

Contents

6G and ICAS for Mobility Applications

Tag-Based Joint Communication and Sensing for Smart Mobility With Modulated Active Backscatter and Harmonic Radar at 61/122 GHz..... 1

Steffen Hansen¹, Dominic Funke¹, Jan Wessel¹, Christian Bredendiek¹, Nils Pohl^{1,2}

¹Fraunhofer FHR, Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR, Wachtberg, Germany

²Ruhr-University Bochum, Bochum, Germany

A Joint Radar and Communication Approach Based on Phase-Coded FMCW Chirp Sequences 5

Mohamad Alami El Dine, Michael Stelzig, Jan Schür, Martin Vossiek, *Institute of Microwaves and Photonics (LHFT), Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU) Erlangen, Germany*

Channel Simulation and Synchronization for Bistatic ICAS Systems Based on OFDM Waveforms 9

Vimukthi Herath, Thomas Dallmann, Tiandi Song, *Technische Universität Ilmenau, Germany*

A Scalable Hybrid Channel Model for ISAC Evaluation..... 13

Ainur Ziganshin¹, Christian Schneider¹, Daniel Czaniera², Reiner Thomä¹

¹Technische Universität Ilmenau, Institute of Information Technology, Ilmenau, Germany

²Fraunhofer Institute of Integrated Circuits, Erlangen, Germany

Excess Delay Estimation Using Power Delay Profiles in V2X-Scenarios..... 17

Lennart Thielecke, Thomas Kuerner, *Braunschweig Technical University, Germany*

Signal Processing Methods for Automotive Radars

Time and Frequency Division Multiplexing in High-Resolution Imaging Radars With LO Feethrough Topology..... 22

Dominik Schwarz, Matthias Linder, Veronika Kienle, Christina Bonfert, Christian Waldschmidt
Institute of Microwave Engineering, Ulm University, Germany

Towards the Detection of Violent Scenes at Public Places by Analyzing Range-Doppler Maps 26

Hans-Günter Hirsch¹, Tobias Bolten¹, Frederik Terstappen¹, Regina Pohle-Fröhlich¹, Manfred Hägelen², Rainer Jetten², Reinhard Kulke²

¹Institute for Pattern Recognition, Niederrhein University of Applied Sciences, Krefeld, Germany

¹IMST GmbH, Kamp-Lintfort, Germany

Monostatic Millimeterwave Radar Imaging of Vulnerable Road Users..... 30

Isabella B. Varga, Willi Hofmann, Andreas Schwind, Thomas Dallmann Matthias A. Hein
Technische Universität Ilmenau, Germany

Effect of Geometrical Anisotropy on Road Surface Radar Cross Sections..... 34

Wietse Bouwmeester, Francesco Fioranelli, Alexander Yarovoy, *TU Delft, The Netherlands*

Angle of Arrival Versus Multipath Propagation Method for Curbstone Height Estimation in Automotive Radar Application 38

Reza Aliabadi, Marlene Harter, *Offenburg University, Germany*

Waveforms and Modulation Schemes for Automotive Radars

Radar Backscatter Communication With Vibrating Surfaces 43

Carlos Pessing, Christoph Domnik, Michael Meuleners, Christoph Degen, *Hochschule Niederrhein, Germany*

Integration of Backscatter Modulation in FMCW Radar Systems: Demonstration at 24 GHz With Slow and Fast Modulation Rates..... 48

Christoph Domnik, Michael Meuleners, Christoph Degen, *Hochschule Niederrhein, Germany*

CDMA and Non-Uniform Multiplexing: A Study of Dynamic Range in MIMO Radar Waveforms .. 53

Aitor Correas-Serrano¹, Nikita Petrov², Maria Gonzalez-Huici¹, Alexander Yarovoy²

¹*Fraunhofer FHR, Germany*, ²*TU Delft, Netherlands*

Calibration and Validation of Automotive Radars

Phase Noise Analysis of Photonic Radar Systems With Optical LO Distribution..... 57

Stephan Kruse¹, Pascal Kneuper¹, Tobias Schwabe¹, Heiko G. Kurz², Marc-Michael Meinecke², Maria A. Gonzalez-Huici³, J. Christoph Scheytt¹

¹*Paderborn University, Germany*, ²*Volkswagen AG, Germany*, ³*Fraunhofer FHR, Germany*

