

2017 European Conference on Networks and Communications (EuCNC 2017)

**Oulu, Finland
12-15 June 2017**



**IEEE Catalog Number: CFP1742Y-POD
ISBN: 978-1-5386-3874-3**

**Copyright © 2017 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:	CFP1742Y-POD
ISBN (Print-On-Demand):	978-1-5386-3874-3
ISBN (Online):	978-1-5386-3873-6

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

2017 European Conference on Networks and Communications (EuCNC)

Applications & Services (APS) Track

APS1

Dynamic Slicing for Mobile Network Infrastructures: Challenges, Opportunities and Business Aspects 1

Engin Zeydan (Türk Telekom Labs, Turkey); Omer Narmanlioglu (P. I. Works & Ozyegin University, Turkey)

The 5D Approach to Control and Manage Smart Spaces 7

Seppo Hätönen, Julien Mineraud and Ashwin Rao (University of Helsinki, Finland); Hannu Flinck (Nokia Bell Labs, Finland); Sasu Tarkoma (University of Helsinki, Finland)

Cross-Domain Discovery of Communication Peers Identity Mapping and Discovery Services (IMaDS) 13

Ingo Friese (Deutsche Telekom Laboratories, Germany); Rebecca Copeland (Telecom SudParis (TSP) & Core Viewpoint Limited, United Kingdom (Great Britain)); Sebastian Göndör (Telekom Innovation Laboratories & TU Berlin, Germany); Felix Beierle (Technische Universität Berlin, Germany); Axel Küpper (TU Berlin, Germany); Ricardo Lopes Pereira (INESC-ID/Instituto Superior Técnico, Portugal); Jean-Michel Crom (Orange Labs, France)

Challenges and Opportunities for Designing Tactile Codecs from Audio Codecs 19

Xun Liu, Mischa Dohler and Toktam Mahmoodi (King's College London, United Kingdom (Great Britain)); Liu Hongbin (King's College, University of London, United Kingdom (Great Britain))

SDN/NFV Based Caching Solution for Future Mobile Network (5G) 24

Yaning Liu (JCP-Connect, France); Jean-Charles Point (JCP-Connect SAS, France); Konstantinos V. Katsaros (Intracom S.A. Telecom Solutions, Greece); Vasileios Glykantzis (Intracom Telecom, Greece); Muhammad Shuaib Siddiqui and Eduard Escalona (Fundació i2CAT, Internet i Innovació Digital a Catalunya, Spain)

APS2

Internet of Skills, Where Robotics Meets AI, 5G and the Tactile Internet 29

Mischa Dohler, Toktam Mahmoodi, Maria Lema, Massimo Condoluci, Fragkiskos Sardis, Konstantinos Antonakoglou and Hamid Aghvami (King's College London, United Kingdom (Great Britain))

Identifying Mosquito Species Using Smart-Phone Cameras 34

Mona Minakshi, Pratoool Bharti and Sriram Chellappan (University of South Florida, USA)

Verifying Large-Scale Networks Using NetCheck 40

Matei Popovici (University Politehnica of Bucharest, Romania)

Group Communication in the reTHINK Framework 45

Jamal Boulmal and Frédéric Luat (Apizee, France); Ahmed Bouabdallah (Institut Mines Telecom / IMT Atlantique & IRISA, France); Michel L'Hostis (Apizee, France)

Decentralized Communications: Trustworthy Interoperability in Peer-To-Peer Networks 51

Paulo Chainho (Altice Labs, Portugal); Steffen Druessedow (Telekom Innovation Laboratories, Germany); Kay Haensge (Deutsche Telekom AG, Germany); Ricardo Jorge Fernandes Chaves (IST - TULisbon/INESC-ID, Portugal); Ricardo Lopes Pereira (INESC-ID/Instituto Superior Técnico, Portugal); Nuno Santos (INESC-ID / Instituto Superior

Técnico, University of Lisbon, Portugal); Anton Roman-Portabales (Quobis Networks SLU, Spain)

APS3

***From Gadget to Gadget-Free Hyperconnected World: Conceptual Analysis of User Privacy Challenges* 56**

Tanesh Kumar and Madhusanka Liyanage (University of Oulu, Finland); An Braeken (Vrije Universiteit Brussel, Belgium); Ijaz Ahmad (University of Oulu, Finland); Mika E Ylianttila (University of Oulu & Centre for Wireless Communications, Finland)

***Monetization of Infrastructures and Services* 62**

Martin Skoviera (Zurich University of Applied Sciences, Switzerland); Piyush Harsh (Zurich University of Applied Sciences & ICCLab, Switzerland); Oleksii Serhiienko, Manuel Perez Belmonte and Thomas Michael Bohnert (Zurich University of Applied Sciences, Switzerland)

***P2P Model for Distributed Energy Trading, Grid Control and ICT for Local Smart Grids* 67**

Ari T. Pouttu (Centre for Wireless Communications University of Oulu, Finland); Jussi P Haapola (Centre for Wireless Communications, University of Oulu, Finland); Petri Ahokangas, Yueqiang Xu and Maria Kopsakangas-Savolainen (University of Oulu, Finland); Eloisa Porras (ENDESA, Spain); Javier Matamoros (Centre Tecnologic de Telecomunicacions de Catalunya, Spain); Charalampos Kalalas (CTTC, Spain); Jesus Alonso-Zarate (Centre Tecnologic de Telecomunicacions de Catalunya - CTTC, Spain); Francisco David Gallego (Regenera Levante, Spain); José Manuel Martín Rapún (Inycom, Spain); Geert Deconinck, Hamada Almasalma and Sander Claeys (KU Leuven, Belgium); Jianzhong Wu and Meng Cheng (Cardiff University, United Kingdom (Great Britain)); Furong Li and Zhipeng Zhang (University of Bath, United Kingdom (Great Britain)); David Rivas and Sindia Casado (Fundacion CENER-Ciemat, Spain)

***Evaluation of Hybrid Terrestrial-satellite Suburban Wireless Mesh Backhauls for LTE Networks* 73**

Jorge Baranda (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); José Núñez-Martínez (Centre Tecnologic de Telecomunicacions de Catalunya, Spain); Josep Mangues-Bafalluy (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Natale Patriciello (University of Modena and Reggio Emilia, Italy)

Networking (NET) Track

NET1

***Wildcard-Rule Caching and Cache Replacement Algorithms in Software-Defined Networking* 79**

Jang-Ping Sheu, Po-Yao Wang and Jagadeesha Rb (National Tsing Hua University, Taiwan)

