2009 International Microwave Symposium

7–12 June, Boston Convention & Exhibition Center IEEE Microwave Theory and Techniques Society www.ims2009.org



Program Book









Saturday

Registration 07:00- 18:00

Registration 14:00- 18:00

×5	WSA: Advances in CMOS RF Power Amplifiers for Cellular and IEEE 802 Connectivity Radios (156AB)					
84	WSB: Current and Future Trends in Frequency Generation Circuits (151AB)					
253	WSC: Advances in PA and TX Architectures (153AB)					
	WSD: Self-Interference and Co-Habitation Considerations in Complex SoC and SiP Integrated Solutions (157C)					
	WSE: Advanced BAW-Enabled Wireless Transceivers: from Devices to System Architectures (154)					
H [®]	WSF: Devices and Design Techniques for Advanced Handset/Mobile PAs (157AB)					
N ^a ;	WSG: Challenges for Future RF Integration (52A)					
8	WSH: System-Level Design and Implementation of Gb/s 60GHz Radios (152)		WSI: Technology and Power Combining Techniques for Millimeter Wave Applications (152)			
50	WSJ: Active Radio Circuits for Bio. & Medical Applications (51)		WSK: Digitally Assisted Analog and RF Circuits (156C)			
	SC-1: Advances in the Design of Electrically Small Antennas (50)		WSL: State of the Art of Low-Noise III-V Narrow-Bandgap and Silicon FET Technologies for Low-Power Applications (153C)			
			SC-2: RFID Transponders and Systems Designs (50)			

SC-3: Study of the State-of-the-Art Short-Range Wireless Networking Standards (51)

S.	Registration 07.00 - 17.00				
akfa					17:30 - 18:45 Plenary
∞ er	WMA: Tunable RF-Components and Modules for Wireless Communication Systems (151AB)				
6 g	WMB: Parameter Extraction Strategies for Compact Transistor Models (157C)				
<u>>₽</u>	WMC: PA Linearization: From Advanced Analog and Digital Techniques to Practical Real-Time Implementations (1	153AB)			
te a	WMD: Digital Receiver Systems for Defense & Related Commercial Applications (156AB)				IMS Plenary
	WME: Subharmonically Pumped Mixers: Design Theory and Systems Applications (153C)				Session:
0%Ĕ	WMF: Is GaN Ready for System Insertion? (157AB)				
≥°°	WMG: New Component Technologies for Vehicular/Industrial Radar Applications (156C)				Openly in
8 S	WMH: RF Applications of Nanotechnology: Towards a New Generation of Extremely Integrated Devices & Systems	ns (152)			Wireless
01:	SC-4: Doherty RF Power Amplifiers, Theory and Practice (52A)				Petteri Alinikula,
ŭ	SC-5: Low Phase Noise Oscillators: Lecture and Laboratory (50&51)				Nokia
- Lo	SC-5A: Low Phase Noise Oscillators: Lecture Only (50)		WMI: Gigabit Packaging of Wireless 60GHz Links (154)		BCEC Ballroom
Ś	08:00 - 11:50 RFIC Technical Sessions (204AB, 205A, 206AB, 203)		13:20 - 17:10 RFIC Technical Sessions (204AB, 205A, 206AB, 203)		west

	Registration 07:00 - 17:00					
st IMS	08:00 - 09:20 Oral Presentations	10:20 -11:40 Oral Presentations	12:00 - 13:10 Panel Session	13.20 - 14:40 Oral Presentations	15:40 - 17:00 Oral Presentations	18:30 - 20:30 Rump
≥‰ ∰			Suctom On Chin us Suctom		TU4C: CMOS Terahertz Electronics (206AB)	Pump Soccion:
	TU1D: UWB Systems and Applications (209)	TU2D: Advances in Radar Systems (209)	On-Package for Emerging 3D	TU3D: Microwave Photonic Techniques (209)	TU4D: Microwave Photonics for Communications (209)	Metamaterials: A
Sea Sea	TU1E: Ferrites & Multiferroics - Theory & Applications (210A)	TU2E: Microwave Acoustic & Power Limiting Devices (2104	()		TU4E: Transceiver Architectures for Wireless Systems (210A)	Rich Opportunity
O Si	TU1F: Implementation of CRLH Transm. Structures (210C)	TU2F: Novel Transmission Structures & Applications (2100	:)		TU4F: Industry/University Collaborative Research (210C)	for Discovery or
	TU1G: Theory & Applications of Metamaterials (211)	TU2G: Novel Structures & Effects (211)		TU3G: Frequency Domain Techniques (211)	TU4G: Advances in Time Domain Modeling (211)	Over-Hyped Gravy
0. ¥	09:20 - 10):20	Interactive Forum (210B)	14:40 - 15:40)	Train?
0	8:00 - 11:40 RFIC Technical Sessions (204	AB, 205A, 206AB)		13:20 - 14:40 RFIC Technical Sessions (20	04AB, 205A, 206AB)	Westin Harbor
				14:00 - 16:00 RFIC Interact	tive Forum (205BC)	Ballrooms II & III

Registration 07:00 - 18:30 00 F. U. D. 0. 84

	08:00 Full Day & Morning Workshops			13:00 Atternoon workshops		
ഷ്	WWA: Integration Trends Towards 4G (153AB)					
e se	WWB: RF Design Components of Magnetic Resonance S	Scanners (152)		WWC: Advanced Measurement Techniques, Adapted for	Different Memory Effects (152)	
ak g				WWD: RF MEMS Testing, Reliability, & Power Handling (151AB)		
Ba	08:00 - 09:20 Oral Presentations	10:20 -11:40 Oral Presentations	12:00 - 13:10 Panel Sessions	13:20 - 14:40 Oral Presentations	15:40 - 17:00 Oral Presentations	
e N	WE1A: High Efficiency PA Architectures (204AB)	WE2A: mmWave & CMOS Based Power Amplifiers (204AB		WE3A: Application of GaN from L to V Band (204AB)	WE4A: HF/VHF/UHF Power Amplifiers (204AB)	
0 P	WE1B: Millimeter Wave Power Amplifiers (205A)	WE2B: Front-End Components for mmWaves (205A)	Will They be Used in Defense and	WE3B: Low Noise Amplifiers from 0.3 to 96GHz (205A)	WE4B: Low Noise Technologies (205A)	
tt ö	WE1C: Compound Semiconductor for Switching (206AB)	WE2C: Si HPwr FETs to 65 nm Transceivers (206AB)	Commercial Systems? (10/ABC)	WE3C: Advances in mmWave Signal Generation (206AB)	WE4C: System Level Packaging & Applications (206AB)	
S 8	WE1D: Novel Packaging Materials & Processes (209)	WE2D: Novel Component-Level Packaging Appr. (209)	Easter than Eiber: Enabling Multi-		WE4D: Smart Antennas & Phased Arrays (209)	
ËΪ	WE1E: Power Dividers (210A)	WE2E: Innovative Power Dividers & Couplers (210A)	Gigabit Wireless Communication Links	WE3E: 180° Hybrid Development (210A)	WE4E: Advanced Passive Components Technology (210A)	
	WE1F: Reconfigurable Filters (210C)	WE2F: Novel Tunable Filters (210C)	(104 ABC)	WE3F: Synthesis of Planar Filters & Multiplexers (210C)	WE4F: Advanced Planar Filter Design (210C)	
	WE1G: Efficient CAD Optimization Methods (211)			WE3G: Ampl. Behavioral & FET NI Mod. (211)	WE4G: Linear and Non-Linear Modeling (211)	
	09:20 - 10	0:20 Int	teractive Forum (205BC/210B)	14:40 - 15:40)	

12:00 Panel Session

A Return to the Classic Heterodyne Architecture for Integrated Transceivers? (104ABC)

Interactive Forum (205BC/210B)

day	:00 IMS	kreakfast
Thur	07:00 - 0	Attendee

Wednesday

Friday 07:00 - 09:00 Workshop & ARFIG Attendee Breakfasts Registration 07:00 - 09:00 08:00 Full Day and Morning Workshops WFA: EM-Based Microwave Optimization Technology: State of the Art and Applications (151B)

Registration 07:00 - 15:00 08:00 - 09:20 Oral Presentations

TH1A: Power Amplifier Linearization (204AB)

TH1E: MEMS Circuits & Applications (210A)

WFB: Modern RFID: Inkjet Printing of "Green" RFID and RFID-enabled Sensors on Flexible Substrates (152)

TH1B: Frequency Conversion & Control Circuits (205A) TH2B: Wireless Sensor Technologies (205A)

09:20 - 10:20

TH1C: Technologies for Large Scale Integration (206AB) TH2C: Reflect Arrays & Power Combining (206AB)

TH1D: Mixed-Signal GHz-Transceiver Front-Ends (209) TH2D: Instrumentation for Nonlinear Characterization (209)

WFC: Recent Advances in Microwave Power Applications and Techniques (RAMPAnT) (156C)

WFD: Emerging Applications of RF-MEMS (153AB)

WFE: Stability of Nonlinear Microwave Circuits and Systems: Concepts, Analysis, and Design (156A)

08:00 - 12:00 ARFTG Technical Sessions (102AB & 104AB)

10:20 -11:40 Oral Presentations

TH2E: Advances in RF MEMS Switches (210A)

TH2F: Innovations in Waveguide Filters (210C)

TH2G: Advanced Microwave CAD (211)

13:30 - 16:40 ARFTG Technical Sessions (102AB & 104AB)

TH3C: Multi-Disciplinary Measurement Techniques (206AB) TH4C: Advances in RF Positioning (206AB)

TH3F: Adv. Realization & Synthesis of High Q Filters (210C) TH4F: Compact Microwave Filters (210C) TH3G: Modeling for Nonlinear Circuits & Systems (211) TH4G: Nonlinear Circuits & Systems Simulation Techn. (211)

14:40 - 15:40

TH3D: Biol.& Med.Appl: Sensing and Monitoring (209) TH4D: Biological & Medical Applications: Imaging (209)

15:40 - 17:00 Oral Presentations

TH4A: High Power Amplifier Techniques (204AB)

TH4B: Microwave History in the Boston Area (205A)

TH4E: Advances in Superconductivity Technology (210A)

13.20 - 14:40 Oral Presentations

TH3B: Progress in Microwave Oscillators (205A)

TH3A: High Power Amplifiers (204AB)

Student Events Social Events **Guest Program** RFIC Symposium Reception 19:00-22:00 Westin Grand Ballroom Harvard University and the JFK Library Student Volunteers 12:30 - 17:00 are actively solicited, see Boston Duck Tours: The Ride of Your Life ims2009.org/studentvol. html for details. 13:00 - 15:00 **Student Travel Grants** are available, see ims2009.org/studentcomp html for details. Student Events Social Events **Guest Program** IMS 2009 Gulf Tournament A Tour of Newport and Its Mansions 08:30 - 17:00 07:00 - 14:00 Granite Links Golf Club, Quincy, MA MTT-S Welcome Reception 19:00 - 21:00 BCEC Ballroom East Complete Tour of Boston: 350 years in a Day 09:00 - 13:00 **Student Events** Social Events **Guest Program** GOLD Reception 17:30 - 19:30 Wrentham Village Outlets 10:00 - 17:00 Student Design Competitions 09:00 - 11:00 Fish Exchange Building, 1 Fish Pier IEEE MTT-S Women in Microwaves Reception, 18:00 - 20:00 BCEC 105 Student Design Competition 13:00 - 17:00 The Boston Freedom Trail Walking Tour 09:30 - 13:30 BCFC 105 Westin Commony alth Ballroom A Student Paper Competition 14:00 - 16:00 BCEC 104ABC Ham Radio Social Boston Red Sox - Fenway Park 19:00 - 22:00 19:00 Westin Commo vealth Ballroom C Boston Pops Performance 20:00 **Student Events Social Events Guest Program** Gloucester and Rockport—Scenic Cape Ann Industry Cocktail Reception 17:00 - 18:30 BCEC Exhibit Hall MTT-S IMS Awards Banquet 09:00 - 17:00 Bike Through the Streets of Boston 19:00 - 22:00 09:30 - 13:30 BCFC Balln Lexington & Concord - The Shot Heard 'Round the World 09:00 - 13:30

Student Events

Student Job Fair 13:00 - 17:00

253ABC

Student Awards Luncheon 12:00 - 14:00

Social Events **Guest Program** MTT-S Student Awards Luncheon 12:00 - 14:00 Masterpieces of Art-Museum of Fine Art 10:00 - 14:00 Westin Commonwealth Ballroom Thursday Evening Social Cruise 19:00 - 21:00 Boston Duck Tours: The Ride of Your Life Provincetown II at the World Trade Ctr. 11:00 - 13:00

June 2009 Ξ

7 June 2009

2009

June

 ∞

2009

June :

൭

June 2009

0

12 June 2009

Table of Contents

Microwave Week Schedule Overview Inside Front Cover Table of Contents Welcome from the General Chair What's New in Microwave Week? 2 **IMS Steering Committee** 3 **IMS Program Overview** Welcome from IMS Technical Program Co-Chairs 4 Plenary Session: Innovating Openly in Wireless 4 **IMS Technical Program Committee** 5 IMS Focus and Special Sessions 6 7 **Student Competitions** Workshops and Short Courses 8 **RFIC Program Overview** Welcome from RFIC Chair 9 9 **RFIC Steering Committee** 9 **RFIC Technical Program Committee Plenary Session** 10 **ARFTG Program Overview** Welcome from ARFTG Chair 11 **ARFTG Steering Committee** 11 **ARFTG Technical Program Committee** 11 MTT Historical Exhibit 12 **IEEE and MTT-S Membership** 13 U.S. Visa Advisory 13 **Conference Registration** 14-16 Workshop and Short Course Index 17 Accommodations 18-19 20 Transportation 21 **IEEE MTT-S Administrative Committee** Future MTT-S International Microwave Symposia 21 **IEEE MTT-S Awards** 22 **Technical Program** Presentations 24-25 Monday (RFIC) Tuesday (RFIC & IMS) 26-33 Wednesday (IMS) 34-43 Thursday (IMS) 44-53 Friday (ARFTG) 54-55 **IMS Panel and Rump Sessions** 56-57 **RFIC, IMS & ARFTG Workshops** 58-69 Short Courses 70-71 **Exhibition MicroApps** 72-73 **Sponsoring Exhibitors** 73 74-75 **Exhibitor Listing** Social and Special Events 76-77 **Guest Program** 78-80 **Boston Convention & Exhibition Center Maps** 81 WalkBoston Map **Back Cover**

Welcome to Microwave Week

Welcome from the General Chair

On behalf of the entire Steering Committee I am pleased to invite and welcome you to International Microwave Symposium. We plan to have over 10,000 participants with over 500 exhibiting companies and listen to over 600 technical presentations. We have been working hard to make this the best symposium ever with numerous improvements and innovations. See "What's New" below.

The symposium is returning to Boston for the 6th time. The first one was in 1959, 50 years ago. That symposium was held across the river at Harvard University in Cambridge. Although much has changed over 50 years, the tradition of providing a top notch technical program and innovative conference amenities continues, and the microwave industry in the Boston area continues to grow.

Before you make your travel plans be sure to look at the schedule and "What's New" below. As usual Microwave Week will include RFIC, IMS and ARFTG. We have fine tuned the schedule. The IMS Plenary Session will be held Monday evening, directly before the reception. The Keynote Speaker, Petteri Alinikula of the Nokia Research Center, will speak on "Innovating Openly in Wireless," a talk you don't want to miss. The Plenary session is open to all attendees.

Our guest program gives you opportunities to explore the Boston area. Take a day off or stay an extra day or two and invite a companion to enjoy New England. If you enjoy sports, you will have the opportunity to witness the greatest rivalry in American sport as the New York Yankees take on the Boston Red Sox in historic Fenway Park. We will have a limited number of tickets available through our guest program.

Make time for the IMS Exhibit, the largest RF and Microwave exhibition in the world. It will be easier than ever to meet with exhibitors that interest you. We



have upgraded MicroApps, so make plans to attend. The Historical Exhibit will include some very interesting local flavor including the first commercial and consumer microwave oven. A special feature is the free "Exhibit Only" registration on Wednesday afternoon that will culminate in the Industry Hosted Reception on the Exhibit Hall Floor.

The MTT Society Awards Banquet will immediately follow the Wednesday reception. The featured speaker will be noted technologist, educator and futurist Dr. David Thornburg. Given the turbulent times we are in, you'll be very interested to hear what he has to say. See page 77 for more details.

I hope to see you in Boston in June! In the meantime, make sure to go to www.ims2009.org for the latest news.

Fred Schindler General Chair, IMS 2009

What's New in Microwave Week?

With so many activities and demands, Microwave Week can be hard to manage. We have fine tuned many features of Microwave Week to make it easier to participate in the events that are most important to you. Some of the changes that you will see at this year's IMS are:

Technical Program

- > Monday evening Plenary session.
- Technical sessions are organized into four focus tracks, making it easier to find papers of interest to you.
- Interactive Forum papers will be presented during full 1 hour breaks in the morning and again in the afternoon.

Print on Demand

> PoD kiosks will be available throughout the convention center to allow you to print out any paper, free!

Workshops

 IMS, RFIC & ARFTG workshops will be held Sunday, Monday, Wednesday and Friday.

Short Courses

- Short Courses for those that want in depth instruction in specific areas.
- > Continuing Education Credits will be available.

Virtual Participation

 Catch up on events that you missed or participate even if you can't come to Boston with Virtual Participation.

MicroApps

 Commercially oriented technical presentations in the upgraded MicroApps Theater in the Exhibit Hall.

Historical Exhibit

 Articles of local interest will be added to the exhibit, including some of the first commercial and consumer microwave ovens.

Feedback and Best Paper Contests

- > To keep the symposium targeted to the needs of the attendees, we are soliciting feedback on your views of the IMS.
- There will be awards for best paper, workshop and panel sessions, based on attendee feedback.

Social Activities

- The Wednesday evening Industry hosted reception before the Awards Banquet will be held on the Exhibit floor.
- A new Thursday evening social if you stay to the end of the symposium, attend Friday workshops or ARFTG.

Student Job Fair

 Meet potential employers, open Thursday, 13:00 - 17:00, to students only.

3 Registration Tiers

 Registration never closes. The best prices are for Early Bird, reduced prices are during Advance, and final prices are On Site.

Special Offers

- Free Exhibit Only registration on Wednesday starting at noon gets you into the world's best RF/Microwave Trade Show, including the evening reception.
- Free retiree Thursday one day Technical Registration.
- SuperPass gives you almost everything and a 15% discount.
- > Discounts for student volunteers.

For more details and all the latest information, visit www.ims2009.org

IMS Technical Program

IMS Steering Committee



General Chair Fred Schindler

Technical Program Mark Gouker, Co-Chair Larry Kushner, Co-Chair

- >Workshops Greg Lyons, Chair Cheryl Liss Doug Teeter Matt Straayer
- Short Courses Robert Jackson, Chair
- Virtual Participation Charlotte Blair, Chair Jon Comeau Dru Reynolds Matt Morton Chin-soon Teoh
- Panel and Rump Sessions
 Phillip Smith, Chair
 Frank Sullivan
 Chris Liessner
- >Interactive Forum Dan Swanson, Co-Chair Chris Galbraith, Co-Chair
- >MicroApps Dave Menzer, Chair Carl Schaefer Steve Richard
- >Focus and Special Sessions Tim Hancock, Chair George Jerinic
- >Plenary Session John Heaton, Chair

>Student Competitions >Programs

- Jim Komiak, Chair Jim Huang >RFIC Liaison
- Luciano Boglione, Chair Larry Whicker
- >ARFTG Liaison Charles Wilker, Chair
- >Feedback Cheryl Liss, Chair Steve Lardizabel

Publications & Publicity

George Heiter, Co-Chair Nick Kolias, Co-Chair

- >Logo & Branding Roger Sudbury, Chair Rich Bushey Dave Vye
- >Electronic Paper Management Jon Hacker Roger Pollard
- Website Kathleen Ballos, Chair Mitch Shifrin Tim Lee
- >**TPC Meeting** Chad Deckman
- >Magazine Special Issue Editor Steve McKnight
- >Calls for Papers Candice Brittain, Chair
- >Proceedings CD Don Sherwood, Chair

- Tom Perkins, Chair
- George Duh John Guenard Nick Kingsley Pete Alfano Judi Glidden
- >PDA Program Tim Lee
- >Workshop Notes & CD(s) Candice Brittain, Chair Nick Kingsley

Raghu Mallavarpu Amit Burstein >Electronic Services

Françios Colomb, Chair Pat Hindle Dogan Gunes Mike Parkes

- >Signs
- Matt Morton, Chair

>Photography Paul Martyniuk, Chair Jim Lyle Tammy Lyle

>Marketing & Publicity

- Howie Vogel, Co-Chair Carl Sheffres, Co-Chair Dave Vye Pat Hindle
- >Publicity Items / Gifts Mark Lewis, Chair Ke Wu

Operations

- Luciano Boglione, Chair
- >**Treasurer** Bob Alongi

>Registration

Joe Nizko, Co-Chair Jeremy Muldavin, Co-Chair Shamsur Mazumder

- >Exhibition
- Lee Wood Nancy Cummings
- >University Booths Luciano Boglione
- >Public Relations Emily Taylor
- Historical Paul Martyniuk, Chair Mike Virostko Ian Gresham Steve Stitzer

>International Liaison Zaher Bardai, Chair Phillip Smith

- >Protocol Peter Staecker, Chair
- >Conference Services Larry Whicker
- >Administrator Joanne Fulciniti
- **Local Arrangements**
- Tom Costas, Chair >Meeting Planner
- Jennifer More
- >Destination Management Darlene Johnson Best of Boston
- >Banquet Ray Waterman, Chair Cliff Drubin

- >Women in Microwaves Katherine Herrick
- >Transportation Bob Alongi, Chair
- >AV Dogan Gunes, Chair >IT
- Mike Parkes
- >Student Volunteers Cleo Alexander, Chair Diane Bull

>Student Job Fair

Ray Pavio, Chair Mike Parkes Pavlo Fedorenko

- >GOLD
 - Chris Galbraith, Co-Chair Sergio Pacheco, Co-Chair
 - >Malt Zymurgy Ian Gresham, Chair
 - >Guest Programs Grace Chu, Chair Carolyn Colomb
 - Marcia Felth Joanne Fulciniti
 - >Golf Outing Al Guarino, Chair
 - >Amateur Radio Tom Perkins, AC1J
 - >At Large Ted Saad Dick Sparks Glenn Thoren

IMS Technical Program

Welcome from IMS Technical Program Co-Chairs



We welcome you to Boston, a city rich in both American and microwave engineering history. There are many refinements to this year's IMS that should make it easier to navigate, more productive, and more enjoyable to attend.

The first change you will notice is the color-coded focus tracks that make the topic of an oral session or interactive forum paper readily apparent. The technical content of the symposium is divided into four tracks—Microwave Modeling, Active Components, Passive Components and Microwave Systems. Each track will be identified by a specific color in both the Oral Presentations and Interactive Forum sessions. The signage at the symposium and this program book reflect this organization. See pages inside front cover for a first look. Note how the focus tracks are spread throughout the week to minimize overlap of technical sessions in the same focus track.

The second change you will notice is the change in the Microwave Week schedule. The Plenary

Session will be held Monday evening before the kick-off reception. The interactive forum papers will be presented during 1-hour time slots in the morning and afternoon, between the oral sessions, in rooms adjacent to the oral sessions of the same topic. We have arranged the Active Component Focus Track to complement the RFIC program and added related Wednesday workshops, so RFIC attendees will find relevant technical activities of interest during the IMS, immediately following the RFIC.

Finally, we want to mention that the IMS web site has information to make it easier to choose which workshops to attend. The ims2009.org web site contains not only the workshop abstracts but also the abstracts of the various presentations in the workshop. This additional information will give you a better idea of the topics that will be covered.

Two key reasons for the success of the IMS are the authors who desire to submit their papers to the symposium and the members of the microwave community that attend. The success of the symposium is also due to the hard work of hundreds of volunteers on the Technical Program Committee, the Boston Steering committee and others. We thank you all.

This year 868 papers were submitted and 430 were accepted — 294 as oral papers and 136 as interactive forum papers. The technical program is complemented by 30 workshops, 5 short course, 5 panel sessions and 1 rump session. At all of the technical sessions we will be asking for inputs from you. We want the conference attendees to give the speakers, session organizers, and IMS steering committee feedback on what you liked, and what can be improved. Awards will be given to the best speakers and session organizers, to encourage the highest quality work. There will also be random drawings to reward you for taking the time to fill out feedback forms.

We hope attending the symposium is both rewarding and enjoyable. Please let us know what you think about the changes we have made this year and how the IMS can be made even better in the future.

Mark Gouker, Larry Kushner Co-Chairs, IMS 2009 Technical Program Committee

Plenary Session: Innovating Openly in Wireless

NOTE: New day and time:

Monday, 17:30 - 18:45

BCEC Ballroom West



Petteri Alinikula, Vice President of Core Technology Research, Nokia

In this presentation, experiences in open innovation in wireless research are discussed from Nokia Research Center's perspective. The research agenda has been geared towards challenging new radio systems, disruptive device implementation aspects and innovative usage of electromagnetic waves. Nokia Research Center has taken a systematic approach in promoting open innovation and in building a global open innovation network with strong university partners. The wireless industry is in transition from telecom towards convergence of mobility and the Internet. The next Billion new Internet users will get to know the Internet through mobile devices. Simultaneously, the offering of consumer Internet services is exploding, driven by advertisement-based business models and Web 2.0 services. Smart environments, e.g. public places like shopping malls, private places like homes or personal vicinity, with interoperable devices and ubiquitous computing will further stretch the energy efficiency requirement of the devices. Smart spaces, new services and business models will introduce significantly more interdisciplinary hard challenges for this research. With open innovation, we can harness the best experts to jointly solve them.

Petteri Alinikula is heading Nokia Research Center, Helsinki. His laboratory focuses on breakthrough technology

research in wireless systems and implementation of high performance mobile platforms and user interfaces. He has been with Nokia Research Center since 1993 in several management positions, most recently as Vice President of Core Technology Research and Head of Strategic Research, Wireless Access. He has worked within Nokia to build a solid strategic research program that has directly impacted the company's products and technologies. Before joining Nokia, Petteri worked at Helsinki University of Technology leading a research team in integrated circuits for communications. Petteri earned his Ph.D. in Electrical Engineering from Pennsylvania State University, USA in 1992 and Engineering Diploma in Radio Engineering from the Helsinki University of Technology in 1988.

IMS Technical Committee

>Field Analysis & Guided Waves

Tapan Sarkar, Chair David Jackson, Vice-Chair Jan Machac Arthur Oliner Ingo Wolff Kai Chang Natalia Nikolova Barry Spielman

>Frequency Domain Techniques

Luca Perregrini, Chair Abbas Omar, Vice-Chair Magdalena Salazar-Palma Wilfrid Pascher Atef Elsherbeni Paolo Lampariello

>Time Domain Techniques

Ruediger Vahldieck, Chair Luca Roselli, Vice-Chair Zhizhang (David) Chen Wolfgang J. R. Hoefer Nathan Bushyager Malgorzata Celuch Costas Sarris Poman So

>CAD Algorithms & Techniques

Paul Draxler, Chair Jose E. Rayas-Sanchez, Vice-Chair John Bandler Q.J. Zhang Arvind Sharma Peter Aaen Michel Nakhla

>Linear & Non-linear Device Modeling

Yusuke Tajima, Chair John Atherton, Vice-Chair Dave Halchin David Root Chris Snowden Robert Trew Matthias Rudolph Wayne Struble Robert Leoni

>Nonlinear Circuit Analysis & System Simulation

Almudena Suarez, Chair Vittorio Rizzoli, Vice-Chair Thomas Brazil Jose Pedro Kevin Gard Dominique Schreurs

>Transmission Line Elements

Tatsuo Itoh, Chair George Eleftherides, Vice-Chair George Ponchak Ke Wu Francisco Mesa Branka Jokanovic

>Passive Circuit Elements

Nick Kolias, Chair Allen Podell, Vice-Chair Victor Fouad Hanna John Owens Inder Bahl Jesse Taub Christopher Galbraith Roberto Vincenti Gatti Peter Russer Linda Katehi Samir El-Ghazaly Rashaunda Henderson

>Planar Passive Filters & Multiplexers

Chi Wang, Chair James Rautio, Vice-Chair Roberto Sorrentino Raafat Mansour Jeff Pond Doug Jachowski Bob Wenzel

>Non-Planar Passive Filters & Multiplexers

Vicente Boria, Chair Giuseppe Macchiarella, Vice-Chair Ming Yu H. Clark Bell Richard Snyder Kawthar Zaki Huiwen Yao Daniel Swanson

>Active & Integrated Filters

Har Dayal, Chair Atsushi Sanada, Vice-Chair Ian Hunter Youji Kotsuka Pierre Blondy Sanghoon Shin

>Ferroelectric, Ferrite, & Acoustic Wave Components

Spartak Gevorgian, Chair Amir Mortazawi, Vice-Chair Steve Stitzer Lionel Davis Robert Weigel Clemens Ruppel

>MEMS Components & Technologies

Scott Barker, Chair John Ebel, Vice-Chair J.C. Chiao Chuck Goldsmith Youngwoo Kwon Gabriel Rebeiz Tom Weller James Hwang

Semiconductor Devices and Monolithic IC Technologies

Tsuneo Tokumitsu, Chair Ho Huang, Vice-Chair Timothy Lee Zaher Bardai Paul Watson Cheng (CP) Wen Edmar Camargo Bernard Geller Vesna Radisic Jonathan Comeau

>Signal Generation

Amarpal (Paul) Khanna, Chair H. John Kuno, Vice-Chair Scott Wetenkamp Yi-Jan Emery Chen John Papapolymerou Kenjiro Nishikawa Bhaskar Banerjee Danny Elad

>Frequency Conversion & Control

Brad Nelson, Chair Huei Wang, Vice-Chair Mohammad Madihian Kenji Itoh Deuk Hyoun Heo Hiroshi Okazaki Jae-Sung Rieh Stephen Maas

>HF/VHF/UHF Technologies & Applications

Frederick Raab, Chair Richard Campbell, Vice-Chair Robert Caverly Alina Moussessian James (Jim) Komiak

Power-Amplifier Devices & Integrated Circuits

Anh-Vu Pham, Chair Wayne Kennan, Vice-Chair Wolfgang Heinrich Charles Weitzel Raghu Mallavarpu Peter Asbeck Leo de Vreede Chang-Ho Lee Aryeh Platzker Debasis Dawn Doug Teeter Frank Sullivan John Heaton

IMS Technical Program

>High-Power Amplifiers

Steve Cripps, Chair Kiki Ikossi, Vice-Chair Paul Tasker James Schellenberg Bumman Kim John Wood Allen Katz Fadhel Ghannouchi

>Low Noise Components and Receivers

Terry Cisco, Chair Phillip Smith, Vice-Chair Marian Pospieszalski Francois Danneville James Whelehan William Deal Alfred Riddle

>Millimeter Wave & Terahertz Components & Technologies

Eric Bryerton, Chair Edward Niehenke, Vice-Chair James Wiltse John Cunningham Gailon Brehm Debabani Choudhury Koji Mizuno Goutam Chattopadhyay Asher Madjar Young-Kai Chen H.Alfred Hung Reynold Kagiwada Kenichi Maruhashi Robert Weikle

>Microwave Photonics

Bill Jemison, Chair Edward Rezek, Vice-Chair Dalma Novak Dieter Jaeger Tibor Berceli Ronald Reano Yifei Li

>Digital Circuits &

Systems at GHz Speeds Keh-Chung Wang, Chair Agnieszka Konczykowska, Vice-Chair Edward Gebara Koichi Murata Hermann Boss Andreas Weisshaar

>Packaging, Interconnects, MCMs, & Hybrid Manufacturing

Kavita Goverdhanam, Chair Eric Strid, Vice-Chair Ken Wong Bruce Kopp Clive Tzuang Mazumder Shamsur Mohamed Megahed Rudy Emrick

>Instrumentation & Measurement Techniques

Andrea Ferrero, Chair Michael Janezic, Vice-Chair Chris Scholz Kate Remley John Barr Jon Martens Roger Pollard Nuno Borges Carvalho

>Biological Effects and Medical Applications

Mohammad-Reza Tofighi, Chair Arye Rosen, Vice-Chair Claude Weil Gerald Dejean Guglielmo D'Inzeo Daniela Staiculescu Joseph Pribetich Anand Gopinath

>Smart Antennas, Spatial Power Combining, & Phased Arrays

Julio Navarro, Chair Constantine Balanis, Vice-Chair Jozef Modelski Kiyo Tomiyasu RongLin Li Wayne Shiroma Nickolas Kingsley Chris Rodenbeck

>Radars & Broadband Communication Systems

Reinhard Knoechel, Chair Glenn Hopkins, Vice-Chair Mohamed Abouzahra Ryan Miyamoto Gregory Lyons Ramesh Gupta Roger Kaul Arne Jacob

>Wireless & Cellular Communication Systems

Vijay Nair, Chair Johann Luy, Vice-Chair Nicholas Buris Richard Ranson John Horton Shoichi Narahashi Kyutae Lim Yuanxun Wang Patric Heide

Sensors and Sensor Systems

Alan Jenkins, Chair Ian Gresham, Vice-Chair George Heiter Hiroshi Kondoh Peter Staecker Manos Tentzeris Lora Schulwitz

IMS Technical Program

IMS Focus and Special Sessions

Tim Hancock, Chair

This year in Boston we have five focus sessions that highlight a wide variety of advance technologies including devices, circuits, systems and modeling/ simulation. Session TH1C – Heterogeneous Integration on Silicon will present work in the area of device integration (III-V, etc.) on silicon. Session TU4C – THz CMOS will present the state-of-the-art work in CMOS at frequencies approaching the Terahertz regime. If RF sensors and systems is your area of interest, session TH4C – RF Positioning will focus on non-GPS based positioning techniques. Session WE1G –Modeling and simulation is represented by the session Computationally Efficient Design Optimization. A Session that spans several applications is TH4E – Recent Advances in Superconductor Technology where the applications cover from cellular base station filters to particle accelerators.

In addition to these five focus sessions, we have two special sessions that will discuss topics that are sure to be of interest to IMS attendees. The first session TU4F – Industry/University Collaboration will address the benefits and challenges of collaborations as well as the mechanics of setting up a program. The second session focuses on the history of microwaves in the Boston area (TH4B). It will highlight everything from the development of the microwave oven to MMIC development at Raytheon for phased array radar systems. We are encouraging local retirees to attend and are offering them free registration on Thursday afternoon. Also light refreshments will be provided for this special session, so come and chat with the microwave pioneers from the Boston area.

IMS Panel/Rump Sessions

Phillip Smith, Chair

Panel and rump sessions bring together experts in a particular area to engage in a lively discussion on topics of contemporary interest to the MTT community.

This year's IMS will feature four lunchtime panel sessions as well as a Tuesday evening rump session. Audience interaction and participation are strongly encouraged. Along those lines, we will be experimenting with the use of so-called "audience response systems" this year, for the first time, enabling realtime polling of audience members during the session. These "RF clickers", now widely used on college campuses, allow audience response to multiple choice questions to be quickly collected and shown. Another first this year: awards will be given to panel session organizers who have excelled in the task at hand. One award will be made for the "Most Well-Attended Panel Session", while a second will be given for the "Most Interesting Panel Session", as evaluated through audience feedback.

Panel sessions are open to all conference attendees — no registration is required. This year's IMS panel and rump sessions are as follows:

12:00 - 13:10	109AB	12:00 - 13:10	107ABC	12:00 - 13:10	104ABC	
Tuesday Lunch Panel Session		Wednesday Lunch Pan	el Session	Thursday Lunch Panel	Session	
System-On-Chip vs. System-On-Packag Emerging 3D Microsystems Details on	e for page 56.	SiGe/CMOS RF-IC Phased Arrays: Will They be Used in Defense and Commercial Systems? Details on page 56.		A Return to the Classic Heterodyne Architecture for Integrated Transceivers? Details on page 57.		
18:30 - 20:30 Westin Grand	d Ballroom	12:00 - 13:10	104ABC			
Tuesday Evening Rump Session		Wednesday Lunch Pan	el Session			
Metamaterials: A Rich Opportunity for D an Over-Hyped Gravy Train? Details on p	iscovery or bage 56.	Faster than Fiber: Enabling Multi-Gigabit Wireless Communication Links. Details on page 57.				
RFIC Panel Sessions						
Yuhua Cheng, <i>Chai</i> r						
12:00 – 13:10	205B	12:00 - 13:10	107B			
Monday Panel Session		Tuesday Panel Session				
Who Will Win the Battle for the Gigabi in Your Home: WirelessHD, 802.11n, W or UWB? For details see the RFIC Prog	t Wireless ireless USB, ram.	Will RF CMOS be Practical Beyond? For details see the	for 60GHz Radio and RFIC Program.			

GOLD Panel Sessions

Chris Galbraith, Sergio Pacheco, Co-Chairs

08:00 - 09:20

00 - 09:20

Thursday GOLD Panel Session

Financial Investments in Times of Crisis. Details on page 57.

10:20 - 11:40

103

Thursday GOLD Panel Session

Is Achieving Work-Life Balance in Microwave Engineering an Oxymoron? Details on page 57.

103

Student Competitions

Student Paper Competition

James Komiak, Chair

Tuesday, 14:00 - 16:00

104ABC

The Student Paper Competition has become one of the largest events at IMS. The purpose of the competition is to determine and acknowledge the best student work of the year in the MTT-S. This year we received 232 student papers approximately 25% of all submissions. Each student paper went through the regular review process by the Technical Program Committee. Based on the review scores only the best student papers are accepted as finalists. The finalists are given complimentary registration for IMS2009, complimentary tickets to the MTT-S Awards Banquet, and travel subsidies. The student finalists will present their papers at the appropriate regular sessions and make special presentations at the Interactive Forum on Tuesday where they will be evaluated by a group of judges. Six top papers and four honorable mentions will be selected to receive cash awards and certificates. These will be announced and presented at the Student Awards Luncheon on Thursday.

TU2G-3: Slotline Operating within a Wide Frequency Band: Excitation of Waves by a Real Source on Lambda/4 Open Stripline T Section V. Kotlan¹, J. Machac¹, F. Mesa², ¹Czech Technical University, Prague, Czech Republic, ²University of T. H. Duong, I. S. Kim, Kyung Hee University, Yongin, Republic of Korea Seville, Spain WE1F-5: Parallel-Coupled Switched Delay Line (SDL) Reconfigurable Micro-Mobility Enhancement and Dynamic Body Biases wave Filter K. Yeh, C. Ku, W. Hong, J. Guo, National Chiao-Tung University, Hsin-chu, Taiwan P. W. Wong, I. C. Hunter, The Institute of Microwaves and Photonics, Leeds, United Kingdom TU1D-2: 60GHz UWB-over-Fiber System for In-flight Communications TU4G-5: A General Methodology for Introducing Structured Nonorthogonal Grids into High-Order Finite-Difference Time-Domain Methods R. B. Armenta, C. D. Sarris, University of Toronto, Canada Waveform Engineering TH1B-1: A 3 mW V-Band Divide-by-2 and W-Band Divide-by-4 Wide Locking Range Frequency Dividers in 90-nm CMOS C. Chen¹, H. Wang¹, H. Tsao¹, C. Wang², ¹National Taiwan University, Taipei, Taiwan, ²MediaTek, Systems Hsin-Chu, Taiwan WE4D-1: Flex-Rigid Architecture for Active Millimeter-Wave Antenna Arrays Research of Quebec (CREER), Ecole Polytechnique de Montreal, Canada A. Geise, A. F. Jacob, Technische Universität Hamburg-Harburg, Germany TH2E-3: Miniature RF MEMS Switch Matrices WE4A-1: HF Outphasing Transmitter using class-E Power Amplifiers A. A. Fomani, R. Mansour, University of Waterloo, Canada R. A. Beltran Lizarraga¹, F. H. Raab², A. Velazquez Ventura¹, ¹CICESE Research Center, Ensenada, Mexico, ²Green Mountain Radio Research, Colchester, Vermont, United States Amplifier TH4F-1: Dual-Mode Half-Cut Dielectric Resonator Filters M. Memarian, R. R. Mansour, University of Waterloo, Canada TU1F-3: Composite Right/Left-Handed Substrate Integrated Waveguide and Half-Mode Substrate Integrated Waveguide **Finite Element Method** Y. Dong, T. Itoh, University of California, Los Angeles, California, United States China, Chengdu, China, ²Carleton University, Ottawa, Canada WE1E-2: Five-Way Power Divider Based on Dielectric Resonator Whispering-Gallery Modes Frequency Down-Conversion L. K. Hady, A. A. Kishk, D. Kajfez, The University of Mississippi, United States WE3C-4: V-band 8th Harmonic Push-Push Oscillator Using Microstrip Ring Resonator K. Kawasaki, T. Tanaka, M. Aikawa, Saga university, Saga-shi, Japan Sensing of up to 300C TU1E-2: Ferrite Effective Perfect Magnetic Conductor (FE-PMC) and Applica-S. Scott, D. Peroulis, Purdue University, Lafayette, Indiana, United States tion to Waveguide Miniaturization A. Shahvarpour, C. Caloz, École Polytechnique de Montréal, Canada a Dipole Radiator for Cardiovascular Implantable Devices TH1D-1: A 9-bit 2.9GHz Direct Digital Synthesizer MMIC with Direct Digital Frequency and Phase Modulations X. Geng, F. F. Dai, J. D. Irwin, R. C. Jaeger, Auburn University, United States cally Aligned Anisotropic Conductive Adhesive

Student Design Competitions

The Technical Committees of MTT-S are sponsoring three Student Design Competitions at IMS. This year the student competition topics are low noise amplifier, packaged ultra-wide-band filter, and high efficiency power amplifier. These topics are geared toward the practical applications that working engineers face everyday and therefore represent an excellent opportunity for students to show off how well prepared they are for a professional career. These competitions are open to all students registered at an educational institution. The winners will receive cash awards and participants will be recognized at the Student Awards Luncheon on Thursday.

Tuesday 09:00 - 11:00

Low Noise Amplifier Design Competition

This competition is sponsored by Microwave/mmWave IC (MTT-6), Microwave Low Noise (MTT-14), Microwave Systems (MTT-16), and Wireless Communications (MTT-20). Competitors are required to design, construct, and measure a low noise amplifier at 2.45GHz. The winner will be judged on the lowest noise figure with a gain of at least 15 dB.

Tuesday 09:00 - 11:00

105

105

Packaged Ultra-Wide-Band Filter Design Competition

This competition is sponsored by Microwave Filters, Multiplexers, and Passive Components (MTT-8) and Interconnects, Packaging, and Manufacturing (MTT-12). Competitors are required to design, construct, and measure a packaged filter for a microwave UWB filter application. The designs will be judged using criteria that include filter performance, robustness and weight.

WE4F-5: Novel Elliptic Function Type Ultra Wideband Bandpass Filter Based

WE4B-4: Low Frequency Noise in Nanoscale pMOSFETs with Strain Induced

M. Beltran, R. Llorente, R. Sambaraju, J. Marti, Universidad Politécnica de Valencia, Spain

WE3A-1: An Efficient, Linear, Broadband Class-J-Mode PA Realized Using RF

P. Wright, J. Lees, P. J. Tasker, J. Benedikt, S. C. Cripps, Cardiff University, United Kingdom

TU4E-2: Tunable Multi-Band Direct Conversion Receiver for Cognitive Radio

E. E. Djoumessi, K. Wu, Poly-Grames Research Center, Center for Radiofrequency Electronics

WE2A-1: A 33-dBm 1.9-GHz Silicon-on-Insulator CMOS Stacked-FET Power

S. Pornpromlikit¹, J. Jeong², C. D. Presti¹, A. Scuderi³, P. M. Asbeck¹, ¹University of California, San Diego, La Jolla, United States, ²Kwangwoon University, Seoul, Republic of Korea, ³STMicroelectronics s.r.l., Catania, Italy

WE1G-1: Neural Network EM-Field Based Modeling for 3D Substructure in

S. Liao¹, J. Xu¹, H. Kabir², Q. Zhang², J. Ma¹, ¹University of Electronic Science and Technology of

TU3D-2: Coherent Optical Receiver with Linear XOR Phase Detection and

V. Vikash, A. Ramaswamy, L. A. Johansson, M. Rodwell, University of California, Santa Barbara, United States TH2B-1: A Capacitively Loaded MEMS Slot Element for Wireless Temperature

TH3D-1: High Frequency Transcutaneous Transmission using Stents Configured as

E.Y. Chow, B. Beier, Y. Ouyang, W. J. Chappell, P. P. Irazoqui, Purdue University, Lafayette, Indiana, United States WE4C-3: Multilayer Silicon RF System-in-Package Technique using Magneti-

S. Moon¹, S. K. Khanna², W. J. Chappell¹, ¹Purdue University, Lafayette, Indiana, United States, ²Shiva Consulting Inc., Carmel, United States

Tuesday 13:00 - 17:00 105 **High Efficiency Power Amplifier Design Competition**

This competition is the fifth sponsored by High Power Amplifiers (MTT-5). Competitors are required to design, construct, and measure a high efficiency power amplifier, at a frequency of their choice above 1GHz but less than 20GHz, and having an output power level of at least 5 Watts. The winner will be judged on the design which demonstrates the highest Power Added Efficiency (PAE) weighted for frequency.

Workshops and Short Courses

Gregory Lyons, IMS Workshops Chair Robert Jackson, IMS Short Courses Chair

IMS/RFIC/ARFTG 2009 Workshops

IMS2009, together with RFIC2009 and ARFTG2009, is pleased to offer 30 workshops to Microwave Week attendees. Beyond noticing there are fewer IMS2009 workshops compared to recent IMSs, we hope you will find the selected workshops reduced overlap, improved focus, and upheld quality.

With those goals in mind, there were many changes introduced into the 2009 workshop selection process. These included an initial workshop proposal solicitation through a Call for Proposals, a web-based proposal submission from workshop organizers, an MTT-S Technical Committee and IMS Workshop Committee review process, a 2-step decision process for accepting workshops, and a web-based posting of complete workshop descriptions prior to the conference. To encourage timely responses, the IMS2009 workshop fee was waived for each speaker who submitted notes by the deadline and for organizers who satisfied all deadlines. The IMS2009 Call for Proposals on Workshops at www.ims2009.org documents the new workshop procedure. For the first time, IMS2009 workshops will be held throughout the week, with several workshops scheduled on Wednesday. IMS sessions have been carefully arranged so that Wednesday workshops will not overlap IMS sessions on the same topic.

There are 11 RFIC workshops, 3 joint IMS/RFIC workshops, 15 IMS workshops, and 1 joint IMS/ARFTG workshop. Full descriptions of all of the workshops can be found on pages 58-69 and at www.ims2009.org. These descriptions include a workshop overview and a complete set of workshop speaker abstracts.

IMS 2009 Short Courses

Short courses are intended to be a teaching vehicle, taught by no more than one or two instructors who are recognized as leading experts in their area of specialization. Decisions on which short course proposals to accept were made by the IMS2009 Steering Committee and were based on a combination of the timeliness of the topic, the quality of a detailed course outline, and the reputation of the proposer both as a technical expert and as a communicator.

This year we have 3 half-day short courses and 2 full-day short courses. The first course on Sunday will cover small antennas and leads nicely into two afternoon short courses, one on RFID systems and one on short-range wireless networks. The full day short courses on Monday will cover Doherty power amplifier design and low noise oscillator design. With regard to the latter, students may choose either a morning half day short course on low noise oscillator theory/design or a full day course that includes a hands-on laboratory component in the afternoon.

We hope you will find great value in the IMS2009 short courses. Further details can be found on pages 70-71 and at www.IMS2009.org.

Attendee Feedback on Workshops and Short Courses

Cheryl Liss, Chair

To gather feedback, attendees will be asked to grade the workshops and short courses. There will be an award for the workshop with the largest attendance and an award for the "best" workshop. Feedback will also be passed along to organizers of future IMSs. A number of the IMS workshops and short courses will be recorded for Virtual Participation.

We hope you will enjoy 2009 Microwave Week and that you will find the workshops and short courses to be productive enterprises.

Welcome to the 2009 RFIC Symposium

The 2009 RFIC Symposium maintains its reputation as one of the foremost IEEE technical conferences dedicated to the latest innovations in RFIC development for wireless and wire line communication ICs and emerging applications. Running in conjunction with the International Microwave Symposium and Exhibition, the RFIC Symposium adds to the excitement of Microwave Week with three days focused exclusively on RFIC technology and innovation. The RFIC symposium will be held at the Boston Center from 7-9 June 2009. The symposium begins on Sunday, 7 June with workshops targeted at RF technology, design, and system issues. Sunday evening activities continue at 17:30 with the Plenary Session where two speakers will share their views on the direction and challenges that the RF IC industry will be facing. The first speaker, **Christopher Snowden**, Ph.D., Vice-Chancellor and Chief Executive of the University of Surrey, Guildford, UK, will discuss "Cost-effective Semiconductor Technologies for RF and Microwave Applications." The second speaker, **George W. Everhart**, CEO of Alien Technology Corporation, will discuss "Real-world RFID Deployments: What Makes Them Work." Following the



Plenary Session, RFIC will host the RFIC Symposium Reception at the Westin Grand Ballroom. This social event is a key component of the conference with the opportunity to connect with old friends and new acquaintances and catch up on the wireless industry. The technical program includes 25 oral presentation sessions, an Interactive Forum (poster session), and two lunchtime panel sessions. The oral presentation sessions start on Monday, 8 June and will continue on Tuesday, 9 June. The poster session will be held on Tuesday afternoon. The poster session is the perfect place to have an opportunity to have more detailed technical discussions with the authors. A newly scheduled IMS Plenary Session will be held on Monday evening from 17:30 to 19:00. Panel Sessions are also planned at lunchtime on Monday and Tuesday. The RFIC Symposium concludes on Tuesday, allowing participants to attend the IMS and ARFTG as well as plenty of time to visit the exhibit hall. The RFIC Committee is thankful to the Microwave Week team, without whom we could not make this conference happen. Most of all, we are particularly thankful to all the technical contributors to the RFIC. Please join us to make this conference the most exciting within the RFIC industry. We look forward to seeing you in Boston.

Enjoy the conference!

Tina Quach General Chair, 2009 RFIC Symposium Yann Deval & David Ngo Co-Chairs, 2009 RFIC Symposium Technical Program Committee

RFIC Steering Committee

>General Chair Tina Quach, Freescale Semiconductor

>**TPC Co-Chairs** Yann Deval, IMS Lab David Ngo, RFMD

Finance Chair Jacques C. Rudell, Univ. of Washington >Workshops Chair Bertan Bakkaloglu, Arizona State Univ.

>Digest & CD ROM Chair Kevin McCarthy, Univ. College Cork

>Publicity Chair Albert Jerng, Ralink >Panel Sessions Chair Yuhua Cheng, SHRIME Peking Univ.

>Transactions/Guest Editor Albert Wang, UC Riverside

- Student Papers Chair Kevin Kobayashi, RFMD
- >Asia Pacific Liaisons Noriharu Suematsu, Mitsubishi Electric

Kevin Kobayashi, RFMD Chang-Ho Lee, Samsung

Domine Leenaerts, NXP Donald Y.C. Lie, Texas Tech. Univ. Jenshan Lin, Univ. of Florida Louis Liu, Northrop Grumman Ting-Ping Liu, Winbond Electronics David Lovelace, ON Semiconductor Danilo Manstretta, Univ. of Pavia Kevin McCarthy, Univ. College Cork Srenik Mehta, Atheros Communications Jyoti Mondal, Freescale Stefano Pellerano, Intel Sanjay Raman, Virginia Tech, DARPA Madhukar Reddy, MaxLinear Bill Redman-White, NXP Eli Reese, TriQuint Semiconductor Mark Roberto, Intel

>Secretary Brian Floyd, IBM

- >IMS Liaisons Luciano Boglione Univ. of Massachusetts, Lowell
- >Webmaster Takao Inoue Univ. of Texas, Austin
- >Conference Coordinator Larry Whicker, LRW Associates

Francis Rotella, Peregrine Jacques Rudell, Univ. of Washington Carlos Saavedra, Queen's Univ. Walter, Canada Derek Shaeffer, Beceem Inc. Osama Shana'a, Mediatek Corp. Eddie Spears, RFMD Joseph Staudinger, Freescale Bob Stengel, Motorola Noriharu Suematsu, Mitsubishi Electric Julian Tham, Arda Technologies Bruce Thompson, Motorola Labs Freek van Straten, NXP Albert Wang, UC Riverside Patrick Yue, UCSB Gary Zhang, Skyworks Solutions

Technical Program Committee

Fazal Ali, Qualcomm Walid Ali-Ahmad, Mediatek Singapore Kirk Ashby, Microtune, Inc. Bertan Bakkaloglu, Arizona State Univ. Jean-Baptiste Bequeret, Univ. of Bordeaux, IMS Lab Didier Belot, ST Microelectronics Paul Blount, Custom MMIC Design Georg Boeck, Microwave Engineering Luciano Boglione, Univ. of Massachusetts, Lowell Natalino Camilleri, Alien Technology Sudipto Chakraborty, Texas Instruments Glenn Chang, MaxLinear Jing-Hong Chen, Analog Devices Nick Cheng, Skyworks Solutions Yuhua Cheng, SHRIME Peking Univ. Stephen Dow, ON Semiconductor Brian Floyd, IBM Lin Fujiang, IME Singapore Ranjit Gharpurey, Univ. of Texas at Austin Aditya Gupta, Anadigics Timothy Hancock, MIT Lincoln Lab. Andre Hanke, Infineon Technologies Stefan Heinen, Infineon Technologies Frank Henkel, IMST GmbH Tian-Wei Huang, National Taiwan Univ. Stavros lezekiel, Univ. of Leeds Lars Jansson, Tumbledown Inc. Albert Jerng, Ralink Waleed Khalil, Intel Jaber Khoja, Microtune, Inc. Sayfe Kiaei, Arizona State Univ.

