

2021 51st European Microwave Conference (EuMC 2021)

**London, United Kingdom
4-6 April 2022**

Pages 1-416



**IEEE Catalog Number: CFP21455-POD
ISBN: 978-1-6654-4721-8**

**Copyright © 2021, European Microwave Association (EuMA)
All Rights Reserved**

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP21455-POD
ISBN (Print-On-Demand):	978-1-6654-4721-8
ISBN (Online):	978-2-87487-063-7

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

SESSION LIST

- [EuMW02](#) EuMW/EuMC Opening Session
- [EuMC01](#) Advanced Packaging and Interconnect Technologies for Emerging Applications
- [EuMC02](#) Innovative Microwave Circulators and Phase Shifters
- [EuMC03](#) Non-Planar Filters I
- [EuMC04](#) Active Antennas and Architectures
- [EuMC05](#) Novel Structures for Power Combiners and Couplers
- [EuMC06](#) 3D to 2D Transitions and New Materials for mm-Wave System Integration
- [EuMC07](#) Non-Planar Filters II
- [EuMC08](#) Digital Predistortion, PA Optimisation and MIMO Architectures
- [EuMC09](#) Metasurfaces and Frequency Selective Surfaces
- [EuMC10](#) Innovative Antenna Methodology and Design
- [EuMC11](#) Front-End and Transceiver Modules
- [EuMC12](#) THz Systems and Applications
- [EuMC13](#) Non-Planar Passive Components
- [EuMC14](#) Electromagnetic Scattering and Diffraction Effects
- [EuMC15](#) Metamaterial Based Devices and Applications
- [EuMC16](#) Integrated Components for Transceivers
- [EuMC17](#) New Design Concepts for Microwave Filters in Planar and Hybrid Technologies
- [EuMC18](#) Frequency Generation, Conversion and Nonlinear Modelling
- [EuMC19](#) 3D Printing: Processes and Reliability
- [EuMC20](#) Advanced High Efficiency Power Amplifier Techniques
- [EuMC21](#) EuMC Posters 1

EuMC 2021 Session List

- [EuMC22](#) Advanced Implementations for Substrate-Integrated and Quasi-Planar Filters
- [EuMC23](#) 5G Communication and Beyond
- [EuMC24](#) Advances in Electromagnetic Modeling and Numerical Techniques
- [EuMC25](#) EuMC Posters 2
- [EuMC26](#) Novel 3D Printing Approaches for mm-Wave Applications
- [EuMC27](#) Measurements for 5G and 6G Systems
- [EuMC28](#) 5G and mm-Wave Arrays
- [EuMC29](#) On the Occasion of Nikola Tesla's 165th Anniversary
- [EuMC30](#) Asia Pacific Focused Session
- [EuMC31](#) Electromagnetic Interactions, Environmental and Biological Applications
- [EuMC32](#) Calibration Techniques and Nonlinear Measurements
- [EuMC33](#) Sub-10GHz Antennas
- [EuMC34](#) RFID and WPT technologies
- [EuMC35](#) Non-Planar Filters and Passive Components
- [EuMC37](#) Radar and Communication Systems
- [EuMC38](#) Advances in mm-Wave Antennas
- [EuMC39](#) Novel IoT Technologies
- [EuMC40](#) Advances in Biological and Medical Applications
- [EuMC41](#) Material and On-wafer Measurements
- [EuMC42](#) Antennas Using Advanced Manufacturing and Novel Substrate Materials
- [EuMC43](#) Sensing and Dynamic Technologies
- [EuMC44](#) EuMC Closing Session
- [EuMIC/EuMC01](#) Novel Filtering Devices in Integrated Technologies
- [EuMIC/EuMC02](#) THz components
- [EuMIC/EuMC03](#) MMIC Power Amplifiers and Supply Modulation
- [EuMIC/EuMC04](#) EuMIC/EuMC Posters
- [EuMC/EuRAD01](#) High Resolution Methods in Range and Azimuth for Environmental Perception
- [EuMC/EuRAD02](#) Channel and Radar Characterization
- [EuMC/EuRAD03](#) EuMC/EuRAD Posters
- [EuMC/EuRAD04](#) Radar Architectures

EuMW02 : EuMW/EuMC Opening Session

Chair: Nick M. Ridler, EuMW 2021 General Chair

Co-Chair: Emma MacPherson, EuMC 2021 Chair

11:20–13:00, Monday 4th April 2022, Room 7-12

Welcome Address: Opening of the European Microwave Week 2021

Nick M. Ridler, EuMW 2021 General Chair

EuMA Welcome Address

Frank van den Bogaart, EuMA President

Greetings from the IEEE MTT-S

Gregory Lyons, IEEE MTT-S President, USA

Greetings from the EuMW 2021 Platinum Sponsor — Keysight Technologies

What's Next for mmWave?

Mike Geen, Filtronic, UK

Awards Ceremony

Nick M. Ridler, EuMW 2021 General Chair

Announcements and Notifications

Emma MacPherson, EuMC 2021 Chair

EuMC01 : Advanced Packaging and Interconnect Technologies for Emerging Applications

Chair: Mehmet Kaynak, IHP, Germany

Co-Chair: Mustafa Bakr, University of Oxford, UK

09:00–10:40, Monday 4th April 2022, Room 16

- (NA) **Advanced Integration and Packaging of High-Power Components and Amplifiers for 5G/Beyond Industrial Applications**
Kamal K. Samanta, AMWT, UK
- 2 **Design and Measurement of Interconnects in Fan-Out Wafer-Level Packaging (FOWLP) for mm-Wave Applications up to 100GHz**
Sherko Zinal¹, Kavin Senthil Murugesan², Marco Rossi¹, Matthias Böttcher¹, Ivan Ndip¹, Klaus-Dieter Lang¹, Marcel Wieland³, Christian Goetze³, Saquib Bin Halim³, Jean Trehwella³
¹Fraunhofer IZM, Germany; ²Technische Universität Berlin, Germany; ³GlobalFoundries, Germany
- 6 **Demonstration of Reproducible Millimeter-Wave SMT Chip Scale Package Using Hot-Via MMICs and Plastic BGA Encapsulation**
A. Bessemoulin¹, L. Maréchal¹, Hermann Stieglauer², P. Poilvert¹, P. Auxemery¹, J.P. Viaud¹
¹UMS, France; ²UMS, Germany
- 10 **Modeling and Measurement of Double Stacked Microvia in Antenna-in-Package Module for 5G mmWave Applications**
Kavin Senthil Murugesan¹, Stefan Kosmider², Oliver Schwanitz², Uwe Maaß², Ivan Ndip², Andreas Ostmann², Klaus-Dieter Lang¹
¹Technische Universität Berlin, Germany; ²Fraunhofer IZM, Germany

EuMC01 continued...

- 14 **Optimised Hot-Via Transition with 20dB Return Loss for MMIC Packaging from DC to 110GHz**
*Leigh E. Milner¹, Shyam G. Mehta¹, Leonard T. Hall², Simon J. Mahon³,
Sudipta Chakraborty³, Michael C. Heimlich³*
¹DSTG, Australia; ²Freespace Solutions, Australia; ³Macquarie University, Australia

EuMC02 : Innovative Microwave Circulators and Phase Shifters

Chair: Bart Nauwelaers, KU Leuven, Belgium

Co-Chair: Marco Pasian, Università di Pavia, Italy

14:20–16:00, Monday 4th April 2022, Room 1

- 18 **Broadband Ku- and Ka-Band Circulators in LTCC Using Sintered Bulk Ferrites**
Carsten Weil¹, Tim Hauck¹, Johannes Schur², Jens Müller²
¹AFT microwave, Germany; ²Technische Universität Ilmenau, Germany
- 22 **Quasi-Reflectionless Differential Phase Shifter with Arbitrary Prescribed Group Delay and Flat Phase Difference**
Girdhari Chaudhary¹, Daehan Lee¹, Muhammad A. Chaudary², Yongchae Jeong¹
¹Jeonbuk National University, Korea; ²Ajman University, UAE
- 26 **A Phase Shifter Composed of Reduced-Size Rat-Race Coupler with CRLH Transmission Lines and Resonating Reactance Circuits**
Masashi Nakatsugawa, Fusuke Kurotani, Yuya Chiba, Tamami Maruyama, NIT Hakodate College, Japan
- 30 **Simultaneous Electric and Magnetic Two-Dimensional Tuning in Nonlinear Magnetic Transmission Line**
MuhibUr Rahman, Ke Wu, Polytechnique Montréal, Canada

EuMC03: Non-Planar Filters I

Chair: Giuseppe Macchiarella, Politecnico di Milano, Italy

Co-Chair: Vicente E. Boria, Universitat Politècnica de València, Spain

14:20–16:00, Monday 4th April 2022, Room 6

- (NA) **The Extracted-Zero Technique**
Simone Bastioli, RS Microwave, USA
- 35 **Dielectric-Loaded Ku-Band Filter for High-Power Space Applications Based on Barrel-Shaped Cavities**
Paolo Vallerotonda¹, Fabrizio Cacciamani¹, Luca Pelliccia¹, Francesco Aquino¹, Cristiano Tomassoni², Petronilo Martín-Iglesias³, Vittorio Tornielli di Crestvolant³
¹RF Microtech, Italy; ²Università di Perugia, Italy; ³ESA, The Netherlands
- 39 **LTCC Based Ka-Band Diplexer for Miniaturized Ground-Segment User Terminals**
Davide Tiradossi¹, Paolo Vallerotonda¹, Luca Pelliccia¹, Stefano Moscato², Antonio Traversa², Giandomenico Cannone², Petar Jankovic³, Fabrizio De Paolis³
¹RF Microtech, Italy; ²SLAE MICROELETTRONICA, Italy; ³ESA, The Netherlands
- 43 **Quadrature-Based Approach Used for Improved Fitting of Filter Measured S-Parameters**
Jedrzej Michalczyk, Jerzy Julian Michalski, SpaceForest, Poland
- 47 **Narrowband Extracted Pole Filters with Mixed Dielectric and Waveguide Resonators in Ku-Band**
Patrick Boe, Daniel Miek, Fynn Kamrath, Kennet Braasch, Michael Höft, CAU, Germany

EuMC04: Active Antennas and Architectures

Chair: Nils Pohl, Ruhr-Universität Bochum, Germany

Co-Chair: Kevin Morris, University of Bristol, UK

14:20–16:00, Monday 4th April 2022, Room 13

- 51 **7.5GHz-Band Digital Beamforming Using 1-Bit Direct Digital RF Transmitter with 10GbE Optical Module**
Ryo Tamura, Mizuki Motoyoshi, Suguru Kameda, Noriharu Suematsu, Tohoku University, Japan
- 55 **Quadruple-Fed Aperture-Coupled Microstrip Patch Antenna for On-Antenna Power Combining**
Timothée Le Gall¹, Anthony Ghiotto², Stefan Varault¹, Gwenaél Morvan Stefan¹, Bruno Louis¹, Grégoire Pillet¹
¹Thales, France; ²IMS (UMR 5218), France
- 59 **Antenna Mutual-Coupling Mitigation with Analogue Compensation Network**
Roger Green, Tommaso A. Cappello, Geoff Hilton, Mark Beach, University of Bristol, UK
- 63 **Conformal Antenna with Reconfigurability of Monopole-Like and Broadside Patterns Realized with Polymer-Conductive Textile Composite**
Roy B.V.B. Simorangkir¹, Bahare Mohamadzade², Ali Lalbakhsh², Sanjeev Kumar¹, John L. Buckley¹, Toni Björninen³, Brendan O'Flynn¹
¹University College Cork, Ireland; ²Macquarie University, Australia; ³Tampere University, Finland
- 67 **Design of a Multi-Mode Transmission System Based on Vortex Electromagnetic Wave**
Jialin Zhang, Qinlu Liu, Yan Zhang, Ruobing Liang, Wenhao Jiang, Jinhao Wang, Beihang University, China

