



Commission C

2014-2017 Triennial Report

Sana Salous, Commission Chair
Amir Zhagoul, Commission Vice Chair
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1. Scope of Activities

[Commission C](#) promoted research and development in:

- Information Theory, Coding, Modulation and Detection;
- Spectrum and Medium Utilization, including cognitive and cooperative techniques;
- Wireless networking;
- Radar, radio localization and navigation systems;
- Green, energy-efficient radio communications.

The design of effective radio-communication and signal processing systems also includes scientific, engineering, and economic considerations. This Commission emphasizes the scientific aspects of radio communications, but also provides enabling technologies to other areas of radio science.

2. International Events Sponsored or Cosponsored by Commission C

2.1 10th edition of the International Symposium on Signal System and Electronics ISSSE 2015

Sponsors: Commissions C and D

Venue: Gran Canaria, Spain

Date: May 18-25, 2015

General Chair: Prof. Sana Salous (Chair URSI Commission C), Durham University, UK, Members: Prof.

Amir Zhaghoul (Vice-Chair URSI Commission C), Dr. Apostolos Georgiadis (Vice-Chair URSI Commission **D**) and Prof. Chandrasekar (Vice-Chair URSI Commission **F**)

The technical programme committee: Chairs Prof Sana Salous and Prof. Gunter Steinmeyer Chair URSI Commission **D**, with members from Commission **C** (Prof. Amir Zhaghoul and Prof. Marco Luis past-Chair Commission C, Prof. Kazuya Kobayashi Vice-chair URSI commission **B**, Dr. Simonetta Paloscia Chair of commission **F**, and Dr. Ing Krstic Milos from **IHP-Microelectronics**, Frankfurt, Germany.

The ISSSE (International Symposium on Signals, Systems and Electronics) is held every three years. Following the decision at the GASS 2014, to initiate bi-annual URSI conference AT-RASC and to collocate other URSI conferences with it, in 2015, the ISSSE was held with AT-RASC 2015 in Gran Canaria, Spain. It was organized under the guidance and with sponsorship of the international steering committee of the URSI Commissions C (Radiocommunication Systems and Signal Processing) and D (Electronics and Photonics) and IHP-Microelectronics the previous organiser of the ISSSE 2012 in Potsdam, Germany. Moreover each radio system depends on its antenna that couples the electromagnetic waves into the medium and on the propagation between terminals. Thus we included aspects of URSI Commission B (Fields and Waves) and Commission F (Wave Propagation and Remote Sensing) into the technical scope of the symposium. In addition to the regular sessions, two special sessions were organized on energy efficient cognitive radio communications and on the COST Action IC1004 on Smart and efficient wireless networks and technologies towards 5G and beyond.

2.2 Asia-Pacific Radio Science Conference AP-RASC 2016

Sponsors: URSI (main sponsor) in cooperation with a number of leading research institutes and universities in Korea which included Korea Research Institute of Standards and Science, Korea Astronomy and Space Science Institute, Electronics and Telecommunications Research Institute, KSTAR Research Center, National Fusion Research Institute, and Seoul National University.

Venue: Grand Hilton Seoul Hotel, Seoul, Korea

Date: Aug. 21-25, 2016

Honorary Chair: Prof. Jung Woong Ra, Past President, South Korea National Committee of URSI (Professor Emeritus, Korea Advanced Institute of Science and Technology, Korea); General Chair: Prof. Sangwook Nam, President, South Korea National Committee of URSI (Seoul National University, Korea); General Co-Chairs: Prof. Kazuya Kobayashi, URSI Assistant Secretary-General (AP-RASC) (Chuo University, Japan), Prof. Piergiorgio L. E. Uslenghi, URSI Assistant Secretary-General (AT-RASC) (University of Illinois at Chicago, USA).

The AP-RASC is the Asia-Pacific regional URSI conference held between the URSI General Assemblies and Scientific Symposia. The objective of the AP-RASC is to review current research trends, present new discoveries, and make plans for future research and special projects in all areas of radio science, especially where international cooperation is desirable, and a particular emphasis is placed on promoting various research activities in the Asia-Pacific area. Scientific sessions composed of oral and poster papers were organized at this conference in order to cover all scientific activities by URSI Commissions A-K. Commission C organized 8 specific sessions on different aspects of radio communications, plus two more joint sessions with other URSI Commissions.

2.3 URSI XXXI General Assembly and Scientific Symposium URSI GASS 2017

Sponsor: Union of Radio Science International

Venue: Palais des Congres, Montreal, Canada

Date: Aug. 19-26, 2017

General Chair: Fabrice Labeau (McGill); Vice Chair: Ahmed Kishk (Concordia University)

The XXXI General Assembly of the International Union of Radio Science will be held at the Palais des Congres Conference Center in Montreal, Canada on August 19-26, 2017. The General Assemblies of

URSI are held at intervals of three years to review current research trends, present new discoveries and make plans for future research and special projects in all areas of radio science, especially where international cooperation is desirable. The first Assembly was held in Brussels, Belgium in 1922. The XXXIInd edition of the GASS will have a scientific program consisting of plenary lectures, public lectures, tutorials, posters, invited and contributed papers organized around the ten Commissions of URSI. In addition, there will be workshops, short courses, special programs for young scientists, student paper competition, programs for accompanying persons, and industrial exhibits. Over 1528 papers and tutorials are to be presented and scientists from more than fifty countries will participate in the Assembly.

The activities by Commission C consist of 12 sessions, and 8 joint sessions organized with other commissions. A total of 135 papers and one tutorial will be presented in sessions either organized by Commission C or joint session led by Commission C and 21 papers in joint sessions led by other commissions. The schedule of the GASS is shown in the table below:

Saturday 19 August		Short courses / Workshops			Lunch	Short courses / Workshops					
		Preparation of the Secretariat		Board		Coordinating Committee					
Sunday 20 August		Short courses / Workshops			Lunch	Council 1	Opening Ceremony	Opening Reception			
		Council 5									
Monday 21 August	Com. Events (4 papers)	Technical Sessions (All Commissions) (3 papers)	Tutorial B (1 paper)	Technical Sessions (All Com. except Com. K) (3 papers)	General Lecture 1	Lunch	Tutorial J (1 paper)	Technical Sessions (All Com. except Com. J) (3 papers)	Technical Sessions (All Commissions) (3 papers)	Commission Business Meetings 1	12 Party
Tuesday 22 August		Technical Sessions (All Commissions) (4 papers)	Technical Sessions (All Commissions) (4 papers)	Technical Sessions (All Com. except Com. K) (3 papers)	Lunch	Tutorial III (1 paper)	Technical Sessions (All Com. except Com. H) (3 papers)	Technical Sessions (All Commissions) (3 papers)	Poster Session 1	Council 2	
Wednesday 23 August		Technical Sessions (All Commissions) (4 papers)	Tutorial C (1 paper)	Technical Sessions (All Com. except Com. C) (3 papers)	General Lecture 2	Lunch	Tutorial D (1 paper)	Technical Sessions (All Com. except Com. D) (3 papers)	Technical Sessions (All Commissions) (3 papers)	Commission Business Meetings 2	Banquet
Thursday 24 August		Technical Sessions (All Commissions) (4 papers)	Technical Sessions (All Commissions) (4 papers)	Technical Sessions (All Com. except Com. A) (3 papers)	Tutorial A (1 paper)	Lunch	Tutorial F (1 paper)	Technical Sessions (All Com. except Com. F) (3 papers)	Technical Sessions (All Commissions) (3 papers)	Poster Session 2	Council 3
Friday 25 August		Technical Sessions (All Commissions) (4 papers)	Tutorial E (1 paper)	Technical Sessions (All Com. except Com. E) (3 papers)	General Lecture 3	Lunch	Tutorial G (1 paper)	Technical Sessions (All Com. except Com. G) (3 papers)	Technical Sessions (All Commissions) (3 papers)	Commission Business Meetings 3	
Saturday 26 August		Technical Sessions (All Commissions) (4 papers)	Technical Sessions (All Commissions) (4 papers)	Public Lecture	Closing Ceremony	Lunch			New Coordinating Committee	New Board	
		Council 4									

