Commission Triennial Report

Commission C

1. Scope of Activities

Commission C promotes 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.
- Artificial Intelligence and Machine Learning tools for communication systems

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 Co-sponsored by URSI Commission C

Commission C participated in a number of URSI conferences and symposia over the triennium that started in 2017, and was extended to 2021 due to the COVID epidemic.

2.1 AT-RASC 2018 (28 May-1st June)

This conference held at Gran Canarias, Canary Islands, Spain, included the following activities:
- 44 papers for Comm. C (16 with joint sessions)
- Commission C ECR tutorial, "Radio Resource Management in Ultra Dense Networks," Haijun Zhang, University of Science and Technology Beijing, China, haijunzhang@ieee.org
- The following Commission C Sessions:

C.1	Cognitive radio and software defined radio
C.2	Distributed sensor networks and sensors array processing
C.3	Energy-efficient cognitive radio communications
C.4	Information theory, coding, modulation and detection
C.5	Novel radio communication systems
C.6	Quantum networks
C.7	Signal processing, including physics-based signal processing
C.8	Small cells for 5G and related technologies
C.9	Spectrum and medium utilization
C.10	Wireless networking, including broadband ubiquitous systems
C.11	5G relocation systems
C.12	Other

- The following sessions, joint with other URSI Commissions

C.13	Special sessions
S-AC	Radio Channel Sounding and Channel Modeling
	Organizers : T. H. Loh, J. Quimby
S-CB1	MIMO and MISO systems, including smart antennas/MIMO techniques

S-CB2	Signal and image processing, synthetic aperture and space-time processing, signal processing antennas, and statistical signal processing of waves in random media
S-CD1	Energy-efficient ("green") communications, including energy harvesting in wireless systems
S-CD2	Radar target detection, localization, positioning and tracking
S-CD3	THz communications
S-CE	Time Reversal in Electromagnetics
S-CF1	Multipath and its mitigation
S-CF2	Communication in Urban Environments
S-CG	Precision modeling, including atmospheric modeling, for GNSS
S-KC	5G, Health and Monitoring
S-CBDF	Radar systems for collision avoidance
S-EACFJ	Spectrum management and utilization

Organizers: J. Borrego, N. Carvalho

The **ISSSE** (International Symposium on Signals, Systems and Electronics) is held every three years and 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). In 2018 ISSSE was held in Gran Canaria (Spain) on May 2018, 28-30, 2018 and run in conjunction with AT-RASC conference.

2.2 AP-RASC 2019 (New-Delhi, 28 May-1st June)

84 papers for Commission C
Keynote lecture "Sparse Vector Transmission for Ultra-Reliable and Low Latency Communications"
Shim Byonghyo

List of sessions
1. Machine learning, deep learning and signal processing
2. Information theory, modulation, coding and detection
3. Cognitive, cooperative and coordinated communications
4. Ressource allocation and heterogeneous networks
5. Sensor networks and applications
6. Navigating, timing and positioning systems
7. Radar systems
8. Energy harvesting for communications and associated devices
9. Green communications

2.3 URSI GASS 2021 (Roma)

64 papers for Commission C
Tutorial : Cognitive Radar, Kumar Vijayn Mishra, United States CCDC Army Research Laboratory.

List of Sessions:
C01 : Resource Management in Future Wireless Communications
C02 : Application of Machine Learning in Wireless Communications
C03 : 5G Wireless Communications and IoT
C05 : Optimization of Wireless Power Transfer
C06 : Internet of Things for licensed and unlicensed spectrum
C09 : Radar and Communications Co-Design

C10 : Multi-antenna technologies and massive MIMO
C11 : Visible Light Communications
C12 : Global Navigation Satellite System
C13 : Open Session
CB1: Functional Metasurfaces for Communication and Radar Systems
CFH1: Radio Science Measurements from Spacecraft Telecom. Signals
CK1: Over-the-Air testing: State-of-the-Art & Future of Technology & Apps

3. Reports from Commission C of Country Members of URSI

This section presents the activities of URSI Commission C at different member countries. Presented here are inputs from: Brazil, France, Germany, Italy, and Japan.