***Network Expansion in OpenStack Cloud Federations* 85**

Mael Kimmerlin (Aalto University, Finland); Peer Hasselmeyer (NEC Laboratories Europe, NEC Europe Ltd., Germany); Seppo Heikkilä (Helsinki Institute of Physics, Switzerland); Max Plauth (Hasso Plattner Institute, Germany); Paweł Parol (Orange Polska, Poland); Pasi Sarolahti (Aalto University, Finland)

***Seamless Network Renumbering in RINA: Automate Address Changes Without Breaking Flows!* 90**

Eduard Grasa (Fundació i2CAT, Internet i Innovació Digital a Catalunya, Spain); Leonardo Bergesio (i2CAT, Spain); Miquel Tarzan-Lorente (i2Cat Foundation, Spain); Diego Lopez (Telefonica I+D, Spain); John Day and Lou Chitkushev (Boston University, USA)

On Service Composition Algorithm for Open Marketplaces of Network Services 96

Shireesh Bhat, Robinson Udechukwu, Rudra Dutta and George N. Rouskas (North Carolina State University, USA)

Ensuring Quality of Service in a Multi-Tenant Cloud-Enabled RAN Environment 102

Elisa Jimeno (Atos); Javier Garcia Lloreda (Atos, Spain); Pouria Sayyad Khodashenas (i2CAT Foundation (i2CAT), Spain); August Betzler (i2CAT Foundation, Spain); Irena Trajkovska and Luca Del Vecchio (ZHAW, Switzerland); Alan Whitehead (Ip Access Ltd, United Kingdom (Great Britain))

NET2

First Demonstration of SDN-based Bit Index Explicit Replication (BIER) Multicasting 107

Alessio Giorgetti, Andrea Sgambelluri and Francesco Paolucci (Scuola Superiore Sant'Anna, Italy); Filippo Cugini (CNIT, Italy); Piero Castoldi (Scuola Superiore Sant'Anna, Italy)

A Customizable Agile Approach to Network Function Placement 113

Akshay Gadre, Anix Anbiah and Krishna M. Sivalingam (Indian Institute of Technology Madras, India)

Benefits of Multi-Layer Application-Aware Resource Allocation and Optimization 119

Marco Savi (Fondazione Bruno Kessler & CREATE-NET Research Center, Italy); Ćiril Rožić (Athens Information Technology, Greece); Chris Matrakidis (University of Peloponnese, Greece); Dimitrios Klonidis (AIT, Greece); Domenico Siracusa (Fondazione Bruno Kessler, Italy); Ioannis Tomkos (Athens Information Technology, Greece)

5G NORMA: System Architecture for Programmable & Multi-Tenant 5G Mobile Networks 124

Christian Mannweiler (Nokia Bell Labs, Germany); Markus Breitbach (Deutsche Telekom, Germany); Heinz Droste (Deutsche Telekom, Laboratories, Germany); Ignacio Labrador Pavon (ATOS, Spain); Iñaki Ucar (University Carlos III of Madrid, Spain); Peter Schneider (Nokia Bell Labs, Germany); Mark Doll (Nokia Bell Labs & Nokia, Germany); Jorge Rivas Sanchez (ATOS, Spain)

Distributed Mobility Management Based on Centrality for Dense 5G Networks 130

Mourad Khanfouci (Mitsubishi electric research center Europe (MERCE), France)

NET3

Architecture Modularisation for Next Generation Mobile Networks 136

Xueli An and Riccardo Trivisonno (Huawei Technologies, Germany); Hans Joachim Einsiedler (Deutsche Telekom, Berlin, Germany); Dirk V Hugo (Telekom Innovation Laboratories & Deutsche Telekom AG, Germany); Kay Haensge (Deutsche Telekom AG, Germany); Xiaofeng Huang (Orange, France); Qing Shen (Engineer at Orange France & Student at ParisTech University, France); Daniel Corujo (Instituto de Telecomunicações Aveiro & Universidade de Aveiro, Portugal); Kashif Mahmood (Telenor, Norway); Dirk Trossen (InterDigital Europe, United Kingdom (Great Britain)); Marco Liebsch (NEC Europe Ltd, Germany); Filipe Leitão (FLeitao(dot)ORG, Germany); Cao Phan and Frederic Klamm (BCOM, France)

Experimental Evaluation of Hierarchical Control over Multi-Domain Wireless/Optical Networks 142

Josep Mangués-Bafalluy (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); José Núñez-Martínez (Centre Tecnològic de Telecomunicacions de Catalunya, Spain); Ramon Casellas (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Arturo Mayoral (CTTC/CERCA, Spain); Jorge Baranda (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Josep Xavier

Salvat and Andres Garcia-Saavedra (NEC Labs Europe, Germany); Ricard Vilalta (CTTC/CERCA, Spain); Iñaki Pascual (CTTC, Spain); Xi Li (NEC, Germany); Ricardo Martinez and Raul Muñoz (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain)

Orchestration of Network Services Across Multiple Operators: The 5G Exchange Prototype 147

Andrea Sgambelluri (Scuola Superiore Sant'Anna, Italy); Francesco Tusa (University College London, United Kingdom (Great Britain)); Molka Gharbaoui (Scuola Superiore Sant'Anna, Italy); Elisa Maini (University College London, United Kingdom (Great Britain)); Laszlo Toka (Budapest University of Technology and Economics, Hungary); Jorge Martín Pérez (Universidad Carlos III de Madrid & IMDEA, Spain); Francesco Paolucci (Scuola Superiore Sant'Anna, Italy); Barbara Martini (CNIT, Italy); Wint Yi Poe (Huawei Technologies - European Research Center, Germany); Javier Melian (ATOS, Spain); Ajmal Muhammad (Royal Institute of Technology (KTH), Stockholm, Sweden); Aurora Ramos (Atos, Spain); Oscar González de Dios (Telefonica I+D, Spain); Balázs Sonkoly (Budapest University of Technology and Economics, Hungary); Paolo Monti (KTH Royal Institute of Technology, Sweden); Ishan Vaishnavi (Huawei Technologies Dusseldorf GmbH & European Research Centre, Germany); Carlos J. Bernardos (Universidad Carlos III de Madrid, Spain); Robert Szabo (Ericsson Hungary Ltd. & Budapest University of Technology and Economics, Hungary)

Reliable Capacity Provisioning for Distributed Cloud/Edge/Fog Computing Applications 152

Per-Olov Ostberg (Umeå University, Sweden); James Byrne (Dublin City University, Ireland); Paolo Casari (IMDEA Networks Institute, Spain); Philip Eardley (BT Group, United Kingdom (Great Britain)); Antonio Fernández Anta (IMDEA Networks Institute, Spain); Johan Forsman (Tieto AB, Sweden); John Kennedy (Intel Labs, Ireland); Thang Le Duc (Umeå University, Sweden); Manuel Noya Mariño (Linknovate Science SL, Spain); Radhika Loomba (Intel Labs, Spain); Miguel Angel López Peña (SATEC & SATEC, Spain); Jose Lopez Veiga (Linknovate Science SL, Spain); Theo Lynn (Dublin City University, Ireland); Vincenzo Mancuso (IMDEA Networks Institute, Spain); Sergej Svorobej (Dublin City University, Ireland); Anders Torneus (Tieto AB, Sweden); Stefan Wesner (Ulm University, Spain); Peter Willis (BT, United Kingdom (Great Britain)); Jörg Domaschka (Ulm University, Germany)

