Aurelia

Cecilia

Flavia

Hortensia

EuMIC01

Modelling and Design of Active and Passive (M)MIC Components

Chair: Ali Rezazadeh, Manchester University
Co-Chair: Giovanni Ghione, Politecnico di Torino

EuMIC02

Transmitter and Receiver Circuits

Chair: Christoph Scheytt, University of Paderborn
Co-Chair: Frank van den Bogaart, TNO

EuMIC03

Millimetre-Wave PA in Silicon Technology

Chair: Chafik Meliani, IHP
Co-Chair: Ullrich Pfeiffer, University of Wuppertal

EuMIC04

Microwave Circuits

Chair: Massimo C. Comparini, Telespazio
Co-Chair: Éric Tournier, LAAS/CNRS

EuMIC01-01 2D Numerical Simulation for InGaP/GaAs HBT Safe Operating Area

B. Lin², N. G. Tao¹, C. Lee^{1,2}, T. Henderson¹, B. J. Lin¹, ¹Triquint Semiconductor, Hillsboro, United States, ²National Chiao Tung University, Hsinchu, Taiwan

EuMIC02-01 A 5GHz/60GHz Receiver Front-End CMOS IC in 90nm CMOS Technology

R. Inagaki¹, T. Tanaka¹, M. Tsuru¹, E. Taniguchi¹, H. Fukumoto¹, S. Kameda², N. Suematsu², A. Taira², T. Takagi², K. Tsubouchi², ¹Mitsubishi Electric Corporation, Kamakura, Japan, ²Tohoku University, Sendai, Japan

EuMIC03-01 A Broadband 65nm CMOS Transformer-Coupled Power Amplifier for WiGig Applications

A. Larie¹, E. Kerhervé¹, B. Martineau², D. Belot², ¹University of Bordeaux, Talence, France, ²STMicroelectronics, Crolles, France

EuMIC04-01 Compact Sub-Harmonic Mixer for Q-Band Satellite Communications

D. Palombini^{1,2}, S. Arena², T. Cavanna², E. Limiti¹, ¹Università di Roma Tor Vergata, Rome, Italy, ²Wave Advanced Technology Applications s.r.l., Rome, Italy

EuMIC01-02 Characterization and Simulation of Traps in InGaP/GaAs HBT by GR Noise Analysis

A. Al Hajjar¹, J. Nallatamby¹, M. Prigent¹, J. Jacquet², ¹XLIM, Brive, France, ²III-V Lab, Marcoussis, France

EuMIC02-02 9mW 6Gbps Bi-Directional 85-90 GHz Transceiver in 65nm CMOS

N. Weissman, E. Socher, Tel Aviv University, Tel Aviv, Israel

EuMIC03-02 An 8-Way Power-Combining E-band Amplifier in a SiGe HBT Technology

E. Ojefors¹, C. Stojij¹, B. Heinemann², H. Rücker², ¹Sivers IMA AB, Kista, Sweden, ²IHP GmbH, Frankfurt (Oder), Germany

EuMIC04-02 6-12 GHz Double-Balanced Image-Reject Mixer MMIC in 0.25_μm AlGaIn/GaN Technology

M. van Heijningen, J. Hoogland, P. de Hek, F. van Vliet, TNO, Den Haag, Netherlands

EuMIC01-03 Influence of Parasitic Effects of the "3ω" Measurement Setup to Improve the Determination of GaN HEMTs Thermal Impedance

M. Avcu, R. Sommet, R. Quéré, XLIM, Université de Limoges, Brive La Gaillarde, France

EuMIC02-03 240 GHz Transmitter and Receiver for 3D Imaging System in SiGe BiCMOS Technology

W. Debski¹, W. Winkler¹, J. Borngräber², ¹Silicon Radar GmbH, Frankfurt (Oder), Germany, ²IHP, Frankfurt (Oder), Germany

EuMIC03-03 79GHz CMOS Power Amplifier Using Temperature Compensation Bias

M. Motoyoshi, K. Takano, T. Yoshida, K. Katayama, S. Amalawa, M. Fujishima, Hiroshima University, Higashi-Hiroshima, Japan

EuMIC04-03 28 Watt X-Band Silicon P-I-N Diode RFIC Switches

J. J. Brogle, A. Rozbicki, T. E. Boles, M/A-COM Technology Solutions, Lowell, United States

EuMIC01-04 Analysis and Modeling of Skin and Proximity Effects for Millimeter-Wave Inductors Design in Nanoscale Si CMOS

R. Chan, J. Guo, National Chiao-Tung University, Hsinchu, Taiwan

EuMIC02-04 Design of a 2 Gb/s Transceiver at 60 GHz with Integrated Antenna in Bulk CMOS Technology

S. Saponara, L. Mattii, B. Neri, L. Fanucci, F. Baronti, University of Pisa, Pisa, Italy

EuMIC03-04 A 17.5 dBm D-Band Power Amplifier and Doubler Chain in SiGe BiCMOS Technology

R. Ben Yishay, D. Elad, IBM Haifa Research Lab, Haifa, Israel

EuMIC04-04 An L-band SiGe BiCMOS Core Chip MMIC for Transmit/Receive Modules

T. Hagiwara, S. Shinjo, M. Kagano, E. Taniguchi, Mitsubishi Electric Corporation, Kamakura, Japan

EuMIC01-05 Integrated RF Transformer and Power Combiner Design in 150nm CMOS Process

E. Lourandakis¹, K. Karouzakis¹, P. Papadopoulos¹, J. Chicharro², R. Weigel², ¹Helic Inc., San Jose, United States, ²University of Erlangen-Nuremberg, Erlangen, Germany

EuMIC02-05 A Fully Integrated 8-channel Wide-Band Receiver for Ku-Band Dual-Polarization Phased Array in SiGe BiCMOS

P. Klatter¹, R. Boot¹, G. Voshhaar¹, C. Roeloffzen², ¹Bruco Integrated Circuits B.V., Borne, Netherlands, ²University of Twente, Enschede, Netherlands

EuMIC03-05 A SiGe-Based E-Band Power Amplifier with 17.7 dBm Output Power and 325-GHz GBW

M. Furqan, F. Ahmed, A. Stelzer, Johannes Kepler University, Linz, Austria

EuMIC04-05 Low Power Consumption and Wide Locking Range Frequency Divider By Two

W. Janne-Wha, H. kai-Cheng, W. Jheng-Wei, National Chung Cheng University, ChiaYi, Taiwan

09:00h - 09:20h

09:20h - 09:40h

09:40h - 10:00h

10:00h - 10:20h

10:20h - 10:40h

EuMIC Poster Session

Chair: Antonio Raffo, Università di Ferrara

Co-Chair: Paolo Colantonio, Università di Roma Tor Vergata

10:00h - 17:30h

The posters are on display from 10:00h - 17:30h

The authors are present for discussion from 10:40h - 11:20h, 13:00h - 14:20h and 16:00h - 16:40h

EuMIC
2014

Hall 10	Hall 10	Hall 10	Hall 10
<p>EuMIC Poster01-1 Charge Partitioning Scheme for FET Models A. E. Parker¹, S. J. Mahon², ¹Macquarie University, Australia, ²Macom Technology Solutions, North Sydney, Australia</p>	<p>EuMIC Poster01-6 4-Bit SiGe Phase Shifter Using Distributed Active Switches and Variable Gain Amplifier For X-Band Phased Array Applications E. Ozeren, C. Caliskan, M. Davulcu, H. Kayahan, Y. Gurbuz, Sabanci University, Istanbul, Turkey</p>	<p>EuMIC Poster01-11 A 1.16 pJ/bit 80 Gb/s 2¹¹-1 PRBS Generator in SiGe Bipolar Technology A. G. Radwan, R. Weigel, D. Kissinger, Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany</p>	<p>EuMIC Poster01-16 A 240 GHz Multiplier Chain with -0.5 dBm Output Power in SiGe BiCMOS Technology R. Ben Yishay, D. Elad, IBM Haifa Research Lab, Haifa, Israel</p>
<p>EuMIC Poster01-2 Extracting a General Distortion Contribution Model from Quasi-Static and Non-Quasi-Static Models J. P. Aikio¹, T. Rahkonen¹, J. C. Pedro², ¹University of Oulu, Oulu, Finland, ²Universidade de Aveiro, Aveiro, Portugal</p>	<p>EuMIC Poster01-7 A High Linearity Amplifier Using an Optimized Transconductance Process A. Noll, D. Pal, MACOM Technology Solutions, Lowell, United States</p>	<p>EuMIC Poster01-12 A 60-GHz CMOS RF Sub-Harmonic RF Transceiver Front-End with Integrated Artificial-Magnetic-Conductor (AMC) On-Chip Yagi-Antenna and Balun Filter C. Lin, H. Kuo, H. Chuang, National Cheng Kung University, Tainan, Taiwan</p>	<p>EuMIC Poster01-17 W-Band IQ Sub-Harmonic Mixers with Low LO Power for Cryogenic Operation in Large Arrays R. S. Gawande¹, R. Reeves¹, L. Samoska², K. Cleary¹, A. Readhead¹, T. Gaier², P. Kangaslahti², S. Church³, M. Sieth³, K. Devaraj³, M. Morgan⁴, ¹California Institute of Technology, Pasadena, United States, ²Jet Propulsion Laboratory, Pasadena, United States, ³Stanford University, Stanford, United States, ⁴National Radio Astronomy Observatory, Charlottesville, United States</p>
<p>EuMIC Poster01-3 Decade Bandwidth 4 bits MMIC Phase Shifter for T/R modules M. Ferrari, L. Piattella, Elettronica S.p.A., Rome, Italy</p>	<p>EuMIC Poster01-8 Structural Field Plate Length Optimization for High Power Applications G. Kurt, A. Toprak, O. A. Sen, E. Ozbay, Bilkent University, Ankara, Turkey</p>	<p>EuMIC Poster01-13 Compact E-Band Single-Chip Transmitter Using 0.1 μm GaAs pHEMT Process M. Kang, ETRI, Daejeon, Republic of Korea</p>	<p>EuMIC Poster01-18 A Full-360 Degree Vector-Sum Phase Shifter with Low RMS Phase and Gain Errors for 60 GHz 5-bit Application Y. Ye^{1,2}, L. Li¹, R. Tong¹, X. Sun¹, ¹Shanghai Institute of Microsystem and Information Technology, Shanghai, China, ²Chinese Academy of Sciences, Beijing, China</p>
<p>EuMIC Poster01-4 A K-Band High Performance Frequency Quadrupler Using CG-CS Balanced Configuration in E/D-mode PHEMT Process G. Chen¹, H. Chang¹, S. Weng¹, Y. Hsin¹, Y. Wang², ¹National Central University, Zhongli, Taiwan, ²WIN Semiconductors Corporation, Taoyuan, Taiwan</p>	<p>EuMIC Poster01-9 A 2.2-2.4 GHz Self-Aligned Sub-Harmonically Injection-Locked Phase-Locked Loop using 65 nm CMOS Process Y. Yeh¹, C. Lu¹, H. Chang¹, K. Chen², ¹National Central University, Zhongli, Taiwan, ²ITRI, Hsinchu, Taiwan</p>	<p>EuMIC Poster01-14 Design and Results of W-Band Power Detectors in a 130 nm SiGe BiCMOS Process Technology R. Jonsson¹, R. Malmqvist¹, S. Reyaz², A. Rydberg², M. Kaynak³, ¹Swedish Defence Research Agency (FOI), Linköping, Sweden, ²Uppsala University, Uppsala, Sweden, ³IHP GmbH, Frankfurt (Oder), Germany</p>	
<p>EuMIC Poster01-5 A 1.9 GHz Low Phase Noise Complementary Cross-coupled FBAR-VCO in 0.18 μm CMOS Technology G. Zhang¹, A. Anand¹, K. Kamada¹, S. Amalina¹, K. Hikichi², S. Tanaka², M. Esashi², K. Hashimoto³, S. Taniguchi⁴, H. Kanaya¹, R. K. Pokharel¹, ¹Kyushu University, Fukuoka, Japan, ²Tohoku University, Sendai, Japan, ³Chiba University, Chiba, Japan, ⁴Taiyo Yuden CO. LTD, Hyogo, Japan</p>	<p>EuMIC Poster01-10 Design and Measurement of 500-MS/s ΣΔ Modulator with Half-Delayed Return-to-Zero Feedback DAC Y. Cho, J. Jung, K. Lee, ETRI, Daejeon, Republic of Korea</p>	<p>EuMIC Poster01-15 37-mW CMOS Voltage-Controlled Oscillators and Dividers for 134-GHz Phase-Locked Loop Synthesizer T. Mitsunaka¹, K. Iizuka¹, M. Fujishima², ¹SHARP Corporation, Fukuyama, Japan, ²Hiroshima University, Higashi-Hiroshima, Japan</p>

Flavia

EuMIC05

EuMIC Opening Session

Chair: Franco Giannini, EuMIC2014 Chair

Co-Chair: Ernesto Limiti, EuMIC2014 Co-Chair

11:20h – 11:30h

Welcome Address

Opening of the European Microwave Integrated Circuits Conference 2014

Franco Giannini, EuMIC2014 Chair

11:30h – 12:15h

Microwaves and the Mysteries of the Universe

Piergiorgio Picozza, Professor of Nuclear Physics at the University of Rome Tor Vergata, Italy

Microwaves play a huge role in space technology. Virtually all communications with vehicles for space exploration is carried on with microwaves. Microwave remote sensing is a field driven by advances in space technique and sensor design. Space-based solar power systems convert sunlight to microwaves outside the atmosphere. However, one of the most fascinating field of microwave study in space concerns with the mysteries of the origin and evolution of the Universe and the fundamental laws on the Nature. Sensitive receivers detect the microwave radiation from stars, galaxies and, specially, the cosmic microwave energy from the Big Bang. The observation of microwaves emission from Ultra-High Energy Cosmic Rays showers has opened a golden channel for the detection of these particles, promising messengers of the world of the Strings and Dark Matter.

12:15h – 13:00h

Microwave Sensors and Technologies for Earth Observation

Luigi Pasquali, CEO of Telespazio, Italy&France

The deployment of a number of microwave sensors for Earth Observation from satellite characterized last decade and as well as the next few years the launch of Copernicus sentinels. A variety of sensors to contribute to a better knowledge of our Earth with remarkable fall outs in terms of scientific application and commercial services. The speech will give a quick overview focusing the key role of microwave technologies and the remarkable positioning of European actors.

