

2020 17th European Radar Conference (EuRAD 2020)

**Utrecht, Netherlands
13 – 15 January 2021**



**IEEE Catalog Number: CFP20590-POD
ISBN: 978-1-7281-7060-2**

**Copyright © 2020, 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:	CFP20590-POD
ISBN (Print-On-Demand):	978-1-7281-7060-2
ISBN (Online):	978-2-87487-061-3

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

EuRAD01 : EuRAD Opening Session

Chair: Mayazzurra Ruggiano, Thales, The Netherlands

Co-Chair: Jacco de Wit, TNO, The Netherlands

08:30-10:10, Wednesday 13 January 2021, Polar





- (NA) **C** **Millimeter-Wave and Terahertz Radar Instruments for Planetary, Cometary, Earth Observations, and Security Applications**
Goutam Chattopadhyay, Jet Propulsion Laboratory, USA
- (NA) **C** **One Step Ahead of the Enemy: Innovative Radar Solutions are Decisive for Military Use**
Jorn Bleijs, DMO, The Netherlands

EuRAD02 : Dual Use & Waveform Design

Chair: Stephen Harman, Aveillant, UK

Co-Chair: R. Firat Tigrek, Technische Universiteit Eindhoven, The Netherlands

10:50-12:30, Wednesday 13 January 2021, Mission 1

- 1  **C Peak Sidelobe Level Based Waveform Optimization for OFDM Joint Radar-Communications**
*Musa Furkan Keskin¹, R. Firat Tigrek², Canan Aydogdu¹, Franz Lampel²,
Henk Wymeersch¹, Alex Alvarado², Frans M.J. Willems²*
¹Chalmers University of Technology, Sweden; ²Technische Universiteit Eindhoven, The Netherlands
- 5  **C Adaptive Filter Design for Simultaneous In-Band Full-Duplex Communication and Radar**
*Seyed Ali Hassani¹, Barend van Liempd², André Bourdoux², François Horlin³,
Sofie Pollin¹*
¹KU Leuven, Belgium; ²imec, Belgium; ³Université Libre de Bruxelles, Belgium
- 9  **C Design and Measurements of MSK-LFM RadCom System**
Husileng Bao¹, Arvid Ziemann², Zhongxia Simon He³
¹Chalmers University of Technology, Sweden; ²Volvo, Sweden; ³SenWellen, China
- 13  **C An Ultrahigh-Resolution Continuous Wave Synthetic Aperture Radar with Photonic-Assisted Signal Generation and Dechirp Processing**
*Ruoming Li¹, Wangzhe Li¹, Yongwei Dong¹, Bingnan Wang¹, Zhilei Wen¹,
Yuchen Luan¹, Zhenli Yang¹, Xing Yang¹, Jiyao Yang², Wei Sun¹, Longyong Chen¹,
Zhenwei Mo², Chunyang Liu¹, Jingwen Dong¹, Henan Zeng², Ziqiang Yin²*
¹Chinese Academy of Sciences, China; ²UCAS, China

EuRAD02 continues next page...

EuRAD02 continued...






- 17   **Discrete-Phase Sequence Design with Stopband and PSL Constraints for Cognitive Radar**
Mohammad Alae-Kerahroodi, Sumit Kumar, M.R. Bhavani Shankar, Kumar Vijay Mishra, Université du Luxembourg, Luxembourg

EuRAD03 : Design and Calibration Concepts for Advanced Radar Systems and Subsystems

Chair: Peter Gardner, University of Birmingham, UK

Co-Chair: Claire Migliaccio, Université Côte d'Azur, France

10:50–12:30, Wednesday 13 January 2021, Quest






- N/A  **C** **An Overarching Strategy for Radar Antenna Design, Optimization, and System Integration**
Giorgia Zucchelli¹, Rick Gentile²
¹MathWorks, The Netherlands; ²MathWorks, USA
- 22  **C** **Angle-Dependent Mutual Coupling in Antenna Arrays by Electromagnetic Modelling of Sub-Volumes**
Ricard L. Grove¹, Poul Leth-Espensen², Jørgen Dall¹
¹Technical University of Denmark, Denmark; ²Terma, Denmark
- 26  **C** **Phase Noise Investigation for a Radar System with Optical Clock Distribution**
Stephan Kruse¹, Meysam Bahmanian¹, Pascal Kneuper¹, Christian Kress¹, Heiko G. Kurz², Thomas Schneider³, J. Christoph Scheytt¹
¹Universität Paderborn, Germany; ²Volkswagen, Germany; ³Technische Universität Braunschweig, Germany
- 30  **C** **Increasing the Efficiency and Robustness of Angular Radar Calibration by Exploiting Phase Symmetry**
André Dürr, Matthias Linder, Christian Waldschmidt, Universität Ulm, Germany
- 34  **C** **Phase Control Method for Subsampling PLL by Varying Phase and Frequency of Clock Signal of S/H Circuit**
Osamu Wada, Hiroyuki Mizutani, Hideyuki Nakamizo, Mitsubishi Electric, Japan

EuRAD04: Doppler Processing Techniques for Low Reflectivity Targets Characterisation