Bumman Kim, Postech

9

RFIC Technical Program

Plenary Speaker 1

Christopher M. Snowden,

Vice-Chancellor & Chief Executive, Univ. of Surrey, Guildford. Surrey. UK

Cost-effective Semiconductor Techniques for RF and Microwave Applications



Microwave systems designers have a wide choice of semiconductor technologies for applications up to 100 GHz. While there is a natural tendency to choose integrated silicon as the technology of choice for most RFIC applications below 2 GHz and for many applications at higher frequencies, there are many other options available which can offer cost-competitive and performance-enhancing solutions. This presentation will examine the current state-of-the-art in microwave and RF semiconductor technologies set

against economic pressures which demand the lowest cost solution while meeting technical performance, reliability and reproducibility requirements. Factors affecting the wafer cost for various microwave technologies and the significance of mask set costs for some choices will be discussed.

The presentation will conclude by offering some insight into emerging technologies and their potential performance advantages for microwave and RF applications.

Christopher Snowden is Vice-Chancellor and Chief Executive of the University of Surrey with wide experience of the international microwave and semiconductor industry as well as the UK university sector. He is Deputy-President of IET, Vice-President of the Royal Academy of Engineering, a Member of the UK's Engineering and Technology Board (ETB).

He is a non-executive Director of Intense Ltd., an advisor to DMD Ltd and Filtronic plc. Dr. Snowden is a Member of the Council of UK's Engineering and Physical Sciences Research Council which allocates over \$1.3Bn each year and he is the Chair of the Daphne Jackson Trust. He is a Fellow of the IEEE, The Royal Society, Royal Academy of Engineering and the IET. He was awarded the Microwave Prize of the IEEE Microwave Theory and Techniques Society in 1999 and the Silver Medal of the Royal Academy of Engineering in 2004. Previous positions have included, CEO of Filtronic plc, Senior Staff Scientist at M/A-Com Inc., and Head of the School of Electrical and Electronic Engineering at the University of Leeds.

Plenary Speaker 2

George W. Everhart Chief Executive Officer, Alien Technology Corporation

Real-world RFID Deployments: What Makes Them Work?



Although there have been a variety of RFID pilots that have failed to reach a full implementation, there have been many real-world deployments which have been fully deployed and are providing a strong improvement in efficiency and effectiveness, netting a sound ROI. This talk will cite a couple of examples of these successful deployments and recount some characteristics, both technical and otherwise, that are critical for these successes. These examples will also provide insight as to some of the

remaining challenges for broad industry adoption.

George W. Everhart joined Alien in January 2007. He has over 25 years of executive leadership experience. Everhart has held CEO and sales and marketing executive positions with both small startup companies in emerging markets and large multinational companies, experiencing a rapid pace of growth.

Everhart recently held CEO positions with early stage startup companies, SealedMedia and Onesecure, where he led successful company funding and expansion and established both companies as recognized leaders in their markets. Previously, Everhart was Sr.VP, Worldwide Sales & Service for 3COM Corporation, managing the Americas, Asia/Pacific, and EMEA (Europe, Middle East & Africa) business activities as well as the 1,000 person global service organization. Prior, Everhart was President & CEO, Fujitsu PC Corporation, where he led the company's market entry and rapid growth in the notebook PC business. Everhart also held a series of executive leadership positions with Apple Computer during the company's fast growth years, 1987-1996, including VP US Sales, VP & GM PC Business Division, and VP Business & Government Sales.

Mr. Everhart holds a Bachelors degree in Psychology, and a Masters degree in Business Administration from Santa Clara University.

RFIC Administrative Committee

Executive Committee

Joseph Staudinger Stefan Heinen Luciano Boglione Jenshan Lin Tina Quach

Advisory Board

Natalino Camilleri Fazal Ali Eliot Cohen Reynold Kagiwada Sayfe Kiaei Louis Liu David Lovelace Vijay Nair Steve Lloyd **SSCS** Liaison

Kenneth O

73rd ARFTG Microwave Measurement Conference

Welcome to the 73rd Automatic RF Techniques Group (ARFTG) Conference being held at the Boston Exhibition and Convention Center on Friday, 12 June 2009. The conference will include technical presentations, an interactive forum, and an exhibition; all to give you ample opportunity to interact with your colleagues in the automated RF and microwave test community. The conference theme is "Practical Applications of Nonlinear Measurements" with papers focusing on nonlinear vector network analysis, nonlinear time domain techniques, on-wafer nonlinear microwave measurement, nondestructive in-circuit



testing, complex waveform analysis and other areas of RF, microwave and millimeter wave measurements. Also, be sure to check out the joint ARFTG/IMS workshop being held on Wednesday titled: "Advanced Measurement Techniques, Adapted for Different Memory Effects." An important part of any ARFTG Conference is the opportunity to interact oneon-one with colleagues, experts and vendors in the RF and microwave test and measurement community. Whether your interests include high-throughput production or one-of-a-kind metrology measurements, complex systems or simple circuit modeling, small signal S-parameter or large-signal non-linear measurements, phase noise or noise figure, dc or lightwave, you will find a kindred spirit or maybe even an expert. Starting with the continental breakfast in the exhibition area, continuing through the two exhibition/interactive forum sessions and the luncheon, there will be ample opportunity for discussion with others facing similar challenges. Attendees find that these interactions are often the best source of ideas and information for their current projects. So come and join us. You'll find that the atmosphere is informal and friendly.

> Charles Wilker Chair, 73rd ARFTG Conference

ARFTG Steering Committee

Conference Chair

Charles Wilker DuPont

Technical Program Chair

David Blackham Agilent Technologies

Executive Committee

President Leonard Hayden Cascade Microtech

>Vice-President & Electronic-Communication Ronald Ginley

NIST

>Secretary & Publicity

Nick Ridler National Physical Lab

>Treasurer

Ken Wong Agilent Technologies

>Treasurer-Elect

David Walker NIST

ARFTG Technical Program Committee

Peter Aaen Freescale Semiconductor

John Barr Retired

Noori Basim Freescale Semiconductor

Loren Betts Agilent Technologies

Juan Mari Collantes University of the Basque Gayle Collins Freescale Semiconductor

Ed Godshalk Maxim Integrated Products

Leonard Hayden Cascade Microtec

Michael Janezic NIST

Jon Martens Anritsu >Publications

David Blackham Agilent Technologies

>Nominations & Awards John Wood Freescale Semiconductor

>Technical-Elect Mohamed Sayed MMS

>Education Dominique Schreurs K.U. Leuven

>Workshops Jean-Pierre Teyssier University of Limoges XLIM

Michal Odyniec NST

Roger Pollard University of Leeds

Nick Ridler National Physical Lab

Yves Rolain Vrije Universiteit Brussel

David Root Agilent Technologies

>Standards

Uwe Arz PTB

>MTT-S Liaison

Charles Wilker DuPont

>At Large

Brett Grossman Intel

Jon Martens Anritsu

Rusty Myers Maury Microwave

Ex-Officio Members

>Executive Secretary

Jim L. Taylor

Mohamed Sayed MMS

Dominique Schreurs U. Leuven

Bela Szendrenyi Verigy

Ken Wong Agilent Technologies.

2009 International Microwave Symposium Historical Exhibit 50 Years Ago in Boston

If during the conference you find the time to venture out to Harvard Square, and the sprawling Harvard University area, you will be at the location of the first MTT Symposium in Boston which happened 50 years ago. Paine Hall is no longer sufficient for the ten thousand plus attendees that are expected this year, and it will be challenging to find a single hotel room in the city for \$5.50! Although much has changed, Ted Saad, who was the local arrangements chair in 1959 is still involved in the 2009 Steering committee today.

Back then, the focus of the symposium was on MASERs and ferrites, diodes were considered an exotic semiconductor, and you could still find mention of barretters, a popular demodulator used in the early 1900's, the days of Reginald Fessenden.

Who is Reginald Fessenden?

The descriptions 'Radio Pioneer' and 'Cult Hero' are not often used in the same sentence, and even less frequently when describing the same person. However, Reginald Fessenden – a native Québecan who eventually made Boston his home and became (in)famous for his experiments on the Massachusetts coast – arguably fulfills both those roles. Ask most people which inventor is associated with Massachusetts and transatlantic radio transmission, and the usual response is 'Marconi'. Fessenden's own notable and impressive achievements: the first audio transmission by radio (which included the development of the heterodyne principle) (1900), the first two-way transatlantic radio transmission (1906), and the first radio broadcast of entertainment and music (1906), have been relatively, and somewhat unjustly, forgotten.

The IEEE has tried to raise the profile of Fessenden, most recently in September 2008 by unveiling a Milestone dedication plaque at the Brant Rock site of his demonstration on December 24, 1906 when he performed what is widely attributed to be the first audio broadcast of entertainment, which included himself playing the violin and reading passages from the Bible. Prior to this evening, the concept of radio transmission had been oriented around the transmission of data using dots and dashes. Although underappreciated at the time, Fessenden was taking the first tentative steps towards the wireless revolution of broadcasting and communication that we know today.

Although Fessenden's career never led to the fame and fortune of other inventors, he did at least receive peer recognition during his lifetime for his revolutionary work, and in 1921, was awarded the Medal of Honor by the Institute of Radio Engineers. If possible while enjoying the IMS conference in Boston, pay a visit to what remains of the Brant Rock station on the way to Cape Cod. Although Fessenden's antenna which once dominated the skyline has long since disappeared (it was demolished in 1917), the insulated base on which it stood still survives. The layers of concrete were originally separated by arrays of ceramic insulators.

Whether you find the time to visit one of these locations or not, remember how the ideas of one person can forever change the world we live in. And the next time someone brings up the subject of the inventor of radio, confidently argue: Fessenden.

How many men did it take to lift the first commercial microwave oven into your kitchen?

You can be the judge of that after you come and see it for yourself, on display at the Historical Exhibit! Invented by Percy Spencer, and the first of its kind



If you have been mistakenly thinking that the Nazis invented the microwave oven as far back as the 1930s, you are strongly encouraged to attend Dr. John M.

> Osepchuk's discussion titled, "The History of the Microwave Oven: A Critical Review". Dr. Osepchuk's talk will be first of four in the TH4B Microwave History in the Boston Area session, scheduled for Thursday 15:40-17:00, and located in Room 205A

National Electronics Museum

The National Electronics Museum is the permanent home of the MIT-S Historical Collection between Symposia. The Museum holds many microwave related items besides the MTTS Collection, including parts of the SCR-270 (Pearl Harbor) radar and complete SCR-584 radar, which was used with the proximity fuse anti aircraft shell in World War II. The Museum also contains an impressive library of over 7,000 books and 11,000 journals. The museum is located near the Baltimore-Washington International Airport, and is approximately 20 minutes from downtown Baltimore. A visit to the Museum is an interesting and educational experience for both young and old.

Additional information on the Museum can be found at www.nationalelectronicsmuseum.org, or call 410-765-0230.



TUESDAY, JUNE 3 and WEDNESDAY, JUNE 3, 1959 FAINE HALL PGMTT NATIONAL SYMPOSIUM PAINE HALL HARVARD UNIVERSITY SYMPOSIUM COMMITTEE

195

falles Sylvenia Dennis Frederic, Inc

Room Knight Composition

Arras

Reptions Residence Company

Surveyore Descriptions interested

Real Arres Knight Corporation

Inge Laboratoria, Inc. Ontoni Chairman, H. Maariman Ingelana Manufasharing Concessor

TECHNICAL PROGRAM COMMITT

Dationes, H. J. Kinkel Microsover Development interventer, Inc.

Tylvestis Electric Anadems, Inc. 2. Onistania, Restlance, Manufacture,

R. Jacon, Revenued Distances

A Real

Fren Bright Carporation

rand Stationally

IEEE and MTT-S Membership

IEEE

The IEEE is a nonprofit, professional association with more than 375,000 members (including 80,000 students) in over 160 countries. This global organization helps support the development and application of technology and science around the world for the benefit of humanity, the individual, and the profession.

MTT-S

The IEEE Microwave Theory and Techniques Society (MTT-S) is a transnational society with more than 11,000 members and 125 chapters worldwide. Our society promotes the advancement of microwave theory and its applications, at frequencies from 200 MHz to 1 THz and beyond. As we enter into an exciting future, our mission is to continue to understand and influence microwave technology.

Benefits of Membership

The benefits of IEEE membership include:

- > Discounted conference registration rates
- > Subscriptions to the award-winning IEEE Spectrum and online access to IEEE Potentials magazines
- > Online access to the tables of contents and expanded abstracts from over one million IEEE documents with full text-searching capability
- > Free IEEE e-mail alias including virus scanning and optional spam filtering
- > IEEE Financial Advantage- negotiated exclusively for IEEE members

Join the IEEE and MTT-S

Web: http://www.ieee.org/web/membership/join/join.htm

Phone: (US and Canada): + 1.800.678.4333/(Worldwide): + 1.732.981.0060

United States Visa Advisory

The United States has updated its visa policy for increased security. As a result, it now takes longer to obtain a visa. Advance planning by travelers is essential to avoid frustration and disappointment. We recommend that you:

- > Review your visa status to find out if you need a US visa or a visa renewal.
- > Plan to submit your visa application well in advance of your intended departure date.
- > Contact your nearest U.S. embassy or consulate for current time estimates and recommendations.
- > Visit the embassy or consular section website, where you find important information on how to schedule an interview appointment and pay fees. An interview is a standard part of processing for most visa applicants.
- > Plan on having finger scans as part of the visa application process. Two index-finger scans are normally collected by the consular officer at the visa interview window. But, in some countries, they may be collected prior to the actual visa interview.

Visa Waiver Program (VWP)

Citizens or nationals of the following countries are currently eligible to travel to the US under the VWP: Andorra, Austria, Australia, Belgium, Brunei, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, The Netherlands, New Zealand, Norway, Portugal, San Marino, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, and the United Kingdom. All VWP travelers, regardless of age or type of passport used, must present a machine-readable passport. Some citizens of Canada and Bermuda do not need a visa to visit the U.S. Attendees who join the IEEE for \$84.50 and MTT-S for \$7.00 before the Symposium will save at least \$195 on their registration fee. The price of an IEEE/MTT-S membership more than pays for itself!

Half-year rates apply to new members only. New applications received between 1 March 2009 and 15 August 2009 will automatically be processed for half-year membership. If the applications specifically request, their application will be processed for the full year.

IEEE and MTT-S Membership Dues

	IEEE Year	Half- Dues	MTT-S Half- Year Dues		
Residence	Member	Student	Member	Student	
United States	\$84.50	\$15.00	\$7.00	\$3.50	
Canada (Including GST)	\$77.23	\$15.90	\$7.00	\$3.50	
Canada (Including HST)	\$82.39	\$17.10	\$7.00	\$3.50	
Africa, Europe, Middle East	\$71.00	\$12.50	\$7.00	\$3.50	
Latin America	\$66.50	\$12.50	\$7.00	\$3.50	
Asia, Pacific	\$67.00	\$12.50	\$7.00	\$3.50	

The optional MTT-S dues include a subscription to IEEE Microwave Magazine. MTT-S members can also purchase electronic and print subscriptions to the IEEE Transactions on Microwave Theory and Techniques, IEEE Microwave and Wireless Components Letters, and IEEE/OSA Journal of Lightwave Technology. See IEEE Membership website for pricing.

Effective 12 January 2009, all VWP travelers will be required to obtain an approved authorization via Electronic System for Travel Advisory (ESTA) before traveling to the U.S. under the VWP. Please visit www.cbp.gov/esta for additional information on applying for an ESTA.

Passports

A passport with a validity date of at least six months beyond the applicant's intended period of stay in the US is required. If more than one person is included in the passport, each person desiring a visa must make a separate application. Temporary Passports will likely merit special scrutiny. Check with your local US consular offices, well ahead of your intended departure dates, to avoid complications.

Visa Letters

A visa support letter can be provided for authors and registered attendees upon request. Please submit your requests for letters of support well in advance of your interview dates to allow sufficient time for processing. Spouses requiring visa assistance must be registered for an IMS Guest Program Event. Check the IMS 2009 website www.ims2009.org for Guest Program details. For additional assistance, please contact Dr. Zaher Bardai at zb@ieee.org.

Disclaimer

This information is provided in good faith but travel regulations do change. The only authoritative sources of information are the U.S. Government websites at www.unitedstatesvisas.gov

Registration Categories

NEW for 2009, the Registration process is now split into three tiers in order to better serve attendee needs. The 1st tier is the **Early Bird Registration**, Monday, 2 February through Friday, 15 May. This period provides an opportunity to register for the Symposium at the lowest possible cost. The 2nd tier or **Advance Registration** is Saturday, 16 May through Friday, 5 June. The 3rd and final tier is the **On-Site Registration**, from the first day of Microwave Week, ending on Friday, 12 June. **Early Bird**, **2 Feb -15 May (midnight HST)**

Advance, 16 May - 5 June (midnight HST) On-Site, 6 June - 12 June (through Microwave Week)

NEW Symposia SUPERPASS

Also NEW for 2009 is the Symposia **SUPERPASS**. For one discounted price, registrants can attend as many technical sessions as they can from any of the three contributing organizations, MTT, RFIC, and ARFTG, as well as attend one full-day workshop (or two half-day workshops, if desired). In addition, the **SUPERPASS** will allow you to attend the Awards Banquet on Wednesday and a new Thursday Evening Social.

The **SUPERPASS** is a **SUPER DEAL** offering a **15% discount** over the combined al a-carte pricing.

Early Bird Registration

Early Bird Registration rates provide *significant* savings from the on-site fees shown on page 16. Registration is required for all attendees including SESSION CHAIRS and PRESENTERS. Only paid attendees will be admitted to the breakfasts, workshops, technical sessions, and Exhibition Hall. This form is not used for guest tour registration, see page 16 for information on registration for tours and special events. Each registrant must submit a separate form with payment. Registration by telephone is available for handicap, special needs, or information; please call 303-530-4562.

1 Methods of Registration

Individuals can register online, by FAX, or by mail. All forms of registration, including mail registrations must be received at MP Associates by the deadline; otherwise, advance or on-site fees will be charged. If the registration is sent by FAX, do not send it by mail. Additional items can be added on site after advance registration.

For phone numbers outside the US, please include a country code. An optional complimentary badge for one guest allows access to the Hospitality Suite, Plenary Session, and Exhibition Hall, but does not allow access to Technical Sessions and Workshops.

2 Membership

Check boxes of all organizations of which you are a member. To receive IEEE member rates, enter your member number and present your IEEE card upon check in at the conference. Registrants who do not have a current IEEE membership card at check in will be charged non-member rates. If you are not a member and wish to take advantage of member rates, call 1.800.678.IEEE or visit www.ieee.org/services/join prior to registering.

Symposia

Microwave Week includes: the International Microwave Symposium (IMS), the RF Integrated Circuits Symposium (RFIC), and the Automatic RF Techniques Group Conference (ARFTG). Membership in IEEE or ARFTG entitles students, retirees, and Life Members discounts on some registration fees (member price applies where discount not indicated).

> IMS Technical Sessions are held on Tuesdays, Wednesday, and Thursday. Registration includes breakfast, admission to the exhibits, abstract books, and a CD-ROM.

- > RFIC Technical Sessions are held on Monday and Tuesday. Registration includes breakfast, admission to the RFIC, Reception, and Exhibition
- > ARFTG Technical Sessions are held on Friday. Registration includes breakfast, a CD-ROM, and admission to the ARFTG Exhibition. ARFTG conference member rates are available to ARFTG and IEEE members.
- > Microwave Week hosts the largest exhibition of its kind with over 500 companies. Exhibit only registration is available on site for \$25. Special Offers:
- > Free Wednesday afternoon exhibit only registration admits you to Exhibit Hall from 12:00 to 19:00, includes the Industry Hosted Reception.
- > Free Thursday one day Technical Registration for retirees.

④Extra CD-ROMs and Digests

Additional CD-ROMs (IMS, RFIC, and ARFTG) and digests (RFIC only) are available for purchase and pickup at the conference. After the Symposium, these digests and CD-ROMs will be available for purchase from IEEE.

6 Awards Banquet

The MTT Awards Banquet will be held on Wednesday, 19:00 to 22:00 hrs, in the BCEC Grand Ballroom. Banquet details are presented on page 77.

The new Thursday Evening Social will feature a cruise in Boston Harbor. For details see page 77.

6 Boxed Lunches

Optional boxed lunches are available for purchase by all attendees and for those attending the panel sessions or exhibition hall during lunchtime. Refunds for lunches are not available.

Workshops and Short Courses

The workshop fee includes a CD-ROM and speakers' notes for that workshop. Full-day workshops include a continental breakfast, a morning refreshment break, a boxed lunch, and an afternoon refreshment break. Morning workshops include a continental breakfast in Room 258AB, a morning refreshment break, and a boxed lunch. Afternoon workshops include a boxed lunch and afternoon refreshment break. The All-Workshop DVD-ROM fee includes material for all RFIC and IMS workshops on one DVD-ROM, but the DVD-ROM price alone does not include admission to any workshops. Note that there are two NEW options for 2009. *First, registrants can save by selecting a combined Workshop (one full day or two half-day workshops) and All Workshop DVD-ROM. And second, for those who might not be able to attend the RFIC workshops, an All RFIC Workshop Only CD-ROM is now offered.

The short course fee includes a CD-ROM (color PDF notes and in some cases software) and speakers' hardcopy notes for that short course. Breakfast, lunch, and breaks are included the same way as for workshops.

8 Remittance

Individual remittance must accompany the registration form and is payable in US dollars only, using one of the following: personal check drawn on a US bank, traveler's check, international money order, wire transfer, or credit card (VISA, MasterCard, or American Express only). Personal checks must be encoded at the bottom with the bank, bank account number, and check number. Bank drafts, cash, and purchase orders are UNACCEPTABLE and will be returned. Make checks and money orders payable to "IEEE/MTT-S". Written requests for refunds will be honored if received by 1 May 2009. See page 16 for full refund policy.

IMS Alumni Between Jobs

Please email inquiries for fee consideration to: alumnirequest@ims2009.org.

IEEE Boston Co	S - RFIC - nvention a	ARFTG Re	egistratio on Center,	n Form 7-12 June 2	2009		ARTO
Use the numbered instruction on the left as a guide to fill out form. All Early Bird and Advance registration must be rece 15 May and 5 June, respectively, for appropriate costs to a	the online online online online online online on on	e: www.ims2009. by fax: 1.303	org/registration.ht 3.530.4334	tml by m	ail: IMS 2009 Reg 1721 Louis	gistration, MP Ass Boxelder St. Sui sville, CO 80027	sociates, Inc. te 107 ' USA
Name:							
Affiliation:							
Address:	bany					Mail Stop	
Stre	et				City		State
Postal Code	Country				Email		
Telephone							
	it				Last		
Guest Email:			Would you l	ike to receive E	mails from: OI	EEE and MTT-S	OIndustry
Superpass All IMS, RFIC, & ARFTG Sessions, Awards Banquet, Evening Social & All Workshop DVD (REIC/IMS)	Earl IEEE or ARI Member	y Bird (2/2 - 5 FTG Membership Student, Retiree, Life Member	/15) Non-Member	Adv. IEEE or ARFI Member	ance (5/16 - 6 G Membership Student, Retiree, Life Member	i/5) Non-Member	Cost
plus Full Day (or 2 Half Day) Workshop Attendance	○\$995	O \$595	O \$1,495	O \$1,195	O\$695	O \$1,745	\$
All IMS Sessions	O\$405	()\$70	O \$600	O\$485	○\$80	O\$720	\$
All IMS Sessions (No CD ROM) Single Day Registration	○\$350 ○\$205		○ \$540 ○ \$300	○\$415 ○\$255		○\$610 ○\$355	\$ \$
RFIC Symposium	~ * * * *		~ +	0 1 1 1		0	
All RFIC Sessions RFIC Reception Only	O\$220 O\$55) \$320) \$75	○\$250 ○\$60		O\$370 O\$80	\$\$
ARFTG Conference		_			_	-	
All ARFTG Sessions Exhibition) \$210	O \$130	O \$310	○\$240	○\$145	○\$360	\$
Exhibition Only Pass	# x \$20		# x \$20	# x \$20		# x \$20	\$
Extra CD's & Digests	# tco		# #440	# +==		# # # # #	¢
RFIC Digest	# x \$60		# x \$110	# x \$75		# x \$140	\$
RFIC CD ROM	# x \$60		# x \$110	# x \$75		∰ x \$140	\$
ARFTG CD-ROM	# x \$60		# x \$110	# x \$75		# x \$140	\$
ARFTG Conf. Compendium CD-ROM 1982-2006	. <u>#</u> x \$65		/# x \$90	[#] x \$65		.# x \$90	\$
Evening Events Awards Banquet (Wed. Night)	# x \$50		# x \$50	# x \$60		# x \$60	s I
NEW Thursday Evening Social	# x \$10		# x \$10	# x \$15		# x \$15	\$
6 Lunch Mon Tues Wed Thur Boxed Lunches O	# x \$20		# x \$20	# x \$20		# x \$20	\$
Workshops and Short Courses (see page 58 for d	escriptions)	_	-	_	_	_	_
Full Day Workshops: O WSA O WSB O) WSC O	WSD OWS	SE 🔿 WSF				
			MH OWW. SI OWM				
Full Day Short Course: O SC-4 Full Day	Short Course wi	th Lab: \bigcirc SC-5	Half D	av Short Course	s [.] O SC-1 O 9	5C-2 O SC-3	
Full Day Workshops	# x \$160	# x \$110	# x \$230	# x \$190	# x \$130	# x \$280	\$
Half Day Workshops	# x \$110	# x \$80	# x \$180	# x \$145	# x \$95	# x \$210	\$
Full Day Short Course SC-4	# x \$285	# x \$200	# x \$410	# x \$340	# x \$230	# x \$500	\$
Full Day Short Course SC-5 (class and lab)	# x \$335	# x \$250	# x \$460	# x \$390	# x \$280	# x \$550	\$
Half Day Short Courses	# x \$200	# x \$140	# x \$320	# x \$260	# x \$170	# x \$375	\$
All Workshop DVD (RFIC/IMS)	# x \$190	# x \$130	# x \$280	# x \$225	# x \$145	# x \$325	\$
NEW All Workshop DVD (RFIC/IMS) with attendance*	# x \$315	# x \$220	# x \$460	# x \$375	# x \$260	# x \$545	\$
(no attendance incl.)	x ⊅105	X ⊅/5	C01¢ X 📖	x ≯140	х ⊅яр	x ⊅132	⊅ ⊄
MasterCard O Visa O America Card Number:	n Express	Expiration Da Signature:	ate: /	Security Code	:	otal Remittance	:: \$

By submitting this form you acknowledge that you have read and understand the policies regarding methods of payment registration, refunds and requirements for proof of membership.

On Site Registration

On Site registration for all Microwave Week events will be available in the BCEC Main Lobby. Registration hours are:

Day	Time
Saturday, 6 June 2009	14:00 – 18:00 hrs
Sunday, 7 June 2009	07:00 – 18:00 hrs
Monday, 8 June 2009	07:00 – 17:00 hrs
Tuesday, 9 June 2009	07:00 – 17:00 hrs
Wednesday, 10 June 2009	07:00 – 18:30 hrs
Thursday, 11 June 2009	07:00 - 15:00 hrs
Friday, 12 June 2009	07:00 – 09:00 hrs

Exhibit Only Registration

Exhibit only registration is available on site for \$25.

Guest Tour Registration

Registration for guest tours can be made in advance at ims2009.org/guest.html and will be available on site in the BCEC lobby. Please refer to the Guest Program section (pages 78 to 80) for further details and tour descriptions.

Press Registration

Credentialed press representatives are welcome to register without cost, receiving access to technical sessions and exhibits. Digests are not included. The Press Room is located in the BCEC and will be open from Tuesday through Friday.

ARFTG Registration

Late on-site registration will be available at the BCEC lobby on Friday from 07:00 to 11:00. If at all possible, please pre-register earlier in the week to avoid last minute queues.

Refund Policy

Written requests received by 1 May 2009 will be honored. Refund requests postmarked after this date and on-site refunds will be generated only if an event is canceled. This policy applies to the registration for the symposium sessions, workshops, digests, extra CD-ROMs, awards banquet and boxed lunches. Please state the pre-registrants name and provide a postal address for the refund check. If registration was paid for by credit card, the refund will be made through an account credit. An account number must be provided if the initial registration was completed on-line. Address your requests to:

Nannette Jordan MP Associates, Inc. 1721 Boxelder Ste. 107 Louisville, CO 80027

nannette@mpassociates.com

On Site Registration Fees

		IEEE or Memb	ARFTG ership	Non- Member
SuperPass		Member	Student, Retiree, Life Member	
	All IMS, RFIC, and ARFTG Sessions, Awards Banquet, Thursday Evening Social, and All Workshop DVD (RFIC/IMS) plus Full Day (or 2 Half Day) Workshop Attendance	\$1,295	\$745	\$1,895
IMS				
	All IMS Sessions	\$525	\$85	\$785
	All IMS Sessions (No CD ROM)	\$450		\$665
	Single Day Registration	\$275		\$385
RFIC Sympos	sium			
	All RFIC Sessions	\$270		\$400
	RFIC Reception Only	\$65		\$85
ARFTG Conf	erence			
	All ARFTG Sessions	\$260	\$160	\$390
Exhibition				
	Exhibition Pass Only	\$25		\$25
Extra CDs an	d Digests			
	IMS CD-ROM	\$80		\$150
	RFIC Digest	\$80		\$150
	RFIC CD ROM	\$80		\$150
	ARFTG CD-ROM	\$80		\$150
	ARFTG Conference Compendium CD-ROM 1982 - 2006	\$65		\$90
Evening Eve	nts			
	Awards Banquet	\$75		\$75
	Evening Social (Thursday Night)	\$20		\$20
Box Lunches				
		\$20		\$20
Workshops a	and Short Courses			
	Full Day	\$205	\$140	\$305
	Half Day	\$155	\$105	\$230
	Full Day Short Courses	\$365	\$250	\$540
	Full Day Short Courses SC-5 (with lab)	\$415	\$300	\$590
	Half Day Short Courses	\$275	\$190	\$410
	All Workshop DVD (RFIC/IMS)	\$245	\$155	\$355
	All Workshop DVD (RFIC/IMS) plus Full Day (or 2 Half Day) Workshop Attendance	\$405	\$280	\$595
	All RFIC Workshop Only CD-ROMs (no attendance included)	\$150	\$105	\$210

Workshops and Short Courses

Complete descriptions can be found on pages 58-71.

Sunday, Full Day 08:00 - 17:00

WSA (RFIC): Advances in CMOS RF Power Amplifiers for Cellular and IEEE 802 Connectivity Radios

WSB (RFIC): Current and Future Trends in Frequency Generation Circuits

WSC (RFIC): Advances in PA and TX Architectures

WSD (RFIC): Self-Interference and Co-Habitation Considerations in Complex SoC and SiP Integrated Solutions

WSE (RFIC): Advanced BAW-Enabled Wireless Transceivers: from Devices to System Architectures

WSF (RFIC): Devices and Design Techniques for Advanced Handset/ Mobile PAs

WSG (RFIC): RFIC-Challenges for Future RF Integration

Sunday, Half Day 08:00 - 12:00

WSH(RFIC): System-Level Design and Implementation of Gb/s 60GHz Radios

WSJ (RFIC): Active Radio Circuits for Bio & Medical Applications

SC-1: Advances in the Design of Electrically Small Antennas

Sunday, Half Day 13:00 - 17:00

WSI (RFIC): Technology and Power Combining Techniques for Millimeter Wave Applications

WSK (RFIC): Digitally Assisted Analog and RF Circuits

WSL(IMS/RFIC): State of the Art of Low-Noise III-V Narrow Bandgap and Silicon FET Technologies for Low-Power Applications

SC-2: RFID Transponders & System Design

SC-3: Comparative Study of the State-of-the-Art Short-Range Wireless Sensor Networking Standards

Monday, Full Day 08:00 - 17:00

WMA (IMS): Tunable RF-Components and Modules for Wireless Communication Systems

WMB (IMS): Parameter Extraction Strategies for Compact Transistor Models

WMC (IMS): Power Amplifier Linearization: From Advanced Analog and Digital Techniques to Practical Real-Time Implementations

WMD (IMS): Digital Receiver Systems for Defense and Related Commercial Applications

WME (IMS): Subharmonically Pumped Mixers (SHP mixers): Design Theory and Systems Applications WMF (IMS): Is GaN Ready for System Insertion?

WMG (IMS): New Component Technologies for Vehicular and Industrial Radar Applications

WMH (IMS/RFIC): Radio-Frequency Applications of Nanotechnology: Towards a New Generation of Extremely Integrated Devices and Systems

SC-4: -Doherty Power Amplifiers: Theory & Practice

SC-5: Low Phase Noise Oscillators: Lecture and Laboratory

Monday, Half Day 08:00 - 12:00

SC-5A: Low Phase Noise Oscillators: Lecture Only

Monday, Half Day 13:00 - 17:00

WMI(IMS): Gigabit Packaging of Wireless 60GHz Links

Wednesday, Full Day 08:00 - 17:00

WWA(IMS/RFIC): Integration Trends Towards 4G

Wednesday, Half Day 08:00 - 12:00

WWB(IMS): RF Design Components of Magnetic Resonance Scanners

Wednesday, Half Day 13:00 - 17:00

WWC(IMS/ARFTG): Advanced Measurement Techniques, Adapted for Different Memory Effects

WWD(IMS): RF MEMS Testing, Reliability, and Power Handling

Friday, Full Day 08:00 - 17:00

WFA(IMS): EM-Based Microwave Optimization Technology: State of the Art and Applications

WFB(IMS): Modern RFID: Inkjet Printing of "Green" RFID and RFID-Enabled Sensors on Flexible Substrates

WFC(IMS): Recent Advances in Microwave Power Applications and Techniques (RAMPAnT)

WFD(IMS): Emerging Applications of RF-MEMS

Friday, Half Day 08:00 - 12:00

WFE(IMS): Stability of Nonlinear Microwave Circuits and Systems: Concepts, Analysis, and Design

Accommodations

The IMS2009 Steering Committee has secured favorable rates for Attendees at the official IMS2009 hotels throughout the city of Boston. The map below shows the location and the rates of those hotels. Complimentary shuttle bus transport will be provided to all attendees that book through the housing bureau. All others will have to pay a bus fee. See page 20 for details.

For advance hotel reservations, visit www.IMS2009.org for online reservations, or submit the Attendee Housing Form by fax or postal mail before 5 May 2009.



Num	ber on	Мар	Hotel	Name
-----	--------	-----	-------	------

Number on Map	Hotel Name	Rate
1	Westin Waterfront Headquarter Hotel	\$299
2	Sheraton Boston Co-Headquarter Hotel	\$285
3	Marriott Renaissance Boston Waterfront	\$299
4	Westin Copley Place	\$299
5	Boston Marriott Copley Place	\$295
6	Courtyard Marriott Boston Tremont	\$249
7	Midtown Hotel	\$149
8	Boston Park Plaza	\$269



Attendee Housing Form

7-12 June, Boston Convention & Exhibition Center

IEEE Microwave Theory and Techniques Society

	MTT-S ARFTG RFIC	
All reservation requests must be received by 5 Ma Changes to existing reservations may be made thro	/ 2009 . Jgh the housing bureau in writing until 5 May 2	009. Phone reservation requests will not be accepted.
Online www.IMS2009.org	Fax 732-297-0878	Mail IEEE IMS2009 Housing P.O. Box 29, Milltown, NJ 08850

Instructions and Housing Bureau Policies

- 1. Please print or type all information. Unreadable forms cannot be processed.
- 2. Housing confirmations will be sent via e-mail after each reservation booking, change or cancellation.
- 3. All rates are per room per night and do not include state and local taxes.
- 4. Room type and special requests are not guaranteed and are based on availability. Room types are assigned at check-in time with each hotel.
- 5. A credit card number for guarantee is required. A deposit equal to the room rate for one night is required for each reservation.
- 6. Reservations without a valid credit card will be cancelled.
- 7. Changes after 15 May 2009 must be made with the individual hotels.
- 8. A valid government ID is required at check-in for government rated rooms.
- 9. Requests for blocks of rooms without named occupants will not be accepted.
- 10. Multiple room reservations require a detailed list of names, arrival and departure information, contact information and payment information in the form of a 'rooming list' which must be attached to this form.
- 11. Cancellations made after 5 May 2009 will be charged a \$25 processing fee
- 12. For questions please call 732-297-5012 or e-mail ims2009@flyevents.net

Housing Reservation Information

First and Last Name		
E-Mail Address		
Company		
Address		
City	State	Zip Code
Country	Daytime Phone #	FAX #
Credit Card Type (circle) MasterCard Visa A	Amex Discover	
Cardholder Name (As it appears on the card)		
Cardholder Signature (REQUIRED)		
Card #	Exp. Date (after 30 June 200)9)
Hotel names, locations and rates are on the facing page. F	Please list a minimum of three choices.	
First Choice Second C	hoice	_Third Choice
Arrival Date	Departure Date	
If hotel choice is not available, which is most important: R	ate or Location (Please sele	ct one)
Special requests (circle all requested) - All hotel rooms in	n Boston are non-smoking rooms	
Government Rate King Bed Two Beds	Wheelchair Accessible	
Other requests		

If more than one room is required, attach a list providing the occupants names and the above information for each additional room.

Transportation (see map on back cover)

Flying to Boston, Boston Logan International Airport:

Boston Logan International Airport (BOS) is located 8 km from downtown Boston and a taxi to/from the center of Boston ranges from \$20-\$40. Convenient mass transmit connections are available all terminal via the Silver Line bus, see details below. Renting a car is not recommended if you will stay in Boston for your entire visit.

Getting to the Boston Convention & Exposition Center (BCEC)

Complimentary Shuttle Service to and from the BCEC and official IMS hotels will be provided for those reserving their hotel room through the IMS2009 housing bureau. Those who have not booked their hotel room through the IMS2009 housing bureau may purchase a shuttle pass for \$75 at registration located in the East lobby of the BCEC. Shuttle eligibility will be electronically verified prior to shuttle boarding. Attendees/Exhibitors who do not have an eligible name badge will not be permitted to board shuttles beginning Tuesday, 9 June 2009.

Pick-Up and Drop-off routes:

Route 1: Sheraton Boston The Midtown Hotel (at Sheraton Boston)

- Route 2: Westin Copley Place Boston Marriott Copley Place
- Route 3: Boston Park Plaza Courtyard Marriott Tremont

From Logan Airport:

- > Take the Silver Line Bus SL1 (MBTA).
- > Exit at the World Trade Center stop and take the elevator up to Level 2.
- > Take a left onto World Trade Center Ave and the BCEC will be directly in front of you.
- > For more information visit: www.massport.com

Via Amtrak and Commuter Rail:

- > Exit at the South Station stop and proceed to Summer Street.
- > Via taxi or walking: take a right onto Summer Street and the BCEC is about 1 km on the right hand side (415 Summer Street).
- > For more information visit: www.amtrak.com or www.mbta.com

Via Subway (MBTA Red Line):

- > Exit at the South Station stop and go up one flight of stairs. Take the MBTA Silver line SL1, SL2 or SL3 to the World Trade Center stop.
- > Take the elevator up to Level 2. Take a left onto World Trade Center Ave and the BCEC will be directly in front of you.
- > For more information visit: www.mbta.com

Via Bus (MBTA #7 Bus - City Point - Otis - Summer Street):

- > Inbound Bus from City Point to South Station and get off at 415 Summer Street. BCEC is directly across the street.
- > Outbound Bus from South Station to City Point, get off at 425 Summer Street in front of the Westin Hotel, turn right off the bus and the BCEC is a half block up on the left.

Via Bus (MBTA Silver Line SL1, SL2 or SL3):

- > Exit at the World Trade Center stop and take the elevator up to Level 2.
- > Take a left onto World Trade Center Ave and the BCEC will be directly in front of you.
- > For more information visit: www.mbta.com

Via Boat (MBTA, City Water Taxi):

Water transportation services are available from locations near the BCEC to several locations throughout Boston's waterfront. The MBTA provides service between Lovejoy Wharf at North Station and the World Trade Center, which is a short 7-10 minute walk from the BCEC: www.mbta.com

Water taxi service also connects the World Trade Center with a number of waterfront destinations, including Logan Airport. Additional information about water taxi service can be found at: www.citywatertaxi.com

Via Taxi: \$15-\$20 One-Way to/from Copley Hotels

Taxi Associations in Boston:

- > Boston Cab: 617.536.5010
- > City Cab: 617.536.5100
- > Independent Taxi (ITOA): 617.825.4000
- > Metro Cab: 617.782.5500
- > Top Cab: 617.266.4800
- > Town Taxi: 617.536.5000

Driving Directions and Parking:

FROM Logan International Airport and Route 1A South:

Take I-90 West/Ted Williams Tunnel to Exit 25 "South Boston". At the top of the ramp, take a right onto Congress Street. Take the next right onto D Street. After the highway ramp, turn right onto Summer Street. The BCEC will be on your left.

FROM Western Massachusetts:

Take the Massachusetts Turnpike/I-90 East to Exit 25 "South Boston". At the top of the ramp, bear left towards "Seaport Boulevard". At the first set of lights, take a right onto Congress Street. Take the second right onto D Street. After the highway ramp, turn right onto Summer Street. The BCEC will be on your left.

FROM points North via I-93:

Take I-93 South to Exit 20A "South Station." At the end of the ramp, take a left at signal, onto Summer Street at South Station. Follow Summer St. for approximately 1 km, the BCEC will be on your right.

FROM points South via I-93:

Take I-93 North to Exit 20 "South Boston". Follow the signs to "I-90 East". Take the first tunnel exit to "South Boston". At the first set of lights, take a right onto Congress Street. Take the second right onto D Street. After the highway ramp, turn right onto Summer Street. The BCEC will be on your left.

Valet & Self Parking:

Is available via Summer Street (\$20). To access, turn onto East Side Drive and the valet area will be immediately on your right. To self park (\$10), drive past valet and continue straight along the side of the building. At the end of the building, make a right and go down the ramp. The South Parking Lot entrance is at the bottom of the ramp, on your left.

Traffic Information:

Real-time traffic information is available in the Boston area by visiting the following website: www.smartroutes.com. You can also access traffic status while on the road by dialing *1 on your mobile phone from the metropolitan Boston area.

For Air Travel & Rental Car Discounts

For your convenience, airline tickets and car rentals may be booked through IEEE's corporate travel agency, World Travel Inc. Hours of operation are 08:00 to 17:30 EDT, Monday through Friday.

For more information, contact: IEEE Travel Program Website:

- www.ieee.org/web/aboutus/travel/index.htm
- Email: ieee@worldtravelinc.com
- Phone: +1 800 TRY IEEE (+1 800.879.4333) in the US and Canada; +1 717 556 1100 elsewhere

Please reference IEEE's account 1iV9

IEEE MTT-S Administrative Committee

2009 Officers

President	Barry Perlman
Vice President	Samir El-Ghazaly
Treasurer	Nick Kolias
Secretary	William Chappell

Elected Adcom Members

Term Expires in 2009	Term Expires in 2010	Term Expires in 2011
Luciano Boglione	Jonathan Hacker	Madhu Gupta
Samir El-Ghazaly	Tim Lee	Joy Laskar
Michael Harris	Amir Mortazawi	Jenshan Lin
Jerry Hausner	Vijay Nair	Yoshio Nikawa
Bumman Kim	Barry Perlman	Dominique Schreurs
Nick Kolias	Wayne Shiroma	Bela Szendrenyi
Robert Weigel	Richard Snyder	Ke Wu

Immediate Past Presidents

2008Joze	f Modelski
2007Ste	ve Kenney
2006	Karl Varian

Honorary Life Members

Tatsuo Itoh, Arthur Oliner, Theodore Saad, Peter Staecker, Kiyo Tomiyasu

Future IEEE MTT-S International Microwave Symposia

2010: Anaheim, CA — 20–28 May, 2010

Chairman J.K. McKinney Dura Sales of Southern California Inc. j.mckinney@ieee.org

2011: Baltimore, MD

Chairman Jeffrey Pond Naval Research Laboratory j.m.pond@ieee.org

2015: Phoenix, AZ

Chairman Vijay Nair Intel Corporation v.nair@ieee.org

2012: Montreal, Can Chairman

Ke Wu Ecole Polytechnique ke.wu@ieee.org

2016: San Francisco, CA

Chairman Paul Khanna Phase Matrix, Inc. apskhanna@ieee.org

2013: Seattle, WA

Chairman Tom Raschko Sea-Port Technical Sales Tom.Raschko@ieee.org

2017: Honolulu, HI

Chairman Kevin Miyashiro TeraSys kmiyashi@ieee.org

2014: Tampa, FL

Chairman Larry Dunleavy University of South Florida dunleavy@eng.usf.edu

IEEE MTT-S Awards

Microwave Career Award

This award recognizes an individual for a career of meritorious achievement and outstanding technical contribution in the field of microwave theory and techniques. This year's recipient is Kaneyuki Kurokawa.

Distinguished Educator Award

This award was inspired by the untimely death of Prof. F.J. Rosenbaum (1937-1992), an outstanding teacher of microwave science and a dedicated AdCom Member and contributor. The award recognizes a distinguished educator in the field of microwave engineering and science who best exemplifies the special human qualities of Fred Rosenbaum who considered teaching a high calling and demonstrated his dedication to the Society through tireless service. This year's recipient is Christopher Snowden.

Microwave Application Award

This award recognizes an individual or team for outstanding application of microwave theory and techniques. This year's recipient is Jerry Fiedziuszko.

Outstanding Young Engineer Award

This award recognizes MTT-S members, who have distinguished themselves through technical achievements, service to the MTT-S, or a combination of both. Nominees must not have reached their 39th birthday and must be an MTT-S member at the time of nomination. This year's recipients are William Deal and John Papapolymerou.

IEEE Fellows

The member grade of Fellow is conferred in recognition of unusual and outstanding professional distinction. It is awarded at the initiative of the IEEE Board of Directors following a rigorous nomination and evaluation process. Individuals receiving this distinction have demonstrated extraordinary contributions to one or more fields of electrical engineering, or related sciences. The total number of Fellows selected in any one year

Yves Baeyens	For contributions to broadband and millimeter-wave circuits for optical and wireless communications
Georg Boeck	For contributions to radio frequency and microwave integrated circuits and systems
Wolfgang Heinrich	For contributions to the modeling of coplanar microwave and millimeter-wave integrated circuits
Arne Jacob	For contributions to the characterization and application of composite materials
Raymond Quere	For leadership in device characterization and computer aided design microwave engineering
Robert York	For contributions to ferroelectric devices, power amplifiers and phased array systems
Ming Yu	For contributions to the design and tuning of microwave filters and multiplexers
Felix Yanovsky (AES)	For contributions to airborne radar for flight safety
Francisco Ares (AP)	For contributions to antenna array pattern synthesis
Jean-Pierre Berenger (AP)	For contributions to perfectly matched layer absorbing boundary condition in computational solutions of Maxwell's equations in open regions
Nicholas Buris (AP)	For contributions to electromagnetic design automation and multidisciplinary optimization of complex wireless communications problems
Jaideva Goswami (AP)	For contributions to wavelet theory and development of electromagnetic sensors and data analysis methods
Levent Gurel (AP)	For contributions to fast methods and algorithms for computational electromagnetics

N. Walter Cox Award

This award was established in recognition of the qualities of N. Walter Cox and his service to the MTT-S prior to his untimely death in 1988. It is given to a Society volunteer whose efforts on behalf of MTT-S best exemplify Walter's spirit and dedication. This year's recipient is Wayne A. Shiroma.

Microwave Prize

This award recognizes on an annual basis the most significant contribution by a published paper within the MTT-S's field of interest. Papers under consideration are those published during the calendar year preceding the Fall meeting of the AdCom. This year's recipients are Joshua D. Schwartz, Jose Azana, and David V. Plant for their paper entitled "A Fully Electronic System for the Time Magnification of Ultra-Wideband Signals." IEEE Transactions on Microwave Theory and Techniques, Volume 55, Issue 2, Part 1, Feb. 2007, pages: 327 – 334.

Hal Sobol Travel Grant

This year's recipient is Simone Bastioli for his paper entitled "Novel Waveguide Pseudo-Elliptic Filters using Slant Ridge Resonators." Coauthors: Luca Marcaccioli and Roberto Sorrentino, 2008 IEEE MTT-S International Microwave Symposium Digest, June 2008, pages: 619–622.

does not exceed one tenth of one percent of the total voting Institute membership. Seven MTT-S members who were evaluated by our Society were elevated to the grade of Fellow, effective 1 January 2009. MTT –S members who were evaluated by another IEEE Society are indicated in parentheses following their names.