11:20h - 13:00h

Aurelia

EuMIC06

Emerging and High-Performance Technologies: from Device Physics to MMICs

Chair: Herbert Zirath, Chalmers University
Co-Chair: Michael Schlechtweg, Fraunhofer IAF

Cecilia

EuMIC07

Active Tuneable Circuits and Oscillators

Chair: Andreas Thiede, University of Paderborn
Co-Chair: Manfred Berroth, University of Stuttgart

Hortensia

EuMIC08

60-320 GHz Downconverters

Chair: Shmuel Auster, Elta Systems
Co-Chair: Angel Mediavilla, University of Cantabria

14:20h - 14:40h

EuMIC06-01 Graphene Field Effect Transistors on SiC with T-Shaped Gate: Homogeneity and RF performance

M. Khenissa, D. Mele, M. Belhaj, I. Colombo, E. Pallecchi, D. Vignaud, H. Happy, CNRS, Villeneuve d'Ascq, France

EuMIC07-01 0.5-9 GHz CMOS Variable Gain Amplifier with Control Linearization, Low Phase Variations and Self-Matching

J. Wagner, R. Wolf, N. Joram, F. Ellinger, TU Dresden, Dresden, Germany

EuMIC08-01 A Low Noise Fully Differential 60 GHz CMOS Active Down Converter with Resonating Current Bleeding

A. Malignaggi¹, A. Hamidian¹, G. Boeck^{1,2}, ¹TU Berlin, Berlin, Germany, ²Ferdinand-Braun-Institut (FBH)

14:40h - 15:00h

EuMIC06-02 20 nm Metamorphic HEMT Technology for Terahertz Monolithic Integrated Circuits

A. Leuther, A. Tessmann, P. Doria, M. Ohlrogge, M. Seelmann-Eggebert, H. Maßler, M. Schlechtweg, O. Ambacher, Fraunhofer IAF, Freiburg, Germany

EuMIC07-02 Tunable Inductance using Transmission Lines

V. E. Issakov¹, D. Siprak^{2,3}, A. Koller³, P. Wambacq^{1,2}, ¹IMEC, Leuven, Belgium, ²Vrije Universiteit Brussel, Brussels, Belgium, ³Intel Mobile Communications GmbH, Neubiberg, Germany

EuMIC08-02 V-band pHEMT Dual-Conversion Down-Converter With Schottky Diode RF Mixer and Analog Gilbert IF Mixer

W. Chang¹, C. Meng¹, C. Chang¹, G. Huang², ¹National Chiao Tung University, Hsinchu, Taiwan, ²National Nano Device Laboratories, Hsinchu, Taiwan

15:00h - 15:20h

EuMIC06-03 On the Correlation Between Kink Effect and Effective Mobility in InAlN/GaN HEMTs

P. Altuntas¹, N. Defrance¹, M. Lesecq¹, A. Agboton¹, R. Ouhachi¹, E. Okada¹, C. Gaquiere¹, J. De Jaeger¹, E. Frayssinet², Y. Cordier², ¹IEMN-CNRS umr8520, Villeneuve d'Ascq, France, ²CRHEA-CNRS upr10, Valbonne, France

EuMIC07-03 Low-Phase-Noise VCO with Active Resonator

L. Pantoli, V. Stornelli, G. Leuzzi, University of L'Aquila, L'Aquila, Italy

EuMIC08-03 High Linearity Active GaN-HEMT Down-Converter MMIC for E-Band Radar Applications

I. Kallfass¹, G. Eren¹, R. Weber², S. Wagner², D. Schwantuschke², R. Quay², ¹Institute of Robust Power Semiconductor Systems University of Stuttgart, Stuttgart, Germany, ²Fraunhofer Institute for Applied Solid-State Physics (IAF), Freiburg, Germany

15:20h - 15:40h

EuMIC06-04 Improving GaN on Si Power Amplifiers Through Reduction of Parasitic Conduction Layer

L. Pattison¹, T. Boles², N. Tuffy¹, G. Lopes², ¹MACOM Technology Solutions, Belfast, United Kingdom, ²MACOM Technology Solutions, Lowell, United States

EuMIC07-04 Subharmonically Injection-Locked Oscillator Using a Nonlinear Transmission Line

E. Fernandez, M. Ponton, A. Suarez, F. Ramirez, Universidad de Cantabria, Santander, Spain

EuMIC08-04 A 220 to 320 GHz Broadband Active Frequency Multiplier-by-Eight MMIC

U. J. Lewark¹, A. Tessmann², S. Wagner², A. Leuther², T. Zwick¹, I. Kallfass³, ¹Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany, ²Fraunhofer Institute of Applied Solid State Physics (IAF), Freiburg, Germany, ³University of Stuttgart, Stuttgart, Germany

15:40h - 16:00h

EuMIC06-05 A GaN Schottky Diode-Based Analog Phase Shifter MMIC

C. Jin¹, E. Okada¹, M. Faucher¹, D. Ducatteau¹, M. Zaknoute¹, D. Pavlidis^{2,1}, ¹Institut d'Electronique, de Microélectronique et de Nanotechnologie (IEMN), Villeneuve d'Ascq, France, ²Boston University, Boston, United States

EuMIC07-05 Design of a Switched Injection-Locked Oscillator at 2.45 GHz for a Local Positioning System

M. Schulz, A. Strobel, N. Joram, F. Ellinger, TU Dresden, Dresden, Germany

EuMIC08-05 A 230-310 GHz Down Converter with Integrated Local Oscillator in 65 nm CMOS Technology

B. Khamaisi, E. Socher, Tel-Aviv University, Tel-Aviv, Israel

Baebiana

EuMC/EuMIC01

High Linearity CMOS Power Amplifiers

Chair: Eric Kerhervé, IMS

Co-Chair: Jochen Rascher, University of Erlangen-Nürnberg

Flavia

EuMC/EuMIC02

GaN RF PA Solutions

Chair: Olof Bengtsson, Ferdinand-Braun-Institut (FBH)

Co-Chair: Rocco Giofrè, University of Rome 'Tor Vergata'

EuMC/EuMIC01-01 A 57-66 GHz Power Amplifier with a Linearization Technique in 65-nm CMOS Technology

J. Yeh¹, J. Cheng¹, J. Tsai², T. Huang¹,

¹National Taiwan University, Taipei, Taiwan, ²National Taiwan Normal University, Taipei, Taiwan

EuMC/EuMIC02-01 Gate Waveform Effects on High-Efficiency PA Design: an Experimental Validation

G. Bosi¹, E. Cipriani², P. Colantonio²,

F. Giannini², A. Raffo¹, G. Vannini¹,
¹Università di Ferrara, Ferrara, Italy,
²Università di Roma Tor Vergata, Roma, Italy

14:20h - 14:40h

EuMC/EuMIC01-02 A High-Linearity Watt-Level 2.45-GHz CMOS Power Amplifier with Adaptive Bias and Integrated Diode Linearizer

Z. Ren, L. Liu, K. Zhang, D. Liu, Z. Liu, X. Zou, Huazhong University of Science and Technology, Wuhan, China

EuMC/EuMIC02-02 50 Watt S-band Power Amplifier in 0.25 µm GaN Technology

G. van der Bent, P. de Hek, M. van der Graaf, F. E. van Vliet, TNO, Den Haag, Netherlands

14:40h - 15:00h

EuMC/EuMIC01-03 A Fully Integrated CMOS Linear Power Amplifier Using an IMD-Reduced Bias Network

S. Lee¹, K. Kim², D. Kim³, ¹Korea Electronics Technology Institute, Bundang-gu, Republic of Korea, ²Seoul National University, Kwanak-gu, Republic of Korea, ³Dongbu hitek, Gangnam-gu, Republic of Korea

EuMC/EuMIC02-03 Efficient and Wideband Two-Stage 100 W GaN-HEMT Power Amplifier

P. Saad¹, D. Maassen¹, G. Boeck^{1,2},
¹Berlin Institute of Technology, Berlin, Germany, ²Leibniz-Institut für Höchstfrequenztechnik, Berlin, Germany

15:00h - 15:20h

EuMC/EuMIC01-04 A 2.0 GHz CMOS Triple Cascode Push-Pull Power Amplifier with Second Harmonic Injection for Linearity Enhancement

K. Terajima¹, K. Fujii¹, T. Sonoda¹, T. Takagi², E. Nakayama², S. Kameda², N. Suematsu², K. Tsubouchi², ¹Wave Technology Inc., Kawanishi, Japan, ²Research Institute of Electrical Communication Tohoku University, Sendai, Japan

EuMC/EuMIC02-04 An Ultra-Wideband, Hybrid, Distributed Power Amplifier Using Flip-Chip Bonded GaN Devices on AlN Substrate

C. A. Ulusoy, C. Barisich, S. Pavlidis, W. T. Khan, J. Papapolymerou, Georgia Institute of Technology, Atlanta, United States

15:20h - 15:40h

EuMC/EuMIC01-05 Fully Integrated CMOS Doherty Power Amplifier with Network Matching Optimization for Die Size Reduction

M. L. Carneiro^{1,2}, N. Deltimple², P. H. Carvalho¹, D. Belot³, E. Kerhervé²,
¹University of Brasília, Brasília, Brazil,
²University of Bordeaux, Talence, France,
³STMicroelectronics, Crolles, France

EuMC/EuMIC02-05 Broadband 1.7-2.8 GHz High-Efficiency (58%), High-Power (43 dBm) Class-BJ GaN Power Amplifier including Package Engineering

E. Ture, V. Carrubba, S. Maroldt, M. Musser, H. Walcher, R. Quay, O. Ambacher, Fraunhofer Institute for Applied Solid State Physics (IAF), Freiburg, Germany

15:40h - 16:00h

**EuMIC
2014**

**EuMIC
2014**

Aurelia

Hortensia

EuMIC09

Focus Session on Diamond for Microwaves: from Substrates to Devices

Chair: Giovanni Ghione, Politecnico di Torino
Co-Chair: Ernesto Limiti, Università di Roma Tor Vergata

EuMIC10

mm-Wave Circuits and Components

Chair: Frank E. van Vliet, TNO
Co-Chair: Ingmar Kalfass, Universität Stuttgart

16:40h - 17:00h

EuMIC09-01 Delta-Doping for Diamond Transistors - Evidence for Multiple Conduction Paths

R. B. Jackman¹, N. Tumilty¹, A. Pakpour-tabrizi¹, R. Lang², ¹University College London, London, United Kingdom, ²Diamond Microwave Devices Ltd, Leeds, United Kingdom

EuMIC10-01 90-140 GHz Frequency Octupler in Si/SiGe BiCMOS using a Novel Bootstrapped Doubler Topology

S. Yuan, H. Schumacher, Ulm University, Ulm, Germany

17:00h - 17:20h

EuMIC09-02 Diamond Delta Doped Structures Exhibiting Ultra-Sharp Interfaces

P. Bergonzo, CEA, Gif-sur-Yvette, France

EuMIC10-02 A V-band High Linearity Two-Stage Subharmonically Pumped Mixer

M. Bao¹, Y. Li¹, H. Zirath², ¹Ericsson AB, Gothenburg, Sweden, ²Chalmers University of Technology, Gothenburg, Sweden

17:20h - 17:40h

EuMIC09-03 Diamond RF Power Transistors: Present Status and Challenges

M. Kasu, Saga University, Saga, Japan

EuMIC10-03 A Novel 10 MHz to 70 GHz Surface Mount Amplifier for Broadband Applications

H. T. Morkner, A. Riddle, MACOM Technology Solutions Inc., Lowell, United States

17:40h - 18:00h

EuMIC09-04 Diamond FETs using heterojunction and high-k dielectrics

Y. Koide, National Institute for Materials Science (NIMS), Tsukuba, Japan

EuMIC10-04 An E-Band 40dB Dynamic Range Multi-Tanh Power Detector in 0.13_μm SiGe Technology

R. Levinger¹, O. Katz¹, B. Sheinman¹, R. Carmon¹, R. Ben-Yishay¹, N. Mazor¹, S. Pivnik¹, D. Elad¹, E. Socher², ¹IBM, Haifa, Israel, ²Tel Aviv University, Tel Aviv, Israel

18:00h - 18:20h

EuMIC09-05 Single-Crystal Diamond Microwave Devices for Space Applications

S. Russell⁴, D. Moran⁴, C. Verona², E. Limiti², F. Cappelluti³, G. Ghione³, A. Barnes¹, ¹European Space Agency ESTEC, Noordwijk, Netherlands, ²Università di Roma Tor Vergata, Roma, Italy, ³Politecnico di Torino, Torino, Italy, ⁴University of Glasgow, Glasgow, United Kingdom

EuMIC10-05 A D-Band 180° Phase Shifter With Very Low Amplitude- and Phase-Error

D. Mueller¹, J. Laengst³, A. Tessmann², A. Leuther², T. Zwick¹, I. Kalfass³, ¹Karlsruhe Institute of Technology, Karlsruhe, Germany, ²Fraunhofer Institute of Applied Solid-State Physics, Freiburg, Germany, ³University of Stuttgart, Stuttgart, Germany

Baebiana

EuMC/EuMIC03

From Device Physics to Linear Power Amplifiers

Chair: Jean-François Villemazet, Thales Alenia Space

Co-Chair: Paul J. Tasker, Cardiff School of Engineering

Cecilia

EuMC/EuMIC04

Device and Circuit-Level Modelling Techniques

Chair: Giorgio Leuzzi, Università di L'Aquila

Co-Chair: Fabrizio Bonani, Politecnico di Torino

Flavia

EuMC/EuMIC05

GaN Solutions for X- and K-Bands

Chair: Franco Giannini, University of Roma Tor Vergata

Co-Chair: Rüdiger Quay, Fraunhofer IAF

EuMC/EuMIC03-01 Improved Phase Linearity in Source Field Plate AlGaIn/GaN HEMTs

P. Colantonio¹, F. Giannini¹, R. Giofrè¹, L. Piazzon¹, V. Camarchia², G. Ghione², M. Pirola², R. Quaglia², A. Nanni³, A. Pantellini³, C. Lanzieri³, ¹University of Roma Tor Vergata, Roma, Italy, ²Politecnico di Torino, Torino, Italy, ³Selex ES, Roma, Italy

EuMC/EuMIC03-02 Soft Compression and the Origins of Nonlinear Behavior of GaN HEMTs

J. C. Pedro, L. C. Nunes, P. M. Cabral, Universidade de Aveiro, Aveiro, Portugal

EuMC/EuMIC03-03 Using Waveform Engineering to Optimize Class-F Power Amplifier Performance in an Envelope Tracking Architecture

Z. A. Mokhti, J. Lees, P. J. Tasker, Cardiff University, Cardiff, United Kingdom

EuMC/EuMIC03-04 High Bandwidth Investigations of a Baseband Linearization Approach Formulated in the Envelope Domain Under Modulated Stimulus

F. L. Ogbol¹, P. Tasker¹, J. Lees¹, M. Akmal¹, J. Benedikt¹, S. Bensmida², K. Morris², M. Beach², J. McGeehan², ¹Cardiff University, Cardiff, United Kingdom, ²University of Bristol, Bristol, United Kingdom

EuMC/EuMIC03-05 Impact of Dispersion Caused by Bandwidth Limitation on the Linearity of Multi-Level LINC Transmitters

J. Guan, X. Nghiem, A. F. Negra, R. Negra, RWTH Aachen University, Aachen, Germany

EuMC/EuMIC04-01 Mixer-Like Modeling with Dynamic Baseband Characterization for Supply-Modulated PAs

G. Gibiino^{1,2}, G. Avolio², D. Schreurs², A. Santarelli¹, F. Filicori¹, ¹University of Bologna, Bologna, Italy, ²KU Leuven, Leuven, Belgium

EuMC/EuMIC04-02 GaN-HEMT Nonlinear Modeling of Single-Ended and Doherty High-Power Amplifiers

R. Hajji, M. Poulton, D. B. Crittenden, J. Gengler, P. Xia, TriQuint Semiconductor, Inc., Richardson, United States

EuMC/EuMIC04-03 Behavioral Power Amplifier Model Considering Memory Effects Dedicated to Radar System Simulation

C. Maziere¹, D. Gapillout¹, T. Gasselting¹, T. Decaesteke², Y. Mancuso², ¹AMCAD Engineering, Limoges, France, ²Thales Systemes Aeroportes, Elancourt, France

EuMC/EuMIC04-04 Multi-Port De-Embedding Methodology Based on Exponential Mapping

M. Ballicchia, C. Turchetti, S. Orcioni, Università Politecnica delle Marche, Ancona, Italy

EuMC/EuMIC04-05 Memristors as Non-Linear Behavioral Models for the Simulation of Passive Intermodulation

J. Sombrin¹, G. Soubercaze-Pun², I. Albert², P. Michel¹, ¹TESA Laboratory, Toulouse, France, ²CNES, Toulouse, France

EuMC/EuMIC05-01 4W X-band High Efficiency MMIC PA with Output Harmonic Injection.

