CEPT Workshop on

New Spectrum Solutions for Industry Sectors

Organised by Electronic Communications Committee

Copenhagen, 2-3 May 2019

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CEPT Workshop on New Spectrum Solutions for Industry Sectors

Scandic Hotel Copenhagen, 2-3 May 2019

Workshop Programme

Day 1: Thursday 2 May 2019

Time	Presentation Title	Presenter
08.15 – 09.00	Registration	
09.00 – 09.15	Opening remarks	Chris Woolford, ECC Chair
Session 1 –Future demands of industry sectors (sectoral representatives) *(Session chair: Michael Sharpe, ETSI) 09.15-12.30 including 30 mins break*		
	1.1 Transportation	
09.20 – 09.40	1.1.1 Road ITS	Reza Karimi, 5GAA Niels Peter Skov Andersen, ETSI/Car-2-Car
09.40 – 10.00	1.1.2 Rail communications	Thomas Chatelet, ERA Yves Amsler, UITP
10.00 – 10.10	1.1.3 Maritime transport	David Hagen, Kongsberg Seatex
10.10 – 10.20	1.1.4 Aviation	Karim Jaser, SITA/SITAONAIR
10.20 – 10.50 Tea/Coffee		
	1.2 Telemetry and automation	
10.50 – 11.00	1.2.1 Industrial automation	Stefan Wimmer, m3connect
11.00 – 11.10	1.2.2 Smart cities (including low-power low-throughput networks)	Mark Beach, University of Bristol
11.10 – 11.20	1.2.3 Smart grids	Julian Stafford, EUTC
11.20 – 11.30	1.2.4 Healthcare	Saad Mezzour, Medtronic
	1.3 Consumer applications	
11.30 – 11.50	1.3.1 Media/entertainment (including PMSE)	Darko Ratkaj, EBU Alan March, APWPT
11.50 – 12.00	1.3.2 Smart homes	Daniel Hartnett, DECT Forum
	1.4 Government and citizens	
12.00 – 12.20	1.4.1 PPDR (including video)	Barbara Held, TCCA Manfred Blaha, PSCE/PSRG
12.30 – 13.30 Lunch		

Session 2 – Spectrum solutions (representatives from CEPT, operators, vendors (Session Chair: Thomas Weilacher, WGFM Chairman) 13.30-17.00 including 30 mins break		
2.1 General authorisation and spectrum sharing (see ECC Report 132)		
13.30 – 13.50	2.1.1 Licence exempt (including mmWave)	Detlef Fuehrer, Wi-Fi Alliance
13.50 – 14.10	2.1.2 LAA	Luigi Ardito, Qualcomm
14.10 – 14.40	2.1.3 Cognitive radio	Scott Blue, Microsoft Heikki Kokkinen, Fairspectrum
14.40 – 15.00	2.1.4 SRD data networks	Simon Dunkley, LPRA
15.00 – 15.30 Tea/Coffee		
15.30 – 16.10	**2.2 Cellular bands/networks**	Andy Hudson, GSMA Sverker Magnusson, GSA
16.10 – 16.40	**2.3 Satellite solutions**	Thomas Schmidt, Airbus/PT FM 44 Cécil Ameil, ESOA
16.40 – 16.50	**2.4 Evolution of policies for Gigabit society**	Christoph Legutko, Intel
17.00 Workshop close on the first day		

Day 2: Friday 3 May 2019

Time	Presentation Title	Presenter
Session 3 – How can administrations best balance the spectrum opportunities with the identified requirements? (representatives from administrations and verticals) (Session chair: Steve Green, ECC PT1 Chair) 09.00-12.30 including 30 mins break		
09.00 – 11.20	**3.1 Administrations**	David Botha, ITU BR Henk Verkerk, Netherlands Vincent Durepaire, France Heidi Himmanen, Finland Miguel Capela, Portugal Pavel Sistek, Czech Republic Daniel Bielefeld, Germany Heli Frosterus, United Kingdom
11.20 – 11.50 Tea/Coffee		
11.50 – 12.30	**3.2 Verticals**	Michael Sharpe, ETSI Ulrich Rehfuess, Digital Europe
Session 4 – Follow up actions (Session chair: Chris Woolford, ECC Chair) 12.30-13.00		
12.30 – 13.00	**4. Follow up actions**	Chris Woolford, ECC Chair
Close of workshop: 13.00 followed by lunch		

