

**Radio Technology SIG****'New developments in multiple access schemes'**

14 December 2017

This SIG is championed by Mark Beach, **University of Bristol**, Brian Collins, **BSC Associates**, Diego Giancola, **PA Consulting Group** and Peter Topham, **Qualcomm Technologies International**

**Venue: Old Hall, Girton College, Huntingdon Road, Cambridge, CB3 0JG**

**AGENDA**

**13:00** Registration and networking with lunch

**14:00** Introduction to Radio Technology SIG from **SIG Champion, Mark Beach, University of Bristol**

Session chaired by SIG Champion, Mark Beach, University of Bristol

**14:20** **'Radio resource management'**

**Michael Fitch, Chief of Wireless Research, BT**

The benefits of dynamic allocation of radio resource are examined.

**14:40** Q&A

**14:45** **'Massive MIMO a key enabler for sub-6GHz wireless connectivity'**

**Mark Beach, Professor of Radio Systems Engineering, University of Bristol @BristolCSN**

This talk will describe the operation of sub-6GHz massive MIMO and how the 'Marzetta' based architecture differs to SDMA baseband beamforming. A brief description of the NI based Bristol Massive MIMO system will be given alongside an overview of field trials and results obtained to date. The talk will conclude by proposing a list of open research questions in the field.

**15:05** Q&A

**15:10** **'Multi-RAT convergence - A new spin through the Edge!'**

**Ping-Heng Wallace Kuo, Staff Engineer, Interdigital @5G\_CORAL; @InterDigitalCom**

The talk will discuss a new spin to Multi-RAT convergence brought by the recent paradigm of Edge (including Fog) networking and computing. This new spin is being addressed in the European-Taiwan 5G-CORAL project launched in September 2017. The concept and architecture of 5G-CORAL will be presented.

**15:30** Q&A

**15:35** **Refreshments and networking**

Session chaired by SIG Champion, Brian Collins, BSC Associates

**16:10** **'Low Power Wide Area Networks: Simple Access Technologies to Create the Big Data'**

**Juan Nogueira, Director of the Center of Excellence for Wireless and Connectivity, Flex @FlexINTL**

Big Data is not only becoming important because of the large amount of collected data, but also because of the large amount of data sources that contribute to it and that enables to run data analytics on them to extract the valuable information hidden behind them. Many of these sources are low cost and remote Things, providing unfrequently small amounts of data. However, research and development in wireless technologies in the last decades have been focused in improving spectral efficiency by increasing modulation complexity, spatial diversity, etc., to come as close as possible to the Shannon limit. These technologies are oversized for the connectivity needs of these Things and too expensive for a positive return of the required investment. To fill this gap, new wireless access solutions based in old RF technologies, commonly known as Low Power Wide Area Networks (LPWAN), were developed in the last 4 years to provide the four "L" these Things were demanding: Low data rate, Long range, Low power consumption and Low cost. This talk will review the most adopted LPWAN technologies, namely LoRa, SigFox Ingenu and NB\_IoT, both from RF and market perspectives.

**16:30** Q&A

---

**16:35 'Physical Layer Approaches for Enabling Extreme Resource Sharing in Future Wireless Communication Systems'****Dr Konstantinos Nikitopoulos, Lecturer (Assistant Prof), Signal Processing for Wireless Communications, 5GIC, The University of Surrey**

There is a current paradigm shift from orthogonal to non-orthogonal signal transmissions that enables extreme sharing of the available resources, but it requires processing complexities far beyond the capabilities of traditional processors and heavy signalling requirements that can substantially reduce transmission efficiency. In this context, we show how new massively parallel detection/precoding approaches can overcome the current processing speed barriers. We also discuss how new physical layer approaches like super-modulation can efficiently enable asynchronous joint medium access and rateless data transmission, and substantially reduce the signalling overhead.