Chair: Ronny Harmanny, Thales, The Netherlands

Co-Chair: Nerea del Rey-Maestre, Universidad de Alcalá, Spain

13:50–15:30, Wednesday 13 January 2021, Mission 1

- 38  **C Radar Measurements for the Assessment of Features for Drone Characterization**
Jacco J.M. de Wit¹, Daniel Gusland², Roeland P. Trommel³
¹TNO, The Netherlands; ²FFI, Norway; ³Thales, The Netherlands
- 42  **C Drone Recognition by Micro-Doppler and Kinematic**
Daniel Brooks, Frédéric Barbaresco, Yani Ziani, Jean-Yves Schneider, Claude Adnet,
Thales Land & Air Systems, France
- 46  **C New Doppler Processing for the Detection of Small and Slowly-Moving Targets in Highly Ambiguous Radar Context**
Linda Aouchiche¹, Laurent Ferro-Famil¹, Jean-Philippe Ovarlez²
¹Université de Rennes 1, France; ²ONERA, France
- 49  **C Deep Learning-Based Identification of Human Gait by Radar Micro-Doppler Measurements**
V.S. Papanastasiou¹, Roeland P. Trommel², R.I.A. Harmanny², Alexander Yarovoy¹
¹Technische Universiteit Delft, The Netherlands; ²Thales, The Netherlands
- 53  **C Distinguishing Living and Non Living Subjects in a Scene Based on Vital Parameter Estimation**
Manjunath Thindlu Rudrappa, Reinhold Herschel, Peter Knott, Fraunhofer FHR, Germany

EuRAD05 : Radar Circuits and Systems

Chair: Nils Pohl, Ruhr-Universität Bochum

Co-Chair: Cicero Vaucher, NXP Semiconductors, The Netherlands

13:50-15:30, Wednesday 13 January 2021, Quest




- 57  **C** **A Fully Integrated 78GHz Automotive Radar System-on-Chip in 22nm FD-SOI CMOS**
Philipp Ritter, Michael Geyer, Tilman Gloekler, Xiaolei Gai, Thomas Schwarzenberger, Gregor Tretter, Yikun Yu, Guenter Vogel, Robert Bosch, Germany
- 61  **C** **A Fully Integrated K-Band UWB Radar IC for Collision Avoidance of Drone and Small UAV**
Byeong Jae Seo¹, Seung Hwan Jung², Sang Gyun Kim³, Yun Seong Eo¹
¹Kwangwoon University, Korea; ²Silicon R&D, Korea; ³Grit Custom-IC, Korea
- 65  **C** **A Ka-Band Solid-State Doppler Polarimetric Cloud Radar**
V. Volkov, Dmytro Vavriv, V. Vynogradov, Ie. Bulah, A. Kravtsov, V. Ksenofontov, I. Kulahin, NASU, Ukraine
- 69  **C** **M-Sequence Radar for High Resolution Ranging with Mixed-Signal Radar Receiver Baseband Using 130nm SiGe BiCMOS Technology**
Abdul Rehman Javed, J. Christoph Scheytt, Universität Paderborn, Germany
- 73  **C** **A Maritime Harmonic Radar Search and Rescue System Using Passive and Active Tags**
Holger Heuermann, Thomas Harzheim, Marc Mühlme, FH Aachen, Germany

EuRAD06 : Emerging & Industrial Applications

Chair: *Naruto Yonemoto, ENRI, Japan*

Co-Chair: *André Bourdoux, imec, Belgium*

16:10-17:50, Wednesday 13 January 2021, Mission 1






- N/A  **C** **Millimeter-Wave Radar for Touchless Interaction: Soli in the Pixel 4**
Jian Wang, Jaime Lien, Google, USA
- 78  **C** **Background and Clutter Removal Techniques for Ultra Short Range Radar**
Matthias G. Ehrnsperger, Maximilian Noll, Uwe Siart, Thomas F. Eibert, Technische Universität München, Germany
- 82  **C** **Standoff Non-Line-of-Sight Vibration Sensing Using Millimeter-Wave Radar**
Samuel Wagner, Anh-Vu Pham, University of California at Davis, USA
- 86  **C** **Multi-Phase CW Doppler Radar for Measuring Small Periodic Displacement**
Jae-Hyun Park, Jae-Young Sim, Jong-Ryul Yang, Yeungnam University, Korea
- 90  **C** **Sensory Substitution Device for the Visually Impaired Using 122GHz Radar and Tactile Feedback**
Pascal Kneuper¹, Stephan Kruse¹, Bjoern Luchterhandt¹, Jan Tünnermann², Ingrid Scharlau¹, J. Christoph Scheytt¹
¹Universität Paderborn, Germany; ²Philipps-Universität Marburg, Germany

