

2021 IEEE 32nd Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC 2021)

**Virtual Conference
13 – 16 September 2021**

Pages 1-500



**IEEE Catalog Number: CFP21PIM-POD
ISBN: 978-1-7281-7587-4**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. 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:	CFP21PIM-POD
ISBN (Print-On-Demand):	978-1-7281-7587-4
ISBN (Online):	978-1-7281-7586-7
ISSN:	2166-9570

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

TABLE OF CONTENTS

TOWARDS AN INTERNET OF REALITY	1
<i>James Gross</i>	
POSITIONING TECHNOLOGY TRENDS AND SOLUTIONS TOWARD 6G	6
<i>Mikko Säily, Osman N. C. Yilmaz, Diomidis S. Michalopoulos, Eva Pérez, Ryan Keating, Joerg Schaepperle</i>	
DEEP NEURAL NETWORK-BASED BLIND MULTIPLE USER DETECTION FOR GRANT-FREE MULTI-USER SHARED ACCESS	13
<i>Thushan Sivalingam, Samad Ali, Nurul Huda Mahmood, Nandana Rajatheva, Matti Latva-Aho</i>	
CLOUD-CONTROLLED AUTONOMOUS MOBILE ROBOT PLATFORM	20
<i>Marcell Balogh, Attila Vidács, Gábor Fehér, Markosz Maliosz, Márton Áron Horváth, Norbert Reider, Sándor Rác</i>	
OPEN SOURCE 5G-NSA NETWORK FOR INDUSTRY 4.0 APPLICATIONS	26
<i>Elizabeth Palacios-Morocho, Pablo Picazo-Martínez, Saúl Inca, Jose F. Monserrat</i>	
POWER ALLOCATION STRATEGY OF UNTRUSTED RELAY NETWORK BASED ON STACKELBERG GAME.....	32
<i>Donghui Xu, Rugui Yao, Yuxin Zhang, Ye Fan, Xiaoya Zuo</i>	
PROACTIVE APPLICATION RATE REQUIREMENT ADAPTATION MECHANISM FOR SIDELINKS	38
<i>Ramya Panthangi Manjunath, Martin Schubert, R. L. G Cavalcante, Mate Boban, Chan Zhou, Slawomir Stanczak</i>	
SIDELINK-ASSISTED URLLC BUILT ON COOPERATIVE RETRANSMISSIONS WITH OPTIMUM POWER CONTROL	44
<i>Tapisha Soni, Malte Schellmann, Alois Knoll</i>	
SMART MANUFACTURING MULTI-SITE TESTBED WITH 5G AND BEYOND CONNECTIVITY	50
<i>Ilkka Harjula, Mikko Uitto, Marko Jurmu, Jukka Koskinen, Jukka Mäkelä, Stefan Walter, Markku Hentula, Tapio Heikkilä, Marja Lintala, Kyösti Rautiola</i>	
ENHANCED POWER SAVING SCHEMES FOR EXTENDED REALITY	56
<i>Dongru Li, Huazheng You, Wei Jiang, Xiaohang Chen, Chaojun Zeng, Xiaodong Sun</i>	
EXPLORING EXTENDED REALITY WITH FLEXIBLE SPECTRUM ACCESS IN WIRELESS CELLULAR NETWORK	62
<i>Yu Gao, Songyan Xue, Mengying Ding, Jinlin Peng, Jiyong Pang</i>	
FRAME SYNCHRONISATION FOR MULTI-SOURCE HOLOGRAPHIC TELEPORTATION APPLICATIONS - AN EDGE COMPUTING BASED APPROACH	68
<i>Sweta Anmulwar, Ning Wang, Andy Pack, Vu San Ha Huynh, Jinze Yang, Rahim Tafazolli</i>	
PERFORMANCE EVALUATION OF EXTENDED REALITY APPLICATIONS IN 5G NR SYSTEM.....	74
<i>Jay Kumar Sundararajan, Hwan-Joon Kwon, Olufunmilola Awoniyi-Oteri, Yuchul Kim, Chih-Ping Li, Jelena Damnjanovic, Shanyu Zhou, Ruifeng Ma, Yeliz Tokgoz, Prashanth Hande, Tao Luo, Kiran Mukkavilli, Tingfang Ji</i>	

UE POWER SAVING TECHNIQUES FOR EXTENDED REALITY (XR) SERVICES IN 5G NR SYSTEMS.....	81
<i>Yuchul Kim, Hwan-Joon Kwon, Olufunmilola Awoniyi-Oteri, Prashanth Hande, Jay Kumar Sundararajan, Yeliz Tokgoz, Tao Luo, Kiran Mukkavilli, Tingfang Ji</i>	
XR QUALITY INDEX: EVALUATING RAN TRANSMISSION QUALITY FOR XR SERVICES OVER 5G AND BEYOND	88
<i>Shengyue Dou, Shuri Liao, Jian Wu, Kedi Wu, Er kai Chen, Weichao Chen, Hui Shen, Nijun Li</i>	
AN LED COMMUNICATION MODEL BASED ON CARRIER RECOMBINATION IN THE QUANTUM WELL.....	94
<i>Jean-Paul M. G. Linnartz, Xiong Deng, Anton Alexeev, Paul Van Voorthuisen</i>	
A VISIBLE LIGHT POSITIONING SYSTEM BASED ON SUPPORT VECTOR MACHINES	100
<i>Neha Chaudhary, Othman Isam Younus, Zahra Nazari Chaleshtori, Luis Nero Alves, Zabih Ghassemlooy, Stanislav Zvanovec</i>	
AN EFFICIENT MULTI-LINK CHANNEL MODEL FOR LIFI.....	106
<i>Sreelal Maravanchery Mana, Kerolos Gabra Kamel Gabra, Sepideh Mohammadi Kouhini, Peter Hellwig, Jonas Hilt, Volker Jungnickel</i>	
DESIGN AND IMPLEMENTATION OF AN OPTICAL CAMERA COMMUNICATION SYSTEM FOR WIRELESS SENSOR NETWORKING IN FARMING FIELDS	112
<i>Vicente Matus, Victor Guerra, Cristo Jurado-Verdu, Stanislav Zvanovec, Jose Rabadan, Rafael Perez-Jimenez</i>	
EXPERIMENTAL CHARACTERIZATION OF FIBER OPTIC LIGHTING - OPTICAL CAMERA COMMUNICATIONS	118
<i>Shivani Rajendra Teli, Klara Eollosova, Stanislav Zvanovec, Zabih Ghassemlooy, Matej Komanec</i>	
EXPERIMENTAL CHARACTERIZATION OF MULTI-HOP VEHICULAR VLC SYSTEMS.....	123
<i>Bassam Aly, Mohammed Elamassie, Murat Uysal</i>	
IMPACT OF SYNCHRONIZATION ERRORS ON THE PERFORMANCE OF ACO-OFDMA SIGNALING FOR MEDICAL EXTRA-WBAN LINKS	129
<i>Md Jahid Hasan, Mohammad Ali Khalighi, Luis Nero Alves, Bastien Béchadergue</i>	
MODELLING OF AN UNDERWATER OPTICAL WIRELESS COMMUNICATION SYSTEM WITH MISALIGNMENT TOLERANCE	135
<i>Veridiano Marques, Henrique M. Salgado, Luís M. Pessoa</i>	
PERFORMANCE ANALYSIS OF INDOOR VEHICULAR VLC LINKS FOR AUTONOMOUS DRIVING	142
<i>Elizabeth Eso, Elnaz Alizadeh Jarchlo, Zabih Ghassemlooy, Stanislav Zvanovec, Falko Dressler, Juna Sathian</i>	
THE IMPACT OF BLOCKING AND SHADOWING ON THE INDOOR VISIBLE LIGHT POSITIONING SYSTEM.....	147
<i>Othman Isam Younus, Neha Chaudhary, Zahra Nazari Chaleshtori, Zabih Ghassemlooy, Luis Nero Alves, Stanislav Zvanovec</i>	
DEEP REINFORCEMENT LEARNING BASED CONGESTION CONTROL FOR V2X COMMUNICATION	153
<i>Moustafa Roshdi, Shubhangi Bhadauria, Khaled Hassan, Georg Fischer</i>	