EuMC05: Novel Structures for Power Combiners and Couplers

Chair: Maurizio Bozzi, Università di Pavia, Italy

Co-Chair: Marco Pasian, Università di Pavia, Italy

16:40–18:20, Monday 4th April 2022, Room 1

- 71 **Electrical Balance Duplexer as In-Band Full-Duplex Antenna Interface with Fast Orthogonal Searching Methodology**
Ting-Li Hsu, Muh-Dey Wei, Renato Negra, RWTH Aachen University, Germany
- 75 **A Miniaturized and Hybrid SIW Resonator Solution for Filtering Power Divider and Antenna Array**
Hossein Sarbandi Farahani, Behrooz Rezaee, Wolfgang Bösch, Technische Universität Graz, Austria
- 79 **A Novel Compact Four-Way Power Combiner with an Embedded Microstrip-to-Waveguide Transition for Ka-Band Power Amplifiers**
Mouayd Hoari¹, Hind Bousbia¹, Hicham Boutayeb¹, Audrey Martin², Pierre Blondy²
¹Safran Data Systems, France; ²XLIM (UMR 7252), France
- 83 **Planar N-Way Power Combiner with High Isolation Between Input Ports**
Sayyed-Hossein Javid-Hosseini, Pouria Toofanzadeh, Vahid Nayyeri, IUST, Iran
- 87 **Wideband Compact-Size 3-dB Backward Directional Coupler Using Slotted-Microstrip Based Unit-Cells**
Mohamed A.G. Elsheikh, Amr M.E. Safwat, Ain Shams University, Egypt

EuMC06: 3D to 2D Transitions and New Materials for mm-Wave System Integration

Chair: Djuradj Budimir, University of Westminster, UK

16:40–18:20, Monday 4th April 2022, Room 4

- 91 **Low-Loss 140–175GHz MMIC-to-Waveguide Transitions and MMIC-to-MMIC Interconnections**
Jian Ding¹, Xiaobang Shang², Chris Buck¹, Mike Geen¹, Nick M. Ridler²
¹Filtronic, UK; ²NPL, UK
- 95 **A Compact K-/Ka-Band Waveguide Transition with Integrated Diplexer and Power Divider**
Kevin Erkelenz, Lars Meyer, Noah Sielck, Björn Deutschmann, Arne F. Jacob, Technische Universität Hamburg, Germany
- 99 **220GHz E-Plane Transition from Waveguide to Suspended Stripline Integrated on Industrial Organic Laminate Substrate Technology**
Victor Fiorese¹, F. Laporte¹, J.-F. Caillet¹, D. Campos¹, G. Catalano², F. Giancesello¹, Guillaume Ducournau³, Emmanuel Dubois³, Christophe Gaquière³, B. Tricoteaux⁴, M. Werquin⁴, Daniel Gloria¹
¹STMicroelectronics, France; ²STMicroelectronics, Italy; ³IEMN (UMR 8520), France; ⁴MC2-Technologies, France
- 103 **Special Glass for Packaging of High Frequency Electronics**
M. Letz¹, H. Engelmann¹, G. Lautenschläger¹, N. Brune¹, Xiaofei Bai², Bartłomiej W. Salski³, Tomasz Karpisz³
¹SCHOTT, Germany; ²SCHOTT, China; ³Warsaw University of Technology, Poland

EuMC07: Non-Planar Filters II

Chair: Richard Snyder, RS Microwave, USA

Co-Chair: Simone Bastioli, RS Microwave, USA

16:40-18:20, Monday 4th April 2022, Room 6

- 107 **Miniaturized All-Reconfigurable Dual-Mode Dielectric Filter Using Piezomotors for Future Satellite Communications**
Abdulrahman Widaa, Chad Bartlett, Michael Höft, CAU, Germany
- 111 **3-D Metal Printed High-Q Inline Filter With Helical Antenna Using Strong Mixed Coupling Resonator**
Jiayu Rao¹, Kenneth Nai², Povilas Vaitukaitis¹, Jiasheng Hong¹
¹Heriot-Watt University, UK; ²Renishaw, UK
- 114 **Dielectric TM Mode Extracted Pole Filters with Large Spurious Free Range**
Kennet Braasch, Daniel Miek, Patrick Boe, Fynn Kamrath, Michael Höft, CAU, Germany
- 118 **Compact Monolithic SLM 3D-Printed Filters Using Pole-Generating Resonant Irises**
Lu Qian, Rafael Martinez, Milan Salek, Moataz Attallah, Yi Wang, Michael J. Lancaster, University of Birmingham, UK
- 122 **Analysis and Design of Re-Configurable Compline Filters Using Dielectric Tuners**
Abhishek Sharma, Santiago Cogollos, Vicente E. Boria, Marco Guglielmi, Universitat Politècnica de València, Spain

EuMC08: Digital Predistortion, PA Optimisation and MIMO Architectures

Chair: José Carlos Pedro, Universidade de Aveiro, Portugal

Co-Chair: Gavin Watkins, Toshiba Europe, UK

16:40-18:20, Monday 4th April 2022, Room 7

- 126 **A Hybrid Heuristic Search Control Assisted Optimization of Dual-Input Doherty Power Amplifier**
Chouaib Kantana¹, Rui Ma¹, Mouhacine Benosman¹, Yuji Komatsuzaki², Koji Yamanaka²
¹MERL, USA; ²Mitsubishi Electric, Japan
- 130 **Offline Method to Determine Optimal Complexity in Predistortion of RF Power Amplifiers**
Marc Vigneau¹, André Prata², Adam Cooman², Christophe Quindroit¹
¹Ampleon, France; ²Ampleon, The Netherlands
- 134 **Simultaneous Measurement of Multiple Power Amplifiers for Phased Array Digital Predistortion Using a Shared Dual-Output Feedback**
Bilal Khan, Nuutti Tervo, Rehman Akbar, Marko E. Leinonen, Olli Kursu, Aarno Pärssinen, Markku Juntti, University of Oulu, Finland
- 138 **Direct Input-to-Output Neural Network for Efficient Digital Predistortion of MIMO Transmitters**
Andrius Vaičaitis, Anqi Hu, John Dooley, Maynooth University, Ireland
- 142 **Averaged and Cluster DPDs for Beamforming Applications**
Ahmadreza Motaqi¹, Mohamed Helaoui¹, Abubaker Abdelhafiz², Wenhua Chen³, Fadhel M. Ghannouchi¹
¹University of Calgary, Canada; ²Huawei Technologies, Canada; ³Tsinghua University, China

EuMC09: Metasurfaces and Frequency Selective Surfaces

Chair: Francisco Medina, Universidad de Sevilla, Spain

Co-Chair: Alexandros Feresidis, University of Birmingham, UK

16:40–18:20, Monday 4th April 2022, Room 12

- (NA) **Transparent Metal Mesh Metasurfaces**
Themos Kallos, Meta Materials, UK
- 147 **Multimode Scattering Matrix Optimisation for the Mitigation of Harmonics in Anomalous Reflection Metasurfaces**
Matthieu Elineau¹, Renaud Loison¹, Stéphane Méric¹, Raphaël Gillard¹, Pascal Pagani², Geneviève Mazé-Merceur², Philippe Pouliguen³
¹IETR (UMR 6164), France; ²CEA Cesta, France; ³DGA, France
- 151 **Assessment of Compact Digital Metasurface with Beam Control for WBAN Applications**
Kassen Dautov¹, Galymzhan Nauryzbayev¹, Mohammad Hashmi¹, N. Nasimuddin²
*¹Nazarbayev University, Kazakhstan; ²A*STAR, Singapore*
- 155 **Design Process of Novel Electro-Mechanically Tuneable Reflectarray Antennas**
Evangelos Vassos, James Churm, Alexandros Feresidis, University of Birmingham, UK
- 158 **A Broadband Polarization-Independent Frequency Selective Surface with an Inhomogeneous Design**
Andreas Röhrner¹, Georg Strauss¹, Thomas F. Eibert²
¹Hochschule München, Germany; ²Technische Universität München, Germany

EuMC10: Innovative Antenna Methodology and Design

Chair: Stefan Lindenmeier, Universität der Bundeswehr München, Germany

Co-Chair: Hubregt Visser, imec, The Netherlands

16:40–18:20, Monday 4th April 2022, Room 13

- (NA) **RF and Antenna Design Methodology for Reliable Air-to-Ground Mobile Communications**
Adrian Payne, Mark Yetman, Marco Degiorgi, Javier Vazquez, Adrian Green, Mike Philippakis, Chelton, UK
- 163 **A Squint Compensated Fully Differential Patch Antenna for Automotive MIMO Applications**
Jan Schoepfel, Stefan Grueter, Jonas Wagner, Nils Pohl, Ruhr-Universität Bochum, Germany
- 167 **A Circular Polarized Set of Ground Terminal Radiators Capable of Beamforming for the Reception of BGAN Services**
Zafer Toprak, Stefan Lindenmeier, Universität der Bundeswehr München, Germany
- 171 **Frequency-Scanning Multi-Yagi-Uda Array Antenna**
Daan P.P. Daverveld, Ad C.F. Reniers, Hubregt J. Visser, Technische Universiteit Eindhoven, The Netherlands

EuMC11: Front-End and Transceiver Modules

Chair: Lorenz-Peter Schmidt, FAU Erlangen-Nürnberg, Germany

Co-Chair: Ernesto Limiti, Università di Roma "Tor Vergata", Italy

16:40–18:20, Monday 4th April 2022, Room 14

- (NA) **How to Package mmWave MMICs: Understanding the Issues, Avoiding the Problems and Optimising Performance**
Liam Devlin, PRFI, UK
- 180 **Multiple Transmitter Coexistence for 5G RF Front End Modules**
Florinel Balteanu, Serge Drogi, Yunyoung Choi, Junhyung Lee, Hardik Modi, Sabah Khesbak, Bipul Agarwal, Skyworks Solutions, USA
- 184 **A 9-Channel Phase Coherent Receive System for Direction of Arrival Estimation**
Andreas Depold¹, Christian Dorn², Stefan Erhardt¹, Robert Weigel¹, Fabian Lurz³
¹FAU Erlangen-Nürnberg, Germany; ²Universität Bayreuth, Germany; ³Technische Universität Hamburg, Germany
- 188 **A Heterodyne Transceiver with Integrated Calibrator for K/Ka-Band Phased Arrays**
Anton Sieganschin, Nils C. Albrecht, Bartosz Tegowski, Thomas Jaschke, Jan Waldhelm, Nadja J. Lamann, Arne F. Jacob, Technische Universität Hamburg, Germany
- 192 **A K/Ka-Band Front-End for Dual-Beam, Dual-Polarized Tx/Rx Phased Arrays**
Anton Sieganschin, Thomas Jaschke, Jan Waldhelm, Nadja J. Lamann, Arne F. Jacob, Technische Universität Hamburg, Germany

EuMC12: THz Systems and Applications

Chair: Oleksiy Sydoruk, Imperial College London, UK

Co-Chair: Catherine Algani, CNAM, France

16:40–18:20, Monday 4th April 2022, Room 17

- (NA) **Uses of Terahertz Pulse Techniques in Industry**
Philip F. Taday, TeraView, UK
- 197 **A 56.32Gb/s 16-QAM Link Over Dielectric Fiber Using a D-Band Channel Bonding Transceiver**
J.L. Gonzalez Jimenez, Baudouin Martineau, A. Hamani, A. Siligaris, Francesco Foglia-Manzillo, F. Hameau, Cédric Dehos, CEA-Leti, France
- 201 **Wideband High-Gain Transmitarray Antenna for Point-to-Point Communications at 300GHz**
Orestis Koutsos¹, Francesco Foglia-Manzillo¹, Antonio Clemente¹, Ronan Sauleau²
¹CEA-Leti, France; ²IETR (UMR 6164), France
- 205 **Short Range Wireless Transmission Using a 295–315GHz Superheterodyne Link Targeting IEEE802.15.3d Applications**
Dominik Wrana¹, Laurenz John², Benjamin Schoch¹, Sandrine Wagner², Ingmar Kallfass¹
¹Universität Stuttgart, Germany; ²Fraunhofer IAF, Germany
- 209 **22Gbps/80cm Low-Cost THz Wireless System**
Jue Wang¹, Abdullah Al-Khalidi¹, Sean Ahearne², Edward Wasige¹
¹University of Glasgow, UK; ²Dell Technologies, Ireland