3.1 Report from Brazil: 2018-2020: Commission C – Telecommunications in Brazil

This section is contributed by: **Marcelo S. Alencar**, Institute of Advanced Studies in Communications (Iecom), Senai Cimatec University Center, Av. Orlando Gomes, 1845, Piat˜a Salvador BA 41650-010 Brazil

Abstract:

This report presents the status of the telecommunication activities in Brazil, for the past triennium, regarding the statistics of telecom operators, number of service subscribers, revenue and market value of the sector. It also presents the activities of the main scientific societies, related to the mission of the Commission C.

Introduction:

The Brazilian telecommunication market decreased in the past years, caused by a lack of investiment by private companies, as well as, an excess of incompetence of the federal governement. Brazil ended 2020 with 230 million mobile lines in service, which is an increase of only 0.7% regaring the previous year, but a decrease regarding the past triennium, and represents a penetration of 95.5%, according to data from telecom regulator Anatel. Postpaid service has surpassed prepaid service and has become, for the first time, the most common type of mobile contract in the country, with 50.4% of accesses. Most of the active mobile lines accessed the Internet, and 4G services accounted for 73.2% of the total. On the other hand, 3G is now less than 15% of the total. The country reached 35 million fixed broadband accesses, an increase of 5.5% over 2019. The service was available to 43.1% of households. Optical fiber access continues to grow and epresents 44% of the total accesses.

Telecommunication Market:

Regarding the composition of the telecom market for fixed broadband acess, in terms of gross operational revenue, in 2020, four telecommunication operators served 76,7% of the population. Claro has 28.2% of the fixed broadband market, followed by Telefonica Brasil (18.5%) and Oi (14.5%), with small Internet service providers accounting together for 33.3% of the segment.

In the mobile sector, Telefonica Brasil is the main market player, with a participation of 33.6%, followed by Claro (25.2%, excluding Nextel), TIM (22.3%) and Oi (15.9%). Pay television is declining, and lost over one million subscriptions in the past year, to a total of 15 million subscribers, with a penetration of 21.3%.

Considering the total number of acesses, a percentage of 42.9% are provided via cable and 49.8% via satellite (DTH). The Claro company leads with a 47.3% share, followed by Sky/AT&T (30.7%), Oi (11%) and Vivo (8.4%).

The Brazilian telecommunications sector collects over US$ 12.3 billion in taxes and contributions annually. But, since 2001, only 8% of the resources of telecom funds have been invested back in telecom development.

Activities of the Scientific Societies and Institutions:

Scientific Events:

The Brazilian Telecommunications Society (SBrT) sponsored the XXXVI Brazilian Telecommunications and Signal Processing Symposium(SBrT'18), which was held in Campina Grande, between 16 and 19 of October, 2018, at the Garden Hotel conventions center. The general chair was Edmar Candeia Gurj˜ao (UFCG), and the technical program chairs were Marcelo Sampaio de Alencar (Iecom, UFCG, UFBA), Wamberto Jos e Lira de Queiroz (Iecom, UFCG) and Waslon Terllizzie A. Lopes (Iecom, UFPB).

The Brazilian Telecommunications Society (SBrT) sponsored the XXXVII Brazilian Telecommunications and Signal Processing Symposium (SBrT'19), which was held in Petr opolis, between September 29 and October 2, 2019, at the Instituto Teol ogico Franciscano (ITF). The general chair was Lisandro Lovisolo (UERJ), and the technical program chair was Eduardo Antˆonio de Barros da Silva (UFRJ).

The Brazilian Telecommunications Society (SBrT) sponsored the XXXVIII Brazilian Telecommunications and Signal Processing Symposium (SBrT'20), which was held in Florianopolis, between November 22 to 25, 2020, in a remote mode. The general chairs were Bartolomeu F. Uchoa (UFSC) and Eduardo L. O. Batista (UFSC), and the technical program chairs were Cecilio J. L. Pimentel (UFPE) and Danilo Silva (UFSC).

The 18th Brazilian Symposium on Microwaves and Optoelectronics and the 13th Brazilian Congress on Electromagnetism (MOMAG 2018) occured at the Inatel, in Santa Rita do Sapuca ı, in 2018. The event was organized by the Inatel. The event was supported by the Brazilian Microwave and Optoelectronics Society (SBMO) and by the Brazilian Electromagnetics Society (SBMag). The general chairs was Arismar Cerqueira Sodr e Junior (Inatel) and the technical program chair was Danilo Henrique Spadoti (Unifei).