Table of GASS events @ URSI GASS 2017

The commission also received a number of nominations for student paper awards and participated in the ranking and selection of the winners of the award and the ranking of the 16 Young Scientists applications received by the Commission for the YS award.

The commission also supported a number of national activities listed below:

1. Technical support to the 4th International Workshop on Next-Generation Green Wireless Networks hosted by CONNECT at Trinity College Dublin, Ireland, 12-13 September 2016.
2. One day workshop on Frequencies & Radiosciences' held on May 3, 2016 in Paris, France.
3. International symposium on Turbo codes and iterative information processing, 5-9 Sept. 2016 in Brest, France.
4. The 9th International Kharkiv Symposium on Physics and Engineering of Microwaves, Millimeter and Sub Millimeter Waves (MSMW'2016) and workshop on Terahertz Technology (Ter-aTech'2016), Kharkiv, Ukraine, June 20-24, 2016
5. International Conference on Mathematical Methods in Electromagnetic Theory (MMET'2016), Ukraine, July 2016
6. SCOSTEP/ISWI International School on Space Science, Maharashtra, India, Nov. 7-17 2016.
7. International Conference on Electromagnetics in Advanced Applications ICEAA 2016 (Cairns,

- Australia, 19-23 September 2016) and IEEE-APS Topical Conference on Antennas and Propagation in Wireless Communications (IEEE APWC 2016)
8. IEEE RADIO 2016 (IEEE Radio and Antenna Days of the Indian Ocean 2016), October, 10-13 2016, Reunion Island
 9. International Conference on Space Science and Communication (IconSpace2015), August 10-12, 2015, Langkawi, Malaysia.
 10. IEEE Radio and Antenna Days of the Indian Ocean, IEEE RADIO2015, 21-24 Sept. 2015, Belle Mare, Mauritius.

3. Activity Reports from Member Nations

Brazil

Overview of Telecommunications in Brazil

Access to Telecommunication Services in Brazil, in 2014 amounts to 43.2 million served by the basic telephone service, representing an increase of 2.8% over the previous year; 257 million mobile cellular communication users; and 18.3 million users of cable television services. Wideband fixed access Internet services comprise 25.6 million users while trunking companies support 4.3 million users and there are 96 million internet users, (55% of population).

In 2016 this has changed to 41 million homes being served by the basic telephone service, a decrease over the previous year, 248 million use mobile cellular communication services, 79% of the cell phones access wideband services. There are 18.9 million users of cable television services with wideband fixed and mobile access services comprise 223 million users.

Cellular Technology, from 2014 to 2016: In 2014, the number of access to 3G surpassed the number of 2G accesses. A similar trend was observed in 2016 with the number of 4G mobile cellular accesses surpassing the number of 2G accesses. In 2016, the number of 2G users was 51 million, the number of 3G users was 126 million, and the number of 4G users, was 52 million.

Telecommunications data: Population Access to Services, in 2016 was 98% of the population served by 3G wideband which corresponds to 4935 municipalities and 66% of the population have access to 4G cellular services which corresponds to 1137 municipalities.

Gross Revenue, in 2016: The gross operational revenue for the telecommunication sector was US \$ 53.13 billion which represents a decrease of 2.9%, as compared to the same period in 2014. The investment was US\$ 5.38 billion, a decrease from US\$ 6.25, in 2014.

Composition of the telecommunication market, in terms of gross operational revenue, in 2012: Industry: US\$ 3.3 billion (35.0%), Fixed operators: US\$ 6.2 billion (a decrease of 8.1%) Fixed wideband providers: US\$ 3.0 billion (6.0%), Mobile personal communication service operators: US\$11.6 billion (14.3%), Cable television providers: US\$ 2.3 billion (33.0%) Trunking operators: US\$ 1.1 billion (12.8%).

The gross operational revenue for the telecommunication sector, in 2014, was US\$ 117 billion; the highest in the history of Brazil, and equivalent to 5% of the country's gross national product (GNP). The

telecommunications service providers collected US\$ 30 billion in government taxes in the fiscal year which is equivalent to 46% of their net operational revenue US\$ 17 billion.

There are 468.4 thousand employees in the Brazilian telecom market with 29.8 thousand in industry; 50.6 thousand in deployment services; 197.8 thousand in telecommunication services and 19.2 thousand in call centres.

Mobile access points in January, 2016: LTE has overcome GSM, in August, 2016; 4G reached 28 million access points, in January; 125 access points per 100 inhabitants; Total of 257 million access points; 71% of cell phones are pre-paid; 60 thousand BSs; 83% of the population live in cities with, at least, four operators; all Brazilian municipalities are covered by mobile telephony. Figure 1 displays the Mobile access points in January 2016 and Figure 2 the share of the LTE and 3G mobile operators in 2016.