EuMC13: Non-Planar Passive Components

Chair: Cristiano Tomassoni, Università di Perugia, Italy

Co-Chair: Yi Wang, University of Birmingham, UK

09:00–10:40, Tuesday 5th April 2022, Room 4

- 217 **Methods for Attenuating and Terminating Waves in Ridge Gap Waveguide at W-Band: Carbon-Loaded Foam, Carbonyl Iron Paint, and Nickel Plating**
Artem R. Vilenskiy, Yingqi Zhang, Marianna V. Ivashina, Chalmers University of Technology, Sweden
- 221 **Design of Compact and High Q-Factor W-Band Cavity in 0.18- μ m CMOS Technology**
Tomoki Fukuda, Baichuan Chen, Samundra K. Thapa, Adel Barakat, Ramesh Pokharel, Kyushu University, Japan
- 225 **Compact C-Band Wilkinson Power Divider in Empty Substrate Integrated Coaxial Line**
José M. Merello, Vicente Nova, Carmen Bachiller, Vicente E. Boria, Universitat Politècnica de València, Spain
- 229 **Full-Band Millimeter Wave Waveguide Magic Tees and Power Dividers for Manufacturing Ability**
Lingyun Ren, Yonghui Shu, Eravant, USA

EuMC14: Electromagnetic Scattering and Diffraction Effects

Chair: Ke Wu, Polytechnique Montréal, Canada

Co-Chair: Tan-Phu Vuong, IMEP-LAHC (UMR 5130), France

09:00–10:40, Tuesday 5th April 2022, Room 13

- 233 **Angle-Dependent Reflectivity of Microwave Absorbers at Oblique Wave Incidence**
Willi Hofmann, Andreas Schwind, Christian Bornkessel, Matthias A. Hein, Technische Universität Ilmenau, Germany
- 237 **Time and Frequency Analysis of Rough Surface Scattering in the THz Spectrum**
Toby Attwood¹, Emily Adams¹, Suzanna Freer¹, Alexander J. Vernon², Stephen M. Hanham¹, Costas Constantinou¹, Leyre Azpilicueta³, Miguel Navarro-Cía¹
¹University of Birmingham, UK; ²King's College London, UK; ³Tecnológico de Monterrey, Mexico
- 241 **Uncertainty Quantification for the RCS of a Coated Target Using an IBC-Based Metamodel**
Pascal Pagani, Pierre Minvielle-Larrousse, Muriel Sesques, CEA Cesta, France
- 245 **Scattering Characterization of a Blended Wing Body Using Numerical Simulations**
Raffaele Scuderi, Dassault Systèmes, Italy
- 249 **Sensing the Charged-Particle Beam Position Using the Terahertz Range Diffraction Radiation from Two Dielectric Rods Covered with Graphene**
Dariia O. Herasymova, NASU, Ukraine

EuMC15: Metamaterial Based Devices and Applications

Chair: Ferran, Martín, Universitat Autònoma de Barcelona, Spain

Co-Chair: Pierre Blondy, XLIM (UMR 7252), France

09:00–10:40, Tuesday 5th April 2022, Room 14

- 253 **Metamaterial Lens for Monopulse Beamforming with a 77-GHz Long-Range Radar**
Christoph Kohlberger¹, Richard Hüttner², Andreas Stelzer²
¹Silicon Austria Labs, Austria; ²Johannes Kepler Universität Linz, Austria
- 257 **Stacked Metasurfaces for Misalignment Improvement of WPT System Using Spiral Resonators**
Yutaro Ikeda, Xin Jiang, Mohamed Aboualalaa, Adel Barakat, Kuniaki Yoshitomi, Ramesh Pokharel, Kyushu University, Japan
- 261 **Beam-Scanning Leaky-Wave Antenna Based on Dielectric Image-Line for Millimetre-Wave Applications**
Solomon Mingle, Despoina Kampouridou, Alexandros Feresidis, University of Birmingham, UK
- 265 **On the Capacitance of Slotted Metamaterial Resonators for Frequency-Variation Permittivity Sensing**
Jonathan Muñoz-Enano¹, Paris Vélez², Lijuan Su¹, Marta Gil³, Pau Casacuberta¹, Ferran Martín¹
¹Universitat Autònoma de Barcelona, Spain; ²IMB-CNM-CSIC, Spain; ³Universidad Politécnica de Madrid, Spain
- 269 **Ultra-Compact Ka-Band Metamaterial Waveguide Filters, Fabricated by Lost-Wax Casting**
M. Khatibi Moghaddam¹, M. Khosrownejad², Romain Fleury¹
¹EPFL, Switzerland; ²MinWave Technologies, Switzerland

EuMC16: Integrated Components for Transceivers

Chair: Almudena Suárez Rodríguez, Universidad de Cantabria, Spain

Co-Chair: Souheil Ben Smida, Heriot-Watt University, UK

09:00–10:40, Tuesday 5th April 2022, Room 17

- 273 **Receive and Transmit Beamforming SiGe BiCMOS ICs for Scalable E-Band Phased Arrays**
Mikko Varonen, Antti Lamminen, Mikko Kantanen, Jan Holmberg, Arto Rantala, Manu Lahdes, Jussi Säily, Dristy Parveg, Mikko Kaunisto, Jouko Aurinsalo, VTT, Finland
- 277 **A Q-Band Capable Sampler for Direct Microwave Sampling in Software Defined Radio Context**
R. Pilard, M. Martin, O. Legendre, F. Boré, J. Palmigiani, S. Renane, Teledyne e2v, France
- 281 **Amplifier Bias for Minimum Noise Figure in Thermally Constrained Systems**
Anton Sieganschin, Nils C. Albrecht, Thomas Jaschke, Arne F. Jacob, Technische Universität Hamburg, Germany
- 285 **A Novel GaN/SiC MMIC Gain Switch Using a Resonant Bidirectional FET Amplifier**
Hiroshi Mizutani¹, Ryo Ishikawa², Kazuhiko Honjo²
¹Salesian Polytechnic, Japan; ²University of Electro-Communications, Japan

EuMC17: New Design Concepts for Microwave Filters in Planar and Hybrid Technologies

Chair: Roberto Gómez-García, Universidad de Alcalá, Spain

Co-Chair: Talal Skaik, University of Birmingham, UK

11:20–13:00, Tuesday 5th April 2022, Room 1

- 289 **Spatiotemporal Modulated Three-Pole Non-Reciprocal Quasi-Elliptic Bandpass Filter**
*David Chatzichristodoulou¹, Salman Arain², Charalambos Pavlou³, Loukia Vassiliou⁴,
Dimitra Psychogiou⁵, Symeon Nikolaou¹, Photos Vryonides¹*
¹Frederick Research Center, Cyprus; ²NFC-IEFR, Pakistan; ³University of Cyprus, Cyprus;
⁴Agricultural Research Institute, Cyprus; ⁵University College Cork, Ireland
- 293 **Transversal-Coupled-Line Dual-Band Bandpass Planar Filters with Quasi-Elliptic-Type Response**
Li Yang¹, Mohamed Malki¹, Maoyu Fan², Roberto Gómez-García¹
¹Universidad de Alcalá, Spain; ²UESTC, China
- 297 **ANN Model Development for Tunable Bandpass Filter**
Chandan Roy¹, Ping Zhao², Ke Wu¹
¹Polytechnique Montréal, Canada; ²Xidian University, China
- 301 **Reconfigurable Transfer Function BST Acoustic Wave Lumped Element Resonator Filters**
Suhyun Nam¹, Dimitra Psychogiou², Amir Mortazawi¹
¹University of Michigan, USA; ²University of Colorado Boulder, USA
- 305 **Quad-Band Bandpass Filter Using Modified Asymmetric Stepped Impedance Resonators**
*Shi-Peng Chen¹, Yung-Wei Chen², Sung-Pu Wu¹, Hung-Wei Wu¹,
Chow-Yen-Desmond Sim¹*
¹Feng Chia University, Taiwan; ²Kun Shan University, Taiwan

EuMC18: Frequency Generation, Conversion and Nonlinear Modelling

Chair: Nils Weimann, Universität Duisburg-Essen, Germany

Co-Chair: Tom Keinicke Johansen, Technical University of Denmark, Denmark

11:20–13:00, Tuesday 5th April 2022, Room 4

- 309 **A Static Frequency Divider in GaN HEMT Technology**
F. Strömbeck, Z.S. He, H. Zirath, D. Kuylenstierna, Chalmers University of Technology, Sweden
- 313 **Blind Receiver Distortion Compensation**
Dhecha Nopchinda¹, Thomas Eriksson², Koen Buisman²
¹University College London, UK; ²Chalmers University of Technology, Sweden
- 317 **Analysis of Inductively Injection Locked Oscillators at an Integer Frequency Ratio**
Franco Ramírez¹, Robert Melville², Almudena Suárez¹
¹Universidad de Cantabria, Spain; ²Emecon, USA
- 321 **Analysis of Clock Signals Imperfections and Their Impact on an N-Path Frequency Down-Converter**
Pierre Labrunée¹, Jacques Sombrin², Jacques David¹, Jean-Louis Cazaux¹
¹LAPLACE (UMR 5213), France; ²TéSA, France
- 325 **A Real-Valued 4D Memory Polynomial Algorithm for Mixer Modeling**
*Nima Hajiabdollahi¹, Siqi Wang¹, Christian Fager¹, Halil Volkan Hünerli²,
Thomas Eriksson¹*
¹Chalmers University of Technology, Sweden; ²Ericsson, Sweden

EuMC19: 3D Printing: Processes and Reliability

Chair: Adrian Porch, Cardiff University, UK

Co-Chair: Yi Wang, University of Birmingham, UK

11:20–13:00, Tuesday 5th April 2022, Room 13

- (NA) **Space Qualified Additive Manufacturing for RF Components**
Esteban Menargues, SWISSto12, Switzerland
- 330 **Reliability Investigations of Additive Manufactured RF-Structures on Low-Cost PCB Materials Based on Inkjet Technology**
Michael Schmalzbauer¹, Johannes Jakob², Franz Xaver Röhr¹, Felix Sepaintner², Andreas Scharl², Kai Löbbicke¹, Werner Bogner², Stefan Zorn¹
¹Rohde & Schwarz, Germany; ²Technische Hochschule Deggendorf, Germany
- 334 **Thermal Stability Analysis of 3D Printed Resonators Using Novel Materials**
Lu Qian¹, Sheng Li¹, Moataz Attallah¹, Talal Skaik¹, Paul Booth², Laurent Pambaguian³, César Miquel España³, Petronilo Martín-Iglesias³, Yi Wang¹
¹University of Birmingham, UK; ²Airbus, UK; ³ESA, The Netherlands
- 338 **Performance of SLA and DMLS 3D Printed Ka-Band Resonators with Integrated Coaxial Launchers**
Jake Cazden¹, Ljubodrag Boskovic¹, Erik Lier², Thomas Hand², William N. Kefauver², Dejan Filipovic¹
¹University of Colorado Boulder, USA; ²Lockheed Martin, USA
- 342 **Different Metallization Techniques Using a 3D Printed E-Band Orthomode Transducer**
Tim Freialdenhoven¹, Patrick Witte¹, Stephan Koß², Johannes Henrich Schleifenbaum², Thomas Dallmann¹
¹Fraunhofer FHR, Germany; ²RWTH Aachen University, Germany