IMPACT OF RECONFIGURABLE INTELLIGENT SURFACE SIZE ON BEAMFORMING EFFICIENCY	159
<i>Giorgos Stratidakis, Sotiris Droulias, Angeliki Alexiou</i>	
RECONFIGURABLE INTELLIGENT SURFACE (RIS): EIGENVALUE DECOMPOSITION-BASED SEPARATE CHANNEL ESTIMATION.....	164
<i>Salah Eddine Zegrar, Liza Afeef, Hüseyin Arslan</i>	
AI BASED LANDSCAPE SENSING USING RADIO SIGNALS	170
<i>Vijaya Yajnanarayana, Dongdong Huang, Deep Shrestha, Yi Geng, Ali Behravan, Erik Dahlman</i>	
INDOOR MAPPING WITH A MOBILE RADAR USING AN EK-PHD FILTER	175
<i>Jukka Talvitie, Ossi Kaltiokallio, Elizaveta Rastorgueva-Foi, Carlos Baquero Barneto, Musa Furkan Keskin, Henk Wymeersch, Mikko Valkama</i>	
INTEGRATION OF COMMUNICATION AND SENSING IN 6G: A JOINT INDUSTRIAL AND ACADEMIC PERSPECTIVE.....	181
<i>Henk Wymeersch, Deep Shrestha, Carlos Morais De Lima, Vijaya Yajnanarayana, Björn Richerzhagen, Musa Furkan Keskin, Kim Schindhelm, Alejandro Ramirez, Andreas Wolfgang, Mar Francis De Guzman, Katsuyuki Haneda, Tommy Svensson, Robert Baldemair, Stefan Parkvall</i>	
LOW-COMPLEXITY AOA AND AOD ESTIMATION IN THE TRANSFORMED SPATIAL DOMAIN FOR MILLIMETER WAVE MIMO CHANNELS	188
<i>Sandra Roger, Carmen Botella-Mascarell, Diego Lloria, Maximo Cobos, Gábor Fodor</i>	
A 140-GHZ MICROSTRIP AMPLITUDE MODULATOR BASED ON SCHOTTKY DIODES	194
<i>Kesen Ding, Wei Kou, Shixiong Liang, Xiaoqing Guo, Sen Gong, Yaxin Zhang</i>	
SUB-THZ VNA-BASED CHANNEL SOUNDER STRUCTURE AND CHANNEL MEASUREMENTS AT 100 AND 300 GHZ	198
<i>Yejian Lyu, Pekka Kyösti, Wei Fan</i>	
TERAHERTZ FREQUENCY QUADRUPLER BASED ON A 2×2 SINGLE-CHIP GAAS MONOLITHIC INTEGRATION	203
<i>Wei Kou, Hongji Zhou, Shixiong Liang, Yaxin Zhang, Sen Gong, Ziqiang Yang</i>	
VERIFICATION OF DUAL-POLARIZED ULTRA-WIDEBAND CHANNEL SOUNDER FOR THZ APPLICATIONS.....	209
<i>Diego Dupleich, Alexander Ebert, Robert Müller, Giovanni Del Galdo, Reiner Thomä</i>	
INTEGRATED SENSING AND COMMUNICATION IN 6G: THE DETERMINISTIC CHANNEL MODELS FOR THZ IMAGING	214
<i>Xianjin Li, Jia He, Ziming Yu, Guangjian Wang, Peiying Zhu</i>	
TERAHERTZ COMMUNICATIONS ENHANCED BY IRS	220
<i>Hanwen Cao, Mate Boban, Josef Eichinger</i>	
AOI OPTIMAL UAV TRAJECTORY PLANNING: A DEEP RECURRENT REINFORCEMENT LEARNING APPROACH	225
<i>Mengjie Wu, Huijia Chi, Shuying Gan, Xijun Wang, Chao Xu</i>	
CLIENT SELECTION BASED ON LABEL QUANTITY INFORMATION FOR FEDERATED LEARNING.....	231
<i>Jiahua Ma, Xinghua Sun, Wenchao Xia, Xijun Wang, Xiang Chen, Hongbo Zhu</i>	

DEEP REINFORCEMENT LEARNING BASED CACHING PLACEMENT AND USER ASSOCIATION FOR DYNAMIC CELLULAR NETWORKS	237
<i>Yue Wang, Chunyan Feng, Tiankui Zhang</i>	
DEEP REINFORCEMENT LEARNING-BASED MULTI-PANEL BEAM MANAGEMENT IN MASSIVE MIMO SYSTEMS: ALGORITHM DESIGN AND SYSTEM-LEVEL SIMULATION	243
<i>Yang Li, Jiamo Jiang, Chao Jia, Yifei Yuan, Zhongyuan Zhao, Ying Du, Zhiqin Wang</i>	
RELEVANCE-BASED WIRELESS RESOURCE ALLOCATION FOR A MACHINE LEARNING-BASED CENTRALIZED CONTROL SYSTEM.....	249
<i>Afsaneh Gharouni, Peter Rost, Andreas Maeder, Hans Schotten</i>	
SMART SCHEDULING BASED ON DEEP REINFORCEMENT LEARNING FOR CELLULAR NETWORKS	256
<i>Jian Wang, Chen Xu, Rong Li, Yiqun Ge, Jun Wang</i>	
A KALMAN-BASED AUTOENCODER FRAMEWORK FOR END-TO-END COMMUNICATION SYSTEMS	262
<i>Bin Hu, Jian Wang, Chen Xu, Gongzheng Zhang, Rong Li</i>	
A SIGNAL DETECTION SCHEME BASED ON DEEP LEARNING IN OFDM SYSTEMS.....	268
<i>Guangliang Pan, Zitong Liu, Wei Wang, Minglei Li</i>	
ADAPTIVE MODULATION FOR WIRELESS FEDERATED LEARNING.....	274
<i>Xinyi Xu, Guanding Yu, Shengli Liu</i>	
FAST CONVERGENCE FOR FEDERATED LEARNING IN OFDMA SYSTEMS	280
<i>Deshi Ye, Songyang Chen, Can Wang</i>	
GPAE-LSTMNET: A NOVEL LEARNING STRUCTURE FOR MOBILE MIMO CHANNEL PREDICTION	286
<i>Zhuoran Xiao, Zhaoyang Zhang, Chongwen Huang, Caijun Zhong, Xiaoming Chen</i>	
MEMETIC ALGORITHM BASED ON COMMUNITY DETECTION FOR ENERGY-EFFICIENT SERVICE MIGRATION OPTIMIZATION IN 5G MOBILE EDGE COMPUTING.....	292
<i>Guo Li, Ling Liu, Zhengping Liang, Xiaoliang Ma, Zexuan Zhu</i>	
A NEW LOOK TO THZ WIRELESS LINKS: FADING MODELING AND CAPACITY ASSESSMENT	299
<i>Evangelos N. Papatotiriou, Alexandros-Apostolos A. Boulogeorgos, Mar Francis De Guzman, Katsuyuki Haneda, Angeliki Alexiou</i>	
THZ CHANNEL MODEL FOR 6G COMMUNICATIONS.....	304
<i>Zahed Hossain, Qian Clara Li, Dawei Ying, Geng Wu, Cong Xiong</i>	
AGE OF CONTROL PROCESS FOR REAL-TIME WIRELESS CONTROL	311
<i>Burak Kizilkaya, Bo Chang, Shuja Ansari, Yusuf A. Sambo, Guodong Zhao, Muhammad A. Imran</i>	
AGE OF LOOP FOR WIRELESS NETWORKED CONTROL SYSTEMS OPTIMIZATION	316
<i>Pedro M. De Sant Ana, Nikolaj Marchenko, Petar Popovski, Beatriz Soret</i>	
INFORMATION PROCESSING AND DATA VISUALIZATION IN NETWORKED INDUSTRIAL SYSTEMS	323
<i>Pavol Mulinka, Charalampos Kalalas, Merim Dzaferagic, Irene Macaluso, Daniel Gutierrez Rojas, Pedro Juliano Nardelli, Nicola Marchetti</i>	

