EUROPEAN MICROWAVE WEEK 2018
IFEMA - FERIA DE MADRID, MADRID, SPAIN
23RD – 28TH SEPTEMBER 2018

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**European Microwave Week Future Events**

*EuMW 2019 - Paris*

*EuMW 2020 - Utrecht*

*Details in this booklet were correct at the time of going to press. They are subject to change. For up-to-date information visit our website: [www.eumweek.com](http://www.eumweek.com)*
Welcome to the 21st European Microwave Week

Welcome to Madrid, the economic and cultural centre of Spain and the third largest city in the European Union! It is our great pleasure to welcome you to the 21st European Microwave Week (EuMW) to be held at IFEMA Feria de Madrid from Sunday 23rd to Friday 28th September 2018. After the very successful edition in Nuremberg (2017) the EuMW comes to the lively, cosmopolitan and friendly city of Madrid. This conference event, which was started by the European Microwave Association (EuMA) in 1998, is comprised of the 48th European Microwave Conference (EuMC) to be held from 25th to 27th September, the 13th European Microwave Integrated Circuits Conference (EuMIC) which will take place from 24th to 25th September, and the 15th European Radar Conference (EuRAD) which will run from 26th to 28th September. The three conferences are accompanied by the traditional 3-day trade show on microwaves and RF, which attracts about 300 exhibitors and is the largest of its kind in Europe.

Based on the invaluable commitment of over 430 reviewers, the 110 members of the Technical Programme Committee constituted an excellent programme comprising 521 presentations. The programme also includes six Special Sessions. We are proud to host in particular the Special Session celebrating the 20th anniversary of EuMW, which encompasses presentations by our esteemed colleagues who launched this successful event as envisioned by, at-the-time, a recently established EuMA. Two other Special Sessions highlight the research activities in Latin America and 5G Technology in the Asia Pacific Region. Two more Special Sessions present the latest research on Additive Manufacturing and High Frequency Flexible Bendable Electronics for Wireless Communication Systems. Finally, a Special Session is devoted to Radar Projects at the European Defence Agency.

The regular programme is organised in 87 oral sessions and five interactive sessions. The programme is complemented by 33 Workshops and eight Short Courses covering the most relevant topics ranging from Millimetre-Wave Circuits to 5G, from Power Amplifiers to Autonomous Car, and from THz Technology to Satellite Communications.

This year’s Defence, Security and Space Forum (DSSF), a well-established and highly appreciated event at the EuMW, is devoted to ‘Integrating Unmanned Aerial Vehicles (UAVs) into Defence and Security Scenarios’. The popularity of UAVs is growing due to a reduction in costs and the increasing capabilities and benefits provided by such systems. Currently, the estimated number of existing UAVs is believed to be a few million with that figure estimated to grow exponentially in coming years. The DSSF Forum organisers have succeeded in attracting high-level speakers to discuss the need from a Defence and Security perspective of integrating UAVs into current air traffic control and air defence systems, together with related technological challenges and solutions.

Internationally renowned speakers will discuss the latest trends and developments in their keynotes at the conferences Plenary Sessions. At the Opening Session of the EuMW Enrique Blanco, Telefónica Global CTIO, will outline how the 5G technologies will impact future communication networks. The EuMIC opens with presentations by Chuck Campbell, Engineering Senior Fellow with the Infrastructure and Defense Products Division of Qorvo, USA, on the progress and problems of Gallium Nitride MMIC design and by Sebastián Gómez-Díaz from University of California, Davis, USA, on Terahertz nanophotonics with 2D materials. Bill Deal, Distinguished Engineer in the RF and Mixed Signal Department of Northrop Grumman, USA, has accepted the invitation to close the EuMIC with a review on Terahertz transistors and their applications. During the EuRAD Opening, which is held in conjunction with the DSSF Forum, M. Carmen Barbero, Head of Naval Radar Programmes, Indra Sistemas, Spain, will present the new radar generation for the F-110 frigate integrated masts, and Stefano Pirandola, from York Centre for Quantum Technologies, UK, will discuss Quantum Radar. Domingo Castro, Rafael Casado and Jacobo Martinez-Villa, from Indra Sistemas, Spain will present the S3T Spanish ESA (European Space Agency) Radar facility for space debris at the EuRAD Closing Session. The EuMW will close with a presentation by Giuliano Gatti, Space Segment Manager of ESA Galileo Satellite Navigation Program.

Following the format introduced in EuMW 2017 of Session Keynotes to boost industrial participation and intensify the interaction between industry and academia, this year’s programme again includes fifteen industrial keynotes by internationally recognized experts from industry who will open selected sessions with presentations on challenges and state-of-the-art achievements in their field.

The traditional Women in Microwave Engineering (WiM) event, co-sponsored by the IEEE MTT-Society, will focus on communications technology for space exploration, and both women and men are welcome. Attendees will visit one of the following two centres located near Madrid: the NASA-MDSCC (Madrid Deep Space Communications Complex) or the ESA-ESAC (European Space Astronomy Centre). Besides visiting the centre, presentations will be given by scientists working at MDSCC or ESAC. As initiated during EuMW 2017, the WiM attendees will have the opportunity to interact with high school students who are invited to participate in this event. Early registration is encouraged, since the number of participants is limited.

The EuMW 2018 will host several events especially for the younger generation. These include the very stimulating and successful Student Challenge, which will have the same format as in previous years. The Student Design Competition comprises two tasks to be prepared in advance. It will also feature a design task to be carried out on-site. This will take place in the frame of a hands-on design experience event. The latter is also part of the Student and the Doctoral School, which start with a high-level, one day and one and a half day lecture programme. The Career Platform will continue the successful format of previous years. Finally, two sessions devoted to Young Professionals are offered.

The ‘Week’ wouldn’t be the ‘Week’ without its traditional social events. These include Monday’s EuMIC Get-Together, which this year will be held at a beautiful restaurant located in the heart of Madrid’s modern down-town, Tuesday’s Welcome Reception sponsored by Keysight Technologies, which will also be held off-site at the Palacio del Negralejo, and the EuRAD lunch on Friday. In addition, a private visit to the Thyssen-Bornemisza Museum, one of Madrid’s Golden Triangle of Art, together with the Prado and the Reina Sofia national galleries, followed by a cocktail dinner, has been organised for Wednesday evening.

The week’s programme will let you enjoy Europe’s Microwave event in 2018 and will give you plenty of opportunities to satisfy your professional PASSION FOR MICROWAVES. Don’t forget to explore the friendly city of Madrid where everyone feels at home. Madrid’s rich artistic and natural heritage, cutting edge transport network, quality accommodation, fine cuisine and the passion locals show when enjoying their city’s day and night life make it one of the most attractive cities in the world. If time permits we invite you to visit some of the many nearby landmarks, from Alcalá de Henares, where Miguel de Cervantes, the well-known author of Don Quijote de la Mancha, was born 471 years ago, to Segovia, Toledo, and more...
EuMA, the European Microwave Association® is an international non-profit organisation with a scientific, educational and technical purpose, under Belgian law.

For more information and contact, visit: www.eumwa.org

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Welcome to Madrid on behalf of the European Microwave Association (EuMA)! Our mission as EuMA is to promote microwaves in Europe and to foster networking between microwave scientists and engineers in Europe. We are pursuing this in various ways but our key event is the European Microwave Week.

For those who are not familiar with EuMA: We are open to membership for all working in the field of microwaves, particularly from Europe, but also from around the world. The General Assembly, the highest governing body of the Association, gathers representatives from European countries, from North America, from the Asia-Pacific region, and from North Africa and Middle East. If you are not a EuMA member yet, I encourage you to join. Among other benefits, you will enjoy reduced fees for attending the Week and other EuMA-sponsored conferences and workshops as well as the IEEE International Microwave Symposium. Moreover, you will have access to the internal part of our website, which provides an archive of publications, the on-line version of the International Journal on Microwave and Wireless Technologies and further networking opportunities.

The European Microwave Week (EuMW) is the premier microwave conference and exhibition event in Europe. Its centrepiece is the European Microwave Conference (EuMC), the largest of the 3 conferences composing the Week. It is complemented by the European Microwave Integrated Circuits Conference (EuMIC) focusing on semiconductor device and circuit technologies, and the European Radar Conference (EuRAD), targeting the field of radar, from components to applications. The success of EuMW is also a result of the collaboration with the IEEE MTT Society (technical co-sponsor of the Week) and the GAAS Association (co-sponsor of EuMIC). But the Week is not only conferences, the Exhibition organised by our long-standing partner Horizon House forms an integral part of it.

As everybody knows, preparing and hosting the EuMW is a major effort, from paper submission and review to on-site organisation at the venue, and this is accomplished by a team of volunteers year by year. Therefore, my special and sincere thanks go to Magdalena Salazar Palma and José Ignacio Alonso Montes, 2018 General Chair and Co-chair, to Almudena Suárez Rodríguez, General TPC Chair, to José Carlos Pedro, Workshops and Short Courses Chair, and to Daniel Segovia Vargas, Treasurer, as well as to Vicente Boria Esbert and Ferran Martín, EuMC Chair and TPC Chair, to Teresa Martín Guerrero and José Ángel García García, EuMIC Chair and TPC Chair, and to Mateo Burgos García and Manuel Rosa Zurera, EuRAD Chair and TPC Chair - just to name a few on behalf of the entire team. Thank you!

It is the first time we are holding the European Microwave Week in Spain, in the beautiful city of Madrid with its many attractions. All members of the team have been working hard to set up an outstanding technical and scientific programme for you and I am sure they will make your stay in Madrid exciting, enjoyable, and a rewarding experience of Spanish hospitality.

With this, I would like to cordially invite you to EuMW 2018. I hope you will not only gain new insights from presentations and posters but also find enough time to meet with colleagues and friends. Join us and see you in Madrid!

Wolfgang Heinrich
President
European Microwave Association
In its 48th anniversary, the European Microwave Conference (EuMC) comes again to Spain, after 25 years. The last Spanish edition of the EuMC was held in Madrid in 1993, and in that time the flagship conference of the current European Microwave Week (EuMW) was not associated to the European Radar Conference (EuRAD) and to the European Microwave Integrated Circuits Conference (EuMIC). In its present format, the EuMC is able to reach a wider audience, since its traditional and widespread set of covered topics (mainly focused on microwave and wireless components, systems and technologies) is enriched with radar technologies and microwave integrated circuits (in this edition through 4 joint sessions with EuMIC and 9 with EuRAD). Thus, the simultaneous celebration of the three conferences during the same week, plus the high number of technical workshops, short courses, associated events, as well as the Industry Exhibition, will contribute to the continuous success that EuMW and particularly EuMC experiences yearly.

We, the entire Team of the EuMW 2018, and particularly the EuMC 2018 Team, with the help of the TPC members and paper reviewers, have done our best to generate an exciting, coherent, balanced, and complete program for this year’s conference, with special emphasis on the latest trends in microwave, millimeter-wave, THz and wireless technologies. In summary, 355 papers grouped in 51 technical sessions or presented in the 4 interactive forums, 9 industrial session keynotes, 28 workshops and 8 short courses have been accepted in the present edition of EuMC. Moreover, 5 special sessions will be held in the following selected domains: “20th Anniversary of the European Microwave Week”, “Microwave Research in Latin America”, “5G Technology in Asia Pacific”, “Additive Manufacturing”, and “High Frequency Flexible Bendable Electronics for Wireless Communication Systems”.

Conference delegates are also warmly encouraged to attend the opening and closing sessions of EuMC (which are also the main plenary sessions of the whole EuMW) on Tuesday and Thursday, respectively, where prominent speakers have been invited. Particularly, Enrique Blanco, Global CTIO of Telefónica, Spain will give a plenary talk on Tuesday 25th September on 5G networks and communication systems; and Giuliano Gatti, Galileo Space Segment Manager at European Space Agency (ESA), will contribute with a presentation about the Galileo global satellite navigation system during the closing session to be held on Thursday 27th September. The EuMC 2018 will be closed with the traditional awards ceremony, when the best paper prizes will be announced.

We do hope that you find the conference of interest and fruitful from a scientific and technical viewpoint. We do also expect that you get in touch with our culture and traditions during the conference week. Finally, we will be very happy if, after the week, you experience a higher motivation and passion for microwaves. Enjoy the event!
Welcome to the 13th European Microwave Integrated Circuits Conference, EuMIC 2018

It is a great pleasure and an honor to welcome you all to the 13th European Microwave Integrated Circuits Conference, EuMIC 2018. EuMIC arrives to Spain after a long journey that started in Rome in 1990 organised by the GAAS® Association and continued, after 2004, in the framework of the European Microwave Week. The city of Madrid is proud to receive the visit of the Passionate European Microwave Community.

This conference is the result of huge efforts made by the panel of reviewers and TPC members. We would like to thank all of them. We also want to thank all authors, workshop and short-course organisers for their submissions and proposals, which has allowed the organisers to guarantee that this event will have great interest and high quality levels. We would especially like to acknowledge the extremely generous help received from previous EuMIC teams.

The scientific panel is composed of 12 regular EuMIC sessions and 3 EuMC/EuMIC joint sessions covering topics from device to system level. Millimetre-wave technologies have gained an important presence in this edition, reflecting their role in paving the way for 5G and beyond. Device modelling is also present with 4 regular sessions, showing how a classic topic remains a challenge for our community. The 5 sessions on amplifiers will focus on system level issues. The interactive poster session has been organised jointly with the EuMC and will be held on Tuesday, enjoying the lively atmosphere of the Exhibition. No less interesting is the offer of Short Courses and Workshops: EuMIC delegates will find a not to be missed appealing offer on Sunday. Finally, it is worth mentioning that EuMIC has included 3 relevant Industrial Keynotes thanks to the kind participation of prominent speakers from Cree, Globalfoundries and Televés. Invited manufacturers will take the floor during the traditional ‘Foundry Session’ hosted by the GAAs® Association.

The EuMIC Opening and Closing plenary sessions will feature three invited speakers, world-class in their fields. During the Opening ceremony Charles F. Campbell, Engineering Senior Fellow with the Infrastructure and Defense Products Division of Qorvo, USA, will present a realistic perspective of the present challenges that GaN monolithic designs faces. In addition, J. Sebastián Gómez-Díaz, Assistant Professor in the Electrical and Computer Engineering Department of the University of California, Davis, USA, will address the use of graphene and other 2D materials as a powerful, reconfigurable, CMOS compatible, and miniaturized on-chip platform for THz device fabrication. During the Closing session William R. Deal, Distinguished Engineer in Northrop Grumman’s RF and Mixed Signal Department, USA, will talk about the status of transistor-based electronics operating above 100 GHz and will describe recent progress in communications and sensors at these frequencies. Also during the Closing ceremony, the best contributed paper to EuMIC 2018 and the Young Engineer Prize will be awarded by the EuMIC Technical Program Committee and the EuMW Steering Committee. Three GAAS® Association PhD student fellowships will also be celebrated.

The members of the Organising Committee of this EuMIC 2018 have done our utmost to make this event possible. EuMIC 2018 is from now on mostly in your hands and we hope you will enjoy days of fruitful discussion, knowledge exchange and networking.

We are looking forward to welcoming you in Madrid.
Welcome to the 15th European Radar Conference, EuRAD 2018

It is a pleasure for me, on behalf of the EURAD 2018 organisation team, to welcome you to this important event for radar professionals, scientists and researchers in Europe. The European Radar Conference reaches this year its 15th edition, after walking a path of continuous growing, both in absolute terms and in terms of its weight and significance within the European Microwave Week. This year we are proud to host the EuRAD in Madrid from 26th to 28th September at IFEMA Feria de Madrid. During these days, top professionals will present their latest research and development, and discuss about the present status and future trends in the fields of radar technology, system design and performance, radar components, radar propagation and target modelling, advanced signal processing techniques, as well as the most innovative radar architectures, concepts and applications.

In the opening session on Wednesday, we will enjoy the presence of two excellent keynote Speakers. First, Mrs M. Carmen Barbero, from Indra Sistemas will present their radar global concept for the next generation of F110 frigates for the Spanish Navy, in which advanced concepts such as full digital implementation using software defined radio concepts, and multiple function front-end sharing are included. Later on, Dr. Stefano Pirandola from the University of York, will present a more long-term vision of our technologies, exploring the capabilities of the quantum radar concept. For the closing session our keynote speakers, Domingo Castro, Rafael Casado and Jacobo Martínez-Villa, from Indra Sistemas, Spain, will describe the new impressive radar facility for space debris surveillance that is starting to be installed in Spain.

This year, 156 papers were submitted to the conference, and after a rigorous selection process, the 93 accepted papers were organised into 22 oral sessions and two interactive sessions, some of them shared with EuMC. Prominent industrial keynotes speakers will open four of these sessions, showing the latest industry approaches to the addressed technologies. A Special Session about radar projects in the European Defense Agency (EDA) has been organized by Dr. Roland Krebs (Project Officer RF Sensor Technologies at EDA) to present the framework of R&T collaboration at EDA. The most relevant outcomes of recent projects in the frame of the RF Sensor Technologies CapTech will be presented by top level speakers, representing the European cooperation in this domain. An attractive topical workshops program will be running alongside the conference programme.

Finally, we would like to express our gratitude to all the reviewers and the TPC members for undertaking their task in a professional and timely manner, and for their contribution to the success of the conference. We look forward to meeting you in our nice city, at the EuRAD 2018 conference, and wish you a very pleasant stay in Madrid.

Mateo Burgos García
EuRAD Chair

Gonzalo de Miguel Vela
EuRAD Co-Chair

Manuel Rosa Zurera
EuRAD TPC Chair

Pilar Jarabo Amores
EuRAD TPC Co-Chair
Welcome from the General TPC Chairs

This year the European Microwave Week is held in Madrid for the first time and we are thrilled about this excellent opportunity for the microwave community to meet, share advances and interact. As General Technical Programme Committee Chairs, we are grateful for the excellent scientific revision and management of the submitted manuscripts by the reviewers and TPC members, meeting all the required deadlines. The total number of contributions submitted was over 900. The reviews were performed by 110 TPC members and more than 430 reviewers, listed in the programme book. The TPC meeting was held in April 7th in Madrid, where an intense scientific activity took place in a friendly atmosphere. The TPC members and reviewers are fundamental to preserve the high scientific standards of the EuMW and we strongly recognize their dedication, which guarantees a thorough and fair decision, typically based on six reviews per paper. Eventually, a total of 521 regular papers were accepted, arranged in 87 oral sessions and 5 interactive sessions. In addition to the regular papers, and following an initiative started in the past EuMW, there are 15 invited industrial keynotes, which will open some of the technical sessions of the three conferences.

It has been a unique opportunity for both of us to chair the TPC, both scientifically and personally. Going through all the submitted papers for the initial review setup, we have been able to appreciate the high global quality of the contributions and the significant advances in the broad diversity of topics covered by EuMW. At a personal level, we have had the pleasure to fruitfully interact with TPC members and reviewers for an optimum execution of the revision procedure.

We are grateful to the previous TPC chairs and EuMW teams for their precious help and availability, especially to Prof. Thomas Zwick for his timely answers to numerous questions and the valuable documents he provided us. We would also like to acknowledge Prof. Lorentz-Peter Schmidt for organising and chairing the hand-over meetings, as well as the members of the EuMA BoD for their useful comments and suggestions.

For the second year, the TPC has been managed with the CONVERIA software. We want to thank Matthias Rudolph, Marc van Heijningen, Cristina Andrei and the staff from CONVERIA, who have actively supported us during the whole review process and TPC meeting. Their help has been invaluable. We are also very grateful to the three conference and TPC Chairs, the Chairs of the Workshops and Short courses, the Chairs of the Special and Focus Sessions, and the whole EuMW 2018 team who have been extremely responsive during the whole process.

We wholeheartedly hope that you will enjoy the technical programme of EuMW 2018 and the lively city of Madrid, with its renowned museums and historic neighborhoods and landmarks.

Our warmest welcome to EuMW 2018 in Madrid, Spain!

Almudena Suárez Rodríguez  General TPC Chair
Juan-Mari Collantes  General TPC Co-Chair

International Journal of Microwave and Wireless Technologies: EuMW 2018 Special Issue

The International Journal of Microwave and Wireless Technologies was created in 2009 by the European Microwave Association (EuMA) and Cambridge University Press for the benefit of the microwave research community in Europe and overseas.

The journal is published ten times a year. It allows academic and industrial researchers to promote their work and stay connected with the most recent developments in microwave and RF technology. The journal is referenced in databases such as Scopus and Google Scholar and is indexed in the Thomson Reuters Web of Science. Following the success of previous microwave weeks, the journal will again publish a special issue dedicated to European Microwave Week 2018.

The authors of a number of highly ranked papers presented at the conferences will be invited to submit an extended version for publication in the journal. The special issue will be guest edited by Vicente Boria Esbert, chair of EuMC 2018, Teresa Martín Guerrero, chair of EuMIC 2018, and Mateo Burgos García, chair of EuRAD 2018.

Accepted papers will be published online at http://journals.cambridge.org/MRF and can be referenced using their DOI (Digital Object Identifier). Once all submissions are received, the articles will be collated into the Special Issue and published in print, which is expected to appear in June 2019.

Vicente Boria Esbert  EuMC 2018 Chair
Teresa Martín Guerrero  EuMIC 2018 Chair
Mateo Burgos García  EuRAD 2018 Chair
The EuMW 2018 Organising Committee
EuMC Microwave Prize (sponsored by EuMA)

Sub-THZ Micromachined Waveguides for Wafer Level Integration of MMICs

P. Pursula, A. Lamminen, M. Kantanen, J. Saariluhto, V. Ermolov
VTT Technical Research Centre of Finland

EuMC Young Engineer Prizes (sponsored by Thales Deutschland GmbH)

High Precision Realtime RF-Measurement System for Imaging of Stroke

S. Poltschak¹, M. Freilinger¹, R. Feger¹, A. Stelzer¹, A. Hamidipour², T. Henriksson², M. Hopfer², R. Planas², and S. Semenov²
¹Johannes Kepler University Linz, ²EMTensor GmbH

EuRAD Young Engineer Prize (sponsored by Hensoldt)

Range Sidelobes Attenuation of Pseudorandom Waveforms for Civil Radars

F. De Palo, G. Galati
University of Rome Tor Vergata

EuMIC Best Paper Prize (sponsored by Rohde & Schwarz)

80-GHz Impulse Radio Receiver with Quadrature PPM Demodulation in 55-nm CMOS Technology

H. Matsumura, Y. Yagishita, I. Soga, K. Oishi, Y. Kawano, Y. Nakasha, T. Iwai
Fujitsu Laboratories Ltd

EuMIC Young Engineer Prize (sponsored by Rohde & Schwarz)

Global Modeling of GaN HEMT Resistive Current Including Charge Trapping and Self-Heating for Multi-Bias Multi-Class PA Performance Prediction

G.P. Gibiino, R. Cinani, A. Santarelli, F. Filicori
University of Bologna

2017 European Microwave Week in Nuremberg Best Paper Prizes
2018 EuMA Pioneer Award

Vittorio Rizzoli received his degrees in Electronic Engineering from the University of Bologna, Italy, in 1971 and 1980. In 1972 he was appointed a Professional Engineer. In 1974 he joined the University of Bologna as an Assistant to the Chair of Electromagnetic Fields and Circuits. In November, 1980, he joined the University of Bologna as a Full Professor of Electromagnetic Fields. His main research interests are in the areas of nonlinear microwave circuit simulation and design with emphasis on modern CAD techniques for large-size problems, electromagnetic design of microwave and millimetre-wave integrated circuits, and nonlinear/electromagnetic co-simulation of wireless systems including environmental aspects. He is author or co-author of over 220 technical papers, most of which have been published in English in refereed international journals or presented at selected international meetings (again in English). In these areas he participated in a large number of national and international research programs funded by national and international Institutions, in many cases as the principal investigator. From 1987 to 2002 he coordinated an applied research program in cooperation between the Department of Electronics and Computer Science of the University of Bologna and Compact Software Inc. (New Jersey, USA), aimed at the development of the first general-purpose software suite for nonlinear microwave circuit simulation and design. The resulting set of design tools was systematically used for many years by Industrial R&D labs worldwide.

Prof. Rizzoli was a member of the Editorial Board of IEEE Microwave and Wireless Components Letters, IEEE Transactions on Microwave Theory and Techniques, and of John Wiley’s International Journal of RF and Microwave Computer Aided Engineering. He is also a member of the Paper Review Board of Electronics Letters. In the years 2005/2007 he served as Associate Editor of the IEEE Transactions on Microwave Theory and Techniques, with autonomous decision capabilities.

From 1987 to 1995, in 2002, and in 2009, he was on the Technical Program Committee of the European Microwave Conference. In 1995 he served as Chairman of the 25th European Microwave Conference that was held in Bologna, Italy, in conjunction with the Celebrations for the First Centenary of the Invention of the Radio. In 1995/96 he served as Chairman of the Management Committee of the European Microwave Conference. In 2001 he organised and chaired a Special Marconian Session devoted to the celebration of the first centenary of Marconi’s 1901 transatlantic radio transmission, that was held in London, UK, in conjunction with the 31st European Microwave Conference.

In 1990 Prof. Rizzoli was appointed by the IEEE “Distinguished Microwave Lecturer” of IEEE MTT-Society for Region 8. In this capacity, in 1990/1993 he presented 15 lectures at top scientific Institutions in Europe, U.S.A., and Middle East (Israel) on “Simulation and Design of Nonlinear Microwave Circuits”. In 1994 he was elected Fellow of the IEEE with the citation “For Contributions to the Simulation and Design of Nonlinear Microwave Integrated Circuits”. From 1999 to 2007 he was a member of the Technical Program Commit-tee of the IEEE MTT-S International Microwave Symposium.

Since 1993 he has been a member of IEEE MTT-1, the Technical Committee of Computer Aided Design whose institutional task is the promotion, development, and dissemination of CAD techniques among the members of the Scientific Community. In this capacity, he also cooperated in the organisation and presentation of several Workshops aimed at the illustration of key aspects of microwave CAD techniques to non-specialist audiences.

2018 EuMA Distinguished Service Award

Robert Weigel was born in Ebermannstadt, Germany, in 1956. He received the Dr.-Ing. and the Dr.-Ing.habil. degrees, both in electrical engineering and computer science, from the Munich University of Technology in Germany where he respectively was a Research Engineer, a Senior Research Engineer, and a Professor for RF Circuits and Systems until 1996. During 1994 to 1995 he was a Guest Professor for SAW Technology at Vienna University of Technology in Austria. From 1996 to 2002, he was Director of the Institute for Communications and Information Engineering at the University of Linz, Austria where, in August 1999, he co-founded the company DICE, since split into an Infineon Technologies (DICE) and an Intel (DMCE) company with a total now of 450 staff members which are devoted to the design of RFICs for mobile radio and MMICs for vehicular radar applications. In 2000, he was appointed a Professor for RF Engineering at the Tongji University in Shanghai, China. Since 2002 he is Head of the Institute for Electronics Engineering at the University of Erlangen-Nuremberg, Germany. Since 2017, he is Spokesman of the University’s Department of Electrical Engineering, in Erlangen, respectively in 2009, in 2012, and in 2015 he co-founded the companies easy-id, easy-ic and easy-innovation.

Prof. Weigel has been engaged in research and development of microwave theory and techniques, electronic circuits and systems, and communication and sensing systems. In these fields, he has published more than 900 papers. He received the 2002 VDE ITG-Award, the 2007 IEEE Microwave Applications Award, the 2016 IEEE MTT-S Distinguished Educator Award, and the 2018 IEEE Rudolf Henning Distinguished Mentoring Award.

Prof. Weigel is a Fellow of the IEEE, an Elected Member of the German National Academy of Science and Engineering (acatech), and an Elected Member of the Senate of the German Research Foundation (DFG). He is and has been serving on numerous advisory boards of government bodies, research institutes and companies in Europe and Asia. Furthermore, he is and has been serving on various editorial boards such as that of the Proceedings of the IEEE. He has been a member of numerous conference steering and technical program committees. He was General Chair of several conferences such as the 2004 URSI International Symposium on Signals, Systems and Electronics (ISSSE) in Linz, Austria and Technical Program Chair of several conferences such as the 2002 IEEE International Ultrasonics Symposium in Munich, Germany. He served in many roles for the IEEE MTT and UFFC Societies. He has been Founding Chair of the Austrian COM/MTT Joint Chapter, Region 8 MTT-S Coordinator, Distinguished Microwave Lecturer, MTT-S AdCom Member, and the 2014 MTT-S President.

Prof. Weigel also served in many roles for the European Microwave Association (EuMA). Since about 1990, he has served as a reviewer and, most of the years, also as a TPC member of one of the EuMW conferences (EuMC, ECWIT or EuMIC). He was General Chair of the EuMW 2013 and Honorary Chair of the EuMW 2017, both in Nuremberg, Germany. Prof. Weigel was the Founding Editor of the Proceedings of the European Microwave Association and served as Editor until 2009 when the Proceedings were transferred into the International EuMA Journal of Microwave and Wireless Technologies. He was TPC Chair of the ECWITs 2003 and 2007 in Munich, Germany. For EuMW 2003 he served as the Treasurer. At the EuMW conferences he organised several workshops as well as special and focused sessions, submitted numerous papers of his research groups and contributed to and organised many special EuMW events such as the Bavarian State Receptions when EuMW has been held in Germany since 1999. At EuMW 2013, he initiated the 1st European Microwave Student School enabling students of European Universities to receive ECTS points for their curricula; and also at EuMW 2013, he initiated the 1st Graduate Student Industrial Career Platform for Ph.D., master and bachelor students. During his time as a Voting Member of the AdCom of the IEEE MTT-Society (2004 to 2017) he always served as a constructive bridge between EuMA and IEEE MTT-S through several functions and activities, e.g. as chair of MTT-S’s AdCom Subcommittee for International Liaison, and in particular when he was the MTT-President in 2014, when the EuMA President and he worked out the new EuMA/MTT-S agreement signed at the EuMW 2014 in Rome.
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Group 7 - Denmark, Faroe Islands, Finland, Greenland
Group 8 - Bulgaria, Czech Republic, Hungary, Romania, Slovakia
Group 9 - Estonia, Latvia, Lithuania, Poland
Group 10 - Armenia, Azerbaijan, Georgia, Moldova, Ukraine
Group 11 - Albania, Bosnia and Herzegovina, Croatia, Cyprus, FYR Macedonia, Montenegro, Greece, Israel, Serbia, Slovenia, Turkey
Group 12 - Belarus, Russia
Group 13 - Austria, Liechtenstein, Switzerland
Group 14 - Andorra, Portugal, Spain
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Image courtesy of Shmuel Auster

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Welcome to EuMW 2018

European Microwave Week, being held in the effervescent and wildly exciting city of Madrid, comes to Spain for the first time ever. Bringing industry and academia together, European Microwave Week 2018 is a SIX day event, including THREE cutting edge conferences and ONE exciting trade and technology exhibition featuring leading players from across the globe. EuMW 2018 provides access to the very latest products, research and initiatives in the microwave sector. It also offers you the opportunity for face-to-face interaction with those driving the future of microwave technology.

The 21st European Microwave Week combines:
• Three Major Conferences
• Associated Workshops
• Tailored Courses and Seminars for industrialists, academics and researchers
• Leading International Trade Show.

In addition, Exhibitor Workshops and Seminars will be provided by several top organisations with superior expertise in Microwave, RF, Wireless or Radar.

BADGES
Online registrants will automatically be e-mailed their badge barcode and an order confirmation receipt immediately after they pay. All those who have pre-registered should bring their badge barcode and confirmation with them to the conference where they can print out their badge by scanning their barcode at the Fast Track desk onsite. Once you have collected your badge, conference attendees can collect the proceedings which are on a USB stick and the delegate bag. Processing will be quick and easy but queues may form at busy times, so please arrange to collect your badge well in advance of your first conference session.

The registration area will be located at the lobby of IFEMA North Convention Centre, close to the North Entrance as signposted.

Those who have not pre-registered can do so on site. There will be onsite registration terminals located within the registration area, where delegates can enter their details and pay immediately by swiping their credit or debit cards through the card readers attached to the terminals.

Alternatively, you can pay at the Cashier desk if you require a printed receipt.

If you have any questions regarding registration procedures and payment, please email: eumwreg@itnint.com.

CONFERENCES
Choose from three separate but complementary conferences. Spanning the length of the week, starting from Sunday 23rd September, the conferences and workshops are scheduled as follows:

• European Microwave Integrated Circuits Conference (EuMIC) 24th-25th September 2018
• European Microwave Conference (EuMC) 25th-27th September 2018
• European Radar Conference (EuRAD) 26th-28th September 2018
• Plus Workshops and Short Courses (23rd - 28th September 2018)
• In addition, EuMW 2018 will include for the 9th year, the Defence, Security and Space Forum on 26th September 2018.

The conferences encompass a wide range of subject areas including:
• Microwave, Millimetre-wave and Submillimetre-wave Systems
• Antennas and Propagation
• Wireless Technologies
• Telecommunication (RF, Microwave and Optical)
• ICs, Semiconductor Materials and Packaging
• Radar Architectures, Systems and Subsystems
• Sensors and Remote Systems
• Test and Measurement

Online registration opens on 28th May 2018 and remains open up to and during the event until 28th September. During the event, you can also register onsite from Saturday 22nd September 2018 (16.00 -19.00) and from 08.00 each morning from Sunday 23rd September 2018 to Friday 28th September 2018.

Conference rooms are located at the North Convention Centre. The conferences will be held in different rooms over the conference dates. Please refer to the Conference Matrix at the back of this booklet for a detailed overview. Delegates can register for one, two or all three of the conferences. Registration at one conference does not allow any access to other conference sessions. Those who wish to register for two or more conferences will receive a discount on these registrations.

Fees and discounts are all explained in the Conference Registration Information section of this booklet.

PROCEEDINGS ON USB STICK
All papers published for presentation at your chosen conference will be on a USB stick given out with the delegate bags. There will be one USB stick combining all three conferences. No hard copies of workshop slides will be provided. All workshop slides will be available on a USB stick for workshop participants.

INTERACTIVE SESSIONS
The interactive poster papers will be presented on electronic screens, which are located in the conference area on Monday and Friday, and in the exhibition as signposted on Tuesday, Wednesday and Thursday.

SPEAKER PREPARATION SPACE
A speaker preparation area is located in the conference area.

EXHIBITION HOURS
The exhibition area will be located in Hall 9 (North Entrance) as shown on the Floor Plan on page 109 of this booklet. As a registered delegate you will have full access to the exhibition area.

The exhibition opening hours are:
• Tuesday 25th September 9.30-18.00 (followed by the Welcome Reception)
• Wednesday 26th September 9.30-17.30
• Thursday 27th September 9.30-16.30

See the back cover for a full listing of the exhibitors (correct at the time of going to press).
EuMA MEMBERSHIP
One can apply for EuMA membership by ticking the appropriate box during registration for EuMW. In general, membership applications received after August 1, or through the EuMW registration form are intended for the next calendar year. However, the discount for the EuMW fees applies immediately.

EuMA membership fee is €25 for Professionals and €15 for Students.

EuMA offers a three-year free membership for people residing in NIS and some African countries.

EUMA KNOWLEDGE CENTRE
The EuMA website has its Knowledge Centre which presently contains over 20,000 papers published under the EuMA umbrella. Full texts are available to EuMA members only, who can make as many copies as they wish, at no extra-cost.

EUMA INTERNATIONAL JOURNAL
The 'International Journal of Microwave and Wireless Technologies' is published annually with 10 issues. EuMA members are entitled to free electronic access to the Journal. There is a special offer when subscribing to both Membership and printed Journal: €67 for Professionals, €57 for Students.

HOTELS AND TRAVEL
HOTEL RESERVATION
Horizon House has teamed up with Connex Hotels and Events, our official hotel booking supplier, to offer you the ability to book your accommodation for EuMW at the most competitive rates available. It is very easy to make an immediate hotel booking.

Simply visit their booking page http://www.connexhotelsandevents.com/eumw-2018-madrid.html and make your booking, or email sally@connexhotelsandevents.com. You will find a wide range of accommodation to suit every budget. Alternatively, see the hotel booking pages within this programme.

GETTING TO IFEMA - FERIA DE MADRID CONVENTION CENTRE
The city of Madrid is located in the geographic centre of Spain and it is well connected to the European motorway, rail and flight networks. IFEMA Feria de Madrid Convention Centre can be accessed through a variety of transportation means.

By Plane: Adolfo Suárez Madrid-Barajas International Airport, or simply Madrid-Barajas Airport, is located only 10 minutes from the exhibition complex, and just 15 kilometres from the city centre, with which it is connected by Metro (Airport stations T-1, T-2, T-3 and T-4). A top international airport that guarantees daily direct connections from Feria de Madrid to most Spanish cities and to those throughout the world.

By Metro: Access to Feria de Madrid is possible from anywhere in the city by means of Feria de Madrid station on Line 8, whose exit is at the South Entrance of the complex. Line 8 also connects the venue with the different terminals of Barajas International Airport.

By Bus: A wide bus network provides access to Feria de Madrid from different points in the city:
Route 112-Feria de Madrid-Bº Aeropuerto.
Route 122-Avda. de América-Feria de Madrid.
Route 828-Universidad Autónoma-Aloberandas-Carillejas-Feria de Madrid.

BY EUWM SHUTTLE BUSES
In order to facilitate the delegate transportation to (and from) IFEMA, a shuttle bus route has been organised from local hotels as well as from the South Entrance (metro) to the North (EuMW) Entrance.

By Taxi: With ranks at each entrance to the exhibition complex, more than 15,000 taxis are available to visitors to Feria de Madrid.

By Car: Feria de Madrid is linked by road to Madrid’s major access routes and ring roads: the M11 (Exits 5 and 7), the M40 (Exits 5, 6 and 7) and the A2 (Exit 7). There is direct access to the various parking areas.

OTHER USEFUL INFORMATION
PERSONAL INVITATION
A valid passport will be required for entry into the organising country, in this case Spain. Since EuMW events are held in the European Union, no visa is usually required for travellers with passports from a number of countries, like for instance: European Union, Australia, Brazil, Canada, Japan, Singapore, South Korea or the United States. At: http://www.exteriores.gob.es/Portal/en/ServiciosAlCiudadano/ InformacionParaExtranjeros/Paginas/RequisitosDeEntrada.aspx you can find additional information to know whether you are required to apply for a visa for Spain. If you are registering as speaker, delegate or exhibitor and you need a visa, we recommend that you speak with the Spanish Consulate, in your own country. You should organise this at least 3 to 4 months prior to EuMW.

The organisers will be pleased to send a letter of invitation to any exhibitor, conference delegate or speaker requesting it.

For requesting this letter of invitation, please pre-fill the invitation letter at http://www.eumweek.com/visitors/passport-visa.html and return it to Prof. Dr. Luis Emilio García Castillo, Visa Chair EuMW 2018, Universidad Carlos III de Madrid, Leganés, Madrid via visa@eumw2018.com

INSURANCE
It is highly recommended that all participants carry the proper travel and health insurance, as the organiser cannot accept any liability for any accidents or injury that occur during or when travelling to the event. Please also insure that personal items are covered for loss, damage or theft either through a personal policy or by a corporate policy. We cannot accept any liability for personal items that are lost, damaged or stolen during or travelling to and from European Microwave Week 2018.

