Yang will share some of his company's forward-thinking research and thought leadership on the telecom and media industries.

Biography
Guang Yang is a senior analyst based in Beijing, China providing deep insights into the operator, service provider, regulatory and device dynamics in this critical market. Yang brings over 10 years of experience in the mobile communications industry to Strategy Analytics. Prior to joining Strategy Analytics, Yang worked in some well-known telecom players, including Lucent, France Telecom R&D and ZTE. His experience covers research and development, standardization and strategic analysis for 3G/4G, spectrum, emerging wireless technologies, and the development of industrial cooperation. Yang will support consulting project execution with Chinese clients, research and write about the Chinese and other Asian markets, expand relationships with Chinese operators, regulators and media players. Yang received his BE and ME degrees on telecom and information system from Beijing University of Posts and Telecommunications.

Keynotes
Tuesday, March 12, 2013
15:30 – 17:00
Main Conference Room
Design Innovation

EDI CON
INVITED SPEAKER

Microwave Technology – Opportunity for Mobile Communication from Backhaul to Access

Dr. Guangyi Liu, Chief Engineer for the Wireless Department, China Mobile Research Institute

Abstract
With the explosive increase of the mobile data application, mobile networks are required to provide more than 1000 times capacity for mobile internet by 2020. In this talk, the trends of mobile communication for future and the potential solutions to solve the capacity problem are summarized. Microwave technology provides an opportunity to enlarge the mobile network capacity greatly by huge spectrum resource. The initial application of microwave technology in mobile network is to provide wireless backhaul and its status in industry is overviewed first, then the challenges for extensive application of it is discussed in detail, e.g. the available spectrum, higher power transmission device, antenna and standardization.

Biography
Dr. Liu received his B.S. in Physics from the Chinese Ocean University in 1997. He received his M.S. degrees and Ph.D. degree in Circuits and System from Beijing University of Posts and Telecommunications, Beijing, China, in 2000 and 2006. In 2000, he was an algorithm researcher in WCDMA R&D of Shanghai Bell Ltd. Corps., which developed wireless communication systems products in China. During 2000-2003, he worked for Siemens China, on TD-SCDMA system engineering and algorithm research. Since 2006, he worked for the China Mobile Research Institute. His research interests include research, standardization, industrialization of LTE/LTE-Advanced and the new concepts and technologies for mobile evolution.

Keynotes
Tuesday, March 12, 2013
15:30 – 17:00
Main Conference Room
Design Innovation

EDI CON
INVITED SPEAKER

Building a Commercial Microwave Ecosystem in China

Deng Jie, General Manager, ZTE Microwave Products Group

Abstract
ZTE contributes greatly to the rapid growth of China's telecom industry. Now it starts to reproduce its success in the commercial microwave radio market. With the fast deployment of 3G and LTE technology, the microwave radio market is growing steadily and has reached 50 Billion RMB Yuan in revenue. By developing and manufacturing microwave radio product, ZTE Microwave has created great opportunities for domestic and international microwave suppliers to grow their business in China. From ICs and passive components to radio subsystems, from microwave accessories to test and measurement equipment, ZTE Microwave has generated strong demand and is fueling the growth of the entire microwave supply chain in China.

Biography
Since 2009 Deng Jie has served as general manager of the ZTE Microwave Products Group. Deng Jie has a rich background in the research and development of wireless communications products with a more profound scientific training emphasizing theoretical basis. He received rigorous technical training in the Military Institute, to develop a rigorous style of work and a good educational background. The key direction of his research is in the area of microwave backhaul. Socialized titles: senior; Academic groups: the seventh, eighth sector nationwide Microwave Academic Committee (December 2001 appointment).

Keynotes
Tuesday, March 12, 2013
15:30 – 17:00
Main Conference Room
Design Innovation

EDICON
INVITED SPEAKER

Progress of Microwave Time and Frequency Metrology at the BIRMM

Feng Keming, General Director, Beijing Institute of Radio Metrology and Measurements

Abstract
This presentation will report the newest research work on measurement standards and calibration in radio, microwave, time and frequency metrology fields. A new wideband microwave power measurement standard and radiometer calibration sets will be described, it will also show the newest performance of a satellite-borne Rubidium atomic clock in a compass navigation system. In addition, it will show the further effort aimed at a high performance passive Hydrogen atomic clock and introduce a small size H-maser for timekeeping.

Biography
Feng Keming was born in 1966. He received his Bachelor's degree in 1987 and Master's degree in 1990 from the University of Electronic Science and Technology of China, respectively. Now he is the director of Beijing Institute of Radio Metrology and Measurement. His major research interests and experience include microwave measurement, frequency synthesizer and atomic clock.

Wednesday, March 13, 2013
Technical Sessions

Wednesday, March 13, 2013
Design Track: VCOs/PLLs/Sources IA
Room A: 08:30 – 08:50

Implementation of Digitally-Controlled Oscillator for Jitter Cleanup

Yin-Chen Lu and Rob Reist, SiTime
Presented by: David Zhao, SiTime

Abstract
When locking to a noisy system clock, jitter clean-up techniques are often needed to generate a stable clock signal with low phase noise and low jitter. An important component of synchronization or jitter clean-up PLLs are high precision oscillators with either analog (VCXO) or digital (DCXO) frequency control. This presentation discusses design options for these oscillators, explaining why DCXOs that adjust frequency using high resolution PLLs are well-suited to this application, with no degradation of close-in phase noise as pull range is increased. As described in the presentation, jitter clean-up has now been successfully implemented using only an FPGA and a DCXO chip. The all-digital PLL solution with DCXO has advantages in both performance and cost, reducing chip count and providing a design that uses only 3000 gates. The solution is easy to implement and could be used in a wide range of clock generator applications.

Biographies
Yin-Chen Lu is the senior manager of customer engineering at SiTime Corp. Prior to joining SiTime, Dr. Lu held engineering, product management and marketing positions at a number of technology companies. Dr. Lu's technical expertise includes RF, optical electronics, and communication system design and testing. He received his B.E. from Southeast University in Nanjing, China and his MSEE and Ph.D. from the University of New Mexico in Albuquerque, NM.

Rob Reist currently works as a principal design engineer designing FPGA IP at Macnica Americas Inc. He has worked for over 20 years designing products and IP in the telecom and wireless industries. He holds an MSEE from Santa Clara University and a BSEL from California Polytechnic University.

Wednesday, March 13, 2013
Design Track: Filters IA
Room A: 08:50 – 09:10

Reconfigurable Multiband SAW Filters for LTE Applications

Xiaoming Lu, National University of Singapore; Jeffery Galipeau, Koen Mouthaan, Emmanuelle Henry Briot, and Benjamin Abbott, TriQuint Semiconductor

Abstract
Reconfigurable surface acoustic wave (SAW) filters are presented for the 700 MHz frequency band currently allocated to Long Term Evolution (LTE). Unlike traditional SAW filters with a fixed center frequency, the proposed filters have a reconfigurable center frequency. First, a novel modular ladder type topology is proposed incorporating SAW resonators and GaAs Single Pole Single Throw (SPST) switches within the basic reconfigurable filter. The measured center frequency in the low band state is 696 MHz and the BW is 3.4%. In the high band state the measured center frequency is 718 MHz and the BW is 2.6%. The center frequency shift is 3.2%. Spurious responses caused by switches are an important design consideration and the root causes of the spurious responses in high band and low band are identified. Then a novel filter topology using Single Pole Double Throw (SPDT) absorptive switches is proposed to remove the spurious responses in the high band state. Finally the root cause of the remaining spurious response is analyzed and a solution is proposed.

Biography
Xiaoming Lu obtained the BSc from Fudan University in 2009, with a major in Microelectronics. Since then, she has been working towards her Ph.D. in electrical engineering as a research scholar at the National University of Singapore (NUS) including work as an intern with TriQuint. Her current research includes reconfigurable filters and SAW filter design, as well as multiband filter design.

Wednesday, March 13, 2013
Design Track: Antenna Design IA
Room A: 09:15 – 09:35

Design of a Novel Multi-Slot Antenna

Chun-Hsien (Milton) Lien, AWR Corp.

Abstract
The paper will present a new antenna design that utilizes waveguide properties of cylinders with longitudinal slots to achieve optimal efficiency. Numerical and simulation data (from AWR's AXIEM 3D Planar EM simulator) alongside data from live experiments will also be presented and show that when the length of the antenna slot approaches the wavelength in free space, the field in the antenna aperture approaches the optimal distribution. Additional novel parameterization and optimization techniques within AXIEM further contribute to the novelty and performance of this design.

Biography
Chun-Hsien (Milton) Lien joined AWR in April of 2012 as a regional technical manager based in China. Prior to AWR, he was a technical applications manager with Advanced Communication Engineering Solution Co. Ltd., Hsinchu, Taiwan and prior to that he was a senior engineer with Universal Scientific Industrial Co., Nan-Tou, Taiwan. Lien received his B.S. degree in communication engineering from National Chiao Tung University, Hsinchu, Taiwan, in 1998, and his Ph.D. degree in communication engineering from National Taiwan University, Taipei, Taiwan, in 2009. His research interests include the design and analysis of RF, microwave and MMW circuits, signal integrity, electromagnetic integrity (EMI) and computational electromagnetic.

Wednesday, March 13, 2013
Design Track: Antenna Design IB
Room A: 09:35 – 09:55

Ten Element 4G Antenna Array for Tablets

Corbett Rowell and Edmund Y. Lam, ASTRI

Abstract
The performance characteristics of a tablet device (165 x 220 mm) with ten antennas are analyzed and measured. There are two main antennas operating in GSM-MC, 3G, and 4G and eight auxiliary antennas in LTE Band 1. Both the LTE and the main antennas are planar monopole antennas (PMA), though the main antennas are three-dimensional in order to attain wider bandwidth in the upper frequency band. The eight auxiliary antennas use parasitics to create a band-stop anti-resonance between the LTE antennas on the corners. The radiation efficiency for the eight auxiliary antennas is 66 percent. The highest mutual coupling occurred between pairs of antennas on opposite corners, but same side, of the tablet PCB with a peak S21 = -8 dB. When used together with the appropriate switching circuitry, the eight auxiliary antennas add 6 dB of mean effective gain over a 2 MIMO channel scheme.

Biography
Corbett Rowell received his BA in Physics from the University of California, Santa Cruz in 1994, and an MPhil in EEE from Hong Kong University of Science and Technology in 1996. After graduation, Rowell joined Allgon Mobile Communications in Sweden as an RF engineer for two years, and worked closely with Nokia. He later started his own antenna design company, Integra Antennas Ltd. and sold part of it in 2003 to Molex Inc. At the same time, he was hired by JP Morgan at Wall Street as a technical expert in venture capital. In 2003, he worked with Molex Inc. in Hong Kong as a senior antenna engineer. From 2005 until present, Rowell has worked at Applied Science and Technology Research Institute (ASTRI) in Hong Kong.

Currently, Rowell is the R&D director of RF, antennas, and digital-RF of the communications technologies group in ASTRI. He has 30 granted patents and 21 publications with over 1000 citations in innovative antenna and RF technology. His research interests are in mobile phone antennas, antenna arrays, power amplifiers, DPD, beamforming and antenna isolation.

Wednesday, March 13, 2013
Design Track: RF Power Amplifiers IA
Room A: 10:35 – 10:55

Wide Dynamic Range Multi-Nested Envelope Tracking Power Amplifier for LTE Application

Zhancang Wang, Nokia Siemens Networks

Abstract
In wireless infrastructure markets, from 10 to 30 percent of network OPEX is utilized on energy. Solutions for improved energy efficiency are strongly desired in the wideband LTE/LTE-Advanced applications. Further, the RF power amplifier (PA) usually takes the lion share, as a signal component, of power dissipation in a base station. The efficiency of RF power amplifier (PA) is rather low in the future wideband LTE-Advanced applications with traditional architectures. Consequently, extensive efforts are made within the wireless industry for the means of enhancing efficiency, e.g. Doherty, envelope tracking, etc. A little improvement in PA efficiency can be substantial. In this paper, a wideband envelope tracking base station power amplifier with multiple nested scheme for both linear and current source array will be presented, which boosts envelope tracking in a power amplifier's overall efficiency over wide dynamic range. Tunable peak efficiency points in the first order nested structure make a flexible efficiency adaptation for various wideband modulated signal besides efficiency boosting. This multi-nested scheme was proposed for enhanced power saving mode for base station, e.g. LTE/LTE-A, to reduce OPEX by lower power operation according to traffic profiles.

Biography
Zhancang Wang received his Bachelor's degree in automation and Master's degree in RFIC from Beijing University of Technology in 2005 and 2008, respectively. He obtained both rich academic and industrial experience by working in Beijing Embedded System Key Lab, RDA Microelectronics, Datang Mobile Inc., Nokia Siemens Networks as RFIC engineer, senior RF researcher, research project manager and consultant for 3rd party research collaborators. He focused on advanced RF technology research and prototyping, including RF transceiver architecture, linearization technology, digital front end algorithm, e.g. E-CFR, broadband and high efficiency PA technologies, e.g. Doherty and variants, envelope tracking, switch mode PA, LINC with GaN, SiC and HV-GaAs. He was an IEEE member and committee member for several international conferences. He is an author and coauthor of 16 papers and one U.S. patent on ET technology. He can be reached by email at: zhancang.wang@ieee.org.

Wednesday, March 13, 2013
Design Track: RF Power Amplifiers IB
Room A: 10:55 – 11:15

A High-Efficiency, Small-Size GaN Doherty Amplifier for LTE Micro-Cell and Active Antenna System Applications

Yu (Peter) Xia and Milos Jankovic, TriQuint Semiconductor

Abstract
In today's communications networks, achieving higher data rates and spectrum efficiency are always motivation for developing new technology. In order to meet the increasingly more stringent requirements of high data rate and high spectrum efficiency demanded by wireless telecommunications subscribers, the 4G wireless system including Long Term Evolution (LTE) have been developed to take advantage of some new technology. In this paper a high-efficiency, small-size GaN Doherty amplifier for LTE micro-cell base station and active antenna systems base station application is presented. It is implemented with a TriQuint Semiconductor wideband discrete GaN RF power transistor, the T1G6001528-Q3. Doherty amplifier performance is in the LTE standard frequency range of 2.62 to 2.69 GHz; average output power = 38.5 dBm; the peak saturated output power is > 46 dBm; drain efficiency is > 55%; gain is > 15 dB; 2 carrier 2x10 MHz; 8 dB PAR LTE signal waveform with Netlogic standard DPD; ACPR is better than -50 dBc; and Doherty amplifier size is 30 x 70 mm.

Biography
Yu (Peter) Xia graduated from UESTC and has been engaged in RF power amplifier for wireless communications as well as research work in the field of radar for over 20 years. He has numerous patents and published articles and is currently an RF power device applications engineer with TriQuint Semiconductor.

Wednesday, March 13, 2013
Design Track: MMICs/RFICs IA
Room A: 11:20 – 11:40

A 60 GHz Four Channel CMOS Receiver with 7 GHz Ultra-Wide Bandwidth for IEEE 802.15.3c Standard

Chunyuan Zhou, Lei Zhang, Hongrui Wang and He Qian, Tsinghua University

Abstract
In this paper, a CMOS millimeter wave (mmW) receiver front-end for high-speed in-door applications centering at 60 GHz is designed and implemented in 90 nm CMOS technology. The receiver is designed with a super-heterodyne architecture consisting of a low noise amplifier (LNA) with inter-stage peaking technique, a single-balanced mixer, an IF amplifier and an I/Q down-conversion mixer. The proposed receiver front-end adopts a sliding-IF structure and is designed with four 2.16 GHz receiving channels around 60 GHz for IEEE 802.15.3c standard applications. Measured results show that the whole receiver consumes a total DC current of 60 mA from 1.2 V voltage supply, and achieves a peak gain of 11 dB and an input 1 dB.

Biographies
Chunyuan Zhou was born in Yichun, Jiangxi Province, China, in 1984. He received his M.S. degree from the Institute of Microelectronics, Tsinghua University, Beijing, China, in 2009, and he is currently working toward his Ph.D. degree at the Institute of Microelectronics, Tsinghua University, Beijing, China. His research activity is focused on the RF integrated circuits and systems, including PLL-based frequency synthesizers, and RF front-ends for wideband wireless communications. He also conducts research on analog mixed signal integrated circuits.

Lei Zhang graduated with honors from the Department of Electronic Engineering from Tsinghua University, Beijing, China, in 2003, and received his Ph.D. degree from Tsinghua University in 2008. From 2008 to 2010, he worked as Postdoctoral Fellow in the University of California, Los Angeles, U.S.A. Since 2010, he has been assistant professor and subsequently associate professor at the Institute of Microelectronics in Tsinghua University. His research interests cover RF and mmW integrated circuits and systems for high speed data communications, data converters, CMOS integrated biochips and integrated neuromorphic circuits.

Hongrui Wang received his B.S. degree in electronics engineering from Tianjin University, Tianjin, China, in 2006, and received the Ph.D. degree at the Institute of Microelectronics, Tsinghua University, Beijing, China, in 2011. Since 2011, he has been a Postdoctoral Fellow at the University of Southern California in Los Angeles. His research interests include radio frequency integrated circuits such as LNA, mixer, VCO and frequency synthesizer for wireless communications and RF and millimeter-wave devices modeling.

He Qian received his Ph.D. in Microelectronics at Xian Jiaotong University, China, in 1990. From 1990 to 2006, he worked at the Institute of Microelectronics Chinese Academy of Sciences (MECCAS) and was appointed professor in 1996 and director in 2001 respectively. From July of 2006 to the end of 2008, he worked for Samsung Semiconductor China R&D Center (SSCR) as general manager. From the beginning of 2009, he joined the Institute of Microelectronics Tsinghua University (IMTU) as a professor. His current research interests are RF circuits design and emerging memory technology development.

Wednesday, March 13, 2013
Design Track: MMICs/RFICs IB
Room A: 11:40 – 12:00

Simulation, Modeling and Design Enablement of Integrated Passive Devices in CMOS Technologies

Qiang (Brian) Chen, Filip Demuynck and George Estep, Agilent Technologies

Abstract
This paper presents a comprehensive methodology that generates scalable, equivalent-circuit-based SPICE models of on-chip passive devices based on electromagnetic (EM) simulations and/or measurement data, and uses those models to enable passive device optimization in IC designs. In this methodology, first a grid of instances of a passive device is constructed where each instance is created to have a unique set of device parameter values. In the case of a spiral inductor, for example, each instance has a unique combination of values for the number of turns, outside diameter, trace width and spacing. The number of instances may reach a few thousand to ensure desired design space coverage.

Biography
Brian Chen currently serves as product manager of the EEsof Division. He is responsible for product strategy and planning of SPICE model extraction and qualification software, Model Builder Program (MBP) and Model Quality Assurance (MQA). Chen joined Agilent in 2012 through acquisition of Accelicon Technologies, where he served as chief scientist with responsibilities in R&D oversight, customer support, product strategic planning and business development. Prior to that, he held R&D positions at Synopsys, Advanced Micro Devices and Korona Semiconductor in CMOS process development, semiconductor device characterization and compact modeling and ASIC design. He has authored or co-authored about 40 research papers in prestigious journals and conferences, such as *Science and IEEE Transactions on Electron Devices*, and holds several U.S. patents. Chen has been serving on the Technical Program Committee at the IEEE Custom Integrated Circuits Conference since 2007, and has chaired its Simulation and Modeling Subcommittee in 2012 and 2013. He received his Ph.D. and M.S. in electrical and computer engineering from the Georgia Institute of Technology, U.S., and his B.S. and M.S. in engineering from Saint-Petersburg Electrotechnical University, Russia.

Wednesday, March 13, 2013
Measurement & Modeling Track:
Noise Measurements IA
Room B: 08:30 – 08:50

Improvements in mm-wave Noise Figure Measurement Accuracy

Jon Martens, Anritsu

Abstract
Millimeter-wave noise figure measurements have long been challenging for reasons of image rejection, receiver linearity, calibration and other reasons. Some approaches will be discussed for minimizing uncertainties including an optimization method for the receivers. Through the use of some case study measurements, estimates of sensitivities to various problems will be presented along with an exploration of best-achievable results.

Biography
Jon Martens, Anritsu fellow, has 20 years of experience in high-speed measurement methodologies and instrumentation and high-speed circuit/system design. Since 1995, he has been with Anritsu, working on measurement system architecture, measurement algorithm design and high-speed circuit development. He has a PhD in electrical engineering from the University of Wisconsin.

Wednesday, March 13, 2013
Measurement & Modeling Track:
Noise Measurements IB
Room B: 08:50 – 09:10


Noise Figure Measurement of Non-Frequency Converting and Frequency Converting Devices Using a VNA

Steffen Neidhardt and Volker Herrmann, Rohde & Schwarz

Abstract
Noise figure is a key parameter for describing the behavior of non-frequency-converting and frequency-converting devices. This paper describes the fundamentals of the noise figure measurements by using a vector network analyzer without the impact of a noise source and low noise receivers. For frequency-converting devices, this paper analyzes the impact of the unwanted sideband frequency of the noise figure measurement. Based on mathematical derivations, a simulation model is given for each kind of DUT to verify the measurement results. Finally the impact of the full two port system error correction to improve the noise figure measurement results is also highlighted.

Biographies
Steffen Neidhardt (1977) studied telecommunication engineering at the Deutsche Telekom University of Applied Science and received a B.Eng degree in 2006 and a M.Eng degree in information and communication technologies in 2008. He has been with Rohde & Schwarz since 2008, in the T&M division as a development engineer for vector network analyzers.

Volker Herrmann (1973) received the Dipl. Ing. (FH) degree from the University of Applied Science of Mannheim in 2000. In 2010, he joined Rohde & Schwarz as an application engineer supporting vector networks analyzers. His previous positions included application engineer and product manager for wireless products at semiconductor companies.

Wednesday, March 13, 2013
Measurement & Modeling Track:
Active Device Modeling IA
Room B: 09:15 – 09:35

Modeling of GaN HEMT Devices

Yusuke Tajima, Auriga Microwave

Abstract
GaN HEMT models are extensions of GaAs PHEMT models, which have been developed since the early 1980s. These models, namely "compact models," were assembled by implementing a set of equations that represent the behavior of measurable characteristics at the terminals, but are not necessarily related to physical parameters that define the device construction. Because measurement conditions critically affect the behavior of the device, conditions must be closely controlled to represent the actual application environment. Specifically, channel temperature and bias conditions are major factors that affect performance. Auriga's AU4750 pulsed IV and S-parameter system is designed to capture device parameters with a controlled environment. The system measures IV characteristics and S-parameters under short bias pulse (0.2 µS) and specified bias conditions. Short bias pulses provide an iso-thermal condition where the channel temperature can be controlled by the base plate. The bias pulse is super-imposed over a constant DC bias which sets up stress distribution in the channel. Both GaN HEMTs and GaAs PHEMTs are known for their field induced traps that greatly affect device behavior. Having a clear understanding of sensitivity of physical parameters to device performance is critical in developing an accurate model. The pulsed IV and S-parameters are the basis of compact device model parameters. Extraction of these parameters and simulation results will be discussed.

