

ISWCS'2014

The Eleventh International Symposium on Wireless Communication Systems

26th – 29th August 2014

Conference Program



Barcelona, Spain

Technical Co-Sponsorship: IEEE Vehicular Technology Society and IEEE Communications Society



CTTC^R

**Centre Tecnològic
de Telecomunicacions de Catalunya**

Timetable for ISWCS 2014

Room	ICÀRIA	BOGATELL	SANT SEBASTIÀ	MAR BELLA	
Tuesday 26th August 2014	08:00	Registration			
	09:00	T1.1 Low EMF Radio link Technologies and Wireless Networks Management (Workshop)	T1.2 Cognitive Radio Advances, Applications and Future Emerging Technologies (CRAFT) & Spectrum OverLay Through Aggregation of Heterogeneous Dispersed Bands (SOLDER)	T1.3 Advanced Multi-Carrier Techniques for Next Generation Commercial and Professional Mobile Systems (Workshop)	T1.4 International Workshop on Self-Organizing Networks (IWSON-Workshop)
	10:50	Coffee break			Demo installation
	11:10	T2.1	T2.2 CRAFT & SOLDER (Workshops)	T2.3	T2.4 IWSON
	12:50	Lunch break			Demo
	14:20		Panels	T3.3	T3.4 IWSON
	16:20	Coffee break			Demonstrator Session
	16:50				T4.4 IWSON

Room	ICÀRIA	BOGATELL	SANT SEBASTIÀ	MAR BELLA	EUROPA	
Wednesday 27th August 2014	08:00	Registration				
	09:00	Welcome Message				EUROPA
	09:20	Plenary Speaker I Prof. Shlomo Shama <i>Technion-Israel Institute of Technology, Israel</i>				EUROPA
	10:30	Coffee break				
	10:50	W1.1 5G	W1.2 Time-varying channels and PAPR	W1.3 Wireless Sensor Networks	W1.4 Cognitive Radio I	T1 Low Power Wi-Fi – How IEEE 802.11ah is transforming M2M
	12:40	Lunch break				
	14:00	Plenary Speaker II Prof. Giuseppe Caire <i>University South California, USA</i>				EUROPA
	15:10	Coffee break				
	15:30 to 17:10	W2.1 Energy-Efficiency & Green Communications	W2.2 SS6: Communications and Navigation for Decentralized Autonomous Devices	W2.3 LTE Networks	W2.4 Interference Alignment (IA)	T2 Designing Intelligent Energy Harvesting Communication Networks
	17:20	W3.1 SS2: Advanced Small Cells for Future Systems	W3.2 Device-to-Device Communication	W3.3 Detection	W3.4 Relaying I	

Room	ICÀRIA	BOGATELL	SANT SEBASTIÀ	MAR BELLA	EUROPA
08:00	Registration				
09:00	Plenary Speaker III Prof. Nikos Sidiropoulos <i>University of Minnesota, USA</i>				EUROPA
10:20	Coffee break				
10:50	TH1.1 Resource Management	TH1.2 Stat Models and Channel Estimation	TH1.3 Network Routing	TH1.4 Joint Source Channel Coding & MIMO	T3 Smart Device To Smart Device Communication for 5G
12:40	Lunch break				
14:00	Plenary Speaker IV Prof. Gerhard P. Fettweis <i>Dresden University of Technology, Dresden-Germany</i>				EUROPA
15:10	Coffee break				
15:30 to 17:10	TH2.1 SS1: Empowering Technologies of 5G Wireless Communications I	TH2.2 Filter Bank Based Systems	TH2.3 Relaying II	TH2.4 SS5: Cognitive and Co-operative Positioning	T4 Energy Efficiency in 5G Heterogeneous and Small-Cell Wireless Networks
17:00 to 17:20	TH3.1 SS1: Empowering Technologies of 5G Wireless Communications II	TH3.2 Multiuser MIMO	TH3.3 Localization	TH3.4 SS3: Distributed Caching in Wireless Networks	

Room	ICÀRIA	BOGATELL	SANT SEBASTIÀ	MAR BELLA	EUROPA
08:00	Registration				
09:00	Plenary Speaker V Prof. Merouane Debbah <i>SUPELEC, France</i>				EUROPA
10:20	Coffee break				
10:50	F1.1 Resource Allocation I	F1.2 Multicell & CoMP	F1.3 Full-Duplex, Power Control and Hardware		T5 Network Processing with Bayesian Graphical Models, with Applications to Distributed Positioning and Sensing
12:40	Lunch break				
14:00	Plenary Speaker VI Prof. Riccardo de Gaudenzi <i>ESA, The Netherlands</i>				EUROPA
15:10	Coffee break				
15:30 to 17:10	F2.1 Cognitive Radio II	F2.2 Energy Efficient Networks	F2.3 QoS and Speech		
17:20	F3.1 SS4: Wireless Communications at Finite Blocklength	F3.2 Multiple Access			
18:40	Closing the Conference				EUROPA

ISWCS 2014 Plenary Speakers

Wednesday 27th August
@ 9:20, Room EUROPA



Shlomo Shamai

Technion – Israel Institute of Technology
Israel

On Cloud Radio Access Networks: Information Theoretic Considerations

Abstract: Cloud radio access networks (C-RANs) emerge as appealing architectures for next-generation wireless/cellular systems whereby the processing/decoding is migrated from the local base-stations/radio units (RU) to a control/central units (CU) in the "cloud".

This is facilitated by fronthaul links connecting the RUs to the managing CUs. We focus on oblivious RUs, and hence the fronthaul links carry digital information about the baseband signals, in the uplink from the RUs to the CU and vice versa in the downlink. The high data rate service demands in C-RANs, imply that even with fast (optical) fronthauls, efficient compression of the basedand signals is of critical importance.

In this talk we review the basic approaches to this setting, with focus on advanced signal processing solutions, emerging by network information theoretic concepts. Analysis and numerical results illustrate the considerable performance gains to be expected for standard simple cellular models.

Short Biography: Shlomo Shamai (Shitz) received the B.Sc., M.Sc., and Ph.D. degrees in electrical engineering from the Technion – Israel Institute of Technology, in 1975, 1981 and 1986 respectively. During 1975-1985 he was with the Communications Research Labs, in the capacity of a Senior Research Engineer. Since 1986 he is with the Department of Electrical Engineering, Technion – Israel Institute of Technology, where he is now a Technion Distinguished Professor, and holds the William Fondiller Chair of Telecommunications. His research interests encompasses a wide spectrum of topics in information theory and statistical communications. Dr. Shamai (Shitz) is an IEEE Fellow, a member of the Israeli Academy of Sciences and Humanities and a Foreign Associate of the US National Academy of Engineering. He is the recipient of the 2011 Claude E. Shannon

Award and the 2014 Rothschild Prize in Mathematics/Computer Sciences and Engineering.

He has been awarded the 1999 van der Pol Gold Medal of the Union Radio Scientifique Internationale (URSI), and is a co-recipient of the 2000 IEEE Donald G. Fink Prize Paper Award, the 2003, and the 2004 joint IT/COM societies paper award, the 2007 IEEE Information Theory Society Paper Award, the 2009 European Commission FP7, Network of Excellence in Wireless COMmunications (NEWCOM++) Best Paper Award, and the 2010 Thomson Reuters Award for International Excellence in Scientific Research. He is also the recipient of 1985 Alon Grant for distinguished young scientists and the 2000 Technion Henry Taub Prize for Excellence in Research. He has served as Associate Editor for the Shannon Theory of the IEEE Transactions on Information Theory, and has also served twice on the Board of Governors of the Information Theory Society. He is a member of the Executive Editorial Board of the IEEE Transactions on Information Theory.

Wednesday 27th August
@ 14:00, Room EUROPA



Giuseppe Caire

University South California
USA

Caching at the Edge: Efficient on-Demand Video Streaming over Wireless

Abstract: Video is responsible for 66% of the 100x increase of wireless data traffic predicted in the next few years. This talk gives a survey of a novel transmission paradigm based on the following two key properties: (i) video shows a high degree of asynchronous content reuse, and (ii) storage is the fastest-increasing quantity in modern hardware. Based on these properties, we suggest caching in helper stations (femto-caching) and/or directly into the user devices, combined with highly spectrally efficient short-range communications to deliver video files. We present results based on uncoded device-to-device and network coded multicast delivery that show a "Moore's law" for throughput: namely, in a certain regime of sufficiently high content reuse, the per-user throughput

increases linearly with the cache size, and it is independent of the number of users, despite the fact that these users make independent and individual video files requests, i.e., the system does not exploit the naive broadcasting property of the wireless medium to send the same source to everybody. We also discuss dynamic adaptive schemes for smooth streaming in such networks, that can be regarded as a multiuser multiple server version of DASH (Dynamic Adaptive Streaming over HTTP), and can be derived systematically from a general Network Utility Maximization problem, where the network utility is a function of the user video qualities, capturing a desired notion of fairness.

Short Biography: Giuseppe Caire was born in Torino, Italy, in 1965. He received the B.Sc. in Electrical Engineering from Politecnico di Torino (Italy), in 1990, the M.Sc. in Electrical Engineering from Princeton University in 1992 and the Ph.D. from Politecnico di Torino in 1994. He was a recipient of the AEI G.Someda Scholarship in 1991, he was with the European Space Agency (ESTEC, Noordwijk, The Netherlands) in 1994-1995 as research staff and, as research fellow, Princeton University in 1997 and Sydney University in summer 2000.

Giuseppe Caire has been assistant professor in Telecommunications at the Politecnico di Torino in 1995-1997, associate professor at the University of Parma, Italy, in 1997-1998 and professor at the Eurecom Institute, Sophia-Antipolis, France, in 1998-2005. He joined the EE Department of the Viterbi School of Engineering, USC, in August 2005. He served as Associate Editor for the IEEE Transactions on Communications in 1998-2001 and as Associate Editor for the IEEE Transactions on Information Theory in 2001-2003. He received the Jack Neubauer Best System Paper Award from the IEEE Vehicular Technology Society in 2003, and the Joint Information Theory/Communications Society Best Paper Award in 2004. He was elected in the Board of Governors of the IEEE Information Theory Society in 2004 and was nominated IEEE Fellow in 2005. His current interests are in the field of communications theory, information theory and coding theory with particular focus on wireless applications.

Thursday 28th August
@ 9:00, Room EUROPA



Nikos Sidiropoulos

University of Minnesota
USA

Frugal Sensing and Estimation over Wireless Networks

Abstract: Spectrum sensing and channel estimation are two important background tasks needed for efficient wireless network operations. As we move towards truly agile spectrum access, channel and spectrum state communication overheads can become a serious burden – unless we design appropriate sensing and estimation strategies that can do the job well with *very* limited, judicious feedback. In this talk, we will consider two “frugal” sensing and estimation problems in this regime: crowdsourced power spectrum sensing using a network of sensors broadcasting few bits; and channel tracking for transmit beamforming in FDD mode. In the case of spectrum sensing, the approach can be seen as generalizing classical spectral analysis to the case of spectrum estimation from power inequalities. We will discuss both passive and active sensing strategies, ranging from energy minimization to maximum likelihood, cutting plane, and parametric model-based methods. We will show that accurate power spectrum sensing is possible from few bits, even for dense spectra. Turning to channel estimation and tracking for transmit beamforming, we will consider a downlink scenario where the receiver has very limited computation and uplink communication capabilities. Shifting the estimation burden from the receiver to the transmitter, we will explore effective channel acquisition and tracking strategies using coarse and infrequent CSI feedback.

Short Biography: Nicholas Sidiropoulos (Fellow, IEEE) received the Diploma in Electrical Engineering from the Aristotelian University of Thessaloniki, Greece, and M.S. and Ph.D. degrees in Electrical Engineering from the University of Maryland—College Park, in 1988, 1990 and 1992, respectively. He has served as Assistant Professor in the Department of Electrical Engineering at the University of Virginia (1997-1999); Associate Professor in the Department of Electrical and Computer Engineering at the University of Minnesota—Minneapolis (2000-2002); Professor in the Department of Electronic and Computer Engineering at the Technical University of Crete, Chania—Crete, Greece (2002-2011); and Professor in the Department of Electrical and Computer Engineering at the University of Minnesota—Minneapolis (2011-). His research interests are in signal processing for communications, convex optimization, cross-layer resource allocation for wireless networks, and multiway analysis – i.e., linear algebra for data arrays indexed by three or more variables. His current research focuses primarily on signal and tensor analytics, with applications in cognitive radio,

big data, and preference measurement. He received the NSF/CAREER award in 1998, and the IEEE Signal Processing Society (SPS) Best Paper Award in 2001, 2007, and 2011. He served as IEEE SPS Distinguished Lecturer (2008-2009), and as Chair of the IEEE Signal Processing for Communications and Networking Technical Committee (2007-2008). He received the 2010 IEEE Signal Processing Society Meritorious Service Award.

Thursday 28th August
@ 14:00, Room EUROPA



Gerhard P. Fettweis

Dresden University of Technology
Dresden-Germany

Designing a Possible 5G Framework with GFDM

Abstract: Two of the main challenges for designing the physical layer of the 5G cellular system are:

- Low latency, requiring very short packet sizes, most likely shorter than the duration of one LTE OFDM symbol
- Massive M2M, requiring at least 10K sensors to be connected to a cell, which again requires relaxing the requirement on synchronization to minimize the overhead and maximize the power efficiency of M2M devices

Another challenge is that it would be of great advantage if the clocking system of 5G was compatible with LTE. The large number of LTE bands which need to be addressed by terminals has created a major challenge in designing clocking and frequency architectures. When using multi-carrier modulation, the short packet size challenge leads to very short symbols. This leads to a highly increased subcarrier spacing when compared with LTE. Hence, per subcarrier now frequency selectivity of the channel kicks in, which again leads to inter-symbol-interference and inter-carrier-interference.

Another challenge exists when addressing the integration of a massive amount of asynchronous M2M terminals in a multi-carrier multiple-access system. In this case some time/frequency resources, as e.g. a resource block of LTE, arrive asynchronously in time and in frequency at the base

station. This leads to inter-carrier and inter-symbol interference. Summarizing, a large challenge is that orthogonality of a classic multi-carrier modulation is lost. A possible way out is to move to advanced multicarrier systems, which are not necessarily based on orthogonal signaling.

A promising approach is GFDM, Generalized Frequency Division Multiplexing. One basic feature is tail-biting filtering which allows for spectral/time engineering of transmission packets, i.e. a tradeoff of time leakage and frequency leakage can be carefully engineered such that tough requirements can be met. As a result, for GFDM tough synchronization requirements in case of a multiple subcarrier based access as in OFDMA do not exist. This allows for asynchronous operations of different terminals in a multiple-access scenario. Also, extremely small out-of-band leakage enables addressing multiple challenges. First, it allows for dense packing in spectrum, second, it allows for a digital generation of signals for/with discontinuous spectrum aggregation, dramatically relaxing the requirements on analog filters, and therefore thirdly, it allows for cost-effective multiband transceiver designs, as needed to operate in the massive amount of frequency bands of 3GPP systems.