Presenters and biographies:

2 May 2019 - Session 1, 09.00 – 12.30

Future demands of industry sectors (sectoral representatives)

Welcome from ECC Chairman Chris Woolford

Chris Woolford, ECC Chairman

Chris Woolford is Ofcom's Director of International Spectrum Policy where his responsibilities cover the UK's international spectrum interests, especially in relation to the ITU, CEPT and EU.

Chris is active in various European spectrum committees and he is currently Chairman of the Electronic Communications Committee (ECC) of CEPT. For many years he has represented the UK at the Radio Spectrum Policy Group (RSPG) and he has closely engaged for the UK on a number of key European initiatives, including reviews of the European regulatory framework for electronic communications. Chris also leads UK engagement with the ITU and led the UK delegations to WRC-15 and WRC-12.

Michael Sharpe, ETSI (Session 1 Chair)

Michael Sharpe is Director of Spectrum and Equipment Regulation at ETSI, responsible for ensuring effective co-operation of ETSI's technical activities with the work of key regulatory bodies and partner standards bodies at the National, European and Global level. His current priorities include working with the European Commission to ensure the smooth introduction of the Radio Equipment Directive, and the continuing close co-operation with CEPT and the Commission Radio Spectrum Unit to ensure that ETSI Harmonised Standards and Regulations on radio frequency use are developed in a co-ordinated and effective manner.
Michael Sharpe received his PhD from the University of Essex in the UK.

1.1: Transportation
1.1.1: Road ITS

Reza Karimi, 5GAA

Reza Karimi is Director, Corporate Strategy, at Huawei Technologies, with focus on technology standards and spectrum regulation. Prior to this, he was Technical Policy Director at the UK communications regulator, Ofcom, with responsibilities in a range of spectrum management initiatives, including a review of the UK's licence exemption framework, the auction of spectrum for 4G mobile communications at 800 MHz/2.6 GHz, and database-assisted access to TV white space spectrum.
He received a first class honours degree in Electronic Engineering from the University of Surrey, UK. He also holds a MSc/DIC degree in Digital Communications, and a PhD in Adaptive Array Signal Processing, both from Imperial College, UK.

Niels Peter Skov Andersen, ETSI/Car-2Car

Niels Peter Skov Andersen is General Manager for the Car-2-Car Communication Consortium and has 25 years background in standardisation. He is currently the chairman of ETSI TC ITS. He has long experience in taking new technologies through standardisation to operational systems, as well as global coordination of standards. He has previously been chairman of 3GPP TSG SA and TSG GERAN. He has been a member of the ETSI Board for more than 10 years and has previously been a member of the Board of directors of the Open Mobile Alliance. In parallel to his standards engagement he has had senior positions within the mobile industry, latest as Vice President of Standards and Technology Strategy at BlackBerry.

1.1.2: Rail Communications

Thomas Chatelet, ERA

The European Union Agency for railways is the system authority for the European Railway Traffic Management System. Within the Railway Systems Unit of the Agency, Thomas is in charge of the standardisation activities related to telecommunication, spectrum and cybersecurity, respectively in ETSI, ECC/CEPT, CEN/CENELEC and Shift²Rail. He is coordinating actions and initiatives relevant in the frame of the ERA Program "Evolution of Railway Radio".
Thomas is also Vice Chairman of the ETSI Technical Committee on Rail Telecommunication.