The 2019 SBMO/IEEE MTT-S International Microwave and Optoelectronics Conference (IMOC 2019) is an international forum of telecommunication technologies organized by the Brazilian Microwave and Optoelectronics Society (SBMO) and co-sponsored by IEEE Microwave Theory and Techniques Society of the Institute of Electrical and Electronic Engineers (IEEE MTT-S). Its 2019 edition was held at the Congress Center, in Aveiro, Portugal. The general chairs were Marcelo Segatto (UFES) and Paulo Andr e (IST/Lisboa and IT Portugal), and the technical program chairs were Mois es Renato Nunes Ribeiro (UFES) and Nuno Borges Carvalho (IT/UA).

The 19th Brazilian Symposium on Microwaves and Optoelectronics and the 14th Brazilian Congress on Electromagnetism (MOMAG 2020) occured at the Universidade Federal Fluminense (UFF), in Rio de Janeiro, in 2020. The event was organized by the UFF, Coppe and IME. The event was supported by the Brazilian Microwave and Optoelectronics Society (SBMO) and by the Brazilian Electromagnetics Society (SBMag). The general chairs were Two: Leni Joaquim de Matos (UFF/SBMO), Andres Pablo Lopez Barbero (UFF) and Rubens de Andrade Junior (UFRJ/SBMag).

The VII National Conference on Communications, Networks and Information Security (ENCOM 2018) was held in Salvador, from October 19 to 21, 2018, under the sponsorship of the Institute for Advanced Studies in Communications (Iecom), UFBA, IEEE ComSoc, IFPE, UPE, UFPE and UFCG. It received support from IBM and Rohde & Schwarz. The general chairs were Marcelo Sampaio de Alencar and Vitaly Felix Rodriguez Esquerre (UFBA), and the technical program chairs were Karcius Day Rosario Assis (UFBA) and Waslon Terllizie A. Lopes (Iecom, UFPB).

The IX National Conference on Communications, Networks and Information Security (ENCOM 2019) was held in Petrolina, from October 18 to 20, 2019, under the sponsorship of the Institute for Advanced Studies in Communications (Iecom), IFSert˜ao, Facape, IFPB, UFRB, UFS, UFPB, IFBA, UnB, IEEE ComSoc, Univasf, UFBA, IFPE, UPE, UFPE and UFCG. It received support from Rohde & Schwarz. The general chairs were Marcelo Sampaio de Alencar (UFBA, Iecom) and Felipe Pinheiro Correia (IFSert˜ao), and the technical program chairs were Francisco Madeiro Bernardino Junior (UPE) and Vitaly Felix Rodriguez Esquerre (UFBA).

The X National Conference on Communications, Networks and Information Security (ENCOM 2020) was held in Natal, from December 4 to 6, 2020, under the sponsorship of the Institute for Advanced Studies in Communications (Iecom), UFRN, IFSert˜ao, Facape, IFPB, UFRB, UFS, UFPB, IFBA, UnB, IEEE ComSoc, Univasf, UFBA, IFPE, UPE, UFPE and UFCG. It received support from Rohde & Schwarz. The general chairs were Marcelo Sampaio de Alencar and Luiz Felipe de Queiroz Silveira (UFRN), and the technical program chair was Antonio Luiz Pereira de Siqueira Campos (UFRN).

Journals Publications in the Area:

The Journal of the Brazilian Telecommunications Society (JBTS) was created in 1986 by the SBrT as a way to document and disseminate the results produced by Brazilian researchers. Effective December, 2005, the Board of the SBrT approved a new title for its publication, which became known as Journal of Communication and Information Systems (JCIS). The Editors-in-Chief, for the first five years, were Marcelo S. Alencar (UFCG), Celia Desmond (IEEE ComSoc) and Elvino S. Sousa (UofT).

