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Monday, April 15

Monday, April 15 9:00 - 10:30

### EURCOMM-1: Enabling Technologies for Future Networks I

Beyond 5G: What will it be?

***On the Reliability of Decode-and-Forward Two-Relay Diversity-enabled NOMA Networks*** 1

Galymzhan Nauryzbayev (Nazarbayev University, Kazakhstan); Mohamed M. Abdallah (Hamad Bin Khalifa University (HBKU), Qatar); Khaled M. Rabie (Manchester Metropolitan University, United Kingdom (Great Britain))

***Network Coded Cooperation Receiver with Analog XOR Mapping for Enhanced BER*** 7

Mohamed Hegazy (Nile University & National Telecom Regulatory Authority, Egypt); Tamer ElBatt (Faculty of Engineering, Cairo University & WINC, Nile University, Egypt); Amr El-Sherif (Nile University, Egypt)

***Low-Complexity Codebook Assisted Channel Estimation in Hybrid Beamforming System*** N/A

Wei Liu, Xinxin He and Xiaoyong Wu (Beijing University of Posts and Telecommunications, P.R. China)

Monday, April 15 9:00 - 9:15

### IWSS-OP: IWSS Opening Session

Monday, April 15 9:00 - 9:45

### MOTION-k1: Modeling and Analysis of Spatially-Correlated Cellular Networks by Using Inhomogeneous Poisson Point Processes

In this talk, we introduce a new methodology for modeling and analyzing downlink cellular networks, where the Base Stations (BSs) constitute a motion-invariant Point Process (PP) that exhibits some degree of interactions among the points, i.e., spatial repulsion or spatial clustering. The proposed approach is based on the theory of Inhomogeneous Poisson PPs (I-PPPs) and is referred to as Inhomogeneous Double Thinning (IDT) approach. In a PP, the distribution of the distance from a randomly distributed (typical) user to its nearest BS depends on the degree of spatial repulsion or clustering exhibited by the PP. Also, the average number of interfering BSs that lie within a given distance from the typical user is a function of the repulsion and clustering characteristics of the PP. The proposed approach consists of approximating the original motion-invariant PP with an equivalent PP that is made of the superposition of two conditionally independent I-PPPs. The inhomogeneities of both PPs are created from the point of view of the typical user ("user-centric"): The first one is based on the distribution of the user's distance to its nearest BS and the second one is based on the distance-dependent average number of interfering BSs around the user. The inhomogeneities are mathematically modeled through two distance-dependent thinning functions and a tractable expression of the coverage probability is obtained. Sufficient conditions on the parameters of the thinning functions that guarantee better or worse coverage compared with the baseline homogeneous PPP model are identified. The accuracy of the IDT approach is substantiated with the aid of empirical data for the spatial distribution of the BSs. This talk is based on the research article titled "Inhomogeneous Double Thinning - Modeling and Analysis of Cellular Networks by Using Inhomogeneous Poisson Point Processes", and published in IEEE Trans. Wireless Communications 17(8): 5162-5182 (2018).

Monday, April 15 9:00 - 12:15

### TUTO-1: ENABLING TECHNOLOGIES FOR CROWD SENSING AND MANAGEMENT

Presenters: Prof. Hossam S. Hassanein (School of Computing, Queen's University, Kingston, ON Canada); Dr. Nizar Zorba (Electrical Engineering Department, Qatar University, Doha, Qatar)

Monday, April 15 9:00 - 9:30

### uHSLLC-k1: Invited Keynote 1

Proactive Cellular Systems for Energy Efficient Operation

The cellular network have long been configured and optimised reactively by identifying events and triggers and readjusting the operation of the cellular system. Our research is paving the way to make a step change by introducing proactive techniques to pre-emptively trigger actions that will save the energy while maintaining a high level of quality of experience for end users. With the advent of ultra-dense deployment of networks, we need to use such mechanisms to schedule multi-level sleep modes of cells, mobility management as well as joint RAN-backhaul optimisation from energy efficiency perspective. We will cover the fundamental framework for the evaluation of energy efficiency and the state of the art as well as futuristic approaches and ideas to achieve energy efficient network management.

Monday, April 15 9:00 - 10:30

wedge-1: Session 1

Including one Keynote : Caching in D2D Communities, Olav Tirkkonen, Aalto University from 9:00-9:30 Paper presentations start from 9:30.