A. Dani, M. Coffey, Z. Popovic, University of Colorado Boulder, Boulder, United States

EuMC/EuMIC05-02 X-band 10W MMIC High-Gain Power Amplifier with over 60% PAE

D. Sardin, T. Reveyrand, Z. Popovic, University of Colorado, Boulder, United States

EuMC/EuMIC05-03 A 25W X-band GaN PA in SMT Package

J. G. Leckey, M/A-COM Technology Solutions, Belfast, United Kingdom

EuMC/EuMIC05-04 Comparison of Second-Harmonic Matching of AlGaIn/GaN HEMTs at K-Band

C. Friesicke¹, R. Quay², A. F. Jacob¹, ¹TU Hamburg-Harburg, Hamburg, Germany, ²Fraunhofer Institute for Applied Solid-State Physics, Freiburg, Germany

EuMC/EuMIC05-05 A 20-Watt Ka-Band GaN High Power Amplifier MMIC

C. Ng, K. Takagi, T. Senjyu, K. Matsushita, H. Sakurai, K. Onodera, S. Nakanishi, K. Kuroda, T. Soejima, Toshiba Corporation, Komukai Complex, Kawasaki, Japan

16:40h - 17:00h

17:00h - 17:20h

17:20h - 17:40h

17:40h - 18:00h

18:00h - 18:20h

WORKSHOPS AND SHORT COURSES - SUNDAY

Duration: 09:00h to 18:20h

Room Minerva

SCS2 (EuMC)

The Dynamics, Bifurcation, and Practical Stability Analysis/ Design of Nonlinear Microwave Circuits and Networks

Organisers:

Almudena Suárez, University of Cantabria, Spain

Christopher P. Silva, The Aerospace Corporation, USA

Abstract

This full-day course addresses the fundamental topic of stability in nonlinear microwave circuits and networks (MCNs), covering concepts, qualitative analysis, simulation, and engineering design. The many unique qualitative behaviors possible in commonly used nonlinear MCNs will be illustrated, as well as the fundamental means by which these behaviors can abruptly arise with parameter changes (termed a bifurcation). Course attendees will learn about different types of steady-state solutions, identify instability problems through small- and large-signal stability analysis in the time/ frequency domains, and understand the dynamical mechanisms responsible for instabilities. The primary approaches for stability analysis will be presented and compared, ranging from the familiar and often inadequate (e.g., Rollet factor, stability circles) to the advanced that can be implemented using classical harmonic balance methods. The most common bifurcations will be described, enabling designers to confidently identify them in measurement and simulation. Practical examples of instability, stability analysis, and stabilization design will be presented for such important nonlinear circuits as power amplifiers, frequency multipliers/dividers, and voltage-controlled oscillators. Other advanced topics covered include stability analysis for modulated signals and of coupled oscillators. Finally, the vast research area on harnessing nonlinear dynamics for useful engineering purposes will be surveyed, providing a glimpse into future nonlinear designs. The course will include video/hardware demonstrations of bifurcation and nonlinear qualitative behaviors, as well as several live stability analysis sessions using ADS.

Programme

09:00h - 09:05h

Course Motivation

Almudena Suárez, University of Cantabria, Spain

Christopher P. Silva, The Aerospace Corporation, USA

09:05h - 09:45h

Classical Dynamical Systems, Bifurcation, & Stability Overview

Christopher P. Silva, The Aerospace Corporation, USA

09:45h - 10:15h

Harmonic-Balance Analysis. Application to Oscillatory Solutions

Almudena Suárez, University of Cantabria, Spain

10:15h - 10:40h

Small Signal Stability. Comparison Between Analysis Methods

Almudena Suárez, University of Cantabria, Spain

10:40h - 11:20h

Coffee Break

11:20h - 11:45h

Small Signal Stability (Continuation)

Almudena Suárez, University of Cantabria, Spain

11:45h - 12:15h

Large Signal Stability. Comparison Between Analysis Methods

Almudena Suárez, University of Cantabria, Spain

12:15h - 13:00h

Bifurcation Detection/Gallery: Voltage-Controlled Oscillators, Power Amplifiers, Analog Frequency Dividers

Almudena Suárez, University of Cantabria, Spain

13:00h - 14:20

Lunch

14:20h - 14:40h

Bifurcation Detection/Gallery (Continuation)

Almudena Suárez, University of Cantabria, Spain

14:40h - 15:00h

Coexisting Oscillation Modes

Almudena Suárez, University of Cantabria, Spain

15:00h - 16:00h

Stabilization Techniques, Application to Power Amplifiers

Almudena Suárez, University of Cantabria, Spain

16:00h - 16:40h

Coffee Break

16:40h - 16:55h

Stability Analysis in the Presence of Modulations

Almudena Suárez, University of Cantabria, Spain

16:55h - 18:05h

Exploitation of Nonlinear Dynamics

Christopher P. Silva, The Aerospace Corporation, USA

18:05h - 18:10h

Conclusions/References

Almudena Suárez, University of Cantabria, Spain

Christopher P. Silva, The Aerospace Corporation, USA

Simulation/Hardware Demonstrations will be presented through the course.

WORKSHOPS AND SHORT COURSES - MONDAY

Duration: 09:00h to 18:20h

Room Domizia

WM1 (EuMC)

New Trends in Substrate Integrated Circuits (SICs)

Organisers:

Ke Wu, École Polytechnique de Montréal, Canada
Maurizio Bozzi, University of Pavia, Italy

Abstract

Substrate integrated circuits (SICs) represent a hot research topics in the last years, which involves a growing number of research groups worldwide from both academia and industry for the implementation of a wide range of components and antennas in a variety of applications. This big research effort has resulted into an exponentially increasing number of publications. Significant advancements have been achieved in the recent years, in terms of components and antennas with superior performance, advances methodologies for integration of complete systems, new material and fabrication technologies. This workshop aims to provide an overview of the most recent advancements in the field of SICs, ranging from new components and design techniques, antennas with advanced performance, circuits operating in the mm-wave and possibly in the THz region, unprecedented fields of applications, new materials and manufacturing techniques. Well known experts from Asia, Europe and America will describe their recent progress and interact with the audience in a very interactive event.

Programme

- 09:00h - 09:50h** *The Next Horizon of Substrate Integrated Circuits and Antennas into Terahertz and Optoelectronics*
Ke Wu, École Polytechnique de Montréal, Canada
- 09:50h - 10:40h** *The Theoretical Researches and Engineering Applications of Planar Integrated Waveguide Technology*
Wenquan Che, Nanjing University of Science and Technology, China

10:40h - 11:20h

Coffee Break

11:20h - 12:10h

Substrate Integrated Waveguide – Base for Leaky Wave Antennas

Jan Machac, Czech Technical University in Prague, Czech Republic

12:10h - 13:00h

Recent Research Advances in Substrate Integrated Components and Systems

Wei Hong, South East University Nanjing, China
Ke Wu, South East University Nanjing, China
Zhe Chen, South East University Nanjing, China
Fang Zhu, South East University Nanjing, China
Peng Chu, South East University Nanjing, China
Mei Jiang, South East University Nanjing, China

13:00h - 14:20h

Lunch

14:20h - 15:10h

Dual-Polarized SICs and SIW Horn Antennas

Marc Esquius, École Polytechnique Fédérale de Lausanne, Switzerland
Juan R. Mosig, École Polytechnique Fédérale de Lausanne, Switzerland

15:10h - 16:00h

SIW Components Based on Paper and Textile Substrate

Maurizio Bozzi, University of Pavia, Italy

16:00h - 16:40h

Coffee Break

16:40h - 17:30h

The Confluence of SIW Antennas and Metamaterials

Douglas H. Werner, Pennsylvania State University, USA

17:30h - 18:20h

Open Discussion and Conclusion

Duration: 09:00h to 13:00h

Room Euphemia

WM2 (EuMC)

Current Research Directions in RFPA Design

Organisers:

Steve Cripps, Cardiff University, U.K.
Zoya Popovic, Univ. of Colorado, U.S.A.

Abstract

Power amplifiers (PA) have a vital role in modern wireless communication and radar systems. The requirements for simultaneously providing improved efficiency and linearity, with ever increasing bandwidth needs, are forcing revival of some old transmitter architectures, development of some new techniques, and improved modeling for more successful design. This workshop will address a wide variety of topics related to PA design. Starting with an overview presentation, technology and design issues at microwave and millimeter-wave frequencies will be overviews. A wide variety of GaN-based power MMIC designs will be presented and analyzed. Switched-mode amplifiers are shown to lead to efficient envelope-tracking transmitters. The application of these and other high efficiency techniques to mm-wave PAs will be also under consideration for Si and SiGe processes. Wideband and efficient solutions based on load modulation concepts, such as the Doherty and outphasing techniques, are covered in a common framework. Evanescent field probing of waveforms internal to the amplifier are shown to give important insights for improved designs. This half-day workshop will feature inspiring presentations from several distinguished speakers who have been prominent in RFPA research over the last few years.

Programme

- 09:00h - 9:15h** *Introduction: Challenges in Pa Design and Some Current Solutions*
Zoya Popovic, Univ. of Colorado, U.S.A.
- 09:15h - 9:45h** *MMIC Design for Broadband, High Efficiency And High Frequency PAs*
Charles Campbell, TriQuint, U.S.A.
- 09:45h - 10:15h** *Si and SiGe High-Efficiency PAs at Millimetre-Wave Frequencies*
James Buckwalter, Univ. of California, U.S.A
- 10:15h - 10:45h** *Device Modeling for PA Design and Large-Signal Stability Analysis*
Stephane Dellier, AmCAD, France
- 10:45h - 11:20h** *Coffee Break*
- 11:20h - 12:10h** *UHF Polar and Outphasing PAs Based on Class-E Topologies*
Jose Angel Garcia, Univ. of Cantabria, Spain
- 12:10h - 12:40h** *Bandwidth and Efficiency Enhancement Techniques for Doherty PAs*
Christian Fager, Chalmers University, Sweden
- 12:40h - 13:00h** *A New Perspective on Doherty PA Design Through E-Field Probing of Device Plane Waveforms*
Steve Cripps, Cardiff Univ., U.K.

WORKSHOPS AND SHORT COURSES - MONDAY

Duration: 14:20h to 18:20h

Room Euphemia

WM3 (EuMC)

Industrial Radar Technologies

Organisers:

Alexander Koelpin, University of Erlangen-Nuremberg, Germany
Gabor Vinci, InnoSenT, Germany

Abstract

Several applications in industrial environment benefit from radar based sensors. Process automation, asset tracking or monitoring and diagnostics are just some of the areas where radar technology emerged in the last decades. This workshop will give an insight in different radar technologies for industrial and professional applications. The basic theory of radar systems, interaction with targets and non-idealities will be discussed before going deep in some radar technologies. A low-cost and low complexity approach is Doppler radar based on continuous wave signals and delivering the velocity of a target. This concept can be enhanced by the use of two or more frequencies, called frequency shift keying (FSK) radar that can additionally measure distances. Also algorithmic aspects will be discussed. If the frequency is swept continuously we will end up with frequency modulated continuous wave (FMCW) radars, a very robust approach for difficult environments with strong multi-path and multi-target influences. A system based on secondary radar will be presented capable for precise in-door 3-D localization. For high range resolutions in the micrometer regime and high measurement value update rates Six-Port based microwave interferometry will be introduced and some special applications (angle-of-arrival, frequency, surface temperature measurements) will be shown. As the antenna is an essential part of a radar system, concepts suitable for industrial applications will be discussed.

Programme

14:20h - 14:40h

Introducing Industrial Radar: Applications, Requirements, Specific Features

Gabor Vinci, InnoSenT, Germany

14:40h - 15:20h

Introduction to Doppler and FSK Radar

Thilo Lenhard, InnoSenT, Germany

15:20h - 16:00h

Distance Evaluation by FMCW Radar

Nils Pohl, Fraunhofer FHR, Germany

16:00h - 16:40h

Coffee Break

16:40h - 17:10h

2D and 3D Radiolocation in Industrial Environments

Andreas Ziroff, Siemens Corporate Technology, Germany

17:10h - 17:40h

Introduction to High-Resolution Distance Measurements by Microwave Interferometry

Alexander Koelpin, University of Erlangen-Nuremberg, Germany

17:40h - 18:20h

Antennas for Industrial Radar Applications

Gabor Vinci, InnoSenT, Germany

44TH EUROPEAN MICROWAVE CONFERENCE 2014

Duration: 09:00h to 18:20h

Room Iustina

WM4 (EuMC)

Wireless Concurrent Technologies for the Smart Evolution of Cities

Organisers:

Luca Roselli, University of Perugia, Italy
Nuno Borges Carvalho, University of Aveiro, Portugal
Apostolos Georgiadis, CTTC, Spain

Abstract

The "Smart City" is a concept with increasing significance as our urban environment is changing with evolving technology. Smart cities imply an electronic infrastructure which enables electronically smart economy, mobility, environment, healthcare, living and governance. Such a trend results in a proliferation of electronic devices and a true concept of the internet of things in a way that was not seen up to date. These devices should communicate and, in order to be mobile, they should be wireless and energetically autonomous, id est very low power, passive or able to scavenge the energy they need. This workshop will discuss the way wireless technologies can intercept future requirements of smart cities and their implementation, with a strong focus on the energy aspects and, specifically, on wireless power transmission opportunities. Some of the talks will include smart environment approaches, by discussing wireless power transmission approaches either for powering up mobile devices, but also for implementing smart floors, in a way that the environment will be an integrated part of the communication medium, driving us to the wide area electronics concept. Some discussions will also be made on smart mobility and wireless power transfer to improve vehicular technology and electric cars in a seamless way.