ELECTRICITY
Electricity is supplied at 230V, 50 Hz (socket type F ("Schuko plug").

SOCIAL EVENTS & PARTNER PROGRAMME
Full details of the social events & dinners that are taking place during EuMW 2018 can be found in the 'Social Events & Partner Programme' section of this programme.

CREDIT CARDS
All major hotels and most restaurants and shops will accept credit cards. It is advisable to carry other identification as well. Visa and MasterCard are the most widely accepted cards.

WIFI
Wifi is available in the exhibition hall and conference area. Login details can be found within your delegate bag.

SHOPPING & SIGHTSEEING
MADRID, its special dynamism as a business centre goes hand in hand with its vibrant vitality, tourist appeal and fervent cultural and recreational life.

Come and discover its sites, iconic museums and spectacular range of hotels and restaurants; and enjoy its endless nightlife and the flood of designs, fashion and trends you will find in the shop windows of one of Europe’s leading capitals.

A great city that boasts a rich treasure of art, culture and natural environments, set in a region packed with history and modernity.

Visit https://www.esmadrid.com/en for information on top attractions and tips for your stay.

Alternatively, see the "Social Events & Partner Programme" section of this booklet for tours and excursions before, during and after EuMW 2018.

For the complete time tables, please check the EuMW website.
EuMIC Get-Together
Date: Monday 24th September 2018
Duration: from 20:00 until 22:00
Location: Larumbe, La Terraza, 4th floor, Centro Comercial ABC
Serrano, Serrano 61, 28006 Madrid
Cost: Free to EuMIC delegates

Following the tradition of the European Microwave Integrated Circuits Conference, delegates are invited to enjoy an informal dinner that will be offered by a first-class catering service in a unique location (Edificio ABC Serrano, a 19th century building) and located in the heart of Madrid, facing Serrano Street and Paseo de la Castellana. An unrivalled setting to have a good time with colleagues and friends and taste the excellent Spanish cuisine.

Welcome Reception
Date: Tuesday 25th September 2018
Duration: 18:30 until 21:30
Location: Palacio del Negralejo, Ctra. San Fernando a Mejorada., km 3, 28522 Rivas-Vaciamadrid, Madrid
Cost: Free to conference delegates & invited exhibitors

All registered conference delegates, as well as invited representatives from companies participating in the exhibition are invited to the EuMW 2018 Welcome Reception, sponsored by Keysight Technologies, Horizon House Publications and EuMA.

Delegates will need to bring their badge and exhibitors their invite along with them to gain entrance. The evening will begin with drinks at 18:30 followed by the General Chairs’ handover from EuMW 2018, Madrid to EuMW 2019, Paris as well as an address from the Platinum Sponsor, Keysight Technologies. The open-buffet dinner will be served from 19:00.

Bus transportation to and from Palacio del Negralejo will be provided.

Private Visit to the Thyssen-Bornemisza Museum and Cocktail Dinner
Date: Wednesday 26th September 2018
Duration: 19:30 until 21:00
Location: Museo Thyssen-Bornemisza, Paseo del Prado, 8, 28014 Madrid
Cost: € 45 for delegates, € 60 for exhibitors

A private visit to the Thyssen-Bornemisza Museum, one of Madrid’s Golden Triangle of Art together with the Prado and the Reina Sofia national galleries, has been organised, followed by a cocktail dinner, on Wednesday, 26th September 2018, starting at 19:30. With over 1,600 paintings and sculptures, the Thyssen-Bornemisza was the second largest private collection in the world after the British Royal Collection. The Museum houses now the core of the collection and fills the historical gaps in its counterparts’ collections. Guides will be available through the different rooms of this magnificent museum. This unique experience will be complemented with a cocktail dinner. Subsidised tickets at € 45 for delegates, and € 60 for exhibitors, are limited, so register as soon as possible.

Young Professionals Meet-Up
Date: Thursday 27th September 2018
Duration: 18:30 until 22:00
Location: A downtown Cafeteria to be announced
Cost: Free to all YPs

EuRAD Lunch
Date: Friday 28th September 2018
Duration: 12:30 until 13:50
Location: Restaurant Puerta de Alcala, IFEMA
Cost: Free to EuRAD delegates and Friday WS/SC delegates
CONFERENECE REGISTRATION INFORMATION

Fast Track Badge Retrieval
Register online and print out your badge in seconds onsite from the Fast Track Check In Desk

Register Online at www.eumweek.com

ONLINE registration is open from 28th May 2018 up to and during the event until 28th September 2018.
ONSITE registration is open from 16:00 on 22nd September 2018.
ADVANCE DISCOUNTED RATE (up to and including 23rd August) STANDARD RATE (from 24th August & Onsite).

CONFERENCE REGISTRATION FEES
There are TWO different rates available for the EuMW conferences:

ADVANCE DISCOUNTED RATE – for all registrations made online up to and including 23rd August (these are approximately 40% cheaper than the Standard Rate).

STANDARD RATE – for all registrations made online from 24th August and onsite.
Please see the Conference Registration Rates table on the following page for complete pricing information. All payments must be in € (Euros) – cards will be debited in € (Euros).

CONFERENCE REGISTRATION DETAILS

Online Registration
All registrations should be made online at www.eumweek.com. Those completed up to and including 23rd August will be charged at the 'Advance Discounted Rate' and those from 24th August will be charged at the 'Standard Rate'.

Online registration is open from 28th May 2018 up to and during the event until 28th September 2018. You can also register ONSITE from 16:00 on Saturday 22nd September 2018 and then at the times detailed below.

Onsite Registration
Onsite registration is available:

Saturday 22nd September 16:00 - 19:00
Sunday 23rd September 08:00 - 17:00
Monday 24th September 08:00 - 17:00
Tuesday 25th September 08:00 - 17:00
Wednesday 26th September 08:00 - 17:00
Thursday 27th September 08:00 - 17:00
Friday 28th September 08:00 - 10:00

Onsite registration will be charged at the Standard Rates (see pricing table on the following page).

HOW TO REGISTER

Online

All registrations should be made online at www.eumweek.com.

Delegates can register for one, two or all three of the conferences, workshops and short courses.

Discounts will be given to those registering for two or more conferences.

Payment can be made online using Amex, Visa, Mastercard or Bank Transfer.

Registrants paying by Credit Card will be sent an automatic email confirmation, with a receipt and badge barcode.

Registrants choosing to pay by Bank Transfer will receive their confirmation, but their receipt and badge barcode will be sent only once payment has been received and cleared by Horizon House.

Onsite

The registration area will be located at the entrance to the conference centre as signposted.

There will be Self Service terminals in the registration area where delegates can enter their details and pay immediately by swiping their credit cards through the readers attached to the terminals.

• Delegates can also choose to 'Pay at Cashier' and then proceed to the Cashier Point and pay using credit cards or cash. Receipts will be given accordingly.

If you have any questions regarding registration procedures and payment, please contact: eumwreg@itnint.com.

BADGE COLLECTION AT FAST TRACK CHECK IN DESK

All online registrants should bring a printed copy of their email registration receipt with the barcode and a photo ID. At the entry to the convention centre, they may scan the barcode at the Fast Track check-in desks and present their ID to obtain the badge.

Online registrants without printed emails may also obtain their badges at the Self Service registration terminals (photo ID required).

All onsite registrants using the Self Service terminals will receive their printed badge upon payment.

Once you have collected your badge, you can collect the conference proceedings on USB stick and the delegate bag for the conferences from the specified delegate bag area by scanning your badge. Processing will be quick and easy but queues may form at busy times, so please arrange to collect your badge well in advance of your first conference session.

COFFEE BREAKS, EUMIC GET-TOGETHER, WELCOME RECEPTION AND EURAD LUNCH

• Upon presentation of their badge conference delegates will be served free coffee during the coffee breaks.

• There will be two coffee breaks per day. On Friday, there will be only one coffee break in the morning.

• Monday’s EuMIC Get-Together, which will be held off-site at Larumbe, La Terraza, is free of cost for EuMIC delegates.

• Tuesday’s Welcome Reception, sponsored by Keysight Technologies, which will be held off-site at the Palacio del Negralejo, is free for delegates and invited exhibitors. Badges must be presented at the entrance.

• Friday’s EuRAD lunch, which will be held at restaurant Puerta de Alcala in IFEMA is free of cost for EuRAD delegates and Friday’s WS/SC delegates.

DELEGATE LUNCHBOXES

Subsidised lunchboxes for delegates, WS/SC, doctoral and student school attendees are being offered by EuMW at the reduced cost of € 5 per lunchbox (one per day). In order to guarantee availability, it is required to order the lunchboxes at the time of registration. We recommend the selection of a lunch box for Tuesday, if you plan to attend the WiM event. Visit www.eumweek.com for more information.

PRIVATE VISIT AND COCKTAIL DINNER AT THE THYSSEN-BORNEMISZA MUSEUM – 26TH SEPTEMBER 2018

A private visit to the Thyssen-Bornemisza Museum, one of Madrid’s Golden Triangle of Art together with the Prado and the Reina Sofia national galleries, has been organised, followed by a cocktail dinner, on Wednesday, 26th September 2018, starting at 19:30. With over 1,600 paintings and sculptures, the Thyssen-Bornemisza was the second largest private collection in the world after the British Royal Collection. The Museum houses now the core of the collection and fills the historical gaps in its counterparts’ collections. Guides will be available through the different rooms of this magnificent museum. This unique experience will be complemented with a cocktail dinner. Subsidised tickets at € 45 for delegates, € 60 for exhibitors are limited, so register as soon as possible.

CONFERENCE LOCATION

The conferences will be held in different rooms over the conference dates. Please refer to the Conference Matrix. Registration at one conference does not allow access to the sessions of the other conferences.
Reduced rates are offered if you have society membership to any of the following*: EuMA, GAAS, IET, EurAAP or IEEE.
EuMA membership fees: Professional € 25/year, Student € 15/year.

If you register for membership through the EuMW registration system, you will automatically be entitled to discounted member rates.

Reduced Rates for the conferences are also offered if you are a Student/Senior (Full-time students 30 years or younger and Seniors 65 or older as of 28th September 2018).

The fees shown below are invoiced in the name and on behalf of the European Microwave Association. EuMA’s supplies of attendance fees in respect of the European Microwave Week 2018 are exempted from Spanish VAT.

ADVANCE REGISTRATION CONFERENCE FEES (UP TO AND INCLUDING 23RD AUG.)

<table>
<thead>
<tr>
<th>CONFERENCE FEE</th>
<th>ADVANCE DISCOUNTED RATE</th>
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<tbody>
<tr>
<td></td>
<td>Society Member (*any of above)</td>
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<tr>
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<tr>
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<td>EuMIC</td>
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<td>EuRAD</td>
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<td>EuMC + EuMIC + EuRAD</td>
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STANDARD REGISTRATION CONFERENCE FEES (FROM 24TH AUG. AND ONSITE)

<table>
<thead>
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<th>CONFERENCE FEE</th>
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<td>Society Member (*any of above)</td>
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<tr>
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<td>EuMIC</td>
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WORKSHOP AND SHORT COURSE FEES (ONE STANDARD RATE THROUGHOUT)

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<td></td>
<td>Society Member (*any of above)</td>
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<tr>
<td></td>
<td>Standard</td>
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<tr>
<td>Half day WITH Conference registration</td>
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<tr>
<td>Half day WITHOUT Conference registration</td>
<td>€ 130</td>
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<td>Full day WITH Conference registration</td>
<td>€ 140</td>
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<tr>
<td>Full day WITHOUT Conference registration</td>
<td>€ 180</td>
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</table>

Other Items

PRIVATE VISIT TO THE THYSSEN-BORNEMISZA MUSEUM & COCKTAIL DINNER – 26TH SEPTEMBER 2018
Tickets for the private visit and cocktail dinner at the Thyssen-Bornemiza Museum are offered at the price of € 45 for delegates, € 60 for exhibitors. Tickets are limited and available on a first-come, first-served basis.

Proceedings on USB Stick
All papers published for presentation at the conferences will be on a USB stick, given out FREE with the delegate bags to those attending conferences. The cost for an additional USB stick is € 50.

International Journal of Microwave and Wireless Technologies (8 issues per year)
International Journal combined with EuMA membership: € 67 for Professionals or € 57 for Students.

Partner Programme and Social Events
Full details and contacts for the Partner Programme and other Social Events can be obtained via the EuMW website www.eumweek.com.

EUROPEAN MICROWAVE WEEK WORKSHOPS & SHORT COURSES

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<th>TUESDAY 25th September</th>
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</thead>
<tbody>
<tr>
<td>Full Day WS-01 EuMC/EuMIC</td>
<td>Half Day PM Wt-01 EuMC</td>
</tr>
<tr>
<td>Full Day WM-01 EuMC</td>
<td>Half Day PM Wt-03 EuMC</td>
</tr>
<tr>
<td>Full Day WS-02 EuMC/EuMIC</td>
<td>Half Day AM Wt-02 EuMC</td>
</tr>
<tr>
<td>Full Day WS-03 EuMC/EuMIC</td>
<td>Half Day PM Wt-03 EuMC</td>
</tr>
<tr>
<td>Full Day WS-04 EuMC</td>
<td>Half Day AM Wt-03 EuMC</td>
</tr>
<tr>
<td>Full Day WS-05 EuMC</td>
<td>Half Day PM Wt-03 EuMC</td>
</tr>
<tr>
<td>Full Day WS-06 EuMC/EuMIC</td>
<td>Half Day AM Wt-04 EuMC/EuRAD</td>
</tr>
<tr>
<td>Full Day WS-07 EuMC</td>
<td>Half Day PM Wt-05 EuMC</td>
</tr>
<tr>
<td>Full Day WS-08 EuMC/EuMIC</td>
<td>Half Day AM Wt-05 EuMC</td>
</tr>
<tr>
<td>Full Day WS-09 EuMC/EuMIC</td>
<td>Half Day PM Wt-06 EuMC</td>
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<tr>
<td>Full Day WS-10 EuMC</td>
<td>Half Day AM Wt-06 EuMC</td>
</tr>
<tr>
<td>Full Day WS-11 EuMC/EuMIC</td>
<td>Half Day PM Wt-07 EuMC</td>
</tr>
<tr>
<td>Full Day WS-12 EuMC/EuMIC</td>
<td>Half Day AM Wt-07 EuMC</td>
</tr>
<tr>
<td>Half Day PM SS-01 EuMC/EuMIC</td>
<td>Half Day PM Wt-08 EuRAD</td>
</tr>
<tr>
<td>Full Day SS-01 EuMC</td>
<td>Half Day PM SS-02 EuMC</td>
</tr>
<tr>
<td>Full Day SS-03 EuMC/EuMIC</td>
<td>Half Day PM SS-03 EuMC</td>
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<table>
<thead>
<tr>
<th>MONDAY 24th September</th>
<th>FRIDAY 28th September</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Day WM-01 EuMC</td>
<td>Half Day AM Wf-01 EuRAD</td>
</tr>
<tr>
<td>Full Day WM-02 EuMC</td>
<td>Full Day Wf-02 EuMC</td>
</tr>
<tr>
<td>Full Day WM-03 EuMC</td>
<td>Full Day Wf-03 EuMC</td>
</tr>
<tr>
<td>Full Day WM-04 EuMC</td>
<td>Full Day Wf-04 EuMC</td>
</tr>
<tr>
<td>Full Day WM-05 EuMC</td>
<td>Full Day Wf-05 EuMC</td>
</tr>
<tr>
<td>Full Day WM-06 EuMC</td>
<td>Full Day Wf-06 EuMC</td>
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<tr>
<td>Full Day WM-07 EuMC</td>
<td>Full Day Wf-07 EuMC</td>
</tr>
<tr>
<td>Half Day AM SF-01 EuMC/EuRAD</td>
<td>Half Day AM Wf-08 EuMC</td>
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</tbody>
</table>

SPECIAL FORUMS & SESSIONS

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Title</th>
<th>Location</th>
<th>No. of Days</th>
<th>Fee</th>
</tr>
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<tbody>
<tr>
<td>Wed 26th September</td>
<td>10:50 - 17:50</td>
<td>Defence, Security &amp; Space Forum</td>
<td>N101 + N102</td>
<td>1</td>
<td>€ 20 for delegates (those registered for EuMC, EuMIC or EuRAD)</td>
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<tr>
<td>Mon 24th - Wed 26th September</td>
<td>08:30 - 17:50</td>
<td>European Microwave Student School</td>
<td>N107</td>
<td>One full day and two half-days</td>
<td>€ 80</td>
</tr>
<tr>
<td>Mon 24th - Wed 26th September</td>
<td>08:30 - 17:50</td>
<td>European Microwave Doctoral School</td>
<td>N108</td>
<td>One full day and two half-days</td>
<td>€ 80</td>
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</tbody>
</table>
# EUROPEAN MICROWAVE WEEK WORKSHOPS AND SHORT COURSES

## SUNDAY 23rd September

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Code</th>
<th>Title</th>
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</thead>
<tbody>
<tr>
<td>Full Day</td>
<td>WS-01</td>
<td>EuMC/EuMIC</td>
<td>GaN HEMT Characterization and Modeling for micro- and mm-Wave Power Amplifier Applications</td>
</tr>
<tr>
<td>Half Day AM</td>
<td>WS-02</td>
<td>EuMC/EuMIC</td>
<td>High Efficiency mm-Wave Power Amplifiers for 5G</td>
</tr>
<tr>
<td>Half Day PM</td>
<td>WS-03</td>
<td>EuMC/EuMIC</td>
<td>Current Trends in Broadband, Efficient and Linear PAs for 5G Wireless Applications</td>
</tr>
<tr>
<td>Half Day AM</td>
<td>WS-04</td>
<td>EuMC</td>
<td>RF Techniques for Cellular Carrier Aggregation and Beyond</td>
</tr>
<tr>
<td>Half Day PM</td>
<td>WS-05</td>
<td>EuMC</td>
<td>5G Systems &amp; Millimeter Wave Communications in Smart Public Transport</td>
</tr>
<tr>
<td>Full Day</td>
<td>WS-06</td>
<td>EuMC/EuMIC</td>
<td>Terahertz Technologies from Fundamentals to Implementations: A Device and Application Prospective</td>
</tr>
<tr>
<td>Half Day AM</td>
<td>WS-07</td>
<td>EuMC</td>
<td>Broadband Power Amplifiers for Wireless Applications</td>
</tr>
<tr>
<td>Full Day</td>
<td>WS-08</td>
<td>EuMC/EuMIC</td>
<td>Transmitter Modules for Smart Antennas and MIMO Systems</td>
</tr>
<tr>
<td>Full Day</td>
<td>WS-09</td>
<td>EuMC/EuMIC</td>
<td>Metamaterials, Metasurfaces and Applications</td>
</tr>
<tr>
<td>Full Day</td>
<td>WS-10</td>
<td>EuMC</td>
<td>Radioastronomy Instrumentation</td>
</tr>
<tr>
<td>Full Day</td>
<td>WS-11</td>
<td>EuMC/EuMIC</td>
<td>Highly Integrated RF Transceiver Systems</td>
</tr>
<tr>
<td>Full Day</td>
<td>WS-12</td>
<td>EuMC/EuMIC</td>
<td>Wideband Supply Modulated RF Power Amplifiers for Energy Efficient Wireless Communication Infrastructure</td>
</tr>
<tr>
<td>Half Day PM</td>
<td>SS-01</td>
<td>EuMC/EuMIC</td>
<td>Introduction to SSPA Design and Considerations for Spaceborne Applications</td>
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<tr>
<td>Full Day</td>
<td>SS-02</td>
<td>EuMC/EuMIC</td>
<td>Fundamentals of Microwave PA Design</td>
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<tr>
<td>Full Day</td>
<td>SS-03</td>
<td>EuMC/EuMIC</td>
<td>Additive Manufacturing of Radio-Frequency Components</td>
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## MONDAY 24th September

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Code</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>Full Day</td>
<td>WM-01</td>
<td>EuMC</td>
<td>Digital Calibration and Nonlinear Compensation Techniques for MIMO Wireless Transmitters in 5G and Beyond</td>
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<tr>
<td>Full Day</td>
<td>WM-02</td>
<td>EuMC</td>
<td>High Power RF Breakdown and PIM in Space Applications</td>
</tr>
<tr>
<td>Full Day</td>
<td>WM-03</td>
<td>EuMC</td>
<td>Recent Advances in RF/Microwave Filters for Space Application</td>
</tr>
<tr>
<td>Full Day</td>
<td>WM-04</td>
<td>EuMC</td>
<td>Substrate Integration Technologies and Applications</td>
</tr>
<tr>
<td>Full Day</td>
<td>SM-01</td>
<td>EuMC</td>
<td>Microwaves for Quantum Information Technology</td>
</tr>
<tr>
<td>Full Day</td>
<td>SM-02</td>
<td>EuMC</td>
<td>Classical and Novel Synthesis Methods for Filters and Multiplexers</td>
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<tr>
<td>Full Day</td>
<td>SM-03</td>
<td>EuMC</td>
<td>Coupling-Matrix-Based Design of RF/Microwave Filters</td>
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<tr>
<td>Full Day</td>
<td>SM-04</td>
<td>EuMC</td>
<td>High-Speed Interconnects and Signal Integrity</td>
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## TUESDAY 25th September

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<tr>
<th>Time</th>
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<th>Title</th>
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<tbody>
<tr>
<td>Half Day PM</td>
<td>WTu-01</td>
<td>EuMC</td>
<td>Microwaves for Biomedical Applications</td>
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<tr>
<td>Half Day PM</td>
<td>WW-01</td>
<td>EuMC/EuRAD</td>
<td>Relevance of Electromagnetics in Communication System Design</td>
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<tr>
<td>Full Day</td>
<td>WW-02</td>
<td>EuRAD</td>
<td>Automotive Radar and HAD</td>
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## WEDNESDAY 26th September

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<tr>
<td>Full Day</td>
<td>WTh-01</td>
<td>EuMC</td>
<td>THz Applications: Present and Future</td>
</tr>
<tr>
<td>Half Day AM</td>
<td>WTh-02</td>
<td>EuMC</td>
<td>Wearable and Smart Electronics: Design, Materials and Applications</td>
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<tr>
<td>Half Day PM</td>
<td>WTh-03</td>
<td>EuRAD</td>
<td>Millimeter-wave Radar for Industrial and Consumer Applications</td>
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<td>WTh-04</td>
<td>EuMC/EuRAD</td>
<td>THz Electronics for Communication and Remote Sensing Systems</td>
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<tr>
<td>Half Day AM</td>
<td>WTh-05</td>
<td>EuMC</td>
<td>New Generations of Microwave Measurements and the Impact of Uncertainty/Sensitivity</td>
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<tr>
<td>Half Day AM</td>
<td>WTh-06</td>
<td>EuMC</td>
<td>Doherty Legacy: from Invention to Revival</td>
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<tr>
<td>Half Day PM</td>
<td>WTh-07</td>
<td>EuRAD</td>
<td>Coexistence in the Crowded Spectrum between 1 and 100 GHz</td>
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## THURSDAY 27th September

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<tr>
<td>Half Day AM</td>
<td>WF-01</td>
<td>EuRAD</td>
<td>Advanced mm-Wave Circuits and Systems for Emerging Radar Applications</td>
</tr>
<tr>
<td>Full Day</td>
<td>WF-02</td>
<td>EuMC</td>
<td>Modern Trends in Terahertz Electronics and Systems</td>
</tr>
<tr>
<td>Full Day</td>
<td>WF-03</td>
<td>EuMC</td>
<td>Tunable/Reconfigurable Filters and Multiplexers for Multi-Band Applications</td>
</tr>
<tr>
<td>Half Day AM</td>
<td>WF-04</td>
<td>EuRAD</td>
<td>Future Automotive Radar towards Autonomous Driving</td>
</tr>
<tr>
<td>Full Day</td>
<td>WF-05</td>
<td>EuMC</td>
<td>Advances toward Autonomous RF Filter Design</td>
</tr>
<tr>
<td>Full Day</td>
<td>WF-06</td>
<td>EuMC</td>
<td>Advanced Solutions for Near-field and Far-field Wireless Charging</td>
</tr>
<tr>
<td>Full Day</td>
<td>WF-07</td>
<td>EuMC</td>
<td>Backscatter Communications the Next Paradigm for IoT Approaches</td>
</tr>
<tr>
<td>Half Day AM</td>
<td>WF-08</td>
<td>EuMC/EuRAD</td>
<td>Multibeam Antennas and Beamforming Networks</td>
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## FRIDAY 28th September

<table>
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<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>Half Day AM</td>
<td>WF-09</td>
<td>EuRAD</td>
<td>Advanced mm-Wave Circuits and Systems for Emerging Radar Applications</td>
</tr>
<tr>
<td>Full Day</td>
<td>WF-10</td>
<td>EuMC</td>
<td>Modern Trends in Terahertz Electronics and Systems</td>
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<tr>
<td>Full Day</td>
<td>WF-11</td>
<td>EuMC</td>
<td>Tunable/Reconfigurable Filters and Multiplexers for Multi-Band Applications</td>
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<td>Half Day AM</td>
<td>WF-12</td>
<td>EuRAD</td>
<td>Future Automotive Radar towards Autonomous Driving</td>
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<td>Full Day</td>
<td>WF-13</td>
<td>EuMC</td>
<td>Advances toward Autonomous RF Filter Design</td>
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<td>Multibeam Antennas and Beamforming Networks</td>
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The Defence, Security and Space (DSS) Forum is jointly organised by the European Microwave Association (EuMA) and Microwave Journal, to complement European Microwave Week’s activity in the defence, security and space sector. This year, local input has been welcomed from: Fundación Círculo (Circle of Technologies for Defence and Security Foundation), TEDAE (Spanish Association of Technological Defence, Aeronautics and Space Companies) and UPN (Universidad Politécnica de Madrid).

Each year the DSS Forum focuses on a hot topic that is engaging industry, academia and organisations/agencies to develop, test and implement leading edge technology. In 2018 the topic is: Integrating Unmanned Aerial Vehicles (UAVs) into Defence and Security Scenarios.

The popularity of Unmanned Aerial Vehicles is growing due to a reduction in costs and the increasing capabilities and benefits provided by such systems. Currently, the estimated number of existing UAVs is believed to be a few million, with that figure estimated to grow exponentially in coming years. From a Defence and Security perspective, there is the need to provide UAVs with innovative technologies enhancing performances for safe and secure systems, and to defend against threats posed by terrorists and insurgents utilising UAVs to achieve their own objectives.

Microwave technologies are essential to meet these challenges by providing UAVs with new and more advanced sensors and communications equipment. However, going forward the development of such systems also anticipates the use of new technologies such as Big Data and Artificial Intelligence which will result in a high level of autonomy that, using the data obtained by the sensors, will provide the ability to learn from the environment and their own errors, eventually facilitating autonomous decision making in a constantly evolving environment.

Keynote speakers will consider the state of the art of leading technologies and systems for unmanned operations, the estimated evolution of technologies and trends and consider expected capabilities and functionalities to address future conflicts. The efforts made by the main players in the sector will be analysed and their views on new trends and technological developments will be offered.

The industry session will reflect the effort and investment that is being made to innovate, develop and bring UAV technologies to market. Specific areas of activity include radar systems being developed for UAV security – detection, identification and denial and obstacle detection for autonomous flying and crash avoidance. From an industry perspective, the emphasis will be on development at system and sub-system level, with particular focus on sub-system integration, not forgetting the significant role that test and measurement has to play in moving the sector forward.

The Executive Forum will present the points of view of the different established and regulatory bodies that allow coexistence between the different aerial platforms and describe the activity of the different players already established and emerging in the field.
EuMW 2018 Student Challenge

**When:** Wednesday 26th September, 2018  
**Location:** Exhibition Hall

Eligible students are invited to take part in the Student Challenge during EuMW 2018. The Student Challenge is an opportunity for Bachelor, Master, and Doctoral students from all over the world with a variety of academic backgrounds, to work together on a specific topic in the wide and challenging field of microwaves. The aim is to promote innovative thinking, teamwork and pro-active behaviour; skills future employers will highly value. Kick-off will take place during the first break on Monday 24th at both the student and the doctoral school.

**Teams**
Each team is composed of a maximum of four members, preferably from different institutions and with a variety of backgrounds. All teams will present, explain, and defend a fresh, visionary, application oriented concept by a short presentation (ePoster). The presentation must be based on at least two papers presented at the EuMW 2018, of which only one paper may be authored by a member of the team. Eventually, each team will give an elevator pitch of the innovative concepts they have devised. Hurry up, register promptly, the number of participants is limited!

**Evaluation Criteria**
- Novelty of the idea
- Relevance of the solution/vision proposed
- Feasibility of the idea
- Clarity of the poster
- Clarity of the oral presentation and discussion

**Registration**
To register, please send an e-mail to student_contests@eumw2018.com and attach a copy of your student identity card or a confirmation, signed by your responsible professor. The deadline for registration is 7th September 2018. Updated information can be found at the EUMW 2018 web site.

**Programme**

**Monday 24th September**
10:10-10:50 Kick-off meeting: Theme disclosure, instructions, team formation (room N108)

**Wednesday 26th September**
13:50-17:50 Poster presentation to jury and audience (exhibition hall)

EuMW 2018 Student Design Competitions

**When:** Tuesday 25th September and Wednesday 26th September, 2018  
**Location:** Exhibition Hall (Tuesday)  
N109 (Wednesday)

**Organisers:** Prof. Roberto Gómez García (Universidad de Alcalá, Spain) & Prof. Miguel Ángel Sánchez Soriano (Universidad de Alicante, Spain)

The Student Design Competitions involve master and doctoral students designing and measuring a microwave device developed prior to and also at the conference.

This year, three competitions will be offered:

**Thrust 1: Transceiver Design**
Thrust 1 is made to learn designing and measuring a transceiver as a result of the European Microwave Student/Doctoral Schools and the actual competition will be held at the end of the school on Wednesday in room N109. Registration at the school is required. This thrust is supervised by Prof. David S. Ricketts (North Carolina State University, USA).

**Thrust 2: Video Bandwidth Enhancement for High Power Amplifiers (sponsored by Ampleon)**
Thrust 2 is dedicated to the development of a power amplifier (transistors are provided by the sponsor) with enhanced video bandwidth performance at 3.6 GHz before the conference. This thrust is supervised by Dr. Osman Ceylan and Dr. Lázaro Marco-Platón. Winners will be awarded € 1500 (1st place) and € 1000 (2nd place). Promising designs will be also awarded € 500. The competition will be held on Tuesday in the exhibition hall. Please refer to the students activities web site for design rules and specifications.

**Thrust 3: Planar Filter Design at C-Band (sponsored by Ansys)**
Thrust 3 is meant to develop a planar filter design at C-band prior to the conference. This thrust is supervised by Prof. Roberto Gómez García and Prof. Miguel Ángel Sánchez Soriano. The winner will be awarded an ANSYS Research HF licence for six months (worth € 2400). The competition will be held on Tuesday in the exhibition hall. Please refer to the students activities web site for design rules and specifications.

www.eumweek.com | 25
3rd European Microwave Student School
‘Microwave Circuits in Planar Technologies’

When: Monday 24th September until Wednesday 26th September, 2018
Location: N107 (Monday and Tuesday)
N109 (Wednesday)
Organisers: Ernesto Ávila & Germán Torregrosa (Miguel Hernández University of Elche, Elche, Spain)

About the European Microwave Student School
This year’s European Microwave Week features the third European Microwave Student School for bachelor and master students from all over Europe. This year’s topic is “Microwave Circuits in Planar Technologies”, spanning from fundamentals of microwave circuits design to new designing techniques, technologies and implementations of microwave planar circuits. The programme features experts from academia and industry and it will enable a theoretical and practical understanding of microwave circuits in planar technologies. The course will be formed by an intensive full day of lectures accompanied by a hands-on design experience event on the second and third days. Together with the Doctoral School, students will build a modern digital transceiver. The best concepts will enter the Student Design Competition. The School is also open to interested PhD students.

Earning Credit Points
The European Microwave Student School will offer certificates to all attendees for earning credit points within the European Credit Transfer System (ECTS). If you need to have a written or oral exam, please contact your professor well in advance for arranging the details of the examination process. By request of your professor via email to studentschool@eumw2018.com we will provide an exam sheet for oral or written examination by the beginning of October 2018.

Registration
The registration fee for this event is €40. For the registration, bachelor and master students will need a valid student ID of an accredited university. ADS and HFSS temporary licenses will be available during the school. Students are prompted to bring their own laptops. For registration, please go to the registration site and select EuMW Student School. Students may also register for lunchboxes. For further information please visit: www.eumweek.com.

Registration closes 7th September 2018. Space is limited, so purchase your ticket well in advance.

Programme

**Monday 24th September**
8:30-8:40  Student School presentation
8:40-9:30  Co-simulation and optimization of microwave planar circuits
           Lluís Pradell, Universidad Politécnica de Cataluña, Barcelona, Spain
9:30-10:10 Integrated electromagnetic modeling and simulation to do more efficient microwave design
          Keysight, Spain
10:10-10:50 Break
10:50-11:40 Addressing Microwave Beamforming challenges in design and test
              Markus Lörner, Rohde & Schwarz
11:40-12:30 Wideband matching networks
              Cándid Reig Escrivà, Universidad de Valencia, Valencia, Spain
12:30-13:50 Lunch
13:50-14:40 Antenna feeding technologies
              Sergio Llorente Romano, Universidad Carlos III de Madrid, Leganés, Spain
14:40-15:30 Low profile planar antennas: fundamentals and applications
              José Luis Masa Campos, Universidad Autónoma de Madrid, Madrid, Spain
15:30-16:10 Break
16:10-17:00 Design of coupled-line bandpass filters by using an energetic coupling approach
              Miguel Ángel Sánchez Soriano, Universidad de Alicante, Alicante, Spain
17:00-17:50 Power amplifier design
              Osman Ceylan, Ampylene, Nijmegen, The Netherlands

**Tuesday 25th September**
8:30-12:30  Hands on activity - Building a modern digital transceiver in one day
             David S. Ricketts, North Carolina State University, Raleigh, USA
12:30-13:50 Lunch

**Wednesday 11th October**
8:30-12:30  Student Design Competition. Hands on activity.
             David S. Ricketts, North Carolina State University, Raleigh, USA
12:30-13:50 Lunch
SPECIAL CONFERENCE EVENTS

3rd European Microwave Doctoral School
‘Emerging Technologies in Microwave Engineering’

When: Monday 24th September until Wednesday 26th September, 2018
Location: N108 (Monday and Tuesday)
N109 (Wednesday)
Organisers: Enrique Bronchalo, Germán Torregrosa (Miguel Hernández University of Elche, Elche, Spain)

About the European Microwave Doctoral School
Following the success of the previous editions, this year’s European Microwave Week features the third European Microwave Doctoral School. The aim of the Doctoral School is to offer to PhD students, beyond the normal conference programme, an overview of various emerging technologies in Microwave Engineering. The School gathers several speakers that develop their research in different topics of the microwave field. The talks of the School are longer (50 min) than typical conference presentations. Additionally, the School includes a Hands-on Design Experience on Wednesday.

Registration
The School is dedicated (but not limited) to PhD students in the microwave field. The registration fee for this event is €80. For the registration, PhD students will need a valid student ID of an accredited university. ADS and HFSS temporary licenses will be available during the school. Students are prompted to bring their own laptops. For registration, please go to the registration site and select EuMW Doctoral School. Students may also register for lunchboxes. Registration is open until 7th September 2018. Space is limited, so secure your ticket well in advance.

Programme

Monday 24th September
8:30-8:40  Doctoral School presentation
8:40-9:20  ANSYS HFSS solvers for accurate and large scale RF and antenna design
David Prestaux, Lead HF application engineer, Ansys Europe.
9:20-10:10  Metamaterial-inspired resonators and applications
Ferran Martín, Universidad Autónoma de Barcelona, Barcelona, Spain
10:10-10:50  Break
Almudena Suárez, Universidad de Cantabria, Santander, Spain
11:40-12:30  Metasurfaces at THz: sensing and communication devices
Miguel Beruete, Universidad Pública de Navarra, Pamplona, Spain
12:30-13:50  Lunch
13:50-14:40  Metasurface-based leaky-wave antennas
Elena Abdo, Universidad de Málaga, Málaga, Spain
14:40-15:30  Filter synthesis using slope parameters: application to dual behaviour resonator
Cédric Quendo, Université de Bretagne Occidentale, Brest, France
15:30-16:10  Break
16:10-17:50  Theoretical and practical aspects of the design of SIW filters
Benjamin Potelon, Université de Bretagne Occidentale, Brest, France

Tuesday 25th September
8:30-9:20  Novel design techniques with sharp/smooth filter profiles
Israel Arnedo, Universidad Pública de Navarra, Pamplona, Spain
Iván Arregui, Universidad Pública de Navarra, Pamplona, Spain
9:20-10:10  High power harming effects in space hardware
Carlos Vicente, Aurorasat, Valencia, Spain
10:10-10:50  Break
Maurizio Bozzi, University of Pavia, Pavia, Italy
11:40-12:30  Radio astronomy receivers development in Yebes Observatory
José A. López-Pérez, Observatorio de Yebes, Instituto Geográfico Nacional, Spain
12:00-12:30  Hands on activity presentation
David S. Ricketts, North Carolina State University, Raleigh, USA
13:00-13:50  Lunch
Maurizio Bozzi, University of Pavia, Pavia, Italy
14:40-15:30  Filter synthesis using slope parameters: application to dual behaviour resonator
Cédric Quendo, Université de Bretagne Occidentale, Brest, France
15:30-16:10  Break
16:10-17:50  Theoretical and practical aspects of the design of SIW filters
Benjamin Potelon, Université de Bretagne Occidentale, Brest, France

Wednesday 26th September
8:30-12:30  Student Design Competition. Hands on activity.
David S. Ricketts, North Carolina State University, Raleigh, USA
12:30-13:50  Lunch

For updates to the programme, visit www.eumweek.com/students/doctoralschool.html
Young Professionals in Microwave Engineering at the European Microwave Week

Following last year initiative, EuMW 2018 has arranged two sessions devoted to Young Professionals (YPs) in Microwave Engineering. As a group of young scientists and engineers at an early career stage, YPs in the field would like to share their knowledge, enthusiasm and collaboration around the globe. Multidisciplinarity and diversity in perspectives are some of the YPs’ tools for pushing new technologies. The session on Tuesday, 25th September, from 13:50 to 15:30, is dedicated to “Career Opportunities in Microwave Engineering”, while the session on Thursday, 27th September, from 16:10 to 17:50, will present successful stories of “Microwave Engineering in Humanitarian Projects” and existing volunteering opportunities for advancing technology for the benefit of humanity. Finally, all Young Professionals are invited to a “Young Professionals Meet-Up” within the casual atmosphere of one of Madrid’s downtown cafeterias on Thursday, 27th September, starting at 18:30.