EuMC20: Advanced High Efficiency Power Amplifier Techniques

Chair: Paul Tasker, Cardiff University, UK

Co-Chair: Francesc Purroy, Huawei Technologies, Sweden

11:20–13:00, Tuesday 5th April 2022, Room 14

- 346 **Phase Compensated Sequential Load Modulated Balanced Amplifier Using Harmonically Tuned Control Amplifier**
Chenhao Chu¹, Tushar Sharma², Sagar K. Dhar², Ramzi Darraji³, Jingzhou Pang⁴, Anding Zhu¹
¹University College Dublin, Ireland; ²Renesas Electronics, USA; ³Ericsson, Canada; ⁴Chongqing University, China
- 350 **A Wideband Highly-Efficient Linearizable 700W Doherty Power Amplifier**
Mitra Gilasgar, Sjoerd van Nederveen, Ampleon, The Netherlands
- 354 **An Enhanced Active Load-Pull Algorithm for Faster Convergence**
Cory Davies-Smith¹, Roberto Quaglia¹, Simon Woodington², Aamir Sheikh², Paul Tasker¹
¹Cardiff University, UK; ²Mesuro, UK
- 358 **A 2-GHz 79%-PAE Power Amplifier with a Novel Harmonic Tuning Circuit Using Only CRLH TLs**
Shinichi Tanaka, Naoki Iisaka, Shibaura Institute of Technology, Japan
- 362 **Bandwidth and Power Back-Off Performances of a Class-EM/F₃ Power Amplifier**
Moïse Safari Mugisho¹, Mury Thian², Anna Piacibello³, Vittorio Camarchia³, Rüdiger Quay¹
¹Fraunhofer IAF, Germany; ²Ericsson, Sweden; ³Politecnico di Torino, Italy

EuMC21 : EuMC Posters 1

Chair: Mustafa Bakr, University of Oxford, UK

10:40–13:30, Tuesday 5th April 2022, Exhibition Hall

- 366 **Compact Wideband Circularly Polarized Quarter-Mode Substrate Integrated Waveguide Antenna for Low-Cost 2.4GHz RFID Reader**
Yongsheng Pan, Yuandan Dong, UESTC, China
- 370 **Miniaturized and Process-Tolerant Ku-Band Power Dividers Using GaN on SiC**
Volkan Erturk¹, Batuhan Sutbas², Ekmel Ozbay¹, Abdullah Atalar¹
¹Bilkent University, Turkey; ²IHP, Germany
- 374 **Micromachined W-Band Eight-Way Power Divider Based on Micro-Coaxial Lines**
Ruihua Liang, Guanghua Shi, Minjie Shu, Zixian Wu, Cheng Guo, Anxue Zhang, Xi'an Jiaotong University, China
- 377 **Bandpass Filter at 5GHz with Reconfigurable Bandwidth Using Integrated ScDDAs**
Rozenn Allanic¹, Denis Le Berre¹, Yves Quéré¹, Cédric Quendo¹, David Chouteau², Virginie Grimal², Damien Valente², Jérôme Billoué²
¹Lab-STICC (UMR 6285), France; ²GREMAN (UMR 7347), France
- 381 **LTCC Implementation for Compact CSIW Resonators with Strong Coupling for Advanced Filters in 5G Applications**
E. Dومانis¹, Brian J. Laughlin², C.A. Lu³, J.J. Yu³, Kalyan Rapolu²
¹Nokia Bell Labs, Finland; ²DuPont, USA; ³ITRI, Taiwan

EuMC21 continued...

- 385 **A Novel Concept in Design of Microwave Planar Dual Band Filter Having the Controllable Closed/Isolated Bands by Using the Simple Vias and the Slow Wave Effect for 5G/IoT Applications**
Ceyhun Karpuz¹, Pinar Ozturk Ozdemir², Huriye Senol¹, Alperen Cengiz¹, Hasan Huseyin Balik², Adnan Gorur³
¹Pamukkale University, Turkey; ²National Defence University, Turkey; ³Niğde Ömer Halisdemir University, Turkey
- 389 **A Novel Chip to PCB-Half-Embedded Waveguide Transition**
T. Lampersberger¹, Reinhard Feger¹, M.J. Lang², J. Minichshofer², S.W. Sattler³, Andreas Stelzer¹
¹Johannes Kepler Universität Linz, Austria; ²Infineon Technologies, Austria; ³AT&S, Austria
- 393 **Design and Test of Wearable Textile-Based Transmission Lines**
Rahil Joshi¹, Symon K. Podilchak¹, Constantine Constantinides², Bob Low³
¹University of Edinburgh, UK; ²Alba Orbital, UK; ³J&D Wilkie, UK
- 397 **Design of 130–290GHz Rectangular COC Fibers for High-Speed Data Links**
Noman Siddique¹, Yinggang Li², Haisu Li³, Qigejian Wang¹, Muhammad Talal Ali Khan¹, Jonas Hansryd², Shaghik Atakaramians¹
¹UNSW Sydney, Australia; ²Ericsson, Sweden; ³Beijing Jiaotong University, China
- 401 **Access Modelling-Based De-Embedding Method for High-Frequency Characterization of Uni-Traveling Carrier Photodiodes**
Djeber Guendouz¹, Marina Deng¹, Chhandak Mukherjee¹, Christophe Caillaud², Patrick Mounaix¹, Magali De Matos¹, Cristell Maneux¹
¹IMS (UMR 5218), France; ²III-V Lab, France

EuMC21 continued...

- 405 **Physical Coupling Background of In-Line-Connectors at System and Vehicle Level**
Emanuel Panholzer¹, Martin Aidam², Walter Franz², Stefan Lindenmeier¹
¹Universität der Bundeswehr München, Germany; ²Mercedes-Benz, Germany
- 409 **Simulation of Granular Media by Numerical Characterization in the Microwave Range in Coaxial Line and in Free Space**
C. Prigent¹, P. Lacoste¹, Geneviève Mazé-Merceur¹, N. Malléjac²
¹CEA Cesta, France; ²CEA Le Ripault, France
- 413 **Microstrip Coupled-Line Directional Coupler for High-Sensitivity Dielectric Constant Measurement**
Zahra Rahimian Omam¹, Vahid Nayyeri², Omar M. Ramahi³
¹Bilkent University, Turkey; ²IUST, Iran; ³University of Waterloo, Canada
- 417 **Measurement Uncertainties for Mixed-Mode S-Parameters**
Karsten Kuhlmann¹, Frauke Gellersen¹, Rainer Pöhmerer²
¹PTB, Germany; ²LEONI Kabel, Germany
- 421 **Characterization of Microwave Substrates for High Accuracy and Long-Term Stability Using Full-Wave Microstrip Ring Resonator Method**
Yuanyan Su¹, Matthieu Pellaton², Christoph Affolderbach², Gaetano Mileti², Miroslav Veljovic¹, Anja Skrivervik¹
¹EPFL, Switzerland; ²Université de Neuchâtel, Switzerland
- 425 **Inter-Laboratory Comparison of On-Wafer Broadband 70kHz–220GHz Single-Sweep Measurements**
Andrej Rumiantsev¹, Ralf Doerner², J. Martens³, Steve Reyes³
¹MPI, Taiwan; ²FBH, Germany; ³Anritsu, USA

EuMC22: Advanced Implementations for Substrate-Integrated and Quasi-Planar Filters

Chair: Michael Höft, CAU, Germany

Co-Chair: Anthony Ghiotto, IMS (UMR 5218), France

14:20–16:00, Tuesday 5th April 2022, Room 1

- 429 **A Compact Filter with Dual-Mode Folded Circular SIW Cavities**
Anton Sieganschin, Bartosz Tegowski, Arne F. Jacob, Technische Universität Hamburg, Germany
- 433 **Ultra-Broadband SIW Diplexer on Low-Cost Laminate Technology for Channel Bonding D-Band Front Ends**
A. Hamani, J.L. Gonzalez Jimenez, Benjamin Blampey, Cédric Dehos, A. Siligaris, F. Hameau, Francesco Foglia-Manzillo, CEA-Leti, France
- 437 **Compact and Low-Loss Stripline Bandpass Filters Made of Liquid Crystal Polymer for n257 and n258 Applications**
Yuta Hasegawa¹, Masayuki Ota¹, Toshiya Iwamura¹, Yusuke Nakatani², Naoki Oyaizu¹, Koichiro Masuko¹, Ning Guan¹
¹Fujikura, Japan; ²Tohoku Fujikura, Japan
- 441 **First Demonstration of Ultra-Miniaturized, High-Performance Filters on Alumina Ribbon Ceramic Substrates for 5G Applications**
Nahid Aslani-Amoli¹, Fuhan Liu¹, Madhavan Swaminathan¹, Cheng-Gang Zhuang², Nikolay Z. Zhelev², Seong-Ho Seok², Cheolbok Kim²
¹Georgia Tech, USA; ²Corning, USA
- 445 **Half-Mode Substrate Integrated Waveguide Filters with Arbitrarily Inserted Transmission Zeros**
Yilong Zhu, Yuandan Dong, UESTC, China

EuMC23: 5G Communication and Beyond

Chair: Yinggang Li, Ericsson, Sweden

Co-Chair: Miguel Navarro-Cía, University of Birmingham, UK

14:20–16:00, Tuesday 5th April 2022, Room 13

- (NA) **Millimeter-Wave and Sub-TeraHz Technology and Research Trends for “Beyond 5G” Applications — An Industry View**
Renato Lombardi, Huawei Technologies, Italy
- 450 **28GHz Over-the-Air Measurement Using an OTFS Multi-User Distributed MIMO**
Noriaki Tawa, Toshihide Kuwabara, Yasushi Maruta, Tomoya Kaneko, NEC, Japan
- 454 **Modulated-Signal-Based EM/RF/DSP Co-Simulation Framework for Predictive Analysis of Fully Digital MIMO Transmitters**
Jin Gyu Lim, Hang Yu, Emile Traore, Mohammed Almoneer, Jingjing Xia, Slim Boumaiza, University of Waterloo, Canada
- 458 **E-Band Transmitter with 3W Complex Modulated Signal Output Power Performance**
Benjamin Schoch¹, Dominik Wrana¹, Ralf Henneberger², Sandrine Wagner³, Erdin Ture³, Axel Tessmann³, Ingmar Kallfass¹
¹Universität Stuttgart, Germany; ²Radiometer Physics, Germany; ³Fraunhofer IAF, Germany
- 462 **Delay-Coded Communication for PHY Layer Security**
L. Manica, Collins Aerospace, Italy

EuMC24: Advances in Electromagnetic Modeling and Numerical Techniques

Chair: Alessandro Galli, Università di Roma “La Sapienza”, Italy

Co-Chair: Walter Fuscaldo, CNR-IMM, Italy

14:20–16:00, Tuesday 5th April 2022, Room 14

- 466 **Segmentation of a Complex Horn Antenna for Efficient Analysis and Optimization**
Lucas Polo-López¹, Juan Córcoles², Jorge A. Ruiz-Cruz², José R. Montejo-Garai³, Jesús M. Reboilar³
¹IETR (UMR 6164), France; ²Universidad Autónoma de Madrid, Spain; ³Universidad Politécnica de Madrid, Spain
- 470 **A Cost-Effective Method for Extracting the Complex Permittivity of Inner Layer Dielectric PCB Materials**
Andreas Scharl¹, Felix Sepaintner¹, Johannes Jakob¹, Franz Xaver Röhr², Werner Bogner¹, Stefan Zorn²
¹Technische Hochschule Deggendorf, Germany; ²Rohde & Schwarz, Germany
- 474 **Preserving Causality in Time Domain Integral Equation-Based Methods**
Fabrizio Loreto¹, Daniele Romano¹, Giulio Antonini¹, Martin Stumpf², Ioan E. Lager³, Guy A.E. Vandenbosch⁴
¹Università dell'Aquila, Italy; ²Brno University of Technology, Czechia; ³Technische Universiteit Delft, The Netherlands; ⁴KU Leuven, Belgium
- 478 **A Finite Element Formulation for Waveguides with First and Second Order Symmetries**
Gines Garcia-Contreras, Juan Córcoles, Jorge A. Ruiz-Cruz, Universidad Autónoma de Madrid, Spain

EuMC25 : EuMC Posters 2

Chair: Mustafa Bakr, University of Oxford, UK

13:50–16:40, Tuesday 5th April 2022, Exhibition Hall

- 486 **A Linear-to-Circular Polarization Converter with Wide Angular Stability and High Ellipticity for Ka-Band Applications**
Mohammad Ayoub Sofi¹, Kushmanda Saurav¹, Shibhan Kishen Koul²
¹IIT Jammu, India; ²IIT Delhi, India
- (NA) **Integrated Antenna Module for 5G Applications**
Zunnurain Ahmad, Khai Yuan Chang, Heinrich Heiss, Hans-Dieter Wohlmuth, Infineon Technologies, Germany
- 494 **A Wideband Circularly Polarized Horn Antenna Using Transmission Type Linear to Circular Polarization Converter for Ka-Band Applications**
Javid Ahmad Ganie, Kushmanda Saurav, IIT Jammu, India
- 498 **Evaluations of the Vector Electric Field Under a Wideband Transmitting Conical Antenna**
Damien Gapillout, Alice Delsert, Jean-Christophe Diot, Bernard Crabos, Jean-Luc Lavergne, CEA Gramat, France
- 502 **Rational Fitting with Weighted Iteration (RFWI) with Application to Chassis Antenna**
Yuming Bai, Peter Gardner, University of Birmingham, UK
- 506 **Reverberation-Chamber Performance of the Oscillating-Wall Stirrer for Estimating Antenna Efficiency**
Anouk Hubrechsen, Ad C.F. Reniers, A.B. Smolders, Laurens A. Bronckers, Technische Universiteit Eindhoven, The Netherlands

EuMC25 continued...