Yves AMSLER, UITP

Yves Amsler is an engineer of the Ecole Nationale Supérieure des Mines de Saint-Étienne (and post-graduate from University Paris 6 - Pierre & Marie Curie) with an entire career dedicated for more than 45 years to local public transport and urban rail in France and abroad worldwide. He has held various management positions at RATP (main Paris Urban Transport Company) and in its subsidiaries SOFRETU and SYSTRA. Since 2001 he is a UITP Senior Advisor (up to 2010 as RATP delegate in Brussels seconded to UITP, and later as an independent consultant). Since 2012 he has been coordinating the UITP "Spectrum User Group" focusing on urban rail ITS needs.
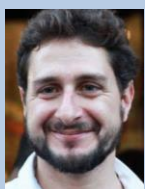
1.1.3: Maritime transport

David Hagen, Kongsberg Seatex

David Møller Hagen is the project manager for the maritime broadband radio technology platform and products arising from this, at Kongsberg Seatex in Norway. One of the latest achievements is the new MBR ETSI standard for a long-range ship-to-ship communication system and a realization of a product range of real-time phased array smart antennas compliant with the standard. At Kongsberg Seatex, a Kongsberg Maritime subsidiary, David has been involved in worldwide customer support, engineering tasks and research and development, working with positioning reference systems and microwave communication systems. In 2006 David received his Master of Science with studies in space technology with specialization on electronics and telecommunication from Narvik University College.

1.1.4: Aviation

Karim Jaser, SITA/SITAONAIR

Karim Jaser is product manager at SITA, focusing on mobility solutions for Airports and Airlines internationally.
In the past he has worked as product manager in Alcatel-Lucent (now Nokia) and Cisco Systems on small cells solutions.
His current portfolio of products aims at enhancing digital convergence through an holistic approach to PTT communications, wi-fi and cellular solutions providing a seamless experience for the end user.

1.2: Telemetry and automation
1.2.1: Industrial automation

Stefan Wimmer, m3connect

Stefan Wimmer is Director of Business Development and Consulting at m3connect responsible for areas including 5G/private-LTE for industry and Campus networks.
He has 30 years of experience in telecommunications including senior positions in network design, wholesale sales, inflight connectivity for T-Mobile and Deutsche Telekom.
He has been founder member for 4 new business startups and core leader for the European Aviation Network and for the broadband-cable business spin-off, and has been involved in the first private network projects in Germany.

1.2.2: Smart cities (including low-power low-throughput networks)

Mark Beach, University of Bristol

Mark is a Professor of Radio Systems Engineering at the University of Bristol and has been Head of the Department of Electrical & Electronic Engineering since August 2006.
The core focus of his research is the application of multi-element antenna systems (also known as Multiple-Input Multiple-Output (MIMO) or Smart Antennas) to enhance the performance of wireless systems in terms of higher data rates, whilst conserving both bandwidth and power.
He has established a world-leading multi-channel spatial-temporal measurement and analysis facility at Bristol, with an operational capability only matched by a few research centres across the global, with the outputs driving the channel models associated with the wireless standards for next generation WLANs, WiMax and 4G (3G LTE, ITU Advanced).

1.2.3: Smart grids

Julian Stafford, EUTC

Julian commenced his working life in a UK Electricity Distribution Company, advancing through several telecoms companies into his current role as Director of the European Utility Telecom Council. He is well-connected internationally in a number of utility telecoms initiatives.

1.2.4: Healthcare

Saad Mezzour, Medtronic

Dr Saad Mezzour holds a PhD in microelectronics from the University of Lille-France and works from the Medtronic Tolochenaz office in Switzerland, reporting to the Vice President Corporate Regulatory Affairs as Director Corporate Regulatory Affairs.
His background is in Radio Telecommunications technologies through various experiences within industries such as Philips Semiconductors, ST Microelectronics and France Telecom. Saad is responsible for leading and maintaining a global standards and Telecom program.
He is the chairman of the LPRA representing the interests of the Short Range Devices (SRD) industry for different market sectors such as Medical, RFID, Transport, Telemetry and Buildings. He was the chairman of ETSI ERM-TG30 responsible for the development of European Radio and EMC standards for Wireless Medical Devices.

