UNION RADIO-SCIENTIFIQUE INTERNATIONALE
INTERNATIONAL UNION OF RADIO SCIENCE

Rapports des Assemblées Générales de l'URSI
Records of URSI General Assemblies

VOLUME XXXII

XXXVème Assemblée Générale et Symposium Scientifique
XXXIVth General Assembly and Scientific Symposium

Sapporo, 19.VIII - 26.VIII 2023

ISSN 0074-9516

Secrétariat général de l'URSI/URSI Secretariat
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Introduction

Acknowledgement

The XXXVth General Assembly and Scientific Symposium of URSI was held at the Sapporo Convention Center, Sapporo, Japan, from 19 to 26 August 2023. In introducing this account of the records, it seems appropriate to offer the warmest thanks of the Union to:

- the Japanese National Committee of URSI;
- the Local Organising Committee;
- the Coordinator and the Associate Coordinator of the Scientific Programme;
- the Chairs, Vice-Chairs of URSI Commissions and Early Career Representatives, who planned the scientific sessions, and to the session Chairs and speakers;
- the organisations which provided funds in support of the Young Scientist Programme: the URSI Member Committees in Japan and France;
- the Financial Sponsors : Hokkaido Prefectural Government, Sapporo City Government, Japan National Tourism Organization (JNTO), Science Council of Japan (SCJ), National Institute of Information and Communications Technology (NICT), The Telecommunication Advancement Foundation, KDDI Foundation, Support Center for Advanced Telecommunications Technology Research (SCAT), The Murata Science Foundation and the Foundation for Promotion of Astronomy

Outline of the Assembly

The URSI Council - which is composed of the official representatives of the Member Committees - met in Sapporo on four occasions between 19 and 26 August 2023. The Resolutions and Recommendations adopted by the Council are reproduced at the end of this volume. Summary accounts of the business transacted by the Council are given elsewhere.

An abundant scientific programme, consisting of 1518 papers (1133 oral, 268 poster and 117 pre-recorded video presentations) had been prepared for the 1434 registrants. Among them were the 92 Young Scientists, who attended the URSI GASS (97 were awarded a YS Award). The programme consisted of 3 General Lectures, 1 Public Lecture and 10 Tutorials.

The Public Lecture was entitled:

- Harmonization of Scientific, Commercial, and Other Radio Uses with Regulatory Science for SDGs (Ryuji Kohno)

The General Lectures, of interest to all participants, were entitled :

- Photonics for next generation radio access network (RAN) (Masataka Nakazawa)
- The History of Radio Astronomy: celebrating 90 years of innovation and discovery (Ron Ekers)
- Space weather disturbances in electrical power networks - preparing for an extreme event (Craig Rodger)

Each Commission had been asked to provide a Tutorial Lecture in its own sphere of interest. The titles of these Lectures were as follows :

- The City as a Measurement Platform (Commission A, Nuno Carvalho)
- Radio Frequency Identification (RFID) Systems: from electromagnetic theory to applications (Commission B, Andrea Michel)
- Multi-Port Based High-Frequency Measurement Technology (Commission C, Toshiyuki Yakabe)
- Lithium niobate photonic integrated circuits for future optical and microwave links (Commission D, Cheng Wang)
- Migration methods for GPR signal enhancement (Commission E, Felix Vega)
- Development and Observation of the Phased Array Radar - New Frontier in Weather Radar (Commission F, Tomoo Ushio)
- The International Reference Ionosphere - A Commission G Success Story (Commission G, Dieter Bilitza)
- Multiple roles of plasma waves in geospace: Arase observations (Commission H, Yoshizumi Miyoshi)
- Instrumentation and the detection of 21cm signals from the infant Universe (Commission J, Cathryn M. Trott)
- Energy-Autonomous Wearable Sensors for Biomedical Sensing (Commission K, Alessandra Costanzo)

List of URSI Officers and Officers of Member Committees

Following the elections at the XXXVth General Assembly and Scientific Symposium in Sapporo, Japan, the Officers of the Union and the URSI representatives on other Organisations are as given below. The list of Presidents and Secretaries of URSI Member Committees is based on information available at the URSI Secretariat up to the time of going to press.

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Dr. D. Bilitza (U.S.A)
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ISPRS (International Society for Photogrammetry & Remote Sensing)
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IUCAF (Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science)
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SCOSTEP (Scientific Committee on Solar-Terrestrial Physics) :
Dr. J. Chau (Peru)

WHO EMF (World Health Organisation-Electromagnetic Field Programme)
Prof. F. Apollonio (Italy)

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	Ms. I. Lievens (Congress Manager)

Names have been updated to reflect recent changes

Opening Meeting

The Opening Ceremony was held on Sunday 20 August 2023 in Main Hall A of the Sapporo Convention center for the on-site attendees and was also live streamed through a link announced on the GASS 2023 website. The Opening Ceremony consisted of three parts. The first part was attended by His Imperial Highness Crown Prince Akishino. During the second part, the URSI Awardees had a meet and greet with His Imperial Highness Crown Prince Akishino. In meantime, the video 'URSI : 100 Years of Radio Science Activities' presented by Prof. Peter Van Daele, Secretary General of URSI, was played for all the other attendees. In the third part, the URSI awards were presented. The master of Ceremony, Satoshi Yagitani, President of the Japan National Committee of URSI officially opened the 35th URSI General Assembly and Scientific Symposium in his welcome speech and then gave the floor to Kazuya Kobayashi, Geneneral Chair of GASS 2023.

Opening Address by the General Chair of the XXXVth General Assembly and Scientific Symposium of the International Union of Radio Science

by Prof. Kazuya Kobayashi

Your Imperial Highness Crown Prince Akishino,
Distinguished guests and participants, Ladies and gentlemen,

Welcome to the "35th URSI General Assembly and Scientific Symposium," URSI GASS 2023, here in Sapporo, Japan.

On behalf of the organizing committees, I would like to welcome all of you from around the world, for attending this conference in-person. In particular, I would like to extend my sincere appreciation to His Imperial Highness Crown Prince Akishino, for your gracious presence at this Opening Ceremony.

The URSI General Assembly and Scientific Symposium, URSI GASS is a top-tier international conference held every three years since 1919, organized by the International Union of Radio Science, URSI.

In the past, the URSI GASS was held twice in Japan: The first was the 14th General Assembly held in Tokyo in 1963, and the second was the 24th in Kyoto in 1993. Both of them were led to a great success. The URSI GASS 2023 is the third GASS held in Japan, 30 years after the Kyoto GASS. I am very happy to see this great number of radio scientists participating in this Sapporo GASS from all over the world.

The development of radio science has significantly contributed to the creation of our modern life. One prominent example is today's smart ICT society which is supported through the use of advanced wireless communication technologies. Radio science is also extremely important in monitoring the global environment, including climate, oceans and land, and in promoting disaster risk management, which will contribute to the realization of the SDGs.

Finally we wish you enjoy the entire scientific program as well as fruitful discussions during the conference. We hope that URSI GASS 2023 will lead to a great success, and contribute to further progress of radio science for our sustainable future.

Welcome to Sapporo, and welcome to URSI GASS 2023! Thank you very much.

Welcome Address by the former President of the Institute of Electronics, Information and Communication Engineers (IEICE)

By Katsuhiko Kawazoe

Your Imperial Highness, Crown Prince Akishino,
Distinguished guests
Ladies and gentlemen,

Greetings and warmest regards to all of you. My name is Katsuhiko Kawazoe, former president of The Institute of Electronics, Information and Communication Engineers. It is an absolute honor to address you today on this momentous occasion.

First of all, I would like to express my deepest gratitude to the organizers for the privilege of speaking in front of such an esteemed audience. I would also like to extend my sincerest appreciation to His Imperial Highness Crown Prince Akishino, for gracing us with your presence at this opening ceremony. Your attendance truly exemplifies the significance of this event and underscores the importance of the topics being discussed.

As we gather here for the General Assembly of the International Union of Radio Science, we are privileged to witness the convergence of brilliant minds and groundbreaking research in the field of radio science. This conference provides us with an invaluable platform to exchange knowledge, share innovative ideas, and forge collaborations that will shape the future of our field.

Throughout this conference, we will explore the frontiers of radio science, delving into areas such as telecommunications, space exploration, and meteorology. The impact of our collective efforts in these fields cannot be overstated, as they touch the lives of people around the globe and contribute to the betterment of our society.

As we engage in thought-provoking discussions, I encourage each and every one of you to seize this opportunity to connect, collaborate, and form lasting partnerships. By fostering an environment of open dialogue and knowledge-sharing, we can propel radio science to new heights, driving innovation and addressing the challenges that lie ahead.

In conclusion, I do hope that this General Assembly of the International Union of Radio Science will be a resounding success, and our collective efforts will lead to a brighter and more connected future for all. Thank you.

Welcome Address by the URSI President

Professor Piergiorgio Uslenghi

Your Imperial Highness Crown Prince Akishino,
Illustrious Representatives of the Japanese Government,
Radio Science Colleagues,
Distinguished Guests,
Ladies and Gentlemen,

It gives me great pleasure to welcome you at this 35th General Assembly and Scientific Symposium of the International Union of Radio Science (URSI) in the beautiful city of Sapporo, Japan.

URSI is one of the oldest scientific organizations devoted to the development of radio science and its peaceful applications for the benefit of humanity. It was founded in 1919 in Belgium, with the participation of four countries: Belgium, France, the United Kingdom, and the United States of America. As it enters its second century of existence, URSI membership has grown more than tenfold from its origin, to a participation by forty-four countries. URSI activities are organized around ten scientific commissions and encompass all areas of radio science, from metrology to electromagnetic fields and waves, communications and signal processing, electronics and photonics, interference, remote sensing, ionospheric phenomena, plasmas, radio astronomy, and electromagnetics in biology and medicine. URSI welcomes the participation in its activities by scientists from all over the world. It especially encourages the active participation of young researchers and of women.

Japan has contributed enormously to the development of radio science, both scientifically and organizationally. We welcome the presence of two Past Presidents of URSI from Japan, Professor Hiroshi Matsumoto and Professor Makoto Ando.

The radio science community and I are grateful to all who worked tirelessly to organize this GASS: Professor Satoshi Yagitani, President of the Japanese National Committee of URSI; Professor Kazuya Kobayashi, Chair of the Local Organizing Committee and Associate Scientific Program Coordinator, and his staff; Professor Ondrej Santolik, Scientific Program Coordinator; Professor Peter Van Daele, URSI Secretary General and his assistants, Mrs. Inge Heleu and Mrs. Inge Lievens; the Members of the URSI Board and the Officers of the URSI Commissions.

I wish you a successful scientific symposium and an enjoyable and memorable visit to this city and this beautiful country.

Welcome Address by the President of the Science Council of Japan

By Takaaki Kajita

Your Imperial Highness Crown Prince Akishino,
Distinguished Guests,

It is my great honor to deliver an address as a co-organizer at the Opening Ceremony of the 35th URSI General Assembly and Scientific Symposium, in the august presence of His Imperial Highness Crown Prince Akishino.

I would like to express my gratitude to Professor Kobayashi, Chair of this meeting, who has contributed enormously to the success of this conference.

The Science Council of Japan is the leading organization of the Japanese scientific community, representing a broad range of scientists from across all disciplines, in the fields of the humanities, social sciences, life sciences, physical sciences and engineering. Our purpose is to fulfill the social responsibilities of the Japanese scientific community through the development of the field of science and to enable science to be reflected in and permeate administration, industry, and the lives of ordinary citizens.