EuMW 2018 Career Platform

The Career Platform is a two-day event (25th and 26th September) within the European Microwave Week 2018 and it is part of the student activities organised by the EuMW 2018 team. The Career Platform is an opportunity for young European graduates to get in touch with those companies making an impact in today’s high-frequency business and to know their main activities, application fields, and market indicators, and for the companies to recruit young talent in the areas of microwave / millimetre-wave, radar, wireless and integrated circuits engineering.

The main aim of the EuMW 2018 Career Platform initiative is to foster relationships between the young engineers and the job market. To this end, a special session will be held on “Professional Opportunities in the European Microwave Industry” on Tuesday, 25th September. The Career Platform will also include a speed-recruiting lounge where companies and institutions will show their current job/internship offers. All this will be complemented by an active presence in the social networks (Facebook, LinkedIn, Xing) during the conference and the maintenance of the European RF and Microwave job portal http://www.rf-and-microwave-jobs-in-europe.eu which is the virtual marketplace for students and companies to meet at and in-between European Microwave Weeks. Further information can be found at www.eumweek.com/docs/Career_platform.html. Please feel free to contact the Career Platform Chair with any questions you may have or to obtain additional details.

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Prof. Juan Córcoles
Autonomous University of Madrid, Spain
Email: juan.corcoles@uam.es

Career Platform Lounge
Date: Tuesday 25th and Wednesday 26th September
Time: 13:20 - 17:50
Room: First Floor, West Entrance Hall
Registration: Free (including visitors)

The Career Platform will be an excellent opportunity for companies to meet students and young engineers looking for a career in the areas of high frequency, microwave, millimetre-wave engineering and Radar.

Career Platform Special Session
Professional Opportunities in the European Microwave Industry
Date: Tuesday 25th September
Time: 08:30 – 10:10
Room: N118
Registration: Free (including visitors)

Programme

The following talks have been confirmed:

1. The European Space Programs: Opportunities & Challenges
   Dr. Javier Ventura-Traveset, Head of Galileo Navigation Science Office, European Space Agency.

2. Millimeter Waves Today - Automotive Radar and 5G as Driving Forces - Career Opportunities,
   Holger H. Meinel, Independent Consultant, formerly with Daimler Corporate Research

3. The Defense Market
   INDRA’s perspective on the Defense Market. Speaker to be confirmed

4. Space Sector: Your first work at a SME in the space sector
   David Díez, Vice President in charge of Space, Microwave and Datalink Systems Business Units, Erzia, Spain

Additional talks will be confirmed before the event, through social networks and in the EuMW website.
On the occasion of the 80th birthday of Prof. Ingo Wolff, a podium discussion on EM simulation based modelling of antennas and microwave systems is being held on Thursday 27th in Room N117 from 12:40-13:40.

Over the last 30 years EM simulation techniques for application in microwave system design have been largely improved; today they are indispensable tools in the design of microwave circuits, antennas and systems. Based mainly on the finite difference time domain (FDTD) and the finite element (FE) technique, the software implementations have reached high performance. They can be used flexibly for varying structures and materials, they can produce highly accurate results, and, using e.g. parallelization techniques, they work with unprecedented high speed and numerical efficiency. Techniques for analyzing noisy electromagnetic fields are under development and a first connection to virtual reality has been demonstrated.

All these techniques, however, are basically analysis methods, i.e., one has to define a microwave component or system and can then analyze its behavior. First approaches for the opposite direction, i.e., synthesizing techniques based on an EM simulation, are available for simple components and also partly installed in the simulation tools. A method called "Inverse Local Imaging" which allows you to calculate the current sources from a given electromagnetic field is still in its infancy and far from an application to synthesize complex microwave antenna and circuit systems. The question is whether upcoming "Artificial Intelligence" processes are able to perform this task together with fast analysis tools in the background.

In the podium discussion, this idea and alternative strategies will be presented and discussed, using an antenna or circuit design task as an example.
Welcome to Madrid!
No city on earth is more alive than Madrid, a beguiling place whose sheer energy carries a simple message: this city really knows how to live.

Few cities boast an artistic pedigree quite as pure as Madrid’s: many art lovers return here again and again. For centuries, Spanish royals showered praise and riches upon the finest artists of the day, from home-grown talents such as Goya and Velázquez to Flemish and Italian greats. Masterpieces by these and other Spanish painters such as Picasso, Dalí and Miró now adorn the walls of the city’s world-class galleries. Three in particular are giants – the Museo del Prado, Centro de Arte Reina Sofía and Museo Thyssen-Bornemisza – but in Madrid these are merely good places to start.

If you would like any other information, please contact Sally Garland on sally@connexhotelsandevents.com

Madrid City Tour

Madrid City Tour is one of the easiest and most comfortable ways of discovering the city. All you have to do is buy your one or two-day ticket, hop on the bus, put on your earphones, listen to the recorded commentaries and enjoy the streets, monuments and places of interest you pass by. You can hop off wherever you want, as many times as you like.

If on the same day you want to visit the Santiago Bernabéu stadium, the Prado Museum and the Royal Palace, with Madrid City Tour, you can get to them all quickly and easily, without having to know the local bus routes or change lines on the underground. The buses are equipped with audio guides in 14 languages (Spanish, English, French, German, Italian, Portuguese, Russian, Japanese, Dutch, Chinese, Arabic, Catalan, Basque and Galician).

ROUTE 1: HISTORICAL MADRID
The first route starts off from Calle Felipe IV, next to the Prado Museum, and then goes on to Puerta de Alcalá and the Prado-Recoletos thoroughfare – where you can find the Neptuno and Cibeles Fountains, followed by Gran Vía. The bus continues along this central avenue to Plaza de España and then, after passing the Debod Temple, enters the old part of the city, where you’ll discover the Royal Palace, La Almudena Cathedral and Puerta del Sol. The last part of the journey takes you back along Paseo del Prado and past the Royal Botanical Gardens, and the Reina Sofia and Thyssen-Bornemisza Museums before coming to the Prado Museum.

The extended route is available twice a day (at 10.05am and 8.40pm) and takes you all the way to Madrid Río, the city’s new urban park and beach. It also goes to the area around Moncloa, taking in the Ejército del Aire (Spanish Air Force Base), the Faro de Moncloa viewpoint tower and Arco de la Victoria (Victory Arch). There’s also a night tour in the summer months, with two departures starting at 10pm.

ROUTE 2: MODERN MADRID
The second route offered by Madrid City Tour also starts off next to the Prado Museum, but then continues along some of the city’s main thoroughfares, such as Castellana, Prado and Recoletos, and their side streets. The route sets out from Plaza de Neptuno and continues to Plaza de Cibeles, where you can see Cibeles Palace, the current seat of the City Council. It’s one of the most spectacular buildings along the route, which also offers views of the Palace of the Marquis of Salamanca, the Nuevos Ministerios government buildings, the AZCA business complex and the Santiago Bernabéu Stadium. The bus also passes through Barrio de Salamanca, with its luxury brand shops and museums like the Lázaro Galdiano Museum. Towards the end of the route we pass the Puerta de Alcalá gate and Puerta del Sol, before ending up in Plaza de las Cortes. The extended version of this route is also available twice a day (at 12.15pm and 4.05pm), going all the way to the new high-rise Cuatro Torres Business Area and Las Ventas Bullring.

Times: March to October: 9am to 10pm (passing by every 8-9 minutes)
Prices: Adults: €21 (one day) and €25 (two consecutive days).
Kids (ages 7-15) and over-65s: €9 (one day) and €12 (two consecutive days).
Families (two adults and two kids): €53 (one day).
Children (under 6): free.

With a ticket valid for either one or two consecutive days, you can hop on the bus at any stop, provided that there are free seats.

The Madrid Top 10 places to Visit!
Paseo del Arte
This area, known in English as the Art Walk, boasts art and beauty as you’ll see nowhere else in the world. Along a stretch of just over one kilometre, you’ll find the Prado Museum, the Thyssen-Bornemisza Museum and the Reina Sofia Museum, as well as a number of other institutions and buildings well worth visiting.

The Essential Art Walk app
The Essential Art Walk App will help you discover 24 great masterpieces, eight in each museum, in a simple and entertaining way. A complete tour of the History of Western Art in the heart of Madrid.
Download via iTunes or Google Play
Before Madrid became a capital city, with its wide avenues and boulevards, its footprint consisted of narrow streets, alleys and passageways, which today take us back to the times of swashbuckling swordsmen and medieval rogues.

Puerta de Alcalá

The gate was built by Sabatini in 1778 as part of the city decoration restorations promoted by Charles III. It is made of granite and is an excellent example of proportion, harmony, and elegance. The King commissioned the work to Sabatini in order to commemorate his arrival at the capital in 1759. The gate was located at the entrance of the city, next to the Alcalá de Henares road, from which it received its name.

Cibeles Fountain

The Cibeles Fountain, created in 1782 and situated in its current location since 1895, has ended up lending its name to one of the most emblematic squares of Madrid. It has also become a symbol of the capital. The Fountain depicts the Roman goddess of the same name (Cybele in English), symbol of the Earth, agriculture, and fertility, atop a chariot drawn by lions.

Santiago Bernabéu Stadium

Real Madrid is one of our city’s three professional football teams, together with Atlético de Madrid and Rayo Vallecano. Holder of multiple European and international titles, the club opens its doors 363 days a year for football and sports fans to explore its historic stadium, an absolute must on your trip to Madrid. Named after the club’s legendary president who headed Real Madrid between 1943 and 1978, the Santiago Bernabéu stadium was opened in 1947.

El Retiro Park

This green oasis in the centre of Madrid has 125 hectares and is home to over 15,000 trees. From a botanical point of view, the park includes some very important gardens: the Jardín de Vivaces, the Jardines de Cecilio Rodríguez (classical gardens of an Andalusian style), the Jardines del Arquitecto Herrero Palacios, the Rose Garden, and the Parterre Francés with the oldest tree in Madrid, a bald cypress that is believed to be 400 years old.

The Rastro

Always full of locals and visitors, it is an attraction no one should miss if they visit the city on a Sunday or a public holiday. Set in the La Latina district, around Ribera de Curtidores, with Plaza de Cascorro as its nerve centre, the market takes in a large, almost triangular block bounded by Toledo, Embajadores and Ronda de Toledo and takes in other streets such as San Cayetano, Fray Ceferino González, Carlos Arniches and Mira el Río, as well as Plaza de General Vara del Rey and Plaza Campillo del Mundo Nuevo.

Hidden Gems

Temple of Debod

A second-century Egyptian temple donated to Spain during the construction of the great Aswan Dam.

Sorolla Museum

Museum dedicated to Joaquin Sorolla, the painter of Mediterranean light, set in his former family home.

National Archaeological Museum

This 19th Century Neo-Classical building houses one of the world’s most important antique collections.

Matadero Madrid

The city’s old slaughterhouse, at Madrid Rio, has been transformed into a cultural megacomplex.

Platform 0. Chamberí Station

Built in 1919, Chamberí is a “ghost station” which has been fully restored with authentic period features.

Museum of the Americas

Situated in the Princesa area, it boasts a collection of pre-Columbine, ethnographic and colonial pieces.
**MONDAY**

**EuMIC 2018**

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**N101 + N102**

**EuMIC01-1**

**Industrial 0.15-µm AlGaNP GaN on SiC Technology for Applications Up to Ka Band**

Valeria Di Giacomo-Brunelli, Estelle Bylv, Christophe Chang, Jan Grünenplatt, Benot Lambert, Guillaume Mauguiro, Daniel Sommer, Helmut Jung, Marc Camnade, Philippe Fleury, Didier Floriot, Hervé Blanck, Jean-Pierre Vaud

**1**United Monolithic Semiconductors SAS, **2**University of Sherbrooke

**EuMIC01-2**

**Comparison of C-Doped AlN/GaN HEMTs and AlN/GaNP/GaN Double Heterostructure for mmW Applications**

Rad Kabouche

EMN-University of Liege

**EuMIC01-3**

**Broadband GaN-based Power Amplifier MMIC and Module for V-Band Measurement Applications**

Dirk Schaarschmidt, Peter Brückner, Raul Arrizou, Axel Tesaman, Martin Kurz, Markus Rafler, Hermann Massler, Roger Quaas, Fraunhofer Institute for Applied Solid-State Physics

**EuMIC01-4**

**AlGaNP/GaN HEMT with Distributed Gate for Improved Thermal Performance**

Maria Elksne, Abdullah Al-Khalidi, Edward Wasige

University of Glasgow

**EuMIC01-5**

**Fully Automated RF-Thermal Stress Workbench With S-Parameters Tracking for GaN Reliability Analysis**

Damien Saugy, Jean-Guy Tartarin, Bernard Franc, Hassan Maher, François Bone

LAAS-CNRS, University of Sherbrooke

**EuMIC02-1**

**A 112 µW F-band Standing Wave Detector in 40nm CMOS for Sensing and Impedance Detection**

Balázs Pálfalvi, Péter Révay, YU Leuen

**EuMIC02-2**

**A Terahertz Direct Detector in 22nm FD-SOI CMOS**

Ralf Jan, Robin Zatta, Janusz Grzyb, David Harame, Ulrich R. Pfeffer

Bergische Universität Wuppertal, GlobalFoundries

**EuMIC02-3**

**204GHz Stacked-Power Amplifiers Designed by a Novel Two-Port Technique**

Ahmed Ahmed, Ali Farid, Miguel Ugueta, Mark Rodwell

University of California, Santa Barbara, Teledyne Scientific Company

**EuMIC02-4**

**A Gain-Boosted S2 142GHz Band-Pass Distributed Amplifier in 0.13µm SiGe Process with fmax of 210GHz**

Hooin Raiahian, Onedel Nane

University of California Davis (UC Davis)

**EuMIC02-5**

**A 79–85 GHz CMOS Amplifier with 0.35 V Supply Voltage**

Rudong Dong, Kazue Katsuyama, Kiyoda Takano, Sanggoop Lee, Takahiro Yoshida, Shuhei Arimakura, Minoru Fujishima

Hiroshima University

**EuMIC03-1**

**A 120 GHz SiGe BiCMOS Monostatic Transceiver for Radar Applications**

Elke Oelχová, Dider Gerschel, Ulrich Yoos, Bert Yilmaz, Dietmar Kaslńger, Wolfgang Weikle

Silicon Radar GmbH, HPT, Technische Universität Berlin

**EuMIC03-2**

**A Multipurpose 76 GHz Radar Transceiver System for Automotive Applications Based on SiGe MMICs**

Jan Schoppel, Simon Kueppers, Klaus Aufinger, Nils Pohl

Ruhr-University Bochum, Fraunhofer FHR, Infineon Technologies AG

**EuMIC03-3**

**High Linearity 57-66 GHz SiGe Receiver for Outdoor Point-to-Point Communication**

Roo Be-Yin, Benny Sherman, Roi Camn, Jakob Vonovitz, Oded Katz, Danny Elad

On Semiconductor

**EuMIC03-4**

**Highly Integrated Transceiver for Mobile Satellite Services User Terminals Incorporating Dual Receivers for Satellite Handover and Digital Pre-Distortion for PA Linearization on 0.18um CMOS**

Cormac O'Sullivan, Chris Campbell, Maeve Colbert, Darren O'Sullivan

S3 Semiconductors

**EuMIC03-5**

**5G 26 GHz and 28 GHz Bands SiGe:C Receiver with Very High-Linearity and 56 dB Dynamic Range**

Alessandro Fanie, Fabio Plutino, Laurence Moguill, Stephanie Razafimamidy, Sebastian Pruxa

SIME Microelettronica, STMicroelectronics

**EuMIC04-1**

**Ensuring Charge Conservation in GaN HEMT Large Signal Model Design**

Cédric Walter, Justin King

University College Dublin

**EuMIC04-2**

**A Procedure for GaN HEMT Charge Functions Extraction from Multi-Bias S-Parameters**

Giang Phong Gian, Alberto Santarelli, Fabio Filicori

University of Bologna

**EuMIC04-3**

**Frequency Domain-Based Method for Two-Port Nonlinear Quasi-Static Model Extraction from Large-Signal Waveforms**

Sergio Perez-Parmata, Teresa M. Martin-Guerrero, Juan O. Balseo-Pollana, Carla Carcacho-Peñafiel

Universidad de Málaga

**EuMIC04-4**

**X-Parameter Characterization of LDMOS Devices for Broadband Doherty High-Power Amplifier Design**

Alessandro Colonnard, Giovanni Collodi

University of Florence

**EuMIC04-5**

**A Systematic Investigation of Behavioural Model Complexity Requirements**

M. Rocchi Mount, Michael Casbon, Monira Fernández Barciela, Paul Tasker

University of Vigo, Cardiff University
10:50 - 11:00
Welcome Address
Opening of the European Microwave Integrated Circuits Conference 2018
Teresa M. Martín-Guerrero, EuMIC 2018 Chair
José Ángel García-García, EuMIC 2018 TPC Chair

11:00 - 11:45
Gallium Nitride MMIC Design – Progress and Problems
Dr. Charles F. Campbell, Qorvo Inc.

GaN based transistor technology’s characteristics of very high current density combined with high voltage operation have held the promise to vastly improve many microwave circuit applications that once utilized GaAs devices. Today, GaN transistors are capable of high voltage operation while simultaneously demonstrating FT & FMAX characteristics more typical of lower voltage GaAs PHEMT devices.

The potential benefits of GaN device characteristics combined with MMIC technology are many. Highly efficient switched modes of power amplifier operation should be possible at higher output power levels and frequency. High output impedance typical of transistors operated at high voltage should facilitate lower loss matching networks and reduced transformation ratios. The higher output power density of GaN devices should lead to greatly reduced die size for GaN implementations of existing power amplifier functions.

The improved heat flow realized by the high thermal conductivity SiC substrate material should allow for acceptable junction temperatures even with the much higher power dissipation. Very high power switches could be designed by using large control voltages and taking advantage of the high current capability of GaN. The RF voltage swings present in GaN MMICs under large signal operation present opportunities to develop circuit functions that self-actuating, reconfigure and re-bias based on power level. While the advantages are manifest, many of the features that make GaN transistors attractive can be shown to create significant issues that are typically not encountered with lower voltage devices.

In this talk, MMIC design examples and scenarios are discussed highlighting the benefits and problems associated to GaN MMIC technology.

11:45 - 12:30
Terahertz Nanoplasmonics with 2D Materials
Prof. J. Sebastián Gómez-Díaz, University of California, Davis

The THz spectrum offers unique opportunities to transform our society through advanced and exciting applications, including wireless communications with terabit-per-second data rates, molecular recognition, ultra-high resolution imaging and screening systems, and real-time spectroscopy, among many others. These applications are not currently being exploited due to the immature state of THz technology in terms of antennas, detectors, sources, and basic components. In fact, this frequency region is known as the “THz gap”, as it occupies a technology gap between the well-developed areas of electronics and photonics.

This talk overviews the use of graphene and other 2D materials as a powerful, reconfigurable, CMOS-compatible, and miniaturized on-chip platform for terahertz nanoplasmonics, addressing some of the shortcomings of current THz technology by compressing electromagnetic waves to deeply subwavelength volumes. This platform offers intriguing opportunities to develop tunable components such as modulators, waveguides, lenses, and antennas, as well as magnetless nonreciprocal devices based on the spatiotemporal modulation of graphene’s conductivity. The talk will conclude attempting to identify and explore current research trends as well as mid- and long-term prospects and challenges.
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<td>Si-Based High-Frequency and Power Devices and Novel Microwave Technologies</td>
<td>Fard Medjoudj, Rüdiger Quay</td>
<td>³EM - CNRS, ³Fraunhofer Institute for Applied Solid State Physics (IAF)</td>
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<td>High Efficiency Design and Linearisation of Power Amplifiers</td>
<td>Carlos Crespo-Cadenas, Denis Barataud</td>
<td>³IEMN - CNRS, ³Fraunhofer Institute for Applied Solid State Physics (IAF)</td>
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<td>RFIC Signal Generation</td>
<td>Patrick Schult, Franco Gaini</td>
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<td>Giovanni Ghione, Teresa M. Martin-Guerrero</td>
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<td>Steven Theeuwen</td>
<td>³Ampleon Netherlands</td>
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<td>Kausik Ghone</td>
<td>University of Southampton</td>
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<td>A Novel Laser-Assisted Fabrication Process for Nanowired Substrate Integrated Devices</td>
<td>Vivien Van Kerckhoven, Luca Pilla, Isabelle Hyten</td>
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<td>A 14-GHz-band Highly Linear Stacked FET Power Amplifier IC with 20.1 dBm P1dB and 40.1 % PAE in 56-nm SOI CMOS</td>
<td>Colin Chen, Tao-Wei Sung, Toshihiko Yoshimasu</td>
<td>Waseda University, Samsung R&amp;D Institute Japan</td>
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<td>Design of an S-Band Chireix Outphasing Power Amplifier Based on a Systematic Bandwidth Limitation Analysis</td>
<td>Anna Podobed, Roberto Guiglia, Nino Pinto, Steve Cripps</td>
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<td>Sparse Model Selection of Digital Predistorters using Subspace Pursuit</td>
<td>Juan A. Becerra, Daniel Herrera, Maria J. Maderos-Ayar, Carlos Crespo-Cadenas</td>
<td>Universidad de Sevilla</td>
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N101 + N102
EuMC01
Power Amplifier Architectures for High Efficiency and Linearity
Chair: Georg Fasch¹
Co-Chair: Paolo Colantonio²
¹FAU Erlangen-Nuremberg, ²University of Roma for Vergata

EuMC02
Measurement Systems
Chair: Iliana Rollits²
Co-Chair: Bianca WAP²
¹Ruhr-University Bochum, ²FH Suidwestfalen

EuMC03
Couplers and Dividers
Chair: Anthony Ghiotto¹
Co-Chair: Roberto Sorrentino²
¹University of Bordeaux, Bordeaux INP, UMR CNRS 5218, IMS Laboratory, ²RF Microtech Srl

EuMC04
Metamaterials and Periodic Structures
Chair: Faramarz Martin³
Co-Chair: Dmitriy Klokodyak⁴
¹Universitat Autonoma de Barcelona, ²St. Petersburg Electrotechnical University / LETI

EuMC01-1
A High-Efficiency GaN-Thick-Film BST-Based Tunable Matching Network
Sebastian Prest¹, Alex Weise⁵, Enrico Li⁶, Wolfgang Heinrich⁷, Rolf Jakoby⁷, Holger Maune⁷, Olaf Bengtsson⁷
¹Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, ²Technische Universität Darmstadt, ³European Space Agency

EuMC02-1
Impact of On-Silicon De-Embedding Test Structures and RF Probes Design in the Sub-Thz Range
Chandran Yadav¹, Marina Deng¹, Sebastian Frageoni¹, Magal Matos¹, Bernard Piano¹, Thomas Zimmer¹
¹University of Bordeaux, IMS laboratory

EuMC03-1
Compact Tunable Wilkinson Power Divider With Simple Structure
Mariusz Niedźwiedzi¹, Radosław Kowalewski¹, Piotr Pospieszalski¹, Piotr Skowroński¹
¹Wroclaw University of Science and Technology, ²University of Wroclaw

EuMC04-1
Three-Dimensional Frequency Selective Surface With Multiple Transmission Zeros for Wide Stopband
Jianping Zhu¹, Zhengyong Yu¹, Wanchun Tang¹
¹Nanjing University of Science and Technology, ²Nanjing Normal University

EuMC01-2
Dynamic Load Modulated Low-Voltage GaN PA Using Novel Low-Loss GaN Varactors
Rudim Angritsu¹, Sebastian Krause¹, Rüdiger Quay¹
¹Fraunhofer Institute for Applied Solid State Physics IAF

EuMC02-2
On-Wafer Broadband Microwave Measurement Devices - CPW Test Structures with Integrated Metallic Nano-Resonances
Khalid Uddin¹, Faisal Mubarik¹, Vincenzo Massaro¹, H. Voit¹, Nick Ritter¹, Isabelle Rac⁴, Giles Dambrie¹, Karel Haddadi¹
¹Univ. Lille - IEMN, ²VSL, ³Advanced Technology Institute, University of Surrey, ⁴NPL

EuMC03-2
Liquid Crystal Based Tunable Reflection-Type Power Divider
Matthias Nickel¹, Mario Knecht¹, Roland Reess¹, Ervin Polat¹, Matthias Jost¹, Rolf Jakoby¹, Holger Maune¹
¹TU Darmstadt

EuMC04-2
Theoretical Minimum of Phase Shift Error of Switchable-channel Phase Shifters on Left-handed and Right-handed Transmission Lines
Gregory Klokodyak¹
¹ST. Petersburg Electrotechnical University / LETI

EuMC01-3
Band-limited Digital Predistortion with Band-switching Feedback Architecture for 5G mmWave Power Amplifiers
Souhilk Dey¹, Tanuja Masaaka¹, Shridiv Hot¹, Nonsik Tan¹, Yasushi Wada¹, Kazuaki Kunihito¹
¹NEC Corporation

EuMC02-3
A Unified, Wave-Based Calibration framework for Vector Network Analyzers Yves Rolain¹, Iry Magna¹, Gest Vandersteen¹
¹VUB

EuMC03-3
High Performance 3dB Coupler (Hybrid) with Broadband Flat Amplitude Characteristics
Xiaolong Wang¹,², Zhewang Ma¹, Masataka Ohira¹, Xiaolong Wang¹,², Zhewang Ma¹, Masataka Ohira¹
¹CNRS 5218, IMS Laboratory, ²RF Microtech Srl

EuMC04-3
Slow-Wave Artificial Transmission Lines Based on Stepped Impedance Shunt Stub (SISS) Loading: Analysis and Stopband Bandwidth Enhancement
Jan Corominas¹, Jordi Selga¹, Paolo Vailà¹, Jordi Bonache¹, Ferran Martín¹
¹Universitat Autonoma de Barcelona

EuMC01-4
Novel DC-Biasing Circuits with Arbitrary Harmonic Control Capability for Compact High-Efficiency Power Amplifiers
Sneha Tanaka¹, Tomoyo Oda¹, Kento Saiki¹
¹NEC Corporation

EuMC02-4
Nonlinear Three-Port Characterization of a Class-G Supply Modulated RF Power Amplifier using a Nonlinear Vector Network Analyzer
Felipe Francisco Takah¹, Tindel Strudsgard Neißen¹, Nikolai Wölf², Ole Kiel Jensen¹, Jan Hedegaard Mikkelsen¹, Old Bengtsson¹
¹Aalborg University, ²Keyight Technologies, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik

EuMC03-4
Design of a SIW Based Hybrid Ring Coupler with Arbitrary Power Splitting Ratio Using Gaussian Process Regression
Kanitkithi Thanataveeewan¹, Muhammad Fayiz Kater¹
¹Nanyang Technological University

EuMC04-4
A Microfluidic-based Reflective-type 1-bit Terahertz Digital Metamaterial
Fangang Hu¹, Peiyong Song¹, Huafeng Liu¹, Liancheng Tu¹
¹Huazhong University of Science and Technology

EuMC01-5
Practical Load Compensation Networks in Chireix Outphasing Amplifiers Using Offset Transmission Lines
Alejandro Boquza¹, Jonathan Lee¹, Roberto Quaglia¹, Gavin Watkinson¹, Steve Crisp¹
¹Cardiff University, ²Thamirka Research Europe Ltd.

EuMC02-5
On Wafer Millimetre Wave Power Detection Using a PN Junction Diode in BiCMOS 55 nm for In-Situ Large Signal Characterization
Joao Carlos Ascensão Goncalves¹, Ivaak Kaj¹, Daniel Gloria¹, Vincent Gley², Frederic Canesse³, Sylvie Leguillier¹, Guillaume Ducournau¹, François Darmelovor², Christophe Gauquier²
¹STMicroelectronics, ²BN

EuMC03-5
Arbitrary Terminated Coupler With Tunable Group Delay Responses
Gmbhei Chaudhary¹, Pranam Pat¹, Pranab Kim¹, Yongcheo Jeong¹
¹Chonbuk National University

EuMC04-5
Practical Design of a Band-Pass Filler Using EBG SIW technology
David Lopez Navarro¹, Angela Coves Soler¹, Enrique Broncal¹, German Tomás-Pereira², Mauricio Buzzó²
¹University of Pavia, ²University Miguel Hernández de Elche (UMH)
TUESDAY

EuMC05
Special Session: 5G Technology in Asia Pacific
Chair: Maurizio Bozzi¹
Co-Chair: Kamran Ghobadi²
¹University of Pavia, ²Royal Melbourne Institute of Technology

EuMC06
Non-Planar 3D Waveguide Filters
Chair: Marco Guigoni¹
Co-Chair: Jerzy Michalski²
¹Technical University of Valencia, ²SpaceForest

EuMC/EuMIC01
III-V Low Noise Amplifiers
Chair: Luisa de la Fuente¹
Co-Chair: Julien Lintignat²
¹Universidad de Cantabria, ²XLIM UMR 7252, University of Limoges/CNRS

TUESDAY

EuMC06-1
Spurious Free Non Uniform Width Dielectric Loaded Filters
Shrikrishna Kulkarni¹, Ian Hunter², Muhammad Yameen Sandhu
¹Saluki IBA University, ²University of Leeds, Leeds, United Kingdom

EuMC/EuMIC01-1
An X-Band Robust GaN Low-Noise Amplifier MMIC with Sub 2 dB Noise Figure
Oguz Kazan¹, Fatih Koçer², Ozlem Aydin Civi¹
¹Middle East Technical University, ²Analog Devices, Inc.

Introduction to the Special Session: 5G Technology in Asia Pacific
Roberto Sorrentino¹
¹RF Microtech Srl

EuMC06-2
Novel Solution for the Coaxial Excitation of Inductive Rectangular Waveguide Filters
Angel-Antonio San-Blas¹, J. C. Mejia-Ordonez², Vicente E. Broll³, Marco Guigoni¹
¹University of Valencia, ²Technical University of Valencia

EuMC/EuMIC01-2
Robust X-band GaN LNA with Integrated Active Limiter
Çağdaş Yağbasan¹, Ahmet Aktug¹
¹Aselsan Inc.

EuMC06-3
Very-Compact Waveguide Bandpass Filter Based on Dual-Mode TM Cavities for Satellite Applications in Ku-band
Luca Pellizza¹, Cristiano Tomassoni¹, Fabrizio Coccia², Paolo Valletta², Roberto Sorrentino¹, Jaime Gallego³, Christoph Ernst³
¹RIF Microtech Srl, ²University of Perugia, ³ESA ESTEC

EuMC/EuMIC01-3
An Ultra-Broadband Low-Noise Distributed Amplifier in InP DHBT Technology
Md Tanjil Shivan¹, Maruf Hossain¹, Dimitri Stoppel¹, Nils Weimann², Ralf Doerner¹, Viktor Krozer¹, Wolfgang Heinrich¹
¹Ferdinand-Braun-Institut (FBH) Leibniz-Institut für Höchstfrequenztechnik, ²Universität Duisburg-Essen, Duisburg, Germany

EuMC06-4
Failure Analysis of Microwave Air Breakdown for the Cavity Filter with Remainder
Zhaorong Li¹
¹Institute of Electronic Engineering, China Academy of Engineer Physics

EuMC/EuMIC01-4
Compensation of Performance Degradation Due to Thermal Effects in GaN LNA Using Dynamic Bias
Johan Stenman¹, Louise Hanning¹, Niklas Rosman¹, Matias Thomsen¹
¹Microwave Electronics Laboratory, Chalmers University of Technology

EuMC06-5
High Quality TE011 Mode Cavity Filter for Input Multiplexer Applications
Fei Li¹
¹China Academy of Space Technology (Xi’an)

EuMC/EuMIC01-5
X-band Low Noise Figure T/R Switch Module using a Superconducting T/R Switch
Hiroaki Ikeuchi¹, Tamio Kawaguchi¹, Noritsugu Shiokawa¹, Yuichi Sawahara¹, Hiroyuki Kayano³
¹Toshiba Corporation

EuMC05-1
Filtering Antennas in China
Quan Xue¹
¹South China University of Technology

EuMC05-2
Synthesized Transmission Lines - Past, Present, and Future
Tzyh-Ghuang Ma¹
¹National Taiwan University of Science and Technology

EuMC05-3
Metatennas for 5G and Beyond
Zhi Ning Chen¹
¹National University of Singapore

EuMC05-4
Introduction to the Special Session: 5G Technology in Asia Pacific
Roberto Sorrentino¹
¹RF Microtech Srl

EuMC05-5
An X-Band Robust GaN Low-Noise Amplifier MMIC with Sub 2 dB Noise Figure
Oguz Kazan¹, Fatih Koçer², Ozlem Aydin Civi¹
¹Middle East Technical University, ²Analog Devices, Inc.

EuMC05-6
Novel Solution for the Coaxial Excitation of Inductive Rectangular Waveguide Filters
Angel-Antonio San-Blas¹, J. C. Mejia-Ordonez², Vicente E. Broll³, Marco Guigoni¹
¹University of Valencia, ²Technical University of Valencia

EuMC05-7
Very-Compact Waveguide Bandpass Filter Based on Dual-Mode TM Cavities for Satellite Applications in Ku-band
Luca Pellizza¹, Cristiano Tomassoni¹, Fabrizio Coccia², Paolo Valletta², Roberto Sorrentino¹, Jaime Gallego³, Christoph Ernst³
¹RIF Microtech Srl, ²University of Perugia, ³ESA ESTEC

EuMC05-8
Failure Analysis of Microwave Air Breakdown for the Cavity Filter with Remainder
Zhaorong Li¹
¹Institute of Electronic Engineering, China Academy of Engineer Physics

EuMC05-9
High Quality TE011 Mode Cavity Filter for Input Multiplexer Applications
Fei Li¹
¹China Academy of Space Technology (Xi’an)

EuMC05-10
X-band Low Noise Figure T/R Switch Module using a Superconducting T/R Switch
Hiroaki Ikeuchi¹, Tamio Kawaguchi¹, Noritsugu Shiokawa¹, Yuichi Sawahara¹, Hiroyuki Kayano³
¹Toshiba Corporation
10:50 - 11:20

Welcome Address

Opening of the European Microwave Week 2018
Magdalena Salazar Palma, EuMW 2018 General Chair
José Ignacio Alonso Montes, EuMW 2018 General Co-Chair
Almudena Suárez Rodríguez, EuMW 2018 General TPC Chair
Juan-Mari Collantes, EuMW 2018 General TPC Co-Chair

EuMA Welcome Address
Wolfgang Heinrich, EuMA President

Greetings from IEEE MTT-S
Dominique Schreurs, IEEE MTT-S President

Opening of the European Microwave Conference 2018
Vicente Boria, EuMC 2018 Chair
Miguel Ángel Gómez Laso, EuMC 2018 Co-Chair
Ferran Martín, EuMC 2018 TPC Chair
Francisco Mesa, EuMC 2018 TPC Co-Chair

11:20 - 12:00

Evolving to 5G
Enrique Blanco, Telefónica Global CTIO

In Telefonica we look at 5G not only as an evolution of radio, but as an opportunity to apply new concepts that can transform our network to make it much more flexible and agile. Concepts like virtualisation, enabled with network function virtualisation (NFV), software defined networking (SDN) and the cloud, can be applied to the architecture – the 5G core and the radio access network (RAN) progressing towards a fully converged fixed and mobile network (FMC). We are talking about an evolutionary transformation of the network that may bring some of the expected 5G capabilities earlier as an evolution of the current LTE networks. On the other hand, a good part of the next investment in 4G in terms of fibre, antennas, base band units, the virtualisation environment and others may be re-used, and sets up the basis, for the future 5G rollout. We understand that 5G is a long journey, and we are working on several areas to get a future-proof network in the meantime.

12:00 - 12:10

Greetings from EuMW 2018 Platinum Sponsor
Benoit Neel, Vice President and General Manager for Keysight EMEA

12:10 - 12:30

Awards Ceremony
Alex Yarovoy, Past Chair EuMA Awards Committee

EuMA Pioneer Award
EuMA Distinguished Service Award
Certificate of Recognition for EuMW 2017 General Chair
International Journal for Microwave and Wireless Technologies Best Paper Prize

12:40 - 13:40

Special Session: 20th Anniversary of the European Microwave Week
Chair: Roberto Sorrentino¹
¹EuMA Founder Member

13:50 - 15:50

EuMC07-1
The Years Before the European Microwave Week
Andrew Wilson¹
¹EuMA Honorary Secretary

EuMC07-2
The Last “stand alone” European Microwave Conference – Jerusalem, 1997
Asher Madjar¹
¹EuMA Founder Member

EuMC07-3
The Simultaneous Creation of the European Microwave Week and Association
André Vander Vorst¹
¹EuMA Founder Member

EuMC07-4
The First European Microwave Week, Amsterdam 1998
Leo Ligthart¹
¹EuMA Founder Member

EuMC07-5
The Evolution of the EuMW and EuMA
Roberto Sorrentino¹
¹EuMA Founder Member

EuMC07-6
The Future Becomes the Present
Holger Meinel¹, Steve Nightingale²
¹EuMA Founder Member, ²CMS Technologies

Several key representatives of RF and microwave semiconductor foundries will give short presentations of their foundry capabilities with respect to the impact of advanced GaN, GaAs and Si technologies for military, space and civilian applications. This includes details of current fully-released and commercially available processes and processes in development. There will also be an opportunity for questions and answers during this interactive forum.