On Implementing RRM/SON in Virtualized Multi-Tenant Small Cell Networks 158

Jordi Pérez-Romero (Universitat Politècnica de Catalunya (UPC), Spain); Oriol Sallent, Ramon Ferrús and Ramon Agustí (Universitat Politècnica de Catalunya, Spain)

NET4

A Flexible and Reconfigurable 5G Networking Architecture Based on Context and Content Information 164

Dario Sabella (Intel, Germany); Pablo Serrano (Universidad Carlos III de Madrid, Spain); Giovanni Stea and Antonio Virdis (University of Pisa, Italy); Ilenia Tinnirello, Fabrizio Giuliano and Domenico Garlisi (CNIT); Panagiotis Vlacheas (WINGS ICT SOLUTIONS, Greece); Panagiotis Demestichas (University of Piraeus, Greece); Vassilis Foteions (WINGS ICT SOLUTIONS, Greece); Nikolaos Bartzoudis and Miquel Payaró (CTTC, Spain); Arturo Medela (TST Sistemas, Spain)

SDN/NFV-based End to End Network Slicing for 5G Multi-tenant Networks 170

Dimitrios Kritharidis, Panteleimon-Konstantinos Chartsias, Athanasios Amiras and Ioannis Plevrakis (Intracom Telecom, Greece); Konstantinos V. Katsaros (Intracom S.A. Telecom Solutions, Greece); Muhammad Shuaib Siddiqui, Albert Viñés and Eduard Escalona (Fundació i2CAT, Internet i Innovació Digital a Catalunya, Spain); Eleni Trouva (NCSR

Demokritos”, Greece); Ioannis Angelopoulos (National Centre for Scientific Research (NCSR), Greece); Anastasios Kourtis (NCSR Demokritos, Greece); Ioakeim Samaras (Intracom-Telecom & Industrial Systems Institute, Greece)

SDN Implementation of Slicing and Fast Failover in 5G Transport Networks 175

Dimitris Giatsios (University of Thessaly); Kostas Choumas and Paris Flegkas (University of Thessaly, Greece); Thanasis Korakis (New York University, USA); Daniel Camps (i2CAT, Spain)

Intelligent Network Management for 5G Systems: The SELFNET Approach 181

Wei Jiang (German Research Center for Artificial Intelligence & Technical University (TU) of Kaiserslautern, Germany); Mathias Strufe (DFKI GmbH, Germany); Hans D. Schotten (University of Kaiserslautern, Germany)

System Architecture of Intelligent Monitoring in Multi-Domain Orchestration 186

Wint Yi Poe (Huawei Technologies - European Research Center, Germany); Ishan Vaishnavi (Huawei Technologies Dusseldorf GmbH & European Research Centre, Germany); Francesco Tusa (University College London, United Kingdom (Great Britain)); Javier Melian (ATOS, Spain); Aurora Ramos (Atos, Spain)

NET5

Analysis of Deployment Challenges of Host Identity Protocol 191

Ijaz Ahmad and Madhusanka Liyanage (University of Oulu, Finland); Mika E Ylianttila (University of Oulu & Centre for Wireless Communications, Finland); Andrei Gurtov (Aalto University, Finland)

REARM: Renewable Energy Based Resilient Deployment of Virtual Network Functions 197

Sameer G Kulkarni and Mayutan Arumaithurai (University of Goettingen, Germany); K. K. Ramakrishnan (University of California, Riverside, USA); Xiaoming Fu (University of Goettingen, Germany)

On the Integration of Verticals Through 5G Control Plane 203

Kashif Mahmood (Telenor, Norway); Toktam Mahmoodi (King's College London, United Kingdom (Great Britain)); Riccardo Trivisonno (Huawei Technologies, Germany); Anastasius Gavras (Eurescom GmbH, Germany); Dirk Trossen (InterDigital Europe, United Kingdom (Great Britain)); Marco Liebsch (NEC Europe Ltd, Germany)

Proactive Edge Computing in Latency-Constrained Fog Networks 208

Mohammed Saad ElBamby (University of Oulu, Finland); Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland); Walid Saad (Virginia Tech, USA)

Physical Layer and Fundamentals (PHY) Track

PHY1

Energy-efficient Joint Source and Relay Precoding Design for Cooperative MIMO-AF Systems 214

Fabien Héliot and Rahim Tafazolli (University of Surrey, United Kingdom (Great Britain))

Semi-blind MAP Channel Estimator for Pilot Decontamination 220

Guangyi Wang (University of Surrey & Institute for Communication Systems, United Kingdom (Great Britain)); Yi Ma, Na Yi and Rahim Tafazolli (University of Surrey, United Kingdom (Great Britain))

Statistical Beam Codebook Design for mmWave Massive MIMO Systems 225

Majid Nasiri Khormuji (Huawei Technologies Sweden AB, Sweden); Renaud-Alexandre Pitaval (Huawei Technologies Sweden, Sweden)

Performance Analysis of FBMC and CP-OFDM in the Presence of Phase Noise 230

Kilian Roth (Technische Universität München, Germany); Leonardo Gomes Baltar (Intel Corporation, Germany); Michael Faerber (Intel Deutschland GmbH, Germany); Josef A. Nossek (TU Munich, Germany & Federal University of Ceara, Fortaleza, Brazil)

Coverage Analysis in the Uplink of mmWave Cellular Network 235

Oluwakayode Onireti (University of Glasgow, United Kingdom (Great Britain)); Ali Imran (University of Oklahoma, USA); Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain))

PHY2

TWEETHER Future Generation W-band Backhaul and Access Network Technology 241

Claudio Paoloni (Lancaster University, United Kingdom (Great Britain)); François Magne (WHEN-AB & SARL, France); Frederic Andre (Thales Electron Devices, France); Xavier Begaud (LTCI, CNRS, Télécom ParisTech, Université Paris-Saclay, France); Viktor Krozer (Goethe University of Frankfurt am Main, Germany); Marc Marilier (OMMIC, France); Antonio Ramirez (Fibernova Systems, Spain); José R. Ruiz (Universitat Politècnica de València, Spain); Ruth Vilar (Universitat Politècnica de Valencia, Spain); Ralph Zimmerman (HF System Engineering, Germany)