Biography
Dr. Yusuke Tajima began his career at Toshiba Central Lab in Japan then joined Raytheon Research in Massachusetts. While at Raytheon, Dr. Tajima's projects included: development of the first-of-a-kind 1st-order harmonic balance program for simulating RF large signal characteristics on GaAs FETs; leadership of the engineering groups that created the test systems for measuring instantaneous IV curves (pulsed IV) and RF components for various military and commercial MMIC programs; creation of two industry models for high-powered FETs, which are named after him. Dr. Tajima has B.S. and Ph.D. degrees from Tokyo University in Electronics Engineering in 1970 and 1980, respectively.

Wednesday, March 13, 2013
Measurement & Modeling Track:
Active Device Modeling IB
Room B: 09:35 – 09:55

Practical Considerations for High-Power X-Parameter Measurements of a 130 W LDMOS Power Transistor

Di Liu, Agilent Technologies

Abstract
This paper presents a high power device measurement using Nonlinear Vector Network Analyzer (NVNA) and X-parameter. Arbitrary-load-dependent X-parameters, automatically measured with a load-tuner working with an NVNA, are used to characterize and model a packaged 130 W LDMOS power transistor. Practical considerations are described in the paper such as how to modify Nonlinear Vector Network Analyzer PNA-X to operate at pulsed-RF high power level, broadband impedance transformer test fixture characterization accuracy, and tuner characterization accuracy.

Biography
Di Liu holds a MSEE from Beijing University of Posts & Telecommunications (2007) and has been with Agilent for over five years, working as an application engineer for CTD (Component Test Division) for passive/active components measurement support, developing rich experience in LNA, PA design and test, converter measurement, test fixture design, on wafer test, mmWave test, SI analysis and material test. As an expert for component test, Di Liu has written application notes, demo guides for component test, and also published four papers related to TRL calibration, noise parameter, and material test for the IEEE conference, local magazines and conferences.

Wednesday, March 13, 2013
Measurement & Modeling Track:
Interconnect Modeling IA
Room B: 10:35 – 10:55

Simulating FPGA Power Integrity Using S-Parameter Model

Colin Warwick, Hany Fahmy, J. Carrel and R. Anderson, Agilent; H. Fu and R. Mayder, Xilinx

Abstract
The purpose of a Power Distribution Network (PDN) is to provide power to electrical devices in a system. Each device in a system not only has its own power requirements for its internal operation, but also a requirement for the input voltage fluctuation of that power rail. PDN simulations, confirmed by hardware measurements, have shown that no PCB caps beyond that recommended by the voltage regulator manufacturer are required in certain instances. While the PCB capacitors are not needed for proper operation of the transceivers, however, proper filtering can be required on the PCB to achieve the input voltage ripple noise specification of 10 mV peak-to-peak (10 kHz to 80 MHz) when measured at the BGA ball of the package.

This technical paper will explain the following four fundamental concepts: Series-Resonance Circuit and Impedance Minimums; Parallel-Resonance Circuit and Impedance Maximums; Frequency Components of Electrical Signals and S-Parameter Model vs. Lumped RLC Model for Decoupling Capacitors.

Biography
Colin Warwick is high speed digital product manager at Agilent EEsof EDA, where he is focused on multi-gigabit per second design and analysis tools. Prior to joining Agilent, Warwick was with Royal Signals and Radar Establishment in Malvern, England, Bell Labs in Holmdel, NJ, and The MathWorks in Natick, MA. He completed his Bachelor's, Master's, and Doctorate degrees in physics at the University of Oxford, England. He has published over 50 technical articles and holds thirteen patents.

Wednesday, March 13, 2013
Measurement & Modeling Track:
Interconnect Modeling IB
Room B: 10:55 – 11:15

Methods of Improving Time/ Frequency Domain Measurements Suited for 3D-EM Simulation

Alfred Neves, Wild River Technology LLC

Abstract
As S-parameter data is often used for model confirmation/ development and time domain simulation (often moving to system level), more detailed aspects of the data such as low frequency values, symmetry, reciprocity, passivity and causality can be critical. The roles of these attributes will be discussed using actual hardware. In terms of model development, rational expansions will be explored, again with an emphasis on how the basic data and measurement setup can affect the end result. This practical paper will address the challenges faced by signal integrity engineers in melding S-parameter-based measurements and 3D-EM models to frequencies of greater than 50 GHz.

After the introduction, a simple work flow that will insure S-parameter measurement integrity will be provided, which starts with validating the calibration using old school microwave standards, such as NIST traceable Beatty and Airline Standards, in conjunction with a family of board level planar structures. Uniquely designed microstrip structures will be used to benchmark 11 psec and 34 psec rise-time TDRs to a 50 GHz VNA Time Domain resolution (using Time Transform). The validation measurements will then be compared to 3D-EM solver analysis of the structures. An effective S-parameter measurement to passive, causal, and (where applicable) symmetric and reciprocal work flow will be discussed.

Biography
Alfred Neves, chief technologist at Wild River Technology, has 30 years of experience in the design and application development of semiconductor products and capital equipment design focused on jitter and signal integrity analysis. He has successfully been involved with numerous business developments for the past 13 years. Neves is involved with the signal integrity community as a consultant, high-speed system-level design manager and engineer. Recent technical accomplishments include development of platforms to improve 3D electromagnetic correspondence to measure-based methods. He earned a bachelor's degree in applied mathematics at the University of Massachusetts.

Wednesday, March 13, 2013
Measurement & Modeling Track:
EMC/EMI IA
Room B: 11:20 – 11:40

3D EMC Simulation of Automotive Multimedia Systems

Ralf Kakerow, Continental Automotive GmbH

Abstract
A key challenge in automotive product design is the compliance to electromagnetic compatibility (EMC) and interference (EMI) requirements in a cost-driven project environment. Traditionally, EMC and EMI issues are solved in the EMC lab, often without getting a full understanding of the underlying effects. The adoption of 3D field simulation provides an insight into the root causes of electromagnetic resonance effects occurring in the product, enabling fast design cycles and high product quality. The most sensitive electronic device from a customer point of view is the car radio. Any internal or external noise sources lead to unwanted disturbances. The automotive OEM's spend a considerable amount of time and money to avoid such effects or reduce them to a minimum. Without special filtering, a significant disturbance signal in GSM D-net can be measured between 890 and 940 MHz. This presentation shows an example of using 3D EM simulation for solving a GSM immunity issue. After setting up a model with the relevant electrical and mechanical components, a combination of several effects that introduce disturbances to the system has been found. The system could then be optimized within a few days by simulating the whole device architecture, leading to a reliable and cost-effective solution.

Biography
Ralf Kakerow received a diploma degree in electrical engineering from the University of Duisburg, Germany, in 1990. Then he joined the Fraunhofer Institute of Microelectronic Circuits and Systems, IMS, in Duisburg, Germany, where he was involved in the design of integrated sensor interfaces for physical, chemical and biochemical transducers. From 1995 to 2008 he was with Nokia Consumer Electronics and Nokia Research Center in Bochum, Germany, developing integrated circuits for multimedia and wireless applications. After taking care of base station amplifiers and audio codec design for mobile terminals he has been responsible for multi-standard transceiver front-end and system design for WCDMA, WLAN and wireless Gigabit applications up to 90 GHz. Since 2008 he has been with Continental Automotive, Infotainment and Connectivity in Wetzlar, Germany, responsible for electromagnetic compatibility (EMC) in automotive product development. Main research interests comprise analog, RF and microwave design, and EMC, as well as design methodologies including modeling and simulation. He has published more than 60 papers on international conferences and in journals.

Wednesday, March 13, 2013
Measurement & Modeling Track:
EMC/EMI IB
Room B: 11:40 – 12:00

Time-Domain Based Measurements and the Related Speed Improvements for EMI Testing

Volker Janssen, Rohde & Schwarz

Abstract
In June 2010 the CISPR committee published amendment 1 to CISPR 16-1-1, 3rd edition, stating that FFT-based measuring instruments that meet the requirements of CISPR 16-1-1 can basically be used for compliance measurements. The paper describes the fundamentals of a CISPR 16 compliant time-domain EMI measurement system based on the R&S ESR EMI test receiver, identifies major challenges using the time-domain method, describes how to solve them without missing any disturbance signal or degrading accuracy and points out the advantages of this novel measurement technique.

Biography
Volker Janssen (1960) studied RF and microwaves at the Technical University of Hannover and joined R&S in 1986, where he works in the T&M division of product management worldwide for EMI Test Equipment especially EMI test receivers.

Wednesday, March 13, 2013
System Engineering Track:
Software Defined Radio IA
Room C: 08:30 – 08:50

Welch Periodogram Detector for QPSK based AWGN Baseband and Passband Cognitive Radio System

M. Tahir Mushtaq, Institute of Communication Networks and Satellite Communication (IKS)

Abstract
One type of the user is known as the primary users and the other are known as the secondary users. The primary users are licensed users and the secondary users are the cognitive users (unlicensed) users. The primary users have the priority of spectrum usage while the cognitive user has the opportunistic nature of the spectrum usage. A cognitive user can use the primary user's frequency when the spectrum holes (primary user is not communicating) are available. There are many signal processing operations in the background of the cognitive radios. One of these operations is the spectrum sensing. Signal detection theory is used for the separation and recognition of information from the noise buried background and mitigation of interference. The spectrum sensing (primary user detection in licensed spectrum) is the most important task and fundamental problem in Cognitive Radio systems and networks. In this paper, Welch periodogram detector is used for the signal detection in QPSK based baseband and passband signal detection through the AWGN channel. The technique is successfully implemented up to SNR = -25 dB Welch periodogram provides an easy and simple solution for the detection of spectrum hole and mitigation of noise in cognitive radio systems and networks.

Biography
Dr. Muhammad Tahir Mushtaq received his MSc physics in 1996 from Punjab University, Lahore; his MSc Computer Science from PUCIT, Lahore in 2004; and his M-Phil Physics, from GC University, Lahore. In September 2012 he received his PhD from TUGRAZ, Austria from Electrical engineering faculty working with his research supervisor, Prof. Dr. Otto. Working in IKS, TUGRAZ, he did spectrum sensing in cognitive radio system by using various statistical signal processing and machine learning techniques. He published several research papers in international journals and conferences. His research interests are jamming techniques, spectrum sensing in cognitive radios, computer consciousness, Quantum teleportation, cognitive networks, FSO and satellite communications.

Wednesday, March 13, 2013
System Engineering Track:
Software Defined Radio IB
Room C: 08:50 – 09:10

Spectrum Re-Use Through Real-Time Signal Processing

Trang D. Nguyen and Chris Chiccone, National Instruments

Abstract
Mobile broadband is growing rapidly and putting demand on the wireless network. The world is becoming more and more connected with ubiquitous smartphones, tablets, WiFi hotspots and laptops. New communication protocols which take advantage of frequency sensing are required to solve the Spectrum Crunch. To support spectrum re-use real time signal processing is required to perform signal detection and digital filtering. A FlexRIO adapter module transceiver, which takes advantage of reconfigurable Virtex 5 FPGA and powerful LabVIEW, can be used for software defined radio research to create algorithms. The frequency range is tunable from 200 MHz to 4.4 GHz while offering 100 MHz of instantaneous bandwidth with full automatic gain control to simulate real world RF communication signals. This paper will demonstrate how flexible and affordable prototyping hardware architecture can be used to explore the boundaries of RF communication research.

Biographies
Trang D. Nguyen has been part of the test and measurement industry for over 22 years working for Hewlett-Packard, Agilent Technologies and more recently National Instruments. Trang has a BSEE from UC Davis, a MSEE from Stanford University, and an MBA from the Haas School of Business at UC Berkeley. Over the course of her career, she has made contributions to vector network analyzers, RF semiconductor test systems, optical spectrum analyzers, sampling oscilloscopes and vector signal analyzers. In her most recent project, she integrated National Instruments' LVFPGA technology to the NI 5791 RF transceiver.

Chris Chiccone obtained a BSEE and MSEE from California Polytechnic at San Luis Obispo with an emphasis in microwave circuits and system. He has been an R&D design engineer on the PXIe 5667 spectrum monitoring receiver and the NI 5791 RF transceiver for National Instruments.

Wednesday, March 13, 2013
System Engineering Track: System Track IA
Room C: 09:15 – 09:35

Impact of Wideband I/Q Vector Impairments on 802.11ac

Stephen Dark and Chris Behnke, National Instruments

Abstract
Quadrature impairments impose well established fundamental limits on the quality of communication signals for both transmitters and receivers. While these impairments are well understood in single carrier modulation schemes, they are less understood in wideband OFDM communications standards like 802.11ac. Even less understood is the impact on EVM due to the vector impairments of test instruments. As the cost requirement of test instrumentation decreases, there is a motivation to use direct conversion RF architectures that also create vector impairments. Consequently, the resulting additional uncertainty is becoming increasingly more important to consider. This paper will begin with an overview of the causes of I/Q impairments and the typical methods used for their correction. A detailed analysis will follow focusing on the impact of vector impairments on OFDM based communication standards. Finally, this paper will show an example of the 802.11ac EVM measurement uncertainty as a result of vector impairments from the test instrumentation.

Biographies
Stephen Dark is a hardware engineer at National Instruments with extensive experience in FPGA based signal processing. National Instruments develops software and hardware tools that empower scientists and engineers to accelerate productivity, innovation and discovery. As a senior hardware engineer, he has been responsible for hardware design and developing FPGA based signal processing algorithms. Due to his expertise in using LabVIEW as a DSP design tool, he has given multiple conference presentations championing its use as a rapid design tool for software defined radio (SDR) applications. More recently, he has focused on creating innovative calibration algorithms for RF hardware and developing future calibration architectures. Dark received his bachelor's and master's in electrical and computer engineering with honors from Baylor University.

Chris Behnke is a staff RF verification and validation engineer at National Instruments. Prior to RF engineering, he spent several years gaining RF application experience as an application engineer and later a product support engineer. His technical expertise lies in RF measurements, calibration design and RF system analysis. He holds a BSEE from the University of Wisconsin in Madison, WI.

Wednesday, March 13, 2013
System Engineering Track: System Track IB
Room C: 09:35 – 09:55

Queueing Behavior Over a Gilbert-Elliott Packet Erasure Channel (802.11 Wireless Communication System)

Yi Cai, National Instruments

Abstract
This paper explores the queueing performance of a wireless communication system that transmits packets over a correlated erasure channel using the IEEE 802.11 protocol suit. The channel states and queue length together form a Markov chain. Exploiting this mathematical structure, the probability of the queue exceeding a certain threshold can be obtained. This paper studies this approach with both Bernoulli and Poisson packet arrival processes. This approach becomes especially valuable for capturing the performance of delay-sensitive communication systems over time-varying channels. Finally, illustrative numerical results are provided in the last section of the paper. From these results, design guidelines for improving the performance of delay-sensitive wireless communication systems are established.

Biography
Yi Cai obtained an M.S. degree from Texas A&M University, United States, in 2011. From then on, he has been working, as a software engineer at National Instruments Corp., on the software support for the world's first vector signal transceiver, NI PXIe-5644R. Cai's research interests lie in the area of communications and wireless networks. He co-authored the paper "Queueing Behavior of the Gilbert-Elliott Channel: BCH Codes and Poisson Arrivals," *Information Theory Proceedings* (ISIT), 2011 IEEE International Symposium.

Wednesday, March 13, 2013
System Engineering Track: SATCOM IA
Room C: 10:35 – 10:55

Global Navigation Satellite Systems and Their Wide Range of Applications

Markus Loerner, Rohde & Schwarz

Abstract
The Global Positioning System (GPS) was once the only operational global navigation satellite system (GNSS), and it was used all over the world to access location-based services (LBS). With the Russian GLONASS navigation system, which became fully operational at the end of 2011 and with the future deployment of China's Compass and Europe's Galileo navigation there will be increased focus on the capabilities and applications of such systems. This paper gives an overview of the different navigation systems, explains the navigation channel and generic approach used by a commercial standard receiver to calculate a user position and generally describes channel acquisition and tracking. GNSS applications such as differential GNSS (D GNSS) and multiple frequency-band navigation, their complexity and benefits are also presented.

Biography
Markus Loerner is a product manager for RF signal generators and power meters at Rohde & Schwarz headquarters in Munich, Germany. Loerner joined Rohde & Schwarz in 2000 after receiving his degree in EE from the University of Erlangen-Nürnberg, Germany.

Wednesday, March 13, 2013
System Engineering Track: SATCOM IB
Room C: 10:55 – 11:15

'Design to Test' Platform Solution for Direct-Sequence Spread Spectrum (DSSS) Communication System for LEO SATCOM

Lei Yue, Agilent Technologies

Abstract
Direct-sequence spread spectrum (DSSS) modulation technique is widely used in modern telecommunications, including A/D and wireless scenarios, typically the LEO satellite communication (SATCOM). However, the system development often faces enormous challenges, especially in testing and verification of complex algorithms. This article introduces a 'design to test' platform solution for a DSSS communication system based on LEO SATCOM, the entire physical layer system is modeled and simulated in SystemVue and system performances are measured through connected-solution.

Biography
Lei Yue received the B.Sc. degree in mechatronics engineering and M.Sc. degree in electronic engineering from the University of Electronic Science and Technology of China, Chengdu, China, in 2006 and 2009, respectively. From December 2007 to January 2009, Yue was with Huawei as an intern. After that he had worked as an RF hardware engineer at Huawei for more than two years, and been engaged in research and development of base station RF systems, especially the front-end of transceivers. Yue joined Agilent in 2011, is an application engineer with Agilent EEsof EDA. His work at Agilent focuses on technical support for aerospace and defense and commercial applications of wireless technology. His research interests include communication system architecture, RF/microwave circuits and systems, MMIC, RFIC, SiP, electromagnetic simulation and high speed digital design.

Wednesday, March 13, 2013
System Engineering Track: TD-LTE IA
Room C: 11:20 – 11:40

Optimizing TD-LTE Performance from RF to Subscriber QoE

Simon Wang, Spirent Communications

Abstract
The promises of TD-LTE performance and the subscriber's Quality of Experience (QoE) are tightly coupled to the deployment of a combination of complex radio antenna techniques, including Multiple-In Multiple-Out (MIMO) and beamforming. While neither is required for TD-LTE deployment, many of the world's first TD-LTE networks will rely on these techniques. Deploying TD-LTE alongside MIMO beamforming presents unique challenges in receiver testing which will require the ability to replicate real-world performance issues early on in the development cycle.

In addition, the networks slated to migrate towards TD-LTE are among the world's largest; any advantages to guarantee subscriber QoE and ease the cost of deployment is critical. While TD-LTE proponents cannot always use the same tools as their FDD counterparts, there are several areas in which the testing methodologies proven to work in FDD LTE rollouts can be effectively applied to TD-LTE.

Field-testing tools used to quantify the subscriber's QoE have been designed to be agnostic to the underlying technology and can assess performance across all radio access networks. These tools, designed to measure voice, video and data service quality, can be utilized early in the TD-LTE deployment lifecycle and go beyond required conformance testing and are able to predict real-world performance and acceptance of TD-LTE service. This presentation will provide a brief overview of the significant challenges in TD-LTE deployment and how available tools and methodologies can address critical testing needs.

Biography
Simon Wang is familiar with industry conformance and performance testing especially for conductive and OTA test and has an extensive background with RF, Protocol and Application test. Wang received his master's and bachelor's degree for EE from SouthEast University, and worked for Bell-Labs before joining Spirent. Simon Wang is currently the sales development director for Spirent Wireless in APAC and has 10 years work experience with T&M for pre-sales and business development.

Wednesday, March 13, 2013
System Engineering Track: TD-LTE IB
Room C: 11:40 – 12:00

System-Level Design of an LTE TDD Tri-Band Receiver

Xin-Dong Xue, Agilent Technologies

Abstract
The emerging communication standards that provide high data rates and enhanced quality of service, such as the Long-Term Evolution (LTE), have raised an increasing demand for system-level design tools. These tools are often able to allow the designer to make valuable comparisons between the system requirements and the actual architecture performance. This helps the designer alleviate the design challenges and make suitable design tradeoffs. For instance, the design of an LTE receiver can be facilitated by capturing and tuning its system-level parameters to fit the standard requirements. In this paper, we use a commercial system-level design framework to walk through a step-by-step design of a tri-band LTE TDD receiver. We start by stating the specifications and suggest a radio frequency (RF) architecture for the intended receiver. The architecture is then optimized to fit the requirements. Specifically, we illustrate the analysis results for the intermodulations, phase noise and image rejection. The impact of the noise and blockers on the adjacent channel selectivity and the receiver performance in the context of LTE are also analyzed. In addition, the effects of some design tradeoffs such as the channel bandwidth and the downlink configuration, are discussed. Finally, some design recommendations are stated to help reduce the design impairments and improve the receiver performance in similar communication systems.

Biography
Xin-Dong Xue received his BSEE from Tsinghua University in 1991 and Master's degree in Microwave and Electromagnetic in 1997. He joined HP/Agilent in 1997 as a microwave/RF support engineer for customer support, training and test system integration. From 2001, he transferred to EEsof EDA as an application engineer. His focus is on RF/MW, MMIC, RF board design and RF/MW system design support and customer training. With more than 15 years RF/MW EDA industry experience, he has rich knowledge in RF/MW design, design flow, test and verification.

Wednesday, March 13, 2013
Commercial Resources Track:
High Performance Materials IA
Room D: 08:30 – 08:50

Diamond Rf™ Resistives: The Answer to High Power and Low Capacitance

Kai Loh, EMC/Florida RF Labs

Abstract
The technology in this article is used in the high power Diamond Rf™ Resistives – resistors, terminations and attenuators – from EMC Technology. These components demonstrate excellent electrical and thermal performance due to the high thermal conductivity of the CVD diamond substrate material, which results in a component size reduction for a given power dissipation. Components built with this material also demonstrate lower parasitic behavior (i.e. better isolation), which is ideal for applications such as phased array radar. The characteristics of the CVD diamond material impacts performance and design for applications such as high power Wilkinson power dividers/combiners, dual junction circulator duplexers and feedback networks for power amplifiers.