Susan Hagness (AP)	For contributions to time-domain computational electromagnetics and microwave medical imaging
George Hanson (AP)	For contributions to the electromagnetic analysis of layered media and nanostructures
.eo Kempel (AP)	For contributions to conformal antenna design and electromagnetic composite materials
Thomas Milligan (AP)	For development of antennas for space exploration
Vichal Okoniewski (AP)	For contributions to computational electromagnetics
_event Sevgi (AP)	For contributions to surface-wave radar systems
George Chrisikos (COM)	For contributions to simulation and design of communication systems
Moises Cases (CPMT)	For contributions to design and noise control for power and signal distribution in digital systems
ih-Tyng Hwang (CPMT)	For contributions to System-in-a-Package technologies
Richard Withers (CSC)	For development of superconductive and cryogenic radio frequency circuits for nuclear magnetic resonance probes
lohn Zolper (ED)	For leadership in compound semiconductor electronics
Omar Ramahi (EMC)	For contributions to computational electromagnetics in electromagnetic compatibility
Matteo Pastorino (IM)	For contributions to analysis of electromagnetic scattering
loe Jensen (SSC)	For contributions to high-speed analog-digital converter and high-speed digital integrated circuit design
Ross Murch (VT)	For contributions to multiple antenna systems for wireless communications



to device my advance registration of the second sec

W. From Even Knight Carp-205 A SA. Needbarn, Mass-

23

RFIC

	Monday	Technical	Sessions	8:00 - 11:50
	RMO1A 204AB Cellular IC I Chair: Didier Belot, ST Microelectronics Co-Chair: Andre Hanke, Infineon	RMO1B 205A Advanced Millimeter-Wave Circuits Chair: Paul Blount, Custom MMIC Design Services Co-Chair: Kevin Kobayashi, RFMD	RMO1C 206AB Broadband IC I Chair: Chris Rudell, University of Washington Co-Chair: Ranjit Gharpurey, UT Austin	RMO1D 203 Transformer Based VCOs Chair: Timothy Hancock, MIT Lincoln Laboratory Co-Chair: Tian-Wei Huang, National Taiwan Univ
08:00	RMO1A-1: RF Receiver Front-End with +3dBm Out-of-Band IIP3 and 3.4dB NF in 45nm CMOS for 3G and Beyond N. K. Yanduru ¹ , D. Griffith ¹ , K-M Low ¹ , P. Balsara ² , ¹ Texas Instruments Inc., Dallas, TX, USA, ² The Univ of Texas at Dallas, Richardson, TX, USA	RM01B-1: Current Combining 60GHz CMOS Power Amplifiers M. Bohsali and A. M. Niknejad, BWRC, Univ of California at Berkeley, CA, USA	RMO1C-1: A DC-102GHz Broadband Amplifier in 0.12 µm SiGe BiCMOS J. Kim and J. F. Buckwalter, Univ of California, San Diego, CA, USA	RMO1D-1: A 24GHz Low-Power VCO with Transformer Feedback C. A. Lin, J. L. Kuo, K. Y. Lin, H. Wang, National Taiwan Univ, Taipei, Taiwan
08:20	RMO1A-2: A SAW-Less CDMA Receiver Front-End with Single-Ended LNA and Single-Balanced Mixer with 25% Duty-Cycle LO in 65nm CMOS RMsmi, Liu?, TCharg, PS Gudent, and LE Lason, 'Univof California San Diega La Jolla, CA, USA, 'Quakcomm Inc, San Diega, CA, USA	RMO1B-2: 60GHz 45nm PA for Linear OFDM Signal with Predistortion Correction Achieving 6.1% PAE and -28dB EVM E. Cohen ¹ , S. Ravid ¹ , D. Ritter ² , 'Intel Haifa, Israel , ² Electrical Engineering Technion, Haifa, Israel	RMO1C-2: A 1.8 mW Wideband 57dBΩ Transimpedance Amplifier in 0.13µm CMOS F. Aflatouni, H. Hashemi, Univ of Southern California, Los Angeles, CA, USA	RMO1D-2: A 1.7mW, 16.8% Frequency Tuning, 24GHz Transformer-Based LC-VCO Using 0.18µm CMOS Technology YH. Kuo ¹ , JH. Tsai ² , TW. Huang ¹ , 'National Taiwan Univ, ² Yuan Ze Univ, Taiwan
08:40	RMO1A-3: A 0.13µm CMOS Multi- Band WCDMA/HSDPA Receiver Adopting Silicon Area Reducing Techniques H. Moon, J. Han, S-I Choi, D. Keum, B-H Park, Samsung Electronics, Korea	RMO1B-3: 60GHz and 80GHz Wide Band Power Amplifier MMICs in 90nm CMOS Technology N. Kurita, H. Kondoh, Central Research Laboratory, Hitachi, Ltd., Japan	RMO1C-3: 1 - 10GHz Inductorless Receiver in 0.13µm CMOS L. Cai, R. Harjani, Univ of Minnesota, Minneapolis, MN	RMO1D-3: A 92.6% Tuning Range VCO Utilizing Simultaneously Controlling of Transformers and MOS Varactors in 0.13µm CMOS Technology Y. Takigawa', H. Ohta', Q. Liu', S. Kurachi ² , N. Itoh ² , T. Yoshimasu', 'Waseda Univ, ² Toshiba Corporation, Japan
00:60	RMO1A-4: A Tunable 300-800MHz RF-Sampling Receiver Achieving 60dB Harmonic Rejection and 0.8dB Minimum NF in 65nm CMOS Z. Ru ¹ , E. Klumperink ¹ , C. Saavedra ² , B. Nauta ¹ , ¹ Univ of Twente, Netherlands, ² Queen's Univ, Canada	RMO1B-4: Low-Loss 0.13µm CMOS 50 - 70GHz SPDT and SP4T Switches Y.A. Atesal, B. Cetinoneri, G. M. Rebeiz, Univ of California, San Diego, CA, USA	RMO1C-4: A 2Gbps RF-Correlation- Based Impulse-Radio UWB Transceiver Front-End in 130nm CMOS L. Zhou, Z. Chen, CC. Wang, F. Tzeng, V. Jain, and P. Heydari, Univ of California, Irvine	RMO1D-4: 1.1 to 1.9GHz CMOS VCO for Tuner Application with Resistively Tuned Variable Inductor S. J. Cheng ¹ , Y. Zheng ² , C. H. Heng ¹ , 'National Univ of Singapore, ² Institute of Microelectronics, Singapore
07:60	RMO1A-5: The First Experimental Demonstration of a SASP-Based Full Software Radio Receiver F. Rivet', Y. Deval', JB. Begueret', D. Dallet', P. Cathelin ² , D. Belot ² , 'IMS Laboratory, Talence Cedex, France,'STMicroelectronics, Crolles Cedex, France	RM01B-5: A Tunable Flipflop Based Frequency Divider up to 113GHz in SiGe:C Bipolar Technology S.Trotta ¹ , J. John ² , ¹ Freescale Semiconductor, Munich, Germany, ² Freescale Semiconductor, Tempe, AZ, USA	RMO1C-5: A Multi-Modulation Low- Power FCC/EC-Compliant IR-UWB RF Transmitter in 0.18µm CMOS D. Barras ¹ , G. von Bueren ¹ , W. Hirt ² , H. Jaeckel ¹ , ¹ Swiss Federal Institute of Technology, Zurich, Switzerland, ² IBM Research, Zurich Research Laboratory, Rüschlikon, Switzerland	RMO1D-5: An Ultra-Low-Power CMOS Complementary VCO Using Three-Coil Transformer Feedback CK. Hsieh, KY. Kao, and KY. Lin, National Taiwan Univ, Taipei, Taiwan
	RMO2A 204AB RFID and Low-Power Wireless Chair: Natalino Camilleri, Alien Technology Co-Chair: Glenn Chang, MaxLinear	RMO2B 205A High-Frequency CMOS RF Receivers Chair: Walid Ali-Ahmad, Mediatek Co-Chair: Sayfe Kiaei, Arizona State Univ	RMO2C 206AB PA Modulator Components Chair: Freek van Straten, NXP Semiconductors Co-Chair: Joseph Staudinger, Freescale Inc.	RMO2D 203 RF Modeling and Design Automation Chair: Kevin McCarthy, Univ College Cork Co-Chair: Francis Rotella, Peregrine Semiconductor
10:10	RMO2A-1: Software Configurable 5.8GHz Radar Sensor Receiver Chip in 0.13 µm CMOS for Non-contact Vital Sign Detection C. Li, X. Yu, D. Li, L. Ran, and J. Lin, University of Florida, Zhejiang University	RMO2B-1: Low-Voltage, Inductorless Folded Down-Conversion Mixer in 65nm CMOS for UWB Applications S. K. Hampel ¹ , O. Schmitz ¹ , M. Tiebout ² , I. Rolfes ¹ , 'Leibniz Universität Hannover, Germany, ² Infineon Technologies Austria AG, Austria	RMO2C-1: A Hybrid Envelope Modulator Using Feedforward Control for OFDM WLAN Polar Transmitter C. Lee, C. Chen and S. Wu, STC, ITRI, Taiwan	RMO2D-1: Effect of Substrate Contact Shape and Placement on RF Character- istics of 45 nm Low Power CMOS Devices U. Gogineni', H. Li ² , S. Sweeney ² , J. Wang ³ , B. Jaganathar ² , J. del Alamo ¹ , 'Massachusetts Institute of Technology, Cambridge, MA, ² IBM Microelectronics, Essex Jct, VT, ³ IBM Microelectronics, Hopewell Junction, NY, USA
10:30	RMO2A-2: An Asymmetric RF Tagging IC for Ingestible Medication Compliance Capsules H. Yu, C. M. Tang, R. Bashirullah, University of Florida, Gainesville, FL, USA	RMO2B-2: A 14GHz CMOS Receiver with Local Oscillator and IF Bandpass Filter for Satellite Applications W. Chen, T. Copani, H. Barnaby, S. Kiaei, Connection One, Arizona State Univ, Tempe, AZ, USA	RMO2C-2: A Spurious Emission Reduction Technique for Power Amplifiers Using Frequency Hopping DC-DC Converters JH. Chen, PJ. Liu,YJ. E. Chen, National Taiwan Univ, Taiwan	RMO2D-2: Design and Modeling of Planar Transformer-based Silicon Integrated Passive Devices for Wireless Applications CH. Huang', TC. Wei', TS. Horng', SM. Wu ² , JY. L ³ , CC. Chen ² , CC. Wang ⁴ , CT, Chiu ² , and CP. Hung ⁴ , 'National Sun Yat-sen Univ, 'National Univ of Kaohsiung, ³ ITRI, ⁴ Advanced Semiconductor Engineering, Taiwan
06:01	RMO2A-3: A Novel CMOS Transmitter Front-end for Mobile RFID Reader T. Gao, J. Wang, C. Zhang, B. Chi, Z. Wang, Tsinghua University, Beijing, China	RMO2B-3: A Two-Channel Ku-Band BiCMOS Digital Beam-Forming Receiver for Polarization-Agile Phased-Array Applications B. Cetinoneri, Y. A. Atesal, G. M. Rebeiz, Univ of California, San Diego, CA, USA	RMO2C-3: A Highly-Linear Radio- Frequency Envelope Detector for Multi-Standard Operation J. Cha ¹ , W. Woo ² , C. Cho ² , Y. Park ² , C. H. Lee ² , H. Kim ³ , and J. Laskar ¹ , 'Georgia Institute of Technology, ² Samsung Design Center, ³ Samsung Electro-Mechanics	RMO2D-3: Characterisation and Macro-modeling of Patterned Micronic and Nano-Scale Dummy Metal-Fills in Integrated Circuits S. Wane ¹ , D. Bajon ² , ¹ NXP Semiconductors Caen, France, ² ISAE/Toulouse Univ Toulouse, France
01:11	RMO2A-4: A RF Transceiver with Auto Signal Detection and Combined PGA/RSSI in 0.18µm CMOS for V2.1 Bluetooth Applications W-Y Hu', J-W Lin', K-C Tien', Y-H Hisich', C-L Chen', H-T Tso', Y-S Shif', S-C Hu', S-C Hen', 'National Taiwan University, "MuChip Corp. Ltd.	RMO2B-4: High Performance CMOS Receiver for Local Positioning Systems M. Krcmar, V. Subramanian, G. Boeck, Berlin Institute of Technology, Berlin, Germany	RMO2C-4: A 1.55GHz to 2.45GHz Center Frequency Continuous-Time Bandpass Delta-Sigma Modulator for Frequency Agile Transmitters M. Schmidt, M. Grözing', S. Heck', I. Dettmann', M. Berroth', D. Wiegner', W. Templ', A. Pascht', 'Univ of Stuttgart, 'Alcatel-Lucent Bell Labs Stuttgart, Germany	RMO2D-4: Mosaic Placement of Very High Density 3D Capacitors for Efficient Decoupling Functionality in the RF Domain O. Tesson, F. Le Cornec, S. Jacqueline, NXP Semiconductors Caen, France
11:30	RMO2A-5: An Ultra-Low-Power 868/915 MHz RF Transceiver for Wireless Sensor Network Applications R. van Langevelde ¹ , M. van Elzakker ¹ , D. van Goor ¹ , H. Termeer ¹ , J. Moss ² and A.J. Davie ¹ , "Philips Research Europe, Eindhoven, The Netherlands, ² Philips Research UK, Cambridge, United Kingdom	RMO2B-5: A CMOS Ku-band Single- Conversion Low-Noise Block Front- End for Satellite Receivers Z. Deng, J. Chen, J. Tsai, A. M. Niknejad, Univ of California at Berkeley, USA	RMO2C-5: A 25 dBm High-Efficiency Digitally-Modulated SOI CMOS Power Amplifier for Multi-Standard RF Polar Transmitters S. Pompromlikit', J. Jeong', C. D. Presti', A. Scuder ³ , and P. M. Asbeck', 'Univ of California at San Diego, 'Zwangwoon Univ, 'STMicroelectronics Sci.J., USA	RMO2D-5: On Modeling Parasitic Control Loops in RF SoCs: RF Cross- Coupling and Spurious Analysis K. Muhammad, Chih-Ming Hung, Hunsoo Choo, Erkin Cubukcu, Texas Instruments Inc., Dallas, TX, USA

Monday

RMO3A

Cellular IC II Chair: Jyoti P. Mondal, Freescale Semiconductor Co-Chair: Fazal Ali, Oualcomm

204AB

RMO3A-1: Asynchronous Modulator for Linearization and Switch-Mode **RF Power Amplifier Applications** T. Johnson, K. Mekechuk, D. Kelly, J. Lu, Pulsewave RF, Inc., USA

RMO3A-2: A Low Power 100 MHz to 2.5GHz Digital-to-Time Conversion Based Transmitter for Constant-**Envelope Direct Digital Modulation** Bob Stengel, S. A. Talwalkar, Tom Gradishar, Gio Cafaro, Motorola, Inc., Plantation, FL, USA

RMO3A-3: A 65nm CMOS Low-Noise **Direct-Conversion Transmitter with** Carrier Leakage Calibration for Low-Band EDGE Application

S. F. Chen, Y. B. Lee, Eric Sun, B. J. Kuo, G. K. Dehng, MediaTek Inc., Taiwan

RMO3A-4: A Low-Cost Quad-Band Single-Chip GSM/GPRS Radio in 90nm Digital CMOS

K. Muhammad, C.-M. Hung, D. Leipold, T. Mayhugh, I. Elahi, I. Deng, C. Femando, M.-C. Lee, T. Murphy, J.L. Wallberg, R.B. Staszewski, S. Larson, T. Jung, P. Cruise, V. Roussel, S.K. Vemulapalli, R. Staszewski, O.E. Eliezer, G. Feygin, K. Kunz, K. Maggio, Texas Instruments Inc., Dallas, TX

RMO3A-5: A Multi-Band High Performance Single-Chip Transceiver for WCDMA/HSDPA

C. S. Chiu¹, B. S. Heng², E. S. Khoo², S. R. Karri², B. J. Kuo¹, C. H. Shen¹, T. Y. Sin², C. Y. Wang², W. Xang², H. L. Zhang², Walid Y. Ali-Ahmad², C. L. Heng², S. K. Dehng¹, ¹ Media² Heng, ¹ J. Kul² Heng¹, ¹ Media² Heng, ¹ J. Media² Heng, ¹ J. Media² Heng², ¹ Media² Heng² Heng², ¹ Media² Heng² Heng²

DIA

NIVIU4A	ZU4AD
WLAN and Wi	Max
Chair: Srenik M	ehta,
Atheros Communi	ications
Co-Chair: Julian	Tham,
Arda Technolo	gies
RMO4A-1: Full Integrated 2	23 dBm Transmit

Chain with On-chip Power Amplifier and Balun for 802.11a Application in Standard 45nm CMOS Process A. A. Kidwai¹, A. Nazimov², Y. Eilat², O. Degani², ¹Intel

Corporation, Hillsboro OR, ²Intel Corporation, Haifa Israel RMO4A-2: A Tri-Band MIMO Transceiver

for Mobile WiMAX with an Image **Rejection Ratio Tunable SSB Mixer** K. Oishi¹, D. Yamazaki¹, N. Hasegawa², N. Kobayashi², M. Kudo², T. Sasaki², S. Sakamoto³, S. Yamaura¹, 'Fujitsu Laboratories Ltd., ²Fujitsu Microelectronics Ltd., ³Fujitsu

Microelectronics Solutions Ltd., Japan

RMO4A-3: Innovative Architecture for Dual-band WLAN and MIMO Front-End Module Based on a Single Pole Three Throw Switch-plexer

C-W P. Huang, W. Vaillancourt, P. Antognetti, T. Quaglietta, M. McPartlin, M. Doherty, and C. Masse, SiGe Semiconductor, Andover, MA, USA

RMO4A-4: A Compact Low Power SDR Receiver with 0.5-20 MHz **Baseband Sampled Filter**

A. Geis^{1,2} J. Ryckaert¹, J. Borremans¹, G. Vandersteen², Y. Rolain², J. Craninckx¹, ¹IMEC, Belgium, ²Vrije Universiteit Brussels, Belgium

RMO4A-5: Wi-Fi/WiMAX Dual Mode **RF MMIC Front-End Module** P. H. Wu, S. M. Wang and M. W. Lee, Industrial Technology Research Institute, Taiwan

Technical Sessions

205A RM03B **60-GHz Phased Arrays** Chair: Brian Floyd, IBM Co-Chair: Georg Boeck, TU-Berlir

RMO3B-1: A Bidirectional TX/RX Four Element Phased-Array at 60GHz with RF-IF Conversion Block in 90nm CMOS Process

E. Cohen¹, C. Jakobson¹, S. Ravid¹, D. Ritter², ¹Intel Haifa, Israel, ² Electrical Engineering Technion, Haifa, Israel

RMO3B-2: A 60GHz Digitally-Controlled RF-Beamforming Receiver Front-End in 65nm CMOS Y.Yu¹, P.G.M. Baltus¹, A.J.M.de Graauw², E.van der Heijden²,

M.Collados², C.Vauche², A.H.Mvan Roemund¹, ¹Eindhoven Univ of Technology, Eindhoven, The Netherlands; ²NXP Semiconductors, Research, Eindhoven, The Netherlands

RMO3B-3: A 60GHz Band CMOS Phased Array Transmitter Utilizing Compact Baseband Phase Shifters S. Kishimoto, N. Orihashi, Y. Hamada, M. Ito, K. Maruhashi, NEC Corporation, Japan

RMO3B-4: Embedded DiCAD Linear Phase Shifter for 57-65GHz Reconfigurable Direct Frequency Modulation in 90nm CMOS T. LaRocca, J. Liu, F. Wang, F. Chang, Univ of

California at Los Angeles, CA, USA

RMO3B-5: 60GHz Passive and Active RF-Path Phase Shifters in Silicon M.-D Tsai¹, A. Natarajan², ¹MEDIATEK INC., Taiwan, ²IBM T.J. Watson Research Center, New York, USA

RMO4B	205A
RF Front End Building	BIOCKS
Chair: Osama Shana'	a,
MediaTek	
Co-Chair: Danilo Manst	retta,
Univ of Pavia	
RMO4B-1: A DC-to-22GHz &	3.4mW

Compact Dual-feedback Wideband LNA in 90nm Digital CMOS M. Okushima^{1,2}, J. Borremans¹, D. Linten¹, G. Groeseneken¹, ¹IMEC, Leuven, Belgium, ²currently at NEC Electronics corp., Japan

RMO4B-2: A 24GHz Transformer-Based Single-In Differential-Out CMOS Low-Noise Amplifier J-F Yeh, C-Y Yang, H-C Kuo, and H-R Chuang, National Cheng Kung Univ, Tainan, Taiwan

RMO4B-3: A 3-to-5GHz UWB LNA with a Low-Power Balanced Active Balun

S. Joo¹, T-Y Choi¹, J-Y Kim², B. Jung¹, ¹Purdue Univ, West Lafayette, USA, ²ETRI, South Korea

RMO4B-4: A 50 dB Image-Rejection SiGe-HBT based Low Noise Amplifier in 24GHz Band

T. Masuda, N. Shiramizu, T. Nakamura, and K. Washio, Hitachi, Central Research Laboratory

RMO4B-5: A 1.3 V, 65nm CMOS, Coilless Combined Feedback LNA with Integrated Single Coil Notch Filter

D. Bormann¹, T. D. Werth¹, C. Schmits², and S. Heinen¹, ¹RWTH Aachen Univ. ²Ruhr-Universitaet Bochum, Germany

De2210112		13.20 - 17.10
RM03C	206AB	RM03D 203
Handset PA's & Concep	ts	Advanced VCO Topologies
Skyworks Solutions		Ohio State Univ
Co-Chair: Eddie Spears, RF Micro Devices		Co-Chair: Timothy Hancock, MIT Lincoln Laboratory
RMO3C-1: A Highly Efficient G	ism/	RMO3D-1: A Low-Power Dual-Band
GPRS Quad-band CMOS PA M C -H Lee ¹ Y Kim ² L I Chang ¹ K S Ya	odule	Oscillator Based on Band-Limited Negative Resistance
An ¹ , I. Lee ² , K. Kim ² , J. Nam ² , H. Kim ² , Design Conter USA ² Samsung Electro	Samsung	B. Catli, M. M. Hella, Rensselaer Polytechnic
Mechanics Corporation, Korea		institute, noy, N1, 03A
RMO3C-2: Scalable CMOS Pow	ver	RMO3D-2: Low Phase Noise Gm-
Devices with 70% PAE and 1, 3.4 Watt Output Power at 2G	2 and Hz	Boosted Differential Colpitts VCO with Suppressed AM-to-FM
M. Acar ¹ , M. P. van der Heijden ¹ , I. Volokhine ² , Apostolidou ¹ J. Sonsky ² and J. S. Vromans ¹ ¹ N	M. IXP	Conversion
Semiconductors Research, Eindhoven, The Ner ² NXP-TSMC Research Center, Leuven, Belgiur	therlands, n	Communications Univ, Korea
RMO3C-3: Asymmetric Multile	evel	RMO3D-3: An SoC with Automatic
Outphasing Architecture for N Standard Transmitters	/lulti-	Bias Calibration of an RF Oscillator I. Bashir, R. B. Staszewski, O. Eliezer, P. T.
S-W Chung, P. A. Godoy, T. W. Barton,	Ε.	Balsara, Texas Instruments Inc., USA, Univ of
Massachusetts Institute of Technology	, , USA	
RMO3C-4: Distributed Power		RMO3D-4: A Low-Power, Small Area
Filtering	monic	3D Solenoid-Shaped Inductor
B. Thompson ¹ , B. Stengel ¹ , S. Olson ¹ , D. Scagmelli ² A Joseph ² J. Dunn ² ¹ Moto	prola Inc	A.Tanabe, K.Hijioka, H.Nagase, Y.Hayashi, NEC Electronics Corp. Japan
² IBM Microelectronics	fiola me,	Liccuonics corp., Jupan
RMO3C-5: Dual Mode Efficien	cy	RMO3D-5: A Gate-Modulated CMOS
Using a New Balanced Struct	liers Jre	LC Quadrature VCO KW. Cheng and D. J. Allstot. Univ of
G. Zhang, S. Chang, S. Chen and J. Sur	۱,	Washington, Seattle, WA, USA
RMO4C	206AB	RMO4D 203
PLLs and Synthesizers	s	Chair: Aditya Gupta,
Chair: Stefano Pellerano, Inte Co-Chair: Bertan Bakkalogi	l Co. lu,	ANADIGICS Co-Chair: Fli Reese Triquint
Arizona State Univ		
RMO4C-1: A 750µW 1.575GHz Temperature-Stable FBAR-Bas	ed PLL	RMO4D-1: Temperature Compensated BAW Resonator and Its Integrated
J. R. Hu ¹ , W. Pang ² , R. C. Ruby ² , and B.	P. Otis ¹ ,	Thermistor for a 2.5GHz Electrical
¹ Univ of Washington, Seattle, WA, ² Av Technologies, Inc., San Jose, CA	ago	D. Petit, E. Césa ⁹ , P. Barl, S. Joblot, G. Parat ⁴ , O. Berchaud ⁹ , J. Verdie ² , J.F.
		Carpentier, 151 Microelectronics, Crolles, Hance, 4NL, Villeurbanne, Hance, ³ ST-NXPWireless, Grenoble, France, ⁴ CEA, LETI, Grenoble
RMO4C-2: A 0.1-5GHz Dual-Ve Software-Defined SA Frequer		RMO4D-2: RF Reliability of Short Channel NMOS Devices
Synthesizer in 45nm Digital C	Mos	D. Stephens ¹ , T. Vanhoucke ² and J.J.T.M.
P. Nuzzo ¹ , K. Vengattaramane ^{1,2} , M. Ingels Giannini ¹ , M. Steyaert ² , J. Craninckx ¹ , ¹ NE	¹ , V. S/ Wireless,	Donkers ² , ¹ NXP-TSMC Research Center , AE Eindhoven, The Netherlands, ² Kapeldreef,
IMEC ² Katholieke Universiteit Leuven, Bel	gium	Leuven, Belgium
RMO4C-3: A 3GHz Wideband 2	ΣΛ	RMO4D-3: Flicker Noise in
Flactional-IN Synthesizer With		Nanoscalo nMOSEETs with Mobility
Voltage-Mode Exponential CF	P-PFD	Nanoscale pMOSFETs with Mobility Enhancement Engineering and
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA	P-PFD a State	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-L Yeh, C-Y Ku, W-L Hong, and J-C Guo.
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA	P-PFD a State	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-L Yeh, C-Y Ku, W-L Hong, and J-C Guo, National Chiao Tung Univ, Hsinchu, Taiwan
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA RMO4C-4: An Integrated 18G	P-PFD a State	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-L Yeh, C-Y Ku, W-L Hong, and J-C Guo, National Chiao Tung Univ, Hsinchu, Taiwan RMO4D-4: High Frequency Noise
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA RMO4C-4: An Integrated 18GI Fractional-N PLL in SiGe BiCM Technology for Satellite Commun	P-PFD a State Hz IOS ications	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-LYeh, C-Y Ku, W-L Hong, and J-C Guo, National Chiao Tung Univ, Hsinchu, Taiwan RMO4D-4: High Frequency Noise in Deep-Submicrometer nMOSFETs under Different Hot Carrier Stresses
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA RMO4C-4: An Integrated 18GI Fractional-N PLL in SiGe BiCM Technology for Satellite Commun F. Herzel ¹ , S.A. Osmany ¹ , K. Schmalz ¹ , W L. C. Scheytt ¹ J. Podreharcek ² R. Followa	P-PFD a State Hz IOS ications Winkler ¹ , m ² H - V	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-L Yeh, C-Y Ku, W-L Hong, and J-C Guo, National Chiao Tung Univ, Hsinchu, Taiwan RMO4D-4: High Frequency Noise in Deep-Submicrometer nMOSFETs under Different Hot Carrier Stresses H. Su, H. Wang, Z. Sun, T. Xu, Nanyang Technological Univ Singapore
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA RMO4C-4: An Integrated 18GG Fractional-N PLL in SiGe BiCM Technology for Satellite Commun F. Herzel ¹ , S.A. Osmany ¹ , K. Schmalz ¹ , W J. C. Scheytt ¹ , T. Podrebersek ² , R. Follmar Heyer ³ , 1IHP, ² IMST GmbH, ³ Kayser-Three	Hz IOS ications .Winkler ¹ , .m ² , HV. de GmbH	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-L Yeh, C-Y Ku, W-L Hong, and J-C Guo, National Chiao Tung Univ, Hsinchu, Taiwan RMO4D-4: High Frequency Noise in Deep-Submicrometer nMOSFETs under Different Hot Carrier Stresses H. Su, H. Wang, Z. Sun, T. Xu, Nanyang Technological Univ, Singapore, Singapore
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA RMO4C-4: An Integrated 18GF Fractional-N PLL in SiGe BICM Technology for Satellite Commun F. Herzel ¹ , S. A. Osmany ¹ , K. Schmla ²¹ , W J. C. Scheyt ¹ , T. Podrebersek ² , R. Follmar Heyer ³ , ¹ IHP, ² IMST GmbH, ³ Kayser-Three RMO4C-5: A 1.2-mW CMOS	P-PFD a State Hz IOS ications .Winkler ¹ , m ² , H-V. de GmbH	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-L Yeh, C-Y Ku, W-L Hong, and J-C Guo, National Chiao Tung Univ, Hsinchu, Taiwan RMO4D-4: High Frequency Noise in Deep-Submicrometer nMOSFETs under Different Hot Carrier Stresses H. Su, H. Wang, Z. Sun, T. Xu, Nanyang Technological Univ, Singapore, Singapore
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA RMO4C-4: An Integrated 18GI Fractional-N PLL in SiGe BiCM Technology for Satellite Commun F. Herzel ¹ , S. A. Osmany ¹ , K. Schmalz ¹ , W J. C. Scheytt ¹ , T. Podrebersek ² , R. Follmar Heyer ³ , 11HP, ² IMST GmbH, ⁴ Kayser-Three RMO4C-5: A 1.2-mW CMOS Frequency Synthesizer with F. Integrated LC VCO for 400-MI	Hz IOS ications Winkler ¹ , nr ² , HV. Je GmbH	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-L Yeh, C-Y Ku, W-L Hong, and J-C Guo, National Chiao Tung Univ, Hsinchu, Taiwan RMO4D-4: High Frequency Noise in Deep-Submicrometer nMOSFETs under Different Hot Carrier Stresses H. Su, H. Wang, Z. Sun, T. Xu, Nanyang Technological Univ, Singapore, Singapore RMO4D-5: K-band Diamond MESFETs for RFIC Technology P. Calvani ¹ , A. Corsaro ¹ , M. C. Rossi ¹ , G. Conte ¹ , E.
Voltage-Mode Exponential CF H. Hedayati and B. Bakkaloglu, Arizon Univ, Tempe, AZ, USA RMO4C-4: An Integrated 18GI Fractional-N PLL in SiGe BiCM Technology for Satellite Commun F. Herzel ¹ , S.A. Osmany ¹ , K. Schmalz ¹ , W J. C. Scheytt ¹ , T. Podrebersek ² , R. Follmar Heyer ³ , ¹ HP, ² IMST GmbH, ³ Kayser-Three RMO4C-5: A 1.2-mW CMOS Frequency Synthesizer with Fi Integrated LC VCO for 400-MI Medical Implantable Transce ¹ A.Italia, G. Palmisano, Univ of Catania	P-PFD aa State Hz IOS ications .Winkler ¹ , n ² , HV. Je GmbH ully- tz vers a, Italy	Nanoscale pMOSFETs with Mobility Enhancement Engineering and Dynamic Body Biases K-L Yeh, C-Y Ku, W-L Hong, and J-C Guo, National Chiao Tung Univ, Hsinchu, Taiwan RMO4D-4: High Frequency Noise in Deep-Submicrometer nMOSFETs under Different Hot Carrier Stresses H. Su, H. Wang, Z. Sun, T. Xu, Nanyang Technological Univ, Singapore, Singapore RMO4D-5: K-band Diamond MESFETs for RFIC Technology P. Calvani', A. Corsaro ¹ , M. C. Rossi ¹ , G. Conte ¹ , E. Giovine ² , W. Ciccognani ³ , E. Limiti ³ , 'Univ of Roma Tre, Rome, ² Istituto di Fotonica e Nanotecnologie,

12.20

17.10

13:20

4:00

15:30

15:50

16:10

6:30

16:50

RFIC

	PTII1A 204AP	DTI11D 205A	PTU1C
	RTUTA 204AB Broadband PAs and MIMO Chair: Noriharu Suematsu, Mitsubishi Electric Co-Chair: Bruce Thompson, Motorola ARTC	KIUIB 2004 New Ideas in CMOS RF Chair: Frank Henkel, IMST GmbH Co-Chair: Reynold Kagiwada, Northrop Grumman	Advanced Device Characterization Chair: Yuhua Cheng, Peking University Co-Chair: Louis C Liu, CT Communication Technologies
0000	RTU1A-1: A 4-Antenna Transmitter in 0.18µm CMOS using Space-Time Block Codes N. M. Neihart ¹ , K. W. Cheng ² , J. S. Walling ² , S. Yoo ² , and D. J. Allstot ² , 'lowa State Univ, ² Univ of Washington	RTU1B-1: Active Feedback Interference Cancellation in RF Receiver Front-Ends T. D. Werth ¹ , C. Schmits ² , S. Heinen ¹ , RWTH Aachen Univ, ² Institute for Integrated Systems Ruhr-Universitaet Bochum, Germany	RTU1C-1: MMW Lab In-Situ to Extract Noise Parameters of 65nm CMOS Aiming 70~90GHz Applications Y. Tagro ¹ , D. Gloria ¹ , S. Boret ¹ , G. Dambrine ² , STMicroelectronics ¹ , IEMN ²
	RTU1A-2: Fully Integrated Dual- Band Power Amplifiers with On-Chip Baluns in 65nm CMOS for an 802.11n MIMO WLAN SoC A Afsahi? A Behzad?, V.Magoor?, L.E.Larson!, 'Univ of California at San Diego, ² Broadcom Corp., USA	RTU1B-2: A 1.3V 26mW 3.2GS/s Undersampled LC Bandpass Sigma- Delta ADC for a SDR ISM-band Receiver in 130nm CMOS N. Beileau', H.Aboushady', F. Montaudon' and A. Cathelin', 'Univ of Pais V. Paris France 'STMorelectorics, Grendole, France	RTU1C-2: 40ns Pulsed I/V Set-up and Measurement Method Applied to InP HBT Characterization and Electro- Thermal Modeling A.Saleh', M.Abou Chahine', T. Reveyrand', G. Neveux', D. Barataud', J.M.Nebus', R. Quéré', YBouvier', J. Godin', and M. Brief Linger II and Chard Therman Market
	RTU1A-3: Multi-Decade GaN HEMT Cascode-Distributed Power Amplifier with Baseband Performance K.W. Kobayashi', Y-C Cher?, I. Smorthkow?, B. Heying', W-B Luo', W. Suttor', M. Wojtowicz', and A. Ok?, IRF MICRO DEVICES, Torrance, CA, ² Northrop Grumman Space & Technology, CA	RTU1B-3: An Inductorless High Dynamic Range 0.3 - 2.6GHz Receiver CMOS Front-End N Poobuapheun ¹ , ² ,WH. Chen ¹ , Z Boos ³ , and A.M. Niknejad ¹ , ¹ Univ of California at Berkeley, ² Maxim Integrated Products, Inc., ³ Infineon Technologies, Munich, Germany	RTU1C-3: Background Estimation of Power Amplifier Nonlinearities for OFDM Signals P. V. Kolinko, L. E. Larson, Univ Of California San Diego, CA, USA
00.00	RTU1A-4: A 90nm CMOS Power Amplifier for 802.16e (WiMAX) Applications O. Degani, F. Cossoy, S. Shahaf, D. Chowdhury, C. D. Hull, C. Emanuel, R. Shmuel, Intel Corp., Israel	RTU1B-4: A 90nm CMOS Highly Linear Clock Bootstrapped RF Sampler Operating at Wide Frequency Range of 0.5GHz to 5GHz M. Sato', H.Abe', M. Hamada', H. Majima', T. Kuroda', H. Ishikuro', 'Keio Univ, 'Toshiba Corp	RTU1C-4: A Rigorous Analysis of Local Oscillator Pulling in Frequency and Discrete-time Domain C. J. Li ¹ , F. K. Wang ¹ , T. S. Horng ¹ , K. C. Peng ² , ¹ National Sun Yat-sen Univ, Taiwan, ² National Kaohsiung First Univ of Science and Technology, Taiwan
	RTU2A 204AB Wideband and Direct Digital Frequency Synthesizers Chair: Domine M. W. Leenaerts, NXP Semiconductors Co-Chair: Sanjay Raman, DARPA / VT	RTU2B 205A Millimeter-Wave Imaging and Communication Systems Chair: Luciano Boglione, University of Massachusetts Lowell Co-Chair: Jenshan Lin, University of Florida	RTU2C 206AB Broadband IC II Chair: Albert Jerng, Ralink Co-Chair: Albert Wang, UC Riverside
	RTU2A-1: A 366 mW Direct Digital Synthesizer at 15GHz Clock Frequency in SiGe Bipolar Technology B. Laemmle', C. Wagner', H. Knapp', L. Maurer', R. Weigel, ¹ Univ Erlangen Nuremberg, ² Johannes Kepler University Linz, ³ Infineon AG, ⁴ DICE, Germany/Austria	RTU2B-1: A CMOS Focal-Plane Array for Heterodyne Terahertz Imaging U.R. Pfeiffer ¹ , E. Öjefors ¹ , A. Lisaukas ² , D. Glaab ² , H.G. Roskos ² , ¹ University of Wuppertal, Germany, ² Physikalisches Institut, Johann Wolfgang Goethe-Universität Frankfurt, Germany	RTU2C-1: A 5 Gbps Optical Receiver with Monolithically Integrated Photodetector in 0.18µm CMOS T. Kao, A. Chan Carusone, E. S. Rogers, University of Toronto
	RTU2A-2: A 24-bit 5.0GHz Direct Digital Synthesizer MMIC with Direct Digital Modulations and Spur Randomization X. Geng, F. F. Dai, J. D. Irwin, R. C. Jaeger, Auburn University, Auburn, AL, USA	RTU2B-2: High-Performance W-Band SiGe RFICs for Passive Millimeter- Wave Imaging J. W. May, G. M. Rebeiz, University of California, San Diego, CA, USA	RTU2C-2: A 4-Channel 24-27GHz CMOS Differential Phased-Array Receiver T. Yu, G. M. Rebeiz, University of California at San Diego, CA, USA
	RTU2A-3: A Digital Frequency Synthesizer for Cognitive Radio Spectrum Sensing Applications TRapingi/K.Stadius/L.Xu/,SLindfors/R.Kaunisto?A.Pärsinen?, I Rynänen, Helsinki University of Technology, Finland, "Texas Instruments, Finland, "Nokia Research Center, Finland	RTU2B-3: W-band 65nm CMOS and SiGe BiCMOS Transmitter and Receiver with Lumped I-Q Phase Shifters I. Sarkas, M. Khanpour, A. Tomkins, P. Chevalier', P. Garcia' and S. P. Voinigescu, University of Toronto, Canada, 'STMicroelectronics, France	RTU2C-3: A Single-Chip 24GHz SiGe BiCMOS Transceiver for FMCW Automotive Radars D.Saudes', S. Birgham', G. Merori', D. Crocket', J. Tori, R. Mende', M. Behrens', N. Jain', A. Alexanian', Rajanish', 'US Monolithics, USA "Smart Microwave Seneors, Germany' Anokivave, USA, "Rfmaker, USA
	RTU2A-4: A Single-Chip 0.125- 26GHz Signal Source in 0.18µm SiGe BiCMOS S.Yu', Y. Baeyens ² , J. Weiner ³ , U. Koc ² , M. Rambaud ² , F. Liao ² , Y. Chen ² , P. Kinget ¹ , 'Columbia	RTU2B-4: A 60GHz CMOS Receiver with an On-Chip ADC M. Varonen ¹ , M. Kaltiokallio ¹ , V. Saari ¹ , O. Vittala ¹ , M. Kärkkäinen ¹ , S. Lindfors ² , J. Ryynänen ¹ , K.A.I Halonen ¹ , ¹ KK Helsinki Univ	RTU2C-4: An 8-18GHz 0.18W Wideband Recursive Receiver MMIC with Gain-Reuse D. Ma, F. F. Dai, R. C. Jaeger and J. D. Irwin, Auburn University, USA

08:00 - 11:40

Tuesday

RTU3A

Millimeter-Wave VCOs Chair: Timothy Hancock, MIT Lincoln Laboratory Co-Chair: Stephen Dow, ON Semiconducto

204AB

RTU3B

Japan

Integrated Filters

for RF Applications

Chair: Jean-Baptiste Begueret, IMS

Co-Chair: Donald Lie,

Texas Tech University **RTU3B-1: Non-Decimation FIR Filter**

for Digital RF Sampling Receiver with Wideband Operation Capability

C. Park, J. Yoon, and B. Kim, Pohang University

of Science and Technology, Republic of Korea

RTU3B-2: A 250MHz Cut-off Charge-

A. Yoshizawa, S. Iida, Sony Corporation, Tokyo,

RTU3B-3: A 6th Order 1.6 to 3.2GHz

Tunable Low-Pass Linear Phase gm-C Filter for Fiber Optic Adaptive EDC Receivers

Elahmadi2, J. Edwards2, C. Gill2, K. Tran2, L. Linder2, H.

RTU3B-4: Compact Circulator Based

Phase Shifter at C-Band in BiCMOS U. Mayer, F. Ellinger, R. Eickhoff, Dresden

University of Technology, Dresden, Germany

Tan2, 1Pacific Microchip Corp., 2Menara Networks, USA

D. Baranauskas1, D. Zelenin1, M. Bussmann2, S.

Improved Stopband Attenuations

Domain Baseband Filter with

RTU3A-1: A Low Power mm-Wave Oscillator Using Power Matching Techniques

L. Li, P. Reynaert, M. Steyaert, KU Leuven ESAT-MICAS, Leuven, Belgium

RTU3A-2: A 24GHz VCO with 20% Tuning Range in 130nm CMOS Using SOP Technology

M. Tormanen, H. Sjoland, Lund University

RTU3A-3: A Dual Band mm-Wave **CMOS Oscillator with Left-Handed** Resonator

S-W. Tam, H-T. Yu, Y. Kim, E. Socher, M-C.F. Chang, T.Itoh, University of California, Los Angeles, CA, USA

RTU3A-4: A 56GHz LC-Tank VCO with 17% Tuning Range in 65nm Bulk CMOS for Wireless HDMI Applications

J. L. González Jiménez¹, F. Badets², B. Martineau², D. Belot², ¹Universitat Politècnica de Catalunya Barcelona, Spain, 2STMicroelectronics, Crolles, France

Technical Sessions 205A RTU3C

On-Wafer Wireless Testing and Passive RFIC Components

206AB

Chair: Gary Zhang, Skyworks Solutions Co-Chair: Chang-Ho Lee, Samsung

RTU3C-1: On-Wafer Wireless Testing and Mismatch Monitoring Using RF Transmitters with Integrated Antennas

P. Park¹, L. Chen¹, L. Wang¹, S. Long¹, H. Yu², and C. P. Yue¹, ¹University of California, Santa Barbara, ²ETRI, USA

RTU3C-2: CMOS-MEMS Variable Capacitors with Low Parasitic Capacitance for Frequency-**Reconfigurable RF Circuits** J. Reinke, A. Jajoo, L. Wang, G. K. Fedder, and T. Mukherjee, Carnegie Mellon University

RTU3C-3: A High Magnetic Coupling, Low Loss, Stacked Balun in Digital 65nm CMOS

S. Akhtar, R. Taylor, P. Litmanen, Texas Instruments Inc., USA

RTU3C-4: High Current 3D Symmetrical Inductor Integrated in an Advanced HR SOI CMOS Technology Targeting **RF Power Applications**

F. Gianesello¹, D. Gloria¹, O. Bon². B. Rauber¹, and C. Raynaud², ¹STMicroelectronics, France, ²CEA Leti, Grenoble, France

Tuesday

RTUIE 205BC Chair: David Ngo, RFMD Co-Chairs: Tina Quach, Freescale Yann Deval. University of Bordeaux, IMS Lab

RTUIF-01: A Dual-Band CMOS CDMA Transmitter without SAW and Driver Amplifier

M. Farazian¹, B. Asuri², Y. Zhao², L. E. Larson¹ ¹University of California San Diego, ²Qualcomm Inc., USA

RTUIF-02: A 50dB Dynamic Range, 11.3 GSPS, Programmable FIR Equalizer in 0.18µm SiGe BiCMOS Technology for High Speed EDC Applications K. Tran, J. Edwards, L.F. Linder, C. Gill, M. Bussmann, S. Elahmadi, H. Tan, Menara Networks Inc., Irvine, CA, USA

RTUIF-03: A 1.2-V Single-Sideband Upconverter System with High Spurious Suppression for UWB **Frequency Synthesizers**

Siu-Kei Tang, Kong-Pang Pun, The Chinese University of Hong Kong

RTUIF-04: A 12.5Gbps Analog Timing **Recovery System for PRML Optical** Receivers

J. Edwards¹, C. Gill¹, K. Tran¹, L. Linder¹, M. Bussmann¹, S. Elahmadi¹, H. Tan¹, D. Zelenin², D. Baranauskas². ¹Menara Networks, Irvine, CA, USA, ²Pacific Microchip, Los Angeles, CA LISA

RTUIF-05: CMOS UWB Pulse Generator **Co-Designed with Package Transition** S. Bourdel, J. Gaubert, O. Fourquin, R. Vauche, N. Dehaese, Aix-Marseille, University, Marseille Cedex, France

RTUIF-06: A 0.17-nJ/Pulse IR-UWB **Receiver Based on Distributed Pulse** Correlator in 0.18µm Digital CMOS J.Hu, Y.Zhu, S.Wang, H.Wu, University of Rochester, NY, USA

RTUIF-07: A Quadrature Charge-Domain Filter with Frequency Down-Conversion and Filtering for **RF Receivers**

Ming-Feng Huang, and Lai-Fu Chen, Industrial Technology Research Institute, Taiwan

RTUIF-08: A UHF Variable Gain Amplifier for Direct-Conversion DVB-H Receivers Masoud Meghdadi, Mehrdad Sharif-Bakhtiar, Ali Medi, Sharif University of Technology

RTUIF-09: A CMOS Resistive Feedback Single to Differential Low Noise

Amplifier with Multiple-Tuner-Outputs for a Digital TV Tuner Donggu Im¹, Ilku Nam², Seong-Sik Song¹, Hong-Teuk Kim¹, ¹LG Electronics Inc., Korea, ²Pusan National University, Korea

RTUIF-10: Two 24GHz Receiver Frontends in 130-nm CMOS using SOP Technology

M. Tormanen, H. Sjoland, Lund University

RTUIF-11: A 0.13µm CMOS 2.5 Gb/s FSK Demodulator Using Injection-Locked Technique

Chao-Shiun Wang, Kun-Da Chu and Chorng-Kuang Wang, National Taiwan University, Taipei, Taiwan

Interactive Forum

RTUIF-12: A 5GHz LC VCO with **Extended Linear-Range Varactor in** Purely Digital 0.15µm CMOS Process Aleksander Dec. Hiroshi Akima, and Ken Suyama, Epoch Microelectronics, Inc., Tarrytown, NY, USA

RTUIF-13: A 5GHz Band Low Noise and Wide Tuning Range Si-CMOS VCO Tuan Thanh Ta, Suguru Kameda, Tadashi Takagi, and Kazuo Tsubouchi. Research Institute of Electrical Communication, Tohoku University, Japan

RTUIF-14: Injection Locked Oscillator Arrays for Spectrum Analysis T.D. Gathman, J.F. Buckwalter, University of California at San Diego, CA, USA

RTUIF-15: Design of a CMOS 12GHz Rotary Travelling Wave Oscillator with Switched Capacitor Tuning F. Ben Abdeljelil^{1,2}, W. Tatinian¹, L. Carpineto², G. Jacquemod¹, ¹LEAT, Sophia Antipolis, France, ²Entropic Communications, Sophia-Antipolis, France

RTUIF-16: A Fast Automatic Frequency Calibration (AFC) Scheme for Phase-Locked Loop (PLL) Frequency Synthesizer

Chan-Young Jeong, Dong-Ho Choi, Changsik Yoo, Department of ECE, Hanyang University, Seoul, Korea

RTUIF-17: Multiple Supply (Class-G) Linear Modulator and PA for Non-CE Modulation

J. S. Walling¹, S. T. Taylor², D. J. Allstot¹, ¹University of Washington, Department of Electrical Engineering, ²Intel Corp., USA

13:20 - 14:40

13:20 ω 4:20

14:00 - 16:00

RTUIF-18: A Non-Uniform GaN Power TWA for 2 to 10GHz Suitable for Square-Wave Operation C. Meliani, E. Ersoy, N. Chaturvedi, S. Freyer, J. Wuerfl, W. Heinrich, and G. Traenkle, Ferdinand-Braun-Inst. fuer Hoechstfrequenztechnik, Berlin - Germany

RTUIF-19: A GSM-EDGE Power Amplifier with a BiFET Current Limiting Bias Circuit G. De la Rosa, D. Osika, N. Scheinberg, ANADIGICS Inc, Warren, NJ, USA

RTUIF-20: A Low-Complexity GSM Baseband Detector for RF BIST I. Elahi, K. Muhammad, Texas Instruments Inc., USA

RTUIF-21: Including Pattern-Dependent Effects in Electromagnetic Simulations of On-Chip Passive Components S. Kapur', D.E. Long', T.L. Hsur', S. Cherr', C.P. Jour', S. Liur', G. S. Chang', C. H. Yehr', H. T. Yang', Integrand Software, Inc., USA, 'Taiwan Semiconductor Manufacturing Corporation, Taiwan

RTUIF-22: Scalable Electromagnetic Segmentation Methodology for Accurate Investigation of Inductive Couplings H. Kampe¹, S. Wane¹, Olivier Tesson¹, Hugues Murray², Philippe Descamps² and Patrick Martin², ¹NXP Semiconductors, ²LaMIPS: NXP-CRISMAT UMR, France

RTUIF-23: Accurate Closed-Form Capacitance Extraction Formulas for Metal Fill in RFICs S. G. Gaskill, V. S. Shilimkar, A. Weisshaar, Oregon State University, USA

Tuesday		Technical Sessions		08:00 - 09:20
	TU1D209UWB Systems and ApplicationsChair: Reinhard Knoechel, University of Kiel Co-Chair: George Heiter, Heiter Microwave Consulting	TUTE210AFerrites and Multiferroics - Theory and ApplicationsChair: Steven Stitzer, Northrop Grumman ES Co-Chair: Amir Mortazawi, University of Michigan	TU1F210CImplementation of CRLH Transmission StructuresChair: George Eleftheriades, University of TorontoCo-Chair: Anthony Grbic, University of Michigan	TU1G 211 Theory and Applications of Metamaterials Chair: Ingo Wolff, IMST GmbH Co-Chair: Natalia Nikolova, McMaster University
08:00	TU1D-1: A 33 pJ/bit 90 nm CMOS UWB Single-Chip Transceiver with Embedded Multi-Gigabit Modem E. Juntunen, D. Yeh, A. Rachamadugu, F. Barale, B. Perumana, K. Chuang, P. Sen, S. Sarkar, S. Pinel, J. Laskar, Georgia Institute of Technology, Atlanta, United States	TU1E-1: Leaky-Wave Antenna Integrated Duplexer using CRLH Uniform Ferrite-Loaded Open Waveguide T. Kodera, C. Caloz, École Polytechnique, Montréal, Canada	TU1F-1: New Composite Right/Left- Handed Transmission Line using Substrate Integrated Waveguide and Metal-Patches K. Okubo ¹ , M. Kishihara ¹ , A. Yamamoto ¹ , J. Yamakita ¹ , I. Ohta ² , ¹ Okayama Prefectural University, Soja, Japan, ² University of Hyogo, Himeji, Japan	TU1G-1: Anisotropic 3-D Right/Left Handed Metamaterial Structures Composed of Stacked Layers using Dielectric Resonators and Mesh Plates T. Ueda ¹ , N. Michishita ² , M. Akiyama ¹ , T. Itoh ³ , 'Kyoto Institute of Technology, Kyoto, Japan, 'National Defense Academy, Vehende Lana, 'Intervente de Celfernie et
08:10				Los Angeles, Los Angeles, United States
08:20	TU1D-2: 60GHz UWB-over- Fiber System for In-Flight Communications M. Beltran, R. Llorente, R. Sambaraju, J. Marti, Universidad Politécnica de Valencia, Valencia, Spain	TU1E-2: Ferrite Effective-Perfect Magnetic Conductor (FE-PMC) and Application to Waveguide Miniaturization A. Shahvarpour, C. Caloz, École Polytechnique , Montréal, Canada	TU1F-2: New Composite, Right/ Left Handed Transmission Lines based on Electrically Small, Open Resonators M. Durán-Sindreu, F. Aznar, A. Vélez, J. Bonache, F. Martín, Universidad Autónoma de Barcelona, Bellaterra, Spain	TU1G-2: Does a Negative Refractive Index Always Result in Negative Refraction? – Effect of Loss V. V. Varadan, L. Ji, University of Arkansas, Fayetteville, United States
08:30		TU1E-3: Isolator Concept based on Ferromagnetic Nanowired Substrates J. C. Spiegel ² , J. de la Torre ² , L. Piraux ² , I. Huynen ¹ , ² Université Catholique de Louvain, Louvain-Ia-Neuve, Belgium, ² Université Catholique de Louvain, Louvain-Ia-Neuve, Belgium		
08:40	TU1D-3: Experimental Assessment of the Cross Coupling and Polarization Effects on Ultra-Wide Band See-Through-Wall Imaging Reconstruction Y. Wang, Y. Yang, A. Fathy, University of Tennessee, Knoxville, United States		TU1F-3: Composite Right/Left- Handed Substrate Integrated Waveguide and Half-Mode Substrate Integrated Waveguide Y. Dong, T. Itoh, University of California, Los Angeles, United States	TU1G-3: A Microstrip Diplexer from Metamaterial Transmission Lines C. Liu ¹ , W. Menzel ² , ¹ Sichuan University, Chengdu, China, ² Ulm University, Ulm, Germany
08:50	TU1D-4: Wave-Radio Interferometer Transceiver for UWB M. S. AlJerjawi, C. Nerguizian, R. G. Bosisio, Y. Xu, C. Caloz, K. Wu, École Polytechnique de Montréal (CREER Research Center), Montreal, Canada	TU1E-4: Novel Electrostatically Tunable FeGaB/(Si)/PMN-PT Multiferroic Heterostructures for Microwave Application J. Lou, D. Reed, M. Liu, C. Pettiford, N. X. Sun, Northeastern University, Boston, United States		
00:60	TU1D-5: Beamforming and Monopulse Technique on Sequentially-Fed Circularly- Polarized Ultra-Wideband Radar Array A. E. Tan, M. Y. Chia, Institute for Infocomm Research, Singapore, Singapore		TU1F-4: A Super-Compact, Balanced, Multi-Layered CRLH Transmission Line with Wideband LH Properties for Microwave Phase Engineering Y. Horii, Kansai University, Takatsuki, Japan	TU1G-4: Electronically Controlled Metamaterial-Based Leaky-Wave Transmission-Line for Conformal Surface Applications M. M. Hashemi, T. Itoh, University of California at Los Angeles, Los Angeles, United States
09:10		TU1E-5: Material and Layout Strategy for Ferrite Embedded LTCC Inductors M. K. Matters-Kammerer, Philips Research, Eindhoven, Netherlands	Interac Foru during the see pages Exhibitior at 09	tive m break, 30 & 31 opens :00