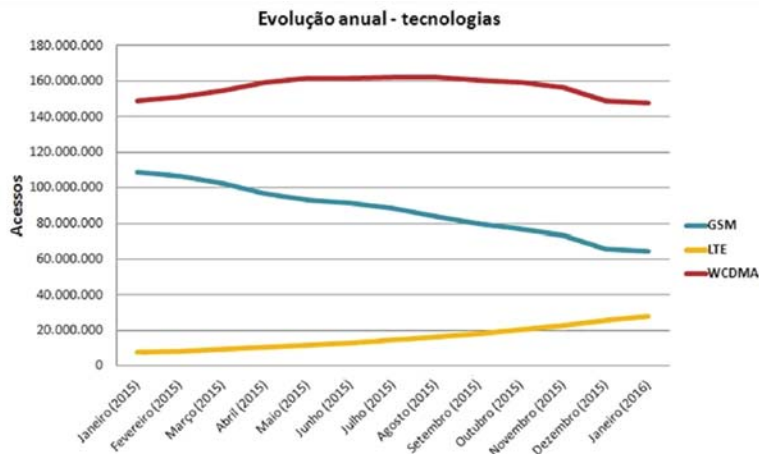


Figure 1: Mobile access points in January 2016

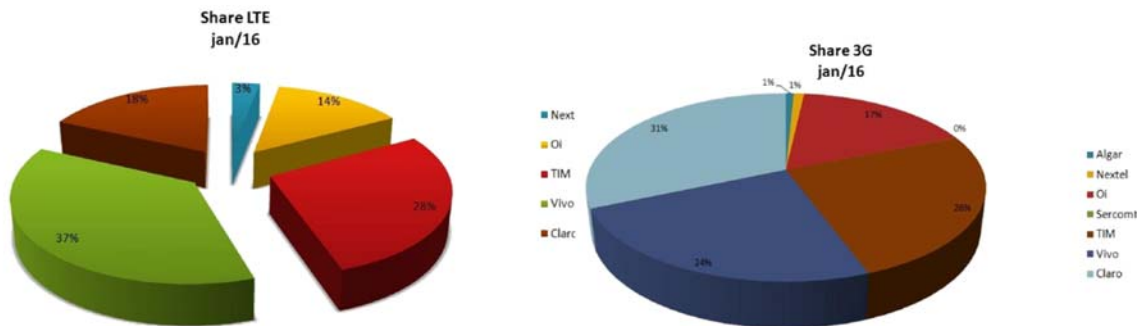


Figure 2. (a) Share of the LTE mobile operators in 2016, (b) share of 3G between operators in 2016

In January 2016, the statistics are: GSM, 64 million accesses; WCDMA (3G), 147 million accesses; LTE (4G), 28 million accesses; CDMA, 2.2 million accesses; Data terminals, 17 million devices; Wideband terminals, 6 million devices; M2M 11 million devices; Total number of devices, 257 million.

Activities of the Scientific Societies and Institutions

1. Scientific Events

- (i) The SBMO International Microwave and Optoelectronics Conference (IMOC 2017) is a biennial forum on telecommunication science, technology and innovation, sponsored by the Brazilian Microwave and Optoelectronics Society (SBMO). In its eighteenth edition, the conference will be held in the city of Águas de Lindóia, São Paulo State, August 27 to 30, 2017. The general chairs are Daniel M. Pataca, Amilca C. César and Hugo E. H. Figueroa; The technical program chairs are Darli A. A. Melo, Mônica L. Rocha and João B. Rosolem.
Webpage: <https://www.imoc2017.com>
- (ii) The Brazilian Telecommunications Symposium (SBrT 2017) is an annual event sponsored by the Brazilian Telecommunications Society (SBrT). In its 35th edition, the symposium will be held in the city of São Pedro, São Paulo State, from September 3 to 6, 2017. The general chairs are Celso de Almeida and Jaime Portugheis. The TPC chairs are Cristiano M. Gallep, Daniel C. Cunha and Leonardo T. Duarte.
Webpage: <http://www.sbrt.org.br/sbrt2017/>
- (iii) The third Annual Meeting of the Iecom on Communications, Networks and Criptography (ENCOM 2017) will be held in São Luis, Maranhão State, from October 13 to 15, 2017, under the sponsorship of the Institute for Advanced Studies in Communications (Iecom), UFMA, UFPB, UFS and UFCG. It also receives support from the Brazilian funding agencies (CNPq, Capes, Fapema) and Rohde & Schwarz. The general chairs are Marcelo Sampaio de Alencar and Rafael Fernandes Lopes, and the technical program chairs are Wamberto José Lira de Queiroz, and Waslon T. Araújo Lopes

2. Journals

- (i) The Journal of Communication and Information Systems (JCIS) features high-quality, peer-reviewed technical papers in several areas of communications and information systems. It is published since 1983. The JCIS is jointly sponsored by the Brazilian Telecommunications Society (SBrT) and the IEEE Communications Society (ComSoc). The Steering Committee includes renowned scholars from the international and the Brazilian Communities. The editors are Renato Rocha Lopes and Charles C. Cavalcante.
- (ii) The Journal of Microwaves, Optoelectronics and Electromagnetic Applications (JMoe) is published by the Brazilian Microwave and Optoelectronics Society (SBMO) and Brazilian Society of Electromagnetism (SBMag). It is a refereed publication to disseminate technical information in the areas of Microwaves, Optoelectronics, Photonics, and Electromagnetic Applications. The journal is published in electronic format since 1997. The editors are Maria Thereza Miranda Rocco Giralardi and Renato Cardoso Mesquita. The JMoe is indexed in the following bibliographic databases: SciELO, SCOPUS, SIMAGO, EMBASE, Engineering Village,

Reaxys, Sumarios.org and Directory of Open Access Journals (DOAJ). It is also part of the Scientific Electronic Library Online-SciELO's collection.

- (iii) The Journal of Information and Communications Technology (RTIC) is published by the Institute for Advanced Studies in Communications (Iecom). The journal is published in electronic and printed formats since 2011. The RTIC is registered by DOI and was

Canada

- Participating in the organization and paper review process of 2015 IEEE International Symposium on Antenna and Propagation and North America Science Meeting, 19-25 July 2015, Vancouver, BC, Canada
- Participating in the organization of the URSI GASS 2017 conference, July 2017, Montreal, QC, Canada

Czech Republic

In 2017, the Czech commission C members supported the event Microwave and Radio Electronics Week 2017 (Marew 2017), held in April 2017 in Brno, Czech Republic. Together with the members of other professional organizations (Czech Electrotechnical Society and IEEE Czechoslovakia section), they have organized the best paper student competition. On behalf of URSI, two students have been awarded for their excellent research.

Egypt

Yearly URSI Egypt Scientific committee has many activities. The most important annual event is the organization of "National Radio Science Conference". The Egyptian Radio Science Committee has held the NRSC conference yearly since 34 years.

NRSC2014 (Ain Shams University, Cairo, 2014). contained different 6 sessions in commission C. These sessions covered many topics such as: Cognitive Radio, Wireless Sensor Networks, Encryption and Security, Image/Video Processing, and LTE/WiMAX Networks. During NRSC2014, Egypt Commission C presented 23 papers with three of these papers receiving the Best Student Paper Award (out of total 5).

NRSC2015 (MSA University, Giza, 2015) contained 6 different sessions by commission C. These sessions covered many topics such as: Coding and Modulation Techniques, MIMO and 4G Technologies, Cognitive Radio, Wireless Sensor Networks, Image/Video Processing, and Networking. During NRSC2015, Egypt Commission C presented 25 papers with three of these papers receiving the Best Student Paper Award (out of total 5).

NRSC2016 (Arab Academy for Science, Technology and Maritime Transport (South Valley Branch, Aswan), 2016) contained 7 different sessions by commission C. These sessions covered many topics such as: Cognitive Radio & Compressive Sensing, Encryption & Secure Communications, MIMO and 4G Technologies, Cognitive Radio, 5G Communications & MM Waves, Image/Video Processing, Communication Networks, and Advanced Communication Systems. During NRSC2016, Egypt

Commission C presented 27 papers with three of these paper receiving the Best Paper Awards (out of total 5).

In addition, in NRSC2016, Egypt Commission C organized a special session entitled “Enabling a Collaborative Environment for Wireless Communication and Networking Research” by Smart CI company and a research team from Alexandria University.