Evaluation of IR-HARQ Schemes in FBMC/OQAM Systems with Imperfect CSIR 246

Màrius Caus and Monica Navarro (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Xavier Mestre and Ana Pérez-Neira (CTTC, Spain); Guillem Femenias and Felip Riera-Palou (University of the Balearic Islands, Spain)

Study on Simple Signal Area Estimation for Efficient Spectrum Measurements 251

Kenta Umebayashi and Hiroki Iwata (Tokyo University of Agriculture and Technology, Japan); Janne Lehtomäki (University of Oulu, Finland); Miguel López-Benítez (University of Liverpool, United Kingdom (Great Britain))

Sparse Doubly-Selective Channels: Estimating Path Parameters Unambiguously 256

Kelvin Chelli and Praharsha Sirsi (Saarland University, Germany); Thorsten Herfet (Saarland University & Intel Visual Computing Institute, Germany)

Filter Design for 5G BF-OFDM Waveform 261

David Demmer and Robin Gerzaguet (CEA-Leti, France); Jean-Baptiste Doré (CEA, France); Didier Le Ruyet (CNAM, France); Dimitri Kténas (CEA, France)

PHY3

An Adaptive Parametric Prediction Method for Mobile MIMO Wireless Systems 266

Ramoni O. Adeogun (University of Cape Town, South Africa & National Space Research and Development Agency, Nigeria); Paul D Teal and Pawel A. Dmochowski (Victoria University of Wellington, New Zealand)

Silicon Area of FBMC Receivers for CMOS 65nm and Comparison to OFDM Receivers 271

Vincent Berg (CEA LETI, France); Jean-Baptiste Doré (CEA, France); Sylvie Mayrargue (CEA-LETI, France)

ASIP Design for Multiuser MIMO Broadcast Precoding 276

Shahriar Shahabuddin (Centre for Wireless Communications, University of Oulu, Finland); Olli Silvén and Markku Juntti (University of Oulu, Finland)

Dual-Polarized 2x2 Element Sub-Array at 15 GHz with High Port Isolation 280

Marko Sonkki and Sami Myllymäki (University of Oulu, Finland); Jussi Putaala and Maciej Sobocinski (Microelectronics Research Unit, University of Oulu, Finland); Aarno Pärssinen

(University of Oulu, Finland); Eero Heikkinen, Tomi Haapala and Kari Nikkanen (Nokia Networks, Finland)

***Pilot Structure Design to Increase Wireless Channel Capacity for High-Speed Railway* 284**
Yongyun Choi and Jae Hong Lee (Seoul National University, Korea)

PHY4

***Waveform Multiplexing for 5G: a Concept and 3D Evaluation* 289**

Yeon-Geun Lim, Taehun Jung, Kwang Soon Kim and Chan-Byoung Chae (Yonsei University, Korea)

***Traffic Aware Pilot De-contamination for Multi-Cell MIMO Systems* 294**

Laddu Praneeth Roshan Jayasinghe, Antti Tölli and Jarkko Kaleva (University of Oulu, Finland); Ganesh Venkatraman (University of Oulu & CWC, University of Oulu, Finland); Matti Latva-aho (UoOulu, Finland)

***Hybrid Beamforming for Single-User MIMO with Partially Connected RF Architecture* 300**

Mohammad Majidzadeh, Aleksi Moilanen, Nuutti Tervo, Harri Pennanen and Antti Tölli (University of Oulu, Finland); Matti Latva-aho (UoOulu, Finland)

***Channel Coding for Enhanced Mobile Broadband Communication in 5G Systems* 306**

Heshani Gamage and Nandana Rajatheva (University of Oulu, Finland); Matti Latva-aho (UoOulu, Finland)

***Exploring Symmetry in Wireless Propagation Channels* 312**

Nazar Ali (Khaifa University, United Arab Emirates); Ahmed Kulaib (Khalifa University, United Arab Emirates); Ehab Salahat (Australian National University, Australia); Raed Shubair (Khalifa University (KU) & Massachusetts Institute of Technology (MIT), United Arab Emirates)

***Hybrid Beamforming in RoF Fronthauling for Millimeter-Wave Radio* 318**

Lorenzo Combi and Umberto Spagnolini (Politecnico di Milano, Italy)

PHY5

***Minimum Power Based Relay Selection for Orthogonal Multiple Access Relay Networks* 323**

Ayswarya Padmanabhan (University of Oulu & CWC - Radio Technologies, Finland); Valtteri Tervo, Jiguang He and Markku Juntti (University of Oulu, Finland); Tad Matsumoto (Japan Advanced Institute of Science and Technology, Japan)

***Channel Estimation for Diffusive MIMO Molecular Communications* 328**

Seyed Mohammadreza Rouzegar and Umberto Spagnolini (Politecnico di Milano, Italy)

***Energy-Efficient Transmission Strategies for Multiantenna Downlink* 333**

Kien-Giang Nguyen, Oskari Tervo, Quang-Doanh Vu and Markku Juntti (University of Oulu, Finland); Le-Nam Tran (Maynooth University, Ireland)

***Enhanced Sparse Bayesian Learning-based Channel Estimation for Massive MIMO-OFDM Systems* 338**

Hayder Al-Salihi and Mohammad Reza Nakhai (King's College London, United Kingdom (Great Britain)); Tuan Anh Le (Middlesex University, United Kingdom (Great Britain))

***Patch Antenna Design for Full-Duplex Transceivers* 343**

Juan Laco and Fernando Gregorio (Universidad Nacional del Sur, Argentina); Gustavo J. González (CONICET & Universidad Nacional del Sur, Argentina); Juan E. Cousseau (Universidad Nacional del Sur, Argentina); Taneli Riihonen and Risto Wichman (Aalto University School of Electrical Engineering, Finland)

PHY6

***Multi-cell Interference Coordination for Multigroup Multicast Transmission* 348**

Oskari Tervo and Harri Pennanen (University of Oulu, Finland); Symeon Chatzinotas (University of Luxembourg, Luxembourg); Björn Ottersten (University of Luxembourg, Luxembourg); Markku Juntti (University of Oulu, Finland)

***Analysis of Out-Of-Band Interference from Saturated Power Amplifiers in Massive MIMO* 353**

Steve Blandino (Imec, Belgium); Claude Desset and Andre Bourdoux (IMEC, Belgium); Liesbet Van der Perre (KUL, Belgium); Sofie Pollin (KU Leuven, Belgium)

***Transparent Spectral Confinement Approach for 5G* 359**

Jamal Bazzi and Katsutoshi Kusume (DOCOMO Euro-Labs, Germany); Petra Weitkemper (UniBw Munich, Germany); Kazuaki Takeda (NTT DOCOMO, Inc., Japan); Anass Benjebbour (NTT DOCOMO, INC., Japan)