- Learning-Based Demand-Aware Communication Computing and Caching in Vehicular Networks** 13  
Zhengwei Lyu and Ying Wang (Beijing University of Posts and Telecommunications, P.R. China)
- Towards Mobility-Aware Proactive Caching for Vehicular Ad hoc Networks** 19  
Yousef Alnagar (Nile, Egypt); Amr El-Sherif and Sameh Hosny (Nile University, Egypt)
- Joint Video Caching and User Association With Mobile Edge Computing** 25  
Hong Wang, Ying Wang, Ruijin Sun, Shan Guo and Honglin Li (Beijing University of Posts and Telecommunications, P.R. China)
- Cache Migration Protocol for Information-Centric Networks** 31  
Fenyu Jiang, Yan Sun and Chris Phillips (Queen Mary University of London, United Kingdom (Great Britain))
- Enabling Ultra Reliability and Low Latency Communications for 5G and Beyond (EURCOMM)** N/A  
Muhammad Ali Imran (University of Glasgow, United Kingdom (Great Britain)); Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland); Nicola Marchetti (Trinity College Dublin, Ireland); M. Majid Butt (Nokia Bell Labs, France); Indrakshi Dey (Trinity College Dublin, Ireland)

Monday, April 15 9:15 - 10:30

IWSS-1: IWSS Technical Session 1

- A Deep Learning Approach to Radio Signal Denoising** 37  
Ebtesam Almazrouei (Khalifa University, United Arab Emirates); Gabriele Gianini (Università degli Studi di Milano, Italy); Nawaf Almoosa and Ernesto Damiani (Khalifa University, United Arab Emirates)
- Carrier-Sense Multiple Access for Heterogeneous Wireless Networks Using Deep Reinforcement Learning** 45  
Yiding Yu and Soung Chang Liew (The Chinese University of Hong Kong, Hong Kong); Taotao Wang (Shenzhen University, P.R. China)
- Spectrum Sensing for Modulated Radio Signals Using Deep Temporal Convolutional Networks** 52  
Amir Ghasemi (Communications Research Centre Canada, Canada); Chaitanya Parekh (Communications Research Centre, Canada); Paul Guinand (Communications Research Centre Canada, Canada)
- Experimental Performance Evaluation of Improved Energy Detection under Noise Uncertainty** 57  
Bansi Gajera (School of Engineering and Applied Science, Ahmedabad University, India); Dhaval Karshanbhai Patel (School of Engineering and Applied Science-Ahmedabad University, India); Brijesh Soni (School of Engineering and Applied Science, Ahmedabad University, India); Miguel López-Benítez (University of Liverpool, United Kingdom (Great Britain))
- Embeddable Convolutional layer-based Filter for Wireless Signal Detection** 63  
Xue Zhou, Zhuo Sun, Hengmiao Wu and Qianqian Wu (Beijing University of Posts and Telecommunications, P.R. China)

Monday, April 15 9:30 - 10:30

ARANFP-1: MIMO

- A Low-Complexity Antenna-Layout-Aware Spatial Covariance Matrix Estimation Method** 69  
Shangbin Wu (Samsung R&D Institute UK, United Kingdom (Great Britain)); Xiaoqing Zhang (Shandong University, P.R. China)
- Hybrid Digital and Analog Precoding Algorithm for Millimeter Wave MIMO Systems** 75  
Ye Wang (Beijing University of Posts and Telecommunications, P.R. China); Weixia Zou (BUPT, P.R. China)

<b><i>Effect of Mutual Coupling on the Performance of STCM-MIMO Systems</i></b>	81
Fatemeh Asghari Azhiri (University of Tabriz, Iran); Reza Abdolee (California State University, Bakersfield, USA); Behzad Mozaffari Tazehkand (University of Tabriz, Iran)	
<b><i>On the use of semidefinite relaxation for uplink phase-only hybrid beamforming with blockers</i></b>	86
Reda Bekkar (CEA LETI, France); Cyrille Siclet (GIPSA-Lab, France); Laurent Ros (GIPSA-lab & INPG & CNRS organisation, France); Benoit Miscopein and Serge Bories (CEA, France)	

## uHSLLC-1: Technical Papers

<b><i>Handover management in dense networks with coverage prediction from sparse networks</i></b>	92
Michael Mollel (The Nelson Mandela African Institution of Science and Technology and Glasgow University, United Kingdom (Great Britain)); Metin Ozturk (University of Glasgow, United Kingdom (Great Britain)); Shubi F Kajjage (Nelson Mandela African Institution of Science and Technology, Tanzania); Michael Kisangiri (Nelson Mandela African Institute of Science and Technology, Tanzania); Oluwakayode Onireti, Muhammad Ali Imran and Qammer H Abbasi (University of Glasgow, United Kingdom (Great Britain))	
<b><i>EMF-reduction Uplink Resource Allocation Scheme for Non-Orthogonal Multiple Access Systems</i></b>	98
Muhammad Ali Jamshed (University of Surrey, United Kingdom (Great Britain)); Osama Amjad (Lakehead University, Thunder Bay, ON, Canada); Fabien Hélot and Tim Brown (University of Surrey, United Kingdom (Great Britain))	
<b><i>Multi-Antenna Based Selective DF Cooperative Relaying Scheme over TWDP Fading</i></b>	N/A
Rahul Makkar (The LNM Institute of Information Technology & Rupa Ki Nangal, Post-Sumel, Via-Jamdoli, India); Divyang Rawal (LNMIIT, India); Nikhil Sharma (The LNM Institute of Information Technology, Jaipur, India); Dushantha Nalin K. Jayakody (National Research Tomsk Polytechnic University, Russia)	
<b><i>Point Controlled Energy Efficient Medium Access in WLANs for Low Latency Communications</i></b>	103
Ghazanfar A. Safdar (University of Bedfordshire, United Kingdom (Great Britain)); Masood Ur-Rehman (University of Glasgow, United Kingdom (Great Britain))	