Several key representatives of RF and microwave semiconductor foundries will give short presentations of their foundry capabilities with respect to the impact of advanced GaN, GaAs and Si technologies for military, space and civilian applications. This includes details of current fully-released and commercially available processes and processes in development. There will also be an opportunity for questions and answers during this interactive forum.
EuMC/EuMIC04 Interactive Session
Chair: Jose A. Garcia¹
Co-Chair: Luisa de la Fuente²
¹University of Cantabria, ²Universidad de Cantabria

13:30 – 15:30

TUESDAY

Exhibition Hall

EuMC/EuMIC04-1 Non-Linear Distortion in Ultra Wideband GaN Power Amplifiers
Emilio Delgado Peñuelas, Eduardo Ortega Gigoño, Juan José Sánchez-Martínez, Maria Luz Gil Heras, Virginia Bueno Fernández, Antonio Bidal-Márquez, Jesús Grijalba
ingria, Instituto de Sistemas S.A., Universidad Politécnica de Madrid

EuMC/EuMIC04-2 Characterization of Bond Wire Interconnects in QFN Packages
Qun Xiao
²NACOM Technology Solutions

EuMC/EuMIC04-3 Rapid Design of Compact Impedance Matching Transformers for Energy Harvesting Applications by Means of Inverse and Forward Surrogates
Slawomir Kozłat, Adrian Bekasiewicz
¹Polish University, ²Gdańsk University of Technology

EuMC/EuMIC04-4 Optimization of PCB Transitions for Vertical Solderless Coaxial Connectors Up to 67 GHz
Paul Stärke, Frank Ellinger
¹Technische Universität Dresden

EuMC/EuMIC04-5 A Three-layer Resist Process for T- and I-gates in High Electron Mobility Transistor Fabrication
Sandra Redmüller, J.-C. Jaquier, M. Nadel, Christophe Chang, G. Callat, S. Piotrowicz, Sylvain Delage, Jan Grünenpflüg, Herve Bianci, F. Scholz
¹United Monolithic Semiconductors GmbH, ²Mikroelektronik, ³SAP, ⁴Amphion, ⁵United Monolitico Semiconductors SAS, ⁶United Monolitico Semiconductors GmbH, ⁷University of Ulm

EuMC/EuMIC04-6 GaAs Balanced Amplifier for Ka-Band Space Communications System
Leonardo Pontile³, Alessandro Banigge³, Giorgio Leuzzi³, Francesco Vitali³, Andrea Sutuani³
¹University of L'Aquila, ²National University of Singapore, ³University of Bologna, ⁴University of Bologna, ⁵University of Bologna

EuMC/EuMIC04-7 Ka-Band P-I-N Diode Based Digital Phase Shifter
Daniel Kramer
²NACOM Technology Solutions

EuMC/EuMIC04-8 An E-band Variable-Gain Amplifier Using a Programmable Attenuator
Kinzia Amsalou², Tyler Ross², Monis Hajeel²
¹Huawei Technologies

EuMC/EuMIC04-9 4 - 18 GHz AlGaAs/GaAs Based Distributed Power Amplifier MMIC
Bartosz Kowal³, Patrick Schuh³, Martin Opfermann³
²Hersoald Sensors GmbH

EuMC/EuMIC04-10 On Stability Analysis and Loop Oscillation of Multi-Finger GaN FET Cells for High Power Amplifiers
Ammar Issaoun², Petra Hemmes², Martin Fagerlind², Francis Call, Thomas Roedle²
¹Ampicon

EuMC/EuMIC04-11 Characterization and Electrical Modeling including Trapping Effects of AlN/GaN HEMT 4x50µm on silicon substrate
Mohamed Bouzit³, Ahmed Ahabji³, Jean-Christophe Nallatany³, Farid Medjoub³
¹ULM Research Institute - UFR CNRS 7252, ²ESIM - CNRS

EuMC/EuMIC04-12 A 28-GHz CMOS 2x2 Phased Array Chip with High Precision Phase Adjusting Function between Subarrays for Beam Multiplexing
Toshikiro Shimagi⁴, Takahiro Oohora⁴, Shouhei Tohka⁴, Shunsuke Fujin³, Kazuyuki Okaï³, Masahiko Shimizu³, Yoji Osawa³
¹Fujitsu Laboratories, ²Kanagawa Institute of Technology

EuMC/EuMIC04-13 A Class E Digital Transmitter for APSK
Gavin Wakahisa
²Toshiba Research Europe Limited

EuMC/EuMIC04-14 X band GaN Based MMIC Power Amplifier With 36.5dBm P1-dB for Space Applications
Armagan Guzeltürk¹, Bušek Apluž Yilmaz¹, Ömer Cengiz¹, Ozlem Serif¹, Ekrem Özçay¹
¹University of Istanbul Technology Research Center (NAMJOTAM), ²Bilkent University

EuMC/EuMIC04-15 A W-Band Frequency Tripler With Integrated Waveguide Filter Matching
Cheng Guo², Jeff Powell², Xiaobang Shang², Mike Lancaster², Jun Xu²
¹The University of Birmingham, ²National Physical Laboratory, ³University of Electronic Science and Technology of China

EuMC/EuMIC04-16 Electrothermal X-Parameters for Dynamic Modeling of RF and Microwave Power Transistors
Sean Gillespie¹, David Roux¹, Mihai Marcu¹, Peter Aser¹
¹University of Surrey, ²Keysight Technologies

EuMC/EuMIC04-17 A Ku-Band Injection-Locked Push-Push Oscillator with Two-Waveband Ring Resonator
Eiko Lima¹, Takayuki Tanaka¹, Ichihiko Toyota¹
²Saga University

EuMC/EuMIC04-18 Millimeter-Wave Detection on Basis of Photo-Thermoelectric Effect
Yuank Feng¹, Matthew Deloach², Robert Weike³, D. Kurt Gaskill³, N. Scott Barlow³
¹University of Virginia, ²U. S. Naval Research Laboratory

EuMC/EuMIC04-19 Frequency Multipliers Based on Hybrid Technology with High Harmonic Suppression
Amaro Díez López¹, Amparo Herrera¹, Juan Carlos Perez-Ambrojo², Javier Cabo Freixeda³
¹University of Cantabria, ²Thales Aerial Space Spain

EuMC/EuMIC04-20 A Hybrid Bipolar Wideband VCO with Linearized Tuning Behaviour for a New Generation TTC Transponder
Jamaa Cannavan Patricia Peres, Amparo Herrera, Javier Cabo Freixeda, Juan Carlos Perez-Ambrojo
²University of Cantabria, ³Thales Aerial Space Spain

EuMC/EuMIC04-21 A Hybrid Bipolar Wideband VCO with Linearized Tuning Behaviour for a New Generation TTC Transponder
Jamaa Cannavan Patricia Peres, Amparo Herrera, Javier Cabo Freixeda, Juan Carlos Perez-Ambrojo
²University of Cantabria, ³Thales Aerial Space Spain

EuMC/EuMIC04-22 Characterization of Flex to Printed Circuit Board Interconnections using Insertion Connectors
Christian Pernot¹, Hong Duc Nguyen², Jean Philippe Coupas², Philippe Minard², Damien Izadi²
¹MIT Atlantic, ²Technicost Connector Home, ³Centre technique du papier

EuMC/EuMIC04-23 Characterization of Flex to Printed Circuit Board Interconnections using Insertion Connectors
Christian Pernot¹, Hong Duc Nguyen², Jean Philippe Coupas², Philippe Minard², Damien Izadi²
¹MIT Atlantic, ²Technicost Connector Home, ³Centre technique du papier

EuMC/EuMIC04-24 Characterization of Flex to Printed Circuit Board Interconnections using Insertion Connectors
Christian Pernot¹, Hong Duc Nguyen², Jean Philippe Coupas², Philippe Minard², Damien Izadi²
¹MIT Atlantic, ²Technicost Connector Home, ³Centre technique du papier
**EuMC/EuMIC02**

Doherty Power Amplifiers

Chair: Daniela Bongiorno
Co-Chair: Nathalie Detemple

University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

**EuMC/EuMIC02-1**

Fully Integrated Asymmetric Doherty Amplifier Based on Two-Power-Level Impedance Optimization

Ryo Iihikawa¹, Yoichiro Takayama¹, Kazuhisa Horie²

University of Electro-Communications

1. University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

**EuMC/EuMIC02-2**

1-Package 500W High Efficiency LDMOS Doherty Amplifier

Hao Zhang¹, Sandra De Meyer¹, Claude Douarat², Small Bard®

NXP Semiconductors, XLIM Research Institute - Duvanaud², Smail Bachir²

University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

**EuMC/EuMIC02-3**

A 50W Highly Linear Three-Way Integrated Wideband Doherty PA for Small-Cell Application

Hao Zhang¹, Sandra De Meyer¹, Claude Douarat², Small Bard®

3. University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

**EuMC/EuMIC02-4**

High-Power Asymmetrical Three-Way Gallium-Doped Heterojunction Power Amplifier at C-Band Frequencies

Eden Deng¹, Erdin Ture², Sebastian Krause¹, Dirk Schwachtchen¹, Rodrigo Quay³, Olivier Ambacher¹

Fraunhofer Institute for Solid State Physics IAF

1. Fraunhofer Institute for Solid State Physics IAF

**EuMC/EuMIC02-5**

Comparison of S-band Analog and Dual-Input Digital Doherty Power Amplifiers

Anna Paczolay¹, Marco Ponzi², Vittorio Camarchia¹, Chiara Ramešiel¹, Roberto Quaglia², Xinyu Zhou³, Wing-Shing Chan³

Politecnico di Torino, Cardiff University, City University of Hong Kong

1. Politecnico di Torino, 2. Cardiff University, 3. City University of Hong Kong

**EuMC/EuMIC03**

Si-Based Amplifiers

Chair: Yudin Issakov³
Co-Chair: Beant Aziz³

Infineon Technologies AG, University of Catania

1. University of Catania

**EuMC/EuMIC03-1**

Three-Path SiGe BiCMOS LNA on Thinned Silicon Substrate for IoT Applications

Sebi Czepiec¹, Markus Gölting⁵, Gebert Alavi¹, Joachim Burghard², Manfred Berndt³

University of Stuttgart

1. University of Stuttgart

**EuMC/EuMIC03-2**

An E-Band Variable Gain Low Noise Amplifier in 90-nm CMOS Process Using Body-Floating and Noise Reduction Techniques

Yunan Wang³, Chun-Nien Chen³, Yi-Ching Wu³, Hue Wang³

National Taiwan University


**EuMC/EuMIC03-3**

Variable Gain Distributed Amplifier with Capacitive Division

Christian von Vangerow¹, Christian von Vangerow¹

University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

1. University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

**EuMC/EuMIC03-4**

A S-band 3D Surface Mount Packaged SiGe and GaN Tx Module Using Flip-Chip Bonding and a Device Embedded PCB Substrate

Kenji Kawai¹, Eigo Kawanishi¹, Hidenori Ishibashi¹, Yuki Suagauchi¹, Takehito Tsuchida¹, Kenta Hirokawa¹

National Institute of Advanced Industrial Science and Technology

1. National Institute of Advanced Industrial Science and Technology

**EuMC/EuMIC03-5**

Compact Multi-Band Forming Network With Three-Way Power Divider Based on 3D Unit-Cells

Ya Hu¹, Hidenori Yukawa¹, Tatsuo Ishida¹

Nagoya University

1. Nagaoka University

**EuMC/EuMIC04**

Waveguide Devices and Circuits

Chair: Maurizio Buzzi³
Co-Chair: Nicolas Delhote²

University of Pavia, XLIM Research Institute, University of Limoges, Limoges, France

**EuMC/EuMIC04-1**

Wideband Probe-Type Waveguide-to-Microstrip Transition for 28 GHz Applications

Andrey Mochanovskiy³, Sergey Churkin³, Alexey Artemenko³, Roman Maskinovko³

Rado Gradić LLC

1. University of Catania, 2. University of Catania

**EuMC/EuMIC04-2**

Design of a Wideband MultiLayer Meander-Line Polarizer (6 – 18 GHz) Using a Semi-Analytical Method

Wafa Abdou², Muhammad Saeed Khan¹, Alhassane Konstantinede², Emirati Technology and Innovation Center (ETIC)

2. University of California, Los Angeles

**EuMC/EuMIC05**

Metasurfaces

Chair: Tatsuo Ishida¹
Co-Chair: Tatsumi Itoh¹

University of California, Los Angeles, 2. University of Hong Kong

**EuMC/EuMIC05-1**

Blazed Metasurface Grating with Handedness Preservation for Circularly Polarized Incident Wave

Yuanyuan Dong¹, Jean-christophe Nanan¹, Sandra DEMEYER¹, Claude DOURANT², Thomas Zwick¹

University of Bordeaux, Bordeaux INP, UMR CNRS 7252

1. University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

**EuMC/EuMIC05-2**

Multi-focus imaging utilizing Huygens metasurface

Kissinger², Thomas Zwick¹

Christian von Vangerow¹, Daniel Strohke¹, Dietmar Steffen¹

University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

1. University of Bordeaux, Bordeaux INP, UMR CNRS S2I8, IMS Laboratory, XLIM Research Institute, University of Limoges, Limoges, France

**EuMC/EuMIC05-3**

Circuit Modelling of Electromagnetically Induced Reflection by Multiple Slits on a Metallic Screen

Fuja Bgap¹, Raul Rodriguez-Bernal³, Francisco Mesa¹, Francisco Medina²

1. AVL university, 2. Universidad de Sevilla

**EuMC/EuMIC06**

Radar Techniques FHR

Chair: Vadim Issakov¹
Co-Chair: Denis Barataud²

1. University of Electro-Communications

**EuMC/EuMIC06-1**

Two-Power-Level Amplifier Based on Asymmetric Doherty Fully Integrated

Naofumi Yoneda¹, Coupler and Branch-Line Three-way Power Divider Compact Multi-Beam Forming Network With

Ryo Ishikawa¹, Yoichiro Takayama¹, Kazuhiko Honjo¹

University of Electro-Communications, Ryo Ishikawa¹, Yoichiro Takayama¹, Kazuhiko Honjo¹

1. University of Electro-Communications

The last dozen years has seen transistor Maximum Frequency of Oscillation (fMAX) push well over 1 THz for transistors in the Indium Phosphide (InP) material system. Integrated circuits have kept pace, and InP HEMT packaged amplifiers have been demonstrated to 1 THz. While InP integrated circuits have seen the largest increase when measured in raw Gigahertz, Si and SiGe integrated circuits have also seen significant advances in operating frequencies. This talk will describe the current status of transistor based electronics operating above 100 GHz and describe recent progress in communications and sensors at these frequencies. Topics include an overview of device technologies and integrated circuit technology. Traditional applications in this frequency range including atmospheric science and radio-astronomy will be briefly described along with emerging applications in imaging and communications. Benchmarks will be provided in terms of noise figures and output power at frequencies above 100 GHz.

EuMIC15
EuMIC Closing Session
Chairs: Teresa M. Martín-Guerrero, EuMIC 2018 Chair and José Ángel García, EuMIC 2018 TPC Chair
Co-Chairs: Carlos Camacho-Peña/la, EuMIC 2018 Co-Chair and Ángel Mediavilla, EuMIC 2018 TPC Co-Chair

16:55 - 17:20
EuMIC Awards Ceremony
Teresa M. Martín-Guerrero, EuMIC 2018 Chair
Lluis Pradell, EuMW 2018 Awards Chair

EuMIC Prize
EuMIC Young Engineer Prize

GaAs Association Address
GaAs Association Student Fellowships

17:20 - 17:30
Closing of the EuMIC 2018
Teresa M. Martín-Guerrero, EuMIC 2018 Chair

17:30 - 17:40
Invitation to EuMIC 2019 in Paris
Farid Medjdoub, EuMIC 2019 Chair

TUESDAY
**TUESDAY**

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<td>Non-Planar Passive Components</td>
<td>Near-Field Sensing and Parameter Extraction</td>
<td>Transceiver and Building Blocks</td>
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<td>Co-Chair: Luca Pernegger</td>
<td>Co-Chair: Diego Mascio</td>
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<td>Co-Chair: Ciro Vauclair</td>
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<td>Excellence Systems, ON Semiconductor</td>
<td>Saga University, University of Padua</td>
<td>University of Bologna, National Institute for Research and Development in Microtechnologies (IMT)</td>
<td>University of Cantabria, Xerox Semiconductors</td>
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**EuMC12-1** Determining Carbon Fiber Composite Loading with Flip-Chip Measurements
- Nina Popovic, Ji-Seop Dinko, Aaron Hagenbom, Joshua Orlik, Jennifer Selte, Daniel Koon, Edward Garcez, Christian Long, Nathan Orlik
- University of Colorado Boulder, National Institute of Standards and Technology, Army Research Laboratory, Aberdeen Proving Ground

**EuMC12-2** Impact of Substrate Modes on mTRL-Calibrated CPW Measurements in G Band
- Ngoc Phung, Franz Josef Schmücker, Ralf Dömer, Wolfgang Heinloth, Thorein Prodol, Uwe Ade
- Ferdinand-Braun-Institut, Leibniz-Institut für Hochfrequenztechnik, Physikalisch-Technische Bundesanstalt

**EuMC12-3** Wideband Complex Parameter Tester for 5G Materials
- Kauko Heinikoski, Timo Tarvainen, Lauri Hynynen
- University of Oulu, Finland

**EuMC12-4** An Accurate Free Space Method for Material Characterization in W Band Using Material Samples with Two to 130 µm Thicknesses
- Isabella Laur, Martin Frank, Kati Sti, Fabian Lust, Armin Talaie, Robert Weigt, Alexander Kochet
- Friedrich-Alexander University Erlangen-Nuremberg, "Brandenburg University of Technology"

**EuMC12-5** Liquids Microwave Characterization Technique Based on Quartz WGM Resonator with a Liquidic Chip
- Alexey Gubin, Irina Protonko, Alexander Barannik, Hanna Hlibhova, Nickolay Cherpak, Svetlana Vlasukova
- "Y. Ul'kiv Institute for Radiophysics and Electronics NAS of Ukraine, "COS-II, Forschungszentrum Jülich"

**EuMC13-1** Industrial Keynote: Complex Border Tracking Algorithm for Determination of Zeros and Poles of Complex Function and its Application in Microwave Analysis
- Jerzy Michaeli
- "SpaceForest"

**EuMC13-2** Frequency Selective Ferrite Circulators with Quasi-Elliptic Response
- Andrea Ashley, Lila Marzali, Zoya Popovic, Dimitra Psychogiou
- University of Colorado Boulder

**EuMC13-3** Design-Oriented Modelling of Microstrip Ferrite Circulators
- Mauricio Pinto, Lila Marzali, Andrea Ashley, Dimitra Psychogiou, Zoya Popovic
- University of Colorado at Boulder

**EuMC13-4** Two-way Waveguide Power Divider Using 3D Printing and Electroless Plating
- Youtzu Lee, Sung-min Shin, Hye-Lim Kang, Ignacio Llamas Garrigues, Yang Wang, Yun-Jo Jang, Jung-Mu Kim
- Chonbuk National University, Republic of Korea, "Centre Tecnològic de Telecomunicacions de Catalunya (CTTC) CCERCA", "The University of Birmingham, "McLlfordics for all, Inc"

**EuMC13-5** A Novel 180° Coupler Based on Double-sided Substrate Integrated Suspended Line Technology with Patterned Substrate
- Yuan Ma, Kaixue Ma, Yongqiang Wang
- University of Electronic Science and Technology of China

**EuMC14-1** Impedance Sensor for Fluid Permittivity Measurements Up to 20 GHz with Single-Liquid Calibration
- Aleksandar Savic, Alexander Steppute, Arne F. Jacobsen
- Hamburg University of Technology

**EuMC14-2** Solute Concentration Measurements in Diluted Solutions by Means of Split Ring Resonators
- Paris Velez, Javier Mata-Contreras, David Dubuc, Katalin Gremier, Ferran Martin
- "Universitat Autonoma de Barcelona, "LAAS-CNRS"

**EuMC14-3** Near-Field Soil Moisture Sensor with Energy Harvesting Capability
- Marti Boada, Antonio Ramon Lazaro, Ramon Maria Villaino, Ernest Giralt, David Gibbou Sala
- "Universitat Rovira I Virgí (URV)"

**EuMC14-4** Progression of the Multipole Resonance Probe: Advanced Plasma Sensors Based on LTCC Technology
- Qianya Fei, Christian Schulz, Motz Oehberg, Alexandra Sewa, Peter Urlich, Peter Aukawicz
- "Ruhr-University Bochum, "MST Gmbh"

**EuMC14-5** Compact Substrate Integrated Wireless Cure Monitoring Sensor for Epoxy Resin
- Jarno Groth, William Barrett Lee, Jan Schörl, Felix Diederl, Martin Vossiek
- Friedrich-Alexander-University Erlangen

**EuMC15-1** An 80-Gbaud Transmitter using Bandwidth Interleaving with Sideband Cancelling Method
- Tenyu Jiyu, Hiroshi Yamasaki, Munehiko Nagai, Hiroshi Hamada, Hiroki Fukumoto, Hideyuki Nosaka
- "NTT Device Technology Lab"
EuMC16
Antennas Based on Artificial Structures
Chair: Mohsen Sazegar¹
Co-Chair: Ferran Paredes²
¹Kymeta Corporation, ²Universitat Autonoma de Barcelona

EuMC17
Manufacturing Techniques of Non-Planar Filters
Chair: Jorge A. Ruiz-Cruz²
Co-Chair: Petrolio Martín-Iglesias²
¹Universidad Autónoma de Madrid, ²ESA/ESTEC

EuMC18
Vehicular Connectivity
Chair: Jan Barowski²
Co-Chair: Jan Barowski²
¹Nokia Bell Labs, ²Ruhr-University Bochum

EuMC16-1
Mohsen Sazegar¹
¹Kymeta Corporation

EuMC17-1
Design of a Compact 3D Printed Coaxial Filter
Giuseppe Venanzoni¹, Marco Dong¹, Cristiano Tomasso¹, Lorenzo Senneno¹
¹University of Perugia, ²RF Microtech Srl

EuMC18-1
Evaluation of Vehicular 4G/5G-MIMO Antennas via Data-Rate Measurement in an Emulated Urban Test Drive
Mahmoud Almarashli¹, Stefan Lindenmeier¹
¹Universität der Bundeswehr München

EuMC16-2
Dichroic Sub-Reflector for Wide Band Techniques for Single Offset Antenna
Yu-Lin Su¹, Chung-Chin Jian¹, Yu-Ling Lee¹, Chung-Hsing Li¹, Thomas Lohey²
¹Wom Element Matter B.V., ²National Central University, ³Rutgers University

EuMC17-2
Impact of Fabrication Process Tolerances on Characteristics of Sub-THz Silicon Micromachined Filters
Antti Lamminen¹, Jaakko Saarihali¹, Peika Pursula¹, Mikko Kankaanranta¹, Vladimir Ermolov¹
¹VTT Technical Research Centre of Finland

EuMC18-2
Engineering the Environment to Enhance Millimetre-Wave Communications for Connected Vehicles
Shailesh Raut¹, Aldo Petosa¹
¹Communications Research Centre Canada

EuMC16-3
Assessment of the Dielectric Losses of Artificial Magnetic Conductors for Antenna-on-Chip Applications
Teun van den Biggelaar¹, Bart Smolders¹
¹Eindhoven University of Technology

EuMC17-3
Frequency Correction Design Technique for Additive Manufactured Cavity Filters
Alejandro Pons Abarca¹
¹Technical University of Cartagena

EuMC18-3
Diversity Performance of Benchmark Scenarios for Hidden Vehicle-to-X Antennas Underneath the Roof
Miguel Bueno Diez¹, Stefan Lindenmeier¹
¹Universität der Bundeswehr München

EuMC16-4
Graphene-based Fabry-Perot Cavity Leaky-Wave Antennas: Towards an Experimental Validation
Walter Fuscaldo¹, Silvia Tofani¹, Paolo Burghignoli¹, Paolo Baccarelli², Andrea Notargiacomo², Sara Cibelló, Marialicia Pezz, Pasquale Carelli³, Neesja Matrici, Carmilla Chieli, Alessandro Galli⁴
¹University of Rome, ²ROMA TRE, ³University of Perugia, ⁴ICNII, "Center for Nanotechnology Innovation ITT"

EuMC17-4
3D Printed Low-Pass Filter with Conical Inductors for RF Broadband Applications
Josep Maria Lopez-Vega¹, Amos Sala¹, Neus Vidal Martínez¹, Javier Seara¹
¹University of Barcelona

EuMC18-4
A Multi-Channel Algorithm for Antenna Diversity of SiriusXM High Band Satellite Reception in Vehicles
Ali Nasar¹, Simon Senega¹, Stefan Lindenmeier¹
¹Universität der Bundeswehr München

EuMC16-5
Bandpass Filter Based on Skeleton-like Monobloc Dielectric Pucks Made by Additive Manufacturing
Auiren Pérez¹
¹AIM Research Institute, University of Limoges, Limoges, France

EuMC18-5
High-Throughput Satellite Connectivity for the Constant Contact Vehicle
Ryan Stevenson¹, David Fairheinham¹, Tom Freema¹, Tamer Neaf¹, Tim Mason¹, Shahnaz Shafie²
¹Kymeta Corporation

TUESDAY

N116

N117

N118
08:30 - 08:40
Welcome Address
Opening of the European Radar Conference 2018
Mateo Burgos, EuRAD 2018 Chair

08:40 - 09:10
A New Radar Generation for F-110 Frigate Integrated Mast
María Carmen Barbero Arrabe, Naval Programmes Director at Indra S.A.
Spain is tackling the design of an Integrated Mast within the development efforts of the new F-110 frigate. Sensor development has had a special emphasis resulting in the activation of a set of Technological Programs in which criteria of risk reduction and industrial development prevail.
In this paper Indra will describe the works that are currently undergoing under the technological programs for F-110 with a special focus on the advances in Radar development on the primary S and X band Radar, secondary radar as well as other sensors.
These designs respond to the new challenges that the operational scenarios demand while having in mind Integrated Mast concept that is the key in the abovementioned frigate. The main operational requirements that have driven the definition of these new systems will be reviewed. In addition, the paper will present the main concepts that have been considered: use of AESA architectures, integration of the most advanced techniques in digitization and amplification of power, intensive use of the concept of multifunctionality as driver in the optimization of time and resources, data exploitation and integration in 4.0 new concepts.

09:10 - 09:40
Quantum Radar: From Quantum Illumination to a Working Prototype
Stefano Pirandola, Full professor at Computer Science Department, University of York, UK
In this talk, the basic ingredients and the main ideas behind quantum radar will be reviewed. It will start by describing techniques of quantum sensing and metrology, before giving details of the protocol of quantum illumination. This protocol is first presented in the optical setting (quantum lidar) and then extended to the microwave frequencies (quantum radar). In the microwave domain, possible radar designs based on current or next-available quantum technology, for instance, considering the use of electro-opto-mechanical converters or superconducting devices.
In particular, the minimum quantum requirements that transmitter and receiver need to have in order to outperform a classical radar-system will be addressed. The quantum advantage specifically occurs in the regime of few photons per pulse, meaning that quantum radar may achieve the same detection performance of highly energetic classical radars while employing extremely faint quantum signals. This low-energy feature is desirable not only for achieving stealthy target detection but also for other potential tasks, including the development of a non-invasive form of microwave rotational spectroscopy.

09:40 - 10:00
EuRAD 2018 Forecast
Manuel Rosa, EuRAD 2018 TPC Chair
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<th>Co-Chair(s)</th>
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<td>EuMC20</td>
<td>Solid State High Power Amplifiers</td>
<td>Roberto Dionisio², Marc Camiade¹</td>
<td>Véronique Serru¹, Jean-Jacques Fontecave¹, Anne-Marie Couturier¹, Nicolas Poitrenaud¹</td>
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<td>EuMC21</td>
<td>Filter Synthesis Techniques</td>
<td>Robert Snyder¹, Giuseppe Maciarello²</td>
<td>RS Microwave, Politecnico di Milano</td>
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<td>Non-Conventional Designs in Antenna Technology</td>
<td>David Escal-Socareaga²</td>
<td>Carlos Montesano¹, Airbus DS Space, INTA</td>
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<td>EuMC23</td>
<td>THz Components</td>
<td>Antti Räisänen¹, Luis Enrique Garcia-Muñoz²</td>
<td>Aalto University, Universidad Carlos III de Madrid</td>
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<td>EuMC20-1</td>
<td>Quasi-MMIC High Power Amplifier with Silicon IPD Matching Network</td>
<td>Jungyun Jeong¹, Jin Koh¹, Planck Pech², Jonguk Lim², Yongho Jeong³</td>
<td>Chonbuk National University, Soonchunhyang University</td>
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<td>EuMC20-2</td>
<td>New Class-F High Efficiency Multi-Bias Optimised GaN HPA for C-Band Applications</td>
<td>Wilfried Demenitroux¹, Frederic Ploneis¹, Audrey Thorinius²</td>
<td>Thales Communications &amp; Security, Thales DMS</td>
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<td>EuMC20-3</td>
<td>Wideband High Efficiency 50 W GaN HEMT Balanced Power Amplifier</td>
<td>Quang Huy Le¹</td>
<td>Fernande University of Applied Sciences, *Vietnamese-German University</td>
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<td>EuMC20-4</td>
<td>50% High Efficiency X-Band GaN MMIC Amplifier for Space Applications</td>
<td>Anit-Marie Coutin², Nicolas Potreshold¹, Vincente Serru², Jean-Jacques Fortescue¹, Roberto Dioniso¹, Marc Camiade¹</td>
<td>United Monolithic Semiconductors SAS, *ESA</td>
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<td>EuMC21-1</td>
<td>Lossy Dual-Mode Bandpass Filter With Non-Uniform Q Method</td>
<td>Jose-Maria Munoz-Ferreras¹, Dimitra Psychoguou², Roberto Gomez-Garcia¹</td>
<td>University of Colorado at Boulder</td>
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<td>EuMC21-2</td>
<td>Linear Time-Invariant Behavioral Digital Models of Frequency-Peiodic Rf/ Microwave Filters</td>
<td>Jose-Maria Munoz-Ferreras¹, Dimitra Psychoguou², Roberto Gomez-Garcia¹</td>
<td>University of Colorado at Boulder</td>
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<td>EuMC21-3</td>
<td>A Theoretical Synthesis of Coupling Matrix by Eigen Mode Expansion Method and Householder Transform</td>
<td>Singke Taleb¹, Tetuo Aradz¹, Chun-Ping Chen¹, Antenna Giken Co. Ltd.</td>
<td>Kasugawa University</td>
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<td>Johannes Mathére, University of Pretoria</td>
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<td>EuMC22-1</td>
<td>Miniaturization Design of Millimeter Wave Conformal Array Antenna</td>
<td>Jingpeng Gu¹, Ning University of Science and Technology</td>
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<td>Novel Single/Dual Beam Scanning Provided by an Array Composed of Two CRLH SIW LWAs</td>
<td>Rihem Noumi¹, Jan Machac¹, Al Gharashian¹</td>
<td>Faculty of Sciences of Tunisia, *Czech Technical University in Prague</td>
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<td>Perforated Rectangular Dielectric Resonator Antenna for Wideband, Dual band and Single band application</td>
<td>Pragat Patel¹, Eeshan Verma¹, Malikayun Evangelu¹, NT Goa</td>
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<td>EuMC22-4</td>
<td>An Electrical-Contactless Substrate-Over-Waveguide Planar Array Slot Antenna</td>
<td>Alfonso Tomas Munu-Barrado¹, Manuel Sierra Pierez, Josu Manuel Fernandez-Gonzalez¹</td>
<td>Technical University of Madrid</td>
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<td>EuMC22-5</td>
<td>Compact Cavity-Backed Spiral Antennas with Enhanced Axial Ratio and Gain at Low Frequencies</td>
<td>Andrea Garcia-Esteves¹, Juan Jose Sanchez-Martinez¹, Area Cristina Gago-Lanch¹, Francesco Vázquez-Vázquez¹</td>
<td>*India Institute of Science and Technology</td>
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<td>EuMC23-1</td>
<td>300-GHz CMOS Receiver Module with WR-3.4 Waveguide Interface</td>
<td>Shinsho Har¹, Kojuke Takaku¹, Kazuki Takayama¹, Ruihong Dong¹, Koichi Mizuno¹, Kazuki Takahashi¹, Issai Washo¹, Norihiko Sakino¹, Atsuki Kasumori¹, Takeaki Yoshida¹, Shuhei Amakawa¹, Minou Fujishima¹</td>
<td>National Institute of Information and Communications Technology, Hiroshima University, Panasonic Corporation</td>
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<td>Monopulse RLNA Antenna with Gap-Waveguide Feeding Network for Space Debris Radar at 94 GHz</td>
<td>Adria Tameze Dominguez¹, José Manuel Fernandez-Gonzalez¹, Manuel Sierra Castille¹</td>
<td>Universidad Politècnica de Madrid</td>
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<td>EuMC23-3</td>
<td>E-band Radio Fiber as Low-Cost mm-Wave Waveguide Junction</td>
<td>Stefano Moccal¹, Matho Oldoni¹, Giuseppe Parrisi¹</td>
<td>ESIEE, *TIMS-Optics</td>
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<td>TeraHertz Gapless Low Insert Loss Waveguide Switch Technology</td>
<td>Chuan Zhang¹, Beijing Aerospace Research Institute of Micro Electrical-Mechanical Technology</td>
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<td>EuMC23-5</td>
<td>THz and Microwave Dual-Band Ultrafast Photoconductive Antenna</td>
<td>Elbott Brown¹, Andrea Mingardi¹, Yingzong Zhang¹, Enrique Garcia¹, Guillermo Carpioº, Daniel Segovia-Vargasº</td>
<td>Wright State University, *University Carlos III de Madrid</td>
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**WEDNESDAY**

**N105**

**EuMC28**
Devices and Systems for Biomedical Sensing
Chair: Dominique Schreurs¹
Co-Chair: Michal Mrozowski²
¹KU Leuven, ²Gdansk University of Technology

**EuMC29**
Bias Modulated Power Amplifier
Chair: Vittorio Camparghi¹
Co-Chair: José Carlos Pedro²
¹Politecnico di Torino, ²Universidade de Aveiro

**EuMC30**
Tunable Planar Filters
Chair: Cédric Quendo³
Co-Chair: Simone Bastioli²
³University of Brest, ²RS Microwave

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**EuMC28-1**
Metal-Polymer Hybrid Embroidered Microwave Multiresonator for High-Frequency Sensing: Modelling, Simulation, and Experimental Analysis
Manuel Schimmack¹, Wolfgang Taute¹, Michael Höft¹
¹Kiel University

**EuMC29-1**
Analysis of Dissipated Power in Envelope Amplifier Output Filters
Sophea Paul¹, Nikola Hof³, Christophe Delpeuch¹, Valéria Valente¹, Wolfgang Heinrich¹, Old Bengtsson¹
¹Ferdinand-Braun-Institut, Lichtenstein Institut fuer Hochfrequenztechnik, ²ESA/ESTEC

**EuMC30-1**
Planar RF Duplexer with Multiple Levels of Transfer-Function Reconfigurability
Gábor Kósa¹, Roberto Gómez-García², Dimitra Peroulis³
¹University of Colorado at Boulder, ²University of Alcala

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**EuMC28-2**
Radar Imaging Using Bilateral Symmetry of Breast Tissue
Yoshio Koshikura¹, Tomoya Osaki¹
¹Shizuoka University

**EuMC29-2**
Supply Modulation of a Linear Doherty Power Amplifier
Dan Falter¹, Tommaso Cappello¹, William Hallberg¹, Taylor Barton¹, Zvez Popovic¹
¹University of Colorado, ²Chalmers University

**EuMC30-2**
A New Adaptive Reconfigurable Bandpass Filter With Flexible Resonance Control
Runzi Zhang¹, Ching-Huan Shao¹, Dimitris Peroulis³
¹Purdue University

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**EuMC28-3**
Investigation of a Time Domain Microwave System for Medical Applications
Xudong Zheng¹, Andreas Flager¹, Mikael Persson², Herbert Zirath³
¹Chalmers University of Technology

**EuMC29-3**
Versatility, Bandwidth and Efficiency: Digital GaN-Based Switch-Mode Supply Modulators
Florian Hühn¹, Andreas Wenzel¹, Wolfgang Heinrich¹
¹Ferdinand-Braun-Institut (FBH)

**EuMC30-3**
Electronically-Controllable Bandpass Planar Filter with Ultra-Large Bandwidth-Tuning Ratio and Enhanced In-Band Amplitude Flatness
Roberto Gómez-García¹, Jose Maria Munoz-Fernandez¹, Jesus Jimenez Campillo¹, Lara Arche-Andrade¹, Federico Brancio-Roxo¹, Petronilo Martin-Guelles¹, Ermelinda Atanasova¹, ²University of Alcala, ³Thales Alenia Space Spain, ⁴European Space Agency, ⁵University of Brest

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**EuMC28-4**
Microwave Blood Sensing for Monitoring Efficiency of Treatment for Chronic Neurological Disorders
Katerina Antipova¹, Fedir Volokh², Volodymyr Lytvyn¹, Pavel Krasov², Anatoliy Faun¹, Volodymyr Malakhov³
¹O.Y. Usikov Institute for Radiophysics and Electronics, ²University of Alcala, ³Kharkiv Medical Academy of Postgraduate Education

**EuMC29-4**
Dynamic Over-Voltage Operation of a Discrete-Level Supply-Modulated GaN-Based RF PA
Nikola Wolf¹, Wolfgang Heinrich¹, Old Bengtsson¹
¹Ferdinand-Braun-Institut Lichtenstein Institut fuer Hochfrequenztechnik

**EuMC30-4**
A Bandwidth-Tunable Active Bandstop Filter Having Variable Loss Compensation Circuits
Yasuhi Itoh¹
¹Shonan Institute of Technology

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**EuMC28-5**
Non-Invasive Detection and Monitoring of Sustained Glycemic Fluctuations Using mm-Wave Spectroscopy
Aitor Morente-Quiroz¹, Pedro Martin-Mateos¹, M. Carmen Aguilera-Morillo¹, Jesús Jimenez Campillo¹, José María Munoz-Fernandez¹, Jesus Jimenez Campillo¹, Lara Arche-Andrade¹, Federico Brancio-Roxo¹, Petronilo Martin-Guelles¹, Ermelinda Atanasova¹, ²University of Alcala

**EuMC29-5**
Gate Bias Modulation for Doherty Power Amplifier
Abduhrahman M. S. Ahmed¹, Ibrahim Khalil², Mir Massoud¹, John Holt¹, Joseph Staudinger³
¹NXP Semiconductors, ²University of Colorado at Boulder, ³University of Florida

**EuMC30-5**
Mixed-Technology Quasi-Reflectionless Planar Bandpass Filters
Gábor Kósa¹, Roberto Gómez-García², Dimitra Peroulis³
¹University of Colorado at Boulder, ²University of Alcala

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**N106**

**EuMC29**
Bias Modulated Power Amplifier
Chair: Vittorio Camparghi¹
Co-Chair: José Carlos Pedro²
¹Politecnico di Torino, ²Universidade de Aveiro

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**EuMC30**
Tunable Planar Filters
Chair: Cédric Quendo³
Co-Chair: Simone Bastioli²
³University of Brest, ²RS Microwave

---

**EuMC30-1**
Planar RF Duplexer with Multiple Levels of Transfer-Function Reconfigurability
Gábor Kósa¹, Roberto Gómez-García², Dimitra Peroulis³
¹University of Colorado at Boulder, ²University of Alcala

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**EuMC30-2**
A New Adaptive Reconfigurable Bandpass Filter With Flexible Resonance Control
Runzi Zhang¹, Ching-Huan Shao¹, Dimitris Peroulis³
¹Purdue University

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**EuMC30-3**
Electronically-Controllable Bandpass Planar Filter with Ultra-Large Bandwidth-Tuning Ratio and Enhanced In-Band Amplitude Flatness
Roberto Gómez-García¹, Jose Maria Munoz-Fernandez¹, Jesus Jimenez Campillo¹, Lara Arche-Andrade¹, Federico Brancio-Roxo¹, Petronilo Martin-Guelles¹, Ermelinda Atanasova¹, ²University of Alcala, ³Thales Alenia Space Spain, ⁴European Space Agency, ⁵University of Brest

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A Bandwidth-Tunable Active Bandstop Filter Having Variable Loss Compensation Circuits
Yasuhi Itoh¹
¹Shonan Institute of Technology

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**EuMC30-5**
Mixed-Technology Quasi-Reflectionless Planar Bandpass Filters
Gábor Kósa¹, Roberto Gómez-García², Dimitra Peroulis³
¹University of Colorado at Boulder, ²University of Alcala