Biography
Kai Loh is a product line manager for EMC Technology and Florida RF Labs, a Smiths Interconnect company. He has 11 years of product development and application engineering experience providing a wide variety of passive RF component solutions for commercial wireless, public safety radio and space applications. He currently works closely with major RF system developers around the world to introduce innovative and easy-to-implement component solutions, including Diamond Rf™ resistives and Doupler™. Loh is an alumnus of the University of Arkansas and previously held design engineering roles at Alcatel-Lucent and MtronPTI.

Wednesday, March 13, 2013
Commercial Resources Track:
High Performance Materials IB
Room D: 08:50 – 09:10

Impact of Conductor Roughness on Insertion Loss and Propagation Constant of High Speed Signals

Allen Horn, Rogers Corp.

Abstract
Since the earliest days of radar development, it has been known that conductor roughness increases the insertion loss of transmission lines at high frequencies. Early theoretical analyses showed that the conductor loss increases when the signal skin depth approaches the size scale of the roughness.[1] In the present work, we experimentally show that the increase in conductor loss on high frequency microstrip transmission lines is larger than the factor of two predicted by the most widely used roughness factor correction correlations.[2] This is consistent with the findings of recent theoretical papers on the effect of random roughness on conductor loss.[3,4] The greater-than-predicted effect of conductor profile on loss is particularly evident on thin circuitry.

We also experimentally show that increasing the conductor roughness alone increases the phase constant, or effective dielectric constant, in thin circuitry. The effect dielectric constant can increase by up to 15 percent and higher conductor roughness also substantially increases dispersion. Conductor profile is clearly a major variable in the performance of thin high frequency circuits. A new conductor model that includes an increase in conductor surface impedance due to increasing conductor profile quantitatively accounts for the measured effects on insertion loss and propagation constant.

Biography
Allen F. Horn, III received a BSChE from Syracuse University in 1979, and a Ph.D. in chemical engineering from M.I.T. in 1984. Prior to joining the Rogers Corp. Lurie R&D Center in 1987, he worked for Dow Corning and ARCO Chemical. He is an inventor/co-inventor on 15 issued U.S. patents in the area of ceramic or mineral powder-filled polymer composites for electronic applications.

Wednesday, March 13, 2013
Commercial Resources Track:
Agilent Education Forum
Room D: 09:15 – 09:55

RF Concepts for High Speed Digital Design

Li Kai, Agilent Technologies

Abstract
The speed of digital signals is becoming higher and higher in many high speed applications such as computer, communications, etc. The data rate of many digital buses such as PCIE, SATA, XAUI,10G Ethernet, are higher than Gb/s. As data rates climb above a few Gb/s, they are not the ideal 0,1 transactions at all and betray their microwave analog reality. So the digital design engineers need RF concept and method to analyze their signals. For example, they need to get the spectrum of their signals to analyze in frequency domain, and they need to get the S-parameters of their transmission channel to analyze reflections and insertion loss. In this paper, we'll talk about the RF concept and method needed for high speed digital design and test.

Biography
Li Kai graduated from Beijing Institute of Technology and got his Master's degree in Optical Electronics. With years of experience in hardware R&D, Li Kai joined Agilent in 2006 and is responsible for the application and development based on Agilent's high speed digital test products, such as high performance scope, logic analyzer and signal integrity analysis. He is familiar with the communication and computer industry and professional in the design and test of embedded systems, high speed buses, programmable logic, clock and power distribution. As the high speed digital test expert, he also wrote many technical documents about the theory and method of high speed bus test and part time, many were impressed with his technical blog at EDN China.

Design of Equalization Circuit to Improve Performance at > 5 GHz Data Rate

Qiujie Lu, Agilent Technologies

Abstract
As high-speed digital interfaces increased continuously, the newest version of these interfaces, such as PCI-Express 3.0 and USB 3.0, all ask for a data rate of 5 Gbps and up. However, after the transmission via band-limited channels (print circuit board, connectors, cables, etc.), the eye diagram of high speed signals degraded seriously or even closed. As a result, the specifications had defined some kind of equalization in the receiver to compensate high-frequency loss. The focus of this paper is on the difficulties and challenges to design and test high speed equalizers, and methods of using test equipment to accelerate the design and evaluation accurately is introduced.

Biography
Qiujie Lu joined Agilent Technologies in early 2011. He is a digital application engineer that focuses on signal integrity and the test & verification of high-speed digital design and embedded system based on Agilent's high performance scope, logic analyzer and bit error rate tester. Lu graduated from Chongqing University of Posts & Telecommunication with a master's degree in communication and information system. Before joining Agilent, he worked as a hardware R&D engineer for more than ten years.

Wednesday, March 13, 2013
Commercial Resources Track: Signal Analysis IA
Room D: 10:35 – 10:55

Dynamic Measurements in Radar and Electromagnetic Spectrum (EMS) Warfare

Walt Schulte, Agilent Technologies

Abstract
This paper discusses signal simulation for counter-improvised explosive device (IED) jammer test. To verify real-world performance of communications and IED jammers, realistic signal environments must be created. Signal environments depend greatly on geography and directed search in these environments requires a prior knowledge of common emitters in a given geography. Parameters such as amplitude, timing and modulation of emitters in an environment can be simulated on a signal analyzer with an internal arbitrary waveform generator in a list mode to validate jammer search schedules and probability of intercept.

Biography
Walt Schulte has 10 years of experience in the aerospace and defense market. Prior to joining Agilent in 2011, Schulte worked for NAVAIR as a systems and test engineer for a defensive electronic warfare countermeasure suite. He has also worked for a small defense company as a scientist developing synthetic aperture radar simulations and models for a government agency. Prior to that, he served as a First Division officer aboard a frigate stationed in San Diego. Schulte received his BSEE from the University of California, Los Angeles.

Wednesday, March 13, 2013
Commercial Resources Track: Signal Analysis IB
Room D: 10:55 – 11:15

Next Generation Arbitrary Waveform Generator Meets Complex Wideband Signal Generation Challenges

Zhang Peng, Tektronix

Abstract
Confronting today's increasingly complex RF signal and high-speed digital baseband signal generation, Tektronix's AWG70000 series of arbitrary waveform generators brings breakthough technology and solutions. Tektronix's next generation AWG provides a very fast 50 G/s D/A converter with 10 bit vertical resolution and is the only instrument to provide frequency ranges with up to 14 and 20 GHz bandwidth. Up to 16G memory enables the generation and playback of long duration signals. Typical applications of AWG70000's next generation arbitrary waveform generator include the generation of very high wideband signals and complex electromagnetic signals in government R&D, research and development of optical transmission communication, generation of high speed serial signals (HSS) and research of leading-edge physics like laser, THz and quantum semiconductor.

Biography
Zhang Peng is the Greater China RF product business development manager of Tektronix and is responsible for the application development and marketing of RF products in government R&D areas.

Wednesday, March 13, 2013
Commercial Resources Track: Product Testing
Room D: 11:20 – 11:40

Accelerating USB 3.0 Protocol Development

Don Schoenecker, Agilent Technologies

Abstract
SuperSpeed USB presents a new set of challenges for design, verification and debug of the protocol layer. To take advantage of the new USB SuperSpeed data rate of 5 Gbps, devices must do much more than simply run at a higher data rate. The right tools and debug methods are critical in accelerating products to the market. Learn how to quickly locate problems in today's complex USB systems. This paper will provide an overview of USB protocol design and specific challenges related to SuperSpeed 3.0 design and debug. Also, see how to apply active error insertions with a jammer, thus stress designs to the limits. Whether you are designing host, hub or device, electrical or protocol, Agilent Technologies offers a complete solution.

Biography
Don Schoenecker is the USB product manager at Agilent Technologies, Protocol and Logic Analyzers. Schoenecker received a Bachelor's degree in Electrical Engineering from Texas A&M University in 1984 and started at Hewlett Packard as an application engineer for local and wide area networks. His work has been to define and implement protocol test solutions and network implementation at HP, Fluke, JDSU and at Agilent. He is passionate about the implementation of test methods and result analysis that lead to faster and more robust product development.

Wednesday, March 13, 2013
Commercial Resources Track: Product Testing
Room D: 11:40 – 12:00

RFID Product Life Cycle Testing Techniques

Zhihua Zhang, HWA-Tech

Abstract
In RFID products life circle, as concept design, prototype, volume products and applications and so on, different test technology is needed in order to solve different problems during different stages of product development. At the same time, it is critical to have a test solution that is aligned with the various test requirements during these different product development stages. This presentation looks specifically at test solutions designed to help the engineer understand the life cycle performance of RFID products.

Biography
Zhihua (Andy) Zhang, CEO of Beijing HWA-Tech, has more than 20 years of experience in RF/MW test and wireless test solutions. Previously, he had been the manager of wireless system and solution in Agilent China. Now he works on EMC test solutions and test solutions of internet of thing (especially in RFID, ZigBee, WiFi and so on).

Thursday, March 14, 2013
Technical Sessions

Thursday, March 14, 2013
Design Track: RF Power Amplifiers IIA
Room A: 08:30 – 08:50

Device Characterization Methods for Advanced RF/Microwave Design

AWR

Abstract
Successful RF and microwave circuit design using active devices requires accurate modeling of nonlinear behavior so that behavior can be reduced to provide linear high-power solutions. This is especially important in the telecommunications industry where nonlinear device behavior contributes to interference issues and a reduction in effective bandwidth. Thus, a vendor agnostic, nonlinear behavioral model that accurately accounts for all of a device's nonlinear effects and works with a variety of RF and microwave simulators is hugely valuable to designers and has become a significant industry investment. In fact, the focus on developing accurate nonlinear behavioral models has produced so many options that the nonlinear behavioral modeling world can be somewhat confusing. This presentation will clarify some of the confusion by presenting an overview of all the different nonlinear behavioral model types and comparing the effects they capture, the simulators they support, and the relative ease-of-extraction and distribution.

Thursday, March 14, 2013
Design Track: RF Power Amplifiers IIB
Room A: 08:50 – 09:10

High Efficiency Inverse Class-F Amplifier Design for Envelope Tracking Line-up Driver

Zhancang Wang, Li Wang, Rui Ma and S. Lanfranco, Nokia Network Systems

Abstract
In this paper, a high efficiency 10 W GaN HEMT switch mode driver amplifier was presented for envelope tracking line-up driver. With current high efficiency transistor technology such as GaN HEMT switch mode PA, final stage or single stage cannot achieve sufficiently high gain to keep the radio transistor line-up high efficiency. Lining up envelope tracking on both driver amplifiers and final stage is capable to boost overall or cascaded power added efficiency (PAE). Key aspects such as power added efficiency issue of envelope tracking, driver design for efficiency and linearization were studied. Finally, an inverse class-F amplifier was implemented and characterized.

Biography
Zhancang Wang received his Bachelor's in automation and Master's degree in RFIC from Beijing University of Technology in 2005 and 2008, respectively. He obtained both rich academic and industrial experience by working in Beijing Embedded System Key Lab, RDA Microelectronics, Datang Mobile Inc., Nokia Siemens Networks as RFIC engineer, senior RF researcher, research project manager and consultant for third party research collaborators. He focused on advanced RF technology research and prototyping, including RF transceiver architecture, linearization technology, digital front end algorithm e.g. E-CFR, broadband and high efficiency PA technologies e.g. Doherty and variants, envelope tracking, switch mode PA, LINC with GaN, SiC and HV-GaAs. He was an IEEE member and committee member for several international conferences. He is an author and co-author of 16 papers and one U.S. patent on ET technology. He can be reached by email at: zhancang.wang@ieee.org.

Thursday, March 14, 2013
Design Track: VCOs/PLLs/Sources IIA
Room A: 09:15 – 09:35

PLL Frequency Synthesizers Based on the DDS in Feedback Loop

Andrew Polyakov, Peter Bobkovich and Andrew Kuzmenkov, Advantex

Abstract
This paper discusses the benefits and disadvantages of the one-loop PLL architecture based on the DDS in feedback loop. It presents mathematical models of phase noise and spur sources with equations for their estimation while taking into account the performance of present-day components. The paper also presents some spur-reducing approaches based on the variable reference frequency and switching SAW filter at the DDS output. The equations for evaluating "bad" frequencies and spur offsets are given.

As a measure of spur, the cumulative distribution of SFDR normalized to 1 GHz is used. This allows designers to evaluate and compare the quality of different synthesizers regardless of their frequency range. Synthesizers with single and dual frequency reference were compared using this measure. This paper also considers the lock process and stability of the PLL based on the DDS in the loop.

Biographies
Andrew Polyakov received his Bachelor's and Master's degrees from the Moscow Institute of Physics and Technology in 2002 and 2004, respectively. From 2001 to 2004 he worked at the Institute of Precision Mechanics and Computer Engineering, Russian Academy of Sciences, in radio engineering and digital communications department. In 2004 he founded Advantex LLC, which designs and develops IF/RF modules and test and measurement instruments.

Peter Bobkovich received his Bachelor's and Master's degrees from the Moscow Institute of Physics and Technology in 2002 and 2004, respectively. He obtained experience in RF design and prototyping by working on RND projects at Impulse Corp. Now he holds the position of chief designer at Advantex LLC.

Andrew Kuzmenkov received his Bachelor's and Master's degrees from the Moscow Power Engineering Institute in 2010 and 2012, respectively. He is focused on advanced simulation and prototyping of RF designs. He has worked at Advantex LLC since 2011.

Thursday, March 14, 2013
Design Track: VCOs/PLLs/Sources IIB
Room A: 09:35 – 09:55

High-Stability Controlled Oscillators for Low-Bandwidth PLLs

by: Sassan Tabatabaei , SiTime
Presented by: David Zhao, SiTime

Abstract
For low bandwidth PLLs, high-Q controlled oscillators (CO) are the devices of choice due to their low gain and high stability. This paper discusses two different implementations of voltage-controlled oscillators (VCXO), varactor-based and PLL-based. It also discusses digitally-controlled oscillators (DCXO) to increase flexibility and robustness in system design while considering the impact of quantization, update delay and loop filter implementation on the loop performance.

Biography
David Zhao is the FAE manager and Northern China sales manager at SiTime Corp. Prior to joining SiTime he was a senior FAE and the Beijing office manager for IDT, and he served as a Hardware team leader at Huawei. David Zhao's technical expertise includes design and support for communications, optical transmission and storage applications. He received his B.E. from Qingdao University and his MSEE from Jilin University.

Thursday, March 14, 2013
Design Track: Passive Components
Room A: 10:35 – 10:55

3 dB Branch Line Coupler with Bandpass Filter Function of Sharp Skirt Selectivity

Werner Arriola and I.S. Kim, Kyung Hee University

Abstract
This paper introduces a new wideband 3 dB branch line coupler which has a bandpass filter function showing sharp roll-off slope characteristic. In general, the bandpass and out-of-band rejection properties are basically obtained by combining two circuit structures, such as four asymmetrical $\lambda/4$ open circuited coupled lines and four Defected Ground Structures (DGS) in microstrip configuration and the sharper skirt selectivity is introduced by using four stepped impedance $\lambda/2$ shunt open circuited stubs. Theoretical model for the circuit has been derived and explained based on a TEM approximation. The circuit structure has been simulated and fabricated. Measurement results show |S21| and |S31| lower than 5.5 dB with roll-off slopes, 33 dB/GHz at the lower transition band and 34 dB/GHz at the higher transition band, respectively, with a rejection higher than 48 dB. Power and phase imbalances are 0.8 dB and $\pm 7^{o}$, respectively. Return loss and isolation characteristics are both better than 20 dB over 32 percent fractional bandwidth.

Biography
After Werner Arriola received his Bachelor's degree in electronic engineering from the San Carlos University in 2010, he worked for the Spanish telecommunication company, Telefonica, as an RF engineer. He obtained his Master's degree from Kyung Hee University in South Korea in 2012. He has worked for projects with Doosan Corp., Korean Electronics Technology Institute and I2M since 2011. He is working toward a Ph.D. in Kyung Hee University. He is interested in microwave technologies, such as hybrid couplers, power dividers/combiners, filters, antennas, frequency selective surfaces, high power microwaves, electromagnetic interference and compatibility, and signal integrity.

Thursday, March 14, 2013
Design Track: Passive Components
Room: 10:55 – 11:15


Edge-Coupled Microstrip and Stripline Bandpass Filters with Stepped or Mitered Bend

by: Changhua Wan, Mentor Graphics
Presented by: Peng Shao, Mentor Graphics

Abstract
A right-angle bend modification to an edge-coupled bandpass filter in microstrip or stripline form is proposed. A commercial electromagnetic simulator verified by measurements is used to study the modification. It is found that a stepped or mitered bend is a simple yet good solution. The proposed bend converts roughly half of the length of a filter to its width for efficient space utilization and/or right-angle input-output arrangement. A stepped bend even improves the performance of a sample three-pole filter.

Biography
Peng Shao has been an SI consultant for Mentor Graphics since joining the company in October 2010. Shao's responsibilities include EDA tool development and simulation methodologies, system architecture and customer support. Prior to his current position, Shao was a research and system engineer for IBM China from March 2006 through 2010 with a focus on die-chip-board signal and power integrity analysis. In addition, Shao worked on micro-processor architecture research for Intel Corp. from 2004 through 2006. Peng Shao has a Master's of Science degree from Peking University, 2003.

Thursday, March 14, 2013
Design Track: Detectors and Rectifiers IA
Room A: 11:20 – 11:40


A Square-Law Microwave Transistor Detector with Extended Dynamic Range

Alexander P. Lavrov, Sergey Ivanov and Yuriy Matveev,
St. Petersburg State Polytechnical University

Abstract
This paper describes the design and measurement of a square-law microwave transistor detector with extended dynamic range. In order to increase the dynamic range of the detector it used negative feedback. Theoretical analysis and CAD harmonics balance simulation were performed to optimize the detector circuit and find the optimal value of the feedback factor. Two variants of the detector were developed on a BJT and FET transistors. Experimental hybrid circuits have been realized with discrete transistors, lumped elements and microstrip transmission lines. Results of measurement of main characteristic are given: tangential sensitivity, transfer characteristic, dynamic range, frequency response and input VSWR. It achieved dynamic range up to 55 dB (at 1 dB compression point and 1 kHz video-bandwidth) with flat frequency response up to 4 GHz. These square-law detectors may be used for precision measurements of microwave power, for example in modulation-type wideband microwave radiometers.

Biographies
Alexander P. Lavrov was born in the USSR in 1950. He received his Dipl. Ing. degree in radio-physics and electrical engineering from the Leningrad Polytechnical Institute (renamed as St. Petersburg State Polytechnical University later), USSR, the Ph.D. degree and the Doctor of Science degree in radio-physics also from the same university in 1973, 1986 and 1999, respectively. In 1973, he joined the Special Astrophysical Observatory of the USSR Academy of Sciences, where he worked in the development of microwave measurement system for 600-meters antenna adjustment. In 1979, he joined the St. Petersburg State Polytechnical University as a researcher and senior researcher. Since 1996 he has been a professor at the radio-physics department. He is a consultant for the Institute of Applied Astronomy of Russian Academy of Sciences. His research interests are in microwave signals processing, acousto-optic signal processing and measuring systems in radio-astronomy.

Sergey I. Ivanov was born in the USSR in 1953. He received his Dipl. Ing. degree in radio-physics and electrical engineering from the Leningrad Polytechnical Institute (renamed as St. Petersburg State Polytechnical University later), USSR, the Ph.D. degree in radio-physics also from the same University in 1977, and 1987, respectively. In 1977, he joined the St. Petersburg State Polytechnical University as a researcher and senior researcher, since 1995 he has been an assistant professor of radio-physics department. At the same time, he joined the laboratory of radio astronomical receiving devices of the Institute of Applied Astronomy of Russian Academy of Sciences. His current research interests include noise characterization and modeling of active devices and circuits in the microwave and optic-wave frequency range. He has authored or co-authored over 70 papers appearing in scientific journals and conferences and six technical papers.

Yuriy Matveev was born in Russia in 1980. He received the B.S. degree and Dipl. Ing. degree in radio-physics and electrical engineering from the St. Petersburg State Polytechnical University, Russia, in 2004 and 2006, respectively, and is currently working toward a Ph.D. degree at the same university. From 2006 to 2008 he was an RF engineer at R&D "Protei" Ltd., and involved to design a high-linearity and high efficiently microwave power amplifier for complex modulated signal. In 2008 he joined "Special Technological Center," Jsc, St. Petersburg, Russia as senior RF/microwave design engineer responsible for the design of microwave/millimeter wave up-down converters and low phase-noise frequency synthesizers for measurement receivers. His research interests include ultra-stable microwave radiometer, detectors for microwave and millimeter wave ranges, high-linearity amplifiers and microwave signal processing circuits.

Thursday, March 14, 2013
Design Track: Detectors and Rectifiers IB
Room A: 11:40 – 12:00

New Design of a 5.8 GHz Microwave Rectifier Circuit

Yu Chengyang, Changjun Liu, Zhang Biao and Tan Feifei, Electronic Information Institute of Sichuan University

Abstract
The microwave rectifier circuit is one of the key technologies of wireless microwave energy transfer (Microwave Power Transmission, MPT). In the design of the high conversion efficiency of the rectifier circuit, in order to achieve fast and accurate simulation, the paper proposes a design method using Mentor Graphics IE3D electromagnetic simulation software and Agilent Advanced Design System (ADS) circuit simulation software co-simulation. Design and produce a work based on this method in the 5.8 GHz microstrip rectifier circuit using microstrip structure with a small size (43 × 26 mm), light weight and ease of integration with the receiving antenna. Experimental measurements under the conditions of the input power of 20 dBm, the circuit achieves a maximum of 62 percent of the microwave - DC conversion efficiency. Good agreement with experimental results and simulation results to verify the effectiveness of the design method.

Biographies
Yu Chengyang graduated from Sichuan University and received his BE degree of electronics and information engineering in 2010. From 2010 to 2012, he devoted himself to design a high-efficiency microwave rectifier, which was used in microwave power transmission system. Now, he is working toward a Ph.D. degree at the same university. His research interests also include RF passive circuits and antenna arrays.

Professor Changjun Liu focuses on microwave/radio frequency circuits. He received an M.S. from Sichuan University, China, in 1997, and a Ph.D. degree of biomedical engineering from the same university in 2000. He studied microwave metamaterials and built high performance microwave components by composite right/left-handed transmission lines. Also, he developed a method to enhance the microwave rectification efficiency and performed research on microwave rectennas. His research is funded by the National Nature Science Foundation of China, Chinese Academy of Sciences, and Sichuan Province.