Since its establishment in 1949, the Science Council of Japan has consistently promoted international exchange in science through its cooperation with academic organizations around the world. To this end, we have hosted international conferences in Japan, and dispatched researchers to conferences held abroad.

We are greatly pleased to co-host this international conference and welcome representatives from many countries and regions.

The central theme of this conference is, "The future opened up by radio science toward a sustainable society". Accordingly, this conference sets out a wide range of related topics for discussion. Your vigorous discussion will contribute to the future development of research in the field of radio science.

As a co-organizer, I hope that there will be fruitful discussion at this conference on significant research topics, providing future perspectives, and enhanced international collaboration among participants from across the globe.

I hope that this conference will be an occasion to highlight the nature of radio science and its importance in society, among the wider public.

Permit me to close my welcome address by reiterating my sincere wishes for the resounding success of this conference. Thank you for your kind attention.

Address by His Imperial Highness Crown Prince Akishino

Distinguished guests and participants,

It is a great pleasure for me to join so many participants from Japan and abroad attending this opening ceremony of the 35th International Union of Radio Science General Assembly and Scientific Symposium, URSI GASS 2023, being held here in Sapporo, under the main theme of "radio science pioneering a sustainable future".

URSI is one of the world's oldest international scientific bodies and the parent organization of this conference. For over 100 years since its foundation in 1919, URSI has been internationally promoting scientific investigations, basic and applied research, and scientific exchange in the various fields of radio science.

My understanding is that radio science extends across basic and applied science and engineering, and is extremely multidisciplinary, involving diverse fields. I believe that international collaboration of the sort promoted and coordinated by URSI is essential in advancing a wide range of research in the multiple disciplines from different perspectives.

I express my deep respect to all those who have engaged in the administration of URSI, and have attained and supported the achievements made so far in radio science.

The evolution of radio science is supporting today's highly advanced information and communication society, and our daily lives. Wireless communications systems such as mobile phones, television, and satellite navigation enable people around the world to communicate "anytime, anywhere, with anyone". The use of electromagnetic energy has led to the spread of such applications as microwave ovens, wireless charging, and Magnetic Resonance Imaging, among others. These applications are essential to our present everyday lives.

Furthermore, radio remote sensing used to monitor the environment has enabled prediction and detection of natural hazards, and assessment of the effects of disasters. During disaster relief operations, radio communications are vital for securing emergency communications networks, and for supporting evacuations and confirming the safety of those affected. Radio observations have also enabled space weather prediction, and the investigation of distant astronomical objects.

Therefore, I understand that various initiatives utilizing radio science are also significantly contributing to achieving the Sustainable Development Goals. I hope that at this conference the exchange of diverse knowledge, and presentations to the world of the most advanced research results, will lead to even greater developments.

In closing my address, I hope that radio science will contribute to pioneering our future in the creation of a sustainable society, and that this conference and your stay in Sapporo will be fruitful, meaningful, and enjoyable for you all. Thank you for your kind attention.

Congratulatory Address by the Minister of State for Economic and Fiscal Policy

By Shigeyuki Goto

Your Imperial Highness Crown Prince Akishino,
Distinguished Guests,

In the august presence of His Imperial Highness Crown Prince Akishino, I am honored to express my congratulations today on the auspicious occasion of the opening ceremony of the 35th URSI General Assembly and Scientific Symposium.

I am most gratified that this meeting, the world's oldest international conference in the field of radio science, is being held in Sapporo, Japan, for the first time in 30 years. I would like to take this opportunity to express my sincere gratitude to all those in Japan and abroad who have made this conference possible.

I am in charge of the new economic policy initiative, "New Capitalism", which aims to realize a virtuous cycle of growth and distribution. In the "Grand Design and Action Plan for a New Form of Capitalism" revised by the Government of Japan in June, this year, it is declared that "science, technology, and innovation" have the power to address many social issues confronting the world today. The plan is expected to formulate national strategies and promote a radical expansion of science and technology investment through partnership between the public and private sectors. This will lead to Japan's renaissance as a science and technology nation.

The development of wireless communication technology based on radio science forms the basis of today's ICT society. The technology contributes greatly to the realization of "Society 5.0". This is a human-centered society that balances economic advancement with the resolution of social problems by a system that deeply integrates cyberspace and physical space, a system which Japan has been promoting since 2016. In addition, technologies such as global environment measurement using radio science also play a major role in disaster countermeasures, and I understand that they are indispensable for the realization of the Sustainable Development Goals established by the United Nations.

Such advancement in the study of radio science is absolutely essential not only for our country but also for other countries and regions of the world.

I earnestly hope that this international conference will foster high-level presentation and discussion, that it will proceed vigorously and thus achieve the meeting's expected goals.

Finally, may I conclude my words of congratulation by reiterating my sincere hope that this meeting will be fruitful for all participants and by sincerely wishing all of you further success in your endeavors.

Congratulatory Address by the Governor of Hokkaido

By Naomichi Suzuki

Honored by the presence of His Imperial Highness Crown Prince Akishino, it is my great pleasure to host the 35th URSI General Assembly and Scientific Symposium here in Hokkaido today, the first time in 30 years that such a meeting is being held in Japan.

I would like to pay tribute to all of you who are present today for the tremendous contribution you continue to make in developing the field of radio science. Also, as the local governor, I would like to extend a warm welcome to all of you who are visiting from around the world.

Hokkaido is comparable in size to Austria and has a wide-area, dispersed community structure; so actively utilizing science and technology is important in order to promote sustainable community development.

For this reason, I believe it is necessary to realize a society that is "connected everywhere" by utilizing new technologies such as high-altitude platform stations and low earth orbit satellites, and at a recent meeting of our nation's governors, I proposed that we promote the development of such a new telecommunications infrastructure.

In this context, it is very significant that this general assembly – one of the world's largest international conferences in the field of radio science – is being held in Hokkaido with the main theme "The Future through Radio Science, in Pursuit of a Sustainable Society." I wish this conference every success.

I also hope that you will take this opportunity to experience the plentiful food and abundant nature that is the pride of Hokkaido, as well as the Ainu culture and other diverse attractions.

I would like to conclude my congratulatory address by offering my best wishes for the happiness and prosperity of His Imperial Highness Crown Prince Akishino, and for the health and success of everyone present.

Congratulatory Address by the Mayor of Sapporo

By Katsuhiro Akimoto

Greetings Ladies and Gentlemen! I am Katsuhiro Akimoto, the mayor of Sapporo.

I would like to take this opportunity to thank His Imperial Highness, Crown Prince Akishino, for being here at the 35th URSI General Assembly and Scientific Symposium, and to express my deep respect for the efforts of Professor Kazuya Kobayashi, the General Chair, and all those involved in the preparations. I would also like to offer a warm welcome both to our Japanese and International participants to Sapporo!

Radio science research plays an extremely important role in supporting our society move toward Society 5.0 (Japan's new blueprint for a super-smart society) through

the use of advanced wireless communication technology. It also significantly contributes to achieving the Sustainable Development Goals (SDGs) from the perspective of using radio waves to monitor the global environment and to promote disaster risk management. The research you are undertaking will help make all of our lives safer and more prosperous.

This is the first time in 30 years that the conference is being held in Japan, following Tokyo in 1963 and Kyoto in 1993, and for many of you, I imagine this is the first time you are coming to Sapporo. We hope that after lots of stimulating discussion at the conference, you will be able to taste the seasonal delicacies of Hokkaido, enjoy the urban and natural beauty of Sapporo city, and take many wonderful memories back home with you.

I would like to offer my best wishes for a successful and fruitful conference and for the continued good health and success of all the participants. Thank you.

Congratulatory Address by the Vice-President of the International Science Council

By Motoko Kotani

Your Imperial Highness, Crown Prince Akishino, esteemed colleagues, ladies and gentlemen, a very good afternoon.

On behalf of the International Science Council, I am honored to be here at the 35th General Assembly of the International Union of Radio Science, or URSI.

Allow me to tell you a bit about the International Science Council - of which I am vice president - and the ISC's longstanding relationship with URSI.

Formed in 2018 through the merger of the International Council for Science (ICSU) and the International Social Science Council (ISSC), the ISC has a diverse membership of over 230 organizations, including international scientific unions and entities from both the natural and social sciences.

Our vison is to promote science as a public good and our mission is to be a global voice for science. The ISC provides a platform for scientific collaboration and cooperation across different disciplines and sectors, and works to promote the integration of science in policy and decision-making at local, national, and global levels. Its activities focus on three main areas: advancing science, promoting its role in society, and promoting the effective use of scientific knowledge in policy-making.

URSI has been a crucial and active member of the ISC from our earliest days, sharing our dedication of promoting science as a global good. Joint initiatives have included research collaborations, workshops, and conferences addressing pressing issues such as space weather monitoring, climate change, and the mitigation of natural disasters.

Additionally, the ISC has been proud to support URSI's efforts to establish radio science education programs in developing countries, empowering young scientists to pursue their interests in telecommunications.

We also extend our appreciation to URSI for its unwavering support of the Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science (or IUCAF), which is one of the 15 co-sponsored affiliate bodies that ISC supports.

I wish you all a productive week ahead and a very successful 35th General Assembly. Thank you!

Message from the Prime Minister of Japan

By Fumio Kishida (read by Satoshi Yagitani)

Your Imperial Highness Crown Prince Akishino,
Your excellencies, distinguished guests.

I am pleased to extend a very warm welcome to all participants from around the world on this occasion of the opening ceremony of the XXXVth URSI General Assembly and Scientific Symposium in Sapporo.

I am honored that the conference is being held under the joint sponsorship of the Science Council of Japan, The Institute of Electronics, Information and Communication Engineers, and the International Union of Radio Science, graced with his Imperial Highness Crown Prince Akishino.

I earnestly hope that this international conference for advancement in the field of radio science will be a great success.

Prof. Kazuya Kobayashi closed Part 1 of the Opening Ceremony and announced that he second and third part of the ceremony will follow after the closed reception. The first part of the Opening Ceremony and the video are online available through the following links on Youtube : https://www.youtube.com/watch?v=ZYTXxUMj6zg and https://www.youtube.com/watch?v=tWkEEkPAnxs

Remarks by the URSI President

By Piergiorgio L.E. Uslenghi

Dear Colleagues, Distinguished Guests, Ladies and Gentlemen,

The triennial URSI Awards recognize the outstanding scientific achievements of some of our colleagues in radio science. On behalf of the URSI Board, I wish to express our heartfelt thanks to the nominators of the awards recipients and to the Awards Committee Members for their painstaking evaluation of the nomination dossiers: Makoto Ando, Immediate URSI Past President and Chair of the Committee, Jeanne Quimby, Ruisi He, Sailing He, Akimisa Hirata, Kamal Sarabandi and Stefan Wijnholds. The President Award recognizes exceptional service to URSI, and Certificates of Recognition are issued to the organizers of the GASS. I invite you to congratulate this year awardees after the ceremony.

Our joy and pride at this Ceremony is tempered by the loss of some of our colleagues. I invite all Commission Chairs to have a moment of silence at the first business meeting of their Commission in memory of their colleagues who passed away from the time of the 2021 GASS to the present.
After the 2021 GASS in Rome, the URSI Board has lost several present and past members:

- Jörgen Bach Andersen, former Vice-President, past Chair of Commission B and co-founder of Commission K.
- Patricia H. Doherty, Vice-President and the second female to hold that position, and the Immediate Past Chair of Commission G.
- François Lefeuvre, former President and Vice-President, and past Chair of Commission G.
- W. Ross Stone, Assistant Secretary General for Publications and GASS, and Editor-in-Chief of the Radio Science Bulletin.
- Maria A. Stuchly, former Vice-President and the first female to hold that position, and the first Chair of Commission K.