1.3: Consumer applications
1.3.1 Media/entertainment (including PMSE)

Darko Ratkaj, EBU

Darko Ratkaj is a senior project manager at the EBU's Technology & Innovation department with the focus on distribution of audiovisual media services and the related regulation and market evolution. This is where technical, regulatory, and policy issues intersect, where broadcast and broadband converge, and where content and technology meet the audience.

He has a special interest in wireless distribution platforms and their potential for making public service media universally available. He maintains working relations with the broadcast and the telecommunications industries, market analysts, national regulators, and the European Commission. He often contributes to regulatory and standardisation forums and trade events.

Alan March, APWPT

Alan has worked in the Professional Audio industry for in excess of 30 years. He currently works for Sennheiser, a major manufacturer of audio equipment, in particular, wireless production tools such as wireless microphones and wireless in-ear monitoring systems. Over that time, he has performed roles in technical sales, marketing, application engineering and business development. Alan's current role is Spectrum Affairs and he regularly attends CEPT and ETSI meetings. He is Vice Chair of ETSI TG17 and Vice President of the Association of Professional Wireless Production Technologies (APWPT), a manufacturer and user group that campaigns for future sufficient access to spectrum for wireless production tools.

1.3.2:Smart homes

Daniel Hartnett, DECT Forum

Daniel Hartnett is Business Development Director for the DECT Forum. He is responsible for the development and implementation of industry strategy in the area of 5G (IMT-2020 approval at ITU-R) as well as driving brand development, shaping the future of DECT and its derivatives, overseeing the openD open source development project, streamlining the certification programs, and guiding the DECT Forum to make sound decisions on behalf of its members and the industry.

He has a strong background in the semiconductor industry and in particular VoIP, operating in product marketing roles at Motorola Semiconductor, Siemens, Infineon and Lantiq.

1.4. Government and citizens
1.4.1 PPDR (including video)

Barbara Held, TCCA

Barbara Held is currently Head of Directorate Strategy and Central Management at the German Federal Agency for Public Safety Digital Radio (BDBOS). She joined the BDBOS in August 2012 as Head of Directorate General Affairs.

She holds a PhD in Communication Science and is board member and director of the TETRA and Critical Communications Association (TCCA).

Manfred Blaha, PSCE/PSRG

Manfred Blaha is Chair of the User Committee and Member of the Board of PSCE, the Public Safety Communications Europe Forum. He is contributing to EU-funded projects, with a focus on First Responder's needs, especially in the PSCE-coordinated broadband project called "BroadWay". Additionally he is Chair of the PSRG – Public Safety Radiocommunications Group, an informal group of European PPDR radio experts.
In his daily life, Manfred is a police officer in Austria's Ministry of Interior, with the rank of a Brigadier-General, responsible for Crisis Communication Issues in the Dept. for Mission Critical Comms Infrastructure, with more than 35 years of experience in Public Safety Communications.

2 May 2019 - Session 2, 13.30 – 17.00

Spectrum solutions (representatives from CEPT, operators, vendors)

Thomas Weilacher, WG FM Chairman (Session 2 Chair)

Thomas Weilacher has been working in the field of telecommunications since he finalised his studies in electronic engineering. Since 1992 he has been working with the German regulatory authority (now "Federal Network Agency", BNetzA). Until 1995 he had been working in the area of licensing and monitoring in a regional office. From 1996 until now he has been involved in international frequency management issues, by working in the headquarters in Mainz. His tasks include the participation in meetings of ECC groups, Radio Spectrum Committee and ITU-R working parties as a member of the German delegation. He was also acting as Vice Chairman of ECC Working Group FM from 2008 to the beginning of 2014 and has become chairman of WG FM in March 2014.

2.1: General authorisation and spectrum sharing (see ECC Report 132)
2.1.1: Licence exempt (including mmWawe

Detlef Fuehrer, Wi-Fi Alliance

Detlef Fuehrer is Senior Manager, Spectrum Management and Regulatory Affairs at Hewlett Packard Enterprise. His main responsibility is to set and drive HPE's legislative & regulatory priorities for radio spectrum in EMEA and to execute all aspects of HPE's EMEA strategy.
Prior to Aruba, Detlef managed the Spectrum Engineering activities of the European Commission's Joint Research Centre where he established the Radio Spectrum Laboratory as a reference institution for radiocompatibility studies in Europe. Holding a diploma in Electronics Engineering from Dortmund University, he worked in the semiconductor industry for almost 20 years, predominantly in the communications domain, at Alcatel, Texas Instruments, and Hitachi.