***Ultra Reliable Communication via CC-HARQ in Finite Block-Length* 364**

Endrit Dosti, Mohammad Shehab and Hirley Alves (University of Oulu, Finland); Matti Latva-aho (UoOulu, Finland)

***Optimized Fast Convolution Based Filtered-OFDM Processing for 5G* 369**

Juha Yli-Kaakinen, Toni A Levanen, Markku K. Renfors and Mikko Valkama (Tampere University of Technology, Finland)

Radio Access Technologies towards 5G (RAT) Track

RAT1

***Antenna Configuration Comparison in Challenging NLOS Locations* 375**

Juha Erkkilä and Marjut Koskela (Centria University of Applied Sciences, Finland); Joni Heikkilä (Central Ostrobothnia University of Applied Sciences, Finland); Tuomo Kupiainen, Marjo Heikkilä and Tero Kippola (Centria University of Applied Sciences, Finland); Asko Nykänen and Risto Saukkonen (Nokia Mobile Networks, Finland)

***A Channel Allocation Algorithm for Citizens Broadband Radio Service/Spectrum Access System* 380**

Kapuruhamy Badalge Shashika Manosha (Centre for Wireless Communications, Department of Communications Engineering, University of Oulu, Finland); Satya Krishna Joshi and Tuomo Hänninen (University of Oulu, Finland); Markku Jokinen (University of Oulu & Centre for Wireless Communications, Finland); Pekka Pirinen (University of Oulu, Finland); Harri Posti (Centre for Wireless Communications, Finland); Kari Horneman (Nokia & Bell Labs, Finland); Seppo Yrjölä (Nokia Innovation Steering, Finland); Matti Latva-aho (UoOulu, Finland)

***Link Performance Evaluation for mmWave Systems* 386**

Vaia Kalokidou and Mark Beach (University of Bristol, United Kingdom (Great Britain)); Peter J Legg (Blu Wireless Technology, United Kingdom (Great Britain)); Timothy Pelham (University of Bristol, United Kingdom (Great Britain)); Andy Lunness (Blu Wireless Technology, United Kingdom (Great Britain))

***Scalable Two-hop Relaying for mmWave Networks* 391**

Junquan Deng and Olav Tirkkonen (Aalto University, Finland); Tao Chen (VTT Technical Research Centre of Finland LTD, Finland); Navid Nikaein (Eurecom, France)

***Improving Device-to-Device Communications Pairing for Underlay Cellular Networks* 397**

Giovanni Giambene and Tran Anh Khoa (University of Siena, Italy)

RAT2

***The Relaxed Power Control Algorithm* 403**

Markus Klügel, Michael Newinger, Wolfgang Utschick and Wolfgang Kellerer (Technische Universität München, Germany)

***Comparison of Interference Control Methods in Large Heterogeneous Networks* 409**

Ole Grøndalen and Kashif Mahmood (Telenor, Norway); Olav Norvald Østerbø (Telenor Corporate Development, Norway)

***User Satisfaction Based Resource Allocation Schemes for Multicast in D2D Networks* 415**

Jagadeesha Rb, Jang-Ping Sheu and Wing-Kai Hon (National Tsing Hua University, Taiwan)

***System Level Analysis of Multi-Operator Small Cell Network at 10 GHz* 420**

Petri Luoto (University of Oulu, Finland); Antti Roivainen (Keysight Technologies Finland Oy, Finland); Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland); Pekka Pirinen (University of Oulu, Finland); Sumudu Samarakoon (Centre for Wireless Communications, University of Oulu, Finland); Matti Latva-aho (UoOulu, Finland)

***Joint Optimization of Energy Efficiency and Spectrum Efficiency in 5G Ultra-Dense Networks* 425**

Mary Adedoyin and Olabisi Emmanuel Falowo (University of Cape Town, South Africa)

RAT3

***Joint Transmission with Dummy Symbols for Dynamic TDD in Ultra-Dense Deployments* 431**

Haris Celik and Ki Won Sung (KTH Royal Institute of Technology, Sweden)

***QoS-based Radio Resource Management for 5G Ultra-dense Heterogeneous Networks* 436**

Mary Adedoyin and Olabisi Emmanuel Falowo (University of Cape Town, South Africa)

***The Implementation of Wideband Cyclostationary Feature Detector with Receiver Constraints* 442**

Ikedieze Gabriel Anyim, John Chiverton, Misha Filip and Abdulkarim Tawfik (University of Portsmouth, United Kingdom (Great Britain))

***Coexistence of FDD Flexible Duplexing Networks* 447**

Sergio Lembo and Olav Tirkkonen (Aalto University, Finland); Mariana Goldhamer (Four G CelleX, Israel); Adrian Kliks (Poznan University of Technology, Poland)

***A Modified Proportional Fair Radio Resource Management Scheme in Virtual RANs* 453**

Behnam Rouzbehani (Instituto Superior Técnico & GROW - Group for Research on Wireless, INOV - INESC Inovação, Portugal); Luis M. Correia (IST - University of Lisbon & INESC, Portugal); Luisa Caeiro (Escola Superior de Tecnologia de Setubal - Polytechnic Institute of Setubal, Portugal)

RAT4

***Optimum Multi-Subframe Scheduling for LTE Licensed-Assisted Access to Unlicensed Spectrum* 458**

Cheng-Jie Tsai and Tsern-Huei Lee (National Chiao Tung University, Taiwan)

***Beyond WYSIWYG: Sharing Contextual Sensing Data Through mmWave V2V Communications* 463**

Cristina Perfecto (University of the Basque Country UPV/EHU, Spain); Javier Del Ser (TECNALIA, Spain); Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland); Miren Nekane Bilbao (University of the Basque Country, Spain)

***Physical Downlink Control Channel for 5G New Radio* 469**

Honglei Miao (Intel Deutschland GmbH); Michael Faerber (Intel Deutschland GmbH, Germany)

Performance Evaluation of Adaptive Beamforming in 5G-V2X Networks 474

Ilmari Maskulainen, Petri Luoto and Pekka Pirinen (University of Oulu, Finland); Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland); Kari Horneman (Nokia & Bell Labs, Finland); Matti Latva-aho (UoOulu, Finland)

Future of Mobile 479

Mischa Dohler, Toktam Mahmoodi, Maria Lema and Massimo Condoluci (King's College London, United Kingdom (Great Britain))

RAT5

Hybrid Paging and Location Tracking Scheme for Inactive 5G UEs 484

Sofonias Hailu (Aalto University, Finland); Mikko Säily (Nokia Bell Labs, Finland)

On the Effective Capacity of MTC Networks in the Finite Blocklength Regime 490

Mohammad Shehab, Endrit Dosti and Hirley Alves (University of Oulu, Finland); Matti Latva-aho (UoOulu, Finland)