Monday, April 15 9:45 - 10:30

## MOTION-1: Models for networks

<b><i>Practical models for interference cancellation residual error in transmission-only networks</i></b>	108
Jiakang Xu (Beijing University of Posts and Telecommunications, P.R. China); Mary Ann Weitnauer (Georgia Institute of Technology, USA)	
<b><i>Stochastic Models for Opportunistic Networks</i></b>	113
Jorge Visca and Matias Richart (Universidad de la República, Uruguay); Javier Baliosian (Universitat Politècnica de Catalunya, Spain)	
<b><i>Stochastic Analysis of UDNs With Resource Capacity and User Scheduling</i></b>	119
Yassine Hmamouche (IMT-Atlantique, France); Mustapha Benjillali (INPT, Morocco); Samir Saoudi (IMT Atlantique, France)	

Monday, April 15 9:45 - 11:00

## WS1-1: Session #1

<b><i>Profit Maximization by Forming Federations of Geo-Distributed MEC Platforms</i></b>	127
Li-Hsing Yen, Chi-Han Chang and Yi Chia Chen (National Chiao Tung University, Taiwan)	
<b><i>Cloud &amp; Edge Trusted Virtualized Infrastructure Manager (VIM) - Security and Trust in OpenStack</i></b>	133
Teodora Sechkova, Enrico Barberis and Michele Paolino (Virtual Open Systems SAS, France)	

Monday, April 15 10:45 - 12:15

## ARANFP-2: Massive MIMO

<b>Quality-of-Service Constrained User and Antenna Selection in Downlink Massive-MIMO Systems</b>	139
Javed Akhtar (IIT Kanpur, India); Ketan Rajawat (Indian Institute of Technology Kanpur, India)	
<b>Hybrid Processing for Multi-user Millimeter-Wave Massive MIMO Systems via Matrix Decomposition</b>	145
Wu Wei and Danpu Liu (Beijing University of Posts and Telecommunications, P.R. China)	
<b>A 3D Ellipsoid Model for Isotropic and Non-Isotropic Scatterers Co-existing Massive MIMO Channels</b>	151
Lingfeng Wang, Jianqiao Chen, Xiaoli Yang and Nan Ma (Beijing University of Posts and Telecommunications, P.R. China); Ping Zhang (WTI-BUPT, P.R. China)	
<b>Low-Complexity Iterative Receiver for Orthogonal Chirp Division Multiplexing</b>	157
Roberto Bomfin (Technische Universität Dresden, Germany); Marwa Chafii (ENSEA, France); Gerhard P. Fettweis (Technische Universität Dresden, Germany)	
<b>Generalized JSDM with Enhanced Interference Management for Massive MIMO Systems</b>	163
Guosen Yue (FutureWei Technologies, Inc., USA); Bohan Zhang (University of Delaware, USA); Xiao-Feng Qi (Futurewei Technologies, Inc., USA); Leonard Cimini (University of Delaware, USA)	

Monday, April 15 10:45 - 11:30

### IWSS-K1: IWSS Keynote Speech

Addressing spectrum scarcity through hybrid optical and radio-frequency wireless networks

Rapid increase in the use of wireless services over the last two decades has led the problem of the radio-frequency (RF) spectrum exhaustion. More specifically, due to this RF spectrum scarcity, additional RF bandwidth allocation, as utilized in the recent past, is not anymore a viable solution to fulfill the demand for more wireless applications and higher data rates. The talk goes first over the potential offered by optical wireless (OW) communication systems to relieve spectrum scarcity. It then summarizes some of the challenges that need to be surpassed before such kind of systems can be deployed. Finally, the talk offers two recent studies illustrating how supplementing OW networks with RF backup access points increases these networks reliability and coverage while maintaining their high capacity.

Monday, April 15 10:45 - 12:15

### MOTION-2: Tools for performance evaluation

<b>On Capacity Sensitivity in Additive Vector Symmetric <math>\alpha</math>-Stable Noise Channels</b>	170
Malcolm Egan (INRIA, France)	
<b>Fast performance evaluation of LoRa communications over Rayleigh fading channels</b>	176
Jules Courjault (Univ Rennes1 IRISA, France); Baptiste Vrigneau (Univ Rennes IRISA & Granit team, France); Olivier Berder (Univ Rennes, CNRS, IRISA, France)	
<b>On the Optimal Rate of Ad Hoc ALOHA Networks</b>	181
Daniel Zucchetto (University of Padova, Italy); Andrea Munari (German Aerospace Center, Germany); Andrea Zanella (University of Padova, Italy)	

