Program

Welcome: Opening and Welcome

Keynotes 1: New Initiative: Industry Harmonization for Unified Standards on Autonomic Management & Control (AMC) of Networks and Services, SDN, and NFV, and Converged Management of Fixed/Mobile Networks

Preface of the 6th IEEE International Workshop on Management of Emerging Networks and Services (IEEE Globecom MENS 2014)
Ranganai Chaparadza (IPv6 Forum, Germany); Jianguo Ding (University of Skövde, Sweden); Djamel Djenouri (CERIST Research Center, Algeria)
pp. 150-154

Industry Harmonization for Unified Standards on Autonomic Management & Control (AMC) of Networks and Services, SDN and NFV
Ranganai Chaparadza (IPv6 Forum, Germany); Tayeb Ben Meriem (Orange, France); John Strassner (Huawei, USA); Said Souli (Ericsson, Sweden); Benoit Radier (Orange France Telecom R&D, France); Jianguo Ding (University of Skövde, Sweden); Zhiwei Yan (CNNIC, P.R. China)
pp. 155-160

Opening

M1: Opening and Welcome

Plenary1: Is it a bird? Is it a plane? .. no it's 5G!

S1: Welcome

Welcome, and introduction to the OWC Workshop program.

We are delighted to introduce the 5th International Workshop on Optical Wireless Communications held in association with IEEE GLOBECOM 2014. This workshop brings together researchers in industry and academia to share novel approaches to the modeling, design, implementation, and use of optical wireless communication (OWC) systems.

OWC encompasses the use of both visible and invisible spectra to solve some of the most interesting challenges in digitally connecting people and machines. Compared against RF technologies, OW systems possess unique properties that offer new capabilities and performance that often supplant or complement RF counterparts. Since the carrier in OWC is well into the terahertz range, there is ongoing interest in developing new electronic and optical materials, techniques, and strategies to fully capitalize on the fundamental capacity of light to transport data over free-space (wireless) channels.

In 2014, we face growth in wireless data demand due to growth in numbers of mobile users and in the amount of consumed data. Cisco predicts growth in traffic of 61% year-over-year for the period of 2013-2018. It is not clear how existing wireless networks can satisfy this demand nor how increased wireless capacity can be sustained by the complementary access and distribution networks serving RF wireless channels.

OWC solutions here include the use of FSO links, for example, to support the backhaul for small cell deployments or the interconnection of computers within data centers; the development of new LOS and NLOS systems for serving small cells in indoor spaces to replace or augment existing RF systems. OW also has excellent potential to improve security of wireless systems due to directionality and its containment inside opaque walls. These features support applications such as secure or stealthy communications and mobile transactions as near field communications (NFC).

Considering the visible spectrum, the need for energy efficiency has spurred the replacement of conventional lighting with LEDs causing an upheaval in the lighting industry. The properties of LEDs permit modulation at speeds appropriate for OW, and the location and ubiquity of lighting devices makes it ideal as a wireless platform for both communications and localization.

This year’s program is comprised of four main areas relating to (1) optical detection including imaging receivers, (2) free-space optical systems, (3) applications, and (4) optical sources and system considerations. We also have two invited sessions; the first by Jean Armstrong focusing on indoor positioning and the second by Zhengyan (Daniel) Xu and Shinichiro Haruyama on recent activities by the Chinese VLC Alliance (C-VLCA) and the Japanese VLC Alliance (VLCA), respectively.

Finally, we are most appreciative to our Technical Program Committee and invited reviewers for their prompt and insightful reviews that make the program possible. This year we received 55 paper submissions representing authors from 22 different countries and accepted 19 for presentation at the workshop. This is a substantial increase from the 38 papers submitted in 2013.
OWC 2014 Workshop Chairs
Thomas DC Little, Boston University, USA Ernesto Ciaramella, Scuola Superiore Sant’Anna, Italy Steve Hranilovic, McMaster University, Canada Mitsui Matsumoto, Waseda University, Japan

Keynote Speech I

Future Trends in Hybrid Fiber-Copper Access Networks

M2: Keynote

mjmarcus@marcus-spectrum.com

Speaker Bio - Michael J. Marcus, Sc.D., F-IEEE FCC (Retired) Adjunct Professor of ECE, Virginia Tech Chair, IEEE-USA Committee on Communications Policy (2012-2013)

Now an independent consultant, Dr. Michael Marcus was a forceful proponent of new technology at FCC for over twenty years. His most significant achievement in the early eighties was his single-handedly championed the formulation of rules for spread spectrum modulation and multiple access, against conventional but misguided wisdom regarding the efficiency and manageability of this technology. He has also championed the commercialization of millimetre-wave communications. He received his PhD from MIT and is a Fellow of IEEE.

S2: Detection and Imaging

S2.1 Linear Receivers for Optical Wireless Scattering Communication with Multiple Photon Detectors
Chen Gong and Zhengyuan Xu (University of Science and Technology of China, P.R. China) pp. 438-443

S2.2 Angle Diversity Receiver for Indoor MIMO Visible Light Communications
Asanka Nuwanpriya and Siu-Wai Ho (University of South Australia, Australia); Chung Shue Chen (Alcatel-Lucent Bell Labs, France) pp. 444-449

S2.3 Motion Modeling of Mobile Transmitter for Image Sensor Based I2V-VLC, V2I-VLC, and V2V-VLC
Masayuki Kinoshita, Takaya Yamazato, Hiraku Okada and Toshiaki Fujii (Nagoya University, Japan); Shintaro Arai (National Institute of Technology, Kagawa College, Japan); Tomohiro Yendo (Nagaoa University of Technology, Japan); Koji Kamakura (Chiba Institute of Technology, Japan) pp. 450-455

S2.4 Optimum Diversity Combining Techniques for Visible Light Communication Systems
Anagnostis Tsiatmas (Eindhoven University of Technology & Philips Research, The Netherlands); Frans M J Willems (Technical University Eindhoven, The Netherlands); Stan Baggen (Philips, The Netherlands) pp. 456-461