PERFORMANCE EVALUATION OF DYNAMIC COMPUTATION OFFLOADING CAPABILITY FOR INDUSTRIAL WEARABLES	329
<i>Asad Ali, Olga Galinina, Jiri Hosek, Sergey Andreev</i>	
SOON: SOCIAL NETWORK OF MACHINES TO OPTIMIZE TASK SCHEDULING IN SMART MANUFACTURING	336
<i>Hatem Ghorbel, Jonathan Dreyer, Farid Abdalla, Vicente Rodríguez Montequín, Zoltán Balogh, Emil Gatial, Ivana Bundinská, Adrian Gligor, Laszlo Barna Iantovics, Stefano Carrino</i>	
INVESTIGATING COMMUNICATIONS ENERGY EFFICIENCY TRADEOFF BETWEEN UAV USERS AND SMALL-CELL USERS	342
<i>Ramin Hashemi, Mohammad Robat Mili, Samad Ali, Hamzeh Beyranvand, Matti Latva-Aho</i>	
ENHANCED 5G PUCCH USING NON-COHERENT CONSTELLATIONS WITH LOW- COMPLEXITY DETECTION	348
<i>Yi Qin, Renaud-Alexandre Pitaval</i>	
ON THE MEAN LOCAL DELAY OF CLUSTERED FOG RADIO ACCESS NETWORKS.....	354
<i>Yanan Zheng, Haonan Hu, Zhiqian Chen, Bo Yin, Jie Zhang</i>	
RELAY SELECTION AND THROUGHPUT MAXIMIZATION FOR FULL DUPLEX WIRELESS POWERED COOPERATIVE COMMUNICATION NETWORKS	360
<i>Syed Adil Abbas Kazmi, Muhammad Shahid Iqbal, Sinem Coleri</i>	
LOW OVERHEAD CODEBOOK DESIGN FOR MMWAVE ROADSIDE UNITS PLACED AT SMART INTERSECTIONS	366
<i>Bryse Flowers, Xinyu Zhang, Sujit Dey</i>	
SECRETIVE CODED CACHING FROM PDAS	373
<i>Shreya Shrestha Meel, B. Sundar Rajan</i>	
CODED CACHING WITH SHARED CACHES FROM GENERALIZED PLACEMENT DELIVERY ARRAYS.....	380
<i>Elizabeth Peter, B. Sundar Rajan</i>	
EXPLOITING JOINT-CACHE-CHANNEL CODING FOR DECENTRALIZED CODED CACHING WITH HETEROGENEOUS LINK RATES AND CACHE SIZES.....	387
<i>Aimin Tang, Yao Liu, Xudong Wang</i>	
ORTHOGONAL MULTIPOINT MULTICAST CACHING IN OFDM CELLULAR NETWORKS WITH ICI AND IBI	394
<i>Mohsen Amidzadeh, Hanan Al-Tous, Giuseppe Caire, Olav Tirkkonen</i>	
MULTI-POPULARITY MULTI-THRESHOLD GROUPED CACHING FOR DEVICE-TO- DEVICE COMMUNICATION.....	400
<i>Ling Huang, Kuan Wu, Ming Jiang</i>	
SEARCH FOR GOOD IRREGULAR LOW-DENSITY PARITY-CHECK CODES VIA GRAPH SPECTRUM.....	405
<i>Dawei Yin, Xiaojing Zhang, Xichao Shu, Guiying Yan, Guanghui Wang</i>	
DESIGN OF CODEBOOK FOR NON-BINARY POLAR CODED SCMA	411
<i>Changhao Han, Hui Zhao, Xiangpin Jiang</i>	
MULTILEVEL POLAR CODED SPACE-SHIFT KEYING	417
<i>Muhammad Zaeem Hasan, Nemanja Stefan Perovic, Mark F. Flanagan</i>	

A GENERAL CONDITIONAL BER EXPRESSION OF RECTANGULAR QAM IN THE PRESENCE OF PHASE NOISE.....	422
<i>Thanh V. Pham, Thang V. Nguyen, Anh T. Pham</i>	
CODED FASTER-THAN-NYQUIST SIGNALING FOR SHORT PACKET COMMUNICATIONS	428
<i>Emre Cerci, Adem Cicek, Enver Cavus, Ebrahim Bedeer, Halim Yanikomeroglu</i>	
A LOW-COMPLEXITY HIGH-RATE SPATIAL MULTIPLEXING AIDED GENERALIZED SPATIAL MODULATION SCHEME.....	434
<i>Yen-Ming Chen, Kuo-Chun Lin, Yao-Hsien Peng, Aswin Balaji, Chih-Peng Li</i>	
GFDM PRE-CODING AND DECODING IN A GABOR SETTING.....	440
<i>Francesco Linsalata, Maurizio Magarini</i>	
MODULATION AND CODING SCHEMES FOR VARIABLE-RATE PARALLEL SEQUENCE SPREAD SPECTRUM.....	446
<i>L. Lopacinski, A. Hasani, N. Maletic, J. Gutiérrez, R. Kraemer, E. Grass</i>	
FREQUENCY REUSE WITH HIGHER-ORDER SECTORISATION AND DIRECTIONAL TERMINALS FOR IMPROVED CAPACITY IN REALISTIC TERRAIN	452
<i>Zubia Ishrat, Philippa A. Martin, Graeme Woodward, Jim Cavers</i>	
ASYMMETRICALLY CLIPPED-FSK MODULATION FOR ENERGY EFFICIENT VISIBLE LIGHT COMMUNICATIONS	458
<i>Muhammad Jehangir Khan, Ali Waqar Azim, Yannis Le Guennec, Ghislaine Maury, Laurent Ros</i>	
EMPIRICAL EVALUATION OF OFDM WAVEFORMS FOR VLC IN THE PRESENCE OF LED NONLINEARITIES	465
<i>Mikko Laakso, Alexis A. Dowhuszko, Risto Wichman</i>	
PERFORMANCE ANALYSIS OF HYBRID SATELLITE-TERRESTRIAL RELAY NETWORKS.....	471
<i>Fei Zou, Rong Chai, Qianbin Chen</i>	
PERFORMANCE OF A NEW FRAMEWORK FOR COORDINATED DIRECT AF RELAY-AIDED DOWNLINK NOMA.....	477
<i>Anand Jee, Kamal Agrawal, Shankar Prakriya</i>	
ENERGY-EFFICIENT COVERAGE ENHANCEMENT OF INDOOR THZ-MISO SYSTEMS: AN FD-NOMA APPROACH	483
<i>Omar Maraqa, Aditya S. Rajasekaran, Hamza U. Sokun, Saad Al-Ahmadi, Halim Yanikomeroglu, Sadiq M. Sait</i>	
LATENCY-AWARE JOINT TRANSMIT BEAMFORMING AND RECEIVE POWER SPLITTING FOR SWIPT SYSTEMS	490
<i>Dileep Kumar, Onel L. Alcaraz López, Antti Tölli, Satya Joshi</i>	
PERFORMANCE OF FULL-DUPLEX COOPERATIVE NOMA NETWORK WITH NONLINEAR ENERGY HARVESTING	495
<i>Ujjawal Makhanpuri, Kamal Agrawal, Anand Jee, Shankar Prakriya</i>	
BACKSCATTER COMMUNICATION SYSTEM WITH DUMB DIFFUSING SURFACE	501
<i>Jean-Marc Kelif, Dinh-Thuy Phan-Huy</i>	

RESOURCE ALLOCATION FOR ENERGY HARVESTING D2D COMMUNICATIONS UNDERLAYING NOMA CELLULAR NETWORKS	507
<i>Vatsala, Abraham O. Fapojuwo</i>	
INTELLIGENT REFLECTING SURFACES VERSUS FULL-DUPLEX RELAYING: PERFORMANCE COMPARISON FOR NON-IDEAL TRANSMITTER CASE	513
<i>Mohd Hamza Naim Shaikh, Vivek Ashok Bohara, Anand Srivastava, Gourab Ghatak</i>	
INTELLIGENT REFLECTING SURFACE AIDED COMMUNICATION SYSTEMS: PERFORMANCE ANALYSIS	519
<i>Jiarui Li, Yi Hong</i>	
AERIAL RECONFIGURABLE INTELLIGENT SURFACE-AIDED WIRELESS COMMUNICATION SYSTEMS	525
<i>Tri Nhu Do, Georges Kaddoum, Thanh Luan Nguyen, Daniel Benevides Da Costa, Zygmunt J. Haas</i>	
SIMMBM CHANNEL SIMULATOR FOR MEDIA-BASED MODULATION SYSTEMS	531
<i>Zehra Yigit, Ertugrul Basar, Ibrahim Altunbas</i>	
PERFORMANCE ANALYSIS OF RIS-SSK IN THE PRESENCE OF HARDWARE IMPAIRMENTS	537
<i>Asma Bouhlef, Malek M. Alsmadi, Emad Saleh, Salama Ikki, Anis Sakly</i>	
SPARSE ACTIVITY DETECTION IN INTELLIGENT REFLECTING SURFACE ASSISTED WIRELESS NETWORKS	543
<i>Mangqing Guo, M. Cenk Gursoy</i>	
OPTIMAL SNR ANALYSIS FOR SINGLE-USER RIS SYSTEMS.....	549
<i>Ikram Singh, Peter J. Smith, Pawel A. Dmochowski</i>	
TRANSFER LEARNING BASED DETECTION FOR INTELLIGENT REFLECTING SURFACE AIDED COMMUNICATIONS.....	555
<i>Saud Khan, Salman Durrani, Xiangyun Zhou</i>	
UNTRAINED DNN FOR CHANNEL ESTIMATION OF RIS-ASSISTED MULTI-USER OFDM SYSTEM WITH HARDWARE IMPAIRMENTS.....	561
<i>Nipuni Ginige, K. B. Shashika Manosha, Nandana Rajatheva, Matti Latva-Aho</i>	
STOCHASTIC GEOMETRY BASED INTERFERENCE ANALYSIS OF MULTIUSER MMWAVE NETWORKS WITH RIS	567
<i>Joonas Kokkonen, Markku Juntti</i>	
ON THE PERFORMANCE OF THE IRS-AIDED COMMUNICATION SYSTEMS WITH ANALOG MISMATCHES	573
<i>Liyuan Wen, Kangqi Han, Kai Kang, Hua Qian</i>	
DEEP REINFORCEMENT LEARNING-BASED BEAM TRAINING FOR SPATIALLY CONSISTENT MILLIMETER WAVE CHANNELS	579
<i>Narengerile Narengerile, John Thompson, Paul Patras, Tharmalingam Ratnarajah</i>	
DNN BASED MULTI-PATH BEAMFORMING FOR FDD MILLIMETER-WAVE MASSIVE MIMO SYSTEMS.....	585
<i>Ke Xu, Fu-Chun Zheng, Pan Cao, Hongguang Xu, Xu Zhu</i>	