The Journal of Communication and Information Systems (JCIS) features high-quality, peer-reviewed technical papers in several areas of communications and information systems. The JCIS is jointly sponsored by the Brazilian Telecommunications Society (SBrT) and the IEEE Communications Society (ComSoc). The JCIS aims at a larger international audience. The Steering Committee includes renowned scholars from the international and the Brazilian communities. Also, distinguished researchers in several fields of Communication and Information Science act as area editors. The editors-in-chief are Rausley Adriano Amaral de Souza, (Inatel) and Jos e Cˆandido Silveira Santos Filho, (Unicamp).

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 devoted to disseminating technical information in the areas of Microwaves, Optoelectronics, Photonics, and Electromagnetic Applications. The journal is published in electronic format since 1997. The editor is Maria Thereza Miranda Rocco Giraldi (IME). 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.

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 awarded a Capes Qualis classification. The editors-in-chief are Wamberto Jos e Lira de Queiroz (UFCG) and Waslon Terlizzie Ara ujo Lopes (UFPB).

Concluding Remarks and Recommendations:

According to a recent report from the International Telecommunication Union (ITU), the
telephone services in Brazil present one of the highest costs in the World, the blocking probability is high, the drop rate is also high and the overall quality is low. Those problems led the Brazilian National Telecommunication Agency (Anatel) to punish several telecom operators.
As a recommendation, it is important that the International Union of Radio Science (URSI), Commission C, sponsors the conferences organized by the Brazilian Telecommunications Society (SBrT), by the Brazilian Microwave and Optoelectronics Society (SBMO), and by the Institute of Advanced Studies in Communications (Iecom).

References:

[1] Bnamericas. Spotlight: The state of Brazil's telecom sector. Technical report, Endicott Growth Equity Partners, L.P (EGEP), June 2021.
[2] Anatel. "Dados sobre Telecomunica c˜oes no Brasil". Internet webpage (www.anatel.gov.br), Brazilian National Telecommunications Agency (Anatel), June 2021.
[3] Institute for Advanced Studies in Communications. "Report of the Institute for Advanced Studies in Communications (Iecom). Technical report, Iecom, December 2020.
[4] Brazilian Microwave and Optoelectronics Society. "Portal of the Brazilian Microwave and Optoelectronics Society. Technical report, SBMO, December 2020.
[5] Brazilian Telecommunications Society. "Portal of the Brazilian Telecommunications Society. Technical report, SBrT, December 2020.
[6] Telebrasil. "O Desempenho do Setor de Telecomunica c˜oes no Brasil S eries Temporais". Technical report, Telebrasil, March 2021.

3.2 International events sponsored by URSI France

This section is contributed by **Yves Louet**, CentraleSupélec - IETR Lab., France.

The following are conferences and events organized and sponsored by URSI Commission C in France.

ICT 2018 (St Malo, France, June 2018) International Conference on Telecommunication

The aim of this conference was to provide a forum for researchers and technologists to present new advances and contributions in the form of keynotes, tutorials, workshops as well as regular and special sessions with the objective to share ideas and progress in wireless communications, networking and signal processing employed to support the needs of the information society. This twenty fifth edition of the ICT event brought together various wireless communication systems developers to discuss the current status, technical challenges, standards, fundamental issues, and future services and applications. ICT'2018 addressed and captured highly-innovative and state-of-the-art research from academia, wireless industry as well as recent advances in standardization.

    The topics of interest were:

    – Fifth generation (5G) mobile communications
    – Heterogeneous networks and small cells
    – Big data networking
    – Software radio
    – Protocols, architectures and applications for the Internet of things
    – Network functions virtualization and software defined networking

- Green communications and energy efficiency
- Self - organizing/self - deploying networks
- Cognitive radio and networks
- Wireless sensor and actuator networks
- D2D and M2M communications
- Ad - hoc communications
- Cooperative communications
- Multi-antenna and beamforming systems
- Game theory for communications
- Signal processing for communications
- Wireless communication testbeds, measurements and modelling
- Optical networks and converged optical-wireless networks
- ICT for smart cities
- Smart grid communications
- Powerline communications
- Vehicular networking
- Pervasive and mobile computing
- Cloud computing
- Satellite & space communications
- Emerging WLANs, WPANs and WMANs
- Optical communications and technologies
- Wireless optical communications and VLC
- Information theory, channel coding and joint source channel coding
- Network coding techniques
- Image processing, video compression and coding
- QoS provision and management
- Metrics and models for QoE
- Multimedia and virtual reality
- Cryptography and network security
- Standards for communications and networking
- Terahertz communications