Finally, we want to show a possible frame structure with GFDM, which perfectly matches the clocking architecture of the existing LTE system. Hence, by proposing GFDM as a new waveform for 5G, the requirements can be met without breaking with current implementation architectures and concepts. On the contrary, LTE can be easily generated as a special case of a 5G GFDM transceiver.

Short Biography: Gerhard P. Fettweis earned his Ph.D. under H. Meyr's supervision from RWTH Aachen in 1990. Thereafter he was at IBM Research and then at TCSI Inc., California. Since 1994 he is Vodafone Chair Professor at TU Dresden, Germany, with main research interest on wireless transmission and chip design. He is an IEEE Fellow and an honorary doctorate of TU Tampere. As repeat entrepreneur he has co-founded 11 startups so far.

He has setup funded projects in size of close to EUR 1/2 billion, notably he runs the German science foundation's CRC HAEC and COE cFAED. He is actively involved in organizing IEEE conferences, e.g. TPC Chair of ICC 2009 and TTM 2012, General Chair of VTC Spring 2013 and DATE 2014.

Friday 29th August
@ 9:00, Room EUROPA



Merouane Debbah

SUPELEC
France

5G Efficient Wireless Design

Abstract: Assume that one is given the ability to design from scratch a network deployment to uniformly cover a given area with maximal energy efficiency (EE). What are the optimal number of antennas, active users, and transmit power taking into account the mobility pattern? The aim of this talk is to answer this fundamental question. We consider jointly the uplink and downlink with different processing schemes at the base station and propose a new realistic power consumption model that reveals how the above parameters affect the EE. Closed-form expressions for the EE-optimal value of each parameter are provided for several signal processing schemes. The expressions prove in particular how the parameters interact and highlight in which regime Massive MIMO or Small Cells are the answer.

Short Biography: Mérouane Debbah entered the Ecole Normale Supérieure de Cachan (France) in 1996 where he received his M.Sc and Ph.D. degrees respectively. He worked for Motorola Labs (Saclay, France) from 1999-2002 and the Vienna Research Center for Telecommunications (Vienna, Austria) until 2003. He then joined the Mobile Communications department of the Institut Eurecom (Sophia Antipolis, France) as an Assistant Professor until 2007. He is now a Full Professor at Supelec (Gif-sur-Yvette, France), holder of the Alcatel-Lucent Chair on Flexible Radio and a recipient of the ERC grant MORE (Advanced Mathematical Tools for Complex Network Engineering). His research interests are in information theory, signal processing and wireless communications. He is a senior area editor for IEEE Transactions on Signal Processing and an Associate Editor in Chief of the journal Random Matrix: Theory and Applications. Mérouane Debbah is the recipient of the "Mario Boella" award in 2005, the 2007 General Symposium IEEE GLOBECOM best paper award, the Wi-Opt 2009 best paper award, the 2010 Newcom++ best paper award, the WUN CogCom Best Paper 2012 and 2013 Award as well as the Valuetools 2007, Valuetools 2008, Valuetools 2012 and CrownCom2009 best student paper awards. He is a WWRF fellow and a member of the academic

senate of Paris-Saclay. In 2011, he received the IEEE Glavieux Prize Award. He is the co-founder of Ximinds.

Friday 29th August
@ 14:00, Room EUROPA



Riccardo de Gaudenzi

ESA
The Netherlands

High Performance Random Access Schemes for Satellite Networks – From Theory to Practice

Abstract: Over the past years there has been a fast growing demand for low-cost interactive satellite terminals supporting both fixed and mobile services, such as consumer broadband access, machine-to-machine communications, SCADA, transaction and safety of life applications. These networks are generally characterized by a large population of terminals sharing the available resources under very dynamic traffic conditions. In particular, in the return link (user to network) of commercial satellite broadband access networks, residential users are likely to generate a large amount of low duty cycle bursty traffic with extended inactivity periods. A similar situation occurs in satellite mobile networks whereby a large number of terminals typically generate infrequent packets for signalling transmission as well for position reporting or other messaging applications. These services call for the development of efficient multiple access protocols able to cope with the above operating conditions. The traditional Combined Free and Demand Assignment Multiple Access (CF-DAMA) satellite protocol used in many professional satellite networks will not perform optimally. Besides, for short packet transmissions, the signalling overhead used for the reservation of the channel is comparable to the capacity needed for the transmission of the message.

The talk will provide a review of modern RA schemes well suited for the provision of the above-mentioned services over the satellite channel with potential spin-off in terrestrial wireless applications such as Machine-to-Machine. First the key terrestrial random access techniques and their applicability to the satellite environment will be shortly reviewed. Then modern random access schemes with high performance over the

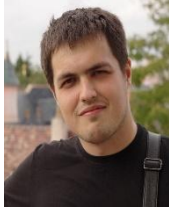
satellite environment will be discussed reporting some analytical, simulation and real implementation performance. Capacity bounds for spread-spectrum and non-spread-spectrum RA schemes will be also reviewed to assess the current RA techniques sub-optimality. Satellite systems and standards adopting random access for the return link will also be listed. Finally, the future research perspectives will be illustrated.

Short Biography: Riccardo De Gaudenzi was born in Italy in 1960. He received his Doctor Engineer degree (cum Laude) in electronic engineering from the University of Pisa, Italy in 1985 and the PhD from the Technical University of Delft, The Netherlands in 1999. From 1986 to 1988 he was with the European Space Agency (ESA), Stations and Communications Engineering Department, Darmstadt (Germany) where he was involved in satellite telecommunication ground systems design and testing. In 1988, he joined ESA's Research and Technology Centre (ESTEC), Noordwijk, The Netherlands where since 2005 he is Head of the Radio Frequency Systems, Payload and

Technology Division. The division is responsible for supporting the definition and development of advanced satellite system, subsystems and related technologies for telecommunications, navigation and earth observation applications. In 1996 he spent one year with Qualcomm Inc., San Diego USA, in the Globalstar LEO project system group under an ESA fellowship. His current interest is mainly related with efficient digital modulation and multiple access techniques for fixed and mobile satellite services, synchronization topics, adaptive interference mitigation techniques and communication systems simulation techniques. He actively contributed to the development and the demonstration of the ETSI S-UMTS Family A, S-MIM, DVB-S2, DVB-S2-X, DVB-RCS2 and DVB-SH standards. From 2001 to 2005 he has been serving as Associate Editor for CDMA and Synchronization for IEEE Transactions on Communications. He is currently Associate Editor for Journal of Communications and Networks. He is co-recipient of the 2003 and 2008 Jack Neubauer Memorial Award Best Paper from the IEEE Vehicular Technology Society.

ISWCS 2014 Tutorials

Wednesday 27th August
@ 10:50, Room EUROPA



Evgeny Khorov

Senior Researcher, IITP RAS
Moscow, Russia

Low Power Wi-Fi – How IEEE 802.11ah is Transforming M2M

Abstract: In 5 years the number of smart devices accessing to the Internet will 5 times exceed people's population, and most of the devices will access the Internet by wireless. Unfortunately existing wireless networking technologies cannot support swarms of battery supplied devices transmitting short messages. To work up the emerging M2M market with its challenging demands, 3GPP, IEEE, IETF and other international organizations are currently adopting their standards.

For example, the IEEE 802 LAN/MAN Standards Committee (LMSC) has formed IEEE 802.11ah Task Group (TGah) to extend the applicability area of IEEE 802.11 networks by designing an energy efficient protocol, which allows thousands of indoor and outdoor devices working at the same area. Apart from new PHY layer providing much longer transmission range than the legacy one, TGah has put much effort in improving channel access by reducing channel busy time, collisions and power consumption in typical M2M scenarios, when thousands of stations transmit short packets. Although IEEE 802.11ah is expected to be adopted in 2016, the main part of work has already been done and the standard development process is at the refinement stage now. In the tutorial we will focus on M2M requirements and very promising revolutionary improvements developed by TGah to meet them.

Short Biography: Evgeny Khorov received his M.S degree from Moscow Institute of Physics and Technology in 2010 and Ph.D. degree in Telecommunications from the Institute for Information Transmission Problems in 2012. Currently he is a Senior Researcher in Network Protocols Research Lab, IITP. In parallel, he lectures on Wireless Networking Protocols, and Mathematical Modeling of Wireless Networks in MIPT. His current research interests include Internet of Things, multiple channel

access, QoS provisioning, multi-hop wireless networks, performance evaluation methods. He has developed several mathematical models of networking protocols. Also he is a co-author of routing protocols developed for scalable mesh and military networks. He has been involved in several national and international research projects (twice as a leader). Apart from that, he participates in the IEEE 802 LMSC standardization activities. Evgeny Khorov has more than 30 research papers. He has received Best Paper Award at IEEE ISWCS 2012, Paris. In 2013 he was awarded the Moscow Prize for Young Scientists in the field of Telecommunications for the study of channel access methods in wireless multi-hop networks. He is the Executive Chair of WiFlex 2013 and ITaS 2014. He also serves as a reviewer for high-reputed scientific journals and conferences.

Wednesday 27th August
@ 15:40, Room EUROPA



Deniz Gündüz

Imperial College London
United Kingdom



Michele Zarzi

Università degli Studi di Padova
Italy

Designing Intelligent Energy Harvesting Communication Networks

Abstract: Devices powered by energy harvesting (EH) are increasingly being deployed in practice, in place of their traditional, battery-operated counterparts, when factors such as the sheer number of nodes or inaccessibility render battery replacement difficult and cost-prohibitive. Their deployment spans the whole gamut of autonomous networked systems: from machineto- machine and sensor networks, to smart buildings and grid asset monitoring. It is no surprise that the global EH market is rapidly expanding: it is expected to reach 1894.87 million dollars by 2017 at an estimated annual growth rate of 24.31. In addition, the interest of the communications and networking research community on EH technologies has steadily

been growing, as manifested by the ever-increasing number of publications and workshops on this topic. In contrast to battery-operated devices, where minimizing energy consumption is crucial to prolong lifetime, in EH-powered devices, the objective is the intelligent management of the harvested energy to ensure long-term, uninterrupted operation. This tutorial will provide a comprehensive overview of recent developments in the design of energy management policies for EH communication systems. We focus on analytical models that capture the main challenges related to their design: the intermittent nature of harvested energy, the limited capacity and energy leakage in energy storage devices, and the constraints on device size and complexity. We will describe analytical tools from communication theory, Markov decision processes and learning theory which are employed to characterize the optimal policies, and to evaluate the performance of low-complexity, near-optimal policies. The tutorial will examine in detail point-to-point as well as multi-user networks and explore the implications of EH on their performance.

Short Biography: Deniz Gunduz received the B.S. degree in electrical and electronics engineering from the Middle East Technical University, Ankara, Turkey in 2002, and the M.S. and Ph.D. degrees in electrical engineering from Polytechnic Institute of New York University, Brooklyn, NY in 2004 and 2007, respectively. Currently he is a Lecturer in the Electrical and Electronic Engineering Department of Imperial College London, London, UK. He was a research associate at CTTC in Barcelona, Spain from November 2009 until September 2012. He also held a visiting researcher position at Princeton University from November 2009 until November 2011. Previously he was a consulting assistant professor at the Department of Electrical Engineering, Stanford University, and a postdoctoral Research Associate at the Department of Electrical Engineering, Princeton University. He is the recipient of a Marie Curie Reintegration Grant funded by the European Commission, and a recipient of the Best Student Paper Award at the 2007 IEEE International Symposium on Information Theory (ISIT). He has participated in numerous research projects in the US and in Europe. Currently, he is the coordinator of the European research project E-CROPS on energy harvesting communication networks (jointly with CTTC, METU, Imperial College London and EURECOM). Previously, he has led two research projects as the principle investigator, COOPMEDIA (funded by the EU) and JUNTOS (funded by Spanish Ministry of Science and Innovation). He is an Associate Editor of the IEEE TRANSACTIONS ON COMMUNICATIONS, and served as a guest editor of the EURASIP Journal on Wireless

Communications and Networking, Special Issue on Recent Advances in Optimization Techniques in Wireless Communication Networks. He is serving as a co-chair of the IEEE Information Theory Society Student Committee. He is a tutorials co-chair of the 2014 International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), and a co-chair of the Network Theory Symposium at the 2013 and 2014 IEEE Global Conference on Signal and Information Processing (GlobalSIP). His research interests lie in the areas of communication theory and information theory with special emphasis on joint source-channel coding, multi-user networks, energy efficient communications and security.

Michele Zorzi received his Laurea and PhD degrees in electrical engineering from the University of Padova in 1990 and 1994, respectively. During academic year 1992-1993 he was on leave at UCSD, working on multiple access in mobile radio networks. In 1993 he joined the faculty of the Dipartimento di Elettronica e Informazione, Politecnico di Milano, Italy. After spending three years with the Center for Wireless Communications at UCSD, in 1998 he joined the School of Engineering of the University of Ferrara, Italy, where he became a professor in 2000. Since November 2003 he has been on the faculty of the Information Engineering Department at the University of Padova. His present research interests include performance evaluation in mobile communications systems, random access in mobile radio networks, ad hoc and sensor networks, Internet-of-Things, energy constrained communications protocols, and underwater communications and networking. He was Editor-In-Chief of IEEE Wireless Communications from 2003 to 2005 and Editor-In-Chief of the IEEE Transactions on Communications from 2008 to 2011, and has been an Editor for several journals and a member of the Organizing or the Technical Program Committee for many international conferences. He was also guest editor for special issues in IEEE Personal Communications ("Energy Management in Personal Communications Systems") and IEEE Journal on Selected Areas in Communications ("Multimedia Network Radios" and "Underwater Wireless Communications and Networking"). He served as a Member-at-Large of the Board of Governors of the IEEE Communications Society from 2009 to 2011, and is currently its Director of Education.

Thursday 28th August
@ 10:50, Room EUROPA



Shahid Mumtaz

Institute of Telecommunication
Aveiro, Portugal



Jonathan Rodriguez

Institute of Telecommunication
Aveiro, Portugal

Smart Device to Smart Device Communication for 5G

Abstract: Analysts predict an explosive growth in traffic demand on mobile broadband systems over the coming years due to the popularity of streaming video, gaming, and other social media services. While 4G wireless technologies are making a significant effort to keep up with this demand, the expectation is that cellular deployments will fall short of the required capacity unless there is a dramatic shift towards smaller cells. There is already a significant interest in femto and picocells deployments for this reason. However, there is another method of creating small cells that the wireless industry has yet to capitalize on, namely direct connectivity between clients in close proximity. 3GPP is currently working to enable smart device-to-device (D2D) communications within Release 12 of LTE-Advanced (LTE-A). This tutorial considers D2D communication over LTE-A band and aims to motivate researchers, operators and manufacturers to broaden their knowledge on D2D communication. While explaining D2D communication, we consider 3GPP LTE-A as a baseline. Moreover, this tutorial explains all fundamental requirements for deploying D2D network under cellular system from an architectural, technical and business point of view and presents real life applications and use cases. In the end, detailed system level simulation will be performed to analyze the performance of D2D communication in LTE-A system. Energy and throughput efficiency of the system will be used as a performance metrics.