S2.5 Experimental Multiuser Mobile Optical Communication Using Compressive Sensing
Javier Perez-Ramirez, Elam Curry and Deva K. Borah (New Mexico State University, USA); Jose Maria Hinojo (University of Seville, Spain) pp. 462-468

Break

K1: Keynote 1

Capacity Planning for Infrastructure-as-a-Service Cloud

From an enterprise perspective, one key motivation to transform the traditional IT management into Cloud is the cost reduction of the hosted services. In an Infrastructure-as-a-Service (IaaS) Cloud, virtual machine (VM) instances share the physical machines (PMs) in the provider’s data center. Increasing the number of PMs can lead to lower downtime cost at the expense of higher infrastructure
and other operational costs (e.g., power consumption and cooling costs). Hence, determining the optimal PM capacity that minimizes the overall cost is of interest. In this talk, we show how an optimization framework can be developed using stochastic availability and performance models of an IaaS Cloud. Specifically, we develop and solve a cost minimization problem to address the capacity planning in an IaaS Cloud: what is the optimal number of PMs that minimizes the total cost of ownership for a given downtime and performance requirement set by service level agreements? We use simulated annealing, a well-known stochastic search algorithm, to solve the optimization model. For each point in the search space, we need to determine, the performance, availability and power consumption requirements. Hence we develop scalable analytic models for the performance, availability and power consumption of an IaaS Cloud. The essence of our approach is in reducing the complexity of analysis by dividing the overall model into multiple interacting stochastic process sub-models and then obtaining the overall solution by (fixed-point) iteration over individual sub-model solutions.

**Plenary2: Software Defined Air Interface: an Air interface Design Paradigm Shift for 5G**

**Keynote Speech II**

Towards Future 5G Mobile Networks - from Research to Standardization to Implementation

**M3: Presentations**

*Measurement-based Angular Characterization for 72 GHz Propagation Channels in Indoor Environments*
Nan Zhang and Xuefeng Yin (Tongji University, P.R. China); Xiaofeng Lu (Huawei Technology Company, P.R. China); Mingde Du (Huawei, P.R. China); Xuesong Cai (Tongji University, P.R. China)
pp. 370-376

*Experimental mmWave 5G Cellular System*
Mark Cudak and Tom Kovarik (Nokia Networks, USA); Timothy A. Thomas (Nokia Solutions and Networks, USA); Amitava Ghosh (Nokia Networks, USA); Yoshihisa Kishiyama and Takehiro Nakamura (NTT DOCOMO, INC., Japan)
pp. 377-381

*Codebook Based Beamforming and Multiuser Scheduling scheme for mmWave Outdoor Cellular Systems in the 28, 38 and 60GHz Bands*
Djamil Eddine Berraki, Simon Armour and Andrew Nix (University of Bristol, United Kingdom)
pp. 382-387

**Poster1: MIMO**

*Decentralized Widely Linear Precoding Design for the MIMO Interference Channel*
Sandra Lagen (Universitat Politècnica de Catalunya, Spain); Adrian Agustín (Universitat Politècnica de Catalunya (UPC), Spain); Josep Vidal (Universitat Politècnica de Catalunya, Spain)
pp. 771-776

*Modeling and Efficient Cancellation of Nonlinear Self-Interference in MIMO Full-Duplex Transceivers*
Lauri Anttila and Dani Korpi (Tampere University of Technology, Finland); Emilio Antonio-Rodríguez (Aalto University, Finland); Risto Wichman (Aalto University School of Electrical Engineering, Finland); Mikko Valkama (Tampere University of Technology, Finland)
pp. 777-783

*Low-Complexity Multiuser Detection in Massive Spatial Modulation MIMO*
Wang Shengchu (Tsinghua University, P.R. China); Yunzhou Li (Tsinghua Univ, P.R. China); Jing Wang (Tsinghua University, P.R. China); Ming Zhao (Tsinghua Univ, P.R. China)
pp. 784-789

*On the Achievable Diversity Multiplexing Tradeoff of K-user Interference Channels*
Young-bin Kim (Korea Advanced Institute of Science and Technology, Korea); Myunggil Kang and Wan Choi (KAIST, Korea)
pp. 790-795
**Dynamic Multi-User Transmission for Efficient Dimensioning in Green LTE-A Uplink Networks**
Lina Mroueh and Emmanuelle Vivier (Institut Supérieur d'Electronique de Paris, France)
pp. 796-801

**Performance Analysis of DRX Mechanism Considering Analogue Beamforming in Millimeter-Wave Mobile Broadband System**
Sang-Wook Kwon and June Hwang (Samsung Electronics, Korea); Anil Agiwal (Samsung India Software Operation, India); Hyunjeong Kang (Samsung, Korea)
pp. 802-807

**Poster 2: 3D and Network MIMO**

**Modeling and Analysis of Ergodic Capacity in Network MIMO Systems**
Kianoush Hosseini, Wei Yu and Raviraj Adve (University of Toronto, Canada)
pp. 808-814

**Achievable Sum Rate Analysis of ZF Receivers in 3D MIMO with Rayleigh/Log-normal Fading Channels**
Fangqing Tan, Hui Gao and Tiejun Lv (Beijing University of Posts and Telecommunications, P.R. China); Jie Zeng (Tsinghua University, P.R. China)
pp. 815-820

**Effect of 3-Dimensional Beamforming on Full Dimension MIMO in LTE-Advanced**
Hyoungho Ji (Samsung Electronics. Co., Ltd, Korea); Yoonsun Kim (Samsung Electronics Co., Ltd., Korea); Youngwoo Kwak (Samsung Electronics & DMC R&D Center, Korea); Juho Lee (Samsung Electronics. Co., Ltd, Korea)
pp. 821-826

**Centralized Resource Coordination Scheme for Inter-eNB CoMP with Non-ideal Backhaul**
Jinyoung Oh (Samsung Electronics, Korea); Hyo-Jin Lee (Samsung, Korea); Sung Hwan Won and Yoonsun Kim (Samsung Electronics Co., Ltd., Korea); Juho Lee (Samsung Electronics. Co., Ltd, Korea)
pp. 827-832