Please join me for a moment of silence in memory of those five colleagues and of all the radio scientists who passed away during the last two years…….. Thank you.

I bring to you some salient points of the summary report that I presented to Council this morning.

The Secretary General will inform you of the results of the election for the Board of Officers, and of the status of the URSI finances.

In my opening statement after my election to President two years ago, I outlined four operational areas that in my opinion are essential for URSI to have a prosperous second century of existence: a yearly flagship conference, archival publications, diversity, and nurturing of the new generations of radio scientists.

The flagship conferences are doing well. In order to return to our three-year schedule after the Covid pandemic, we combined the Atlantic Radio Science Conference (AT-RASC) and the Asia-Pacific Radio Science Conference (AP-RASC) into a joint AT-AP-RASC which was held in the Gran The Canaria, Spain on 29 May – 3 June 2022 and which was scientifically and financially successful. The present GASS in Sapporo has surpassed expectations in terms of attendance, and has been exceptionally well organized. Future flagship meetings are being planned: the 2024 AT-RASC will be in the Gran Canaria on 19-24 May 2024, the 2025 AP-RASC will be held in Sydney, Australia in August 2025, and the 2026 GASS will be in Kraków, Poland. I urge you to attend these future meetings.

In terms of publications, we suffered a setback with the death of Ross Stone, EIC of the *Radio Science Bulletin*. The *Bulletin* was two years behind schedule due to Ross' failing health and after his passing it was no longer operationally and financially sustainable. Hence, the Board decided to end its publication and to replace it with a much simpler *Newsletter* edited by the Secretariat. The journal *Radio Science* of the American Geophysical Union with Sana Salous as EIC remains the main outlet for full-length papers authored by radio scientists. The new journal *Radio Science Letters* is owned and operated by URSI, and it is in its fifth year of publication. After four years, I have relinquished the editorship of the *Letters*; its new EIC is Henrik Wallén. We have applied for full retroactive indexing of the *Letters*. I urge you to support our publications by submitting your scientific works to *Radio Science* and to *Radio Science Letters.*

After the death of Pat Doherty, Sana Salous has directed the organization of Women In Radio Science (WIRS), of which we now have ten chapters created since the last GASS, with additional chapters being considered. The Young Scientists program and the Student Paper Competition are implemented at every flagship meeting.

The future is not without difficulties and obstacles to the development of radio science and its applications to benefit humanity. However, I am confident that if we all work together, we will be able to assist effectively in overcoming the challenges posed by pandemics, wars and climate change. URSI is a wonderful organization; thank you all for supporting it.

Opening Remarks by the URSI Secretary General

By Peter van Daele

Mesdames, messieurs, cher collègues, cher amis,

Bienvenue a Sapporo a l'occasion du 35ieme assemblée général de l'Union Radio Scientifique Internationale, l'URSI.

Distinguished guests, ladies and gentlemen, dear colleagues, dear friends,
Welcome to Sapporo, at the occasion of the 35th General Assembly of the International Union of Radio Science.

Some of you might have wondered why I suddenly started welcoming you all in French, but out of the presentation you have seen a few minutes ago, you will have learned that URSI was founded more than 100 years ago in Belgium. At that time the statutes were written in French, and the French version still remains today the dominant version. So URSI is historically bilingual, and I wanted to recognize the French language within URSI by my opening.
It is the traditional duty of the secretary general to present at the opening session a concise report of the scientific activities, the finances and the general administrative situation of our Union.

In past triennium which spanned a period of only 2 years, since our Rome General Assembly, the Board under the leadership of our president, Prof. George Uslenghi, has worked hard towards 3 objectives:

- expanding our URSI community covering scientific activities in the field of Radio Science worldwide
- stimulating the participation of young and emerging scientists in our Union and
- improving the service in general that URSI can bring to the Radio scientists worldwide.

Let me just take a few moments to clarify these objectives with concrete examples.
Besides the paying Member Committees, representing the regional URSI communities, URSI is gradually expanding its network of individual members as well. Through mailing lists and social media channels individuals can now be easier engaged and informed. Make sure you apply for the membership, enjoy the benefits associated with it and make sure you follow URSI on the social media. The 10 Scientific Commissions of URSI are the heart of our Union and so I encourage you to get involved in the activities of the URSI Commission which is of interest to you. During the GASS here in Sapporo, there are the Commission Committee Activity Meetings where you can meet and interact with

the officials and get involved in the activities yourself. Look for them on the program and make sure you join them.

Expanding the URSI community takes also shape in other initiatives. Over the past few years, the URSI Board has stimulated the creation of a Women in Radio Science committee, with local chapters at the Member Committees. Again, if this applies to you, make sure you get involved.

The URSI Board has continued taking several initiatives to engage young scientists and young researchers in our union. The well-known Young Scientists program was also implemented here in Sapporo. We received 186 applications of which 97 were awarded. These brilliant young researchers will present their work throughout the program of this GASS on the same level as more senior researchers and experts and for some, this might even be the 1st international conference in which they participate and a first small step towards a successful career. For this YS program, we are very grateful to the Japanese MC for financial support.

We also support Student Paper Competitions at national level and with thanks to the US National Committee a Student Paper Competition is held here in Sapporo with 62 applications and 10 finalists.

Facilitating the exchange of scientific information and results is one of the primary tasks of URSI. Next to our symposia, publications are a 2nd important channel. As a result of Dr. Ross Stone passing away recently, the URSI Board has decided to revision the concept of the RSB and work on new ideas and formats. You will be informed later on this.

The International Open Access Journal, the Radio Science Letters is now well established and indexed offering a channel to rapidly publish original scientific research work in all areas of radio science. Special reduced page charges are available for URSI Senior Members and for those having presented a paper at the URSI Flagship meetings, including this General Assembly.

From a financial point of view URSI is still in relatively good shape. In view of the changing environment in which we live, URSI also had to adapt to the fast digital transformation of our society…

For many of us, online meetings are daily business and all of us have become Zoombies and experts in Teams… But all of us will have experienced that person-to-person interaction is only possible in a physical way. The COVID pandemic has taught us how much we must value these personal contacts. The added value of an all-in-person

conference is very high, not only because of the interaction between speaker and audience, but mainly of the networking possibilities which do not exist in online meetings. This networking and cross-discipline interaction is very typical and also one of the key elements and selling points for URSI Flagship meetings. Consequently the Board decided very quickly, together with the LOC here in Japan, to go for a full in-person GASS 2023.

Many of you may not realize which impact this has on the budget for a conference. Last year in 2022 we organized AT-AP-RASC in Gran Canaria as a full hybrid event. Compared to the AT-RASC 2018 conference, held in the same location and venue, prior to COVID, the budget for the audiovisual support tripled and became by far the largest cost item, greater than the rental of the rooms, or the total of the catering. Extra staff, extra equipment and extra software is required to run a full hybrid event, and this is expensive and justifies the choice for an in-person only GASS 2023.

At this point, I would like to thank all members of the outgoing board for their work, dedication, and friendly collaboration in guiding the development of URSI in the past 2-years spanning triennium.

Regarding the new board it is my pleasure to announce the results of the elections that were held earlier today in Council.

Was elected as:
President: Prof. Ari Sihvola (Finland)
As Vice Presidents:

Prof. Kazuya Kobayashi (Japan)
Prof. Giuliano Manara (Italy)
Prof. Sana Salous (United Kingdom)
Prof. Ondrej Santolik (Czechia)

And I thank Council for allowing me to continue to serve as secretary general. I look forward to a fruitful collaboration with this new board.

Finally let me express some words of thanks. First of all to all of you. You submitted papers, you make up the core and the reason for having our Union and our Flagship Meetings. Thank you for your commitment and involvement.

I would also like to thank all URSI Officials, Commission Chairs, Vice-Chairs, ECRs, members of the Board,... for their commitment on a pure voluntary basis. URSI as a union needs you, and needs to be very grateful to all of you.

Let me also express my sincere gratitude to the whole local organizing committee of this GASS who have worked hard, to make this unique GASS a success. With regards to the scientific program, I would like to thank Prof. Ondrej Santolik for his contribution as Scientific Coordinator of this GASS.

Finally I would like a personal word of thanks to 2 specific individuals. Mrs. Inge Heleu, as executive secretary of URSI has, over so many years, been the memory of URSI. Since the General Assembly in Kyoto in 1993, exactly 30 years ago, when I joined URSI, she has been my direct line of help in running URSI and keeping up with the correct procedures. I have always been able to rely on her knowledge and expertise.

Last but not least, nearly everybody of us here in the room has been in direct contact with our URSI event manager, Mrs. Inge Lievens. She is the person behind and running the paper submission website, the registration website as well as the mobile app. Perhaps you did not notice, but any request or mail, did not remain unanswered. Most of us took it for granted and did not realize that Inge, despite differences in time zones, was active and responsive at any time of the day and any day of the week, including weekends, to deliver feedback to you in most cases within less than a few hours. Please join me in a round of applause in thanking her for all this effort in making this GASS a success.

Finally, it just rest me to wish you all a most fruitful, rewarding and pleasant GASS here in Sapporo. Thank you.

Award Presentation GASS 2023

Prof. Makoto Ando, Chair of the URSI Awards Panel

The Award Ceremony was recorded and can be watched through the following link : https://www.youtube.com/watch?v=Jpklv3-oRyA

On behalf of the 2023 URSI Awards Panel, I'm happy to chair this part of the Ceremony. URSI acknowledges scientific research in the field of Radio Science through awarding individuals with a number of URSI awards : the Balthasar van der Pol Gold Medal, the John H. Dellinger Gold Medal, the Booker Gold Medal, the Appleton Prize, the Karl Rawer Gold Medal, the Issac Koga Gold Medal and the Santimay Basu Prize. The URSI Awardees are selected through a system of nominations, which are evaluated by the URSI Awards Panel. In addition, in 2017, we introduced the President's Award, which honours outstanding contributions to the work and mission of URSI.

Balthasar van der Pol Gold Medal

presented by Prof. S. Wijnholds, Chair of the Netherlands National Committee

The Balthazar van der Pol Gold Medal for 2023 is awarded to Prof. Yasuhiko Arakawa for "Pioneering and ground-breaking contributions to development and application of quantum dots based high-performance semiconductor lasers."

Reply by Yasuhiko Arakawa

It is my great honour to be here on this stage as official recipient of the Balthasar van der Pol Award that was established in 1963. Twenty years later in 1982, I proposed the concept of quantum dots and his application to semiconductor lasers. Nowadays the quantum dots is used is communication systems and quantum dot photonics has been involved in the field of quantum technologies. I am sincerely grateful to the URSI Awards Committee for recognizing the advances in this field. I need to say that this award presents the result of the support and contribution of my colleagues, my friends, my students and family members. Thank you very much again for this award.

John H. Dellinger Gold Medal

presented by Prof. M.H. Newkirk, Chair of the US National Commitee

The John H. Dellinger Gold Medal for 2023 is awarded to Prof. Hisashi Hirabayashi for "Major contribution to setting up and developing the first space VLBI satellite and obtaining invaluable astronomical results using it."