Objectives: Although ad-hoc WLAN mode has been available in 802.11 for many years, the usage has been rather limited

compared with the infrastructure mode. Nevertheless, there has been an increased interest in D2D communication recently, as manifested by the WiFi Direct specifications and proposals for LTE-A D2D standardization. A key motivation for D2D connectivity is the potential for operators to offload traffic from the core network, and the framework for a new communication paradigm to support social networking through localization as shown in Figure 1. The current ad-hoc mode of communication does not support this functionality due to configuration complexity. As a first step towards LTE-A D2D, 3GPP has recently consolidated a move towards a D2D technology (Release 12 June 2012) on this topic and besides 3GPP, IEEE 802.15.4g smart utility networks (SUN) is also profoundly focused on D2D technology.

D2D communication uses cellular spectrum (license band) supported by a cellular infrastructure and promises three types of gain: the proximity of user equipment (UE) may allow for extremely high bit rates, low delays and low energy consumption; the reuse gain implies that radio resources may be simultaneously used by cellular as well as D2D links, tightening the reuse factor, even on reuse-1 system; finally, the hop gain refers to using both uplink and downlink resources when communicating via the access point in the cellular mode. Moreover, D2D communication may extend the cellular coverage and facilitate new types of wireless peer-to-peer services whilst at the same time increase the energy efficiency of communication. It is clear that D2D can offer a palette of interesting colours that can paint new business opportunities for mobile stakeholders promoting its candidacy for next generation wireless

Short Biography: Shahid Mumtaz is currently working as a Senior Researcher and Technical Manager at the Instituto de Telecomunicações (Portugal) under 4Tell group. Prior to his current position, he worked as a Research Intern at Ericsson Research Labs in 2005 at Karlskrona, Sweden. From March 2002 till August 2002, he worked as a System Engineer at Pakistan Telecommunication (PTCL). He received his MSc and PhD degrees in Electrical & Electronic Engineering from Blekinge Institute of Technology (BTH) Karlskrona, Sweden and University of Aveiro, Portugal in 2006 and 2011, respectively. Dr Shahid MSc and PhD were funded by Swedish government and FCT Portugal, respectively. He has been involved in several EC R&D Projects (CoDIV, FUTON, C2POWER, GREENET, GREEN-T ORCALE, ROMED, FP6, FP7) in the field of green communication and next generation wireless systems. In EC projects, he holds the position of technical manager, where he oversees the

project from a scientific and technical side, managing all details of each work packages which gives the maximum impact of the project's results for further development of commercial solutions. He has also been involved in two Portuguese funded projects (SmartVision & Mobilia) in the area of networking coding and development of system level simulator for 5G wireless system. Dr Shahid research interests lie in the field of architectural enhancements to 3GPP networks (i.e., LTE-A, user plan & control plan protocol stack, NAS and EPC), green communications, cognitive radio. Dr. Shahid has more than 45 publications in international conferences, journal papers and book chapters. He is also editor of two books and a guest editor for special issue in IEEE Wireless Communications Magazine and IEEE Communication Magazine. He has been on the technical programme committee of different IEEE conferences, including Globecom, ICC, and VTC, and chaired some of their symposia. He was the workshop chair of IEEE ISWCS, 13 in Germany and recipient of the 2006 IITA Scholarship, South Korea. Dr. Shahid is an IEEE member.

Jonathan Rodriguez received his Masters degree in Electronic and Electrical Engineering and Ph.D from the University of Surrey (UK), in 1998 and 2004 respectively. In 2002, he became a Research Fellow at the Centre for Communication Systems Research and was responsible for coordinating Surrey involvement in European research projects under framework 5 and 6. Since 2005, he is a Senior Researcher at the Instituto de Telecomunicações (Portugal), and founded the 4TELL Wireless Communication Research Group in 2008. The 4TELL group currently constitutes 30 researchers with a project portfolio that includes 10 ongoing European collaborative research projects. He is currently the project coordinator for the seventh framework C2POWER project, technical manager for COGEM, and project coordinator for CELTIC GREEN-T. He is author of more than 160 scientific publications, served as general chair for several prestigious conferences and workshops, and has carried out consultancy for major manufacturers participating in DVB-T/H and HS-UPA standardization. His research interests include green communications, cognitive radio, cooperative networking, radio resource management, cross-layer design and baseband digital signal processing. Dr Jonathan Rodriguez presents different tutorials on system level simulator and green technology in wireless communication in different conferences while Dr Shahid Mumtaz has a distinguished and long research background.

Thursday 28th August
@ 15:40, Room EUROPA



Eduard Jorswieck

Technical University of Dresden Chair of
Communications Theory



Alessio Zappone

Technical University of Dresden, Chair of
Communications Theory

Energy Efficiency in 5G Heterogeneous and Small-Cell Wireless Networks

Abstract: The exponential increase of wireless devices and the demand for higher communication rates has put forward the issue of sustainable growth of modern wireless communication systems. Future wireless networks will be required to provide much higher data-rates, but at a similar power consumption as present networks, which makes energy efficiency optimization a natural need. Also, saving energy is important in order to extend the lifetime of battery-powered devices and to reduce the amount of electromagnetic pollution. Thus, a crucial challenge in future wireless networks is the development of resource allocation schemes able to strike the optimal balance between reliably transmitting with high rates and saving as much energy as possible. The aim of this tutorial is to provide a solid theoretical framework to model and handle energy-efficient problems in future heterogeneous and small-cell networks, as well as to describe the latest findings in the field.

The tutorial is divided into two parts. Energy-efficient problems are naturally formulated as fractional problems in which the ratio between the performance in terms of rate and reliability, and the consumed energy, is to be optimized. The first part of the tutorial provides the audience with a comprehensive overview on fractional programming theory, explaining the concepts and key-tools to understand and formulate energy-efficient problems. By means of simple examples we will show how different energy-efficient problems from real-world systems fit into the fractional theory framework. The essential notion of generalized convexity is introduced and the most

popular approaches and algorithms to solve fractional problems are described. At the end of Part I, the audience will be able to tackle the widely-encountered single-ratio maximization problem, as well as more advanced problems such as the maximization of a sum of ratios or of the minimum of a family of ratios, which are also often encountered in heterogeneous networks and in worst-case designs. The second part of the tutorial focuses on state-of-the-art applications and results. In particular, OFDMA, MIMO, and multi-hop networks are considered, with particular emphasis on future heterogeneous and small-cell wireless networks.

The focus is both on cooperative resource allocation schemes to be centrally implemented, and on distributed algorithms which allow for self-organizing networks. Centralized and distributed schemes are compared in terms of performance, feedback requirements, and computational complexity, clearly pointing out pros and cons of the two approaches. The latest research directions and open issues are discussed, describing the challenges that future cellular networks pose as far as energy-efficient designs are concerned. The target audience includes both academic researchers interested in studying the theoretical foundation of energy-efficient wireless communications, and industry practitioners wishing to learn the latest results and findings about energy efficiency in wireless networks.

Short Biography: Alessio Zappone obtained his Master degree in telecommunication engineering and his Ph.D. degree in electrical engineering in 2007 and 2011, respectively, from the Università degli Studi di Cassino e Del Lazio Meridionale, Italy. His Ph.D. studies were focused on distributed algorithms for energy-efficient resource allocation in wireless networks. After obtaining his Ph.D. Alessio worked as a Post-doc researcher with CNIT (Consorzio Nazionale Interuniversitario per le Telecomunicazioni) until 2012. During this period he worked on both centralized and distributed energy efficiency optimization in the framework of the FP7 EU-funded project TREND. Since October 2012, Alessio is with the Technische Universität Dresden, serving as project leader of the project GEMRIN (Competitive resource allocation for Energy efficiency Maximization in Relay-assisted Interference wireless Networks), funded by the German research foundation (DFG). Alessio's research interests lie in the area of communication networks and signal processing, with main focus on resource allocation techniques for energy efficiency optimization.

Eduard A. Jorswieck was born in 1975 in Berlin, Germany. He received his Diplom-Ingenieur (M.S.) degree and Doktor-

Ingenieur (Ph.D.) degree, both in electrical engineering and computer science from the Technische Universität Berlin, Germany, in 2000 and 2004, respectively. He was with the Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut (HHI) Berlin, in the Broadband Mobile Communication Networks Department from December 2000 to February 2008. From April 2005 until February 2008, he was a lecturer at the Technische Universität Berlin. From February 2006 until February 2008, he worked for the Department of Signals, Sensors and Systems at the Royal Institute of Technology (KTH) as a post-doc and Assistant Professor. Since February 2008, he has been the head of the Chair of Communications Theory and Full Professor at Dresden University of Technology (TUD), Germany. Eduard's main research interests are in the area of signal processing for communications and networks, applied information theory, and communications theory. He has published more than 60 journal papers and some 180 conference papers on these topics. Dr. Jorswieck is senior member of IEEE. He is member of the IEEE SPCOM Technical Committee (2008-2013). Since 2011, he acts as Associate Editor for IEEE Transactions on Signal Processing. Since 2008, continuing until 2011, he has served as an Associate Editor for IEEE Signal Processing Letters. Since 2012, he is Senior Associate Editor for IEEE Signal Processing Letter. Since 2013, he serves as Associate Editor for IEEE Transactions on Wireless Communications. In 2006, he received the IEEE Signal Processing Society Best Paper Award.

Friday 29th August
@ 10:50, Room EUROPA



Henk Wymeersch

Chalmers University of Technology
Sweden

Network Processing with Bayesian Graphical Models, with Applications to Distributed Positioning and Sensing

Abstract: Bayesian inference in wireless networks is based on a number of generic building blocks. Two of these blocks are Bayesian graphical models and average consensus, which are arguably the most important. Using these building blocks relies on knowledge from Bayesian statistics, wireless communications, graph theory, and optimization. The aim of this

tutorial is to provide an introduction of both tools and apply them to several practical distributed inference problems, selected from recent technical literature. Our approach is hands-on with many practical problems, which are solved by the attendants. At the same time, we will go over fundamental results in terms of applicability and convergence. A final part of the tutorial will be devoted to distributed control strategies for wireless networks, with the explicit aim to improve the inference. This part relies on tools from Fisher information and information theory.

Short Biography: Henk Wymeersch is an Associate Professor with the Department of Signals and Systems at Chalmers University of Technology, Sweden. He is also affiliated with the FORCE research center on fiber-optic communication, and is the PI of COOPNET, an ERC project on cooperative networks. Prior to joining Chalmers, he was a Postdoctoral Associate during 2006-2009 with the Laboratory for Information and Decision Systems (LIDS) at the Massachusetts Institute of Technology (MIT). Henk Wymeersch obtained the Ph.D. degree in Electrical Engineering/Applied sciences in 2005 from Ghent University, Belgium. For his thesis, he won the 2006 Alcatel Bell Scientific

Award. He received a fellowship from the Belgian American Educational Foundation in 2005-2006. He is a member of the IEEE, and served Associate Editor for IEEE Transactions on Wireless Communications (2013-present), for IEEE Communication Letters (2009-2013) and the Transactions on Emerging Telecommunications Technologies (ETT) (2011-present). He served as Guest Editor for EURASIP Journal on Wireless Communications and Networking (special issue on Localization in Mobile Wireless and Sensor Networks), and for EURASIP Journal on Advances in Signal Processing (special Issue on Signal Processing Techniques for Anywhere, anytime positioning). He has co-authored over 100 contributions in journals and international conferences, and is the author of Iterative Receiver Design (Cambridge University Press, August 2007). In 2009, he was part of a team that won the L3 Communications Prize at the 2009 Soldier Design Competition, for the practical demonstration of cooperative ultra-wide bandwidth (UWB) localization. Other awards include a best paper award at Globecom 2009 and a NEWCOM++ best paper award in 2010. His research interests include algorithm design for wireless transmission, statistical inference and iterative processing.

ISWCS 2014 Workshops

Tuesday 26th August
@ 9:00, Room ICÀRIA

Low-EMF Radio-link Technologies and Wireless Networks Management

General Chair:

Ramón Agüero Calvo, University of Cantabria, Spain

General Vice-Chairs:

Milos Tesanovic, Fujitsu Laboratories of Europe Ltd., UK

Antonio De Domenico, CEA LETI, France

The main focus of the existing EMF exposure evaluation framework is conformance testing using worst-case scenarios, in which wireless networks equipment and mobile terminals transmit at maximum power levels, and uplink (UL) and downlink (DL) are treated separately. The mounting worries about the exposure of end-users to EMF could change the users' view of QoS, making EMF exposure an integral part of day-to-day network performance.

Hence, the Workshop is envisaged as an inter-disciplinary forum centred on the topic of low-EMF networking and its impact on future networks deployment. The Workshop is aimed at EMF exposure and Green Wireless experts, radio-link design and standardisation specialists, network designers, representatives of operators and manufacturers, as well as regulatory and standardisation bodies representatives (including 3GPP, CENELEC, IEEE). It is expected that representatives of funding bodies including the EC, as well as some of the existing research projects in the field of low-EMF technologies will find the Workshop useful.

- ◆ **Opening Keynote: ANFR and exposure of the public to electromagnetic fields (Dr. Emmanuelle Conil, ANFR)**

Abstract: In France, the rollout of the 4th generation's network and the arrival of a new operator have increased public's attention to the exposure to electromagnetic fields (EMF). ANFR, the French public spectrum agency, is a neutral technical expert supporting the government regarding the exposure of the public to EMF. ANFR ensures the compliance with regulatory limits values, maintains and updates measurement protocol, manages the process to measure EMF and controls the conformity of terminal equipment on the market. The can make any proposal to the government to reduce the EMF exposure.

French government has commissioned technical works aiming at studying the feasibility of reducing the exposure related to radiotelephony base stations, while maintaining existing coverage and quality of service. The report has showed that to insure a 0.6 V/m maximal exposure the number of transmitting sites has to be multiplied by at least three. New studies will probably be initiated in the near future in order to take into account all the sources of emissions in particular the mobile phones.



Short Biography: Emmanuelle Conil received her engineer degree from the École Centrale, Lille, France, in 2002 and her Ph.D. degree in physics from the Grenoble Institute of Technology, France, in 2005. After a postdoctoral position at the Electromagnetics Research Department at the engineering institute SUPELEC, Gif-sur-Yvette, France, she joined in 2007 Orange Labs, Issy-les-moulineaux, France as a research engineer on the interactions of radio-frequency waves with human bodies. Since 2014, she has worked for the French national frequencies agency (ANFR) in charge in particular of the enforcement of the regulation on the exposure of the public to electromagnetic fields.

- ◆ **Panel: Minimizing network roll-out delays—future-proofing wireless networks against exposure concerns and reducing any potential increase in EMF levels**

Abstract: EMF exposure from wireless communication networks is often cited as a major cause of public concern and is frequently given considerable media coverage. This has had ramifications on roll-out times for future network deployments, potentially negatively affecting the emerging trend of network densification. In many countries, severe constraints have as a result been put on addition of new cell sites. Current standards and metrics are built to either specifically measure the compliance of a given device or to evaluate the exposure at a specific location in a given system, which operates at a maximum power level. Additionally, current metrics do not take user QoS into account, including various ways in which EMF levels could be reduced while maintaining the required QoS.