10:20

10:30

10:40

10:50

11:00

11:10

11:20

11:30

Tuesday	Technical Sessions		10:20 - 11:40	
TU2D 209 Advances in Radar Systems Chair: Mohamed D. Abouzahra, MIT Lincoln Laboratory Co-Chair: Glenn D. Hopkins, Georgia Tech Research Institute	TU2E210AMicrowave Acoustic and Power Limiting DevicesChair: Clemens Ruppel, EPCOS AGCo-Chair: Robert Weigel, University of Erlangen-Nuremberg	TU2F210CNovel Transmission Structures and ApplicationsChair: Ke Wu, Ecole Poly Montreal Co-Chair: Francisco Mesa, University of Seville	TU2G 211 Novel Structures and Effects Chair: David R. Jackson, Dept of ECE Co-Chair: Tapan K Sarkar, Syracuse University	
TU2D-1: A Phased-Array Radar Transmitter based on 77GHz Cascadable Transceivers C. Wagner ¹ , A. Stelzer ¹ , H. Jaeger ² , ¹ University of Linz, Linz, Austria, ² DICE, Linz, Austria Tuesday Panel Session, see page 56	TU2E-1: Switchable Contour Mode Acoustic Wave Resonators Based on Barium Titanate Thin Films X. Zhu, V. C. Lee, J. D. Phillips, A. Mortazawi, University of Michigan, Ann Arbor, United States	TU2F-1: Broadband, Low-Loss Negative-Permeability and Negative-Index Media for Free- Space Applications S. M. Rudolph, A. Grbic, The University of Michigan, Ann Arbor, United States	TU2G-1: Twisted Waveguides for Particle Accelerator Applications J. L. Wilson ¹ , Y. W. Kang ² , A. E. Fathy ¹ , ¹ University of Tennesse at Knoxville, Knoxville, United States, ² Oak Ridge National Laboratory, Oak Ridge, United States	
TU2D-2: Recent Advances in 94GHz FMCW Imaging Radar Development D. S. Goshi, Y. Liu, K. Mai, L. Bui, Y. Shih, Honeywell International, Torrance, United States	TU2E-2: Ultra Low-Profile Self- Matched SAW Duplexer with a Flip-Chip HTCC Package for W-CDMA 2100 Mobile Applications R. D. Koch ¹ , M. Schwab ¹ , F. M. Pitschi ¹ , J. E. Kiwitt ¹ , R. Weigel ² , ¹ Epcos Ag, Munich, Germany, ² University of Erlangen- Nuremberg, Erlangen, Germany	TU2F-2: Novel Diplexer Synthesis Using the Composite Right/Left- Handed Phase-Advance Delay Lines P. Chi, T. Itoh, University of California, Los Angeles, United States	TU2G-2: Finite Element Analysis of a Balanced Microstrip Line Filled with Nematic Liquid Crystal R. James, F. A. Fernandez, S. E. Day, University College London, London, United Kingdom	
TU2D-3: Integrated Active Pulsed Reflector for FMCW Radar Localization S. Wehrli ¹ , D. Barras ¹ , F. Ellinger ² , H. Jaeckel ¹ , ¹ ETH Zurich, Zurich, Switzerland, ² Dresden University of Technology, Dresden, Germany	TU2E-3: Parameter Extraction for Tunable TFBARs Based on BSTO M. Norling ¹ , J. Berge ¹ , S. Gevorgian ^{1,2} , ¹ Physical Electronics Laboratory, Gothenburg, Sweden, ² Microwave and High Speed Electronics Research Center, Mölndal, Sweden	TU2F-3: Novel Compact and Broadband Interconnects based on Ridge Substrate Integrated Waveguide M. Bozzi ¹ , S. A. Winkler ² , K. Wu ² , ¹ University of Pavia, Pavia, Italy, ² Ecole Polytechnique de Montreal, Montreal, Canada	TU2G-3: Slotline Operating within a Wide Frequency Band: Excitation of Waves by a Real Source V. Kotlan ¹ , J. Machac ¹ , F. Mesa ² , ¹ Czech Technical University in Prague, Prague, Czech Republic, ² University of Seville, Spain	
TU2D-4: ADS-B Based Collision Avoidance Radar for Unmanned Aerial Vehicles C. Lai, Y. Ren, C. Lin, Intelligent Automation, Inc., Rockville, United States	TU2E-4: Spread Spectrum Orthogonal Frequency Coded SAW Tags and Sensors using Harmonic Operation D. R. Gallagher, M. W. Gallagher, N. Saldanha, J. M. Pavlina, D. C. Malocha, University of Central Florida, Orlando, United States		TU2G-4: A Method to Realize Epsilon Near-Zero-Like Materials for Waveguide Discontinuities M. Kashanianfard, O. M. Ramahi, University of Waterloo, Waterloo, Canada	
TU2D-5: A Digital Array Radar with a Hierarchical System Architecture C. J. Fulton, P. G. Clough, W. J. Chappell, Purdue University, West Lafayette, United States	TU2E-5: CPW Self-Resetting Power Limiting Devices Based on Microwave Power Induced Semiconductor-Metal Transition in Vanadium Dioxide J. Givernaud ¹ , A. Crunteanu ¹ , A. Pothier ¹ , C. Champeaux, A. Catherinot ² , P. Blondy ¹ , ¹ Université de Limoges, Limoges, France, ² Ilbiwges, Limoges, France,	TU2F-4: A Compact CMOS Marchand Balun Incorporating Meandered Multilayer Edge- Coupled Transmission Lines M. Chiang, H. Wu, C. C. Tzuang, Graduate Institute of Communication Engineering, Taipei, Taiwan	TU2G-5: Experimental Validation of a Plasma Model for Electromagnetic Metal Foam Shields G. Monti, L. Catarinucci, L. Tarricone, University of Salento, Lecce, Italy	
	oniversite de Linioges, Linioges, France		TU2G-6: Three-Dimensional Isotropic Scalar Metamaterial with Drude Dispersion for the Permittivity and Permeability M. Zedler ¹ , G. V. Eleftheriades ¹ , P. Russer ² , ¹ Univ. of Toronto, Toronto, Canada, ² Munich Univ. of Technology Munich, Germany	

Tuesday	Interactive Forum		9:20 - 15:40	
TUPA 210B SC1: Field Analysis and Guided Waves	TUPA-9: Characteristics of J-Shaped Monopole Antenna Array with Matching Circuit at UHF Band S. Kashihara, F. Kuroki, Kure National College of Technology, Kure, Japan	TUPC-4: Pulse Propagation in Photonic Crystal Multimode Interference Waveguides using Time Domain Beam-Propagation Method H. Nihei ¹ , Y. Takakura ¹ , C. Chen ¹ , T. Anada ¹ , Z. Ma ² , ¹ Kanagawa Univ., Yokohama, Japan, ² Saitama Univ., Saitama-shi, Japan	TUPE 210B SC8: Transmission Line Elements	
TUPA-1: Design and Measurement of Metallic Post-Wall Waveguide Components T. J. Coenen ^{1,2} , D. J. Bekers ¹ , J. L. Tauritz ² , F. E. van Vliet ¹ , ¹ TNO Defence, The Hague, Netherlands, ² Univ. of Twente, Enschede, Netherlands	TUPA-10: MIC-Fed L-Shaped Vertical Strip Line Primary Radiator for Planar Antennas at 60GHz M. Okiyokota, F. Kuroki, Kure National College of Technology, Kure, Japan	TUPC-5: A Total-Field/Scattered- Field Technique Applied for the TLM-Integral Equation Method N. Fichtner, P. Russer, Technische Universität München, München, Germany	TUPE-1: X-Band 3D Meander Strip Line Delay Line using Multilayer LTCC H. Jiang, X. Ruimin, Univ. of Electronic Science and Technology of China, Chengdu, China	
TUPA-2: Design of Coaxial Line to Circular Waveguide Transitions Q. C. Zhu, A. G. Williamson, M. J. Neve, The Univ. of Auckland, Auckland, New Zealand	TUPA-11: Low-Loss and Low-Cost Solution for Printed Transmission Lines at Millimeter-Wavelengths by Using Bilaterally Metal-Loaded Tri-Plate Transmission Line F. Kuroki, R. Tamaru, Kure National College of Technology, Kure, Japan	TUPC-6: FDTD Lattice Termination with Periodic Boundary Conditions D. Li, C. D. Sarris, Univ. of Toronto, Toronto, Canada	TUPE-2: Low-Loss, Ultra-Wideband Transition Between Conductor- Backed Coplanar Waveguide and Substrate Integrated Waveguide X. Chen, K. Wu, Poly-Grames Research Center, Montreal, Canada	
TUPA-3: Calculation of Characteristic Impedance for Parallel Coupled Stripline based on Eigenmode Analysis and Equivalent Network T. Hiraoka, K. Ding, J. Hsu, Kanagawa Univ., Yokohama, Japan	TUPB 210B SC2: Frequency Domain Techniques	TUPD210BSC13: Ferroelectric, Ferrite and Acoustic Wave Components	TUPE-3: Carbon Nanotube-Based Planar Transmission Lines M. A. EL Sabbagh, S. M. El-Ghazaly, H. A. Naseem, Univ. of Arkansas, Fayetteville, United States	
TUPA-4: Investigation of Space- Time Focusing of Time Reversal Using FDTD H. Terchoune ¹ , D. Lautru ² , A. Gati ¹ , M. Wong ¹ , J. Wiart ¹ , V. Fouad Hanna ² , ¹ Orange Labs, Issy Les Moulineaux, France, ² Université Pierre et Marie Curie, Paris, France	TUPB-1: Broadband Equivalent Circuit Derivation for Multi-Port Circuits based on Eigen-State Formulation S. Wane ¹ , D. Bajon ² , P. Russer ³ , Y. Kuznetsov ⁴ , U. Siart ³ , A. Baev ⁴ , ¹ NXP-Semiconductors, Caen, France, ² Su paero(isae), Toulouse, France, ² TUM, Munich, Germany, ⁴ Theoretical Radio Egr. Depart. Moscow Aviation Inst., Moscow, Russian Federation	TUPD-1: 4.5GHz Lamb Wave Resonator composed of LiNbO3 Thin Film deposited by CVD M. Kadota, T. Ogami, K. Yamamoto, Y. Negoro, H. Tochishita, Murata Mfg. Co., Ltd., Kyoto, Japan	TUPF 210B SC23: Microwave Photonics	
TUPA-5: Exploitation of Spurious Coupling in Metal Enclosures for Oscillator Design S. Held ¹ , T. Bolz ² , K. Solbach ¹ , ¹ Univ. Duisburg-Essen, Duisburg, Germany, ² IMST, Kamp-Lintfort, Germany	TUPC 210B SC3: Time Domain Techniques	TUPD-2: Low-Loss BAW Filters on High Resistivity Silicon for Mobile Radio A. Hagelauer ¹ , B. Bader ² , G. Henn ² , A. Schaeufele ² , S. Marksteiner ² , K. Wagner ² , R. Weigel ¹ , ¹ Univ. of Erlangen-Nuremberg, Erlangen, Germany, ² Epcos AG, Munich, Germany	TUPF-1: Performance Evaluation of Bidirectional MB-OFDM UWB Over Cable, MMF and SMF M. Yee, Y. Guo, M. L. Ong, J. Zhu, J. Hao, Institute for Infocomm Research, Singapore, Singapore	
TUPA-6: A Near-Field Probe for Subwavelength-Focused Imaging L. Markley, G. V. Eleftheriades, Univ. of Toronto, Toronto, Canada	TUPC-1: Towards the Development of Unconditionally Stable Time- Domain Meshless Numerical Methods Y. Yu, Z. Chen, Dalhousie Univ., Halifax, Canada	TUPD-3: Characterization of Nonlinear Behavior in A Tunable Phase Shifter Using Ferroelectric PZT Thin-Film Capacitors and Its Effect on System Performance J. X. Qiu, D. C. Judy, J. S. PulsKamp, R. G. Polcawich, R. Kaul, F. Crowne, Army Research Laboratory, Adelphi, United States	TUPF-2: Performance Improvement of Multiband OFDM Ultra-Wideband over Fiber Link Using a Novel Optical Double Sideband Subcarrier Modulation Scheme B. Hraimel ^{1,2} , X. Zhang ¹ , M. Mohamed ¹ , M. N. Sakib ¹ , K. Wu ² , ¹ Concordia Univ., Montreal, Canada, ² Ecole Polytechnique, Montreal, Canada	
TUPA-7: Mode Symmetry Assessment of Structurally Non- Uniform, Asymmetric Coupled Lines Meandered for CMOS Passive Component Design K. Tsai, C. C. Tzuang, National Taiwan Univ., Taipei, Taiwan	TUPC-2: Efficient Implementation of 3-D ADI-FDTD Method for Lossy Media D. Y. Heh, E. L. Tan, Nanyang Technological Univ., Singapore, Singapore		TUPF-3: Digital Coherent Receiver Employing Photonic Downconversion for Phase Modulated Radio-Over-Fibre Links D. Zibar, A. Caballero, N. G. Gonzalez, I. T. Monroy, DTU Fotonik, Kgs. Lyngby, Denmark	
TUPA-8: High Permittivity Tape Transmission Line Supported by Low Permittivity Substrate at Millimeter-Wave Frequencies R. Tamaru, F. Kuroki, Kure National College of Technology, Kure, Japan	TUPC-3: A Novel Three-Dimensional Unconditionally-Stable FDTD Method with High-Order Accuracy Y. Kong, Q. Chu, South China Univ. of Technology, Guangzhou, China		TUPF-4: Dispersion-Tolerant All- Optical Frequency Upconversion Technique for Radio-over-Fiber Applications H. Kim, J. Song, Gwangju Institute of Science and Technology, Gwangju, Republic of Korea	

9:20 - 15:40

Tuesday

TUPF-5: Microwave Carrier Modulated by Fast Synchronous Pulsed Transitions Using Electro-Optical Gating Modulators

E. M. Barrientos, C. S. Castelli, A. M. Ribeiro, E. Conforti, Univ. of Campinas - Unicamp, Campinas, Brazil

TUPF-6: New All-Optical Method for Direct QAM Signal Generation Based on a Wavelength-Modulated Nd:YVO4 laser

G. Kovacs¹, T. Berceli², P. R. Herczfeld¹, ¹Drexel Univ., Philadelphia, United States, ²Budapest Univ. of Technology and Economics, Budapest, Hungary

TUPG 210B SC29: Radars and Broadband

Communication Systems

TUPG-1: Active Quasi-Circulators using Quadrature Hybrids for Simultaneous Transmit and Receive

S. K. Cheung, T. Halloran, W. H. Weedon, C. Caldwell, Applied Radar, Inc., North Kingstown, United States

TUPG-2: High Gain Quasi-Yagi Planar Antenna Evaluation in Platform Material Environment for 60GHz Wireless Applications

A. L. Amadjikpè', D. Choudhury², G. E. Ponchak³, J. Papapolymerou¹, ¹Georgia Institute of Technology, Atlanta, United States, ²Intel Corp. Hillsboro, United States, ³NASA Glenn Research Center, Cleveland, United States

TUPG-3: Four-Channel Spatial Multiplexing Over a Millimeter-Wave Line-of-Sight Link

C. Sheldon, M. Seo, E. Torkildson, M. Rodwell, U. Madhow, Univ. of California, Santa Barbara, United States

TUPG-4: POLARIS: ESA's Airborne Ice Sounding Radar Front-End Design, Performance Assessment and First Results

C. Cilla Hernández, V. Krozer, J. Vidkjær, J. Dall, Technical Univ. of Denmark, Kgs. Lyngby, Denmark

TUPG-5: Low Complexity, 165 μW, 5 Mbit/s Wideband Radio Front-End with Range of Several Meters

I. McGregor, G. Whyte, K. Elgaid, University of Glasgow, Glasgow, United Kingdom

Communication Systems

SC30: Wireless and Cellular

TUPH

Interactive Forum

210B

TUPH-1: Phase Wrapping Digital Polar Transmitter for Multi-Band OFDM Ultra-Wideband System

W. Loke, M. Y. Chia, P. Chee, Institute for Infocomm Research, Singapore, Singapore

TUPH-2: Design of Compact-Sized Class-F PA for Wireless Handset Applications

C. Lee, Y. Park, Hankuk Univ. of Foreign Studies, Youngin-si, Republic of Korea

TUPH-3: 2.4GHz, 0.18 µm, CMOS Passive Mixer with Integrated Baluns

C. Song¹, I. Lo², O. Boric-Lubecke², ¹Concentris Systems LLC, Honolulu, United States, ²Univ. of Hawaii, Honolulu, United States Presenters available 09:20 - 10:20 & 14:40 - 15:40

Focus Track Color Codes: Microwave Modeling Active Components Passive Components Microwave Systems



Tuesday	Technical	Sessions	15:40-17:00	
TU4D 209 Microwave Photonics for Communications Chair: Yifei Li, UMass Dartmouth Co-Chair: Bill Jemison, Lafayette College	TU4E210ANovel Transceiver Architectures for Wireless Communications SystemsChair: Nick Buris, Motorola Inc Co-Chair: Shoichi Narahashi, NTT DOCOMO	TU4F 210C Industry/University Collaborative Research Chair: Peter Ersland, M/A-COM Semiconductor Sector Co-Chair: Samson Mil'shtein, UMass Lowell	TU4G 211 Advances in Time Domain Modeling Chair: Malgorzata Celuch, Warsaw Univ. Technology Co-Chair: Costas Sarris, Univ. of Toronto	
TU4D-1: Performance Analysis of IEEE 802.16e WiMAX Radio-Over- Fiber Distributed Antenna System M. Yee, A. Ng' Oma, M. Sauer, Corning Incorporated, Corning, United States	TU4E-1: A Compact 802.11 a/b/g/n WLAN Front-End Module Using Passives Embedded in a Flip-Chip BGA Organic Package Substrate T. Kamgaing, Intel Corporation, Chandler, United States	TU4F-1: Development of Student Innovation Skills through Industry- University Research Collaboration S. Mil'shtein, Univ. of Massachusetts at Lowell, Lowell, United States	TU4G-1: Acceleration of the 3D ADI-FDTD Method Using Graphics Processor Units T. P. Stefanski, T. D. Drysdale, Univ. of Glasgow, Glasgow, United Kingdom	15:40 15:50
TU4D-2: No Dispersion Compensation 2000 km NDSF Transmission of a 10 Gb/s Signal Using Microwave Single-Sideband Multiplexing M. C. Cardakli, W. Way, Opvista, Inc, Milpitas, United States	TU4E-2: Tunable Multi-Band Direct Conversion Receiver for Cognitive Radio Systems E. E. Djoumessi, K. Wu, Poly-Grames Research Center, Center for Radiofrequency Electronics Research of Quebec (CREER), Ecole Polytechnique de Montreal, Montreal, Canada	TU4F-2: Suggested Improvements to Industry/University Collaboration S. M. Orton, Raytheon, Waltham, United States	TU4G-2: Modeling of Dielectric Material Interfaces for the Radial Point Interpolation Time-Domain Method T. Kaufmann ¹ , T. Merz ¹ , C. Fumeaux ² , R. Vahldieck ¹ , ¹ ETH Zurich, Zurich, Switzerland, ² Univ. of Adelaide, Adelaide, Australia	16:00
			TU4G-3: Effects of Numerical Dispersion on the Accuracy of FDTD Modeling of Propagating and Evanescent Waves in Negative Index Media C. D. Sarris, Univ. of Toronto, Toronto, Canada	16:10
TU4D-3: Experimental Comparison of 10 Gbit in Radio over Fiber Systems I. Gonzalez Insua, C. G. Schaeffer, TU Dresden, Dresden, Germany	TU4E-3: Technique for Joint Balancing of IQ Modulator- Demodulator Chains in Wireless Transceivers S. Mutha ¹ , P. Roblin ¹ , D. Chaillot ² , X. Yang ¹ , J. Kim ¹ , J. Strahler ³ , R. Rojas ¹ , J. Volakis ¹ , ¹ Ohio State University, Columbus, United States, ² CEA, Le Barp, France, ³ Andrew Corporation, Westerville, United States	TU4F-3: The Challenges and Rewards of Industry/University Collaborative Research T. Palacios, Massachusetts Institute of Technology, Cambridge, United States		16:20
			TU4G-4: Toeplitz Property on Order Indices of Laguerre Expansion Methods A. Geranmayeh, W. Ackermann, T. Weiland, Technische Universitaet, Darmstadt, Germany	16:30
TU4D-4: MB-OFDM UWB Signal Co-Transmission with WCDMA, WLAN and GSM Over Multi-mode Radio-Over-Fiber Y. Guo, Institute for Infocomm Research, Singapore, Singapore	TU4E-4: Adaptive Tuning for Handheld Transmitters L. Sankey, Z. Popovic, Univ. of Colorado at Boulder, Boulder, United States	Rump Session on Metamaterials on Tuesday evening, see page 56		16:40
	TU4E-5: Lost Node Recovery in a City-Wide Wireless Sensor Network Using Adaptive Preselect Filtering S. Jeong, W. J. Chappell, Purdue Univ., West Lafayette, United States		TU4G-5: A General Methodology for Introducing Structured Nonorthogonal Grids into High- Order Finite-Difference Time- Domain Methods R. B. Armenta, C. D. Sarris, Univ. of Toronto, Toronto, Canada	16:50

	Wednesday	Technical	Sessions	08:00 - 09:20
	WE1A 204AB High Efficiency PA Architectures Chair: Leo de Vreede, TuDelft Co-Chair: Frank Sullivan, Raytheon Company	WE1B 205A Millimeter Wave Power Amplifiers Chair: Edward C. Niehenke, Niehenke Consulting Co-Chair: H. Alfred Hung, Army Research Lab	WE1C 206AB Advances in Compound Semiconductor Technologies for Switching and Amplification Chair: Edmar Camargo, RF Microdevices Inc Co-Chair: Paul Watson, Air Force Research Laboratory	WE1D 209 Novel Packaging Materials and Processes Chair: Bruce Kopp, DPM Consulting Co-Chair: Mohamed Megahed, Intel
08:10 08:00	WE1A-1: A 45/46/34% PAE Linear Polar Transmitter for EDGE/ WCDMA/Mobile-WiMax J. Choi, D. Kim, D. Kang, M. Jun, B. Jin, J. Park, B. Kim, Pohang Univ. of Science and Technology, Gyeongbuk, Republic of Korea	WE1B-1: A 144GHz Power Amplifier MMIC with 11dBm Output Power, 10dB Associated Gain and 10% Power-Added Efficiency I. Kallfass ¹ , P. Pahl ¹ , H. Massler ¹ , A. Leuther ¹ , A. Tessmann ¹ , T. Zwick ² , 'Fraunhofer Institute for Applied Solid State Physics, Freiburg, Germany, ² Univ. of Karlsruhe, Karlsruhe, Germany	WE1C-1: Novel RF Devices with Multiple Capacitively Coupled Electrodes G. Simin ¹ , R. Gaska ² , M. Shur ³ , ¹ Univ. of South Carolina, Columbia, United States, ² Sensor Electronic Technology, Inc., Columbia, United States, ³ Rensselaer Polytechnic Institute, Troy, United States	WE1D-1: Liquid Metal Vertical Interconnects for RF Flip-Chip Assembly J. Wood ¹ , K. Vummidi ¹ , L. Chen ² , N. S. Barker ² , S. Raman ¹ , ¹ Virginia Tech, Blacksburg, United States, ² Univ. of Virginia, Charlottesville, United States
08:30 08:20	WE1A-2: High Efficiency Dual Mode RF Transmitter Using Envelope Tracking Dual-Band Class-E Power Amplifier for W-CDMA/WiMAX Systems C. Chen ¹ , C. Li ¹ , T. Horng ¹ , J. Jau ² , J. Li ² , ¹ National Sun Yat-sen Univ., Kaohsiung, Taiwan, ² Industrial and Technology Research Institute, Hsinchu, Taiwan	WE1B-2: V-Band Power Amplifier MMICs Exhibiting Low Power Slump Characteristics Utilizing a Production Released 0.15µm GaAs PHEMT Process C. F. Campbell', S. S. Moochalla ² , D. R. Daugherty ² , W. J. Taft ² , M. Kao ¹ , D. Fanning ¹ , 'TriQuint Semiconductor, Richardson, United States, ² Lockheed Martin, Newtown, United States	WE1C-2: DC-2:GHz Low Loss Cryogenic InAs/AISb HEMT Switch B. Ma, J. Bergman, J. Hacker, G. Sullivan, A. Sailer, B. Brar, Teledyne Scientific and Imaging, Thousand Oaks, United States	WE1D-2: Micro-Coaxial Lines for Active Hybrid-Monolit Circuits N. Ehsan ¹ , E. Cullens ¹ , K. Vanhille ² , D. Frey ³ , S. Rondineau ⁴ , R. Actis ⁵ , S. Jessup ⁵ , R. Lender ⁵ , A. Immorlica ⁵ , D. Nair ⁶ , D. Filipovic ¹ , Z. Popovic ¹ , ¹ Univ. of Colorado, Boulder, United States, ² Nuvotronics LLC, Blacksburg, United States, ³ Cobham Defense Electronic Systems, Lansdale, United States, ⁴ TSM Antennas, Santa Maria, Brazil, ³ BAE Systems, Nashua, United States, ⁶ DuPont Electronic Technologies, Research Triangle Park, United States
08:50 08:40	WE1A-3: Input Power Dividing of Doherty Power Amplifiers for Handset Applications D. Kang ¹ , J. Choi ¹ , D. Yu ² , K. Min ² , M. Jun ¹ , D. Kim ¹ , J. Park ¹ , B. Jin ¹ , B. Kim ¹ , ¹ Pohang Univ. of Science and Technology, Pohang, Democratic People's Republic of Korea, ² Wireless Power Amplifier Module, Inc., Seongnam, Democratic People's Republic of Korea	WE1B-3: A 68-83GHz Power Amplifier in 90 nm CMOS J. Lee ¹ , C. Chen ¹ , J. Tsai ² , K. Lin ¹ , H. Wang ¹ , ¹ National Taiwan Univ., Taipei, Taiwan, ² Yuan Ze Univ., Chung-Li, Taoyuan, Taiwan	WE1C-3: Ka Band High Power AlGaAs PIN Diode Switches A. Rozbicki ¹ , J. Brogle ¹ , N. Jain ² , T. Boles ¹ , D. Hoag ¹ , ¹ MA-COM Technology Solutions - a Cobham Company, Lowell, United States, ² Anokiwave Inc., San Diego, United States	WE1D-3: Rapid Prototyping of LTCC Microwave Circuits Using Laser Machining M. F. Shafique, I. D. Robertson, Univ. of Leeds, Leeds, United Kingdom
09:10 09:00	WE1A-4: Sequential Power Amplifiers with Adaptable Combiners T. Lehmann, R. Knoechel, Univ. of Kiel, Kiel, Germany	WE1B-4: A Broadband 60-to- 120GHz Single-Chip MMIC Multiplier Chain M. Abbasi ¹ , R. Kozuharov ¹ , C. Karnfelt ¹ , I. Angelov ¹ , H. Zirath ¹ , I. Kallfass ³ , A. Leuther ³ , ¹ Chalmers Univ. of Technology, Gothenburg, Sweden, ² Ericsson AB, Mondal, Sweden, ³ Fraunhofer Institute for Applied Solid State Physics, Freiburg, Germany	WE1C-4: Ku-Band AlGaN/GaN- HEMT with over 30% of PAE K. Takagi ¹ , S. Takatsuka ¹ , Y. Kashiwabara ¹ , S. Teramoto ¹ , K. Matsushita ¹ , H. Sakurai ¹ , K. Onodera ¹ , H. Kawasaki ¹ , Y. Takada ² , K. Tsuda ² , ¹ Toshiba Corporation, Kawasaki, Japan, ² Toshiba Corporation, Kawasaki, Japan	WE1D-4: Multi-Lead Organic Air- Cavity Package for High Power High Frequency RFICs D. J. Dougherty ¹ , M. Mahalingam ¹ , V. Viswanathan ¹ , M. Zimmerman ² , 'Freescale Semiconductor, Tempe, United States, ² Quantum Leap Packaging, Wilmington, United States
Wednesday	Technical	Sessions	08:00 - 09:20	
---	--	--	---	-------------
WE1E 210A Power Dividers Chair: Roberto Vincenti Gatti, University of Perugia Co-Chair: Allan Podell, Besser Associates	WE1F210CReconfigurable Filters Using New Circuit TopologiesChair: Har Dayal, BAE SYSTEMS -EWSCo-Chair: Atsushi Sanada, Yamaguchi University	WE1G 211 Computationally Efficient Microwave Design Optimization Methods Chair: Slawomir Koziel, Reykjavik Univ. Co-Chair: John Bandler, McMaster Univ.		
WE1E-1: Multi-Layer Four-Way Out-of-Phase Power Divider for Substrate Integrated Waveguide Applications D. Eom, J. Byun, D. Kim, H. Lee, Ajou Univ., Suwon, Republic of Korea	WE1F-1: Dual-Mode Tunable Filter with Simple Bandwidth Control Scheme J. S. Sun, T. Itoh, Univ. of California, Los Angeles, United States	WE1G-1: Neural Network EM- Field Based Modeling for 3D Substructure in Finite Element Method S. Liao ¹ , J. Xu ¹ , H. Kabir ² , Q. Zhang ² , J. Ma ¹ , ¹ Univ. of Electronic Science and Technology of China, Chengdu, China, ² Carleton Univ., Ottawa, Canada	Interactive	08:00 00:80
			Forum during the break, see pages 38 & 39 Exhibition opens at 10:00	8:10
WE1E-2: Five-Way Power Divider based on Dielectric Resonator, Whispering-Gallery Modes L. K. Hady, A. A. Kishk, D. Kajfez, The Univ. of Mississippi, Univ., United States	WE1F-2: Overlapped Loaded Line Filters Used for Design of Switched Band-Select Filters with Arbitrary Characteristics M. Koochakzadeh ¹ , A. Abbaspour-Tamijani ² , ¹ Arizona State Univ., Tempe, United States, ² Arizona State Univ., Tempe, United States	WE1G-2: Space Mapping-based Optimization Exploiting Tolerant Cauchy Approximations G. Shaker ¹ , M. H. Bakr ² , N. Sangary ³ , S. Safavi-Naeini ¹ , 'Univ. of Waterloo, Waterloo, Canada, ² McMaster Univ., Hamilton, Canada, ³ Research in Motion, Waterloo, Canada		08:20
	WE1F-3: Compact PCB Embedded Tunable Filter for UHF TV Broadcasting T. Lee, J. Park, Kwangwoon Univ., Seoul, Republic of Korea			08:30
WE1E-3: Compact Dual Band Three Way Bagley Polygon Power Divider Using Composite Right/Left Handed (CRLH) Transmission Lines D. S. Elles, Y. Yoon, Univ. at Buffalo, The State Univ. of New York, Buffalo, United States	WE1F-4: Miniaturized Reconfigurable and Switchable Filter from UWB to 2.4GHz WLAN Bands Using PIN Diodes M. F. Karim, G. Yong-Xin, C. Z. Ning, M. O. Ling Chen, Institute for Infocomm Research, Singapore, Singapore	WE1G-3: EM-Based Optimization of a Single Layer SIW with Microstrip Transitions Using Linear Output Space Mapping J. E. Rayas-Sanchez, J. A. Jasso-Urzua, ITESO, Tlaquepaque, Mexico		08:40
				08:50
WE1E-4: Compact Multi-Way Power Dividers for Dual-Band, Wide-Band and Easy Fabrication I. Sakagami', T. Wuren ² , 'Univ. of Toyama, Toyama, Japan, ² Toyohashi Univ. of Technology, Toyohashi, Japan	WE1F-5: Parallel-Coupled Switched Delay Line (SDL) Reconfigurable Microwave Filter P. W. Wong, I. C. Hunter, Institute of Microwave and Photonics, Leeds, United Kingdom	WE1G-4: Accuracy Improvement of the S-Parameter Adjoint Sensitivity Analysis for Shape Parameters X. Zhu, N. K. Nikolova, McMaster Univ., Hamilton, Canada		00:00
WE1E-5: New Technique for the Design of Ultra-Broadband Power Dividers Based on Tapered Lines B. Mencía-Oliva, A. M. Peláez-Pérez, P. Almorox-González, J. I. Alonso, Universidad Politécnica de Madrid, Madrid, Spain				09:10

	Wednesday	Technical	Sessions	10:20 - 11:40
	WE2A 204AB	WE2B 205A	WE2C 206AB	WE2D 209
	Millimeter-Wave and CMOS Based Power Amplifiers Chair: Debasis Dawn, Georgia Tech Co-Chair: Chang-Ho Lee, Samsung Design Center	Front-End Components for Millimeter-Wave Applications Chair: Debabani Choudhury, Intel Corporation Robert Weikle, University of Virginia	Si-Based Circuits & Devices: High Power FETs to 65 nm Transceivers Chair: Jonathan Comeau, AutoLiv Co-Chair: Dr. Zaher Bardai, IMN Epiphany	Novel Component-Level Packaging Approaches Chair: Kavita Goverdhanam, Co-Chair: Eric Strid, Cascade Microtech
10:20	WE2A-1: A 33dBm 1.9GHz Silicon- on-Insulator CMOS Stacked-FET Power Amplifier S. Pornpromlikit ¹ , J. Jeong ² , C. D. Presti ¹ , A. Scuderi ³ , P. M. Asbeck ¹ , ¹ Univ. of California San Diego, La Jolla, United States, ² Kwangwoon Univ., Seoul, Republic of Korea, ³ STMicroelectronics s.r.l., Catania,	WE2B-1: W-band Transmitter and Receiver Modules for 10Gb/s Impulse Radio Y. Nakasha, M. Sato, T. Tajima, Y. Kawano, T. Suzuki, T. Takahashi, K. Makiyama, T. Ohki, N. Hara, Fujitsu Limited, Atsugi, Japan	WE2C-1: New Vertical Silicon Microwave Power Transistor Structure and Package with Inherent Thermal Self Protection B. Gogoi, R. Davies, J. Crowder, D. Lutz, P. Le, D. Rice, W. Wright, B. Battaglia, S. Tran, A. Elliott, M. Golio, HVVi Semiconductors, Inc., Phoenix, United States	WE2D-1: Design and Implementation of a Novel Three Dimensional CMOS Low Noise Amplifier with Transmission Lines on Parylene-N R. R. Lahiji ¹³ , H. Sharifi ³ , L. P. Katehi ² , S. Mohammadi ¹³ , ¹ Purdue Univ, West Lafayette, United States, ² Univ. of Illinois, Urbana-Champaign, United States, ³ Purdue Univ, West Lafayette, United States
10:30	italy			WE2D-2: Millimeter Wave Micro- machined Cavity Resonators on MCM-D: Oscillator-Resonator Co- Design and Packaging Considerations I. Ocket ^{1,2} , A. Phommahaxay ² , H. A. Tilmans ² , J. B. Mills ³ , B. Nauwelaers ¹ , "K.U.Leuven, Heverlee, Belgium, "Interuniversity Micro-electronics Centre (IMEC), Heverlee, Belgium, ³ Philips Research, Eindhoven, Netherlands
10:40	WE2A-2: 60GHz CMOS Power Amplifier with 20dB-Gain and 12dBm Psat D. Dawn, S. Sarkar, P. Sen, B. Perumana, M. Leung, N. Mallavarpu, S. Pinel, J. Laskar, Georgia Institute of Technology, Atlanta, United States	WE2B-2: 120-GHz-band BPSK Modulator and Demodulator for 10Gbit/s Data Transmission H. Takahashi', T. Kosugi², A. Hirata', K. Murata², N. Kukutsu', 'NTT Microsystem Integration Laboratories, Atsugi, Japan, ² NTT Photonics Laboratories, Atsugi, Japan	WE2C-2: A Low Noise Amplifier Co-designed with ESD Protection Circuits in 65nm CMOS A. M. Tsai, S. S. Hsu, K. K. Tan, National Tsing Hua Univ., Hsinchu, Taiwan	WE2D-3: DC-50GHz Compensation Structure for Flip-Chip Assembled SPST RF MEMS 1040-1050 K. Hettak ¹ , G. A. Morin ² , M. G. Stubbs ¹ , ¹ Communications Research Centre Canada, Ottawa, Canada, ² Defence R&D Canada, Ottawa, Canada
10:50				WE2D-4: Packaging Effects on the Figure of Merit of a CMOS Cascode Low-Noise Amplifier: Flip-Chip Versus Wire-Bond F. Han', K. Lu', T. Horng', J. Lin ² , H. Cheng ³ , C. Chiu ³ , C. Hung ³ , ¹ National Sun Yat-Sen Univ., Kaohsiung, Taiwan, ² Univ. of Florida, Gainesville, United States, ³ Advanced Semiconductor Engineering Inc., Kaohsiung, Taiwan
11:00	WE2A-3: Wideband Medium Power Amplifiers Using a Short Gate- Length GaAs MMIC Process M. Morgan ¹ , E. Bryerton ¹ , H. Karimy ² , D. Dugas ² , L. Gunter ² , K. Duh ² , X. Yang ² , P. Smith ² , P. Chao ² , ¹ National Radio Astronomy Observatory, Charlottesville, United States, ² BAE Systems, Nashua, United States	WE2B-3: A 36-38GHz, 4-Element, Transmit/Receive, Phased-Array with 5-bit Amplitude and Phase Control J. Kim ¹ , D. Kang ² , B. Min ³ , G. M. Rebeiz ² , ¹ Kwangwoon Univ., Seoul, Republic of Korea, ² Univ. of California, San Diego, United States, ³ Qualcomm, Inc., Santa Clara, United States	WE2C-3: 60GHz Receiver and Transmitter Front-Ends in 65 nm CMOS M. Kärkkäinen, M. Varonen, D. Sandström, K. A. Halonen, TKK / Helsinki Univ. of Technology, Espoo, Finland	
11:10		United States		WE2D-5: Substrate-Embedded, Millimeter Wave, SiGe VCO Chip M. D. Richter, M. Schneider, Univ. of Bremen, Bremen, Germany
11:20	WE2A-4: Compact Low-Cost 1-Watt and 4-Watt Quad Flat Non-Leaded (QFN) Packaged Ka-Band High Power Amplifiers Y. Suh, S. Chen, TriQuint Semiconductor, Richardson, United States	WE2B-4: Integrated CMOS mm- Wave Phase Shifters for Single Chip Portable Radar P. B. Vadivelu, P. Sen, S. Sarkar, D. Dawn, S. Pinel, J. Laskar, Georgia Electronic Design Center, Atlanta, United States	WE2C-4: A Dual-Mode Programmable Distributed Amplifier/Mixer L. Rabieirad, S. Mohammadi, Purdue University, West Lafayette, United States	
11:30	WE2A-5: Analysis of Output Power Variation under Mismatched Antenna Load in Power Amplifier FEM with Directional Coupler X. Mu, Z. Alon, G. Zhang, S. Chang, Skyworks Solutions, Inc., Newbury Park, United States		WE2C-5: A Low Power 45dB Dynamic-Range Variable Gain Mixer in 0.18µm CMOS C. Ryu ¹ , C. Cho ¹ , J. Lee ¹ , J. Kim ² , ¹ Korea Aerospace Univ., Goyang, Republic of Korea, ² Yonsei Univ., Seoul, Republic of Korea	WE2D-6: Ultra-Low-Profile Small- Size LTCC Front-End Module (FEM) for WLAN Applications based on a Novel Diplexer Design Approach S. Sakhnenko', D. Orlenko', B. Vorotnikov', O. Aleksieiev ¹ , P. Komakha', P. Heide ¹ , M. Vossiek ² , 'Epcos AG, Munich, Germany, ² Clausthal Univ. of Technology, Clausthal - Zellerfeld, Germany

Wednesday	Technica	Sessions	10:20 - 11:40
WE2E210AInnovative Power Dividers and CouplersChair: Christopher Galbraith, MIT-Lincoln Laboratory Co-Chair: Samir El-Ghazaly, University of ArkansasWE2E-1: Design of Reduced Size	WE2F 210C New Technologies and Implementations for Tunable Filters Chair: Youji Kotsuka, Metamaterial Research Inst. Int'l Co-Chair: Sanghoon Shin, RS Microwave WE2F-1: High Q Narrow-Band	10:	
Power Divider for Lower RF Band Using Periodically Loaded Slow Wave Structure K. Rawat, F. Ghannouchi, Univ. of Calgary, Calgary, Canada	Tunable Filters with Controllable Bandwidth H. Joshi, H. H. Sigmarsson, S. Moon, D. Peroulis, W. J. Chappell, Purdue Univ., West Lafayette, United States	20	
WE2E-2: A 180° Wilkinson Power Divider Using Slotline T-Junction J. Kim, M. Park, M. Kim, Kyungsung Univ., Pusan, Republic of Korea		Wednesday Panel Sessions, see pages 56 & 57	
	WE2F-2: In-Situ Control of Tunable Evanescent-Mode Cavity Filters Using Differential Mode Monitoring H. H. Sigmarsson, A. J. Christianson, H. Joshi, S. Moon, D. Peroulis, W. J. Chappell, Purdue Univ., West Lafayette, United States	10:40	
WE2E-3: A Compact Coupled-Line Forward Coupler using Composite Right/Left-Handed Transmission Lines A. Hirota, Y. Tahara, N. Yoneda, Mitsubishi Electric Corp., Ofuna, Kamakura, Japan	WE2F-3: Novel Tunable Hexaferrite Bandpass Filter Based on Open- Ended Finlines M. Sterns, R. Rehner, D. Schneiderbanger, S. Martius, L. P. Schmidt, Univ. of Erlangen- Nuremberg, Erlangen, Germany	10:50	
	WE2F-4: Voltage Tunable Microwave Ferrite Resonator D. E. Oates, G. F. Dionne, R. L. Slattery, MIT Lincoln Laboratory, Lexington, United States	11:00	
WE2E-4: Stepped Impedance Microstrip Couplers with Improved Directivity J. Müller, C. Friesicke, A. F. Jacob, Technische Universität Hamburg-Harburg, Hamburg- Harburg, Germany	WE2F-5: Microstrip Cross-Coupled Stepped-Impedance Line Bandstop Filter W. Tang, J. Hong, Y. Chun, Heriot-Watt Univ., Edinburgh, United Kingdom	11:10	
	WE2F-6: Frequency-Agile Bandstop Filter with Tunable Attenuation D. R. Jachowski, C. Rauscher, Naval Research Laboratory, Washington, United States	11:20	
WE2E-5: Dual-Band Rat Race Hybrid Coupler Implemented Through Artificial Lines Based on Complementary Split Ring Resonators		11:30	

Wednesday	Interactiv	ve Forum	9:20 - 15:40
WEPA 205BC SC15: Semiconductor Devices and Monolithic IC Technologies	WEPC 205BC SC19: Power Amplifier Devices and Integrated Circuits	WEPE 205BC SC22: Millimeter Wave and Terahertz Components and Technologies	WEPE-7: A Wafer-Level Diamond Bonding Process To Improve Power Handling Capability of Submillimeter-wave Schottky Diode Multipliers C. Lee ¹ , J. S. Ward ¹ , R. H. Lin ¹ , E. T. Schlecht ¹ , G. Chattopadhyay ¹ , J. J. Gill ¹ , B. C. Thomas ¹ , A. Maestrini ² , I. Mehdi ¹ , P. H. Siegel ¹ , ¹ Jet
WEPA-1: Raman Channel Temperature Measurement of SiC MESFET as a Function of Ambient Temperature and DC Power G. E. Ponchak, J. I. Eldridge, I. L. Krainsky, NASA Glenn Research Center, Cleveland, United States	WEPC-1: The Dependence of GaN HEMT's Frequency Figure of Merit on Temperature A. M. Darwish, B. Huebschman, E. Viveiros, H. A. Hung, Army Research Laboratory, Adelphi, United States	WEPE-1: Rain Attenuation Statistics for a 120-GHz-Band Wireless Link A. Hirata ¹ , H. Takahashi ¹ , T. Kosugi ² , K. Murata ² , K. Naoya ¹ , Y. Kado ¹ , ¹ NTT Corporation, Atsugi-shi, Japan, ² NTT Corporation, Atsugi-shi, Japan	Propulsion Laboratory, Pasadena, United States, ² Univ. Pierre et Marie-Paris, Paris, France
WEPA-2: RF Waveform Engineering Applied to GaAs MESFET Radiation Safe Operating Area N. Le Gallou, F. Sturesson, European Space Agency ESA/ESTEC, Noorwijk, Netherlands	WEPC-2: A Novel Reconfigurable Power Amplifier Structure for Multi- Band and Multi-Mode Portable Wireless Applications using a Reconfigurable Die and a Switchable Output Matching Network C. Zhang, A. E. Fathy, Univ. of Tennessee, Knoxville, United States	WEPE-2: Enhanced Terahertz Detection Using Multiple GaAs HEMTs Connected in Series T. A. Elkhatib, D. B. Veksler, K. N. Salama, X. C. Zhang, M. S. Shur, Rensselaer Polytechnic Institute, Troy, United States	WEPE-8: SU-8 Micromachining of Millimeter and Sub-Millimeter Waveguide Circuits C. H. Smith, A. Sklavounos, N. S. Barker, Univ. of Virginia, Charlottesville , United States
WEPB 205BC SC18: HF/VHF/UHF Technologies and Applications	WEPC-3: Thermal Analysis and its Application to High Power GaN HEMT Amplifiers A. Prejs, S. M. Wood, R. S. Pengelly, W. L. Pribble, Cree Inc., Durham, United States	WEPE-3: Toward Real-Time Penetrating Imaging Radar at 670GHz R. J. Dengler ¹ , K. B. Cooper ¹ , N. Llombart ² , G. Chattopadhyay ¹ , T. Bryllert ² , I. Mehdi ¹ , P. H. Siegel ^{1,2} , ¹ Jet Propulsion Laboratory, Pasadena, United States, ² California Institute of Technology, Pasadena, United States	WEPE-9: A Micro-Machined Contacting Sliding Short for High Frequency Applications J. R. Stanec, N. S. Barker, Univ. of Virginia, Charlottesville, United States
WEPB-1: Observing Transistor Voltage Waveform in High Efficiency Class-E HF/VHF/UHF Power Amplifiers A. Mediano ¹ , K. Narendra ² , ¹ Univ. of Zaragoza, Zaragoza, Spain, ² Motorola Technology, Penang, Malaysia	WEPC-4: Alternative M-Derived Termination for Distributed Amplifiers A. Kopa, A. B. Apsel, Cornell Univ., Ithaca, United States	WEPE-4: A Six-Port Reflectometer for In-Situ Monitoring of Frequency Multipliers G. Wu ¹ , H. Xu ² , J. L. Hesler ³ , R. M. Weikle ² , ¹ Univ. of Virginia, Charlottesville, United States, ² Univ. of Virginia, Charlottesville, United States, ³ Virginia Diodes, Inc., Charlottesville, United States	WEPG 210B SC6: Linear and Nonlinear Device Modeling
WEPB-2: Modeling PIN Diodes in High Power RF and Microwave Applications R. H. Caverly, Villanova Univ., Villanova, United States	WEPC-5: High Efficiency Switching- Mode Class-E Doherty Amplifier Using GaN HEMT G. W. Choi, H. J. Kim, W. J. Hwang, S. W. Shin, J. J. Choi, Kwangwoon Univ., Nowon-Gu, Republic of Korea	WEPE-5: A Field-deployed 810GHz Receiver incorporating a Superconducting Mixer developed for Herschel Space Telescope and a SiGe Low Noise Amplifier A. Hedden ¹ , H. Li ¹ , C. Tong ¹ , S. Paine ¹ , R. Blundell ¹ , J. H. Kawamura ² , C. Groppi ³ , C. Kulesa ³ , C. Walker ³ , G. de Lange ⁴ , H. Mani ⁵ ,	WEPG-1: Multi-Fidelity Space Mapping Modeling of Microwave Devices with Double Coarse Model Processing and Functional Approximation S. Koziel ¹ , J. W. Bandler ² , ¹ Reykjavik Univ., Reykjavik, Iceland, ² McMaster Univ., Hamilton, Canada
WEPB-3: Low Distortion Amplification of Multisine Signals using a Time-Frequency Technique G. J. Mazzaro, K. G. Gard, M. B. Steer, North Carolina State Univ., Raleigh, United States	WEPD 205BC SC21: Low Noise Components and Receivers	S. Weinreb ⁵ , ¹ Harvard-Smithsonian Center for Astrophysics, Cambridge, United States, ² Jet Propulsion Lab, Pasadena, United States, ³ Univ. of Arizona, Tucson, United States, ⁴ Space Research Organisation of Netherlands, Groningen, Netherlands, ⁵ California Institute of Technology, Pasadena, United States	WEPG-2: Lumped Element Thermal Modeling of GaN-Based HEMTs F. Bertoluzza, G. Sozzi, N. Delmonte, R. Menozzi, Univ. of Parma, Parma, Italy
WEPB-4: The Use of High Q Toroid Inductors for LTCC Integrated Tunable VHF Filters E. E. Hoppenjans, W. J. Chappell, Purdue Univ., West Lafayette, United States	WEPD-1: An 8 - 18GHz Wideband SiGe BiCMOS Low Noise Amplifier D. Ma, F. F. Dai, R. C. Jaeger, J. D. Irwin, Auburn Univ., Auburn, United States	WEPE-6: Novel Wide-band 3D Transitions on Liquid Crystal Polymer for Millimeter-Wave Applications up to 100GHz A. Rida', A. Margomenos ² , T. Wu', M. M. Tentzeris', 'Georgia Institute of Technology, Atlanta, United States, ² Toyota Research Institute North America, Ann Arbor, United States	WEPG-3: Characterization of Annular-Structure RF LDMOS Transistors Using Polyharmonic Distortion Model C. Chiu ^{1,3} , K. Chen ¹ , G. Huang ¹ , K. Liao ¹ , W. Chen ¹ , S. Wang ¹ , Y. Teng ¹ , M. Chen ² , Y. Yang ² , K. Wang ² , L. Wu ³ , ¹ National Nano Device Laboratories, Hsinchiu, Taiwan, ² United
			Microelectronics Corporation, Hsinchiu, Taiwan, ³ National Chiao Tung Univ., Hsinchiu, Taiwan

210B

9:20 - 15:40

SC25: Packaging, Interconnects, MCMs and Hybrid

Manufacturing

WEPM-1: Measurement on Dipole

Antenna with Light Polarized

Nano-Material (PNM) Textile

F. Liu¹, W. Chen¹, Z. Zhang¹, Z. Feng¹, Y.

China, ²Siemens Ltd., Beijing, China

Chen¹, H. Zhang², ¹Tsinghua Univ., Beijing,

WEPM

Reflector

Wednesday

WEPG-4: EM-Based Modeling of Cascode FETs Suitable for MMIC Design

D. Resca¹, J. A. Lonac², R. Cignani¹, A. Raffo³, A. Santarelli¹, G. Vannini³, F. Filicori¹, ¹Univ. of Bologna, Bologna, Italy. ²M.E.C. - Microwave Electronics for Communications, Bologna, Italy, ³Univ. of Ferrara, Ferrara, Italy

WEPG-5: Dynamic Models for Predicting the Thermal Behavior of Vertical MOSFET Transistors under Pulsed Conditions

D. Rice, J. Crowder, B. Battaglia, HVVi Semiconductors, Inc., Phoenix, United States

WEPJ 210B SC9: Passive Circuit Elements

WEPJ-1: A Two-Layer Planar Spatial Power Divider/Combiner

Q. Chu, J. Yan, South China Univ. of Technology, Guangzhou, China

WEPJ-2: Theory of Compact Narrow-Band Directional Couplers and Implementation in Silicon IPD Technology