### MOTION-2: Tools for performance evaluation

<b>A Graph-Based Resource Sharing and Admission Control for Vehicular Networks</b>	187
Lei Gao (Beijing University Of Posts And Telecommunications, P.R. China); Yanzhao Hou, Xiaofeng Tao and Min Zhu (Beijing University of Posts and Telecommunications, P.R. China)	
<b>On the Resource Utilization of Multi-Connectivity Transmission for URLLC Services in 5G New Radio</b>	193
Nurul Huda Mahmood (University of Oulu, Finland); Ali Karimi and Gilberto Berardinelli (Aalborg University, Denmark); Klaus I. Pedersen (Nokia-Bell Labs, Aalborg University, Denmark); Daniela Laselva (Nokia Bell Labs, Denmark)	

Monday, April 15 10:45 - 11:10

### uHSLLC-k2: Invited Keynote 2

Virtual Radios, Real Services: End-to-end Resource Orchestration for Network Slicing

The diverse and demanding requirements for the next generation of mobile networks necessitate a shift away from the rigid networks of previous generations, towards greater versatility and adaptability. Essential enablers for this versatility include: new, more flexible radio access technologies; the ability to share network infrastructure and spectrum; and dynamic management of resources across the wireless access and the optical backbone and core networks. In this talk, we will present our recent results on the virtualisation of the radio access network and how they affect planning for future network deployments. We will also discuss how our vision of broad resource sharing aligns with trends in 5G including software-defined networking, virtualization, and network slicing.

Monday, April 15 10:45 - 11:30

wedge-2: Session 2

- Age Based Task Scheduling and Computation Offloading in Mobile-Edge Computing Systems** 199  
Xianxin Song, Xiaoqi Qin, Yunzheng Tao and Baoling Liu (Beijing University of Posts and Telecommunications, P.R. China); Ping Zhang (WTI-BUPT, P.R. China)
- Adaptive Task Allocation for Mobile Edge Learning** 205  
Umair Yaqub Mohammad (University of Idaho, USA); Sameh Sorour (Queen's University, Canada)
- Energy Minimization of Delay-Constrained Offloading in Vehicular Edge Computing Networks** 211  
Tianyu Yang (Technical University of Berlin, Germany); Yao Zhu, Yulin Hu and Rudolf Mathar (RWTH Aachen University, Germany)
- Intelligent Offloading Strategies For High Throughput Traffic Intersection Coordination** 217  
Yangan Mo, Mengqi Wang and Tingting Zhang (Harbin Institute of Technology, Shenzhen Graduate School, P.R. China); Qinyu Zhang (Shenzhen Graduate School, Harbin Institute of Technology, P.R. China)
- An MEC-Enabled Wireless VR Transmission System with View Synthesis-based Caching** 223  
Jianmei Dai and Danpu Liu (Beijing University of Posts and Telecommunications, P.R. China)

Monday, April 15 11:00 - 12:30

EURCOMM-2: Enabling Technologies for Future Networks II

Getting to High Reliability in Wireless Access

- Filtered OFDM Based URLLC in 5G New Radio: Principles and Performance** N/A  
Toni A Levanen (Tampere University, Finland); Zexian Li (Nokia Bell Labs, Finland); Jukka Talvitie (Tampere University, Finland); Markku K. Renfors and Mikko Valkama (Tampere University of Technology, Finland)
- 5G Experiments on Distributed MIMO Beamforming for Straightly Traveling Mobile Station at 28 GHz** 230  
Daisuke Kitayama, Daisuke Kurita, Kiichi Tateishi, Atsushi Harada, Minoru Inomata, Tetsuro Imai and Yoshihisa Kishiyama (NTT DOCOMO, INC., Japan); Shoji Itoh (Ericsson Japan, Japan); Hideshi Murai (Ericsson Research, Japan); Arne Simonsson and Peter Ökvist (Ericsson Research, Sweden)

Monday, April 15 11:10 - 11:55

uHSLC-2: Technical Papers

- Low-Complexity Detection of M-ary PSK Faster-than-Nyquist Signaling** 236  
Ebrahim Bedeer (University of Saskatchewan, Canada); Halim Yanikomeroglu (Carleton University, Canada); Mohamed Hossam Ahmed (Memorial University, Canada)
- Optimizing Energy Consumption for NOMA-MEC Offloading: A Reinforcement Learning Approach** N/A  
Lixin Li and Shaomin Zhang (Northwestern Polytechnical University, P.R. China); Wei Liang (Northwestern Polytechnical University, P.R. China); Jia Shi (Xidian University, P.R. China); Zhiguo Ding (University of Manchester, United Kingdom (Great Britain))
- Dynamic Radio Frame Configuration by Exploiting Uplink Control Channel for URLLC** 241  
Navuday Sharma and Muhammad Mahtab Alam (Tallinn University of Technology, Estonia); Yannick Le Moullec (TTU, Estonia); Hassan Malik (Tallinn University of Technology, Estonia); Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland); Sven Pärand (Telia Estonia Ltd, Estonia)

Monday, April 15 11:30 - 12:15

[IWSS-2: IWSS Technical Session 2](#)