Reply by Hisashi Hirabayashi

Space VLBI is a prestigious type of telescope using antennas on the ground and one or more than one antennas in space. By this, humankind has now the technique to even build a larger telescope than the earth sides. To do this, a lot of ground support are necessary for the orbit determination, information downloading.. and so on, a very sophisticated array of tracking stations. And also all the systems are connected by the use of the VLBI technology. By this, very high angular resolution observation of the universe can be done and exotic phenomena can be seen. For example, you must know that event horizon telescope by using the shuttle wave VLBI technique can have the shadow of the super massive black holes. This can be done also by space VLBI and by the combination of space VLBI and event horizon telescope. We can enjoy the shadow of the black hole and

what may happen in the vicinity of the black holes. So the universe is very interesting to watch and to report to the people, to the society. To do this, so many people collaborate worldwide. So the telescope can be done by peaceful frienships. I would like to thank all the individual members and institutes that collaborated and also the URSI selection panel committee. Thank you very much for understanding our efforts. The universe may show much more interesting phenomena hereafter. Thank you very much !

Appleton Prize

presented by Prof. Sana Salous, Chair of the UK National Committee

The Appleton Prize is awarded to Prof. Ondrej Santolik for "Outstanding contributions to experimental studies on electromagnetic waves in space."

Reply by Ondrej Santolik

It's a great honour to receive this prize. I'd like to thank the United Kingdom URSI Committee for sponsoring it, and also the URSI Award Panel for considering my nomination and the URSI Board for approving it. Appleton was connected with URSI's glorious past. He was President of this Union for more than 20 years and for 10 years he was Honorary President. So this is linked to the past of this Union and I'd like also to mention that what we do now with analyzing waves in space plasmas is based on his work also, on the equations he invented. I would like to thank all my teachers and older colleagues who taught me how to analyse waves in space plasmas and that's what I'm doing now. I was also inspired by reading many papers so thanks to those colleagues who wrote them and also presented interesting results in scientific meetings. On a personal note, when I looked at the list of achievements of colleagues who preceded me in receiving this award, I think I can do some more work, so I will try to do it. To conclude, I will use the first official language of URSI by saying 'Merci' !

Booker Gold Medal

presented by Prof. M.H. Newkirk, Chair of the US National Commitee

The Booker Gold Medal is awarded to Prof. Carlo Sirtori for " Pioneering contributions in quantum science, leading to breakthroughs in device design and fabrication, opening mid-infrared and THz frequency ranges to optoelectronic semiconductor technology." Dr. L. Mir, the nominator, accepted the Award in his place and thanked the USNC URSI Committee.

Reply by Lluis Mir

As President of the French URSI Committee, I am very glad to accept the Booker Medal in the name of Prof. Sirtori. He sent me a message a few days ago with a few words to address to you and so I am going to read his message.

I am deeply honoured to have received the Booker Gold Medal by the URSI for my contribution in quantum science. I would like to warmly thank the leading members of URSI France, Lluis Mir, Alain Sibille and Frederique Griot who encouraged and supported my candidacy. My research has been conducted at the école normale supérieure de Paris Université in the framework of the industrial chair école normal supérieure Thales. I am much obliged to the école normale supérieure and the company Thales for the agreement that has supported most of my investigations. Finally this award would not have been possible without the amazing contributions and inspiration from my collaborators in the quantum physics and devices group. Thank you very much !

Karl Rawer Gold Medal

presented by Prof. Ludger Klinkenbush, Chair of the German National Committee

The Karl Rawer Gold Medal is awarded to Paul S. Cannon for “His contributions to radio science and to the URSI Community in general. Specifically, to measurements of space weather and understanding its system impact.

Reply by Paul S. Cannon

Members of URSI, Ladies and Gentlemen,

It’s with great pleasure that I receive the Karl Rawer Gold Medal. I would like to thank both the URSI Board and the German URSI Member Committee for honouring me with this award. I would also would like to thank these colleagues, who became friends, who supported me through my career and I would also especially like to achnowledge Professor Michael Rycroft, Dr. B. Burgess, Prof. Tudor B. Jones and Prof. Bodo Reinish. Without their faith in me during my early days of my career, I would have achieved so much less. Above all, I would like to thank my wife Vivian, who supported me with love and patience and often with tea coffee and sometimes even cake, as I work long days and nights. If I may I would also like to say something about Karl Rawer and for me the significance

of this award. Karl was a remarkable man, who in his long life worked hard to bind his country to the international network of scientists. This alone would have brought him recognition but he also excelled in identifying important research questions. My message to the youngsters in this room is to follow his example. Identify big and important and go else and solve them. Thank you !

The Issac Koga Gold Medal

presented by Prof. S. Yagitani Chair of the Japanese URSI Committee

The Issac Koga Gold Medal is awarded to Sean Elvidge for his "Groundbreaking work in ionospheric modelling and its operational deployment to the broader community."

Reply by Sean Elvidge

Thank you very much, I'm deeply honoured to receive this award from URSI and the Japanese URSI Committee especially as we are clearly here in Japan. Thank you to my nominators and the URSI Award Panel and the broader Commission G community.With the full knowledge that the lenght of my speech is proportional to how long it takes you to the reception I will keep it just short and say that there are just three people I especially would like to thank. First is Paul Cannon for essentially being the best mentor any early career academic could hope for. Secondly David Themens who's out there somewhere for being a wonderful collaborator and friend and then finally my very first URSI meeting, at the first morning of that meeting, I met Pat Doherty who obviously we sadly lost not too long ago. In the time I knew her, she was incredibly generous with her time and a great person to look up to and I know a lot of people in this room miss her and I just wanted to put on my records to thank her as well. Thank you very much !

The Santimay Basu Prize

presented by Prof. S. Yagitani Chair of the Japanese URSI Committee

The Santimay Basu Prize is awarded to Haonan Chen for "Outstanding contributions to active and passive remote sensing of precipitation and machine learning applications."

Reply by Haonan Chen

Haonan Chen unfortunately could not come to Sapporo but Professor Newkirk will deliver his speech.

Unfortunately Prof. Chen could not join us tonight. He has the joyous occasion of becoming soon a father, he's expecting a son to be born next week, so I think he has a good reason not to be here. I want to read his words of thanks when he learned he has won the award. I really appreciate the URSI Board of Officers for the great efforts and support. I am also grateful to USNC URSI for the continuing support througout mant years. I will definitely try my best to contribute to our community as much as I can. Thank you.

The President's Award

presented by Prof. George P.L.E. Uslenghi, URSI President

The President's Award for 2023 is awarded to Inge Heleu for "her dedicated commitment to URSI as Executive Secretary in Ghent, Belgium, her support to the URSI Community, her assistance to the URSI Secretary General, URSI Board, Commission Chairs, Vice-Chairs and ECRs in all adminstrative and procedural matters and being a point of contact and information for our Member Committees and all the URSI scientists since 1990.

Reply by Inge Heleu

It's a real honour to receive this award. It's been a pleasure for me to work for URSI for 33 years now and it's a pleasure to be in Japan for the second time. Thank you very much for all the people who are helping, all the people who are sending me emails all the time, I'm so glad I'm seeing their faces here. Thank you very much !

Certificates of Recognition

presented by Prof. George P.L.E. Uslenghi, URSI President

Thre 2023 certificates of Recognition were awarded to :

Prof. Kazuya Kobayashi, for "his outstanding contributions devoted to organizing the URSI GASS 2023 in Sapporo, Japan".

Prof. Satoshi Yagitani, for "his outstanding contributions devoted to organizing the URSI GASS 2023".

Prof. Ondrej Santolik, for “his outstanding contributions as Scientific Programme Coordinator of URSI GASS 2023”.

Mrs. Inge Lievens, for “her outstanding efforts in organizing the URSI GASS 2023 in Sapporo, Japan”.

A reception was held afterwards in the Sapporo Convention Center.

Closing Meeting

The Closing Meeting was held on Saturday 26 August 2023 in Main Hall A of the Sappro Convention Center, Sapporo, Japan. Professor Satoshi Yagitani opened the closing Ceremony and gave the floor to Prof. Kazuya Kobayashi, General Chair of the GASS 2023.

Closing remarks by the chair of the URSI GASS 2023

Professor Kazuya Kobayashi

Good afternoon ladies and gentlemen.

The "35th URSI General Assembly and Scientific Symposium," URSI GASS 2023, is now approaching the end. I would say that the Conference was a success with excellent presentations including, General and Public Lectures, Commission and ECR Tutorial Lectures, and a number of oral and poster papers.

After the COVID pandemic for several years, we have finally been able to return to the normal situation. I am sure that we all have realized that in-person events lead to much more fruitful results than online or hybrid events. I hope you have had enjoyable and scientifically interesting time during your stay in Sapporo.

Let me give you some statistics on the numbers of papers and registered participants in which you might be interested. The total number of submissions was 1682 from 60 countries/regions as of May 12. I can also give you the latest information on the number of registered participants. As of today, the total number of registered participants is 1444 from 55 countries/regions.

I would like to express my sincere appreciation to all the committee members, the members of the URSI Board and Secretariat, and the Commission officers for their hard work. I should also thank all of you submitting papers and coming to Sapporo.

As you all know, the next URSI General Assembly and Scientific Symposium will be

held in Krakow, Poland in August 2026. Krakow is a very nice city to visit. So please mark your calendar in order not to miss the next URSI GASS.

I very much look forward to seeing you again in Krakow in August 2026 on the occasion of the next URSI GASS. Please have a safe trip back home.

Thank you very much!

Closing remarks by the Secretary General

Professor Peter Van Daele

Distinguished Guests,
Colleagues, Ladies and Gentlemen,

The 35th General Assembly and Scientific Symposium of URSI is now coming to its end and at the request of the President, I am pleased to recall the results of the elections of the Board of Officers and to announce the results of the elections of the Chairs, Vice-Chairs and Early Career Representatives of the Commissions for the next triennium.

As already mentioned during the opening ceremony the incoming President is Prof. Ari Sihvola (Finland)
and the Vice-Presidents in alphabetical order are:

- Prof. Kazuya Kobayashi (Japan)
- Prof. Giuliano Manara (Italy)
- Prof. Sana Salous (United Kingdom)
- Prof. Ondrej Santolik (Czech Republic)

While myself, Peter Van Daele, am pleased to be elected by Council to continue to serve as Secretary General and Prof. George Uslenghi will remain on the Board as Past-President.

Let me welcome the new Board members, but at this point I would also especially like to thank Prof. Makoto Ando, who has been serving for 12 years on the URSI Board and has contributed a lot to URSI. At the secretariat, we will miss his expertise and support, but we assume we will still be able to call upon him if necessary.

The election results of the Chairs and Vice-Chairs of the Commissions are as follows:

Commission A:
Chair: Amitava Sen Gupta (India)
Vice-Chair: José Mauricio López Romero (Mexico)
Commission B:
Chair: Henrik Wallén (Finland)
Vice-Chair: Ludger Klinkenbusch (Germany)
Commission C:
Chair: Kumar Vijay Mishra (USA)
Vice-Chair: Peter Vouras (USA)
Commission D:
Chair: Atsushi Kanno (Japan)
Vice-Chair: Tahsin Akalin (France)
Commission E:
Chair: Carlo Carobbi (Italy)
Vice-Chair: Chaouki Kasmi (France)
Commission F:
Chair: Motoyuki Sato (Japan)
Vice-Chair: Slawomir J. Ambroziak (Poland)
Commission G:
Chair: Keith Groves (USA)
Vice-Chair: Sean Elvidge (United Kingdom)
Commission H:
Chair: Craig J. Rodger (New Zealand)
Vice-Chair: Robert A. Marshall (USA)
Commission J:
Chair: Stefan J. Wijnholds (The Netherlands)
Vice-Chair: Yashwant Gupta (India)
Commission K:
Chair: Francesca Apollonio (Italy)
Vice-Chair: Lars Ole Fichte (Germany)

The outgoing Commissions Chairs have been involved for at least 2 trienniums in URSI and have spend much time in coordinating the activities within the Commissions and also coordinating the programme for all our URSI Flagship meetings. URSI is very grateful to them and all of them have received a certificate of appreciation for their work and commitment.