Recently developed concepts of population exposure aim at quantifying the cumulative effect of the RF-EMF on a population living and working in an area. These new metrics for global EMF

exposure combine near and far-field exposure with a view to providing a tangible EMF footprint of the wireless networks. The panel will build on the invited talk and papers presented and will cover:

- A debate around new metrics for global EMF exposure combining near and far-field exposure
- The commonly used radio access technologies (RATs), the ways in which they are managed, and how their deployment and management impact the EMF levels
- How to introduce EMF into day-to-day management of wireless networks and changes in the existing networks required for this
- The design and deployment of low-EMF, QoS-aware radio link technologies and network architectures
- How to create and foster a new inter-disciplinary community centred around low-EMF networking



Short Biography: Dino Flore received a M.S. degree in Electrical Engineering from the Politecnico di Torino, Italy and a M.S. degree in Mobile Communications from the EURECOM Institute, France, in 2000. From 2001 to 2003 he worked at Arraycomm as Senior Research Engineer on smart antenna technology. In 2003 Dino joined Qualcomm where he is currently serving as a Director of Technical Standards, with a leadership role in the area of 3GPP RAN standardization. Since 2005 Dino has contributed to the design, development and specification of 3G and LTE systems through active participation in 3GPP RAN. From August 2009 to May 2013 he has served as Chairman of 3GPP RAN WG3, the Working Group responsible for the access network interfaces. In March 2013 he was elected Chairman of 3GPP RAN, the Technical Specification Group with overall responsibility for the radio interface and access network for both 3G and LTE.



Short Biography: Milica Popovic joined Telekom Srbija in 2003. She worked as an access network development engineer and licensed designer for wireline and wireless networks. She was also engaged in planning, construction, interoperability and acceptance testing and troubleshooting in the access and transport network. Participated in and led trials and deployments of new technologies in fixed and mobile network: WLL (FH-CDMA and DS-SS-CDMA), MSAN devices, DSL cables design, WiMAX, CDMA450, GLL (fixed service through GSM/UMTS network), LTE. She was involved in regulatory activities. She is currently working on high-level planning of the access, transport and core network. Since 2010 has participated on

behalf of Telekom Srbija in FP7 projects, LOLA and LEXNET. She graduated at the Faculty of Electrical Engineering, University of Belgrade, and department for telecommunications (M.Sc.), in 2002.



Short Biography: Ramón Agüero received his PhD in Telecommunications Engineering from the University of Cantabria in 2008, where he is an Associate Professor. He has participated in several collaborative research projects and his research focuses on future network architectures, especially on the (wireless) access part of the network. He is also interested on multi-hop networks and device-to-device communications. He has published more than 100 papers in such areas and he is a regular TPC member and reviewer on various related conferences and journals. At the moment, he is coordinating the activities of University of Cantabria within the LEXNET project.

Tuesday 26th August
@ 9:00, Room BOGATELL

Cognitive Radio Advances, Applications and Future Emerging Technologies (CRAFT)

Chairs: Panagiotis Demestichas (University of Piraeus, Greece), Adrian Kliks (Poznan University of Technology, Poland) and Kareem Baddour (Communications Research Centre Canada)

There has been a surge in wireless technologies over the last decade, which has led to the crowding of existing spectrum. In order to address the resulting congestion and shortage of capacity, the cognitive radio (CR) concept has been envisioned to increase the efficiency of spectrum utilization, and improve the management, performance and coexistence of heterogeneous networks with diverse radio access technologies.

Several research efforts are currently on-going around the world to introduce CR-related mechanisms at various OSI layers. A primary challenge being addressed is the identification of technical enablers for CR, i.e., theories, concepts, and practical algorithms to implement these mechanisms at a reasonable operational cost on flexible radio platforms. There have been many advances in the field of CR in recent years with respect to enabling environmental (spectrum) awareness and designing robust and flexible transmission techniques for hostile CR communication environments with varying channel conditions. However, there are still a number of open issues and

research challenges to be addressed before CR technology can become truly flexible and practical.

Issues with efficient spectrum management, real time implementation, CR security and applications, as well as regulatory and standardisation aspects, all require significant attention for operation in cognitive networks. In response to the above, the CRAFT Workshop aims to gather researchers, engineers and practitioners both from academia and industry (universities, research centres, network operators, etc.), as well as end users which aim to inspire the analysis and development of new solutions and realizations of the cognitive radio concept, and to present advanced flexible transmission techniques, platforms, and CR applications. The main focus of this workshop is on the practical implementation of the CR concept and the "shift-to-market" activity, including legal and economic aspects.

Tuesday 26th August
@ 9:00, Room BOGATELL

Spectrum Overlay through Aggregation of Heterogeneous Dispersed Bands (SOLDER)

Chairs of SOLDER: Fotis Foukalas (Athena RC, Industrial Systems Institute Greece), Florian Kaltenberger, (Eurecom-France), Guillaume Vivier (Sequans Communication, France), Somsai Thao (Thales Communications & Security SAS France), Sławomir Pietrzyk (IS-Wireless, Poland)

4G mobile communication systems achieve high data rates, which might be comparable with those achieved by landline communication systems. Several key technologies play significant roles towards this end, among them Carrier Aggregation (CA). Carrier Aggregation has been introduced in LTE since Release 10 (LTE-Advance) and is also used in recent WLAN system, sometimes referred as Channel or Carrier Bundling.

Carrier Aggregation consists in combining several carriers available within the communication system to enhance the data rate for the end-user. This could enable access to a very large bandwidth, and has the supplementary benefit of facilitating the use of fragmented spectrum for wireless operators. As a result, Carrier Aggregation has become a hot topic, both from the research perspective and from the commercial deployment standpoint.

This proposed workshop aims to discuss the applications and the challenges of Carrier Aggregation as deployed nowadays, with reflections on experience from prototyping, field trials or

commercial deployments. Moreover, the workshop will explore the evolution of Carrier Aggregation by addressing all kinds of aggregation, as pragmatic steps toward full flexible spectrum usage. In particular, the workshop will address the aggregation of heterogeneous radio access technologies and the use of LTE in license-exempt spectrum.

Tuesday 26th August
@ 9:00, Room SANT SEBASTIÀ

Advanced Multi-Carrier Techniques for Next Generation Commercial and Professional Mobile Systems

Chairs: Markku Renfors (Tampere University of Technology, Finland), Xavier Mestre (CTTC, Barcelona, Spain), Gerhard Wunder (Fraunhofer Heinrich-Hertz-Institut & TU Berlin, Germany), and Martin Haardt (TU Ilmenau, Germany)

Future communication systems will be characterized by their needs for increased flexibility, high data rate, efficient use of the fragmented spectrum, and bandwidth-efficient handling of unsynchronized transmissions. Heterogeneous networks, with co-existent systems of different bandwidth characteristics, in cell-based, device-to-device, and ad-hoc networking configurations should be accommodated. Such scenarios include cognitive radio and the co-habitation of broadband data services with narrowband professional mobile radio (PMR).

Furthermore, going beyond the Long Term Evolution (LTE) standard is a current trend, stemming from the need to improve the spectral characteristics and maximize the spectral efficiency, while preserving/improving the offered quality of service. Orthogonal frequency division multiplexing (OFDM) has been established as a simple and powerful approach to cope with many of these issues. However, CP-OFDM is not the most appropriate solution in the above scenarios. Nearly orthogonal, asynchronous waveform approaches such as filter bank multicarrier (FB-MC) techniques or even non-orthogonal waveforms, such as generalized frequency division multiplexing (GFDM) and universal filtered multicarrier (UFMC) have recently been shown to significantly outperform CP-OFDM in relevant application scenarios. The use of spectrally well-contained subcarrier frequency responses provides a major improvement in spectrum efficiency and relaxes the synchronization requirements and limitations for system cohabitation. The gains come, however, at the costs of increased complexity.

Tuesday 26th August
@ 9:00, Room MAR BELLA

Fourth International Workshop on Self-Organizing Networks (IWSON)

In recent years, there has been an increasing interest in the Self-Organizing Network (SON) paradigm applied to wireless communications networks. Approaching the challenges in radio network SON is a focus area in both industry and academia research. Currently, we note rising interest in field experience from early LTE SON deployments, SON coordination approaches and techniques, SON features tailored to the needs of multi-radio access technology and multi-layer networks/heterogeneous networks, SON in multi-vendor networks, and SON for future radio access technologies beyond LTE and LTE-Advanced.

With the success of the first three IWSON events in Budapest, Paris and Dresden, and the progressive focus on SON as the means to improve the performance and operability of mobile radio networks, it is timely and important to continue this workshop series bringing together people with SON interests. The scope of IWSON is intended to attract both industry and academia, primarily with a focus on 3GPP technologies such as LTE, but other systems can be considered as well.

Demonstrators

The *Demonstrator for Objective Driven SON Operation* shows a self-management system for heterogeneous mobile wireless networks that uses operator-defined weighted and network-context specific target values for Key Performance

Indicators (KPIs). From the KPI targets and models of the implemented SON functions a SON Policy is generated. A policy system uses the SON Policy to automatically and autonomously configure the SON functions such that they contribute to achieving the defined KPI targets by appropriately optimising the network configuration. Changes to the KPI targets or the network context lead to a re-configuration of the SON functions. The impact of the changes to the SON Policy, the SON function configuration and the network configuration can be seen and traced in the demonstrator's realistic network scenario and KPI charts.

The *Experimental System for SON Verification* shows a function for the verification of Configuration Management (CM) changes induced by the activity of SON function instances. The main part of this system is the SON Verification Function being triggered in case CM change requests get acknowledged by the SON coordinator. By analyzing Performance Management data it can detect undesired network behavior and thereupon send a request to the SON coordinator to undo the causative changes.

The demonstrator *SONVer: SON Verification for Operational Cellular Networks* shows a tool that uses anomaly detection and diagnosis techniques applied within a specified spatial scope larger than an individual cell, and that automatically classifies the state of the network in the presence of CM changes, indicating the root cause for anomalous conditions. The demonstrator uses KPIs and CM history from real cellular networks to determine the state of the network, to visualize anomalies at a large scale, and to identify the causes of anomalies and the group of cells that were affected.

Detailed Technical Program

Tuesday 26th August 2014

9:00 – 10:50

**Workshop on: EMF Radio-link Technologies and
Wireless Networks Management**

Room: ICÀRIA

- ◆ **Welcome and talk**
- ◆ **Strategies for reducing the global EMF exposure: cellular operators perspective**
Milica Popovic (Telekom Srbija, Serbia), Milos Tesanovic (Fujitsu Laboratories of Europe Ltd., United Kingdom), Benoit Radier (Orange France Telecom R&D, France).
- ◆ **Designing Green Wireless Access Networks: Optimizing towards Power Consumption versus Exposure of Human Beings**
Margot Deruyck (Ghent University / IBBT, Belgium), Wout Joseph (Ghent University, Belgium), Emmeric Tanghe (Ghent University, Belgium), David Plets (Ghent University, Belgium), Luc Martens (Ghent University, Belgium).
- ◆ **Towards EMF exposure assessment over real cellular networks: an experimental study based on complementary tools**
Thierry Sarrebourg (Orange-France Telecom, France), Laura Rodriguez de Lope (University of Cantabria, Spain), Abdelhamid Hadjem (Orange Labs, France), Luis Diez (University of Cantabria, Spain), Shoaib Anwar (Microwave Vision Group, Satimo Industries, France), Ramón Agüero (University of Cantabria, Spain), Yann Toutain (Microwave Vision, France), Joe Wiart (Orange- France Telecom, France).

11:10 – 12:50

- ◆ **Super Directive Antennas for Low Electromagnetic Field Mobile Communications**
Antonio Clemente (CEA-LETI Minatoc, France), Antonio De Domenico (CEA-LETI Minatoc, France), Dimitri Kténas (CEA, France), Christophe Delaveaud (CEA-LETI, France), Serge Bories (CEA, France).
- ◆ **Whole-body and Localized SAR and Dose Prediction Tool for Indoor Wireless Network Deployments**
David Plets (Ghent University - iMinds, Belgium), Wout Joseph (Ghent University, Belgium), Kris Vanhecke (Ghent

University, Belgium), Gunter Vermeeren (Ghent University, Belgium), Sam Aerts (Ghent University, Belgium), Margot Deruyck (Ghent University / IBBT, Belgium), Luc Martens (Ghent University, Belgium).

- ◆ **Panel discussion**

9:00 – 10:50

Workshops on: Cognitive radio Advances, applications and Future Emerging technologies (CRAFT) & Spectrum Overlay through Aggregation of Heterogeneous Dispersed Bands (SOLDER)

Room: BOGATELL

- ◆ **Welcome and Opening**
- ◆ **The Impact of Hardware Implementation on the Performance of Spectrum Sensing Algorithms**
Krzysztof Cichoń (Poznan University of Technology, Poland), Adrian Kliks (Poznan University of Technology, Poland).
- ◆ **MIMO channel analysis in the context of Body Area Networks**
Adrian Kliks (Poznan University of Technology, Poland), Pawel Kryszkiewicz (Poznan University of Technology, Poland), Michal Mackowiak (INDV-INESC / IST - University of Lisbon, Portugal), Luis M. Correia (IST - University of Lisbon, Portugal).
- ◆ **SNR Wall Analysis of Multi-Sensor Energy Detection with Noise Variance Estimation**
Daniel Rivello (Politecnico di Torino, Italy), Pawan Dhakal (Politecnico di Torino, Italy), Roberto Garelli (Politecnico di Torino, Italy).
- ◆ **Smart energy management of wireless technologies and mobile applications**
Dimitris Kelaidonis (University of Piraeus, Greece), Panagiotis Vlachas (University of Piraeus, Greece), Vassilis Foteinos (University of Piraeus, Greece), Antonis Moustakos (University of Piraeus, Greece), Theodoros Michalareas (Velti, Greece), Zhiyong Feng (Beijing University of Posts and Telecommunications, P.R. China), Meng Dexiang (China Mobile Group Design Institute Co.,

Ltd., P.R. China), Panagiotis Demestichas (University of Piraeus, Greece).

◆ **Inter-band Carrier Aggregation in Heterogeneous Networks: Design and Assessment**

Georgia D. Ntouni (Aristotle University of Thessaloniki, Greece), Alexandros-Apostolos A Boulogeorgos (Aristotle University of Thessaloniki, Greece), Dimitrios S. Karas (Aristotle University of Thessaloniki, Greece), Theodoros Tsiftsis Athena Research Innovation Centre, Greece, Fotis Foukalas (Aristotle University of Thessaloniki, Greece), Vasileios M. Kapinas (Aristotle University of Thessaloniki, Greece), George K. Karagiannidis (Aristotle University of Thessaloniki, Greece).