- A Relevant Energy-Efficient Metric in OFDM for Opportunistic Users*** 247  
Raouia Masmoudi Ghodhbane (Safran Tech, Safran Sensing Systems, France)
- Dynamic Contention Window Methods for Improved Coexistence Between LTE and Wi-Fi in Unlicensed Bands*** 253  
Moawiah Alhulayil and Miguel López-Benítez (University of Liverpool, United Kingdom (Great Britain))
- Time and Frequency Varying Noise Floor Estimation for Spectrum Usage Measurement*** 259  
Hiroki Iwata and Kenta Umebayashi (Tokyo University of Agriculture and Technology, Japan); Ahmed Al-Tahmeesschi (The University of Liverpool, United Kingdom (Great Britain)); Miguel López-Benítez (University of Liverpool, United Kingdom (Great Britain)); Janne Lehtomäki (University of Oulu, Finland)

[wedge-3: Session 3](#)

- 5G Service Based Core Network Design*** 265  
Xia Lei, Ming Zhao and Zhigang Tian (Tsinghua University, P.R. China)
- Proactive Caching for Vehicular Ad hoc Networks Using The City Model*** 271  
Yousef Alnagar (Nile, Egypt); Sameh Hosny and Amr El-Sherif (Nile University, Egypt)
- Enabling End-to-End Secure Connectivity for Low-Power IoT Devices with UAVs*** 278  
Archana Rajakaruna (University of Oulu, Finland); Ahsan Manzoor (Rovio Entertainment Company & University of Oulu, Finland); Pawani Poramage, Madhusanka Liyanage and Mika E Ylianttila (University of Oulu, Finland); Andrei Gurtov (Linköping University, Sweden)

Monday, April 15 11:45 - 12:15

[WS1-PNL: Panel Discussion](#)

Moderated by Emilio Calvanese, CEA.

The Edge Eating the Cloud: MEC and its role for 5G verticals - from Automotive to Factories of the Future, e-Health, Smart Cities. Evolutionary paths from edge toward distributed computing.

Monday, April 15 11:55 - 12:15

[uHSLLC-BPA: Best Paper Award and Presentation of Shields to the Invited Keynote Speakers](#)

Monday, April 15 14:00 - 14:30

[ARANFP-k1: Mobile AI for Beyond 5G Networks](#)

Monday, April 15 14:00 - 15:30

[EURCOMM-3: Enabling Technologies for Future Networks III](#)

- Design and Implementation of Multi-Cloud VNFs Deployment Utilizing Lightweight LXC Virtualization*** 284  
Tariro Mukute (University of Cape Town, South Africa); Michael Pauls (TU Berlin, Germany); Joyce Mwangama (University of Cape Town, South Africa); Thomas Magedanz (Fraunhofer Institute FOKUS / TU Berlin, Germany)
- On the Demonstration and Evaluation of Service-Based Slices in 5G Test Network using NFV*** 289  
Muhammad Arif, Olli Liinamaa and Ijaz Ahmad (University of Oulu, Finland); Ari T. Pouttu (Centre for Wireless Communications University of Oulu, Finland); Mika E Ylianttila (University of Oulu, Finland)
- Online Wireless Lab Testbed*** 295



Martin Danneberg, Roberto Bomfin and Shahab Ehsanfar (Technische Universität Dresden, Germany); Ahmad Nimr (Dresden University of Technology, Germany); Zhitao Lin (Technische Universität Dresden, Germany); Marwa Chafii (ENSEA, France); Gerhard P. Fettweis (Technische Universität Dresden, Germany)

Monday, April 15 14:00 - 15:00

### IWSS-PNL: IWSS Panel Session

Smart Spectrum Exploitation in Current and Future Wireless Communication Systems

Monday, April 15 14:00 - 14:45

### MOTION-k2: Information theory of multiple-access channels with many users

The radio networks' paradigm is gradually shifting from servicing a few simultaneously-active traffic-hungry (human) users to hundreds of thousands of low-rate (machine) users. In this talk we consider new information-theoretic (IT) questions arising from formalizing this problem. A surprising discovery is existence of coded-access schemes that are able to perfectly reject multi-user interference, so that increasing the density of users (without increasing space-time-frequency resources!) does not lead to any deterioration of service. What is perhaps more important is that all of the industry-standard schemes (treating interference as noise, orthogonalization, ALOHA) become severely energy inefficient as user-density increases. I will discuss some of the proposed solutions for solving multiple (and random) access to alleviate these issues. Theoretically, we discover that this transition in IT parallels the one in statistics when dimensionality of feature (regressor) vectors has dramatically increased and sparsity considerations surfaced. Similarly, we will find that traditional IT tools need to be augmented with methods such as Gaussian widths and Gordon's lemma. In fact our methods allow us to derive simple firm bounds that closely match replica-method predictions from statistical physics.