The 2019 International Symposium on Ubiquitous Networking (UNet 2019)
September 16-19 2019, Limoges-France,
Co-located with IEEE Global 5G-IoT Summit Limoges

The international symposium on Ubiquitous Networking (UNet) highlights new trends and findings in hot topics related to ubiquitous computing/networking. UNet provides an excellent opportunity to share knowledge and the practicability of sciences and technologies of information and communications. This unique event intends to bring together researchers and practitioners to present and discuss their recent progresses in all major areas of ubiquitous networking with a particular focus on 5G, IoT, Ambient Intelligence and Tactile Internet.

UNet 2019 featured thematic content and solicits original contribution across, but not limited to, the following:

Track 1: Ubiquitous Communication Technologies and Networking
Track 2: Tactile Internet and Ubiquitous Internet of Things
Track 3 : Mobile Edge Networking and Fog-Cloud Computing
Track 4: AI and Machine Learning for Ubiquitous Communications
Track 5: Data Engineering, Cyber Security and Pervasive Services

URSI France medal

Jacques Palicot (Honorary Professor with CentraleSupélec) got the medal of URSI France in 2019. Jacques Palicot has been serving URSI for a very long time both at the national (French) and international levels. Jacques Palicot has been working on signal processing, digital communications for radio and telecommunication systems. He contributed a lot on equalization, software radio and cognitive radio. He developed the concept of Green Cognitive Radio and how cognitive radio can reduce the carbon footprint of worldwide communications. He created and headed SCEE team (2004-2018) from IETR Laboratory (CNRS research cluster) in Rennes (France).

Other activities and contributions to URSI by Commission C of French URSI

French Commission C is led by Prof. Yves LOUET (CentraleSupélec) and co-led by Prof. Yannis Pousset (Poitiers University) and Prof. Guillaume Villemanud (INSA Lyon).

- AT-RASC 2018: 3 papers from French Comm C ; 4 sessions convened by French URSI Comm. C
- AP-RASC 2019: 4 papers from French Comm C ; 4 sessions convened by French URSI Comm. C
- GASS 2021: 7 papers from French Comm C ; 7 sessions convened by French URSI Comm.

3.3 URSI of Germany

This section was contributed by Prof. Dr. Jens Anders of thr University of Stuttgart, Institute of Smart Sensors, Pfaffenwaldring 47 - 70569 Stuttgart

Short summary

In addition to preparing sessions for the annual meeting of URSI Germany, the "Kleinheubacher Tagung", the members of Commission C participated in a large number of national and international conferences with their own contributions during the reporting period. In addition, they actively participated in various program committees and in the organization of national and international conferences as session or conference chairs.

German URSI Commission C meetings

The members of Commission C Germany met annually during the Kleinheubacher Tagung with the exception of 2020, when the Kleinheubacher Tagung was cancelled due to the Corona pandemic.

Organized conferences (Excerpt)

March 2019, the 21st Workshop Analog Circuits, Stuttgart, Germany (approximately 100 participants)
March 2020, 1st Workshop EPR-on-a-chip (EProC), Stuttgart, Germany (approximarel50 participants)

Plenary Talks and Invited Talks (Excerpt)

1. Prof. Dr. J. Anders (Uni Stuttgart) at the Rocky Mountain Conference for Magnetic Resonance 2018 In Snowbird, Utah, USA
2. Prof. Dr. J. Anders (Uni Stuttgart) at ESSDERC 2018 In Dresden