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**EuMC30-6**
A New Adaptive Reconfigurable Bandpass Filter With Flexible Resonance Control
Runzi Zhang¹, Ching-Huan Shao¹, Dimitris Peroulis³
¹Purdue University

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**EuMC30-7**
A Bandwidth-Tunable Active Bandstop Filter Having Variable Loss Compensation Circuits
Yasuhi Itoh¹
¹Shonan Institute of Technology

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**EuMC30-8**
Mixed-Technology Quasi-Reflectionless Planar Bandpass Filters
Gábor Kósa¹, Roberto Gómez-García², Dimitra Peroulis³
¹University of Colorado at Boulder, ²University of Alcala
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| 10:50 - 11:10 | EuMC31 Innovative Technologies for Tunable Microwave and Millimeter-Wave Circuits  
Chair: Mehmet Kaynak¹  
Co-Chair: Jorge Perez-Martinez²  
¹HP, ²UPV |
| 11:10 - 11:30 | EuMC32 Computational Electromagnetics and Material Characterization  
Chair: Jan Vrba¹  
Co-Chair: Maurizio Bozzi²  
¹Czech Technical University in Prague, ²University of Pavia |
| 11:30 - 11:50 | EuMC34 Planar Components and Technologies  
Chair: Cristiano Tomassoni³  
Co-Chair: Alessandro Takaca²  
³University of Perugia, ²LAAS-CNRS |
| 12:10 - 12:30 | EuMC32-1 Industrial Keynote: Status and Perspective of RF-MEMS Technology  
Industrial Applications  
Carlo Coinelli  
¹Aurora Software and Testing S. L. U. (CST/3DS) |
| 11:10 - 11:30 | EuMC32-1 Industrial Keynote: High-Power Effects  
Modelling using EM-Based Software Tools  
Sebastian Heunisch¹  
¹Lund University |
| 11:30 - 11:50 | EuMC32-1 Liquid Crystal Based SPDT with Adjustable Power Splitting Ratio in LTCC Technology  
Matthias Joerl, Andreas Heunisch, Ananto Eka Prasetyo, Babett Schulz, Roland Reeser, Matthias Nickol, Eran Patir, Matthias Gabel, Holger Maune, Torsten Raber, Rüdiger Follmann, Rolf Jakoby  
¹TU Darmstadt, ²Federal Institute for Materials Research and Testing, ³IMST GmbH |
| 12:10 - 12:30 | EuMC32-2 Pulse-Distortion Analysis for Millimeter-Wave Time-Domain Material Identification  
Sebastian Heunisch¹  
¹Lund University |
| 11:10 - 11:30 | EuMC32-2 A Tunable Series Negative Capacitor Using Distributed Amplifier-Based Reconfigurable Negative Group Delay Circuit  
Mingyung Zhu, Chung-Tse Michael Wu  
¹Rutgers University |
| 11:30 - 11:50 | EuMC32-3 Compact Ultra-Broadband Power Dividers with Integrated Resistors  
Björn Deutschmann¹  
²Hamburg University of Technology |
| 12:10 - 12:30 | EuMC32-3 Four-Way Power Divider and Combiner Based on a Luzzatto Divider Using Vertically Installed Planar Bridge Isolator  
Ahmed Mokayyed  
²OpenTink |

**EuMC31**

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| 10:50 - 11:10 | EuMC31-1 High-Linearity 5.3-7.0 GHz 3-Pole Tunable Bandpass Filter Using Commercial RF MEMS Capacitors  
Tsu-Wei Lin¹, Kevin Kai Wei Law¹, Roberto Galli¹, Gabriel Rebež¹  
¹University of California, San Diego, ²Cavendish Kinetics, Inc |
| 11:10 - 11:30 | EuMC31-2 Zero-Level Packaged 5W CW RF-MEMS Switched Capacitors  
Nesrine Belkadi¹, Kevin Nadaf¹, Clément Hallepe¹, Damien Passerieux¹, Pierre Blondy¹  
¹IRM - UFR 7521 - CNRS-Université De Limoges, ²Grenoble - Université de Tours |
| 11:30 - 11:50 | EuMC31-3 Characterization and Modeling of Epitaxially Grown BST on a Conducting Oxide Electrode  
Donnica Vaid¹, Patrick Salj¹, Daniel Kienemund¹, Albin Redinš¹, Lukas Zeran¹, Christian Schuster¹, Philipp Korisiksky³, Lambert All³, Rolf Jakoby³, Holger Maune³  
¹TU Darmstadt, IMP, ²TU Darmstadt, ATFT |
| 12:10 - 12:30 | EuMC31-4 Suppression of Acoustic Resonances in Fully-Printed, BST Thick Film Varactors Utilizing Double MIM Structures  
Daniele Kienemund¹, Donnica Vaid¹, Nicole Boehr¹, Joachim Binder¹, Rolf Jakoby¹, Holger Maune¹  
¹TU Darmstadt, Karlsruhe Institute of Technology |
| 10:50 - 11:10 | EuMC31-5 Electromagnetic Analysis of Nanoscale Heterogeneity - the Domain-integrated Perspective  
Ivan Langer¹, Guy Vandenbosch², Martin Stump²  
¹Dept of University of Technology, ²Katholieke Universiteit Leuven, ³Brno University of Technology |
| 11:10 - 11:30 | EuMC31-6 Four-Way Power Divider and Combiner Based on a Luzzatto Divider Using Vertically Installed Planar Bridge Isolator  
Ahmed Mokayyed  
²OpenTink |
| 11:30 - 11:50 | EuMC31-7 Compact and Wideband CPW Wilkinson Power Dividers for GaN MMIC Applications  
Bababgar Umar¹, Ameer Othman²  
¹Bilkent University, ²National Technology Research Center (NANOTAM) |
### WEDNESDAY

#### EuRAD02 - Radar Applications

**Chair:** Mateo Burgos-García<br>
**Co-Chair:** Carlos Castillo<br>
*Universidad Politécnica de Madrid, Indra*

| 10:40 - 11:10 | **EuRAD02-1**<br>**Industrial Keynote:** Advances in Space Radar and Telecom Microwave Equipment<br>**Andrés Suárez**<br>Thales Alenia Space |
| 11:10 - 11:30 | **EuRAD02-2**<br>UAV-Mounted GPR for NDT Applications<br>**Mara García-Fernández**, Yan Alvarado-López, Borja González-Vázquez, Ana Arbóayas-Abulafia, Yolanda Rodríguez-Vaquero, Fernando Las-Heras, Antonio Pino<br>*Universidad de Oviedo, Universidad de Vigo, Universidad Rey Juan Carlos *

#### EuMC/EuRAD01 - THz Electronics

**Chair:** Jan Stane<br>
**Co-Chair:** William Dej<br>
*Chalmers University of Technology, Northrop Grumman*

| 10:40 - 11:10 | **EuMC/EuRAD01-1**<br>A W-Band Spatial Power-Combining Amplifier Using GaN MMICs<br>Lorene Samoska, Mark Taylor, Jose Velazco, Andy Fung, Robert Lin, Alejandro Peralta<br>*Jet Propulsion Laboratory, California Institute of Technology *
| 11:10 - 11:30 | **EuMC/EuRAD01-2**<br>A Compact Room-Temperature 510-560 GHz Frequency Tripler with 30-mW Output Power<br>Jose V. Siles, Ken Cooper, Choonsup Lee, Robert Lin, Goutam Chattopadhyay, Imran Mehdi<br>*NASA Jet Propulsion Laboratory *

#### EuMC33 - Special Session: Microwave Research in Latin America

**Chair:** Apolinar Reynoso<br>
**Co-Chair:** Jose Loo-Yau<br>
*ITESO, Cinvestav-GDL*

| 10:50 - 11:10 | **EuMC33-1**<br>Industry-Oriented Research Projects on Computer-Aided Design of High-Frequency Circuits and Systems at ITESO Mexico<br>**Jose E. Rayas-Sánchez**, Francisco Rangel-Padro, Andres Vivanco-Wächter, Jose Chavez-Hurtado, Rafael del-Rey, Felipe Leal-Ramírez, Zulene Brito-Brito<br>*ITESO: The Jesuit University of Guadalajara, Intel Corp, Mexico, Continental Automotive Mexico *
| 10:50 - 11:10 | **EuMC33-2**<br>High Frequency Device Characterisation Laboratory at the "Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE)" Tonantzintla, Puebla, México<br>**Roberto Murphy**, **Reydezel Torres**<br>*INAOE *

#### EuRAD02-3 - LTE-R Based Passive Multistatic Radar for High-Speed Railway Network Surveillance<br>**Rodrigo Bilzaga-García**, Jorge Casamayor-Antón, Mateo Burgos-García<br>*Universidad Politécnica de Madrid*

#### EuMC33-3 - RF & Microwave Activities in CINVESTAV Campus Guadalajara (CINVESTAV-GDL)<br>**Jose Loo-Yau**, **Pablo Moreno**<br>*CINVESTAV-GDL *

#### EuRAD02-4 - Three-dimensional Advanced Tomographic Procedure for the Imaging of Metallic and Dielectric Targets through GPR Data<br>**Federica Muraglia**, Davide Combe, Ivana Calapursio, Francesco Solderoff, Alessandro Galli<br>*University of Rome La Sapienza, I.RE.A. – C.N.R., Naples, Italy*

#### EuMC33-4 - Microwave Research Activities In CICESE: Quo Vadis<br>**Apolinar Reynoso**, Maria del Carmen Maya Sánchez<br>*CICESE *

#### EuRAD02-5 - Multistatic Holographic Imaging for Breast Cancer Detection<br>**Igna Aghah**, **Amin Al Khan**<br>*COMSATS Institute of IT*

#### EuMC33-5 - The Millimeter- & Submillimeter-Wave Laboratory at Universidad de Chile<br>**Nicolás Reyes**, **Patrick Mena**, **Ricardo Finger**, **Leonardo Brindman**<br>*Universidad de Chile *

#### EuMC33-6 - Overview of Microwave Research in Peru<br>**Guillermo Rafael-Vidal**, **Omar Castañeda-Rallheros**<br>*Universidad La Salle, Universidad Estatal Península de Santa Elena*
WEDNESDAY

EuMC35
Interactive Session 1
Chair: Miguel A. G. Laso
Co-Chair: Jorge A. Ruiz-Cruz
¹Public University of Navarre, ²Universidad Autonoma de Madrid

12:30 – 13:50

Exhibition Hall

EuMC35-1
Frequency Dependence of NTC Thermistor Pastes Used in High Frequency Temperature Variable Attenuators
Moamer Hasanovic¹, Nina Slamnik², Conrad Jordan²
¹Smiths Interconnect Inc, University of Sarajevo

EuMC35-2
Multilayer Miniaturized Wideband Electromagnetic Band-Gaps for Wideband Full-Duplex Transceiver
Petra Bandalov², Marc Le Roy¹, André Pérennec¹, Raafat Lababidi², Denis Le Jeune²
¹Lab-STICC UBO, MOM group, ²Lab-STICC ENSTA-Bretagne, IEMN group, ENSTA-Bretagne

EuMC35-3
Miniaturized Humidity Sensor Based on a Partially Air-Filled Slow-Wave SIW Resonator
Ho-Anh Tu¹
¹IMEP-LAHC Grenoble

EuMC35-4
A Mechanically Tunable Artificial Magnetic Conductor using 3D Printing Technology
Fengchao Wang¹, Zhigui An², University of Edinburgh

EuMC35-5
Dispersive Delay Structures Using Cascaded Coupled CRLH C-Sections
Hassan Nazemi-Rafi ¹, Masoud Movahhedi¹
¹Michigan State University

EuMC35-6
A Compact Double-Balanced Diode Ring Mixer for Wideband Applications
Waleed A. Atla¹, Dong Hee Lee¹, Dong Hee Kim¹, In Bok Kim¹, Hyun Chul Cho¹, Kang Wook Kim¹
¹Kyoungpook National University, ²LGInnotek Co. Ltd.

EuMC35-7
Fully Inkjet Printed 85GHz Band Pass Filter on Flexible Substrate
Naofumi Yoneda¹, Moriyasu Miyazaki¹, Hidenori Yukawa¹, Yu Ushijima¹, Takeshi Yuasa¹, Masahide Hata³
¹Lab-STICC-Université de Bretagne Occidentale, ²Elliptika, ³GTID Brest

EuMC35-8
Low Cost S-Band Phase Modulator for Modern TTC Application
Charis Kehpogly Gavriel¹, Angelos Herentes¹, Juan Carlos Perez-Ambrojoy², Javier Cabo Freire²
¹University of Cantabria, ²Thales Alenia Space Spain

EuMC35-9
Dual-Frequency-Comb Resonators for Four-Port Bandpass Filters
Elfrat Hachamson⁴, George Coutsoulis⁵
⁴Nokia Corp., ⁵Herold Watt University

EuMC35-10
Top-Layer Wideband Transition from Waveguide to Planar Differential Line for 60 GHz Applications
Sergey Chulkov¹, Andrey Mishinovskiy⁴, Alexander Myakov³, Alexey Artemenko⁴, Roman Matsemikov⁵
¹Radio Gigabit LLC

EuMC35-11
RF Characterization of Stripline with Thick MnFe2O4 Nanoparticle Films Under DC Magnetic Bias Conditions
Yuehua He¹, Eric Chen¹, He-Ya Chen¹, Z. John Zhang¹, Timothy Hogan¹, John Papapolymerou¹
¹Michigan State University

EuMC35-12
Additively Manufactured Frequency Selective Structures on Curved Surfaces
Jennifer Byford¹, Christopher Oakley¹, Premjeet Chahal¹
¹Michigan State University

EuMC35-13
Fabrication and Evaluation of a Waffle Type Waveguide for Ku-Band Application
Kang Hwang¹, Sang-Sook Lee¹
¹Tottori University

EuMC35-14
Infinite-Area Isovolumetric Transformation for Electromagnetic Invisibility Cloaks Based on Transformation Electromagnetics
Yuma Takano¹, Yusuke Nakano¹, Osaka University

EuMC35-15
Bandpass Phase Correction Methodology for Ladder-Type Acoustic Filters
Iulia E candescu¹, Ionut Viesca¹, Pedro de Pasc¹
¹UBB

EuMC35-16
Ultra-Wideband Bandpass Low-Cost Multilayer Technologies Filter Using Varnish
Hasan Bouazzazou², Kian Dorrani¹, Alexandre Manche¹, Cédric Guendou², Razem Alhassan³, Florent Karpou⁴, Heng Bouzaid⁴
¹Lab-STICC-Université de Bretagne Occidentale, ²Eltipla, ³GTID Brest

EuMC35-17
180-Degree Branch Line Coupler Composed of Two Types of Iris-Loaded Waveguides
Hidenori Yukawa¹, Yu Ushijima¹, Takeshi Yuasa¹, Masahide Hata³
¹University of Tokyo

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¹University of Greenwich, ²Institute of Physics, Chinese Academy of Sciences (IOP, CAS), ³University of Birmingham

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¹SEQUA Technologies, ²Atal

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¹Fujikura Ltd., ²Hiroshima University

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¹Wilton Microwave Co., Ltd., ²National Yunlin University of Science and Technology, ³National Changhua University of Education
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Chair: Justin King¹
Co-Chair: Guan Lei²
¹University College Dublin, ²Nokia Bell Labs

EuMC37 Special Session: High Frequency Flexible Bendable Electronics for Wireless Communication Systems
Chair: Frank Elsinger¹
Co-Chair: Tio Meister²
¹Technical University Dresden, ²Technische Universität Dresden

EuMC38 SIW and Planar Filter Technologies
Chair: Miguel Angel Gomez Lazo³
Co-Chair: Felipe Lora³
³Public University of Navarra, ³Thales Alenia Space Spain

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¹AMCAD Engineering

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¹Tokyo Metropolitan Industrial Technology Research Institute, ²National Institute of Information and Communications Technology

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¹University Politécnica de Madrid, ¹TechOnRails

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¹Sinclair Technologies, ³MMSense Technologies

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¹DFG, German Research Foundation, ¹TU Dresden

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¹TU Dresden, ²University of Paderborn

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³University of Pavia, ²Politecnico di Milano

EuMC37-7 Study of Graphene Flexible Electronics for Microwave Application
Chun-Yu Fan¹, M. Saeed¹, A. Hamed¹, Z. Wang¹, M. Shayan², Daniel Neumann¹, Renato Negra³
³RWTH Aachen, ²Mannesmann Microelectronic Center Aachen (AMICA) AWD GmbH, ¹Advanced Microelectronic Center Aachen (AMICA) AWD GmbH, ²RWTH Aachen University

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³University of Pavia, ²Politecnico di Milano

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¹University of Bordeaux, IMS laboratory, ²Cobham Microwave, ³Université Grenoble Alpes
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Co-Chair: Alessandra Costanzo²  
¹IMT Atlantique, ²University of Bologna

#### EuMC40
**Microwave Photonics**
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¹ESYCOM - ESIEE Paris, ²University Carlos III de Madrid

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¹National Institute for Research and Development in Microtechnologies (IMT), ²University of Bologna

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¹Carlos III University of Madrid, ²Southern Methodist University

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¹Cardiff University

#### EuMC40-2
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¹Infineon Technologies AG, ²University of Grenoble Alpes, ³CEA-Leti, ⁴University of Grenoble Alpes, TIMA Laboratory

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¹Tokyo Institute of Technology

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¹Tomsk State University of Control Systems and Radioelectronics (TUSUR)

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¹INDRA Sistemas, ²University of Cantabria, ³Universidad Politécnica de Madrid

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¹Sofia University “St. Kliment Ohridski”, ²Sofia University “St. Kliment Ohridski

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¹Bergische Universität Wuppertal, ²IHP Microelectronics

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Wael A. Ahmad¹, Dietmar Kissinger¹, Herman Ng¹
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¹University of Glasgow, ²Shanghai Electro-Mechanical Engineering Institute
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EuMC44: Microwaves for 5G and Space

Chair: Cesar Barquinero
Co-Chair: Christoph Baer

*INDRA Sistemas, Ruhr-Universität Bochum*

**EuMC44-1**

Industrial Keynote: Anticipate the 5G and New Space Measurement Challenges

Jean-Pierre Teyssier

Keysight Technologies

**EuMC44-2**

Highly Compact GaN-based All-Digital Transmitter Chain Including SPDT Switch for Massive MIMO

Florian Höhn, Andreas Wenzel, Wolfgang Heinrich

Ferdinand-Braun-Institut (FBH)

**EuMC44-3**

An FPGA-Based Measurement Generator for Cyclically Shifted Binary Signals

Gordon Notzon, Robert Storch, Thomas Mußel, Michael Vogt

Ruhr-University Bochum

**EuMC44-4**

A High-Performance Ka-band Cryo-Cooled Receiver for Deep Space Applications

Angel Mediano, Juan Luis Caro, David Vegue, Eduardo Ariño, Antonio Tazon, Luis de la Fuente, Cedric Chambon, Bernd Faursch, Remi Rayet, Steve Rawson, Stephanie Hallé

University of Cantabria, Universidad de Cantabria, Callisto France, European Space Agency

**EuMC44-5**

A Ka-band Transceiver for Cubesat Satellites: Feasibility Study and Prototype Development

Alessandro Libera, Federico Alimenti, Francesc Coromina, Erica De Fabritiis, Filippo Bonini, Stefano Pompilio, Alper Turkeli, Adnan Gorur, Engin Dogan, Ian Povey, Allan Doolan, Carson Romanian

European Space Agency, ESAESTEC, Veryag Devices Inc., Politecnico di Torino

**N106**

EuMC45: Phased-Arrays and MIMO Systems

Chair: Wim van Cappellen
Co-Chair: Daniel Segovia-Vargas

ASTRON, Carlos III University of Madrid

**EuMC45-1**

28 GHz Downlink Multi-User MIMO Experimental Verification using 360 Element Digital AAS for 5G Massive MIMO

Noriaki Tawa, Toshihide Kanabara, Yasushi Maruda, Masao Tahara, Tomoya Kaneko

NEC Corporation

**EuMC45-2**

Highly Compact GaN-based All-Digital Transmitter Chain Including SPDT Switch for Massive MIMO

Florian Höhn, Andreas Wenzel, Wolfgang Heinrich

Ferdinand-Braun-Institut (FBH)

**EuMC45-3**

An FPGA-Based Measurement Generator for Cyclically Shifted Binary Signals

Gordon Notzon, Robert Storch, Thomas Mußel, Michael Vogt

Ruhr-University Bochum

**EuMC45-4**

A High-Performance Ka-band Cryo-Cooled Receiver for Deep Space Applications

Angel Mediano, Juan Luis Caro, David Vegue, Eduardo Ariño, Antonio Tazon, Luis de la Fuente, Cedric Chambon, Bernd Faursch, Remi Rayet, Steve Rawson, Stephanie Hallé

University of Cantabria, Universidad de Cantabria, Callisto France, European Space Agency

**EuMC45-5**

Low-Voltage Phase Shifters Based on HfzZr1-xO2 Ferroelectrics Integrated with Phased Antenna Arrays

Mirco Dragomir, Matheo Aldino, Sergio Iordache, Miroslav Medvedar, Ivan Povey, Dan Viaklenko, Adrian Doolan, Carson Romanian

National Institute for Research and Development in Microtechnologies (MI), Tyndall National Institute

**N107**

EuMC46: Planar Filter Technology

Chair: Roberto Gomez-Garcia
Co-Chair: Anthony Ghiotto

University of Alcala, University of Bordeaux, Bordeaux INP, UMR CNRS 5218, IMS Laboratory

**EuMC46-1**

A Novel S-Band Bandpass Filter (BPF) With Extremely Broad Stopband

Photos Vryonides, Salim Kanat, Abdul Qudious, Marco A. Antoniades, Symeon Nicolaou

University of Alcala, Ruhr-University Bochum, University of Cyprus

**EuMC46-2**

A Novel Half-Wavelength Coupled-Resonator Filter with Multiple Attenuation Poles

Toshihiko Ishizaki, Ayaka Shimizu

Ryukoku University

**EuMC46-3**

Small Size Dual-band Bandpass Filters with Multiconductor Transmission Lines and Shunt Open Stubs

Mario Perez Escribano, Juan Jose Sanchez-Martinez, Enrique Margaret Segura

University of Malaga, Irdra

**EuMC46-4**

Design of Compact Quad-Band Bandpass Filter Using Stepped Impedance Resonators

Yu-Chen Lu, Yung-Kai Wu, Ya-Chun Jiang, Hung-Wei Wu, Yen-Kuei Su

Yun Shan University, National Cheng Kung University

**EuMC46-5**

Design of a Novel Compact Microstrip Diplexer Using Dual-Mode Square Loop Resonators Having Narrow Sits Loaded Open-Circuited Stubs

Ceyhun Karpuz, Ali Kursad Gorur, Alper Turkeli, Engin Dogan, Adrian Gorur

Pamukkale University, University of Trieste, University of Perugia, European Space Agency, ESA/ESTEC, Politecnico di Torino
### Wednesday

#### EuMC47
RF and Millimeter-Wave Identification Techniques
- Chair: Hervé Aubert¹
- Co-Chair: Luciano Tarricone²
  ¹LAAS-CNRS, ²University of Salento

#### EuMC48
Integrated Signal Generation
- Chair: Patrick Gamand¹
- Co-Chair: Ichihiko Tsudo²
  ¹Consulting, ²Saga University

#### EuMC49
Microwave Passive Components
- Chair: Roberto Sorrentino¹
- Co-Chair: Benjamin Potelon²
  ¹RF Microtech Srl, ²Université de Bretagne Occidentale

---

#### EuMC47-1
An Enhanced Chipless RFID System in 60 GHz Using Pattern Recognition Techniques
- Larry M. Arjomandi¹, Nemai-Chandra Karmakar¹
  ¹Monash University

#### EuMC48-1
Phase Controlled 2.6-3.5 GHz Fractional-N PLL IC
- Maurice van Wanum¹, Lex de Boer¹, Frank van Vliet¹
  ¹TNO

#### EuMC49-1
Realization of Fully 3D Printed W-band Bandpass Filters using Aerosol Jet Printing Technology
- Michael Thoma Creton¹, Jakub Sandor², Iona Piekarcz³, Stawomir Gruszynski³, Krzysztof Wincza³, John Pappaloumpou³
  ¹Michigan State University, ²AGH University of Science and Technology

---

#### EuMC47-2
A Fully-Textile Chipless Tag
- Laura Corchia¹, Giuseppina Murti¹, Luciano Tarricone²
  ¹University of Salento

#### EuMC48-2
60 GHz Tail-Node-Coupled Multi-Core Push-Push VCOs in 22 nd FD SOI CMOS Technology
- Johannes Rimmeljapachecz¹, Robert Weigel¹, Annele Haglebauer¹, Vadim Isakov²
  ¹University of Erlangen-Nuremberg, ²Infineon Technologies AG

#### EuMC49-2
Towards Carbon Based Artificial Impedance Surfaces for Conformal Aerospace Applications
- Alcoy Alcoy¹, Karam Ghorbani¹, Thomas Baer¹, Kenan Nicholson², Rick Zielinski²
  ¹Royal Melbourne Institute of Technology, ²DST Group, ³University of Arizona

---

#### EuMC47-3
RFID Tag Coupled With a Magnetic Sensor for Wireless Sensing of Home Electrical Devices
- Ali Louzi¹, Rupesh Kumar¹, Jean-Yves Le Naour¹
  ¹Technicolor, ²XLIM

#### EuMC48-3
Design of a Low Power 24 GHz LC-VCO in 45 nm RF-SOI CMOS
- Najia El-Aghwani¹, Mohammed El-Shennawy¹, Niko Joran², Frank Eltinge³
  ¹TU Dresden

#### EuMC49-3
Signal-Interference-Based Structure With Negative Group Delay Properties
- Miguel Sanchez Soriano¹, Javier Duran¹, Stefano Sirci², Stephan Marini³
  ¹University of Alicante, ²Universitat Politècnica de València

---

#### EuMC47-4
A Novel Design Strategy for Small On-Metal UHF-RFID Tags with Long Read Range based on Complementary Split-Ring Resonator (CSR)
- Ferran Paredes¹, Gerard Zaino², Thuy Nguyen², Ferran Martin³, Jordi Bonache³
  ¹Universitat Autonoma de Barcelona

#### EuMC48-4
Highly Efficient D-Band Fundamental Frequency Source Based on InP-DHBT Technology
- Marat Housain¹, Nils Wehmann¹, Wolfgang Heinrich¹, Vitez Krozer²
  ²Ferdinand-Braun-Institut (FBH) Leibniz-Institut für Höchstfrequenztechnik, ³University of Duisburg-Essen

#### EuMC49-4
A Continuous 2π Phase Shifter for Ka-Band Applications
- Hussam Al-Saedi¹, Suren Gaganov¹, Nael Abdull Wahab¹, Andrej Polščak¹, S. Safavi-Naeini²
  ¹Queen’s University, ²University of Waterloo

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#### EuMC47-5
Orientation Independent Printable Backscattering Chipless RFID Tags Based on L-Resonator
- Vijay Sharma¹, Sambhav Malhotra¹, Mohammad Hashmi²
  ¹IIT Delhi, ²Nazarbayev University

#### EuMC48-5
A 52-to-61 GHz Push-Push VCO in 28 nm CMOS
- Vadim Isakov¹, Fabio Padovan², Johannes Rimmeljapachecz¹, Robert Weigel²
  ¹Infineon Technologies, ²Infineon Technologies Austria AG, ³Friedrich-Alexander University Erlangen-Nuremberg

#### EuMC49-5
Mitigation of Passive Intermodulation on Planar Microstrip Circuits with Distributed Current-Driven Nonlinearities
- Dmitri Kudov¹, Senad Gajic¹, Nikolaj Vdovichenko¹, S. Safavi-Naeini²
  ¹Bell Labs, ²University of Waterloo

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**Note:**
- All sessions from 16:10 to 17:10.
- **EuMC48-1** and **EuMC49-1** are scheduled for 16:10-16:30.
- **EuMC47-2** and **EuMC49-2** are scheduled for 16:30-16:50.
- **EuMC47-3** and **EuMC49-3** are scheduled for 16:50-17:10.
- **EuMC47-4** and **EuMC49-4** are scheduled for 17:10-17:30.
- **EuMC47-5** and **EuMC49-5** are scheduled for 17:30-17:50.
EuMC/EuRAD04 - Emerging Antenna Fabrication Technologies

Chair: Jean-Yves Daugrand¹
Co-Chair: Ville Viikari²
¹Université Côte d’Azur, CNRS, LEAT, France,
²Aalto University

EuMC/EuRAD04-1
3D Printed Slotted Waveguide Array Antenna for Automotive Radar Applications in W-Band
Konstantin Lomonак⁴, Dominik Simon⁴, Mark Sippel⁴, Gerald Gold⁴, Klaus Helmreich⁴, Ernst Seiler⁴, Zojang Torg⁴, Ralf Reuter⁴
¹Friedrich-Alexander University Erlangen-Nürnberg (FAU), ²NXP Semiconductors Germany GmbH

EuMC/EuRAD04-2
A 24-GHz Radar With 3D-Printed and Metallized Lightweight Antennas for UAV Applications
Thomas Lampenberger¹, Reinhard Feger¹, Andreas Haderer², Christian Egger¹, Martin Friedl¹, Andreas Steiner¹
¹Johannes Kepler University Linz, ²Inras GmbH

EuMC/EuRAD04-3
Additive Manufactured Antenna in Mixed Material Technology for 24 GHz FMCW Miniaturized Radar
Cristina Yepes¹,², Erio Gandini², Raymond van Dijk³, Fabian Bruning³, Hessel Maalderink³, Stefania Monni²
¹Delft University of Technology, ²TNO Defense, Safety and Security, ³AMSYSTEMS Center/TNO

EuMC/EuRAD04-4
A New Waveguide Slot Array Antenna with High Isolation and High Antenna Bandwidth operation on Ku- and K- bands for Radar and MIMO Systems
Mohammad Alibakhshikenari¹, Ernesto Limiti¹, Bal Singh Virdee², Francisco Falcone³, Raed Abd-Alhameed⁴, Chan H. See³
¹University of Rome “Tor Vergata”, ²London Metropolitan University, ³Universidad Pública de Navarra, ⁴University of Bradford, ⁵University of Bolton

EuMC/EuRAD04-5
Study on Antenna Mutual Coupling Suppression Using Integrated Metasurface Isolator for SAR and MIMO Applications
Shahriar Sabery¹, Fatemeh Honoozan¹, Marina Gashenov¹, Mikhail Cherniakov¹, Peter Gardiner¹, Edward Hoare¹
¹University of Birmingham

EuMC/EuRAD05 - THz Radar

Chair: María Pilar Jarabo-Amores¹
Co-Chair: Nils Pohl²
¹University of Alcala, ²Ruhr-University Bochum

EuMC/EuRAD05-1
Long Range-Doppler Demonstration of a 95 GHz FMCW Radar
Raquel Monje¹, Ken Cooper¹, Robert Dingle⁵, Corey Coddename¹, Stephen Duerden¹, Adrian Tang¹, Mathieu Choukroun¹
¹Jet Propulsion Laboratory, California Institute of Technology

EuMC/EuRAD05-2
Size determination in Particle Streams Using a Multistatic Dual Frequency Millimeter Wave Radar
Alex Reinhardt¹, Alexander Teltyuk¹, Reinhard Knöche¹, Michael Hoff¹
¹University of Kiel

EuMC/EuRAD05-3
Differential Absorption Radar at 170 GHz for Atmospheric Boundary Layer Water Vapor Profiling
Richard Roy¹, Ken Cooper¹, Matthew Lebsock¹, Luis Million¹, Jose V. Stiel¹, Raquel Rodriguez Monje¹
¹Jet Propulsion Laboratory, California Institute of Technology

EuMC/EuRAD05-4
CM-CFAR Parameter Learning based Square-Law Detector For Foreign Object Debris Radar
Kudret Acapinar¹, Süleyman Baykul¹
¹TÜBİTAK BİLGEM

EuMC/EuRAD05-5
Signal Reduction by Tree Leaves in Low-THz Automotive Radar
Shahriar Sabery¹, Fatemeh Honoozan¹, Marina Gashenov¹, Mikhail Cherniakov¹, Peter Gardiner¹, Edward Hoare¹
¹University of Birmingham
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<th>Session</th>
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<th>Authors</th>
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<td>EuMC50-1</td>
<td>Bare chip Connections via Aerosol Jet Technology for Millimeter Wave Applications</td>
<td>Franz Roehrl¹, Johannes Jakob¹, Werner Bogner¹, Robert Weigel², Stefan Zorn³&lt;br&gt;¹DIT Deggendorf Institute of Technology, ²Friedrich-Alexander University Erlangen-Nuremberg, ³Rohde &amp; Schwarz GmbH &amp; Co. KG</td>
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<tr>
<td>EuMC51-1</td>
<td>Resolution Improvement Method for Non-Destructive Imaging with Near-Field Scanning Microwave Microscopy</td>
<td>Lin Tianjun¹, Lasi Tsaim¹, Gu Sijia¹&lt;br&gt;¹Université des Sciences et Technologies de Lille 1</td>
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<td>EuMC52-1</td>
<td>Antenna Module with new Wideband 5G-Antenna Array at 28 GHz in Combination with GNSS- and 4G/WLAN/DSRC in Automotive Environment</td>
<td>Christian Ballesteros¹, Andreas Pfadler¹, Jordi Romeu¹, Lluis Jofre¹&lt;br&gt;¹Universitat Politècnica de Catalunya (UPC)</td>
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<tr>
<td>EuMC50-2</td>
<td>Fully Inkjet-Printed Ramp Interconnects for Wireless Ka-Band MMIC Devices and Multi-Chip Module Packaging</td>
<td>Bijan Tehrani¹, Manos Tentzeris¹&lt;br&gt;¹Georgia Institute of Technology</td>
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<td>EuMC51-2</td>
<td>Demonstration of Improvement of Repeatability in Thru-Reflect-Line Calibration Using Precision Probing Technique</td>
<td>Ryo Sakamaki¹, Masahiro Horibe¹&lt;br&gt;¹National Institute of Advanced Industrial Science and Technology</td>
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<tr>
<td>EuMC52-2</td>
<td>5G Vehicle MIMO Antenna Capacity Based on a Rigorous Electromagnetic Channel Modeling</td>
<td>Christian Ballesteros¹, Andreas Pfadler¹, Jordi Romeu¹, Lluis Jofre¹&lt;br&gt;¹Universitat Politècnica de Catalunya (UPC)</td>
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<tr>
<td>EuMC50-3</td>
<td>Low-Loss Silicon Micromachined Waveguides Above 100 GHz Utilising Multiple H-Plane Splits</td>
<td>Bernard Beuerle¹, James Campion¹, Umer Shah¹, Joachim Oberhammer¹&lt;br&gt;¹KTH Royal Institute of Technology</td>
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<td>EuMC51-3</td>
<td>Accurate Millimeter-Wave Carrier Frequency Offset Measurement Using Six-Port Interferometric Technique</td>
<td>Mansoor Dashti Ardakani¹, Chaouki Hannachi¹, Boualem Zouggari¹, Emilia Moldovan¹, Serioja Ovidiu Taiu¹&lt;br&gt;¹Institut National de la Recherche Scientifique (INRS)</td>
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<td>EuMC52-3</td>
<td>Rod Waveguides as Future 5G Antennas for Mobile Device Use</td>
<td>Resti Montoya¹, Juhu Aila-Laurinaho¹, Ville Vikari¹&lt;br&gt;¹Aalto University</td>
</tr>
<tr>
<td>EuMC50-4</td>
<td>A Rectangular Waveguide-to-Planar Waveguide Transition at D-band Using Wideband Patch Antenna</td>
<td>Yunfeng Dong¹, Tom Kärkkäinen¹, Vitaliy Zhurbek¹, Peder Jesper Hanning¹&lt;br&gt;¹Technical University of Denmark</td>
</tr>
<tr>
<td>EuMC51-4</td>
<td>Six-Port Based Multitone and Low-Power Radar System for Waveguide Measurements in Smart Factories</td>
<td>Benedikt Scharfer¹, Fabian Lerz¹, Fabian Michler¹, Sarah Lutz¹, Robert Weigel¹, Alexander Koeckn¹&lt;br&gt;¹Friedrich-Alexander University of Erlangen-Nürnberg, ²Brandenburg University of Technology</td>
</tr>
<tr>
<td>EuMC52-4</td>
<td>A Wideband Dielectric Resonator Antenna with Truncated Ground for 5G Applications</td>
<td>Ahmed Abdalrazik¹, Adel Abdelrahman¹, Ahmed Ali¹, Mohammed Koozaat²&lt;br&gt;¹Egypt-Japan University of Science and Technology, Alexandria 21934, Egypt</td>
</tr>
<tr>
<td>EuMC50-5</td>
<td>Low-cost D-band Waveguide Transition on LCP Substrate</td>
<td>Ahmed Hassan¹, Ali Say-Pepe-Otege¹, Zhongjia Simon He¹, Herbert Zirath¹&lt;br&gt;¹Chalmers University of Technology</td>
</tr>
<tr>
<td>EuMC51-5</td>
<td>Performance Analysis of E-band Duplex Transceiver Based on Waveguide Diplexer Filters</td>
<td>Georg M. Diehl¹, Ralf Henseberger¹, Ingo Kallias¹&lt;br&gt;¹Universitat Stuttgart, ²Radiometer Physics</td>
</tr>
<tr>
<td>EuMC52-5</td>
<td>Graphene Based Antenna Array for 5G Applications</td>
<td>Siti Nor Hafizah Sardon¹, Mohd Nor Saaluddin¹, Muhammad Ramies Kamaruddin¹, Mohamed Alain¹, Mohammed Koozaat²&lt;br&gt;¹University Technology Malaysia, ²Aalto University</td>
</tr>
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EuMC53 - Advanced Technologies for Microwave Passive Components
Chair: Richard Söyder³
Co-Chair: Ferran Martí²
1RS Microwave, 2Universitat Autonoma de Barcelona

| N109 + N110 |
| EuMC53-1 | Compact Duplexer Design with High Isolation Based on Low-Temperature Co-fired Ceramics (LTCC) Process for LTE Band 1 | 08:30 - 08:50 |
| EuMC53-2 | A Novel Type of Broadband Radial Stub Transformers in a 28 nm Bulk CMOS Technology | 08:50 - 09:10 |
| EuMC53-3 | Experimental Comparison of Integrated Transformers on a 28 nm Bulk CMOS Technology | 09:10 - 09:30 |
| EuMC53-4 | A Folded Edge-coupled Transformer Balun in GaAs with Excellent Balance from 9 to 20 GHz | 09:30 - 09:50 |
| EuMC53-5 | Large-Scale Fabrication of RF MOSFETs on Liquid-Exfoliated MoS2 | 09:50 - 10:10 |

EuMC54 - Antenna Technology
Chair: Nino Paul³
Co-Chair: Napatpong Somji³
1Karlruhe Institute of Technology (KIT), 2University of Leuven, 3University of California Los Angeles (UCLA), 4IHP