NRSC2017 (Arab Academy for Science, Technology and Maritime Transport Main Campus, Alexandria), 2017 contained different 7 sessions in commission C. These sessions covered many topics such as: Cognitive Radio & Compressive Sensing, Secure Communications, 4G Systems, Wireless Networks, Modulation & Coding, and Advanced Signal processing for Communications. In this conference, Egypt Commission C presented 28 papers. Also in this conference, three of the C papers got the Best Paper Award (out of total 5).

In NRSC2017, Egypt Comm. C organized 3 special sessions entitled “Optimization Algorithms, WSNs for Nuclear Material Detection and Localization, Internet of Things Technologies” by NRSC scientific committee members. Also, NRSC2017 contained an invited talk entitled “Recent Research Trends in Wireless Multimedia Communications” by Prof. Said El-Khamy.

Egypt Comm. C participated in URSI-GASS2014, URSI-AP-RASC2015 and will take part in URSI-GASS2017. Two young Scientists from Egypt Commission C received the YS Award in URSI-GASS2014 and one received the YS Award in URSI-AP-RASC2015.

During the last three years, Prof. Said El-Khamy acted as the Associate Editor of the Radio Science Bulletin for Wireless Communications and Signal Processing.

France

French Commission C is led by Prof. Yves LOUET (CentraleSupélec) and co-led by Profs. Michel TERRE (CNAM) and Yvan DUROC (University of Lyon).

The annual URSI French Scientific days (2014) were dedicated to “Human and connectivity”. Commission C organized a special session on WPAN chaired by Yves Louët and Michel Terré. Following this event, French Commission C presented 13 papers in the URSI GASS (Beijing, 2014) and organized two special sessions (Advances in signal processing for cognitive radio (1) and (2)) chaired by Yves Louët and Jacques Palicot (Comm C).

French Comm. C organized and chaired a special session in URSI AT-RASC in 2015 (Gran Canaria) entitled “Cognitive and software radio communications” whose conveners were Yves Louet, Yvan Duroc and Carlos Bader.

In 2016, the URSI French Scientific days (with theme “Energy and Radio Science”) were held in Rennes (Centrale Supélec) and organized by Yves Louët’s and Jacques Palicot research team (SCEE from IETR Lab.) from Commission C. Although this event gathered all commissions, commission C organized and chaired two sessions (“Low power communications” and “Energy efficiency in networks” by Jacques

Palicot). Comm. C published 19 papers at this event and one of these paper (“La modulation en ondelettes : une modulation alternative à faible consommation d’énergie” Chafii M, Palicot J, Gribonval R, URSI, Rennes, France (2016)) received the the Best Paper Award. This paper has led to the following paper: Marwa Chafii, Jacques Palicot, and Rémi Gribonval. “Wavelet-OFDM: An Alternative Modulation with low Energy Consumption”, Special Issue on Energy in Radiosciences, Compte Rendus de l’Académie des Sciences (CRAS), 2016”.

Yves Louët and Jacques Palicot as members of French Comm. C wrote the Editorial of the French journal REE (issue 5, 2016).

French Comm. C was involved in GASS URSI 2017 and proposed three special sessions:

- Exploitation of non linearities for passive wireless sensors (with Comm. D and B)

Conveners: Yvan Duroc (Prof. University Lyon 1, France), Ville Viikari (Ass. Prof. Aalto University, Finland), Ke Wu or one of its colleague (Prof. PolyGRAMES, Montréal, Canada)

- Sub-Nyquist sampling for Green Radio

Conveners: Yves Louet (CentraleSupélec, France), Sumit Darak (Prof. IIT New Delhi, India)

- Communications for the Smart Grid

Convener : Jacques Palicot (CentraleSupélec, France) and Co-convener (Kostas Berberidis, Patras University ,Greece)

Germany

Apart from the preparation of the annual national meeting in Miltenberg (Kleinheubacher Tagung 2016) members of Commission C actively participated with submitted abstracts in a large number of national and international conferences. Moreover, Commission C members were part of a large number of technical program committees and organized a number of conferences and workshops.

Commission C Meetings

The annual Commission C meeting took place as part of the Kleinheubacher Tagung (KHT) 2016 in Miltenberg. During this meeting it was again decided to organize a joint session with Commission D for the KHT2017. Of the 95 abstracts submitted in total to the KHT2016, 19 were submitted in Commission C. Additionally, as part of the KHT 2016, two special sessions in memory of Prof. Alfred Fettweis and Prof. Dietrich Wolf were organized. Finally, a special session on the merging topic of “Mobile Communications and Internet of Things” took place at KHT 2016.

Key Note Speakers (extract)

Prof. Dr.-Ing. G. Fettweis (TU Dresden) auf dem 2016 IEEE Wireless Communications and Networking Conference Workshops (WCNCW), Doha, Qatar.

Prof. Dr.-Ing. G. Fettweis (TU Dresden) auf der 2016 European Solid State Circuits Conference (ESSCIRC), Lausanne, Switzerland.

Participation in conferences (extract)

2016 IEEE International Symposium on Circuits and Systems 2016 (ISCAS 2016), Montreal, Canada; May 2015

2016 IEEE 84th Vehicular Technology Conference (VTC-Fall), Montreal, Canada, September 2016

2016 International Symposium on Wireless Communication Systems (ISWCS), Poznan, Poland, September 2016

2016 IEEE Wireless Communications and Networking Conference Workshops (WCNCW), Doha, Qatar, April 2016

2016 IEEE International Conference on Communications (ICC), Kuala Lumpur, Malaysia, May 2016

2016 IEEE Nordic Circuits and Systems Conference (NORCAS), Copenhagen, Denmark, November 2016

2016 IEEE 17th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Edinburgh, UK, July 2016

2016 IEEE 27th Annual International Symposium on Personal, Indoor, and Mobile Radio Communications (PIMRC), Valencia, Spain, September 2016

2016 European Solid State Circuits Conference (ESSCIRC), Lausanne, Switzerland, September 2016

Activities in TPCs (extract)

5th International Conference on Telecommunications and Remote Sensing (ICTRS 2016) (International Program Committee)

23rd International Conference, Mixed Design of Integrated Circuits and Systems (MIXDES 2016) (International Program Committee)

2016 Design, Automation and Test in Europe Conference and Exhibition (DATE16) (International Program Committee, Executive Committee)

Ireland

Specific Commission C activities include an All-Ireland research wireless and radio science colloquium held in 2017 and researchers participated in the AT-RASC, 2015. Details about these are provided in the following.

(a) The 18th URSI All-Ireland Research Colloquium 2017, Commission C and D, entitled 'Communications And Radio Science For A Smarter World' was hosted by the Royal Irish Academy under the auspices of its Engineering and Computer Sciences Committee at Academy House, Dublin on 8 and 9 March 2017. This

was the 18th in the series of such colloquia, which normally happen on a biennial basis to showcase relevant research happening in Universities and industries in the field.

Steering Committee: Dr M. O'Droma (Chair, URSI Ireland President), Prof T. J. Brazil, Dr. C. Brennan, Dr. R O'Connor; Members of the RIA E&CS Committee.

Organisational Committee: Dr C. Brennan (OC Chair; DCU), Professor T. J. Brazil (UCD), Prof. M. Ammann (DIT) , Dr R. Farrell (NUIM), Prof V. Fusco (QUB), Dr J. King (IBM), Dr K. McCarthy (UCC), Dr R. O'Connor (DMCNR), Dr M. O'Droma (UL).