R. Frye¹, R. Melville¹, G. Badakere², Y. Lin², K. Liu³, ¹RF Design Cons. LLC., Berkeley Heights, United States, ²STATS ChipPAC Ltd., Singapore, Singapore, ³STATS ChipPAC Inc., Tempe, United States

WEPJ-3: Integrated Broadband Lumped-Element Symmetrical-Hybrid N-way Power Dividers

M. M. Elsbury¹, P. D. Dresselhaus², S. P. Benz², Z. Popovic¹, ¹Univ. of Colorado, Boulder, United States, ²National Institute of Standards and Technology, Boulder, United States

WEPJ-4: Ka-band Lange Coupler in Multilayer Thick-Film Technology

A. Bikiny¹, C. Quendo¹, E. Rius¹, J. Favennec¹, C. Person¹, B. Potelon¹, L. Rigaudeau², P. Moroni³, J. Cazaux³, ¹Lab-STICC, Brest, France, ²CNES, Toulouse, France, ³ThalesAlenia Space, Toulouse, France

WEPJ-5: Cryogenic Hybrid Coupler for Ultra Low Noise Radioastronomy Receiver

I. Malo¹, J. D. Gallego¹, M. C. Díez¹, C. Cortés², C. Briso-Rodriguez², ¹Centro Astronómico de Yebes, Guadalajara, Spain, ²Universidad Politécnica de Madrid, Madrid, Spain

WEPJ-6: Systematic Design of Reconfigurable Quadrature Directional Couplers

H. Mextorf, T. Lehmann, R. Knoechel, Univ. of Kiel, Kiel, Germany

Interactive Forum

WEPJ-7: Equivalent Circuit Model of Square Waveguide T-junction for Ortho-Mode Transducers

Y. Tao¹, Z. Shen¹, G. Liu², ¹Nanyang Technological University, Singapore, Singapore, ²ST Electronics, Singapore, Singapore

WEPJ-8: An Enhanced Physical and Scalable Lumped Model of RF CMOS Spiral Inductors

S. Salimy¹, S. Toutain¹, A. Rhallabi², A. Goullet², J. Saubat³, F. Challali³, ¹Institut de Recherche en Electronique de Nantes Atlantique, Nantes, France, ²Institut des matériaux Jean Rouxel, Nantes, France, ³MHS Electronics, Nantes, France

WEPJ-9: Design of a UWB Phase Shifter Using Shunt $\lambda/4$ Stubs

X. Tang, K. Mouthaan, National Univ. of Singapore, Singapore, Singapore

WEPJ-10: MHMICs on Ceramic Substrate for Advanced Millimeter Wave Systems

B. Boukari¹, D. Hammou¹, E. Moldovan¹, R. G. Bossio², K. Wu², S. O. Tatu¹, ¹Institut National de la Recherche Scientifique, INRS-EMT, Montreal, Canada, ²Poly-Grames Research Center, École Polytechnique de Montréal, Montreal, Canada

WEPJ-11: Via-Less Microwave Crossover Using Microstrip-CPW Transitions in Slotline Propagation Mode

K. U-yen, E. J. Wollack, S. H. Moseley, T. R. Stevenson, W. Hsieh, N. T. Cao, NASA Goddard Space Flight Center, Greenbelt, United States

WEPJ-12: 3D MMIC Compact Semi-Lumped Loaded CPW Stubs for Spurious Suppression Fabricated with a Standard Air Bridge Process

K. Hettak¹, K. Elgaid², I. G. Thayne², G. A. Morin³, M. G. Stubbs¹, ¹Communications Research Centre Canada, Ottawa, Canada, ²Univ. of Glasgow, Glasgow, United Kingdom, ³Defence Research and Development Canada, Ottawa, Canada

WEPK 210B SC10: Planar Passive

SC10: Planar Passive Filters and Multiplexers

WEPK-1: A Quasi-Lumped, Ultra-Broadband, Contiguous, SSL-Diplexer from DC - 80GHz

R. Rehner, M. Sterns, D. Schneiderbanger, S. Martius, L. Schmidt, Univ. of Erlangen-Nuremberg, Erlangen, Germany

WEPK-2: Design of a Novel Four-Band Microstrip Bandpass Filter Using Double-Layered Substrate

K. Hsu, W. Tu, National Central Univ., Jhongli, Taiwan

WEPL 210B SC12: Active, Tunable and Integrated Filters

WEPL-1: Tunable MEMS Hybrid Coupler and L-band Tunable Filter

T. Nishino¹, Y. Kitsukawa¹, M. Hangai¹, S. Lee², S. Soda², M. Miyazaki¹, I. Naitoh¹, Y. Konishi¹, ¹Mitsubishi Electric Corp., Kamakura, Japan, ²Mitsubishi Electric Corp., Kamakura, Japan

WEPL-2: Low Voltage Tunable Narrow Bandpass Filter Using Cross-Coupled Stepped-Impedance Resonator with Active Capacitance Circuit

K. Park, Y. Cho, S. Yun, Sogang Univ., Seoul, Republic of Korea

WEPL-3: High Resistive Silicon Based Low-pass Active Filter Design for TV on Mobile Application

M. Lababidi¹, D. Lo Hine Tong¹, A. Louzir¹, J. Lintignat², B. Barelaud², B. Jarry², ¹Thomson R&D, Rennes, France, ²XLIM, Limoges, France

WEPL-4: Miniaturized Ultra-Wideband Bandpass Filter from Silicon Integrated Passive Device Technology

K. Liu¹, R. Frye², R. Emigh¹, ¹STATS ChipPAC, Inc., Tempe, United States, ²RF Design Consulting, LLC, Berkeley Heights, United States

WEPL-5: Narrowband Barium Strontium Titanate (BST) Tunable Bandpass Filters at X-band

Z. Feng¹, W. M. Fathelbab³, P. G. Lam², V. Haridasan¹, J. P. Maria², A. I. Kingon⁴, M. B. Steer¹, ¹North Carolina State Univ., Raleigh, United States, ²North Carolina State Univ., Raleigh, United States, ³South Dakota School of Mines and Tech, Rapid City, United States, ⁴Brown Univ., Providence, United States

WEPL-6: Compact WiMAX Filter with Three Independent Transmission Zeros Using PCB Embedded Passive Technology

S. Lim, J. Park, Kwangwoon Univ., Seoul, Republic of Korea



	Wednesday	Technical	Sessions	13:20 - 14:40
	WE3A204ABApplication of Gallium Nitride Technology from L to V BandChair: Aryeh Platzker, RaytheonCo-Chair: John L Heaton, BAE Systems	WE3B205ALow Noise Amplifiers from 0.3 to 96GHzChair: Terry C Cisco, Raytheon Company Co-Chair: Alfy Riddle, Finesse Solutions	WE3C 206AB Advances in Millimeter-Wave Signal Generation Chair: Bhaskar Banerjee, University of Texas at Dallas Co-Chair: Scott Wetenkamp, SCEAN	WE3E 210A 180 Degree Hybrid Development Chair: Rashaunda Henderson, University of Texas at Dallas Co-Chair: Jesse Taub, Consultant
13:20	WE3A-1: An Efficient, Linear, Broadband Class-J-Mode PA Realized Using RF Waveform Engineering P. Wright, J. Lees, P. J. Tasker, J. Benedikt, S. C. Cripps, Cardiff Univ., Cardiff, United Kingdom	WE3B-1: Design and Analysis of Ultra Wideband GaN Dual-Gate HEMT Low Noise Amplifiers S. E. Shih, W. R. Deal, D. Yamauchi, W. E. Sutton, Y. Chen, I. Smorchkova, B. Heying, M. Wojtowicz, M. Siddiqui, Northrop Grumman Corporation, Redondo Beach, United States	WE3C-1: DCO with Embedded DiCAD Resonator in 90nm CMOS for 58-64GHz Linear Frequency Tuning and Low Phase Noise T. LaRocca, J. Liu, F. Wang, D. Murphy, F. Chang, Univ. of California at Los Angeles, Los Angeles, United States	WE3E-1: New Miniaturized, Dual- Band, Rat-Race Coupler with Microwave C-Sections Y. Chiou, J. Kuo, C. Chan, National Chiao Tung Univ., Hsinchu, Taiwan
13:30				WE3E-2: Miniaturized Hybrid Ring Circuits using T-Type Folded Substrate Integrated Waveguide (TFSIW) Y. Ding, K. Wu, Ecole Polytechnique of Montreal, Montreal, Canada
13:40	WE3A-2: A Compact 12-Watt High- Efficiency 2.1-2.7GHz Class-E GaN HEMT Power Amplifier for Base Stations M. P. van der Heijden, M. Acar, J. S. Vromans, NXP Semiconductors, Eindhoven, Netherlands	WE3B-2: CMOS Wideband LNA Design Using Integrated Passive Device H. Chen ¹ , 2, Y. Hsu ¹ , T. Lin ¹ , D. Chang ¹ , Y. Juang1, S. Lu ¹ , 1National Applied Research Lab., Hsin-Chu, Taiwan, 2National Taiwan Univ, Taipei, Taiwan	WE3C-2: A V-Band Low-Phase- Noise CMOS Oscillator using a Micromachined Cavity Y. Koh, S. Song, J. Kim, Y. Kim, Y. Kwon, K. Seo, Seoul National Univ., Seoul, Republic of Korea	
13:50				WE3E-3: Miniaturized Rat-Race Coupler with Bandpass Response and Good Stopband Rejection W. Wang, T. Shen, T. Huang, R. Wu, National Taiwan Univ., Taipei, Taiwan
14:00	WE3A-3: Design of Highly-Efficient GaN X-Band Power-Amplifier MMICs J. Kühn', F. van Raay', R. Quay', R. Kiefer', T. Maier1, R. Stibal', M. Mikulla', M. Seelmann-Eggebert', W. Bronner', M. Schlechtweg', O. Ambacher', M. Thumm ² , 'Fraunhofer Institute Applied Solid-State	WE3B-3: A Miniature Q-band CMOS LNA with Triple-Cascode Topology B. Hunag, H. Wang, K. Lin, National Taiwan Univ., Taipei, Taiwan	WE3C-3: Low Phase Noise 77GHz VCO with Optimized Terminated Impedance at Fundamental and Second Harmonic Frequencies S. Watanabe, T. Matsuzuka, H. Amasuga, S. Goto, T. Oku, T. Ishikawa, Mitsubishi Electric Corporation, Itami, Japan	
14:10	Physics, Freiburg, Germany, ² Univ. of Karlsruhe, Karlsruhe, Germany			WE3E-4: A Laminated Waveguide Magic-T in Multilayer LTCC T. Shen, T. Huang, R. Wu, National Taiwan Univ., Taipei, Taiwan
14:20	WE3A-4: A 76GHz GaN-on-Silicon Power Amplifier for Automotive Radar Systems S. Yoshida, M. Tanomura, Y. Murase, K. Yamanoguchi, K. Ota, K. Matsunaga, H. Shimawaki, NEC Corporation, Ohtsu, Japan	WE3B-4: A W-Band Low-Noise Amplifier with 22K Noise Temperature E. W. Bryerton ¹ , X. Mei ² , Y. Kim ² , W. Deal ² , W. Yoshida ² , M. Lange ² , J. Uyeda ² , M. Morgan1, R. Lai ² , 'National Radio Astronomy Observatory, Charlottesville, United States, ² Northrop Grumman Space Technology,	WE3C-4: V-Band 8th Harmonic Push-Push Oscillator using Microstrip Ring Resonator K. Kawasaki, T. Tanaka, M. Aikawa, Saga Univ., Saga-shi, Japan	
14:30		Redondo Beach, United States		WE3E-5: Dual-Band Branch- Line Balun for Millimeter-Wave Applications H. Zhang, H. Xin, Univ. of Arizona, Tucson, United States

Technical Sessions Wednesday 13:20 - 14:40 WE3F 210C WE3G 211 Nonlinear Modeling: Amplifier Behavioral and FET Synthesis of Planar Filters and Multiplexers Chair: Raafat Mansour, University of Waterloo Chair: Robert E. Leoni III, Raytheon Company Co-Chair: David E. Root, University of Perugia Agilent Technologies 13:20 WE3F-1: Synthesis of Microwave WE3G-1: Two-Input Two-Output **Duplexers Using Fully Canonical Band-Pass Power Amplifiers Microstrip Filters** Model Extraction by Integrating Linearized Large-Signal Vector G. Macchiarella¹, S. Tamiazzo², ¹Politecnico Measurements di Milano, Milano, Italy, ²Andrew A. Cidronali, C. Accillaro, G. Manes, Univ. of Telecommunications Products, Agrate Florence, Florence, Italy Brianza, Italy 13:30 WE3F-2: Synthesis/Design of Novel Wideband Bandpass Filter Using Open-Ended Stub Loaded Parallel WE3G-2: Extension of X-parameters to Include Long-Term 13:40 Dynamic Memory Effects Coupled Three-Line Unit J. Verspecht¹, J. Horn², L. Betts², D. Gunyan², C. Chen¹, Z. Ma², H. Nihei¹, Y. Takakura¹, T. R. Pollard³, C. Gillease², D. E. Root², ¹Jan Anada1, 1Kanagawa Univ., Yokohama-shi, Verspecht B.V.B.A., Opwijk, Belgium, Japan, ²Saitama Univ., Saitama-shi, Japan ²Agilent Technologies, Santa Rosa, United States, ³Univ. of Leeds, Leeds, United Kingdom 13:50 14:00 WE3F-3: Accounting for Spurious WE3G-3: A Power-Scalable Couplings in Quadruplet Microstrip Linearized Model for RF Power Amplifiers Starting from Filters **S-Parameter Measurements** A. B. Jayyousi¹, M. J. Lancaster², ¹Amman Univ., Amman, Jordan, ²Birmingham Univ., K. Vandermot¹, Y. Rolain¹, G. Vandersteen¹, R. Pintelon¹, F. Ferranti², T. D'Haene², ¹Vrije Birmingham, United States Universiteit Brussel, Brussels, Belgium, ²Ghent Univ., Ghent, Belgium 14:10 WE3G-4: Electrothermal Large-Signal Model of III-V FETs Accounting for Frequency Dispersion and Charge Conservation L. Liu, J. Ma, Univ. of Electronic Science and Technology of China, Chengdu, China Interactive WE3G-5: An Improved Empirical Large-Signal Model for High-Power GaN HEMTs Including Self-Heating WE3F-4: Design of Absorptive Microwave Filters using Allpass Networks in a Parallel-Cascade Forum 4 20 during the break, see pages 38 & 39 Configuration and Charge-Trapping Effects A. C. Guyette¹, I. C. Hunter², R. D. Pollard², K. S. Yuk¹, G. R. Branner¹, D. J. McQuate², ¹Univ. of ¹Naval Research Laboratory, Washington, California at Davis, Davis, United States, ²Clear United States, ²Univ. of Leeds, Leeds, United Stream Technologies, Fulton, United States Kingdom 4:30

	Wednesday	Technical	Sessions	15:40 - 17:00
	WE4A 204AB HF/VHF/UHF Power Amplifiers	WE4B 205A Low Noise Technologies	WE4C 206AB System Level Packaging	WE4D 209 Smart Antennas and
	Chair: Frederick H. Raab, Green Mountain Radio Research Co-Chair: Alina Moussessian, Jet Propulsion Laboratory	Chair: James Whelehan, JJW Consulting Inc Co-Chair: Francois Danneville, IEMN UMR CNRS	Chair: Rudy Emrick, Motorola Co-Chair: Clive Tzuang, National Taiwan University	Chair: Julio Navarro, Boeing Co-Chair: Chris Rodenbeck, Sandia National Laboratories
15:40	WE4A-1: HF Outphasing Transmitter using Class-E Power Amplifiers R. A. Beltran ¹ , F. H. Raab ² , A. Velazquez ¹ , ¹ CICESE Research Center, Ensenada, Mexico, ² Green Mountain Radio Research, Colchester, United States	WE4B-1: On-Die Source-Pull for the Characterization of the W-Band Noise Performance of 65nm General Purpose (GP) and Low Power (LP) n-MOSFETs K. Yau ¹ , M. Khanpour ¹ , M. Yang ² , P. Schvan ³ , S. Voinigescu ¹ , ¹ Univ of Toronto, Toronto, Canada, ² TSMC, Hsinchu, Taiwan, ³ NORTEL, Ottawa, Canada	WE4C-1: Millimeter-Wave, Low Cost Plastic Packages for 77GHz Automotive RADAR and High Data Rate E-Band Radios P. Alléaume, C. Toussain, T. Huet, M. Camiade, United Monolithic Semiconductors, Orsay, France	WE4D-1: Flex-Rigid Architecture for Active Millimeter-Wave Antenna Arrays A. Geise, A. F. Jacob, Technische Universität Hamburg-Harburg, Hamburg, Germany
15:50			WE4C-2: Effective Die-Package- PCB Co-Design Methodology and its Deployment in 10 Gbps Serial Link Transceiver FPGA Packages 1550-1610 X. Jiang, H. Shi, Altera Corporation, 101 Innovation Dr., San Jose, United States	
16:00	WE4A-2: Broadband GaN Switch Mode Class E Power Amplifier for UHF Applications A. Al Tanany, A. Sayed, G. Boeck, Berlin Institute of technology, Berlin, Germany	WE4B-2: Temperature Dependent Microwave Noise Parameters and Modeling of AlGaN/GaN HEMTs on Si Substrate Z. Liu ^{1,2} , S. Arulkumaran ² , G. I. Ng ^{1,2} , ¹ Nanyang Technological Univ., Singapore, Singapore, ² Nanyang Technological Univ., Singapore, Singapore		WE4D-2: Switched-Beam Antenna Based on EBG Periodic Structures M. A. Habib ¹ , M. N. Jazi ¹ , A. Djaiz ¹ , M. Nedil ² , T. A. Denidni ¹ , ¹ INRS-EMT, Montreal, Canada, ² LRCS, Val d'Or, Canada
116:10			WE4C-3: Multilayer Silicon RF System-in-Package Technique Using Magnetically Aligned Anisotropic Conductive Adhesive S. Moon ¹ , S. K. Khanna ² , W. J. Chappell ¹ , ¹ Purdue Univ., Lafayette, United States, ² Shiva Consulting Inc., Carmel, United States	
16:30 16:20	WE4A-3: Phase Controlled Class E Amplifiers for Pulsing Applications A. Eroglu', S. Sivakuma ² , 'Indiana Univ., Fort Wayne, United States, ² MKS Instruments, Rochester, United States	WE4B-3: Highly Robust X-Band LNA with Extremely Short Recovery Time M. Rudolph ¹ , M. Dewitz ¹ , A. Liero ¹ , I. Khalil ¹ , N. Chaturvedi ¹ , C. Wipf ² , R. M. Bertenburg ³ , J. Miller ³ , J. Würfl ¹ , W. Heinrich ¹ , G. Tränkle ¹ , ¹ Ferdinand-Braun-Institut, Berlin, Germany, ² IHP Innovations for High Performance Microelectronics, Frankfurt (Oder), Germany, ³ Nanowave Technologies Inc., Etobicoke, Canada	WE4C-4: Large Area Integration of Embedded High Power RF Amplifiers in a Thin Organic Panel A. T. Wegener, C. J. Fulton, J. J. Gregory, W. J. Chappell, Purdue Univ., West Lafayette, United States	WE4D-3: An Inter-Element Phase- Detecting Retrodirective Array for Nonuniform Wavefronts A. Zamora, M. K. Watanabe, J. M. Akagi, T. F. Chun, W. A. Shiroma, Univ. of Hawaii, Honolulu, United States
16:40	WE4A-4: A Linear GaN UHF SSPA with Record High Efficiency A. Katz ¹ , B. Eggleston ² , D. McGee ² , ¹ The College of New Jersey, Ewing, United States, ² Linearizer Technology, Inc., Hamilton, United States	WE4B-4: Low Frequency Noise in Nanoscale pMOSFETs with Strain Induced Mobility Enhancement and Dynamic Body Biases K. Yeh, C. Ku, W. Hong, J. Guo, National Chiao-Tung Univ., Hsin-chu, Taiwan	ise in Strain lent WE4C-5: Studies on RF- Optical Dual Mode Wireless S Communication Modules A A. O. Boryssenko ¹ , J. Liao ² , J. Zeng ³ , Z. Huang ² , V. Joyner ³ , ¹ Univ. of Massachusetts, o Amherst, United States, ² Rensselaer Polytechnic Institute, Troy, United States, ³ Tufts Univ., Medford, United States	WE4D-4: A 2.4GHz Active Phase Shifter Architecture for Smart Antennas Control F. Hutu, D. Cordeau, J. Paillot, LAII, ESIP, Univ. of Poitiers, Angoulême, France
16:50				WE4D-5: Low Cost 1K Elements Phased Array Antennas P. Mousavi ¹ , M. Fakharzadeh ² , S. Safavi- Naeini ² , ¹ Intelwaves Technologies, Waterloo, Canada, ² Univ. of Waterloo, Waterloo, Canada

Technical Sessions 15:40 - 17:00 Wednesday WE4G 210A WE4F 210C 211 Advanced Planar Filter Design Linear and Non-Linear Modeling **Advanced Passive Components** Chair: John Atherton, WIN Technology Chair: Chi Wang, Orbital Sciences Corp. Chair: Nick Kolias, Raytheon Company Co-Chair: Huiwen Yao, Orbital Sciences Corp. Co-Chair: Wayne Struble, Triquint WE4E-1: Miniaturized Carbon 15:40 WE4F-1: Realization of a Microstrip WE4G-1: Causality Enforcement Nanotube-Based RF Resonator Triple-Mode Bandpass Filter Using in Fast EM-Based Simulation of a Square-Loop Resonator Multilayer Transmission Lines M. A. EL Sabbagh, S. M. El-Ghazaly, Univ. of R. M. Biernacki, Y. Chu, F. Rao, Y. Hu, Agilent Arkansas, Fayetteville, United States A. Balalem¹, A. R. Ali¹, S. Amari², J. Machac³, A. Omar¹, ¹Univ. of Magdeburg, Magdeburg, Technologies Inc., Santa Rosa, United States Germany, ²Royal Military College of Canada, Kingston, Canada, ³Czech Technical Univ., Prague, Czech Republic 15:50 WE4F-2: UWB Bandpass Filter WE4G-2: Scalable Small-Signal Modeling of RF CMOS FET Based on 3-D EM-based Extraction of 16:00 WE4E-2: Rigorous Investigation of RF Breakdown Effects in High with a Multilayer Non-Uniform **Power Microstrip Passive Circuits** Periodical Structure on LCP Substrates Parasitic Effects F. J. Perez Soler¹, S. Anza Hormigo², M. G. Jung, W. Choi, Y. Kwon, Seoul National Mattes³, C. M. Espana⁴, F. D. Quesada Z. Hao, J. Hong, Heriot-Watt Univ., Pereira¹, M. Jimenez Nogales¹, J. Gil Raga², Edinburgh, United Kingdom Univ., Seoul, Republic of Korea C. Vicente Quiles², J. R. Mosig³, D. Raboso Garcia-Baquero⁴, V. E. Boria Esbert⁵, B. Gimeno Martinez⁶, A. Alvarez Melcon¹, ¹Technical Univ. of Cartagena, Cartagena, Spain, ²AURORA Software and Testing, Paterna, Spain, ³Ecole Polytechnique Federale de Lausanne, Laussane, Switzerland, ⁴ESA, Nordwijk, Netherlands, ⁵Universidad Politecnica de Valencia, Valencia, Spain, 6Universidad de Valencia, Burjassot, Spain WE4E-3: A Time-Varying Matching WE4F-3: Design of a Dual Band-WE4G-3: A Straight-Forward 16:20 Scheme for Pulse-based High-Q Pass Filter Using Modified Folded Method to Determine the Parasitic Stepped-Impedance Resonators Gate Resistance of GaN FET X. Wang¹, L. P. Katehi², D. Peroulis¹, ¹Purdue M. Velazguez-Ahumada¹, J. Martel¹, F. J. A. Reynoso-Hernandez¹, J. R. Loo-Yau², J. E. Zuniga-Juarez¹, J. L. del Valle-Padilla², ¹Centro Univ., West Lafayette, United States, ²Univ. Medina¹, F. Mesa¹, ¹Univ. of Seville, Seville, of Illinois , Champaign, United States Spain de Investigacion Científica y de Esutidos Superiores, Ensenada, Mexico, ²Centro de Investigacion y Estudios Avanzados del I.P.N, Guadalajara, Mexico WE4G-4: Electrothermal Gate and Channel Breakdown Model for Prediction of Power and Efficiency in FET Amplifiers A. E. Parker¹, J. G. Rathmell², ¹Macguarie Univ., Macquarie , Australia, ²The Univ. of Sydney, Sydney, Australia WE4F-4: Dual-Band Filter based on WE4E-4: A 24GHz CMOS 16:40 **Miniaturized Phase-Invertible** Non-Degenerate Dual-Mode Slow-Variable Attenuator Incorporating Wave Open-Loop Resonators **Industry Reception** Edge-Coupled Synthetic J. Hong, W. Tang, Heriot-Watt Univ., & Awards Banquet, Transmission Lines Edinburgh, United Kingdom see page 77 C. Wang, H. Wu, C. C. Tzuang, National Taiwan Univ., Taipei, Taiwan WE4E-5: Substrate Integrated WE4F-5: Novel Elliptic Function 6:50 Waveguide (SIW) Broadband Compensating Phase Shifter Type Ultra Wideband Bandpass Filter based on Lambda/4 Open **Stripline T Section** Y. Cheng¹, K. Wu^{2,1}, W. Hong¹, ¹State Key Laboratory of Millimeter Waves, Nanjing, T. H. Duong, I. S. Kim, Kyung Hee Univ., China, ²Poly-Grames Research Center, Yongin, Republic of Korea Montreal, Canada

WE4E

Receivers

	Thursday	Technical	Sessions	08:00 - 09:20
	TH1A 204AB Power Amplifier Linearization Chair: Dr John Wood, Freescale Semiconductor, Inc. Co-Chair: Dr Fadhel Ghannouchi, iRadio Lab / Univ. of Calgary, Canada	TH1B205AFrequency Conversion and Control CircuitsChair: Stephen Maas, AWRCo-Chair: Hiroshi Okazaki, NTT Docomo, Inc	TH1C206ABAdvanced Mixed Technologies for Large Scale IntegrationChair: Mark Rosker, DARPACo-Chair: Bernie Geller, BDG Consulting Services	TH1D209Advances in Mixed-Signal GHz-Transceiver Front-EndsChair: Hermann Boss, Rohde & SchwarzCo-Chair: Koichi Murata, NTT Photonics Labs.
08:00	TH1A-1: An Improved Doherty Amplifier Using Cascaded Digital Predistortion and Digital Gate Voltage Enhancement R. N. Braithwaite, S. Carichner, Powerwave Technologies, Santa Ana, United States	TH1B-1: A 3 mW V-Band Divide- by-2 and W-Band Divide-by-4 Wide Locking Range Frequency Dividers in 90-nm CMOS C. Chen ¹ , H. Wang ¹ , H. Tsao ¹ , C. Wang ² , ¹ National Taiwan Univ., Taipei, Taiwan, ² MediaTek, Hsin-Chu, Taiwan	TH1C-1: Integrated On-chip Ba, Ti ₉ O ₂₀ Dielectric Resonator Oscillator in GaAs Technology 0800-0820 A. P. Freundorfer, P. Bijumon, M. Sayer, Queen's Univ., Kingston, Canada	TH1D-1: A 9-bit 2.9GHz Direct Digital Synthesizer MMIC with Direct Digital Frequency and Phase Modulations X. Geng, F. F. Dai, J. D. Irwin, R. C. Jaeger, Auburn Univ., Auburn, United States
08:10				
08:30 08:20	TH1A-2: Fully Orthogonal Multi- Carrier Predistortion Linearization X. Yang ¹ , P. Roblin ¹ , D. Chaillot ² , S. Mutha ¹ , J. Strahler ³ , J. Kim ¹ , M. Ismail ¹ , J. Wood ⁴ , J. Volakis ¹ , ¹ The Ohio State Univ., Columbus, United States, ² CEA, Le Barp, France, ³ Andrew Corporation, Westerville, United States, ⁴ Freescale Corporation Inc., Tempe, United States	TH1B-2: A Miniature DC-70GHz SP4T Switch in 0.13μm CMOS B. Cetinoneri, Y. A. Atesal, G. M. Rebeiz, Univ. of California at San Diego, La Jolla, United States	TH1C-2: Advanced Heterogeneous Integration of InP HBT and CMOS Si Technologies for High Performance Mixed Signal Applications A. Gutierrez-Aitken, P. Chang-Chien, W. Phan, D. Scott, B. Oyama, R. Sandhu, J. Zhou, P. Nam, K. Hennig, M. Parlee, B. Poust, K. Thai, C. Geiger, A. Oki, R. Kagiwada, Northrop Grumman Space Technology, Redondo Beach, United States	TH1D-2: A 9 GS/s 2.1 to 2.2GHz Bandpass Delta-Sigma Modulator for Class-S Power Amplifier P. Ostrovskyy ¹ , H. Gustat ¹ , C. Scheytt ¹ , Y. Manoli ² , ¹ HP GmbH, Frankfurt (Oder), Germany, ² Univ. of Freiburg, Freiburg, Germany
08:50 08:40	TH1A-3: A Wideband Multi-Branch Analog Predistorter with Memory- Effect Compensation for Multi- Carrier WCDMA Repeater Systems Y. Lee, M. Lee, Y. Jeong, Pohang Univ. of Science and Technology, Pohang, Republic of Korea	TH1B-3: Application of Class-F Techniques to the Design of Efficient Frequency Multipliers Y. Park, C. Lee, Hankuk Univ. of Foreign Studies, Yongin, Republic of Korea	TH1C-3: A High Performance Differ- ential Amplifier Through the Direct Monolithic Integration of InP HBTs and Si CMOS on Silicon Substrates T. E. Kazior ¹ , J. R. LaRoche ¹ , D. Lubyshev ² , J. Fastenau ² , W. K. Liu ² , M. Urteaga ³ , W. Ha ³ , J. Bergman ³ , M. J. Choe ³ , M. T. Bulsara ⁴ , E. A. Fitzgerald ⁴ , D. Smith ⁵ , D. Clark ⁵ , R. Thompson ⁵ , C. Drazek ⁶ , N. Daval ⁶ , L. Benaissa ⁷ , E. Augendre ⁷ , 'Raytheon, Andover, United States, ² IQE, Bethlehem, United States, ³ Teledyne, Thousand Oaks, United States, ⁴ MIT, Cambridge, United States, ⁵ Raytheon, Glenrothes, United Kingdom, ⁶ SOITEC, Bernin, France, ⁷ LEITI, Grenoble, France	TH1D-3: A 900 MHz, 3.6 Gb/s Bandpass DSM Receiver with 55.7 dB two-tone SFDR in 1 MHz bandwidth U. Karthaus, S. Ahles, A. El Maghraby, C. Schick, P. K. Datta, C. Rheinfelder, Ubidyne GmbH, Ulm, Germany
00:60	TH1A-4: Effects of Crest Factor Reduction on the Predistortion Performance for Multi-Carrier 3G RF Power Amplifiers O. Hammi ^{1,2} , S. Carichner ³ , B. Vassilakis ³ , F. M. Ghannouchi ¹ , ¹ Univ. of Calgary, Calgary, Canada, ² Green Radio Technologies, Inc, Calgary, Canada, ³ Powerwave Technologies, Inc. Calgary, Canada, ⁴ Powerwave Technologies, Inc.	TH1B-4: Broadband CMOS Gilbert Down-Converter Utilizing a Low- Loss Step-Impedance Rat-Race Coupler H. Wei, C. Meng, S. Yu, National Chiao Tung Univ. , Hsinchu, Taiwan	TH1C-4: On-Wafer Integration of Nitrides and Si Devices: Bringing the Power of Polarization to Si T. Palacios, J. W. Chung, B. Lu, Massachusetts Institute of Technology, Cambridge, United States	TH1D-4: A 1 GSample/s, 15GHz Input Bandwidth Master-Slave Track-and-Hold Amplifier in InP- DHBT Technology Y. Bouvier ^{1,2} , A. Konczykowska ¹ , A. Ouslimani ² , J. Godin ¹ , ¹ Alcatel-Thales III-V Lab, Marcoussis, France, ² ECS-ENSEA, Cergy- Pontoise, France
09:10	nic, santa Ana, uniteu states		TH1C-5: MEMS Varactor Enabled Frequency-Reconfigurable LNA and PA in the Upper UHF band A. Jajoo, L. Wang, T. Mukherjee, Carnegie Mellon Univ., Pittsburgh, United States	TH1D-5: A 10 Gb/s Two Dimensional Scanning Eye Opening Monitor in 0.18 µm CMOS Process D. Bhatta, K. Lee, H. Kim, E. Gebara, J. Laskar, Georgia Institute of Technology, Atlanta, United States



Technical Sessions

08:00 - 09:20

Interactive Forum during the break, see pages 48 & 49 Exhibition opens at 09:00

	Thursday	Technical	Sessions	10:20 - 11:40
	TH2B 205A Wireless Sensor Technologies Chair: Manos M. Tentzeris, Georgia Tech Co-Chair: Lora Schulwitz, General Dynamics	TH2C 206AB Reflect Arrays and Power Combining Chair: Nickolas Kingsley, Auriga Measurement Systems Co-Chair: Wayne Shiroma, University of Hawaii	TH2D209Instrumentation for Nonlinear CharacterizationChair: Nuno Borges Carvalho, IT - Universidade de Aveiro Co-Chair: Kate A. Remley, NIST	TH2E210AAdvances in RF MEMS SwitchesChair: Pierre Blondy, Xlim Institute of Research Co-Chair: Scott Barker, University of Virginia
10:20	TH2B-1: A Capacitively Loaded MEMS Slot Element for Wireless Temperature Sensing of up to 300C S. Scott, D. Peroulis, Purdue Univ., West Lafayette, United States	TH2C-1: 60GHz Electrically Reconfigurable Reflectarray Using PIN Diode H. Kamoda, T. Iwasaki, J. Tsumochi, T. Kuki, Japan Broadcasting Corporation, Tokyo, Japan	TH2D-1: Characterization Setup for Device Level Dynamic Load Modulation Measurements M. Thorsell, K. Andersson, C. Fager, Chalmers Univ. of Technology, Göteborg, Sweden	TH2E-1: A Compact SPDT RF MEMS Switch with High Contact Force H. Sedaghat-Pisheh, G. M. Rebeiz, Univ. of California at San Diego, San Diego, United States
10:30				
10:40	TH2B-2: A Novel RF Sensing Circuit Using Injection Locking and Frequency Demodulation for Cognitive Radio Applications C. Li ¹ , F. Wang ¹ , W. Yen ¹ , T. Horng ¹ , K. Peng ² , ¹ National Sun Yat-Sen Univ., Kaohsiung, Taiwan, ² National Kaohsiung First Univ. of Science and Technology, Kaohsiung, Taiwan	TH2C-2: Design and Experimental Verification of Steerable Reflect- Arrays based on Two-Bit Antenna- Filter-Antenna Elements C. Cheng, A. Aabbaspour-Tamijani, Arizona State Univ., Tempe, United States	TH2D-2: Broadband Time Domain Measurement System Applied to the Characterization of Cross Modulation in Nonlinear Microwave Devices. M. Abouchahine, A. Saleh, G. Neveux, T. Reveyrand, J. Teyssier, D. Barataud, J. Nebus, Univ. of Limoges, Limoges, France	TH2E-2: Thermally-Actuated Latching RF MEMS Switch M. Daneshmand ¹ , S. Fouladi ² , R. R. Mansour ² , T. Stajcer ³ , M. Lisi ³ , ¹ Univ. of Alberta, Edmonton, Canada, ² Univ. of Waterloo, Waterloo, Canada, ³ Comdev, Cambridge, Canada
10:50				
0 11:00	TH2B-3: Microwave Acoustic Sensors as an Efficient Means to Monitor Water Infrastructures D. Trinchero, A. Galardini, B. Fiorelli, R. Stefanelli, Politecnico di Torino, Italy	TH2C-3: Directive Surface-Wave Launchers and Application to Planar Quasi-Optical Power Combining using a Metallic Grating Lens S. K. Podilchak ^{1,2} , A. P. Freundorfer ² , Y. M. Antar ^{1,2} , ¹ Royal Military College of Canada, Kingston, Canada, ² Queen's University, Kingston, Canada	TH2D-3: A Set-Up with Load- and Source-Pull Capabilities for Phase Noise and Frequency Stability Characterization of Microwave Devices under Oscillating Operation C. Florian, P. A. Traverso, Univ. of Bologna, Bologna, Italy	TH2E-3: Miniature RF MEMS Switch Matrices A. A. Fomani, R. R. Mansour, Univ. of Waterloo, Waterloo, Canada
11:1				
11:20	TH2B-4: Aerosol Particle Sensor Based on Millimeter-Wave Coherent Radar with High Spatial Resolution A. Teplyuk ¹ , R. Knoechel ¹ , G. Khlopov ² , ¹ Kiel Univ., Kiel, Germany, ² Insitute of Radio Physics & Electronics, Kharkov, Ukraine	TH2C-4: A 60GHz Rotman Lens on a Silicon Wafer for System-on- a-Chip and System-in-Package Applications W. Lee ¹ , J. Kim ¹ , C. Cho ² , Y. Yoon ¹ , ¹ Yonsei Univ., Seoul, Republic of Korea, ² Korea Aerospace Univ., Seoul, Republic of Korea	TH2D-4: Characterization of Traps in AlGaN/GaN HEMTs with a Combined Large Signal Network Analyzer/Deep Level Optical Spectrometer System C. Yang, P. Roblin, A. Malonis, S. Ringel, The Ohio State Univ., Columbus, United States	TH2E-4: A Cryogenic Broadband DC Contact RF MEMS Switch S. Gong, H. Shen, N. S. Barker, Univ. of Virginia, Charlottesville, United States
11:30		TH2C-5: Multiple Interrogation of Phase-Conjugating Arrays T. F. Chun, M. K. Watanabe, A. Zamora, J. M. Akagi, W. A. Shiroma, Univ. of Hawaii, Honolulu, United States		TH2E-5: Performance of Molybdenum as a Mechanical Membrane for RF MEMS Switches C. Goldsmith', D. Forehand', D. Scarbrough', I. Johnston ² , S. Sampath ² , A. Datta ² , Z. Peng ³ , C. Palego ³ , J. Hwang ³ , 'IMEMtronics Corporation, Plano, United States, ² Innovative Micro Technology, Santa Barbara, United States, ³ Lehigh Univ., Bethlehem, United States

Thursday	Technica	l Sessions	10:20 - 11:40
TH2F210CInnovations in Waveguide FiltersChair: H.C. Bell, HF PlusCo-Chair: R. Snyder, RS Microwaves	TH2G 211 Advanced Microwave Computer-Aided Design Chair: Q.J Zhang, Carleton University Co-Chair: Arvind Sharma, Northrop Grumman		
TH2F-1: An Original Resonant Y-Junction for Compact Waveguide Diplexers S. Bastioli', L. Marcaccioli ² , R. Sorrentino ¹ , ¹ Univ. of Perugia, Perugia, Italy, ² RF Microtech s.r.l., Perugia, Italy	TH2G-1: Rigorous Computer-Aided Design of Spherical Dielectric Resonators for Wireless Non- Radiative Energy Transfer M. Mongiardo ¹ , C. Tomassoni ¹ , P. Russer ² , R. Sorrentino ¹ , ¹ Univ. of Perugia, Perugia, Italy, ² Technische Universität München, Munich,	10:20	
	Germany	10:30	
TH2F-2: Triple Mode Conductor Loaded Cavity Filter H. Salehi, T. Bernhardt, T. Lukkarila, S. Amir, Radio Frequency Systems, Meriden, United States	TH2G-2: Reducing a Number of Full-Wave Analyses in RBF Neural Network Optimization of Complex Microwave Structures E. K. Murphy, V. V. Yakovlev, Worcester Polytechnic Institute, Worcester, United States	10:40	
		10:50	
TH2F-3: Dual-Mode Surface-Mount Cavity Resonator and Filter J. Hesselbarth, R. Vahldieck, Swiss Federal Institute of Technology, Zurich, Switzerland	TH2G-3: Tuning Space Mapping Optimization Exploiting Embedded Surrogate Elements Q. S. Cheng ¹ , J. W. Bandler ² , S. Koziel ³ , ¹ McMaster Univ., Hamilton, Canada, ² Bandler Corporation, Dundas, Canada, ³ Reykjavík Univ., Reykjavík, Iceland	11:00	
		11:10	
TH2F-4: Compact Waveguide Bandstop Filters for Wide Stopbands R. Levy, R. Levy Associates, La Jolla, United States	TH2G-4: Trust-Region-Based Convergence Safeguards for Space Mapping Design Optimization of Microwave Circuits S. Koziel ¹ , J. W. Bandler ² , Q. S. Cheng ² , ¹ Reykjavik Univ., Reykjavik, Iceland, ² McMaster Univ., Hamilton, Canada	11:20	
		11:30	

Thursday	Interacti	ve Forum	9:20 - 15:40
THPA 205BC SC16: Signal Generation	THPC-2: Reducing the Drive Signal Bandwidths of EER Microwave Power Amplifiers A. K. Mustafa, V. Bassoo, M. Faulkner, Victoria Univ., Melbourne, Australia	THPE 205BC SC28: Smart Antennas, Spatial Power Combining and Phased Arrays	THPG-4: A Pre-Corrected FFT Algorithm for Fast Electromagnetic Modeling of Three-Dimensional Integrated Passives in Multilayered Substrates V. Okhmatovski', M. Yuan ² , I. Jeffrey ¹ , R. Phelps ² , ¹ Univ. of Manitoba, Winnipeg, Canada, ² Cadence Design Systems Inc., Tempe, United States
THPA-1: Novel Low Phase Noise VCO Using High-Q Metamaterial Transmission Line Based on Complementary Spiral Resonators J. Choi, C. Seo, Soongsil Univ., Seoul, Republic of Korea	THPC-3: A General Method for Passband Quantization Noise Suppression in Pulsed Transmitter Architectures U. Gustavsson ¹ , T. Eriksson ² , C. Fager ³ , ¹ Ericsson AB, Stockholm, Sweden, ² Chalmers Univ. of Technology, Gothenburg, Sweden, ³ Chalmers Univ. of Technology, Gothenburg, Sweden	THPE-1: A 2.45GHz Smart Antenna for Location-Aware Single-Anchor Indoor Applications A. Cidronali ¹ , S. Maddio ¹ , G. Giorgetti ² , I. Magrini ¹ , S. Gupta ² , G. Manes ¹ , ¹ Univ. of Florence, Florence, Italy, ² Univ. of Arizona, Tempe, United States	THPH210BSC7: Nonlinear Circuit Analysis and System Simulation
THPA-2: High-Efficiency Power Oscillator Using Harmonic-Tuned Matching Network W. Hwang, S. Shin, G. Choi, H. Kim, J. Choi, Kwangwoon Univ., Seoul, Republic of Korea	THPC-4: Distortion Arising from Polar to PWM/PPM Conversion in an All-Digital Upconverter for Switching RF Power Amplifiers V. Bassoo, A. K. Mustafa, M. Faulkner, Victoria Univ., Melbourne, Australia	THPE-2: A Modular Approach to Design Transmit Phase Arrays based on the Extended Resonance Technique D. Ehyaie, A. Mortazawi, Univ. of Michigan, Ann Arbor, United States	THPH-1: A Compact Volterra Model for Power Amplifiers with Memory J. Reina-Tosina, C. Crespo-Cadenas, M. J. Madero-Ayora, Univ. of Seville, Seville, Spain
THPB 205BC SC17: Frequency Conversion and Control	THPC-5: Dynamic Load Modulation of High Power Amplifiers with Varactor-Based Matching Networks A. S. Tehrani, H. M. Nemati, H. Cao, T. Eriksson, C. Fager, Chalmers Univ. of Technology, Goteborg, Sweden	THPE-3: High-Efficiency Wire Bond Antennas for On-Chip Radios R. Willmot, D. Kim, D. Peroulis, Purdue Univ., West Lafayette, United States	THPH-2: Semi-Analytical Formulation for the Analysis and Reduction of Injection-Pulling in Front-End Oscillators J. Domínguez, A. Suárez, S. Sancho, Univ. of Cantabria, Santander, Spain
THPB-1: Impact of the Semiconductor Diode Structure on the Virtual Local Oscillator Leakage of GaAs Sub-Harmonic Mixers V. Gutta, A. E. Parker, Macquarie Univ., Sydney, Australia	THPC-6: Ka-Band Waveguide Hybrid Combiner for MMIC Amplifiers with Unequal and Arbitrary Power Output Ratio R. N. Simons ¹ , C. T. Chevalier ² , E. G. Wintucky ¹ , J. C. Freeman ¹ , ¹ NASA Glenn Research Center, Cleveland, United States, ² Analex Corporation, Cleveland, United States	THPE-4: Tunable Harmonic Re- Radiator for Sensing Applications S. M. Aguilar ^{1,2} , T. M. Weller ¹ , ¹ Univ. of South Florida, Tampa, United States, ² Univ. of Wisconsin, Madison, United States	THPH-3: Simulation of Intermodulation Distortion in Passive CMOS FET Mixers H. Khatri ¹ , P. S. Gudem ² , L. E. Larson ¹ , ¹ Univ. of California at San Diego, La Jolla, United States, ² Qualcomm Inc., San Diego, United States
THPB-2: A Ka-band High-Power Switch with Open/Short-Stub Selectable Circuits M. Hangai, K. Nakahara, M. Yamaguchi, M. Hieda, Mitsubishi Electric Corporation, Kamakura, Japan	THPC-7: Inward Nonlinear Characterization of Doherty Power Amplifiers M. Fares ¹ , S. Boumaiza ¹ , Y. Wu ¹ , J. Wood ² , ¹ Univ. of Waterloo, Waterloo, Canada, ² Freescale Semiconductor, Tempe, United States	THPG 210B SC4: CAD Algorithms and Techniques	THPH-4: Modeling of Complex Telecommunication Satellite Payloads P. Angeletti, S. D'Addio, E. Colzi, M. Aloisio, European Space Agency, Noordwijk, Netherlands
THPB-3: 2.4/5.7GHz Dual-Band Dual-Conversion Architecture with Correlated LO Signal Generators J. Syu ¹ , C. Meng ¹ , S. Yu ¹ , T. Wu ¹ , G. Huang ² , ¹ National Chiao Tung Univ. , Hsinchu, Taiwan, ² National Nano Device Laboratories, Hsinchu, Taiwan	THPD 205BC SC26: Instrumentation and Measurement Techniques	THPG-1: Efficient Optimization of Microwave Circuits Using Shape- Preserving Response Prediction S. Koziel, Reykjavik Univ., Reykjavik, Iceland	THPJ 210B SC11: Non-Planar Passive Filters and Multiplexers
THPC 205BC SC20: High-Power Amplifiers	THPD-1: Electronic Multi- Harmonic Load-Pull System for Experimentally Driven Power Amplifier Design Optimization M. S. Hashmi, A. L. Clarke, S. P. Woodington, J. Lees, J. Benedikt, P. J. Tasker, Cardiff Univ., Cardiff, United Kingdom	THPG-2: Accurate Analysis of CMOS Inverter Driving Transmission Line Based on FDTD X. Li ¹ , J. Mao ¹ , M. Swaminathan ² , ¹ Shanghai Jiao Tong Univ., Shanghai, China, ² Georgia Institute of Technology , Atlanta, United States	THPJ-1: Bandpass Filter Using TM- Mode Dielectric Rod Resonators with Novel Input Coupling M. Höft, Panasonic Electronic Devices Europe, Lueneburg, Germany
THPC-1: Design of a Current Mode Class-D RF Amplifier Using Load C. Schuberth ¹ , P. Singerl ² , H. Arthaber ¹ , M. Gadringer ¹ , G. Mager ¹¹ , ¹ Vienna Univ. of Technology, Vienna, Austria, ² Infineon Technologies, Villach, Austria		THPG-3: Integration of FDTD EM Analysis and Transient Circuit Simulation of RF Systems N. M. Kriplani ¹ , J. Fletcher ² , S. Langdon ² , C. W. Penney ² , S. A. Fast ² , M. B. Steer ¹ , ¹ North Carolina State Univ., Raleigh, United States, ² Remcom, Inc., State College, United States	THPJ-2: A LTCC-Based 35GHz Substrate-Integrated-Waveguide Bandpass Filter H. Grubinger, H. Barth, R. Vahldieck, ETH Zurich, Zurich, Switzerland

J. M. Oliver¹, J. Rollin², K. Vanhille², S. Univ., Tao-Yuan, Taiwan Raman¹, D. Filipovic⁴, N. S. Barker³, C. Smith³, A. Sklavounos³, ¹Virginia Tech, Blacksburg, United States, ²Nuvotronics, LLC, Blacksburg, United States, ³Univ. of THPJ-4: LTCC Layer-to-Layer Virginia, Charlottesville, United States, ⁴Univ. Misalignment Resistant Coupled of Colorado, Boulder, United States Inductor and Bandpass Filter H. Lu, T. Chao, T. Chan, Y. Chou, National Taiwan Univ., Taipei, Taiwan **THPJ-5: A Very Compact Bandstop** THPK-4: Fully Electronic Method Waveguide Filter for Quantifying the Post-Release Gap-Height Uncertainty of S. Fallahzadeh¹, H. Bahrami², M. Tayarani¹, Capacitive RF MEMS Switches ¹Iran Univ. of Science and Technology, Tehran, Iran, ²Tarbiat Modares Univ., Tehran, A. K. Mahapatro, J. Chee, D. Peroulis, Purdue Univ., West Lafayette, United States Iran THPJ-6: Topological and Functional Partitioning in EM Analysis: THPK-5: Charging Acceleration in Dielectric Less RF MEMS Switched Application to Wafer-Level Chip-Varactors under CW Microwave Scale Harmonic Filters Power S. Wane¹, J. Rautio², V. Mühlhaus³, ¹NXP-D. Mardivirin, A. Pothier, J. Orlianges, Semiconductors, Caen, France, ²Sonnet Software, A. Crunteanu, P. Blondy, XLIM CNRS / Inc., Syracuse, United States, ³Dr. Mühlhaus Université de Limoges , Limoges, France Consulting & Software GmbH, Witten, Germany THPJ-7: Design of Dual-Mode THPK-6: Investigation of Charging Mechanisms in RF-MEMS Capacitive **Ridge Cavity Filters** Switches with Silicon Nitride: The S. Amari¹, F. Seyfert², ¹Royal Military College, Effect of Material Stoichiometry Kingston, Canada, ²INRIA, Sophia-Antipolis, France G. Papaioannou², N. Tavassolian¹, M. Koutsoureli², E. Papandreou², J. Papapolymerou¹, ¹Georgia Institute of Technology, Atlanta, United States, ²Univ. of Athens, Athens, Greece **THPJ-8: Compact Quintplexer** THPK-7: Nanocrystalline Diamond Module with Meshed Ground **RF MEMS Capacitive Switch Plane for US-CDMA Handset** S. Balachandran^{1,2}, A. M. Hoff^{1,2}, A. Kumar^{2,3}, Applications T. M. Weller^{1,2}, ¹Univ. of South Florida, D. Bang, S. Cheon, J. Park, Kwangwoon Tampa, United States, ²Univ. of South Florida, Tampa, United States, ³Univ. of Univ., Seoul, Republic of Korea South Florida, Tampa, United States THPK 210B THPL 205BC **SC14: MEMS Components** SC24: Signal Processing and Technologies **Circuits and Systems** at GHz Speeds THPK-1: A Single-Crystal Silicon DC-40GHz RF MEMS Switch THPL-1: De-Interleaved Direct **Down-Conversion Receiver for SDR** Applications A. J. Fruehling, D. Peroulis, Purdue Univ., S. Bassam, M. Helaoui, F. Ghannouchi, Univ. West Lafayette, United States of Calgary, Calgary, Canada THPK-2: Effect of Packaging on THPL-2: Maximizing the Sequence **Dielectric Charging in RF MEMS** Length in a MASH Delta Sigma Capacitive Switches Modulator by Dithering A. Sanyal, T. K. Bhattacharyya, Indian Z. Peng¹, C. Palego¹, J. C. Hwang¹, C. Moody², A. Malczewski², B. W. Pillans², D. I. Forehand³, Institute of Technology, Kharagpur, India C. L. Goldsmith³, ¹Lehigh Univ., Bethlehem, United States, ²Raytheon Corp., Dallas, United States, ³MEMtronics Corp., Plano, United States