EuRAD07: Radar Scenario Simulations

Chair: Stéphane Kemkemian, Thales, France

Co-Chair: Mohammed Jahangir, University of Birmingham, UK

16:10-17:50, Wednesday 13 January 2021, Quest


- N/A  **C** **Radar Signature Prediction with Shooting-and-Bouncing Rays and Hybrid Method**
David Prestaux, ANSYS, France
- 95  **C** **Radar Target Simulator and Antenna Positioner for Real-Time Over-The-Air Stimulation of Automotive Radar Systems**
M.E. Asghar¹, Sreehari Buddappagari¹, F. Baumgärtner², S. Graf³, F. Kreutz¹, Andreas Löffler⁴, J. Nagel², T. Reichmann², R. Stephan¹, Matthias A. Hein¹
¹Technische Universität Ilmenau, Germany; ²Mercedes-Benz, Germany; ³dSPACE, Germany; ⁴Continental, Germany
- 99  **C** **Back Scattering of Traffic Participants Based on an Automotive Radar Measurement**
Sevda Abadpour, Axel Diewald, Sören Marahrens, Mario Pauli, Thomas Zwick, KIT, Germany
- 103  **C** **SimROS: A Simulator for the Design of HF Surface Wave Radar — Application to Maritime Target Detection**
A. Reineix¹, C. Guiffaut¹, N. Bourey², M. Darces², M. Hélier², S. Reynaud³, N. Ticaud³, P. Dorey⁴, G. Auffray⁴, S. Saillant⁴, Q. Herbette⁴, M. Menelle⁴, Y. Béniguel⁵, Philippe Pouliguen⁶
¹XLIM (UMR 7252), France; ²Sorbonne Université, France; ³CISTEME, France; ⁴ONERA, France; ⁵IEEA, France; ⁶Ministère des Armées AID, France
- 107  **C** **Synthetic Sea-Clutter for Long Integration Processing**
Sabrina Machhour, Stéphane Kemkemian, Pierre-Albert Breton, Vincent Corretja, Thales, France

EuRAD08: Object Classification in Automotive Radars

Chair: Marlene Harter, Hochschule Offenburg, Germany

Co-Chair: Frank Gruson, Continental, Germany

08:30-10:10, Thursday 14 January 2021, Mission 1

- N/A  **C** **Driving a Zero-Road-Fatality Reality**
Noam Arkind, Arbe, Israel
- 112  **C** **Road User Classification with Polarimetric Radars**
Julius F. Tilly¹, Fabio Weishaupt¹, Ole Schumann¹, Jürgen Dickmann¹, Gerd Wanielik²
¹Mercedes-Benz, Germany; ²Technische Universität Chemnitz, Germany
- 116  **C** **Short Range Height Classification in FMCW Radar**
A. Vijayaraghavan, A.G.C. Koppelaar, F. Laghezza, NXP Semiconductors, The Netherlands
- 120  **C** **Object Detection on Radar Imagery for Autonomous Driving Using Deep Neural Networks**
Ana Stroescu, L. Daniel, Dominic Phippen, Mikhail Cherniakov, Marina Gashinova, University of Birmingham, UK
- 124  **C** **Statistical Image Segmentation and Region Classification Approaches for Automotive Radar**
L. Daniel, Y. Xiao, E. Hoare, Mikhail Cherniakov, Marina Gashinova, University of Birmingham, UK

EuRAD09: Defence Applications

Chair: Willem A. Hol, Thales, The Netherlands

Co-Chair: Richard Heusdens, Netherlands Defence Academy, The Netherlands

08:30-10:10, Thursday 14 January 2021, Mission 2


- 128  **C Gabor Transforms for Compressing RESM Data**
A.G. Stove, Stove Specialties, UK
- N/A  **C R&T Activities Related to RF Sensor Technologies at the European Defence Agency**
Roland Krebs, European Defence Agency, Belgium
- N/A  **C Looking into the Future: NATO Surveillance**
R. Thaens, NATO, The Netherlands
- N/A  **C Formidable Shield: A Dutch Perspective**
Martien Joosten, Thales, The Netherlands
- 136  **C Target-Borne ECM Against OFDM-Based Imaging Passive Radars**
Elisa Giusti, Amerigo Capria, Marco Martorella, CNIT, Italy

EuRAD10: SAR Processing

Chair: Krzysztof Kulpa, Warsaw University of Technology, Poland

Co-Chair: Alicja Ossowska, Valeo Schaltes und Sensoren, Germany

08:30-10:10, Thursday 14 January 2021, Quest

- 140  **C** **Enhanced Azimuth Resolution in Synthetic Aperture Radar Using the MUSIC Algorithm**
AmirHosein Oveis¹, Marco Martorella², Mohammad Ali Sebt³, Ali Noroozi³
¹CNIT, Italy; ²Università di Pisa, Italy; ³K.N. Toosi University of Technology, Iran
- 144  **C** **Guided Generative Adversarial Network for Super Resolution of Imaging Radar**
Hyun-Woong Cho, Woosuk Kim, Sungdo Choi, Minsung Eo, Seungtae Khang, Jongseok Kim, SAIT, Korea
- 148  **C** **Spatial-Variant Phase Error Compensation for Widebeam Spotlight Synthetic Aperture Radar**
Pavel A. Makarov, Ersin Aytac, Nurullah Akkaya, Near East University, Cyprus
- 152  **C** **An Accurate SAR Imaging Method Based on Total Variation & Nonconvex Regularization**
Zhongqiu Xu¹, Guoru Zhou², Bingchen Zhang¹, Yirong Wu¹
¹CAS, China; ²Beijing Institute of Technology, China
- N/A  **C** **An Accurate Range Model for Airborne CSSAR Ground Moving Target Imaging**
Yongkang Li¹, Lei Wang¹, Yifeng Wu²
¹NPU, China; ²AVIC, China

EuRAD12 : [Focussed Session] Radar Interference Cancellation and Waveform Agility