11:10 – 12:50

◆ **QoS-Aware Joint Uplink-Downlink Scheduling in FDD LTE-Advanced with Carrier Aggregation**

Abdulaziz M. Ghaleb (Qatar Mobility Innovations Center (QMIC), Qatar), Elias Yaacoub (Qatar Mobility Innovations Center (QMIC), Qatar), Ayad Atiyah Abdulkafi (Universiti Tenaga Nasional (UNITEN), Malaysia).

◆ **Cognitive radio results of ACROPOLIS NoE project**

14:20 – 16:20

◆ **Panel on:**

- Spectrum Sharing and Inherent challenges for LTE Carrier Aggregation
- Carrier Aggregation Schemes for typical Public Safety: Use Cases
- Licensed Shared Access with Aggregation Capabilities
- Practical Aspects of Carrier Aggregation Implementation
- The future of carrier aggregation in 5G

9:00 – 10:50

Workshop on: Advanced Multi-Carrier Techniques for Next Generation Commercial and Professional Mobile Systems

Room: SANT SEBASTIÀ

◆ **Introduction of 5GNOW project**

Gerhard Wunder

◆ **Introduction of EMPHAtiC project**

Xavier Mestre (Centre Tecnològic de les Telecomunicacions de Catalunya, Spain)

◆ **Integrating LTE Broadband System in PMR Band: OFDM vs. FBMC Coexistence Capabilities and Performances**

Yahia Medjahdi (Université Catholique de Louvain, Belgium), Le Ruyet Didier (Electronics and Communication Laboratory, France), Faouzi Bader (SUPELEC, France), Laurent Martinod (Cassidian Systems, France).

◆ **Spectral Efficient Channel Estimation Algorithms for FBMC/OQAM Systems: A Comparison**

Leonardo Gomes Baltar (Technische Universität München, Germany), Amine Mezghani (Technische Universität München, Germany), Josef A. Nossek (Technische Universität München, Germany).

◆ **A simplified scattered pilot design for FBMC/OQAM in high frequency selective channel**

Zhao Zhao (Huawei European Research Center, Germany), Nikola Vucic (Huawei Technologies Duesseldorf GmbH, Germany), Malte Schellmann (Huawei Technologies Duesseldorf GmbH, Germany).

11:10 – 12:50

◆ **Relaxed Synchronization Support of Universal Filtered Multi-Carrier including Autonomous Timing Advance**

Frank Schaich (Bell Labs, Alcatel-Lucent AG, Germany), Thorsten Wild (Bell Labs, Alcatel-Lucent AG, Germany).

◆ **Frequency Offset Estimation Based on PRACH Preambles in LTE**

Aijun Cao, Pei Xiao, Rahim Tafazolli

◆ **Frequency Domain Pilot-based Carrier Frequency Offset Estimation in SC-FDMA system**

Aijun Cao (ZTE Wistron Telecom AB, Sweden), Guangyi Wang (Surrey University, United Kingdom), Yi Ma (Surrey University, United Kingdom), Pei Xiao (Surrey University, United Kingdom), Rahim Tafazolli (Surrey University, United Kingdom).

◆ **Widely Linear Filtering based Kindred Co-Channel Interference Suppression in FBMC Waveforms**

Sladjana Josilo (Faculty of Technical Sciences, University of Novi Sad, Serbia), Milan Narandžić (Faculty of Technical Sciences, University of Novi Sad, Serbia), Stefan Tomić (Faculty of Technical Sciences, University of Novi Sad, Serbia), Slobodan Nedic (Faculty of Technical Sciences, University of Novi Sad, Serbia).

◆ **Efficient Adaptive Equalization of Doubly Dispersive Channels in MIMO-FBMC/OQAM Systems**

Christos Mavrokefalidis (University of Patras, Greece), Athanasios A. Rontogiannis (National Observatory of Athens, Greece), Eleftherios Kofidis (University of Piraeus, Greece), Antonis Beikos (Computer Technology Institute, Greece), Sergios Theodoridis (University of Athens, Greece).

14:20 – 16:20

- ◆ **On precoding MIMO-FBMC with imperfect channel state information at the transmitter**
Didier Le Ruyet (CNAM, France), Rostom Zakaria (CNAM, France), Berna Özbek (Izmir Institute of Technology, Turkey).
- ◆ **Real-domain SIC for MIMO with FBMC Waveforms**
Vladimir Stanivuk (Faculty of Technical Sciences, University of Novi Sad, Serbia), Stefan Tomić (Faculty of Technical Sciences, University of Novi Sad, Serbia), Milan Narandžić (Faculty of Technical Sciences, University of Novi Sad, Serbia), Slobodan Nedic (Faculty of Technical Sciences, University of Novi Sad, Serbia).
- ◆ **Fast-Convolution Implementation of Linear Equalization Based Multiantenna Detection Schemes**
Markku K. Renfors (Tampere University of Technology, Finland); Juha Yli-Kaakinen (Tampere University of Technology, Finland).
- ◆ **A margin adaptive scheduling algorithm for FBMC/OQAM systems**
Màrius Gaus (Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Spain), Ana Perez-Neira (UPC, Spain), Marco Moretti (Università di Pisa, Italy), Adrian Kliks (Poznan University of Technology, Poland).

9:00 – 10:30

International Workshop on Self-Organizing Networks (IWSN)

Room: MAR BELLA

- ◆ **Welcome and Opening**
- ◆ **Managing and Altering Mobile Radio Networks by Using SDN Function Performance Models**
Sören Hahn (Technische Universität Braunschweig, Germany), Thomas Kürner (Technische Universität Braunschweig, Germany).
- ◆ **SDN Management based on Weighted Objectives and Combined SDN Function Models**

Christoph Frenzel (University of Augsburg, Germany), Simon Lohmüller (University of Augsburg, Germany), Lars Christoph Schmelz (Nokia, Germany).

10:30 – 11:10

- ◆ **Demonstrator Installation**
Room: LOBBY and MAR BELLA

11:10 – 12:10

- ◆ **Performance Evaluation & SDN Aspects of Vertical Sectorisation in a Realistic LTE Network Environment**
Konstantinos Trichias (TNO, The Netherlands), Remco Litjens (TNO, The Netherlands), Zwi Altman (Orange Labs, France), Abdoulaye Tall (Orange Labs, France), Pradeepa Ramachandra (Ericsson Research, Sweden).
- ◆ **Performance of SDN for RSRP-based LTE/WLAN access network selection**
István Z. Kovács (Nokia, Denmark), Daniela Laselva (Nokia Siemens Networks, Denmark), Per Henrik Michaelsen (Nokia Siemens Networks, Denmark), Yu Wang (Ericsson, Sweden), Relja Djapic (TNO, The Netherlands), Kathleen Spaey (iMinds / University of Antwerp, Belgium).
- ◆ **Performance of WLAN RSS-based SDN for LTE/WLAN access network selection**
Yu Wang (Ericsson, Sweden), Relja Djapic (TNO, The Netherlands), Andreas Bergström (Ericsson, Sweden), István Z. Kovács (Nokia, Denmark), Daniela Laselva (Nokia Siemens Networks, Denmark), Kathleen Spaey (iMinds / University of Antwerp, Belgium), Bart Sas (iMinds, Belgium).

12:20 – 14:20

- ◆ **Demo: An Experimental System for SDN Verification (LOBBY)**
- ◆ **Demo: Demonstrator for Objective Driven SDN Operation (LOBBY)**
- ◆ **Demo: SDN Verification for Operational Cellular Networks (MAR BELLA)**

14:20 – 15:20

- ◆ **A Configuration Management Assessment Method for SDN Verification**
Tsvetko Tsvetkov (Technische Universität München, Germany), Szabolcs Nováczki (Nokia Siemens Networks, Hungary), Henning Sanneck (Nokia Solutions and

Networks, Germany), Georg Carle (Technische Universität München, Germany).

◆ **Managing Scope Changes for Cellular Network-level Anomaly Detection**

Gabriela F. Ciocarlie (SRI International, USA), Chih-Chieh Cheng (SRI International, USA), Christopher Connolly (SRI International, USA), Ulf Lindqvist (SRI International, USA), Szabolcs Nováczki (Nokia Siemens Networks, Hungary), Henning Sanneck (Nokia Solutions and Networks, Germany), Muhammad Naseer-ul-Islam (Nokia Solutions and Networks, Germany).

◆ **Autonomics and SDN for Self-Organizing Networks**

Giorgos Poullos (University of Piraeus, Greece), Kostas Tsagkaris (University of Piraeus, Greece), Panagiotis Demestichas (University of Piraeus, Greece), Abdoulaye Tall (Orange Labs, France), Zwi Altman (Orange Labs, France), Christian Destré (Orange Labs, France).

15:20 – 16:50

◆ **Demonstrator Session**

16:50 – 18:00

◆ **On Design Principles for Self-Organizing Network Functions**

Kristina Zetterberg (Ericsson Research, Sweden), Fredrik Gunnarsson (Ericsson Research, Sweden), Bart Sas (iMinds, Belgium), Zwi Altman (Orange Labs, France), Abdoulaye Tall (Orange Labs, France), Hans van den Berg (TNO, The Netherlands), Daniela Laselva (Nokia Siemens Networks, Denmark), István Z. Kovács (Nokia Siemens Networks, Denmark), Mehdi Amirijoo (Ericsson Research, Ericsson AB, Sweden), Hendrik Hoffmann (Technische Universität Braunschweig, Germany), Kathleen Spaey (iMinds / University of Antwerp, Belgium).

◆ **Wrap-up and closing**

Wednesday 27th August 2014

10:50 – 12:30

WI.1: 5G

Room: ICARIA

- ◆ **Improving Link Robustness in 5G Ultra-Dense Small Cells by Hybrid ARQ**
Marta Gatnau Sarret (Aalborg University, Denmark), Davide Catania (Aalborg University, Denmark), Frank Frederiksen (Nokia Siemens Networks, Denmark), Andrea F. Cattoni (Aalborg University, Denmark), Gilberto Berardinelli (Aalborg University, Denmark), Preben Mogensen (Aalborg University, Denmark).
- ◆ **A Distributed Interference-Aware Rank Adaptation Algorithm for Local Area MIMO Systems with MMSE Receivers**
Nurul H. Mahmood (Aalborg University, Denmark), Gilberto Berardinelli (Aalborg University, Denmark), Fernando M. L. Tavares (Aalborg University, Denmark), Preben Mogensen (Nokia Siemens Networks, Aalborg, Denmark)
- ◆ **Uplink Non-Orthogonal Multiple Access for 5G Wireless Networks**
Mohammed Al-Imari (University of Surrey, United Kingdom), Pei Xiao (University of Surrey, United Kingdom), Muhammad Ali Imran (University of Surrey, United Kingdom), Rahim Tafazolli (University of Surrey, United Kingdom)
- ◆ **Coping with the Upcoming Heterogeneity in 5G Communications and Storage Using Fulcrum Network Codes**
Daniel E. Lucani (Aalborg University, Denmark), Morten V. Pedersen (Aalborg University, Denmark), Janus Heide (Steinwurf, Denmark), Frank H.P. Fitzek (Aalborg University, Denmark)
- ◆ **Modelling Trust in Random Wireless Networks**
Justin P. Coon (University of Oxford, United Kingdom)

10:50 – 12:50

WI.2: Time-varying channels and PAPR

Room: BOGATELL

- ◆ **Performance of Mobile OFDM Systems over Time-varying Non-linearities with Memory**
Alexander Beremiz Hilario Tacuri (Pontificia Universidade Catolica do Rio de Janeiro, Brazil), Fortes Jose Mauro (PUC, Brazil)

- ◆ **Reinforcement-based data transmission in temporally-correlated fading channels: Partial CSIT scenario**
Behrooz Makki (Chalmers University of Technology, Sweden), Tommy Svensson (Chalmers University of Technology, Sweden), Mérouane Debbah (Supelec, France)
- ◆ **On the Study of Faster-than-Nyquist Multicarrier Signaling Based on Frame Theory**
Cyrille Siclet (GIPSA-Lab, France), Damien Roque (ISAE, France), Huaqiang Shu (Gipsa-Lab, France), Pierre Siohan (Orange Labs, France)
- ◆ **Spectral Shaping for Faster-Than-Nyquist Signaling**
Marwa El Hefnawy (DOCOMO Euro-Labs, Germany), Guido K E Dietl (University of Applied Sciences Landshut, Germany), Gerhard Kramer (Technische Universität München, Germany)
- ◆ **On the PAPR of SC-FDE Systems using Widely Linear Tomlinson-Harashima Precoding**
Bruno Chang (Federal University of Technology - Paraná, Brazil), Carlos Aurélio Rocha (Federal University of Santa Catarina, Brazil), Didier Le Ruyet (CNAM, France), Daniel Roviras (Cnam, France)
- ◆ **Experimental Assessment of WiMAX Transmissions under Highly Time-Varying Channels**
Pedro Suárez-Casal (University of A Coruña, Spain), José Rodríguez-Piñeiro (University of A Coruña, Spain), José A. García-Naya (University of A Coruña, Spain), Luis Castedo (University of A Coruña, Spain)

10:50 – 12:50

WI.3: Sensor Networks

Room: SANT SEBASTIA

- ◆ **Residual Energy-Based Transmission Schemes for Event Reporting Wireless Sensor Networks**
Carlos Alberto Guzmán Medina (Unidad Profesional Interdisciplinaria en Ingeniería y Tecnologías Avanzadas, Mexico), Mario E. Rivero-Angeles (Instituto Politecnico Nacional, Mexico), Gerardo Rubino (INRIA, France)
- ◆ **Low Complexity Duty Cycle Control with Joint Delay and Energy Efficiency for Beacon-enabled IEEE 802.15.4 Wireless Sensor Networks**
Yun Li (Queen Mary, University of London, United Kingdom), Kok Keong Chai (Queen Mary University of London, United Kingdom), Yue Chen (Queen Mary

University of London, United Kingdom), Jonathan Loo (Middlesex University, United Kingdom)

◆ **Randomized Gossip Protocol in Wireless Sensor Networks with Partial Sensor Involvement**

Zhiliang Chen (TU Darmstadt, Germany), Alexander Kuehne (TU Darmstadt, Germany), Anja Klein (TU Darmstadt, Germany)

◆ **Comparative study of in-sensor processing vs. raw data transmission using ZigBee, BLE and Wi-Fi for data intensive monitoring applications**

Khurram Shahzad (Mid Sweden University, Sweden), Bengt Delmann (Mid Sweden University, Sweden)

◆ **An Efficient Clustering Approach using Genetic Algorithm and Node Mobility in Wireless Sensor Networks**

Omar Banimelhem (Jordan University of Science and Technology, Jordan), Moad Y Mowafi (Jordan University of Science and Technology, Jordan), Eyad Taqieddin (Jordan University of Science and Technology, USA), Fahed H Awad (Jordan University of Science and Technology, Jordan), Manar Al Rawabdeh (Jordan University of Science and Technology, Jordan)

◆ **A Simulation Testbed to Jointly Exploit Multiple Image Compression Techniques for Wireless Multimedia Sensor Networks**