Thursday, March 14, 2013
Measurement & Modeling Track:
High Speed IA
Room B: 08:30 – 08:50

Signal Lines to Power Plane Coupling Caused by Common Mode Current in High Speed SerDes Interconnect Design

Lian Kheng Teoh, H.Y. Lee, eASIC; C.T. Chiang, K. Krohne and A. Ciccomancini Scogna, CST

Abstract
One of the main problems in the design of high speed printed circuit boards (PCB) and package substrate is the uncontrolled path of the return current which couples to power planes and leads to both signal integrity (SI) and electromagnetic interference (EMI) problems. Existing design rules in electronic package substrate which fail to address reduction bump pitch of 180 um or less cause layout congestion and this inevitably leads to common mode conversion event. This problem is mainly caused by the uncontrolled return current which couples to the power planes in multilayer structures. A real design is investigated and several numerical simulations are performed to prove the concept of common mode insertion loss does offer a very clear and vivid indicator to detect such uncontrolled return current event and its impact on the signal performance of high speed interconnects. It will be showed how uncontrolled paths for the current can cause resonances in the spectrum of the insertion loss and closures in the eye diagrams. Numerical quantification of the signal degradation will be provided and design guidelines are suggested to overcome the problem. These guidelines generally include via fence and/or sticking vias around the critical nets as well as better grounding in the layout can be a solution and restore the proper performance for these high speed signals.

Biography
Lian Kheng Teoh is currently with eASIC as section manager of package design and he is working on package and system development toward signal and power integrity analysis and methodology development for eASIC products. During 2000 – 2006, he worked as senior characterization engineer in a product characterization group in Altera, Malaysia. He was responsible for product characterization and board design for high-speed interface. Lian Kheng received his BS degree in Electronics Engineering from the Universiti Teknologi Malaysia (UTM).

Thursday, March 14, 2013
Measurement & Modeling Track:
High Speed IB
Room B: 08:50 – 09:10

Using Microwave Switches in Testing Multi-Lane MIPI D-PHY and M-PHY Interfaces

Min Jie Chong, Agilent Technologies

Abstract
In today's mobile design, a lot of components have to be squeezed into a small and tight space. Design considerations such as power supply delivery, heat dissipation, signal crosstalk and coupling become more prominent. In addition, the digital and RF circuits that are fitted together in this confined space will promote electromagnetic interference (EMI). MIPI Alliance promotes the designs to be tested against the Conformance Test Suites (CTS), which is the test requirement for the transmitter and receiver circuits. The intention is to increase the chance of system interoperability, or the guarantee that the designs from different vendors will work well when they are used together. The challenges to accurately validate the designs become increasing more difficult with these high-speed, multilane D-PHY and M-PHY designs. To help improve your electrical validation, there are a few considerations to evaluate before you validate your multilane D-PHY and M-PHY designs.

Biography
Min Jie Chong is the Agilent Technologies product manager responsible for mobile interface (MIPI) and storage (SATA/SAS) technology test solutions. He is a contributor to the MIPI PHY and Serial ATA Working Group. His other responsibility includes the product planner for the high-performance oscilloscope software applications. He has completed nine years working for Agilent in areas spanning from product manufacturing and business development. Prior to joining Agilent, Chong worked as a design engineer for Intel in north and south bridge chipset design. He has a bachelor's degree in Electrical Engineering from Malaysia and recently obtained his post-graduate degree in MBA at the University of Colorado.

Thursday, March 14, 2013
Measurement & Modeling Track:
Communication System Test IA
Room B: 09:15 – 09:35

Memory Polynomial Digital Pre-Distortion Measurement and Implementation

Jinbiao Xu, Agilent Technologies

Abstract
Power amplifier linearization using digital pre-distortion (DPD) techniques is critical for designers transitioning 3G systems to 3.9G and 4G. This paper introduces Agilent's digital pre-distortion measurement platform using Agilent's vector signal generator and vector signal analyzer. A novel DPD measurement method is proposed in this paper. Unlike the traditional method which adopts both PA input and PA output to extract DPD model, this method uses baseband input and PA output to extract DPD model. Based on this new DPD model extraction, Agilent developed an automatic tool to extract DPD model and apply DPD and can sweep PA input power to get EVM vs. output power and ACP vs. Output power curves. Experimental test using LTE confirms the effectiveness of this novel DPD measurement method. In real-time digital pre-distorter implementation, the traditional method is the Look-Up Table (LUT). In this paper, we introduce a direct FPGA implementation method to implement memory polynomial pre-distorter by reading DPD coefficients directly. According to experimental test, only half the dB is lost between FPGA fixed-point DPD and floating-point DPD.

Biography
Jinbiao Xu received his Bachelor's Degree in Mathematics, Master's and Ph.D. degrees in information engineering from Xidian University at Xi'an, China in 1991, 1994 and 1997, respectively. From 1997 to 1998, he was a postdoctoral researcher on low speech codec investigation at the Institute of Acoustics, Chinese Academy of Science. Since joining Agilent EEsof EDA in 1999, he has been responsible for the OFDM series wireless library development (including DVB-T, ISDB-T, IEEE802.11a, WiMedia, mobile WiMAX and 3GPP LTE). His current responsibility is to implement digital pre-distortion, MIMO channel model, custom OFDM, etc. His research interests include MIMO, OFDM, pre-distortion and satellite communications.

Thursday, March 14, 2013
Measurement & Modeling Track:
Communication System Test IB
Room B: 09:35 – 09:55

Carrier Aggregation Performance Testing: Challenges and Opportunities

Erik Org, Azimuth Systems

Abstract
While spectrum usage efficiency has been improved to support the demands of technologies like LTE Advanced, this alone cannot provide the required data rates that users expect. In order to achieve very high data rates, carriers need to find more efficient ways to utilize their licensed spectrum. Carrier aggregation is a promising way to enable devices to provide greater throughput but, while it has the potential to significantly benefit the carrier and enable a better user experience, carriers need to be prepared for the diverse set of real world propagation conditions that will occur in the field. Carrier Aggregation is defined in the latest 3GPP releases for a wide range of frequency band combinations. These combinations represent potential deployments at carriers around the globe. The interest arises from the possibility to take advantage of the range of propagation environments seen in the real world in order to deliver improved throughput. Deployment goals may range from increased bandwidth to load balancing. While the requirements for conformance test may be relatively straightforward, performance test requirements may vary. This paper will explore comprehensive real world test methodologies that support carrier aggregation scenarios and discuss the potential to apply automated test solutions for benchmarking carrier aggregation solutions in order to ensure successful deployment and high performance in the field.

Biography
Erik Org is senior marketing manager at Azimuth Systems and brings over 15 years of experience in improving corporate performance and value. His positions have been with both Fortune 500 companies as well as startups in the wireless communications field. At BitWave Semiconductor, he built a successful track record of driving sales, evangelizing new technology, and managing the overall marketing program. Prior to BitWave, Org worked for TVM Capital, an early stage technology investor, and earlier, for Motorola and Qualcomm. He has had a varied career including sales, business development, marketing, venture investing and manufacturing. He started his career as a commissioned officer in the U.S. Navy where he served aboard USS Cincinnati (SSN-693). Org holds an MBA from Columbia Business School, and an undergraduate degree from Renssalaer Polytechnic Institute with a major in Electrical Engineering.

Thursday, March 14, 2013
Measurement & Modeling Track:
Time/Mixed-Domain Measurements
Room B: 10:35 – 10:55 AM

Accurate Test of 28 Gb/s High-Speed Data Electrical Interface

Haiyang Hu, Agilent Technologies

Abstract
The worldwide demand for data capacity in networks greatly increases every year, driven by services like cloud computing and Video on Demand. As installed networks approach their capacity, operators need to either add physical capacity, which is very expensive, or transfer more data through the existing networks. These factors drive the need for migration from 10 Gb/s dominant network to much higher data rates, which will be delivered using four lanes of 25-28 Gb/s. Extra challenges arise when transferring these signals on printed circuit boards, even for short distances. This paper will focus on the challenge of high data rate test and method to accurately characterize a 28 Gb/s interface and it will also discuss the new OIF-CEI standard about test conditions and test parameters.

Biography
Haiyang Hu graduated from Zhejiang University in 1996 and received his Ph.D. from Shanghai Institute of Optics & Fine Mechanics in 2001. Then he joined Agilent as a senior application engineer in the optical communication test & measurement field. He has deep application knowledge, industry knowledge and much experience in optical/lightwave test (especially for test and measurement techniques in Coherent Communication, Ultra-Fast Optical Interface, Radio Over Fiber, etc.), and provides advanced technical support, consulting and system integration services for the top optical communication component and network equipment company worldwide.

Thursday, March 14, 2013
Measurement & Modeling Track:
Time/Mixed-Domain Measurements
Room B: 10:55 – 11:15

Comparison and Contrast of State-of-the-Art Time Domain Reflectometry Measurement Instrument

Takuya Hirato, Agilent Technologies

Abstract
In this paper we will compare vector network analyzer and oscilloscope based Time Domain Reflectometers. We will answer the question, what is TDR and what are the key challenges customers face with qualitative and quantitative measurements. Recent advances in both types of instruments means a review of the relative strengths and weaknesses of each approach is worth close consideration. This is especially worth considering for some challenging applications beyond transmission line structures, such as active device test.

Biography
Takuya Hirato is a product marketing engineer for Agilent Technologies' component test division. He started his career in R&D at Agilent Technologies in 2001. Since 2007, he has been a product marketing engineer for Agilent ENA series network analyzers. His role is in application development of component test with the network analyzers.

Thursday, March 14, 2013
Measurement & Modeling Track:
RF, MW & HSD Measurements
Room B: 11:20 – 11:40

Wafer-Level S-Parameter Calibration: How to Choose the Optimal Strategy for Your Application?

Andrej Rumiantsev, Cascade Microtech

Abstract
This topic will cover popular two-port calibration methods used for wafer-level RF and mm-wave device characterization. Special attention will be given to the common misconceptions and errors. Special attention will be given to accurate definition of calibration reference impedance. We also discuss the specifics of calibrating with a customized set of standards for both silicon and III-Vs, as well as the impact of the calibration standard design and measurement environment.

Biography
Andrej Rumiantsev (M'04) was born in Minsk, Belarus in 1972. He received the Diploma-Engineer degree (with highest honors) in telecommunication systems and the Research-Engineer degree in electrical engineering from the Belarusian State University of Informatics and Radio Electronics (BSUIR) in Minsk, Belarus, in 1994 and 1997 respectively. From 1997 to 2001, he was a research and teaching assistant in the Department of Telecommunication Systems at the BSUIR. Since 2001, he has been employed at SUSS MicroTec Test Systems (from January 2010 Cascade Microtech). He significantly contributed to the development of the SUSS' RF wafer probe, the |Z| Probe, wafer-level calibration standards, calibration methods and software, as well as probe systems. He is currently the product marketing manager of device characterization for modeling and process development. His research interests include RF calibration and wafer-level measurement techniques for advanced semiconductor devices at mm and sub-mm wave frequencies. Rumiantsev is a member of the IEEE MTT-11 Microwave Measurements Committee. He is an active publishing author and technical reviewer at several international conferences and journals. He serves in the Technical Program Committee of IEEE Bipolar/BiCMOS Circuits and Technology Meeting (BCTM). He holds several patents in the area of wafer-level RF calibration and measurements techniques. He received the ARFTG-71th Best Interactive Forum Paper Award.

Thursday, March 14, 2013
Measurement & Modeling Track:
RF, MW & HSD Measurements
Room B: 11:40 – 12:00

Characterizing Crosstalk/Noise of Multi-Lane High-Speed Interconnect

Weidong Hu, Teledyne LeCroy

Abstract
One of the highlights in the DesignCon 2013 is the popularity of 25 Gbps high-speed systems. It showed that high-speed signal such as 25 Gbps will be popular in high-speed interconnect design. Higher signal speed is to transfer huge amounts of data, which can be reached by the other method that is to add the number of signal transmission channels. For example, there are 10 Gbps with 10 channels or 25 Gbps with four channels being used in 100G Optical communication system. So higher signal speed with multi-channels will be one of the highlighted characteristics in current high-speed systems, which also will bring the new challenges to the test and analysis, one of which is the effect of crosstalk and noise, which cannot be ignored in multi-channel high-speed system. This presentation will introduce some new methods to characterize the crosstalk and noise in multi-channel/high-speed system with Teledyne LeCroy's multi-ports SPARQ network analyzer multi-channels high bandwidth oscilloscope and multi-channels serial data and crosstalk and noise analysis tools: SDAIII-CompleteLinQ. Also we will use the multi-channel's test and comparison capability of the SDAIII-completeLinQ to analyze the performance of the different channels when the aggressor is present or not and to find out the root cause with its strong analysis capabilities.

Biography
Weidong Hu joined Teledyne LeCroy and is responsible for the technical support of high end oscilloscopes in the Southeast district of China and the marketing development in China. Previously he had worked for ZTE, and been in charge of the Signal Integrity Simulation and test work. He had many years' experience in high-speed signal design and analysis area. Hu graduated from Xi'dian University in 2005 and got his Master's of Engineering degree.

Thursday, March 14, 2013
System Engineering Track:
Near-Field Communications IA
Room C: 08:30 – 08:50

Bluetooth-Based Room Localization Research Based on NB and SVM Approach

Pengming Wang and Qing Chen, East China Jiaotong University

Abstract
It has been generally recognized that the application of localization technology in home environment is beneficial to the development of health monitoring and mobile identification system development. As a kind of highly efficient sensor with obvious advantages such as low cost, the Bluetooth device has been widely used in our daily life. Research is carried out in an integrated environment based on mobile phone network signal measurement and Bluetooth link measurements in developing home localization systems. This paper presented a hybrid classification method, based on the combination of Bayesian network and supported vector machines, to support the development of Bluetooth-based room localization system. The proposed method mainly considers the dependency between features and nonlinear overlapping of features between rooms. The results show that the prediction accuracy has been improved greatly in comparison to the traditional Naive Bayes classifier and the hidden Markov model used in previous studies.

Thursday, March 14, 2013
System Engineering Track:
Near-Field Communications IB
Room C: 08:50 – 09:10

Analysis of UHF RFID SD Tag Antennas

Md. Abdul Karim, Technischi Universität Darmstadt (TUD)

Abstract
In this paper we present the analysis of UHF RFID antennas. The passive RFID tag, one of the most important parameters is the read range. The power is transferred to the tag and the reading range of tag is maximized when the antenna impedance and the tag chip impedance are complex conjugate-matched. In this paper we also studied designing effects of an antenna performance which are based on SD tag and Dipole antenna reader for which we found better performance. It directly influences RFID system performance characteristics such as the range of a tag. We analyzed the experimental data for UHF Gen2 chips (UCODE G2iL). We observed that the reading range of the tag antenna could be measured away from more than 4 to 4.5 meters in the open field test.

Biography
Abdul Karim is currently an M.Sc. engineering student, faculty of Elektrotechnik und Informationstechnik (etit), Information and Communication Engineering (ICE), Technische Universität Darmstadt (TUD), Germany.

Thursday, March 14, 2013
System Engineering Track: Communications IIA
Room C: 09:15 – 09:35

Digital Up Conversion VS IQ Modulation Using a Wideband Arbitrary Waveform Generator

Beate Hoehne, Agilent Technologies

Abstract
In many applications, including radar, EW and SIGINT, the modulation bandwidth requirements are constantly increasing, but at the same time excellent signal fidelity is necessary and distortions have to be kept at a minimum. Traditional signal generators can provide the required signal purity, but most of them offer modulation bandwidths of only about 100 MHz. External arbitrary waveform generators and IQ modulators can achieve a much larger bandwidth, but the downside to their use is carrier feed-through and images. Another alternative is the digital I/Q modulation inside the arbitrary waveform generator (AWG). This paper presents a solution using a wide-bandwidth, high-precision AWG to generate waveforms with 2 GHz or more of modulation bandwidth and discusses the pros and cons of the different alternatives.

Biography
Beate Hoehne is the product manager for pulse pattern generators, Digital Test Division, Agilent Technologies. Hoehne designs and implements marketing strategies for the most comprehensive pulse and data generator product portfolio for Agilent Technologies' Digital Verification Solutions Division. Beate is responsible for the marketing activities along the entire product life cycle.

Thursday, March 14, 2013
System Engineering Track: Communications IIB
Room C: 09:35 – 09:55

Correlation Between RF Receiver Architecture and RF Measurement

Nikhil Ayer and Brian Avenell, National Instruments

Abstract
With the prevalence of wireless devices like smartphones and tablets, there is an urgent need for critical RF measurements like harmonics, EVM, ACLR and many more to validate the devices. Currently there are a variety of RF receivers available in the market with different types of receiver architecture namely super heterodyne, homodyne and zero-IF to make different types of RF measurements. This paper explains receiver architecture and its implication on the different types of RF measurements. This will help the engineers and the system designers to better understand their measurement requirements and choose the appropriate RF receiver architecture.

Biography
Nikhil Ayer received his Bachelor's and Master's of Science degrees in Electrical Engineering from the University of Texas at Arlington in 2006 and 2008 respectively. He has been with National Instruments since 2009, where he is currently an RF product manager. He has extensive professional experience with RF test and measurement and applications engineering.

Thursday, March 14, 2013
System Engineering Track: Receivers IA
Room C: 10:35 – 10:55

Novel Architecture for QR Decomposition

Yong Rao and Ian Wong, National Instruments

Abstract
QR decomposition is a widely used method to solve linear equations, MIMO MMSE detector etc. in FPGA hardware. In this paper, we present a generic architecture of QR decomposition to cover general QR, QR with R inverse and MMSE solution. The design was implemented in LabVIEW FPGA (LVFPGA) on Xilinx Virtex-5 target. We integrated the design in LTE Advanced 8x8 MIMO prototype using National Instruments PXI platform.

Biographies
Yong Rao received his BS and MS degrees in radio electronics from Fudan University, Shanghai, China in 1988 and 1991, respectively. He also received his MS degree in electrical engineering from the University of Texas at Austin in 1998. From 1991 to 1995, he was a software engineer at Lattice Semiconductor Shanghai. He joined National Instruments in 1998 and he is currently a senior engineer researching unified hardware and software platforms for next generation wireless system design, simulation and prototyping as well as advanced IP development.

Dr. Ian C. Wong received his BS degree in electronics and communications engineering (magna cum laude) from the University of the Philippines in 2000, and MS and PhD degrees in electrical engineering from the University of Texas at Austin in 2004 and 2007, respectively. Dr. Wong is the co-author of the Springer book "Resource Allocation for Multiuser Multicarrier Wireless Systems," has six patents, 25 peer-reviewed journal and conference papers, and over 40 standards contributions. He was awarded the Texas Telecommunications Engineering Consortium Fellowship in 2003-2004, and the Wireless Networking and Communications Group student leadership award in 2007. His research interests include models of computation for signal processing, statistical signal processing and optimization for wired and wireless broadband communication systems. From 2007-2009, he was a systems research and standards engineer with the Cellular Products Group, Freescale Semiconductor, Austin, TX USA, where he represented Freescale in the 3GPP LTE standardization efforts. He is currently a senior engineer at National Instruments in Austin, TX researching unified hardware and software platforms for next-generation wireless system design, simulation and prototyping.

Thursday, March 14, 2013
System Engineering Track: Receivers IB
Room C: 10:55 – 11:15

Design and Implementation of FPGA-Based 4 GHz Bandwidth Digital IFM

Megha S. Badad and S.B. Shruti,
Dept. of ECE, K S Institute of Technology

Abstract
This paper presents the design and simulation results of a digital wideband receiver widely used in electronic warfare application. This Intermediate frequency measurement plays a key role in communication and radar systems which are mainly used to detect and analyze a wide range of radio frequency (RF). A digital Instantaneous Frequency Measurement (IFM) receiver is designed, where implementation of a real-time architecture of a Hilbert transform and autocorrelation algorithm is presented. Real-time architecture performs continuous monitoring and processing of the incoming signal. Prior to the previous one bit design, the input data fed to the Hilbert transform is 64-bit wide at a clock rate of 160 MHz with the input data rate increased by a factor of eight, a 64-bit autocorrelation algorithm is designed to maintain the real-time data processing for signal detection. This new digital IFM design was implemented on MATLAB and Xilinx Vertex-4, and tested on FPGA and is capable of assorting the continuous and short pulse wave signal up to 4 GHz bandwidth with a frequency detection error less than ±6 percent for time resolution of 100 nsec.

Biography
Megha S. Badad was born in Yadgir, India. She received her M.Tech degree from Visvesvaraya Technological University (VTU) Belgaum in 2009 and joined K S Institute of Technology (KSIT) in July of 2009 as assistant professor. Prior to KSIT she was working for DARE DRDO with RF Design. She has several publications in national and international journals with respect to RF Design.

Thursday, March 14, 2013
System Engineering Track: Antenna Modeling
Room C: 11:20 – 11:40

Modeling of Antennas and Arrays Using Domain Decomposition Method

Kezhong Zhao and Nancy Lambert, ANSYS

Abstract
The domain decomposition method (DDM) has emerged as a powerful and attractive technique for the analysis of large-scale electromagnetic problems due to its inherent parallelism and its beauty as an efficient and effective preconditioner. DDM is based on a divide-and-conquer philosophy. Instead of tackling a large and complex problem directly as a whole, the original problem is partitioned into smaller, possibly repetitive, and easier to solve sub-domains. In this paper DDM is used as an effective FEM preconditioner where a higher order Robin's transmission condition (TC) is devised to enforce the continuity of electromagnetic fields between adjacent sub-domains and at the same time accelerate the convergence of the iterative process. DDM is also employed to formulate a novel hybridization of FEM with the boundary element method that exact treatment of the radiation condition can be realized. Through this DDM-based hybrid finite element-boundary integral (FE-BI) method, we can allow FEM-domains to be disconnected; the coupling between disjoint domains is naturally taken into account via the Green's function. The advantages of DDM-based FE-BI compared to traditional FE-BI include modularity of FEM and BI domains in terms of mesh and selection of basis functions. This "non-conformal" ability significantly simplifies the integration of existing state-of-art FEM and BEM solvers.

Biography
Kezhong Zhao received B.S. (Summa Cum Laude), M.S. and Ph. D. degrees in electrical engineering from The Ohio State University, in September 2001, March 2003 and September 2007, respectively. He is currently with ANSYS, Pittsburgh, PA, as a lead R&D engineer. From September 2001 to May 2007, he was a Graduate Research Associate in the ElectroScience Lab, Dept. of Electrical Engineering, The Ohio State University. His research interests include all aspects of computational electromagnetics with emphasis on fast integral equation methods, hybrid FEM-BEM methods, hybrid numerical methods, and domain decomposition methods. Dr. Zhao was awarded second prize in the student paper competition at the 2007 IEEE AP-S symposium. He was the recipient of best student paper at the 2006 international Zurich symposium on electromagnetic compatibility (EMC-Zürich). He was also the co-recipient of best poster award at the 2006 IEEE conference on electromagnetic field computation (CEFC).