DEEP LEARNING BASED JOINT BEAM SELECTION AND PRECODING DESIGN FOR MMWAVE SYSTEMS WITH LENS ARRAYS.....	591
<i>Qiyu Hu, Yanzhen Liu, Yunlong Cai, Guanding Yu</i>	
CHANNEL PREDICTION AND PMI/RI SELECTION IN MIMO-OFDM SYSTEMS BASED ON DEEP LEARNING.....	598
<i>Zhen Yuan, Kai Niu, Chao Dong</i>	
ONE-BIT QUANTIZED CHANNEL PREDICTION WITH NEURAL NETWORKS.....	604
<i>Nurettin Turan, Michael Koller, Wolfgang Utschick</i>	
MODEL-BASED ADAPTIVE MODULATION AND CODING WITH LATENT THOMPSON SAMPLING.....	610
<i>Vidit Saxena, Hugo Tullberg, Joakim Jaldén</i>	
DEEP LEARNING-BASED SIGNAL DETECTION FOR UPLINK IN LORA-LIKE NETWORKS.....	617
<i>Angesom Ataklity Tesfay, Eric Pierre Simon, Sofiane Kharbech, Laurent Clavier</i>	
HYBRIDDEEPRX: DEEP LEARNING RECEIVER FOR HIGH-EVM SIGNALS.....	622
<i>Jaakko Pihlajasaloo, Dani Korpi, Mikko Honkala, Janne M. J. Huttunen, Taneli Riihonen, Jukka Talvitie, Alberto Brihuega, Mikko A. Uusitalo, Mikko Valkama</i>	
A DNN-BASED OTFS TRANSCEIVER WITH DELAY-DOPPLER CHANNEL TRAINING AND IQI COMPENSATION.....	628
<i>Ashwitha Naikoti, A. Chockalingam</i>	
DEEP LEARNING-BASED ACTIVE USER DETECTION FOR GRANT-FREE SCMA SYSTEMS.....	635
<i>Thushan Sivalingam, Samad Ali, Nurul Huda Mahmood, Nandana Rajatheva, Matti Latva-Aho</i>	
DEEP LEARNING-BASED ESTIMATOR FOR FAST HARQ FEEDBACK IN URLLC.....	642
<i>Saleh Almarshed, Dionysia Triantafyllopoulou, Klaus Moessner</i>	
RATE-SPLITTING RANDOM ACCESS MECHANISM FOR MASSIVE MACHINE TYPE COMMUNICATIONS IN 5G CELLULAR INTERNET-OF-THINGS.....	648
<i>Yeduri Sreenivasa Reddy, Garima Chopra, Ankit Dubey, Abhinav Kumar, Trilochan Panigrahi, Linga Reddy Cenkeramaddi</i>	
EXPLOITING SPATIAL CORRELATION FOR PILOT REUSE IN SINGLE-CELL MMTC.....	654
<i>Lucas Ribeiro, Markus Leinonen, Hanan Al-Tous, Olav Tirkkonen, Markku Juntti</i>	
ENERGY EFFICIENT PRECODER DESIGN AND POWER ALLOCATION FOR A LOW COMPLEXITY MMWAVE SYSTEM.....	660
<i>Kali Krishna Kota, P. Ubaidulla</i>	
DARK BLIND INTERFERENCE ALIGNMENT FOR DOWNLINK OF FUTURE RAILWAY COMMUNICATION SYSTEMS.....	666
<i>Karine Amis, Thomas Galezowski, Xavier Lagrange</i>	
CELL-FREE MASSIVE MIMO IN LOS.....	672
<i>Hong Yang</i>	
HYBRID PRECODING DESIGN BASED ON DUAL-LAYER DEEP-UNFOLDING NEURAL NETWORK.....	678
<i>Guangyi Zhang, Xiao Fu, Qiyu Hu, Yunlong Cai, Guanding Yu</i>	

QUANTIZED VS. ANALOG CHANNEL FEEDBACK FOR FDD MASSIVE MIMO SYSTEMS WITH MULTIPLE-ANTENNA USERS	684
<i>Mahmoud Alaaeldin, Emad Alsusa, Karim G. Seddik</i>	
LARGE SYSTEM ANALYSIS OF THE MAXIMUM RATIO TRANSMISSION PRECODING UNDER IMPERFECT CHANNEL STATE INFORMATION WITH HARDWARE IMPAIRMENTS	691
<i>Yasser Naguib Ahmed</i>	
DEEP LEARNING FOR MASSIVE MIMO: CHANNEL COMPLETION FOR TDD DOWNLINK	696
<i>Sida Dai, Martin Kurras, Lars Thiele, Slawomir Stanczak, Litao Chen, Zhimeng Zhong</i>	
IRREGULAR SUPERIMPOSED MULTI-PILOT FOR GRANT-FREE MASSIVE MIMO	703
<i>Yihua Ma, Zhifeng Yuan, Weimin Li, Zhigang Li</i>	
IMPERFECT JAMMING CANCELLATION ON NOMA NETWORKS WITH RANDOMLY LOCATED EAVESDROPPERS	708
<i>G. M. Da Silva, D. P. M. Osorio, M. Latva-Aho</i>	
COLLABORATIVE PHYSICAL LAYER AUTHENTICATION IN INTERNET OF THINGS BASED ON FEDERATED LEARNING.....	714
<i>Shiji Wang, Na Li, Shida Xia, Xiaofeng Tao, Hua Lu</i>	
ON THE SECRECY-RELIABILITY PERFORMANCE TRADE-OFF FOR NOMA-ENABLED 5G MMWAVE NETWORKS	720
<i>Sourabh Solanki, Devendra S. Gurjar, Pankaj K. Sharma, Shree K. Sharma, Symeon Chatzinotas</i>	
SECURE TRANSMISSION DESIGN BASED ON THE GEOGRAPHICAL LOCATION OF EAVESDROPPER	726
<i>Tao Li, Yongzhao Li, Octavia A. Dobre</i>	
ON SECURE DOWNLINK NOMA SYSTEMS WITH AERIAL EAVESDROPPERS	733
<i>Hongjiang Lei, Chen Zhu, Ki-Hong Park, Weijia Lei, Imran Shafique Ansari</i>	
DISTRIBUTED UAV-ENABLED ZERO-FORCING COOPERATIVE JAMMING SCHEME FOR SAFEGUARDING FUTURE WIRELESS NETWORKS	739
<i>X. A. Flores Cabezas, D. P. Moya Osorio, M. Latva-Aho</i>	
INTELLIGENT REFLECTING SURFACE-ASSISTED WIRELESS KEY GENERATION FOR LOW-ENTROPY ENVIRONMENTS.....	745
<i>Paul Staat, Harald Elders-Boll, Markus Heinrichs, Rainer Kronberger, Christian Zenger, Christof Paar</i>	
ON ENLARGED 5G PRACH PREAMBLE SET USING ALLTOP CUBIC-PHASE SEQUENCES.....	752
<i>Renaud-Alexandre Pitaval</i>	
JAMMING DETECTION WITH SUBCARRIER BLANKING FOR 5G AND BEYOND IN INDUSTRY 4.0 SCENARIOS.....	758
<i>Leonardo Chiarello, Paolo Baracca, Karthik Upadhyaya, Saeed R. Khosravirad, Thorsten Wild</i>	
INTERFERENCE MITIGATION AGAINST FMCW SIGNALS APPLICABLE INTO IEEE 802.11AD FOR INTRA-VEHICLE COMMUNICATIONS	765
<i>Kenichi Takizawa, Ryotaro Suga, Huan-Bang Li, Fumihide Kojima, Kotaro Ikeda, Kentaro Kobayashi, Yuya Kaneko, Tadahide Kunitachi</i>	