2.1.2: LAA

Luigi Ardito, Qualcomm

Luigi Ardito is currently working as Senior Director of government affairs for Europe, Middle East and Africa at Qualcomm and drives Qualcomm spectrum and regulatory policy agenda in Europe dealing with various government entities and industry organisations. Prior to joining Qualcomm, Luigi worked for over a decade at Sony Corporation both in Japan and in the UK. Luigi gained also professional experience at France Telecom and at the Italian Public Broadcaster RAI.

He holds an Electronic Engineering Degree gained at the Politecnico di Torino in Italy and a Master of Business Administration gained at the Henley Management College in the UK.

2.1.3: Cognitive radio

Scott Blue, Microsoft

Scott has been involved in the introduction of new telecom technology for almost 25 years. He represents Microsoft in dialogues with regulators as well as at organisations including the ITU, CEPT, ETSI, IEEE, 3GPP, GSMA and Wi-Fi Alliance. He got pulled into the world spectrum management in 2003 at the IEEE after proposing a real-time mapping-based method for allowing mobile devices to make use of what has come to be called TV whitespace. Scott lives in Oulu, Finland, a major centre for both test and early commercial 5G networks, and where 6G research is already underway.

Heikki Kokkinen, Fairspectrum

Heikki Kokkinen is CEO and founder Fairspectrum. He holds a doctoral degree in Computer Science, an academic entrepreneur degree from Aalto School of Business, a licentiate degree in telecommunications and industrial economics, and a Master's degree in electronics. Fairspectrum provides a world leading range of dynamic spectrum access tools, CBRS SAS, LSA, TVWS geolocation databases, frequency coordination, co-existence management, spectrum club use systems, and customised dynamic spectrum management systems.

2.1.4: SRD data networks

Simon Dunkley, LPRA

Simon works for Itron Metering Systems (UK) Ltd, looking after radio regulatory affairs. Simon is also Secretary General of the TALQ smart outdoor networks Industrial Consortium and sits on the council of the Low Power Radio Association (LPRA). He has been closely involved with the work of ECC SE24 and SRD-MG for the past eight years, focusing on networked SRDs.

2.2: Cellular bands/networks

Andy Hudson, GSMA

*Andy is Head of Policy for the GSMA. The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with over 350 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies. Andy has global responsibility for spectrum and regulatory modernisation, as well as the regulatory and policy aspects of the future networks, IoT and identity programmes.
He has a doctorate in Engineering Science from Oxford University and an MBA.*

Sverker Magnusson, GSA

Sverker Magnusson joined Ericsson in 1995, initially at Ericsson Research where he held various positions including that of Master Researcher and Manager for Radio Network Algorithms. Subsequently he has spent more than a dozen years working with spectrum matters, in particular participating in CEPT and ITU-R meetings, and is currently Director of Spectrum Standardization at Ericsson's CTO office. He holds a Master's degree in Engineering Physics from the KTH Royal Institute of Technology in Stockholm and received a Ph.D. in Operations Research 1994 from Cornell University.

2.3: Satellite solutions

Thomas Schmidt, Airbus/PT FM 44

Thomas Schmidt is Spectrum Manager for Airbus Defence & Space, and has worked in the company's Toulouse Office of Frequency Management since 2018. He is currently contributing to ECC works on satellite communications as rapporteur on the Work Item FM44_33 and he is also engaged in ITU-R SG4 working parties.
Between 2015 and 2018 he was Head of Spectrum Management for Sigfox, a start-up company specialized in IoT networks. Before that, he worked for the French Frequency Management Agency (ANFR) for over 10 years, as head of regional offices with a main focus on frequency monitoring and law-enforcement. He holds a Master degree in Maritime Telecommunications and a degree in Applied Physics respectively from the University of Toulon and the University Pierre and Marie Curie, Paris, France.

