Radio Technology SIG

'Advance Techniques for Radio Transmitters'

25th September 2014

Jointly sponsored by CSR and Rohde & Schwarz

*This SIG is championed by **Brian Collins** of **BSC Associates, Diego Giancola** of **PA Consulting Group,***

John Haine** of **u-blox** and **Gerald Miaille** of **CSR

Venue: The Howard Theatre, Downing College, Regent Street, Cambridge, CB2 1DQ

AGENDA

11:45	Registration & Networking over lunch
12:45	Introduction to the Cambridge Wireless Radio Technology SIG from **Diego Giancola** of **PA Consulting Group**
12:55	Welcome from sponsor **Hamid Ahmadi, Vice President & Chief Innovation Officer, CSR**
13:00	Welcome from sponsor **Steve Edwards, Marketing and T&M Sales Manager, Rohde & Schwarz**
Session chaired by SIG Champion, Diego Giancola of PA Consulting Group	
13:05	**'System-level implications of 802.11 Transmit Beamforming'** **Swaroop Venkatesh, Director, Systems Architecture, CSR** The talk provides an overview of 802.11 transmit beamforming technology, followed by an outline of its impact on the design of 802.11 PHY and MAC layers.
13:35	Q&A
13:40	**'Potential of in-band full duplexing for future wireless systems'** **Alain Mourad, Wireless Specialist, InterDigital Europe Ltd** Recent advances in self-interference cancellation have opened the door for in-band full duplexing to become a real disruptive technology candidate for future wireless systems. Not only the technology promises up to 2x link spectral efficiency compared to half-duplex TDD and FDD, it also offers multiple other benefits such as reduced air interface latency, improved MAC efficiency, UL/DL decoupling, better trunking efficiency and spectrum sharing. Although significant progress has been made recently for the technology development, there is still a number of challenges that need to be tackled before the technology graduates for adoption in the forthcoming next generation wireless standards (e.g. 5G). This talk will give an introduction to the in-band full duplexing and highlight its potential benefits and challenges for future wireless systems.
14:10	Q&A
14:15	**'Challenges for Power Amplifier Testing with Envelope Tracking - concepts, pit falls, state of the art and trends'** **Rainer Lenz, Product Manager, Rohde & Schwarz** Mobile devices have become an important tool in our everyday life. We want to use them everywhere and all the time, unfortunately operation time is limited by battery capacity. During the recent years, mobile devices have made more and more use of all broadband access technologies which tend to consume a lot of battery capacity. In order to offer longer operation times, energy saving techniques have drawn the attention of all major chipset manufacturers. One of the key technologies is envelope tracking. This talk will have a look at the basic concepts of envelope tracking and will focus on the challenges which evolve once the design needs to be tested against its specifications - starting from required performance of the measurement equipment throughout the concepts for measuring all the required parameters of power amplifiers with Envelope Tracking Technology. A brief outlook will be given on what might be required in the future to keep pace with the latest trends in the wireless community.
14:45	Q&A
14:50	**Coffee/Tea & Networking**

Session chaired by SIG Champion, Gerald Miaille of CSR	
15:20	**'Envelope Tracking – fuel injection for the RF Front End'** **Jeremy Hendy, VP Marketing, Nujira** The presentation will introduce ET technology, explain how it overcomes the energy efficiency penalty introduced when transmitting advanced high data-rate waveforms with high PAPR, how it extends to MIMO systems, and how ET can ultimately enable single-chip CMOS integration.
15:50	Q&A
15:55	**'Programmable Wideband PA with Digital Pre-Distortion for High Efficiency'** **Chris Clifton, Chief Technology Officer & Technology Office Director, Sony SES** We will be discussing a wideband PA (700-3800MHz) PA which can be programmed digitally to meet the requirements for software defined radio architectures. A number of approaches for improving efficiency over the whole operating region will be presented and discussed together with the use of simulation techniques.
16:25	Q&A
16:30	**'Digital Pre-distortion – Transmitter System Engineering and Optimisation'** **Richard Hewitt, Co-founder and CTO, Systems4Silicon** Digital Pre-distortion (DPD) has been widely researched, however the papers don't contain the whole story or how to design a practical system. This talk will unearth some of the key engineering decisions that face today's transmitter system engineer when incorporating DPD and the challenges for DPD as transmit bandwidths increase.
17:00	Q&A
17:05	Panel Session with all speakers chaired by **SIG Champion, Gerald Miaille of CSR**
18:05	**Event closes** Please Fill in Evaluation Forms
Delegates are invited to attend the Founders' Dinner pre-dinner drinks, which are taking place at Downing College in the Grace Howard Room and are kindly sponsored by Rohde & Schwarz	
With the permission of the speakers, presentations will be loaded to the Cambridge Wireless website on the day 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 & mobile, internet, semiconductor and software technologies. With 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 the annual Future of Wireless International Conference and Discovering Start-ups competition 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. For more information, please visit www.**cambridgewireless**.co.uk