- 510 **A Local Hot-Cold Antenna Measurement System**
Sean Manas¹, Jacki Gilmore¹, Elmine Meyer²
¹Stellenbosch University, South Africa; ²Technische Universiteit Eindhoven, The Netherlands
- (NA) **Wide-Band, Dual Circularly-Polarized, Slot Antenna for 5G- and Beyond- Applications**
Abdullah Haskou, Ali Louzir, Anthony Pesin, InterDigital, France
- 518 **Wideband Dual Polarized Shared Aperture Antenna for LTE Applications**
Yang Cheng, Yuandan Dong, UESTC, China
- 522 **A Dual-Band Flexible Printed Graphene Antenna Array for 2.4 and 5GHz WLAN IoE Applications**
Xinyao Zhou, Ting Leng, Kewen Pan, Zhirun Hu, University of Manchester, UK
- (NA) **Miniaturized Supershaped Sinuous Antennas**
G. Mevoli¹, C.M. Lamacchia², P. Bia³, A. Manna³, D. Caratelli⁴, L. Mescia¹
¹Politecnico di Bari, Italy; ²IAMatek, Italy; ³Elettronica, Italy; ⁴Antenna Company, The Netherlands
- 530 **High Performance C/Ku Band Dual Polarization Feed System for 25 Meters Cassegrain Reflector Antenna**
Oleksandr Sushko¹, Rostyslav Dubrovka², Stepan Piltyay¹, Serhii Martyniuk¹, Fedir Dubrovka¹
¹NTUU KPI, Ukraine; ²Queen Mary University of London, UK

EuMC25 continued...

- 534 **Air-Filled Cavity-Backed 28GHz Antenna Array Implemented by 2.5D PCB Process and Network Analysis**
H. Takahashi¹, S.W. Sattler², E. Schlaffer², B. Reitmaier², Hossein Sarbandi Farahani¹, H. Paulitsch¹, Wolfgang Bösch¹
¹Technische Universität Graz, Austria; ²AT&S, Austria
- 538 **20GHz Dual-Polarized Array Antenna with Low Cross-Polarization and High Gain**
Qingling Yang¹, Yi Wang¹, Steven Gao²
¹University of Birmingham, UK; ²University of Kent, UK

EuMC26: Novel 3D Printing Approaches for mm-Wave Applications

Chair: Tudor Williams, Filtronic, UK

Co-Chair: Miguel Navarro-Cía, University of Birmingham, UK

16:40-18:20, Tuesday 5th April 2022, Room 13

- (NA) **Additively Manufactured Electronic (AME) Devices for mmWave Applications**
Jaim Nulman, Nano Dimension, USA
- 547 **3D-Printed Dielectric Dual Lens for a 140GHz CMOS Radar Transceiver**
Juan C. Garcia-Santos¹, Bart Nauwelaers¹, Guy A.E. Vandenbosch¹, Siddhartha Sinha², Miguel Glassee², Ilja Ocket²
¹KU Leuven, Belgium; ²imec, Belgium
- 551 **Aerosol Jet Printed Microstrip Lines on Polyimide for D-Band**
Georg Gramlich, Joachim Hebel, Christian Bohn, Uli Lemmer, Thomas Zwick, KIT, Germany
- 555 **Three-Dimensional Printing of a Waveguide Termination for Millimeter Wave Applications**
Evan Roué¹, Vincent Laur¹, Alexis Chevalier¹, Gérard Tanné¹, Camille Patris², Olivier Vendier², Rose-Marie Sauvage³
¹Lab-STICC (UMR 6285), France; ²Thales, France; ³DGA, France
- 559 **Comparison of E-Band SLM and SLA Printed Waveguides and Automotive Radar Antennas**
Aleksandar Dukanovic¹, Maximilian Eschbaumer²
¹Technische Universität München, Germany; ²Infineon Technologies, Germany

EuMC27: Measurements for 5G and 6G Systems

Chair: Jon Martens, Anritsu, USA

Co-Chair: Tian Hong Loh, NPL, UK

16:40–18:20, Tuesday 5th April 2022, Room 14

- (NA) **Sub THz Bands for 6G: 10× the Bandwidth with 10× the Problems?**
Michael Dieudonné, Keysight Technologies, Belgium
- 564 **A Novel OTA Near-Field Measurement Approach Suitable for 5G mmWave Validation and Test**
Martin Laabs¹, Dirk Plettemeier¹, Thomas Deckert², Vincent Kotzsch³, Marc Vanden Bossche⁴
¹Technische Universität Dresden, Germany; ²National Instruments, USA; ³National Instruments, Germany; ⁴National Instruments, Belgium
- 568 **Benchmarking of GHz Resonator Techniques for the Characterisation of 5G / mmWave Materials**
M. Celuch¹, M.J. Hill², Tomasz Karpisz³, M. Olszewska-Placha¹, S. Phommakesone⁴, U. Ray⁵, Bartłomiej W. Salski³
¹QWED, Poland; ²Intel, USA; ³Warsaw University of Technology, Poland; ⁴Keysight Technologies, USA; ⁵iNEMI, USA
- 572 **Transient Phased Array Distortion Measurements**
J. Martens, Anritsu, USA
- 576 **Delay Spread Estimation in Presence of Obstruction Medium for 6G Channels**
Priyansha Kaurav, Shibhan Kishen Koul, Ananjan Basu, IIT Delhi, India

EuMC28: 5G and mm-Wave Arrays

Chair: Tomoya Kaneko, NEC, Japan

Co-Chair: Lehu Wen, University of Kent, UK

16:40–18:20, Tuesday 5th April 2022, Room 17

- 580 **A 39GHz MU-MIMO Using 256 Element Hybrid AAS with Coherent Beam-Forming for 5G and Beyond IAB Applications**
Toshihide Kuwabara, Noriaki Tawa, Yasushi Maruta, Shinichi Hori, Tomoya Kaneko, NEC, Japan
- 584 **An Eight-Port Antenna Array for 5G MIMO Handset**
Long Qian¹, Xiaodong Chen¹, Wei Hu²
¹Queen Mary University of London, UK; ²Xidian University, China
- 588 **26GHz Band Beam-Steered Antenna for mm-Wave 5G Systems**
M. Rabbani¹, James Churm¹, S. Payami², M. Khalily², P. Xiao², R. Rahim Tafazolli², T.H. Loh³, Alexandros Feresidis¹
¹University of Birmingham, UK; ²University of Surrey, UK; ³NPL, UK
- 592 **Scalable Planar Phased Array Antenna with Dual Polarization and Metasurface Shield at 28GHz**
M.W. Rousstia, J. Zhao, S. Kits, Sergio C. Pires, Ampleon, The Netherlands
- 596 **Low-Coupling and Dual-Polarized Horn-Based Antenna Array Aimed to Massive MIMO Applications**
T.H. Brandão, H.R.D. Filgueiras, Arismar Cerqueira S. Jr., Inatel, Brazil

EuMC29: On the Occasion of Nikola Tesla's 165th Anniversary

Chair: Djuradj Budimir, University of Westminster, UK

Co-Chair: Zoya Popovic, University of Colorado Boulder, USA

09:00-10:40, Wednesday 6th April 2022, Room 6

- (NA) **"No Bigger Than a Pocketwatch": Nikola Tesla's Early Vision of the Information Age**
W. Bernard Carlson, University of Virginia, USA
- (NA) **Advanced Retrodirective System for Beam WPT**
Naoki Shinohara, University of Virginia, USA
- (NA) **Tesla and Marconi: Wireless Energy and Information Transfer**
Alessandra Costanzo¹, Zoya Popović²
¹Università di Bologna, Italy; ²University of Colorado Boulder, USA
- (NA) **On Smart Energy Systems Supported by Wireless Networks**
Vladimir Terzija, Sinisa Djurovic, Dragorad Milanovic, Dragan Cetenovic, Skoltech, Russia
- (NA) **Unlock the Secret Key of Nikola Tesla to Free Energy**
Xiaoqiang Gu, Ke Wu, Polytechnique Montréal, Canada

EuMC30: Asia Pacific Focused Session

Chair: Yi Wang, University of Birmingham, UK

Co-Chair: Tomoya Kaneko, NEC, Japan

09:00-10:40, Wednesday 6th April 2022, Room 9

- 605 **Millimeter-Wave Digital Beam-Forming Massive-MIMO and Distributed-MIMO Technologies and Their Verifications Toward 5G-Beyond Further Capacity Enhancement**
Tomoya Kaneko, NEC, Japan
- 606 **Material Characterization Using Power Measurements: Miracle of Machine Learning**
Tahoura Mosavirik¹, Mohammad Hashemi², Mohammad Soleimani¹, Vahid Nayyeri¹, Omar M. Ramahi³
¹IUST, Iran; ²University of Tehran, Iran; ³University of Waterloo, Canada
- 610 **Metamaterial Inspired Geometries for Wireless Power Transfer to Biomedical Implants**
Ramesh Pokharel¹, Adel Barakat¹, Costas Sarris²
¹Kyushu University, Japan; ²University of Toronto, Canada
- 611 **Plane Wave Generator Design for 5G Massive MIMO Base Stations OTA Testing**
Shiyao Zhu, Zhengpeng Wang, Yusheng Zhang, Jungang Miao, Beihang University, China

EuMC31 : Electromagnetic Interactions, Environmental and Biological Applications

Chair: Michał Mrozowski, Gdansk University of Technology, Poland

Co-Chair: Ioan E. Lager, Technische Universiteit Delft, The Netherlands

09:00–10:40, Wednesday 6th April 2022, Room 10

- 614 **On the Potential for Viruses as Nano Microwave Transmitters**
Gabriel G. Machado, Vincent F. Fusco, Queen's University Belfast, UK
- 618 **Impact of Small-Cell Deployment on Combined Uplink and Downlink RF Exposure Compared to the Status Quo in Mobile Networks**
Lisa-Marie Schilling, Christian Bornkessel, Matthias A. Hein, Technische Universität Ilmenau, Germany
- 622 **Microwave-Assisted Chemical Recycling for Polymeric Waste Valorisation**
I. Julián, C. González-Niño, A. Frisa-Rubio, N. García-Polanco, CIRCE, Spain
- 626 **A Microdosimetric Study at the Cellular and Intracellular Level Using a 3D Realistic Cell Model**
Laura Caramazza¹, Annalisa De Angelis², Zain Haider³, Maxim Zhadobov³, Franck Andre⁴, Lluís M. Mir⁴, Francesca Apollonio¹, Micaela Liberti¹
¹Università di Roma "La Sapienza", Italy; ²IIT, Italy; ³IETR (UMR 6164), France; ⁴METSY (UMR 9018), France
- 630 **Analogous Maxwellian Algorithm for Photon Geodesic Calculation in General Static Isotropic Metrics**
Enderson Falcón-Gómez¹, Gabriel Santamaría-Botello², Vittorio De Falco³, Adrián Amor-Martín¹, Valentín de la Rubia⁴, Luis Enrique García Muñoz¹
¹Universidad Carlos III de Madrid, Spain; ²University of Colorado Boulder, USA; ³Università di Napoli Federico II, Italy; ⁴Universidad Politécnica de Madrid, Spain