Monday, April 15 14:00 - 15:30

### SFCS-1: Privacy and Investigation in Networked Systems

**Conspiracy communication reconstitution from distributed instant messages timeline** 300

Lilian Noronha Nassif (Public Ministry of Minas Gerais, Brazil)

**Android Malware Detection Based on System Calls Analysis and CNN Classification** 306

Abderrahmane Abada, Yacine Challal and Adnane Guettaf (Ecole Nationale Supérieure d'Informatique, Algeria); Khireddine Garri (Institut National de Criminologie et de Criminologie, Algeria)

**Privacy-Preservation Mechanisms for Smart Energy Metering Devices Based on Differential Privacy** 312

Alaa Gohar, Amr Elmougy and Farida Shafik (German University in Cairo, Egypt); Frank Dürr and Kurt Rothermel (University of Stuttgart, Germany)

Monday, April 15 14:00 - 14:05

### WS5-OP: The 12th International Workshop on Evolutional Technologies & Ecosystems for Beyond 5G

Opening

Monday, April 15 14:05 - 14:45

### WS5-K1: Millimeter-Wave Phased-Array Transceiver Design for 5G New Radio

The wireless communication is one of the key technologies for realizing the future smart society. The conventional omni-directional wireless communication using microwave has been studied so far, and now the directional wireless communication using millimeter-wave (30-300GHz) is opening a new technology field of communication. The directional wireless communication using the millimeter-wave spectrum can accept spatial co-existence and multiplexing as well as use of wide frequency bandwidth. In this presentation, the overview of phased-array transceiver design using CMOS device will be explained as well as several surrounded issues such as IC cost, test cost, PCB design, antenna integration, power consumption, PA performance, etc.

Monday, April 15 14:30 - 15:30

### ARANFP-3: Waveform design and receiver processing

**Fractional Media-Based Modulation with Golden Angle Modulation** 318

Ibrahim Yildirim (Istanbul Technical University, Turkey); Ertugrul Basar (Koc University, Turkey); İbrahim Altunbaş (Istanbul Technical University, Turkey)

**Moment-Based Bound on Peak-to-Average Power Ratio and Reduction with Unitary Matrix** 323  
Hirofumi Tsuda (Kyoto University & Graduate School of Informatics, Japan)

**Robust block-sparsity-based multiuser detection with inaccurate channel estimation for NOMA** N/A  
Yan Tian (Beijing University of Post and Telecom, P.R. China)

**Optimum Pilot and Data Energy Allocation for BPSK Transmission over Massive MIMO Systems** N/A  
Tarig Ballal (King Abdullah University of Science and Technology (KAUST), Saudi Arabia); Mohamed A. Suliman (Imperial College London, United Kingdom (Great Britain)); Ayed M. Alrashdi (King Abdullah University of Science and Technology (KAUST) & University of Hail, Saudi Arabia); Tareq Y. Al-Naffouri (King Abdullah University of Science and Technology, USA)

Monday, April 15 14:45 - 15:30

### MOTION-3: Massive connectivity and short packets

**Low complexity Detector for massive uplink random access with NOMA in IoT LPWA networks** 329  
Diane Duchemin (University of Lyon, France); Jean-Marie Gorce (INSA-Lyon & CITI, Inria, France); Claire Goursaud (INSA-Lyon, France)

### MOTION-3: Massive connectivity and short packets

**Superimposed Frame Synchronization Optimization for Finite Blocklength Regime** 335  
Alex The Phuong Nguyen (Institut Mines Telecom - Telecom Bretagne, France); Raphael Le Bidan (Telecom Bretagne, France); Frederic Guilloud (IMT Atlantique, France)

**Multi-Channel Access Solutions for 5G New Radio** 341  
Nurul Huda Mahmood (University of Oulu, Finland); Daniela Laselva (Nokia Bell Labs, Denmark); David Palacios (Tupl Inc., Spain); Mustafa Emara (Intel Deutschland GmbH & Hamburg University of Technology, Germany); Miltiades C. Filippou (Intel Germany GmbH, Germany); Dong Min Kim (Soonchunhyang University, Korea); Isabel de la Bandera-Cascales (University of Málaga, Spain)

Monday, April 15 14:45 - 16:30

### WS5-1: The 12th International Workshop on Evolutional Technologies & Ecosystems for Beyond 5G

**A Low-complexity Beam Searching Method for Fast Handover in MmWave Vehicular Networks** 347  
Junsheng Wang and Yawen Chen (Beijing University of Posts and Telecommunications, P.R. China); Zhaoming Lu (BUPT, P.R. China); Xiang Ming Wen (Beijing University of posts and telecommunications, P.R. China); Zifan Wang (Beijing University of Post and Telecommunications, P.R. China)

**Recharging of Flying Base Stations using Airborne RF Energy Sources** 353  
Salil S Kanhere (UNSW Sydney, Australia); Jahan Hassan and Ayub Bokani (Central Queensland University, Australia)

**An Opportunistic Cooperative Packet Transmission Scheme in Wireless Multi-hop Networks** 359  
Yating Gao (Beijing University of Posts and Telecommunications, P.R. China); Ningbo Zhang (Beijing University of Posts and Telecommunications & Science and Technology on Information Transmission and Dissemination in Communication Networks Lab, P.R. China); Jianming Cheng and Guixia Kang (Beijing University of Posts and Telecommunications, P.R. China)