DISTANCE ESTIMATION ERROR PERFORMANCE OF VISIBLE LIGHT COMMUNICATION UNDER THE EFFECT OF SIGNAL-DEPENDENT NOISE.....	771
<i>Ahmad Cheema, Malek Alsmadi, Salama Ikki</i>	
COMPRESSION OF CLIPPED OFDM IQ SAMPLES FOR CLOUD RADIO ACCESS NETWORK.....	777
<i>Aya Shehata, Philippe Mary, Matthieu Crussière</i>	
RECIPROCITY CALIBRATION OF DISTRIBUTED MASSIVE MIMO ACCESS POINTS FOR COHERENT OPERATION	783
<i>Joao Vieira, Erik G. Larsson</i>	
SPACE TIME BLOCK CODING AND STRUCTURED MULTIPLEXING FOR QUADRATURE SPATIAL MODULATION.....	788
<i>K S Shafrin, K S Sanila, Neelakandan Rajamohan</i>	
NEARLY PASSIVE RECONFIGURABLE INTELLIGENT SURFACE WITH CONSTANT PHASE-SHIFTS.....	794
<i>Zeeshan Sattar, Afshin Haghighat</i>	
DUAL POLARIZATION BEAMFORMING COVERAGE DEMONSTRATED WITH 5G NR SSB.....	800
<i>Arne Simonsson, Sven O. Petersson, Gunnar Widell</i>	
IMPACT OF CHANNEL CORRELATION AND HARDWARE IMPAIRMENTS ON LARGE INTELLIGENT SURFACES-AIDED COMMUNICATION SYSTEMS	805
<i>Emad Saleh, Malek M. Alsmadi, Asma Bouhleb, Ayse E. Canbilen, Najah Abu Ali, Salama Ikki</i>	
FEED FORWARD PHASE NOISE CANCELLATION IN CELLULAR RF-RECEIVERS.....	811
<i>Birgit Pühringer, Andreas Springer</i>	
RECONFIGURABLE INTELLIGENT SURFACE AIDED SECURE UAV COMMUNICATIONS.....	818
<i>Wen Wang, Hui Tian, Wanli Ni, Meihui Hua</i>	
NONLINEAR POWER AMPLIFIER EFFECTS ON A FULL DUPLEX SPATIAL MODULATION SYSTEM	824
<i>Yanni Zhou, Florin Hutu, Guillaume Villemaud, Taneli Riihonen</i>	
PATH LOSS IN RECONFIGURABLE INTELLIGENT SURFACE-ENABLED CHANNELS	829
<i>S. W. Ellingson</i>	
WIRELESS VEHICULAR MULTIBAND MEASUREMENTS IN CENTIMETERWAVE AND MILLIMETERWAVE BANDS	836
<i>Markus Hofer, David Löschenbrand, Jiri Blumenstein, Herbert Groll, Stefan Zelenbaba, Benjamin Rainer, Laura Bernadó, Josef Vychodil, Tomas Mikulasek, Erich Zöchmann, Seun Sangodoyin, Hussein Hammoud, Bernhard Schrenk, Robert Langwieser, Stefan Pratschner, Ales Prokes, Andreas F. Molisch, Christoph F. Mecklenbräuker, Thomas Zemen</i>	
ON THE BUILDING MAP FOR RADIO PROPAGATION PREDICTION USING MACHINE LEARNING.....	842
<i>Kazuya Inoue, Koichi Ichige, Tatsuya Nagao, Takahiro Hayashi</i>	
LIGHTWEIGHT UAV-BASED MEASUREMENT SYSTEM FOR AIR-TO-GROUND CHANNELS AT 28 GHZ	848
<i>Vasilii Semkin, Seongjoon Kang, Jaakko Haarla, William Xia, Ismo Huhtinen, Giovanni Geraci, Angel Lozano, Giuseppe Loianno, Marco Mezzavilla, Sundeep Rangan</i>	

POWER DELAY PROFILE ANALYSIS OF INDUSTRIAL CHANNELS AT 2.1, 2.6, 3.8 AND 5.1 GHZ.....	854
<i>Eike Lyczkowski, Christian Sauer, Felix Reichert, Hannes Frey</i>	
ANALYSING THE 3GPP SPATIAL CONSISTENCY PROCEDURE THROUGH CHANNEL MEASUREMENTS	860
<i>William Sloane, Mansoor Shafi, Camillo Gentile, Graeme Woodward, Philippa Martin, Pan Tang, Jianhua Zhang, Chiehping Lai</i>	
28 GHZ INDOOR AND OUTDOOR PROPAGATION MEASUREMENTS AND ANALYSIS AT A REGIONAL AIRPORT.....	866
<i>Kairui Du, Ozgur Ozdemir, Fatih Erden, Ismail Guvenc</i>	
MEASUREMENTS AND MODELING OF THE MOBILE WIRELESS CHANNEL AT 2.4 GHZ IN URBAN AND SUBURBAN AREAS.....	873
<i>Leonardo Gonsioroski, Luiz Da Silva Mello, Amanda Beatriz Dos Santos</i>	
IN-VEHICLE MOBILE CELLULAR SIGNAL RECEPTION: MEASUREMENTS OF VEHICLE ENTRY LOSS.....	880
<i>A. Aldabbagh, A. Lodhi, S. R. Saunders</i>	
SCALABLE, RESOURCE AND LOCALITY-AWARE SELECTION OF ACTIVE SCATTERERS IN GEOMETRY-BASED STOCHASTIC CHANNEL MODELS.....	885
<i>Benjamin Rainer, Markus Hofer, Stefan Zelenbaba, David Löschenbrand, Thomas Zemen, Xiaochun Ye, Peter Priller</i>	
CDI MAPS: DYNAMIC ESTIMATION OF THE RADIO ENVIRONMENT FOR PREDICTIVE RESOURCE ALLOCATION.....	892
<i>Daniel Fabian Külzer, Slawomir Stanczak, Mladen Botsov</i>	
ANGULAR POWER DISTRIBUTION IN 60 GHZ WIRELESS UPLINK FOR VEHICLE-TO-INFRASTRUCTURE SCENARIOS.....	899
<i>Jan M. Kelner, Cezary Ziolkowski, Jaroslaw Wojtun, Aniruddha Chandra, Aleš Prokeš, Tomas Mikulasek, Jiri Blumenstein</i>	
ASSESSMENT OF USER MOBILITY'S INFLUENCE ON SYSTEM LOSS IN SEVERAL BODY-TO-BODY SCENARIOS	905
<i>Filipe D. Cardoso, Manuel M. Ferreira, Slawomir J. Ambroziak, Kenan Turbic, Luis M. Correia</i>	
A STUDY ON THE PREDICTION METHOD FOR SPATIOTEMPORAL CHANNEL PARAMETERS BY CONVOLUTIONAL NEURAL NETWORK USING A SPHERICAL IMAGE.....	911
<i>Satosih Ito, Takahiro Hayashi</i>	
A 3D NON-STATIONARY GEOMETRY-BASED STOCHASTIC MODEL FOR INDUSTRIAL AUTOMATION WIRELESS COMMUNICATION SYSTEMS	916
<i>Yuxiao Li, Cheng-Xiang Wang, Yang Liu</i>	
PERFORMANCE EVALUATION OF GAM IN OFF-BODY PATH LOSS MODELLING FOR BODY AREA NETWORKS.....	922
<i>Michal Laskowski, Slawomir J. Ambroziak, Luis M. Correia, Krzysztof Swider</i>	
PERFORMANCE ANALYSIS OF M-DPSK MODULATION OVER FAST-HOYT FADING CHANNELS UNDER NON-ISOTROPIC SCATTERING CONDITIONS.....	928
<i>Nazih Hajri, Matthias Pätzold, Rym Hicheri, Neji Youssef</i>	