**Poster 3: D2D & Cognitive Radio**

**Service Discovery Protocols in D2D-enabled Cellular Networks: Reactive versus Proactive**
Faustin Ahishakhiye and Frank Y. Li (University of Agder, Norway)
pp. 833-838

**Device-to-Device Assisted Two-stage Cooperative Multicast with Optimal Resource Utilization**
Chong Yin, Ying Wang, Wenxuan Lin and Jing Xu (Beijing University of Posts and Telecommunications, P.R. China)
pp. 839-844

**Power and Spectrum Allocation for Network Coded Primary-Secondary Cooperation in Cognitive Radio Networks**
Zhihui Liu, Wenjun Xu, Shengyu Li, Xiaomei Lu and Jiaru Lin (Beijing University of Posts and Telecommunications, P.R. China)
pp. 845-850

**Full Duplex Assisted Interference Suppression for Underlay Device-to-Device Communications**
Shengqian Han, Pan Chen and Chenyang Yang (Beihang University, P.R. China)
pp. 851-856

**Spectral Efficiency Improvements in HetNets by Exploiting Device-to-Device Communications**
Hafiz Attalib Mustafa (University of Surrey, United Kingdom); Muhammad Zeeshan Shakir (Texas A&M University at Qatar (TAMUQ) & Dept. of Electrical and Computer Engineering, Qatar); Yusuf Sambo (University of Surrey & Centre for Communication Systems Research CCSR, United Kingdom); Khalid A. Qaraqe (Texas A&M University at Qatar, USA); Muhammad Ali Imran (University of Surrey, United Kingdom); Erchin Serpentin (Texas A&M University, USA)
pp. 857-862
Optimal Caching for Device-to-Device Content Distribution in 5G Networks
Derya Malak (University of Texas at Austin, USA); Mazin Al-Shalash (Huawei, USA)
pp. 863-868

Discovery Resource Grouping for D2D Discovery for Mitigation of In-band Emission in LTE-Advanced
Donghan Kim (Samsung Electronics, Korea); Yongjun Kwak (Samsung Electronics Co., Ltd., Korea); Jinyoung Oh (Samsung Electronics, Korea); Younsun Kim (Samsung Electronics Co., Ltd., Korea); Juho Lee (Samsung Electronics. Co., Ltd, Korea)
pp. 869-874

K2: Keynote 2

The Perfect Storm Intensifies - The Convergence of BigData, Cloud and the Internet of Things is Now at Full Strength

Almost everyone sees the potential of Internet of Things but how can businesses truly unlock that potential. The key will be in the ability to discover business insight in the midst of an ocean of Big Data generated from billions of embedded devices via Systems of Discover. Businesses will also need to ensure that they can sustain that insight by leveraging the cloud for global reach, scale and elasticity. Without bringing these three elements together via Systems of Discover you either end up with an Internet of somethings and/or a big mess of data.

Coffee break

Coffee Break

M4: Posters

LOS and NLOS Channel Modeling for Terahertz Wireless Communication with Scattered Rays
Anamaria Moldovan (University of Erlangen-Nürnberg, Germany); Michael A. Ruder (Friedrich-Alexander-University Erlangen-Nürnberg (FAU), Germany); Ian F. Akyildiz (Georgia Institute of Technology, USA); Wolfgang Gerstacker (University of Erlangen-Nuernberg, Germany)
pp. 388-392

Outdoor-to-Indoor Coverage in High Frequency Bands
Eliane Semaan (Ericsson, Sweden); Fredrik Harrysson (Ericsson Research, Sweden); Anders Furuskar (Ericsson AB, Sweden); Henrik Asplund (Ericsson Research, Ericsson AB, Sweden)
pp. 393-398

Joint IQ Imbalance and PA Nonlinearity Pre-Distortion for Highly Integrated Millimeter-Wave Transmitters
Linlin Fan, Yabo Li and Minjian Zhao (Zhejiang University, P.R. China)
pp. 399-404

Capacity Performance of Millimeter Wave Heterogeneous Networks at 28GHz / 73GHz
Jietao Zhang (Huawei Technologies Co., Ltd., P.R. China); Andrian Beletchi (Huawei Technologies Co., LTD., P.R. China); Youwen Yi (Yuntop CO., P.R. China); Hongcheng Zhuang (Huawei Technologies Co., Ltd, P.R. China)
pp. 405-409

Oscillator Phase Noise and Small-Scale Channel Fading in Higher Frequency Bands
Mohammad Reza Khanzadi (Chalmers University of Technology, Sweden); Rajet Krishnan (Chalmers University of Technology & Division for Communication Theory and Information Theory, Sweden); Dan Kuylenstierna and Thomas Eriksson (Chalmers University of Technology, Sweden)
pp. 410-415

Millimeter Wave MIMO Channel Tracking Systems
Jiguang He and Taejoon Kim (City University of Hong Kong, Hong Kong); Hadi Ghauch (Royal Institute of Technology (KTH), Sweden); Liu Kunpeng (Huawei Technologies, Co. Ltd., Chengdu, P.R. China); Wang Guangjian (Huawei Technologies, P.R. China)
pp. 416-421
Coverage and Rate Trends in Moderate and High Bandwidth 5G Networks
Mandar N. Kulkarni (The University of Texas at Austin, USA); Timothy A. Thomas and Frederick W. Vook (Nokia Solutions and Networks, USA); Amitava Ghosh (Nokia Networks, USA); Eugene Visotsky (Nokia Siemens Networks, USA)
pp. 422-426

Channel Model for millimeter-Wave Communications Based on Geometry Statistics
Qian (Clara) Li and Geng Wu (Intel Corporation, USA); Theodore Rappaport (New York University & NYU WIRELESS, USA)
pp. 427-432

Requirements of Power Amplifier on Super High Bit Rate Massive MIMO OFDM Transmission Using Higher Frequency Bands
Jiyun Shen, Satoshi Suyama, Tatsunori Obara and Yukihiro Okumura (NTT DOCOMO, INC., Japan)
pp. 433-437

MENS 1-1: SDN & Openflow, and Network Virtualization

Class-based Traffic Recovery with Load Balancing in Software-Defined Networks
Davide Adami (CNIT Pisa Research Unit, University of Pisa, Italy); Stefano Giordano, Michele Pagano and Nicola Santinelli (University of Pisa, Italy)
pp. 161-165