**Risk assessment in 5G infrastructure deployment: an aid tool for estimating spectrum auction prices** 365  
Marco Araujo (Stockholm University, Sweden); Love Ekenberg (Stockholm University / KTH, Sweden); João Confraria (Portuguese Catholic University, Portugal)

**Joint Resource Allocation for Latency-Constrained Dynamic Computation Offloading with MEC** 371  
Mattia Merluzzi, Paolo Di Lorenzo and Sergio Barbarossa (Sapienza University of Rome, Italy); Valerio Frascolla (Intel Deutschland GmbH, Germany)

**Backhaul Bandwidth Consideration for Workload Placement in Hierarchical Edge Cloud Architecture** 377

Katsuo Yunoki (KDDI Research, Japan); Hiroyuki Shinbo (KDDI Research, Inc., Japan)

**Outdoor Experiment of mmWave Meshed Backhaul for Realtime Edge Content Delivery** 383

Gia Khanh Tran, Makoto Nakamura and Hiroaki Nishiuchi (Tokyo Institute of Technology, Japan); Ricardo Santos (Karlstad University, Sweden); Konstantin Koslowski (Fraunhofer HHI, Germany); Kei Sakaguchi (Tokyo Institute of Technology & Fraunhofer HHI, Japan)

Monday, April 15 15:00 - 15:30

**IWSS-3: IWSS Technical Session 3**

**The 5GENESIS testing facility as an enabler for integrated satellite/terrestrial 5G experimentation** 389

Georgios Gardikis and Nikos Papadakis (Space Hellas (Cyprus) Ltd., Cyprus); Andreas Perentos (Avanti HYLAS 2 Cyprus LTD, Cyprus); Marios Fotiou (Avanti HYLAS 2 Cyprus Ltd., Cyprus); Alexander Phinikarides (PrimeTel PLC, Cyprus); Michael Georgiades (Primetel & PLC, Cyprus); Luc Ottavj (OneAccess Networks, France); Mamoutou Diarra and Thierry Masson (Ekinops, France); Antonio Jorge Morgado (Instituto de Telecomunicacoes, Portugal); Shahid Mumtaz (Instituto de Telecomunicações, Portugal); Jara Suárez de Puga (Universitat Politècnica de València, Spain); Carlos E Palau (Universitat Politècnica Valencia, Spain); Harilaos Koumaras and Michail Alexandros Kourtis (NCSR Demokritos, Greece); Charalampos Skiadas (Maran Gas Maritime Inc., Greece)

**A Novel Authentication Mechanism for Mobile Satellite Communication Systems** 395

Anca Delia Jurcut and Jinyong Chen (University College Dublin, Ireland); Anshuman Kalla (Manipal University Jaipur, India); Madhusanka Liyanage (University of Oulu, Finland); John Murphy (University College Dublin, Ireland)

Monday, April 15 15:45 - 16:15

**ARANFP-k2: The 5G network deployment in Japan**

Monday, April 15 15:45 - 16:25

**EURCOMM-4: Enabling Technologies for Future Networks IV**

**An Open 5G NFV Platform for Smart City Applications Using Network Softwarization** 402

Aloizio Pereira Da Silva (Northeastern University, USA); Monchai Bunyakitanon, Raquel F. Vassallo, Reza Nejabati and Dimitra Simeonidou (University of Bristol, United Kingdom (Great Britain))

Monday, April 15 15:45 - 16:45

**IWSS-4: IWSS Technical Session 4**

**Forecasting Spectrum Demand for UAVs Served by Dedicated Allocation in Cellular Networks** 410

Raphael Amorim (Aalborg University, Denmark); István Z. Kovács (Nokia Bell Labs & Aalborg, Denmark); Jeroen Wigard (Nokia, Denmark); Troels B. Sørensen and Preben Mogensen (Aalborg University, Denmark)

**Collision Avoidance in V2X Communication Networks** 416

Junwei Zang and Vahid Towhidlou (King's College London, United Kingdom (Great Britain)); Mohammad Shikh-Bahaei (Kings college London, United Kingdom (Great Britain))

**High Density Spectrum Sharing Method among Micro Operators considering Spectrum Database** 422

Hirofumi Nakajo (The University of Electro-Communications & Advanced Wireless and Communication Research Center (AWCC), Japan); Yuya Aoki (The University of Electro-Communications, Japan); Keita Katagiri (The University of Electro-Communication & Advanced Wireless and Communication Research Center (AWCC), Japan); Takeo Fujii (The University of Electro-Communications, Japan)

**An Optimal Spectrum Allocation Strategy for Dynamic Spectrum Markets** 427

Hope Mauwa (University of Mpumalanga, South Africa); Antoine Bagula and Emmanuel Tuyishimire (University of the Western Cape, South Africa)