AI-AIDED CHANNEL QUALITY ASSESSMENT FOR BLUETOOTH ADAPTIVE FREQUENCY HOPPING.....	934
<i>Ziyang Guo, Peng Liu, Chunqing Zhang, Jiajun Luo, Zhongying Long, Xun Yang</i>	
TOWARDS FDD MASSIVE MIMO: DOWNLINK CHANNEL COVARIANCE MATRIX ESTIMATION USING CONDITIONAL GENERATIVE ADVERSARIAL NETWORKS	940
<i>Bitan Banerjee, Robert C. Elliott, Witold A. Krzymien, Hamid Farmanbar</i>	
QOS-CONSTRAINED FEDERATED LEARNING EMPOWERED BY INTELLIGENT REFLECTING SURFACE.....	947
<i>Jingheng Zheng, Wanli Ni, Hui Tian, Yingying Wang</i>	
TRAFFIC PREDICTION FOR RECONFIGURABLE ACCESS SCHEME IN CORRELATED TRAFFIC MTC NETWORKS.....	953
<i>Atoosa Dalili Shoaee, Duc Tuong Nguyen, Tho Le-Ngoc</i>	
LEARNING TO DYNAMICALLY ALLOCATE RADIO RESOURCES IN MOBILE 6G IN-X SUBNETWORKS	959
<i>Ramoni Adeogun, Gilberto Berardinelli, Preben Mogensen</i>	
TRANSFERABLE AND DISTRIBUTED USER ASSOCIATION POLICIES FOR 5G AND BEYOND NETWORKS	966
<i>Mohamed Sana, Nicola Di Pietro, Emilio Calvanese Strinati</i>	
ENERGY-EFFICIENT AUTONOMOUS RESOURCE SELECTION FOR POWER-SAVING USERS IN NR V2X.....	972
<i>Dariush Mohammad Soleymani, Lavanya Ravichandran, Mohammad Reza Gholami, Giovanni Del Galdo, Mehdi Harounabadi</i>	
Q-LEARNING BASED RADIO RESOURCE ADAPTATION FOR IMPROVED ENERGY PERFORMANCE OF 5G BASE STATIONS	979
<i>S. Krishna Gowtam Peesapati, Magnus Olsson, Meysam Masoudi, Sören Andersson, Cicek Cavdar</i>	
ANALYTICAL EVALUATION OF BANDWIDTH PART ADAPTATION IN 5G NEW RADIO.....	985
<i>Venkatesh Ramaswamy, Jeffrey T. Correia, Darcy Swain-Walsh</i>	
QOS-AWARE SCHEDULING IN NEW RADIO USING DEEP REINFORCEMENT LEARNING	991
<i>Jakob Stigenberg, Vidit Saxena, Soma Tayamon, Euhanna Ghadimi</i>	
5G QOS FLOW MIGRATION OVER URLLC RELAYS.....	998
<i>Rafael Kaliski</i>	
RESOURCE RE-SELECTION WITH ADAPTIVE MODULATION AND COLLISION DETECTION IN LTE V2X MODE 4.....	1005
<i>Saif Sabeeh, Krzysztof Wesolowski</i>	
DISCRETE-TIME ANALYSIS OF WIRELESS BLOCKCHAIN NETWORKS.....	1011
<i>Francesc Wilhelmi, Lorenza Giupponi</i>	
PERFORMANCE OF VEHICLE PLATOONING UNDER DIFFERENT V2X RELAYING METHODS.....	1018
<i>Tiago R. Gonçalves, Vineeth S. Varma, Salah E. Elayoubi</i>	
TCP-AWARE OFDMA TRANSMISSION BASED ON TRAFFIC INTENSITY IN DOWNLINK AND UPLINK DIRECTIONS IN IEEE 802.11AX WIRELESS LANS	1024
<i>Takeru Uemura, Yosuke Tanigawa, Hideki Tode</i>	

SECURITY ANALYSIS OF SHARDING IN THE BLOCKCHAIN SYSTEM.....	1030
<i>Dachao Yu, Hao Xu, Lei Zhang, Bin Cao, Muhammad Ali Imran</i>	
OUTAGE PREDICTION FOR URLLC IN RICIAN FADING	1036
<i>Andreas Traßl, Tom Hößler, Lucas Scheuven, Nick Schwarzenberg, Gerhard P. Fettweis</i>	
USER SCHEDULING FOR PRECODED SATELLITE SYSTEMS WITH INDIVIDUAL QUALITY OF SERVICE CONSTRAINTS	1042
<i>Trinh Van Chien, Eva Lagunas, Tung Hai Ta, Symeon Chatzinotas, Björn Ottersten</i>	
ALGORITHMIC AND SYSTEM APPROACHES FOR A STABLE LIFI-RF HETNET UNDER TRANSIENT CHANNEL CONDITIONS.....	1048
<i>Hansini Vijayaraghavan, Anna Prado, Thomas Wiese, Wolfgang Kellerer</i>	
UAV DEPLOYMENT FOR THROUGHPUT MAXIMIZATION IN A UAV-ASSISTED CELLULAR COMMUNICATIONS	1055
<i>Nishant Gupta, Satyam Agarwal, Deepak Mishra</i>	
CLOUD NATIVE HARDWARE ACCELERATED 5G VIRTUALIZED RADIO ACCESS NETWORK	1061
<i>Jean Dion, Julien Lallet, Laurent Beaulieu, Patrick Savelli, Philippe Bertin</i>	
PERFORMANCE ANALYSIS OF RF/VLC ENABLED UAV BASE STATION IN HETEROGENEOUS NETWORK.....	1067
<i>Yash Gupta, Mansi Peer, Vivek Ashok Bohara</i>	
NETWORK-LOAD ESTIMATION FOR K-REPETITION GRANT-FREE ACCESS ENABLING ADAPTIVE RESOURCE ALLOCATION TOWARDS QOS ENHANCEMENT	1073
<i>Zixiao Zhao, Qinghe Du, Li Sun</i>	
A SELF-CONFIGURABLE GROUPING METHOD FOR INTEGRATED WI-SUN FAN AND TSCH-BASED NETWORKS	1079
<i>Xinyu Ni, Michael Baddeley, Nan Jiang, Yichao Jin</i>	
A NOVEL TIME-OF-ARRIVAL ESTIMATION APPROACH WITH CHANNEL FREQUENCY RESPONSE RECONSTRUCTION IN OFDM SYSTEMS.....	1085
<i>Ziming He, Fei Tong</i>	
CONSTRAINED K-MEANS USER CLUSTERING AND DOWNLINK BEAMFORMING IN MIMO-SCMA SYSTEMS	1091
<i>Sara Norouzi, Yunlong Cai, Benoit Champagne</i>	
A NOVEL SCHEME TO MITIGATE CRS INTERFERENCE IN LTE AND NR NON CO- LOCATED SCENARIO	1097
<i>Sen Xu, Jincan Xin, Shangkun Xiong, Yue Liu</i>	
RESOURCE ALLOCATION IN FULL-DUPLEX UNCOORDINATED COMMUNICATION SYSTEMS WITH NOMA	1104
<i>Joseph Doumit, Marie-Josépha Youssef, Charbel Abdel Nour, Joumana Farah, Catherine Douillard</i>	
MMWAVE FRONTHAUL-TO-BACKHAUL INTERFERENCE IN 5G NR NETWORKS	1111
<i>Edgar Jirousek, Zeyu Huang, Stefan Pratschner, Robert Langwieser, Stefan Schwarz, Markus Rupp</i>	

UPLINK MASSIVE MIMO FUNCTIONAL SPLIT FOR C-RAN SYSTEM UNDER RAPID USER MOBILITY CONDITIONS	1117
<i>Alexei Davydov, Victor Sergeev, Artyom Putilin, Bishwarup Mondai, Thushara Hewavithana, Apostolos Papathanassiou, Avik Sengupta</i>	
REINFORCEMENT LEARNING FOR ANTENNAS' ELECTRIC TILTS OPTIMIZATION IN SELF ORGANIZING NETWORKS.....	1122
<i>Antonio Massaro, Dan Wellington, Armen Aghasaryan, Robert Seidl</i>	
QUANTUM COMPUTING FOR ARTIFICIAL INTELLIGENCE BASED MOBILE NETWORK OPTIMIZATION	1128
<i>Furqan Ahmed, Petri Mähönen</i>	
LOS/NLOS CLASSIFICATION USING SCENARIO-DEPENDENT UNSUPERVISED MACHINE LEARNING	1134
<i>Anil Kirmaz, Diomidis S. Michalopoulos, Irina Balan, Wolfgang Gerstacker</i>	
A GENERAL DRL-BASED OPTIMIZATION FRAMEWORK OF USER ASSOCIATION AND POWER CONTROL FOR HETNET	1141
<i>Zimu Li, Xiangming Wen, Zhaoming Lu, Wenpeng Jing</i>	
A SAFE REINFORCEMENT LEARNING ARCHITECTURE FOR ANTENNA TILT OPTIMISATION.....	1148
<i>Erik Aumayr, Saman Feghhi, Filippo Vannella, Ezeddin Al Hakim, Grigorios Iakovidis</i>	
BAYESIAN-BASED SYMBOL DETECTOR FOR ORTHOGONAL TIME FREQUENCY SPACE MODULATION SYSTEMS.....	1154
<i>Xinwei Qu, Alva Kosasih, Wibowo Hardjawana, Vincent Onasis, Branka Vucetic</i>	
ENERGY-EFFICIENT FEDERATED LEARNING FRAMEWORK FOR DIGITAL TWIN-ENABLED INDUSTRIAL INTERNET OF THINGS	1160
<i>Jiaxiang Zhang, Yiming Liu, Xiaoqi Qin, Xiaodong Xu</i>	
CELLULAR TRAFFIC TYPE RECOGNITION AND PREDICTION.....	1167
<i>Tuan Anh Nguyen, Philippe Martins</i>	
ENERGY-EFFICIENT MODEL COMPRESSION AND SPLITTING FOR COLLABORATIVE INFERENCE OVER TIME-VARYING CHANNELS.....	1173
<i>Mounssif Krouka, Anis Elgabli, Chaouki Ben Issaid, Mehdi Bennis</i>	
RAN RESOURCE SLICING IN 5G USING MULTI-AGENT CORRELATED Q-LEARNING.....	1179
<i>Hao Zhou, Medhat Elsayed, Melike Erol-Kantarci</i>	
SEMI-SUPERVISED LEARNING FRAMEWORK FOR UAV DETECTION	1185
<i>Olusiji O Medaiyese, Martins Ezuma, Adrian P Lauf, Ismail Guvenc</i>	
SPLIT LEARNING MEETS KOOPMAN THEORY FOR WIRELESS REMOTE MONITORING AND PREDICTION.....	1191
<i>Abanoub M. Girgis, Hyowoon Seo, Jihong Park, Mehdi Bennis, Jinho Choi</i>	
COMMUNICATION-AWARE PATH DESIGN FOR INDOOR ROBOTS EXPLOITING FEDERATED DEEP REINFORCEMENT LEARNING	1197
<i>Ruyu Luo, Hui Tian, Wanli Ni</i>	
EFFICIENT NON-LINE-OF-SIGHT IDENTIFICATION IN LOCALIZATION USING A BANK OF NEURAL NETWORKS.....	1203
<i>Abbas Abolfathimomtaz, Mostafa Mohammadkarimi, Masoud Ardakani</i>	