3. Prof. Dr. J. Anders (Uni Stuttgart), "CMOS integrated hyperpolarized NMR using NV centers in diamond", SPIE Security + Defence International Symposium,Strasbourg, France
4. Prof. Dr. J. Anders (Uni Stuttgart), "EPR-on-a-chip: A new paradigm in EPR spectroscopy", Keynote lecture at the XIth EFEPR Conference, Bratislava, Slovakia
5. Prof. Dr. Wolfgang Mathis, "100 Years Multivibrator – History, Circuits and Mathematical Analysis", Keynote lecture at the XX International Symposium on Theoretical Electrical Engineering (ISTET-2019), Sofia, Bulgaria
6. Prof. Dr. Jens Anders, "Integrated quantum sensors as a new challenging problem in theoretical electrical engineering", Keynote lecture beim XX International Symposium on Theoretical Electrical Engineering (ISTET-2019), Sofia, Bulgaria
7. Prof. Dr. Jens Anders, "MR-to-go: Making Magnetic Resonance Mobile Using Integrated Circuit Technology", 60th Experimental Nuclear Magnetic Resonance Conference (ENC 2019), Asilomar, USA
8. Prof. Dr. Gerhard Fettweis, 6G – Just a better 5G?, IEEE 5G World Forum
9. Prof. Dr. Gerhard Fettweis, Scaling of Wireless Systems and Networks, IEEE Globecom 2019

Member activities

In 2019 Prof. Dr.-Ing. Tobias Weber was suggested by Dr. Wolfgang Sauer-Greff as potential new member. Prof. Dr. Jens Anders has been promoted to an U.R.S.I Senior Member. One of the first seven BMBF (German federal ministry of education and research) clusters of the future is led by URSI Commission C member Jens Anders

New members : None

Contributions to conferences (Excerpt)

The members of Commission C Germany were actively involved with presentation and poster contributions at numerous national and international meetings in all thematic areas of the Commission. Below, a list of example TPC memberships is given:
– IEEE Sensors
– BioCAS
– ICECS
– ISCAS
– ESSDERC
– ESSCIRC
– ISTET
– ENC
– IEEE ANTS
– GLOBECOM
– IEEE Access
– IEEE LATINCOM

Memberships in TPCs etc. (Excerpt)

The members of Commission C were involved in numerous program and organization committees of national and international conferences. Below, a list of example TPC memberships is given:

– ISTET
– IEEE Sensors
– ESSDERC
– ESSCIRC
– ISSCC

3.4 URSI Commission C of Italy

Radio communications is a major area of activity for the Italian research community, with many people committed and a very large number of contributions in international journal and conference papers, research projects, participation in technical program committees and editorial boards. Among others, joint commitments of the industrial and academic communities to successful 5G experimental trials deserve a particular mention for the whole period 2018-2020: the trials ended up in June 2020 and have paved the way for longer term research and development activities at both national and European level. For instance, 5G Italy (https://www.5gitaly.eu/) has been successfully started and consolidated during the three years of this reporting as a yearly event that is fully participated by academics, industry researchers and executives, public agencies and public institutions)

Other specific activities of major interest for URSI are summarized as follows.

– Commission C members have distributed URSI calls and promoting actions throughout the telecommunications community in Italy.

– Commission C members have been part of the URSI GASS 2020/2021 organizing committee, with specific commitments in finance and involvements of companies and institutions.

– Commission C members have promoted participation in URSI conferences, e.g. AT-RASC 2018.

– Commission C members have acted as session conveners at URSI GASS 2020/2021, contributing to solicit research reports from 5G experimental trials in various vertical domains.

– Commission C members have contributed as reviewers for URSI journals, e.g. Radio Science Letters.

– In 2019 Commission C members have actively contributed to the chapter entitled "A Century of Radio Science in Italy: History, Developments and Perspectives", included in the URSI Centenary Book.

3.5 URSI Commission C of Japan

The scientific committee of URSI-C in Japan had usually held scientific conferences/workshops four times a year before COVID-19 disaster began. From 2017 to 2020 during the 24th term, including the last workshop held by 23rd committee[1], we had the scientific conferences eight times as the followings. All the speakers are invited by the committee. These are open workshops for any people and the registration fee is free every time.

The 12th scientific workshop of the 23rd URSI-C in Japan

– Session title: "Recent trend of Antenna, Propagation, System, and Signal Processing Technologies toward to future"
– Date/time: 09:00 - 11:35, 22nd March 2018
– Venue: Tokyo Denki University (Adachi ward, Tokyo pref.)
– Listed attendees: 28 persons
– Presentation: "The status on standardization for channel models used in the 5G," by Koshiro Kitao (NTT Docomo）, and 4 totally five invited talks.