EuMC54-1 | 120-GHz and 240-GHz Broadband Bow-Tie Antennas in eWLB Package for High Resolution Radar Applications | 08:30 - 08:50 |
EuMC54-2 | On-Chip Millimeter Wave Surface Wave Launcher for Off-Chip Leaky Wave Antennas | 08:50 - 09:10 |
EuMC54-3 | Mutual Coupling Reduction in UWB Modified Maltese Shaped DRA Array for MIMO Applications | 09:10 - 09:30 |
EuMC54-4 | Noise Measurement of a Small Antenna, Actively Matched with a Non-Foster Form | 09:30 - 09:50 |
EuMC54-5 | A Compact Dual-Band MIMO Antenna with High Isolation for WLAN Applications | 09:50 - 10:10 |

EuRAD03 - Automotive Radar 1
Chair: Maria Gasshoïva³
Co-Chair: Carlos Castillo³
1University of Birmingham, 2India

EuRAD03-1 | Autonomous Driving Features based on 79 GHz Polarimetric Radar Data | 08:30 - 08:50 |
EuRAD03-2 | Expanding the Unambiguous Velocity Limitation of the Stepped-Carrier OFDM Radar Scheme | 08:50 - 09:10 |
EuRAD03-3 | Self-Adaptive Short-Range Leakage Canceller for Automotive FMCW Radar Transceivers | 09:10 - 09:30 |
EuRAD03-4 | Polarimetric SAR for Automotive Applications | 09:30 - 09:50 |
EuRAD03-5 | Impact of an Automotive Chirp-Sequence Interferer on a Wideband OFDM Radar | 09:50 - 10:10 |

EuRAD04 - Special Session: Radar Projects at the European Defense Agency
Chair: Matteo Burgani³
Co-Chair: Roland Krebs²
1Universidad Politecnica de Madrid, 2European Defense Agency

EuRAD04-1 | Managing and Promoting Innovation in Defence: EDAs & R&T Activities related to RF Sensor Technologies | 08:30 - 08:50 |
EuRAD04-2 | Deep Learning for Automatic Target Recognition with Radar | 08:50 - 09:10 |
EuRAD04-3 | Multichannel Passive ISAR Imaging for Military Applications (MAPIS) | 09:10 - 09:30 |
EuRAD04-4 | Architectures for Multifunction RF & Optoelectronics Sensors Onboard RPAS Platforms | 09:30 - 09:50 |
EuRAD04-5 | Signal Processing for Enhanced Radar Imaging | 09:50 - 10:10 |
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<th>Time</th>
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<td>10:30 - 11:10</td>
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<td>Wireless IoT and Localization</td>
<td>Hideshi Motoyama¹, Sachio Iida¹, Ken Yamamoto¹, Noboru Saito¹, Masahisa Tamura¹, Norihito Suzuki¹, Naddo Yoshikawa¹, Katsuyuki Tanaka¹, Hiroshi Aoki¹, Kento Shoji¹, Seji Kobayashi¹</td>
<td>Sony Semiconductor Solutions</td>
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<td>10:30 - 11:10</td>
<td>EuMC56</td>
<td>Antennas for Space Applications</td>
<td>Victor Sanchez¹, Fernando Martin¹, Francisco Jose Caro¹</td>
<td>SENER INGENIERIA Y SISTEMAS</td>
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<td>11:10 - 11:30</td>
<td>EuMC57</td>
<td>Special Session: Additive Manufacturing</td>
<td>Paul Booth¹, Elena Valieie Uich¹</td>
<td>Airbus Defence &amp; Space</td>
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<td>11:10 - 11:30</td>
<td>EuMC55-1</td>
<td>2% EVM 920 MHz 13 dBm Constant Envelope pi/2 shift BPSK</td>
<td>Stefan Erhardt¹, Bernhard Gaede¹, Robert Weigel¹, Alexander Koelpin¹</td>
<td>Friedrich-Alexander University of Erlangen-Nuremberg, Brandenburg University of Technology</td>
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<td>11:10 - 11:30</td>
<td>EuMC56-1</td>
<td>Industrial Keynote: On Board Deep Space Steerable Antennas</td>
<td>Markus Artle-Campo¹, Darwin Blanco¹, Giorgio Carlucci¹, Oliver Lischke¹, Simona Bruni¹, Nuria Lombart Juan¹</td>
<td>IMST GmbH, TU Delft</td>
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<td>11:30 - 11:50</td>
<td>EuMC55-2</td>
<td>Hybrid RSSI-AoA Positioning System with Single Time-Modulated Array Receiver for LoRa IoT</td>
<td>Kyung-Jin Baik¹, Sangkoo Lee¹, Byung-Ju Jang¹</td>
<td>Kookmin University</td>
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<td>11:30 - 11:50</td>
<td>EuMC56-2</td>
<td>Circularly Polarized Lens Antenna for Tbps Wireless</td>
<td>Marta Artle-Campo¹, Darwin Blanco¹, Giorgio Carlucci¹, Oliver Lischke¹, Simona Bruni¹, Nuria Lombart Juan¹</td>
<td>IMST GmbH, TU Delft</td>
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<td>11:50 - 12:10</td>
<td>EuMC55-3</td>
<td>Enhanced GSM Broadcast Receiver Using the Phase Output of a Sub-GHz Transceiver</td>
<td>Stefan Erhardt¹, Bernhard Gaede¹, Robert Weigel¹, Alexander Koelpin¹</td>
<td>Friedrich-Alexander University of Erlangen-Nuremberg, Brandenburg University of Technology</td>
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<td>11:50 - 12:10</td>
<td>EuMC56-3</td>
<td>Integrated Lens Antennas for E-band</td>
<td>Salim Kari¹, &quot;Ulrich Ails-Laurinato¹, Ali Kartunen¹, Ville Vilkari¹</td>
<td>&quot;Aalto University</td>
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<td>11:50 - 12:10</td>
<td>EuMC55-4</td>
<td>Detailed Performance Analysis of an Ultra Wideband Transceiver for Real-Time Localization</td>
<td>Fabian Mohler¹, Harun Deniz², Fabian Lutz¹, Robert Weigel¹, Alexander Koelpin¹</td>
<td>Friedrich-Alexander University of Erlangen-Nuremberg, Brandenburg University of Technology</td>
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<td>11:50 - 12:10</td>
<td>EuMC56-4</td>
<td>A Compact Circularly-Polarized Lens-Horn Antenna with Very Low Axial Ratio and SLL</td>
<td>Fernando Rodriguez Varadi¹, Jose Luis Breda Saimmar¹, Belén Galocha-Heagon¹</td>
<td>UPM</td>
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<td>12:10 - 12:30</td>
<td>EuMC55-5</td>
<td>Enhance Charge-Induced Properties of a BCS</td>
<td>Gianluca Dassano¹, Mario Orefice², Fulvio Fresia², Fritz Schurig²</td>
<td>&quot;Philencron di Torino, DET-LACE, &quot;CNR - IEBT, &quot;F2TSafeConsulting, &quot;Eutelsat S.A.</td>
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<td>12:10 - 12:30</td>
<td>EuMC56-5</td>
<td>Silver Metallization of 77 GHz 3D Printed Horn Antennas</td>
<td>Samuel Shemlotheta²</td>
<td>Jet Metal Technologies</td>
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<tr>
<td>12:10 - 12:30</td>
<td>EuMC57-5</td>
<td>Silver Metallization of 77 GHz 3D Printed Horn Antennas</td>
<td>Samuel Shemlotheta²</td>
<td>Jet Metal Technologies</td>
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¹Tele Synergy Technologies, ²Bogazici University, ³Bogazici University, ⁴Eutelsat S.A.
### EuMC/EuRAD07 Interactive Session

**Chair:** Manuel Sierra Castañer¹  
**Co-Chair:** Daniel Segovia Vargas²  

¹Technical University of Madrid; ²Carlos III University of Madrid

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| 12:30 – 13:50 | EuMC/EuRAD07-1 Implementing Wideband Monopole/Dipole Antennas on Paper Substrates  
Christian Person¹, Hong Duc Nguyen¹, Jean Philippe Coupez¹, Philippe Minharn², Dominique Ikhire Tong¹, Pascal Baré⁹, Damien Bordaz⁹  
¹MT Atlantique; ²Technicolor Connected Home; ³Centre technique du papier

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| 12:30 – 13:50 | EuMC/EuRAD07-2 Digitally Compensated Millimeter Wave Frequency Doubler Based Outphasing Systems using Multi-tone Based Stimulation  
Arthur Chung¹, Manwen Ben Rejeb¹, Ali Darwesh¹, Richard H. Alfred Hung¹, Simm Boumaiz¹  
¹University of Waterloo; ²Army Research Lab

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| 12:30 – 13:50 | EuMC/EuRAD07-3 A 2D Method for Acquiring the Radiation Pattern of Two-Identical Vivaldi Antennas by Using a Stepped-Frequency Continuous Wave (SCFQ) Radar and a Rotation Stage  
Valentino Otero¹, Jorge Luis Salazar¹, Ramakrishna Sa Sila¹, Werner Schröder¹, Lüter Schüssler¹  
¹Offenburg University of Applied Sciences

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| 12:30 – 13:50 | EuMC/EuRAD07-4 Dipole Antenna Printed on Paper Substrate for WLAN Applications  
Dominique Ikhire Tong¹, Philippe Minard², Christian Person¹, Jean Philippe Coupez¹, Damien Bordaz⁹, Pascal Baré⁹  
¹Technicolor Connected Home; ²Technicolor Connected Home

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| 12:30 – 13:50 | EuMC/EuRAD07-5 EBG Enhanced Broadband Dual Antenna Configuration for Passive Self-Interference Suppression in Full-Duplex Communications  
Prathul Doi¹, Darian Minhasz-Syathak¹, Gan Zheng¹  
¹University of Essex, ²Loughborough University

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| 12:30 – 13:50 | EuMC/EuRAD07-6 A Real-Time Non-Destructive Water Status Monitoring System at Terahertz Band  
Carlos Quiroga¹, Juan Carlos Ibarra⁹, Diana Maini¹, Carlos Miranda², Ramon Gonzalez², L. Gonzalez Sanzesteban¹, Rigo Eter⁹  
¹Public University of Navarra; ²Public University of Navarra; ³Institute of Smart Cities (ISC)

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| 12:30 – 13:50 | EuMC/EuRAD07-7 W-Band Millimeter-Wave On-Chip Log-Periodic Dipole Antenna with Integrated Balun Filter in GIPD Process  
Hsiu-Ru Chuang¹  
¹National Cheng Kung University

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Moo-Lee Chung¹  
²Yonsei Astronomy and Space Science Institute

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| 12:30 – 13:50 | EuMC/EuRAD07-9 Low-loss Loaded Line Phase Shifter for Radar Application in X Band  
Xiaolong Sun¹, José Manuel Fernández-González¹, Manuel Sierra-Pérez¹, Belén Galacho-Iregir¹  
¹Universidad Politécnica de Madrid

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| 12:30 – 13:50 | EuMC/EuRAD07-10 Mode Conversion Processes in Multilayer Spherical Resonators  
Ingo Wolff¹  
¹MST GmbH

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| 12:30 – 13:50 | EuMC/EuRAD07-11 Double-Tuned Composite Right/Left-Handed Leaky Wave Antennas Based on Liquid Crystals  
Shuang Ma¹, Fan-Yi Meng¹, Fu-Liang Zhang², Lei Zhu¹, Qun Wu¹  
¹Harbin Institute of Technology; ²Changsha University; ³Qiqihar University

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| 12:30 – 13:50 | EuMC/EuRAD07-12 A Stand Alone Millimeter Wave Imaging Scanner: System Design and Image Analysis Setup  
Andrés Kile¹, Christopher Schwabb¹, Christian Kreb¹, Ralf Brauns¹, Stefan Kose¹, Dirk Kübler¹  
¹Fraunhofer FHR; ²Technical University of Bochum

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| 12:30 – 13:50 | EuMC/EuRAD07-13 Dispersion of THz Modes Localized on Layered Superconductor Controlled by DC Magnetic Field  
Teliana Kohmanov, Jan-Mark Apriadmo, Nita Kyliti, Valery Yangolivi²  
¹Centro de Física del Condensado; ²Technicolor Connected Home

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Hidmi Nakamura¹, Iku Soga¹, Shonji Sibita¹, Kazueki Ohki¹, Yusuke Nakahara¹, Yuchi Kawano¹, Tooshido Suzuki¹  
¹Fujitsu Laboratories Ltd.

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| 12:30 – 13:50 | EuMC/EuRAD07-15 A DC to 40 GHz, High Linearity Monolithic GaAs Distributed Amplifier with Low DC Power Consumption as a High Bit-Rate Pre-Driver  
Laura Dejlo¹, Bench Hafner¹, Amapero Hernandez¹, Yan Haentjens¹  
²Vivatech, University of Cantabria

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| 12:30 – 13:50 | EuMC/EuRAD07-16 Design of Broadband Gap Waveguide Transitions for Millimeter-Wave Antenna Arrays  
Miguel Fernando-Roche¹, Daniel Sánchez-Escudero¹, Jose Ignacio Herranz-Hernández¹, Alejandro Valez-Nogueras¹  
¹Universidad Politécnica de Valencia

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| 12:30 – 13:50 | EuMC/EuRAD07-17 A Circularly Polarized Circular Antenna Array for Satellite TV Reception  
Ahmed A1erad¹, Yi Huang¹, Manoj Banerji¹, Sunil Joseph¹  
¹University of Liverpool

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| 12:30 – 13:50 | EuMC/EuRAD07-18 Design and Demonstration of Linearly-Polarized Transmit-Arrays in X-band  
Hamza Kacem¹, Mohamed Ali Belaid¹  
²LAPLACE, ³ENISO

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| 12:30 – 13:50 | EuMC/EuRAD07-19 Distributed Signal Processing of High-Resolution FM/CW MIMO Radar for Automotive Applications  
Farhan Bin Khalid¹, Dian Nugraha¹, Andre Roges¹, Roman Ignace¹, Markus Boll¹  
²Infineon Technologies AG

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Farhan Bin Khalid¹, Florian Fenebacher¹, Gabor Babacs¹, Andre Roges¹, Dian Nugraha¹  
²Infineon Technologies AG

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| 12:30 – 13:50 | EuMC/EuRAD07-21 Dual-Channel Single Sideband Transmitter in 45 nm CMOS SOI for a 70 GHz OFDM Radar  
Daniel Schneider¹, Michael Trier¹, Mohamed Elkholy¹, Yukan Yu¹, Benedikt Schweizer¹, Jürgen Hasch¹, Christian Wlaschek²  
²Robert Bosch GmbH, ³Ulm University
In the podium discussion, this idea and circuit systems. The question is whether allows to calculated the current sources techniques based on an EM simulation, are for the opposite direction, i.e., synthesizing microwave component or system and can then analyze its behavior. First approaches and numerical efficiency. Techniques for analyzing noisy electromagnetic fields are under development and a first connection to virtual reality has been demonstrated.

All three techniques, however, are basically analysis methods, i.e., one has to define a microwave component or system and can then analyze its behavior. First approaches for the opposite direction, i.e., synthesizing techniques based on an EM simulation, are available for simple components and also partly installed in the simulation tools. A method called "Inverse Local Imaging" which allows to calculated the current sources from a given electromagnetic field is still in its infancy and far from an application to synthesize complex microwave antennas and circuit systems. The question is whether upcoming "Artificial Intelligence" processes are able to perform this task together with virtual reality has been demonstrated.

In the podium discussion, this idea and alternative strategies will be presented and discussed, using an antenna or circuit design task as an example.

EuRAD08-1 Towards a Single Pixel Millimeter-Wave Freeform Antenna
Guillermo-Avendaño Argüello, Michael Lopez-Porrua, Fernando C. Ferrando, Jaime Lavada
*University of Porto, Portugal

EuRAD08-2 3D Millimeter-Wave Screening of Wind Turbine Blade Segments
Reinhard Henschel, Sebastian Pawlicki
*Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR, Ruhr-University Bochum

EuRAD08-3 Real-Time Wireless Vibration Monitoring Using SAW RFID Coupled with Sensors
Pau Calders*, Dominik Ziolek
*University of Erlangen-Nuremberg, Siemens AG

EuRAD08-4 Radar Based High Precision Thickness Measurement For Rolling Mills
*Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR, "M5 Messsysteme GmbH

EuRAD08-5 Effectiveness of Deghosting Process for Multi-target Localization in Multistatic Passive Radar
Muhammad Hadi*, Raza Umar, Mobin Shoaib, Muhammad Bilal, Khalid Jarrar
*PSATRI, King Saud University

EuRAD09-1 Joint Super-Resolution and Array Interpolation for MIMO Radar Virtual Arrays
Maurice Hoff*, Jan Metzner*, Steffen Lutz*, Michael Bockmaier*, Peter A. Hofer*
*Christian-Albrechts-University of Kiel, Hamburg University of Applied Sciences, "Hensoldt" Sensors GmbH

EuRAD09-2 2D Maximum Likelihood Angle Estimation for MIMO Radar with Unequally Spaced L-Shaped Arrays
Takashi Kishigami*, Kenzo Iwasa*, Hidekazu Yomo*, Akiko Matsumura*, Junji Sabo
*Panasonic Corporation

EuRAD09-3 Frequency Domain System Identification for High Resolution IRCI-Free Collocated MIMO Radar
Mohammed Ashraph*, Mehrdad Yaghoubi*, Bernd Mudrak
*University of Edinburgh, "King Abdulaziz City for Science and Technology (KACST)

EuRAD09-4 Orthogonal Waveform Designs for Pulse-Based and Continuous-Wave MIMO Radars
Gövhram Piyal*, Jan Neitzner*, Volker Winkler*, Peter A. Hofer*
*Christian-Albrechts-University of Kiel, Hamburg University of Applied Sciences, "Hensoldt" Sensors GmbH

EuRAD09-5 Multiplier-less Correlator for Noise SAR Imaging
Kisho Maruyama*, S. Mukherjee*, V. Padakad*, D. Talpade*, O. Zemlyanov
*YRC NASU, Universita degli Studi di Napoli Parthenope
### THURSDAY

| 13:50 - 14:10 | EuRAD11-1 | A UAV Airborne Passive Digital Radar for Aerial Surveillance
| | Chair: J. M. van der Plas | Co-Chair: Mateusz Groth |
| | ¹ONERA | ¹Gdansk University of Technology |
| 14:10 - 14:30 | EuMC59-1 | Singular Edge and Corner Basis Functions for Scattering from Conducting Plates
| | Chair: Alessandro Galdi | Co-Chair: Roberto Grassi |
| | ²Politecnico di Torino, ³Georgia Institute of Technology | ²Politecnico di Torino |
| 14:30 - 14:50 | EuMC/EuRAD08-1 | Efficient Shaped-Beam Reflectarray Design Using Machine Learning Techniques
| | Chair: Ioan Lager | Co-Chair: Daniel Prado |
| | ¹Delft University of Technology, ²Military University of Technology | ¹Heriot-Watt University, ²Universidad de Oviedo |
| 14:50 - 15:10 | EuMC/EuRAD09-1 | Accurate PPCC-Based DoA Estimation Using Multiple Calibration Planes for WSN Nodes Equipped with ESPAR Antennas
| | Chair: Jozef Modelski | Co-Chair: Mateusz Groth |
| | ¹Warsaw University of Technology, ²Ulm University | ¹Gdansk University of Technology |
| 15:10 - 15:30 | EuMC59-2 | Electromagnetic Finite Element Solver for HPC Environments Using Direct Substructuring Method
| | Chair: Francesco Mola | Co-Chair: Roberto Grassi |
| | ¹Sapienza University of Rome, ²Universidad de Sevilla | ²Politecnico di Torino |

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| 14:30 - 14:50 | EuRAD11-2 | Combined Backscatter and Forward Scatter Radar Tracking of People
| | Chair: N. Tervo | Co-Chair: Marko Sonkki |
| | ¹University of Oulu | ²University of Oulu |
| 14:50 - 15:10 | EuMC59-3 | Near-Field to Far-Field Propagation of Correlation Information for Noisy Electromagnetic Fields
| | Chair: Maria C. Oliveira | Co-Chair: Michael Haidt |
| | ²University of California Los Angeles (UCLA) | ²Technische Universität München |
| 15:10 - 15:30 | EuMC/EuRAD08-2 | Interpolation of Missing Antenna Measurements or RCS Data Using the Matrix Pencil Method
| | Chair: M. Modelski | Co-Chair: Daniel R. Prado |
| | ¹Warsaw University of Technology, ²Ulm University | ¹Heriot-Watt University, ²Universidad de Oviedo |

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| 14:30 - 14:50 | EuRAD11-3 | Analysis of a Coherent Distributed MIMO Photonics-Based Radar System
| | Chair: L. O. Vegard | Co-Chair: Jianbing Zhang |
| | ¹Oslo University of Science and Technology | ¹eCATT, ²University of California Los Angeles (UCLA) |
| 14:50 - 15:10 | EuMC59-4 | Two-dimensional Non-periodic Metasurface for Dual Polarization Retrosynthesis
| | Chair: Alexey Shitov | Co-Chair: Jianbing Zhang |
| | ²St. Petersburg Electrotechnical University ''LETI'', ³School of Physics and Astronomy, Cardiff University | ²St. Petersburg Electrotechnical University ''LETI'', ³School of Physics and Astronomy, Cardiff University |

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| 14:50 - 15:10 | EuMC/EuRAD08-3 | Quality Analysis of Antenna Reflection Coefficient in Massive MIMO Antenna Array Module
| | Chair: Ignacio Regueiro | Co-Chair: Marco E. Leonori |
| | ¹University Carlos III de Madrid | ²University Carlos III de Madrid |

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| 15:10 - 15:30 | EuMC/EuRAD08-4 | Characteristics of Circularly Polarized Multimode Helical Beams
| | Chair: Giuseppe Dasso | Co-Chair: Guo-Rich Lin |
| | ¹University of California Los Angeles (UCLA) | ²Virginia Tech |

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| 15:10 - 15:30 | EuMC/EuRAD09-1 | Analog Beamforming Based on Fourier Rotman Lens for Multibeam Applications
| | Chair: J. M. van der Plas | Co-Chair: Dominik Gierst |
| | ¹University of Oulu | ²University of Oulu |

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| 15:10 - 15:30 | EuMC/EuRAD09-2 | Initial Design of Phase-Frequency Scanned Array Using CRH Leaky-Wave Antennas
| | Chair: N. Tervo | Co-Chair: Jianbing Zhang |
| | ¹University of Oulu | ²University of Oulu |

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| 15:10 - 15:30 | EuMC/EuRAD09-3 | Overview of Naval Multifunction RF Systems
| | Chair: Peter Moo | Co-Chair: Saeed Sadjadi |
| | ¹Defence R&D Canada - Ottawa | ²University of California Los Angeles (UCLA) |

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| 15:10 - 15:30 | EuMC/EuRAD09-4 | Through-the-Multilayered Wall Imaging Using Passive Synthetic Aperture Radar
| | Chair: Bjoern Zabel | Co-Chair: Babak Nooshabadi |
| | ¹Babak Nooshabadi University of Technology | ¹Babak Nooshabadi University of Technology |

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| 15:10 - 15:30 | EuMC/EuRAD09-5 | One-dimensional Patch Array for Microwave-based Vital Sign Monitoring of Elderly People
| | Chair: Saeed Sadjadi | Co-Chair: Babak Nooshabadi |
| | ¹University of California Los Angeles (UCLA) | ¹Babak Nooshabadi University of Technology |

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| 15:10 - 15:30 | EuMC/EuRAD09-6 | Experimental Demonstration of a Software-Defined-Radio Adaptive Beamformer
| | Chair: Daniel Goyer | Co-Chair: Piyamin Huy |
16:10 - 16:20
Session Remarks
Magdalena Salazar Palma, EuMW 2018 General Chair
José Ignacio Alonso Montes, EuMW 2018 General Co-Chair

16:20 - 17:10
Galileo: Europe’s Global Satellite Navigation System
Giuliano Gatti, Galileo Space Segment Manager, European Space Agency

Galileo is Europe’s own global navigation satellite system, providing a highly accurate, guaranteed global positioning and time service under civilian control. The Galileo System began Initial Services on 15 December 2016, and since then performances are excellent and steadily improving, as regularly reported through the Galileo open service quarterly performance reports. A growing number of commercial devices are using the system today. It is actually estimated that over 95% of the satellite navigation chipset supply market supports today Galileo in their new products, including the leading manufacturers of smartphone chipsets. Completion of the nominal constellation is planned to be achieved this year with the launch of 4 new Galileo satellites on July 2018, which will bring the 24-satellite Galileo constellation to the point of completion, plus two orbital spares. In parallel to that, a steady stream of orbital spares, ready to replace satellites reaching the end of their operational lives, is necessary to ensure Galileo continues operating seamlessly. A further 12 satellites were therefore ordered from industry in June 2017. During this presentation the current status of Galileo, its performances and its future modernization plans will be presented, highlighting also the extraordinary contribution of the European microwave and RF community on this program.

17:10 - 17:30
Awards Ceremony
Lluís Pradell i Cara, EuMW 2018 Awards Committee Chair
Germán Torregrosa Penalva, EuMW 2018 Student Activities Committee Chair

EuMC Microwave Prize
EuMC Young Engineer Prizes
Student Challenge Prize
Student Design Competition Prize

17:30 - 17:40
Closing Remarks
Magdalena Salazar Palma, EuMW 2018 General Chair
Denis Barataud, EuMW 2019 General Chair
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<td>08:30</td>
<td>EuRAD12</td>
<td>Radar Micro Doppler Analysis</td>
<td>Chair: Felix Yanovsky¹, Co-Chair: Jacco J. M. de Wit¹</td>
<td>National Aviation University, TNO</td>
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<td>08:50</td>
<td>EuRAD13</td>
<td>Remote Sensing</td>
<td>Chair: Mayazzurra Ruggiano¹, Co-Chair: Stephen Herman¹</td>
<td>Thales Nederland B.V., QinetiQ</td>
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<td>09:10</td>
<td>EuRAD12</td>
<td>EuRAD12-1 Target Detection and Classification of Small Drones by Boosting on Radar Micro-Doppler Signatures</td>
<td>Svante Björklund¹</td>
<td>Swedish Defence Research Agency (FOI)</td>
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<td>09:30</td>
<td>EuRAD13</td>
<td>EuRAD13-1 Industrial Keynote: Multi-Temporal Space-Borne SAR Data Exploitation for Surface Monitoring Applications</td>
<td>Ruben Iglesias¹, Javier Duro¹, Johanna Granda¹, Fernando Vicente¹, Giuseppe Centoloanza¹, Emma Garcia¹, Dan Morelo¹</td>
<td>TNO</td>
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<tr>
<td>09:50</td>
<td>EuRAD12</td>
<td>EuRAD12-2 Radar Classification for Traffic Intersection Surveillance Based on Micro-Doppler Signatures</td>
<td>Alexia Gonzalez Argüello¹, Dominik Berges¹</td>
<td>Technical University of Munich</td>
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<td>10:10</td>
<td>EuRAD13</td>
<td>EuRAD13-2 Ground Based Synthetic Aperture Radar with 3D Imaging Capability</td>
<td>Massimiliano Pieraccini¹, Neda Rojhani¹, Lapo Miccinesi¹</td>
<td>University of Florence</td>
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<td>10:30</td>
<td>EuRAD12</td>
<td>EuRAD12-3 Deep Learning-Based Segmentation for the Extraction of Micro-Doppler Signatures</td>
<td>Javier Martinez Garcia¹, Martin Vossiek¹</td>
<td>FAU Erlangen-Nuremberg</td>
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<td>10:50</td>
<td>EuRAD13</td>
<td>EuRAD13-3 Radar Detection Algorithms for Oil Spill Applications</td>
<td>Bilal Hammoud¹, Ghaleb Facout¹, Hussam Ayad¹, Fabien Notaglioni¹, Jalal Jomaah¹</td>
<td>Lebanese University, Grenoble Alpes University, CNRS-L</td>
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<td>11:10</td>
<td>EuRAD12</td>
<td>EuRAD12-4 Deep Learning for Range-Doppler Map Single Frame Classifications of Cooking Processes</td>
<td>Marco Ahmann¹, Peter Ort¹, Christian Waldschmidt¹</td>
<td>Hochschule Holzbahn, Universität Ulm</td>
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<td>11:30</td>
<td>EuRAD13</td>
<td>EuRAD13-4 First Results of Passive Radar Imaging and Tracking Using Geostationary Satellites</td>
<td>Holger Nies¹, Florian Behner¹, Simon Reuter¹, Omar Loicif¹</td>
<td>University of Siegen</td>
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<td>11:50</td>
<td>EuRAD12</td>
<td>EuRAD12-5 Human Detection by Deep Neural Networks Recognizing Micro-Doppler Signals of Radar</td>
<td>Jihoon Kwon¹, Seungou Lee¹, Nojun Kwak¹</td>
<td>Seoul National University</td>
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<td>12:10</td>
<td>EuRAD13</td>
<td>EuRAD13-5 Helicopter Flight Evaluations of High-Voltage Power Lines Detection Based on 76 GHz Circular Polarized Millimeter-Wave Radar System</td>
<td>Shunichi Futatsumori¹, Capucine Amielh², Norihiko Miyazaki¹, Keji Kobayashi¹, Nobufu Katsuno¹</td>
<td>Electronic Navigation Research Institute, École Nationale de l’Aviation Civile, Japan Aerospace Exploration Agency, Hokkaido Broadcasting Co., Ltd</td>
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EuRAD14
EuRAD Interactive Session
Chair: Manuel Rosa-Zurera¹
Co-Chair: María Pilar Jarabo-Amores¹
¹University of Alcalá

FRIDAY

10:10 – 12:30

Corridor

EuRAD14-1
Kernel Extended Local Tangent Space Alignment for SAR Image Classification
Xue Li¹
¹University of Electronic Science and Technology of China

EuRAD14-2
Polarimetric Scattering Center Representation for Electric-Large Targets
Xuan Wang¹
¹Leiden University

EuRAD14-3
Enhanced ISAR for Classification of Multiple Drones in Air by Time-Varying Micro-Doppler Rejection
Woojoyong Lee¹, Min Song¹
¹Korea Aerospace University

EuRAD14-4
Comparison of DoA Algorithms for MIMO GPR Radar
Jessica Sanchez¹, Alfio Garone¹, Daniel Castañeda¹, Paulo Monteiro¹
¹Instituto de Telecomunicaciones-Aveiro

EuRAD14-5
Deep Learning Based Human Activity Classification in Radar Micro-Doppler Image
Yuan He¹
¹Beijing University of Posts and Telecommunications

EuRAD14-6
Monopole Fed Grounded Dielectric Slab Leaky Wave Bull’s-Eye Antenna
Unai Debeloza¹, Aitana Elena Torres-García¹, Miguel Beruete¹
¹UPNA

EuRAD14-7
Enhanced Hidden Object Detection with a Circularly Polarized W-band Imaging Radar System
Rana Ghereishi¹, Rafal Braun¹, Oliver Aspe¹, Christian Krebs¹
¹University of Cape Town, ²Fraunhofer FHR

EuRAD14-8
Radar Cross Section and Near Field of an Engine Digital Mock-Up Under UHF and 5 Band Radar Illumination
Shih-Chung Tsai¹, Shen-Shou-Mei Chang¹
¹Oriental Institute of Technology, Taiwan, ²Air Force Institute of Technology, Taiwan

EuRAD14-9
Lightweight Broadband Antennas for UAV Based GPR Sensors
Ralf Bür¹, Markus Scharte¹, Winfried Mayer¹, Thomas Walter¹, Christian Waldschmidt¹
¹LMU University of Applied Sciences, ²Ulm University, ³Endress+Hauser SE+Co. KG

EuRAD14-10
Noise Removal in Near Range Active Millimeter Wave Three-Dimensional Imaging System
Xin Wei¹, Peng Fei¹
¹Science and Technology on Metrology and Calibration Laboratory

EuRAD14-11
Delamination Detection in Glass-Fibre Reinforced Polymer (GFRP) Using Microwave Time Domain Reflectometry
Muhammad Firdaus¹, Ghasan Nihat Jawad¹, Laith Dacron¹, Robin Stan¹
¹The University of Manchester, ²National Taiwan University

EuRAD14-12
2.5D Physical Optics Based Algorithm for Vehicles Classification Through a FM-CW Radar
Agnes Mazanghi¹, Luca Facheri¹, Fabrizio Cucco¹, Angelo Freni¹
¹University of Florence, ²RaSS Center – CNIT

EuRAD14-13
High Resolution TeraHertz 3-D Image Reconstruction
Jing Li¹
¹Shenyang Institute of Automation

EuRAD14-14
Non-destructive Crack Detection and Classification for Waterproof-Coated Concrete Surfaces by Millimeter-Wave Imaging
Ashiko Hirata¹, Makoto Nakai², Kochi Suzuki³
¹Chiba Institute of Technology, ²Ais Engineering

EuRAD14-15
A Compact Dual-band Antenna at Ka-band Frequencies for Next Generation Cellular Applications
Ting-Jui Huang¹, Heng-Tung Hsu¹, Ho-Tseng Chou¹
¹National Chiao Tung University, ²National Taiwan University

EuRAD14-16
A New Radar Based On Panel Active Array
Jia Pang¹, Hui Qin¹, Zengping Chen¹
¹ECRIEE

EuRAD14-17
Intermodulation Radar for RF Receiver Detections
Jeremy Rass¹
¹University Montpellier, CNRS

EuRAD14-18
Probabilistic Track Initiation Algorithm Using Radar Velocity Information in Heavy Clutter Environments
Gyejeong Lee¹, Seungjeu Lee¹, Kwangsung Kim¹, Nojun Kwak¹
¹Seoul National University, ²Agency for Defense Development, Republic of Korea

EuRAD14-19
Cumulative Probability of Detection of Fast Targets using Frequency Diverse Array Radar
Ramsaz Cihan¹, Ahsan Hizal¹
¹Aestian Inc.

EuRAD14-20
Experimental Study of Passive Bistatic Radar Using Uncooperative Illuminator
Pante Hu¹, Yingbang Cao¹, Jiayu Peng¹, Yat-Chun Wang¹, Zenghui Cao¹
¹Science and Technology on Automatic Target Recognition Laboratory of National University of Defense Technology

EuRAD14-21
Improvement of The Angle Measurement Accuracy for Indoor UWB Localization
Nour Awad¹, Jean-christophe Couzin¹, Martin Muller¹, Neil Samara¹
¹Telecom ParisTech, ²Telecom sud-Paris
FRIDAY

EuRAD15
FMCW and Continuous Wave Radar
Chair: Reinhard Feger¹
Co-Chair: Nils Pohl²
¹Ruhr-University Bochum, ²Johannes Kepler University Linz

EuRAD16
Drones Detection by Radar
Chair: Pierfrancesco Lombardo¹
¹Sapienza University of Rome, ²National Aviation University

EuRAD15-1
BPSK-based MIMO FMCW Automotive-Radar Concept for 3D Position Measurement
Yoke Lean Shi¹, Gang Li¹, Sarath Manchala¹, Hamid Afrasiabi¹, Christian Sturm¹, Urs Lübert¹
¹Valeo Schalter und Sensoren GmbH

EuRAD16-1
Numerical and Experimental Evaluation of the Radar Cross Section of a Drone
Bafano Pisi¹, Emanuele Pizzù¹, Erika Pitella¹, Pierfrancesco Lombardo¹, Alessio Genovese¹, Domenico Boldt¹, Daniela Nardi¹, Pablo D’Alessandro², Alessandro Zambotti²
¹Sapienza University of Rome, ²ENEA

EuRAD15-2
Mixed-Signal Transmitter Leakage Cancellation for PMCW MIMO Radar
Marc Bauduin¹, André Bourdoux¹
¹IMEC

EuRAD16-2
Drone Detection Feasibility with Passive Radars
María Pilar Janío-Amores¹, David Mba-Moya¹, Pedro José Gómez-del-Hoyo¹, José Luis Bárcena-Humans¹, Javier Rosado Sanz¹, Nerea de Rey-Maestre¹, Manuel Rosa-Zurera¹
¹University of Alcala

EuRAD15-3
IQ Imbalance Robust OFDM Radar Waveform
André Bourdoux¹, Marc Bauduin¹, Claude Desset¹
¹IMEC

EuRAD16-3
Remotely Piloted Aircraft Detection with Persistent Radar
Álvaro Duque de Quevedo¹, Fernando Ibañez Urzaiz¹, Javier Gismero Menoyo¹, Alberto Asensio López¹
¹Information Processing and Telecommunications Center. Universidad Politécnica de Madrid

EuRAD15-4
Non-Linear Effect Mitigation for FMCW Radar System
Nizar Bouhla¹, Stéphane Merc¹, Claude Moulec¹, Christian Brosseau¹
¹Institut d’électronique et de télécommunications de Rennes, IETR, ²ADVANTEN

EuRAD16-4
Circular Micro-SAR for Mini-UAV
Makem Otten¹, Noud Maaë¹, Roland Bolt¹, Miguel Cao-Cuenc¹, Henk Medenblik¹
¹TNO Defense, Safety and Security

EuRAD15-5
A Highly Integrated Dual Band FMCW Radar Receiver for Indoor Positioning Applications
Mohamed El-Shennawy¹, Belal Al-Qudsi¹, Niko Joran¹, Frank Ellinger¹
¹TU-Dresden

EuRAD16-5
Comparisons Between Simulated and Measured X-band Signatures of Quad-, Hexa- and Octocopters
Peter Spind¹, Arne Schröder¹, Matthias Renker², Peter Wellig², Axel Mark³
¹Universität Bern, ²armasuisse
Spanish Advanced Radar for LEO Space Surveillance and Tracking
Domingo Castro Fernández, Defence Systems Director, Indra Sistemas, Rafael Casado Gómez, Primary Radars Director, Indra Sistemas, Jacobo Martínez-Villa Salmerón, Project Leader, Indra Sistemas.

The S3T Surveillance Radar (S3TSR) is a radar system developed by Indra within a project funded by Spanish Administration and technically managed by ESA. It is a ground-based radar, based in a close monostatic configuration, operating at L band and capable of providing positional information of orbital objects. The radar provides automatic surveillance and tracking of space objects in Low Earth Orbit (from 200 km to 2000 Km of orbit height above Earth). This is performed by continuously scanning the instrumented Field of Regard (FoR), generating track reports for all detected objects. Situational awareness of LEO is an activity with increasing strategic value for national sovereignty. Based on this tracks, the SSTOC (Space Surveillance and Tracking Operation Centre) generates a catalogue in which objects are updated every pass. The radar architecture is scalable and the performances of the radar can improve by just adding building blocks (tiles). Both, TX and RX antennas are separated electronically scanning arrays (AESA). The Tx antenna has high power amplifier modules based in GaN technology to improve efficiency and reliability. The RX modules use direct RF undersampling technology. RX beamforming architecture is fully digital, each antenna input is digitized to maximize functional flexibility, and entirely over optical fiber making possible the simultaneous formation of multiple RX radiation patterns. The system is designed as very modular to improve availability.