SIMULTANEOUS LOCALIZATION AND CHANNEL ESTIMATION FOR 5G MMWAVE MIMO COMMUNICATIONS.....	1208
<i>Bingpeng Zhou, Risto Wichman, Lei Zhang, Zhiyong Luo</i>	
HOW MUCH LOCALIZATION PERFORMANCE GAIN COULD BE REAPED BY 5G MMWAVE MIMO SYSTEMS FROM HARNESSING MULTIPATH PROPAGATION?.....	1215
<i>Bingpeng Zhou, Risto Wichman, Lei Zhang</i>	
SELF-SYNCHRONIZATION BASED DISTRIBUTED LOCALIZATION OF WIRELESS TRANSMITTERS.....	1222
<i>Evert I. Pocoma Copa, François Quitin, Luc Vandendorpe, Philippe De Doncker, François Horlin</i>	
LOCALIZATION ERROR BOUNDS FOR 5G MMWAVE SYSTEMS UNDER HARDWARE IMPAIRMENTS	1228
<i>Fariba Ghaseminajm, Emad Saleh, Malek Alsmadi, Salama S. Ikki</i>	
HIGH PRECISION POSITIONING USING MULTI-CELL MASSIVE MIMO SYSTEM FOR 5G AND BEYOND.....	1234
<i>Vikram Singh, Abhijeet Abhimanyu Masal, J. Klutto Milleth, Bhaskar Ramamurthi</i>	
BLIND TRANSMITTER LOCALIZATION IN WIRELESS SENSOR NETWORKS: A DEEP LEARNING APPROACH	1241
<i>Ivo Bizon Franco De Almeida, Marwa Chafii, Ahmad Nimr, Gerhard Fettweis</i>	
COOPERATIVE MAGNETO-INDUCTIVE LOCALIZATION	1248
<i>Henry Schulten, Gregor Dumphart, Antonios Koskinas, Armin Wittneben</i>	
WIRELESS POSITIONING USING DEEP LEARNING WITH DATA AUGMENTATION TECHNIQUE.....	1255
<i>Kegang Tian, Shijie Song, Wenbo Xu, Dong Li, Kun Yang</i>	
DEEP LEARNING FOR ULTRA-WIDEBAND INDOOR POSITIONING	1260
<i>Yi-Min Lu, Jang-Ping Sheu, Yung-Ching Kuo</i>	
MULTI-STEP OPTIMIZATION OF INDOOR LOCALIZATION ACCURACY USING COMMODITY WIFI	1267
<i>Shuyu Li, Sherif Welsen, Vladimir Brusic</i>	
FINGERPRINT WITH PARTICLE FILTERING FOR POSITIONING BASED ON MDT	1273
<i>Peter Qi, Yuxin Zhao, Fredrik Gunnarsson, Kangning Zhao</i>	
OPTIMIZATION OF COVERAGE AND LOCALIZATION IN WLAN APS WITH SWITCHED DIRECTIONAL ANTENNAS.....	1279
<i>Lester Ho, Holger Claussen</i>	
ADAPTIVE CREATION AND MIGRATION OF TIME-SERIES CITY PROFILES BASED ON EDGE COMPUTING.....	1285
<i>Fang-Jing Wu, Yudong Zhao, Ling-Jyh Chen</i>	
OPTIMAL CPU FREQUENCY SCALING POLICIES FOR SUSTAINABLE EDGE COMPUTING	1291
<i>Yu Luo, Lina Pu, Chun-Hung Liu</i>	
SHARING IS CARING: A MOBILE EDGE COMPUTING PERSPECTIVE	1298
<i>Nilanjan Biswas, Hamed Mirghasemi, Luc Vandendorpe</i>	

QOE-AWARE JOINT SEGMENT-BASED VIDEO CACHING AND USER ASSOCIATION OPTIMIZATION	1304
<i>Shuyue Zhao, Wenpeng Jing, Xiangming Wen, Zhaoming Lu</i>	
EXPERIMENTAL EVALUATION OF END-TO-END FLOW LATENCY REDUCTION IN SOFTWAREZED CELLULAR NETWORKS THROUGH DYNAMIC MULTI-ACCESS EDGE COMPUTING	1310
<i>Pablo Fondo-Ferreiro, David Candal-Ventureira, Felipe Gil-Castiñeira, Francisco Javier González-Castaño, Diarmuid Collins</i>	
OPTIMIZATION OF THE IEEE 802.15.4 SUPERFRAME FOR CLUSTERED WSNS USING DIFFERENTIAL EVOLUTION.....	1316
<i>Hossein Amirinia, Ramiro Liscano</i>	
AGE-OPTIMAL POWER ALLOCATION IN INDUSTRIAL IOT: A RISK-SENSITIVE FEDERATED LEARNING APPROACH	1323
<i>Yung-Lin Hsu, Chen-Feng Liu, Sumudu Samarakoon, Hung-Yu Wei, Mehdi Bennis</i>	
ON THE RELIABILITY OF SPREAD FBMC WIRELESS SENSOR NETWORKS FOR OFF-TONE JAMMING.....	1329
<i>Hamad Fadhel Aldoseri, Lars Haering, Andreas Czylik</i>	
Q-LEARNING-BASED SCMA FOR EFFICIENT RANDOM ACCESS IN MMTC NETWORKS WITH SHORT PACKETS.....	1334
<i>Duc-Dung Tran, Shree Krishna Sharma, Symeon Chatzinotas, Isaac Woungang</i>	
REDUCED CAPABILITY DEVICES FOR 5G IOT.....	1339
<i>Rapeepat Ratasuk, Nitin Mangalvedhe, Gilsoo Lee, David Bhatoolaul</i>	
REINFORCEMENT LEARNING BASED GREEN RATE-CONSTRAINED UAV TRAJECTORY AND USER ASSOCIATION DESIGN FOR IOT NETWORKS	1345
<i>Abhishek Mondal, Ganesh Prasad, Deepak Mishra, Ashraf Hossain</i>	
DATA COLLECTION IN UAV-ASSISTED WIRELESS SENSOR NETWORKS POWERED BY HARVESTED ENERGY	1351
<i>Ilham Benmad, Elmahdi Driouch, Mustapha Kardouchi</i>	
COMPARISON OF MULTI-CONNECTIVITY SCHEMES ON DIFFERENT LAYERS FOR RELIABLE LOW LATENCY COMMUNICATION	1357
<i>Marie-Theres Suer, Christoph Thein, Hugues Tchouankem, Lars Wolf</i>	
MACHINE LEARNING ENABLES PREDICTIVE RESOURCE RECOMMENDATION FOR MINIMAL LATENCY MOBILE NETWORKING	1363
<i>Yingze Wang, Qimei Cui, Kwang-Cheng Chen</i>	
5G NETWORK PERFORMANCE EVALUATION AND DEPLOYMENT RECOMMENDATION UNDER FACTORY ENVIRONMENT	1370
<i>Kaiyue Zeng, Wei Deng, Rui Wang, Long Zhang, Jinxia Cheng, Tao Chen, Na Yi</i>	
ADAPTIVE DATA REPLICATION FOR URLLC IN COOPERATIVE 4G/5G NETWORKS.....	1376
<i>Faten Bou Dih, Amal Abdel Razzac, Ammar El Falou, Salah Eddine Elayoubi</i>	
A MULTI-CELL OPEN-LOOP COMMUNICATION APPROACH TO ULTRA-RELIABLE MOBILE NETWORKS.....	1382
<i>Chun-Hung Liu, Yu Luo, Lina Pu</i>	