Programme

09:00h - 09:30h

Energy Harvesting for a Sustainable City

Apostolos Georgiadis, CTTC, Spain

09:30h - 10:00h

Smart Environments: The Use of Passive Systems to Enable the IoT

Nuno Borges Carvalho, University of Aveiro, Portugal

10:00h - 10:30h

Smart Surfaces: A Tile to Pave Smart Cities

L. Roselli, University of Perugia, Italy

44TH EUROPEAN MICROWAVE CONFERENCE 2014

F. Alimenti, University of Perugia, Italy

P. Mezzanotte, University of Perugia, Italy

G. Orecchini, University of Perugia, Italy

M. Virili, University of Perugia, Italy

C. Mariotti, University of Perugia, Italy

10:30h - 10:40h

Comments and discussion

10:40h - 11:20h

Coffee Break

11:20h - 11:50h

Transceiver Technologies for Infrastructure to Vehicle

Free-Flow Intelligent Transportation Systems

Alessandro Cidronali, University of Florence, Italy

11:50h - 12:20h

Design Methods for Near-Field WPT

A. Costanzo, University of Bologna, Italy

M. Dionigi, University of Perugia, Italy

F. Mastri, University of Bologna, Italy

M. Mongiardo, University of Perugia, Italy

12:20h - 12:50h

Wireless Power Transfer Systems for Movable Objects

Toshio Ishizaki, Ryukoku University, Japan

12:50h - 13:00h

Comments and Discussion

13:00h - 14:20h

Lunch

14:20h - 14:50h

Challenges of Wireless Power Transfer in NFC Devices and Smartcards

Gernot Hueber, NXP, The Netherlands

14:50h - 15:20h

Inkjet-Printed Zero-Power Wireless Sensing Platforms for Structural Health Monitoring (SHM) and i-Metering Applications

Manos Tentzeris, GeorgiaTech, USA

15:20h - 15:50h

Low-Power Electronics for Self-Powered Distributed Wireless Sensors

Zoya Popovic, University of Colorado, USA

15:50h - 16:00h

Comments and Discussion

16:00h - 16:40h

Coffee Break

16:40h - 17:30h

Round Table with Speakers

WORKSHOPS AND SHORT COURSES - MONDAY

Duration: 09:00h to 18:20h

Room Livia

WM5 (EuMC)

Time as the 4th Dimension for Emerging Microwave Communication and Sensing Array Systems

Organisers:

Diego Masotti, University of Bologna, Italy

Paolo Rocca, University of Trento, Italy

Randy L. Haupt, Colorado School of Mines, USA

Abstract

The use of the fourth dimension (4D), time, in the synthesis and analysis of antenna arrays will play a fundamental role in modern communication and sensing systems. The need of highly reconfigurable systems, ultra-wideband signals in radar applications, and high-throughput in communications has boosted the research activities in this area in the last few decades. The almost unlimited control combinations and the ease of implementation make these arrays a versatile and adequate radiation system for modern wireless applications, such as Cognitive Radio solutions. This workshop aims to provide an overview on the application scenarios of this new family of arrays, together with a deep description of the different techniques employed: such as time-modulation by means of time-controlled switches or as timed arrays. The important role played by the optimization algorithms in handling time and related parameters is deeply discussed, by considering different design methods and array applications. Indeed, modern implementations of 4D arrays enable the remote and software reconfiguration of the antenna features (frequency, steering, beam shape, multi-beam generation) by means of the time-domain control of the array control points. This class of arrays is also investigated from the RF modelling viewpoint: the design and characterization of radar and cognitive radio system using wideband multi-sine approach is presented, together with the nonlinear circuit-level simulation of time-modulated arrays.

Programme

09:00h - 09:50h

Time-Modulated Arrays for Cognitive Radio Systems – Potentialities and Trends

Paolo Rocca, University of Trento, Italy

Giacomo Olivieri, University of Trento, Italy

Andrea Massa, University of Trento, Italy

09:50h - 10:40h

Timed Arrays for Wideband Signals

Randy L. Haupt, Colorado School of Mines, USA

10:40h - 11:20h

Coffee Break

11:20h - 12:10h

Coherent Pulse Radiation in Time Domain for the Design of High Directive Arrays

Michele D'Urso, Selex-ES, Italy

12:10h - 13:00h

4D Arrays and Radar Applications

Regis Guinvarc'h, Supélec, France

13:00h - 14:20h

Lunch

14:20h - 15:10h

Exploiting Time-Varying Beams to Tag Sidelobe Interferers in a Digital Beamformer

William C. Barott, Embry-Riddle Aeronautical University, USA

15:10h - 16:00h

Time Modulated Arrays for Digital Communications

Julio Claudio Brégains, Universidade de Coruña, Spain

16:00h - 16:40h

Coffee Break

16:40h - 17:30h

RF System Wideband Characterization for Cognitive Radio System Design

Nuno Borges Carvalho, Universidade de Aveiro, Portugal

Pedro Cruz, Universidade de Aveiro, Portugal

Diogo Ribeiro, Universidade de Aveiro, Portugal

17:30h - 18:20h

Nonlinear/Electromagnetic Co-Simulation of Linear Time-Modulated Arrays

Diego Masotti, University of Bologna, Italy

Alessandra Costanzo, University of Bologna, Italy

Vittorio Rizzoli, University of Bologna, Italy

WORKSHOPS AND SHORT COURSES - MONDAY

Duration: 09:00h to 18:20h

Room Minerva

WM6 (EuMC)

Progresses in Multilayer/3D Technologies and Techniques for Advanced Millimetre-Wave Circuits and Modules

Organisers:

Kamal K. Samanta, Milmega/AMETEK Ltd, UK
Ali A. Rezazadeh, University of Manchester, UK

Abstract

Millimetre-wave has been experiencing an ever-increasing demand even for commercial applications, such as high-speed communication, automotive radar and imaging, due to overcrowding towards lower frequency bands and wideband multimedia requirements. MMIC/RFIC technologies are quite matured and cost-effective for mass production. But, because of parasitics, the circuit/system assembling techniques are more complex and costlier. The multilayer/3D Multi-Chip-Module (MCM/SoP) is widely regarded as an excellent solution for mmW systems and is providing ever-smaller size and weight with greater repeatability at a low cost. In the recent years, there has been massive advancement in this field, from fabrication techniques to heterogeneous (wafer-level) circuit integration technologies. This workshop will provide a comprehensive overview and a complete understanding on recent important progresses in multilayer/3D technologies, including that in dielectric substrate (like LTCC, LCP, photoimageable thick-film, organic and IPD/BCB) for embedding high quality passives, metallization processes (including Inkjet-printing, Photoimageable and Aerosol-jet printing) for realising fine and defined conductor geometry, and multilayer substrate and wafer-level integration techniques (including ball-grid-array (eWLB), fun-out (FO-WLB) and interposer). This will also cover the 3D/2.5D MMICs, including Si/glass interposer based ICs. Further, will aware the participants on the challenges and the advancement in mixed technologies, enabling novel components and emerging mm-wave applications (including a 120 GHz MCM Radar). The speakers are the leading contributors and are from both academic and industrial sectors.

Programme

09:00h - 09:50h

Recent Advances in Multilayer Organic Microwave and Millimetre-Wave Front Ends

John Papapolymerou, Georgia Tech, USA

09:50h - 10:40h

QFN based Packaging Concepts for Millimeter-Wave Transceivers

Thomas Zwick, Karlsruher Institut für Technologie (KIT), Germany

10:40h - 11:20h

Coffee Break

11:20h - 12:10h

TSV/TGV Model and Power Integrity Analysis of Si and Glass Interposers for 2.5D IC

Joung-ho Kim, KAIST, Korea

12:10h - 13:00h

MCM Technologies and Advanced Multilayer Photoimageable Technique for Ceramic-Based MM-wave Applications

Kamal K Samanta, Milmega/AMETEK Ltd, UK

13:00h - 14:20h

Lunch

14:20h - 15:10h

On the Development of Compact mmW CMOS/PCB Modules for Multi Gigabit Wireless

Joy Laskar, Anayas360 Partner Centric Technologies, USA

15:10h - 16:00h

Advances in 3D/Multilayer MMIC Technology

Ali A. Rezazadeh, University of Manchester, UK

16:00h - 16:40h

Coffee Break

16:40h - 17:20h

Microwave and Millimeter-wave System-in-Packaging (SiP) Integration Technologies

Hsin-Chia Lu, National Taiwan University, Taiwan

17:20h - 18:20h

Inkjet-Printed mmW Multilayer Modules for Radar, Sensing and Communication Applications

Manos M. Tentzeris, Georgia Tech, USA

18:10h - 18:20h

Remarks and Conclusions

Duration: 09:00h to 13:00h

Room Niside

WM7 (EuMC)

Biomedical Applications of Microwaves: From System View to Innovative Sensor Concepts

Organisers:

Chafik Meliani, IHP-Innovations for High Performance Microelectronics, Germany
Viktor Krozer, Johann Wolfgang Goethe-Universität Frankfurt, Germany

Abstract

This workshop addresses the use of RF, microwaves and microelectronics based solutions for biomedical applications and presents the latest developments on system, single device and sensor concept level. The two first presentations address permittivity measurement in the RF to mm-wave range and CMOS based solutions for biomedical applications. This will be followed by focussing on two main applications: electro-magnetic tracking systems and hyperthermia. Finally, the volume integration of electronic components in medical catheters and related aspects will be presented and discussed.

Programme

09:00h - 09:35h

Electrical Interferometry for Permittivity Measurements of Biological Samples

Jan Wessel, IHP, Germany
Klaus Schmalz, IHP, Germany
Brian Cahill, Institute for Bioprocessing and Analytical Measurement Techniques, Germany
Christoph Scheytt, University of Paderborn, Germany
Chafik Meliani, IHP, Germany

09:35h - 10:10h

CMOS Platforms for High Spatiotemporal In-Vitro and In-Vivo Recording and Stimulation of Neural Tissue

Roland Thewes, Stefan Keil, Gabriel Bertotti, Norman Dodel, Sven Schroeder, TU Berlin, Germany
Dirk Wolanski, Bernd Tillack, IHP, Germany
Guenther Zeck, NMI, Germany
Andreas Moeller, Karl-Heinz Boven, MCS GmbH, Germany
Marco Barbetta, Stefano Vassanelli, University of Padova, Italy

10:10h - 10:45h

Latest Results of RF and MW Hyperthermia Methods to Heat Tumors

Hans Crezee, University of Amsterdam, The Netherlands.

10:45h - 11:20h

Coffee Break

11:20h - 12:00h

Electromagnetic Tracking Systems and RF Signal Processing in Intraoperative Procedures

Amin Katouzian, Technical University of Munich, Germany
Christopher Hennesperger, Technical University of Munich, Germany
Nassir Navab, Technical University of Munich, Germany

12:00h - 12:40h

Volume integration and Test of Electronic Components in Medical Catheters

Ulrich Schumann, David Wagner, Helmut Bresch, Georg Rose, Bertram Schmidt, Markus Detert, Otto-von-Guericke-University, Germany

12:40h - 13:00h

Discussion and Conclusions

WORKSHOPS AND SHORT COURSES - MONDAY

Duration: 14:20h to 18:20h

Room Niside

WM8 (EuMC)

Advances in the "Carbon Based Smart System for Wireless Application" (NANO RF) European Project

Organisers:

Luca Pierantoni, Università Politecnica delle Marche, Italy
Afshin Ziaei, THALES Research and Technology, France,

Abstract

From the strategic agendas of ENIAC, EPoSS and ITRS, it is evident that wireless applications are gaining more and more importance that results to new requirements in terms of miniaturization and increased complexity. The limitations of Moore's Law in term of physics but also in terms of manufacturability, flexibility and multi-functionality has motivated research and development to implement new technologies and new wireless architectures identified as Beyond CMOS and More than Moore. Carbon nanotubes (CNTs) are featuring very attractive intrinsic multi-physic properties. These properties coupled with CMOS compatibility offer promise for a new generation of smart miniaturized systems for wireless communications. Graphene also exhibits impressive electrical and mechanical properties. CMOS compatible microwave graphene devices, still at their infancy, hold promise for extremely low noise and high speed communications. The main concept of the NANO-RF project relies on the development of CNT & graphene based advanced component technologies for the implementation of miniaturized electronic systems for 2020 and beyond wireless communications and radars. The major objectives of NANO-RF are the development of i) Active components from CNTs & graphene, ii) Passive components from CNTs & graphene, iii) capacitive RF NEMS form CNTs, iv) CNTs based vertical interconnects, v) CNTs & graphene based ICs. The goal of this workshop is to introduce recent advances and achievements performed in the context of the NANO RF project.