EuMC32 : Calibration Techniques and Nonlinear Measurements

Chair: Nuno Borges Carvalho, Universidade de Aveiro, Portugal

Co-Chair: Anding Zhu, University College Dublin, Ireland

09:00–10:40, Wednesday 6th April 2022, Room 11

- (NA) **Load-Pull Techniques with Wideband Modulated Signals: State-of-the-Art and Future**
Gustavo Avolio, Antevorta-mw, The Netherlands
- 635 **Increasing the Accuracy of Interpolated Calibration with a Local Rational Modelling Technique**
Dries Peumans, Sander De Keersmaeker, Jeroen De Geeter, Yves Rolain, Vrije Universiteit Brussel, Belgium
- 639 **Design of Microwave Calibration Standards for Characterising S-Parameters of Quantum Integrated Circuits at Millikelvin Temperatures**
M. Stanley, S.E. de Graaf, T. Lindström, M.J. Salter, J. Skinner, Nick M. Ridler, NPL, UK
- 643 **Mode Purity Evaluation for OAM Communication Using Integrated Loop Antenna Array**
Haruki Kikuchi, Akira Saitou, Wataru Wada, Hiroshi Suzuki, Kazuhiko Honjo, Ryo Ishikawa, University of Electro-Communications, Japan
- 647 **Emulation of Non-Reciprocity Applied in Load-Modulated Power Amplifier Architectures Using Single Amplifier Load-Pull Measurements**
Jose-Ramon Perez-Cisneros, Han Zhou, Christian Fager, Koen Buisman, Chalmers University of Technology, Sweden

EuMC33: Sub-10GHz Antennas

Chair: James Kelly, Queen Mary University of London, UK

Co-Chair: Kamil Yavuz Kapusuz, Ghent University, Belgium

09:00–10:40, Wednesday 6th April 2022, Room 13

- (NA) **Fifth Generation Sub-6GHz Antennas Design Challenges for Laptop and Tablet Applications — Need More Attention**
Sampson Hu, Novocomms, UK
- 652 **Performance Analysis of Equivalent-Circuit Topologies for Periodic Leaky-Wave Antenna Asymmetric Radiators**
Alberto Hernández-Escobar¹, Elena Abdo-Sánchez¹, Pablo Mateos-Ruiz¹, Jaime Esteban², Teresa M. Martín-Guerrero¹, Carlos Camacho-Peñalosa¹
¹Universidad de Málaga, Spain; ²Universidad Politécnica de Madrid, Spain
- 656 **Ultra-Wideband and Substrate-Independent AFSIW Cavity-Backed Slot Antenna for High-Performance Smart Surfaces**
Kamil Yavuz Kapusuz, Sam Lemey, Piet Demeester, Hendrik Rogier, Ghent University, Belgium
- 660 **Design of a High Gain, High Steering Angle and Wide Band Antenna for S Band Application**
Paul Karmann¹, Edson Martinod², Joël Andrieu², Mohamad Majed¹, Mohamad Rammal¹
¹ITHPP, France; ²XLIM (UMR 7252), France
- 664 **A Triple-Mode Cylindrical Cavity-Backed Slot Filtering Antenna with High Selectivity**
Gen-Zhu Liang, Fu-Chang Chen, Kai-Ran Xiang, SCUT, China

EuMC34: RFID and WPT technologies

Chair: Alessandra Costanzo, Università di Bologna, Italy

Co-Chair: Jiafeng Zhou, University of Liverpool, UK

09:00–10:40, Wednesday 6th April 2022, Room 17

- 668 **Comparison Between Cross-Polarization and Circular Polarization Interrogation for Robust Chipless RFID Reading**
O. Rance, N. Barbot, E. Perret, LCIS (EA 3747), France
- 672 **A Dielectric Lens Rectenna for Wireless Power Transmission**
Abdel-Hadi Hobballah, Romain Négrier, Michèle Lalande, XLIM (UMR 7252), France
- 676 **Analog Frontend for a Passive 5.8-GHz RFID Transponder in 130-nm CMOS Technology**
Dominic A. Funke¹, Christian Bredendiek², Nils Pohl²
¹Ruhr-Universität Bochum, Germany; ²Fraunhofer FHR, Germany
- 680 **Design of a Compact Harmonic Transponder Based on Quarter-Wavelength Impedance Transformers**
Jinyao Zhang, Sumin David Joseph, Yi Huang, Jiafeng Zhou, University of Liverpool, UK
- 684 **Design of a 24-GHz Dual-Polarized Rectenna Integrated on Silicon**
Simone Trovarello¹, Diego Masotti¹, Martino Aldrigo², Mircea Modreanu³, Alessandra Costanzo¹
¹Università di Bologna, Italy; ²IMT Bucharest, Romania; ³Tyndall National Institute, Ireland

EuMC35 : Non-Planar Filters and Passive Components

Chair: Anthony Ghiotto, IMS (UMR 5218), France

11:20–13:00, Wednesday 6th April 2022, Room 1

- 688 **Collective Fabrication of LMST Thermally-Stable Surface-Mount Ceramic Devices for Millimeter-Wave Bands**
A. Fontana¹, A. Perigaud¹, N. Delhote¹, D. Carsenat², G. Acikalin², P. Richard², S. Bila¹
¹XLIM (UMR 7252), France; ²Thales, France
- (NA) **Design and Characterization of a Compact 6–18GHz 200W Dual Directional Coupler for Power Amplification Applications**
J. Belluot, B. Gerfault, J.-L. Piquet, J. Sence, Thales, France
- 696 **High-Yield Waveguide Diplexer for Low-Cost E-Band 5G Point-to-Point Radio Links**
F. Teberio¹, I. Calero¹, I. Arregui², Petronilo Martín-Iglesias², J. Teniente², M.A.G. Laso²
¹Anteral, Spain; ²Universidad Pública de Navarra, Spain
- 700 **A Broadband Multilayer Vertical Transition at 79GHz Employing FR4 as Core Material**
Dominik Schwarz, Nico Riese, André Dürr, Christian Waldschmidt, Universität Ulm, Germany
- 704 **3D Metal Printed Deformed Elliptical Cavity Bandpass Filter with Wide Stopband**
Povilas Vaitukaitis¹, Kenneth Nai², Jiayu Rao¹, Jiasheng Hong¹
¹Heriot-Watt University, UK; ²Renishaw, UK

EuMC37 : Radar and Communication Systems

Chair: Nils Pohl, Ruhr-Universität Bochum, Germany

Co-Chair: Francesca Schenkel, Ruhr-Universität Bochum, Germany

11:20–13:00, Wednesday 6th April 2022, Room 12

- 713 **An Automatic Driving Test for V2X-Communication and Application on a Scan-Phase-Antenna Diversity**
Anton Dobler, Stefan Lindenmeier, Universität der Bundeswehr München, Germany
- 717 **Experimental Evaluation of Filtering and Isolation in Highly Integrated mmWave Harmonic Radar**
Steffen Hansen, Nils Pohl, Fraunhofer FHR, Germany
- 721 **Car-to-Car Communication Based on Modulated Active Backscatter and Automotive Radar**
A. Lazaro¹, M. Lazaro¹, R. Villarino¹, P. de Paco²
¹Universitat Rovira i Virgili, Spain; ²Universitat Autònoma de Barcelona, Spain
- 725 **Real-Time Wideband Spectrum Monitor Using Multiple Sampling Frequency Direct RF Undersampling for Wireless IoT**
Takashi Shiba, Tomoyuki Furuichi, Kohei Akimoto, Mizuki Motoyoshi, Suguru Kameda, Noriharu Suematsu, Tohoku University, Japan

EuMC38: Advances in mm-Wave Antennas

Chair: Tian Hong Loh, NPL, UK

Co-Chair: Djuradj Budimir, University of Westminster, UK

11:20–13:00, Wednesday 6th April 2022, Room 13

- 733 **A Self-Diplexing Dual-Polarized K-/Ka-Band Patch Antenna**
Noah Sielck, Kevin Erkelenz, Arne F. Jacob, Technische Universität Hamburg, Germany
- 737 **5G mmWave Dual-Polarized Stacked Patch Antenna**
Mojtaba Sohrabi¹, Ronny Hahnel¹, Dirk Plettemeier¹, Stefan Schindler², Hans-Dieter Wohlmuth²
¹Technische Universität Dresden, Germany; ²Infineon Technologies, Germany
- 741 **Side Lobe Lowered Novel Axially Displaced Ellipse Antenna Design for Radio Link System Compliant with ETSI EN 302 217-4-2 Class 3**
Mehmet Akif Tulum¹, Ahmet Serdar Turk²
¹Neta Electronics, Turkey; ²Yildiz Technical University, Turkey
- 745 **Novel Bull's Eye Antenna at Ku Band with Enhanced Gain Bandwidth**
Despoina Kampouridou, Alexandros Feresidis, University of Birmingham, UK
- 749 **Vertical and Horizontal SIW Horn Antennas at 60GHz**
T.H. Le Dam¹, Thi-Them Truong², Minh-Thuy Le², Alejandro Niembro-Martin³, Emmanuel Dreina³, Tan-Phu Vuong¹
¹IMEP-LAHC, France; ²HUST, Vietnam; ³Schneider Electric, France

EuMC39: Novel IoT Technologies

Chair: Dominique Schreurs, KU Leuven, Belgium

Co-Chair: Jiafeng Zhou, University of Liverpool, UK

11:20–13:00, Wednesday 6th April 2022, Room 17

- 753 **FDD for Low Power Backscattering in Batteryless Sensor Nodes**
Yasser Qaragoez, Sofie Pollin, Dominique Schreurs, KU Leuven, Belgium
- 757 **Wireless Power Transfer Procedure via Hybrid Frequency Diversity**
Enrico Fazzini, Alessandra Costanzo, Diego Masotti, Università di Bologna, Italy
- 761 **Meshed Microstrip Printed Antenna for Matching Network-Free RF Energy Harvesting**
Mahmoud Wagih, Alex S. Weddell, Steve Beeby, University of Southampton, UK
- 765 **A Temperature-Compensated BLE Beacon and 802.15.4-to-BLE Translator on a Crystal-Free Mote**
Titan Yuan¹, Filip Maksimovic¹, Brad Wheeler¹, David C. Burnett¹, Lydia Lee¹, Thomas Watteyne², Kristofer S.J. Pister¹
¹University of California at Berkeley, USA; ²Inria, France
- 769 **RF Energy Extraction Using Wave Impedance Matching**
Sandhya Chandravanshi, Vincent F. Fusco, Neil Buchanan, Queen's University Belfast, UK

EuMC40: Advances in Biological and Medical Applications

Chair: Katia Grenier, LAAS-CNRS, France

Co-Chair: Adrian Porch, Cardiff University, UK

14:20–16:00, Wednesday 6th April 2022, Room 6

- (NA) **First-in-Human Clinical Investigation of the Wavelia Microwave Breast Imaging System**
Angie Fasoula, MVG Industries, France
- 773 **Radar-Based Detection of Hidden People at Different Frequency Bands**
Sandra Nowok¹, Patrick Wallrath¹, Reinhold Herschel¹, Ralph Langkemper²
¹Fraunhofer FHR, Germany; ²Fraunhofer EMI, Germany
- 777 **Long-Range LoRaWAN Backscatter Based Sensors for Medical and Wearable Applications**
M. Lazaro, A. Lazaro, R. Villarino, Universitat Rovira i Virgili, Spain
- 781 **Optimized Sensor for Broadband Dielectrometry of Biological Liquids of Small Volume**
Shilpi Pandey¹, Alexey I. Gubin², Sönke Schmidt³, Martin Schüßler³, Svetlana A. Vitusevich⁴, Nickolay T. Cherpak², Rolf Jakoby³, Carolin Hessinger³
¹IFW Dresden, Germany; ²NASU, Ukraine; ³Technische Universität Darmstadt, Germany; ⁴Forschungszentrum Jülich, Germany
- 785 **Controlled Drug Delivery Mediated by CW Electric Fields: Experimental Setup and 3D Microdosimetry Modelling**
Laura Caramazza, Alessandra Paffi, Micaela Liberti, Francesca Apollonio, Università di Roma “La Sapienza”, Italy