**16:55** Q&A

---

**17:00** Panel session with all speakers chaired by **SIG Champion, Mark Beach, University of Bristol**

---

**17:45** **Event closes**

---

With the permission of the speakers, presentations will be loaded to the CW website following the event

### Profile of organisers

#### Cambridge Wireless (CW)

CW is the leading international community for companies involved in the research, development and application of wireless and mobile, internet, semiconductor and software technologies. With over 400 members from major network operators and device manufacturers to innovative start-ups and universities, CW stimulates debate and collaboration, harnesses and shares knowledge, and helps to build connections between academia and industry. CW's 20 Special Interest Groups (SIGs) provide its members with a dynamic forum where they can network with their peers, track the latest technology trends and business developments and position their organisations in key market sectors. CW also organises major conferences and start-up competitions along with other high-quality industry networking events and dinners. With headquarters at the heart of Cambridge, UK, CW partners with other international industry clusters and organisations to extend its reach and remain at the forefront of global developments and business opportunities. [www.cambridgewireless.co.uk](http://www.cambridgewireless.co.uk)

### Profile of SIG Champions

#### Mark Beach, University of Bristol

Mark Beach received his PhD for research addressing the application of Smart Antenna techniques to GPS from the University of Bristol in 1989, where he subsequently joined as a member of academic staff. He was promoted to Senior Lecturer in 1996, Reader in 1998 and Professor in 2003. He was Head of the Department of Electrical & Electronic Engineering from 2006 to 2010, and then spearheaded Bristol's hosting of the EPSRC Centre for Doctoral Training (CDT) in Communications. He currently manages the delivery of the CDT in Communications, leads research in the field of enabling technologies for the delivery of 5G and beyond wireless connectivity, as well as his role as the School Research Impact Director. Mark's current research activities are delivered through the Communication Systems and Networks Group, forming a key component within Bristol's Smart Internet Lab. He has over 25 years of physical layer wireless research embracing the application of Spread Spectrum technology for cellular systems, adaptive or smart antenna for capacity and range extension in wireless networks, MIMO aided connectivity for through-put enhancement, Millimetre Wave technologies as well as flexible RF technologies for SDR modems underpins his current research portfolio. [www.bristol.ac.uk](http://www.bristol.ac.uk)

#### Brian Collins, BSC Associates

Brian has designed antennas for applications including radio and TV broadcasting, base stations, handsets and consumer products, and has operated his own consultancy firm for the last 12 years. He has published more than 70 papers on antenna topics and contributed chapters to several recent textbooks. He operates a small consultancy company, chairs the Antenna Interface Standards Group and is an Honorary Visiting Professor in the School of Electronic Engineering and Computer Science at Queen Mary, University of London. [www.bscassociates.co.uk](http://www.bscassociates.co.uk)

### **Diego Giancola, PA Consulting Group**

Diego has spent his career in radio systems R&D and modem design in the wireless communication sector, from 2G to the latest 4G evolutions. His research interests lie in multi-antenna systems and novel signal processing and architectures for radio signals. He currently co-runs PA's signal processing team and leads the research activities in LTE evolution and 5G landscaping. Diego has a first degree in telecommunication engineering and a doctorate in electronics and communication engineering from Politecnico di Milano. [www.paconsulting.com](http://www.paconsulting.com)

### **Peter Topham, Qualcomm Technologies Inc.**

Peter has more than 30 years' experience of RF and high-speed circuit design, taking chips into production ranging from FM Band II through cellular, Bluetooth and on to UWB at 10GHz. He has been with Qualcomm for 7 years, specialising in low-power RF design for portable and wearable products. [www.qualcomm.com](http://www.qualcomm.com)

## **Profile of speakers**

### **Mark Beach, Professor of Radio Systems Engineering, University of Bristol @BristolCSN**

Profile as above. [www.bristol.ac.uk](http://www.bristol.ac.uk)