Technical Programme Committee: Dr R. Farrell (Chair), Prof. M. Ammann, Dr P. Bradley, Prof. T. J. Brazil, Dr C Brennan, Dr C. Browning, Dr N. Buchanan, Dr M. Condon, Dr R. Conway, Dr J. Dooley , Prof. V. Fusco, Prof. P. Kennedy, Dr J. King, Dr K. McCarthy , Dr M. O'Droma, Dr P. O'Leary, Dr A. Shitvov, Dr P. Varahram, Dr J. Walker, Dr A. Zhu.

Paper Prize Committee Dr. K McCarthy (Chair), Prof. V Fusco, and Dr. R. Farrell

The call for papers, issued in late September 2016, was primarily directed at URSI Commission C and Commission D interests. Submissions were subject to at least two peer reviews.

Colloquium Proper: On Wednesday 8 March 2017, evening, the colloquium opened with a wine reception, a welcome address by URSI-Ireland President Dr Máirtín O'Droma, University of Limerick formally opening the Colloquium, a research paper poster session, and two presentations by invited speakers Mr Joe Lynch, Test and Trial Ireland (COMREG) on 'Ireland's Radio Spectrum Management Strategy 2016-2018' and Dr Peter Cochrane OBE, BSc, MSc, PhD, DSc, CGIA, FEng, FRSA, FIEE, FIEEE on 'Infinite Capacity Wireless Sans Channels and Bands'.

On Thursday 9 March 2017, the colloquium research paper presentations continued in four oral sessions entitled: I. Wireless Systems and Subsystems I (Chair: Dr Justin King, UCD); II. Wireless Innovation, Development and Application Trends (Chair: Dr Máirtín O' Droma, UL); III. Antennas and Propagation (Chair: Vince Fusco, MRIA, QUB); IV. Wireless Systems and Subsystems II (Chair: Dr Kevin McCarthy, UCC); and a poster session. Three oral sessions were headed with leading industrial Invited Speakers: John Doyle, Benetel on 'LTE cellular wireless communication serving public safety applications', Mark Kelly, Intel on 'The I in IoT' and Mickael Viot, Decawave: 'Impulse Radio UWB: "Adding value and security to the IoT"'

Paper Prizes: (a) The Best Paper Prize was jointly awarded to (€425 each): P. Varahram, J. Dooley, Z. Wang, K. Finnerty and R. Farrell, NUIM for their paper 'A low complexity NARX structure using indirect learning architecture for digital pre-distortion;' And C. Browning¹, A. Farhang², A Saljoghei¹, N. Marchetti², V. Vujicic¹, L. E. Doyle², L. P. Barry¹ of 1: DCU, 2: CONNECT Research Centre TCD for their paper: 'Fixed-wireless convergence in a passive optical network for 5G fronthaul.' The Best Postgraduate Student Paper Prize (€850) was awarded to: Ian Kavanagh, DCU for his paper 'Analysis of full-wave 2D to 3D propagation models and ray tracing for indoor environments'.

The Colloquium Proceedings are available in CD format from the Royal Irish Academy—ISBN: 978-1-908997-60-9.

(b) AT-RASC: Ireland also sent a delegate to the AT-RASC and to participate in the URSI business meeting there. Three Commission C papers also were presented at AT-RASC.

Italy

During the past triennium, activities have continued and increased within the Italian academic environment in the field of Commission C competence area. Many research groups are fully committed with the exploding context of wireless technologies, with a lot of successful applications for research grants from national and European agencies, a relevant record of top-level publications and an increasing attention for large scale experimental activities. In this frame it is worthwhile mentioning that many universities have committed as partners in large partnerships that responded to the call issued by the Ministry of Economic Development to launch the first 5G trials in Italy with 100 MHz of contiguous bandwidth by the end of 2017.

Contributions to organisation of conferences and workshops worldwide have been provided in the field of interest of Commission C. In the specific context of URSI events, Commission C has been active in soliciting submissions to URSI GASS 2017 in Montreal and in promoting Rome as a candidate city for hosting GASS 2020: in particular, the Commission is committed in involving sponsors and exhibitors. Finally, Commission C is committed to contribute to an URSI special session within the IEEE MTT-S International Microwave Workshop Series on Advanced Materials and Processes (IMWS-AMP) 2017, which is financially sponsored by the IEEE Microwave Theory and Techniques Society (MTT-S) and technically co-sponsored by the European Microwave Association (EuMA). The IMWS-AMP 2017 edition will be hosted by the University of Pavia, Italy from Sept. 20th to Sept 22nd, 2017 and the URSI special session is planned for Sept. 21 and the topic promoted by Commission C relates to energy harvesting and advanced technologies for energy neutral communications in IoT.

Netherland

Every year the Netherland organizes the URSI Benelux Forum (Belgium, Netherlands and Luxembourg), this year in Brussels, Belgium.

Besides 6 keynote talks, we also organized a poster session for young researchers. With more than 30 posters, this is very successful.

Besides the Forum, we also organize evening sessions on specific topics. Most recently we organized an evening session of radio and health, including talks on Hyperthermia, radio and MRI, Lab on a chip research and Body Area Networks.

Slovakia

Specific Commission C activities include presentations made in Slovak University of Technology which were included into a Wireless seminar for students from the following universities in Central Europe:

Vienna University of Technology (Austria), Pan - European University (Slovakia), Brno University of Technology (Czech Republic) and Slovak University of Technology (Slovakia).

In April 6-th, 2017

1. “5G myths and realities”, Presenter: Matúš Turcsány (Leader of RAN Innovation Cooperation with a major global operator focusing on LTE evolution and 5G leader, Ericsson in Slovakia)

Abstract: In the talk the drivers and expectations behind 5G were discussed. The economics of the mobile industry, the role of LTE in the 5G ecosystem were also touched and the talk was also about the different approaches the operators are taking to introduce 5G with a special attention to the comparison of Europe versus rest of the world.

2. “Guide for Near-field Characterization of Unintentional Stochastic Radiators”, Presenter: Prof. Dave Thomas, University of Nottingham, UK

Abstract: Traditional techniques for characterizing the electromagnetic spectrum assume it is composed of stationary waves with constant and measurable phase. Due to the time dependent nature of intentional and unintentional emissions from modern digital electronics and communications, ambient electromagnetic fields often do not exhibit a stationary phase. A new approach and new standards are needed to quantify these fields which essentially behave in a stochastic way.

May 4-th, 2017; “Overview of 5G”, Presenter: Jonathan Borrill (Director of Engineering and Technology Team ANRITSU)

Abstract: 5G Core Network Technologies; 5G Access Network Technologies; Details of Latest 3GPP 5G NR Specification.