Towards Robust Trust in Software Defined Networks
Christopher Lamb (University of New Mexico, USA); Gregory Heileman (University of New MExico, USA)
pp. 166-171

Additions to the ETArch Control Plane to Support Multimedia QoS-Guaranteed Content Transport over OpenFlow-Enabled SDN Future Internet Systems
José Castillo Lema (Universidade de São Paulo, Spain); Augusto J. Venancio Neto (Federal University of Rio Grande do Norte & Centro de Ciências Exatas da Terra, Brazil); Flavio de Oliveira Silva (Federal University of Uberlândia, Brazil); Pedro Frois Rosa (Federal University of Uberlândia & Faculty of Computing, Brazil); Rui L. Aguiar (University of Aveiro & Instituto de Telecomunicações, Portugal); Airton Ishimori and Fernando N. N. Farias (Federal University of Pará, Brazil); Antonio Jorge Gomes Abelem (UFPA - Federal University of Pará, Brazil)
pp. 172-177

A SDN-based Network Virtualization Architecture with Autonomic Management
Qinglei Qi (Beijing University of Posts and Telecommunications P.R. China, P.R. China); Wendong Wang (Beijing University of Posts and Telecommunications, P.R. China); Gong Xiangyang (Beijing University of Posts and Telecommunications P.R. China, P.R. China); Xirong Que (Institute of Networking Technology, P.R. China)
pp. 178-182

Panel Discussion

S3: FSO Systems

S3.1 Adaptive Multi-Rate Designs for Hybrid FSO/RF Systems over Fading Channels
Vuong Mai and Anh T. Pham (The University of Aizu, Japan)
pp. 469-474

S3.2 Efficient Direct Detection of M-PAM Sequences with Implicit CSI Acquisition for The FSO System
Tianyu Song and Pooy-Yuen Kam (National University of Singapore, Singapore)
pp. 475-480

S3.3 Performance Metrics and Design Parameters for an FSO Communications Link Based on Multiplexing of Multiple Orbital-Angular-Momentum Beams
Guodong Xie, Long Li, Yongxiong Ren, Hao Huang, Yan Yan, Nisar Ahmed and Zhe Zhao (University of Southern California, USA); Martin Lavery (University of Glasgow, USA); Nima Ashrafi (University...
of Texas at Dallas & NxGen Partners, USA); Solyman Ashrafi (NxGen Partners, USA); Moshe Tur (Tel Aviv University, Israel); Andreas Molisch and Alan Willner (University of Southern California, USA)
pp. 481-486

**S3.4 Resilient Topology design for Free Space Optical Cellular Backhaul Networking**
Yuan Li (Lund University, Sweden); Nikolaos Pappas and Vangelis Angelakis (Linköping University, Sweden); Michal Pióro (Warsaw University of Technology & Lund University, Poland); Di Yuan (Linköping University, Sweden)
pp. 487-492

**S3.5 Wavelength Dependence of a Fiber-Bundle Based FSO Link**
Peter LoPresti (Tulsa University, USA); M. Fahd Babelli (University of Oklahoma, USA); Hazem Refai (Oklahoma University, USA); Nathan Hutchins and Steven Kohrmann (University of Tulsa, USA)
pp. 493-498

### IS1: Interactive Session-1

**An Architecture for Co-ordinated Monitoring for Multi-provider Cloud Platforms**
Ishan Vaishnavi (Huawei Research Centre, Germany); Riccardo Guerzoni (Huawei Technologies Co., Ltd. & European Research Center, Germany); Sergio A. Beker (DOCOMO Euro-Labs, Germany)
pp. 1-6

**Adaptive SLA-based Elasticity Management Algorithms for a Virtualized IP Multimedia Subsystem**
Hani Nemati (École de Technologie Supérieure, Canada); Arjun Singhvi (PES Institute of Technology, India); Nadja Kara (École de Technologie Supérieure, Canada); May El Barachi (Zayed University, UAE)
pp. 7-11

**Securing Offloading Process within Small Cell Cloud-based Mobile Networks**
Matej Rohlik (Czech Technical University in Prague & Faculty of Electrical Engineering, Czech Republic); Tomas Vanek (Czech Technical University in Prague, Czech Republic)
pp. 12-17

**Performance evaluation of a SDN/OpenFlow-based Distributed Mobility Management (DMM) approach in virtualized LTE systems**
Luca Valtulina (SpeakUp, The Netherlands); Morteza Karimzadeh (University of Twente, The Netherlands); Georgios Karagiannis (Huawei Technologies, Germany); Geert Heijenk and Aiko Pras (University of Twente, The Netherlands)
pp. 18-23

### S1: Sustainable Cloud Computing

**Context-oriented Opportunistic Cloud Offload Processing for Energy Conservation in Wireless Devices**
Constantinos X. Mavromoustakis (University of Nicosia, Cyprus); George Mastorakis and Athina Bourdina (Technological Educational Institute of Crete, Greece); Evangelos Pallis (Technological Educational Institute of Crete, Greece); Georgios Kormentzas (University of the Aegean, Greece); Joel J. P. C. Rodrigues (Instituto de Telecomunicações, University of Beira Interior, Portugal)
pp. 24-30

**Green Cloud Architecture: Low Power Routers for an Energy-Aware Data Transport**
Fatoumata B. Kasse and Bamba Gueye (Université Cheikh Anta Diop de Dakar, Senegal); Halima Elb haze (University of Quebec at Montreal, Canada)
pp. 31-35

**Survivable Mapping for Multicast Virtual Network under Single Regional Failure**
Dan Liao and Gang Sun (University of Electronic Science and Technology of China, P.R. China); Vishal Anand (The College at Brockport, State University of New York, USA); Kexiang Xiao (University of Electronic Science and Technology of China, P.R. China)
pp. 36-41
**Energy-Aware Offloading in Mobile Cloud Systems with Delay Considerations**
Markos Anastasopoulos, Anna Tzanakaki and Dimitra Simeonidou (University of Bristol, United Kingdom)
pp. 42-47