Programme

14:20h - 14:50h

Detecting Electromagnetic Waves with a Single Atom Sheet

M. Dragoman, National Institute for Research and Development in Microtechnology (IMT), Romania

14:50h - 15:20h

Carbon Based RF Circuits Fabrication, Putting Silicon Aside

G. Deligeorgis, Forth-IESL, Greece
G. Konstantinidis, Forth-IESL, Greece

15:20h - 15:50h

Investigation of the E-Beam Evaporation and Atomic Layer Deposition of Metal Oxides Growth on Pristine Graphene

Mircea Modreanu, Tyndall National Institute-UCC, Ireland
Ian Povey, Tyndall National Institute-UCC, Ireland
Raluca Gavrilă, IMT Bucharest, Romania
Mircea Dragoman, IMT Bucharest, Romania
Stephane Xavier, Thales Research & Technology, France
Frederic Wyczisk, Thales Research & Technology, France
Andrea Di Donato, Università Politecnica delle Marche, Italy
Davide Mencarelli, Università Politecnica delle Marche, Italy
Peter Blake, Graphene Industries Ltd., UK
Yifeng Fu, SHT Smart High Tech AB, Sweden
Johan Liu, Chalmers University of Technology, Sweden
George Deligeorgis, FORTH-IESL, Greece

16:00h - 16:40h

Coffee Break

16:40h - 17:10h

RF Nano Electromechanical Systems Based on Vertically Aligned Carbon Nanotubes

Stéphane Xavier, Thales R&T France, France
Yifeng Fu, SHT Smart High Tech AB, Sweden
Johan Liu, Chalmers University of Technology, Sweden
Matthieu Leballif, Thales R&T France, France
Paolo Martins, Thales R&T France, France
Shailendra Bansropun, Thales R&T France, France
Afshin Ziaei, Thales R&T France, France

17:10h - 17:40h

Electromagnetic Modelling of MW CNT Bundles from Microwave Characterization: Application to Small Microwave Antenna Design in Integrated Technology

C. Tripon-Canseliet, UPMC, France
S. Xavier, THALES Research and Technology, France
G. Deligeorgis, CNRS-LAAS, University de Toulouse, France
F. Coccetti, Institute of Electronic Structure and Laser, Greece
A. Ziaei, THALES Research and Technology, France
M. Modreanu, TYNDALL, Ireland
J. Chazelas, Thales Systèmes Aéroportés, France

17:40h - 18:10h

Advanced Numerical Tools for the Design of Carbon-Based Devices

L. Pierantoni, Università Politecnica delle Marche, Italy
D. Mencarelli, Università Politecnica delle Marche, Italy

17:40h - 18:20h

Final Discussion

WORKSHOPS AND SHORT COURSES - MONDAY

Duration: 09:00h to 13:00h

Room Ottavia

WM9 (EuMC & EuMIC)

RF MEMS-Enabled Microwave and mm-Wave Reconfigurable Components

Organisers:

Jorge Perez Martinez, University Polytechnic Valencia, Spain

Pierre Blondy, XLIM, University of Limoges, France

Abstract

RF MEMS are already in the market and they are now becoming off-the-shelf components. Thus, interest is quickly expanding from device to circuit and system levels, where RF MEMS could be a key enabling technology for both already established and novel applications demanding low-loss, low power consumption and high linearity tuning elements. This workshop will provide an overview of microwave and mm-wave applications where RF MEMS are effective in order to meet tight specifications or high end application requirements not well satisfied by semiconductor counterparts: low-loss and high-linearity tunable filters in planar and waveguide technologies, wide-band voltage controlled oscillators, phase shifters, adaptive matching networks, antenna arrays, etc. The focus of the workshop is put not only on RF MEMS researchers but also in any RF or microwave designer that can become an RF MEMS user in the near future.

Programme

09:00h - 09:30h	RF MEMS-Tunable Microwave Components for Radio Link and Space Applications Paola Farinelli, RF Microtech, Italy Hamza el Ghannudi, RF Microtech, Italy
09:30h - 10:00h	RF MEMS Reconfigurable Multimodal Microwave Circuits Lluís Pradell, Universitat Politècnica de Catalunya, Spain
10:00h - 10:40h	RF-MEMS All-Metal Switches and Varactors for Microwave and Millimeter-Wave Circuits Pierre Blondy, Université de Limoges, France
10:40h - 11:20h	Coffee Break
11:20h - 12:00h	BiCMOS Embedded RF-MEMS Components for Re-Configurable mm-Wave Applications Mehmet Kaynak, IHP Microelectronics, Germany
12:00h - 12:20h	Commercial Monolithically-Integrated RF-MEMS Art Morris, Wispy Inc., USA
12:20h - 12:40h	MEMS-Based High-Q Tunable Filters Raafat Mansour, University of Waterloo, Canada
12:40h - 13:00h	RF MEMS Reconfigurable Components in Space Laurent Marchand, ESA ESTEC, The Netherlands

WORKSHOPS AND SHORT COURSES - FRIDAY

Duration: 09:00h to 13:00h

Room Domizia

WF1 (EuMC)

EMI Challenges in Future Complex Multi-Functional (Digital) Systems

Organisers:

David Thomas, The University of Nottingham, UK

Peter Russer, Technische Universität München, Germany

Ioan E. Lager, Delft University of Technology, The Netherlands

Abstract:

The growth of Internet-enabled smart infrastructures underpinning virtually every sector of economic and social life requires complex, high performance and highly integrated miniature electronic systems. The electromagnetic interference will increase with the anticipated increase of clock speeds, frequency of operation and circuit density. Immunity levels will also decrease due to lower supply voltages and lower signal power levels. Traditionally, the potential EMI sources were assessed in the frequency domain assuming static emissions. This is not valid for multifunctional devices with many operating modes. New approaches that fully account for time dependence and uncertainty are needed. The workshop will present some state-of-the-art, unconventional methods and instruments in the realm of EMI prediction and assessment and will speculate on the challenges lying ahead and the feasible manners to approach them.

Programme

- 09:00h - 09:40h** *The Characterisation and Propagation of Stochastic Fields from Printed Circuit Boards*
D. Thomas, The University of Nottingham, UK
- 09:40h - 10:20h** *Pulsed-Field Electromagnetic Immunity in a Complex Digital Environment*
A.T. de Hoop, Delft University of Technology, The Netherlands
I.E. Lager, Delft University of Technology, The Netherlands
- 10:20h - 10:40h** *Conclusions – Open Forum*
- 10:40h - 11:20h** *Coffee Break*
- 11:20h - 12:00h** *Parametric Identification of Stochastic EMI Sources Based on Near-Field Measurements*
Y. Kuznetsov, Moscow Aviation Institute, Russia
A. Baev, Moscow Aviation Institute, Russia
A. Gorbunova, Moscow Aviation Institute, Russia
- 12:00h - 12:40h** *Near-Field Measurement and Modelling of Stochastic Fields in EMI*
J.A. Russer, Technische Universität München, Germany
P. Russer, Technische Universität München, Germany
T. Asenov, University of Nis, Serbia
- 12:40h - 13:00h** *Conclusions – Open Forum*

WORKSHOPS AND SHORT COURSES - FRIDAY

Duration: 09:00h to 18:20h

Room Euphemia

WF2 (EuRAD)

Photonics for RADAR Systems

Organisers:

Antonella Bogoni, CNIT-Photonic Networks National Laboratory, Italy

Abstract

This workshop aims at highlighting the issues of the current radar technologies and the role that photonics can play in radar systems in overcoming these issues and enabling a novel paradigm of multifunctional and software defined radars. The workshop wants to represent a significant overview of the state of the art of photonic-based radar subsystems and available technologies for optical devices in radar applications. Moreover, the workshop wants to envisage the future development of microwave photonics in the radar industrial perspective. The final goal of the workshop is to support the synergy between the players developing the new generation radar systems as the device suppliers, the system vendors, the final users and the involved authorities, both in the military and in the civil environments.

Programme

09:00h - 09:20h

Workshop Introduction

Antonella Bogoni, CNIT, Italy

09:20h - 09:50h

The Navy Case Study: From Shipboard Requirements to Technological Challenges

Andrea Manco, CSSN (Naval Support and Test Center), Italy

09:50h - 10:40h

RF Signal Generation Based on Photonics

Janping Yao, Ottawa University, Canada

10:40h - 11:20h

Coffee Break

11:20h - 12:10h

General Purpose Integrated Microwave Photonic Processors

José Capmany, The Universidad Politécnica de Valencia, Spain

12:10h - 13:00h

Photonic True Time Delays for Beamforming and Signal Processing

Daniel Dolfi, Thales Research & Technology, France

13:00h - 14:20h

Lunch

14:20h - 15:10h

Integrated Microwave Photonics for Radar Systems

David Marpaung, CUDOS, IPOS, School of Physics, University of Sydney, Australia

15:10h - 16:00h

Photonic Applications on EW Solutions

Alessandro Albertoni, Elettronica, Italy

16:00h - 16:40h

Coffee Break

16:40h - 17:30h

A Company Overview on MWP Devices and Applications

Annamaria Fiorello, Selex ES, Italy

17:30h - 18:20h

A Practical Implementation: The PHODIR-Photonic-Based Fully Digital Radar System Project

Paolo Ghelfi, CNIT, Italy

Duration: 09:00h to 13:00h

Room Flavia

WF3 (EuRAD)

Compressive Sensing for Radar Application

Organisers:

Joachim Ender, Fraunhofer-Institute for High Frequency Physics and Radar Techniques FHR, Germany
Laura Anitori, TNO, The Netherlands

Abstract

The goal of the workshop is to bring together recognised experts in the field of Compressive Sensing (CS) and radar to provide the audience with the latest theoretical and experimental results on applications of CS to radar. CS is a relatively new method for acquisition and processing of sparse signals. The benefits of using this technique for reducing the acquisition time and costs will be discussed, and its high-resolution capabilities for target detection, classification and recognition will be presented. Particular interest will be dedicated to the fields of radar imaging, Synthetic Aperture Radar (SAR), sparse arrays and MIMO radars. Furthermore, although the application of CS to radar has been successfully demonstrated in the last few years, there are still several open questions regarding the integration and implementation of CS techniques in current and future operational systems. The workshop will provide an opportunity to the audience to address these open questions and discuss them with the experts.

Programme

09:00h - 09:50h

An Overview on CS Radar Applications and Statistical Analyses

Joachim Ender, Fraunhofer Institute FHR, Germany
Laura Anitori, TNO, The Netherlands

09:50h - 10:40h

Compressed Sensing Solutions for Airborne Low Frequency SAR

S. I. Kelly, University of Edinburgh, UK
Michael Davies, University of Edinburgh, UK

10:40h - 11:20h

Coffee Break

11:20h - 12:10h

Compressive Sensing for Doppler and MicroDoppler Signature Estimation

Moeness Amin, Villanova University, USA

12:10h - 13:00h

Compressed Sensing in Electronics for Defence

G. Prisco, Selex-ES, Italy
P. Vinetti, Selex-ES, Italy
M. D'Urso, Selex-ES, Italy

WORKSHOPS AND SHORT COURSES - FRIDAY

Duration: 09:00h to 13:00h

Room Iustina

WF4 (EuMC & EuRAD)

Noise Radar: Monostatic, Multistatic and MIMO

Organisers:

Krzysztof Kulpa, Warsaw University of Technology, Poland
Gaspere Galati, University of Rome Tor Vergata, Italy

Abstract

In classical pulse radars, several types of waveforms are used. Most popular are linear and non-linear frequency modulation (chirp signals), Costas codes, polyphase codes, Barker codes and other. The pulse radar however have several limitations including range and velocity ambiguity, high peak power and lack of LPI (low probability of intercept) properties, as their emissions can easily be detected and classified. Since a long time more complicated waveform are being search to improve some significant properties of radars and increase its performance, including a renewed interest in the old concept of continuous wave radar, an architecture often used nowadays. A group of very interesting waveforms is based on band-limited noise, sometimes modified slightly to obtained required properties of its ambiguity function. While the available computational power is now very high, the main limitations in design of sophisticated noise radars come not from hardware (inc. computing power) but from the lack of deep knowledge of the synthesis means. The workshop will presents recent development in Noise Radar Technology with some practical examples and implementations. It will start with fundamentals of noise radar technology. Then the idea of multistate noise radar will be presented. The recent development in noise radars is focus on MIMO concept to increase the angular resolution and the sensitivity of noise radars. Some examples of noise radar demonstrator will be also presented, starting from simple monostatic ones via sophisticated designs of noise interferometric and synthetic aperture radars ending on MIMO demonstrators. The presentation will be focused on modern MIMO radars using noise and noise-like waveform to increase the radar sensitivity and its functionality. The presentation will highlight the concept of MIMO radars, shows different waveforms used in such systems and finally shows how to design noise waveforms for MIMO radar

Programme

09:00h - 09:50h

Noise Radar Fundamentals – From Monostatic to MIMO

Ram M. Narayanan, The Pennsylvania State University, USA

09:50h - 10:40h

Signal Processing in Noise Radar

Krzysztof Kulpa, Warsaw University of Technology, Poland

10:40h - 11:20h

Coffee Break

11:20h - 12:10h

Pseudorandom and Semideterministic Waveforms Design for Noise and MIMO radar

Gaspere Galati, Dept. of E.E.-Tor Vergata University, Italy

12:10h - 13:00h

Active and Radiometric Noise Synthetic Aperture Radars – Challenges for High Resolution Images and High Resolution Interferometry

Konstantin Lukin, National Academy of Sciences of Ukraine, Ukraine

Duration: 09:00h to 13:00h

Room Livia

WF5 (EuRAD)

Forward Scatter Radar: Challenges, Capabilities and Modern Modalities

Organisers:

Marina Gashinova, University of Birmingham, UK
Alexander Myakinkov, Nizhny Novgorod State Technical University, Russia

Abstract

Research in Forward Scatter Radar (FSR) has proven the concept's high efficiency for the detection of 'difficult' targets in complex environments.

Currently interest in FSR is increasing, firstly because of the introduction of 'stealth' targets and small low flying aircraft, secondly for its capability to provide main radar missions using passive coherent location (PCL) potentially forming a low cost, self-sustaining multi-channel/multistatic radar network.

This workshop will focus on the key capabilities of FSR, such as detection, target motion parameter estimation, tracking and imaging. FSR is proposed as a potential solution to provide flexibility of counter-measures to emerging threats in a modern world, including the development of deployable low cost sensor networks, re-use of existing communication systems and over-the-horizon operation, as well as discussion of the issues associated with FSR.

The workshop will start with an overview of FSR (Prof. M. Cherniakov, UK), discussing current trends and challenges. Introduction into the Forward Scatter Mode of passive radar will be given by Prof. P. Lombardo (Italy). The next topic will be dedicated to ground and maritime for surface target detection and classification (Dr. M. Gashinova, UK). Finally the practical issues of air target detection and tracking in FSR will be analysed in detail by Prof. A. Myakinkov (Russia). All presenters have a long-standing experience of cooperation with industry.

Programme

09:00h - 09:50h

Overview of Forward Scatter Radar. State-of-the-art, Challenges and Future Trends

Mikhail Cherniakov, University of Birmingham, UK

09:50h - 10:40h

Passive Forward Scatter Radar operation

Pierfrancesco Lombardo, University of Rome "La Sapienza", Italy

10:40h - 11:20h

Coffee Break

11:20h - 12:10h

Fundamental and Practical Aspects of Target Detection and Classification In Ground-Based and Maritime FSR Sensor Networks

Marina Gashinova, University of Birmingham, UK

12:10h - 13:00h

Detection and Tracking of Low-Observable Moving Targets in FSR

Alexander Myakinkov, Nizhny Novgorod State Technical University, Russia

WORKSHOPS AND SHORT COURSES - FRIDAY

Duration: 09:00h to 13:00h Room Minerva

WF6 (EuMC & EuRAD)

The Social and Societal Implications of Autonomous Driving

Organisers:

Holger H. Meinel, Daimler AG, Germany
Katharina Kilian-Yasin, University of Pforzheim, Germany

Abstract

Autonomous Driving is not only a technical, but also and especially in the future a social and societal subject - on one hand it is an old dream of mankind - on the other hand it takes control out of the hand of the driver, giving it on to a machine. If this societal situation and its very specific implications are not cleared entirely and positively, there will never be a market for autonomous driving anywhere in this world! This is quite a challenge we jointly have to overcome to make things happen. Bringing together technical and social researchers, as well as people being able to distinguish and analyze the variance of acceptance in very different societies, the BRIC-States for instance, we are going to discuss and analyze this subject.