EuMC41: Material and On-wafer Measurements

Chair: Xiaobang Shang, NPL, UK

Co-Chair: Andrej Rumiantsev, MPI, Taiwan

14:20–16:00, Wednesday 6th April 2022, Room 7

- 789 **In-situ Automatic Adjustment of Probe Positions and Tilt Angles for GSGSG Probe**
Ryo Sakamaki, Masahiro Horibe, AIST, Japan
- 793 **Dielectric Measurement of Substrate Materials Using 3D Printed Re-Entrant Cavity Resonator**
Ali Musa Mohammed¹, Yi Wang², Milan Salek²
¹Federal Polytechnic Damaturu, Nigeria; ²University of Birmingham, UK
- 797 **Complex Permittivity of 3D-Printing Filaments in the 20–50GHz Frequency Band**
Mateusz M. Kryszicki, Bartłomiej W. Salski, Tomasz Karpisz, Pawel Kopyt, Warsaw University of Technology, Poland
- 801 **Single and Differential Microstrip Lines Excitation Using a Contactless Dielectric Waveguide Probe for V-Band**
Amr Samir, Mohamed Basha, Ahmed Metwally Hegazy, Mohammad Chavoshi, Mostafa Alizadeh, Ardeshir Palizban, Safieddin Safavi-Naeini, University of Waterloo, Canada
- 805 **Terahertz Non-Destructive Testing of the Mica Insulation of Power Generator Bars in FMCW Measurements with a Dielectric Waveguide Antenna**
Maris Bauer¹, Carsten Matheis¹, Andrey Mashkin², Stefan Krane², Friedhelm Pohlmann², Fabian Friederich¹
¹Fraunhofer ITWM, Germany; ²Siemens, Germany

EuMC42: Antennas Using Advanced Manufacturing and Novel Substrate Materials

Chair: Alexandros Feresidis, University of Birmingham, UK

Co-Chair: Fatemeh Hoveizavi, CSA Catapult

14:20–16:00, Wednesday 6th April 2022, Room 13

- 809 **Additive Manufactured Filtering Lens Antennas for Radar Measurements at 240GHz**
Sven Thomas, Alex Shoykhetbrod, Nils Pohl, Fraunhofer FHR, Germany
- (NA) **A Compact 26GHz Filtering Antenna with Cross Coupling Using LTCC Substrate**
Kaoru Sudo¹, Ryo Mikase¹, Yoshinori Taguchi¹, Koichi Takizawa¹, Natsumi Minamitani¹, Kengo Onaka¹, Saneaki Ariumi¹, Hisao Hayafuji¹, Masataka Ohira²
¹Murata Manufacturing, Japan; ²Saitama University, Japan
- 817 **HIS Design for an Environment-Robust UHF/UWB Antenna with 3D-Printed Inclusions**
Shobit Agarwal¹, David Chadzichristodoulou², Abdul Quddious³, Diego Masotti¹, Symeon Nikolaou², Alessandra Costanzo¹
¹Università di Bologna, Italy; ²Frederick Research Center, Cyprus; ³University of Cyprus, Cyprus
- 821 **Using Gypsum Material as the Substrate for Inside Wall Embedded Wireless IoT Sensors**
Zahra Badamchi, Tarek Djerafi, INRS-EMT, Canada
- 825 **Holographic Conical Beam Scanning Antenna for mm-Wave Radars Using Glass Technology**
Thomas Frey, André Dürr, Christian Waldschmidt, Tobias Chaloun, Universität Ulm, Germany

EuMC43: Sensing and Dynamic Technologies

Chair: Jasmin Grosinger, Technische Universität Graz, Austria

Co-Chair: Xiaodong Chen, Queen Mary University of London, UK

14:20–16:00, Wednesday 6th April 2022, Room 17

- 829 **Comparison Between Hybrid- and TM-Polarized Bessel-Beam Launchers for Wireless Power Transfer in the Radiative Near-Field at Millimeter Waves**
Francesca Benassi¹, Walter Fuscaldo², Edoardo Negri³, Giacomo Paolini¹, Elisa Augello¹, Diego Masotti¹, Paolo Burghignoli³, Alessandro Galli³, Alessandra Costanzo¹
¹Università di Bologna, Italy; ²CNR-IMM, Italy; ³Università di Roma “La Sapienza”, Italy
- 833 **Optimal Operation of RF Energy Rectifiers by Adaptive Number of Frequency Selection Using Multisine Excitation**
Lichen Yao¹, Guido Dolmans¹, Jac Romme²
¹Technische Universiteit Eindhoven, The Netherlands; ²Holst Centre, The Netherlands
- 837 **Smart Tire Sensor Design Using Numerical Simulations**
Raffaele Scuderi, Dassault Systèmes, Italy
- 841 **Remote Microwave Sterilization Applicable to Coronaviruses Using a Van-Atta Retrodirective Antenna Array with 2-D Tracking Capability**
Maksim Kuznetsov¹, Konstantinos Kossenas¹, Symon K. Podilchak¹, Davide Comite², Pascual D. Hilario Re³, George Goussetis³, Sumanth K. Pavuluri³, Samantha Griffiths¹, Robert J. Chadwick⁴, Chao Guo¹, Nico Bruns¹, Christine Tait-Burkard¹, Jürgen G. Haas¹, Marc P.Y. Desmulliez³
¹University of Edinburgh, UK; ²Università di Roma “La Sapienza”, Italy; ³Heriot-Watt University, UK; ⁴University of Strathclyde, UK
- 845 **Differential Analysis in Microwave Dielectric Probing for Transcutaneous Biomedical Sensing**
Adrián M. Llop Recha, Dag T. Wisland, Tor S. Lande, Kristian G. Kjelgård, University of Oslo, Norway

EuMC44 : EuMC Closing Session

Chair: Nick M. Ridler, EuMW 2021 General Chair

Co-Chair: Emma MacPherson, EuMC 2021 Chair

16:40–18:20, Wednesday 6th April 2022, Room 8-11

- (NA) **Session Welcome**
Nick M. Ridler, EuMW 2021 General Chair
- (NA) **The (R)Evolution of Wireless Communications**
Eric Hawthorn, Radio Design, UK
- (NA) **Awards Ceremony**
Kamal K. Samanta, EuMW 2021 Awards Chair
- (NA) **Challenges and Opportunities for Terahertz Communications Towards 6G and Beyond**
Tadao Nagatsuma, Osaka University, Japan
- (NA) **Closing Remarks**
Nick M. Ridler, EuMW 2021 General Chair

EuMIC/EuMC01 : Novel Filtering Devices in Integrated Technologies

Chair: Roberto Gómez-García, Universidad de Alcalá, Spain

Co-Chair: Michael Höft, CAU, Germany

09:00–10:40, Monday 4th April 2022, Room 1

- 849 **A Millimeter-Wave Substrate Integrated Waveguide Filter in Si-BCB Technology**
Jordan Corsi¹, Giuseppe Aciri¹, Maxime Moulin¹, Nicolas Zerounian², Anne-Sophie Grimault-Jacquin², Loïc Vincent³, Guillaume Ducournau⁴, Frédéric Aniel², Florence Podevin¹, Philippe Ferrari¹, Emmanuel Pistono¹
¹RFIC-Lab (EA 7520), France; ²C2N (UMR 9001), France; ³CIME Nanotech, France; ⁴IEMN (UMR 8520), France
- 853 **A 100GHz Bandpass Filter Employing Shielded Folded Ridged Quarter-Mode SIW Resonator in CMOS Technology**
Baichuan Chen, Samundra K. Thapa, Adel Barakat, Ramesh Pokharel, Kyushu University, Japan
- 857 **SAW Resonator Band-Pass Filter on GaN/Si Operating at 8GHz**
Alina-Cristina Bunea¹, Dan Neculoiu², Adrian Dinescu¹
¹IMT Bucharest, Romania; ²UPB, Romania
- 861 **Engineered High Resistivity Silicon Substrates in IPD Technology Used for Miniaturized Sub-6GHz Filters**
Atte Haapalinn¹, Heikki Holmberg¹, Arto Hujanen², Katja Parkkinen¹, Pekka Rantakari², Jan Saijets², Tauno Vähä-Heikkilä²
¹Okmetic, Finland; ²VTT, Finland
- 865 **Glass-Integrated Single- and Dual-Band Bandpass Filters**
Andrea Ashley, Dimitra Psychogiou, University of Colorado Boulder, USA

EuMIC/EuMC02 : THz components

Chair: Emma MacPherson, University of Warwick, UK

Co-Chair: Oleksiy Sydoruk, Imperial College London, UK

09:00–10:40, Monday 4th April 2022, Room 4

- 869 **A SiGe Based 0.48THz Signal Source with 45GHz Tuning Range**
Jonathan Wittemeier¹, Florian Vogelsang¹, David Starke¹, Holger Rucker², Nils Pohl¹
¹Ruhr-Universität Bochum, Germany; ²IHP, Germany
- 873 **The Effect of Surface Passivation for Sub-THz Silicon Gradient Refractive Index Lens**
Antti Lamminen¹, Aleksi Tamminen², Jaakko Saarilahti¹, Vladimir Ermolov¹, Pekka Pursula¹
¹VTT, Finland; ²Aalto University, Finland
- (NA) **Optoelectronic Millimeter-Wave Integrated Circuits Fabricated in Pure Silicon-Based Technologies**
Uroschanit Yodprasit, Wolfgang Winkler, Silicon Radar, Germany
- 881 **140GHz Differential Antennas in Embedded Wafer Level Ball Grid Array Technology**
Akanksha Bhutani, Elizabeth Bekker, Teng Li, Lucas Giroto de Oliveira, Thomas Zwick, KIT, Germany
- 885 **Enhancing mmWave On-Chip-Antennas Using In-Package Electromagnetic Bandgap Structures**
Dmitrii Kruglov, Oleg Iupikov, Marianna V. Ivashina, Rob Maaskant, Chalmers University of Technology, Sweden

EuMIC/EuMC03 : MMIC Power Amplifiers and Supply Modulation

Chair: Jeff Powell, Teratech Components, UK

Co-Chair: Markus Mayer, ARELIS, France

14:20–16:00, Monday 4th April 2022, Room 14

- (NA) **A 6–18GHz 13W and 22% PAE GaN Power Chipset**
Mehdi Dinari, Benoît Mallet-Guy, Yves Mancuso, Thales, France
- 890 **On-Chip Power Combining with 3-Stage 75–110GHz GaN MMIC Power Amplifiers**
Shane Verploegh, Timothy Sonnenberg, Mauricio Pinto, Akim Babenko, Zoya Popović, University of Colorado Boulder, USA
- 894 **Wideband Phase Modulator MMIC for K-Band Supply-Modulated Power Amplifier Linearization**
Gregor Lasser¹, Connor Nogales¹, Maxwell R. Duffy², Zoya Popović¹
¹University of Colorado Boulder, USA; ²Northrop Grumman, USA
- 898 **Compact Design of a L-Band 40W 40MHz Envelope Tracking GaN Power Amplifier for Small Cells**
Olivier Nonet¹, Wilfried Dementitroux¹, Frederic Ploneis¹, Denis Barataud², Michel Campovecchio²
¹Thales, France; ²XLIM (UMR 7252), France
- 902 **A 600-W Enhancement-Mode GaN Multi-Level Dynamic Converter for Supply Modulated PAs**
Connor Nogales, Zoya Popović, Gregor Lasser, University of Colorado Boulder, USA

EuMIC/EuMC04 : EuMIC/EuMC Posters

Chair: Mustafa Bakr, University of Oxford, UK

13:50–16:40, Monday 4th April 2022, Exhibition Hall

- (NA) **Microwave Sensing Using Metal-Insulator-Metal Diodes Based on 4-nm-Thick Hafnium Oxide**
Martino Aldrigo¹, Mircea Dragoman¹, Sergiu Iordanescu¹, Mazen Al Shanawani², George Deligeorgis³
¹IMT Bucharest, Romania; ²Università di Bologna, Italy; ³FORTH, Greece
- (NA) **Automatic Nonlinear Nonquasi-Static Diode Model Extraction from Large-Signal Measurements**
A. García-Luque¹, Teresa M. Martín-Guerrero¹, Alberto Santarelli², Carlos Camacho-Peñalosa¹
¹Universidad de Málaga, Spain; ²Università di Bologna, Italy
- (NA) **Compact GaN RF-Switches for Power Applications**
Samira Driad¹, Charles Teyssandier¹, Laurent Caille¹, C. Chang¹, Laurent Brunel¹, Benoit Lambert¹, Hermann Stieglauer², Valeria Brunel¹
¹UMS, France; ²UMS, Germany
- (NA) **Analysis of RF Stress Influence on Large-Signal Performance of 22nm FDSOI CMOS Transistors Utilizing Waveform Measurement**
Dang Khoa Huynh¹, Quang Huy Le¹, Steffen Lehmann², Zhixing Zhao², Germain Bossu², Wafa Arfaoui², Defu Wang¹, Thomas Kämpfe¹, Matthias Rudolph³
¹Fraunhofer IPMS, Germany; ²GlobalFoundries, Germany; ³BTU, Germany

EuMIC/EuMC04 continued...