Thursday

Compact Resonator

THPJ-3: Design of a Ka-Band

Bandpass Filter with Asymmetrical

C. Yang, H. Chiu, Y. Chiang, Chang Gung

Antenna Array with Integrated Rectacoax Transition to Waveguide **Measurement Techniques** THPM-1: Modifying Branch-line Coupler Design to Enhance Six-Port Reflectometer Performance J. Yao¹, S. Yeo¹, M. E. Bialkowski², ¹National Univ. of Singapore, Singapore, Singapore, ²Univ. of Queensland, Brisbane, Australia THPM-2: Phase-Evolving, Real-Time Visualization of 100GHz Traveling Waves M. Tsuchiya¹, A. Kanno¹, K. Sasagawa², T. Shiozawa³, ¹National Institute of Information and Communications Technology, Koganei, Japan, ²Nara Institute of Science and Technology, Ikoma, Japan, ³Takuma National College of Technology, Mitovo, Japan

Interactive Forum

тнрм

THPK-3: A 3-D Micromachined

W-Band Cavity-Backed Patch

THPM-3: Experimental Verification of Sensitivity Improvement in Near Field Probes using Single Negative Metamaterials

M. S. Boybay, O. M. Ramahi, Univ. of Waterloo, Waterloo, Canada

THPN 210B SC27: Biological Effects and Medical Applications

THPN-1: Design and Measurements of Implantable Chip Radiator and External Receptor for Wireless **Blood Pressure Monitoring System**

D. S. Gamini, P. N. Shastry, Bradley Univ., Peoria, United States

THPN-2: DNA Sensing Based on Single Element Planar Double Split-Ring Resonator

H. Lee, H. Lee, K. Yoo, J. Yook, Yonsei Univ., Seoul, Republic of Korea

THPN-3: A Bi-Directional Multi-**Aperture Planar Coaxial Applicator** for Low-Power Microwave Hyperthermia

D. Kim¹, K. Kim¹, J. Oh¹, C. Cheon², Y. Kwon¹, Seoul National Univ., Seoul, Republic of Korea, ²Univ. of Seoul, Seoul, Republic of Korea

9:20 - 15:40

205BC

SC31: Sensors and Sensor Systems

THPP

205BC

SC26: Instrumentation and

THPP-1: A Ku-band RFID system for robust road-to-car communications

L. Roselli, V. Palazzari, F. Alimenti, P. Mezzanotte, Univ. of Perugia, Perugia, Italy

THPP-2: Linearity Study of DDS-Based W-band FMCW Sensor

Y. Liu, D. Goshi, K. Mai, L. Bui, Y. Shih, Honeywell International, Torrance, United States

THPP-3: A Novel Front-End Radio Frequency Pressure Transducer Based on a Millimeter-Wave **Dual-Band Resonator for Wireless** Sensing

T. T. Thai¹, G. R. DeJean², T. M. Manos¹, ¹Georgia Institute of Technology, Atlanta, United States, ²Microsoft Research, Redmond, United States

> Presenters available 09:20 - 10:20 & 14:40 - 15:40

Focus Track Color Codes: Microwave Modeling Active Components Passive Components Microwave Systems

	Thursday	Technical	Sessions	13:20 - 14:40
	TH3A 204AB High Power Amplifiers Chair: Paul J Tasker, Cardiff University Co-Chair: James Schellenberg, QuinStar Technology	TH3B 205A Progress in Microwave Oscillators Chair: John Papapolymerou, Georgia Tech Co-Chair: Kenjiro Nishikawa, NTT Corporation	TH3C206ABMulti-Disciplinary Measurement TechniquesChair: Jon Martens, Anritsu Company Co-Chair: John Barr	TH3D209Biological Effects and Medical Applications: Sensing and MonitoringChair: Mohammad-Reza Tofighi, Penn State UniversityCo-Chair: Arye Rosen , Drexel University
13:30 13:20	TH3A-1: C-Band 340W and X-Band 100W GaN Power Amplifiers with over 50-% PAE H. Shigematsu, Y. Inoue, A. Akasegawa, M. Yamada, S. Masuda, Y. Kamada, A. Yamada, M. Kanamura, T. Ohki, K. Makiyama, N. Okamoto, K. Imanishi, T. Kikkawa, K. Joshin, N. Hara, Fujitsu Laboratories Ltd., Atsugi, Japan	TH3B-1: Miniaturized VCOs Arm Configurable Synthesizers U. L. Rohde ^{1,2} , A. K. Poddar ¹ , ¹ Synergy Microwave Corp., Paterson, United States, ² University of Cottbus, Cottbus, Germany	TH3C-1: A 70kHz-70GHz VNA Automatic Calibration Approach with Improved Performance J. Martens ¹ , D. Judge ¹ , A. Feldman ² , ¹ Anritsu Company, Morgan Hill, United States, ² Phase Matrix, Inc., San Jose, United States	TH3D-1: High Frequency Transcutaneous Transmission using Stents Configured as a Dipole Radiator for Cardiovascular Implantable Devices E. Y. Chow ¹ , B. Beier ¹ , Y. Ouyang ² , W. J. Chappell ² , P. P. Irazoqui ¹ , 'Purdue University, West Lafayette, United States, 'Purdue University, West Lafayette, United States
13:50 13:40	TH3A-2: A 900 MHz, 200 W Silicon LDMOS Power Amplifier Using Integrated Passive Devices in a New Over-Molded Plastic Package T. Ho, F. Santos, R. Uscola, M. Szymanowski, S. Marshall, Freescale Semiconductors, Tempe, United States	TH3B-2: Ultra Low Phase Noise 2.1GHz Colpitts Oscillators Using BAW Resonator H. El Aabbaoui, E. DeFoucauld, P. Vincent, Cea, Grenoble, France	TH3C-2: Measurement of Ultra Low Passive Intermodulation with Ability to Separate Current/ Voltage Induced Nonlinearities A. Christianson, W. J. Chappell, Purdue University, West Lafayette, United States	TH3D-2: Feasible Methods for the Evaluation of the Specific Absorption Rate and the Temperature Rise in the Human Eyes L. Liu ¹ , N. K. Nikolova ¹ , N. T. Sangary ² , ¹ McMaster University, Hamilton, Canada, ² Research In Motion, Waterloo, Canada
14:00	TH3A-3: A 33W GaN HEMT Doherty Amplifier with 55% Drain Efficiency for 2.6GHz Base Stations H. Deguchi, N. Ui, K. Ebihara, K. Inoue, N. Yoshimura, H. Takahashi, Eudyna Devices, Inc., Yokohama, Japan	TH3B-3: Supply Voltage Switching Dual-Band SiGe HBT VCOs Using a Dual-Band Resonator with Inductor-Loaded Varactor Diodes Y. Itoh, H. Hasegawa, M. Shirata, K. Sakamoto, Shonan Institute of Technology, Fujisawa, Japan	TH3C-3: High-Power Reflection Coefficient Measurement of Biological Material Applicable to Microwave Hyperthermia N. Kim ¹ , J. Yoon ¹ , C. Cheon ² , Y. Kwon ¹ , 'Seoul National University, Seoul, Republic of Korea, ² University of Seoul, Seoul, Republic of Korea	TH3D-3: Low-Cost Differential Front-End for Doppler Radar Vital Sign Monitoring R. Fletcher, J. Han, Massachusetts Institute of Technology, Cambridge, United States
14:10				TH3D-4: New Broadband and Contact-Less RF/Microfluidic Sensor Dedicated to Bioengineering K. Grenier ¹ , D. Dubuc ¹ , P. Poleni ² , M. Kumemura ¹ , H. Toshiyoshi ² , T. Fujit ² , H. Fujita ² , ¹ LIMMS CNRS, Tokyo, Japan, ² Institute of Industrial Science, Tokyo Univ., Tokyo, Japan
14:20	TH3A-4: A Linear, 250 Watt, Doherty Power Amplifier based on Two-Stage Power ICs for 1.8GHz Single and Multi-Carrier GSM Applications M. Bokatius, G. Bigny, P. Hart, J. Wood, Freescale Semiconductor, Inc., Tempe, United States	TH3B-4: A K-Band CMOS Low Power Modified Colpitts VCO using Transformer Feedback C. Hsieh, K. Kao, J. R. Tseng, K. Lin, National Taiwan University, Taipei, Taiwan	TH3C-4: Circuital Analysis of a Coaxial Re-Entrant Cavity for Performing Dielectric Measurement F. L. Penaranda-Foix ¹ , M. D. Janezic ² , J. M. Catala-Civera ¹ , A. J. Canos-Marin ¹ , ¹ UPV, Valencia, Spain, ² NIST, Boulder, United States	TH3D-5: A Microwave Microdosimetric Study on Blood Cells: Estimation of Cell Membrane Permittivity and Parametric EM Analysis C. Merla, M. Liberti, F. Apollonio, C. Nervi, G. d'Inzeo, Sapienza Univ of Rome, Rome, Italy
14:30			TH3C-5: The Development of a MEMS Six-Port Reflectometer Calibration Standard T. J. Reck, R. M. Weikle, N. S. Barker, University of Virginia, Charlottesville, United States	

Thursday	Technical	Sessions	13:20 - 14:40
TH3F210CAdvanced Realization and Synthesis of Compact High Q FiltersChair: Ming Yu, COM DEV Co-Chair: Vicente Boria, Tech. Univ. Valencia	TH3G 211 Advanced Modeling Issues for Nonlinear Circuits and Systems Chair: Jose Pedro, University of Aveiro Co-Chair: Tom Brazil, University College Dublin		
H3F-1: Compact Ridge Waveguide Filters Using Non-Resonating Nodes M. M. Fahmi ¹ , J. A. Ruiz-Cruz ² , R. R. Mansour ¹ , K. A. Zaki ³ , ¹ University of Waterloo, Ontario, Canada, ² Universidad Autonoma de Madrid, Madrid, Spain, ³ University of Maryland, College Park, United States	TH3G-1: Improvements on Long Term Memory Modeling in Power Amplifiers E. Ngoya, C. Quindroit, J. Nebus, XLIM, UMR CNRS 6172, University of Limoges, Limoges, France	13:00 Interactive Forum during the break, see pages 48 & 49	
TH3F-2: Use of Generalized Coupling Coefficients in the Design of Extracted-Poles Waveguide Filters with Non-Resonating Nodes G. Macchiarella, M. Politi, Politecnico di Milano, Milano, Italy	TH3G-2: Base-Band Derived Volterra Series for Power Amplifier Modeling E. G. Lima ¹ , T. R. Cunha ² , H. M. Teixeira ² , M. Pirola ¹ , J. C. Pedro ² , 'Politecnico di Torino, Torino, Italy, ² Universidade de Aveiro, Aveiro, Portugal	13:40 13:50	
TH3F-3: An Analytical Approach to Extracting Coupling Matrix and Unloaded Q of a Bandpass Filter M. Meng, K. L. Wu, The Chinese University of Hong Kong, Hong Kong, China	TH3G-3: Wideband Characterization of Power Amplifiers Using Undersampling P.N. Landin ¹² , C. Nader ¹² , N. Björsell ¹ , M. Isaksson ¹ , D. Wisell ³ , P. Händel ¹² , O. Andersen ⁴ , N. Keskitalo ¹³ , 'University of Gävle, Gävle, Sweden, 'Royal Institute of Technology, Stockholm, Sweden, ³ Ericsson AB, Stockholm, Sweden, 'Ericsson AB, Gävle, Sweden	14:00	
TH3F-4: Tunable Combline Bandstop Filter with Constant Bandwidth A. I. Abunjaileh, I. C. Hunter, University of Leeds, Leeds, United Kingdom	TH3G-4: Efficiency Analysis of a Limit-Cycle Class-D Amplifier With a Random Gaussian Excitation M. Sarkeshi, R. Mahmoudi, A. van Roermund, Technical University of Eindhoven, Eindhoven, Netherlands	14:10	
TH3F-5: High Power Analysis and Design of Dual-Mode Channel Filters J. Monge ¹ , J. Ruiz-Cruz ² , S. Anza ¹ , C. Vicente ¹ , K. Zaki ³ , J. R. Montejo-Garai ⁴ , J. M. Rebollar ⁴ , J. Gil ¹ , B. Gimeno ⁵ , V. E. Boria ⁶ , ¹ AURORA Software and Testing S.L., Paterna, Spain, ² Universidad Autónoma de Madrid, Madrid,	TH3G-5: Behavioral Modeling and Simulation of a Parametric Power Amplifier B. R. Gray ¹ , J. S. Kenney ¹ , R. E. Melville ² , ¹ Georgia Institute of Technology, Atlanta, United States, ² National Science Foundation, McMurdo Station, Antarctica	14:20	
Spain, ³ University of Maryland, College Park, United States, ⁴ Universidad Politécnica de Madrid, Madrid, Spain, ⁵ Universitat de València, Burjasot, Spain, ⁶ Universidad Politécnica de Valencia, Valencia, Spain	TH3G-6: Compact Parametric Downconversion using MOS Varactors S. Magierowski ¹ , T. Zourntos ² , J. Bousquet ¹ , ¹ University of Calgary, Calgary, Canada, ² Texas A&M University, College Station, United States	14:30	

Thursday		Technical	Sessions	15:40 - 17:00	
	TH4A 204AB High Power Amplifier Techniques Chair: Dr. Kiki Ikossi, DTRA Co-Chair: Prof. Steve C Cripps, Cardiff University, UK	TH4B205AMicrowave History in the Boston AreaChair: George Jerinic, Paradox ScientificCo-Chair: Nicholas J. Kolias , Raytheon Company	TH4C 206AB Advances in RF Positioning Chair: Timothy Hancock, MIT Lincoln Laboratory Co-Chair: Christopher Galbraith, MIT Lincoln Laboratory	TH4D 209 Biological Effects and Medical Applications: Imaging Chair: Anand Gopinath, University of Minnesota Co-Chair: Gerald R. DeJean, Microsoft Corporation	
15:50 15:40	TH4A-1: Wideband Envelope Tracking Power Amplifier with Reduced Bandwidth Power Supply Waveform J. Jeong ¹ , D. F. Kimball ² , M. Kwak ¹ , C. Hsia ¹ , P. Draxler ³ , P. M. Asbeck ¹ , ¹ University of California at San Diego, La Jolla, United States, ² California Institute for Telecommunications and Information Technology, La Jolla, United States, ³ Qualcomm Inc., San Diego, United States	TH4B-1: The History of the Microwave Oven: A Critical Review J. M. Osepchuk, Full Spectrum Consulting, Concord, United States	TH4C-1: A System Level Design Approach to UWB Localization M. Kuhn ¹ , C. Zhang ² , S. Lin ² , M. Mahfouz ¹ , A. E. Fathy ² , ¹ University of Tennessee, Knoxville, United States, ² University of Tennessee, Knoxville, United States	TH4D-1: Novel Multi-Channel Transmission Line Coil for High Field Magnetic Resonance Imaging C. E. Akgun', L. DelaBarre ¹ , S. Sohn ² , C. J. Snyder ¹ , G. Adriany ¹ , K. Ugurbil ¹ , J. T. Vaughan ¹ , A. Gopinath ² , 'University of Minnesota Medical School, Minneapolis, United States, ² University of Minnesota, Minneapolis, United States	
116:10 16:00	TH4A-2: Hybrid EER Transmitter Using Highly Efficient Saturated Power Amplifier for 802.16e Mobile WiMAX Application I. Kim, J. Kim, J. Moon, J. Kim, B. Kim, Pohang University of Science and Technology, Pohang, Republic of Korea	TH4B-2: Boston Radar History – From \$10,000 Magee to \$10 Single Chip T/R Module Better Than Fiction E. Brookner, Raytheon Company, Sudbury, United States	TH4C-2: Real-Time Noncoherent UWB Positioning Radar with Millimeter Range Accuracy in a 3D Indoor Environment C. Zhang ¹ , M. Kuhn ² , A. Fathy ¹ , M. Mahfouz ² , ¹ University of Tennessee, Knoxville, United States, ² University of Tennessee, Knoxville, United States	TH4D-2: Design and Implementation of a Quadrature RF Volume Coil for In-Vivo MR Brain Imaging of Rhesus Macaques Monkey in a Stereotaxic Head Frame C. A. Roopnariane ¹ , P. A. Miller ² , B. S. Park ² , L. Ansel ² , S. Oh ² , C. Lieu ³ , T. Subramanian ³ , M. Tofighi ¹ , C. M. Collins ² , ¹ Penn State University, Middletown, United States, ² Penn State University, Hershey, United States, ³ Penn State University, Hershey, United States	
16:30 16:20	TH4A-3: Ku-Band, 120W Power Amplifier Using Gallium Nitride FETs H. Sumi', H. Takahashi', T. Soejima', R. Mochizuki ² , 'Toshiba Corporation Corporate Manufacturing Engineering Center, Yokohama, Japan, ² Toshiba Corporation Social Infrastructure Systems Company, Tokyo, Japan	TH4B-3: Solid State Phased Array Radars; A History at Raytheon D. G. Laighton, Raytheon IDS/RF Components, Andover, United States	TH4C-3: 3D Positioning using Spherical Location Algorithms for Networked Wireless Sensors Deployed in Grain G. Parkinson', M. Boon', J. Davis², R. Sloan', 'University of Manchester, Manchester, United Kingdom, ² BAE Systems, Preston, United Kingdom	TH4D-3: Ultra-Wideband Antennas for Combined Magnetic Resonance Imaging and UWB Radar Applications U. Schwarz ¹ , F. Thiel ² , F. Seifert ² , R. Stephan ¹ , M. Hein ¹ , ¹ Ilmenau University of Technology, Ilmenau, Germany, ² Physikalisch-Technische Bundesanstalt, Berlin, Germany TH4D-4: Microwave Imaging of the Knee: Application to Ligaments and Tendons S. M. Salvador ¹ , E. C. Fear ² , M. Okoniewski ² , J. R. Matyas ³ , ¹ Politecnico di Torino, Torino, Italy, ² University of Calgary, Calgary, Canada, ³ University of Calgary, Calgary, Canada	
16:50 16:40	TH4A-4: Highly Linear and Efficient Asymmetrical Doherty Power Amplifiers with Adaptively Bias- Controlled Predistortion Drivers Y. Lee, M. Lee, Y. Jeong, Pohang University of Science and Technology, Pohang, Republic of Korea	TH4B-4: MMIC Pioneers: A Historical Review of MMIC Development at Raytheon N. J. Kolias, Raytheon Company, Andover, United States	TH4C-4: A Compact Positioning and Velocity RF Sensor for Improved Inertial Navigation C. Zhou, J. Downey, D. Stancil, T. Mukherjee, Carnegie Mellon University, Pittsburgh, United States	TH4D-5: Accuracy Evaluation of Time Domain Measurement Systems for Microwave Tomography X. Zeng ¹ , A. Fhager ¹ , P. Linne ² , M. Persson ¹ , H. Zirath ² , ¹ Chalmers Univ. of Technology, Gothenburg, Sweden, ² Chalmers Univ. of Technology, Gothenburg, Sweden TH4D-6: Variation of Cole-Cole Model Parameters with the Complex Permittivity of Biological Tissues T. M. Said, V. V. Varadan, University of Arkansas, Fayetteville, United States	

Thursday	Technical	15:40 - 17:00	
TH4E 210A Recent Advances in Microwave Superconductivity Technology Chair: Martin Nisenoff, Naval Research Laboratory Co-Chair: Jeffrey Pond, Naval Research Laboratory	TH4F210CCompact Microwave FiltersChair: Kawthar Zaki, University of MarylandCo-Chair: Giuseppe Macchiarella, Politecnico di Milano	TH4G 211 Nonlinear Circuits and Systems Simulation Techniques Chair: Dominique Schreurs, Catholique University of Leuven Co-Chair: Almudena Suarez, Dpro. Ingenieria de Comunicaciones.	
TH4E-1: Microwave Receivers with Direct Digitization D. E. Kirichenko, T. V. Filippov, D. Gupta, HYPRES, Elmsford, United States	TH4F-1: Dual-Mode Half-Cut Dielectric Resonator Filters M. Memarian, R. R. Mansour, University of Waterloo, Waterloo, Canada	TH4G-1: Coupled Numerical and Field-Theoretical Computation of the Effects of Circuit-Package Interactions on the Linear and Nonlinear Performance of Active MMIC's V. Rizzoli, D. Masotti, A. Costanzo, University	15:40
		of Bologna, Bologna, Italy	15:50
TH4E-2: A Passive, Real-time, Terahertz Camera for Security Screening, using Superconducting Microbolometers E. Grossman ¹ , C. Dietlein ¹ , M. Leivo ² , A. Rautiainen ² , A. Luukanen ² , ¹ NIST, Boulder, United States, ² VTT Research Center of Finland, Espoo, Finland	TH4F-2: Compact Low Loss Alumina Band-Pass Filter in Ku Band Using Layer-By-Layer Stereolithography Technology A. Khalil', N. Delhote', A. Pothier', Bessaudou', Baillargeat', S. Verdeyme', H. Leblond ² , 'Université de Limoges, Limoges, France, ² Thales Alenia Space, Toulouse, France	TH4G-2: Analysis and Design of Soliton Oscillators Using Harmonic Balance M. Ponton, F. Ramirez, A. Suarez, J. Pascual, University of Cantabria, Santander, Spain	16:00
	TH4F-3: Compact LTCC Bandpass 180° Hybrid Using Lumped Single- to-Differential and Single-to- Common Bandpass Filters C. H. Wu, C. H. Chen, National Taiwan University, Taipei, Taiwan	Thu S S	ursday Evening ocial Cruise, see page 77
TH4E-3: Practical Cryogenic Receiver Front Ends for Commercial Wireless Applications B. A. Willemsen, Superconductor Technologies Inc., Santa Barbara, United States		TH4G-3: Steady State Simulation and Noise Analysis for Driven Oscillators X. Lai, Y. Zhu, D. Feng, Cadence Design Systems, Inc., San Jose, United States	16:20
	TH4F-4: Tunable High Q Narrow- Band Triplexer H. Joshi, H. H. Sigmarsson, S. Moon, D. Peroulis, W. J. Chappell, Purdue University, West Lafayette, United States		16:30 0
TH4E-4: Engineering Challenges in the Design of the International Linear Collider M. S. Champion, Fermi National Accelerator Laboratory, Batavia, United States	TH4F-5: A New Version of DR Tunable Filters with Horseshoe Resonators K. D. Pance, G. Rochford, Cobham, Lowell, MA, United States	TH4G-4: HB-Based CAD-Oriented Dynamic Stability Analysis of Circuits and Devices: Application to the Assessment of Thermal Instabilities in Multifinger HBTs F. L. Traversa, F. Cappelluti, F. Bonani, G. Ghione, Politecnico di Torino, Torino, Italy	16:40 0
		TH4G-5: Linearity Analysis of Laterally Graded Channel in RF Power MOSFETs C. Chen ¹ , O. Tornblad ² , R. Dutton ¹ , ¹ Stanford University, Stanford, United States, ² Infineon Technologies, Morgan Hill, United States	16:50

53

ARFTG

Пиау	lechnical Sessions			
08:00-09:40 102AB	09:40-10:20	104AB	10:20-12:00	102AB
Nonlinear Measurements Chair: John Woods	Interactive Forum A Chair: Rusty Myers		Nonlinear Measurements Chair: Mohamed Sayed	
Practical Applications of Nonlinear Measurements (<i>Invitexd Paper</i>) K. A. Remley, NIST, Boulder, United States	A Nonlinear Smooth A for Measurements Cu Delay Z. Rui, Z. Feng, G. L. Qing, V Academy of Telecommunica MIIT, Beijing, China	Algorithm rve of Group V. Nan, China ation Research of	A Mixed-Signal App High-Speed, Fully Co Multi-dimensional L Parameter Sweeps M. Squillante, M. Marche de Vreede, Delft Universi Delft, Netherlands	roach for ontrolled, .oad-Pull tti, M. Spirito, L. C. ty of Technology,
Wave Distortion in Multiplying, Switching or Sampling Mixers Y. Rolain ¹ , J. Dunsmore ² , J. Schoukens ¹ , W. Van Moer ¹ , G. Vandersteen ¹ , ¹ Vrije Universiteit Brussel, Brussel, Belgium, ² Agilent Technologies, Santa Rosa, United States	RF Validation of a Noi Feedback Model for a Detector L. Gomme, Y. Rolain, J. Scho Pintelon, Vrije Universiteit I Belgium	nlinear I Crystal Jukens, R. Brussel, Brussels,	Pulsed Multi-Tone M for Time Domain Loa Characterizations of P F. De Groote ¹ , P. Roblin ³ , J. Te Doo ³ , M. Vanden Bossche4, DeGroote, Brive, France, ² XL University, Brive, France, ³ OS States, 4NMDG, Bornem, Be	easurements Id Pull Yower Transistors eyssier ² , C. Yang ³ , S. ¹ Verspecht-Teyssier- IW - Limoges 50, Columbus, United elgium
Bursts of Pulses for Time Domain Large Signal Measurements J. Faraj ¹ , F. De Groote ² , J. Verspecht ² , R. Quéré ¹ , J. Teyssier ¹ , ¹ XLIM , Brive, France, ² VTD sas, Brive, France	On the High Frequency & Modeling of FET Devi I. Angelov ¹ , K. Kanaya ² , G. S ¹ Chalmers Univ., Goteborg, ² Mitsubishi Electric Corpora Japan	De-Embedding ces ieiki ² , M. Abbasi ¹ , Sweden, ition, Itami City,	Fast Component Chu Using "Smart Modu for Manufacturing T M. Vanden Bossche, NME Belgium	aracterization lation Signals" est DG, Bornem,
	Impact of Waveguide Dimensions and Misa the Calibrated Perfor Network Analyzer fro 325GHz L. Lok ¹ , S. Singh ² , K. Elgaid ¹ , 7 Glasgow, Glasgow, United K Technologies, Santa Rosa, Un	Aperture lignment on mance of a m 140 to Univ. of ingdom, ² Agilent nited States	Nonlinear Validation Load X-parameter and Based Device Models D. Gunyan, J. M. Horn, J. J. Agilent Technologies, Sar States	of Arbitrary d Measurement- s Xu, D. E. Root, nta Rosa, United
	Recommendations for Sizes at Sub-Millimete Wavelengths N. M. Ridler, National Physi Teddington, United Kingdo	r Waveguide er cal Laboratory, m		
	Making Pulsed RF + P Power Measurements Vector Network Analy J. G. Burns, H. C. Hearne, No Grumman, Linthicum, Unite	vulsed DC with a vzer orthrop ed States		
	Design of In-Line Pow and Performance Eva Y. B. Lee, M. Neumann, Anr Morgan Hill, United States	ver Sensors luation tsu Company,		

2:00

WMC(IMS/ARFTG) "Advanced Measurement Techniques, Adapted for Different Memory Effects" For details see page 67.

ARFTG

			ARFIG
Friday	Technica	13:30 - 16:40	
13:30-14:45 102AB	14:45-15:15 104AB	15:15-16:40 102AB	
VNA Calibration Chair: Jon Martens	Interactive Forum B Chair: Rusty Myers	Other Areas of Microwave and Millimeter Wave Measurements Chair: Ken Wong	
Applying the Calibration Comparison Technique for Verification of Transmission Line Standards on Silicon up to 110GHz A. Rumiantsev ¹ , S. L. Sweeney ² , U. Arz ³ , ¹ SUSS MicroTec Test Systems GmbH, Sacka, Germany, ² IBM Microelectronics, Essex Junction, United States, ³ Physikalisch-Technische Bundesanstalt	A Method for Estimating the Complex Residual Errors of a VNA in One-Port Measurements J. Kim, J. Kang, D. Kim, Korea Research Institute of Standards and Science (KRISS), Daejeon, Republic of Korea	Non-Linear Effects and the Use of Network Analyzer Time Domain J. Martens, Anritsu Company, Morgan Hill, United States	
	Traceability Chart for Vector Network Analyzers from 70 kHz to 70GHz Y. B. Lee, Anritsu Company, Morgan Hill, United States	Permittivity Measurements of Dielectric Substrates Using the TE111 Mode of a Split-Cylinder Cavity M. D. Janezic ¹ , U. Arz ² , S. Begley ³ , P. Bartley4, 1National Institute of Standards and Technology, Boulder, United States, ² Physikalisch-Technische Bundesanstalt,	
A Time Domain Dynamic PA Characterization Setup and Its Phase Calibration Y. Shen ¹ , J. Gajadharsing ¹ , J. Tauritz ² , ¹ NXP semiconductors, Nijmegen, Netherlands, ² University of Twente, Enschede, Netherlands	Multi-Line TRL Calibration Compared to a General De-Embedding Method M. Ferndahl, K. Andersson, C. Fager, Chalmers University, Goteborg, Sweden	Braunschweig, Germany, ³ Agilent Technologies, Santa Rosa , United States, 4Innovative Measurement Solutions, Portsmouth, United States	
A Reformulation of TRL and LRM for S-Parameters J. Stenarson, K. Yhland, SP, Boras, Sweden	VNA Traceability Tool M. Horibe, M. Shida, K. Komiyama, National Metrology Institute of Japan (NMIJ), Tsukuba, Japan	Traceability to National Standards for S-parameter Measurements of Waveguide Devices at Frequencies from 110GHz to 170GHz R. G. Clarke ² , R. D. Pollard ² , N. M. Ridler ¹ , M. J. Salter ¹ , A. Wilson ¹ , ¹ National Physical Laboratory, Teddington, United Kingdom, ² University of Leeds, Leeds, United Kingdom	
	Two-tier L-L De-Embedding Method for S-Parameters Measurements of Devices Mounted in Test Fixture J. E. Zuñiga-Juarez ¹ , J. A. Reynoso- Hernández ¹ , J. R. Loo-Yau ² , 'Centro de Investigacion Científica y Educacion Superior de Ensenada, Ensenada, Mexico, ² Centro de Investigacion y Estudios Avanzados del I. P. N., Guadalajara, Mexico		

Second-Order Error Correction of a Calibrated Two-Port Vector Network Analyzer

R. H. Judaschke¹, G. Wuebbeler², C. Elster², ¹PTB, Braunschweig, Germany, ²PTB, Berlin, Germany

IMS Panel and Rump Session Listings

Tuesday, 12:00 - 13:10

109AB

Panel Session:

System-On-Chip vs. System-On-Package for Emerging 3D Microsystems

Organizer: Dr. Debabani Choudhury, Intel Panelists:

- > Prof. Madhavan Swaminathan, Georgia Tech
- > Prof. Larry Larson, UCSD
- > Dr. John U. Knickerbocker, IBM
- > Dr. Tsugumichi Shibata, NTT
- > Prof. Jenshan Lin, University. of Florida

Abstract: As new wireless applications emerge and existing ones grow, there is an increasing need to develop large-scale, low-cost small form-factor platforms. With the high volumes and required portability of these mobile devices along with continually dynamic applications, wireless industry manufacturers are always looking for new ways to reduce cost and size. There are two basic approaches to solving these issues: integrating the discrete active and passive components into a single package, known as the "system-on-package" (SOP) paradigm, or combine all functions on a single integrated circuit (or chip), referred to as the "system-on-chip" (SOC) approach.

At first glance, SOP and SOC might seem quite similar, since the end result is a single system. However, for a SOC device, all the components and functions are formed using a single process; for the SOP approach, various process technologies can be utilized and then integrated in a higher-level circuit. There are advantages and drawbacks to both methods, even as new technologies develop. For instance, advancements in deep-submicron CMOS processing have allowed more and more functions to be integrated on a silicon chip, yet the complexity and demand of systems have also grown, and there are functions better suited to other processes, such as GaAs, highperformance passives, etc.

It can be argued that one approach is superior to the other, but in reality both methods must overcome a myriad of technical and business challenges. This panel will present divergent views from various experts, discussing the trade-offs between SOC and SOP.

Tuesday, 18:30 - 20:30 Westin Harbor Ballrooms II & III

Rump Session:

Metamaterials: A Rich Opportunity for Discovery or an Over-Hyped Gravy Train?

Organizer: Barry E. Spielman, Washington Univ. in St. Louis Moderator: Arthur Oliner, Merrimac Industries Panelists:

- > Smain Amari, Royal Military College of Canada
- > Christophe Caloz, École Polytechnique de Montréal
- > George V. Eleftheriades, Univ. of Toronto
- > Tatsuo Itoh, UCLA
- > David R. Jackson, Univ. of Houston
- > Ralph Levy, R. Levy Associates
- > J. David Rhodes, ISOTEK
- > Richard V. Snyder, RS Microwave

Abstract: In 1967 Soviet physicist Victor Veselago published a paper that explored the technical ramifications if a material with negative permittivity and/or permeability were discovered. However, it was nearly 30 years later that British physicist John Pendry first described how traditional materials could be periodically loaded with electrically-small and closely-spaced

split-ring ring resonators or parallel wires to produce an aggregate material that he claimed exhibited either macroscopic negative permeability or permittivity. Soon after this, David Smith et. al. reported the results of work which combined such periodic loading to produce material that also was claimed to exhibit both negative permeability and permittivity. About a year later, C. Caloz and T. Itoh, G. Eleftheriades et. al., and A. Oliner, independently described how these properties could be realized by periodically-loading traditional transmission media with electrically-small and closely-spaced series capacitance and shunt inductance. Since these seminal publications appeared, hundreds of papers and articles and several books have been written about this class of materials and their applications.

However, during this robust period of discovery, some serious concerns have emerged. These include: disputes over terminology used in describing these effects ("left-handed or right-handed transmission lines or metamaterials"); questions about the significance or validity of some reported findings or representations (e.g. some claim no such material has yet been developed); a seeming lack of understanding or disregard for the rich foundation that has been laid and advancements that could be made in the more traditional area of filter theory and techniques; an over-valuation of the potential impact of "metamaterial" technology at the expense of equally- or even more-promising investments in technological advancement.

For this session, a panel of serious thinkers will objectively explore and resolve these issues. On one side, this panel includes individuals who have made important scientific and technical contributions to the field of metamaterials. On the other side, the panel includes individuals who have made important scientific and technical contributions to the field of microwave filters and networks. It is hoped that the result of this panel will be a new appreciation for both the potential for this field and for the appropriate directions to be taken to characterize and quantify results. In addition, it is hoped the results of this panel will provide guidelines that will improve the effectiveness and fairness of the review process for manuscripts submitted to MTTS journals in this field.

A reception will be held 18:30 - 19:00, followed by the panel starting at 19:00.

Wednesday, 12:00 - 13:10 107ABC

Panel Session: SiGe/CMOS RF-IC Phased Arrays: Will They be Used in Defense and Commercial Systems?

Organizers: Dr. Frank van Vliet, TNO

Prof. Gabriel Rebeiz, UCSD

Panelists:

- > Antonio Cetronio, Selex SI
- > Johan Stahl, Saab
- > Julio Navarro, Boeing
- > Brian Floyd, IBM
- > Michael Sarcionne, Raytheon

Abstract: Whereas phased arrays were traditionally confined to the military and space domain, phased-arrays are now pervading other domains such as security and communication systems. This is driven by strong technological progress, cost reduction and a mature understanding of the technology's possibilities and limitations. This wider usage requires further introduction of low-cost technology, and the introduction of SiGe or CMOS technologies currently give rise to considerable debate.

The purpose of this panel will be to provide an overview of the applicability of silicon technologies into new architectures and applications, and to discuss the difference between SiGe, CMOS and III-V technologies.

103

Wednesday, 12:00 - 13:10

104ABC

Panel Session:

Faster than Fiber: Enabling Multi-Gigabit Wireless Communication Links

Organizer: Dr. Jonathan Wells, AJIS LLC Panelists:

- > Doug Lockie, Gigabeam
- > Mark Hebeisen, Endwave
- > Michael Stewart, Escape Communications
- > Brian Rhea, AOptix
- > Dr. Heinz Willebrand, Rayawave
- > Saul Umbrasas, E-Band Communications

Abstract: Wireless links offering Gigabit-per-second transmission speeds offer great potential as a valid alternative to wired broadband communications, providing fiber-like speeds but at a fraction of the cost to install, commission and maintain.

Blasting beams of high speed data through free space is not new. Terahertz spectrum near visible light has been used for Gbps Free Space Optics for many years. Newly released mm-wave bands at 60, 75, 85 and 94 GHz, have sufficient bandwidth to permit similar ultra-high data rate radio transmissions. Novel use of the widely-used microwave bands has also allowed support of higher data rate communications. Each of these technologies has strengths and weaknesses, adding to their effectiveness, adoption and failure under different operating circumstances. Nevertheless, systems are being developed that outpace traditional wireless data delivery used for most wireless networks.

Recently, manufacturing techniques for making high-frequency radio transmitters out of gallium arsenide have improved significantly, making cost-effective circuits possible. Also advances in FPGA processor speeds and super-fast A/D & D/A converters have allowed Gbps and higher modems to be reliably developed. The building blocks for high speed wireless wave systems are finally commercially available.

This panel session will explore the technologies being developed within industry to enable this new field of communications, bringing together leading device engineers with system providers to provide a complete overview of Gbps communication state-of-the-art and the roadmap for the future.

Thursday, 08:00 - 09:20

103

GOLD Panel Session: Financial Investment in Times of Crisis

Chair: Rashaunda Henderson, University of Texas at Dallas Co-Chair: Pilar Molina Gaudó, University of Zaragoza, Spain Sponsor: IEEE MTT-S GOLD Committee

Abstract: This panel session will address the issue of how to make correct decisions about financial investments in this time of economic crisis. Not only will short-term financial issues be discussed, but also techniques for creating long-term value. The final part of the panel session will be devoted to a highly interactive discussion between attendees and speakers.

GOLD Panel Session:

Thursday, 10:20 - 11:40

Is Achieving Work-Life Balance In Microwave Engineering An Oxymoron?

Chair: Pilar Molina Gaudó, University of Zaragoza, Spain Co-Chair: Rashaunda Henderson, University of Texas at Dallas Sponsor: IEEE MTT-S GOLD Committee

Abstract: Speakers of both genders will address the issue of how to get a reasonable balance between professional and personal life. In our personal life we do not only imply family life but also any free time, and time away from the workplace. The subject of telecommuting will also be addressed. The final part of the panel session will be devoted to a highly interactive discussion between attendees and speakers

Thursday, 12:00 - 13:10

104ABC

Panel Session: A Return to the Classic Heterodyne Architecture for Integrated Transceivers?

Organizer: Prof. Jim Wight, Carleton University

Panelists:

- > Prof. Rick Carley, Carnegie Mellon & Renaissance Microwave
- > Tom Riley, Kaben Wireless Silicon
- > R.B. Stazewski, Texas Instruments
- > Mark Cloutier, Hittite Microwave
- > Makoto Kitagawa, Mitsumi Electric

Abstract: Due to the inability to realize an integrated IF filter on an RFIC, wireless transceivers have, over the past 15 years, generally adopted a zero-IF architecture. Zero-IF architectures avoid the need for an IF filter, but come with several undesirable features, such as DC offset (due to IP2), high 1/f noise levels, and large A/D dynamic range and bandwidth. Recently, new technologies have emerged that can allow high performance IF filters to be realized on-chip. These advancements, in turn, can allow a return to the classic heterodyne architecture, with all of its advantages: adjacent channel blocking, high linearity, low noise, relaxed ADC dynamic range and bandwidth (reduced power consumption), and relaxed digital filtering (reduced latency). On the other hand, the zero-IF architecture is now mature, and presents a significant barrier to a return to the classic heterodyne system.

The session will present opposing views on the viability of on-chip IF filters in volume production, and on the necessity (real or perceived) for such filters in standard applications. The following topics will be addressed:

- > An overview of the advantages and limitations of both the heterodyne architecture and the zero-IF architecture
- > Realization of the on-chip heterodyne architecture using a novel sampling IF filter
- > Realization of the on-chip heterodyne architecture using a novel MEMS IF filter
- > Advantages of the low-IF architectures (no on-chip filters)
- > Advantages of the zero-IF architectures (no on-chip filters)
- > Architectural challenges for high performance receivers

RFIC, IMS & ARFTG Workshop Listings

Complete descriptions of each workshop including speaker abstracts and co-authors can be found at www.ims2009.org.

WSA (RFIC) Sunday, 08:00 - 17:00 156AB

Advances in CMOS RF Power Amplifiers for Cellular and IEEE 802 Connectivity Radios

Full-day workshop reviewed by RFIC.

Organizers:

Malcom Smith, Amalfi Semiconductor Upkar Dhaliwal, Future Wireless Technologies; MTT-20 Stewart Taylor, Intel

Abstract: This workshop will present the latest design and developments in RF Module/RFIC power amplifiers, as well as covering the RF system requirements for Cellular and IEEE 802 connectivity power amplifiers. Until very recently CMOS power amplifiers were not mature enough to compete against other non-silicon technologies and could not be used widely in handheld cell-phones. With some new developments in device technologies, circuit solutions as well as system-level improvements, several companies have announced CMOS power amplifiers products with the ability to be used in mass-market handsets, PC cards, laptops and netbooks. Challenges remain in terms of output power, mismatch handling, thermal and DC performance for the power amplifier so that it may be integrated with the rest of the RF and in future with the baseband. This workshop will present and discuss the advantages, disadvantages and future of CMOS and siliconbased power amplifiers for Cellular (2G - GSM, EDGE, CDMA) (3G UMTS, HSDPA, DO1x) and IEEE 802 (WLAN/WiFi, WiMAX/WiBRO) connectivity power amplifiers

Speakers:

- 1. Michael Bailey, Amalfi Semiconductor "Utilizing Bulk CMOS Transistors for High Frequency Power Amplifiers"
- 2. Ali M. Niknejad, Berkeley Wireless Research Center (BWRC) "Low Voltage Transformer Coupled CMOS PAs"
- 3. Rahul Magoon, Axiom Microdevices "The Integration of Cellular CMOS PAs with RF, Mixed Signal, and Digital Circuits on a Single Die Radio: Challenges and Opportunities"
- 4. Susanne Paul, Black Sand Technologies "Class P Architectures in Linear 3G CMOS Power Amplifiers"
- 5. Bumman Kim, Pohang University of Science and Technology "CMOS Linear Power Amplifier Design"
- 6. Antonino Scuderi, STMicroelectronics, Catania, Italy "Multimode Digital CMOS PA for Polar Architectures"
- 7. Dan Nobbe, Peregrine Semiconductor "Radio Frequency Front End Integration in UltraCMOS"
- Peter Gammel, SiGe Semiconductor
 "High Performance, Low Cost .35μm SiGe BiCMOS Dual-Band Integrated RF front end ICs for WLAN Applications"
- 9. Chris .D. Hull, Intel Corporation "A WiMAX Power Amplifier in 90nm CMOS Technology"

WSB (RFIC) Sunday, 08:00 - 17:00 151AB

Current and Future Trends in Frequency Generation Circuits

Full-day workshop reviewed by RFIC.

Organizers:

Waleed Khalil, Intel; RFIC TPC Ahmed Helmy, Intel

Abstract: In order to adapt to the highly competitive IC market, chip suppliers are racing to reduce the total chip count by integrating many functionalities onto a single IC. However, one of the few elements that escaped this integration and remains to be off-chip is the timing source. In both wireless and wired systems, the reference source requires varying degrees of accuracy and stability over time and temperature. More often these accuracy requirements can only be met by using externally compensated reference sources such as (TCXOS) or (VCXOS), which occupy a large fraction of the board space. Hence a large emphasis is placed on eliminating these components by either integrating their functionality on- chip or replacing them with a much smaller footprint solution. This workshop will review various aspects in the design of stable and low phase noise oscillator circuits. Solutions that are gaining more popularity such as (DCXOS), MEMS and self-referenced oscillators will also be presented.

Speakers:

- 1. Michael M. Driscoll, Northrop Grumman "Introduction to the Design and Performance of Quartz Crystal Oscillators"
- 2. Michael McCorquodale, Mobius Microsystems "Self-Referenced CMOS Oscillators"
- 3. Ayman Ahmed, Si-Ware Systems "Temperature Compensation Techniques of Crystal-less Reference Oscillators"
- 4. Justin Black, Harmonic Devices Inc. "Emerging Piezoelectric MEMS Resonators for Clock Synthesis"
- 5. Eric Klumperink, University of Twente "Recent Advances in Low-Jitter CMOS Clock Generation Stimulated by FoM Definitions"
- 6. Ning Zhang, University of Florida "Millimeter-wave Signal Generation in CMOS"
- 7. Gennady Feygin, Texas Instruments "Integrated Digitally-Controlled Crystal Oscillators for Cellular Systems in Deep Sub-micron CMOS"
- 8. Mona M Hella, Rensselaer Polytechnic Institute "Recent Advances in Multi-Standard Oscillator Design"

WSC (RFIC) Sunday, 08:00 - 17:00 153AB Advances in PA and TX Architectures

Full-day workshop reviewed by RFIC.

Organizers:

Patrick Reynaert, K.U.Leuven, Belgium Dominique Schreurs, K.U.Leuven, Belgium; AdCom; MTT-11, IMS TPC

Abstract: Although most PA and TX architectures (Doherty, Polar, outphasing, LINC, ...) have been envisioned several decades ago, there is not a clear winner today. Technology considerations (GaN, CMOS, SiGe,...), system level considerations (output power, bandwidth,...), implementation and packaging issues and the specific cost or business model (basestations, terminals,...), make the optimal choice less obvious. This workshop will cover the different solutions that exist today for PA and TX architectures. It will discuss the different trade-offs and implementation issues of the various architectures, crucial information when selecting the architecture of choice. All speakers will also give an outlook of new PA architectures that are being developed in their field.

Speakers:

- 1. Steve C. Cripps, Cardiff University, United Kingdom "Old Dogs and New Tricks in the Pursuit of Higher RFPA Efficiency"
- 2. John Gajadharsing, NXP, Netherlands "Recent Advances in Doherty Amplifiers for Wireless Infrastructure"
- 3. Leo de Vreede, T.U.Delft, The Netherlands "Enhanced LINC/Chireix Power Amplifiers"
- 4. Thomas Johnson, PulseWave RF, USA "Carrier Frequency Switch Mode Amplification and Linearization"
- 5. Georg Fischer, University of Erlangen / Alcatel-Lucent, Germany "Practical Design and Implementation Challenges of the Class-S PA"
- 6. Earl McCune, Panasonic Emerging Advanced RF Laboratory (PEARL), USA "Polar Modulation and Power Amplifiers"
- 7. Patrick Reynaert, K.U.Leuven ESAT-MICAS, Belgium "CMOS RF Power Amplifiers"
- 8. Gottfried Magerl, TU Vienna, Austria "Class F Amplifiers"
- 9. Panel discussion with speakers and attendees

WSD (RFIC) Sunday, 08:00 - 17:00 157C

Self-Interference and Co-Habitation Considerations in Complex SoC and SiP Integrated Solutions

Full-day workshop reviewed by RFIC.

Organizers:

Jan Niehof, NXP Semiconductor Oren Eytan Eliezer, Texas Instruments Paul Blount, Custom MMIC Design Services; RFIC TPC

Abstract: With the integration of RF, mixed signal and digital building blocks on a single die, combined with the trend of increased frequencies (both in the RF and in the digital circuitry), it is essential to consider various on-chip coupling effects in the early design phases of the RF SoC or SiP. Additionally, provisions should be made for mitigating the impact of peripheral interactions (e.g., package, antenna), as well as the potential for self- interference, such that these are either eliminated or can be resolved on the fabricated product without hardware redesign. The focus of this interactive workshop will be on resolving self-interference problems: onchip coupling effects, chip-package co-design, substrate issues, couplingaware RFIC floor planning, digitally assisted solutions for interference problems, design practices, modeling and CAD/EDA capabilities to address coupling effects. Recognized companies and partnerships active in the semiconductor industry will present actual issues encountered in their designs and the solutions/design-practices used to address them. Interactive discussions will be facilitated to exchange valuable ideas for the benefit of participants and the industry at large.

Speakers:

1. Jonathan Jensen, Intel

"Single Chip Radio Design; Thinking Beyond the Circuits and the Silicon" 2. Stephane Bronckers, IMEC

- "A Novel Methodology to Predict the Impact of Substrate Noise in Complex Analog/RF Systems"
- 3. Scott Morris, RFMD

"Innovative Techniques for Shielding RF Components at the Package Level"

- Matthias Locher, ST-Ericsson "Bottom-up coexistence physical design and verification approach for multi standard SoC"
- 5. Nikos Haralabidis, Broadcom "SoC System and Physical Design Approach for Co-Exist
- "SoC System and Physical Design Approach for Co-Existence of Transceivers of Multiple Standards"

- 6. Oren Eliezer, Texas Instruments
 - "Software Assisted Radio Design to Compensate for Analog Impairments and for RF Interference Effects"
- 7. José Luis González, Universitat Politecnica de Catalunya "Substrate Noise Interference in RF Integrated Circuits"
- 8. Francois Clement, Coupling Wave Solutions "Electrical Signal Integrity Analysis in Mixed-Signal and RF ICs"
- 9. Jan Niehof, NXP Semiconductors "Dealing with Physical Design Issues in Complex RF Applications"

WSE (RFIC) Sunday, 08:00 - 17:00 154

Advanced BAW-Enabled Wireless Transceivers: from Devices to System Architectures

Full-day workshop reviewed by RFIC.

Organizers:

Andreas Kaiser, IEMN-ISEN Andreia Cathelin, ST Microelectronics Edgar Schmidhammer, EPCOS AG

Abstract: Bulk Acoustic Wave (BAW) resonators are now being used in functions such as filters or duplexers, namely for US-based PCS system. Key-advantages of this technology are reduced size and cost at good performance. This workshop will discuss recent advances in the technology and at the device level, such as zero temperature drift, multiple frequency bands on the same wafer, improved power durability, and increased quality factors. Combined with advanced packaging technologies, modules with high functionality can be realized. Beyond replacing other filtering technologies, BAW technology can have a significant impact on system architectures, and will allow novel approaches namely for low power radios. BAW resonators also have a strong potential as high-precision frequency references where they could advantageously replace quartz resonators for this purpose. All these points, as well as design tools and methodology, will be described by the speakers in this workshop.

Speakers:

- 1. Alexandre Reinhardt, CEA-LETI "BAW Technology for Advanced RF Architectures"
- 2. Florin Constantinescu, Politehnica University Bucharest, Romania "Circuit and Field Models of Power BAW Resonators"
- 3. Arto Nurmela, VTT "Power Durability and Non-Linear Effects in BAW Resonators"
- Jean-Baptiste David, CEA-LETI
 "An Operant Methodology to Handle BAW Designs: Application to a WCDMA/UMTS Duplexer"
- 5. Eric Tournier, LAAS "Phase Noise of FBAR/SMR Resonators - Application to Frequency Generation and Measurement"
- 6. Andreia Cathelin, STMicroelectronics "BAW Enabled Advanced Digital RF Transmitter Architectures for Wireless Systems"
- 7. Alexandre Volatier, Triquint Semiconductor "A High Performance PCS Front End Module Incorporating a BAW Duplexer and a Tri-Mode Power Amplifier for a Fully Integrated CDMA/WCDMA Transmit Module Solution"
- 8. Rich Ruby, Avago
- "Future Extensions of FBAR Technology"
- 9. Brian Otis, University of Washington Seattle "Innovative Use of BAW Resonators in Low-Power Transceivers"

WSF (RFIC) Sunday, 08:00 - 17:00

157AB

Devices and Design Techniques for Advanced Handset/Mobile PAs

Full-day workshop reviewed by RFIC.

Organizers:

Nick Cheng, Skyworks Solutions; RFIC TPC David Ngo, RF Micro Devices; RFIC TPC Co-Chair

Abstract: During the past decade, cellular handsets have moved from single-band, single-mode platforms to very complex multiband, multimode architectures that optimize carrier capacity flexibility, support numerous geographic air-interface standards and enable more multimedia features. The ever-increasing complexity in cellular handsets has been imposing more and more stringent requirements on power amplifiers. Advancements in both device technology and design techniques have been escalating in addressing critical issues such as efficiency, linearity, noise, harmonics, and switching transient, to name a few. Several presentations in this workshop will cover future handset trends, requirements on advanced power amplifiers and choice of device technology. Furthermore, design techniques of linearization, efficiency enhancement, power detection and controls will be covered with design examples demonstrated on various technologies, such as GaAs HBT, CMOS, Silicon-on-Insulator and Silicon Germanium.