Chair: Stefan Brüggewirth, Fraunhofer FHR, Germany

Co-Chair: Christoph Fischer, HENSOLDT Sensors, Germany

10:50–12:30, Thursday 14 January 2021, Mission 1


- 160  **C** **FMCW-Interference of Frequency Agile OFDM Radars**
Christina Knill, Benedikt Schweizer, Simon Stephany, David Werbunat, Christian Waldschmidt, Universität Ulm, Germany
- 164  **C** **PMCW Waveform Cross-Correlation Characterization and Interference Mitigation**
André Bourdoux, Marc Bauduin, imec, Belgium
- 168  **C** **Radar Waveform Coexistence: Interference Comparison on Multiple-Frame Basis**
J. Overdevest, F. Laghezza, F. Jansen, A. Filippi, NXP Semiconductors, The Netherlands
- 172  **C** **Interference Avoidance and Mitigation in Automotive Radar**
M. Alhumaidi, M. Wintermantel, Continental, Germany
- 176  **C** **Analysis of Automotive Radar Interference Mitigation for Real-World Environments**
Mate Toth¹, Johanna Rock¹, Paul Meissner², Alexander Melzer², Klaus Witrisal¹
¹Technische Universität Graz, Austria; ²Infineon Technologies, Austria


EuRAD13 : [Special Session] Radar and Electronic Warfare


Chair: Sue Robertson, EW Defence, UK


Co-Chair: Mayazzurra Ruggiano, Thales, The Netherlands


10:50-12:30, Thursday 14 January 2021, Mission 2

- N/A  **C Cognitive Electronic Warfare (EW) as a Training Aid**
Warren P. du Plessis, Nicholas R. Osner, University of Pretoria, South Africa

- N/A  **C A Brief Introduction to Electronic Warfare and the AOC**
Sue Robertson, EW Defence, UK

- N/A  **C Collecting Intelligence from Modern Radar Systems**
David Stupples, London City University, UK

- N/A  **C MicroESM: Broadening the Application of Passive Radar Detection**
Jon Roe, ESROE, UK

- N/A  **C Microwave Photonics as an Emerging Technology to Enhance EW Receivers**
David Lázaro Loscos, Indra, Spain

EuRAD14: Surveillance and SAR

Chair: Volker Ziegler, Airbus, Germany

Co-Chair: Willem A. Hol, Thales, The Netherlands

10:50-12:30, Thursday 14 January 2021, Quest







- N/A  **C** **Next Generation AESA Radar Architectures**
Chris Mountford, Leonardo, UK
- 186  **C** **Small UAV-Based High Resolution SAR Using Low-Cost Radar, GNSS/RTK and IMU Sensors**
Jan Svedin, Anders Bernland, Andreas Gustafsson, FOI, Sweden
- 190  **C** **Recent L-C- and X-Band MetaSensing Airborne SAR Campaigns for Emerging Applications**
Karlus A.C. de Macedo, Gerard Masalias, Alex Coccia, Adriano Meta, MetaSensing, The Netherlands
- 194  **C** **The SWALIS Project: First Results for Airborne Radar Measurements in Ka Band**
Jean-Claude Kokou Koumi, Stéphane Méric, Éric Pottier, Guy Grunfelder, IETR (UMR 6164), France
- 198  **C** **Direct Ocean Surface Velocity Measurement for Chinese Gaofen-3 SAR Satellite**
Lei Liu¹, Mihai Datcu², Qingjun Zhang¹, Gottfried Schwarz², Jie Liu¹, Yadong Liu¹
¹CAST, China; ²DLR, Germany

EuRAD15 : EuRAD Interactive Poster Session

Chair: *Jacco de Wit, TNO, The Netherlands*









Co-Chair: *Mark Oude Alink, University of Twente, The Netherlands*

12:30-14:10, Thursday 14 January 2021, Hall 1

- 202  **C On the Needlessness of Signal Bandwidth for Precise Holographic Wireless Localization**
Melanie Lipka, Stefan Brückner, Erik Sippel, Martin Vossiek, FAU Erlangen-Nürnberg, Germany
- 206  **C Dynamic Estimation of Vital Signs with mm-Wave FMCW Radar**
Guigeng Su, Nikita Petrov, Alexander Yarovoy, Technische Universiteit Delft, The Netherlands
- 210  **C Further Investigation of Two-Way Classification for Activities of Daily Living**
Ronny G. Guendel, Technische Universiteit Delft, The Netherlands
- N/A  **C Human Walking Detection by Cascaded Deep Neural Networks Classifying Micro-Doppler Signals**
Jihoon Kwon¹, Nojun Kwak², Joonho So³
¹Hanwha Systems, Korea; ²Seoul National University, Korea; ³ADD, Korea
- 218  **C A Radar Target Simulator for Generating Synthesised and Measured Micro-Doppler-Signatures of Vulnerable Road Users**
Johannes Iberle, Patrick Rippl, Thomas Walter, Technische Hochschule Ulm, Germany
- 222  **C RCS-Enhancement for Improving the Detectability of Bikes in Road Safety Applications**
C. Charlo, Stéphane Méric, R. Gillard, IETR (UMR 6164), France





EuRAD15 continues next page...

EuRAD15 continued...