Spain

Most of the URSI activities in Spain are concentrated in the first week of September when the General Spain URSI symposium is organized. This symposium usually has more than 250 experts in all the URSI Commissions and spans three days with oral and poster technical contributions. Usually three to five invited speakers participate in the symposium and all the contributions must be approved after a three expert review. In the last three years this symposium took place in:

- 2015. XXX URSI Symposium in Pamplona (Navarra) at the “Universidad Publica de Navarra” organized by de same university and the president was Prof. Jorge Teniente Vallinas. In this year the symposium included an International Meeting on THz Engineering. In the Symposium Prof Sorolla was remembered, who organized of the XIII URSI Symposium and was internationally known professor. <http://www.unavarra.es/ursi2015/presentacion>
- 2016. XXXI URSI Symposium in Madrid at the “ Universidad Autónoma de Madrid” organized at the same university and presided by Prof. Javier Ortega García. <http://rfcas.eps.uam.es/ursi2016/index.php>

- 2017 XXXII URSI Symposium will be organized in Cartagena (Murcia) at the “Universidad Politécnic de Cartagena” and the president is Prof. Leandro Juan Llácer. <http://ursicartagena2017.com/>

Switzerland

Commission C continues to be active in the analysis and processing of measured electromagnetic fields and currents from lightning as well as time reversal. Data from the Säntis tower and from the EUCLID network were analyzed, location algorithms were developed and the time reversal technique was studied in view of applying it to the location of atmospheric discharges. The extremely fruitful collaboration with Commission E in Switzerland (representative: Prof. Farhad Rachidi of the EPFL) continues.

The following journal and conference articles prepared in collaboration with Commission E on the recording, processing, analysis of measured current and electromagnetic field waveforms generated by atmospheric discharges to the Säntis Tower in north eastern Switzerland and on the theory and applications of the Time- Reversal technique.

1. M. Azadifar, F. Rachidi, M. Rubinstein, V. A. Rakov and M. Paolone et al. Bipolar Lightning Flashes Observed at the Säntis Tower: Do We Need to Modify the Traditional Classification?, in *Journal of Geophysical Research: Atmospheres*, vol.121, 2016.
2. H. Karami, F. Rachidi and M. Rubinstein. On Practical Implementation of Electromagnetic Models of Lightning Return-Strokes, in *Atmosphere*, vol. 7, num. 135, 2016.
3. M. Azadifar, F. Rachidi, M. Rubinstein, V. A. Rakov and M. Paolone et al. Fast Initial Continuous Current Pulses vs Return Stroke Pulses in Tower-initiated Lightning, in *Journal of Geophysical Research: Atmospheres*, vol. 121, 2016.
4. M. Stojilović, M. Rubinstein, "Quasi and A. R. Djordjevi -Impulse Response of Frequency-Periodic Microwave Networks," in *IEEE Transactions on Electromagnetic Compatibility*, vol. 58, no. 2, pp. 468-476, April 2016.
5. D. Li, M. Azadifar, F. Rachidi, M. Rubinstein and M. Paolone et al. On Lightning Electromagnetic Field Propagation Along an Irregular Terrain, in *IEEE Transactions on Electromagnetic Compatibility*, vol. 58, num. 1, p. 161-171, 2016.
6. M. Azadifar, F. Rachidi, M. Rubinstein, M. Paolone and G. Diendorfer et al. Evaluation of the performance characteristics of the European Lightning Detection Network EUCLID in the Alps region for upward negative flashes using direct measurements at the instrumented Säntis Tower, in *Journal of Geophysical Research: Atmospheres*, vol. 121, num. 2, p. 595-606, 2016.
7. D. Li, M. Azadifar, F. Rachidi, M. Rubinstein and G. Diendorfer et al. Analysis of lightning electromagnetic field propagation in mountainous terrain and its effects on ToA-based lightning location systems, in *Journal of Geophysical Research: Atmospheres*, vol. 121, num. 2, p. 895-911, 2016.
8. M. Stojilović, Mohammad Azadifar, Marcos Rubinstein and Farhad Rachidi, Lightning Location Systems and Interstroke Intervals: Effects of Imperfect Detection Efficiency. 33rd international Conference on Lightning Protection (ICLP), Estoril, Portugal, 2016.

9. Rubinstein, J. Zuber, A. Smorgonskiy, F. Rachidi and G. Diendorfer, Correlation vs. Causality in Other-Triggered Upward Lightning in Tower Flashes. 33rd International Conference on Lightning Protection (ICLP), Estoril, Portugal, 2016.
10. M. Azadifar, F. Rachidi, M. Rubinstein, V.A. Rakov, M. Paolone and D. Pavanello, Bipolar Lightning Flashes Observed at the Säntis Tower. 33rd International Conference on Lightning Protection (ICLP), Estoril, Portugal, 2016.
11. S. Van de Beek, M. Stojilovic, N. Mora, M. Rubinstein, F. Rachidi and Frank Leferink. Protection Strategy against IEMI for Wireless Communication Infrastructures. 2016 International Symposium on Electromagnetic Compatibility - EMC Europe, Wroclaw, Poland, 2016.
12. M. Azadifar, M. Lagasio, E. Fiori, F. Rachidi and M. Rubinstein et al. Occurrence of Downward and Upward Flashes at the Säntis Tower: Relationship with -10 degrees C Temperature Altitude. European Electromagnetics International Symposium EUROEM 2016, London, UK, 2016.
13. A. Smorgonskiy, F. Rachidi, M. Rubinstein, N. Korovkin and A. Vassilopoulos. On the Adequacy of Standardized Lightning Current Waveform for Composite Structures for Aircraft and Wind Turbine Blades. IEEE International Symposium on electromagnetic Compatibility, Ottawa, Canada, 2016.
14. D. Li, F. Rachidi, M. Rubinstein, G. Diendorfer and Z. Wang. Location Accuracy Evaluation of ToA-Based Lightning Location Systems over Mountainous Terrain. 24th International Lightning Detection Conference (ILDC), San Diego, California, 2016.
15. A. Smorgonskiy, F. Rachidi, M. Rubinstein and G. Diendorfer. On the Estimation of the Number of Upward Flashes From Wind Turbines in Mountainous Areas. 24th International Lightning Detection Conference (ILDC), San Diego, California, 2016.
16. M. Azadifar, D. Li, F. Rachidi, M. Rubinstein and G. Diendorfer et al. Simultaneous Current and Distant Electric Field Waveforms from Upward Lightning: Effect of Ionospheric Reflection. 24th International Lightning Detection Conference (ILDC), San Diego, California, 2016.
17. F. Rachidi and M. Rubinstein. An Overview of Lightning Research in Switzerland. World Meeting on Lightning, Cartagena, Colombia, 2016.
18. G. Lugrin, S. V. Tkachenko, F. Rachidi, M. Rubinstein and R. Cherkaoui. High-Frequency Electromagnetic Coupling to Multiconductor Transmission Lines of Finite Length, in IEEE Transactions on Electromagnetic Compatibility, vol. 57, num. 6, p. 1714-1723, 2015.
19. A. Smorgonskiy, A. Tajalli, F. Rachidi, M. Rubinstein and G. Diendorfer et al. An analysis of the initiation of upward flashes from tall towers with particular reference to Gaisberg and Säntis Towers, in Journal of Atmospheric and Solar-Terrestrial Physics, vol. 136, p. 46-51, 2015.
20. G. Lugrin, N. Mora, F. Rachidi, M. Righero and M. Rubinstein. Protection contre les interférences électromagnétiques intentionnelles. Peut-on utiliser les techniques classiques de la CEM ?, in Bulletin Electrosuisse, vol. 6, p. 38-41, 2015.
21. A. Smorgonskiy, E. Egüz, F. Rachidi, M. Rubinstein and V. Cooray. A model for the evaluation of the electric field associated with the lightning-triggering rocket wire and its corona, in Journal of Geophysical Research: Atmospheres, vol. 120, 2015.
22. A. Tatematsu, F. Rachidi and M. Rubinstein. Analysis of Electromagnetic Fields Inside a Reinforced Concrete Building With Layered Reinforcing Bar due to Direct and Indirect Lightning