Speakers:

1. Ville Vintola, Nokia "Handset Trends and Advanced PA Requirements"

- 2. Peter Zampardi, Skyworks Solutions "Device Technology for Handset Power Amplifiers"
- 3. R. Magoon, Axiom Microdevices "Fully Integrated CMOS PAs for the Handsets"
- Ali Tombak, RFMD "Highly Integrated Wireless Handset Front-End Modules Based on Bulk Silicon and Silicon-on-Insulator (SOI) Technologies"
- 5. Youngwoo Kwon, Seoul National University "Low-Power PAE Enhancement for 3G Handset Power Amplifiers"
- 6. Donald Lie, Texas Tech University "SiGe PA for WLAN/WiMax and Handset Applications"
- 7. Leo de Vreede, Delft University of Technology "Out-Of-Band Linearization of Semiconductor Devices"
- 8. David Ripley, Skyworks Solutions "Power Detection and Control for Handset Power Amplifiers"

WSG (RFIC) Sunday, 08:00 - 17:00

Challenges for Future RF Integration

Full-day workshop reviewed by RFIC.

Organizers:

Gernot Hueber, DICE GmbH & Co KG

R. Bogdan Staszewski, Texas Instruments

Stefan Heinen, RWTH Aachen University; MTT-23, RFIC TPC

Abstract: Current and future transceivers for mobile terminals are facing increasing complexity because of the market's demands for lower cost, lower power consumption, and higher data-rate. As a result, multi-band and multi-mode radios covering the diversity of communication standards impart unique challenges on the RF-transceiver design due to limitations in terms of reconfigurable RF components that meet the demanding cellular performance criteria at costs that are attractive for mass market applications. The focus of this workshop will be on the challenges the cellular standards pose on future transceiver integration, along with a thorough discussion of advanced techniques for receivers and transmitters

towards integration in SoC approaches including novel architectures, highly configurable analog circuitry, digitally assisted and enhanced analog/ RF modules, and the integration of digital signal processing into the traditionally purely analog front-end. However, the utilization of digital signal processing capabilities is in line with the ongoing trend towards SoCs in minimum-feature-sized CMOS in the cellular market. Moreover, advances in the field of RF front-end modules and novel analog signal processing architectures are covered to give a consolidated outlook on future concepts for cellular radios.

Speakers:

- 1. R. Bogdan Staszewski, TU Delft, The Netherlands "Advances in Digital RF Architectures"
- 2. Bertan Bakkaloglu, Arizona State University, USA "Reconfigurable Transmitters and Power Management"
- 3. Larry Larson, University of California, San Diego, USA "Power Amplifier Integration Challenges for Highly Integrated Multi-Mode Transceivers"
- 4. Aarno Pärssinen, Nokia Research Center, Helsinki, Finland "RF System and Architecture Challenges for Multi-Standard Mobile Devices"
- 5. Yann Deval, IMS Laboratory, Talence Cedex, France "Toward Software Radio Receiver"
- 6. Sebastian Hoyos, Texas A&M University, USA "Multi-Path Receivers Architectures for Wideband Multi-Standard Radios"
- 7. Ranjit Gharpurey, University of Texas at Austin, USA "Interference Cancellation and Linearity Enhancement in Wireless Receiver Front-ends"
- 8. Geoff Dawe, BitWave Semiconductor, Lowell, MA USA "Software Defined (Configured) Radio Transceivers"

WSH (RFIC) Sunday, 08:00 - 12:00

152

System-Level Design and Implementation of Gb/s 60GHz Radios

Half-day workshop reviewed by RFIC.

Organizers:

52A

Alberto Valdes Garcia, IBM Research, Yorktown Heights, NY Su-Khiong Yong, Samsung Electronics, San Jose, CA

Abstract: In recent years, the design of active and passive mm-wave components in general, and in the 60GHz band in particular, has become a center of gravity for academic and industrial research. The time has come to move beyond circuit components and fulfill the motivation for the development of this technology: the deployment of commercial solutions capable of delivering Gb/s wireless links in a variety of applications. A successful Gb/s 60GHz radio module is the result of holistic design. These contemporary systems push the boundary not only of RF design, but also of DSP techniques, and communication system design. This workshop includes experts leading the standards, design and system integration for 60GHz commercial solutions. The physical layer design and specifications for key applications, such as high-definition video and fast download, are covered considering both single-carrier and OFDM modulations with different usage scenarios. The impact of RF circuit non-idealities in these systems is also addressed. Full system implementation examples, including radio and baseband, are presented with 60GHz end-to-end systems and link experiments. One of the specific challenges and opportunities of 60GHz is the directionality of phased-arrays. The impact of beamforming on a high data rate communication system will be covered from a system viewpoint. All of the presentations will address how these important aspects of 60GHz systems are addressed by the emerging standards such as the IEEE 802.15.3c 60GHz standard.

Speakers:

- 1. Alberto Valdes-Garcia, IBM Research, USA "Introduction and Overview of 60GHz Standardization"
- 2. Yasunao Katayama, IBM Tokyo Research Laboratory, Japan "End-to-end 60GHz Single-Carrier System Implementation and Link Experiments"
- 3. Su-Khiong Yong, Samsung Electronics, USA "OFDM System Design for 60GHz High-Definition Video Applications"
- 4. Chang-Soon Choi, IHP Microelectronics GmbH, Germany "60GHz SiGe BiCMOS Radio and OFDM Baseband Implementation for Gbps WLAN Applications"
- 5. André Bourdoux, IMEC, Belgium "Beamforming at 60GHz: Challenges and Solutions"

WSI (RFIC) Sunday, 13:00 - 17:00

Technology and Power Combining Techniques for Millimeter Wave Applications

Half-day workshop reviewed by RFIC.

Organizers:

Didier Belot, STMicroelectronics; RFIC TPC Eric Kerhervé, IMS Lab

Abstract: This workshop highlights the difficulties in designing silicon power amplifiers at MMW and RF frequencies. The presentations will focus of the limitations of CMOS, BiCMOS, bipolar and other advanced silicon technologies. In a second part, innovative design approaches such as power-combining techniques will be discussed in order to address the drastic specifications of radio communications from mobile phone standards (GSM, UMTS, WIMAX, WLAN...) to MMW standards (60GHz WMAN, 77GHz radar ...).

Speakers:

- 1. Wilhelm Keusgen, Fraunhofer HHI, Berlin, Germany "PAs for MMW Applications: A Comparison of Technologies and Achievements"
- 2. Christine Raynaud, STMicroelectronics CEA LETI "Advanced CMOS (sub-0.25µm) Technologies for RF and MMW PA"
- 3. Domine Leenaerts, NXP Semiconductors, Research "Power Amplifier Design in CMOS Technology for Cellular and WLAN"
- 4. Debopriyo Chowdhury, University of California "Matching Techniques from RF to MMW"
- 5. Ullrich Pfeiffer, University of Wuppertal "Innovative Power Combining Structures for MMW PA"
- 6. Panel discussion

WSJ (RFIC) Sunday, 08:00 - 12:00

Active Radio Circuits for Bio & Medical Applications

Half-day workshop reviewed by RFIC.

Organizers:

Jacques Rudell, University of Washington, Seattle, WA Donhee Ham, Harvard University, Cambridge, MA Brian Otis, University of Washington, Seattle, WA

Abstract: Scientists and engineers have spent the better part of the last century developing more efficient radio circuits, systems and software for wireless communication. Recently, the scientific community has begun exploring the use of radio-frequency circuits for bio-medical applications. These bio-able radio circuits can be categorized into two sub-topics. The first is the use of radios to communicate sensed information from the human body to the outside world. The second is the use of traditional radio circuits

for medical analysis. Two speakers in this workshop will explore using radio circuits for biomedical sensing and diagnosis, such as early-cancer detection and Protein and DNA analysis. Two additional speakers will describe current work on communication with radios links for body area networks (BAN) and implantable devices.

Speakers:

152

- 1. Arjang Hassibi, University of Texas, Austin, TX "Challenges in CMOS Integrated Biosensors""
- 2. Brian P. Otis, University of Washington, Seattle "BANning Low Power Radio Design"
- 3. Joel L. Dawson, Massachusetts Institute of Technology, Cambridge, MA "A New Architecture for Implantable Transceivers"
- 4. Donhee Ham, Harvard University, Cambridge, MA "NMR-Based CMOS RF Biomolecular Sensor"

WSK (RFIC) Sunday, 13:00 - 17:00 156C Digitally Assisted Analog and RF Circuits

Half-day workshop reviewed by RFIC.

Organizers:

Joel L. Dawson, Massachusetts Institute of Technology Stewart Taylor, Intel Josie Ammer, Qualcomm

Abstract: The purpose of this workshop is to push forward the discipline of digitally assisted analog and RF design by taking a snapshot of the cuttingedge work going on in this field. Rather than hunt through the various journals and conference proceedings to piece together design trends, we offer attendees the chance to hear oral presentations from several of the leading experts in this young field. The workshop format is particularly advantageous for this topic, as in our view many of the breakthroughs in digitally assisted RF will find inspiration from similar work going on in analog design, and vice versa. Attendees will get a chance to hear about and ask questions concerning published work, and will also get a glimpse at cutting-edge but as-yet-unpublished work. Most importantly, attendees are encouraged to share their own thoughts and expertise concerning the techniques that are discussed. We expect the open exchange to benefit presenters and listeners alike.

Speakers:

51

- 1. Joel L. Dawson, Massachusetts Institute of Technology "Digitally Assisted Architectures for RF Transceivers"
- 2. Boris Murmann, Stanford University "Overview of Digital Correction Techniques for High-Speed Data Converters"
- 3. Larry Larson, University of California at San Diego "Digitally Enhanced RF Circuits"
- 4. Khurram Muhammad, Texas Instruments "Software- Assisted Radio Design to Compensate for Analog Impairments and for Interference Effects"
- 5. Michael P. Anthony, Intersil Corporation "Mixed Digital/Analog Correction of Mismatch and Process Variability in a Pipeline ADC"

WSL (IMS/RFIC) Sunday, 13:00 - 17:00

State of the Art of Low-Noise III-V Narrow-Bandgap and Silicon FET Technologies for Low-Power Applications

Half-day workshop reviewed by MTT-14, MTT-7, MTT-23.

Organizers:

Francois Danneville, IEMN-DHS, UMR CNRS, France; MTT-14, IMS TPC Paulius Sakalas, CEDIC, Dresden University of Technology, Germany; MTT-14

Abstract: This workshop aims to investigate various state-of-the-art lownoise FET technologies for low-power applications: (i) narrow-bandgap III-V HEMTs technologies (on InP or GaAs substrate) (ii) Si CMOS Technology. The first part will focus on InGaAs/InAlAs and Antimonide-Based Compound Semiconductor (ABCS) InAs/AISb HEMTs. Devices specifically designed to operate at lower DC power consumption, or for low-noise operation, will be presented along with corresponding characterizations (models extraction). Their capability will be shown through ultra-low power MMIC (or hybrid) circuits, including low-noise amplifiers (operating at room and cryogenic temperatures) and switches in cm/mm-wave range. Strengths and limitations of such technologies will also be addressed. The second part will focus on Si CMOS technology. Millimeter-wave LNA will be presented with recent advances concerning CMOS mm-wave building blocks. Special attention will be paid on particular techniques taking advantage of CMOS technology while circumventing its weaknesses. Finally, a new scheme to optimize RF noise of MOSFETs through channel engineering will be described in detail.

Speakers:

- 1. Jan Grahn, Chalmers University of Technology, Göteborg, Sweden "Narrow-Bandgap InGaAs/InAlAs and InAs/AlSb HEMTs for Low-Noise and Low-Power Applications"
- 2. Jonathan Hacker, Teledyne Scientific
- "Antimonide Based Compound Semiconductors (ABCS) for Ultra-Low Power Applications"
- Tatsuya Hirose, Fujitsu Ltd.
 "InP HEMT and Si-CMOS Device and Circuit Design for mm-Wave Low-Noise Applications"
- 4. Ali Niknejad, University of California Berkeley "Recent Advances in CMOS mm-Wave Building Blocks"
- 5. Francois Danneville, IEMN-DHS, UMR CNRS "Noise Properties of Low-Power Si MOSFETs Through Different Channel Engineering"

WMA (IMS) Monday, 08:00 - 17:00

151AB

Tunable RF-Components and Modules for Wireless Communication Systems

Full-day workshop reviewed by MTT-13, MTT-8, MTT-20.

Organizers:

Holger Maune, Technische Universität Darmstadt Robert Weigel, University of Erlangen-Nuremberg; AdCom, MTT-2, IMS TPC Rolf Jakoby, Technische Universität Darmstadt Georg Fischer, University of Erlangen-Nuremberg

Abstract: This workshop highlights the current research and development efforts in the design and the implementation of reconfigurable RF-frontends for wireless systems, in particular for terrestrial and satellite-based mobile communication. In the first part, it addresses the realization of different tunable components such as phase shifters, filters, duplexers, matching networks. The second part will focus on reconfigurable/adaptive antennas such as beam-steering antennas or reflect-arrays. The presented RF-components and modules are based on different materials such as novel

tunable non-linear dielectrics or semiconductors and techniques such as RF-MEMS. Moreover, some of these devices are based on metamaterial design approaches.

Speakers:

153C

- 1. Robert Weigel, University of Erlangen-Nuremberg "Frequency Agile Ferroelectric Filters, Power Dividers, and Couplers"
- 2. Andrew Hunt, nGimat Co. "Low Voltage and Low Loss Tunable Dielectrics for Phase Shifters/Phased Array Antennas and Tunable Filter Components"
- 3. Spartak Gevorgian, Chalmers University of Technology "Agile Ferroelectric Components in EC Project NANOSTAR"
- 4. Holger Maune, Technische Universität Darmstadt "Tunable Modules based on Ferroelectric Thick-Film Technology"
- 5. Georg Fischer, University of Erlangen-Nuremberg "High-Q Planar Filter Platform Incorporating Macro MEMS Tuning Elements"
- 6. Christophe Caloz, École Polytechnique de Montréal "Reconfigurability at Microwaves using Recent Metamaterial Concepts and Techniques"
- 7. Christian Damm, Technische Universität Darmstadt "Artificial Lines for Matching Purposes"
- 8. Luca Marcaccioli, University of Perugia "Tunable Components for Electronic Beam Steering and Smart Antenna Systems"
- 9. Wolfgang Menzel, University of Ulm "Investigation Methods for Reconfigurable Liquid Crystal Reflectarrays"
- Etienne Girard, Thales Alenia Space
 "MEMS-based Reflectarrays for Satellite Antennas: Design and Prototypes Development at Thales Alenia Space France"

WMB (IMS) Monday, 08:00 - 17:00 157C

Parameter Extraction Strategies for Compact Transistor Models

Full-day workshop reviewed by MTT-1, IMS09.

Organizers:

Matthias Rudolph, Ferdinand-Braun-Institut, Germany; MTT-1, MTT-14, IMS TPC

David Root, Agilent Technologies, USA; MTT-1, IMS TPC Christian Fager, Chalmers University, Göteborg, Sweden

Abstract: "Transistor modeling" often means to circuit designers the determination of the model parameters in order to fit a selected model to a specific device. Parameter extraction and model verification are vital to make theoretically accurate device models practically useful. However, the modeling literature and model documentation usually focus primarily on how the device physics or phenomena are represented in a model, while the question of how the parameters can be determined is often only briefly addressed. It is the aim of this workshop to provide a broad overview of the different techniques and methods of parameter extraction. Rather than discussing individual models, generic strategies will be presented and real-life challenges will be addressed, like the impact of package, temperature and dispersion. It is the purpose of this workshop to provide a comprehensive introduction in order to enable the attendee to successfully deal with devices like GaAs & GaN HEMT, LDMOS, CMOS, GaAs & SiGe HBT

Speakers:

1. Matthias Rudolph, Ferdinand-Braun-Institut für Höchstfrequenztechnik (FBH), Germany

"Introduction to Transistor Model Parameter Extraction"

2. Masaya Iwamoto, Agilent Technologies, Santa Rosa, CA, USA "DC and Thermal Modeling"

- 3. Sonja Nedeljkovic, RFMD, Greensboro, NC, USA "Extrinsic Parameter and Parasitic Elements in III-V HBT and HEMT Modeling"
- 4. Christian Fager, Chalmers University, Göteborg, Sweden "Uncertainties in Small-Signal Equivalent Circuit Modeling"
- David E. Root, Agilent Technologies, Santa Rosa, CA, USA "The Large-Signal Model: Theoretical and Practical Considerations, Tradeoffs, and Trends"
- 6. Jens Flucke, Ferdinand-Braun-Institut für Höchstfrequenztechnik (FBH), Germany

"Modelling of Large and Packaged Transistors"

- 7. R. Quéré, MITIC/XLIM University of Limoges, France "Nonlinear Characterization and Modeling of Low Frequency Dispersive Effects in Power Transistors"
- 8. Dominique Schreurs, KU Leuven, Belgium "Optimizing (Non-)Linear Measurements for Model Extraction and Validation"
- 9. Pete Zampardi, Skyworks Solutions, Newbury Park, CA "Practical Statistical Simulation for Efficient Circuit Design"
- 10. Manfred Berroth, Universität Stuttgart, Germany "Noise Modeling"

WMC (IMS) Monday, 08:00 - 17:00 153AB

Power Amplifier Linearization: From Advanced Analog and Digital Techniques to Practical Real-Time Implementations

Full-day workshop reviewed by MTT-5, MTT-17, MTT-20.

Organizers:

John Wood, Freescale Semiconductor, Tempe, AZ USA; IMS TPC Slim Boumaiza, University of Waterloo, Ontario, Canada

Abstract: In RF transmitters, the power amplifier is usually the limiting factor in terms of both the efficiency of the system and the overall linearity. In recent years, as the spectral efficiency of the modulation methods required for communications standards such as WiMAX, LTE, etc. has increased, improvements in the PA efficiency have been wrought by better device technology and circuit & system architectures. While the linearity and efficiency must be traded-off against each other, the communications standards also specify limits of acceptable nonlinearity in terms or error vector and spectral spreading, for instance. The PA or system designer must then include some form of linearizer to meet these specifications. In this workshop we shall present some background for the sources and effects of nonlinear behavior in RF power amplifiers, including memory effects. A number of approaches for improving the linear performance of the PA when deployed in a transmitter system will be described, including analog linearization methods such as feedforward, feedback and harmonic injection, and various implementations of digital pre-distortion schemes. Peak-to-Average Power Reduction (Crest Factor Reduction) schemes will also be described. Base station and handset PA linearizing techniques will be presented, and both academic and industry approaches will be covered. This will be an advanced workshop, for academics and industry professionals active in RF PA design, and in linearization & DPD development.

Speakers:

- 1. John Wood, Freescale Semiconductor
- "Nonlinear Behavior & Linearizability of RF Power Amplifiers"
- 2. Jose Carlos Pedro, University of Aveiro "Power Amplifier Behavioral Modeling and Linearizer Identification Methods"
- 3. Anding Zhu, University College, Dublin "Volterra Series-Based Digital Predistorter Design"
- 4. Paul Draxler, Qualcomm, Inc. & University of California, San Diego "Techniques for Envelope Tracking Linearization"

- 5. R. Neil Braithwaite, Powerwave Technologies "Crest Factor Reduction (CFR) of Wideband Wireless Multi-Access Signals"
- 6. Slim Boumaiza, University of Waterloo "Advanced Memory Polynomial Linearization Techniques"
- 7. Roland Sperlich, Texas Instruments "Digital Pre-distortion Systems and Tradeoffs in Commercial Deployments"
- 8. R. Neil Braithwaite, Powerwave Technologies "Adaptive Feedforward Linearization of Power Amplifiers"
- 9. Gayle Collins, Freescale Semiconductor Linearization using Controlled Harmonic Injection"
- 10. Kelly Mekechuk, Pulsewave RF "Direct Digital Predistortion at Radio Frequency via Real-Time Feedback"

WMD (IMS) Monday, 08:00 - 17:00 156AB

Digital Receiver Systems for Defense and Related Commercial Applications

Full-day workshop reviewed by MTT-16, MTT-9, IMS09.

Organizers:

Lamberto Raffaelli, LNX Corporation; MTT-16 Klaus Breuer, ITT; MTT-16

Abstract: This workshop will discuss digital receiver applications, implementations, and challenges. With emphasis on wideband digital receivers used in defense and radar systems, the discussions will straddle issues that are of interest in both military and commercial systems. The prime motivators for employing digital receivers are functional and performance flexibilities, as well as improved system capabilities. The rapid advances of sampling devices, FPGAs, embedded processors, and integrated circuits have expanded the use of digital receivers across a wide range of systems, especially communication systems. The technical challenges include performance requirements for wideband microwave systems, and size and power restrictions for commercial applications. Workshop topics will include signal analysis, radar receivers, signal processing receivers for direction finding, and communication receivers. Requirements and challenges such as sensitivity, dynamic range, noise, bandwidth, signal density, mixed-signal electronics, and power consumption will be defined. Design examples of high-speed wideband sampling techniques, noise reduction themes, and wideband architectures will be given. The status and trends of device and IC technologies that impact the path to the next generation of systems will be provided. There will be allotted time for workshop attendees to engage in open discussions with the presenters.

Speakers:

- 1. Janusz Majewski, MIT Lincoln Laboratory, USA "Digital Receiver System Design"
- 2. Werner Neuhaus, EADS, Germany "Receivers for Broadband EW Applications"
- 3. Andrea De Martino, Elettronica S.p.A., Italy "Improved EW Functionality as Provided by Large Bandwidth Digital Receivers"
- 4. Geoff Dawe, Bitwave, USA "Digital Receivers for Commercial Applications"
- 5. John Kedziora, Kedziora Innovation Group, USA "Phase Noise, Jitter, Stability and SNR: Navigating the Lexicon and How to Relate Hardware Measurements to System Performance"
- 6. Mike Groden, LNX Corporation, USA "Wideband Receiver with Wideband Track and Hold"
- 7. Mark Rosker, DARPA, USA "Advanced Device and Integrated Circuit Technologies for Digital Receivers"
- Gil Raz, GMR Research & Technology, USA
 "Digital Compensation of Nonlinear and Mismatch Errors in Wideband RF Receivers"

9. Fred Harris, San Diego State University, USA "Applications of Multichannel DSP-Based Receivers"

WME (IMS) Monday, 08:00 - 17:00

Subharmonically Pumped Mixers (SHP Mixers): Design Theory and Systems Applications

Full-day workshop reviewed by MTT-22, IMS09.

Organizers:

Kenji Itoh, Mitsubishi Electric; MTT-22, IMS TPC

Bert Henderson, Cobham Defense Electronic Systems, M/A-Com; MTT-22

Abstract: From early years of microwave engineering, the subharmonically pumped (SHP) mixer technique was used for the higher frequency bands because of the lower frequency local oscillator. In addition to this well-known historical fact, the SHP mixer technique is re-focused for new RF applications by its unique nature of spurious mixing products. In this workshop, following technical contents will be presented by experts in this field:

- History of the SHP mixer techniques
- Circuit theory
- Circuit design
- GaAs/Si implementations of SHP mixers
- RF system applications of SHP mixers from cellular phone to THz radio astronomy

Speakers:

- 1. Edmar Camargo, RF Micro Devices "History of the SHP Mixer: from Tube to CMOS"
- 2. Stephen Maas, AWR "Theory of the Subharmonically Pumped Mixers"
- 3. Bert Henderson, Cobham Defense Electronic Systems, M/A-Com "SHP mixer Circuit Designs"
- 4. Kenji Itoh, Mitsubishi Electric "RF Systems with Even Harmonic Mixers, Unique Spurious Nature"
- 5. Carlos Saavedra, Queen's University, Canada "CMOS Subharmonic Mixers and Applications"

6. Tsuneo Tokumits, Eudyna

- "Design and Implementation of SHP MIX in the 3-D MMIC"
- 7. Erich Schlecht, JPL

"THz SHP Mixers for Planetary, Earth, and Astronomical Observations"

8. Zhiyang Liu, Tyco Electronics

"High-Order Subharmonically Pumped Mixers Using Phased Local Oscillators"

WMF (IMS) Monday, 08:00 - 17:00 157AB Is GaN Ready for System Insertion?

Full-day workshop reviewed by MTT-6, MTT-16, MTT-20.

Organizers:

153C

Bernie Geller, BDG Consulting Services, USA; MTT-6, MTT-20, IMS TPC Ruediger Quay, Fraunhofer Institute, Freiburg, Germany; MTT-6 Frank Sullivan, Raytheon Company, Sudbury, MA; MTT-6, MTT-16, IMS TPC

Abstract: The significant benefits of power density, efficiency, and bandwidth brought by GaN technology have brought with them substantial system-related issues, such as the need for higher operating voltages. more efficient heat removal techniques, high reliability, and, of course, affordability. These issues have called for innovative solutions not only on the system side, but also in the design, manufacture, packaging, and testing of these devices. The objective of this workshop is both to help GaN component developers understand system issues which will effect their designs and, conversely, to help system designers understand both the potentials and limitations of GaN technology in its various forms. The following topics are covered in this workshop: component-level technical status and reliability of GaN discretes and MMICs on both silicon carbide and silicon substrates; status and trends of non-linear modeling of GaNrf devices; management of power densities with respect to ruggedness and thermal performance; potential of GaN technology in mobile radio communication systems; military and government system requirements and application of GaN MMICs in military systems, specifically radar and electronic warfare; and cost and affordability issues. The workshop will conclude with a panel discussion in which the attendees will be asked to submit their questions and comments to the speakers.

Speakers:

- 1. Ray Pengelly, Cree Inc. Research Triangle Park, NC, USA "GaN HEMT Technical Status: Transistors and MMICs for Military and Commercial Systems"
- 2. Kevin Linthicum, Nitronex Corporation, Durham, NC, USA "Status of GaN-on-Silicon for Military and Commercial Communications Systems"
- 3. R. H. Jansen, RWTH Aachen University "Advanced Large-Signal Modeling of GaN Power Devices, Electrical, Thermal and Distributed Effects"
- 4. Rüdiger Quay, Fraunhofer Institute of Applied Solid-State Physics "Managing Power Density of High-Power GaN Devices"
- 5. Patrick Jüschke, Alcatel-Lucent Bell Labs Radio Communications "GaN Technology for Future Mobile Radio Communication from a System Supplier's Perspective"
- 6. Mike Wojtowicz, Northrop Grumman "Status of GaN HEMT Technology for MMW Applications"
- 7. Patrick Schuh, EADS Defense Electronics, Ulm, Germany "Using GaN Technology in Military Systems"
- 8. Colin S. Whelan, Raytheon Company, Andover, MA, USA "Affordability of Gallium Nitride Technology"
- 9. Panel Discussion

WMG (IMS) Monday, 08:00 - 17:00 156C

New Component Technologies for Vehicular and Industrial Radar Applications

Full-day workshop reviewed by MTT-2, MTT-11, MTT-16.

Organizers:

Linus Maurer, DICE, Linz, Austria Andreas Stelzer, University of Linz, Austria Thomas Ußmüller, University of Erlangen-Nuremberg, Germany Robert Weigel, University of Erlangen-Nuremberg, Germany; AdCom, MTT-2, IMS TPC

Abstract: For a long time radar systems were only used for military systems and for civil aviation. One major reason for the limited application scenarios were the high costs involved with these systems. Nowadays the application scenarios are much broader. They range from location-aware smart-sensor systems for industrial applications to automotive systems for enhanced car safety. The recent advances in semiconductor technology have opened new mass-market potentials for radar systems. This workshop will give insights to several aspects of industrial and automotive radar systems. The topics covered during this workshop span from sub-component design to application scenarios. Fully integrated radar frontends in silicon technologies will be shown. Furthermore, challenges and solutions for the integration of these transceiver ICs into complete systems will be addressed. Another important aspect for the complete system is the antenna design, which will be covered by a separate talk. In addition, examples for modern industrial and automotive radar systems will be shown.

Speakers:

- 1. Dietmar Kissinger, University of Erlangen-Nuremberg, Germany "High-Linearity 77GHz SiGe Automotive Radar Front-Ends"
- 2. Joy Laskar, GEDC at Georgia Tech, Atlanta, USA "Digital CMOS Phase Shifter Technology for Precision Radar Applications"
- S.P. Voinigescu, University of Toronto, Canada "W- and D-Band CMOS and SiGe BiCMOS Radars for Remote Sensing and Industrial Applications"
- 4. Thomas Ussmueller, University of Erlangen-Nuremberg, Germany "Concepts and Design Methods of Antennas for Automotive Long Range Radar"
- 5. Johann-Peter Sommer, Fraunhofer Research Institution, Germany "FE Simulations and Micro-Range Deformations Measurements – Efficient Tools for Design Support"
- 6. Johnna Powell, Massachusetts Institute of Technology, Cambridge, USA "77 and 94-GHz SiGe Receiver Front Ends and Integrated Antennas for Millimeter-Wave Applications"
- 7. P. Feil, Institute of Microwave Techniques, University of Ulm, Germany "Broadband Automotive Sensors in Industrial and Security Applications"
- 8. A. Teplyuk, University of Kiel, Germany "94-GHz Industrial Radar Sensor for the Quantitative Monitoring of Dust Particles and Aerosoles"
- 9. A. Stelzer, Johannes Kepler University, Linz, Austria "FMCW MIMO Radar Concepts based on SiGe Transceivers"

WMH (IMS/RFIC) Monday, 08:00 - 17:00 Room 152

Radio-Frequency Applications of Nanotechnology: Towards a New Generation of Extremely Integrated Devices and Systems

Full-day workshop reviewed by MTT-15, MTT-20, MTT-23.

Organizers:

Luca Pierantoni, Università Politecnica delle Marche, Ancona, Italy Fabio Coccetti, LAAS-CNRS Toulouse, France Manos M. Tentzeris, Georgia Institute of Technology, Atlanta, GA; IMS TPC

Abstract: The goal of this workshop is to present research activities on high-performance nanodevices for RF applications, showing the potential offered by emerging nano-scale materials. The latter include carbon nanotubes and graphene nanoribbons that exhibit unique electromechanical properties. The topics cover issues from production technology to recent advances in modelling. We describe the development of nanocomponents such as gas sensors, resonators, nano-antennas arrays, high-frequency interconnects, nano-electro-mechanical switches, nanoplasmonic structures, carbon based transistors and molecular devices for RF nanoelectronics. We focus on experimental techniques for the growing, assembling, positioning, contacting and broadband characterization of nanostructures, thus highlighting recent and emerging solutions. We introduce novel numerical techniques aimed at describing the coupling of Maxwell's equations with those governing the quantum transport

Speakers:

- 1. Fabio Coccetti, LAAS-CNRS Toulouse France "CNT Based Devices for Sensing and Communication Applications"
- Trang T. Thai, Georgia Institute of Technology, Atlanta, GA, USA "Carbon Nanotubes and Graphene Nano-Ribbons: Electrical Properties in Wireless Sensing Nodes"
- 3. Peter Burke, University of California, Irvine CA, USA "Arrays of SWNT Devices for Analog RF: Overview of the Field"
- 4. Luca Pierantoni, Università Politecnica delle Marche, Ancona, Italy "Novel Frequency- and Time-Domain Techniques for the Combined Maxwell-Dirac Problem in the Characterization of Nanodevices"
- 5. P. Kabos, National Institute of Standards and Technology, Boulder, CO "Broadband Characterization of High Impedance Nanoscale Systems"
- 6. Paul Salet, Ecole Polytechnique Fédérale de Lausanne, Switzerland "Carbon Nanotube Nano-Electro-Mechanical Switches"
- 7. Paolo Lugli, Technische Universitaet Munich, Munich, Germany "Molecular Devices for RF Nanoelectronics"
- 8. Erping Li, Singapore National Research Institute, A*STAR-IHPC, Singapore

"Coupling of Maxwell's and Schrödinger's Equations for Modeling of Nano-Plasmonic Structures"

9. Tomas Palacios, Massachusetts Institute of Technology, Cambridge, MA, USA "Graphene RF Electronics"

WMI (IMS) Monday, 13:00 - 17:00

Gigabit Packaging of Wireless 60GHz Links

Half-day workshop reviewed by MTT-12, MTT-20, IMS09.

Organizers:

Rick Sturdivant, Microwave Packaging Technology; MTT-12 Robert Jackson, University of Massachusetts, USA; MTT-12, IMS09 Anh-Vu Pham, University of California-Davis, USA; MTT-12, IMS TPC

Abstract: Multi-gigabit communications systems are driving the development of packaging methods for 60GHz. Applications include video transport, medical, high-speed file transfer, wireless networks such as LANs and PANs, and military applications such as secure communication. These systems require high-quality signal paths, low radiation and integrated components such as antennas and baluns. This workshop will focus on packaging issues and examples for 60-GHz high data rate modules and subsystems.

Speakers:

- 1. S. Tabatabaei, Endwave Corporation
- "New Developments and Choices in Low-Cost Packaging for 60-GHz Applications"
- 2. Konichi Maruhashi, NEC
- "Development of mmW Modules for Gigabit Wireless Transceivers"
- 3. J. Laskar, Georgia Tech "Integrated mmW Module Technology at PCB Price Points"
- 4. Debabani Choudhury, Intel
- "Packaging Challenges and Opportunities for Multi-Gigabit Applications"
- 5. Mike Pettus, VubIQ "Packaging Solution For 60GHz SiGe Transceivers"

WWA (IMS/RFIC) Wednesday, 08:00 - 17:00 153AB Integration Trends towards 4G

Full-day workshop reviewed by MTT-2, MTT-20, MTT-23.

Organizers:

Robert Weigel, Universität Erlangen-Nürnberg; AdCom; MTT-2, IMS TPC Clemens Ruppel, EPCOS AG; MTT-2, IMS TPC

Abstract: 4G will not facilitate the design of cell phones. Compared to today's 3G, future 4G multi-standard, multi-band cellular phones have to cover an increasing number of wireless standards. These standards include GSM, CDMA, WCDMA, 3GPP LTE/4G, WIMAX and even MIMO WIMAX AND MIMO LTE/4G at up to 25 frequency bands, and includes connectivity systems like WLAN and Bluetooth, and support navigation systems like GPS and Galileo. Pressure on integration clearly increases. This workshop will highlight all relevant topics in the transceiver value-chain of cell phones. The presentations cover the full range starting with the discussion of architecture issues and transceiver concepts. Reporting on the progress made with CMOS integration follows. Then, in the direction of the chain towards the antenna, flexibility issues are discussed. Finally, novel power amplifier concepts, RF front-end integration, and multi-band antennas are addressed.

Speakers:

- 1. Aarno Pärssinen, Nokia NRC, Helsinki, Finland
- "RF System and Architecture Design Challenges in Multi-mode Mobile Devices in 4G Era"
- Kyutae Lim and J. Laskar, Georgia Tech, Atlanta, USA
 "All Digital Out-Phasing Transmitter (ADOPT) for Multi-band/Multi-standard Applications"
- 3. A. Hanke, Infineon Technologies, Neubiberg, Germany "Evolution of Cellular Transceivers in nm CMOS Technologies towards 4G"

- R. Bogdan Staszewski, TU Delft, The Netherlands "Trends for Highly Integrated Multi-mode Transceiver Architectures in Nanoscale CMOS"
- 5 Faraz Ali and R. Gloeckler, Ericsson/University of Erlangen-Nuremberg, Germany

"Trends in Multiband PA"

- 6. Chafik Meliani and G. Boeck, University of Technology Berlin, Germany "High Efficiency Broadband/Multiband PAs for Next Generation Transmitters"
- 7. Pasi Tikka, EPCOS, Munich, Germany "Future RF Frontend towards 4G"
- 8. Dirk Manteuffel and I. Wolff, IMST, Kamp-Lintfort, Germany "Design Challenges for the Integration of Antennas into 4G Mobile Handsets"

WWB (IMS) Wednesday, 08:00 - 12:00 152

RF Design Components of Magnetic Resonance Scanners

Half-day workshop reviewed by MTT-17, IMS09.

Organizers:

154

Robert Caverly, Villanova University; MTT-17, IMS TPC William Doherty, Microsemi-Lowell Corp

Abstract: The tutorial will present material covering the RF design practice used in Magnetic Resonance Scanners with presentations on hardware component design. The workshop will be geared for RF and microwave engineers wishing gain insight into technology as a means to move this important medical imaging forward. The tutorial topics range from brief review of magnetic resonance phenomenon, the need for high field scanning and its related RF components in the VHF region, the need for and design of tightly controlled RF pulse sequence generation, and high efficiency pulse transmitters for faithful reproduction of these well-defined pulse sequences. The tutorial will continue on the weak received signals by reviewing high gain, low noise amplifiers for the MR scanner receiver front end along with the transmit/receive coils as part of the MR transceiver system.

Speakers:

- 1. Robert Caverly, Villanova University "Brief Overview of MR Scanning Fundamentals"
- 2. Matthew R. Cummings, Cummings Electronics Labs "Practical RF Electronics for MRI/NMR Transceivers"
- 3. Ron Watkins, Stanford University Department of Radiology "Transmit Concepts & Arrays (Pulse Controllers and Pulse Sequencing)"
- 4. Fritz Raab, Green Mountain Radio Research Company "High Efficiency MRI Transmitter Design Concepts"
- 5. William Doherty, Microsemi and Ron Watkins, Stanford University Dept. of Radiology

"Switching and Limiting Issues for MRI"

6. Patrick Ledden, Nova Medical

"Radio Frequency Detectors for Human Magnetic Resonance Imaging"

WWC (IMS/ARFTG) Wednesday, 13:00 - 17:00 152

Advanced Measurement Techniques, Adapted for Different Memory Effects

Half-day workshop reviewed by MTT-11, MTT-1, IMS09, ARFTG09, IMS-S TC33.

Organizers:

Dominique Schreurs, K.U.Leuven, Belgium; AdCom, TCC, MTT-11, IMS TPC Marc Vanden Bossche, NMDG, Belgium

Abstract: Memory effects in transistors and amplifiers have been troublesome from the early days. The goal of this workshop is to give an overview of the present state-of-the-art characterization techniques in relation to the different types of memory effects that can occur within transistors and amplifiers. This workshop will provide an understanding of the different measurement setups that produce the necessary information to develop, for example, linearization techniques. The first talk overviews the different memory effects for emerging wideband PA designs and clarifies the importance of an in-depth understanding. Related to these different types of memory effects, the other talks elaborate on the various state-of-the-art measurement techniques to properly characterize and quantify these effects, going from DC via small-signal measurements to large-signal measurements.

Speakers:

- 1. Nuno Borges Carvalho, IT, Portugal "Importance of Memory Effects from a Designer Point of View"
- 2. Leo de Vreede, T.U. Delft, Netherlands "Large-Signal Device Characterization for Wide-Band PA Applications"
- 3. Christian Fager, Chalmers University, Sweden "Electrical Characterization of Self-Heating Effects"
- 4. Anthony Parker, Macquarie University, Australia "Measurement and Modeling of FET/HEMT Trapping Dynamics"
- 5. Christophe Gaquiere, IEMN, France "Time Domain Analysis of Trapping Effects of AlInN/GaN HEMT Devices"

WWD (IMS) Wednesday, 13:00 - 17:00 151AB RF MEMS Testing, Reliability, and Power Handling

Half-day workshop reviewed by MTT-21, MTT-8, MTT-12.

Organizers:

John L. Ebel, Air Force Research Laboratory; MTT-21, IMS TPC Daniel J. Hyman, XCOM Wireless; MTT-21

Abstract: RF MEMS devices continue to demonstrate steady increases in lifetime, reliability, and other critical performance metrics. Reliability issues, however, continue to be the primary impediments to mainstream commercial adoption of these technologies. As a result, potential users of RF MEMS technology have an increased interest both in understanding the methods used by manufacturers to evaluate their devices, and in developing their own methods to evaluate devices for particular applications. In this workshop, reliability and lifetime issues will be addressed and analyzed with respect to various RF MEMS devices, as well as testing and experimentation for the characterization of the electrical and mechanical performance of the devices. Concepts that address several of the present problems and improve the MEMS device performance will also be presented.

Speakers:

- 1. John Maciel, Radant MEMS
- "A High-Reliability, High-Power Ohmic MEMS Switch"
- 2. Daniel Hyman, XCOM Wireless
- "Ohmic-contact RF MEMS Repeatability and Environmental Test Methods" 3. Jeffrey S. Pulskamp, US Army Research Laboratory
- "Reliability Testing, Characterization, and Design in Piezoelectric RF MEMS"

- 4. Jeremy Muldavin, MIT Lincoln Laboratory "Challenges in Reliability Testing of Capacitive and DC RF MEMS Switches"
- 5. George Papaioannou, University of Athens "Dielectric Charging in MEMS by Material, Structure and Temperature"
- 6. James Hwang, Lehigh University "Surface vs. Bulk Charging of the Dielectrics in RF MEMS Capacitive Switches"
- 7. Steve Patton, University of Dayton Research Institute "Tribological Challenges in MEMS/NEMS Devices"

WFA ((IMS) Friday	, 08:00	- 17:00	151B

EM-Based Microwave Optimization Technology: State of the Art and Applications

Full-day workshop reviewed by MTT-1, MTT-8, MTT-15.

Organizers:

John W. Bandler, Bandler Corporation, Canada; MTT-1, IMS TPC Slawomir Koziel, Reykjavik University, Iceland

Abstract: This workshop addresses the state-of-the-art of EM-oriented CAD technology for effective modeling and optimization of microwave and related circuits. Going beyond conventional approaches, recent advances exploit available adjoint sensitivity information, sophisticated modeling algorithms, multilevel co-simulation, space mapping, and more. Our objective is to assist the microwave engineer in accelerating convergent design solutions while avoiding needless expensive simulations, all without sacrificing EM accuracy. We cover the fundamentals, some methodologies, practical applications, and expected trends in research and development. We illustrate the material through RF and microwave designs, antenna designs, photonic device design, and inverse problems for industrial and biomedical applications. A substantial part of the workshop will be tutorial, devoted to introducing the state of the art and explaining to the microwave engineer how existing CAD tools can be taken advantage of, and what to expect in the years ahead. We will present progress in the development of advanced algorithms and user-friendly software. The workshop will also allow state-of- the-art microwave practitioners to review their achievements.

Speakers:

- 1. Ming Yu, Com Dev, Canada "Electromagnetic Simulators for the Design of Large Microwave Circuits"
- 2. Q.J. Zhang, Carleton University, Canada "Neural Network Inverse Modeling and Applications to Microwave Filter Design"
- 3. José E. Rayas-Sánchez, ITESO, Mexico "Neural Space Mapping Approaches to EM-based Statistical Analysis"
- 4. Natalia K. Nikolova, McMaster University, Canada "Adjoint Sensitivities in Microwave Imaging and Design Tuning"
- 5. Mohamed Bakr, McMaster University, Canada "Efficient Surrogate Model Optimization of High Frequency Structures"
- 6. Peter Thoma, CST, Germany "Complete Technology for Optimizing EM Designs"
- 7. John Bandler, Bandler Corporation, Canada "Surrogate Modeling and Space Mapping: The State of The Art"
- 8. Slawomir Koziel, Reykjavik University, Iceland "Coarse Models and the Robustness of the Space Mapping Optimization Process"
- 9. James Rautio, Sonnet Software, USA "Examples of Microwave Filter Optimization Using Perfectly Calibrated Ports"

WFB (IMS) Friday, 08:00 - 17:00

Modern RFID: Inkjet Printing of "Green" RFID and RFID-enabled Sensors on Flexible Substrates

Full-day workshop reviewed by IMS09, MTT-16, MTT-20.

Organizers:

Manos Tentzeris, GEDC/ECE, Georgia Tech; IMS TPC Amin Rida, GEDC/ECE, Georgia Tech Jan Sumerel, Fujifilm Dimatix

Abstract: This workshop presents a step-by-step discussion of the design and development of RFID and RFID-enabled sensors on flexible low-cost substrates for the UHF band and up to microwave frequencies. Various examples of fully function building blocks (design and fabrication of antennas, integration with ICs and microcontrollers, power sources, as well as ink-jet printing techniques) demonstrate the revolutionary effect of this approach in low-cost RFID and RFID-enabled sensors fields. The first part of the workshop will demonstrate the state-of-the-art inkjet printing techniques focusing on the novelty of digital printing, next generation and mass production of inkjet printing while giving several examples and guidelines. The second part will focus on the "first green RFID-enabled sensor", battery-less long-range RFID modules, and current problems in design/measurements of RFID-enabled sensors that make extensive use of power scavengers of renewable energy sources.

Speakers:

- 1. Paul Calvert, University of Massachusetts-Dartmouth, USA "Reactive Inkjet Printing of Electronic Materials"
- Amin Rida, GEDC/ECE Georgia Tech, Toyota TTC "Modern RFID: Inkjet Printing of "Green" RFID & RFID Enabled Sensors on Flexible Substrates Conductive Ink-Jet Printed Antennas & Passives on Flexible Organics for RFID & WSN"
- 3. Dimitrios Anagnostou, South Dakota School of Mines and Technology, Rapid City, USA
 - "Green" Antennas Beyond RFIDs"
- 4. Li Yang, Georgia Institute of Technology, Atlanta, USA "Green" RFID-Enabled Wearable Sensors"
- 5. Edward Gebara, Georgia Institute of Technology, Atlanta, USA "Anti-Counterfeit Technology for RFID Applications"
- 6. Tohru Asami, The University of Tokyo, Bunkyo-ku, Japan "Toward Energy Harvesting for Wireless Sensor Networks"
- 7. Leila Deravi, Vanderbilt University "Progress Towards Inkjet Printed Metal Particle Films as Potential Memory Storage Devices"

152 WFC (IMS) Friday, 08:00 - 17:00

Recent Advances in Microwave Power Applications and Techniques (RAMPAnT)

Full-day workshop reviewed by MTT-15, MTT-1, IMS09.

Organizers:

Malgorzata Celuch, Warsaw University of Technology, Poland; IMS TPC Vadim V. Yakovlev, Worcester Polytechnic Institute, USA

Abstract: The RAMPAnT workshop presents an overview of current and emerging microwave energy applications in science and industry. It also exposes the MTT community to the recent advancements in electromagnetic modeling techniques relevant to high-power microwave processes, computer-aided optimization of microwave heating systems, experimental studies in material processing, imaging and measurements for high-power microwave scenarios, and developments of new industrial microwave technologies. Contemporary applications of microwave power span an increasing number of research and industrial sectors. Beyond widely known microwave heating and thawing of food products, applications include sintering of particulate materials, powder metallurgy and metal casting, microwave plasma generation and acceleration of chemical reactions, manufacturing of nanomaterials, processing of biocompatible alloys, and surface coating of polymers. All of these applications are represented in the workshop program. While on the fundamental level, microwave power applications deal with the same electromagnetic laws as conventional telecommunications, the multidisciplinary field of high power engineering has been historically somewhat outside the developments in "traditional" electromagnetics. The RAMPAnT Workshop aims to bring the communities of "classical" and "high power" microwave theory and techniques together to initiate information exchange and to identify the areas of common concerns.

Speakers:

- 1. Paolo Veronesi, University of Modena and Reggio Emilia, Modena, Italy "Control of the Microstructure of Powder Metallurgy Products by Microwave Heating"
- 2. Aly E. Fathy, University of Tennessee, Knoxville, TN "Electromagnetic and Thermal Analysis of High Power Industrial Microwave Ovens for Metal Casting Applications"
- 3. Sébastien Vaucher, EMPA, Thun, Switzerland "Time-Resolved Imaging of Material Changes Under Microwave Irradiation"
- 4. Wojciech K. Gwarek, Warsaw University of Technology, Warsaw, Poland "Modeling and Measurements of Susceptors for Microwave Heating Applications"
- 5. José Manuel Catalá-Civera, Technical University of Valencia, Valencia, Spain "Advanced Microwave Measurements for High-Power Applications"
- 6. Monika Willert-Porada, University of Bayreuth, Bayreuth, Germany "Parameter Analysis of Atmospheric Microwave Plasma Generation in Fluidized Beds"
- 7. Matthias Graf, Fraunhofer Institute for Chemical Technology, Pfinztal, Germany

"FEM Simulation of Microwave Plasma"

- 8. Vadim V. Yakovlev, Worcester Polytechnic Institute, Worcester, MA "Efficient Techniques of ANN-Based Microwave Imaging in Closed Systems"
- 9. Yoshio Nikawa, Kokushikan University, Tokyo, Japan "Microwave Power Applications to Metamaterials and Measurement of Complex Permittivity under NMR Temperature Mapping"
- 10. Lambert Feher, Forschungszentrum, Karlsruhe, Germany "Microwave Quantum Interactions for Polymer and Composite Curing"

WFD (IMS) Friday, 08:00 - 17:00 Emerging Applications of RF-MEMS

Full-day workshop reviewed by MTT-21, MTT-8, IMS09.

Organizers:

Pierre Blondy, XLIM - CNRS - Université de Limoges; MTT-21, IMS TPC Gabriel Rebeiz, University of California at San Diego; MTT-21, IMS TPC

Abstract: RF-MEMS are entering a maturing phase, where several companies are currently developing or proposing components that can be integrated into microwave systems. The workshop will first address the system level applications in an introductory talk, followed by the presentation of the latest results and development of several industrial switches. The technical development of high reliability RF-MEMS switches for microwave applications will be discussed in detail, from several developing companies in the US and Europe. In the afternoon, the workshop will focus on academic development and new and emerging areas in the field. Recent advances in high-Q tunable microwave cavities will be presented, with the latest results from US and Europe.

Speakers:

- 1. Brandon Pillans, Raytheon
- "Defense Applications of RF MEMS Technology"
- 2. Julio Costa, RFMD "RF-MEMS Switch Technology for Radio Front End Applications"
- 3. Jeroen Bielen, Epcos Netherlands "RF-MEMS Design for Reliability in Smart RF Communication Systems"
- 4. Tauno Vaha Heikkila, VTT Finland "Reconfigurable RF MEMS Tuning Networks from Handset to Millimeter Wave Applications"
- 5. Art Morris, Wispry "Tunable RF Modules for Mobile Applications"
- 6. Matthieu Chatras, XLIM CNRS Université de Limoges "Development of High-Q MEMS Tunable Filters"
- 7. Dimitrios Peroulis, Purdue University "Evanescent Cavity-Based Tunable RF MEMS Filters"
- 8. Gabriel Rebeiz, University of California at San Diego "Development of High-Q Evanescent Mode Tunable Filters and Planar Ceramic Tunable Filters for 1.5-6.0GHz Applications"
- 9. Raafat Mansour, University of Waterloo "Realization and Design of High-Q Tunable Filters"

153AB WFE (IMS) Friday, 08:00 - 12:00 156A

Stability of Nonlinear Microwave Circuits and Systems: Concepts, Analysis, and Design

Half-day workshop reviewed by MTT-16, MTT-1, MTT-6.

Organizers:

Christopher P. Silva, The Aerospace Corporation; MTT-16 Almudena Suárez, University of Cantabria; IMS TPC

Abstract: This workshop provides a comprehensive and practical treatment of the general nonlinear stability problem that arises in essentially all modern microwave circuits and systems. It is motivated by the fact that current analysis and design practices are inadequate at mapping out the full behavior of a given circuit or system, thereby leading to the possibilities of anomalous unstable behaviors or designs with marginal stability. The workshop will address the three basic aspects of this subject: concepts, analysis, and design applications. Definitions and classification of steadystate behavior, as well as their stability and change with parameters (bifurcation), will be discussed. The detection, analysis, and control of bifurcation in microwave circuits and systems will be addressed based on two fundamental CAD approaches that have been implemented. A set of practical applications of the techniques and tools covered here will be presented, ranging from the device to the system level. The representative set of applications will include such common circuits and systems as oscillators, power amplifiers, frequency dividers, self-oscillating mixers, frequency multipliers, phase-locked loops, and parametric circuits. The unresolved problem of instabilities in multi-device circuits, such as multi-function MMIC chips, will also be addressed, presenting available techniques to locate the instabilities in large, complex-topology circuits.