Programme

09:00h - 09:45h

Autonomous driving – What it is Today and What it will be in the Future

Bela Peterson, consulting4drive, Germany

09:45h - 10:30h

Societal Implications of Autonomous Driving

Chris Schreiner, Strategy Analytics, USA

10:40h - 11:20h

Coffee Break

11:20h - 12:05h

Socio-Economic Impact of Autonomous Driving in Emerging Countries - India as an Example

Roland Haas, QSO Technologies India Pvt. Ltd., India

12:05h - 13:00h

Social Acceptance of Autonomous Driving Within the BRICS-states

Katharina Kilian-Yasin, University of Pforzheim, Germany

Duration: 09:00h to 13:00h Room Niside

SCF1 (EuMC & EuRAD)

Multibeam Antennas and Beamforming Networks/Electronic Scanned Arrays Design

Organisers:

Piero Angeletti, European Space Agency, The Netherlands
Giovanni Toso, European Space Agency, The Netherlands

Abstract

Multi-Beam Antennas (MBAs) find application in several fields including wireless and satellite communications, RADARs for electronic surveillance and remote sensing, science (e.g. radio telescopes), RF navigation systems, etc. Beam-Forming Networks (BFNs) play an essential role in any antenna system relaying on a set of radiating elements to generate a beam. The objective of the course is to present design principles and state-of-the-art in MBAs and BFNs. The course will cover both theoretical and practical aspects for the following topics:

- Overview of Multibeam Antennas and system requirements
- Satellite Communication Systems
- Wireless Communications
- RADARs
- Multibeam Array Antennas
- Array architecture and building blocks
- Aperture design (partitioning and sub-arrays, element lattices, feed design, grating and quantization lobes, etc.)
- Multibeam Reflector Antennas
- Single-Feed-per-Beam
- Multiple-Feed-per-Beam
- Beamforming Networks
- Analogue BFNs (Serial, Corporate, Blass, Nolen, Butler matrices)
- Digital BFNs

Programme

09:00h - 09:50h

MBA for Telecom and Radar Applications

Giovanni Toso, European Space Agency, The Netherlands

09:50h - 10:40h

Array Based Solutions

John S. Williams, The Aerospace Corporation, USA

10:40h - 11:20h

Coffee Break

11:20h - 12:10h

Reflector Based Solutions

Roberto Mizzoni, Thales Alenia Space, Italy

12:10h - 13:00h

Analog and Digital Beamforming

Piero Angeletti, European Space Agency, The Netherlands

WORKSHOPS AND SHORT COURSES - FRIDAY

Duration: 09:00h to 18:20h

Room Ottavia

SCF2 (EuRAD)

Passive Radar Sensors: Theory and Application

Organisers:

Pierfrancesco Lombardo, University of Rome La Sapienza, Italy
Daniel W. O'Hagan, Fraunhofer Institute, Germany
Dominique Poullin, ONERA, France

Abstract

This Short Course is devoted to the passive radar sensor, which over the last five years has moved from an "emerging technology" to a mature sensor that is ready to be deployed in the field to fulfil the requirements of a range of surveillance applications. Whilst the progress in passive radar has largely been facilitated by the impressive increase in real-time signal processing capabilities, a significant technology enabler has come in the evolution of adaptive signal processing techniques, which permit superior effectiveness, reliability and agility. Special attention is devoted, in this course, to those applications which have gained a very wide scope and which are largely combined with advanced processing techniques. Therefore, the capability to cope with large amounts of data, perform long integration times, and adaptively cancel clutter and interferences are among the core aspects of realising passive radar surveillance. These features, in addition to several other advanced topics, will form the basis of the short course, which will also identify and discuss current relevant-technology trends. Specific attention will be given to air traffic surveillance applications with the combined use of multiband sensors, as well as applications for maritime situational awareness (MSA), which has potential for continuous coastal radar coverage. In certain operational environments, exploitation of forward scatter can enhance detection of low-observable targets. Furthermore, short-range applications have specific peculiarities for both air and surface target detection and classification that are presented in a unified frame that includes detection, cross-range profiling and multi-sensor operation.

The short course will cover the topic of tracking air and surface targets of interests. Both 2D and 3D tracking techniques will be presented by leading authorities. Additionally, advances in target identification will be shown. Finally, Earth observation applications which exploit space-based sources of opportunity complete a wide scope view of the present applications. These include the capability to form passive synthetic aperture radar images usable for differential interferometry applications, as well as the retrieval of environmental parameters of surface vegetation and atmosphere from the passive radar measurements.

Programme

09:00h - 09:20h

Welcome and Introduction to the Short Course

Pierfrancesco Lombardo, University of Rome La Sapienza, Italy

09:20h - 10:00h

Surveillance Trends - and the Role For Passive Radar

Chris Baker, The Ohio State University, USA

10:00h - 10:40h

Air Traffic Surveillance with Multiband PCL

Daniel W. O'Hagan, Fraunhofer Institute, Germany
Heiner Kuschel, Fraunhofer Institute, Germany

10:40h - 11:20h

Coffee Break

11:20-11:55h

Maritime Surveillance with PCL

Alfonso Farina, SELEX-ES, Italy
Enrico Tilli, SELEX-ES, Italy

11:55h - 12:25h

Passive Forward Scatter Radar for Low Observable Targets

Marina Gashinova, University of Birmingham, UK

12:25h - 13:00h

Short-Range PCL for Surveillance and Classification

Fabiola Colone, University of Rome La Sapienza, Italy
Debora Pastina, University of Rome La Sapienza, Italy

13:00h - 14:20h

Lunch

14:20h - 14:55h

STAP for Airborne Passive Radar

Krzysztof Kulpa, Warsaw University of Technology, Poland

14:55h - 15:30h

Passive Radar Tracking in 2D and 3D

Marc Lesturgie, ONERA, France
Dominique Poullin, ONERA, France

15:30h - 16:00h

Passive Radar Imaging for Target Recognition and Identification

Fabrizio Berizzi, University of Pisa, Italy
Marco Martorella, University of Pisa, Italy

16:00h - 16:40h

Coffee Break

16:40h - 17:15h

Earth Observation: Passive SAR Imaging and Change Detection

Mikhail Cherniakov, University of Birmingham, UK
Michael Antoniou, University of Birmingham, UK

17:15h - 17:50h

Earth Observation: GNSS Reflecto-Metry for Environmental Monitoring

Nazzareno Pierdicca, University of Rome La Sapienza, Italy

17:50h - 18:20h

Conclusions

Daniel W. O'Hagan, Fraunhofer Institute, Germany

WORKSHOPS AND SHORT COURSES

National Instruments Workshops

- Free to attend -

Location: Room Minerva

Wednesday 8th October, 09:00h - 12:00h

Workshop - RF and Microwave System Design and Test

Hosted By: National Instruments

Who should attend: engineers and researchers

Learn how to use National Instruments tools for simulation, design, and test of radar and electronic warfare/communications systems. This seminar will explain methods for prototyping advanced radar systems. Also included will be best practices for both the design of electronic warfare and communications systems.

Within this session, learn how to introduce real world measurements alongside simulation in the design process and explore a system-level approach to complex system testing. Finally, you will have a chance to see new National Instruments product capabilities such as the AWR Visual System Simulator (VSS) co-simulation in LabVIEW, user-programmable FPGA instrument technology, and PXI multi-computing (PXImc).

AWR Design Forum (ADF) / User Group Meeting

- Free to attend -

Location: Room Minerva

Wednesday 8th October, 13:00h - 16:30h

Hosted By: AWR/National Instruments

Who should attend: AWR Users

The AWR Design Forum / User Group Meeting is scheduled for Wednesday 8th of October during EuMW 2014. Come and spend time with us to learn about our tools (software & hardware) that span design thru to test for RF/Microwave circuits, systems and sub-systems. The event will focus on RF/microwave design and showcase the NI AWR Design Environment™ product portfolio of EDA design tools, namely Microwave Office®, Visual System Simulator™, AXIEM® and Analyst™ as well as co-simulation with NI LabVIEW. Customer and partners will also be presenting how they use these software solutions to bring their design ideas from concept to production.

For registration and agenda visit:

www.awrcorp.com/eumw2014 and/or www.awrcorp.com/ADF

Agilent Technologies Workshops

- Free to attend -

Location: Room Livia

Agilent Technologies

Agilent's Electronics Measurement business is soon to become Keysight Technologies Inc. Its electronic test, measurement and software solutions have been unlocking measurement insights for 75 years, and delivering reliable, long-lasting products, backed by an industry-leading 3-year standard warranty. Learn more visit www.keysight.com

Connect with the Experts

As you know, On January 7, 2014 Agilent's Electronic Measurement Group unveiled the news that, as of August 1st, we will become Keysight Technologies! Keysight Technologies will concentrate solely on the electronic measurement industry, focusing on its test and measurement customers.

For this year's EuMW program, Keysight Technologies' 'Connect with the Experts' workshops will allow you to meet Keysights industry experts around five major topics which are critical for the EuMW delegates :

- New Aerospace & Defense Applications demanding Advanced Test Solutions
- Latest development in Material Measurement and Device Characterization
- Solving design challenges with EDA software
- Wireless Research Future: The quest for higher & broader frequency bands
- RF & Microwave Measurement Fundamentals

If you are interested to connect with our industry recognised experts, register now to the module(s), you want to attend at: www.agilent.com/find/eumw2014

Tuesday 7th October 13:30h – 17:15h

***Connect with the Experts' Workshop 1:
New Aerospace & Defense Applications
Demanding Advanced Test Solutions
Moderator: Bob Nelson, Signal Analysis
Senior Product Engineer***

13:30h – 14:15h

Multi-emitter Simulation for Electronic Warfare Receiver Test

Presenter: Erik Diez, Senior Product Manager

14:30h – 15:15h

Advances in Active Array Calibration

Presenter: Alex Dickson, Application Engineer

15:30h – 16:15h

New Technologies and Techniques for Wideband Analysis

Presenter: Bob Nelson, Signal Analysis Senior Product Engineer

16:30h – 17:15h

Precision Validation of Radar System Performance in the Field

Presenter: Dan Dunn, General Manager RF/Microwave Handheld

Wednesday 8th October 9:30h – 17:15h

***'Connect with the Experts' Workshop 2:
Latest Development in Material
Measurement and Device Characterization
Moderator: Joel Dunsmore, Senior Solution
Architect***

09:30h – 10:15h

Novel Methodologies for Complete Active Component Characterization

Presenter: Joel Dunsmore, Senior Solution Architect

10:30h – 11:15h

Impedance Measurement: From Micro Scale to Nano-Scale

Presenter: Giovanni D'Amore, Market Development Manager

11:30h – 12:15h

Breakthrough On-Wafer Test Solutions

Presenter: Keysight Technologies in collaboration with Cascade Microtech

12:30h – 13:15h

Improvements in Y-factor Noise Figure Measurement Uncertainty

Presenter: Stewart Forsyth, Business Development Manager

WORKSHOPS AND SHORT COURSES

'Connect with the Experts' Workshop 3: Solving Design Challenges with EDA Software

***Moderator: Matt Ozalas, Senior RF Module
Specialist***

13:30h – 15:15h

**How to Improve RF Module Design
Performances using Integrated Electro-
Magnetic & Electro-Thermal Analysis**

Presenter: Matt Ozalas, Senior RF Module Specialist

15:30h – 17:15h

**Anticipate EMC Issues by Simulating Your
Boards with EM Based Simulation**

Presenter: HeeSoo Lee, 3DEM Application Specialist

Thursday 9th October 9:30h – 17:15h

'Connect with the Experts' Workshop 4: Wireless Research Future: The Quest for Higher & Broader Frequency bands

***Moderator: Suren Singh, Mm-wave and Thz
Application specialist***

09:30h – 10:15h

**New Developments in mm-Wave and THz
Markets, Technologies and Measurements**

Presenter: Suren Singh & Tom Crowe - Virginia Diodes
Inc, Mm-wave and Thz Application specialist

10:30h – 11:15h

**Millimeter Wave Applications in Wireless:
5G and Backhaul**

Presenter: Allison Douglas & Jeffrey Hessler, Market
Development Manager & CTO Virginia Diodes Inc.

11:30h – 12:15h

**Customized Real-Time Signal Processing
with High Speed Multi-Channel Digitizer
Platform and Firmware Development Kit**

Presenter: Alex Dickson, Application Engineer

12:30h – 13:15h

**Using Modular and Handheld Instruments
for Microwave Education**

Presenter: Wilkie Yu, Marketing Manager RF/Microwave
Handheld Instruments

'Connect with the Experts' Workshop 5: RF & Microwave Measurement Fundamentals

***Moderator: Roland Marquardt, RF PXI
Solution Specialist***

13:30h – 14:15h

Signal Analysis Fundamentals

Presenter: Bob Nelson, Signal Analysis Senior Product
Engineer

14:30h – 15:15h

Network Analysis Fundamentals

Presenter: David Ballo, Senior Application Manager

15:30h – 16:15h

**RF Hand-Held and Power Measurement
Fundamentals**

Presenter: Andrew Benn, Business Development
Manager

16:30h – 17:15h

**One Measurement Science across Test
Platforms (Benchtop vs. PXI)**

Presenter: Roland Marquardt, RF PXI Solution Specialist

Rohde & Schwarz Workshops

- Free to attend -

For more information, details and registration:
<http://www.eumw.rohde-schwarz.com/>

Location: Hall 9, 1st Floor (as signposted)

Tutorial Seminars - RF Basics in Test and Measurement

Tuesday 7th October 10:30h – 11:30h

Fundamentals of Spectrum Analysis

Tuesday 7th October 12:00h – 13:00h

Fundamentals of Signal Generators and Oscillators (YIG vs. VCO)

Tuesday 7th October 13:30h – 14:30h

Fundamentals of Vector Signal Generation in the Microwave Domain

All the major building blocks of a vector signal generator are addressed, from synthesizer to RF chain. The major requirements for microwave signal generators will be presented and explained.

The following topics are covered:

- Operation and usability
- Concept for signal generation in microwave domain
- Signal setup and measurement with an analyzer
- Key specifications and performance characteristics of microwave signal generators

Tuesday 7th October 15:00h – 16:00h

Fundamentals of Power Sensors and Measurements

Tuesday 7th October 16:30h – 17:30h

Fundamentals of Vector Network Analysis

Tutorial Seminars – Digital Modulation Basics in Test and Measurement

Wednesday 8th October 09:00h – 10:00h

Introduction to Digital Signals and Digital Modulation

Wednesday 8th October 10:30h – 11:30h

Generation and Analysis of Digital Signals and Modulation

Wednesday 8th October 12:00h – 13:00h

Understanding Fading and its Effects

ROHDE & SCHWARZ

Wednesday 8th October 14:00h – 15:00h

Pulse Generation for Radar Applications

In aerospace and defense, high flexibility for signal generation is required. The most prominent application area is radar, with all its various test cases for the different types. The need for signal generation for these applications is necessary throughout the entire development cycle, from simple component testing up to more complex emitter testing together with receivers. These applications mainly address all types of pulsed signals, from simple CW pulses to complex concatenation of vector modulated pulses.