Monday, April 15 15:45 - 17:15

#### MOTION-4: Machine learning and applications for IoT

- Some Aspects of Totally Positive Kernels Useful in Information Theory*** 435  
Semih Yaglı, Alex Dytso and H. Vincent Poor (Princeton University, USA); Shlomo (Shitz) Shamai (The Technion, Israel)
- Upper-Confidence Bound for Channel Selection in LPWA Networks with Retransmissions*** 441  
Rémi Bonnefoi (Edison Ways, France); Lilian Besson (CentraleSupélec, IETR & Inria Lille/ CRISTAL, France); Julio César Manco (CentraleSupélec, France); Christophe Moy (Université de Rennes 1 & IETR, France)
- Joint Channel Selection and Power Control for NOMA: A Multi-Armed Bandit Approach*** 448  
Mohamed Ali Adjif (University of LIMOGES, France); Oussama Habachi (XLIM, France); Jean Pierre Cances (University of Limoges, France)

#### MOTION-4: Machine learning and applications for IoT

- Performance of Multi-carrier Technology over VHF Channels for Rural Area Applications*** 454  
Dick Carrillo Melgarejo (Lappeenranta University of Technology, Finland); Gustavo Fraidenraich (Unicamp & Communication Department, Brazil); Luiz Quirino Costa, F.º (Universidade Federal de Juiz de Fora, Brazil); Alvaro Augusto Machado de Medeiros (Federal University of Juiz de Fora, Brazil); Pedro Henrique Juliano Nardelli (Lappeenranta University of Technology & University of Oulu, Finland)
- Lightweight Architecture for IoT Devices with Context-aware Autonomous Control*** 460  
Luis Gomes (Polytechnic of Porto, Portugal); Zita Vale (Polytechnic Institute of Porto, Portugal); Bruno Serra (Polytechnic of Porto (ISEP/IPP), Portugal)

Monday, April 15 15:45 - 16:45

#### SFCS-2: 5G Security

- Guidelines for 5G End to End Architecture and Security Issues*** N/A  
Tahao Ting (National Taiwan University & Graduate Institute of Communication Engineering, Taiwan); Tsungnan Lin (National Taiwan University, Taiwan); Shan-Hsiang Shen (National Taiwan University of Science and Technology, Taiwan); Yu-Wei Chang (National Taiwan University & Graduate Institute of Communication Engineering, Taiwan)
- Secrecy-Aware Jointly Optimal Transmit Power Budget Sharing and Trusted DF Relay Placement*** 466  
Kotha Venugopalachary (Shiv Nadar University, India); Deepak Mishra (University of New South Wales (UNSW) Sydney, Australia); Ravikant Saini (Indian Institute of Technology Jammu, India); Vijaykumar Chakka (Shiv Nadar University, India)

Monday, April 15 16:15 - 17:15

#### ARANFP-4: Networking aspects

- On the Fundamental Queue Analysis for Relay-assisted Two-stage Communication Networks*** 472  
Nan Qi (Nanjing University of Aeronautics and Astronautics, P.R. China & KTH Royal Institute of Technology, Sweden); Nikolaos I. Miridakis (University of Piraeus, Greece & Jinan University, Zhuhai, P.R. China); Theodoros Tsiftsis (Jinan University, P.R. China); Rugui Yao (Northwestern Polytechnical University, P.R. China)
- Development and Piloting of Novel 5G-Enabled Road Safety Services*** 478  
Tiia Ojanperä and Matti Kuttila (VTT Technical Research Centre of Finland, Finland); Pasi Pyykönen (VTT & VTT, Finland); Johan Scholliers (VTT Technical Research Centre of Finland, Finland); Timo Sukuvaara and Kari Mäenpää (Finnish Meteorological Institute, Finland); Oiva Huuskonen (Destia, Finland)
- Delay-Based Congestion Control for Multipath TCP in Heterogeneous Wireless Networks*** 484  
Honglin Li, Ying Wang, Ruijin Sun, Shan Guo and Hong Wang (Beijing University of Posts and Telecommunications, P.R. China)
- ICIC-Enabled Association and Channel Selection for UAV-BSs Based on User Locations and Demands*** 490  
Syed Awais Wahab Shah (Hong Kong University of Science and Technology, Hong Kong); Mohammad Galal Khafagy (KTH Royal Institute of Technology, Sweden); Tamer Khattab, Mazen Omar Hasna and Khalid Abualsaud (Qatar)

Monday, April 15 16:30 - 17:15

WS5-PNL: Panel discussion

Monday, April 15 16:45 - 17:00

IWSS-CL: IWSS Closing Session (Best paper award)

## Additional Papers:

A Framework for MEC-enabled Platooning 497

Antonio Viridis, Giovanni Nardini, and Giovanni Stea (University of Pisa, Italy)

An Edge and Fog Computing Platform for Effective Deployment of 360 Video Applications 503

Giovanni Rigazzi (InterDigital Germany GmbH, Berlin, Germany); Jani-Pekka Kainulainen, Charles Turyagyenda, and Alain Mourad (InterDigital Europe, London, UK); Jaehyun Ahn (InterDigital Asia, Seoul, South Korea)

Flexible MEC service consumption through edge host zoning in 5G networks 509

Miltiades C. Filippou and Dario Sabella (Intel Deutschland GmbH, Germany); Vincenzo Riccobene (Intel Labs, Ireland, Ireland)