**S2: Security in Cloud Systems**

**Cloud-based Secure Health Monitoring: Optimizing Fully-Homomorphic Encryption for Streaming Algorithms**
Alex Page, Ovunc Kocabas, Scott Ames, Muthuramakrishnan Venkitasubramaniam and Tolga Soyata (University of Rochester, USA)
pp. 48-52

**Practical runtime security mechanisms for an aPaaS cloud**
Mehmet Tahir Sandikkaya (Istanbul Technical University, Turkey); Bahadir Odevci (Imona Technologies Ltd., Turkey); Tolga Ovatman (Istanbul Technical University, Turkey)
pp. 53-58

**A survey of common security vulnerabilities and corresponding countermeasures for SaaS**
Donghoon Kim and Mladen A Vouk (North Carolina State University, USA)
pp. 59-63

**Web Bugs in the Cloud: Feasibility Study of A New Form of EDoS Attack**
Natalija Vlajic and Armin Slopek (York University, Canada)
pp. 64-69

**M5: Panel Discussion**

**Plenary3: Millimeter-Wave MIMO Architectures for 5G Gigabit Wireless**

**MENS 1-2: SDN & Openflow, and Network Virtualization**

**SDN-Based Autonomic CCN Traffic Management**
Qi Sun, Wendong Wang and Yannan Hu (Beijing University of Posts and Telecommunications, P.R. China); Gong Xiangyang (Beijing University of Posts and Telecommunications P.R. China, P.R. China); Xirong Que (Institute of Networking Technology, P.R. China)
pp. 183-187

**A NaaS-enabled Framework for Service Composition in Software Defined Networking Environment**
Yongyi Ran, Enzhong Yang, Shuangwu Chen and Jian Yang (University of Science and Technology of China, P.R. China)
pp. 188-193

**Handover Management in SDN-based Mobile Networks**
Slawomir Kuźniński (Warsaw University of Technology & Orange, Poland); Yuhong Li (Beijing University of Posts and Telecommunications, P.R. China); Khoa Truong Dinh (Warsaw University of Technology, Poland)
pp. 194-200

**Plenary4: Advanced Channel Measurements and Channel Modeling for Millimeter-Wave Mobile Communication**

**M6: Lunch**

(includes poster viewing)
**Poster4: Multiple Access**

*Random Access Preamble Format for Systems with Many Antennas*
Henrik Sahlin (Ericsson, Sweden); Stefan Parkvall (Ericsson Research, Sweden); Mattias Frenne and Peter Nauclér (Ericsson, Sweden)
pp. 875-880

*Turbo Trellis Coded Multiple Access*
Alberto G. Perotti and Branislav M. Popovic (Huawei Technologies Sweden AB, Sweden)
pp. 881-886

*Device-Centric Radio Access Virtualization for 5G Networks*
Amine Maaref (Huawei Technologies Canada, Canada); Jialgei Ma (Huawei, Canada); Mohamed Rashad Salem (Huawei Technologies Co. LTD., Canada); Hadi Baligh (Huawei Canada, Canada); Keyvan Zarifi (Huawei Technologies, Canada)
pp. 887-893

*Licensed-Assisted Access for WiFi-LTE Coexistence in the Unlicensed Spectrum*
Nadisanka Rupasinghe and Ismail Güvenç (Florida International University, USA)
pp. 894-899

*Uplink Contention Based SCMA for 5G Radio Access*
Kelvin Au and Liqing Zhang (Huawei Technologies, Canada); Hosein Nikpour (Huawei Technologies Canada, Canada); Eric Yi (Huawei Technologies Canada Co., LTD, Canada); Alireza Bayesteh (Huawei Technologies Co., Ltd., Canada); Usa Viliaporsawai (Huawei Technologies Canada Co., Ltd, Canada); Jialgei Ma (Huawei, Canada); Peiying Zhu (Huawei Technologies, Canada)
pp. 900-905

*Dynamic Resource Optimization with Congestion Control in Heterogeneous Cloud Radio Access Networks*
Jian Li (Beijing University of Posts and Telecommunications, P.R. China); Mugen Peng (Beijing University of posts & Telecommunications, P.R. China); Yuling Yu and Aolin Cheng (Beijing University of Posts and Telecommunications, P.R. China)
pp. 906-911

**Poster5: HetNet & Relay**

*Relay-Based Harvest-Then-Transmit Protocol for Uplink Cellular Networks*
Sudha Lohani (The University of British Columbia, Canada); Roya Arab Loodaricheh (University of British Columbia, Canada); Ekram Hossain (University of Manitoba, Canada); Vijay Bhargava (University of British Columbia, Canada)
pp. 912-917

*Link State Based Decode-Forward Schemes for Two-way Relaying*
Lisa Pinals and Mai Vu (Tufts University, USA)
pp. 918-923

*Non-orthogonal compute-and-forward with joint lattice decoding for the multiple-access relay channel*
Tzu Yueh Tseng (Graduate Institute of Communication Engineering, National Taiwan University, Taiwan); Chung-Pi Lee (National Taiwan University, Taiwan); Shih-Chun Lin (National Taiwan University of Science and Technology, Taiwan); Hsuan-Jung Su (National Taiwan University, Taiwan)
pp. 924-929

*Performance Analysis and Cooperation Mode Switch in HARQ-based Relaying*
Jingya Li, Behroz Makki and Tommy Svensson (Chalmers University of Technology, Sweden)
pp. 930-935

*Practical Joint Network-Channel Coding Schemes for Orthogonal Multiple-Access Multiple-Relay Channel*
Abdulaziz Mohamad (Supélec & Orange Labs, France); Raphael Visoz (Orange Labs, France); Antoine O. Berthet (Supélec, France)
pp. 936-941
**Poster6: Emerging Technologies**

**Nonlinear Distortion Suppression for Active Analog Self-Interference Cancellers in Full Duplex Wireless Communication**
Ying Liu, Xin Quan, Wensheng Pan, Shihai Shao and Youxi Tang (University of Electronic Science and Technology of China, P.R. China)  
pp. 948-953