- 226  **C** **A Cognitive FMCW Radar to Minimize a Sequence of Range-Doppler Measurements**
Marco Altmann¹, Peter Ott¹, Nicolaj C. Stache¹, Dmitrii Kozlov¹, Christian Waldschmidt²
¹Hochschule Heilbronn, Germany; ²Universität Ulm, Germany
- N/A  **C** **A Novel Velocity Estimation Algorithm for TDM-MIMO Based Automotive Radar**
Ben Wang, Dejian Li, Dapeng Lao, Jiamin Chen, Hisilicon Technologies, China
- 234  **C** **Scalable 2×2 MIMO Radar Demonstrator with BPSK Data Communication at 79GHz**
*Wael A. Ahmad¹, Arzu Ergintav¹, Maciej Kucharski¹, Dietmar Kissinger²,
Herman Jalli Ng¹*
¹IHP, Germany; ²Universität Ulm, Germany
- 238  **C** **Deep Neural Network Detection for Pulsed Radar-Embedded M-PSK Communications**
Christopher Y. Liu, Ric A. Romero, Naval Postgraduate School, USA
- 242  **C** **Vibrating Antenna Doppler Radar**
*Nathan Chordas-Ewell, Kevin Xu, Ravi Kadlimatti, Adly T. Fam, Jun H. Choi, SUNY Buffalo,
USA*
- N/A  **C** **A New Radar Based On Panel Active Array**
Jia Fang, Hao Qin, Rui Cao, CETC 38, China
- N/A  **C** **Series-Fed Single-Layer Ring Resonator Antenna Array with Wide Fan-Beam and High Gain**
Hyunyoung Cho, Hye-won Jo, ByungKuon Ahn, Ju-Ik Oh, Jong-Won Yu, KAIST, Korea
- 254  **C** **High Permittivity CPW-SIW Power Divider for Antenna Feed Networks in Airborne Phased Arrays Applications**
Diego Lorente¹, Alicja Schreiber¹, Markus Limbach¹, Héctor Esteban², Vicente E. Boria²
¹DLR, Germany; ²Universidad Politécnica de Valencia, Spain

EuRAD15 continues next page...

EuRAD15 continued...

- 258   **Novel Noise-Tolerant Method for Extracting Target Resonances Using Pulse Radar**
Mihail Georgiev¹, Paul Rice², Jian-Kang Zhang¹
¹McMaster University, Canada; ²Patriot One Technologies, Canada
- 262   **Avoiding Interference in Multi-Emitter Environments: A Reinforcement Learning Approach**
Serkan Ak, Stefan Brüggewirth, Fraunhofer FHR, Germany

EuRAD16: Automotive

Chair: André Bourdoux, imec, Belgium

Co-Chair: Noam Arkind, Arbe Robotics, Germany

13:50-15:30, Thursday 14 January 2021, Mission 1






- 266  **C Channel Influence for the Analysis of Interferences Between Automotive Radars**
Lizette Lorraine Tovar Torres, Maximilian Steiner, Christian Waldschmidt, Universität Ulm, Germany
- 270  **C Automotive Radar Interference Mitigation via Multi-Hop Cooperative Radar Communications**
Canan Aydogdu, Musa Furkan Keskin, Henk Wymeersch, Chalmers University of Technology, Sweden
- 274  **C An Efficient Sparse Sensing Based Interference Mitigation Approach for Automotive Radar**
Tai Fei, Honghao Guang, Yuliang Sun, Christopher Grimm, Ernst Warsitz, HELLA, Germany
- 278  **C Over-The-Air Vehicle-in-the-Loop Test System for Installed-Performance Evaluation of Automotive Radar Systems in a Virtual Environment**
Sreehari Buddappagari¹, M.E. Asghar¹, F. Baumgärtner², S. Graf³, F. Kreutz¹, Andreas Löffler⁴, J. Nagel², T. Reichmann², R. Stephan¹, Matthias A. Hein¹
¹Technische Universität Ilmenau, Germany; ²Mercedes-Benz, Germany; ³dSPACE, Germany; ⁴Continental, Germany
- 282  **C A Roadside Camera-Radar Sensing Fusion System for Intelligent Transportation**
Lefei Wang, Zhaoyu Zhang, Xin Di, Jun Tian, Fujitsu R&D Center, China

EuRAD17: Advanced Techniques and Innovative Array Configurations for Direction of Arrival Estimation

Chair: Laurent Ferro-Famil, IETR, France

Co-Chair: Francois Le Chevalier, Technische Universiteit Delft, The Netherlands

13:50–15:30, Thursday 14 January 2021, Mission 2






- 286  **C** **An IEEE 802.15.4 Wireless Half-Cubic Node Based on a Switched-Beam Antenna for Indoor Direction of Arrival Estimation**
Alessandro Cidronali, Giovanni Collodi, Matteo Lucarelli, Stefano Maddio, Marco Passafiume, Giuseppe Pelosi, Università di Firenze, Italy
- 290  **C** **Improving an IEEE 802.15.4 Based Direction of Arrival Estimation System Reliability in a Real Case Scenario Exploiting a Smart Multichannel Approach**
Alessandro Cidronali, Giovanni Collodi, Matteo Lucarelli, Stefano Maddio, Marco Passafiume, Giuseppe Pelosi, Università di Firenze, Italy
- 294  **C** **Selecting the Best DOA Estimates Among Estimates Obtained Using Toeplitz Matrix Approximation and General Covariance Matrix**
Volodymyr Vasylyshyn, Ivan Kozhedub National Air Force University, Ukraine
- 298  **C** **A Discriminant-Based RMSE Improvement Technique for Classical Prony Method in Small Array Radars**
Atsushi Yoshizawa, Shigenori Uchida, Sony, Japan
- 302  **C** **Direction of Arrival Estimation Using the Generalized SPICE Criterion**
Adham Sakhnini, Andreas Jakobsson, Lund University, Sweden