- Strikes Using the FDTD Method, in IEEE Transactions on Electromagnetic Compatibility, vol. 57, num. 3, p. 405-417, 2015.
23. M. Azadifar, F. Rachidi, M. Rubinstein, M. Paolone and V. A. Rakov et al. Characteristics of Electric Fields of Upward Negative Stepped Leaders. XIII International Symposium on Lightning Protection (SIPDA), Balneario Camboriu, Brazil, 2015.
 24. S. Runke, M. Stojilovic, S. Sliman, M. Rubinstein and M. Clemens et al. Evaluation of The Electric-Field Transfer Functions Between IEMI Sources and Banking IT Equipment. Joint IEEE International Symposium on EMC and EMC Europe, Dresden, Germany, 2015.
 25. J. Dawson, Dawson, L., Flintoft, I., Garbe, H., Leferink, F., Menssen, B., Mora, N., Rachidi, F., Righero, M., Rubinstein, M. and Stojilovic, M., 2015. The European project STRUCTURES: challenges and results.
 26. D. Li, J. Paknahad, F. Rachidi, M. Rubinstein and K. Sheshyekani et al. Propagation Effects on Lightning Magnetic Fields Over Hilly and Mountainous Terrain. Joint IEEE International Symposium on EMC and EMC Europe, Dresden, Germany, 2015.
 27. M. Rubinstein, A. Smorgonskiy, F. Rachidi and J. Juber. On the Classification of Tower Flashes as Self-Initiated and Other-Triggered. Asia Electromagnetics International Symposium (ASIAEM), Jeju, Republic of Korea, 2015.
 28. M. Azadifar, F. Rachidi, M. Rubinstein, M. Paolone and D. Pavanello. An Update on Experimental Data Obtained at the Sântis Tower. IEEE International Conference on Environmental and Electrical Engineering, Rome, Italy, 2015.
 29. H. Karami, F. Rachidi and M. Rubinstein. On the Use of Electromagnetic Time Reversal for Lightning Location. URSI Atlantic Radio Science International Conference, Gran Canaria, 2015.
 30. A. Smorgonskiy, N. Mora, F. Rachidi, M. Rubinstein and K. Sheshyekani et al. Measurements of Transient Grounding Impedance of a Wind Turbine at Mont-Crosin Wind Park. 2015 Asia Pacific International Symposium on Electromagnetic Compatibility, Taipei, Taiwan, 2015.
 31. N. Mora, F. Vega, G. Lugrin, F. Rachidi and M. Rubinstein. Study and Classification of Potential IEMI Sources, in System Design and Assessment Notes, Note 41, 2014.
 32. N. Mora, F. Vega, G. Lugrin, F. Rachidi and M. Rubinstein. Study and Classification of Potential IEMI Sources, in System Design and Assessment Notes, Note 41, 2014.
 33. G. Lugrin, N. M. Parra, F. Rachidi, M. Rubinstein and G. Diendorfer. On the Location of Lightning Discharges Using Time Reversal of Electromagnetic Fields, in IEEE Transactions on Electromagnetic Compatibility, vol. 56, num. 1, p. 149-158, 2014.
 34. A. Mimouni, F. Rachidi and M. Rubinstein, M., Electromagnetic Fields of a Lightning Return Stroke in Presence of a Stratified Ground, IEEE Transactions on Electromagnetic Compatibility, vol. 56, num. 2, p. 413-418, April 2014, doi:10.1109/TEMPC.2013.2282995.
 35. A. Smorgonskii, A. Tajalli, F. Rachidi, M. Rubinstein and G. Diendorfer et al. Analysis of Lightning Events Preceding Upward Flashes from Gaisberg and Sântis Towers. 32nd International Conference on Lightning Protection (ICLP), Shanghai, China, 2014.
 36. M. Azadifar, M. Paolone, D. Pavanello, F. Rachidi and V. Rakov, , C. Romero, M. Rubinstein, An Update on the Characteristics of Positive Flashes Recorded on the Sântis Tower. 32nd International Conference on Lightning Protection (ICLP), Shanghai, China, 2014.

37. F. Rachidi and M. Rubinstein. EMC/Lightning Applications of Electromagnetic Time Reversal. 32nd International Conference on Lightning Protection (ICLP), Shanghai, China, 2014.
38. M. Stojilovic, B. Menssen, I. Flintoft, H. Garbe, J. Dawson and M. Rubinstein, TDoA-Based Localisation of Radiated IEMI Sources, International Symposium on Electromagnetic Compatibility - EMC Europe 2014, Gothenburg, Sweden, 2014.
39. J. F. Dawson, I. D. Flintoft, P. Kortoci, L. Dawson, A. C. Marvin, M. P. Robinson, M. Stojilović, M. Rubinstein, B. Menssen, H. Garbe, W. Hirschi, L. Rouiller, A Cost- Efficient System for Detecting an Intentional Electromagnetic Interference (IEMI) Attack, International Symposium on Electromagnetic Compatibility - EMC Europe 2014, Gothenburg, Sweden, 2014.
40. O.D. Recordon, M. Rubinstein, M. Stojilovic, N. Mora and G. Lugrin et al. A Comparator- based Technique for Identification of Intentional Electromagnetic Interference Attacks. International Symposium on Electromagnetic Compatibility - EMC Europe 2014, Gothenburg, Sweden, 2014.
41. M. Azadifar, M. Rubinstein, F. Rachidi, M. Paolone, and Davide Pavanello, On the Influence of Measuring Instruments Bandwidth Limitations on the Inferred Statistical Parameters for Lightning Currents. 2014 URSI General Assembly, Beijing, China, 2014.
42. F. Rachidi, M. Rubinstein, M. Paolone and D. Pavanello. Measurement of Lightning Currents at the Säntis Tower in Switzerland. American Electromagnetics International Symposium AMEREM, Albuquerque, New Mexico, USA, 2014.
43. N. Mora, C. Romero, F. Vega, F. Rachidi, M. Rubinstein, Response of an Electrical and Communication Raceway to HPEM Transient Field Illumination, 2014 American Electromagnetics International Symposium AMEREM, Albuquerque, USA, 2014.
44. N. Mora, C. Kasmi, F. Rachidi, M. Darces, M. Helier, M. Rubinstein, Analysis of the Propagation of High Frequency Disturbances along Low-Voltage Test Raceway, 2014, American Electromagnetics International Symposium AMEREM, Albuquerque, USA, 2014.
45. M. Stojilović, M. Rubinstein and A. Djordjević, Impulse Response and IEMI Susceptibility of Commensurate-Line Filters, 2014 American Electromagnetics International Symposium AMEREM, Albuquerque, USA, 2014.
46. M. Paolone, D. Pavanello, F. Rachidi, M. Rubinstein, Measurement of Lightning Currents at the Säntis Tower in Switzerland, 2014 American Electromagnetics International Symposium AMEREM, Albuquerque, USA, 2014.
47. M. Azadifar, M. Stojilović, M. Rubinstein, F. Rachidi, Influence of LLS Detection Efficiency on the Measured Distribution of Interstroke Intervals, 2014 American Electromagnetics International Symposium AMEREM, Albuquerque, USA, 2014.
48. D. Recordon, M. Stojilović, M. Rubinstein, L. Rouiller, W. Hirschi, A Multi-Channel Hardware Prototype for IEMI Diagnosis, 2014 American Electromagnetics International Symposium AMEREM, Albuquerque, USA, 2014.
49. A. Tatematsu, F. Rachidi and M. Rubinstein, FDTD Calculation of LEMP Inside a Reinforced Concrete Building, 2014 American Electromagnetics International Symposium AMEREM, Albuquerque, USA, 2014.
50. P. Bertholet, A. Kaelin, G. Lugrin, N. Mora, M. Nyffeler, F. Rachidi, M. Rubinstein, Design and Realization of a High-Voltage Adapter for the Testing of Surge Protective Devices against