**Joint Invariant Estimation of RF impairments for Reconfigurable Radio Frequency(RF) Front-end**
Minhee Jun, Rohit Negi, Ying-Chih Wang, Tamal Mukherjee, Xin Li, Jun Tao and Larry Pileggi (Carnegie Mellon University, USA)  
pp. 954-959

**Estimation of TX I/Q Imbalance at the RX side with RX I/Q Imbalance and Carrier Frequency Offset for OFDM Systems**
Fenfang Wu, Yabo Li and Minjian Zhao (Zhejiang University, P.R. China)  
pp. 960-965

**Quasi-deterministic Approach to mmWave Channel Modeling in a Non-stationary Environment**
Alexander Maltsev (Intel Corporation & University of Nizhny Novgorod, Russia); Andrey Pudeyev (Intel, Russia); Ingofer Karls (Intel Mobile Communications GmbH, Germany); Ilya Bolotin (Intel, Russia); Gregory Morozov (Intel Corp., Russia); Richard J. Weiler and Michael Peter (Fraunhofer HHI, Germany); Wilhelm Keusgen (Fraunhofer Heinrich Hertz Institute, Germany)  
pp. 966-971

**Interference Management via Sliding-Window Superposition Coding**
Hosung Park (University of California, San Diego, USA); Young-Han Kim and Lele Wang (UCSD, USA)  
pp. 972-976

**Lunch break**

**Lunch**

**Lunch**

**S4: Keynote**

Indoor Visible Light Positioning: State of the Art and Future Trends

**IS2: Interactive Session-2**

**Dynamic Break even pricing for Cloud Federation**
Bassem El Zant (Telecom ParisTech (Ecole Nationale Superieure des Telecommunications), France); Maurice Gagnaire (Telecom Paristech & Institut Telecom, France)  
pp. 70-74

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Abdallah Jaray (University of Ottawa, Canada); Javier Salazar (University of Paris Descartes & University of Ottawa, France); Ahmed Karmouch (University of Ottawa, Canada); Jocelyne Elias (Université Paris Descartes & Sorbonne Paris Cité, France); Ahmed Mehaoua (University of Paris Descartes, France)
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Michael Faulwasser (Fraunhofer Institute for Photonic Microsystems & Dresden University of Technology, Germany); Frank Deicke (Fraunhofer Institut für Photonische Mikrosysteme, Germany); Tobias Schneider (Fraunhofer Institute for Photonic Microsystems, Germany)
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Ranganai Chaparadza, PhD: IPv6 Forum & ETSI NTECH/AFI
Jianguo Ding, PhD: University of Skövde, Sweden
Djamel Djenouri, PhD: CERIST Research Center; Algeria
Tayeb Ben Meriem, PhD: Orange; (ETSI NTECH/AFI; NGMN; TMF)
John Strassner, PhD: Huawei; (TMF ZOOM, ETSI NFV, ONF Architecture and Frameworks)
Latif Ladid, PhD: IPv6 Forum President
Leo Bhebe, PhD: Nokia Solutions Networks
Manish Patil, PhD: Dell, OMG SDN WG Chair
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Valerio Frascolia (Intel Mobile Communications GmbH, Germany); Michael Faerber (Intel Mobile Communications, Germany); Giovanni Romano (Telecom Italia, Italy); Karri Ranta-Aho (Nokia Siemens Networks, Finland); Jyrn Putkonen (Nokia & Network, Finland); Vincent Kotzsch (National Instruments, Germany); Javier Valiño (TST Sistemas, Spain); Laurent Dussopt (CEA, LETI, Minatec, France); Emilio Calvanese Strinati (CEA-LETI, France); Ronan Sauleau (University of Rennes 1, France)
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Markus Dominik Mueck (Intel Mobile Communications, Germany); Ingolf Karls (Intel Mobile Communications GmbH, Germany); Reza Arefi (Intel Corporation, USA); Thomas Haustein (Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut, Germany); Richard J. Weiler (Fraunhofer HHI, Germany); Kei Sakaguchi (Osaka University & Tokyo Institute of Technology, Japan)
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Hugo M Tullberg (Ericsson Research, Sweden); Heinz Droste (Deutsche telekom, Laboratories, Germany); Mikael Fallgren (Ericsson Research, Sweden); Peter Fertil and David Gozalvez-Serrano (BMW Group Research and Technology, Germany); Eiman Mohyeldin (Nokia Solutions and Networks, Germany); Olav Queseth (Ericsson Research, Sweden); Yngve Selén (Ericsson AB, Sweden)
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Plenary 7: Millimeter Wave MIMO Precoding/Combining: Challenges and Potential Solutions

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Coffee Break

Coffee: Coffee Break

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Visible Light Communications in China and Japan