Cécil Ameil, ESOA

Cécil Ameil works for the satellite communications operator SES. He's now responsible for SES regulatory affairs (policy advocacy and operational licensing) in Europe, Africa and Middle East.
He has been the chairperson of the regulatory working group in ESOA (EMEA Satellite Operators Association) for many years and is an active member of the Global VSAT Forum (GVF).
Cécil joined SES in 1998 to represent the Luxembourg-based satellite operator on public affairs and regulatory matters with the European Union (EU), the CEPT, the Council of Europe and the ITU, under the responsibility of the SES General Counsel.

2.4: Evolution of policies for Gigabit society

Christoph Legutko, Intel

Christoph Legutko is responsible for the European broadband communication policy in the Government, Markets & Trade Department of Intel Corporation.
He represents Intel towards European Commission, CEPT, and other regulatory and industrial bodies like Digital Europe or Bitkom.
Christoph joined Intel in 2006.
He studied at the Mining and Metallurgical Academy in Krakow, Poland, and received his master's degree in Electronics Engineering in 1981.

3 May 2019 - Session 3, 09.00 – 12.30

How can administrations best balance the spectrum opportunities with the identified requirements (representatives from administrations and verticals)

Steve Green, ECC PT1 chairman (Session 1 Chair)

Steve Green is a Principal in the Spectrum Group at Ofcom in the United Kingdom, where he leads on international activities of the Spectrum Technology, Engineering & Enforcement team. Steve chairs ECC PT1, which is the leading group in Europe on IMT matters and is preparing CEPT positions on WRC-19 agenda items 1.13, 9.1.1, 9.1.2 and 9.1.8. He was previously a CEPT coordinator for WRC-15, looking after agenda item 1.2 on the 694-790 MHz frequency band.

3.1: Administrations

David Botha, ITU BR

David Botha, ITU-R Study Group Counsellor for ITU-R Study Group 3 since 2011.

Henk Verkerk, Netherlands

Henk Verkerk is the Coordinator of International Affairs at Spectrum management department of the Netherlands Radiocommunications Agency of the Ministry of Economic Affairs and Climate Policy. Based in the innovation unit, he focusses on strategic and policy issues, societal needs and market dynamics in spectrum issues and digital connectivity. Henk is member of the ECC plenary, the RSC and ITU-RAG and the liaison to the Dutch NRA ACM.
Henk was educated in economics (MSc) and general technics (BSc). He started his career in the merchant navy, worked at LRQA, and was Ministry-expert in government and enforcement policies using standardisation, conformity assessment and accreditation, including European legislation and policies on CE-marking and RTTE/RED/EMC.

Vincent Durepaire, France

Vincent Durepaire is a senior spectrum management expert at the ANFR, Vice-chairman of the WG FM and chairman of WG FM project team FM56 (Radio Spectrum for Railway Applications). Before that, he worked for Ericsson, Bouygues and Kapsch CarrierCom.

Heidi Himmanen, Finland

Heidi Himmanen works as Chief Adviser at the Finnish Transport and Communications Agency Traficom in the 5G Momentum ecosystem project. The 5G Momentum project promotes new services and innovations based on 5G technology through trials to make Finland number one in 5G, brings together the needs and ideas of different actors, encourages cooperation, develops Finnish digital society and makes Finnish 5G-knowledge visible. She has previously worked as a manager in spectrum planning and spectrum supervision. She has received a Dr. Sc. (Tech) degree in 2009 from University of Turku, Finland, and a M. Sc. (Tech) degree in 2005 from Helsinki University of Technology, Finland.

Miguel Capela, Portugal

Miguel Capela, is working in Spectrum Planning and Engineering since 2000 in the Portuguese Regulator ANACOM (Autoridade Nacional de Comunicações). He has a degree in Electronic and Telecommunications Engineering granted by Universidade de Aveiro in 2000, a post-graduate degree in mobile communications granted by Universidade de Aveiro in 2002 and a post-graduate degree in Telecommunications and Information Technologies granted by Instituto Superior Técnico (Lisboa) in 2010.
In CEPT he was and is participating in several groups (e.g., SRD/MG, ECC PT1) and was technical secretary of ECC TG6 on Long Term Vision UHF. Additionally, at national level he is working on 5G related matters.