The 1st scientific workshop of the 24th URSI-C in Japan

– Session title: "Wireless Access TechnologiesTowards the 5th Generation Mobile Communication"
– Date/time: 14:00 - 17:00, June 29th, 2018
– Venue: 16th Building, Yagami Campus (Yokohama city, Kanagawa pref.)
– Listed attendees: 28 persons
– Presentations: "Docomo's 5G Trial for 5G Realization" by Dr. Satoshi Suyama (NTT Docomo）and 3 totally four presentations.

The 2nd scientific workshop of the 24th URSI-C in Japan

– Session title: "OAM radio transmission technologies"
– Date/time: 14:00 - 17:00, October 12th, 2018
– Venue: Setsunan University, Neyagawa-shi, Osaka Pref.
– Listed attendees: 22 persons
– Presentations: "Analog OAM Multiplexing and Related Technologies" by Prof. Atsushi Sanada (Osaka University), and two totally three presentations.

The 3rd scientific workshop of the 24th URSI-C in Japan

– Session title: "Millimeter / Terahertz Wave Devices and Circuits their Applications for Ultra-High Speed Wireless Communication Systems"
– Date/time: 13:30 - 17:20, December 14th, 2018
– Venue: Room "Hourai", Hotel Ryokusui-Tei in Akiu-Onsen (Sendai, Miyagi pref.)
– Listed attendees: 18 persons
– Presentations: "Advances in terahertz wireless communication technology utilizing resonant-tunneling diodes" by Prof. Safumi Suzuki (Tokyo Institute of Technology), and three totally four presentations.

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[1] Each scientific committee of URSI in Japan is usually renewed on 1st April so this workshop was steered by the previous 23rd committee.

The 4th scientific workshop of the 24th URSI-C in Japan

- Session title: "Wireless Access Technologies Beyond the 5th Generation Mobile Communications"
- Date/time: 13:20 - 17:30, March 1st, 2019
- Venue: Room "the meeting room in the KKR Kinosaki-Genbu", Kinosaki-cho, Toyooka, Hyogo
- Listed attendees: 19 persons
- Presentations: "IoT standardization activity in 3GPP" by Mr. Satoshi Nagata (NTT DOCOMO, Inc.), and four totally five invited talks.

The 5th scientific workshop of the 24th URSI-C in Japan

- Session title: "Current status and issues of antenna propagation technology in V2X communications"
- Date/time: 13:45—17:25, May 31st, 2019
- Venue: Room "The meeting room 1 in the Tenbusu Naha" (Naha, Okinawa, Japan)
- Listed attendees: 20 persons
- Presentations: "Antenna configuration methods on V2V communications for Platooning" by Mr.Kazuma Tomimoto (Softbank Corp.), and three totally four presentations.

The 6th scientific workshop of the 24th URSI-C in Japan

- Session title: "Progress of Millimeter Wave Devices for Wireless Communications"
- Date/time: 14:00—17:50, September 27th, 2019
- Venue: Presentation Room, Shin-Kawasaki Technology Square, Fujitsu Limited (Saiwai-ku, Kawasaki, Kanagawa, Japan)
- Listed attendees: 39 persons
- Presentations: "Recent trends in GaN HEMTs for improved performance" by Prof. Masaaki Kuzuhara (Fukui University), and three totally four presentations.

The 7th scientific workshop of the 24th URSI-C in Japan

- Session title: "Semiconductor device technologies supporting high-speed big-capacity radio communications beyond 5G"
- Date/time: 13:30—17:25, December 6th, 2019
- Venue: Room No. 23, EE-Bldg. 1F, Faculty of Eng., Koorimoto Campus, Kagoshima University, Kagoshima.
- Listed attendees: 20 persons
- Presentations: "Advances and future trends in 5G mobile communications systems" by Prof. Fumiyuki Adachi (Tohoku University), and three totally four presentations.

Note that all the workshops planned after Jan. 2020 were cancelled due to COVID-19 disaster.
The activities in details are available more precisely at our web site, https://www.ursi-net.org/jp/Commission-C/24th/index-en.shtml .

Amir I. Zaghloul, Commission Chair
Yves Louet, Commission Vice Chair
Ruisi He, Early Career Researcher
Haijun Zhang, Early Career Researcher