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The Impact of Random Power Assignment in Handshaking on Wireless Sensor Network Lifetime
Huseyin Uğur Yıldız (TOBB University of Economics and Technology & Türk Telekom, Turkey); Bulent Tavli (TOBB University of Economics and Technology, Turkey)
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Opportunistic Wireless Charging for Mobile Social and Sensor Networks
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Qi Lin (Beijing University of Posts and Telecommunications, P.R. China); Yitong Liu (Beijing University of Post and Telecommunications, P.R. China); Yun Shen, Hui Shen, Lin Sang and Dacheng Yang (Beijing University of Posts and Telecommunications, P.R. China)
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Qizhi Zhang (Huawei Technologies Co. Ltd., P.R. China); Changqing Yang (Beijing University of Posts and Telecommunications, P.R. China)
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Introducing Quick Sleeping using the Broadcast Channel for 3GPP LTE MTC
Naveen Mysore Balasubramanya and Lutz Lampe (University of British Columbia, Canada); Gustav Vos and Steve Bennett (Sierra Wireless, Canada)
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Xiong Xiong and Tong Wu (Beijing University of Posts and Telecommunications, P.R. China); Hang Long (Beijing University of Posts & Telecommunications, P.R. China); Kan Zheng (Beijing University of Posts&Telecommunications, P.R. China)
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Asma Elmangoush (Technical University Berlin & Fraunhofer FOKUS Institute, Germany); Adel Al-Hezmi (Fraunhofer Institute Fokus, Germany); Thomas Magedanz (Fraunhofer Institute FOKUS / TU Berlin, Germany)
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Werner Coomans (Bell labs, Alcatel-Lucent, Belgium); Rodrigo B. Moraes (Alcatel-Lucent & Bell Labs, Belgium); Koen Hooghe (Bell Labs, Alcatel-Lucent, Belgium); Alex Duque and Joe Galaro (Alcatel-Lucent, USA); Michael Timmers (Alcatel-Lucent Bell Labs, Belgium); Adriaan J. van Wijngaarden (Bell Laboratories, Alcatel-Lucent, USA); Mamoun Guenach (Bell Laboratories, Alcatel-Lucent, Antwerp, Belgium); Jochen Maes (Alcatel-Lucent Bell Labs, Belgium)
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Leiming Zhang (Huawei Technologies Co., Ltd., P.R. China); Jianghua Liu and Kunpeng Liu (Huawei Technologies Co. Ltd., P.R. China); Yongxing Zhou (Huawei, P.R. China)
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Friedemann Köster and Sebastian Möller (Quality and Usability Lab, Telekom Innovation Labs, TU Berlin, Germany)
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Bluetooth Standard v4.1: Simulating the Bluetooth Low Energy Data Channel Selection Algorithm
Mohamad Omar Al Kalaa (University of Oklahoma, USA); Hazem Refai (Oklahoma University, USA)
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Kenneth Kerpez (ASSIA, Inc., USA); Georgios Ginis (ASSIA Inc., USA); Marc Goldberg (ASSIA, Inc., USA); John Cioffi (Stanford University, USA); Stefano Galli (ASSIA, Inc., USA)
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LTE in the Unlicensed Spectrum: Evaluating Coexistence Mechanisms
Jeongho Jeon (Intel Corporation, USA); Huaining Niu (Intel, USA); Qian (Clara) Li (Intel Corporation, USA); Apostolos Pathanassiou (Intel Corporation & Intel Architecture Group, USA); Geng Wu (Intel Corporation, USA)
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Rapeepat Ratasuk, Nitin Mangalvedhe and Amitava Ghosh (Nokia Networks, USA)
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Wei Feng, Yong Li, Depeng Jin and Lieguang Zeng (Tsinghua University, P.R. China)
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Block Acknowledgment in IEEE 802.15.4 by Employing DSSS and CSS PHY Layers
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Sung Hwan Won (Samsung Electronics Co., Ltd., Korea); Hyo-Jin Lee (Samsung, Korea); Jinyoung Oh (Samsung Electronics, Korea); Song Yean Cho (Samsung electronics, Korea); Younsun Kim (Samsung Electronics Co., Ltd., Korea); Juho Lee (Samsung Electronics. Co., Ltd, Korea)
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On the Impact of Hardware Impairments on Massive MIMO
Ulf Gustavsson (Ericsson AB, Sweden); Cesar Sanchez Perez and Thomas Eriksson (Chalmers University of Technology, Sweden); Fredrik Athley (Ericsson AB, Sweden); Giuseppe Durisi, Per N Landin, Katharina Hausmair, Christian Fager and Lars Svensson (Chalmers University of Technology, Sweden)
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**I/Q Imbalance Aware Widely-Linear Precoding for Downlink Massive MIMO Systems**
Shahram Zarei (Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany); Wolfgang Gerstacker (University of Erlangen-Nuernberg, Germany); Robert Schober (University of British Columbia, Canada)
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**Sum Rate Maximization for Uplink Distributed Massive MIMO Systems with Limited Backhaul Capacity**
Meysam Sadeghi and Chau Yuen (Singapore University of Technology and Design, Singapore); Yong Huat Chew (Institute for Infocomm Research, Singapore)
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**SCF: Sparse Channel-State-Information Feedback using Karhunen-Loeve Transform**
Jingon Joung and Sumei Sun (Institute for Infocomm Research, Singapore)
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**Panel: Panel Discussion: 5G: What to expect, and where to start**

**S7: Sources and Systems**

**S7.1 Multi-Wavelength Visible Light Communication System Design**
Pankil M Butala and Hany Elgala (Boston University & NSF Smart Lighting ERC, USA); Payman Zarkesh-Ha (University of New Mexico, USA); Thomas DC Little (Boston University & NSF Smart Lighting ERC, USA)
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**S7.2 Imaging-MIMO Visible Light Communication System using μLEDs and Integrated Receiver**
Sujan Rajbhandari (University of Oxford, United Kingdom); Hyunchea Chun (Oxford University, United Kingdom); Grahame Faulkner (University of Oxford, United Kingdom); Katherine Cameron, Aravind Venugopalan Nair Jalajakumari, Robert Henderson, Dobroslav A. Tsonev, Muhammad Ijaz and Zhe Chen (University of Edinburgh, United Kingdom); Harald Haas (The University of Edinburgh, United Kingdom); Enyuans Xie, Jonathan McKendry, Johannes Herrmsdorf, Erdan Gu and Martin Dawson (University of Strathclyde, United Kingdom); Dominic O'Brien (Oxford University, United Kingdom)
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**S7.3 Si Integrated Optical Phased Array for Efficient Beam Steering in Optical Wireless Communications**
Ke Wang (University of Melbourne, Australia); Yang Wang, Shitao Gao and Ampalavanapillai Nirmalathas (The University of Melbourne, Australia); Christina Lim (University of Melbourne, Australia); Stan Skafidas (The University of Melbourne, Australia); Kamal Alameh (Centre for MicroPhotonic Systems, Australia)
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**S7.4 Performance Comparison for Illumination and Visible Light Communication System using Buck Converters**
Xiong Deng (Eindhoven University of Technology (TU/e), The Netherlands); Yan Wu (Eindhoven University of Technology, The Netherlands); Kumar Arulandu (Philips Research Eindhoven, The Netherlands); Guofu Zhou and Jean-Paul Linnartz (Philips Research, The Netherlands)
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**MENS 2-2: Management of Emerging Networks**