Fahed H Awad (Jordan University of Science and Technology, Jordan), Eyad Taqieddin (Jordan University of Science and Technology, USA), Moad Y Mowafi (Jordan University of Science and Technology, Jordan), Omar Banimelhem (Jordan University of Science and Technology, Jordan), Amani AbuQdais (Jordan University of Science and Technology, Jordan)

10:50 – 12:50

WI.4: Cognitive Radio I

Room: MAR BELLA

◆ **Robust Spectrum Allocation for Cognitive Radio Networks**

Germán Capdehourat (Universidad de la República, Uruguay), Federico Larroca (Universidad de la República, Uruguay), Pablo Belzarena (Universidad de la República, Uruguay)

◆ **Throughput Analysis of Secondary Network over a Medium-traffic Primary Network using Cooperative Spectrum Sensing**

Ramtin Rabiee (Nanyang Technological University (NTU), Singapore), Kwok Hung Li (Nanyang Technological University, Singapore)

◆ **Effective Capacity of Cognitive Radio Links: Accessing Primary Feedback Erroneously**

Majid Butt (Qatar University, Qatar), Ahmed Anwar (Qatar University, Qatar), Amr Mohamed (Qatar University, Qatar), Tamer ElBatt (Faculty of Engineering, Cairo University, Egypt)

◆ **Efficient use of Random Neural Networks for Cognitive Radio System in LTE-U/L**

Ahsan Adeel (Glasgow Caledonian University, United Kingdom), Hadi Larijani (Glasgow Caledonian University, United Kingdom), Ali Ahmadinia (Glasgow Caledonian University, United Kingdom)

◆ **Outage Probability of a Multi-Relay Cognitive Network with an Uncertain Number of Forwarding Relays**

Yulin Hu (RWTH Aachen University, Germany), James Gross (Royal Institute of Technology (KTH), Sweden), Anke Schmeink (RWTH Aachen University, Germany)

◆ **Model-Based Development for Cognitive radio applications**

Doussama Lazrak (IETR/SUPELEC, France), Christophe Moy (SUPELEC/IETR, France)

15:30 – 17:10

WZ.1: Energy-Efficiency & Green Communications

Room: ICÀRIA

◆ **Optimizing the Energy Efficiency of SIMO Receivers with Compact Uniform Linear Arrays**

Qing Bai (Technische Universität München, Germany), Amine Mezghani (TU Munich, Germany), Michel Ivrlač (Munich University of Technology, Germany), Josef A. Nassek (TU Munich, Germany).

◆ **Resource Scheduling to Jointly Minimize Receiving and Transmitting Energy in OFDMA Systems**

Lei Lei (Linköping University, Sweden), Di Yuan (Linköping University, Sweden), Chin Keong Ho (Institute for Infocomm Research, A*STAR, Singapore), Sumei Sun (Institute for Infocomm Research, Singapore).

◆ **Energy-Aware Resource Allocation with Energy Harvesting in Heterogeneous Wireless Network**

Jian Feng (Beijing University of Posts and Telecommunications, P.R. China), Mengxue Yinxia (BUPT,

P.R. China), Pingyang Wang (BUPT, P.R. China), Xing Zhang (Beijing University of Posts and Telecommunications, P.R. China), Wenbo Wang (Beijing University of Posts and Telecommunications, P.R. China).

◆ **Energy Efficiency Optimization in Hardware-Constrained Large-Scale MIMO Systems**

Xinlin Zhang (Chalmers University of Technology, Sweden), Michail Matthaiou (Queen's University Belfast, United Kingdom), Mikael Coldrey (Ericsson Research, Sweden), Emil Björnson (Linköping University, Sweden).

◆ **A powerful and real time PAPR reduction process for energy efficiency improvement in OFDM communication systems**

Marc Lanoiselée (Orange Labs, France), Hao Lin (France Telecom, France).

15:30 – 17:10

W2.2: SSG: Communications and Navigation for Decentralized Autonomous Devices

Room: BOGATELL

◆ **LTE-compatible 5G PHY based on Generalized Frequency Division Multiplexing**

Ivan Gaspar (Technische Universität Dresden, Germany), Luciano Leonel Mendes (Inatel, Brazil), Maximilian Matthé (Technical University Dresden, Germany), Nicola Michailow (Technische Universität Dresden, Germany), Andreas Festag (TU Dresden, Germany), Gerhard Fettweis (Technische Universität Dresden, Germany)

◆ **A mathematical framework for cooperative collision avoidance of human-driven vehicles at intersections**

Alessandro Colombo (Politecnico di Milano, Italy)

◆ **Communication Analysis for Centralized Intersection Crossing Coordination**

Erik Steinmetz (Chalmers University of Technology, Sweden), Robert Hult (Chalmers University of Technology, Sweden), Gabriel Rodrigues de Campos (Chalmers University of Technology, Sweden), Matthias Wildemeersch (Singapore University of Technology and Design (SUTD), Singapore), Paolo Falcone (Chalmers University, Sweden), Henk Wymeersch (Chalmers University of Technology, Sweden)

◆ **Tightly coupled position and attitude determination with two low-cost GNSS receivers**

Patrick Henkel (Technische Universität München, Germany), Michele Iafrancesco (Technische Universität München, Germany)

◆ **Multi-Agent Flocking with Noisy Anchor-Free Localization**

Siwei Zhang (German Aerospace Center (DLR), Germany), Ronald Raulefs (German Aerospace Center (DLR), Germany).

15:30 – 17:10

W2.3: LTE Networks

Room: SANT SEBASTIÀ

◆ **Mathematical Model for Vertical Sectorization (VS) in AAS Based LTE Deployment**

Dereje Woldemedhin Kifle (Nokia Solutions and Networks, Germany), Bernhard Wegmann (Nokia Solutions and Networks, Germany), Ingo Viering (Nomor Research GmbH, Germany), Anja Klein (TU Darmstadt, Germany)

◆ **An open-source simulation of QoE for video applications in Relay Enhanced LTE-A Networks**

Cesar A Sierra Franco (Pontifical Catholic University of Rio de Janeiro Rio de Janeiro, Brazil), José Roberto B. de Marca (PUC/Rio, Brazil)

◆ **Spectrum Splitting-Based Cognitive Interference Management in Two-Tier LTE Networks**

Diky Siswanto (University of Leeds, United Kingdom), Li Zhang (University of Leeds, United Kingdom), Keivan Navaie (University of Leeds, United Kingdom)

◆ **QoS Aware Pre-emption: a New Proposition for LTE Downlink Schedulers**

Saloua Hendaoui (High School of Communication of Tunis (SUPCOM), Tunisia), Nawel Zangar (Université de Versailles Saint Quentin en yvelines, France), Sami Tabbane (Sup Telecom, Tunisia)

◆ **Performance Comparison of LTE-A RAN Operating in 800MHz and 2.4GHz Bands for M2M Communications**

Fatemah A. Alsewaidi (University of Bristol, United Kingdom), Dritan Kaleshi (University of Bristol, United Kingdom), Angela Doufexi (University of Bristol, United Kingdom).

15:40 – 17:00

W2.4: Interference Alignment (IA)

Room: MAR BELLA

- ◆ **BER Enhancements for Practical Interference Alignment in the Frequency Domain**
Alexander Kuehne (TU Darmstadt, Germany), Adrian Loch (Technische Universität Darmstadt, Germany), Thomas Nitsche (IMDEA Networks, Spain), Joerg C. Widmer (Institute IMDEA Networks, Spain), Matthias Hollick (Technische Universität Darmstadt, Germany), Anja Klein (TU Darmstadt, Germany).
- ◆ **Relay-Aided Interference Alignment for Multiple Partially Connected Subnetworks**
Xiang Li (University of Rostock, Germany), Hussein A Al-Shatri (University of Rostock, Germany), Rakash SivaSiva Ganesan (TU Darmstadt, Germany), Daniel Papsdorf (TU Darmstadt, Germany), Anja Klein (TU Darmstadt, Germany), Tobias Weber (Uni Rostock, Germany)
- ◆ **Combining Interference Alignment and Two-Way Relaying in Partially Connected Networks with only Local CSI**
Daniel Papsdorf (TU Darmstadt, Germany), Rakash SivaSiva Ganesan (TU Darmstadt, Germany), Xiang Li (University of Rostock, Germany), Tobias Weber (Uni Rostock, Germany), Anja Klein (TU Darmstadt, Germany)
- ◆ **Iterative Interference Alignment in Macrocell-Femtocell Networks: A Cognitive Radio Approach**
Mohamed Rihan Elmeligy (Egypt Japan University of Science and Technology, Egypt), Osamu Muta (Kyushu University, Japan), Maha Elsabrouty (Egypt Japan University for Science and Technology, Egypt), Hiroshi Furukawa (Kyushu University, Japan)

17:20 – 18:40

W3.1: SS2: Advanced Small Cells for Future Systems

Room: ICÀRIA

- ◆ **Approximating the Interference Distribution in Large Wireless Networks**
Marios Kountouris (Supélec, France), Nikolaos Pappas (Linköping University, Sweden)
- ◆ **Efficient Small Cell Discovery Mechanism Exploiting Network Synchronization and Assistance for Future Radio Access Networks**
Hiroki Harada (NTT DOCOMO, INC., Japan), Satoshi Nagata (NTT DoCoMo, Inc., Japan), Yoshihisa Kishiyama (NTT

DOCOMO, INC., Japan), Hiroyuki Ishii (DOCOMO Innovations, Inc, Japan)

- ◆ **Analysis of Small Cell Partitioning in Urban Two-Tier Heterogeneous Cellular Networks**
Martin Taranetz (Vienna University of Technology, Austria), Tianyang Bai (The University of Texas at Austin, USA), Robert Heath (The University of Texas at Austin, USA), Markus Rupp (Vienna University of Technology, Austria)
- ◆ **Dynamic Clustering and Sleep Mode Strategies for Small Cell Networks**
Sumudu Samarakoon (Centre for Wireless Communications, University of Oulu, Finland), Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland), Walid Saad (Virginia Tech, USA), Matti Latva-aho (UoOulu, Finland)

17:20 – 18:20

W3.2: Device-to-Device Communications

Room: BOGATELL

- ◆ **Connectivity and Security in a D2D Communication Protocol for Public Safety Applications**
Leonardo Goratti (Create-net, Italy), Gary Steri (European Commission JRC, Italy), Karina Mabel Gomez (Create-Net, Italy), Gianmarco Baldini (Joint Research Centre - European Commission, Italy)
- ◆ **Investigation of Filter Bank Based Device-to-Device Communication Integrated into OFDMA Cellular System**
Hongnian Xing (Tampere University of Technology, Finland), Markku K. Renfors (Tampere University of Technology, Finland)

- ◆ **Link-Aware Opportunistic D2D Communications: Open Source Test-bed and Experimental Insights into their Energy, Capacity and QoS Benefits**

Alejandro Morales-Soler (Miguel Hernández University of Elche, Spain), Baldomero Coll-Perales (Miguel Hernández University of Elche, Spain), Javier Gozalvez (Universidad Miguel Hernandez de Elche, Spain)

17:20 – 18:40

W3.3: Detection

Room: SANT SEBASTIÀ

- ◆ **Multi-Branch Lattice Reduction Successive Interference Cancellation for Multiuser MIMO Systems**

José Arévalo García (Pontifical Catholic University of Rio de Janeiro, Brazil), Rodrigo C. de Lamare (University of York, United Kingdom), Keke Zu (University of York, United Kingdom), Raimundo Sampaio-Neto (Cetuc-Puc-Rio, Brazil)

- ◆ **Approximate ML Detector for MIMO Channels in Unknown Spatio-Temporal Colored Noise with Kronecker Product Correlation**
Stanislav Markus (Nizhny Novgorod State Technical University, Russia), Evgeny Mavrychev (Nizhny Novgorod State Technical University, Russia)
- ◆ **Resource Allocation for Secret Key Agreement by LLR Thresholding over Parallel Channels**
Alberto Dall'Arche (DEI - University of Padua, Italy), Stefano Tomasin (University of Padova, Italy)
- ◆ **A Linear Adaptive Algorithm for Data Fusion in Distributed Detection Systems**
Rodrigo David (Inmetro, Brazil), Raimundo Sampaio-Neto (Cetuc-Puc-Rio, Brazil), César A Medina (PUC-Rio, Brazil)

17:20 – 18:40

W3.4: Relaying I
Room: MAR BELLA

- ◆ **Resource Allocation for Distributed Beamforming with Multiple Relays and Individual Power Constraints**
Stephan Schedler (University of Rostock, Germany), Volker Kuehn (University of Rostock, Germany)
- ◆ **Spectral and Energy Efficiency in 3-Way Relay Channels with Circular Message Exchanges**
Bho Matthiesen (Technische Universität Dresden, Germany), Alessio Zappone (Dresden University of Technology, Germany), Eduard Jarswieck (TU Dresden, Germany)
- ◆ **Adaptive Delay-Tolerant Distributed Space-Time Coding in Opportunistic Relaying Cooperative MIMO Systems**
Tong Peng (University of York, United Kingdom), Rodrigo C. de Lamare (University of York, United Kingdom)
- ◆ **Analysis of Coverage Region for MIMO Relay Network with Multiple Cooperative DF-Relays**
Behrooz Razeghi (Ferdowsi University of Mashhad, Iran), Alireza Alizadeh (Ferdowsi University of Mashhad, Iran), Sima Naseri (Ferdowsi University of Mashhad, Iran), Ghosheh Abed Hodtani (Ferdowsi University of Mashhad, Mashhad, Iran), Seyed Alireza Seyedin (Ferdowsi university of Mashhad, Mashhad, Japan)

Thursday 28th August 2014

10:50 – 13:10

TH1.1: Resource Management

Room: ICÀRIA

- ◆ **User-centric Pre-selection and Scheduling for Coordinated Multipoint Systems**
Annika Klockar (Karlstad University, Sweden), Mikael Sternad (Uppsala University, Sweden), Anna Brunstrom (Karlstad University, Sweden), Rikke Apelfröjd (Uppsala University, Sweden)
- ◆ **Combining Dual Tessellation and Temporal Opportunities for Spectrum Reuse in Cellular Systems**
Juan Jose Alcaraz (Universidad Politécnica de Cartagena, Spain), Jose A. Ayala-Romero (Universidad Politécnica de Cartagena, Spain), Mario López-Martínez (Technical University of Cartagena, Spain), Javier Vales-Alonso (Universidad Politécnica de Cartagena, Spain)
- ◆ **Design Trade-offs for the Wireless Management Networks of Constraint Device Testbeds**
Justin Cinkelj (XLab LLC, Slovenia), Adnan Bekan (Jozef Stefan Institute, Slovenia), Marjan Sterk (XLAB LLC, Slovenia), Mihael Mohorcic (Jozef Stefan Institute, Slovenia), Carolina Fortuna (Jozef Stefan Institute, Slovenia)
- ◆ **Node Virtualization and Network Coding: Optimizing Data Rate in Wireless Multicast**
Mousie Fasil (TU Darmstadt, Germany), Alexander Kuehne (TU Darmstadt, Germany), Anja Klein (TU Darmstadt, Germany)
- ◆ **A framework for modeling and implementing QoS-aware Load Balancing solutions in WiFi Hotspots**
Mehmet Ali Ertürk (Istanbul University, Turkey), Luca Vollero (Universita' Campus Bio-Medico (Roma), Italy), M. Ali Aydin (Istanbul University, Turkey), Özgür Can Turna (Istanbul University, Turkey), Massimo Bernaschi (Italian National Research Council, Italy)
- ◆ **Optimized Mobile Connectivity for Bandwidth-Hungry, Delay-Tolerant Cloud Services toward 5G**
Osman N. C. Yilmaz (Nokia Research Center, Finland), Carl Wijting (Nokia Research Center, Finland), Petteri Lunden (Nokia Research Center, Finland), Jyri Hämäläinen (Aalto University, Finland)