Thursday, March 14, 2013
System Engineering Track: Antenna Modeling
Room C: 11:40 – 12:00

Equivalent Current Reconstruction Applications

François Chauvet, L.J. Foged, L. Scialacqua, F. Saccardi and G. Vecch, Microwave Vision Group

Abstract
The inverse source or equivalent current/source method, EQC allows the reconstruction of sources on arbitrary 3D surfaces that enclose the antenna under test (AUT). This method is highly suitable for diagnostics on low and medium directivity antennas and even allows the possibility to isolate, identify and filter unwanted effects close to the antenna from the measurements such as feeding cable interactions. The equivalent source approach is a true 3D approach as opposed to the traditional method based on plane wave expansion using hemispherical field information.

In the reference literature,[1–7] the inverse source technique has been applied for two main purposes: to obtain diagnostic information (i.e. location, qualitative or quantitative characterization of antenna radiation phenomenon) and to obtain compact numerical models of antennas that reproduce and possibly extrapolate the original measured fields, e.g. to perform Near-Field to Far-Field (NF-FF) and Near-Field to Near-Field (NF-NF) transformation. In[8] a unified EQC formulation was presented, in which the Equivalence Theorem is used to determine the set of equivalent electric and magnetic sources fully representing the fields on the 3D reconstruction surface. In this paper, we examine the application of the EQC method as an antenna diagnostics tool on different antennas in practical measurement situations.[9-12] Various applications are presented such as: array element failure and/or excitation errors, detection and spatial filtering removal of interaction between antenna and the surroundings (positioner, mounting structure, fixture, cables, etc.), detection of spurious radiation (EMC/Shielding) and echo suppression/Spatial filtering.

Biography
François Chauvet received his PhD degree in Electronics from the University Pierre et Marie Curie, Paris VI, France in 2007. His research interests are in the antenna arrays design for radar purposes. Since 2007, Chauvet has been working as technical and customer support manager for Asia, at Satimo, a Microwave Vision Group company. He is currently based in Hong Kong. He also represents Satimo as a member of ETSI at 3GPP meetings for Standardization of MIMO testing.

Thursday, March 14, 2013
Commercial Resources Track:
Power Sensing Techniques
Room D: 08:30 – 08:50

Error Analysis of Equivalent Source Reflection Measurements

Igor Chirkov, VNIIFTRI; Vladislav Chuiko, MIET; and Dr. Alexey Pivak, Rohde & Schwarz

Abstract
The main equipment for traceability of microwave power measurement from primary standards to the commercially available power sensors are feed-through power meter (FP). The prototype of the first FP was comparator of reference primary power standard of the United States, used in the stabilization chain of power, which is incident to the input of terminated power sensor. This FP unit was based on a directional coupler with a reference power meter in the secondary channel. Describes a method for measuring the equivalent reflection coefficient of feed-through power standards. The analysis of measurement error and comparisons of results against other methods is done. The proposed method is universal and does not depend on design of feed-through power meter.

Biographies
Igor P. Chirkov completed Moscow Research University of Electronic Technology in 2006. Since 2006 he joined the microwave power lab of the All-Russian Institute of Physics and Radio Measurements. He studies the primary power standard errors and methods of power measurements.

Vladislav G. Chuiko was born in 1942, received a Ph.D. in Microwave Metrology from All-Russian Institute of Physical and Radio Measurements, Moscow in 1971, where he worked from 1965 to 2009 as chief of microwave power lab. Currently he is associate professor of Moscow University of Electronic Technology and teaches radio measurements.

Alexey V. Pivak received a Ph.D. in Microwave Metrology from the Institute of Electronics and Mathematics, Moscow in 2004. He joined the microwave power lab of the All-Russian Institute of Physics and Radio Measurements in 2000 where he developed metrology for the characterization of linearity of power standards. He is working at Rohde & Schwarz Russia as head of application engineers at this moment.

Thursday, March 14, 2013
Commercial Resources Track:
RF/mW Sources
Room D: 08:50 – 09:10

Modeling Magnetron Sources with VSim

Chuandong Zhou, Tech-X

Abstract
This talk presents simulations with the VSim for microwave devices modeling tool, which provides time-domain self-consistent charged particle dynamics, coupled with the electromagnetic fields of cross-field and other devices. Specific examples including 3D cooker and 2D rising-sun magnetrons are discussed. In addition, we illustrate a range of modeling tasks, including geometry construction, CAD import, and typical engineering measurements, from device calibration through measurement of output spectrum, power and gain.

Biography
Chuandong Zhou received his B.S. degree in mechanical engineering from Zhejiang University, Hangzhou, China, in 2002, and the M.S. and Ph.D. degrees in mechanical engineering and plasma physics from the University of Rochester, Rochester, New York, in 2004 and 2008, respectively.

In 2008, he joined the Tech-X Corp. located in Boulder, Colorado, as a research assistant, and became an associate research scientist in 2009, and a research scientist in 2010. Since October 2009, he has been with the Beam-Plasma Interactions Group of the Tech-X Corp. His current research interests include high performance scientific computation and numerical simulations of various engineering and physical systems, including vacuum electronics, plasma physics, radiation hydrodynamics and high energy density physics. Dr. Zhou has been a member of the American Physical Society (APS) since 2003. He was the recipient of the Frank J. Horton Fellowship awarded by the Laboratory for Laser Energetic from 2004 to 2008. This paper was co-authored by Sulmer Fernandez, Boise State University.

Thursday, March 14, 2013
Commercial Resources Track: Power Devices IIA
Room D: 09:15 – 09:35

GaN HEMTs for Telecommunications

David Dai, Sanetronic for Cree

Abstract
This presentation provides a background of Cree Inc. and introduces its full line of leading GaN products such as broadband, 50 V new products and telecom application. Meanwhile it will show the reliability and ECCN of Cree products. Frequency will cover DC to 18 GHz and power will be from 6 to 400 W. It will show the perfect performance of Cree GaN from lots of actual DEMO testing data.

Biography
David Dai graduated from the Science & Technology University of Beijing in 2002. Joint in Sanetronic from 2008. He worked as sales manager and products manager at Sanetronic. Focused on the promotion of RF products such as Cree, Dow-Key, K&L Microwave. Sanetronic Co. Ltd., a Hong Kong registered company founded in 1988 has grown into a professional representative and distributor firm that supplies various kinds of RF/microwave, millimeter-wave, Optical and Hi-REL electronic components and devices.

Thursday, March 14, 2013
Commercial Resources Track: Power Devices IIB
Room D: 09:35 – 09:55

Linearizing GaN Microwave Power Amplifiers Using RF Pre-Distortion

Mendy Ouzillou, Scintera

Abstract
In order to accommodate increasing demand for data services, the requirements imposed on microwave systems are becoming more stringent and more difficult to achieve. Increasing bandwidth, modulation index and output power as well as ensuring consistent performance over time have caused microwave Original Equipment Manufacturers (OEM) to rethink transmitter design and component choices. Many microwave P2P OEMs are presently evaluating GaN amplifiers as a possible replacement for GaAs in order to achieve wider BW, higher power density and to a lesser degree higher efficiency. As with many engineering solutions, GaN amplifiers present the designer with a new set of trade-offs and challenges that must be carefully considered. One such trade-off is the need for some form of pre-distortion in order to meet desired linearity requirements not just at peak power but in backoff as well. This presentation will demonstrate how adaptive Radio Frequency Pre-Distortion (RFPD) offers a field-proven and simple solution that delivers the performance and flexibility necessary to meet the stringent requirements of microwave P2P systems in design today and the future.

Biography
Mendy Ouzillou has over 25 years of marketing, engineering management and system design experience. Before joining Scintera, Ouzillou was director of marketing for Telegent Systems that was later sold to Broadcom and Spreadtrum. Previously, he was the senior director of marketing at Impinj responsible for both RFID reader systems and tag ICs. Ouzillou also spent six years with Silicon Laboratories as a marketing manager responsible for various products including the first CMOS GSM power amplifier for handsets. Over the course of nearly five years at National Instruments, he was the R&D group manager for the sound & vibration instrument group that he founded and led. Ouzillou also worked at the University of Texas Applied Research Laboratories where he designed parallel digital signal processing systems for use in active SONAR by the U.S. Navy. He has published numerous technical articles for various trade magazines and has been awarded four patents. Ouzillou holds a BSEE from the University of Texas at Austin.

Thursday, March 14, 2013
Commercial Resources Track:
Power Devices
Room D: 10:35 – 10:55

Simulating an NXP Doherty Power Amplifier with Digital Pre-Distortion

Dr. John Dunn, AWR

Abstract
Digital pre-distortion (DPD) is gaining in importance as designers seek maximum efficiency and minimum adjacent channel power ratio (ACPR) from their power amplifiers. This paper will examine a complete design flow for a Doherty amplifier using NXP transistors. The paper will follow the design flow from matching the device (including electromagnetic simulation of the large matching structures) through to circuit-level nonlinear analysis using harmonic balance. System-level analysis featuring the DPD correction will be demonstrated using as an example AWR's Microwave Office, AXIEM and Visual Systems Simulator software. In particular, significant improvement will be shown in ACPR, and simulation results will be compared to measurements.

Biography
John Dunn is AWR's electromagnetic technologist and is also in charge of training and university program development. His area of expertise is electromagnetic theory, simulation and modeling. Dr. Dunn's past experience includes both the worlds of industry and academia. Prior to joining AWR, he was head of the interconnect modeling group at Tektronix, Beaverton, OR, for four years. Before entering the engineering industry, Dr. Dunn was a professor of electrical engineering at the University of Colorado, Boulder from 1986 to 2001, where he led a research group in the areas of electromagnetic simulation and modeling. Dr. Dunn received his Ph.D. and M.S. degrees in applied physics from Harvard University, Cambridge, MA, and his B.A. in physics from Carleton College, Northfield, MN. He is a senior member of IEEE and has authored papers and presented at numerous conferences and symposia throughout the world.

Thursday, March 14, 2013
Commercial Resources Track:
Power Devices
Room D: 10:55 – 11:15

Optimizing the Design and Verification of 4G RF Power Amplifiers

Peter Xu, National Instruments

Abstract
Higher-order modulation schemes employed in today's wireless networks demand exceptional linearity in the transmit signal path and RF amplifier designers must accommodate this demand. This invariably requires trade-offs between key performance parameters such as linearity and efficiency, which is greatly aided by the use of digital pre-distortion (DPD) circuits. The path to optimizing circuit performance requires not just time-domain and frequency-domain simulators but circuit envelope simulation and stimulation. This paper examines new circuit envelope technology and how it can enhance the design process. A case study will be used showing how Infineon used AWR circuit envelope software in the design of its recent line of power amplifiers (PA) such that the end product not only met expected levels of performance, but was readily manufacturable as well.

Biography
Peter Xu is AWR's dedicated application engineer supporting the China region. Before joining AWR in 2011, he worked for several years at VIRE Co., a distributor for AWR in China, where he was an application engineer supporting AWR products. Prior to that he was a microwave R&D engineer with ChuanMei Technology Development Co. Xu's research experience has been focused on the design of microstrip forward traveling wave antennas, RF low noise amplifiers, microwave filters, 6 to 18 GHz up and down converters and RF/microwave EDA software applications. Xu holds an electronic engineering degree from the University of Electronic Science and Technology of China (UESTC) in Chengdu.

Thursday, March 14, 2013
Commercial Resources Track:
Power Devices
Room D: 11:20 – 11:40

Technological Advances of Gallium Nitride

Bruce Green, Freescale Semiconductor

Abstract
Over the last decade, some Gallium Nitride (GaN) proponents have touted the technology as the future for high power cellular base stations that will displace silicon LDMOS devices. One may speculate on how LDMOS technological advances, GaN market acceptance, reliability, or cost have moderated GaN's advance into the LDMOS domain. This paper will discuss GaN technology and RF applications, present and future. The paper will then address thermal management, scalability and recent state-of-the-art results compared to Si LDMOS and how GaN and LDMOS technology complement each other for RF applications. While GaN Doherty amplifiers produce > 400 W from a single package device for 2.5 GHz+, LDMOS devices perform similarly using multiple packages. Unlike Doherty amplifiers where GaN versus Si LDMOS is a close question, GaN will dominate switch mode power amplifier technology since the amplifiers demand high frequency, high harmonic content at moderate to high power.

Biography
Bruce M. Green received the B.S. and M.S. degrees in Electrical Engineering from Brigham Young University in Provo, Utah in 1996 and 1997 and his Ph.D. degree from Cornell University in Ithaca, New York in 2001. His Ph.D. research focused on the characteristics, optimization and integrated circuit applications of gallium nitride (GaN) transistors. After graduation from Cornell, he joined Motorola, now Freescale Semiconductor, where he is a senior member of the technical staff involved in GaN transistor research and development. He has over twenty five papers in refereed journals and conference proceedings and eight issued U.S. patents. Dr. Green is a member of IEEE Microwave Theory and Techniques and Electron Device Societies and serves as a reviewer for journals published by these societies. He also serves on the Technical Program Committee for the IEEE Compound Semiconductor IC Symposium.

Thursday, March 14, 2013
Commercial Resources Track:
Power Devices
Room D: 11:40 – 12:00

Challenges in the Design and Selection of Power Broadband Amplifiers

Wolfram Titze, Rohde & Schwarz

Abstract
Broadband amplifiers are subject to various requirements which have to be met by the designer. For example, for many applications, the amplifiers must be extremely linear which is reflected in their harmonic behavior. Additionally, in a non broadcast environment like for example EMC, the amps must be able to cope with high mismatch at the amplifier output caused by the properties of the connected antenna, by resonance and reflection in the EMC chamber and, not least, by reflections from the DUT itself.

From a commercial point of view, not only the initial investment but also the operational expenditure during the lifetime of an amplifier is of paramount importance. High reliability and easy serviceability are key factors in the amplifier design to achieve this goal. Furthermore, optimum power efficiency (i.e. low power consumption) is also desirable, especially in the case of high power amplifiers to reduce the running costs. This paper will look into all these partly contradictory requirements for the amplifier designer and show what options there are to get as close as possible to these goals. It will also give some advice on which critical design parameters to look at in a datasheet when choosing an amplifier for a particular application.

Biography
Dr. Wolfram Titze, C. Eng., MIEE, Berlin, Germany, graduated from Friedrich-Alexander University Erlangen and received his Ph.D. in electronic engineering from University College London in 1993. Dr. Titze started to work for Robert Bosch GmbH where he became head of the department for multimedia systems development. After joining Rohde & Schwarz in 2003, he became head of amplifier system development and is now head of product management for headend and amplifier systems of the Broadcasting Division of Rohde & Schwarz.

Wednesday, March 13, 2013
Workshops & Panels

Wednesday, March 13, 2013
13:30 – 14:10
Room A:
RFIC/MMIC and Semiconductor Track

RF CMOS Foundry Workshop

Sponsored by:

TOWERJAZZ
The Global Specialty Foundry Leader

Addressing RFIC Reliability with a Programmable Electrical Rule Checker

Presented by: Ofer Tamir, TowerJazz Semiconductor

Abstract

The Calibre Programmable Electrical Rule Checker (PERC) reduces the risk of low reliability and provides a platform to translate the designer's intent into a set of rules. The PERC uses the designer's rules throughout the whole development process, at pre- and post-layout stages. It identifies the place with high reliability risk in the early stage of development, and it checks that the solution used to reduce reliability risk satisfies the designer's netlist-based and layout-based requirements.

The Calibre PERC can be applied to find ESD unprotected devices and pads, to check the ESD protection structure, and to find cross-power domain interface structures and check them. The PERC can be used to find common errors (such as floating gates or prohibited power domains) in the pre-layout stage. It can also be used to verify that third-party IP blocks satisfy the designer's reliability standards.

In the workshop we will describe the TowerJazz PERC rules, methodology of implementing and run these rules and real results on customer designs that show the importance of using such tools. We will also do a live demo of the results on real design.

Biography

Ofer Tamir's role as director of design enablement and CAD includes all design kit components development and support, design environment definition and support for the TowerJazz Global Design Center as well as design support for TowerJazz customers. He has more than 25 years of experience as a CAD engineer – starting with physical verification (LVS, DRC) rule writing and support, and then as a CAD manager responsible for all tool design flow. Tamir has an MA degree in Computer Science from Ben Gurion University in Israel.

Wednesday, March 13, 2013
13:30 – 14:10
Room B:
Nonlinear and Power Amplifier Design Track

Agilent PA Workshop

Sponsored by:

Agilent Technologies

A Doherty Power Amplifier with Envelope Tracking Design

Presented by: Cheng-Cheng Xie, Agilent Technologies

Abstract

Many modern modulated signals have high peak-to-average power ratios (PAPR). Power amplifiers that must amplify these high PAPR signals, if using a fixed bias, must be operated at relatively high output power back off, to avoid greatly distorting the signal when its envelope excursion is near its peak. However, the greater the amount of back off, the lower the efficiency of the power amplifier will be.

This paper will introduce the Doherty PA with envelope tracking design. Firstly, we design a Doherty PA successfully, including DC-bias design, loadpull design, stability analysis, bias circuit design, impedance matching design, offset line design and optimization, PCB layout and schematic co-simulation, and show the AM-AM and PAE results. The efficiency is about 43 percent when backoff 7.5 dB from saturation output power. Next, we add the envelope tracking design to the Doherty PA, and compare the result with and without envelope tracking; last, we do the DPD co-simulation based on LTE communication system with the Doherty and envelope tracking PA designed and show the PA linearization improvement.

Biography

Cheng-Cheng Xie is an application engineer of Agilent Technologies since 2006 and his focus is on MW/RF circuits and system simulation, EM simulation, SI/PI applications. He received his B.E. degree from Xi'an Jiaotong University and his MSEE degree from the University of Electronic Science and Technology of China (UESTC).

Wednesday, March 13, 2013
13:30 – 14:10
Room C: Nonlinear Power Amplifier Design Track

Amplifier Characterization Workshop

Sponsored by:

ROHDE&SCHWARZ

Single Connection Amplifier Characterization

Presented by: Fabricio Dourado, Rohde & Schwarz

Abstract

Test engineers characterizing devices on-wafer, power amplifiers, mixers or more complex modules have a lot of work connecting and reconnecting their devices to do all required measurements. They are looking for ways to perform all measurements with a single connection to the DUT: single connection device characterization, in short SCDC, enables to carry out the necessary measurements like S-parameter, compression point, intermodulation distortion, pulse profile and noise figure measurements. This Rohde & Schwarz workshop will explore SCDC best practices, the reasons why past pulse reconstruction technique with floating trigger delay or noise source are not required anymore and advise on how to make best use of your R&S®ZVA vector network analyzer in manual or automated test systems.

Biography

Fabricio Dourado joined Rohde & Schwarz in 1996 and he has worked in various roles of test and measurement product marketing and technical support covering customers in Europe, Americas and Asia. He joined the headquarters team dedicated to Asia in 2001 focusing on China. Now he is the Asia-Pacific director of business development for aerospace and defense test and measurement solutions. He looks forward to meeting T&M customers in the areas of radar/EW, satellite or millimeter wave applications, from component to system level testing.

Wednesday, March 13, 2013
13:30 – 14:10
Room D: EM Modeling Track

Time Domain Materials Modeling Workshop

Sponsored by:

TECH-X
SIMULATIONS EMPOWERING YOUR INNOVATIONS.

Time Domain Modeling of Drude and Lorentz Dielectrics with VSim

Presented by: Chuandong Zhou, Tech-X

Abstract

The VSim for electromagnetics is a high performance, Finite-Difference, Time Domain (FDTD) simulation tool with the most advanced dielectric algorithms on the market. It offers very efficient scalability with an increasing number of parallel processing elements and is powered by the latest general purpose GPU technology. It features both curved conducting boundaries and perfect matched layers (PML) to truncate the simulation domain. Here we demonstrate the capabilities by showing various dielectric algorithms, including the Drude and Lorentz models which are useful for modeling dispersive materials such as dielectrics with metallic nanoparticles.

Biography

Chuandong Zhou received his B.S. degree in mechanical engineering from Zhejiang University, Hangzhou, China, in 2002, and the M.S. and Ph.D. degrees in mechanical engineering and plasma physics from the University of Rochester, Rochester, New York, in 2004 and 2008, respectively.

In 2008, he joined the Tech-X Corp. located in Boulder, Colorado, as a research assistant, and became an associate research scientist in 2009, and a research scientist in 2010. Since October 2009, he has been with the Beam-Plasma Interactions Group of the Tech-X Corp. His current research interests include high performance scientific computation and numerical simulations of various engineering and physical systems, including vacuum electronics, plasma physics, radiation hydrodynamics and high energy density physics. Dr. Zhou has been a member of the American Physical Society (APS) since 2003. He was the recipient of the Frank J. Horton Fellowship awarded by the Laboratory for Laser Energetic from 2004 to 2008.

Workshops

Wednesday, March 13, 2013
14:15 – 14:55
Room A: Semiconductor Track

UltraCMOS® Workshop

Sponsored by:

Peregrine Semiconductor

UltraCMOS® Technology Enables Today's High-Performance RF and Microwave Designs

Presented by: Jian Zhou, Peregrine Semiconductor

Abstract

Today's RF and microwave system designers are challenged to create high-performance designs that cover broader frequency ranges, with high linearity, in ever-smaller footprints. These challenges are only expected to increase as frequencies and modulation schemes become more complex. Attend this presentation to learn how Peregrine Semiconductor's products enable designers to meet these challenges. At the heart of Peregrine's products is its patented Silicon-on-Sapphire (SOS) process technology—Ultra CMOS®. UltraCMOS technology involves a highly-insulating sapphire substrate, which enables the integration of digital, analog and mixed-signal on a single die, as well as low parasitic capacitance, high signal isolation and low insertion loss. The result is RF components with high linearity—such as Peregrine's SPDT PE42422 RF switch, which has linearity up to 70 dBm IIP3—and excellent high-frequency capabilities, power-handling capabilities and network efficiency.

Biography

As field applications engineer with Peregrine Semiconductor Corp., Jian Zhou supports customers in the use of Peregrine's products throughout Greater China. Prior to joining Peregrine Semiconductor in 2007, Zhou has held various electrical engineering positions with companies such as Nan Jing Electric Device Institute, SEG Communications and WJ Communications. Zhou earned his Bachelor's of Science Degree in Electrical Engineering from Southeast University in China.