**Scaling the number of DNS root servers with Internet**
Xiaodong Lee and Zhiwei Yan (CNNIC, P.R. China); Ranganai Chaparadza (IPv6 Forum, Germany)
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**Bandwidth Aggregation in Allied WiFi Routers**
Daniel Robertson (Worcester Polytechnic Institute, USA); Craig A. Shue (Worcester Polytechnic Institute & Oak Ridge National Laboratory, USA); Krishna Kumar Venkatasubramanian and Curtis Taylor (Worcester Polytechnic Institute, USA)
MENS 3-2: QoS/QoE and performance optimization of applications and network services

**Application-Independent Information Infrastructure (AI3): design and implementation**
Tracy Y. Cheng, Bo Zhang and Xiaohua Jia (City University of Hong Kong, Hong Kong); Jianfei He (Huawei Technologies Co., Ltd., P.R. China); Shucheng Liu (Huawei Technologies, P.R. China)  
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**LTE performance data reduction for knowledge acquisition**
Emil Khatib (University of Malaga & Ericsson, Spain); Raquel Barco (University of Malaga, Spain); Inmaculada Serrano (Ericsson, Spain); Pablo Muñoz-Luengo (University of Málaga, Spain)  
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**Estimation with Minimum Mean Square Error for Real-Valued Channel Quantization**
Cibele Cristina Trinca (State University of Campinas (UNICAMP), Brazil); Jean-Claude Belfiore (Ecole Nationale Supérieure des Télécommunications, France); Edson Donizete de Carvalho (UNESP-Ihia Solteira, Brazil); Jozué Vieira Filho (UNESP-São João da Boa Vista, Brazil)  
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**Precoded Massive MU-MIMO Uplink Transmission under Transceiver I/Q Imbalance**
Aki Hakkarainen and Janis Werner (Tampere University of Technology, Finland); Kapil Dandekar (Drexel University, USA); Mikko Valkama (Tampere University of Technology, Finland)  
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**Compressed Channel Feedback for Correlated Massive MIMO Systems**
Min Soo Sim and Chan-Byoung Chae (Yonsei University, Korea)  
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**Closed-form Analysis of Channel Non-Reciprocity Due to Transceiver and Antenna Coupling Mismatches in Multi-user Massive MIMO Network**
Orood Raeesi and Yaning Zou (Tampere University of Technology, Finland); Antti Tölli (University of Oulu, Finland); Mikko Valkama (Tampere University of Technology, Finland)  
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**Secure Communication via Jamming in Massive MIMO Rician Channels**
Jue Wang (SUTD, Singapore); Jemin Lee (Singapore University of Technology and Design (SUTD), Singapore); Fanggang Wang (Beijing Jiaotong University, P.R. China); Tony Q. S. Quek (Singapore University of Technology and Design, Singapore)  
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**Deployment and Implementation Strategies for Massive MIMO in 5G**
Berthold Panzner (NSN, Germany); Wolfgang Zirwas (Nokia Siemens Networks GmbH&CoKG, Germany); Stefan Dierks (Technische Universität München, Germany); Mads Lauridsen and Preben Mogensen (Aalborg University, Denmark); Kari Pajukoski (Nokia-Siemens Networks, Finland); Deshan Miao (Nokia Siemens Networks, P.R. China)  
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**Massive MIMO for Crowd Scenarios: A Solution Based on Random Access**
Jesper H Sørensen, Elisabeth de Carvalho and Petar Popovski (Aalborg University, Denmark)  
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**Increasing Capacity in Massive MIMO Cellular Networks via Small Cells**
Abbas Kazerooni (Stanford University, USA); Francisco Javier Lopez-Martínez (Universidad de Malaga, Spain); Andrea Goldsmith (Stanford University, USA)  
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Projection Based Feedback Compression for FDD Massive MIMO Systems
Yonghee Han, Wonjae Shin and Jungwoo Lee (Seoul National University, Korea)
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S8: Roundtable

Reflections on the workshop and planning for 2015

Welcome and Keynote Session

Workshop Introduction

K1: Keynote Session 1

RAT: Radio Access Technologies for Wireless Optical Networks

Keynote Title: "Load Modulated MIMO: A New Hardware Concept to Reduce Cost, Size, and Amplifier Back-off"

Keynote Abstract: This talk presents the current state-of-the-art of massive antenna array architectures with significant front-end hardware savings, as an enabler for future small and powerful cell nodes that will be able to carry massive MIMO technology. Radio frequency (RF) hardware architectures with a single power amplifier are reviewed, compared, and found superior to conventional MIMO implementations in terms of cost, dissipated heat, and physical size. This progress on the RF-side allows to merge the two competing cellular concepts of virtual and massive MIMO into a hybrid approach of remote radio heads with massive MIMO arrays.

Load Modulated MIMO: A New Hardware Concept to Reduce Cost, Size, and Amplifier Back-off - This talk presents the current state-of-the-art of massive antenna array architectures with significant front-end hardware savings, as an enabler for future small and powerful cell nodes that will be able to carry massive MIMO technology. Radio frequency (RF) hardware architectures with a single power amplifier are reviewed, compared, and found superior to conventional MIMO implementations in terms of cost, dissipated heat, and physical size. This progress on the RF-side allows to merge the two competing cellular concepts of virtual and massive MIMO into a hybrid approach of remote radio heads with massive MIMO arrays.

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**TCPLS - 01**

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pp. 1211-1216

WON: Wireless Optical Networks for Cloud Architectures

Keynote Speech Title: "Wireless Optical Network Convergence in 5G Access Network"

Keynote Speech Abstract: Huawei vision on 5G wireless systems in term of service requirements and network architecture is presented. Some scenarios for wireless optical network convergence at the access network and at base-stations are analyzed. Finally, hot research topics on wireless optical network convergence are suggested and discussed.

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**Carrier Components Assignment Method for LTE and LTE-A Systems Based on User Profile and Application**  
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**Power Allocation in OFDM based NOMA Systems: A DC Programming Approach**  
Priyabrata Parida and Suvk Sekhar Das (Indian Institute of Technology Kharagpur, India)  
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**Wi-UAV-K: Keynote Prof. Gregory H. Huff, Texas A&M University, USA**

Multifunctional Antennas and Adaptive Arrays in Unmanned Autonomous Systems

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