Profile of Sponsor

CSR plc

CSR is a global provider of innovative silicon and software solutions for the location-aware, media-rich, cloud-connected world. Our platforms are optimised for the automotive navigation and infotainment, digital cameras and imaging, connected home infotainment and wireless audio markets. We provide solutions to complex problems in the audio-visual, connectivity and location technology domains across a broad range of markets, with a technology portfolio that includes GPS/GNSS systems, Bluetooth®, Wi-Fi®, FM, NFC, aptX® and CVCTM audio codecs, JPEG, MPEG, H.264 imaging, PDL printing, microcontrollers, DSPs and broadband receivers. CSR's technology solutions and market

platforms enable its customers to deliver a superior user experience and are adopted by leaders in the auto, computer, home and mobile markets. For further information please visit www.**csr**.com

Dr Hamid Ahmadi, Vice President & Chief Innovation Officer, CSR

Dr Ahmadi is Vice President and Chief Innovation Officer at CSR Technologies Inc, a pioneering designer and developer of silicon and software for the consumer electronics market. He is responsible for CSR's innovation framework and technology strategy to achieve the company's ambition to increase revenues by creating unique and valuable technologies for our future products. He has maintained affiliation as visiting scholar with the Center for Networked Systems, University of California at San Diego since June 2009. Dr. Ahmadi received his B.S., M.S., and Ph.D. degrees in electrical engineering from Columbia University, NY, respectively. For further information please visit www.**csr**.com

Rohde & Schwarz UK

Rohde & Schwarz UK Ltd has been the UK subsidiary of Rohde & Schwarz GmBH for 40 years. Based in Fleet, RSUK employs 105 people to provide dedicated sales, services and support to customers across the UK and Ireland. Rohde & Schwarz has designed and manufactured the highest-quality specialist products in Germany for 77 years across a wide range of technologies and industries, including wireless, broadcast, aerospace, defence and security markets. For more information please visit www.**rohde-schwarz**.co.uk

Profile of SIG Champions

Brian Collins, BSC Associates

Brian Collins has designed antennas for applications from radio and TV broadcasting to base station and handset antennas. He has published more than 60 papers on antenna topics and contributed chapters to several recent textbooks. As well as his work with Antenova, Brian operates a small consultancy company, chairs the Antenna Interface Standards Group and is a Visiting Professor in the School of Electronic Engineering and Computer Science at Queen Mary, University of London. For more information please visit www.**bscassociates**.co.uk

Diego Giancola, PA Consulting

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. For more information please visit www.**paconsulting**.com

John Haine, u-blox AG

John Haine has spent his career in the electronics and communications industry working for British Telecom, Marconi, PA Consulting, and with start-ups including Cognito and Ionica. His technical background includes R&D in radio circuitry and microwave circuit theory; and the design of novel radio systems for cordless telephony, mobile data, and fixed wireless access. He has led standardisation activities in both the latter areas in ETSI, and contributed to WiMax. In 1999 he joined TTP Communications working on research, technology strategy and M&A activities; and af ter the company's acquisition by Motorola became a Director of Technology Strategy in Motorola Mobile Devices. After leaving Motorola he was CTO Enterprise Systems with ip.access Limited, the leading manufacturer of GSM picocells and 3G femtocells. In early 2010 he joined Cognovo Limited, which was acquired by u-blox AG in 2012. In u-blox John is defining RF platform strategy for future wireless modules and looking at emerging standards for M2M. John has a first degree from Birmingham and a doctorate from Leeds universities. For further information please visit www.**u-blox**.com