Wednesday, March 13, 2013
14:15 – 14:55
Room B: Nonlinear Power Amplifier Design Track

Doherty Power Amplifier Workshop

Sponsored by:

freescale

Doherty Power Amplifier Theory and Design for Cellular Infrastructure

Presented by: Damon Holmes, Freescale Semiconductor

Abstract

The Doherty method has become the most prevalent power amplifier architecture for cellular infrastructure applications due to its high efficiency at backoff power levels, relative ease of implementation and recent advancements in digital pre-distortion techniques that mitigate its nonlinear behavior. In this workshop, the Doherty power amplifier technique will be analyzed in detail with emphasis on attributes and implementation for high power applications. After review of driving market forces within the cellular infrastructure market and transmitter requirements, the material focuses on some of the underlying principles and key fundamentals of the Doherty amplifier. A framework of symmetric, asymmetric and N-way Doherty architectures is outlined to show the governing design equations for high efficiency Doherty amplifiers and to reveal its advantages beyond cellular infrastructure applications. From this point onward, attention is focused on key physical impairments associated with high power Doherty amplifiers which must be considered in practice. Chief among these are device finite output impedance and degradations resulting from the peaking sub-amplifier, frequency dispersion, and carrier and peaking sub-amplifier gain and phase inequalities. Impairments are introduced one by one to give the attendee insight into their consequence, and some techniques to compensate their deleterious effects are presented as well. Those "real-world" challenges are easily and conveniently demonstrated through the use of large signal device models and loadpull characterization. It is shown how Doherty amplifier performance can be maximized through input signal splitter, output summing network optimization, and implementing proper phase compensation.

Biography

Damon G. Holmes received his B.Sc. and M.Sc. degrees from the University of Calgary, Calgary, Canada in 2002 and 2005, respectively. From 2005 to 2008, he was with Nortel Networks, Calgary, Canada, where he was involved with the design and characterization of transceiver circuits and Doherty power amplifiers for baseband pre-distortion linearization. Since 2008, he has been with the RF Division at Freescale Semiconductor, Tempe, AZ, USA, primarily involved with high efficiency Doherty amplifier design. His research interests include MMIC, broadband and large signal power amplifiers, high efficiency Doherty circuits and power amplifier impairments.

Wednesday, March 13, 2013
14:15 – 14:55
Room C: Measurement Track

High Speed Measurement Workshop

Sponsored by:

Agilent Technologies

Which is More Important: Oscilloscope Noise or Bits of Resolution?

Presented by: Caren Johnson, Agilent Technologies

Abstract

When selecting an oscilloscope, it is very important to understand each of the major specifications and how they will impact your measurements or ability to accurately view signals. We are now seeing oscilloscopes with more than 8 bits of resolution so an important question is: What is more important – oscilloscope noise or bits of resolution. This paper will discuss what to look for with these two specifications, how they each impact the viewing and analysis of signals, and ultimately will discuss why it is important to look at both specifications together to judge the quality of your oscilloscope.

Biography

Caren Johnson is currently the Agilent high performance oscilloscope marketing manager. With a Master's degree in Computer Science, Johnson spent the past 24 years in R&D primarily focused on the Infiniium Oscilloscope software products. She spent the past 13 years managing the Infiniium Software application and compliance software teams. She is married with two children and lives in Colorado Springs, Colorado.

How to Use VNA to Analyze High-Speed Backplane and Cable

Presented by: Shaohua Lian, Agilent Technologies

Abstract

As the development of electronic science and technology, high-speed communication network and PC server are used widely. The high-speed serial data transfer is now everywhere. At present, the electrical serial data rate is higher than 10 Gbps, cables and high-speed backplanes are used for the high-speed serial data transmission. In order to ensure signal integrity in high-speed serial data transmission cable and backplane, it's necessary for us to measure the cable and the backplane both in time and frequency domains. Vector network analyzer (VNA) with more than 100 dB dynamic range, can be used to measure the cable and high-speed backplane's S-parameters directly. Currently, many VNAs are also integrated TDR test software, which can be used to achieve cable and backplane's characteristic impedance and precise position the impedance discontinuity point. Therefore, VNA has become the ideal solution for high-speed data transmission cables and backplanes tests.

Biography

Shaohua Lian, graduated from Beijing Institute of Technology and got his Master's degree of Physical Electronics in 2008. More than two years in electronic system hardware and software research and design experience after the graduation from an institute. In 2010, he joined Agilent as a software engineer, responsible for the development of the FD system. In 2011, he joined Agilent's market department as the digital application engineer. He is responsible for technology support of digital oscilloscope, logic analyzer, arbitrary waveform generator and protocol analyzer and digital interfaces.

Wednesday, March 13, 2013
14:15 – 14:55
Room D: Antenna Design Track

Antenna Workshop

Sponsored by:

ANSYS®

Antenna Design Platform Integration

Presented by: Matthew Commens, ANSYS

Abstract

ANSYS will overview the capabilities within HFSS related to modeling, simulating and post processing antennas and antenna placement studies. This will include discussion on techniques in geometry modeling, parametric definition, setup of ports and excitations and how to properly define absorbing boundary conditions for the most accurate results. In addition techniques for scattering and RCS analysis will be discussed. Also to be discussed in detail will be more advanced techniques for modeling large scale structures with distribute memory techniques such as the domain decomposition method, DDM, finite elements-boundary integral, FE-BI and hybrid finite element method of moment techniques.

Biography

Dr. Matthew Commens is a lead product manager at ANSYS Inc. in charge of HFSS, High Frequency Structure Simulator, a 3D full wave electromagnetic field simulator. He has held this position since January of 2009 and works in Pittsburgh, PA USA. He first joined the greater ANSYS organization in August of 2001 working for Ansoft LLC as an applications engineer specializing in high frequency electromagnetic simulation tools. Prior to joining ANSYS he worked as an antenna designer and simulation manager at Rangestar Wireless of Aptos, CA USA where he specialized in the design of a compact, integrated antenna solution for commercial wireless applications. Prior to this he worked at Varian Inc. as a high resolution NMR probe designer. Dr. Commens holds five patents in the areas of NMR coil and antenna design. He received a B.S. in Physics from the University of Missouri-Rolla (1989) USA and a Ph.D. in physics from Washington University in St. Louis, MO USA.

EDI CON 2013 GaN Panel

Wednesday, March 13, 2013
15:30 – 17:00
Room A: Semiconductor Track – Marquee Event

The EDI CON 2013 GaN Panel

Sponsored by:

RichardsonRFPD
An Arrow Company

Featuring: Freescale, M/A-COM Technology Solutions, Microsemi, Nitronex, TriQuint and Scintera

Overview

The EDI CON 2013 GaN Panel will feature presentations from leading RF semiconductor vendors currently manufacturing Gallium Nitride devices for high-power RF applications. Each company representative will make an introductory presentation on the state of their company's GaN technology and the issues that are of concern for RF/microwave design engineers who want to take advantage of these transistors/ICs outstanding bandwidth and high power density characteristics.

GaN Based Power Transistors in the Cellular Infrastructure Market

Presented by: Mario Bokatius, Freescale Semiconductor

Abstract

GaN based power transistors have been discussed for many years as the next semiconductor technology for power amplifiers for the cellular infrastructure market, the largest customer of high power transistors. However, to date they have not been able to take away significant market share from the incumbent, Si LDMOS. The reason most often quoted is that the performance advantage brought along by GaN has not been able to offset its higher cost, where this statement is being made in the context of Doherty based power amplifiers that are operated in a single frequency band with fractional bandwidth in the 3 to 5 percent range. As wireless networks move to fourth generation air-interfaces and power amplifier technology advances, new opportunities for GaN based power amplifier will open up. Some of those opportunities where GaN could be successful in the future will be discussed in this presentation.

Biography

Mario Bokatius is currently the RF product manager for emerging markets. He has been with Freescale since 2000 and has held various positions in design, applications engineering and business development. He has been involved with the design of LDMOS, GaAs and GaN based power transistors and amplifiers in discrete and monolithic form ranging from the Milliwatt range to several hundred Watts and spanning frequencies from a few hundred MHz to 6 GHz. Bokatius holds Diplom-Ingenieur and Master of Science degrees from the University of Applied Sciences Giessen-Friedberg, Germany and King's College, University of London, UK, respectively. He has published more than 10 technical articles and holds two patents.

GaN Power Transistors in COTS Plastic Packaging

Presented by: Damian McCann, M/A-COM Technology Solutions

Abstract

GaN power transistors are traditionally packaged in hermetic or B-Stage sealed ceramic cavity packages. These devices can be prohibitively expensive, large and difficult to implement into systems. M/A-COM Tech has developed plastic lead frame packaged GaN with "handset like" matching methods. This packaging gives OEMs a small, low parasitic, commercial-off-the-shelf solution with a small size and low weight. These transistors will provide OEMs with high performing and reliable transistors for next generation phased array radar applications. GaN in plastic leverages a number of advantages of GaN on SiC, including a high power density, excellent thermal performance, and a rugged product that withstands high breakdown voltages. Packaging GaN in plastic COTS packaging presents a number of challenges. For one, the heat generated by the high wattage per mm of GaN must be mitigated. Matching the product to the application allows for the creation of powerful GaN transistors that are also thermally stable. Ultimately, GaN in plastic presents an opportunity to create powerful GaN on SiC transistors at a lower cost and manufactured for ease of use, while maintaining performance and quality.

Biography

Damian McCann is the director of engineering for M/A-COM Technology Solutions' Long Beach facility. There, he is leading development of innovative GaN solutions with emphasis on cost effective design, manufacturing, and packaging techniques for RF and microwave power generation. McCann has held various leadership positions in the semiconductor industry at Mimix Broadband, Celeritek and Marconi Electronics Devices.

GaN Power Transistors for Avionics and Radar Market

Presented by: Jerry W. Chang, Microsemi

Abstract

This presentation reviews the latest GaN technology development status and introduces a full range of industry leading edge GaN high power transistors from Microsemi. These new products are specifically designed for avionics application, including applications such as TPR (Transponder), IFF (Identify Friend and Foe), MDS (Mode-S), MDS-ELM, Data Link; radar applications such as ATC (Air Traffic Control) radar, phase array radar, weather radar, long range radar, surveillance radar; medical radiation application; and communication markets. The frequency band of interest covers L-Band, S-Band, C-Band, X-Band up to Ku-Band. Power level ranges from 30 W driver stage to 1000 W output stage; pulse format from short pulse - a few micro seconds, long pulse - milliseconds, to CW.

Biography

Jerry W. Chang, director of transistor engineering in Microsemi RFIS Transistor Solution, manages the transistor engineering department and leads the product development team designing state-of-the-art high power transistors and modules utilizing Si BJT, SiC SIT and GaN HEMT technologies for radar, avionics and communication markets. Prior to joining Microsemi, Chang worked in engineering, business development and product line manager for Signal Technology, Watkins-Johnson and CTT Inc. In these positions, he has been intimately involved in a wide variety of GaAs based RF/microwave components, amplifier and subsystem designs, technology development, business strategy and volume manufacturing operation. He holds an MBA degree from Santa Clara University, an MSEE degree from UC San Diego, California, and a BSEE degree from Chiao-Tung University in Taiwan.

A Robust 75 W, 48 V, 0.02 to 1 GHz Broadband GaN Amplifier

Presented by: Xinjian Zhao, Nitronex

Abstract

This work presents a 75 W broadband power amplifier suited for use across the 0.02 to 1 GHz frequency band. To the authors' knowledge, this work utilizes the first ever commercial 48 V GaN devices to be fabricated on a silicon substrate. High voltage operation increases the output impedance and hence allows for easier broadband matching. Through the use of custom 4:1 transformers, we achieve more than 75 W of CW output power over a decade of bandwidth utilizing a single ended device. In addition to the bandwidth, this device exhibits state of the art robustness, surviving a 15:1 VSWR test with no observed degradation in linear RF performance.

Biography

Xinjian Zhao is currently the GaN MMIC power amplifier design engineer with 25 years of experience in RFIC/MMIC/wireless research, development and management. He has been with Nitronex since 2010. From 2008 to 2010, Zhao was a principal engineer for Cobham Sensor System. From 2000 to 2008, he was principal engineer at M/A-COM Tyco Electronics. From 1998 to 2000, he was a senior member technical staff at GaAsTEK, ITT Industry. From 1997 to June 1998, he was senior engineer at APICs Inc. From 1982 to1996 Zhao was director of the Microwave Design Center, senior engineer, NEDI, Nanjing, China. He has been involved with the design of GaAs, SiGe and GaN based RFIC, MMICs, from a few hundred MHz to 10 GHz frequencies, the power range is up to a hundred Watts. He holds BS degrees from Fudan University of Shanghai, China in 1982, respectively. He has published more than 15 technical articles and holds one patent.

GaN Doherty Amplifier for LTE Micro-Cell and Active Antenna System Applications

Presented by: Peter Xia, TriQuint Semiconductor

Abstract

To meet the increasingly more stringent requirements of high data rate and high spectrum efficiency demanded by wireless telecommunications subscribers, the 4G wireless system including Long Term Evolution (LTE) have been developed to take advantage of some new technology. In this paper a high-efficiency, small-size GaN Doherty amplifier for LTE micro-cell base station and active antenna systems base station application is presented. It is implemented with a TriQuint Semiconductor wideband discrete GaN RF power transistor, theT1G6001528-Q3. Doherty amplifier performance is in the LTE standard frequency range 2.62 GHz ~2.69 GHz; average output power=38.5 dBm; the peak saturated output power is > 46 dBm; drain efficiency is > 55%; gain is > 15 dB; 2 carrier 2x10 MHz; 8 dB PAR LTE signal waveform with Netlogic standard DPD; ACPR is better than -50 dBc; Doherty amplifier size 30 x 70 mm.

Biography

Peter Xia graduated from UESTC and has been engaged in RF power amplifier for wireless communications as well as research work in the field of radar for over 20 years. He has numerous patents and published articles and is currently an RF power device applications engineer with TriQuint Semiconductor.

Wednesday, March 13, 2013
15:30 – 16:10
Room B: Nonlinear Power Amplifier Design Track

MMIC Design Workshop

Sponsored by:

AWR NATIONAL INSTRUMENTS

Design Methodology for GaAs MMIC, 1 W, X-Band PA

Presented by: Dr. John Dunn, AWR

Abstract

In this workshop, a high power microwave monolithic integrated circuit (MMIC) amplifier is designed using one of the more common current design methodologies—the Cripps linear power estimation method.[1] The design is carried out in AWR's Microwave Office® software, which has a number of useful features for streamlining the design and layout of the circuit. The completed MMIC is a two-stage, 1 W, X-Band design. The first phase of the design is accomplished using the Cripps method, where linear simulations are used to get the approximate performance. The design is tweaked and verified using full, nonlinear simulation methods (the harmonic balance method). Details discussed include design of the matching networks and optimization of the amplifier's performance.

Biography

John Dunn is AWR's electromagnetic technologist and is also in charge of training and university program development. His area of expertise is electromagnetic theory, simulation and modeling. Dr. Dunn's past experience includes both the worlds of industry and academia. Prior to joining AWR, he was head of the interconnect modeling group at Tektronix, Beaverton, OR, for four years. Before entering the engineering industry, Dr. Dunn was a professor of electrical engineering at the University of Colorado, Boulder from 1986 to 2001, where he led a research group in the areas of electromagnetic simulation and modeling. Dr. Dunn received his Ph.D. and M.S. degrees in applied physics from Harvard University, Cambridge, MA, and his B.A. in physics from Carleton College, Northfield, MN. He is a senior member of IEEE and has authored papers and presented at numerous conferences and symposia throughout the world.

Wednesday, March 13, 2013
15:30 – 16:10
Room C: Measurement Track

High Speed Interconnect Workshop

Sponsored by:

Anritsu

Overcoming High-Speed Interconnect Challenges

Presented by: Bob Buxton, Anritsu

Abstract

Cloud computing, smartphones and LTE services are causing a large increase in network traffic. The instantaneous traffic rates at internet data centers have reached 1 Tbit/s. To support this increased traffic, speed of IT equipment – such as those used in high-end services in data centers – must be increased. Device interconnects may cause transmission bottlenecks in many of these applications. As speeds increase, signal integrity engineers, charged with ensuring delivery of high quality high speed serial data signals, increasingly have to make measurements using microwave vector network analyzers. Various considerations will be highlighted including the importance of the extent of the measurement frequency range at low and high ends, how this affects achieving correlation between simulation and measurement, and some practical de-embedding techniques for these applications that include partial-information techniques and time-domain-based methods.

Biography

Bob Buxton is manager of product marketing at Anritsu Co. Buxton has 34 years of R&D, product definition and marketing experience in connection with microwave components, operational equipment and test equipment in the fields of radar, communications, signal integrity and video. Since April 2010, he has been leading Anritsu's general-purpose microwave bench instrument product marketing team. Buxton earned his MSc. in Microwaves and Modern Optics from the University College London and his MBA from George Fox University, Oregon.

Wednesday, March 13, 2013
15:30 – 16:10
Room D: Antenna Track

CST Microwave Studio Workshop

Sponsored by:

CST

Integrated Antenna Design for a GSM Tracking Device

Presented by: Dr. Klaus Krohne, CST

Abstract

A common strategy when designing an electronic communication device is to use an off-the-shelf antenna. Although the ease with which such antennas can be obtained is a certain benefit, the designer is limited to commercially available antennas which may not be of the right shape for the application, and when purchased in bulk, could become quite costly. In this workshop we aim to illustrate, through demonstration of a real world example, how an existing chip antenna on a GSM tracking device designed to monitor the acceleration (and thus level of distress) of sheep, can be replaced by an embedded, integrated antenna. The final design shows improved antenna performance and communication range while adhering to the technical and spatial requirements. In addition, its planar nature allows it to be integrated with the existing PCB layout, resulting in reduced manufacturing and assembly time and costs. The workshop will show how the design capabilities of Antenna Magus, a searchable database of antennas, can be combined with the full-wave 3D electromagnetic simulation tools in CST STUDIO SUITE to create an embedded design, where full coupling in a complex environment can be taken into account.

Biography

Dr. Klaus Krohne received his Diploma in Electrical Engineering from the Darmstadt University of Technology, Germany in 2002 and his Doctor of Sciences from the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland in 2007. From 2007 to 2009 he was a researcher with the A*Star Institute of High Performance Computing in Singapore. His research interest is in the area of electromagnetic simulation and component optimization techniques. Since 2009 Klaus is working as a sales and customer support manager for CST (Computer Simulation Technology) South East Asia Pte. Ltd. in Singapore.

Wednesday, March 13, 2013
16:15 – 17:00
Room B: Measurement Track

ATE Test Solutions Workshop

Sponsored by:

Mini-Circuits® ISO 9001 ISO 14001 AS9100

Smart Portable Test Equipment for ATE Applications

Presented by: Chi Man Shum, Mini-Circuits

Abstract

Mini-Circuits has developed a family of low cost smart portable test equipment (PTE) that can provide quick and accurate test results without big investment in laboratory equipments. New second generation products include super-wide band signal generator, high performance true RMS power sensor, ultra low loss and high isolation electro-mechanical switch, and rack mount test solutions for ATE applications. The company's PTE products, when combined with application specific software, can significantly reduce test time and increase production throughput. All products include built-in user-friendly GUI for users without prior programming experience.

Biography

Chi Man Shum is currently the worldwide portable test equipment applications manager at Mini-Circuits, where he leads the product introduction and marketing of smart power sensors, frequency counters, I/O control boxes, switch matrices, synthesized signal generators and rack mounted test systems for high speed automated production requirements. Previously also at Mini-Circuits as the applications manager, he managed and trained the sales team in the promotion of signal-processing components such as VCOs, frequency synthesizers, mixers, power dividers, and filters into both commercial and military markets. Shum started his career in the laser industry as a research scientist specializing in electro-optics devices with applications in RF communications. He holds a Ph.D. degree in physics from Stevens Institute of Technology (Hoboken, NJ) in 1990.

Wednesday, March 13, 2013
16:15 – 17:00
Room C: Connectivity Track

Connectivity Workshop

Sponsored by:

MITEQ SANETRONIC COMPANY LIMITED

Applications of Fiber Optic Links in RF and Microwave Systems

Presented by: Howard Hausman, MITEQ (Sanetronic)

Abstract

An ideal interface between RF and microwave systems is one that has minimal distortion, i.e. a flat frequency response and linear phase over the band of interest. Coaxial cables satisfy most of these requirements but have limitations that show up at higher frequencies, wide bandwidths and long distances. Fiber optic links in contrast have lower losses and less frequency dependence over long distances, making it a desirable and sometimes necessary technology to consider when components are not located close to each other. Fiber optic link characteristics are such that once installed, distance between microwave systems from a few meters to as much as a few kilometers are virtually irrelevant. This technology opens various applications to a wider range of possibilities, such as interfacing with antennas, measuring systems over large geographical areas, remote communication systems, etc. all in secure non-interfering environments. Presented in this paper are some typical applications together with an analysis of a remote low noise amplifier in a communication system that shows the advantages and limitations of this technology.

Biography

Howard Hausman directs the four divisions of MITEQ: Microwave Electronics Components and Systems, Microwave Amplifiers, Satellite Communication Systems, and Microwave High Power Amplifiers. Before being appointed MITEQ's president/CEO, Hausman served as chief technology officer, vice president of engineering, and other related titles. As an engineer, Hausman has designed microwave systems and components for satellite communications, radar and reconnaissance systems that include receivers, transmitters and synthesizers. Hausman also was an adjunct professor at Polytechnic University and Hofstra University, where he taught graduate and undergraduate courses in electronic engineering. He is a recipient of the New York University/Polytech Distinguished Alumni Award. Hausman has presented many lectures and authored many papers relating to microwave systems, satellite communications, radar and reconnaissance systems. He received his BSEE and MSEE degrees from Polytechnic University.

Wednesday, March 13, 2013
16:15 – 17:00
Room D: Antenna Track

Beamforming Workshop

Sponsored by:

SPIRENT

MIMO Beamforming in All Its Forms – Maximizing Efficiency in Limited Spectrum

Presented by: Kang Chen, Spirent Communications

Abstract

This session will begin with a review of the fundamentals of MIMO, including the effects of MIMO beamforming on throughput and system capacity. The session will cover differences between different forms of MIMO (e.g. MU-MIMO vs. SU-MIMO) and the possibilities offered by adding beamforming to the MIMO channel. The discussion will include techniques (e.g. IRC) used to minimize the effects of interference. Special attention will be paid to the unique aspects involved in implementing MIMO beamforming in a TD-LTE environment.