In this session, the major requirements for testing are presented together with real-life example scenarios.

The following topics are covered:

- Setup of simple pulses, pulse trains and emitter signals of radar systems
- Scenario emulation with integrated antenna patterns and antenna scans
- Typical modulation types, sequencing concepts and more complicated setups of multiple emitters
- Automatic instrument configuration according to emulation scenarios
- Analysis of generated pulse signals

Wednesday 8th October 15:30h – 16:30h

Fundamentals and Measurements of Radar Waveforms

The all-weather capability and performance of radar sensors is an important argument for their diverse application. Measurement accuracy and resolution depend on the radar sensor and the used waveform. Radars often apply pulse and pulse-compression waveforms, continuous wave (CW) signals of high bandwidth in combination with digital beamforming techniques to measure range, radial velocity and azimuth angle unambiguously and in multi-target situations. To ensure the high performance and reliability of these sensors, dependable and fast test solutions are required.

This seminar explains basic radar signal processing of different waveforms (e.g. pulse and pulse compression, continuous waveforms such as chirp sequences, hopping waveforms) and indicates trends. It also explains fully automated pulse and CW signal analysis solutions for research, development and production of radars to verify radar key performance indicators.

The following topics are covered:

- Fundamentals of pulse and CW radar waveforms
- Measurement needs
- Fully automated measurement of pulse parameters such as width, rise/fall times, PRI, pulse-to-pulse measurements, trending
- Measurement of FMCW signals, chirp deviation, chirp linearity

Thursday 9th October 9:00h – 9:30h

Group Delay Measurements Using Wideband Multicarrier Signals for Satellite Communications

A demodulation bandwidth of 500 MHz makes today's high-end signal and spectrum analyzers a powerful tool for wideband applications. One example is the measurement of group delay utilizing a multicarrier CW signal for calibration and group delay measurements. Group delay is a critical specification, for example in satellite communications terminals. The necessary option now enables engineers and technicians to perform this measurement easily with minimal external hardware and calibration steps, using a spectrum analyzer instead of a vector network analyzer for a 500 MHz channel.

The following topics are covered:

- Principle of multicarrier group delay measurement for characterizing transmission path quality
- Calibration techniques
- Group delay measurements on frequency-converting devices

Thursday 9th October 9:45h – 10:30h

Easy and Precise Phase Noise Measurement Using Advanced Spectrum Analyzers

In this session, the fundamental concepts and ideas of measuring phase noise parameters on a wide range of devices under test (VCXO, OCXO, etc.) will be introduced and demonstrated using a state-of-the-art signal and spectrum analyzer in combination with the dedicated phase noise measurement application.

The combination of an analyzer with a very good internal reference signal source, high-performance analog-to-digital converters and signal processing, and sophisticated algorithms generates a measurement tool for all needs of modern phase noise measurement.

The following topics are covered:

- Fundamental concepts of RF and digital processing concerning phase noise
- All results at a glance – state-of-the-art user interfaces
- Special phase noise measurement functions – spot noise, residuals, spurs, limits
- Digital PLL, monitoring and tracking fast-drifting devices

Thursday 9th October 11:00h – 12:00h

Calibrating and Verifying Network Analyzers – How to Achieve Reliable Measurement Results

For many users, calibration (to be more precise: system error correction) of network analyzers is a mystery. Selecting the optimal calibration method requires deep insight, and defining the calibration kit and doing the calibration are always potential sources of error. And after calibration, the question users are faced with is: What degree of accuracy was actually achieved using the current test parameters? The workshop describes some basics of calibration as well as individual calibration methods, clarifies the difference between calibration and verification, and presents a solution for verifying the true accuracy of vector network analyzers

Thursday 9th October 12:30h – 13:30h

Configurable Signal Conditioning for Network Analyzers – Getting a Complete (T/R) Module Characterization with a Single Connection

Amplifiers and, in particular, composed devices such as receivers, transceivers and T/R modules require a large number of test parameters and different test setups for a complete characterization: Typically (conversion) gain measurements require the handling of very low and/or very high stimulation and response power levels. Intermodulation testing and the unique Rohde & Schwarz solution for group delay measurements on embedded LO converters are based on two-tone stimulation. Finally, pre-amplification is typically conditional for noise figure evaluation, etc.

Reconnecting the device under test and reconfiguring the test setup is error prone, time consuming, and requires frequent recalibration. On the other hand, the test system should be optimally adapted to the needs of every single test, to ensure the desired performance and to save costs.

This workshop presents solutions for T/R module tests based on the R&S®ZVA network analyzer. This instrument allows extensive characterization even of demanding active devices – and on a single connection. The equipment can be tailored to individual requirements, and components such as internal combiner or pulse modulators can be fitted as separate options as desired and controlled during the test sequences. The R&S®ZVA network analyzer is a flexible, robust and powerful system for testing amplifiers and T/R modules – single-connection device characterization (SCDC) at its best.

Thursday 9th October 14:00h – 15:00h

Challenges in Millimeter-Wave Measurements

Measurements at millimeter-wave frequencies are more demanding than at microwave frequencies. Besides the system error correction, active device characterization requires a precise power calibration, which is a challenge especially for on-wafer testing. R&S®ZVA vector network analyzers combined with Rohde & Schwarz millimeter-wave converters are able to handle such applications and ensure e.g. a precise power calibration in the wafer plane. As a result, compression measurements, common in the coaxial world, can be performed at millimeter-wave frequencies. The workshop will give an overview of the current status of millimeter-wave solutions, focusing on active device characterization and on-wafer calibration.

Thursday 9th October 15:30h – 16:30h

Insight into Nonlinear Device Characterization – from Modeling and Waveform Engineering to Active Harmonic Load Pull Systems – in cooperation with mesuro

Increasing the efficiency of active components such as amplifiers is becoming more and more important in today's communications systems. In order to achieve this, S-parameter characterization has to be extended by nonlinear device characterization. Rohde & Schwarz and Mesuro offer versatile systems for nonlinear device characterization from X-parameter equivalent measurements and waveform engineering to active harmonic load pull systems based on the four-source models of the R&S®ZVA vector network analyzer. This workshop will give an overview of the different nonlinear solutions from Rohde & Schwarz and Mesuro.

WORKSHOPS AND SHORT COURSES

Anritsu Workshops

- Free to attend -

Location: Room Minerva

Tuesday 7th October, 10.00 – 10.40

The Best of Both Worlds: Benefits of the Anritsu Universal Power Sensor Architecture

This workshop will discuss benefits users can expect to receive when using an Anritsu power sensor with its unique universal sensor architecture. The architecture combines two RF power measurement techniques in one sensor. This enables users to quickly characterize their DUT with a CW signal then do a final average power measurement of their DUT in normal operation regardless of modulation type – all with one sensor.

Tuesday 7th October, 11.00 – 11.40

Connecting the Dots: Connector Design, Performance and Care

Connectors are a critical part of the design and resulting performance of any microwave product. As a test and measurement company, Anritsu has been at the forefront of developing new designs of connector to cover increasing frequencies. These include firsts such as the K Connector® to 40 GHz and more recently a 0.8 mm coaxial connector to 145 GHz. Various types of coaxial connector will be reviewed with an assessment of their electrical and physical performance and general aspects of connector care will be discussed.

Tuesday 7th October, 13.00 – 13.40

Taking the Pulse: Measurement Techniques for Radar System Applications

This workshop will describe how improved pulses S-parameter

measurements can be made by use of innovative high-speed digitizer architecture. The session will conclude with a consideration of calibration methodologies relevant to pulse measurements and the associated uncertainties.

Tuesday 7th October, 14.00 – 14.40

Expanding Waveguide Boundaries: Broadband Device Characterization from 70 kHz to 145 GHz

The proliferation of W band applications has created a demand for improved performance through more accurate device models. Until now, coaxial connector and VNA frequency limitations have prevented single sweep device characterization above 110 GHz using a vector network analyzer. This workshop will discuss the different industry-first developments that are included in the design of the VectorStar 145 GHz Broadband System.

Tuesday 7th October, 15.00 – 15.40

Capture & Replay – An easy task with MS2830A Signal Analyzer

Using the VSG MS2830A Signal Analyzer for ATC test it is possible to replace obsolete instruments on the lab bench. Remote controlling the Signal Analyzer with LabView allows an automated Air traffic Control System signal capturing for production testing. It will be shown that this way of production testing offers time savings and reduces significantly the complexity of an overall ATC / IFF Interrogator measurement.

EuMW MICROAPPS 2014

- Free to attend -

Stand 105B

Welcome to the fourth annual European Microwave Week Microwave Application Seminars (MicroApps). MicroApps will be held from Tuesday 7th October through to Thursday 9th October 2014.

MicroApps are sponsored by National Instruments/AWR, Rohde & Schwarz and Horizon House and will take place in the MicroApps Auditorium, which is located within the exhibition hall, making it an ideal stop while visiting the EuMW show. EuMW exhibitors will present 20 minute long technical presentations describing state-of-the-art applications, products, design techniques, and processes of interest to the RF and microwave community.

Intent of this free to attend forum is that engineers gain insight into products and techniques that they can find useful in their everyday work.

Sponsored by:

ROHDE & SCHWARZ

MicroApps Highlights

- MicroApps feature practical application papers describing novel products and processes
- Keynotes are presented by leading industry names
- All MicroApps sessions are held on the exhibition floor at the MicroApps Auditorium
- Exhibition-only Badges or Conference Badges enable free access to all MicroApps sessions
- A complimentary CD of papers presented will be available
- A free notepad, pen and bottle of water are available for all attendees

Once finalized, a detailed agenda will be made available at the MicroApps website: www.eumicroapps.com and published in the official EuMW Show Guide. Additionally, printed copies will also be made available at the EuMW registration desks.

We hope to see you at EuMW MicroApps 2014!

MicroApps Committee

CONFERENCE SESSIONS MATRIX - SUNDAY

Room	09:00h - 10:40h	Coffee Break	11:20h - 13:00h	Lunch	14:20h - 16:00h	Coffee Break	16:40h - 18:20h
Aurelia	WS1 EuMC/EuMIC Terahertz Technologies - from Materials to Devices and their Applications						
Baebiana	WS2 EuMC MEMS Technology and Application: From RF to THz, Convergence with Microfluidics and Biosensing						
Domizia	WS3 EuMC Wireless Power Transmission – Near and Far Field Approaches						
Flavia	WS4 EuMC/EuMIC Recent Advancements in GaN Power Amplifiers - Wireless Communication and Electromagnetic Compatibility (EMC)						
Giulia	SCS1 EuMIC Fundamentals of Microwave Power Amplifier Designs				WS5 EuMIC GaN Technology for Space Applications		
Hortensia	WS6 EuMC Localization of Energy Autonomous Devices						
Iustina	WS7 EuMC/EuMIC Microwave Nanoscale Microscopy: the Scanning Microwave Microscope (SMM) as a Novel Tool for Measuring Micro- and Nano-Structures, Devices, and Biological Cells						
Livia	WS8 EuMC Nanoelectromagnetics of Advanced Materials for Microwave-to-THz Applications						
Minerva	SCS2 EuMC The Dynamics, Bifurcation, and Practical Stability Analysis/Design of Nonlinear Microwave Circuits and Networks

EuMW		Joint EuMC/ EuMW
EuMC		Joint EuMC/ EuMIC
EuMIC		Joint EuMC/ EuRAD
EuRAD		

CONFERENCE SESSIONS MATRIX - MONDAY

Room	09:00h - 10:40h	Coffee Break	11:20h - 13:00h	Lunch	14:20h - 16:00h	Coffee Break	16:40h - 18:20h
Aurelia	EuMIC01 Modelling and Design of Active and Passive (M)MIC Components				EuMIC06 Emerging and High-Performance Technologies: From Device Physics to MMICs		EuMIC09 Focus Session on Diamond for Microwaves: from Substrates to Devices
Baebiana					EuMC/EuMIC01 High Linearity CMOS Power Amplifiers		EuMC/EuMIC03 From Device Physics to Linear Power Amplifiers
Cecilia	EuMIC02 Transmitter and Receiver Circuits				EuMIC07 Active Tuneable Circuits and Oscillators		EuMC/EuMIC04 Device and Circuit-Level Modelling Techniques
Domizia	WM1 EuMC New Trends in Substrate Integrated Circuits (SICs)						
Euphemia	WM2 EuMC Current Research Directions in RFPA Design				WM3 EuMC Industrial Radar Technologies		
Flavia	EuMIC03 Millimetre-Wave PA in Silicon Technology		EuMIC05 EuMIC Opening Session		EuMC/EuMIC02 GaN RF PA Solutions		EuMC/EuMIC05 GaN Solutions for X- and K-Bands
Hortensia	EuMIC04 Microwave Circuits				EuMIC08 60-320 GHz Downconverters		EuMIC10 mm-Wave Circuits and Components
Iustina	WM4 EuMC Wireless Concurrent Technologies for the Smart Evolution of Cities						
Livia	WM5 EuMC Time as the 4th Dimension for Emerging Microwave Communication and Sensing Array Systems						
Minerva	WM6 EuMC Progresses in Multilayer/3D Technologies and Techniques for Advanced Millimetre-Wave Circuits and Modules						
Niside	WM7 EuMC Biomedical Applications of Microwaves: From System View to Innovative Sensor Concepts				WM8 - EuMC Advances in the 'Carbon Based Smart System for Wireless Application' (NANO RF) European Project		
Ottavia	WM9 EuMC/EuMIC RF MEMS-Enabled Microwave and mm-Wave Reconfigurable Components						
Hall 10		EuMIC Poster Session					