EuRAD18: SAR Applications

Chair: Debora Pastina, Università di Roma "La Sapienza", Italy

Co-Chair: Mikhail Cherniakov, University of Birmingham, UK

13:50-15:30, Thursday 14 January 2021, Quest






- 306  **C Realistic SAR Implementation for Automotive Applications**
Hasan Iqbal, Andreas Löffler, Mohamed Nour Mejdoub, Frank Gruson, Continental, Germany
- 310  **C Space-Variant Phase Error Estimation and Correction for Automotive SAR**
M. Farhadi¹, R. Feger¹, J. Fink², T. Wagner¹, M. Gonser², J. Hasch², Andreas Stelzer¹
¹Johannes Kepler Universität Linz, Austria; ²Robert Bosch, Germany
- 314  **C Egomotion Estimation for a Sensor Platform by Fusion of Radar and IMU Data**
Patrick Wallrath, Reinhold Herschel, Fraunhofer FHR, Germany
- 318  **C Azimuth Ambiguity Discrimination Using Doppler Spectrum of the Compressive Sensing-Based SAR Image with Downsampled PRF**
Ryogo Horiuchi, Takehiro Hoshino, Noboru Oishi, Kei Suwa, Mitsubishi Electric, Japan
- 322  **C Spatial Mapping of Material Properties Utilizing FMCW Near Field Radar Scans**
S. Pawliczek¹, Reinhold Herschel², Nils Pohl¹
¹Ruhr-Universität Bochum, Germany; ²Fraunhofer FHR, Germany

EuRAD19: MIMO Radar

Chair: *Andreas Stelzer, Johannes Kepler Universität Linz, Austria*

Co-Chair: *Matthew Ritchie, UCL, Germany*






08:30-10:10, Friday 15 January 2021, Mission 1

- 326  **C Radar Imaging Using Electrically Large Arrays with High Range Resolution at 160GHz**
André Dürr, Benedikt Schnee, Dominik Schwarz, Christian Waldschmidt, Universität Ulm, Germany
- 330  **C On the Impact of Channel Imbalance on MIMO Radar Performance**
Ricard L. Grove, Jørgen Dall, Technical University of Denmark, Denmark
- 334  **C MIMO-ISAR-Based UWB Imaging System for Non-Destructive Testing**
Harun Cetinkaya, Sandra Nowok, Reinhold Herschel, Fraunhofer FHR, Germany
- 338  **C Coherent MIMO Radar Systems in Three-Dimensional Surveillance Scenarios**
David R. Sanchez-Jacome¹, Salvatore Maresca², Carsten Rockstuhl¹, Paolo Ghelfi³, Antonella Bogoni²
¹KIT, Germany; ²Scuola Superiore Sant'Anna, Italy; ³CNIT, Italy
- 342  **C Sparse MIMO Array for Improved 3D mm-Wave Imaging Radar**
R.Z. Syeda¹, T.G. Savelyev², M.C. van Beurden¹, A.B. Smolders¹
¹Technische Universiteit Eindhoven, The Netherlands; ²Radarexense, The Netherlands

EuRAD20: Passive Radars

Chair: *María-Pilar Jarabo-Amores, University of Alcalá, Spain*

08:30-10:10, Friday 15 January 2021, Mission 2

- 346  **C Airborne Targets Detection by UAV-Embedded Passive Radar**
Benjamin Gabard, Valentine Wasik, Olivier Rabaste, Thierry Deloues, Dominique Poullin, Hervé Jeuland, ONERA, France
- 350  **C Comparing Phase-Locked and Non-Phase-Locked Architectures for Dual-Channel DVB-S Passive Radar**
Octavio Cabrera, Carlo Bongioanni, Fabiola Colone, Pierfrancesco Lombardo, Università di Roma "La Sapienza", Italy
- 354  **C Characterization of Single Frequency Networks for Passive Radar Applications**
Volker Winkler, Steffen Lutz, Michael Brandfass, Hensoldt Sensors, Germany
- 358  **C Passive DVB-T SAR Phenomenology: First Results from a Bistatic Campaign**
G. Atkinson, M. Antoniou, Mikhail Cherniakov, University of Birmingham, UK
- 362  **C A DVB-T Passive Radar 3D-Detection Approach Based on Non-Coherent Spatial Integration**
Nerea del-Rey-Maestre, María-Pilar Jarabo-Amores, David Mata-Moya, Anabel Almodóvar-Hernández, Pedro-José Gómez-del-Hoyo, Universidad de Alcalá, Spain