### **Michael Fitch, Chief of Wireless Research, BT**

Michael Fitch works in BT Research and Innovation, providing technical leadership to a small research team specialising in physical and systems aspects of wireless communications. He is currently working on a number of projects on emerging wireless technologies such as mm-wave, spectrum sharing and 5G. In addition, he provides engineering consultancy to other parts of BT on wireless topics. Previous experience is with modelling and engineering of fixed and mobile links over satellite, cellular and point to multipoint systems. Michael holds a first degree in maths and physics, a PhD in satellite communications, is a visiting Professor of communications at the University of Strathclyde, and is a member of the IET. [home.bt.com](http://home.bt.com)

### **Ping-Heng Wallace Kuo, Staff Engineer, Interdigital @5G\_CORAL; @InterDigitalCom**

Ping-Heng (Wallace) Kuo is a staff engineer at InterDigital Europe, London, UK, focusing on pre-standard research of 5G radio access network technologies. He is currently involved in the European 5G-PPP 5G-Crosshaul and 5G-CORAL project, and additional collaborative projects in the UK researching radio access technologies for 5G and beyond. Prior to joining InterDigital in 2016, he has been a wireless communications technologies research engineer and a 3GPP RAN1 delegate at Industrial Technology Research Institute (ITRI) in Taiwan for 7 years. Ping-Heng also held a visiting scholar position at Harvard University in 2014, and he has served as an editor of Industry Perspectives Column for IEEE Wireless Communications Magazine in 2015. He received his Ph. D. from University of Canterbury, New Zealand, and conducted an internship at Samsung Advanced Institute of Technology (SAIT) in Korea. [www.interdigital.com](http://www.interdigital.com)

### **Dr Konstantinos Nikitopoulos, Lecturer (Assistant Prof.), Signal Processing for Wireless Communications, 5GIC, The University of Surrey**

Dr. Nikitopoulos is a Lecturer (Assistant Professor) with the Institute for Communication Systems, Electrical and Electronic Engineering Department, University of Surrey, Guildford, U.K. His recent research interests lie in the field of signal processing for wireless communication systems, with an emphasis in advanced transceiver design, in signal processing techniques for large MIMO systems and in massive parallel processing. He is a member of the 5G Innovation Centre, and he is leading the "Proof-of-Concept and mmWave Solutions" work area. Before joining the University of Surrey, he has held research positions with the Institute for Communication Technologies and Embedded Systems, RWTH Aachen University, with the California Institute for Telecommunications and Information Technology, University of California at Irvine, Irvine, and with the Computer Science Department, University College London. He has also been a consultant for the Hellenic General Secretariat for Research and Technology, where he also served as a National Delegate of Greece to the Joint Board on Communication Satellite Programs of European Space Agency. Dr Nikitopoulos is a recipient of the prestigious First Grant of the U.K.'s Engineering and Physical Sciences Research Council. [www.surrey.ac.uk/5gic](http://www.surrey.ac.uk/5gic)

### **Juan Nogueira, Director of the Center of Excellence for Wireless and Connectivity, Flex @FlexINTL**

Dr. Nogueira is director of the Center of Excellence for Wireless and Connectivity at Flex. In this role he is defining technology roadmaps, evaluating new innovative solutions, establishing strategic collaborations with partner companies and leading internal research programs in the field of wireless communication in general and Internet of Things in particular. Prior to working at Flex, he was Lead System Architect of advance development and system

architecture first at Robert Bosch GmbH and then at Bosch Connected Devices and Solutions GmbH (BCDS) in Reutlingen (Germany). In this position he defined the connectivity technology roadmap that later concluded with the foundation of BCDS as the Bosch subsidiary focused in connectivity and IoT. Before that, he worked in corporate R&D for wireless communication and sensing systems at Sony Corporation in Stuttgart (Germany) where he held the positions of Senior System Engineer and Principal Engineer. Dr. Juan Nogueira holds a PhD in Telecommunications Engineering from the University of Vigo (Spain). He subsequently became an associated professor at the University of Vigo in the Electronic Technology Department, collaborating with industry on projects in the area of industrial field buses. He has written numerous articles and holds 20+ patents in the area of communication protocols and wireless sensor networks. [flex.com](http://flex.com)