Since 2014, the Commissions also incorporate Early Career Representatives which have proven to bring in new ideas and initiatives in the Commissions and stimulate new discussions. They play a role model for young scientists in URSI. These newly elected ECRs will continue now to serve for 6 years in URSI

The results of this election are:

Commission A : Ricardo Figueiredo (Portugal)
Commission B : Satheesh Bojja Venkatakrishnan (USA)
Commission C : Sangeeta Bhattacharjee (India)
Commission D : Giacomo Paolini (Italy)
Commission E : Flávio Miguel da Silva Jorge (Portugal)
Commission F : Gargi Rakshit (India)
Commission G : David R. Themens (United Kingdom)
Commission H : David Hartley (USA)
Commission J : Mohamed Said Darwish (Egypt)
Commission K : Kun Li (Japan)

Dr. Nosherwan Shoaib has been serving as Chair of the ECR Committee over the past triennium and will now be replaced by Bruce Fritz (USA). Nosherwan has been very active and has participated as ECR Chair in the Board meetings channelling the many new ideas originating from the ECRs towards the Board and triggering new initiatives within the ECR committee. URSI is very grateful to him and was already presented with a certificate of appreciation.

The next General Assembly will be held in Krakow 2026, that was already decided at our previous General Assembly, but Council now also accepted the invitation of the Member Committee in Singapore to organise the 2029 URSI General Assembly and Scientific Symposium. The venue will be Singapore, 11 - 18 August 2029.

As in previous General Assemblies the quality of the scientific presentations here in Sapporo was very high. There was a good balance between contributed papers, invited papers, tutorials, general and public lecture. At this point I would like to express the gratitude of the URSI community to Prof. Ondrej Santolik, the scientific coordinator, al of the commission chairs, vice chairs and convenors who managed to put together the excellent scientific program of this GASS. Let me also thank Prof. Paul Smith and Michael Newkirk who volunteered to serve as the standing committee on finances and Prof. Alain Sibille, Prof. Lluis Mir, Prof. Paul Cannon and Prof. Phil Wilkinson who volunteered to serve as the drafting committee during this GASS and put all the resolutions and terms of reference in impeccable French and English. As you will recall from my remarks at the Opening Ceremony, French is still the 1st official language of URSI.

Special thanks are also due to the Awards Panel, which under the chairmanship of Prof. Makoto Ando, managed to bring the difficult selection process to the right conclusion. I already invite you to think of nominees for the URSI Awards in 2026. Please send your suggestions to your member committee.

We also have been treated very well by the local organising committee with respect to the social programme. Please join me in thanking the Japanese LOC for the quality for the social events, reception and banquet, organised by the Japanese LOC.

It is my intention as Secretary General, in the next triennium to establish a standard set of services and a minimum line of quality of what is offered at the URSI Flagship meetings and based on your response, you like the baseline set by the Japanese LOC and we will try to set this as a reference.

At this point I would like to take the opportunity to point you at our Social media channels, Twitter, Facebook and LinkedIn where we regularly post information and messages about URSI and our activities. This is the new way of communicating and we will work on this in the future to improve our presence. The pictures which was taken at the YS party last Monday has reached over 2000 impressions on LinkedIn.Please make use of these channels, subscribe, like, post messages and enlarge our community and visibility.

This GASS was a very special one … and for those who were present in Rome in 2021, they may remember, I have used exactly the same words.. but for very different reasons. GASS Rome was a GASS of hope…getting back together in person after a long period, but still only partially as it was still in a hybrid mode… This GASS 2023 was a full in-person meeting, taking full advantage of the in-person contacts, networking and cross-disciplinary character of an URSI Flagship meeting.

However, everybody will remember this GASS by recalling the special Opening ceremony. This GASS and the URSI Community was honoured by the presence of and the address by his imperial highness, crown Prince Akishino. We are very grateful for his presence and participation. We cannot imagine what impact this had on the LOC and we have to be thankful to Prof Kobayashi and his staff to have been able to achieve this. You might have looked back during the Opening Ceremony and have seen in the back of the room all the camera's and press, and this will definitely have increased the visibility of URSI and our GASS here in Japan.

During the GASS many practical problems arise that need to be solved. The LOC, supported by tens of volunteers and colleagues here in Sapporo, did the job in screening off these difficulties from you as attendee!! Council voted this morning a special resolution of thanks to the team, but I would like to call upon all of you to thank them for the job they did.

I would like to express my sincere thanks to both Mrs. Inge Heleu and Mrs. Inge Lievens, assisting me here on site. Mrs. Inge Heleu has been my support in running the

administrative meetings of our Union, embedded in the General Assembly, and Mrs. Inge Lievens did a tremendous job in supporting the mobile app, the programme website and also the LOC with the registration. Last minute changes were implemented immediately I know that the GASS with its large number of technical sessions, Council meetings, various committee meetings and its YS program is very complex to organise. From a financial point of view it is also a challenge due to the extensive logistical requirements and the revenue required by URSI. May I in the name of URSI express my deep gratitude and congratulations to the Japanese URSI Member Committee, the Institute of Electronics, Information and Communication Engineers here in Japan and the Science Council of Japan for the financial responsibility they took to organize and host our General Assembly. Finally there is one final group of people I need to thank, and as URSI our most sincere thanks have to go to them… and that is YOU, authors, co-authors, participants. Taking the challenge to present your work at our General Assembly, taking the effort to come to Sapporo, confronting the difficulties in travelling. I mentioned this already at the Opening ceremony, but I like to stress this again. Your work, your effort is the heart of our Flagship conferences. We can choose a nice venue, we can build a nice social programme, we can appoint a good team, but without your participation, without your papers, it would have been a very boring week here in Sapporo.

URSI has now a Flagship meeting every year. I invite you to submit your work to the AT- RASC conference next year 19 to 24 May in Gran Canaria. Make it an even more interesting event as again, without your presentation and participation there will be no conference at all… I look forward to welcome all of you next year in Gran Canaria, in 2 years in Sydney for AP-RASC and in 3 years time at the GASS in Krakow.

For now, Sapporo is not the center of our Radio Science community anymore, but it will be remembered by all of us as a nice event, welcoming city and a very friendly team. I wish you all a very nice remainder of the day, thank you and have a very safe trip back home.

Closing remarks by the outgoing President

Professor P.L.E. Uslenghi

Dear Colleagues, Ladies and Gentlemen,

Since the GASS in Rome two years ago, URSI has overcome the pandemic and has made good progress. In two years, we went from one chapter of Women in Radio Science (WIRS) to ten chapters. The number of young scientists and students attending our flagship conferences has been high; for example, 27% of the participants in the 2022 AT-AP-RASC in the Gran Canaria were students: this is a very promising trend for the future of URSI. The approximately one hundred young scientists who attended the Young

Scientists Party five days ago were enthusiastic about URSI. Thus, we are doing well in promoting diversity and participation by young researchers, which have been top priorities of mine. I urge you to attend the 2024 AT-RASC in the Gran Canaria, the 2025 AP-RASC in Sydney, the 2026 GASS in Krakow, and to motivate young researchers to attend as well.

Our journals are serving the radio science community well. Radio Science continues to publish a large number of full-length papers and has expanded its scope to cover the areas of interest of all ten Commissions. Radio Science Letters is in its fifth year of publication and has applied for full retroactive indexing, which should be finalized by the end of this calendar year. I urge you to submit your research findings to Radio Science and Radio Science Letters; please support our journals.

This is my last address to you as URSI President. The new URSI Board, under the leadership of our newly elected President, Professor Ari Sihvola, will take over at the end of this Closing Ceremony. I wish to thank the members of the exiting Board, the Secretariat, the officers of the Commissions and all those volunteers who worked hard during the past two years for the advancement of URSI. On behalf of all of us, I congratulate the winners of the URSI awards, and I extend our gratitude to Kazuya Kobayashi, Satoshi Yagitani, Ondrej Santolik, their staff members, the Secretariat, the officers of the Commissions, the GASS session conveners, authors, reviewers and participants who have made this 35th General Assembly and Scientific Symposium a resounding success.

I hope to see all of you next May at the AT-RASC in the Gran Canaria. I wish you a safe trip back home. Thank you for your support.

Closing remarks by the incoming President

Professor Ari Sihvola

Dear friends of radio science, mesdames et messieurs,
go raihin no minasama, go sankasha no minasama,

The year was 1982. I became acting secretary of the Finnish Member Committee of URSI. Well, by that time I had already fallen in love with radio science — Maxwell equations, waves emanating from moving charges, the mystery of magnetism. But URSI was first strange, then familiar, and soon my home.
Little did I know. Even less could have I imagined that time that one day — I would be the URSI President! Dear community, thank you for this trust!
Here a word about how I see radio science.

We heard from the presentation by our Secretary General on Sunday, of the history of URSI — that the motivations to establish, a century ago, this radioscientific organization were quite practical, like solving path-loss and interference problems. But the mission of URSI started soon to reach higher scientific ambition levels. One of the intriguing and difficult problems was caused by ionosphere: how does ionized plasma, biased by the Earth's magnetic field, affect the propagation of radio waves? For example, the puzzle of a reflecting layer in empty-looking sky had bothered physicists from the time of Marconi's trans-Atlantic link. With radio soundings, progress was made in 1920's to map its layered structure. Later, the close relationship between ionospheric radio propagation, geomagnetism, and solar activity was established.

En effet, les ondes radio vont au-delà de l'atmosphère et de la magnétosphère de notre planète. Les observations radioastronomiques ont révélé une telle variété de nouveaux phénomènes imprévus que nous avons connu une révolution dans notre compréhension de l'univers et de la cosmologie, grâce aux Radiosciences. À titre d'exemple, je ne mentionnerai ici que la découverte des quasars (objets fortement décalés dans le rouge, donc localisés dans le ciel très profond), la découverte des pulsars (phares cosmiques avec des pulsations périodiques très rapides émises par des étranges étoiles à neutrons en rotation) et la découverte du bruit de fond cosmique, ou rayonnement de fond cosmologique micro-onde (bruit-radio à une température équivalente de trois kelvins arrivant de partout de façon presque isotrope).

As I just said, and I repeat: Those fascinating discoveries, thanks to radio science, about the deep space (of which we heard in the General lecture on Wednesday by Professor Ronald Ekers), quasars, pulsars, microwave background radiation have transformed our understanding of the universe. Man-made satellites made it possible not only to study the universe without atmospheric aberrations that plague earthbound receiving systems, but also to turn the antennas down, to look into this our loved Earth. Unprecedented knowledge of dynamic processes of the geosphere and biosphere are hidden in radio spectrum emissions of our earth.