EuRAD21 : New Radar Concepts

Chair: Daniel O'Hagan, Fraunhofer FHR, Germany

Co-Chair: Pierfrancesco Lombardo, Università di Roma "La Sapienza", Italy

08:30-10:10, Friday 15 January 2021, Quest






- 366  **C Cognitive Approaches to Detection of Small Targets**
E. Humphreys¹, M. Antoniou¹, Chris J. Baker¹, W. Stafford²
¹University of Birmingham, UK; ²BAE Systems, UK
- 370  **C Co-Engineering of a Radar System with Mixed Grey Wolf Optimizer: Application to Concealed Object Classification**
Julien Marot¹, Claire Migliaccio², Jérôme Lantéri², Paul Lauga¹, Salah Bourennane¹
¹Institut Fresnel (UMR 7249), France; ²LEAT (UMR 7248), France
- 374  **C Millimeter- and Submillimeter-Wave Differential Absorption Radar**
Ken B. Cooper, Richard J. Roy, Jose Siles, Matthew Lebsack, Luis Millan, Raquel Rodriguez-Monje, Robert Dengler, Omkar Pradhan, Leslie Tamppari, Brian Drouin, Caltech, USA
- 378  **C Passive Radio Imaging of Hybrid Radar System for Security Inspections**
Naruto Yonemoto, Akiko Kohmura, Shunichi Futatsumori, Kazuyuki Morioka, Yoshio Makita, ENRI, Japan
- 382  **C The Application of Performance Metrics to Staring Radar for Drone Surveillance**
Mohammad Jahangir¹, Bashar I. Ahmad², Chris J. Baker¹
¹University of Birmingham, UK; ²Aveillant, UK

EuRAD22 : Automotive Radar MIMO Processing

Chair: Reinhard Feger, Johannes Kepler Universität Linz, Austria

Co-Chair: Kevin Cinglant, ZF, France

10:50-12:30, Friday 15 January 2021, Mission 1

- 386  **C High Angle Resolution Automotive Radar Based on Simultaneous 12Tx Doppler-Multiplex MIMO**
Nadjah Touati, Christian Sturm, Muneeb Imran, Alexander Vanaev, Markus Kohler, Kevin Krupinski, Waqas Malik, Urs Lübbert, Valeo Schalter und Sensoren, Germany
- 390  **C Fast Chirp MIMO Radar System Using Doppler Offset Orthogonal Codes**
Takaaki Kishigami, Kenta Iwasa, Tomohiro Yui, Hidekuni Yomo, Akihiko Matsuoka, Junji Sato, Panasonic, Japan
- 394  **C Millimeter-Wave Automotive Radar Using Extrapolation for Improved Angular Resolution**
Cristian Alistarh¹, Laura Anitori², Symon K. Podilchak¹, John Thompson¹, Pascual D. Hilario Re³, Mathini Sellathurai³, George Goussetis³, Jaesup Lee⁴
¹University of Edinburgh, UK; ²TNO, The Netherlands; ³Heriot-Watt University, UK; ⁴SAIT, Korea
- 398  **C Kalman Tracking in Driver Assistance Systems — Collision Warning for Vulnerable Road Users**
Simon Hüsges, Christoph Degen, Hochschule Niederrhein, Germany
- 402  **C Automatic Delay and Phase Mismatch Calibration in FMCW MIMO Radar**
Adrian Figueroa, Niko Joram, Frank Ellinger, Technische Universität Dresden, Germany

EuRAD23 : Target Characterisation with Radar

Chair: Christopher Baker, University of Birmingham, UK

Co-Chair: Jacco de Wit, TNO, The Netherlands

10:50-12:30, Friday 15 January 2021, Mission 2

- N/A  **C** **Physics Based Radar Simulation**
Thijs van Putten, Rogier H. van Aken, Michael Phillips, Siemens, The Netherlands
- 409  **C** **Towards Safe Autonomous Driving: Challenges of Pedestrian Detection in Rain with Automotive Radar**
Dagmar Steinhäuser, Patrick Held, Bernhard Thöresz, Thomas Brandmeier, Technische Hochschule Ingolstadt, Germany
- 413  **C** **High Resolution 802.11ax-Based Passive Radar for Human Movement Monitoring**
Hasan Can Yildirim¹, Laurent Storrer¹, François Rottenberg², Jérôme Louveaux², Philippe De Doncker¹, François Horlin¹
¹Université Libre de Bruxelles, Belgium; ²UCLouvain, Belgium
- 417  **C** **Refraction Compensation for Non-Destructive Testing of Fibre-Composite Materials**
André Froehly, Reinhold Herschel, Fraunhofer FHR, Germany
- 421  **C** **Size Estimation of Space Debris Models from Their RCS Measured in Anechoic Chamber**
S. Ghio¹, Marco Martorella²
¹CNIT, Italy; ²Università di Pisa, Italy

EuRAD24: [Special Session] Civilian Radar Research and Development in China

Chair: Cheng Hu, Beijing Institute of Technology, China

Co-Chair: Alexander Yarovoy, Technische Universiteit Delft, The Netherlands

10:50-12:30, Friday 15 January 2021, Quest

- N/A  **C Probabilistic Deep Models for Radar Target Recognition**
Bo Chen, Wenchao Chen, Xidian University, China
- N/A  **C Entomological Radar Signal Processing and Experimental Validation**
Cheng Hu, Weidong Li, Rui Wang, Beijing Institute of Technology, China
- N/A  **C Coherent Multidimensional Agility Radar Signal Processing**
Wen-Qin Wang, UESTC, China
- N/A  **C The State-of-the-Art of Terahertz Technologies and Applications**
Wei-dong Hu¹, Shi Chen¹, Yade Li¹, Zhong-bo Zhu¹, Yang Liu¹, Leo P. Ligthart²
¹Beijing Institute of Technology, China; ²Technische Universiteit Delft, The Netherlands
- N/A  **C Microwave Photonics Radar Technology**
Wangzhe Li, Chinese Academy of Sciences, China