Intentional Electromagnetic Interferences, 2014 American Electromagnetics International Symposium AMEREM, Albuquerque, USA, 2014.

51. M. Rubinstein and F. Rachidi, Lightning Detection and Location : From Early Methods to Electromagnetic Time Reversal. 2nd Radio and Antenna Days of the Indian Ocean, Mauritius, 2014.
52. A. Tatematsu, F. Rachidi and M. Rubinstein. Calculation of Electromagnetic Fields Inside a Building with Layered Reinforcing Bar Struck by Lightning Using the FDTD Method. 2014 International Symposium on Electromagnetic Compatibility, Tokyo, Japan, 2014.
53. A. Smorgonskiy, G. Berger, S. Pedebay, F. Rachidi and M. Rubinstein. A. Smorgonskiy, G. Berger, S. Pedebay, F. Rachidi, M. Rubinstein, "On the Influence of Topography on Lightning Incidence in the Region of Pic du Midi",. 6th International Conference on Lightning Physics and Effects, Manaus, Brazil, 2014.
54. H. Karami, F. Rachidi and M. Rubinstein. On Practical Implementation of Electromagnetic Time Reversal to Locate Lightning. 23rd International Lightning Detection Conference, Tucson, Arizona, USA, 2014.
55. F. Rachidi, M. Rubinstein, M. Paolone and D. Pavanello. Lightning Experiments on the Sântis Tower (Invited Lecture). 23rd International Lightning Detection Conference, Tucson, Arizona, USA, 2014.

United Kingdom

Over the past triennium, activities under Commission C have continued to be pursued actively within the UK. Activities in the UK that fall under the remit of Commission C are carried out by a significant number of key Universities and companies across the UK. As an example of the strength in this area, approximately £17m of current UK Government funded Engineering and Physical Sciences Research Council (EPSRC) funding, directly related to Commission C areas, is spread across 12 leading UK Universities. Topics span emerging communication technologies, such as visible light communication, massive MIMO technologies and full duplex radios, as well as application of state of the art signal and image processing algorithms for communication systems. The activity in this area is recognised internationally, with seven international conferences or workshops directly related to Commission C activities being hosted within the UK in the past two years, including two flagship IEEE Communication Society conferences, namely the International Conference on Communications (ICC2015) held in London, and the Vehicular Technology Conference (VTC2015Spring) held in Glasgow. As part of the UK branch of URSI, Commission C participates in the UK's annual Festival of Radio Science, the most recent Festival attracting 17 oral and 12 poster presentations from young research scientists across the UK.

4. Radio Science Bulletin:

Radio Science Bulletin is one of the primary publications of URSI. The contributions to the Bulletin come from all commissions of URSI.

Commission C solicited papers

Published Sept 2014: Anthony F. Martone, "Cognitive Radar Demystified"

Papers under review:

1. Mina Labib, Vuk Marojevic, Anthony F. Martone, Jeffrey H. Reed, and Amir I. Zaghloul, “Coexistence between Communication and Radar Systems - A Survey”
2. Ronald E. Meyers, Arnold D. Tunick, Keith S. Deacon, and Philip R. Hemmer, “Survey of Emerging Information Teleportation Networks and Protocols”

Papers published in the RSB which are related to Commission C:

Sept 2016:

Gaspare Galati and Piet van Genderen, “Introduction to the Special Section on Some Less-Well-Known Contributions to the Development of Radar: From its Early Conception Until Just After the Second World War”

Yves Blanchard, “A French Pre-WW II Attempt at Air-Warning Radar: Pierre David’s “Electromagnetic Barrier””

Felix J. Yanovsky, “Glimpses of Early Radar Developments in Ukraine and the Former Soviet Union”

B. A. Austin, “On the Development of Radar in South Africa and Its Use in the Second World War”

István Balajt1 and Ferenc Hajdú, “Surprising Findings from the Hungarian Radar Developments in the Era of the Second World War”

June 2016:

Thomas W. Thompson, Bruce A. Campbell, and D. Benjamin J. Bussey, “50 Years of Arecibo Lunar Radar Mapping”

March 2016:

Takashi Takeuchi, Shinichiro Ohnuki, and Tokuei Sako, “A Quantum Switching System Manipulated by a Light Pulse Pair Designed in a Maxwell-Schrödinger Hybrid Algorithm”

Y. Yasuda, S. Hisatake, S. Kuwano, J. Terada, A. Otaka, and T. Nagatsuma, “Terahertz Wireless Transmission Enabled by Photonics Using Binary Phase-Shift Keying at 300 GHz”

Li Yi, Kazunori Takahashi, and Motoyuki Sato, “Large-Scale Subsurface Velocity Estimation with YAKUMO GPR Array System”

Dec 2015:

Tullio Joseph Tanzi, “Some Thoughts on Disaster Management”

Michel Parrot and Mei Li, “DEMETER Results Related to Seismic Activity”

Daniel Camara, “Topology Control of a Network of Autonomous Aerial Drones”

Tullio Joseph Tanzi, Olivier Sebastien, and Caroline Rizza, “Designing Autonomous Crawling Equipment to Detect Personal Connected Devices and Support Rescue Operations: Technical and Societal Concerns

V. Chandrasekar, Luca Baldini, Nitin Bharadwaj, and Paul L. Smith, “Calibration Procedures for Global Precipitation-Measurement Ground-Validation Radars”

Sept 2015:

Ryszard Struzak, Terje Tjelta, and José P. Borrego, “On Radio-Frequency Spectrum Management”

December 2014:

William F. Young, Kate A. Remley, Christopher L. Holloway, Galen Koepke, Dennis Camell, John Ladbury, and Colton Dunlap, “Radiowave Propagation in Urban Environments with Application to Public-Safety Communications”