Cooperative Transmissions in Ultra-Dense Networks Under a Bounded Dual-Slope Path Loss Model 495

Yanpeng Yang and Ki Won Sung (KTH Royal Institute of Technology, Sweden); Jihong Park (Aalborg University, Denmark); Seong-Lyun Kim and Kwang Soon Kim (Yonsei University, Korea)

Traffic Safety in the METIS-II 5G Connected Cars Use Case: Technology Enablers and Baseline Evaluation 501

David Martín-Sacristán (Universitat Politècnica de València & iTEAM Research Institute, Spain); Carlos Herranz (Universitat Politècnica de València, Spain); Jose F Monserrat (Universitat Politècnica de València)

A Method for Resolving Users' Collision in Random Access Schemes in 5G Systems 506

Mohammed Al-Imari (Samsung R&D Institute UK, United Kingdom (Great Britain))

RAT6

Vehicle Clustering for Improving Enhanced LTE-V2X Network Performance 511

Petri Luoto (University of Oulu, Finland); Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland); Pekka Pirinen (University of Oulu, Finland); Sumudu Samarakoon (Centre for Wireless Communications, University of Oulu, Finland); Kari Horneman (Nokia & Bell Labs, Finland); Matti Latva-aho (UoOulu, Finland)

On the Performance of Ultra-Reliable Decode and Forward Relaying Under the Finite Blocklength 516

Parisa Nouri and Hirley Alves (University of Oulu, Finland); Matti Latva-aho (UoOulu, Finland)

Coordinated Multi-Cell Resource Allocation for 5G Ultra-Reliable Low Latency Communications 521

Vesa Hytönen (Magister Solutions Ltd., Finland); Zexian Li (Nokia Bell Labs, Finland); Beatriz Soret (Nokia Bell Labs, Denmark); Vuokko Nurmela (Nokia Bell Labs, Finland)

Comparison of Different Beamtraining Strategies from a Rate-Positioning Trade-Off Perspective 526

Jani Saloranta (University of Oulu & Centre for Wireless Communications, Finland); Giuseppe Destino (University of Oulu, Finland); Henk Wymeersch (Chalmers University of Technology, Sweden)

***Lousy Processing Increases Energy Efficiency in Massive MIMO Systems* 531**

Sara Gunnarsson and Micaela Bortas (Lund University, Sweden); Yanxiang Huang (IMEC & KU Leuven, Belgium); Cheng-Ming Chen (KU Leuven, Belgium); Liesbet Van der Perre (KUL, Belgium); Ove Edfors (Lund University, Sweden)

RAT7

***Energy Efficient Optimization of a Sleep Mode Strategy in Heterogeneous Cellular Networks* 536**

Marco Dolfi (University of Florence & CNIT, Italy); Simone Morosi (University of Florence - CNIT, Italy); Cicek Cavdar (KTH Royal Institute of Technology, Sweden); Enrico Del Re (University of Florence & CNIT, Italy)

***Traffic-aware Carrier Allocation with Aggregation for Load Balancing* 542**

Haeyoung Lee, Seiamak Vahid and Klaus Moessner (University of Surrey, United Kingdom (Great Britain))

***On Spectrum Sharing Among Micro-Operators in 5G* 548**

Tachporn Sanguanpuak (University of Oulu, Finland); Sudarshan Guruacharya and Ekram Hossain (University of Manitoba, Canada); Nandana Rajatheva (University of Oulu, Finland); Matti Latva-aho (UoOulu, Finland)

***Towards Low-Latency and Ultra-Reliable Vehicle-to-Vehicle Communication* 554**

Ikram Ashraf (Oulu, Finland); Chen-Feng Liu (Centre for Wireless Communications, University of Oulu, Finland); Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland); Walid Saad (Virginia Tech, USA)

***Coexistence of Wireless Technologies in Medical Scenarios* 559**

Heikki Karvonen (University of Oulu, Centre for Wireless Communications, Finland); Matti Hämäläinen, Jari Iinatti and Carlos A Pomalaza-Ráez (University of Oulu, Finland)

Special Sessions (SPS) Track

SPS1: Ultra-Reliable & Low-Latency Communication (URLLC): Fundamentals and Applications

***On Wireless Networks for the Era of Mixed Reality* 564**

Klaus Doppler and Eric Torkildson (Nokia Bell Labs, USA); Jan Bouwen (Alcatel-Lucent, France)

***Overbooking Radio and Computation Resources in mmW-Mobile Edge Computing to Reduce Vulnerability to Channel Intermittency* 569**

Sergio Barbarossa, Elena Ceci and Mattia Merluzzi (Sapienza University of Rome, Italy)

***5G Ultra-Reliable and Low-Latency Systems Design* 574**

Chih-ping Li (Qualcomm, USA); Jing Jiang (Qualcomm Inc., USA); Wanshi Chen (Qualcomm, France); Tingfang Ji (Qualcomm Inc., USA); John Smee (QUALCOMM Incorporated, USA)

SPS2: Toward 300 GHz wireless networks, challenges and opportunities

***Trends and Challenges for Autonomic RRM and MAC Functionality for QoS Provision and Capacity Expansions in the Context of 5G Beyond 6GHz* 579**

Ioannis-Prodrimos Belikaidis and Andreas Georgakopoulos (WINGS ICT Solutions, Greece); Panagiotis Demestichas (University of Piraeus, Greece); Uwe Herzog (Eurescom, Germany); Klaus Moessner and Seiamak Vahid (University of Surrey, United Kingdom (Great Britain)); Michael Fitch (BT Exact, United Kingdom (Great Britain)); Keith Briggs

(BT Group, United Kingdom (Great Britain)); Benoit Miscopein (CEA, France); Bismark Okyere and Valerio Frascolla (Intel Deutschland GmbH, Germany)

SPS4: Spectrum for 5G

Virtualization of Spectrum Resources for 5G Networks 584

Shah Nawaz Khan (FBK CREATE-NET, Italy); Adrian Kliks (Poznan University of Technology, Poland); Tao Chen (VTT Technical Research Centre of Finland LTD, Finland); Miia Mustonen (VTT Technical Research Centre of Finland, Finland); Roberto Riggio and Leonardo Goratti (FBK CREATE-NET, Italy)

Millimeter Wave for 5G Mobile Fronthaul and Backhaul 589

Alain Abdel-Majid Mourad (Interdigital Europe Ltd, United Kingdom (Great Britain)); Ping-Heng Kuo (InterDigital Europe, United Kingdom (Great Britain))

Spectrum Sharing in Hybrid Terrestrial-Satellite Backhaul Networks in the Ka Band 594