◆ **Addressing Cell Edge Performance by Extending ANDSF and Inter-RAT UE Steering**

Luis Carlos BS Goncalves (ISCTE-IUL/Instituto de Telecomunicações, Portugal), Pedro Sebastião (ISCTE, Instituto de Telecomunicações, Portugal), Nuno Souto (ISCTE/Instituto de Telecomunicações, Portugal), Américo Correia (Instituto de Telecomunicações, Portugal)

10:50 – 12:50

TH1.2: Stat Models and Channel Estimation

Room: BOGATELL

- ◆ **Channel Estimation for Stationary Fading Channels: Orthogonal Versus Superimposed Pilots**
A. Taufiq Syhary (University of Bradford, United Kingdom), Stephan ten Brink (University of Stuttgart, Germany)
- ◆ **A Fast Subspace Channel Estimation for STBC-based MIMO-OFDM systems**
Biling Zhang (Beijing University of Posts and Telecommunications, P.R. China), Jung-Lang Yu (Fu Jen Catholic University, Taiwan), Jian-Wei Lai (Fu Jen Catholic University, Taiwan)
- ◆ **Mutual Information of Phase-Noise Impaired Wireless Networks**
Giuseppa Alfano (Politecnico di Torino, Italy), Alessio Zappone (Dresden University of Technology, Germany), Eduard Jorswieck (TU Dresden, Germany), Guido Montorsi (Politecnico di Torino, Italy)
- ◆ **Log-Cumulants-based Edgeworth Expansion for Skew-Distributed Aggregate Interference**
Giancarlo Pastor (Aalto University, Finland), Inmaculada Mora (Rey Juan Carlos University of Madrid, Spain), Antonio J. Caamaño (Rey Juan Carlos University of Madrid, Spain), Riku Jäntti (Aalto University School of Electrical Engineering, Finland)
- ◆ **On the PAPR of SC-FDE Systems using Widely Linear Tomlinson-Harashima Precoding**
Bruno Chang (Federal University of Technology - Paraná, Brazil), Carlos Aurélio Rocha (Federal University of Santa Catarina, Brazil), Didier Le Ruyet (CNAM, France), Daniel Roviras (Cnam, France)
- ◆ **Effects of Phase Shift Errors on the Antenna Directivity of Phased Arrays in Indoor Terahertz Communications**

Bile Peng (Technische Universität Braunschweig, Germany), Sebastian Priebe (Technische Universität Braunschweig, Germany), Thomas Kürner (Technische Universität Braunschweig, Germany)

10:50 – 12:50

TH1.3: Network Routing

Room: SANT SEBASTIÀ

- ◆ **Testbed-based Performance Evaluation of a Connectionless Multicast Protocol for MANETs**
Viet Thi Minh Do (Norwegian University of Science and Technology, Norway), Lars Landmark (Norwegian Defence Research Establishment (FFI), Norway), Øivind Kure (Norwegian University of Science and Technology (NTNU), Norway)
- ◆ **Modeling the network convergence time in RPL in error-prone, IEEE 802.15.4 chain topology multihop networks**
Hamidreza Kermajani (Technical University of Catalonia (UPC), Spain), Carles Gomez (UPC, Spain)
- ◆ **Low False Alarm Rate RPL Network Monitoring System by Considering Timing Inconstancy between the Rank Measurements**
Takumi Matsunaga (Keio University, Japan), Kentaroh Toyoda (Keio University, Japan), Iwao Sasase (Keio University, Japan)
- ◆ **Point-of-Interests Based Best Path Selection Using Cluster-based Routing**
Ahsan Mustafa (University of Engineering and Technology, Peshawar, Pakistan), Atif Jan (University of Engineering and Technology, Peshawar, Pakistan), Sahibzada Ali Mahmud (University of Engineering and Technology, Peshawar, Pakistan), Zeeshan Shafiq (University of Engineering and Technology, Peshawar, Pakistan), Gul Muhammad Khan (University of Engineering and Technology Peshawar, Pakistan), Mohammad Haseeb Zafar (University of Engineering and Technology, Peshawar, Pakistan)
- ◆ **RPL Modifications to Improve the End-to-End Delay Estimation in WSN**
Pedro Pinto (Instituto Politécnico de Viana do Castelo, Portugal), Antonio Pinto (INESC Porto, Portugal), Manuel Ricardo (Universidade do Porto, Portugal)
- ◆ **Accelerated Service Discovery in Vehicular Networks**
Christiane Reinsch (University of the West of Scotland, Germany), Qi Wang (University of the West of Scotland,

United Kingdom), Ansgar Gerlicher (Media University Stuttgart, Germany), Christos Grecos (University of West of Scotland, United Kingdom)

10:50 – 13:10

TH1.4: Joint Source Channel Coding & MIMO

Room: MAR BELLA

- ◆ **Explicit MMSE MIMO Transceiver Solution for Analog Joint Source Channel Coding**
Markus Rupp (Vienna University of Technology, Austria), Óscar Fresnedo (University of A Coruña, Spain), Luis Gastedo (University of A Coruña, Spain)
- ◆ **Design of MAC Access Schemes for Analog Joint Source Channel Coding**
Óscar Fresnedo (University of A Coruña, Spain), José P González-Coma (University of A Coruña, Spain), Luis Gastedo (University of A Coruña, Spain), Javier Garcia-Frias (University of Delaware, USA)
- ◆ **On beamforming performance in Wi-Fi outdoor networks**
Stefan Wendt (Orange Labs, France), Alain Chicot (Orange Labs R&D, France), Michel Skrok (Orange Labs R&D, France)
- ◆ **Optimization of Switched-Beam Arrays for Communication Systems**
Edson Schlosser (Universidade Federal do Pampa, Brazil), Roger Farias (Universidade Federal do Pampa, Brazil), Marcos V. T. Heckler (Universidade Federal do Pampa, Brazil), Renato Machado (Federal University of Santa Maria, Brazil)
- ◆ **Mean Square Error Beamforming in SatCom: Uplink-Downlink Duality with Per-Feed Constraints**
Andreas Gründinger (Technische Universität München, Germany), Michael Joham (Technische Universität München, Germany), Andreas Barthelme (Technische Universität München, Germany), Wolfgang Utschick (Technische Universität München, Germany)
- ◆ **Diversity Orders and Coding Gains of Repetition Coding and Transmit Laser Selection over MIMO Free-Space Optical Links**
Chadi Abou-Rjeily (Lebanese American University (LAU), Lebanon)
- ◆ **Optical MIMO: Results and Analysis**

Apostolos Karadimitrakis (University of Athens, Greece),
Mérouane Debbah (Supelec, France), Aris Moustakas
(University of Athens, Greece)

15:30 – 17:10

**TH2.1: SSI: Empowering Technologies of 5G Wireless
Communications I**

Room: ICÀRIA

◆ **Massive MIMO Architecture for 5G Networks: Co-Located,
or Distributed?**

Deli Qiao (Huawei Technologies, Inc., P.R. China), Ye Wu
(Huawei Technologies, P.R. China), Yan Chen (Huawei, P.R.
China)

◆ **Is Precoding for Massive MIMO Systems Well-Analyzed?**

Deli Qiao (Huawei Technologies, Inc., P.R. China), Ye Wu
(Huawei Technologies, P.R. China), Dageng Chen (Huawei
Technologies Co., Ltd., P.R. China)

◆ **Inter-cell interference management using Maximum Rank
Planning in 5G small cell network**

Fernando M. L. Tavares (Aalborg University, Denmark),
Gilberto Berardinelli (Aalborg University, Denmark), Nurul
H. Mahmood (Aalborg University, Denmark), Troels B.
Sørensen (Aalborg University, Denmark), Preben
Mogensen (Nokia Siemens Networks, Aalborg, Denmark)

◆ **Device Cooperation-Assisted Scalable Video Multicast
with Heterogeneous QoE Guarantees**

Yu Cao (Huawei Technologies Canada Co. Ltd., Canada),
Amine Maaref (Huawei Technologies Canada, Canada)

◆ **Spatial Coordination Strategies in Future Ultra-Dense
Wireless Networks**

Antonis G Gotsis (University of Piraeus, Greece), Stelios
Stefanatos (University of Piraeus, Greece), Angeliki
Alexiou (University of Piraeus, Greece)

15:30 – 17:10

TH2.2: Filter Bank Based Systems

Room: BOGATELL

◆ **Filter Bank Based Wideband Cognitive Radio Sensing
Using Joint Distribution of Pseudo Wishart Matrix
Eigenvalues**

Usama Y. Mohamad (University of Kassel, Germany), Dirk
Dahlhaus (University of Kassel, Germany)

◆ **Pilot Decontamination in CMT-based Massive MIMO
Networks**

Arman Farhang (CTVR Trinity College, Ireland), Amir
Aminjavaheri (University of Utah, USA), Nicola Marchetti
(CTVR Trinity College, Ireland), Linda Doyle (Trinity College
Dublin, Ireland), Behrouz Farhang-Boroujeny (University
of Utah, USA)

◆ **SDR Based Prototype for Filter Bank based Multi-Carrier
Transmission**

Ali Dziri (CNAM Paris, France), Christophe Alexandre
(CNAM, France), Rostom Zakaria (CNAM, France), Didier Le
Ruyet (CNAM, France)

◆ **Power Loading and Spectral Efficiency Comparison of
MIMO OFDM/FBMC for Interference Alignment Based
Cognitive Radio Systems**

Mohammed El-Absi (University of Duisburg-Essen,
Germany), Musbah Shaat (CTTC, Spain), Faouzi Bader
(SUPELEC, France), Thomas Kaiser (Universität Duisburg-
Essen, Germany)

◆ **PAPR Reduction for FBMC-QQAM Systems using
Dispersive SLM Technique**

S S Krishna Chaitanya Bulusu (Conservatoire National des
Arts et Metiers, France), Hmaied Shaiek (CNAM, France),
Daniel Roviras (Cnam, France), Rafik Zayani (Innov'COM
Lab, Sup'Com, Tunisia)

15:30 – 17:00

TH2.3: Relaying II

Room: SANT SEBASTIÀ

◆ **A Quantized Reliability-Relay Selection Method for
Wireless Cooperative Communications**

Wassim Alexan (The German University in Cairo, Egypt),
Ahmed E. El-Mahdy (The German University in Cairo,
Egypt)

◆ **A Dynamic Hybrid Antenna/Relay Selection Scheme for
the Multiple-Access Relay Channel**

Dimas Alves (Federal University of Santa Catarina, Brazil),
Renato Machado (Federal University of Santa Maria,
Brazil), Daniel Benevides da Costa (Federal University of
Ceara (UFC), Brazil), Andrei P Legg (Federal University of
Santa Maria, Brazil), Bartolomeu F. Uchôa-Filho (Federal
University of Santa Catarina, Brazil)

◆ **Linear Wireless Physical-layer Network Coding based on
binary matrices for Multilayer Relay Networks**

Alister G. Burr (University of York, United Kingdom), Dong
Fang (University of York, United Kingdom), Mehdi M. Molu
(University of York, United Kingdom)

◆ **Subset relay selection in wireless cooperative networks using sparsity-inducing norms**

Luis Blanco (CTTC, Spain), Montse Najar (Universitat Politècnica de Catalunya, Spain)

15:30 – 17:10

TH2.4: SS5 Cognitive and Co-operative Positioning

Room: MAR BELLA

◆ **Effect of Channel Variability on Pilot Design for Joint Communications and Positioning in OFDM**

Arash Shahmansoori (Universitat Autònoma de Barcelona (UAB), Spain), Rafael Montalban (Universitat Autònoma de Barcelona, Spain), Gonzalo Seco-Granados (Universitat Autònoma de Barcelona, Spain)

◆ **Cooperative Spectrum Sensing for Positioning in Cognitive Radios**

Francesco Benedetto (University of Roma Tre, Italy), Antonio Tedeschi (University Roma TRE, Italy), Gaetano Giunta (University of "Roma TRE", Italy)

◆ **Hand-Grip Impact on Range-based Cooperative Positioning**

Francescantonio Della Rosa (Tampere University of Technology, Finland), Tommi Paakki (Tampere University of Technology, Finland), Gianluca Della Rosa (Ekin Labs Ltd, Finland), Mauro Pelosi (Ekin Labs Ltd, Finland), Jari Nurmi (Tampere University of Technology, Finland)

◆ **RSS-Based Clustering of Mobile Terminals for Localization in Wireless Networks**

Hadi Nouredine (Supelec, France), Honggang Zhang (Université Européenne de Bretagne (UEB) and Supelec, France), Jacques Palicot (IETR/Supelec, France)

◆ **Cyclostationary features of downsampled 802.11g OFDM signal for cognitive positioning systems**

Pedro Figueiredo e Silva (Tampere University of Technology, Finland), Ondrej Daniel (Tampere University of Technology, Finland), Jari Nurmi (Tampere University of Technology, Finland), Elena Simona Lohan (Tampere University of Technology, Finland)

17:20 – 18:40

TH3.1: SS1: Empowering Technologies of 5G Wireless Communications II

Room: ICÀRIA

◆ **Blind Detection of SCMA for Uplink Grant-Free Multiple-Access**

Alireza Bayesteh (Huawei Technologies Co., Ltd., Canada), Eric Yi (Huawei Technologies Canada Co., LTD, Canada), Hosein Nikopour (Huawei Technologies Canada, Canada), Hadi Baligh (Huawei Canada, Canada)

◆ **Error reduction of channel estimation based on singular value decomposition**

Chang Wenting (University of Tsinghua, P.R. China), Guangjie Li (Intel China, P.R. China), Xu Zhang (Intel Labs China, P.R. China)

◆ **Dynamic Uplink-Downlink Optimization in TDD-based Small Cell Networks**

Mohammed Saad ElBamby (University of Oulu, Finland), Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland), Walid Saad (Virginia Tech, USA), Matti Latva-aho (UoOulu, Finland)

◆ **Content-Aware User Clustering and Caching in Wireless Small Cell Networks**

Mohammed Saad ElBamby (University of Oulu, Finland), Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland), Walid Saad (Virginia Tech, USA), Matti Latva-aho (UoOulu, Finland)