Speakers:

- 1. Christopher P. Silva, The Aerospace Corporation, USA "Overview of Steady-State Stability Concepts and Analysis for Microwave Circuits & Systems"
- 2. Almudena Suárez, University of Cantabria, Spain "Bifurcation Analysis and Control in Nonlinear Microwave Circuits"
- 3. Juan Mari Collantes, University of the Basque Country, Spain "Expanding the Capabilities of Pole-Zero Identification Techniques for Stability Analysis"
- Diego Masotti, University of Bologna, Italy
 " Global Stability Analysis of Nonlinear Microwave Circuits Based on Numerical Implementation of Bifurcation Theory "
- 5. Sebastien Mons, University of Limoges CNRS, France "Stability Issues in the Design of High Power Amplifiers and Oscillators"
- 6. Robert Melville, USAP, McMurdo Station, USA "Theory and Applications of Strong Parametric Excitation"

Sunday

SC-1 08:00 - 12:00 Room 50

Advances in the Design of Electrically Small Antennas

Instructor: Steven R. Best, The MITRE Corporation, Burlington, MA

Topics:

- > Fundamental Performance Limitations
- > Understanding Quality Factor and Bandwidth
- > Fundamental Electrically Small Antenna Elements
- > The Significance of Antenna Geometry
- > Impedance Matching Techniques
- > Mutual Coupling between Small Antennas
- > The Inverted-L, Inverted-F and PIFA Antennas
- > Considerations for RFID Applications
- > Recent Advances in Small Antenna Designs

Abstract: This half day short course is intended to provide microwave professionals and researchers with an understanding of the theoretical and practical limitations associated with designing electrically small antennas for wireless communication systems. The short course will describe numerous techniques that can be used to impedance match and optimize the efficiency and operating bandwidth of the small antenna. The relationships between the small antenna's physical and electrical properties will be considered in detail. This short course also presents and describes practical approaches for the design of PIFA and RFID antennas in the UHF band. These discussions include an understanding of the basic theory of these designs, equivalent circuit analysis, and ground plane effects. At the conclusion of the course, participants will understand the basic approaches and techniques used to design a number of practical electrically small antennas.

SC-2 13:00 - 17:00 Room 50

RFID Transponders and Systems Design

Instructors: Pavel Nikitin and KVS Rao, Intermec Technologies, Everett, WA

Topics:

- > History and operating principles
- > Forward and reverse links
- > Transponder and system characteristics
- > Overview of transponders, ICs, readers and printers
- > Testing and measurement systems and methods
- > Transponder design process and tradeoffs
- > Wideband transponder design examples
- > System design process and tradeoffs
- > Test and measurement system example
- > Latest developments in UHF RFID

Abstract: This half day short course is intended to introduce microwave professionals and researchers to the foundations of UHF RFID technology and to show how this knowledge can be applied to analysis and design of real transponders and systems. The course will provide an RF-centric tutorial overview of RFID systems, including simple models for forward and reverse links, test and measurement solutions, and design basics. The course will include several practical transponder and system design examples for various applications.

Comparative Study of the State-of-the-Art Short-Range Wireless Networking Standards

13:00 - 17:00

Instructor: Shahin Farahani, Freescale Semiconductor, Tempe, AZ

Topics:

SC-3

- > IEEE 802.15.4 and ZigBee
- > Ultra Low Power (ULP) Bluetooth (Wibree)
- > IPv6 over IEEE 802.15.4 (6LoWPAN)
- > Z-Wave
- > WirelessHART
- > Ultra Low Power WLAN
- > Overview of Other Short-Range Wireless Networking Standards

Abstract: The area of short range, low data rate wireless networking has become crowded with several standards. Some of these standards are competing for the same market segment, while other standards can be complementary. The goal of this half day short course is to describe the fundamentals and applications of each standard and identify the advantages and disadvantages of each standard for various applications.

Room 51
Short Courses

Monday

SC-4 08:00 - 17:00 Room 52A

Doherty RF Power Amplifiers, Theory and Practice

Instructor: Professor Steve C Cripps, Cardiff University, UK MTT Affiliations: MTT-20, IMS2009 TPC

Topics:

- > RFPA overview, PA Classes, efficiency tradeoffs
- > Introduction to Doherty PA, basic theory
- > Advanced DPA theory; matching networks, impedance inversion, bandwidth and linearity issues
- > Peaking PA design, "Doughnuts" simulator demonstration
- > Variations on classical Doherty PA
- > Practical issues

Abstract: The Doherty PA (DPA) has now reached high volume commercial implementation in the mobile communications sector, where it has allowed significant improvements in efficiency, combined with stringent linearity compliance. For example, 3G basestation PA modules are being shipped which have mean output powers up to 100 Watts (400Watt PEP), which have mean efficiencies of 50% and can be predistorted to give ACP levels of -60dBc. Yet the DPA is still regarded as a "guirky customer", which can frequently display significant performance variations from unit to unit in production. This shortcourse will present new critical look at the basic DPA theory. A new theory will be presented, which is able to predict most of the familiar "quirks" that are widely observed by DPA designers, and offers robust design strategies for eliminating the guirks in the design process, rather than in costly post-assembly alignment procedures. The full day course will include a Doherty PA configuration simulator ("Doughnuts") which illustrates some aspects of the new theory and will be made available to all course participants.

SC-5 08:00 - 17:00 Rooms 50&51

Low Phase Noise Oscillators: Lecture and Laboratory

Instructor: Jeremy K.A. Everard, BAE Systems/Royal Academy of Engineering Research, Professor, Department of Electronics, University of York, UK

Topics:

- > Oscillator phase noise theory
- > Optimum operating conditions
- > Flicker noise measurement and reduction
- > Oscillator tuning and the effect on phase noise
- > Generic design rules for low noise oscillators
- > Oscillator designs: LC, Crystal, SAW, CRO, DRO
- > Phase noise measurements: Phase detector and Direct digital measurements
- > Lab class
 - -Non contact measurement of Q0 and design of the resonator for correct QL/Q0
 - -Simulate and measure the open loop resonator on PCB
 - -Close Oscillator loop, measure phase noise and compare with theory

Abstract: This full day course will present theory and design lectures in the morning and a lab class in the afternoon. The lectures will present the theory and design rules required to design low noise oscillators operating within 0 to 1dB of the theory. The course will include the latest state of the art techniques and results as well as the material required for a clear understanding of the underlying principles. Detailed design discussions will cover oscillators using, LC, Crystal, SAW, Ceramic (CR) and Dielectric (DR) resonators. A battery powered laboratory pack will be provided to enable the delegates to design,

simulate, build and measure a 100MHz low noise oscillator. This pack will enable both fixed frequency and tunable oscillators to be built. The delegates will be provided with a copy of the PowerPoint slides and a disk containing the specific software required for simulation of the resonator and the phase noise. Delegates should bring a laptop to the laboratory class. The latest test equipment will be provided by Agilent, Rohde & Schwarz, Symmetricom. Delegates can either attend this full day class including lab or just the morning theory/design class (see separate listing SC-5A); however, the number of delegates attending the full day class is limited.

SC-5A 08:00 - 12:00 Room 50

Low Phase Noise Oscillators: Lecture Only

Instructor: Jeremy K.A. Everard, BAE Systems/Royal Academy of Engineering Research Professor, Department of Electronics, Univ. of York, Heslington, York, UK

Topics:

- > Oscillator phase noise theory
- > Optimum operating conditions
- > Flicker noise measurement and reduction
- > Oscillator tuning and the effect on phase noise
- > Generic design rules for low noise oscillators
- > Oscillator designs: LC, Crystal, SAW, CRO, DRO
- > Phase noise measurements: Phase detector and Direct digital measurements

Abstract: This half day course will present the theory and design rules required to design low noise oscillators operating within 0 to 1dB of the theory. The course will include the latest state of the art techniques and results as well as the material required for a clear understanding of the underlying principles. Detailed design discussions will cover oscillators using, LC, Crystal, SAW, Ceramic (CR) and Dielectric (DR) resonators. The delegates will be provided with a copy of the PowerPoint slides.

MicroApps

David Menzer, Chair

The Microwave Applications Seminars (MicroApps) serves as a forum for Exhibitors to present the technology behind their commercial products and their special capabilities. Again, this year, MicroApps is being hosted by Agilent Technologies and will feature a variety of measurement specific presentations by Agilent's measurement experts as well as a variety of other presentations from other exhibitors. Attendees will receive a free CD-ROM that includes informative details from every presentation. This year's MicroApps will be located in the Exhibition Hall between the main entrance escalators. For more information on the Agilent presentations please visit www.agilent.com/find/ IMS2009 where you can see how Agilent is helping connect expert to expert to solve tough design and measurement challenges.

Technical Sessions

Tuesday

09:20 - 09:40

Fast Component Characterization Using Modern Network Analysis Techniques Guillaume PAILLONCY, NMDG

10:00 - 10:20

Basic RADAR Measurements Using Modern Spectrum Analyzers Richard Overdorf, Agilent Technologies, Inc

10:20 - 10:40

Intermodulation Distortion Measurements with Improved Speed and Accuracy Considerations Hiroyuki Maehara, Agilent Technologies, Inc

11:00 - 11:20

mmWave Power Leveling and True Mode Stimulus Application Suren Singh, Agilent Technologies, Inc

11:40 - 12:00

Coherent Multi-Channel & Diversity Systems

John Hansen, Agilent Technologies, Inc

12:20 - 12:40

Low Cost and High Performance GaAs MMIC Solutions for Automotive Radar

Markus Behet, TriQuint Semiconductor, GmbH

12:40 - 13:00

Advanced MMIC Chipsets for 3G/4G Digital Microwave Radio Transceivers

Mark Hebeisen, Endwave Corporation

13:00 - 13:20

New Low-Cost GaAs MMIC Technologies for Millimeter Wave Applications

Mike Peters, Triquint Semiconductor

13:20 - 13:40

Low Noise, Low Harmonics and High Output Power – a Powerful Signal Generator Combination for High Performance Receiver Testing

Paul Schmitz, Agilent Technologies, Inc

13:40 - 14:00

Connectors – Precision or Not? Sathya Padmanabhan, Sr. Microwave Engineer, Maury Microwave Corporation

14:00 - 14:20

High-Speed Testing of Multi-State RF/ Microwave Devices and Sub-Systems Larry Smith, Director of Custom Test Systems, Auriga Measurement Systems, LLC; Loren Betts, Research Scientist, Agilent Technologies, Inc.

14:20 - 14:40

Fast, Flexible Automated Pulsed IV/RF Measurements for Accurate Non-linear Model Development

David Wandrei, Chief Scientist, Auriga Measurement Systems, LLC; Loren Betts, Research Scientist, Agilent Technologies, Inc.

14:40 - 15:00

Agilent Teams-up With T-Tech to Deliver the Fastest Way to Go From Idea to Prototype for RF Board Design

Mounir Adada, Agilent Technologies, Inc

15:00 - 15:20

Spatially Combined Amplifiers for Wide Band Power Applications Scott Behan, Cap Wireless, Inc.

15:20 - 15:40

4G System-Level Performance Simulation Strategy for Highly Manufacturable RFICs

Paul Colestock, Agilent Technologies, Inc

16:00 - 16:20 Enhanced Primary Noise

Calibration Systems (DC-110GHz) – Accuracy and Advantages Sathya Padmanabhan, Sr. Microwave Engineer, Maury Microwave Corporation

16:20 - 16:40

Application of Connectorless Connections to Microwave Switch Matrices Greg Mau, Custom Microwave Components,

lnc.

16:40 - 17:00

Basics for the Young (or "Less Experienced") RF/Microwave Subsystem

Greg Mau, Custom Microwave Components, Inc.

Wednesday

10:20 - 10:40 Test Solutions for LTE/MIMO Basestation Antennas

Rick Hartman, President; Drew Martin, Sales Manager; Summitek Instruments

10:40 - 11:00

Multi-Frequency Tuning using Cascaded Mechanical Tuners Roman Meierer, Gary Simpson, Maury

Microwave Corporation

11:00 - 11:20

OE Microwave Filters and Oscillators Danny Fung, OEWaves, Inc.

11:20 - 12:00

Prevention of Multipaction and PIM Mitigation in High Power, Space-based Applications

Vahid Badii, PhD., Meggitt Safety Systems, Inc.

12:00 - 12:20

Design Considerations and Methodologies for Low-loss, Highly Integrated Broadband Microwave Modules

Kavita Goverdhanam, Oksana Manzhura, Kenneth Hermanny, Shawn Dow, Nishant Patel, Anthony Pospishil, Micro-Con/Micronetics

12:20 - 12:40

Testing Methods and Interoperability Analysis of a Software Defined Radio Richard Overdorf, Agilent Technologies, Inc

12:40 - 13:00

Microstrip Launched Filters Craig Higginson and Sunita Shah, Q Microwave Inc.

13:00 - 13:20

New Measurement Technique of Testing Instantaneous Phase Fluctuation of Signal Sources

Akihiko Oginuma, Agilent Technologies, Inc

13:40 - 14:00

Ultra-Fast Noise Parameter Measurements with Improved Accuracy

Gary Simpson, Chief Technical Officer, Maury Microwave Corporation

14:00 - 14:40

Nonlinear Vector Network Analysis and Applications of X-parameters

Loren Betts, Research Scientist, Agilent Technologies, Inc

14:40 - 5:00

Load Pull with X-Parameters Produces Instant Large Signal Model with High Accuracy

Gary Simpson, Chief Technical Officer, Maury Microwave Corporation

15:00 - 15:20

New Ultra-High Output Power Signal Generator Simplifies High Power Amplifier Testing

Paul Schmitz, Agilent Technologies, Inc

15:20 - 15:40

Efficient and Causal Modeling of Multilayer Transmission Lines in ADS 2009

Radoslaw M. Biernacki and Yunhui Chu, Agilent Technologies, Inc

16:00 - 16:20

Measuring Amplifier Large Signal Noise Figure via Phase Noise

Jason Breitbarth, PhD., Holzworth Instrumentation

Exhibit Hall

MicroApps

16:20 - 16:40 SiGe Capabilities for High Frequency Applications Melinda Jarrell, Jazz Semiconductor

16:40 - 17:00

IonScan 800 – Ultra-precise Frequency and Film thickness Trimming for Semiconductor Industry

Andrea Kunz, Roth & Rau AG

Thursday

09:20 - 09:40 Ferrite Components Dr. Anthony Edridge, Rene Quintanilla, M2 Global Technology, Ltd.

09:40 - 10:00

Next Generation EM Analysis Software Scott Langdon, Remcom, Inc.

Technical Sessions

10:00 - 10:20

EMPIRE XCcel - Fast 64 bit EM Simulation Exploiting Modern Multicore CPU Technology W. Simon, A. Lauer, A. Wien, IMST GmbH

10:20 - 10:40

EM.CUBE® Electromagnetic Modules - A Collaborative Userware and Benchmarking Environment

Kazem F. Sabet, PhD., EMAG Technologies Inc.

10:40 - 11:00

Virtuoso Spectre GXL with "Turbo" Technology Enables Complete Verification of Multi-band Digitally-controlled RFIC Hany Elhak, Cadence Design Systems

11:00 - 11:20

Advances in EM Simulation of Large Structures Milos Pavlovic, WIPL-D d.o.o. 11:20 - 11:40 **SMT Equalizer for Gain Compensation in X Band Amplifiers** Alen Fejzuli, Shawn Karr, Gabriel Orozco, EMC/RF Labs

11:40 - 12:00

QuickSyn™ — A Compact, Fast-Switching, Low-Phase-Noise Frequency Synthesizer Alexander Chnakin, Phase Matrix, Inc.

12:00 - 12:40

High Power Amplifier Design Using Non-Linear Models in Agilent Genesys

Marvin Marbell, Chris Reul, Lawrence Dunleavy, Modelithics, Inc.

Exhibit Hall

12:40 - 13:00 GEMS Software and Turnkey System Wen Yu, Phd., Computer and Communication Unlimited

13:00 - 13:20

CAD Software Solutions for Passive Waveguide Components and Horn Antennas with Mician's µWave Wizard

Dr. Ralf Beyer, Mician GmbH

13:20 - 13:40

High Dynamic Range Hybrid Integrated Fiber Transmitters John A. MacDonald, Linear Photonics,LLC

Sponsoring Exhibitors

Platinum Sponsor



Gold Sponsors









Silver Sponsors

Anritsu Co. | Microwave Engineering Europe | Mimix Broadband | Murata Electronics | Synergy Microwave Corp.

Media Partners

Journal





The official media source of the MTT-Society

Microwave Week

Commercial Exhibit

The 2009 IEEE MTT-S International Microwave Symposium Exhibits are in Halls A & B1 of the Boston Convention and Exhibition Center. The IMS2009 is comprised of more than 500 exhibitors providing products and services for Wireless Communication, Radar, RF technologies, high frequency semiconductors, electromagnetics, commercial and military RF, microwave and mm-wave electronics and applications.

EXHIBIT HOURS have been scheduled to provide maximum interaction between conference attendees and exhibitor personnel:

Tuesday, 9 June	09:00 to 17:00 hrs
Wednesday, 10 June	10:00 to 18:30 hrs
Thursday, 11 June	09:00 to 15:00 hrs

Children under the age of 14 will not be permitted access to the exhibition hall at anytime.

Following is a list of exhibiting companies that was complete as of 17 February 2009.

2COMU 3G Metalworx Inc. A-Alpha Waveguide Co. A.J. Tuck Co. Acceleware Corp. Accumet Engineering Corp. Actipass R&M Co., Ltd. AdTech Ceramics Advance Reproductions Corp. Advanced Control Components Inc. Advanced Microwave Components Advantage Business Media/Wireless Design Aeroflex Inc. Aethercomm Inc. Agilent Technologies AKON Inc. Aldetec, Inc. Allrizon-TG Communications Equipment AMCAD Engineering American Bervllia, Inc. American Microwave Corp. American Standard Circuits Inc. American Technical Ceramics Ametek HCC Industries AML Communications Inc. Amplifier Solutions Corp. AmpliTech Inc. Analog Devices Inc. AnaPico AG Anaren, Inc. Anatech Electronics, Inc. Anoison Electronics, Ltd. Anritsu Co. Ansoft, LLC Antcom Corp. Antenna Magus Antenna Research Associates-ARA Inc. Antenna Systems & Technology Magazine APA Wireless Technologies Apollo Microwaves Ltd. Applied Radar, Inc. Applied Thin-Film Products AR RF/Microwave Instrumentation ARC Technologies, Inc. Arlon Tech. Enabling Innovation Artech House Artek, Ink. ASB Inc. Assemblies Inc. Astrolab Inc. AT Wall Company ATTEN Microwave Components Co., Ltd. Auriga Measurement Systems, LLC. Aurora Software & Testing SL Avago Technologies Averna

Avnet Electronics Marketing AWR Corp. AWT Co., Ltd. **B&Z** Technologies Barry Industries, Inc. Besser Associates, Inc. Bliley Technologies Inc. Bonding Source Boonton (Wireless Telecom Group) Bowei Integrated Circuits Co., Ltd. Brush Ceramic Products C W Swift & Associates, Inc. C-Tech Co., Ltd. **CAD** Design Software Cadence Design Systems, Inc. Cambridge University Press CAP Wireless Inc. CapeSym, Inc. Carlisle Interconnect Technologies Cascade Microtech, Inc. Centellax. Inc. Centerline Technologies, LLC Century Seals Inc. Cernex Inc. Channel Microwave Corp. Charter Engineering, Inc. Chengdu AINFO Inc. Ciao Wireless, Inc. Cirexx International Inc. Cobham DES Coilcraft Inc. Coining, Inc. Coleman Microwave Co. **Colorado Microcircuits** COM DEV Ltd. **Communications & Power Industries** Compex Corp. Component Distributors Inc. COMSOL Inc. Connectronics, Inc. Constant Wave, Inc. Corning Gilbert, Inc. Corry Micronics CORWIL Technology Corp. Crane Aerospace & Electronics Crane Polyflon Cree, Inc. Cristek Interconnects, Inc. Crystek Corp. CST of America Inc. CTT Inc. Cuming Microwave Corp. Custom Cable Assemblies Inc. **Custom Interconnects** Custom Microwave Components Inc. Daa-Sheen Technology Co., Ltd. dBm Delta Electronics Mfg. Corp.

Delta Microwave Design Workshop Technologies Inc. DeWeyl Tool Company, Inc. Diablo Industries Thin Film Diamond Antenna & Microwave Corp. Dielectric Laboratories Inc. Diemat, Inc. DiTom Microwave Inc. Dorado International Corp. DowKey Microwave Corp. Ducommun Technologies Inc. Dyconex AG Dynawave Inc. E2v EADS North America Eagle Comtronics, Inc. Eclipse Microwave, Inc. Elcom Technologies Inc. Electro Rent Corp. ElectroMagneticWorks Inc. EM Research Inc. EM Software & Systems-SA (PTY) Ltd. EMAG Technologies Inc. EMCO Elektronik GmbH Emerson & Cuming Microwave Products **Emerson Connectivity Solutions** Empower RF Systems Endicott Interconnect Technologies, Inc. Endwave Corp. Epoch Microelectronics, Inc. Equipment Management Technology ET Industries ETL Systems ETS-Lindaren Eudyna Devices Inc. EuMW2009 Excelics Semiconductor Inc. EZ Form Cable Corp. F&K Delvotec, Inc. Farran Technology Ltd. FCT Electronics Ferrite Co., The Ferro-Ceramic Grinding Filtel Microwave Inc. Flann Microwave Flexco Microwave Inc. Florida RF Labs Inc. Focus Microwaves Inc. Fotofab Freescale Semiconductor FTG Corp. FujiFilm Dimatix, Inc. FutureComm Co., Ltd. G-Way Microwave/G-Wave Inc. G.T. Microwave Inc. Gel-Pak / Quik-Pak

General Dynamics Satcom Technology Georgia Electronic Design Center Gerotron Communication GmbH **GGB** Industries Inc. Giga-Tronics Inc. GigaLane Co. Ltd. **Global Communication Semiconductors** GNI Microwave Co., Ltd. **Gowanda Electronics** Greenray Industries Inc. GuangShun Electronic Tech. Research Inst. Harbour Industries, Inc. HEI Inc. Helic S.A. Herley Industries Herotek Inc. Hesse & Knipps Inc. **High Frequency Electronics** Hirai SK Corp. Historical Booth Hittite Microwave Corp. Holzworth Instrumentation Inc. HTMicrowave Co., Ltd. Huada Intl. Electronics & Technology HUBER+SUHNER, Inc. HVVi Semiconductors Inc. HXI, LLC **IEEE Microwave Magazine** IHP GmbH IKE Micro Impellimax IMST GmbH In-Phase Technologies Infineon Technologies Innertron, Inc. **Innovative Fabrication** Innovative Micro Technology Instek America Corp. Instruments For Industry (IFI) Integra Technologies Inc. Integrand Software, Inc. International Manufacturing Services Ion Beam Milling, Inc. Isotec Corp. ITF Co., Ltd. ITT Corp. IW Inc. J & E Precision Tool, Inc. J MicroTechnology, Inc. Jazz Semiconductor Jersey Microwave, LLC. JFW Industries, Inc. Johanson Manufacturing Corp. Johanson Technology Inc. JQL Electronics Inc. JRE Test, LLC. Junper Interconnection Inc.

Jye Bao Co., Ltd. K&L Microwave Inc. Keithley Instruments, Inc. Keragis Group KMIC Technology Inc. Krvtar Inc. Kyocera America, Inc. L Gordon Packaging L-3 Communications - NARDA L-3 Electron Technologies, Inc. L-3 Narda Safety Test Solutions Labtech Ltd. LadyBug Technologies LLC Lake Shore Cryotronics Inc. Lansdale Semiconductor Inc. Lark Engineering Co. Laser Process Mfg. Inc. Laser Processing Technology, Inc. Laser Services Inc. Laserod, Inc. Linearizer Technology, Inc. Lintek Pty Ltd. LNX Corp. Logus Microwave Corp. Lorch Microwave Lorentz Solutions, Inc. LPKF Laser & Electronics M/A-COM Technology Solutions M2 Global Technology Ltd. Marcel Electronics International Maury Microwave Corp. Maxtek Components Corp. McGraw-Hill Professional MECA Electronics, Inc. Mega Circuit Inc. MegaPhase RFMW Cable Meggitt Safety Systems, Inc. Merix Corp. Merrimac Industries Inc. MESL Microwave Ltd. Metropole Products Inc. Mician GmbH Micreo Limited Micro Communication Inc. Micro Lambda Wireless, Inc. Micro-Chem Micro-Coax Inc. Micro-Mode Products Inc. **MicroApps** MicroFab Inc. Microlab (Wireless Telecom Group) Micronetics Inc. Microphase Corp. Microsemi Corp. Microsorb Technologies Inc. Microtech, Inc. **Microwave Applications Group** Microwave Circuits, Inc. Microwave Communications Labs, Inc. Microwave Development Labs Inc. Microwave Dynamics Microwave Engineering Corp. Microwave Engineering Europe Microwave Filter Co., Inc. Microwave Journal Microwave Technology, Inc. Microwavefilters S.R.L **MIG-Microwave Innovation Group** Millitech, Inc. Mimix Broadband Mini-Circuits Mini-Systems Inc. MITEQ, Inc. Mitsubishi Electric & Electronics

Modelithics Inc.

Modular Components National Molex Mosis MPDevice Co., Ltd. MtronPTI Municom GmbH Murata Electronics NaF Technology Corp. Nagase America Corp. Nanjing Jiexi Technologies Co., Ltd. Nanowave Natel Engineering Co., Inc. National Instruments National Reconnaissance Office NAVICP NDK Netcom Inc. Networks International Corp. (NIC) Nitronex Corp. Noise Com (Wireless Telecom Group) NoiseWave Corp. Norden Millimeter Inc. Northeast Electronics Corp. NSI NTK Technologies, Inc. Nuvotronics, LLC NuWaves Engineering NXP Semiconductors **Octagon Communications** OEwaves Inc. OMMIC Oneida Research Services, Inc. **OPHIR RF Inc.** Orient Microwave Corp. P/M Industries Inc. P1dB, Inc. PA&E Paratek, Inc. Partron Co. Ltd. Pascall Electronics Ltd. Passive Microwave Technology, Inc. Passive Plus Inc. PedaSoft LLC. Pendulum Instruments, Inc. Penn Engineering Components, Inc. Penton Media Peregrine Semiconductor Corp. Phase Matrix Inc. Phoenix Company Of Chicago, The **Piconics Inc.** Planar Monolithics Industries, Inc. Plextek Ltd. Pole/Zero Corp. Polyfet RF Devices Ponn Machine Cutting Company, Inc. Poseidon Scientific Instruments Precision Connector, Inc. Precision Ferrites & Ceramic Inc. Precision Photo-Fab, Inc. Presidio Components Inc. Prewell Corp. Pulsar Microwave Corp. Q Microwave, Inc. Q-par Angus Ltd. Q3 Laboratory Quest Microwave Inc. **Ouestech Services Corp.** QuinStar Technology Inc. R&D Microwaves LLC R&K Company Ltd. R-Theta Thermal Solutions Inc. Radant MEMS, Inc. Radiall-AEP Reactel Inc. Reinhardt Microtech AG

RelComm Technologies Inc. Remcom Inc. Remtec, Inc. Resin Systems Corp. Response Microwave Inc. RF Depot Inc. RF Globalnet RF Industries RF Connectors Div. **RF** Logic **RF** Morecom RFcore Co., Ltd. **RFHIC Corp.** RFMD RFMW, Ltd. RFS Ferrocom Ferrite Division RH Laboratories Inc. **Richardson Electronics** RIV Inc. **RJR Polymers Inc.** RLC Electronics Inc. Rogers Corp. Rohde & Schwarz Inc. Rojone Pty. Ltd. Rosenberger North America LLC Roswin, Inc. Roth & Rau AG RTx Technology Co., Ltd. Sage Laboratories Inc. Sainty-Tech Communications Ltd. Samsung Electro-Mechanics Co. San-tron Inc. Sangshin Elecom Co., Ltd. Sawnics Inc. Scientific Microwave Corp. SciTech Publishing Inc. SEI Semi Dice Inc. SGMC Microwave Shadow Technologies, Inc. Shenzhen Sinte Technology Co., Ltd. Sigma Systems Corp. Signatone (Lucas/Signatone) Sinclair Manufacturing Co. SIPAT (CETC-26) Skyworks Solutions, Inc. Sonnet Software Inc. Sonoma Scientific, Inc. Soshin Electric Co., Ltd. Southwest Microwave Inc. Spectrum Elektrotechnik GmbH Spectrum Microwave Inc. Spinner Atlanta Sprague-Goodman Electronics Inc. SRI Connector Gage Company **SRI** Hermetics SRI Hermetics SSI Cable Corp. State Of The Art Inc. Stellar Industries Corp. Stellar Microelectronics StratEdge Corp. Summitek Instruments Inc. Sunwave Communication Co., Ltd. SUNWAVETEC Co., Ltd. Superior Technical Ceramics Corp. Suron ACA Ltd. SUSS Microtec Inc. Suzhou New ChengShi Electronics Co., Ltd. SV Microwave Inc. Synergy Microwave Corp. Synopsys, Inc. T-Tech Inc. Taconic Tactron Elektronik oHG

Microwave Week

Tahoe RF Semiconductor, Inc. TDK-Lambda Americas Tecdia Inc. Techmaster Electronics, Inc. Technical Research & Manufacturing Technical Services Laboratory Inc. Tegam, Inc. Tektronix Inc. Teledyne Coax Switches Teledyne Cougar Teledyne Defence Limited Teledyne MEC Teledyne Microelectronics Teledyne Microwave **Teledyne Relays** Teledyne Scientific Company Teledyne Storm Products Teledyne Technologies Telegartner, Inc. Telogy Temp-Flex Cable Inc. TestEquity LLC Thales Components Corp. Thermacore, Inc. THINFILMS Inc. Times Microwave Systems TMD Technologies Ltd. Toshiba America Electronic Cmpts. TRAK Microwave Corp. Trans-Tech Transcom Inc. Trilithic Inc. **TriQuint Semiconductor** Tronser Inc. TRU Corporation Inc. TT Electronics TTE Inc. UBE Industries, Ltd. UltraSource Inc. UMS (United Monolithic Semiconductors) University Booth UTE Microwave Inc. Validus Technologies LLC Valpey Fisher Corp. Vectron International Verspecht-Teyssier-Degroote VIDA Products, Inc. Virginia Diodes Inc. Vishay Intertechnology Voltronics Corp. W.L. Gore & Associates Wave-Tech Inc. Wavenics, Inc. Weinschel Associates Wenzel Associates Inc. Werlatone Inc. West Bond Inc. Wevercomm Wilev Williams Advanced Materials Inc. WIN Semiconductor Corp. WIPL-D D.O.O. Wireless Telecom Group Xi'an Forstar S&T Co., Ltd. Xi'an HengDa Microwave Tech. Dev. Co. XMA Corp. YaGuang Electronics Co., Ltd. Yangzhou Jingcheng Electronics Co., Ltd. YanTat Group Z-Communications, Inc. Zeeteq Electronics Ltd. Zeland Software, Inc. Zentrix Technologies ZIFOR Enterprise Co. Ltd.

Microweek Week

Social and Special Events

Sunday, 7 June 2009

RFIC Symposium Reception 19:00 - 22:00

Westin Grand Ballroom

Immediately following the RFIC Plenary Session, all RFIC Symposium attendees are invited to attend a complimentary reception hosted by RFMD. This social event is a key component of the RFIC Symposium, providing an opportunity to connect with old friends make new acquaintances and catch up on the wireless industry. Admittance is included with RFIC Symposium registration. Additional tickets can also be purchased separately at registration.

Monday, 8 June 2009

Workshop and Short Course Breakfast 07:00 - 09:00 **RFIC Attendees Breakfast**

07:00 - 09:00

253ABC

258AB

These breakfasts are for all persons registered as technical participants in the Workshop, Short Courses and RFIC events. Technical coded badge required for admission.

IMS 2009 Golf Tournament

07:00 - 14:00

Granite Links Golf Club, Quincy, MA

Start your week off right; relax with fellow conference attendees at the IMS 2009 Golf Tournament.

In the format of a four-man scramble, the tournament will take place at the Granite Links Golf Club (www.granitelinksgolfclub.com), set amidst a former granite quarry with spectacular views of the Boston skyline and voted "Top Ten Best New Upscale Golf Course in the US".



Individual and team prizes will be given after the tournament and attendees can choose to participate in a lunch after awards are announced. Please join us to celebrate the conference, of which you, the participants, are a key ingredient. All skill levels are welcome.

Note: Transportation departs Boston

Convention and Exhibition Center at 06:30. Check-in 07:00 and Shotgun Tournament runs from 08:00–13:00. Continental breakfast and lunch will be provided at the Tavern Restaurant, named one of the fifty "Best 19th Holes in the Country" by Golf Digest! Return trip to Boston departs promptly at 14:00.

Register at www.ims2009.org/golf/ims2009

MTT-S Welcome Reception 19:00 - 21:00

BCEC Ballroom East

All Microwave Week attendees and exhibitors are invited to attend a complimentary reception hosted by MTT-S immediately following the IMS Plenary Session in the adjoining Ballroom. The Plenary and Reception are open to all IMS attendees.

Tuesday, 9 June 209

RFIC and IMS Attendees Breakfast

07:00 - 09:00

253ABC

This breakfast is for all persons registered as technical participants in RFIC and IMS events. Technical coded badge required for admission.

GOLD Reception 17:30 - 19:30

The Fish Exchange Building, 1 Fish Pier

The IEEE MTT Graduates of Last Decade (GOLD) Committee invites all MTT GOLD members to a complimentary reception at the Exchange Conference Center on Boston's Historic Waterfront. This will be an excellent opportunity not only to relax and entertain, but also to interact and network with other GOLD members. From the BCEC walk northeast on D street to the end of the Fish Pier.

IEEE MTT-S Women in Microwaves Reception Westin Commonwealth Ballroom A 18:00 - 20:00

Meet and interact with industry professionals who share a mutual interest in promoting the WIM forum. An association celebrating the growing number of women in the tech field is the IEEE Women in Microwave (WIM). The WIM recognizes women's outstanding achievements in electrical and electronics engineering within the microwave discipline through various award nominations. It also promotes advancement for women and facilitates the gathering and dissemination of information regarding the status of women in the industry; initiatives for, by and on behalf of women, and ways to improve the climate for women in the workplace.

Ham Radio Social 19:00 - 22:00

Westin Commonwealth Ballroom C

CQ, CQ, CQ, Calling All Hams

IMS2009 will host a social on Tuesday evening for ham radio operators. Dale Clement, AF1T will give a unique talk titled, "See How Antennas Work", using live physical examples on the 70 cm band. Bring your QSL card for display!

For those Attendees who are involved with Amateur Radio, Boston is radioactive. You should plan on bringing a radio for 2M, 440MHz, and 900MHz. Repeaters for the symposium will be Boston at 145.230 (PL 88.5) and at 444.700 (PL 88.5), Waltham at 449.075 (No PL), and Waltham at 927.1375 (PL 131.8).

You can find an up to date list of repeaters blanketing the Boston area at the following website: http://www.nerepeaters.com/. 73 de AC1J, KA1LEP

Wednesday, 10 June 2009

Workshop Breakfast	
07:00 - 09:00	258AB
IMS Attendees Breakfast	
07:00 - 09:00	253ABC

These breakfasts are for all persons registered as technical participants in the Workshop and IMS events. Technical coded badge required for admission.

Industry Hosted Cocktail Reception 17:00 - 18:30

BCEC Exhibit Hall

Symposium exhibitors will host a cocktail reception in the exhibit hall of the Convention Center. Refreshments and hors d'oeuvres will be served throughout the exhibit area courtesy of the exhibitors beginning at 17:00. The reception is open to all registered attendees.

MTT- S IMS Awards Banquet 19:00 - 22:00

BCEC Ballroom



Continuing a tradition for the Boston IMS, the MTT-S Awards Banquet, scheduled for June 10, 2009 will again feature a distinguished speaker. Dr. David Thornburg is an award-winning futurist, author and consultant whose clients range across the public and private sector, both in the United States and in Brazil. As the founder and director of global operations for the Thornburg Center, and as Senior Fellow of the Congressional Institute for the

Future, he conducts research and provides staff development in the areas of educational futures, multimedia, communications and whole mind education throughout the Americas. He helps clients to think intelligently about the future and is active in exploring ways that telecommunications and multimedia will change the face of learning, both at home and in the classroom. The evening event promises to be engaging, fun and informative. Beginning at 7 PM, following the conference general reception, IMS Chairman Fred Schindler will open the event with welcoming remarks. After a superb dinner with live background music, awards will be presented for the accomplishments of exceptional people working in the field of microwaves.

Thursday, 11 June 2009

IMS Attendees Breakfast

07:00 - 09:00

This breakfast is for all persons registered as technical participants in the IMS event. Technical coded badge required for admission.

MTT-S Student Awards Luncheon 12:00 - 14:00

Westin Commonwealth Ballroom

253ABC

All students and advisors are invited to attend this luncheon which recognizes recipients of the MTT-S Undergraduate Scholarships, MTT-S Graduate Fellowships, IMS2009 Student Volunteers, IMS 2009 Student Paper Awards, and the winners and participants of the IMS2009 Student Design Competitions. The luncheon is complementary to all students, their advisors, competition judges, and presenters.

Thursday Evening Social Cruise Provincetown II at the World Trade Center 19:00 - 21:00

Thursday evening will be the time to take a break from the sessions and workshops to enjoy Boston from a wonderful vantage point. We invite you to join us for a couple of hours on Thursday evening for a cruise of Boston Harbor. Let us share with you the views of Boston's skyline and the harbor islands from our ship, while relaxing with something to drink, something to eat, and music to serenade us while we cruise the evening away.

Our ship sails from the World Trade Center in the Seaport District, a short two block walk from the convention center. The ship is outfitted with table seating, perimeter seating, an enclosed deck, semi enclosed deck, and the enormous top deck will ensure a wonderful time on the water.

Friday, 12 June 2009

Workshop Breakfast	
07:00 - 09:00	258AB
ARFTG Attendees Breakfast	
07:00 - 09:00	104AB

These breakfasts are for all persons registered as technical participants in the Workshop and ARFTG events. Technical coded badge required for admission.

Guest Program

For information on Guest Tour pre-registration see page 16.

Guest Hospitality Suite

Location: Westin Boston Waterfront, Harbor Ballroom I – Conference Level

A hospitality suite is planned for all guests of IMS 2009 technical attendees. Guests are invited to relax, enjoy a bite to eat and take advantage of the activities planned throughout the city of Boston. All tours will depart from the guest hospitality suite and a representative from the city will be available for questions about Boston. A continental breakfast and light refreshments will be served daily.

The hospitality suite will be open from Sunday, 7 June through Thursday, 11 June from 07:00 – 16:00 and is reserved for guests of attendees only. IMS 2009 attendees are encouraged to take advantage of the food, beverage and services available at the Boston Convention and Exposition Center (BCEC).

Tours and Special Events

Sunday, June 7, 2009

Harvard University and the JFK Library—with Stop at Harvard Museum of Natural History to view Glass Flowers Time: 12:30 - 17:00 Price: \$55.00 per person

You will explore the world famous Harvard University area where the young JFK lived and studied. You will stroll through Harvard Yard, the original campus of the oldest university in the country. You will have time to browse in Harvard Square, with its shops, boutiques, and over 25 bookstores.

Following Harvard Square, your guests will stop at the Harvard Museum of Natural History to view the showplace that houses unique glass flowers.

Since the 1880's the Botanical Museum of Harvard University has been the showplace of the unique "garden in glass." True to life glass models of over 700 plant species have inspired reactions ranging from amazed admiration to disbelief. The accuracy of their forms corroborated by botanists, attests to the artistic and scientific skill of their creators, Leopold Blaschkka and his son Rudolf.

Their family, originally from Venice, included numerous artistic technicians who had, through many generations, developed great proficiency in the working of glass, enamel and metals. In addition to being a popular attraction, the glass flowers collection serves as a useful adjunct to the study of botany and is regularly used for that purpose by the students of Harvard and other colleges in the Boston area.

Your tour will continue as you travel from Cambridge to the shoreline of Dorchester Bay, where you will visit the spectacular John F. Kennedy Library, designed by I.M. Pei. First you will see a short film about President Kennedy, and then you will walk the campaign trail, view the famous Kennedy/Nixon debates, see the often-humorous press conferences, and continue on through the highlights of his presidency. You can sit in on the strategy sessions during the Cuban Missile crisis; see the Kennedy oval office and the gifts the Kennedy's received during his presidency, as well as mementos from his



personal life. For a short time, you will re-live the thousand days of "Camelot".

Includes: Roundtrip transportation via executive coach, professional guide service, admissions and taxes

Boston Duck Tours: The Ride of Your Life Time: 13:00 – 15:00 Price: \$42.00 per person

Unless you fought in World War II, you probably haven't ridden on a "DUKW" before. This "duck" is an authentic renovated amphibious landing vehicle, retrofitted to take you on a special historical tour of Boston, with a



special splashdown right into the Charles River for a breathtaking waterside view of Boston, the kind of view that you can't get anywhere else. The tour starts off impressively at your hotel when your chartered "duck" and conDUCKtor call for you. Your tour will last approximately 70-80 minutes, during which you'll

see the highlights of Boston's Freedom Trail and other famous landmarks. You'll cross over the Charles River, and once on the Cambridge side, your "duck" becomes waterborne, for the ride of your life.

Includes: Private duck rental, professional guide service and taxes

Monday, June 8, 2009

A Tour of Newport and Its Mansions Time: 08:30 - 17:00 Price: \$115.00 per person

Newport, Rhode Island, is rich in both history and culture. A town which was established in the colonial era, made a name for itself during America's Gilded Age, and since has become the yachting capital of the world. Today, the town thrives as a hub for American culture and visitors are faced with an abundance of activities, quaint B&B's, museums, shops, beaches, and outstanding restaurants. Newport is not to be missed.

Located seventy miles south of Boston, guests will be whisked to Newport for an opportunity to explore the town and experience the lifestyles of the rich and famous while touring the infamous mansions. You will visit the spectacular "Breakers" mansion, the summer "cottage" of Cornelius Vanderbilt, Chairman and President of the New York Central Railroad system. In 1893, Cornelius Vanderbilt II, commissioned architect Richard Morris Hunt to design and create a 70-room Italian Renaissance- style palazzo inspired by the 16th century palaces of Genoa and Turin.

Guests will also tour The Marble House, built for William K. Vanderbilt. Constructed between 1888 and 1892, it was to become a social and architectural landmark that set the pace for Newport's transformation from a quiet summer colony of wooden houses to the legendary resort of opulent stone palaces.

Inspired by the Petit Trianon at Versailles, the cost of the house was reported in contemporary press accounts to be \$11

t Versailles, orted in to be \$11

million, of which \$7 million was spent on 500,000 cubic feet of marble.

After touring these homes, guests will explore Newport Harbor and will enjoy a luncheon at one of the town's most charming restaurants. The group will then take pleasure in a tour of the famed 10 mile Ocean Drive for a view of the area's estates and gardens which dot this beautiful shoreline.

Includes: Roundtrip transportation via executive coach, professional guide service, admissions, tours, luncheon and taxes



For information on Guest Tour pre-registration see page 16.

Complete Tour of Boston: 350 Years in a Day with Guided Trolley Tour Time: 09:00 - 13:00 Price: \$40.00 pt

Price: \$40.00 per person

Boston is comprised of many neighborhoods, each with its own architecture and atmosphere. You'll have an overview of the city when you see the major neighborhoods and the historic sites that make Boston such a fascinating place to visit. You'll see Beacon Hill, Boston's most prestigious address, and visit the Back Bay, an elegant section of Boston which, one hundred years ago, was built according to the plan of Paris' Bois de Bologne.



You'll pass by the Midtown Cultural District, Chinatown, and the South End, which boasts the largest Victorian neighborhood in the United States. Fenway Park is on your route, and the Fens section of Boston, which contains the Museum of Fine Arts, Symphony Hall, and the Isabella Stewart Gardner Museum (will also be seen). You'll drive by the Waterfront and then walk into the North End, Boston's famous Italian neighborhood where you will visit the Old North Church to

see where the lanterns were hung to signal the beginning of Paul Revere's famous "midnight ride". Boston's Freedom Trail continues from here. You will see the USS CONSTITUTION, as well as the Massachusetts State House, the Old South Meeting House, Boston Common, and other sites along the Trail.

To enhance the tour, your guests will be guided in an Old Town Trolley.

Includes: Roundtrip transportation via Trolley, professional guide service, admissions and taxes

Note: This tour involves a considerable amount of walking on hills and cobblestones. Participants should be aware of these conditions and are advised to wear walking shoes.

Tuesday, June 9, 2009

Wrentham Village Outlets Time: 10:00 - 17:00

Price: \$35.00 per person

Wrentham Village is one of the easiest to negotiate and most attractive outlet shopping areas in the country. With 170 outlet stores, one can find impressive savings at Barneys New York Outlet, Bebe, Donna Karan, Gap Outlet, Hugo Boss, Kenneth Cole, Liz Claiborne, Nike, Polo Ralph Lauren, Reebok, Sony, Timberland, Versace, Williams-Sonoma and much more! There are shops of every kind, as well as many areas to relax and enjoy refreshments during your visit. You will be given a map, as well as a variety of coupons prior to your arrival. Wrentham is located approximately 45 minutes from Boston and the drive is well worth it! Here you can truly "shop 'til you drop"!

Includes: Roundtrip transportation, professional guide, coupons, maps and taxes

The Boston Freedom Trail Walking Tour Time: 09:30 - 13:30 Price: \$33.00 per person

In 1958, local journalist William Schofield had the idea that Boston's sites could be more accessible to residents and visitors, and conceived of the Freedom Trail. Follow the Red Bricks Road! The Freedom Trail is a 2.5 mile red brick or red painted line that travels through Beacon Hill, downtown Boston, the North End and Charlestown.

A natural and easily accomplished idea, the sixteen historic sites between Boston Common and The Bunker Hill Monument in Charlestown were connected by a red line, and The Freedom Trail was born. In addition to the historic sites, the beauty of the sights, sounds, and neighborhoods along the way makes walking The Freedom Trail an instantly popular activity. Whether taking a brisk walk or a lazy day stroll slip into a cozy pub for coffee, tea or a more spirited beverage or relax in an outdoor café for refreshing summer cooler. Be sure to wear layers, bring an umbrella and be sure to put on your most comfortable walking shoes!

This tour will be enhanced as your guests go on a ride on Boston's famed Swan Boats!

Includes: Professional guide service, refreshments and ride on swan boats

Note: This tour involves a considerable amount of walking on hills and cobblestones. Participants should be aware of these conditions and are advised to wear walking shoes.

Boston Red Sox-Fenway Park Time: 19:00

Bleachers: \$165.00

Enjoy a Red Sox game at America's most beloved stadium. Your senses will light up as you step onto Yawkee Way and catch a smell of a "Fenway frank," hear the cheers of the most dedicated fans, and see the most authentic stadium in America. Visit the home of the 2004 and 2007 World Champion Red Sox team as they battle it out with their opponent. This is the park where the Babe pitched, the Kid hit, Yaz dazzled, and famed players such as Yuke and Big Papi Ortiz still thrill young fans today.

Soak up the rich history, hear the echoes of the past and get a glimpse of the Green Monster. Throughout the duration of the game you're guests have the opportunity to shop in a licensed Red Sox gift shop for authentic Red Sox souvenirs right in the Park and on Yawkee Way. Enjoy the excitement and intensity of a Boston Red Sox vs. New York



Yankees evening game!! All guests are on their own for transportation to Fenway Park. Price includes seat only.

Limited number of seats are available

Boston Pops Performance Time: 20:00 performance

Boston Pops Performance on this evening is a Judy Garland program consisting of all of her well-known songs with special guest, Linda Eder, a fabulous Broadway singer who will accompany the orchestra with her fabulous vocals. All guests are on their own for transportation to Symphony Hall. Price includes seat only.

Limited number of seats are available

Price: \$51.00

Guest Program

For information on Guest Tour pre-registration see page 16.

Wednesday , 10 June, 2009

Gloucester and Rockport — Scenic Cape Ann Time: 09:00 - 17:00 Price: \$98.00 per person

You'll see some of the Northeast's most beautiful coastline, as well as the "Man at the Wheel" — the fisherman's Memorial Statue on Gloucester harbor. Gloucester balances it's intertwined past and future with assurance and skill. The city, long renowned among artists for the purity of its light, has traditionally been the home of internationally known painters like



Winslow Homer, Edward Hopper and Fitzhugh Lane and sculptors like Walker Hancock.

In addition, the Cape Ann Symphony makes its home in Gloucester as does the critically acclaimed Gloucester Theatre Company, whose director and playwright, Israel Horovitz, is known on and off Broadway. But the beautiful harbor that attracts a sizeable artistic population is also a working harbor which is one of the top three fishing ports in the Northeast. The picturesque fishing fleet, manned primarily by Portuguese and Italian residents of the city, supports a major fish packaging and freezing industry. There will be a photo stop at the Fisherman's Statue and a visit

to beautiful Hammond Castle perched on the Atlantic. John Hays Hammond, Jr. built his medieval style castle between the years 1926 and 1929 to serve both as his home and as a backdrop for his collection of Roman, medieval, and Renaissance artifacts. Visitors are welcome to explore the castle on a self-guided tour of eight rooms including the great hall, indoor courtyard, Renaissance dining room, two guest bedrooms, the inventions exhibit room, the Natalie Hays Hammond exhibit room, the tower galleries, as well as several smaller rooms and passage ways. Luncheon will be enjoyed at a local restaurant and then you will be driven further north to Bearskin Neck in Rockport, world-renowned home of artists and artisans. Here you can capture your own photograph of "Motif #1" - one of the most photographed and painted scenes in America. Time will also be allotted for shopping and browsing before returning to your hotel.

Includes: Roundtrip transportation via executive motor coach, professional guide service, lobster lunch and all taxes

Bike Your Way Through the Streets for Boston Time: 09:30 - 13:30 Price: \$100.00 per person

Why see the city through the windows of a bus, when you can see the city in a much more intimate way... on bike!! Without question this biking experience provides the best way to see all that Boston has to offer in a fun and exciting setting. Boston is notorious for its vast history, its quaint community districts and its traffic! Why put yourself through that? On bike you will have better access to all of the sites of the city. The signature city view tour allows you to pedal from historic Fenway Park, home of the World Champion Boston Red Sox, through modern and dynamic Back Bay, into historic Beacon Hill, with a stop for a cup of coffee and a pastry in the Italian North End. You will see parts of Boston off the beaten path and experience the diversity of Boston's contemporary and classic neighborhoods. You are sure to enjoy this unique way of seeing the city.

Includes: Bike Delivery to hotel, professional tour guide service, bike and helmet rental, and customized city tour of Boston, water, taxes and gratuities

Lexington and Concord — The Shot Heard 'Round the World Time: 09:00 - 13:30 Prio

Price: \$52.00 per person

You will see many historic sites on this visit to Lexington and Concord.

This tour includes a stop at historic Lexington Green, the site of the initial skirmish of the Revolutionary war.

Surrounding the Green are three historic homes, all of which played a significant role in the events which occurred in April 1775. You will have a private tour of one of these homes and learn what role it played as our



country declared its freedom from England. You will travel the Battle Road between Lexington and Concord. You will visit the Old North Bridge, see the Minuteman Statue and stand on the site where "the embattled farmers stood and fired the shot heard round the world". While in Concord, you will pass by the homes of Louisa May Alcott, Ralph Waldo Emerson and Nathaniel Hawthorne, three of Concord's most famous residents.

Includes: Roundtrip transportation via executive motor coach, professional guide service, admissions and taxes.

Thursday, June 11, 2009

Masterpieces of Art with lunch at Bravo Restaurant Time: 10:00 - 14:00 Price: \$107.00 per person

Bostonians have always supported the arts and the Museum of Fine Arts is a grand example of this commitment. You will view the incomparable collections of paintings, sculpture, decorative arts, drawings and photographs, representing Eastern and Western cultures from ancient

times to the present. To make these collections even more meaningful, our fine arts lecturer will interpret.

The masterpieces of art as they were perceived by various artists and cultures throughout the ages. This is a fascinating tour and one you will long remember. Following the tour your guests will have time on their own to



browse through the museum and gift shop, and then head to the West Wing Galleria to will enjoy a delicious seated luncheon at Bravo Restaurant.

Includes: Roundtrip transportation via executive coach, services of a professional guide, admissions, docent tour of the Museum of Fine Arts, Lunch at Bravo Restaurant at MFA.

Boston Duck Tours: The Ride of Your Life Time: 11:00 - 13:00 Price: \$42.00 per person

For details see "Boston Duck Tours" on page 78.

Includes: Private duck rental, professional guide service and taxes

Microwave Week

公



Boston Convention & Exhibition Center 415 Summer Street Boston, Massachusetts 02210 ph: 617.954.2800 fx: 617.954.3326 www.AdvantageBOSTON.com





ion Center Authority owns and operates the Boston Convention & Exhibition Center and the Hynes Convention Center

etts Conve

2009 International Microwave Symposium

1721 Boxelder St. Ste. 107 Louisville, CO 80027



Plenary Session now on Monday Night! See pg. 4