Xavier Artiga (Centre tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Miguel Ángel Vázquez (Centre Tecnològic de les Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Ana Pérez-Neira (CTTC, Spain); Christos G. Tsinos (University of Luxembourg, Luxembourg); Eva Lagunas (University of Luxemburg - SnT, Luxembourg); Symeon Chatzinotas (University of Luxembourg, Luxembourg); Venkatesh Ramireddy and Christian Steinmetz (Ilmenau University of Technology, Germany); Rudolf Zetik (Fraunhofer Institute for Integrated Circuits IIS, Germany); Konstantinos Ntougias, Dimitrios Ntaikos and Constantinos B. Papadias (Athens Information Technology, Greece)

SPS7: 5G physical layer design for high speed vehicles

From Architecture to Field Trial: A Millimeter Wave Based MHN System for HST Communications Toward 5G 599

Hee Sang Chung and Junhyeong Kim (ETRI, Korea); Gosan Noh (Electronics and Telecommunications Research Institute, Korea); Bing Hui (ETRI, Korea); Ilgyu Kim (ETRI of KOREA, Korea); Young Min Choi (Cleverlogic, Korea); Changseob Choi and Myong Sik Lee (KMW, Korea); Dong Ha Kim (Seoul Metropolitan Rapid Transit Corporation, Korea)

Configurable 5G Air Interface for High Speed Scenario 604

Petri Luoto and Kari Rikkinen (University of Oulu, Finland); Pasi E Kinnunen and Juha Karjalainen (Nokia Bell Labs, Finland); Kari Pajukoski (Nokia, Bell-Labs, Finland); Jari Hulkkonen (Nokia Bell Labs, Finland); Matti Latva-aho (UoOulu, Finland)

Static Sequence Wrapped DFT-s-OFDM for High-Speed Train Scenarios in high-SHF Bands 609

Fumihito Hasegawa, Hiroshi Nishimoto, Akihiro Okazaki and Atsushi Okamura (Mitsubishi Electric Corporation, Japan)

Location-Aware 5G Communications and Doppler Compensation for High-Speed Train Networks 614

Toni A Levanen and Jukka Talvitie (Tampere University of Technology, Finland); Risto Wichman (Aalto University School of Electrical Engineering, Finland); Ville Syrjälä, Markku K. Renfors and Mikko Valkama (Tampere University of Technology, Finland)

Testbeds & Experimental Research (TER) Track

TER1

***5G Trial System Coverage Evaluation Utilizing Multi-Point Transmission in 15 GHz Frequency Band* 620**

Kimmo Hiltunen (Ericsson Research, Oy L M Ericsson Ab, Finland); Arne Simonsson and Peter Ökvist (Ericsson Research, Sweden); Björn Halvarsson (Ericsson, Sweden)

***On LoRaWAN Scalability: Empirical Evaluation of Susceptibility to Inter-Network Interference* 625**

Konstantin Mikhaylov, Juha Petäjälä and Janne Janhunen (University of Oulu, Finland)

***An SDR-based Prototype of Spectrally Precoded OFDM* 631**

Medhat Mohamad (Luleå Technical University, Sweden); Rickard Nilsson and Jaap van de Beek (Luleå University of Technology, Sweden)

***Experimental Evaluation of Relative Calibration in a MISO-TDD System* 637**

Theoni Magounaki (Orange Labs, France); Florian Kaltenberger (Eurecom, France); Xiwen Jiang (EURECOM, France); Cyril Buey (Orange Labs - La Turbie, France); Philippe Ratajczak (Orange Labs, France); Fabien Ferrero (University Nice Sophia Antipolis, CNRS, LEAT & CREMANT, France)

***Energy Monitoring and Management in 5G Integrated Fronthaul and Backhaul* 642**

Osamah Ibrahim Abdullaziz (National Chiao Tung University, Taiwan); Marco Capitani (Nextworks, Italy); Claudio E. Casetti and Carla-Fabiana Chiasserini (Politecnico di Torino, Italy); Shahzoob Bilal Chundrigar (ITRI, Taiwan); Giada Landi (Nextworks, Italy); Xi Li (NEC, Germany); F Moscatelli (Nextworks, Italy); Kei Sakaguchi (Fraunhofer Heinrich Hertz Institute, Germany); Samer T. Talat (Industrial Technology Research Institute, Taiwan)

TER2

***Experimental RF-Signal Based Wireless Energy Transmission* 648**

Janne Janhunen, Konstantin Mikhaylov and Juha Petäjälä (University of Oulu, Finland)

***5G Case Study of Internet of Skills: Slicing the Human Senses* 654**

Maria Lema, Konstantinos Antonakoglou, Fragkiskos Sardis, Nantachai Sornkarn, Massimo Condoluci, Toktam Mahmoodi and Mischa Dohler (King's College London, United Kingdom (Great Britain))

***5G E-band Backhaul System Evaluations: Focus on Moving Objects and Outdoor to Indoor Transmission* 660**

Zhou Du (Nokia Bell Labs); Eckhard Ohlmer (National Instruments, Germany); Kimmo Aronkytö (Nokia Bell Labs, Finland); Jyri Putkonen and Jouko Kapanen (Nokia Bell Labs); Daniel Daniel Swist (National Instruments, Germany)

***A Reference Architecture for Federating IoT Infrastructures Supporting Semantic Interoperability* 665**

Francois Carrez (University of Surrey, United Kingdom (Great Britain)); David Gómez (Universidad de Cantabria, Spain); Tarek Elsaleh (University of Surrey, United Kingdom (Great Britain)); Luis Sanchez and Jorge Lanza (University of Cantabria, Spain); Paul Grace (IT Innovation & University of Southampton, United Kingdom (Great Britain))

TER3

***Computational and Experimental Studies for Probe Ring Radius in MIMO OTA Test Systems* 671**

Dmytro Anin (University of Oulu, Finland); Md Miah (Aalto University & School of Electrical Engineering, Finland); Erkki T. Salonen (University of Oulu, Finland)

***Experimental Analysis on Possible Coexistence Issues Related to the Introduction of LTE in the 2300-2400 MHz Band* 676**

Valeria Petrini and Doriana Guiducci (Fondazione Ugo Bordonis, Italy); Claudia Carciofi (FUB, Italy); Claudio Cecchetti (Fondazione Ugo Bordonis, Italy); Manuela Vaser (University of Rome Tor Vergata, Italy); Elisa Ricci (Università di Roma Tor Vergata, Italy); Elio Restuccia (Istituto Superiore delle Comunicazione e delle Tecnologie dell'Informazione - MISE, Italy); Gianmarco Fusco (Istituto Superiore delle Comunicazione e delle Tecnologie dell'Informazione, Italy)