17:20 – 18:40

TH3.2: Multiuser MIMO

Room: BOGATELL

◆ **MU-MIMO Power Control under Statistical CSI and Probabilistic Constraints**

Krishna Chitti (University of Stuttgart, Germany)

◆ **Coordinated Tomlinson-Harashima Precoding Design Algorithms for Overloaded Multi-user MIMO Systems**

Keke Zu (University of York, United Kingdom), Bin Song (Ilmenau University of Technology, Germany), Martin Haardt (Ilmenau University of Technology, Germany), Rodrigo C. de Lamare (University of York, United Kingdom)

◆ **System-Level Throughput Evaluation of Multiuser MIMO Using Enhanced Codebook Considering User Mobility in LTE-Advanced Downlink**

Yanyan Ma (NTT DOCOMO, INC., Japan), Yu Jiang (DoCoMo Beijing Labs, P.R. China), Yuichi Kakishima (NTT DOCOMO, Inc., Japan), Satoshi Nagata (NTT DoCoMo, Inc., Japan), Yoshihisa Kishiyama (NTT DOCOMO, INC., Japan), Takehiro Nakamura (NTT DOCOMO, INC., Japan)

◆ **Robust Precoding for Network MIMO with Hierarchical CSIT**

Paul de Kerret (EURECOM, France), Richard Fritzsche (Technische Universität Dresden, Germany), David Gesbert (Eurecom Institute, France), Umer Salim (Intel Mobile Communications, France)

17:05 – 18:40

TH3.3: Localization
Room: SANT SEBASTIÀ

- ◆ **Weighted Consensus Algorithms for Distributed Localization in Cooperative Wireless Networks**
Gloria Soatti (Politecnico di Milano, Italy), Monica Nicoli (Politecnico di Milano, Italy), Andrea Matera (Politecnico di Milano, Italy), Silvia Schiaroli (Politecnico di Milano, Italy), Umberto Spagnolini (Politecnico di Milano, Italy)
- ◆ **Analysis of Wireless Localization with Golomb-optimized Multipoint Ranging**
Omotayo O Oshiga (Jacobs University Bremen, Germany), Giuseppe Abreu (Jacobs University Bremen, Germany)
- ◆ **Beacon Placement using Simulated Annealing for RSS-based Localization Systems**
Soufien Kammoun (Telecom ParisTech, France), Jean-Baptiste Pothin (DataHertz, France), Jean-Christophe Cousin (Telecom ParisTech, France)
- ◆ **Hybrid Indoor Localization using GSM Fingerprints, Embedded Sensors and a Particle Filter**
Ye Tian (Université Pierre et Marie Curie, France), Bruce Denby (Université Pierre et Marie Curie, France), Iness Ahriz (CNAM, France), Pierre Roussel (ESPCI-ParisTech, France), Gerard Dreyfus (ESPCI - Paristech, France)
- ◆ **Compressed Sensing-based Centralized Multiple Targets Localization**

Iness Ahriz (CNAM, France), Ali Dziri (CNAM Paris, France), Didier Le Ruyet (CNAM, France)

17:20 – 18:40

TH3.4: SS3: Distributed Caching in Wireless Networks
Room: MAR BELLA

- ◆ **Cache-enabled Small Cell Networks: Modeling and Tradeoffs**
Ejder Baştuğ (Supélec, France), Mehdi Bennis (Centre of Wireless Communications, University of Oulu, Finland), Mérouane Debbah (Supelec, France)
- ◆ **A Stochastic Geometry Approach to Distributed Caching in Large Wireless Networks**
Andrés Altieri (University of Buenos Aires, Argentina), Pablo Piantanida (SUPELEC, France), Leonardo Rey Vega (University of Buenos Aires, Facultad de Ingeniería, Argentina), Cecilia G. Galarza (University of Buenos Aires, Argentina)
- ◆ **Learning Distributed Caching Strategies in Small Cell Networks**
Avik Sengupta (Virginia Tech, USA), SaiDhiraj Amuru (Virginia Tech, USA), Ravi Tandon (Virginia Tech, USA), Michael Buehrer (Virginia Tech, USA), T. Charles Clancy (Virginia Tech, USA)
- ◆ **On the Average Performance of Caching and Coded Multicasting with Random Demands**
Mingyue Ji (University of Southern California, USA), Antonia Tulino (Bell Laboratories, USA), Jaime Llorca (Bell Labs, Alcatel-Lucent, USA), Giuseppe Caire (University of Southern California, USA)

Friday 29th August 2014

10:50 – 12:50

F1.1: Resource Allocation I

Room: ICARIA

◆ **Femtocells Coordination in Future Hybrid Access Deployments**

Christos J Bouras (University of Patras CTI&P-Diophantus, Greece), Georgios Diles (Computer Engineering and Informatics Dept., University of Patras, Greece), Vasileios Kokkinos (CTI Diophantus and University of Patras, Greece), Andreas Papazois (CTI and University of Patras, Greece)

◆ **A Conservative Approach to Sum Rate Maximization in Asynchronous Ad Hoc Networks using Multi-Carrier Modulation Schemes**

Juwendo Denis (CNAM, France), Mylene Pischella (CNAM, France), Le Ruyet Didier (Electronics and Communication Laboratory, France)

◆ **Joint User Association and Reuse Pattern Selection in Heterogeneous Networks**

Quan Kuang (Technische Universität München, Germany)

◆ **Resource Allocation in Block Diagonalization-based Multiuser MIMO-OFDMA Networks**

Guillem Femenias (University of the Balearic Islands, Spain), Felip Riera-Palou (University of the Balearic Islands, Spain), Javier Pastor-Pérez (University of the Balearic Islands, Spain)

◆ **Improving the Quality of Experience with Size-Based and Opportunistic Scheduling**

Magnus Proebster (Universität Stuttgart, Germany)

◆ **Neighbor-Friendly Autonomous Algorithm for Power Spectrum Allocation in OFDM Networks**

Rodolfo Torrea-Duran (KUL, Belgium), Paschalis Tsiaflakis (Bell Labs, Alcatel-Lucent, Belgium), Luc Vandendorpe (University of Louvain, Belgium), Marc Moonen (KU Leuven, Belgium)

10:50 – 12:30

F1.2: Multicell & CoMP

Room: BOGATELL

◆ **Clustering and Precoding Design for CoMP-CB in Downlink Heterogeneous Networks**

Paolo Baracca (Alcatel-Lucent, Germany), Danish Aziz (Alcatel-Lucent Bell Labs, Germany)

◆ **Discrete-Event Simulation of Backhaul Impact on Coordinated Multi-Point in LTE-Advanced**

Matteo Artuso (Technical University of Denmark, Denmark), Henrik Christiansen (Technical University of Denmark, Denmark)

◆ **Robust Linear Precoder for Coordinated Multipoint Joint Transmission under Limited Backhaul with Imperfect CSI**

Rikke Apelfröjd (Uppsala University, Sweden), Mikael Sternad (Uppsala University, Sweden)

◆ **Sum capacity maximization in distributed multicell MISO-OFDMA systems with reduced feedback links**

Berna Üzbek (Izmir Institute of Technology, Turkey), Didier Le Ruyet (CNAM, France), Mylene Pischella (CNAM, France)

◆ **Optimized Quantization Resolution for Limited CSI Feedback with Outage**

Richard Fritzsche (Technische Universität Dresden, Germany), Gerhard Fettweis (Technische Universität Dresden, Germany)

10:50 – 12:50

F1.3: Full-Duplex, Power Control and Hardware

Room: SANT SEBASTIÀ

◆ **High Efficient Rectenna Using a Harmonic Rejection Low Pass Filter for RF Based Wireless Power Transmission**

Min-Seok Han (KAIST, Korea), Hoon Sohn (KAIST, Korea), Seunghwan Jung (KAIST, Korea)

◆ **A W-Band Down-Conversion Mixer in 90 nm CMOS with Excellent Matching and Port-to-Port Isolation for Automotive Radars**

Stephen Yo-Sheng Lin (National Chi Nan University, Taiwan)

◆ **A New In-band Full-duplex Transmission Scheme Using Alamouti's Code in Fast Fading Environment**

Dongkyu Kim (CTD division, LG Electronics, Korea), Haesoon Lee (Yonsei University, Korea), JaeYeong Choi (Yonsei University, Korea), Daesik Hong (Yonsei University, Korea)

◆ **Robust Multi-User Decode-and-Forward Relaying with Full-Duplex Operation**

Omid Taghizadeh (RWTH Aachen University, Germany), Rudolf Mathar (RWTH Aachen University, Germany)

◆ **Signal and Noise Power Maximum Likelihood Estimation for Fast AGC In Packet Based Systems**

Steven Ferrante (Interdigital Communications, USA), Philip Pietraski (InterDigital Communications, USA)

◆ **Complexity-Reduced Optimal Power Allocation in Passive Distributed Radar Systems**

Omid Taghizadeh (RWTH Aachen University, Germany), Gholamreza Alirezaei (RWTH Aachen University, Germany), Rudolf Mathar (RWTH Aachen University, Germany)

15:30 – 17:10

F2.1: Cognitive Radio II

Room: ICÀRIA

◆ **Optimal Power Control for Cooperative Underlay Cognitive System**

Marwa Chami (CNAM, France), Mylene Pischella (CNAM, France), Le Ruyet Didier (Electronics and Communication Laboratory, France)

◆ **Distributed Power Allocation for Cognitive Noncooperative BIC-OFDM Systems**

Paolo Del Fiorentino (University of Pisa, Italy), Riccardo Andreotti (University of Pisa, Italy), Vincenzo Lottici (University of Pisa, Italy), Filippo Giannetti (University of Pisa, Italy), Ivan Stupia (Université Catholique de Louvain, Belgium)

◆ **Efficient Decentralized Dynamic Spectrum Learning and Access Policy for Multi-standard Multi-user Cognitive Radio Networks**

Sumit Jagdish Darak (Université Européenne de Bretagne (UEB), France), Honggang Zhang (Université Européenne de Bretagne (UEB) and Supelec, France), Jacques Palicot (IETR/Supelec, France), Christophe Moy (SUPELEC/IETR, France)

◆ **Iterative Primary Systems Detection and Complexity Reduction for Spectrum Sharing Technique**

Kohei Ohno (Meiji University, Japan), Makoto Itami (Tokyo University of Science, Japan), Tetsushi Ikegami (Meiji University, Japan)

◆ **Spectrum Sensing in MIMO Cognitive Radio with Temporally and Spatially Correlated Signal**

Sikandar Kumar (Indian Institute of Technology Guwahati, India), Sonali Chouhan (Indian Institute of Technology Guwahati, India)

15:30 – 17:10

F2.2: Energy Efficient Networks

Room: BOGATELL

◆ **Minimum Power Broadcast Trees Subject to Interference**

Rebal Al-Jurdi (American University of Beirut, Lebanon), Ghadi Sayegh (American University of Beirut, Lebanon), Hawraa Salami (American University of Beirut, Lebanon), Ibrahim Abou-Faycal (American University of Beirut, Lebanon), Fadi Zaraket (American University of Beirut, Lebanon)

◆ **Energy Savings in Heterogeneous Networks with Clustered Small Cell Deployments**

Emmanuel Ternon (DOCOMO Euro-Labs, Germany), Patrick Agyapong (DOCOMO Euro-Labs, Germany), Liang Hu (NTT DOCOMO EuroLab, Germany), Armin Dekorsy (University of Bremen, Germany)

◆ **Area Energy Efficiency Analysis for OFDMA Femtocell Networks**

Prabhu Chandhar (Indian Institute of Technology Kharagpur, India), Suvra Sekhar Das (Indian Institute of Technology Kharagpur, India)

◆ **PASC: Power Aware Scheduled Clustering in Wireless Sensor Networks**

Chérifa Boucetta (ENSI, Tunisia), Hanen Idoudi (National School of Computer Science - University of Manouba, Tunisia), Leila Azouz Saidane (ENSI, University of Manouba, Tunisia)

15:30 – 17:10

F2.3: QoS and Speech

Room: SANT SEBASTIÀ

◆ **Robust Remote Speaker Recognition System Based on AR-MFCC features and Efficient Speech activity detection Algorithm**

Ajjou Riadh (University of El-oued, Algeria), Sbaa Salim (LESIA Laboratory, Med Khider University Biskra, Algeria), Said Ghendir (Faculty of the Sciences and Technology, El-oued University, Algeria), Chamsa Ali (El-oued University, Algeria), Abdelmalik Taleb-Ahmed (Universit of Valenciennes and Hainaut Cambrésis, France)

◆ **A Cloud-based Service Recommendation System for Use in UCWW**

Ivan Ganchev (University of Limerick, Ireland), Zhanlin Ji (University of Limerick, Ireland), Máirtín O'Droma (University of Limerick, Ireland)

◆ **Voice Traffic Bicasting Enhancements in Mobile HSPA Network**

Vesa Hytönen (University of Jyväskylä, Finland)

◆ **Slicing the Next Mobile Packet Core Network**

Younghan Kim (Soongsil University, Korea), Van-Giang Nguyen (Soongsil University, Korea)

17:20 – 18:40

F3.1: SS4: Wireless Communications at Finite Blocklength

Room: ICÀRIA

◆ **A Complex-Integration Approach to the Saddlepoint Approximation for Random-Coding Bounds**

Alfonso Martinez (Universitat Pompeu Fabra, Spain), Jonathan Scarlett (University of Cambridge, United Kingdom), Marco Dalai (University of Brescia, Italy), Albert Guillén i Fàbregas (ICREA and Universitat Pompeu Fabra, Spain)

◆ **Diversity versus multiplexing at finite blocklength**

Johan Östman (Chalmers University of Technology, Sweden), Wei Yang (Chalmers University of Technology, Sweden), Giuseppe Durisi (Chalmers University of Technology, Sweden), Tobias Koch (Universidad Carlos III de Madrid, Spain)

◆ **Variable-length coding for short packets over a multiple access channel with feedback**

Kasper F Trillingsgaard (Aalborg University, Denmark), Petar Popovski (Aalborg University, Denmark)

◆ **Spatially Coupled Turbo Codes: Principles and Finite Length Performance**

Alexandre Graell i Amat (Chalmers University of Technology, Sweden), Saeedeh Moloudi (Lund University, Sweden), Michael Lentmaier (Lund University, Sweden)

17:20 – 18:20

F3.2: Multiple Access

Room: BOGATELL

◆ **On the Single-User Capacity of some Multiple Access Channels**

Jihad Fahs (American University of Beirut, Lebanon), Ibrahim Abou-Faycal (American University of Beirut, Lebanon)

◆ **SINR Tight Lower bound for Asynchronous OFDM-based Multiple-Access Networks**

Yahia Medjahdi (Université Catholique de Louvain, Belgium), Mustapha Amara (EURECOM, France), Jerome Louveaux (Université Catholique de Louvain, Belgium)

◆ **Extended Generalized DoF Optimality Regime of Treating Interference as Noise in the X Channel**

Soheil Gharekhloo (Ruhr Universität Bochum, Germany), Anas Chaaban (RUB, Germany), Aydin Sezgin (RUB, Germany)