Gerald Miaille, CSR

Gerald Miaille has spent his entire career in the semiconductor industry, designing RF and mixed signal ICs for various wireless technologies including WLAN, BlueTooth, NFC, FM, SoftGPS as well as Cellular radios. He has developed novel ideas, which have seen patents as well as an engineering award appended to his name. Gerald currently works for Cambridge Silicon Radio (CSR plc) as a director of RF/Analog IC design. He leads two design centers which are developing state of the art wireless connectivity IC solutions for stand alone as well as Combo chips. For further information please visit www.**csr.**com

Profile of Speakers

Chris Clifton, Chief Technology Officer & Technology Office Director, Sony SES

Chris is Chief Technology Officer for Sony Semiconductor and Electronic Solutions (SES). His responsibilities include new technology/ product incubation as well as a number of the company's European research and development activities. Chris joined Sony's semiconductor operation in 1997, managing development and applications related activities for mobile RF products, Bluetooth chipsets and analogue devices for digital TV applications. More recently, his activities have included design and business development activities relating to display, image device and wireless system development. RF front-end device development for next generation communications terminals remains a strong interest area. Before joining Sony, Chris held positions as a Chief Design Engineer with GEC and RF Engineering Manager at DSC Communications. For further information please visit www.**sony-europe**.com

Jeremy Hendy, VP Marketing, Nujira

Jeremy Hendy is VP Marketing at Nujira. Before joining Nujira in 2009, he held marketing positions at Cambridge UWB start-up Artimi and video compression start-up Aspex Semiconductor. His technical background is in DSP and digital IC design gained at TI, Symbionics & Cadence and he graduated from the University of Liverpool. For further information please visit www.**nujira.**com

Richard Hewitt, Co-founder and CTO, Systems4Silicon

Richard Hewitt is co-founder and CTO at Systems4Silicon and has over 25 years' experience directly at the coal-face of wireless engineering. Richard helped to develop one of the first practical software designed radios for Racal and went on to HP-Labs, conducting early research into spread-spectrum for 3G and the use of OFDM for 802.11. More recently, he enjoys the engineering diversity of design service provision and the multi-disciplinary challenge posed by digital pre-distortion. For further information please visit www.**systems4silicon.**com

Rainer Lenz, Product Manager, Rohde & Schwarz

Rainer Lenz studied electrical engineering at the University of Karlsruhe (TH) where he got his Dipl.-Ing. degree and his PhD degree. After his studies, he worked several years in RF engineering and in system engineering. After that, he joined Rohde & Schwarz GmbH & Co. KG in Munich as product manager for signal generators and power meters. For more information please visit www.**rohde-schwarz**.co.uk

Alain Mourad, Wireless Specialist, InterDigital Europe Ltd

Alain Mourad holds a PhD degree (hons) in wireless communications from ENST Bretagne in France. In March 2014, he joined InterDigital Europe Ltd in the UK as a Wireless Specialist with focus on the development of new spectrally efficient technology for future wireless systems (5G and beyond). Prior to his work with InterDigital Europe, Dr Mourad was with Samsung Electronics R&D in the UK (Nov 2007 – Feb 2014) and Mitsubishi Electric R&D Centre Europe in France (Mar 2002 – Oct 2007), where his focus was on pre-standardization research and standardization of next generation wireless communication and broadcasting systems, namely 3GPP LTE, IEEE 802.16, DVB-T2/NGH, and ATSC 3.0. Dr Mourad is author of over 20 granted patents with many other patent applications, and over 35 scientific publications. He is the recipient of Samsung Electronics R&D UK Inventor of the Year Award for two consecutive years, in 2012 and 2013. For further information please visit www.**InterDigital**.com

Swaroop Venkatesh, Director, Systems Architecture, CSR

Swaroop Venkatesh has spent over a decade designing wireless communication and localization systems spanning academia and industry. He is currently Director, Wi-Fi System Architecture at CSR in San Jose, USA and has previously built and managed Wi-Fi and Bluetooth design teams at Marvell Semiconductor, USA. He has a Ph.D. in Electrical Engineering from Virginia Tech, and his broad interests are in analog and digital signal processing, communication system design and information theory. For further information please visit www.**csr**.com