Throughout the hundred years of URSI, technology and pure science played essential roles in our operations. Science and technology are connected. We may see the electronic applications be fruits of science, radio science. True, think about Oersted's discovery of electromagnetism leading to electric machines, Maxwell's equations to radio, or quantum physics to transistors. But science is not the mother of technology. Technology, I mean a clever use of tools is much older than science, has existed tens of thousands of years before science. And many scientific discoveries would not be possible without ingenious engineering achievements. Planck satellite, CERN particle accelerators…

Science and technology have a true interaction. But they live their own lives. Let's take another point of view of a radioscientist as a person, as a subject. What are her motivations, what are his reasons to do research? Well, I can think of many. Intellectual satisfaction emanating from that intensive work, and emotional reward that it brings, salary with which to support the family, advances in academic career…

Are there deeper imperatives for doing research? To serve the public good? It is well known that scientific findings and results of systematic engineering research can be used to create prosperity and welfare in the society through boosting industrial productivity and bringing forth other material innovations. And this is a call not only for engineers: Economists and other social scientists are expected to provide solutions for communities troubled with poverty and crime. Multidisciplinary scientific teams advice governments on global environmental problems. Indeed, science is considered today as a powerful strategic resource. As you remember, this was underlined at the opening Ceremony, where we learned about the work of ICS (International Council of Science), from Mrs. Motoko Kotani.

Yes, various mechanisms of scientific counsel exist in countries around the world and also transnationally. However, bridging scientific evidence into policymaking is not a straightforward task of transferring objective facts onto the table of politicians. Science is not an answer-providing machine. Scientific evidence is by nature complex, it is characterized by uncertainty, even controversial. It requires interpretation. And, also scientists are human beings, affected by values and preferences.

Despite such difficulties, all these science-councel efforts deserve the full support of all of us. I see, however, a more serious problem in such a view in which science and research are measured from the point of their impact. When the focus is on the instrumental use of science, its absolute value is left aside. The quintessence of science is not its service potential, admittedly so powerful.

And again, nothing wrong with service. Life is service. What I try to say is that reaping the benefits of radio science happens outside science, it happens in its lower-dimensional shadow. And radio science itself lives in a broader space.

Once more, thank you for the trust you have on me, the President of our Union. With this, let's begin the new triennium of URSI!

Reports of Meetings

Board of Officers

Summary Report

19 August 2023

Prof. P.L.E. Uslenghi opened the meeting at 11:00 AM and welcomed all the participants. He thanked Prof. Yagitani and Prof. Kobayashi for their excellent preparation of the GASS. Prof. Van Daele welcomed all the Officers at this last meeting of this Board. He thanked all the Officers of the Board for their cooperation over the last two or more years.

For the drafting committee of GASS 2023, the Board proposed to ask Lluis Mir and Alain Sibille for the French language and Paul Cannon and Phil Wilkinson or Paul Smith for the English language. Inge Heleu will be the ex officio link from the Secretariat.

The Board also proposes to ask Paul Smith and Michael Newkirk to be on the Finance Committee. The ad hoc committee on WIRS (Women in Radio Science) was chaired by Pat Doherty and after her passing Sana Salous did a great job taking over from Pat.

The Board discussed the unit contribution. There was an increase by one percent every year since 2015 but all of our expenses are in Euro and the inflation of the Euro-zone in recent years was very high. Therefore the unit contribution should be increased. The Secretary General suggests a one-time increase of 5% for the 2024 membership dues and the following years until the next GASS in 2026, an annual increase of maximum 3%.

The Secretary General had a few comments with respect to the GASS 2029 bids regarding the financial and legal responsibility to sign the contracts. It might be needed to rethink the way the GASS is organized. It was also pointed out that hybrid meetings should be avoided as it triples the general cost.

The question was raised if the page charges for Radio Science Letters should be increased but it was decided to wait until it is fully indexed.

26 August 2023

The meeting was chaired by the new elected President, Prof. Ari Sihvola, who welcomed the newly elected officers of the Board: Prof. Kazuya Kobayashi, Prof. Giuliano Manara, Prof. O. Santolik, and Prof. Sana Salous and the Secretary General Peter Van Daele.

Prof. K. Kobayashi was appointed as Treasurer. Prof. P.L.E. Uslenghi was appointed as Assistant Secretary General for Publications, Prof. K. Kobayashi as Assistant Secretary General for AP-RASC and Prof. S. Wijnholds as Assistant Secretary General for AT-RASC. Prof. J. Volakis was appointed as Associate Secretary General for GASS.

Prof . P.L.E Uslenghi will be responsible for the URSI Awards and the Young Scientist Committee will be chaired by Prof. S. Wijnholds. Prof. S. Salous will be responisible for WIRS and will serve as liaison with ITU. Prof. O. Santolik will serve as liaison with the different URSI Commissions. He will also be responsible for the Individual Membership together with Prof. G. Manara, who will also be the liaison with ISC.

Council

Summary Report

The Resolutions and Recommendations adopted by the URSI Council are reproduced at the end of this volume.

Council met on
Sunday 20 August (8:20 AM to 12.00 PM)
Tuesday 22 August (17:00 PM to 19.00 PM)
Thursday 24 August (17:00 PM to 19.00 PM)
Saturday 26 August (08:20 AM to 10:40 AM)

1. Membership of the Council

President :	Prof. George Uslenghi
Secretary General:	Prof. Van Daele

Australia:	Prof. Paul Smith
Belgium:	Prof. Peter Van Daele
Canada:	Prof. Dave Michelson
China CIE:	Prof. Jian Wu
China SRS:	Prof. Ruey-Beei Wu
Czech Rep.:	Dr. Ivana Kolmasova
Denmark:	Prof. Olav Breinbjerg
Egypt:	Prof. Rowayda Sadek
Finland:	Prof. Jaan Praks
France:	Prof. Lluis Mir
Germany:	Prof. Ludger Klinkenbush
India:	Prof. Amitava Sen Gupta
Ireland:	Prof. Dimitra Psychogiou
Israel:	Prof. Ehud Heyman
Italy:	Prof. Carlo Carobbi

Japan:	Prof. Satoshi Yagitani
Netherlands:	Prof. Stefan Wijnholds
New Zealand:	Prof. Aaron Hendry
Norway:	Dr. Terje Tjelta
Peru:	Prof. Danny Scipion
Poland:	Prof. Jozef Modelski
	Prof. Artur Rydosz
Portugal:	Prof. José Pedro Borrego
Russia:	Prof. Elena Pavlyukova
Slovak Republic:	Prof. Vladimir Stofanik
South Africa:	Prof. Zama T. Katamzi
South Korea:	Prof. Seong-Ook Park
Spain:	Prof. Mikel Laso
Sweden:	Prof. Daniel Sjöberg
Switzerland:	Dr. Marcos Rubinstein
Turkey:	Prof. Ayhan Altıntaş
United Kingdom	Prof. Sana Salous
USA	Prof. Michael Newkirk
	Prof. Sembian Rengarajan

Observers :

USA:	Ms. Ana Ferreras, US National Academies
India:	Prof. Paulraj Rajamani (Observer)

Commission A:	Chair:	Prof. N. B. Carvalho
	Vice-Chair:	Prof. A. Sengupta
Commission B:	Chair:	Prof. J. Volakis
	Vice-Chair:	Prof. H. Wallén
Commission C:	Chair:	Prof. Y. Louët
	Vice-Chair:	Prof. K. Mishra
Commission D:	Chair:	Prof. N. Shinohara
	Vice-Chair:	Dr. A. Kanno
Commission E:	Chair:	Prof. Virginie Deniau (could not attend)
	Vice-Chair:	Prof. C. Carobbi
Commission F:	Chair:	Prof. T. Tanzi (could not attend)
	Vice-Chair:	Prof. Motoyuki Sato
Commission G:	Chair:	Prof. G. de Franceschi
	Vice-Chair	Prof. K. Groves
Commission H:	Chair:	Prof. J. Manninen
	Vice-Chair:	Dr. C. Rodger

Commission J:	Chair:	Prof. D. Bock
	Vice-Chair:	Prof. S. Wijnholds
Commission K:	Chair:	Prof. K. Ito
	Vice-Chair:	Prof. F. Apollonia

The Officers of the Board, the Coordinator of the scientific program and the Assistants Secretary General attended in an advisory capacity. Some Chairs of standing committees and various URSI Officials attended the meetings partially or totally.

2. Elections

The Officers of the Board were elected during the first Council meeting. An electronic voting system was used. The result of the election was as follows:

a) President
There were three candidates nominated for President: Prof. Ari Sihvola (Finland), Prof. Prof. Giuliano Manara (Italy), Prof. Ondrej Santolik (Czech Republic). Prof. Ari Sihvola was elected as President for the triennium 2023-2026.

b) Vice-Presidents
The result of the elections for Vice-President, conducted by secret ballot, was as follows (in alpahabetical order):
Prof. Kazuya Kobayashi
Prof. Giuliano Manara
Prof. Sana Salous
Prof. Ondrej Santolik

c) Secretary General
Prof. Peter Van Daele was elected by acclamation.

d) Commission Chairs & Commission Vice-Chairs

Council approved the outcome of the elections of the new Commission Vice-Chairs:

Commission A:		
	Chair :	A. Sen Gupta (India)
	Vice-Chair :	J. M. López Romero (Mexico)
Commission B:		
	Chair :	H. Wallén (Sweden)
	Vice-Chair :	L. Klinkenbusch (Germany)

Commission C:

Chair :	K.V. Mishra (U.S.A.)
Vice-Chair :	P. Vouras (USA)

Commission D:

Chair :	A. Kanno (Japan)
Vice-Chair :	T. Akalin (France)

Commission E:

Chair :	C. Carobbi (Italy)
Vice-Chair :	C. Kasmi (UAE)

Commission F:

Chair :	M. Sato (Japan)
Vice-Chair :	S. J. Ambroziak (Poland)

Commission G:

Chair :	K. Groves (UK)
Vice-Chair :	S. Elvidge (UK)

Commission H:

Chair :	Dr. Craig Rodger (New Zealand)
Vice-Chair :	R. A. Marshall (USA)

Commission J:

Chair :	Prof. S. Wijnholds (The Netherlands)
Vice-Chair :	Y. Gupta (India)

Commission K:

Chair :	Prof. F. Apollonio (Italy)
Vice-Chair :	L. Ole Fichte (Germany)

e) Election Early Career Representatives (ECR)

The Secretary General reports on the outcome of the elections of the Early Career Representatives. It was decided to keep the ECR's who served from 2021 to 2023 for the first time for another term. For every Commission, a second ECR was elected.

Commission A:	G. Signorile (Italy)
	R. Figueiredo (Portugal)
Commission B:	D. Tzarouchis (U.S.A.)
	S. B.Venkatakrishnan (U.S.A)
Commission C:	K.K. Cwalina (Poland)
	S. Bhattacharjee (India)
Commission D:	V. Palazzi (Italy)
	G. Paolini (Italy)
Commission E:	R. Trinchero (Italy)
	F. M. da Silva Jorge (Portugal)

Commission F:	F. T. Dagefu (U.K.)
	G. Rakshit (India)
Commission G:	Bruce Fritz (USA)
	Dario Sabbagh (Italy)
	D. R. Themens (UK)
Commission H:	Dr. F. Nemec (Czech Republic)
	D. Hartley (USA)
Commission J:	Dr. D. Fenech (UK)
	M. S. Darwish (Egypt)
Commission K:	Dr. E. Porter (USA)
	K. Li (Japan)

This result is formally approved by Council.

3. Establishment of Temporary Committees and Ad Hoc Groups

Council approved the formation of a drafting committee with as members: Prof. Lluis M. Mir (on-site) and Prof. Alain Sibille (online) for the French, and Prof. Paul S. Cannon (on-site) and Dr. Phil Wilkinson (online) for the English.