EuRAD25 : EuRAD Closing Session

Chair: Mayazzurra Ruggiano, Thales, The Netherlands

Co-Chair: Jacco de Wit, TNO, The Netherlands

13:50-15:10, Friday 15 January 2021, Progress






- (NA)  **Multi-Band Functionally Integrated Multi-Function Radar Sensor Suites**
Winston van Oosterhout, Thales, The Netherlands

EuMC/EuRAD01 : Radar Receivers and Front-Ends

Chair: Massimo C. Comparini, Telespazio, Italy

Co-Chair: Jens Engelmann, Thales, Germany

08:30-10:10, Thursday 14 January 2021, Expedition






- 430  **C** **A 1.5–40GHz FMCW Radar Receiver Front-End**
Mantas Sakalas¹, Niko Joram², Frank Ellinger²
¹BPTI, Lithuania; ²Technische Universität Dresden, Germany
- 434  **C** **Analysis of Time-Interleaved ADC Offset and Gain Mismatch Errors in PMCW Radar**
D. Rosenmuller¹, Kostas Doris², Georgi Radulov¹, Marion K. Matters-Kammerer¹
¹Technische Universiteit Eindhoven, The Netherlands; ²NXP Semiconductors, The Netherlands
- 438  **C** **Analogue Baseband Processing for Single Chip Radar Proximity Sensor**
Maurice van Wanum, M. Polushkin, R. van Dijk, TNO, The Netherlands
- N/A  **C** **Active MMIC Circulator Performance in a Phased-Array-Like Environment**
Laila Marzall¹, Shane Verploegh¹, Tommaso Cappello¹, Michael Roberg², Zoya Popović¹
¹University of Colorado Boulder, USA; ²Qorvo, USA
- N/A  **C** **A 9 to 12.1GHz Sub-Sampling ADPLL Based on a Stochastic Flash TDC and a DCO with a “Folded” Common-Mode Resonator Exhibiting Less Than 90fs Jitter and a Peak FoMj of -248dB in 16nm FinFet CMOS**
R. Levinger, E. Shumaker, A. Farber, S. Bershansky, N. Geron, O. Degani, A. Ravi, R. Banin, E. Banin, J. Kadry, G. Horovitz, Intel, Israel

EuMC/EuRAD02 : [Special Session] Focus Day: Active Array Antennas for Space

Chair: Giovanni Toso, ESA-ESTEC, The Netherlands

Co-Chair: Natanael Ayllon, ESA-ESTEC, The Netherlands

10:50-12:30, Thursday 14 January 2021, Auditorium

- N/A  **C** **Recent Developments on MMIC for Active Array Antenna**
*T. Huet¹, H. Moula-Karimdjy¹, Marc Camiade¹, Veronique Serru¹, G. Mouchon²,
A. Maati²*
¹United Monolithic Semiconductors, France; ²Thales, France
- N/A  **C** **Architecture and Capacity Evolution in Active Antennas for Earth Observation, Telecom, and Deep Space at AIRBUS DS SPAIN**
Antonio Montesano, Airbus, Spain
- N/A  **C** **Additive Manufacturing: Enabling Technology for GEO Active Antennas**
*Tomislav Debogovic¹, Esteban Menargues¹, Mathieu Billod¹, José Ignacio Echeveste²,
Francisco Cano², Antonio Montesano²*
¹SWISSto12, Switzerland; ²Airbus, Spain
- N/A  **C** **Active Antenna Development at Thales Alenia Space**
*Christophe Benoist, Michael Blum, Anne Couarraze, Thierry Girard, Jérémie Le Guen,
Benoit Lejay, Laurent Levert, Madivanane Nadarassin, Olivier Perrin, Thierry Rostan,
Julien Rotureau, Hassan Solhi, Eric Vourch, Thales Alenia Space, France*
- N/A  **C** **Airbus UK Active Antenna Developments, Challenges and the Future**
*Sonya Amos, Glyn Thomas, Steve McLaren, Carolina Tienda-Herrero, David Dupuy,
Airbus, UK*

EuMC/EuRAD03 : [Special Session] Focus Day: Active Array Antennas for Defence

Chair: Peter Knott, Fraunhofer FHR, Germany

Co-Chair: Patrick Langlois, European Defence Agency, Belgium

13:50-15:30, Thursday 14 January 2021, Auditorium

- N/A  **C Research Progress of Intelligent Active Phased Array Radar**
Jun Sun, CETC 14, China
- N/A  **C Digital Frontends for Multi-Functional RF Systems**
Michael Brandfass, Hensoldt Sensors, Germany
- N/A  **C Naval and Ground-Based Multi-Mission AESA Radars**
Simon van den Berg, Thales, The Netherlands
- N/A  **C AESA Radar for Space Situational Awareness — About the Status of GESTRA**
H. Wilden¹, C. Kirchner¹, A. Brenner¹, T. Eversberg²
¹Fraunhofer FHR, Germany; ²DLR, Germany
- N/A  **C AESA Radar Development at Lincoln Lab**
David Conway, MIT Lincoln Laboratory, USA