SEMI-GRANT-FREE NON-ORTHOGONAL MULTIPLE ACCESS FOR TACTILE INTERNET OF THINGS	1389
<i>Dimitrios Pliatsios, Alexandros-Apostolos A. Boulogeorgos, Thomas Lagkas, Vasileios Argyriou, Ioannis D. Moscholios, Panagiotis Sarigiannidis</i>	
ANALYSIS OF CRLB FOR AOA ESTIMATION IN MASSIVE MIMO SYSTEMS.....	1395
<i>Masoud Arash, Hamed Mirghasemi, Ivan Stupia, Luc Vandendorpe</i>	
PLANNING MM-WAVE ACCESS NETWORKS WITH RECONFIGURABLE INTELLIGENT SURFACES.....	1401
<i>Eugenio Moro, Ilario Filippini, Antonio Capone, Danilo De Donno</i>	
ON RESOURCE OPTIMIZATION IN MULTI-IRS-ASSISTED AND INTERFERENCE- COUPLED MULTI-CELL SYSTEMS.....	1408
<i>Zhanwei Yu, Di Yuan</i>	
CAPACITY CHARACTERIZATION FOR RECONFIGURABLE INTELLIGENT SURFACE AIDED MIMO COMMUNICATION UNDER PRACTICAL PHASE SHIFT MODEL	1413
<i>Zhenyu Wang, Ting Zhou, Tianheng Xu, Yapeng Zhao, Honglin Hu</i>	
WHERE TO DEPLOY RECONFIGURABLE INTELLIGENT SURFACES IN THE PRESENCE OF BLOCKAGES?	1419
<i>Gourab Ghatak, Vikrant Malik, Sanket S. Kalamkar, Abhishek K. Gupta</i>	
MOBILITY MODELS FOR THE INDUSTRIAL PEER-TO-PEER CONTEXT BASED ON EMPIRICAL INVESTIGATION.....	1425
<i>Christian Sauer, Eike Lyczkowski, Marco Schmidt</i>	
NETWORK UNDER CONTROL: MULTI-VEHICLE E2E MEASUREMENTS FOR AI-BASED QOS PREDICTION	1432
<i>Alexandros Palaïos, Philipp Geuer, Jochen Fink, Daniel F. Külzer, Fabian Götsch, Martin Kasparick, Daniel Schäuufele, Rodrigo Hernangómez, Sanket Partani, Raja Sattiraju, Atul Kumar, Friedrich Burmeister, Andreas Weinand, Christian Vielhaus, Frank H. P. Fitzek, Gerhard Fetweis, Hans D. Schotten, Slawomir Stanczak</i>	
PERFORMANCE ANALYSIS OF CATERPILLAR RLNC FOR MULTI-HOP COMMUNICATION	1439
<i>Paul Schwentek, Elif Tasdemir, Rico Radeke, Frank H. P. Fitzek</i>	
A COOPERATIVE MULTI-RSU CACHING SCHEME IN VEHICULAR NETWORKS WITH FOUNTAIN CODES.....	1445
<i>Yanyang Li, Qinghe Du</i>	
COEXISTENCE OF DSRC AND C-V2X COMMUNICATION: MODELING A COMPETING SCENARIO	1451
<i>Blanca Ramos Elbal, Markus Rupp</i>	
SYSTEM-LEVEL SIMULATION PLATFORM OF C-V2X MODE 4: INTEGRATING CARMAKER AND NS-3	1457
<i>Hang Hu, Rong Chai, Miling Chen, Xizheng Yang</i>	
DATA TRAFFIC OFFLOADING AND RATE CONTROL FOR VEHICLES USING RADIO ENVIRONMENT, NETWORK LOAD AND ROUTE PLANNING.....	1463
<i>Takeo Ohseki, Kosuke Yamazaki, Daiki Maemoto, Shigeki Kawai, Tsuneo Nakata, Akira Itou</i>	

ROGUE ACCESS POINT DETECTION BY USING ARP FAILURE UNDER THE MAC ADDRESS DUPLICATION	1469
<i>Kosuke Igarashi, Hiroya Kato, Iwao Sasase</i>	
FULL-DUPLEX DOUBLE RELAY SECURE COMMUNICATION.....	1475
<i>Sin-Yuan Huang, Chih-Yu Wang, Szu-Liang Wang, Wei-Chong Chen, Wei-Ho Chung</i>	
RANGING AND LOCATION ATTACKS ON 802.11 FTM.....	1481
<i>Jerome Henry, Yann Busnel, Romaric Ludinard, Nicolas Montavont</i>	
A PRIVACY-PRESERVING PEDESTRIAN DEAD RECKONING FRAMEWORK BASED ON DIFFERENTIAL PRIVACY	1487
<i>Tianyi Feng, Zhixiang Zhang, Wai-Choong Wong, Sumei Sun, Biplab Sikdar</i>	
SPECIFIC EMITTER IDENTIFICATION FOR WIFI DEVICES VIA BEZIER CURVE FITTING	1493
<i>Shaoying Guo, Yanyun Xu, Weiqing Huang, Bo Liu</i>	
RAPID IMPLEMENTATION AND DEMONSTRATION OF RADIO APPLICATIONS USING WISCANET	1500
<i>Jacob Holtom, Gerard Gubash, Andrew Herschfelt, Owen Ma, Wylie Standage-Beier, Hanguang Yu, Daniel W. Bliss</i>	
DESIGN AND EXPERIMENTAL VALIDATION OF RADIO ACCESS NETWORK CONTROLLER PROTOTYPE FOR MULTI-RAT TECHNOLOGIES WITH SCHEDULER STRATEGIES.....	1506
<i>Md Arifur Rahman, Adam Flizikowski, Slawomir Pietrzyk, Md Munjure Mowla</i>	
A LIFELOG GATHERING SYSTEM BASED ON AUTONOMOUS DEVICE-TO-DEVICE COMMUNICATIONS.....	1512
<i>Huan-Bang Li, Lin Shan, Kenichi Takizawa, Fumihide Kojima, Yasushi Fuwa, Takeshi Matsumura</i>	
COMPREHENSIVE MEASUREMENT-BASED EVALUATION OF POSTURE DETECTION FROM ULTRA LOW POWER UWB SIGNALS	1518
<i>Robert Heyn, Armin Wittneben</i>	
HOW DOS ATTACKS CAN BE MOUNTED ON NETWORK SLICE BROKER AND CAN THEY BE MITIGATED USING BLOCKCHAIN?	1525
<i>Tharaka Hewa, Anshuman Kalla, Pawani Porambage, Madhusanka Liyanage, Mika Ylianttila</i>	
JOINT RADIO RESOURCES ALLOCATION IN THE COEXISTING NR-U AND WI-FI NETWORKS.....	1532
<i>Bo Yin, Haonan Hu, Bing Xi, Qiaoshou Liu, Yanan Zheng, Zhizhong Zhang</i>	
EMBEDDING ML ALGORITHMS ONTO LPWAN SENSORS FOR COMPRESSED COMMUNICATIONS.....	1539
<i>Antoine Bernard, Aicha Dridi, Michel Marot, Hossam Afifi, Sandoche Balakrichenan</i>	
LOW-EFFORT DEEP LEARNING METHOD TRAINED THROUGH VIRTUAL TRAJECTORIES FOR INDOOR TRACKING.....	1546
<i>Aisha Javed, Naveed Ul Hassan</i>	
A SMART PARKING-LOT OCCUPANCY MODEL IN 5G V2V AND V2I WIRELESS COMMUNICATION	1552
<i>Bipasha Mukhopadhyay, Tuhina Samanta</i>	

DATA TRADING FOR BLOCKCHAIN-BASED DATA MARKET IN CYBER-PHYSICAL- SOCIAL SMART SYSTEMS	1558
<i>Yuchen Zhou, Jian Chen, Bingtao He, Lu Lv</i>	
A FRAMEWORK FOR ENERGY AND CARBON FOOTPRINT ANALYSIS OF DISTRIBUTED AND FEDERATED EDGE LEARNING	1564
<i>Stefano Savazzi, Sanaz Kianoush, Vittorio Rampa, Mehdi Bennis</i>	
IMPACT OF NETWORK DENSIFICATION ON THE PERFORMANCE OF A NON-PUBLIC URLLC FACTORY NETWORK	1570
<i>Kimmo Hiltunen, Yanpeng Yang, Fedor Chernogorov</i>	
CACHE-ENABLED PRE-DOWNLOADING AND POST-UPLOADING CONTENT DELIVERY STRATEGIES FOR HSR COMMUNICATIONS USING C-RAN	1576
<i>Jiachi Zhang, Liu Liu, Lu Li, Botao Han, Tao Zhou</i>	
5G SMART CONNECTIVITY PLATFORM FOR UBIQUITOUS AND AUTOMATED INNOVATIVE SERVICES	1582
<i>Maria Rita Palattella, James O’Sullivan, David Pradas, Kevin McDonnell, Ignacio Rodriguez, Georgios Karagiannis</i>	
LAZY LEARNING-BASED SELF-INTERFERENCE CANCELLATION FOR WIRELESS COMMUNICATION SYSTEMS WITH IN-BAND FULL-DUPLEX OPERATIONS.....	1589
<i>Ou Zhao, Wei-Shun Liao, Keren Li, Takeshi Matsumura, Fumihide Kojima, Hiroshi Harada</i>	
NB-IOT FOR SATELLITE COMMUNICATIONS: PHYSICAL LAYER ANALYSIS AND PERFORMANCE	1595
<i>Valérian Mannoni, Vincent Berg, Sonia Cazalens, Patrice Raveneau</i>	

Author Index