The Standing Finance Committee consisted of Prof. Paul Smith (Australia) and Prof. Michael H. Newkirk (USA).

An ad hoc Committee on Women in Radio Science was formed and chaired by Prof. Sana Salous (United Kingdom). The Standing Committee on Women in Radio Science was confirmed by Council.

An ad hoc Committee on the Terms of Reference of the URSI-ITU working group was formed and led by Prof. David G. Michelson (Canada).

4. Finances

Prof. Paul Smith and Prof. Michael Newkirk were appointed as members of the Standing Committee on Finances. They examined the report prepared by the Prof. Ari Sihvola (Treasurer) of the URSI Finances covering the period 2021-2023 and they noted that the accounts have been audited by Ernst&Young. On the basis of this information in the report they noted a worrying, slightly declining trend during the two most recent years in the member committee income. Besides this there was a dramatic increase in the expenses due to inflation rates. The Finance Committee therefore advised to increase the Member Committee dues by 5% in 2024 and to plan for an additional increase of up to a maximum

of 3% in the subsequent two years. The Member Committees should also be encouraged to increase their units. It was also advised that the cost of any adminstrative support to the flagship meetings by the Secretariat should be included in the agreed conference budget. Once Radio Science Letter is indexed, the page charges should be increased. Last recommendation is to minimize the use of online components in flagship meetings to keep the registration cost as low as possible.

Council authorized the Board to increase the membership dues by 3.5% per annum over the next triennium.

5. URSI Membership

With a great majority of votes, Brazil was moved to Associate Membership. One of the ECR candidates of Commission G is from Brazil. Although he was not elected, he may be our new contact in Brazil or help us to find a new active contact there.

It was also decided to maintain Argentina, Bulgaria, Chile, Greece, Iraq, Singapore and Ukraine as Associate Members of URSI.

6. Publications

After the passing of Ross Stone, George Uslenghi took over as Interim Chair of the Publications Committee; he is the author of this report. At the time of the 2023 GASS, the other members of the Committee are:

Peter Van Daele, EIC of the *Radio Science Bulletin*
Kazuya Kobayashi, Interim Editor of the *Radio Science Bulletin*
Sana Salous, EIC of *Radio Science*
Henrik Wallén, EIC of the *Radio Science Letters*
Inge Lievens, Editorial Assistant for the *Radio Science Bulletin* and for the *Radio Science Letters.*

The Board decided to replace the *Bulletin* with a much simpler *URSI Newsletter*, that will not be indexed and will be edited by the Secretary General with the assistance of his staff. The *Newsletter* will be distributed electronically to all member countries and individual members. It will contain informational items, such as minutes of the Board, reports of working groups, calendar of conferences, etc.

Despite the loss of the Bulletin, radio scientists have two high-quality publications under URSI control for output of their scientific work: Radio Science for full papers, and Radio Science Letters for short contributions. All radio scientists are encouraged to submit their research results to these journals, and to contact the EICs for additional information.

7. URSI Flagship Meetings

7.1 Selection of venue of the XXXVIIth General Assembly and Scientific Symposium of URSI in 2029.
The representatives of Tapei (China CIE), Singapore, Ottawa (Canada) and Vancouver (Canada) gave a presentation about their proposal to host the 2029 General Assembly and Scientific Symposium.

Singapore was elected to host the XXXVIIth General Assembly and Scientific Symposium of URSI in 2029.

The President thanked both the successful and the unsuccessful candidates for their presentation and all the time they have put in their proposal.

7.2 Presentation of AT-RASC 2022
Prof. P. Van Daele gave a presentation on AT-RASC 2022. This meeting was fully hybrid. We had in increase of participants with regard to AT-RASC 2018 but the cost for the meeting was considerably higher due to the high AV costs for online participation.

7.3 Presentation of AT-RASC 2024
AT-RASC 2024 will be held from 19 until 24 May, 2024, in an on-site format. The General Chair will be Prof. Stefan J. Wijnholds. There was a request from some of the Commission Chairs to have the option to present virtually. The Board discussed this thoroughly without reaching a final solution

The question was raised if AT-RASC 2027 should be held in another place. The Secretary General is willing to look at another venue for AT-RASC 2027 but the budget will be the main issue.

7.4 Presentation of AP-RASC 2025
Prof. Paul Smith gave an update of the plans for AP-RASC 2025, which will be held on 17-22 August 2025 in Sydney, Australia. Upon request of Prof. Rowayda Sadek, a WIRS session will be included in the scientific program.
Upon request of Prof. M. Ando, Prof. Smith is exploring the option for online participation without using the convention centre's online facilities, as these are very expensive.

8. Report on the International Science Council (ISC)

Prof. M. Ando explained that URSI is an ISC member in category 1 and that ISC is of interest to the URSI committees. He highlighted all the activities carried out by the ISC. Prof. Manara represents URSI in the ISC-GeoUnions Working Group 'Disaster Risk

Reduction and Management'. He attended the ISC Mid-term meeting in Paris on May 9-12, 2023. He was also appointed to help selecting the keynote speakers for the ISC "Distinguished Lecture Series (DLS)" on Basic Sciences for Sustainable Development. A webinar from URSI was organized on October 17, 2023 with the title "Energy sustainability for net zero radio communications", and presented by Prof. Nuno Carvalho (URSI Commission A).

It was recommended that the ISC-GeoUnions Standing Committee on Disaster Risk Reduction and the new URSI Inter-Commission WG contribute to ISC. Council was also invited to consider the possible development of an evidence based global voice of radio science, which can be utilized in every level of decision making for a better society.

9. Strengthening of the URSI-ITU Inter-Unions Working Group

David Botha from the Radio Regulations Board (RRB) of ITU-R was invited by the URSI Secretariat and the Japanese LOC to give some background info about ITU. He explained that the association between the ITU and URSI has been long and fruitful since the 1920's until now. At the 2021 GASS it was decided through a resolution that the Board should form an URSI-ITU Inter-Union Working Group. The main functions of this WG are to communicate, coordinate and stimulate activities between URSI and ITU, to contribute to relevant ITU groups and facilitate interaction.

At the GASS in Sapporo, a report was provided to Council describing the work carried out in producing a draft of the Terms of Reference and working principles for the URSI-ITU Inter-Union Working Group. It was decided that the Board shall continue to work on the formation of this URSI-ITU Inter-Union Working Group and work on the goals described in the resolution.

Council unanimously accepted this resolution.

10. Scientific Commissions

Council approved the updated terms of reference of the Commissions, which are:

Commission A on ELECTROMAGNETIC METROLOGY, Electromagnetic measurements and standards.

The commission promotes research and development in the field of measurement standards and physical constants, calibration and measurement methodologies, improved quantification of uncertainty, continued achievement of accuracy and traceability of measurements. Areas of emphasis are:

- development and refinement of new measurement techniques and calibration standards including techniques for antennas;
- primary standards including those based on quantum phenomena and the realization and dissemination of time scales and frequency standards;
- characterization of the electromagnetic properties of materials, physical constants, and the properties of engineered materials, including nanotechnology;
- methodology of space metrology and electromagnetic dosimetry, and measurements for health diagnostics, and biotechnology, including biosensing;
- measurements in advanced communication systems and other applications.

The commission fosters accurate and consistent measurements needed to support research, development, and exploitation of electromagnetic technologies across the spectrum and for all commissions.

Commission A - METROLOGIE ELECTROMAGNETIQUE, Mesures et étalons électromagnétiques

La Commission encourage la recherche et le développement dans le domaine des étalons de mesure et des constantes physiques, des méthodologies d'étalonnage et de mesure, de l'amélioration de la quantification des incertitudes, du maintien de la précision et de la traçabilité des mesures. Les domaines d'intérêt sont les suivants :

- Le développement et le perfectionnement de nouvelles techniques de mesure et normes d'étalonnage, incluant les techniques portant sur les antennes ;
- Les étalons primaires, y compris ceux basés sur les phénomènes quantiques et la réalisation et la diffusion d'échelles temporelles et d'étalons de référence des fréquences ;
- La caractérisation des propriétés électromagnétiques des matériaux, des constantes physiques, et des propriétés des matériaux manufacturés, y compris les nanotechnologies ;
- Les méthodologies pour la métrologie spatiale et la dosimétrie électromagnétique, et les mesures pour les diagnostics de santé, et les biotechnologies, y compris la biodétection ;

  Les mesures dans les systèmes de communication avancés et autres applications.

La Commission favorise les meilleures pratiques et la formation pour des mesures précises et cohérentes nécessaires pour soutenir la recherche, le développement et l'exploitation des technologies électromagnétiques dans tout le spectre et pour toutes les Commissions.

Commission B - FIELDS AND WAVES, Electromagnetic theory and applications.

The interests of Commission B are fields and waves, encompassing theory, analysis, computation, modeling, simulation, experiments, validation, and applications. Areas of emphasis are:

- Time-domain and frequency-domain phenomena;
- Scattering and diffraction;
- Propagation and effects, including waves in specialized media;
- Guided waves and components;
- Antennas and radiation;
- Inverse scattering and imaging.

The Commission fosters the creation, development, and refinement of analytical, numerical, simulation, and measurement techniques to understand these phenomena. It encourages innovation and seeks to apply interdisciplinary concepts and methods.

Commission B - ONDES ET CHAMPS, théorie électromagnétique et applications

L'intérêt de la Commission B porte sur les champs et les ondes, et englobe la théorie, l'analyse, le calcul, la modélisation, la simulation, les expériences, leurs confirmations et leurs applications, l'accent étant mis sur les sujets suivants :

- Les phénomènes dans les domaines temporel et fréquentiel ;
- La diffusion et la diffraction ;
- La propagation et ses effets y compris dans les milieux particuliers ;
- Les ondes guidées et composants ;
- Le rayonnement et les antennes ;
- Les méthodes inverses appliquées à la diffusion et aux images.

La Commission encourage les études ayant pour but de créer, de développer et d'affiner les méthodes numériques et analytiques, susceptibles d'améliorer la compréhension de ces phénomènes. Elle préconise l'esprit d'innovation et s'efforce d'appliquer des concepts et méthodes pluridisciplinaires.

Commission C - RADIO COMMUNICATION AND SIGNAL PROCESSING SYSTEMS

The Commission promotes research and development in:

- Information theory, coding, modulation and detection;
- Massive Multi-Input Multi Output antenna systems;

- Waveform for radar and communications;
- Smart radio-communications: cognitive radio, software defined radio;
- Reconfigurable intelligent surfaces;
- Radar, sonar, navigation systems and positioning;
- Artificial intelligence and machine learning;
- Energy efficient communications and power transfer;
- Security and privacy in communications;
- Quantum communications;
- Wireless networks;
- 6G and future high frequency radio systems;
- Integrated Sensing and Communications;
- Non-terrestrial networks.

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.

Commission C - SYSTEMES DE RADIOCOMMUNICATION ET TRAITEMENT DES SIGNAUX

La Commission tend à promouvoir les recherches et le développement dans les domaines suivants :

- Théorie de l'information, codage, modulation et détection ;
- Systèmes d'antennes massifs multi-entrées multi-sorties ;
- Formes d'onde pour le Radar et les communications ;
- Communications radio intelligentes et radio logicielle ;
- Surfaces intelligentes reconfigurables ;
- Radar, sonar, systèmes de navigation et positionnement ;
- Intelligence artificielle and apprentissage machine ;
- Communications efficaces en énergie et transfert de puissance ;
- Sécurité et confidentialité en radio-communications ;
- Communications quantiques ;
- Réseaux sans fil ;
- 6G et futurs systèmes très hautes fréquences ;
- Détection et communications intégrées ;
- Réseaux non-terrestres.