Biography

Kang Chen is a product manager at Spirent Communications. Prior to joining the company in 2007, Chen held senior engineering positions at Agilent and Alcatel. He earned a BEng from Chongqing University of Posts and Telecom, and an MSEE from Rutgers University, where he researched MIMO and cooperative communications.

Thursday, March 14, 2013
Workshops & Panels

Thursday, March 14, 2013
13:30 – 14:10
Room A: Measurement Track

RF Signal Analysis Workshop

Sponsored by:

CETC 41st

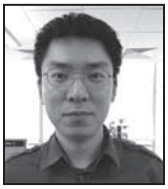
Presented by: CETC41

Thursday, March 14, 2013
13:30 – 14:10
Room B:
MMIC/RFIC and Semiconductor Track

RFIC Workshop

Sponsored by:

cadence




RFIC Advances in RF Simulation for Transceiver Designs

Presented by: Xu Wang and Nebabie Kebebew, Cadence

Abstract

The complexity resulting from multiple wireless protocols, high-frequency systems with many radio elements, and advanced-node technologies presents significant challenges for the everyday RFIC designer. Large RFICs like transceivers contain analog and digital functions that include data converters, VCOs, PLLs, mixers, filters, amplifiers and AGC loops. We will introduce recent improvements in RF simulation to increase the confidence of producing working silicon.

Biographies

Xu Wang is a product engineer for Spectre RF at Cadence Design Systems Inc. He has worked on RF customer support and tool development with R&D team. He received both a bachelor's and a master's degree from Shanghai Jiaotong University, focusing on analog/RF integrated circuit design.

Nebabie Kebebew is a senior product manager for custom IC simulation products at Cadence Design Systems Inc. She has worked on analog circuit design, digital ICs and analog/RF design methodology. She received a BSEE from California Polytechnic University and a MSEE from the University of Southern California in Communications System Design.

Thursday, March 14, 2013
13:30 – 14:10
Room C: Measurement Track

MW and MM Solutions Workshop

Sponsored by:

ROHDE&SCHWARZ

MW and MM Solutions (VNA, SpA, SG, Frequency Converters)

Presented by: Christoph Wagner, Rohde & Schwarz

Abstract

Higher bandwidths, larger data rates, better resolutions and lower atmospheric attenuations are only some of many reasons why more and more applications in the areas of wireless communication, automotive and body scanning are shifted to millimeter wave ranges. Indispensable for such applications is the flexible extension of existing test and measurement instruments like network and spectrum analyzer into such frequency ranges by using external frequency converters and frequency mixers respectively. The target of this workshop is the description of measurement setups for mm-applications providing continuous frequency sweeps up to 67 and 110 GHz and banded measurements up to 500 GHz. Furthermore the operational principle of a frequency converter and suitable (power) calibration techniques will be discussed.

Biography

Christoph Wagner is regional manager for test and measurement in China, Taiwan and Hong Kong, with a focus on the Network and Spectrum Analysis solutions, specialized in the micro- and millimeter-wave measurements. Prior to joining Rohde & Schwarz in 2004, Wagner held positions at the major network infrastructure providers in Germany, U.A.E. and Indonesia in installation and project management. He holds a Telecommunication Technologies degree from the University of Applied Sciences in Berlin, Germany and in Copenhagen, Denmark, and a MBA from the University of Wales, U.K.

Thursday, March 14, 2013
13:30 – 14:10
Room D: LTE/LTE-A Track

TD-LTE and TD-LTE-Advanced Solutions Workshop

Sponsored by:

Agilent Technologies

It's Time for TD-LTE

Presented by: Qin Zhang, Agilent Technologies

Abstract

As China Mobile, the world's biggest operator will get TD-LTE license in 2013, TD-LTE is finally on the way. More and more operators take this technology as a new opportunity to maintain their leading positions. This paper explains the technical concepts of TD-LTE (aka LTE TDD) technology. In addition, current hot topics for TD-LTE are discussed while addressing the following questions:

- Why has TD-LTE become popular?
- What are the differences between LTE FDD and LTE TDD?
- What are the key drivers for the TD-LTE industry?
- Who else besides China also made commitments to deploy TD-LTE networks, and why?
- What are the most popular topics/issues that the TD-LTE industry is facing today?

Biography

Qin Zhang is a technical marketing engineer from Agilent China Communications Operations and is in charge of technical support and marketing of signal source, signal analyzer and wireless applications such as LTE, W-CDMA, etc. He has participated in several projects of TD-LTE base station performance test, TD-LTE 8 antenna beamforming test and more. Zhang has published several technical papers in industry magazines and websites. He has a Master's degree of Electromagnetic Field and Microwave Technology, graduated from the Beijing Jiaotong University.

Compound Semiconductor Workshop

Thursday, March 14, 2013
14:15 – 15:15
Room A: Semiconductor Track
Compound Semiconductor Workshop

Sponsored by:

win SEMICONDUCTORS
Leading the Global Communication

HBT Technology for Multi-Mode, Multi-Band RF Power Amplifier Design

Presented by: Cheng-Kuo Lin, Win Semiconductors

Abstract

Multi-mode multi-band (MMMB) power amplifiers have been developed in recent years for next generation mobile handsets applications. These mobile devices are required to support higher data rates by 3G/4G standards with backward compatibility to the legacy 2G standards. From HBT technology's point of view, the one critical requirement for 2G PA is the ruggedness of HBT which can maintain the same performance after the stress of high voltage standing wave ratio (VSWR). In addition, the power added efficiency (PAE) plays a more important role due to PA back-off operation for 3G/4G higher data rate standard. Therefore, the new HBT epi-structure design is necessary to meet multipurpose requirement. Furthermore, the PA module size and cost are other important aspects of products beyond performance. In this paper, we present an ultra high ruggedness and high efficiency HBT technology with several layout design rule changes to achieve the stringent requirements of MMMB PA design.

Biography

Cheng-Kuo Lin received his Ph.D. degree from the Department of Electrical Engineering, National Central University, Taiwan in 2004. He has worked at WIN semiconductors for six years (2005~2009, 2010~until now) and was the visiting scholar at the University of Illinois at Urbana Champaign from June 2009 to May 2010. He was the project manager of HEMT technology development department and process integration team for two years. He is currently the department manager of HBT technology development and is in charge of the HBT/BiHEMT technology development projects including epitaxial structure design, transistor cell design, process design rule establishment, process development, and device characterization. He is also the WIN's technical contact window for China customers.

Sponsored by:

OMMIC
Innovating with III-V's

W-Band Chip-Set for Microwave Imaging

Presented by: Marc Rocchi, OMMIC

Abstract

High sensitivity microwave imaging systems for quality control as well as security portals requires one to develop ultra wideband and low noise W-Band receivers. A state of the art chipset including a switch, low noise amplifiers and zero biased on chip matched tunnel diode will be presented as well as the way to full integration of the receiver.

Biography

Marc Rocchi received his degree in electrical engineering from l'Ecole Supérieure d'Electricité de Paris in 1972. He is the author of more than 100 papers in the field of III/V and Si MMICs. He is a senior member of IEEE and overseas advisor of the CSICS symposium. He is currently the president of OMMIC.

Thursday, March 14, 2013
14:15 – 15:15
Room B: Nonlinear Power Amplifier Design Track
Nonlinear/Load Pull Workshop

Sponsored by:

An Update on Passive, Active, Hybrid-Active, Mixed-Signal Active, Harmonic, Pulsed, NVNA/ Time-Domain Load Pull and Modeling Techniques

Presented by: Zhang Nianmin, Maury Microwave

Abstract

Device characterization measurement and modeling techniques have evolved at an exponential rate over the past several years, and a greater number of varying solutions exist on the market today. When is traditional passive load pull sufficient? When is VNA-based load pull required? Do we need harmonic load pull and which harmonic load pull solution best satisfies our needs? Pulsed-RF, pulsed-bias, time domain, wideband impedance control, device modeling and many other techniques will be discussed in this presentation.

Biography

Zhang Nianmin graduated from Shanghai Tongji University in 1987, with an EE degree. He majored in electronic test and measurement instrumentation. He is general manager of Maury Microwave Corp. in China. Before his current job, he had been working for HP/Agilent as sales engineer, marketing engineer and business development manager for 16 years. He is experienced in the component test and device characterization industry. He also worked as R&D engineer developing test method for large scale integrated circuits at Beijing Institute of Test Automation, and as project manager at Institute of Electronic Science and Technology affiliated with the China Electronics Corp.

Sponsored by:

Load Pull System Common Test Problems and Solutions

Presented by: Zacharia Ouardirhi, Focus Microwaves

Abstract

Engineers have encountered a variety of problems in the process of the practical application of load-pull systems. This presentatation will provide a detailed description of the problem, the principle, and then propose effective solutions. Common system calibration of load-pull system test results, the solution to the problem of shock load-pull system test process, using the load-pull system test ultra-low impedance and load-pull system test limit will be discussed.

Biography

Zacharia Ouardirhi joined Focus Microwaves in 2005 as an RF development engineer. After years of hands on load pull experience, project managements and countless customer demonstrations and installations, he was promoted to acting general manager in 2008. He received his B.Sc., M.Sc.A and Ph.D from École Polytechnique of Montreal, Canada in 1997, 2000 and 2005 respectively. Dr. Ouardirhi continues to support his interest in education by co-directing of a number of graduate students. Dr. Ouardirhi is also a member of the scientific committee of CREER, RF and Electronic Research Center in Québec.

Thursday, March 14, 2013
14:15 – 15:15
Room C: High-Speed Measurement Track

High Frequency Measurement/Calibration Workshop

How to Remove the Effect of Fixtures and Probes in High Speed Test

Presented by: Yong Zhao, Agilent Technologies

Abstract
The date rate of high speed signal is up to 10 Gbps, bandwidth of signal is also increased. When testing high speed signal, fixtures, cable and probes would degrade the test results for their unexpected frequency response. How to remove the impacting effect is most important for accurate test. When oscilloscope is used to test high speed signal, method to remove the effect is introduced in this paper.

Biography
Yong Zhao graduated from Northwestern Polytechnic University with a master's degree of computer architecture in 2006 and joined Agilent Technologies in 2011. Yong Zhao gives technical support of oscilloscope, logic analyzer, protocol analyzer and high speed system test instruments.

De-Embedding via Time Domain Gating

Weidong Hu, Teledyne LeCroy

Abstract
Fixture/Probe's effects are getting more and more important as the signal speeds increase in high-speed interconnect design. Currently there are several de-embedding technologies which can be used to remove the fixture/probe's effects. Using S-parameters to do the de-embedding will be easy but it's always very difficult to get the fixture/probe's S-parameters; the TRL de-embedding technology needs to develop the special cal kits that include Through/Reflection/Line. The cal kits will bring the effects to the measurement and many troubled steps are needed to complete the calibration. Now there's a new de-embedding method called Time Domain Gating in Teledyne LeCroy's SPARQ network analyzer which can do the de-embedding more easily. This presentation will introduce the time domain gating de-embedding method.

Biography
Weidong Hu joined Teledyne LeCroy and is responsible for the technical support of high end oscilloscopes in the Southeast district of China and the marketing development in China. Previously he had worked for ZTE and been in charge of the Signal Integrity Simulation and test work. He had many years' experience in high-speed signal design and analysis area. Hu graduated from Xi'dian University in 2005 and got his Master's of Engineering degree.

Thursday, March 14, 2013
14:15 – 15:15
Room D: RF and Wireless Test

RF and Wireless Test Workshop

Sponsored by:

NATIONAL INSTRUMENTS

Redefining RF and Wireless Test

Presented by: Yuan Yao, National Instruments China

Abstract

The number of wireless devices, diversity of communication standards, and sophistication of modulation schemes are increasing dramatically each year. With each subsequent generation of technology, the cost of testing wireless devices using traditional techniques has also increased, as a greater amount of more complex test equipment is needed. However, a new approach—software-defined modular approach—can better meet all these challenges by quickly utilizing the latest Commercial Off The Shelf (COTS) technology such as field-programmable gate arrays (FPGA), multicore CPUs and high-performance RF components. This presentation will go into the details about the redefined RF approach proposed by National Instruments using an open software and modular hardware with key COTS technology. RF test engineers will benefit from the ability to achieve test time reductions that are orders of magnitude beyond what was previously possible without custom or standard-specific instrumentation.

Biography

Yuan Yao received his Dual Master's degree in electronics engineering from Shanghai Jiaotong University and Technical University of Berlin in 2008 and 2010 respectively. He joined National Instruments as an application engineer and system engineer in 2010 and then transferred to the marketing department. His current role is the technical marketing engineer and is responsible for local marketing strategy, planning and business development for NI RF and wireless test platform and solutions.

Thursday, March 14, 2013
15:45 – 18:00
Room A: Connectivity Track – Marquee Event

EDI CON 2013 Connectivity Workshop & Panel

Featuring Mitron, Insulated Wire, Southwest Microwave, Maury Microwave and Times Microwave

How to Offer the Best Cable Assembly Solution Based on the Customer Application

Presented by: Wei Liu, Mitron

Abstract
The cable assembly is one of the most widely used components in various military and commercial systems. It is used for the connection between components within the rack, subsystem, antenna feed system and various test platforms. Although the cable assembly looks like a simple component, in many situations it is really the critical factor that decides the system performance, life and cost. So how to develop the most suitable cable assembly that can help the system or subsystem designer to solve their problems in application and cost down is the real challenge to every cable assembly supplier.

Biography
Wei Liu received his Bachelor's degree for electromagnetics and microwave technology from UESTC (University of Electronic and Science Technology of China) in 1988. From July 1988 he served as a microwave and RF engineer for Southwest Research Institute of Electronics Equipment of China, and in 1989 became the leader of the technical team of the Micro-electronics Department. In 1990, he was one of the earliest members joined to establish National EW Key Lab. of China. He was in charge of microwave circuit and subsystem design there. In mid-1993, joined CASIX, the first high-tech joint venture between China and U.S., was the manager of the microwave and RF division. In September 1996, established Mitron Inc. as the owner, and has been president of Mitron up till now. At present, Mitron is the representative and partner of many well-known companies such as Mini-Circuits, Herley General Microwave and Harbour Industries. In 2007, Wei Liu built up the joint venture called Micable Inc. with SSI Cable from the U.S. and took the position of president. Now Micable mainly develops and produces various high-end cable assemblies and connectors up to 50 GHz. Micable products are sold to the U.S., Europe, India, Taiwan and Chinese domestic high end cable assemblies markets.

Thursday, March 14, 2013
15:45 – 18:00
Room A: Connectivity Track – Marquee Event

How to Get the Best Performance Out of Your Cable Assembly

Presented by: John Morelli, Insulated Wire Inc.

Abstract
RF cable assemblies are designed to operate at the highest electrical performance level. High performance cables require special handling procedures to ensure optimum electrical performance. This presentation will provide information on best practices to ensure cable assembly integrity and long life. By taking a few basic preventative measures during cable handling, installers and system assembly technicians can significantly extend the life of their assembly and avoid system failures. The presenter will provide tips on how to prevent some common problems such as internal damage caused by compression and how to prevent the cable from bending below its minimum bend radius which would otherwise cause the cable to kink and results in internal damage. To maximize connector performance and lifetime, the presenter will discuss proper torque down procedures, connector orientation and how to avoid assembly twisting and use of proper cable tie down techniques and discussing the effects of workmanship in the assembly process and its effects on performance.

Biography
John Morelli is the vice president of engineering at Insulated Wire (IW) since joining the company in 2009. Prior to his current position, Morelli was the vice president of business development with Amphenol RF from 2005 until 2008, after the company acquired SV Microwave where Morelli had been the VP of engineering since 1995. Prior to SV Microwave, Morelli worked for Automatic Connector and M/A-COM, where he was the director of connector development from 1983 to 1990. He has a BSEE with a focus on microwave technology from Pratt Institute in New York City.

Thursday, March 14, 2013
15:45 – 18:00
Room A: Connectivity Track – Marquee Event

Southwest Microwave Connector Solutions for Achieving Optimum Circuit Board Match

Bob Griffin, Southwest Microwave

Abstract
Microwave connectors are an integral component often over looked during a product's design stage. It is essential the connector provide the lowest loss signal path possible to achieve the end product's signal integrity. If the proper connector considerations are not taken at the launch of the circuit, the product's overall performance might not be met. This presentation will discuss an overview on connector design, selecting the proper connector type for various bandwidth applications, tips to achieve the best circuit to board match, and proper connector care and mating procedures. The presentation will also briefly discuss elements the designer should consider in the product's simulation model.

Biography
Bob Griffin received his Bachelor's of Science degree for Electronic Engineering Technology in 1986 and Electrical Engineering in 1992 from Arizona State University. He is currently technical support and regional sales manager at Southwest Microwave Inc.

Thursday, March 14, 2013
15:45 – 18:00
Room A: Connectivity Track – Marquee Event

Combining Ease-of-Use With Calibration-Grade Precision Adaptors

Presented by: Zhang Nianmin, Maury Microwave

Abstract
Maury Microwave will discuss their new ColorConnect™ precision adapters, which are designed for lab and field use addressing the need for quality, performance, ease-of-identification and ease-of-use. New manufacturing techniques have resulted in improved VSWR specifications bridging the gap between calibration-grade metrology adapters and daily-use lab adapters. Following the proposed IEEE high-frequency connector/adapter color convention, the components are the first commercially available products to offer clear indications of compatibility and intermatability. Zhang will discuss how the product makes it a simple matter to avoid and eliminate damaged equipment, degraded equipment reliability, degraded performance and lengthy maintenance times due to improper mating (and attempted mating) of incompatible adapters.

Biography
Zhang Nianmin graduated from Shanghai Tongji University in 1987, with an EE degree. He majored in electronic test and measurement instrumentation. He is general manager of Maury Microwave Corp. in China. Prior to this, he had been working for HP/Agilent as sales engineer, marketing engineer and business development manager for 16 years. He is experienced in the component test and device characterization industry. He also worked as R&D engineer developing test method for large scale integrated circuits at Beijing Institute of Test Automation, and as project manager at the Institute of Electronic Science and Technology affiliated with China Electronics Corp.

Thursday, March 14, 2013
15:45 – 18:00
Room A: Connectivity Track - Marquee Event

How to Build the Highest Performance Phase Cable Assemblies for Your Phase Critical Applications

Presented by: Yi Huang, Times Microwave

Abstract
Radio frequency and microwave systems have become increasingly sensitive to phase variations of their sub assemblies and components. Cable assemblies, that form the interconnecting backbone of these systems, can be a significant source of poor system performance unless proper choices are made when selecting and designing these components. Satellite and military aircraft often deploy Synthetic Aperture RADAR (SAR) systems that use multi-element co-planar arrays. Many wireless applications use switched beam and adaptive array antenna systems. The high-end test and measurement systems request the most stable components, all these applications request high phase stability on interconnection. This presentation will show you how to build the perfect phase stable cable assemblies for interconnection solutions.

Biography
Yi Huang received his Master's degree from East China Normal University in 2004, where he majored in electromagnetic and microwave technology. Since 2008, he has been a regional sales manager at Times Microwave Systems. Huang has a strong wireless communication and RF/microwave technology background.

Thursday, March 14, 2013
15:45 – 18:00
Room B: EDA Track – Marquee Event

EDA Design Flow Workshop and Panel

Industry Best Practices for a High-Speed Digital Design Workflow

Presented by: Colin Warwick, Agilent Technologies

Abstract

When high-speed digital design entered the multi-gigabit per second regime, engineers had to adopt new simulation tools and techniques to account for RF and microwave impairments like impedance discontinuity and reflection from distributed components, for example PCB traces and vias. In order to mitigate these impairments, it was also necessary to adopt signal processing techniques from communication science, for example equalization and clock/data recovery. Initially, the only way to simulate the design was to collect several point tools and their models together: Enterprise PCB tools, SPICE-like time-domain circuit simulators, frequency-domain EM field solvers, data flow signal processing tools. However file transfer between point tools is time-consuming and error-prone. In this module, we'll present an integrated workflow which we believe will become an industry best practice for a high-speed digital design. The flow integrates appropriate simulators and models into enterprise PCB and package design tools.

Biography

Colin Warwick is high speed digital product manager at Agilent EEsof EDA, where he is focused on multigigabit per second design and analysis tools. Prior to joining Agilent, Warwick was with Royal Signals and Radar Establishment in Malvern, England, Bell Labs in Holmdel, NJ, and The MathWorks in Natick, MA. He completed his bachelor's, master's, and doctorate degrees in physics at the University of Oxford, England. He has published over 50 technical articles and holds thirteen patents.

Thursday, March 14, 2013
15:45 – 18:00
Room B: EDA Track – Marquee Event

Fully Integrating 3D Electromagnetic (EM) Simulation into Circuit Simulation

Presented by: Dr. John Dunn, AWR

Abstract

EM simulation has become an essential tool for circuit designers for design, verification and modeling. Traditionally, EM simulators fall into two different categories: planar and full 3D. Planar simulators have long been integrated into existing circuit design flows. But now this extraction flow has been extended to include 3D EM. For example, bond wires can be extracted and simulated without the time-consuming task of redrawing them. Since most circuit designers use standard 3D objects, for example, bond wires, BGA balls, vias, and SMA launches, they can now benefit from the ability to use 3D simulation without the tediousness of drawing 3D objects in a separate EM simulator. Design time as well as the risks of drawing errors is therefore reduced significantly. This paper will demonstrate the productivity gains that can be made using 3D EM simulation integrated into circuit design flows.

Biography

John Dunn is AWR's electromagnetic technologist and is also in charge of training and university program development. His area of expertise is electromagnetic theory, simulation and modeling. Dr. Dunn's past experience includes both worlds of industry and academia. Prior to joining AWR, he was head of the interconnect modeling group at Tektronix, Beaverton, OR, for four years. Before entering the engineering industry, Dr. Dunn was a professor of electrical engineering at the University of Colorado, Boulder from 1986 to 2001, where he led a research group in the areas of electromagnetic simulation and modeling. Dr. Dunn received his Ph.D. and M.S. degrees in applied physics from Harvard University, Cambridge, MA, and his B.A. in physics from Carleton College, Northfield, MN. He is a senior member of IEEE and has authored papers and presented at numerous conferences and symposia throughout the world.