EuRAD Awards Ceremony
Gonzalo de Miguel, EuRAD 2018 Co-Chair, Lluís Pradell, EuMW 2018 Awards Chair

Closing of EuRAD 2018
Mateo Burgos, EuRAD 2018 Chair

Invitation to EuRAD 2019
Philippe Eudeline, EuRAD 2019 Chair
Welcome from the Workshop and Short Courses Chair

This year we are pleased to offer the EuMW 2018 delegates a wide range of workshops and short courses that cover the topics of all three conferences throughout the week.

To guarantee this wide coverage of topics, the accepted 33 workshops and eight short courses were selected from a pool of 51 submitted proposals. This selection was the result of a pre-established review process.

Current key applications of microwave technology are addressed ranging from quantum information systems, or biomedical sensors to 5G communications, Internet-of-Things, wireless power transfer, automotive radar or satellite communications. In addition, other workshops cover technological topics such as GaN, CMOS and SiGe as well as THz-technologies. Fundamental knowledge is provided in short courses on active and passive microwave circuit design, radar fundamentals and packaging and interconnect technology. The nowadays hot topics of automotive radar, power amplifiers and THz are covered by another series of workshops and short courses.

We are very grateful to all the organisers, presenters and authors of workshop and short course materials for sharing their knowledge with the EuMW 2018 delegates, and for their hard work and dedication before and during the conference. These events could only happen because of their willingness to serve the microwave community.

Each workshop and short course is individually endorsed by one or two of the conferences that make up EuMW. However, they are available and accessible to any scientist or engineer wishing to gain a broader perspective on microwave and RF systems and devices, or to learn about a new specialism within our broad field.

Due to the wide range of covered topics, the workshops and short courses’ programme fills the entire week. Workshops or short courses that focus on topics relevant for EuMIC mainly take place from Sunday to Tuesday. On Thursday and Friday, we present most of the workshops endorsed by EuRAD. Similarly, EuMC devoted workshops are distributed throughout the whole week.

Slides for the workshops and short courses will be provided electronically at the conference on a separate USB stick. No hard copies of the slides will be provided.

José Carlos Pedro
Workshops and Short Courses Chair

Telmo Cunha
Workshops and Short Courses Co-Chair
Semiconductor Power Amplifiers are key components in radio frequency and microwave transmitter systems. They have received a great deal of attention and development effort over the last decades and are still a hot topic in the research area.

This short course aims to provide a comprehensive overview of all aspects of the fundamental semiconductor microwave power amplifier design. It is an introductory course, aimed at graduate engineers who have moved into the field of RF design, as well as to microwave designers who aim to deeply understand the power amplifier’s basic concepts.

This short course features a range of presentations and provides a comprehensive overview and basic understanding on recent important progress and novel state-of-the-art achievements in semiconductor power amplifiers. Very recent advances in semiconductor amplifiers and their applications will also be covered.

Starting from the fundamental concepts on semiconductor devices, the core of a power amplifier design, the theoretical foundations of a power amplifier design are discussed. It will include fundamental concepts and state-of-the-art results on actual designs of a range of semiconductor power amplifiers using existing foundries. The load pull technique is also addressed and focused on the designer’s perspective.

The presentations will also cover a variety of advanced topics, and will provide the attendees with a clear overview of the main streams of current and important research trends worldwide in this field, as the Doherty architecture and the more recent load modulation power amplifier design concepts.

The short course will also focus on major challenges, such as stability (small and large signal) and how to address these in the amplifier design. Finally, accounting for the linearity issue, a basic overview on linearization techniques and their adoption to properly mitigate the amplifier distortion effects will conclude the short course.

**Programme**

**Semiconductor Devices for PAs**
Ilitcho Angelov¹
¹Chalmers University

**PA Theoretical Foundation**
Franco Giannini¹
¹University of Roma Tor Vergata

**Design and Model Oriented Load Pull Techniques**
Marco Pirola¹
¹Politecnico di Torino

**The Doherty Power Amplifier**
Paolo Colantonio¹
¹University of Roma Tor Vergata

**Load Modulated PAs**
Steve Cripps¹
¹Cardiff University

**X-parameter Modeling of PAs for System Level Analysis**
Alessandro Cidronali¹
¹University of Florence

**Trading off High Efficiency and Linearity in PA and Transmitter Design**
Zoya Popovic¹
¹University of Colorado

**Linear and Nonlinear Stability Analysis of Power Amplifiers**
Giorgio Leuzzi¹
¹University of L’Aquila

**Linearization Techniques Overview**
Pere L. Gilabert¹, Gabriel Montoro¹
¹Universitat Politècnica de Catalunya
Additive Manufacturing (AM) has the potential to change how future space products are designed, integrated and operated. This technology is considered already as a strategic technology approach for space applications.

AM will enable design for performance, mass optimization and easy design changes possible while also massively reducing the design/manufacturing/assembly cycle/costs as well as providing an environmentally friendly alternative to conventional machining. AM is also considered a key enabling technology for the miniaturization of small complex systems.

AM is likely to become a breakthrough technology for the development of RF hardware. The use of this manufacturing process allows RF hardware manufacturers to achieve enhanced performance. RF, thermal and mechanical performance can be improved by using the additional design freedom provided by AM.

The assessment of different AM approaches for RF hardware has already started and will consider the whole process chain, including design, material supply, processing, post processing, qualification and verification, and standardization. This assessment exercise is helping to identify already those AM approaches (materials, designs, processing, etc.) best suited for the manufacturing of RF hardware.

However, the goal of AM is not to replace well-known and consolidated manufacturing approaches such as milling, but to exploit the additional freedom for advanced designs.

This workshop will focus on three main aspects related to the use of AM for the manufacturing of RF hardware.

The first part will introduce the AM process and review its features. The suitability of AM for the space sector will also be addressed. In a second part, the impact of AM on satellite systems will be presented, followed by a third part, where some manufacturing approaches and real examples will be presented by companies and universities.
The telecommunication industry is preparing the fifth generation (5G) of mobile network to connect people and machines on a massive scale with broadband mobile communication with tens of gigabits per second. With the information-communication technology ecosystem estimated to use up to 10% of the world’s total energy generation, an important goal of 5G is to save energy while accommodating 10 times more traffic. Given the higher cell density expected, power amplifiers (PAs) exhibiting high average efficiencies are thus needed for 5G microcell and metrocell base-stations to curtail the operating cost. In this workshop, experts from Europe and America will present the recent advances in device modeling tools, which will facilitate the development of such high-performance GaN power amplifiers from microwave to mm-Waves.

The workshop will start with several presentations on the state-of-the-art GaN technologies available from different foundries for wireless, military and space applications at mm-Wave including the 28 and 38 GHz bands of 5G and at higher frequencies (backhaul). The trade-off between power gain, output power and dissipated power will be explored and the measured performances of state-of-the-art power amplifiers at 30, 40 and 50 GHz presented. The GaN FET modelling at the single intrinsic gate finger will be investigated to facilitate the development of device models for more complex layouts and address issues such as internal oscillations. The PA design using a nonlinear embedding device model will also be reviewed to address the unique opportunities it offers for the accelerated design of high-performance PAs at mm-Waves.

The challenges in device modeling and characterization of memory effects, stability and noise in GaN HEMTs at microwave and mm-waves will be the focus of the second half of the workshop. The goal will be to more accurately describe the device behavior for various PA classes of operation, such as envelope tracking, nonlinear dynamic load modulation, and pulse operation. Novel characterization and modeling techniques available to account for the dependence of the device characteristic on trapping and self-heating and to reliably predict the response of GaN HEMTs under modulated and pulsed waveforms will be presented. Further, the linear and noise modeling of GaN/Si HEMTs will be presented, with applications to both single-chip front-ends and mm-wave HPA design.
In this workshop, speakers from leading industries and universities will present state-of-the-art results in advanced power amplifiers for 5G wireless communications. The 5G communication system offers high data rate up to 10 Gbps and potentially deploys beamforming techniques with high device density and dense base-station deployment. These unprecedented demands require new-generation power amplifiers (PAs) operating at millimeter-wave bands and delivering high linear power with wide-bandwidth and high efficiency yet with a highly reduced size and cost. Therefore, broadband linear PAs with high efficiency at high PAPR, supporting higher order modulation, are among the most critical components for 5G. The workshop will include a wide range of presentations highlighting the recent trends and the state-of-the-art developments of power amplifiers in different semiconductor technologies from K-band to E-band. In addition, several advanced circuit architectures to achieve high efficiency will be presented, encouraging the audience to ask questions and discuss results.

Programme

- **mm-Wave PAs in CMOS Technologies**
  Patrick Reynaert¹
  ¹KU Leuven Micas

- **Broadband, Linear, and High-Efficiency mm-Wave Power Amplifiers and Co-Designs with Antennas --- The Unreasonable Quest for "Perfect" mm-Wave PAs and Some Reasonable Solutions**
  Hua Wang¹
  ¹Georgia Institute of Technology

- **Integrating Doherty Power Amplifiers in K-band**
  Roberto Quaglia¹, Vittorio Camarchia²
  ¹Cardiff University, ²Politecnico di Torino

- **Millimeter-Wave High Efficiency Doherty Power Amplifier**
  Anh-Vu Pham¹
  ¹University of California, Davis

- **MMW 5G PA with Build-in Broadband Linearizer**
  Tian-Wei Huang¹
  ¹National Taiwan University

- **Comparison of Different Designs of mm-Wave PA for Application in 5G Base Stations**
  Maurizio Pagani¹
  ¹Huawei

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**WS-04 (EuMC)**

**RF Techniques for Cellular Carrier Aggregation and Beyond**

Organiser: Florinel Balteanu¹
¹Skyworks Solutions

The demand for higher data rates in 4G and future 5G determines a great focus on the development of user equipment (UE) radio and RF front-end (RFFE) architectures and implementation. In these days, mobile video traffic accounts for 55% of total data traffic and specifically for smartphones, which accounts for 97% of global handset traffic. In order to address this explosive demand for data rates, a number of enabling features are being standardized and deployed in commercial handset products. One of the features is LTE carrier aggregation (CA) which enhances cellular network performance by enabling operators to combine multiple LTE component carriers (CC) to create wider-bandwidth services. LTE carrier aggregation (4G) used to increase the data rate together with key technologies in millimeter-wave, massive MIMO antenna arrays paves the way for 5G. This workshop will present the RF circuit, technology and system requirements for RF front-end used to implement 4G and future 5G in mobile devices.

Programme

- **Analog-to-Information Conversion, a New Paradigm Investigated by RFIC, Design by Mathematics**
  Francois Rivet¹
  ¹IMS Laboratory

- **Innovation by Material Engineering for Highly Integrated 5G RF FEM**
  Christine Raynaud¹
  ¹CEA-LETI

- **Advanced RF SOI Technology Targeting 5G Front End Module**
  Vincent Knopik¹
  ¹STMicroelectronics

- **Power Amplifier and Front End Module Design in RF SOI Technology**
  Alexandre Gry¹
  ¹CEA-LETI

- **Cellular RF Front End Modules for LTE Carrier Aggregation**
  Florinel Balteanu¹
  ¹Skyworks Solutions
THz technology opens up new possibilities for various applications extending among other from sensing and spectroscopy to communications and imaging. While important advances have been made over the last two decades, THz technology can benefit from further developments in the area of devices, circuits and system implementation. This requires understanding of fundamentals, consideration of new device concepts and/or optimization of their characteristics, hybrid or integrated approaches for circuit realization and use of the knowledge obtained from such studies for system development. This workshop will bring together experts from various academic, national labs and commercial enterprises to discuss the most recent advances in their respective fields and to provide insight into what the future might hold for exploration of this frequency range. It will focus on a variety of materials such as traditional III-Vs, III-Nitrides, Silicon, Graphene and Transition metal dichalcogenides (TMDs), as well as various device concepts for efficient THz generation and detection. The operation of the components to be discussed is based on plasmonics, photoconductors, plasma waves, photomixing, Resonant Tunneling, Negative Differential Resistance and CMOS. Devices such as Quantum Cascade Lasers and Self-switching Diodes will also be addressed. Advanced Sensing, Imaging and Communications and terrestrial, space applications will be discussed. The Workshop is intended for young scientists and engineers who are interested in learning about this emerging field, as well as individuals with a more advanced understanding of related concepts. The topics addressed include fundamental and engineering considerations together with the latest results in Terahertz technology.
WS-07 (EuMC)

Broadband Power Amplifiers for Wireless Applications

Organiser: Wenhua Chen¹, Karun Rawat²
¹Tsinghua University, ²IIT

The workshop will focus the design theory of broadband power amplifiers and novel techniques below or around 6 GHz for wireless applications, perhaps including broadband continuous mode PA, broadband load modulated or distributed PA. The PA back-off output power efficiency enhancement techniques will also be covered in this workshop.

WS-08 (EuMC/EuMIC)

Transmitter Modules for Smart Antennas and MIMO Systems

Organiser: Christian Fager¹, Leo de Vreede²
¹Chalmers University of Technology, ²Delft University of Technology

MIMO- and smart antennas are key technologies to improve capacity and energy efficiency in future wireless systems. However, shifting from traditional single-antenna systems to active antenna systems, with up to hundreds of individually controlled low power transmitter modules, is a paradigm shift that raises fundamental and practical challenges that need to be addressed by both industrial and academic researchers with the highest priority. These challenges are exacerbated by the recent trend towards higher frequencies and larger bandwidths for further capacity enhancement.

This workshop will review the most important research directions in the area of transmitter modules for smart antennas and MIMO systems, with a focus on the emerging 5G communication applications. While the stand-alone power amplifier was traditionally considered to be the key building block of any transmitter, this workshop will particularly target more complete transmitter solutions that serve the smart antenna operation. Therefore, highly-integrated TX solutions are within the focus of this workshop. Several talks will illustrate the great integration possibilities offered by modern silicon CMOS and SiGe technologies for realizing high performance digital and analogue functions in the range below 6 GHz, as well as, at mm-wave frequencies.

The workshop is based on a combination of presentations by leading industry, institute, and academic researchers. This will give the audience both perspectives of detailed technical solutions, as well as, an overview of the requirements that drive the industrial system and testbed development activities.
Victor Veselago first predicted the unique, unusual and exotic properties of metamaterials, particularly left-handed media, in 1968. However, David R. Smith and his team conducted the first experimental verification of such properties many years later, in 2000. This singular year is considered by many researchers involved in the topic to represent the onset of the Metamaterials History, initiated by its “big bang” after 32 years of latency. Therefore, 2018 is a key year, coinciding with the 50th anniversary of the seminal paper by Veselago, and with the adult age of Metamaterials. Since 2000, the research activity on the topic of metamaterials and artificial materials, and related topics, including metasurfaces, frequency selective surfaces, electromagnetic bandgaps, etc., has experienced a significant growth, and many applications, in fields as diverse as communications, sensing, or security, among others, have been reported. The aim of this workshop is to provide the attendees an overview of the research activity on the topic of microwave and THz metamaterials, with special emphasis on metasurfaces (a hot topic nowadays), and their applications. To this end, a balanced team of prominent researchers worldwide has been carefully selected. Workshop topics include metasurfaces for blazed gratings and reflectors, metasurfaces for sensing, metasurfaces for anomalous and negative refraction, high-gain antennas based on metasurfaces, metamaterials and metasurfaces based on active 'negative' elements, analytical circuit modeling of metasurfaces, wave propagation in time-modulated metamaterials, invisibility cloaks for advanced antennas, novel sensors and chipless-RFID systems based on metamaterials and symmetry, and industrial applications of metamaterials. These topics will be presented in a coherent manner in the workshop, and the different concepts introduced will be illustrated with multiple examples of applications, including applications in industry.

Programme

Metasurface for Blazed Gratings and Reflectors for Microwave through THz Applications
Tatsuo Itoh¹
¹University of California Los Angeles

Metasurfaces for Anomalous and Negative Refraction
Sergei Tretyakov¹
¹Aalto University

Terahertz Metasurfaces for High Sensitivity Thin-film Sensing Devices
Miguel Benitez¹
¹Universidad Pública de Navarra

Low Profile High Gain Antennas Based on Modulated Metasurfaces
Enrica Martini¹
¹University of Pisa

Radiofrequency Metamaterials and Metasurfaces based on Active ‘Negative’ Elements
Silvio Hrabar¹
¹University of Zagreb

Analysis of 2D Periodic Structures from an Equivalent Circuit Standpoint
Francisco Mesa¹
¹Universidad de Sevilla

Wave Propagation in Time-modulated Metamaterials
Andrea Alù¹
¹University of Texas Austin

From Artificial Electromagnetic Materials to Metamaterials: Unprecedented Properties for Conceptually New Microwave Devices
Filiberto Bilotti¹
¹University of Rome TRE

Novel Sensors and Chipless-RFID Systems Based on Metamaterials and Symmetry Properties
Ferran Martin¹, Paris Velez², Cristian Herrojo³
¹Universitat Autònoma de Barcelona

Commercializing Metamaterial Surface Antenna Technology: A Market-Driven Approach
Ryan Stevenson¹
¹KyMETA
Radioastronomy instrumentation is a very exciting area where huge interdisciplinary areas must work together. This workshop aims to bring together astronomers, physicists, and engineers working on detectors and low-noise instruments for the far-infrared/submm/mm wavelength range. It will cover current and future imaging and spectroscopic arrays, both bolometric and heterodyne, for ground-based and space-borne telescopes, the physics of semiconducting and superconducting detectors and readouts, the optimization of long-wavelength optical systems, new developments in coherent receivers and spectrometers, and the design and optimization of components such as optics, filters, and local oscillators. In addition to these component technologies, the conference will examine instrument architectures as well as recent application examples.

This Radioastronomy instrumentation workshop is designed to explore the current and foreseeable state-of-the-art of space telescope and instrumentation programs, concepts and technologies from the near-ultraviolet and visible wavelengths through the infrared and millimeter regions. NASA’s Hubble Space Telescope (HST), the Spitzer Space Telescope, Kepler/K2, and the airborne SOFIA programs are continuing observations and/or reviewing science proposals for new observation cycles. ESA has launched and is collecting data from the Global Astrometric Interferometer for Astrophysics (GAIA), a mission that will compile an astrometric catalogue of ~1 billion stars with a second data release in April 2018.

For this workshop, status reports on projects of all sizes and the science questions that they address are sought, as well as talks addressing topics that include, but are not limited to, the following issues and opportunities: performance requirements; instrumentation (imaging, polarimetric, and spectroscopic); instrument performance; detectors; receiver technologies; signal read-out; optical design; optical components; other associated technologies; observing techniques; emerging concepts.

Finally, the events and studies that will determine the future of space observatories for the next few decades are occurring right now, and the active participation of students is particularly important for this workshop. Students are encouraged to assist addressing both science requirements and technology enablers, conventional and unconventional. Opportunities to reach out to other disciplines and to the public at large are sought to increase understanding of the value of space observatories and consequently their basis of support. We look forward to a vigorous response to this workshop from across the space telescope community.
With the advent of nano-scale CMOS technology, exciting new developments have recently taken place in the field of RF and mm-wave transmitters, receivers and frequency synthesizers. The low-voltage, fast speed, fine feature-size and low cost of the new technology have forever changed the way we design circuits, architectures and systems. Not only the RF/mm-wave circuits have taken different shapes from what has been taught in textbooks but also their integration with digital processors have enabled new possibilities for digital assistance, offering autonomous built-in self-testing and self-calibration. This workshop gives an overview and samples of such latest developments.

**Programme**

**A CMOS 79GHz PMCW Radar SoC**
Mark Ingels¹
³imec

**Pushing the Linearity and RF Selectivity of Mixer-First Receivers and N-path Filters**
Eric Klumperink¹
¹University Twente

**A Wideband Single-PLL Multi-Channel and Multi-Band Car Radio Receiver with High-Resolution DS ADCs**
Lucien Breems¹
¹NXP Semiconductors

**Recent Advances in Radio ICs for Wireless Cubic-mm Sensor Nodes**
David Wentzloff¹
¹University Michigan

**Pursuing Hardware Integration for Commercial mmW Cellular Systems**
Fredrik Tillman¹
¹Ericsson Research

**New System Concepts Towards 5G RFIC’s**
Aarno Pärssinen¹
¹University of Oulu

**Capacitor-based TX Architectures: from Low-noise to High Power**
Ka-Fai (Keith) Un¹ and Pedro Emiliano Paro Filho¹
¹University College Dublin

**Benefits of 22FDX for NB-IOT RF Integration**
Thomas G. McKay¹
³DMTS Circuit & System Pathfinding, Globalfoundries, Santa Clara

**Discrete-Time Approach to Push High-Performance in Receivers**
R. Bogdan Staszewski¹
¹University College Dublin
The large instantaneous modulation bandwidth and high peak-to-average power ratio of signals used in future wireless communication systems is a challenge for the established power amplifier (PA) topologies targeting high back-off efficiency like Doherty PAs. Meanwhile, recent work on supply modulated systems, where the supply voltage of the PA is dynamically modified according to the envelope of the signal, has shown an impressive bandwidth improvement and competitive efficiency results. This is much attributed to the use of GaN technology for the fast switches in the supply modulators. Such systems allow, depending on the signal dynamics and frequency of operation, efficiency enhancement in the range of 10-20 % points. Novel topology supply modulators and/or discrete level systems have shown the potential to be used in very large bandwidth, including integrated systems up to Ka-band for future cellular infrastructure (5G) and for space applications. The applications and possible suggested architectures for such systems will be presented in this workshop with their respective pros and cons.

A challenge in the design of such systems is the characterization and modelling for digital pre-distortion (DPD), since most systems feature a low-frequency (LF) supply modulator input in addition to the RF input. Multi-port vectorial data for such dual-input, single-output (DISO) system with one LF non-50 Ω port is required for the dynamic characterization necessary for extracting the appropriate shaping function. Some measurement solutions based on alternative hardware for the vectorial receiver and the LF path will be presented in this workshop, as well as novel DPD models optimized for linearization of DISO systems.

A special challenge in modelling poses discrete level supply modulated systems (class-G) with large discontinuous non-linearities, as well as supply modulated systems with digital supply modulators (class-S) where the dynamic supply signal is coded in a pulse-pattern.

Finally, with the novel communication systems operating at much higher frequencies, the technology is directed to smaller integrated transceiver cells, fabricated in short gate length GaN technology. The supply modulator operates in the baseband and is less affected by the RF operational frequency, but in general, the maximum supply voltage of the RF PA drops for short gate length technology, which lowers the expected performance improvement using supply modulation since the possible voltage swing is reduced. Furthermore, short-channel GaN technology is more immature and shows larger trapping effects. In supply modulated systems, the drain lag can have a severe effect depending on the modulation BW and on the type of supply modulation (discrete or continuous modulation). This is also discussed in the workshop.

Programme

Wideband GaN-based Discrete Level Supply Modulated Power Amplifier Systems
Nikola Wolff¹
¹FBH Berlin

Efficient Supply-modulated GaN PAs for Wide RF and Instantaneous Bandwidths
Zoya Popovic¹
¹University of Colorado

Modular RF and Baseband Measurement Architectures
Enabling Calibrated Multi-port Supply-modulated PAs
Marc Vandenhove³
³National Instruments

Digital Class-S Supply Modulators for Envelope Tracking
Andreas Wenzel¹
¹Ferdinand-Braun-Institut (FBH)

Three-Port Characterization of Nonlinear Power Amplifiers using a PNA-X Microwave Network Analyzer
Troels Nielsen¹
¹Keysight Technologies

Long-Term Memory Effects in GaN Devices: From Modeling to Compensation
José Carlos Pedro¹
¹Instituto de Telecomunicações, DETI, Universidade de Aveiro

Roadmap to Envelope Tracking in L-Band for Space Applications
Natanael Ayllon¹
¹European Space Agency
**WS-03 (EuMC/EuMIC)**
**Current Trends in Broadband, Efficient and Linear PAs for 5G Wireless Applications**

Organiser: Kamal Samanta¹, Bumman Kim²

¹Sony Europe, ²Pohang University of Science and Technology

The ever-increasing demand for high data-traffic expects significant deployment of 5G cellular systems as of 2020. The 5G communication system demands high data rate, up to 10 Gbps, RF or hybrid beamforming, high-density devices for IoT and very dense base-station deployment. These unprecedented demands require new-generation power amplifiers (PAs) operating at higher frequency bands and delivering high linear power with wide-bandwidth and high efficiency, yet at a highly reduced size and cost. Therefore, broadband linear PAs with high efficiency at high PAPR, supporting higher order modulation, is one of the most critical components for a 5G mobile and backhaul system.

In this very timely workshop, we will highlight the recent important trends and the state-of-the-art developments in GaN- (for higher performance) as well as CMOS- (for lower cost) based PA circuits design and linearization to system implementation (with analog and hybrid beamforming) for 5G applications, including those for Ka-, V- and W-band handsets and infrastructure. GaN being the most suitable candidate for mmW performance, a special emphasis will be given on GaN based PA developments on Si as well as SiC semiconductor and linearization (recent advances in software and hardware implementations), covering PAs for large arrays and hybrid sub-six single element. The workshop will present the latest result and compare performance of novel PAs for various circuit and device technologies, and in terms of BW, ACLR/linearity, efficiency with high PAPR, and cost. Further, it will present PAs with circuit topologies including Doherty, out phasing, stacked and envelope tracking for enhanced performance (especially efficiency and bandwidth) at back-off power, to meet the challenging high performance and low cost requirements for 5G deployment.

The speakers are experts and are the leading contributors in both the industrial and academic sectors.

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**WS-05 (EuMC)**
**5G Systems & Millimeterwave Communications in Smart Public Transport**

Organiser: José I. Alonso¹, César Briso¹

¹Universidad Politécnica de Madrid

The fifth generation (5G) aims to provide considerable broader bandwidths and a network capable of offering a flexible technology for transportation applications. The use of mmW combined with new 5G technologies can be the most disruptive technology in smart transportation since it can allow the addition of new services and applications to make mass public transportation more efficient, safer and profitable.

However, there are great challenges to overcome; the first is to provide critical communications for control and safety applications. Critical communications require a very high quality of service to allow control and automation applications. For this reason, a precise knowledge of the physical interface and careful modeling of propagation are necessary, and in this case, new 5G technologies can play an important role.

On the other hand, mass transport systems demand broadband communications services for users. To provide these services, it will be necessary to use new mmW bands (26-34 /60 GHz) where there is a large bandwidth available and solutions like moving relay or distributed antenna systems. Nevertheless, the use of these frequencies is new for mobile communications, and requires a careful modeling of the environment and the use of new simulation tools for propagation design and modeling.
entire PDN. Multiple plane cavities and parallel resonance structures and interactions in the network (PDN), the effects of decoupling capacitances, package lead inductance, performance. This includes the interconnects behavior in the power distribution aka Power integrity, are also addressed, due to their critical influence on the design losses, topology, terminations, ISI, jitter, eye diagrams, crosstalk and ground bounce.

Topics covered in this tutorial include the most important issues of Signal integrity, like single ended and differential signal propagation from the transmitter to the receiver, including preparation, programming, and readout of quantum computers. Silicon-based quantum technologies are presented, where microwave circuits and systems for scalable quantum computing, operating down to 4K, is highlighted and shown to provide integration levels that may be needed to go from today’s small number (~10) qubits to thousands of qubits as may be needed for the realization of practical quantum algorithms.

High-speed signaling is the critical enabler of multi-gigabit data transfer rates that are essential for today’s communications. The true challenges, however, are the physical limitations of the channel (in board, package, and connector), the transistor circuits, as well as the voltage and timing noises introduced along the signal paths. Accurate design of high-speed digital systems requires a good understanding of the physical effects and system architecture. Modeling and analysis capabilities, based on a sound microwave background, are introduced next. The course focuses on several specific technologies of practical importance where microwave circuits play a critical role.

The course begins with a high-level overview of QIT including quantum computation, quantum communication, quantum sensing, and quantum cryptography. The basic physical principles of QIT, from qubits (quantum bits) to quantum algorithms, and challenges to realization, are introduced next. The course focuses on several specific technologies of practical importance where microwave circuits play a critical role.

Quantum engineering of superconducting qubits is covered from the perspectives of control, extensibility, measurement, and the quantum states of microwave light. Advanced, scalable, microwave electronics and software tools are presented that can address the significant challenges of classical control of multiple qubits, including preparation, programming, and readout of quantum computers. Silicon-based quantum technologies are presented, where microwave circuits are used to control the electron spin, THz pulses control orbital angular momentum, and information manipulation and readout is based on principles similar to microwave-based nuclear magnetic resonance. The role of cryogenic CMOS (Cryo-CMOS) circuits and systems for scalable quantum computing, operating down to 4K, is highlighted and shown to provide integration levels that may be needed to go from today’s small number (~10) qubits to thousands of qubits as may be needed for the realization of practical quantum algorithms.
Over the past decade, there has been a spectacular increase in demand for cellular communication and satellite-based services. This has been the singular reason in pushing the state-of-the-art of wireless systems to achieve even higher communication capacity within the constraints of the available frequency spectrum. Therefore, frequency allocations are regarded as a natural resource. Filters and multiplexing networks play a critical role in maximizing the effective use of the available bandwidth to achieve the highest capacity for a diverse range of traffic scenarios, and are deemed as critical elements of these communication systems.

This short-course is designed to give the attendees a system overview and tradeoffs for microwave filtering requirements in satellite communication systems. This is followed by a critical review of classical and modern synthesis techniques, either using lumped element parameters, circuit models and/or coupled-mode theory, with special emphasis on different filter performances (e.g. single- and multi-band responses), diplexers and multiplexers. The next step in filter design is the realization of the physical dimensions of the filter from the circuit model and the required coupling coefficients. This topic is dealt with: (i) a brief overview of the classical techniques based on circuit models of the physical structures and (ii) an extensive and in depth review of modern techniques based on EM modelling. A number of examples will be shown to illustrate the filter tradeoffs and realization of different filtering and multiplexing networks.

Students who complete this course will be able to understand basic and advanced filter concepts as well as comprehend the state-of-the-art designs published in recent technical literature.
WM-01 (EuMC)
Digital Calibration and Nonlinear Compensation Techniques for MIMO Wireless Transmitters in 5G and Beyond

Organiser: Anding Zhu¹, Pere L. Gilabert²
¹University College Dublin, ²Universitat Politècnica de Catalunya

In the existing cellular base stations, to guarantee linearity, digital predistortion (DPD) is widely used to compensate for the nonlinear distortion generated by RF power amplifiers (PAs). In 5G, particularly in wideband millimetre wave transmitters, the conventional DPD is no longer workable. With increasing demands for higher data rates, the signal bandwidth will continue to increase. At millimetre bands, the modulation signal bandwidths can reach hundreds of MHz or even multi-GHz and the peak to average power ratio of the signal may well exceed 10 dB. This requires not only very high sampling rates for digital signal processing but also sophisticated DPD models to compensate the nonlinearity, that leads to high power consumption and high cost. To increase power efficiency and meet the demands for high capacity, dense networks of base stations will be deployed and transmitters with multiple antennas (e.g., with massive MIMO architectures) and multiple power amplifiers will be used. In these transmitters, the output power of each PA will be significantly reduced compared to that in the existing high power base stations, which leaves limited headroom for digital predistortion in terms of power and cost budget. New digital compensation solutions for linear and nonlinear distortion compensation of ultra-wideband or multi-band 5G systems will be required. In addition, due to multiple antennas and PAs are used in MIMO transceivers, characterization and compensation of coupling effects between the antenna array and the PAs must be addressed.

In this workshop, we will discuss the future trends of 5G wireless transmitters and the related modelling and system design challenges that we are facing in developing digital calibration and nonlinear compensation techniques for such systems. Particular emphasis will be given to MIMO system architectures, digital compensation model selection, feedback loop data acquisition, model extraction algorithms and various system architectures. System characterisation, theoretical analysis, experimental test and hardware/software system implementation issues will be discussed.

WM-02 (EuMC)
High Power RF Breakdown and PIM in Space Applications

Organiser: David Raboso Garcia-Baquero¹, Oscar Monerris², Petronilo Martín-Iglesias³
¹European Space Agency, ²Valencian Space Consortium, ³ESTEC (European Space Agency)

This one-day workshop seeks to present in a condensed format the most relevant advances achieved in the field of high power radio-frequency breakdown effects in space applications: Multipactor, Corona and Passive Intermodulation. For this purpose, most of the relevant topics will be covered. Following a phenomena introduction, the speakers will present the status-quo in material science, simulations, testing, component design and regulation. At the end of the workshop the attendees will be able to understand this topic as a whole.

By selecting speakers from industry and research entities, this workshop aims to present its content not only from an academic point of view but also from a practical approach. Having this in mind, the workshop has been prepared to cover areas of interest for students/researchers and engineers dealing with the design and manufacture of high power RF devices for space applications.

In addition, this workshop will emphasize the effort paid in order to achieve a consensus on how multipactor testing and simulation is conducted along the European partners.
This workshop aims to present the state-of-the-art for microwave filter design and manufacturing, but also aims to create an adequate forum for the discussion of all of them will help the satellite operators to cover the traffic demand when and where is needed. This is forcing the satellite manufacturers to move to flexible architectures (active antennas, beam hopping, digital processors, etc.). This new ecosystem where shorter lead times, lowers cost, additional flexibility, new payload architectures among others, are forcing the filter manufacturers to be highly innovative. Additionally, new market opportunities also comes with new players. This workshop aims to present the state-of-the-art for microwave filter design and manufacturing, but also aims to create an adequate forum for the discussion regarding the current market situation and perspective.

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**Programme**

**Current and Future Requirements for RF/Microwave Filters**
Petronilo Martín-Iglesias¹
¹ESTEC (European Space Agency)

**Substrate Integrated Coaxial Filters for Satellite Telecommunication Systems**
Stefano Sirò¹
¹Iteam (Universitat Politècnica de València)

**Compact 3D Filters for Satellite Applications**
Luca Pelliccia¹
¹RF uTECH

**Ultra High Power Filter for Space Application**
Antonio Pananieli¹
¹Honeywell

**New Class of IMUX Filters from C to Ka-band**
Rubén Gómez Chacón¹
¹Thales Alenia Space Spain

**Advanced Design Techniques for Waveguide Filters for Satellite Applications**
Fernando Teberio¹
¹Microwave Components Group (MCG) – Public University of Navarre (UPNA)

**High Power Filters and Multiplexers for PIM Set-ups**
Pablo Solo¹, Marco Guglielmi¹
¹Team (Technical Univ. Valencia)

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**WM-04 (EuMC)**

**Substrate Integration Technologies and Applications**

Organiser: Maurizio Bozzi¹, Ke Wu²
¹University of Pavia, ²École Polytechnique de Montreal

The evolution of microwave and RF technology towards the needs of the Internet of Things (IoT) and the fifth generation of mobile communication (5G) requires innovative technologies for the development and integration of the wireless systems. Substrate integrated waveguide technology represents a viable solution for the integration of complete systems at microwaves and millimeter waves. This workshop will cover a variety of topics related to substrate integration technologies and their current and future applications.

With worldwide known experts in the field, the workshop will provide the attendees with a complete view on the current scenario of the substrate integrated waveguide technology. The speakers have been selected to guarantee a good balance between industrial and academic contributions and a reasonable geographical distribution, with contributions from Europe, America, and Asia. The proposed topics cover in a coherent way both different applications (ranging from radars to radio-astronomy) and innovative technological solutions (from miniaturized filters to air-filled structure).

The full-day workshop comprises nine presentations and a complete session (1 hour and 40 minutes) for the panel discussion, involving the speakers, the organizers, and the attendees.

**Programme**

**The State-of-the-Art of Substrate Integration Technology**
Ke Wu¹
¹École Polytechnique de Montreal

**Applications of SIW Technologies to Photonics and Microwaves**
Renato Lombardo¹, Valentina Verni¹, Maurizio Mattivi¹, Alberto Rampulla¹
¹Huawei Italy
Due to rapid advances in radar techniques, high frequency electronics, wireless communication, and integration of microfluidics and microsensors in RF devices, microwave technologies have become readily available for uses in biomedical applications. Utilization of electromagnetic techniques for biological interaction and effects has enabled a dramatic paradigm shift in medicine and science. Particularly, these techniques make it possible for new noninvasive and continuous sensing methods that potentially can create novel clinical tools and understanding of diseases.

This workshop includes state-of-the-art reports on RF, microwave, and millimeter-wave technologies in clinical applications and biology studies by pioneering experts in the fields. These applications include radio frequency sensors for individual cells and physiological monitoring. The research scopes presented are truly multidisciplinary and broad. With the evident increase of research activities and progresses, the workshop aims to provide a platform to present stimulating information and inspire microwave engineers to explore new applications.

Programme

Ultra-wideband Impedance Spectroscopy of Live Biological Cells
James C. M. Hwang¹
¹Lehigh University

Microwave Dielectric Spectroscopy as an Analytic and Label Free Technique for Molecular and Cellular Sensing
Katia Grenier¹, David Dubuc¹
¹LAAS-CNRS

In Vitro and in Vivo Applicators for Pico- and Nanopulses Electric Fields Require RF-design Structures: an Overview
Micaela Liberti¹, Caterina Merla¹, Francesca Apollonio¹
¹University of Rome

Exploiting Short-range Multi-mode Continuous-wave Radar Architectures in Biomedical Applications
Roberto Gomez-Garcia¹
¹University of Alcala, Madrid

Electromagnetic Sensors for the Detection of African Trypanosomiasis using RNA Aptamer Derivatized Surfaces
Christian Damm¹
¹Ulm University

Microwave Non-invasive Blood Glucose Monitoring for People with Diabetes: Potential and Challenges
Heungjae Choi¹
¹Cardiff University
Automotive radar at 77 GHz is in production and on our roads since 1998; only recently the production numbers have exploded. Currently, we have around 120 million radar systems on our streets worldwide. Two of the big 4 – Bosch and Conti – are delivering about 5 million. Radar sets each per year. VALEO presented a 77 GHz radar sensor based on LTCC for mass production at the recent EuMWeek 2017 in Nuremberg.

Up-to-now OEMs just sell their cars – and that’s it.

In the future, we will need maintenance facilities at the dealership of the different OEMs as well as certifications; otherwise, automotive radar cannot be part of a safety system. A 77 GHz sensor already on the road for 100,000 km or being nearly 10 years old must still be able to perform faultlessly! AEB (Automated Emergency Braking) Systems for trucks and sedans have already become an important economic issue – especially under insurance considerations.