Pavel Sistek, Czech Republic

Pavel Šístek began his radio spectrum career as expert on evaluation of effects of electromagnetic field on humans. During last decade, he remains involved in spectrum; however he changed his focus to telecommunications.
Today, within the Czech NRA, Pavel deals with radio spectrum issues and related matters, such as radio spectrum utilisation plans, government radio spectrum strategies and policies, open data approach and spectrum information websites, auction planning, spectrum fee policy, WRC preparations.

Daniel Bielefeld, Germany

Daniel Bielefeld is a Senior Policy Officer at the Federal Network Agency (BNetzA), Germany, which he joined in 2011. Since 2016, he has been Assistant Head of Section for International Affairs and Radio Frequency Utilisation Concepts. His responsibilities include representing Germany in various groups of CEPT, RSPG, and ITU-R, including as head of the German delegation to the ECC Working Group for Frequency Management. From 2011 to 2016, he was Assistant Head of Section for Non Public Radio Applications. Prior to joining BNetzA, he worked for six years as research and teaching associate at RWTH Aachen University, from which he also received his PhD.

Heli Frosterus, United Kingdom

Heli Frosterus is a Spectrum Policy Principal at Ofcom, working mainly on 5G and supporting wireless innovation in industry. She has 10 years of experience from different roles in the public sector both in Finland and in the UK. Before coming to the UK, she worked as an economist in the Finnish Competition Authority, where she handled a lot of cases on food supply chain and intellectual property rights. She has also worked in the Finnish Communications Regulatory Authority, managing the business connectivity market review and working on UHF band issues.
Heli has master's degrees on economics (University of Helsinki) and EU Competition Law (King's College, London).

3.2: Verticals

Michael Sharpe, ETSI

Michael Sharpe is Director of Spectrum and Equipment Regulation at ETSI, responsible for ensuring effective co-operation of ETSI's technical activities with the work of key regulatory bodies and partner standards bodies at the National, European and Global level. His current priorities include working with the European Commission to ensure the smooth introduction of the Radio Equipment Directive, and the continuing close co-operation with CEPT and the Commission Radio Spectrum Unit to ensure that ETSI Harmonised Standards and Regulations on radio frequency use are developed in a co-ordinated and effective manner.
Michael Sharpe received his PhD from the University of Essex in the UK.

Ulrich Rehfuess, Digital Europe

Ulrich holds a diploma degree in Electrical Engineering of Technical University of Munich, Germany and one in Industrial Engineering of Fernuniversität Hagen, Germany. Of his 25+ years of professional experience in Siemens, Nokia Siemens Networks and Nokia, he spent 20+ years in R&D, business strategy, system architecture and product management of mobile radio network systems covering GSM, EDGE, UMTS, Flash OFDM, WiMAX, LTE and LTE Advanced. In 2011, he assumed responsibility for spectrum policy at Nokia, organised within the Nokia Bell Labs and CTO team. Ulrich heads a 5G project group within the German National Digital Summit, is vice chair of the BITKOM spectrum working group in Germany and chairs the DIGITALEUROPE spectrum working group in Brussels.

4: Follow up actions

Chris Woolford, ECC Chairman

Chris Woolford is Ofcom's Director of International Spectrum Policy where his responsibilities cover the UK's international spectrum interests, especially in relation to the ITU, CEPT and EU.
Chris is active in various European spectrum committees and he is currently Chairman of the Electronic Communications Committee (ECC) of CEPT. For many years he has represented the UK at the Radio Spectrum Policy Group (RSPG) and he has closely engaged for the UK on a number of key European initiatives, including reviews of the European regulatory framework for electronic communications. Chris also leads UK engagement with the ITU and led the UK delegations to WRC-15 and WRC-12.