EDA Design Flow Workshop

Thursday, March 14, 2013
15:45 – 18:00
Room B: EDA Design Flow Workshop

Integrating EDA Design with Best-in-Class Analysis Tools

Presented by: Dr. Matt Commens, ANSYS

Abstract

The trend in modern consumer electronics is to pack greater functionality into smaller, more portable devices at low cost with long battery life. Manufacturers need to ensure that their products will achieve high levels of performance while meeting requirements for electronic reliability and standards compliance. Challenges of signals transmitted and power drawn by the chip via the board, package, and on-die power delivery network (PDN) are no longer just the chip designers' problem. All parties involved in the design must be able to comprehend and address issues early in the process through simulation. This means providing greater access to simulation throughout the design process by the implementation of an integrated analysis and verification methodology for chip, package and PCB which includes rigorous electromagnetic field simulation. Allowing the designers to remain in their design flow and extract on demand highly accurate models with "industry gold standard" capability is a must for enabling this paradigm in electronics design.

Biography

Dr. Matthew Commens is a lead product manager at ANSYS Inc. in charge of HFSS, High Frequency Structure Simulator, a 3D full wave electromagnetic field simulator. He has held this position since January of 2009 and works in Pittsburgh, PA USA. He first joined the greater ANSYS organization in August of 2001 working for Ansoft LLC as an applications engineer specializing in high frequency electromagnetic simulation tools. Prior to joining ANSYS he worked as an antenna designer and simulation manager at Rangestar Wireless of Aptos, CA USA where he specialized in the design of compact, integrated antenna solution for commercial wireless applications. Prior to this he worked at Varian Inc. as a high resolution NMR probe designer. Dr. Commens holds five patents in the areas of NMR coil and antenna design. He received a B.S. in Physics from the University of Missouri-Rolla (1989) USA and a Ph.D. in physics from Washington University in St. Louis, MO USA.

Panel Discussion

Featuring: Agilent, AWR, ANSYS, CST and Cadence

Thursday, March 14, 2013
15:45 – 18:00 PM
Room C: RF Front-End Workshop

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Efficient Design Methodology for Wideband Digital Radio

Presented by Lei Xu PhD, Altera

Abstract

The exponential growth in mobile data traffic that has been experienced in the recent years is driving mobile operators and base station providers to produce digital radio front end (DFE) equipment that can support dramatically wider bandwidths. In addition to this, increasing pressure on operators to reduce OPEX and the trend towards green technology is driving the need for more power efficient solutions in the digital front end. Digital pre-distortion (DPD) is an essential part of radio frequency transmitters for improving efficiency of power amplifiers in DFE, where it linearizes power amplifier behaviour by adaptively estimating nonlinear characteristics and then compensate. This presentation will overview the fundamental rationale of wideband DPD and its technical challenges first and then illustrate how Altera's advanced offerings can improve designers' productivity and reduce the cost/effort of the implementation and verification with examples. In addition, the new transceiver based high speed analog to digital interface conveying the so called JESD 204A/B protocol will be also introduced to show enormous benefits on power, cost and the form factor over its counterpart technology, along with examples of using Altera's JESD 204B solution on Arriv/Stratix family of FPGA and ADC/DAC parts such as those from Texas Instruments.

Biography

Lei Xu is a wireless system architect in the communication and broadcasting business unit. His main responsibility is to define and architect market requirement, to deliver successful and valuable product portfolio from semiconductor devices, intellectual property to system solutions for the wireless market segment. Prior to this role, he has been with wireless system solution group of Altera in UK, developing various wireless system solutions such as DPD, MIMO, Turbo SIC, etc. He has been also working as the system algorithmic/architecture expert in VIA technology and Agilent Technologies on various wireless and broadcasting systems. He holds a BSEE and MSEE from Tsinghua University, China and PhD of Wireless Communication from the University of Southampton, UK and has published 25 leading journal and conference papers and holds/filed 12 patent disclosures.

RF Front-End Solutions for High-Speed Designs

Presented by: Aiguo Leng, Texas Instruments

Abstract

The increasing bandwidth demands of today's telecommunications networks require new high-speed analog front-end evaluation boards to be used in the design and development of radio systems exceeding 100 MHz of instantaneous bandwidth. Such evaluation boards must be inclusive of the transmit, receive and DPD-observation signal chains. This workshop looks at solutions that include Texas Instruments' TSW30H84 and TSW30SH84 wideband dual transmit signal chain capable of up to 600 MHz of complex signal bandwidth, the TSW1265 wideband dual receiver capable of receiving up to 75 to 100 MHz bandwidth (LC filter restriction) of real IF signals at 1.7 GHz to 2.2 GHz frequencies, and the TSW1266 complex receiver capable of receiving RF signals in the 2 GHz frequency range and providing a complex receiver function or complex feedback signal to the baseband processor. Presentation material will review BTS signal metrics, DPD concepts and DPD signal chain requirements, as well as these evaluation boards, including their individual components and expected performance, and how they can be used with the ARRIA V FPGA RF Development Kit.

Biography

Aiguo Leng is a telecom systems manager at Texas Instruments for analog single chain. His areas of product expertise include data converters, amplifiers, RF, interface and analog front ends. Leng holds both a bachelor's and master's degree from the University of Electronic Science and Technology of China (UETC).

Thursday, March 14, 2013
15:45 – 16:45
Room D: Measurement Track

MIMO OTA Workshop

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MIMO-OTA Testing Methodologies: Reverb vs. Anechoic

Presented by: Kang Chen, Spirent Communications

Abstract
The complexity of assessing MIMO performance has driven a need to supplement traditional conducted testing with testing using controlled radiated signals, giving rise to several methods of implementing Over-the-Air (OTA) testing. While different OTA approaches have been presented and discussed by industry leaders, the main contenders involve the use of either reverberation chambers or anechoic chambers. While topically similar, these two methods invoke differences in cost structure, accuracy, and depth of detail in the modeling required to take advantage of higher degrees of accuracy.

Biography
Kang Chen is a product manager at Spirent Communications. Prior to joining the company in 2007, Chen held senior engineering positions at Agilent and Alcatel. He earned a BEng from Chongqing University of Posts and Telecom, and an MSEE from Rutgers University, where he researched MIMO and cooperative communications.

Thursday, March 14, 2013
15:45 – 16:45
Room D: Measurement Track

MIMO OTA Measurement with Anechoic Chamber Method

Presented by: François Chauvet, L. J. Foged, L. Scialacqua, F. Saccardi and G. Vecchi, SATIMO

Abstract
In MIMO systems, spatial correlation, a function of antenna and propagation characteristics, plays a key role. Indeed, the level of correlation cannot be determined based on propagation characteristics without knowing the characteristics of the antenna. Similarly, the level of correlation cannot be determined based on the antenna characteristics without knowing the propagation characteristics. Therefore, it is necessary to include both antenna and propagation characteristics at the same time when testing multi-antenna terminals. In order to understand the end-to-end reception performance of a MIMO device, Over-the-Air (OTA) testing is needed. Due to the complexity of multiple antenna set-up, a flexible and fast accurate testing solution becomes a major asset in the antenna design cycle and final product verification (and consequently, Time To Market). To date, three fundamentally different approaches are being studied by the wireless industry through 3GPP (3rd Generation Partnership Project).[1] COST2100 (European Cooperation in Science and Technology),[2] and CTIA (International Association for the Wireless Telecommunication Industry). The first one is the Anechoic Chamber Based that simulates a complex multipath environment at the location of the device in a repeatable way by using radio channel emulators connected to a circular array of probes[3,4]. The other two are the reverberation chamber and the multistage methods. This paper will describe the features and highlight the advantages of the anechoic chamber based method.

Biography
François Chauvet received his PhD degree in Electronics from the University Pierre et Marie Curie, Paris VI, France in 2007. His research interests are in the antenna arrays design for radar purposes. Since 2007, François has been working as technical and customer support manager for Asia, at Satimo, a Microwave Vision Group company. He is currently based in Hong Kong. He also represents Satimo as a member of ETSI at 3GPP meetings for Standardization of MIMO testing.

Thursday, March 14, 2013
15:45 – 16:45
Room D: Measurement Track

Two-Stage MIMO OTA Research for Differentiated MIMO Device Radiation Performance Evaluation

Presented by: Ya Jing, Agilent Technologies

Abstract
Multiple antenna technology utilize the multiple path propagation characteristics of the environment to achieve the performance improvement over single antenna. The performance of multiple antenna technology is highly impacted by the antenna performance like the spatial correlation, antenna imbalance and overall antenna efficiency, etc., which are the results of both the antenna used and also the multiple path channel characteristics like the angular distributions of the paths at the transmitter side and receiver side, the power delay profiles, etc. To measure the multiple antenna

radiation performance or so called MIMO over the air test, it is thus necessary to evaluate the antenna performance under some representative channel models. There are different MIMO OTA test methods proposed to 3GPP, CTIA, etc. for MIMO over the air test, namely, multiple probe antenna based method, reverberation chamber based method and two-stage method. These methods differ in how they create and emulate the channel model to do the MIMO OTA test. In this paper, we will introduce the two-stage MIMO OTA test method, highlight its advantages for MIMO OTA test. We will also present the MIMO OTA test results on real device using two stage methods and compare the test results with simulation results to show that two-stage test method is able to provide accurate test results which are aligned with theoretical simulation results.

Biography

Ya Jing received her Ph.D. degree in wireless communication from Southeast University in 2006, and Master's and Bachelor's degrees from Chongqing University of Post and Communication in 2002 and 1999, respectively. She joined Agilent Measurement Research Lab in 2006. Her research interests include MIMO signal analysis, MIMO channel emulation and MIMO antenna performance evaluation. During the past three years her work has mainly focused on MIMO OTA test.

EDI CON 2013 MIMO / A-GPS OTA Expert Panel

Thursday, March 14, 2013
16:45 – 18:00
Room D: MIMO OTA Measurement Track – Marquee Event

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EDI CON 2013 MIMO / A-GPS OTA Expert Panel

Overview

This panel will be led by Spirent and will include three additional industry participants representing various aspects of the wireless ecosystem specific to the Asia market. Spirent and the other panelists will share their perspectives on the need for Over-The-Air (OTA) test methodologies as a means to achieve a complete picture of real-world performance for mobile devices and base stations.

Featuring: Simon Wang, Spirent Communications; Yulong Tang, ETS-Lindgren; Klas Arvidsson, Bluetest and Lin Guo, The China Academy of Telecommunication Research - Telecommunication Metrology Center (TMC)

The Changing Face of Testing: Moving from Conducted to OTA

Presented by: Simon Wang, Spirent Communications

Abstract

This discussion will consider both Multiple-In-Multiple-Out (MIMO) and Assisted Global Navigation Satellite System (A-GNSS) OTA test requirements. When paired with beamforming technology, MIMO offers the ability to deliver higher data rates, greater coverage and lower operational costs. These technologies, however, present increased complexity in RF testing of base stations and mobile device receivers making MIMO OTA testing more critical than ever before.

Equally compelling is the significant role A-GNSS technology plays in enabling the next-generation Location-Based Services (LBS), resulting in a vital need to accurately quantify and benchmark the performance of A-GNSS via OTA testing. A key objective of this panel session is to clearly illustrate the pre-commercial benefits of testing per the CTIA standards for radiated OTA performance, in addition to the 3GPP industry standards for conducted minimum performance.

Biography

Simon Wang is familiar with industry conformance and performance testing especially for conductive and OTA test and has an extensive background with RF, Protocol and application test. Wang received his Master's and Bachelor's degrees for EE from SouthEast University, and worked for Bell-Labs before joining Spirent. Simon Wang is currently the sales development director for Spirent Wireless in APAC and has 10 years work experience with T&M for pre-sales and business development.

An Introduction to Over-The-Air Performance Testing of Wireless Devices

Presented by: Yulong Tang, ETS-Lindgren

Abstract

Wireless device performance is a function of the end-to-end performance of the wireless network. The quality of a communication link is a function of the radiated signal strength of the transmitter and the radiated sensitivity of the receiver. Whenever either of these functions is degraded, the overall network performance suffers, resulting in lower data rates and increased call drops. Two industry standard metrics, Total Radiated Power (TRP) and Total Isotropic Sensitivity (TIS) have been defined to quantify the transmitter and receiver performance of a wireless device. This presentation will briefly illustrate the impact of these metrics on network link budgets, and introduce the industry standard test methodologies designed to determine the average radiated performance of the wireless device in normal operation.

Biography

Yulong Tang received his M.S. in Electrical Engineering from the California Institute of Technology in 2004. During his studies, he conducted research work on the MMIC development for radio astronomy applications, as well as mmW point-to-point communication systems. He joined TriQuint Semiconductor in 2005 as a design engineer, working on the MMIC development for wireless communication systems. Since 2008, he has been with ETS-Lindgren and working on the RF design of anechoic chambers and antenna measurement systems. His research interests include RF circuit and system design for radio astronomy, electromagnetic wave measurement and medical applications.

EDI CON 2013 MIMO / A-GPS OTA Expert Panel

Thursday, March 14, 2013
16:45 – 18:00
Room D: MIMO OTA Measurement Track - Marquee Event

MIMO Over-the-Air Testing With the Bluetest Reverberation Test System

Presented by: Klas Arvidsson, Bluetest

Abstract

In this presentation, the speaker will start with an introduction to measuring MIMO OTA with a reverberation test system, which provides a rich isotropic multipath environment for mobile device testing. Offering some practical examples from CTIA/3GPP, this presentation will discuss how measuring MIMO throughput with a reverberation test system and a channel emulator enables the recreation of more complex channels in the laboratory with increasing flexibility.

Biography

Klas Arvidsson received his M.Sc in Electrical Engineering at Chalmers University of Technology, Sweden in 1990. He has since then accumulated more than 20 years of experience from the telecom industry, both from leading positions within Ericsson working with the development of mobile network infrastructure as well as within mobile operators working with network planning and network optimization projects. In 2005-2006 Arvidsson was the project leader for the development of the radio to a WiMAX MIMO base station and in 2007 he headed the pre-study of the LTE radio within Ericsson. Since 2011, Arvidsson has been strategic product manager at Bluetest AB – the specialists in MIMO OTA measurement equipment. He is also heading the R&D team in the development of new products and Reverberation Test System measurement methods.

The EDI CON 2013 MIMO Over-the-Air Expert Panel

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Validation of the MIMO OTA Channel Model and Methods at the TMC

Presented by: Lin Guo, The China Academy of Telecommunication Research - Telecommunication Metrology Center (TMC)

Abstract

In recent years, enforcement of test and measurement standards for both performance validation and product conformity testing have provided a level platform for certifying telecommunication equipment as well as other electronic equipment. To maintain good Over-The-Air (OTA) communication, the antenna performance at its carrier frequency band is very important for wireless telecommunication equipment. For this reason, more and more certification bodies list the OTA antenna performance test as a mandatory requirement. Lin Guo of TMC will discuss how The China Academy of Telecommunication Research - Telecommunication Metrology Center validated the MIMO OTA channel model and methods in MIMO OTA early stage test development.

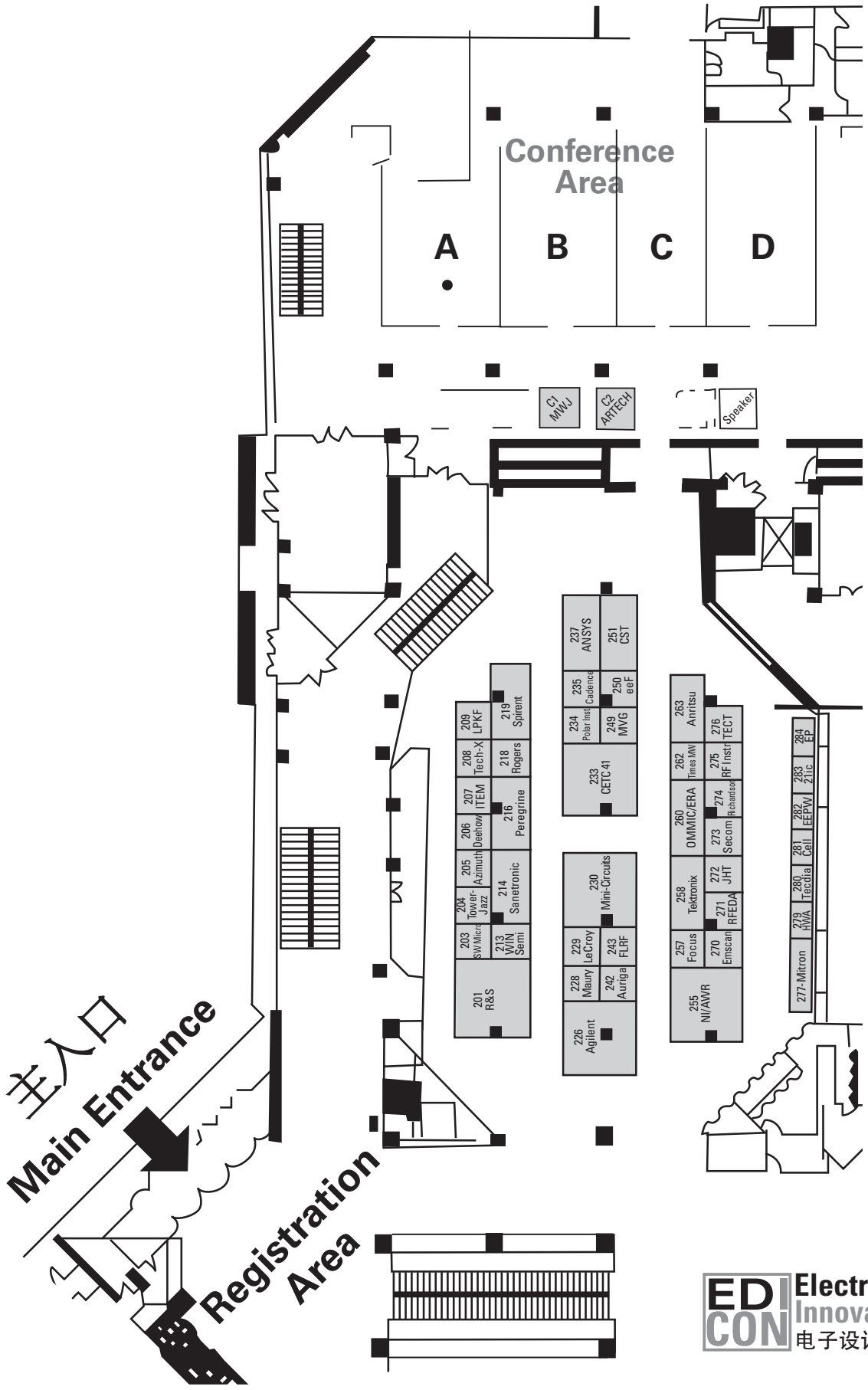
Biography

Lin Guo is principal engineer of the China Academy of Telecommunication Research (CATR) of MIIT. He graduated from the North China Electric Power University with a master's degree of Electromagnetic Field and RF technology in 2004. He started his career with the EMC test, research and standardization work at the EMC lab of CATR, then he started to run China's first OTA lab and changed his responsibility to antenna related work. He is now the Rapporteur of ITU-T SG5 Q16, member of CTIA, 3GPP and CCSA OTA standards group and drafted many related standards. He has successfully finished many national key projects and has won national awards.

Exhibitor List

The following list is complete as of February 19, 2013.

Floor Plan



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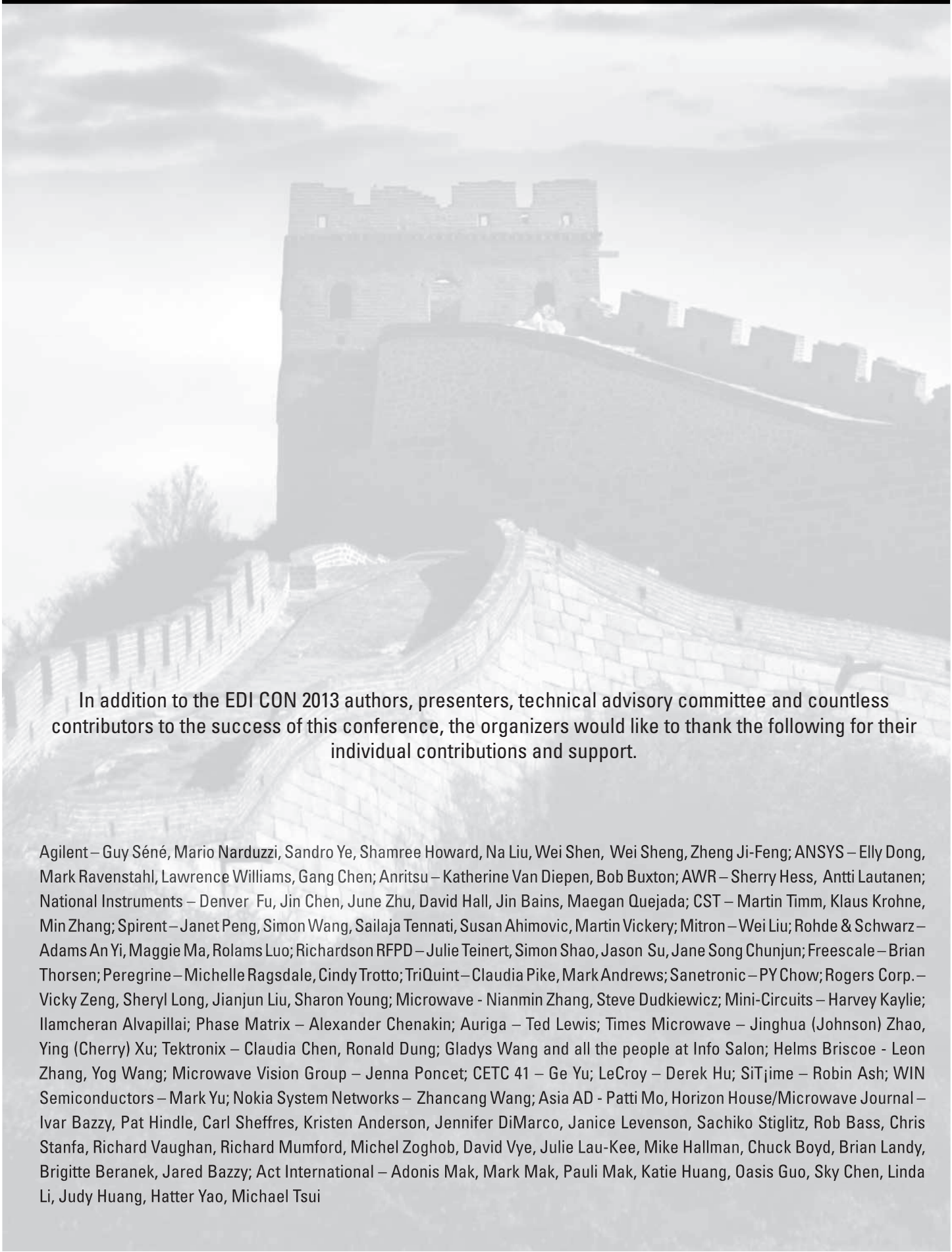
Acknowledgements



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