Coherent Virtual Aperture Calibration in Uncoupled MIMO Radar Networks 61

Vinzenz Janoudi¹, Pirmin Schoeder¹, Timo Grebner¹, Christian Waldschmidt¹, Juergen Dickmann², Nils Appenrodt², ¹*Ulm University, Germany*, ²*Mercedes-Benz Group AG, Germany*

On-The-Fly Self-Calibration for Millimeter-Wave Radar Sensors Exploiting High Channel Counts 65

Matthias Linder, Dominik Schwarz, Nico Riese, Christian Waldschmidt, *University of Ulm, Germany*

Generative Adversarial Synthesis of Radar Point Cloud Scenes..... 69

Muhammad Saad Nawaz^{1,3}, Thomas Dallmann², Torsten Schön³, Dirk Heberling¹

¹*RWTH Aachen University Germany*, ²*TU Ilmenau, Germany*

³*Almotion Bavaria, Technische Hochschule Ingolstadt, Germany*

Emulation of Multipath Effects With Automotive Radar Test System 73

Arvid Sims¹, Bernhard Holzinger¹, Tom Vandeplas², Thomas Dallmann³, Dirk Heberling⁴

¹*Keysight Technologies Germany GmbH, Böblingen, Germany*

²*Keysight Technologies Belgium, Rotselaar, Belgium*

³*TU Ilmenau, Germany*

⁴*RWTH Aachen, Germany*

Cognitive Cooperative Mobility

Protection of Vulnerable Road Users by AI- and V2X-Based Infrastructure Measures..... 77

Leon Kiefer, Christian Vollrath, Xiao Ni, Lukas Rilling, Carsten Kühnel, Torsten Wissmann

University of Applied Sciences Erfurt, Germany

V2X Based Human-Centered Decision Making for Autonomous Mobile Robots Operating in Urban Outdoor Environment..... 81

Yekaterina Strigina, Tarunkumar Parmar, Venkata Prashanth Uppalapat, Swaraj Tendulkar, Frank Schrödel

Schmalkalden University of Applied Sciences, Schmalkalden, Germany

The CCAM Decision Support Platform of the DIGEST Project – the Digital Twin as the Result of a Long-Term Research and Development Roadmap	85
Wolfgang Schildorfer ¹ , Matthias Neubauer ¹ , Thomas Novak ¹ , Andreas Kuhn ² , Walter Aigner ³	
¹ <i>FH OÖ - Logistikum, Steyr, Austria</i> , ² <i>Andata, Hallein, Austria</i>	
³ <i>Vereinigung High Tech Marketing, Vienna, Austria</i>	
Wide-Band Low-Profile Quadripod Kettle Antenna for Automotive 5G Mobile Communications	91
Umair Tayyab, Muhammad Ehtisham Asghar, Matthias Hein, <i>TU Ilmenau, Germany</i>	
Machine Learning and Simulations for Autonomous Driving	
Radar-Based Gesture Recognition Using Gaussian Mixture Variational Autoencoder	95
Muhammad Ghufuran Janjua ^{1,2} , Kevin Kaiser ² , Muhammad Arsalan ¹ , Gianfranco Mauro ² , Stephan Schoenfeldt ² , Vadim Issakov ^{1,2} , ¹ <i>TU Braunschweig, Germany</i> , ² <i>Infineon Technologies AG, Neubiberg, Germany</i>	
Hierarchical Architecture and Feature Mixing for Ego-Motion Estimation Using Automotive Radar.....	99
Simin Zhu ¹ , Francesco Fioranelli ¹ , Alexander Yarovoy ¹ , Satish Ravindran ² , Lihui Chen ²	
¹ <i>Delft University of Technology, Delft, The Netherlands</i> , ² <i>NXP Semiconductors, San Jose, California, USA</i>	
SCaRL- A Synthetic Multi-Modal Dataset for Autonomous Driving.....	103
Avinash Nittur Ramesh, Aitor Correias-Serrano, María González-Huici, <i>Fraunhofer FHR, Germany</i>	
Assessment of OFDM Radar in Automotive and Joint Communication and Sensing Scenarios Using Realistic Ray Tracing Simulations	107
Theresa Noegel, Oliver Sura, Christian Schuessler, Marcel Hoffmann, Martin Vossiek	
<i>Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany</i>	