Quo Vadis - ADAS and HAD ? – Market, measurement and society-wise. These future directions will be reviewed and discussed in this workshop being described here.
Relevance of Electromagnetics in Communication System Design

Organiser: Tapan K. Sarkar¹, Miguel Ángel Lagunas Hernández²
¹Dept. of Electrical Engineering and Computer Science, College of Engineering and Computer Science, Syracuse University, NY, ²Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Castelldefels, Barcelona

Current research on wireless radiofrequency (RF) and Microwave systems often makes unphysical simplifying assumptions and treats the associated signal-processing and electromagnetic (EM) analyses independently, resulting in the improper inclusion of the underlying physics (EM theory) of such systems and consequently leading to inaccurate and erroneous performance predictions of various microwave systems. To achieve accurate modeling and predictions, EM theory and signal processing must be intelligently merged. Examples of such errors commonly appear in both fields: not including the platform on which an antenna is mounted leads to completely erroneous predictions of antenna coverage, a serious issue for designing relevant antennas for RF systems; optimizing transmitted waveforms without including proper differentiability requirements imposed by Maxwellian electromagnetics yields inaccurate and physically unrealizable waveforms. This presentation will also discuss the different concepts of channel capacity and their implications and the antenna and its relationship to the Maximum Power Transfer Theorem. Although the discussion addresses communication systems, much of it is applicable to non-communication systems. A future of improved performance and better spectral harmony requires coding at RF for microwave transmission and receive systems, initially envisioned by Shannon and subsequently investigated by Viterbi, which is similar to the coding in GPS and satellite communication. Such a methodology can also be carried out in radar, where, for example, a radar can transmit coded waveforms, such as a Barker code, to increase detection capabilities. In summary, the objective of this workshop will be to illustrate that certain issues need to be factored into the design of microwave radiofrequency systems (communication, radar, navigation, countermeasures, etc.). For example, the exclusive use of communication principles in the design of the physical layer of such systems may not be sufficient in the proper design of a microwave system. Three specific topics will be treated in detail: the different concepts of channel capacity and their implications; the antenna and its relationship to the Maximum Power Transfer Theorem and the S-parameters used in conventional Microwave system design and, ultra wideband (UWB) wireless transmission of microwave signals without any distortion. Examples will be presented to illustrate these issues.
The terahertz frequency range can be defined as the band of the electromagnetic spectrum centered at 1THz. Thus, the rule of factor 10 expands the frequency range from 0.1 THz to 10 THz. The so-called THz range lies in the gap between the microwave and the infrared bands. The combination of the technologies used in these two frequency ranges has been applied during the last decade to develop successful application oriented THz systems.

This workshop covers two fundamental aspects of the THz field. On one hand, the differences between THz generators/receivers consist of radiation sources, detectors, passive/active components, and transmission technologies will characterize their pros and cons. Indeed, the availability of commercial THz generators/receivers (with all the components needed to perform its correct operation) is quite modern. Hence, in the first part of the workshop our top-recognized speakers will present an overview of the commercial THz generators/receivers along with its fundamental physical insight. On the other hand, due to the fact that the THz band is the last region of the electromagnetic spectrum technologically conquered (from RF to optics should be understood) many unsolved industrial problems have tried to be figured out with THz waves. Thus, in the second part of the workshop, a multitude of thriving applications in many fields will be presented: communication, biology, medicine, astrophysics, security, material detection, non-destructive evaluation, etc.

The historical perspective, the current state-of-the-art and the future perspective of both THz generators/receivers and THz applications are covered in this workshop being a great opportunity for beginners in the field but also for experts who want to expand their scope of knowledge in a really broad sense.

Programme

- **Introduction to THz and their Applications**
  - Israel Amedo¹
  - Public University of Navarre

- **Fundamentals of THz Generation**
  - Bjorn Globisch¹
  - Fraunhofer Heinrich Hertz Institute

- **Fundamentals of THz Generation**
  - Javier Tejada¹
  - Universidad de Barcelona

- **Available Current Instrumentation for THz**
  - Joachim Jonuscheit¹, Fabian Friederich¹
  - Fraunhofer Institute for Industrial Mathematics ITWM

- **Future Trends in THz Instrumentation**
  - Ole Peters¹, Milan Öri¹
  - Menlo Systems GmbH

- **THz Applications in Pharmaceutics and Medicine**
  - Phil Taday¹
  - Teraview

- **THz Applications in Automotive and Wind-power Industry**
  - Albert Redo-Sanchez¹
  - das-Nano S.L.

- **THz Rays for the Graphene Industry**
  - Peter Uhd Jepsen¹
  - Technical University of Denmark

- **THz Rays for Art and Object Conservation**
  - Enrique Castro-Camús¹
  - Centro de Investigaciones en Óptica A.C. Mexico

- **Future THz Applications**
  - Jan Balzer¹
  - Faculty of Engineering, University Duisburg-Essen
The emphasis will be on the materials to be used, the design approaches and possible fabrication techniques. Aspects related to the robustness of the performance will be discussed. Specific applications will also be analyzed.

Programme

Wearable and Smart Electronics: Design, Materials and Applications
Organiser: Alessandra Costanzo¹, Luciano Tarricone², Giuseppina Monti²
¹University of Bologna, ²University of Salento

In recent years, wearable electronics has gained a great research interest, with applications that range from health-care monitoring, to public safety and mobile computing. The design and fabrication of wearable electronics require that the embedding of electronic components inside clothes and/or other wearable accessories must not compromise the appearance and usability of the product. Additionally, it must not be intrusive to the user, who must be able to carry out his daily activities without any movement limitation and/or additional burden.

One of the crucial aspects which complicate the design of a wearable device is the need to use flexible materials, such as conductive threads or textiles, able to guarantee a seamless integration into wearable accessories.

Another issue is related to the need of operating on or in the proximity of the human body; in fact, for most devices (consider the case of a dipole antenna) the performance is strongly affected by the operation in the proximity of the human tissues that should be taken into account during the design process.

Additionally, when a device is intended for wearable applications, a key role is played by the variability of the operating conditions in terms of parameters such as geometry and surface application materials.

All the above considerations suggest that the best strategy for developing high-added value wearable devices consists in adopting an application-centered design approach, where the materials, the design and the fabrication technique are selected taking into account the constraints of the specific application of interest.

Accordingly, the contributions of this workshop will illustrate different possible approaches for the development of performing and robust wearable devices; the main problems to be solved for developing non-intrusive and comfortable wearable devices and systems will be addressed.

Wearable Textile Sensors for Remote Monitoring of Bioparameters
Annalisa Bonfiglio¹, Beatrice Fraboni²
¹University of Cagliari, ²University of Bologna

The potential use of low-THz bands in radar systems will be explored, with an emphasis on automotive radar applications and sensing and imaging systems for autonomous vehicles, through the results from PATHCAD and TRAVEL projects.

High data rate applications will be explored, Exabyte data distribution requires high capacity new generation wireless networks. The sub-THz portion of the spectrum provides very wide bandwidth to enable area capacity at the 100Gbps/km2 level. The challenge of developing affordable devices and systems for high data rate outdoor distribution will be explored. New advances in the field will be presented, including the results from the EU H2020 ULTRAWAVE “Ultra capacity wireless layer beyond 100 GHz based on millimeter wave Traveling Wave Tubes”. High power applications made possible using gyrotron sources will also be considered. Very high data rate (>10 Gbps) wireless links implemented using resonant tunneling diode technology will also be explored along with some example applications.

Technological challenges involved in exploiting these bands from an electronic perspective include finding the right circuit medium and implementing low-loss interconnects. The workshop will cover recent advances in the use of low-loss high-Q transmission media, passive devices and integrated antennas technology in the low THz bands using compatible THz-MIC technology, avoiding excessive unwanted parasitics and substrate losses.

Over 10 Gbps mm-Wave and THz Wireless Links
Edward Weage¹
¹Glasgow University

Sub-THz Wireless Networks for the Exabyte Age
Claudio Paoloni¹
¹Lancaster University

Novel Materials and Substrate Integrated Waveguide Technology for Smart Wireless Devices
Maurizio Bozzi¹
¹University of Pavia

Robust Textile Antenna Design: Design, Fabrication and Characterization
Hendrik Rogier¹
¹Ghent University – imec, Dept. of Information Technology, IDLAB-EM group

Communicating Textiles
Marina Normann¹, Anne Schwarz-Pfeiffer¹
¹Hochschule Niederrhein University of Applied Sciences

Development of Minimally Invasive Honey-bee Telemetry Systems
Cristiano Palego¹
¹Bangor University

Wearable Solutions for Localization and Tracking
Alessandra Costanzo¹
¹University of Bologna

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Passive Components and Interconnect for THz-MIC Applications
Khaled Elgaid¹
¹Cardiff University

Sub-THz Wireless Networks for the Exabyte Age
Claudio Paoloni¹
¹Lancaster University

Over 10 Gbps mm-Wave and THz Wireless Links
Edward Weage¹
¹Glasgow University

Broadband Gyrotron Travelling Wave Amplifiers in the mm-Wave and THz Bands
Wentong He¹
¹University of Pavia

THz Imaging Radar for Automotive Applications
Marina Gasinova¹
¹University of Birmingham

A Selective Review of Measurements at THz Frequencies
Nick Rider¹
¹University of Birmingham

Applications that range from health-care monitoring, to public safety and mobile computing. The design and fabrication of wearable electronics require that the embedding of electronic components inside clothes and/or other wearable accessories must not compromise the appearance and usability of the product. Additionally, it must not be intrusive to the user, who must be able to carry out his daily activities without any movement limitation and/or additional burden.

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Finally, challenges and innovative solutions in THz electronics measurements will be highlighted in a selective review.

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The Doherty Power Amplifier (DPA) was invented in 1936 by W.H. Doherty, a very brilliant engineer working on the development of high efficiency radio transmitters for transoceanic communications, at American Telegraph and Telephone Company Long Lines Department in Boston. The ability of the DPA of operating at high efficiency at significant output power back-off has led the RF and microwave community to re-discover its concept and adapt it to the requirements of modern high frequency transmitters. In particular, the DPA has had a huge success in the mobile base-stations market, where in combination with powerful digital linearizers, has become the de-facto standard HPA configuration. This workshop aims to present and describe all the aspects related with this architecture, starting from the basic idea up to more advanced and state-of-the-art results and guidelines.

The DPA historical aspect is also covered describing the time-line of its evolution, highlighting why, more than 80 years after its invention, this architecture is still on the wave to realize very advanced power amplifier stages for modern wireless systems. The limitations of the original DPA architecture are put into evidence and the proposed solutions aiming to improve its performances in terms of efficiency, gain and bandwidth will be presented and commented. To this purpose, the integration of the DPA architecture with high efficiency power amplifier classes, some solutions to improve the output power back-off, and several advantage solutions to improve its frequency response will be described.

Both Silicon and compound based solutions will be presented and both hybrid and monolithic examples will be shown and commented. Finally, the usefulness of the DPA architecture in space application will be addressed by the European Space Agency and a Ka-band Doherty HPA MMIC will be presented as example.

Programme

Doherty Standard Architecture and its Limitations
Rocco Giofrè¹
¹University of Roma Tor Vergata

Optimized Design of Doherty Amplifier with Transistors
Bumman Kim¹
¹Pohang University of Science and Technology

State of the Art and Present Trends of Doherty PAs
Marco Pirola¹
¹Politecnico di Torino

Technologies and Architectures for Space-borne High-efficiency HPAs
Vaclav Valenta¹
¹European Space Agency

Low-power mm-Wave Active Sensors: Potential Applications, Circuit Topologies, and Technology Requirements
S. P. Voinigescu¹, J. Hasch², M. Dadash¹, S. Shopov¹
¹University of Toronto, ²Bosch GmbH, Stuttgart

Design of Ultra-Wideband Radar Transceiver Chips for High Resolution Measurements Applications
Nils Pohl¹
¹Ruhr University Bochum

Radar Systems and Concepts for Level Measurement of Liquids and Bulk Solids in Process Industry
Michael Vogt¹
¹KROHNE Messtechnik GmbH, Duisburg

New Applications for Millimeter-wave Radars: from UAVs to Throat Microphones
Christian Waldschmidt¹
¹Ulm University

Novel Solutions for mmWave Automotive Radar Testing
Ahmed Sherif¹
¹Rohde & Schwarz
In recent years, the number of frequency users has increased continuously and this trend is ongoing for several reasons: With the unbroken demand for more digital bandwidth, the evolution of communication technology towards 5G requires more radio frequency (RF) bandwidth and more frequency users are active in all bands (1-6 GHz and in the future mm-wave). New radars arise from new operational needs (e.g. sense & avoid radars, hostile fire indication, multifunctional systems). In addition, new requirements for radars, such as a better resolution in range, result in higher demand for RF bandwidth. Reliability and immunity to interference becomes more and more important. Especially in the automotive area, where the number of cars equipped with radar sensors is constantly increasing, automated driving requires a new level of reliability.

Coexistence by spectral separation is not realistic anymore in this crowded environment, as frequency spectrum is finite and rare. Caused by the dense packing of frequency channels, interference from adjacent frequencies increases and new technologies for interference mitigation become necessary. The coordination of frequency allocation is getting more and more important between technologies and beyond borders, for communication as well as for radar. Frequency users and interferers today are commonly mobile, so that a spatial separation cannot be ensured.

The aim of this workshop is to present the experiences related to coexistence and interference of different spectrum users from the fields of radar (automotive and surveillance) and communications. Technologies that allow coexistence without interference as well as intelligent frequency sharing concepts are discussed.
The amount of new applications based on millimeter-wave radar sensors is continuously growing. The radar sensors are used extensively almost everywhere to make daily life more comfortable. Particularly driven by the advance of the Internet of Things (IoT), autonomously driving cars and Industry 4.0, the amount of radar sensors and their networks is fast growing, promising radar chipset to reach mass volume market in the near future. Driven by the demand for module size reduction, the operating frequencies of the radar modules keep on increasing, as one can integrate antennas in package and reduce the chip size. However, higher frequencies also pose challenge on circuit level realization, due to limitations of the technology.

Hence, in this half-day workshop we will address several emerging radar applications for consumer, industrial and automotive electronics, operating at higher mm-wave frequencies. Each talk will address the system architecture, the performance requirements translated into specification of circuit blocks and considerations during circuit design. Additionally, each application will be described in detail from the system point of view.

Hence, the main idea of the workshop is to cover the full range of the design considerations for radar applications at mm-wave frequencies starting from the circuit design, to system specification, to system architecture and to the final target application. The applications themselves are novel and emerging radar applications with mass-market potential.

In this workshop, the first talk focusses on circuits and system for novel radar-based 140 GHz sensors for people tracking and vital signs detection. Next, modulated mm-wave MIMO radar at 77GHz is discussed both on system level, as well as on circuit design level, for secure resilient to interferences autonomous driving. Next, 3D high-differentiation mm-Wave Radar Systems for Emerging IoT Applications are discussed. Further, 61 GHz transceivers are presented and discussed for the application of Touch-Free Industrial Vibration Monitoring System. Next, NXP Semiconductor presents their newest development on automotive 77 GHz radar sensor networks and considerations on the suitable semiconductor technology. Finally, Infineon discusses 60 GHz and 120 GHz radar chipsets and systems for gesture sensing and additional consumer and industrial applications.

In this workshop we have a good mixture of industry (Infineon, NXP, Uhnder) and research institutes/ academia (imec, IHP, TU Cottbus). As well, the contributions are from three different countries (Belgium, USA and Germany) by highly recognized speakers in the field of radar circuits and systems.

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**Programme**

<table>
<thead>
<tr>
<th>140 GHz Radar for People Tracking and Vital Signs Detection</th>
<th>Wim van Thillo¹</th>
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</thead>
<tbody>
<tr>
<td>Resilient Millimeter-Wave Radar Sensor Concepts for Secure Autonomous Transportation</td>
<td>Dietmar Kissinger¹</td>
</tr>
<tr>
<td>3D High Contrast Differentiation mm-Wave Radar Systems</td>
<td>Vito Giannini¹</td>
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<tr>
<td>Touch-Free Industrial Vibration Monitoring System</td>
<td>Alexander Koelpin¹</td>
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<tr>
<td>mm-Wave Radar Sensors for Autonomous Driving</td>
<td>Ralf Reuter¹</td>
</tr>
<tr>
<td>Highly-Integrated mm-Wave Front-Ends for Gesture Sensing Applications</td>
<td>Vadim Issakov¹</td>
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</tbody>
</table>
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 relying on a set of radiating elements to generate a beam.

Depending mainly on the antenna mission (i.e. operational frequency, pattern requirements, transmitting and/or receiving functionality, number of beams to be generated, etc.) different MBA architectures may be selected: from antenna systems completely based on independent feeds illuminating a number of reflectors, to hybrid systems based on both arrays and reflectors, from phased arrays to lens antennas.

The trade-off on the antenna solution largely involves the BFN interconnectivity and flexibility requirements, with a wide range of applicable BFN architectures with different complexity and performance.

The objective of the course is to present design principles and state-of-the-art in MBAs and BFNs.

The course presents design principles and state-of-the-art in Multi-Beam Antennas (MBAs) and Beam-Forming Networks (BFNs) covering both theoretical and practical aspects. The covered topics include:

- Overview of Multibeam Antennas and system requirements.
  - Satellite Communication Systems;
  - Wireless Communications;
  - RADARs.
- Multibeam Array Antennas
  - Linear and Planar Direct Radiating Arrays (based on Periodic or Aperiodic lattices)
  - Reflector-based architectures (Single-Feed-per-Beam, Multiple-Feed-per-Beam)
  - Lens-based architectures (free space and constrained)
- Analog Beamforming Networks
  - Corporate divider/combiners;
  - Blass and Nolen matrices;
  - Butler matrices.
- Digital Beamforming Networks
- Overview of some Operational Multibeam Antennas/BFNs
  - MBAs for Spaceborne Narrowband and Broadband Satellite Communication Systems
  - MBAs for Wireless Communications
- On-going European Developments and Current Design and Technological Challenges
Modern Trends in Terahertz Electronics and Systems

Organiser: Jan Stake¹, Heinz-Wilhelm Hübers²
¹Chalmers University of Technology, ²Deutsches Zentrum für Luft- und Raumfahrt

Submillimeter wave radiation (0.1-1 mm) or radiation in the terahertz frequency range (0.3-10 THz) occurs between the short wavelength of infrared light and the long wavelength limit of radio waves, which represents the area of the electromagnetic spectrum where optical and microwave techniques meet. In this frequency range, electromagnetic waves are difficult to generate ("THz-gap"), explaining why this region has been uncharted for decades. However, the recent development of advance terahertz systems and terahertz sources, mainly driven by space applications, has opened up new possibilities also for high-speed wireless communication and remote sensing for a wide range of applications at terahertz frequencies. With the goal to expand the use of the electromagnetic spectrum and close the terahertz gap, the workshop aims to discuss latest trends in terahertz applications with a focus on recent progress in terahertz electronics. The workshop offers a number of selected talks by renowned international experts, covering topics from basic research on components to new applications and THz-systems.

Programme

Integrated THz Electronics in SiGe BiCMOS Technology
Dietmar Kissinger¹
¹Technical University Berlin / IHP, Frankfurt (Oder)

THz MMIC for Signal Generation and Reception
Viktor Krozer¹
¹FBH

THz Radar
Tomas Bryllert¹
¹Chalmers University of Technology

Development of Solid State THz Transceivers for Test and Measurement Applications
Jeffrey Hesler¹
¹Virginia diodes, Inc.

An Integrated-Circuit Approach to Terahertz Nearfield Imaging
Ulrich R. Pfeiffer¹
¹University of Wuppertal, Wuppertal

THz Detection with Integrated FETs towards a THz Camera
Hartmut Roskos¹
¹GOETHE, Frankfurt

THz Sensing using Resonant Tunneling Diode Oscillator
Safumi Suzuki¹
¹Tokyo Institute of Technology

THz HEMT MMICs
William Deal¹
¹Northrop Grumman

Terahertz Instrumentation based on Heterogeneous Integration and Silicon Micromachining
Bobby Weikle¹
¹UVa

THz Integrated Circuits
Goutam Chattopadhyay¹
¹JPL

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### Programme

**Design and Tuning of Reconfigurable Microwave Filters**  
Christian Schuster¹, Holger Maune¹  
¹Technical University of Darmstadt, Darmstadt

**Reflectionless and Highly-Reconfigurable Filtering Devices with Static Couplings**  
Roberto Gomez-Garcia¹, Dimitra Psychogiou²  
¹University of Alcala, Madrid, ²University of Colorado, Boulder

**Multi-Band and Reconfigurable Filters: From Hybrid Technologies to Silicon Integration**  
Julien Lintignat¹  
¹University of Limoges, Limoges

**Frequency-Selective Limiters and Tunable RF-Power-Activated Filters for Interference Protection in Wireless Systems**  
Eric J. Naglich¹  
¹Naval Research Laboratory, DC

**Reconfigurable and Switchable Filters using Ferrofluidic and Liquid-Metal Actuation**  
Hjalti H. Sigmarsson¹  
¹University of Oklahoma, OK

**Automatically-Tuned Bandpass and Notch-Type Filters**  
Dimitrios Peroulis¹  
¹Purdue University, West Lafayette

**Space Qualification on Frequency and Bandwidth Tunable Filters and Multiplexers**  
Christian Arnold¹  
¹Tesat Spacecom, Backnang

**Advanced ReconfigurableOMUX/DEMUX Design with Flexible Channel-Bandwidth Reallocations**  
Petronilo Martin-Iglesias¹, Uwe Rosenberg²  
¹ESTEC (European Space Agency), ²Micran Global Engineering GbR, Bremen

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**WF-03 (EuMC)**  
**Tunable/Reconfigurable Filters and Multiplexers for Multi-Band Applications**

Organiser: Roberto Gomez-Garcia¹, Holger Maune²  
¹University of Alcala, Madrid, ²Technical University of Darmstadt, Darmstadt

Modern trends for the development of multi-mode/multi-standard wireless communication and remote-sensing systems demand the development of highly adaptable RF electronics for their RF front ends. Reconfigurable filters and multiplexers are among the key devices in this scenario to carry out the dynamic signal-preselection task demanded by these upcoming highly versatile RF systems. However, several challenges need to be overcome before their practical employment in real applications. Among them, enabling very-high levels of transfer-function adaptivity for different technologies (e.g., planar, integrated, and 3-D), the conception of new tuning principles and materials for high-power operation in linearity regimes, the implementation of robust automatic-tuning mechanisms, and even the incorporation of advanced features such as power dependent/activated behavior for dynamic-range preservation and interference protection.

The purpose of this workshop is to present the latest advances in the exciting area of adaptive microwave filtering components for multi-band RF systems from the academia, national laboratories, and industry. Specifically, new reconfigurable filter structures in planar technologies and their system implications are presented. Tunable filtering devices in integrated circuits based of signal-interference and N-path schemes are also described, as well as frequency-selective limiters and power-dependent/activated filters and multiplexers suitable for interference congested EM environments. Advanced tuning materials (e.g., ferrofluidic and liquid-metal) and real-time monitoring and control mechanisms for notch- and bandpass-type filters are also expounded. Furthermore, high-performance reconfigurable 3-D filters and multiplexers in substrate-integrated and classic waveguide/cavity implementations for satellite communications are also covered on this workshop.
WORKSHOPS AND SHORT COURSES - FRIDAY

WF-04 (EuRAD)
Future Automotive Radar towards Autonomous Driving

Organiser: Jürgen Hasch¹, Christian Waldschmidt²
¹Bosch GmbH, Stuttgart, ²Ulm University

Autonomous driving and the electric car are the two hottest topics in the automotive industry today. With announcements of new field tests for electrified and autonomous vehicles nearly every day, these topics are present in the news all over the world. Still, there are significant challenges to the realization of the vision of fully autonomous driving. Especially, the correct and reliable perception of the environment using sensors plays a key role in providing safe and reliable autonomous driving. Radar plays a crucial part here.

The workshop will present the state-of-the-art in automotive radar, providing an overview of state-of-the-art sensors, technological realization, and sensor information processing using advanced signal processing and machine learning techniques. The key issues and challenges still present in today’s radars will be discussed, and an outlook on what future radar sensors will be able to accomplish will be given.

WF-05 (EuMC)
Advances Toward Autonomous RF Filter Design

Organiser: Wesley N. Allen¹, Dimitra Psychogiou²
¹Purdue University, Indiana, ²University of Colorado, Boulder

Historically, the design of RF filters has been viewed as a combination of science, experience, and art. However, over the past decades significant advances in computational capabilities have led to the widespread adoption of computer-aided design tools from the circuit to the 3D multi-physics level that assist and provide new insights to the designer or engineer. In parallel, developments in synthesis procedures, optimization approaches, and machine learning have led to high impact results in areas such as filter coupling matrix synthesis and the application of space mapping and neural networks to the RF filter domain.

While the marriage of these paths has pushed the field closer toward autonomous design, challenges remain in computational efficiency, particularly when dealing with complex systems. In this workshop, area experts from academia and industry will present the most recent advances, remaining challenges, and ultimate limitations in the road toward fully-autonomous RF filter design.
Many researchers are currently focusing their activities on the challenging task of wireless recharging the inexpensive and wherever distributed computing devices, representing the so-called “pervasive intelligence”.

This full-day workshop is aimed at providing an overview of the most recent promising approaches that enable to enhance both the near- and the far-field Wireless Power Transfer performances. Signal, circuit and system design solutions will be considered and their possible integration will be discussed. Engineering requirements and design challenges for making wireless power a reliable solution for pervasive distributed sensors are deeply investigated.

The investigation will be carried out in a twofold manner: (i) from the RF source point of view, by properly synthesizing the transferred signal shape for RF-to-dc efficiency maximization (e.g. multi-sine or delayed-pulsed signals) or by resorting to advanced radiating architectures, such as leaky-wave antennas, and to specific optimization rules in their design; (ii) from the receiving antenna/coil point of view, by considering realistic and unconventional scenarios (e.g. sliding coils).

All the talks will be enriched with the most recent results on the prototyping and experimentation, in the wide range of areas covered by the workshop spanning sensors and devices, RF design for wireless power and wireless communications.

Lectures presentations will be alternated with periods of open discussions to engage the audience and to discuss next exploitable research areas in this field.

**Programme**

**Communications and Signal Design Advances in Wireless Power Transmission**

**Bruno Clerck** ¹

*Imperial College (London)*

**How to Optimize the Overall Efficiency in Far Field Wireless Power Transmission**

**Nuno Borges Carvalho** ¹

*Instituto de Telecomunicações, Universidade de Aveiro*

**Increasing Received Power Levels in Near- and Far-field WPT**

**Hub Visser** ¹

*IMEC/ Holst Centre, Eindhoven*

**Dynamic Far-field Wireless Charging in Wireless Sensor Networks using Frequency-scanning Beaming**

**José Luis Gómez-Tornero** ¹

*Technical University of Cartagena*

**Array Antenna Designs for Radio-Waves Wireless Power Transfer**

**Andrea Massa**, **Paolo Rocca**¹

*University of Trento*

**Battery-free IoT Sensor Network Field Experiment in Japan**

**Naoki Shinohara**¹

*Kyoto University*

**Energizing UHF-RFID Passive Tags in Unconventional Scenarios**

**Paolo Nepa**¹

*University of Pisa*

**Position-independent Wireless Power Transfer in Sliding Inductive Links**

**Alessandra Costanzo**, **Diego Masotti**¹

*University of Bologna*

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**WF-06 (EuMC)**

**Advanced Solutions for Near-field and Far-field Wireless Charging**

Organiser: Alessandra Costanzo¹, Diego Masotti¹

¹University of Bologna

Many researchers are currently focusing their activities on the challenging task of wireless recharging the inexpensive and wherever distributed computing devices, representing the so-called “pervasive intelligence”.

This full-day workshop is aimed at providing an overview of the most recent promising approaches that enable to enhance both the near- and the far-field Wireless Power Transfer performances. Signal, circuit and system design solutions will be considered and their possible integration will be discussed. Engineering requirements and design challenges for making wireless power a reliable solution for pervasive distributed sensors are deeply investigated.

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All the talks will be enriched with the most recent results on the prototyping and experimentation, in the wide range of areas covered by the workshop spanning sensors and devices, RF design for wireless power and wireless communications.

Lectures presentations will be alternated with periods of open discussions to engage the audience and to discuss next exploitable research areas in this field.

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**WF-07 (EuMC)**

**Backscatter Communications the Next Paradigm for IoT Approaches**

Organiser: Nuno Borges Carvalho¹, Smail Tedjini²

¹Instituto de Telecomunicações, Universidade de Aveiro, ²Université Grenoble-Alpes

The Internet-of-Things’ (IoT) vision calls for thousands of interconnected devices in wearables, vehicles, buildings, using a multitude of sensors to provide us with useful information. As a result, mechanical and electrical properties become important, such as conformal profile, compact size, flexibility, stretchability, or even biodegradable properties and performance in terms of operating range, low power consumption and energy efficiency. Backscatter communication provides an enabling technology to address the needs of IoT due to the simplicity of the tag circuit and the ability to minimize battery usage or even eliminate them completely by taking advantage of wireless power transmission as well as energy harvesting.

This workshop presents the latest advances in backscatter communication technology in an IoT environment.

**Programme**

**Wearable Antennas for Wireless Applications**

**Smail Tedjini**¹

*Université Grenoble-Alpes*

**Higher Order Modulation Backscatter Combined with WPT**

**Nuno Borges Carvalho**¹

*Instituto de Telecomunicações, Universidade de Aveiro*

**Energy Harvesting and Ambient Backscattering for Low Power Communication and Sensing**

**Apostolos Georgiadis**, **Spyros Daskalakis**, **Ana Collado**¹

¹Heriot-Watt University, Edinburgh

**3D/4D/-Inkjet-Printed Flexible Backscattering RF Sensors and Modules for IoT and Smart Skin Applications**

**Manos M. Tentzeris**¹

*Georgia Tech*

**Energy Autonomous UWB Localization**

**Alessandra Costanzo**¹

*University of Bologna*

**Back-scatterer Tags for Vehicular Communications**

**Alessandro Cidronali**¹

*University of Florence*

**High-data Rate Communication using Back-scattering, Near-field Complex Vector Modulation**

**David S. Ricketts**¹

*North Carolina State University*

**Harmonics on Backscattering Communication**

**Gianfranco Andía**¹

*Université Grenoble-Alpes*

**Near-field Chipless-RFID Systems with Very High Data Capacity for Secure Paper Applications**

**Ferran Martín**, **Cristian Herrojo**, **Eloi Ramon**²

¹Universitat Autònoma de Barcelona, ²Institut de Microelectrònica de Barcelona (CNM-CSIC)
Rohde & Schwarz Workshops

- Free to attend -

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

Location: A9.13

Tutorial Seminars – RF Basics in Test and Measurement

A sound understanding of RF and mmWave testing methods is a key factor for every mmWave engineer, helping them to successfully implement solutions and designs in mmWave and RF circuits. Moreover, digital communications engineering and mmWave engineering are merging more and more and becoming a cross-discipline. As a result, mmWave engineers are confronted with the challenge of how to master the territory of the former RF and digital communications world.

The Rohde & Schwarz seminars about RF basics in test and measurement will familiarize you with the elementary aspects of signal generators, spectrum analyzers and network analyzers. You will learn to benefit from the great flexibility of our T&M equipment when designing communications and radar systems. New this year is a seminar on realtime spectrum analysis that will introduce you to the methods for debugging RF and mmWave circuits in the time and the frequency domain.

Using vector network analyzers for component testing and evaluation and applying various calibration techniques common in advanced network analysis lets you characterize mmWave and RF components, which are necessary for mmWave designs and digital communications systems, to the highest precision.

Tuesday 25th September 2018  09:30 – 11:00
Fundamentals of Signal Generators and Oscillators (YIG vs. VCO)

Tuesday 25th September 2018  11:15 – 12:45
Fundamentals of Spectrum Analysis

Wednesday 26th September 2018  09:30 – 11:30
Introduction to Digital Signals and Digital Modulation

Wednesday 26th September 2018  11:45 – 13:15
Real time Spectrum Analysis Embedded in Advanced Spectrum Analyzers

Thursday 27th September 2018  09:30 – 10:30
Fundamentals of Vector Network Analysis

Thursday 27th September 2018  10:45 – 12:15
Calibration in Vector Network Analysis
NI AWR Software Workshops
- Free to attend -

Location: A9.8

Tuesday 25th September 12:00 – 16:00
Filter Design Forum

The first EuMW Filter Design Forum focuses on design and simulation techniques of RF and microwave filters and provides insight into the latest approaches relevant to filter design, as well as modern filter theory. Noted filter specialist Dan Swanson of DSG Associates will open the session with a keynote presentation. The agenda is segmented into sequential sessions to enable attendees to selectively attend any/all presentations of interest.

To view the complete agenda and to register, visit: awrcorp.com/eumw2018

Wednesday 26th September 10:00 – 16:00
RF and Microwave Power Amplifier (PA) Forum

The fifth annual EuMW RF and Microwave PA Forum focuses on device technologies, characterization, modeling, and end-use applications of RF and microwave PAs and provides insight into the latest approaches to device models, parameter extraction measurement techniques, and process technologies, as well as modern PA design flow and theory. Noted PA expert Dr. Steve C. Cripps of Cardiff University will open the session with a keynote presentation. The agenda is segmented into sequential sessions to enable attendees to selectively attend any/all presentations of interest.

To view the complete agenda and to register, visit: awrcorp.com/eumw2018

EuMW MicroApps 2018
Free Admission with Exhibition and Conference Badges
25th - 27th September
MicroApps Theatre

Welcome to the eighth annual European Microwave Week (EuMW) Microwave Application Seminars (MicroApps), sponsored by National Instruments, Rohde & Schwarz, and Horizon House. MicroApps will be held from Tuesday, September 25th through Thursday, September 27th, 2018 in the MicroApps Theatre, which is located within the exhibition floor, making it a convenient stop while attending EuMW.

MicroApps are 20-minute exhibitor technical presentations that provide an opportunity for EuMW attendees to experience state-of-the-art applications, products, design techniques, and processes of interest to the RF and microwave community.

Sponsored by:

2018 MicroApps highlights include:
- Keynotes:
  - Dr. Steve Cripps, Cardiff University, UK
  - Dr. David Ricketts, North Carolina State University, USA
- Special Panel Session:
  - Hosted by Pat Hindle, Microwave Journal, USA
- A variety of practical application topics describing novel products and processes.

Once finalized, a complete agenda will be posted on the EuMW MicroApps website at www.eumicroapps.com and published in the official EuMW Show Guide. Additional printed copies will also be available on site at the EuMW registration desks. MicroApps admission is free for both exhibition-only and conference badges. Also included is a complimentary web download of the papers presented and bottled water.

We look forward to seeing you at EuMW 2018 in the MicroApps Theatre!

Antti Lautanen
EuMW 2018 MicroApps Co-Chair
### CONFERENCE SESSIONS MATRIX - SUNDAY

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<tr>
<th>Room</th>
<th>09:00-10:40</th>
<th>Coffee Break</th>
<th>11:20-13:00</th>
<th>Lunch</th>
<th>14:20-16:00</th>
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<td>GaN HEMT Characterization and Modeling for micro- and mm-Wave Power Amplifier Applications</td>
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<td>Terahertz Technologies from Fundamentals to Implementations: A Device and Application Perspective</td>
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<td>Transmitter Modules for Smart Antennas and MIMO Systems</td>
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<td>Additive Manufacturing of Radio-Frequency Components</td>
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## Conference Sessions Matrix - Monday

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<tr>
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<th>08:30-10:10</th>
<th>10:50-12:30</th>
<th>Lunch</th>
<th>13:50-15:30</th>
<th>Coffee Break</th>
<th>16:10-17:50</th>
<th>18:30 - 22:00</th>
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<td>N101 + N102</td>
<td>EuMIC01 Millimeter-Wave GaN Devices and MMICs and Thermal, Reliability Considerations</td>
<td>EuMIC05 EuMIC Opening Session</td>
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## Conference Sessions Matrix - Tuesday

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<th>13:50-15:30</th>
<th>Coffee Break</th>
<th>16:10-17:50</th>
<th>18:30 - 22:00</th>
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<td>EuMC28 Devices and Systems for Biomedical Sensing</td>
<td>EuMC36 Wireless Transceivers and Mobile Systems</td>
<td>EuMC44 Microwaves for 5G and Space</td>
<td>EuMC45 Phased-Arrays and MIMO Systems</td>
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<td>EuMC29 Bias Modulated Power Amplifier</td>
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<td>EuMC46 Planar Filter Technology</td>
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<td>EuMC32 Computational Electromagnetics and Material Characterization</td>
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**Career Platform (2 of 2) (13:20 - 17:50)**

**Defence, Security and Space Forum Cocktail Reception**

**EuMW Student Challenge**

**EuMC35 Interactive Session 1**

**EuMC43 Interactive Session 2 (15:10-16:30)**

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## Conference Sessions Matrix - Thursday

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<th>13:50-15:30 Coffee Break</th>
<th>16:10-17:50</th>
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<td>EuRAD05 Automotive Radar 2</td>
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<td>EuMW02 EuMW/EuMC Closing Session</td>
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<td>EuMC50 Advances in Millimeter-wave Packaging and Additive Manufacturing</td>
<td>EuRAD06 Radar Target Classification and Tracking</td>
<td>EuRAD09 MIMO Radars</td>
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<td>EuMC55 Wireless IoT and Localization</td>
<td>EuRAD10 Synthetic Aperture Radar</td>
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<td>EuMC/EuRAD08 Innovative Signal Processing in Array Technology</td>
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<td>WTh-03 Millimeter-wave Radar for Industrial and Consumer Applications</td>
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<td>EuRAD11 Multi-Static and Netted Radar</td>
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<td>WTh-06 Doherty Legacy: from Invention to Revival</td>
<td>WTh-07 Coexistence in the Crowded Spectrum between 1 and 100 GHz</td>
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<th>Room</th>
<th>Time</th>
<th>Workshops</th>
</tr>
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<tbody>
<tr>
<td><strong>Tuesday 25th September</strong></td>
<td>Meeting Room A9.8</td>
<td>12:00 – 16:00</td>
<td>National Instruments Workshops</td>
</tr>
<tr>
<td></td>
<td>Meeting Room A9.13</td>
<td>09:30 - 12:45</td>
<td>Rohde &amp; Schwarz Tutorial Seminars</td>
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<td>13:30 - 17:30 Rohde &amp; Schwarz Workshops</td>
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<td>Meeting Room A9.4</td>
<td>09:30 - 17:30</td>
<td>MathWorks Ltd Workshops</td>
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<tr>
<td><strong>Wednesday 26th September</strong></td>
<td>Meeting Room A9.8</td>
<td>10:00 – 16:00</td>
<td>National Instruments Workshops</td>
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<td></td>
<td>Meeting Room A9.13</td>
<td>09:30 - 13:15</td>
<td>Rohde &amp; Schwarz Tutorial Seminars</td>
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<td>13:30 - 17:30 Rohde &amp; Schwarz Workshops</td>
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EuMW 2018 Conference Rooms (North Convention Center, First Floor)

The Career Platform will be located at the West Entrance Hall, First Floor
Meeting and function space
INFOIFEMA
BUSINESS CENTRE
Exhibitor assistance
Exhibition office
Trade visitors registration
Press accreditations
Exhibitors access to exhibition halls
BusFeria stop
Medical centre
Public transport

Please note: EuMW 2018 Conference Rooms and Exhibition Hall are located near the North Entrance
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