	EuMW		Joint EuMC/ EuMW
	EuMC		Joint EuMC/ EuMIC
	EuMIC		Joint EuMC/ EuRAD
	EuRAD		

CONFERENCE SESSIONS MATRIX - TUESDAY

Room	09:00h - 10:40h	Coffee Break	11:20h - 13:00h	Lunch	14:20h - 16:00h	Coffee Break	16:40h - 18:20h	19:00h - 22:00h
Auditorium Hall 8			EuMW01 EuMW/EuMC Opening					
Aurelia	EuMIC11 Low-Noise Amplifiers and Subsystems				EuMC/EuMIC08 Technologies and Designs for Low-Noise Circuits		EuMC07 Measurement of Permittivity and Permeability	
Baebiana	EuMC/EuMIC06 Advanced Architectures for Power Amplifiers				EuMC04 Propagation Modelling and Characterisation		EuMIC14 EuMIC Closing Session	
Cecilia	EuMIC12 FET Characterisation and Modelling				EuMC/EuMIC09 Characterisation and Modelling of Dispersion and Noise in Microwave Transistors		EuMC08 Wireless Systems and Applications	
Domizia	EuMIC13 Focus Session on European Gallium Nitride Industrialisation Capability				EuMC/EuMIC10 Focus Session on System Level Characterisation and Modelling for Mobile Communications		EuMC09 Microwave Sensing	
Flavia	EuMC/EuMIC07 CMOS and BiCMOS Solutions for RF and Millimetre-Wave PA				EuMC/EuMIC11 Focus Session on Advances and New Applications in Carbon-Based Nanoelectronics		EuMC10 Advanced Waveguide Filter Realisations	
Giulia	EuMC01 Focus Session on 3D/ Additive and Inkjet-Printed RF Components, Modules and Large-Area 'Smart Skins and Antenna Arrays'						EuMC11 MEMS Based Techniques for Tuneable Devices and Systems	
Hortensia	EuMC02 Transmission Lines and New Technologies				EuMC05 Broadband Planar Couplers		EuMC12 Power Dividers	
Iustina	EuMC03 Reconfigurable and Multi-Band Antennas				EuMC06 Integrated Millimetre Wave and Terahertz Antennas		EuMC13 Multi-Channel and Antenna Array Technology	
Niside				EuMW Women in Microwave Engineering Event				
Exhibition Hall		EuMC/EuMIC Poster Session						
Hall 8								Welcome Reception

EuMW		Joint EuMC/ EuMW
EuMC		Joint EuMC/ EuMIC
EuMIC		Joint EuMC/ EuRAD
EuRAD		

CONFERENCE SESSIONS MATRIX - WEDNESDAY

Room	09:00h - 10:40h	Coffee Break	11:20h - 13:00h	Lunch	14:20h - 16:00h	Coffee Break	16:40h - 18:20h	18:20h - 19:00h
Aurelia	EuMC14 Passive RFID Technologies		EuMC22 Wireless Power Transfer		EuMC30 High Frequency Monolithic VCOs		EuMC37 Microwave VCOs and Modules	
Baebiana	EuMC15 Focus Session on Microwave Biosensing		EuMC23 Special Session: A Tribute to Arthur A. Oliner and His Scientific Heritage for the European Microwave Community		EuMC31 Integrated Transceivers		EuMC38 Special Session on 50 years of Matthaei, Young, Jones's Handbook	
Cecilia	EuMC16 Advances in Resonators and Transitions		EuMC24 Non Planar Passive Components for Power Applications		EuMC32 Filter Synthesis and Practical Considerations			
Domiziana	EuMC17 Planar Passive Circuits and Antennas Based on Metamaterials		EuMC25 Microwave-Based Medical Applications		EuMC33 Characterisation of Material Properties		EuMC39 Microwave Measurements	
Flavia	The Defence, Security & Space Forum		EuRAD01 EuRAD Opening	The Defence, Security & Space Forum				The DS&S Forum Cocktail Reception
Giulia	EuMC18 Innovative Approaches Enabling Tuneability and Reconfigurability		EuMC26 Emerging Tuneable and Reconfigurable Devices and Systems		EuMC34 Rectennas and Electromagnetic Energy Harvesting		EuMC40 RFID and Energy Harvesting	
Hortensia	EuMC19 Graphene Devices and Novel Concepts		EuMC27 Emerging Technologies and Novel Applications		EuMC35 Emerging Optical Components and Applications			
Iustina	EuMC20 Novel Antenna Concepts		EuMC28 Lumped Elements and Wideband Planar Filters		EuMC/EuRAD01 Antenna Arrays		EuMC/EuRAD02 Application-Driven Antenna Design	
Niside	EuMC21 New Modelling Techniques for Guiding Structures		EuMC29 Frequency- and Time-Domain Electromagnetic Modeling		EuMC36 Bioelectromagnetic Sensors		EuMC41 Bioelectromagnetics for Medicine	
Exhibition Hall		EuMW Student Design Competition						
Exhibition Hall		EuMC Poster Session

EuMW		Joint EuMC/ EuMW
EuMC		Joint EuMC/ EuMIC
EuMIC		Joint EuMC/ EuRAD
EuRAD		

CONFERENCE SESSIONS MATRIX - THURSDAY

Room	09:00h - 10:40h	Coffee Break	11:20h - 13:00h	Lunch	14:20h - 16:00h	Coffee Break	16:40h - 18:20h
Aurelia	EuMC42 THz Circuits		EuMC47 High Data-Rate Wireless Communications		EuMC53 Advanced Signal Generation Techniques		
Baebiana	EuMC43 Digital Predistortion and Crest Factor Reduction		EuMC48 Components for Microwave Front-ends		EuMC54 Microwave Techniques for Sensing		
Cecilia	EuMC44 Filters Based on SIW Technology		EuMC49 Tuneable and Multiband Planar Filters		EuMC55 Advances in Design and Implementation of Planar Filters		
Domiziana	EuRAD02 Multi-Channel Radar Signal Processing		EuRAD05 High-Resolution Radar Signal Processing and Imaging		EuRAD06 Radar Imaging and Range-Doppler Processing		
Flavia	EuMC45 Advanced Antenna Design Methods		EuMC/EuRAD04 Antennas for Communication Applications		EuMC/EuRAD06 Special Session on Autonomous Driving: Status-Quo and the Next Generation of Automotive RADAR		EuMW/EuMC02 EuMW/EuMC Closing Session
Giulia	EuMC/EuRAD03 Technologies for Communication, Radar and Remote Sensing		EuMC/EuRAD05 Phased Arrays: System Aspects		EuMC/EuRAD07 Phased Arrays: Components		
Hortensia	EuRAD03 Special Session on 110 years of Radar Developments in Europe after Hülsmeyer's Telemobiloskope		EuMC50 Special Session on Asia Pacific Microwave Conference		EuMC/EuRAD08 High-Resolution FMCW/SFCW Radars		
Iustina	EuMC46 FSS and AMC: Modelling and Applications		EuMC51 Advances in Metamaterials and EBG Structures		EuMC56 Planar Passive Devices		
Niside	EuRAD04 Radar Sensors for Measurements and Imaging		EuMC52 Interconnects, Packaging and MCM		EuRAD07 Focus Session on Clutter Modelling and Interference Suppression in Bistatic Radar Systems		
Exhibition Hall				EuMW Student Challenge, Poster Session			
Exhibition Hall		EuMC/EuRAD Poster Session

EuMW		Joint EuMC/ EuMW
EuMC		Joint EuMC/ EuMIC
EuMIC		Joint EuMC/ EuRAD
EuRAD		

CONFERENCE SESSIONS MATRIX - FRIDAY

Room	09:00h - 10:40h	Coffee Break	11:20h - 13:00h	Lunch	14:20h - 16:00h	Coffee Break	16:40h - 18:20h
Aurelia	EuRAD08 Focus Session on Advances in Passive Radar Systems		EuRAD13 Focus Session on Advanced Tomographic SAR Imaging: Processing Techniques and Applications				
Baebiana	EuRAD09 Radar Architectures and Systems		EuRAD14 Radar Performance, Noise and Clutter		EuRAD18 EuRAD Closing Session		
Cecilia	EuRAD10 Feature Extraction and Micro-Doppler Processing		EuRAD15 Antenna-Based Processing				
Domizia	WF1 EuMC EMI Challenges in Future Complex Multi-Functional (Digital) Systems						
Euphemia	WF2 EuRAD Photonics for RADAR Systems						
Flavia	WF3 EuRAD Compressive Sensing for Radar Applications						
Giulia	EuRAD11 Automotive Radar and Applications		EuRAD16 mm-Waves and UWB Radar				
Hortensia	EuRAD12 Advances in Meteorological Radar Applications		EuRAD17 Advances in Industrial and Naval Radars				
Iustina	WF4 EuMC/EuRAD Noise Radar: Monostatic, Multistatic and MIMO						
Livia	WF5 EuRAD Forward Scatter Radar: Challenges, Capabilities and Modern Modalities						
Minerva	WF6 EuMC/EURAD The Social and Societal Implications of Autonomous Driving						
Niside	SCF1 EuMC/EURAD Multibeam Antennas and Beamforming Networks/Electronic Scanned Arrays Design						
Ottavia	SCF2 EuRAD Passive Radar Sensors: Theory and Application						

	EuMW	Joint EuMC/ EuMW
	EuMC	Joint EuMC/ EuMIC
	EuMIC	Joint EuMC/ EuRAD
	EuRAD	

EXHIBITOR WORKSHOP MATRIX

Date	Room		
Tuesday 7th October	Hall 9, 1st Floor	10:30h - 13:00h Rohde & Schwarz Workshops	13:30h - 17:30h Rohde & Schwarz Workshops
	Livia		13:30h - 17:15h Agilent Workshops
	Minerva	10:00h - 11:40h Anritsu Workshops	13:00h - 16:40h Anritsu Workshops
Wednesday 8th October	Hall 9, 1st Floor	09:00h - 13:00h Rohde & Schwarz Workshops	14:00h - 16:30h Rohde & Schwarz Workshops
	Livia	09:30h - 13:15h Agilent Workshops	13:30h - 17:15h Agilent Workshops
	Minerva	09:00h - 12:00h National Instruments Workshops	13:00h - 16:30h AWR Workshops
Thursday 9th October	Hall 9, 1st Floor	09:00h - 13:30h Rohde & Schwarz Workshops	14:00h - 16:30h Rohde & Schwarz Workshops
	Livia	09:30h - 13:15h Agilent Workshops	13:30h - 17:15h Agilent Workshops

	Agilent Workshops
	National Instruments / AWR Workshops
	Rohde & Schwarz Workshops
	Anritsu Workshops

FLOOR PLAN

Conference Centre / Centro Convegni (Hall 10)

EXHIBITOR LIST

A&V Elettronica	EDA Solutions Ltd.	Kyland	RFHIC Corp.
Adamant Co. Ltd.	EGIDE	L-3 Communications Narda Microwave-East	RN2 LTCC
Aeroflex	Elbit Systems EW and SIGINT-Elisra	Lake Shore Cryotronics Inc.	Robustel
AFT Microwave GmbH	Electronics and Telecommunications Research Institute (ETRI)	LPKF Laser & Electronics AG	Rogers Corp.
Agilent Technologies	Electronics World	MACOM	Rohde & Schwarz
Alfa Microonde Srl	EM Software & Systems GmbH	MAJR Products Corp.	Rosenberger Hochfrequenztechnik GmbH & Co. KG
American Technical Ceramics (ATC)	Emerson & Cuming Microwave Products NV	Marki Microwave Inc.	SAF Tehnika
Anritsu EMEA Limited	EMXYS	Maury Microwave Corp.	Saras Technology Ltd.
ANSYS	ErreBi Plastic Innovation Srl	MEC-Microwave Electronics for Communications	Schmid & Partner Engineering AG
API Technologies Corp.	ERZIA	Meinberg Funkuhren GmbH & Co. KG	Schott Electronic Packaging
Applied ThinFilm Products	Erzia Technologies SL	Mercury Systems Inc.	Schott ES SpA
AR Europe Ltd.	everything RF	Mician GmbH	Selex ES SpA
Arlon MED	Fancort Industries	Micro Systems Engineering GmbH	SIAE Microelettronica
ART-FI	Farran Technology Ltd.	MicroApps	Sincron Sistemi Srl
ART-FI	Filtronic Broadband Ltd.	Microwave Engineering Europe	Sincron Srl
Artech House	Flann Microwave Ltd.	Microwave Journal	Sonnet Software Inc.
Aspocom Group Plc	Focus Microwaves Inc.	Microwave Product Digest	Southwest Microwave Inc.
Assystem	Fraunhofer FHR	Microwave Technology	Special-Ind SpA
Assystem France	Fraunhofer IAF	Microwaves & RF	Spinner GmbH
AT Wall Company	Freescall Halbleiter Deutschland GmbH	Mitsubishi Electric Europe BV	SRT
Auriga Microwave	Genmix	Molex Deutschland GmbH	SRTechnology Corp.
Aurora Software and Testing	Gigatronics	Morion Inc.	Sumitomo Electric Device Innovations
AVX Corp.	Gorgy	MOSIS	Sumitomo Electric Europe Ltd.
AWR UK	Gowanda	MPG Instruments	Sumitomo Electric Industries
Barry Industries	Greenray Industries	National Instruments	Synopsis Corporation Group
Berex	High Frequency Electronics	Norden Millimeter	Synopsis Technologies
BSC Filters Ltd.	Holzworth Instrumentation	Nuova Eurostar srl	Taconic
bsw TestSystems & Consulting AG	Huang Liang Technologies Co. Ltd.	OML	Tanner EDA
Cambridge University Press	Huber + Suhner AG	OMMIC SAS	Tecdia Inc.
Cascade Microtech Inc.	Ideal Aerosmith	Optiprint AG	Teledyne Coax Switches
CCI Limousin (Elopsys)	IEEE Communications Magazine	Pacific Millimeter Products	Teledyne Labtech Ltd.
CELTE SRL	IEEE Microwave Magazine	Panorama Difesa	Teledyne LeCroy
Chemical Machining Spa	IHP GmbH	Pasquali Microwave Systems Srl	Teledyne Ltd.
Cobham Microwave	IMS 2014	Passive Plus Inc.	Teledyne Microwave Solutions
Coilcraft	IMST GmbH	Pasternack Enterprises Inc.	Teledyne Relays
Compound Semiconductor	Infacom SL	PCTEL	Times Microwave Systems
Connectronics	Infineon Technologies AG	Pharad	TNO Defense, Safety and Security
Copper Mountain Technologies	INFOCOM	Pickering Interfaces Ltd.	TriQuint Semiconductor
Corry Micronics Inc.	Ingun Prüfmittelbau GmbH	PICO Technology Ltd.	United Monolithic Semiconductors (UMS)
Crystek	Innovative Power Products	Pole Zero	Universidad Carlos III de Madrid (UC3M)
CST-Computer Simulation Technology AG	Insulated Wire Inc.	Premix Oy	Universitat Politècnica de Valencia-Val Space Consortium (UPV-VSC)
Diamond Microwave	Isola GmbH	Printech	Vectrawave
Diconex	Isotemp	Public University of Navarre (UPNA)	VIA electronic GmbH
Dielectric Laboratories Inc.	ITF	Radar Systems Technology Inc.	Wiley
Dow-Key Microwave	K&L Microwave	Rakon Ltd.	WIN Semiconductors Corp.
DSPM Telecomunicazioni Srl	Kalky	Ranatec Instrument AB	XSIS
ECHO Microwave Co. Ltd.	Krytar	RF Microtech srl	

The Exhibitor List is correct at the time of going to press. It is subject to change.

For up-to-date information visit:

www.eumweek.com