- (NA) **Towards an Excitable Microwave Spike Generator for Future Neuromorphic Computing**
Qusay Al-Taaï¹, Razvan Morariu¹, Jue Wang¹, Abdullah Al-Khalidi¹, Ali Al-Moathin¹, Bruno Romeira², José Figueiredo³, Edward Wasige¹
¹University of Glasgow, UK; ²INL, Portugal; ³Universidade de Lisboa, Portugal
- (NA) **Numerical and Experimental Investigations of Self-Mixing Effect of a Planar Gunn Diode Oscillator**
Ming Yan Zhong, David R.S. Cumming, Chong Li, University of Glasgow, UK
- 930 **An Ultra-Wideband Microstrip-to-WR15 Waveguide Transition for MMIC Applications**
Bent Walther, Marcel van Delden, Thomas Musch, Ruhr-Universität Bochum, Germany
- 934 **An Integrated Multiphysics Model for Phase-Change Material Switches**
Ines Bettoumi¹, Kateryna Kiryukhina¹, Olivier Puig¹, Pierre Blondy²
¹CNES, France; ²XLIM (UMR 7252), France
- 938 **Doherty Load Modulation Based on Non-Reciprocity**
Paul Saad¹, Han Zhou², Jose-Ramon Perez-Cisneros², Rui Hou¹, Christian Fager², Bo Berglund¹
¹Ericsson, Sweden; ²Chalmers University of Technology, Sweden
- 942 **Adopting Supercapacitors in a Single-Stage Marx-Type Multilevel Supply Modulator**
Lukas Hüssen, Renato Negra, RWTH Aachen University, Germany
- 946 **A 30-W GaN Quasi-MMIC Doherty Power Amplifier Based on All-Distributed Inductors Load Network**
Rui-Jia Liu¹, Xiao-Wei Zhu¹, Jing Xia², Peng Chen¹, Chao Yu¹, Lv Zhang³, Zhi-Yong Chen¹
¹Southeast University, China; ²Jiangsu University, China; ³Guobo Electronics, China

EuMIC/EuMC04 continued...

- 950 **A Digital Power Amplifier for 32-QAM**
Gavin T. Watkins, Toshiba, UK
- 954 **Effect of Switch Figure of Merit on Frequency-Reconfigurable Power Amplifier Performance**
Adam Der, William Sear, Taylor Barton, University of Colorado Boulder, USA
- 958 **Practical Work for Master2 Students: MMIC Distributed Amplifier Design for High Data Rate Receiver on GaAs-UMS Technology**
C. Algani¹, E. Leclerc²
¹ESYCOM (UMR 9007), France; ²UMS, France

EuMC/EuRAD01 : High Resolution Methods in Range and Azimuth for Environmental Perception

Chair: Thomas Dallmann, Fraunhofer FHR, Germany

Co-Chair: Frank Gruson, Continental, Germany

11:20–13:00, Wednesday 6th April 2022, Room 7

- (NA) **Real-Time DoA Estimation for Automotive Radar**
Yubo Wu, Chengzhang Li, Y. Thomas Hou, Wenjing Lou, Virginia Tech, USA
- (NA) **Simultaneous Multi-Mode Automotive Imaging Radar Using Cascaded Transceivers**
F.G. Jansen¹, F. Laghezza¹, S. Alhasson², P. Lok¹, L.M.A. van Meurs¹, R. Geraets¹, Ö. Paker¹, J. Overdeest¹
¹NXP Semiconductors, The Netherlands; ²NXP Semiconductors, Germany
- (NA) **Auto-Calibration of Automotive MIMO Radars Using Simultaneous Localisation and Mapping**
Nikita Petrov, Alexander Yarovoy, Technische Universiteit Delft, The Netherlands
- (NA) **An Approach for High-Angular Resolution Implementation in Moving Automotive MIMO Radar**
Sen Yuan, Francesco Fioranelli, Alexander Yarovoy, Technische Universiteit Delft, The Netherlands
- (NA) **Synthetic Aperture Radar Imaging of Moving Targets for Automotive Applications**
Masoud Farhadi¹, Reinhard Feger¹, Johannes Fink², Thomas Wagner¹, Andreas Stelzer¹
¹Johannes Kepler Universität Linz, Austria; ²Robert Bosch, Germany

EuMC/EuRAD02 : Channel and Radar Characterization

Chair: Dirk Plettemeier, Technische Universität Dresden, Germany

11:20–13:00, Wednesday 6th April 2022, Room 11

- 982 **Radio Wave Propagation Inside Buried Sewer Pipes for Infrastructure Robotics**
Viktor Doychinov, Ian D. Robertson, University of Leeds, UK
- 986 **Quantifying Modulation Quality at the Physical Layer Using Equalized Channel Capacity**
Jan Verspecht, Keysight Technologies, USA
- 990 **Impairments of Atmospheric Attenuation on a Wideband E-Band Outdoor Communication Link**
Laura Manoliu¹, Ralf Henneberger², Axel Tessmann³, Jochen Seidel¹, Michael Eppard⁴, Ingmar Kallfass¹
¹Universität Stuttgart, Germany; ²Radiometer Physics, Germany; ³Fraunhofer IAF, Germany; ⁴MPI for Solid State Research, Germany
- 994 **Effect of Microsphere Concentration and Size in Compacts on Terahertz Scattering**
Keir N. Murphy¹, Mira Naftaly², Alison Nordon¹, Daniel Markl¹
¹CMAC, UK; ²NPL, UK
- 998 **High Temporal Resolution Time-Gating for Wideband Radar Cross Section Measurements**
Rachel E. Jarvis, Justin G. Metcalf, Jessica E. Ruyle, Jay W. McDaniel, University of Oklahoma, USA

EuMC/EuRAD03 : EuMC/EuRAD Posters

Chair: Mustafa Bakr, University of Oxford, UK

10:40–13:30, Wednesday 6th April 2022, Exhibition Hall

- (NA) **Design of Narrow Wall Slotted Waveguides Planar Array for 3D S-Band Radar with Very Low Sidelobe Level**
Quoc Duy Nguyen, Hoang Viet Tran, Thi Huong Ngo, Dinh Hung Pham, VHT, Vietnam
- (NA) **Transmission Line Based Frequency Modulated Continuous Wave Radar for Monitoring Airbag Deployment Processes**
Björn Möhring¹, Uwe Siart¹, Sebastian Schweizer², Thomas F. Eibert¹
¹Technische Universität München, Germany; ²Audi, Germany
- (NA) **Compressed Sensing for MIMO Radar Using SIW Antennas for High Resolution Detection**
Cristian Alistarh¹, Laura Anitori¹, Wim L. van Rossum¹, Symon K. Podilchak², John Thompson², Mathini Sellathurai³
¹TNO, The Netherlands; ²University of Edinburgh, UK; ³Heriot-Watt University, UK
- (NA) **Spectrum Estimation for Very High Frequency RF Systems**
Mario LaManna¹, Pietro Monsurrò², Pasquale Tommasino², Alessandro Trifiletti²
¹Evoelectronics, Italy; ²Università di Roma “La Sapienza”, Italy
- (NA) **Enhancing Unambiguous Velocity in Doppler-Division Multiplexing MIMO Radar**
Yuliang Sun, Marc Bauduin, André Bourdoux, imec, Belgium
- (NA) **VBR: A S Band Tile of 16 T-R Modules for Fully Digital AESA Antennas (DAR Technology)**
F. Macro, M. Di Battista, B. Buccinnà, VirtuaLabs, Italy

EuMC/EuRAD03 continued...

- (NA) **Wideband 6-Bit SiGe BiCMOS T/R Module Core-Chip for X-Band Phased-Arrays**
Can Çalışkan¹, Abdurrahman Burak¹, Melik Yazici¹, Nihan Öznazlı², Yasar Gurbuz¹
¹Sabancı University, Turkey; ²ASELSAN, Turkey
- 1030 **Enhanced Self-Interference Cancellation by Means of Adaptively Calibrated Filters**
Johannes Steigert, Daniel Schwab, CommScope, Germany
- 1034 **Dosimetric Analysis of Plane Wave Propagation in Biological Tissues: Comparison Between Planar Multilayer vs Realistic Anatomical Models**
Micol Colella¹, Simona Di Meo², Paolo Marracino³, Micaela Liberti¹, Marco Pasian², Francesca Apollonio¹
¹Università di Roma "La Sapienza", Italy; ²Università di Pavia, Italy; ³Rise Technology, Italy
- 1038 **Design of a Miniature Smart Pill Antenna**
Hubregt J. Visser¹, Esmee Huismans², Minyoung Song¹, Yao-Hong Liu¹
¹imec, The Netherlands; ²Technische Universiteit Eindhoven, The Netherlands
- 1042 **Status and Ongoing Development of a kW-Level Broadband W-Band Gyro-TWA**
Liang Zhang, Craig R. Donaldson, Colin G. Whyte, Adrian W. Cross, University of Strathclyde, UK

EuMC/EuRAD04: Radar Architectures

Chair: David Greig, Leonardo, UK

Co-Chair: Nils Pohl, Ruhr-Universität Bochum, Germany

14:20–16:00, Wednesday 6th April 2022, Room 1

- (NA) **Efficient Calibration of Very Large mm-Wave Radars by Virtual Phase Center Analysis**
André Dürr, Matthias Linder, Dominik Schwarz, Thomas Frey, Christian Waldschmidt, Universität Ulm, Germany
- (NA) **Impact of Channel Imbalances on Beamforming Performance in Automotive MIMO Radar**
Maximilian Eschbaumer, Infineon Technologies, Germany
- (NA) **A Low-Power 24-GHz Radar Transceiver for Automotive Hands-Free Trunk Opener Applications in a 0.13 μ m SiGe BiCMOS Technology**
Abhiram Chakraborty¹, Claus Lautenschlager², Markus Ortner³, Andreas Wickmann², Daniel Englisch¹, Manfred Meindl², Muhammad Qureshi¹, Martin Frank¹, Aizemaiti Yuemaier¹, Hans-Peter Forstner¹
¹Infineon Technologies, Germany; ²eesy-ic, Germany; ³Infineon Technologies, Austria
- (NA) **D-Band FMCW Radar with Sub-cm Range Resolution Based on a BiCMOS mmWave IC**
Wael A. Ahmad¹, M. Kucharski², Herman Jalli Ng³, Dietmar Kissinger⁴
¹IHP, Germany; ²SIRC, Poland; ³Hochschule Karlsruhe, Germany; ⁴Universität Ulm, Germany
- (NA) **Surface Pressure Sensing Radar Using V-Band**
Rohit Gawande, Ziad Haddad, Martin Michalik, Mark Taylor, Michael Tsai, Jet Propulsion Laboratory, USA