***System Analysis and Design of mmW Mobile Backhaul Transceiver at 28 GHz* 681**

Giuseppe Destino (University of Oulu, Finland); Olli Kursu, Saila Tammelin and Jari Haukipuro (Centre for Wireless Communications, University of Oulu, Finland); Marko Sonkki, Timo Rahkonen and Aarno Pärssinen (University of Oulu, Finland); Aki Korvala and Marko Pettissalo (Nokia, Finland); Matti Latva-aho (UoOulu, Finland)

***Measuring LTE and WiFi Coexistence in Unlicensed Spectrum* 686**

Nikos Makris (University of Thessaly & CERTH, Greece); Agorastos Dimitrios Samaras and Virgilios Passas (University of Thessaly, Greece); Thanasis Korakis (New York University, USA); Leandros Tassioulas (Yale University, USA)

***Application of LTE 450 MHz in the Electric Energy Sector* 692**

Dick Carrillo (CPqD, Brazil); Ricardo Caldeira (Fundação CPqD - Centro de Pesquisa e Desenvolvimento em Telecomunicações, Brazil); Renato Coutinho (CPqD, Brazil)

Wireless and Optical Networks (WON) Track

WON1

***On the Performance of Video Streaming in Energy-Aware Wireless Mesh Networks* 697**

Yong Yao, Adrian Popescu and Markus Fiedler (Blekinge Institute of Technology, Sweden); Rickard Ljung (Sony Mobile, Sweden)

***Multi-service SDN Controlled Reconfigurable Long-Reach Optical Access Network* 703**

Giuseppe Talli (Tyndall National Institute, University College Cork, Ireland); Stefano Porto, Daniel Carey, Nicola Brandonisio, Alan Naughton, Peter Ossieur and Paul Townsend (Tyndall National Institute, Ireland); Rene Bonk and Thomas Pfeiffer (Alcatel-Lucent, Germany); Frank Slyne (Connect Research Centre - Trinity College Dublin, Ireland); Séamas McGettrick (University of Dublin, Trinity College, Ireland); Christian Bluemm (CONNECT at Trinity College Dublin, Ireland); Marco Ruffini and Alan Hill (CTVR, Trinity College Dublin, Ireland); David B Payne (Trinity College Dublin, United Kingdom (Great Britain)); Nick Parsons (Polatis Ltd., United Kingdom (Great Britain))

***5G Transport Network Blueprint and Dimensioning for a Dense Urban Scenario* 708**

Ilker Demirkol (Universitat Politècnica de Catalunya, Spain); Daniel Camps (i2CAT, Spain); Jens Bartelt (Technische Universität Dresden, Germany); Jim Zou (ADVA Optical Networking, Germany)

***Statistical Multiplexing in Fronthaul-Constrained Massive MIMO* 714**

Jay Chaudhary, Jens Bartelt and Gerhard Fettweis (Technische Universität Dresden, Germany)

***The ADRENALINE Testbed: An SDN/NFV Packet/Optical Transport Network and Edge/Core Cloud Platform for End-to-end 5G and IoT Services* 720**

Raul Muñoz (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Laia Nadal Reixats (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Ramon Casellas (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Michela Svaluto Moreolo (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain); Ricard Vilalta (CTTC/CERCA, Spain); Josep M. Fabrega (Centre Tecnològic de Telecomunicacions de Catalunya, Spain); Ricardo Martinez (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC/CERCA), Spain); Arturo Mayoral (CTTC/CERCA, Spain); Francisco Javier Vilchez (Centre Tecnològic de Telecomunicacions de Catalunya, Spain)

WON2 ADDITIONAL PAPERS:

***Impact of CoMP VNF Placement on 5G Coordinated Scheduling Performance* 725**

Andrea Marotta (University of L'Aquila, Italy); Koteswararao Kondepu (Scuola Superiore Sant'Anna, Italy); Francesco Giannone (Scuola Superiore Sant'Anna, Italy); Dajana Cassioli and Cristian Antonelli (University of L'Aquila, Italy); Luca Valcarengi and Piero Castoldi (Scuola Superiore Sant'Anna, Italy)

***5G Radio Access Network Architecture Based on Flexible Functional Control / User Plane Splits* 731**

Jakob Belschner (Deutsche Telekom AG, Germany); Nico Bayer and Paul Arnold (Telekom Innovation Laboratories, Germany); Gerd Zimmermann (Deutsche Telekom AG, Germany)

***Routing Protocols for Video Surveillance Drones in IEEE 802.11s Wireless Mesh Networks* 736**

Charles Jumaa Katila, Antonio Di Gianni, Chiara Buratti and Roberto Verdone (University of Bologna, Italy)

***Self-organizing Mesh Topology Formation in Internet of Things with Heterogeneous Devices* 741**

Dudu Ok and Furqan Ahmed (KTH Royal Institute of Technology, Sweden); Mohit Agnihotri (KTH Royal Institute of Technology & Eindhoven Technical University, Sweden); Cicek Cavdar (KTH Royal Institute of Technology, Sweden)

***Experimental-based Propagation Model for VLC* 746**

Lorenzo Mucchi (University of Florence, Italy); Francesco Saverio Cataliotti (LENS Università di Firenze & Dip. Energetica, Università di Firenze, Italy); Luca Simone Ronga (Self Employed, Italy); Stefano Caputo and Patrizio Marocci (University of Florence, Italy)

WON3

***Multi-core Fiber Undersea Transmission Systems* 751**

Md. Nooruzzaman and Toshio Morioka (Technical University of Denmark, Denmark)

***Outage Probability Analysis in Finite Wireless Networks Operating in LOS Environment* 756**

Natalia Ermolova (Aalto University, Finland)

***Scheduling in an Ethernet Fronthaul Network* 761**

Mohamad Kenan Al-Hares (University of Kent, United Kingdom (Great Britain)); Philippos Assimakopoulos (University of Kent & Communications Research group, United Kingdom (Great Britain)); Daniel Muench (ADVA Optical Networking SE, Germany); Nathan J Gomes (University of Kent, United Kingdom (Great Britain))

***On the Optimal Space-Frequency to Frequency Mapping in Indoor Single-Pair RoC Fronthaul* 766**

Andrea Matera and Umberto Spagnolini (Politecnico di Milano, Italy)

***Adaptive In-band Full-Duplex Collision Detection for Balancing Sensing and Collision Costs* 771**

Brecht Reynders, Tom Vermeulen, Fernando Rosas and Sofie Pollin (KU Leuven, Belgium)

ADDITIONAL PAPERS:

Group Vertical Handover Management based SDN-DMM-IPv6 RH 776

Mouad Idri (Namur University, Belgium)

An Experimental Investigation of SDN Controller Live migration in Virtual Data Centers 782

Sajad Khorsandroo, Ali Smana Tosun (The University of Texas at San Antonio)