La conception de systèmes de radiocommunications efficaces fait aussi appel à des considérations scientifiques, d'ingénierie et économiques. La Commission met l'accent

sur les aspects scientifiques des radiocommunications mais fournit également l'expérience nécessaire à la conception des systèmes dans d'autres domaines des radiosciences.

Commission D - ELECTRONICS AND PHOTONICS

The Commission promotes research and reviews new developments in:

- Nanotechnologies and nanoelectronics systems that push beyond current frontiers;
- Microwave, millimeter wave, terahertz, and photonics devices, circuits and systems and their applications;
- Wireless devices, circuits and systems;
- Combined and hybrid photonic and electronic devices and systems;
- Optoelectronic systems, plasmonics, and electro-optics;
- Photonic signal processing schemes, regardless of frequency of signal processed;
- Physics, theoretical modeling, and numerical simulation of all of the above.

The Commission focuses on electronic and photonic devices , circuits, systems and wireless solutions to address applications in particular 6G and beyond, Internet of Things, Sensors, Artificial Intelligence, energy harvesting, WPT, Pandemics/disaster management.

Commission D - ÉLECTRONIQUE ET PHOTONIQUE

La Commission tend à promouvoir les recherches et à faire le point des nouveaux développements dans les domaines :

- Des nanotechnologies et systèmes nanoélectroniques qui repoussent les frontières actuelles ;
- Des dispositifs, circuits et systèmes au fréquences micro-ondes, millimétriques, térahertz et photoniques et leurs applications ;
- Des dispositifs, circuits et systèmes sans fil ;
- Des dispositifs et systèmes photoniques et électroniques combinés et hybrides ;
- Des systèmes optoélectroniques, plasmoniques et électro-optiques;
- Des techniques de traitement des signaux photoniques, quelle que soit la fréquence du signal traité ;
- Relevant de la physique, de la modélisation théorique et de la simulation numérique pour tout ce qui précède;

La Commission se concentre sur les dispositifs électroniques et photoniques et sur les circuits, systèmes et solutions sans fils pour des applications en particulier pour la 6G et au-delà, les capteurs, l'intelligence artificielle, la récupération d'énergie, le transfert de puissance sans fil, la gestion des pandémies et des désastres.

Commission E - ELECTROMAGNETIC ENVIRONMENT AND INTERFERENCE

The Commission deals with the study, modeling and characterization of:
- electromagnetic noise of natural origin;
- man-made electromagnetic noise, both intentional and unintentional;
- complex electromagnetic systems and environments;

by using measurement, deterministic, statistical, stochastic and machine learning techniques.

Further, the Commission promotes research and development in:
- the effects of noise on system performance;
- the electromagnetic eavesdropping and EM cybersecurity;
- the hardware and software techniques for the suppression and mitigation of electromagnetic interference;
- the scientific basis, standardization and metrology of electromagnetic compatibility;
- the efficient use and management of the radiofrequency spectrum.

Commission E - ENVIRONNEMENT ELECTROMAGNETIQUE ET INTERFERENCES

La Commission est concernée par l'étude, la modélisation et la caractérisation :

- Des bruits électromagnétiques d'origine naturelle ;
- Des bruits d'origine humaine, intentionnels ou non intentionnels ;
- Des systèmes et environnements électromagnétiques complexes ;

au travers de mesures, de techniques déterministes, statistiques, stochastiques et d'apprentissage machine.
En outre, la Commission promeut les recherches et les développements dans les domaines suivants :

- Les effets des bruits sur les performances des systèmes ;
- L'écoute et la cybersécurité électromagnétiques ;
- Les techniques matérielles et logicielles pour la suppression et la réduction des interférences électromagnétiques ;
- Les bases scientifiques, la normalisation et la métrologie de la compatibilité électromagnétique ;
- L'utilisation et la gestion efficaces du spectre des radiofréquences.

Commission F - WAVE PROPAGATION AND REMOTE SENSING (planetary atmospheres, surfaces and subsurfaces)

The Commission encourages:

- The study of all frequencies in a non-ionized environment:
  - wave propagation through planetary, neutral atmospheres and surfaces;
  - wave interaction with the planetary surfaces (including land, ocean and ice), and subsurfaces;
  - characterization of the environment as it affects wave phenomena;
- The application of the results of these studies, particularly in the areas of remote sensing and communications;
- The appropriate co-operation with other URSI Commissions and other relevant organizations.

Commission F - PROPAGATION DES ONDES ET TELEDETECTION (atmosphères planétaires, surfaces et subsurfaces)

La Commission tend à encourager :

- L'étude des milieux non ionisés à toutes fréquences :
  - propagation des ondes en atmosphères planétaires neutres et en surfaces ;
  - interaction des ondes avec les surfaces planétaires (océans, sol et glace), et subsurfaces ;
  - caractérisation de l'environnement en ce qu'il affecte les phénomènes ondulatoires ;
- L'application des résultats de ces études, en particulier dans les domaines de la télédétection et des communications ;
- Le développement d'une collaboration appropriée avec les autres commissions de l'URSI et les organisations concernées.

Commission G - IONOSPHERIC RADIO AND PROPAGATION

The Commission deals with the study of terrestrial and extra-terrestrial ionospheres in order to provide the broad understanding necessary to support space and ground-based radio systems. Specifically, the Commission addresses the following areas:

- Global morphology and modeling of the ionosphere;
- Ionospheric space-time variations and the impacts of space weather on systems;
- Development of tools and networks needed to measure ionospheric properties and trends;
- Theory and practice of radio propagation in and through the ionosphere;
- Application of ionospheric information to radio systems.

To achieve these objectives, the Commission co-operates with other URSI Commissions, corresponding bodies of the ISC family (IUGG, IAU, COSPAR, SCOSTEP, SCAR, etc.) and other organisations (ITU, IEEE, etc.).

Commission G - RADIOELECTRICITE IONOSPHERIQUE ET PROPAGATION

La Commission s'occupe de l'étude des ionosphères terrestre et extraterrestres afin de fournir les connaissances générales nécessaires pour soutenir les systèmes radio spatiaux et au sol. Plus précisément, la Commission s'occupe des domaines suivants :

- La morphologie globale et la modélisation de l'ionosphère ;
- Les variations spatio-temporelles ionosphériques et les impacts de la météorologie spatiale sur les systèmes ;
- Le développement d'outils et de réseaux nécessaires pour mesurer les propriétés et les tendances ionosphériques ;
- La théorie et la pratique de la propagation radio dans et à travers l'ionosphère ;
- L'application de l'information ionosphérique aux systèmes radio.

Pour atteindre ces objectifs, la Commission coopère avec d'autres Commissions de l'URSI, des organismes correspondants de la famille ISC (IUGG, IAU, COSPAR, SCOSTEP, SCAR, etc.) et d'autres organisations (UIT, IEEE, etc.).

Commission H - WAVES IN PLASMAS (including space and laboratory plasmas)

The goals of the Commission are:

- To study waves in plasmas in the broadest sense, and in particular:
  - the generation, propagation, and detection of waves in plasmas,
  - wave-wave and wave-particle interactions,
  - plasma turbulence and chaos,
  - spacecraft-plasma interaction,
  - instabilities, heating, and diagnosis of laboratory plasmas;

- To encourage the application of these studies, particularly in the areas of solar/planetary plasma interactions, space weather, and an increased exploitation of space as a research laboratory.

Commission H - ONDES DANS LES PLASMAS (y compris les plasmas spatiaux et de laboratoire)

La Commission a pour buts :

- D'étudier les ondes dans les plasmas au sens le plus large et, en particulier :
  - la génération, la propagation et la détection des ondes dans les plasmas ;
  - les interactions onde-onde et onde-particule ;
  - les processus de turbulence dans les plasmas et le chaos ;
  - les interactions entre les plasmas et les engins spatiaux ;
  - les instabilités, le chauffage et les diagnostics des plasmas de laboratoire
- D'encourager l'application de ces études, en particulier dans les domaines des interactions entre les plasmas solaires et planétaires et utilisation accrue de l'espace comme un laboratoire de recherche.

Commission J - RADIO ASTRONOMY

The activities of the Commission include:

- Observation and interpretation of cosmic radio emissions from the early universe to the present epoch, and
- Radio reflections from solar system bodies.

Emphasis is placed on:

- The promotion of science-driven techniques for making radio-astronomical observations and data analysis;
- Support of activities to protect radio-astronomical observations from harmful interference.

Commission J - RADIOASTRONOMIE

Les activités de la Commission concernent :

- L'observation et l'interprétation de toutes les émissions, des premier instants de l'univers à l'époque actuelle, et
- Les réflexions radioélectriques en provenance d'objets célestes.

L'accent est mis sur :

- La promotion de moyens techniques pour les observations et analyse des données radioastronomiques ;
- L'appui des démarches ayant pour but d'obtenir la protection des observations radioastronomiques contre les brouillages nuisibles.

Commission K - ELECTROMAGNETICS IN BIOLOGY AND MEDICINE

Commission K is charged with promoting research and development in the following domains:

- Physical interaction of electromagnetic fields (from static to optical) with biological systems;
- Biological and health effects of electromagnetic fields;
- Effects of electromagnetic fields due to human activity on ecosystems, biodiversity, and planetary health;
- Biological mechanisms and effects associated with exposure to electromagnetic fields;
- Electromagnetic exposure systems, dosimetry and tissue-equivalent models;
- Monitoring and assessing the exposure to electromagnetic fields;
- Diagnostic and therapeutic applications of electromagnetic fields;
- Healthcare and rehabilitative applications of electromagnetic fields.

Commission K - ÉLECTROMAGNETISME EN BIOLOGIE ET EN MEDECINE

La Commission K a pour tâche de promouvoir les recherches et les développements dans les domaines suivants :

- Interactions des champs électromagnétiques (des champs statiques au domaine optique) avec les systèmes biologiques au niveau de la physique ;
- Effets biologiques et sur la santé des champs électromagnétiques ;
- Effets des champs électromagnétiques causés par l'activité humaine sur les écosystèmes, la biodiversité et la santé de la planète ;
- Mécanismes à la base des effets biologiques des champs électromagnétiques ;
- Systèmes expérimentaux d'exposition aux champs électromagnétiques, dosimétrie et modèles équivalents à des tissus ;
- Suivi et évaluation de l'exposition aux champs électromagnétiques ;
- Applications diagnostiques et thérapeutiques des champs électromagnétiques.
- Applications des champs électromagnétiques dans les soins de confort et la réadaptation physique et fonctionnelle

12. Any other business

The Secretary General invited feedback on the way Council and other meetings are organized. Prof. Mir suggested that all the candidates for the Board should introduce themselves at the first Council meeting before the voting. The voting was done by an electronic voting tool, mostly used within companies. The Secretary General received a comment regarding the tool and the procedure and will investigate this further.

Co-ordinating Committee

Summary Report

The Co-ordinating Committee met on
Saturday 19 August 2023 (2.00 PM to 6.00 PM) and
Saturday 26 August 2023 (2.40 PM to 5.00 PM).

1. First Co-ordinating Committee meeting

1.1 Local arrangements for the Sapporo GASS
Prof. Kazuya Kobayashi, chair of the LOC gave a presentation regarding local arrangements, hotels, submission and registration details, Social Program, Post Conference Tours, Opening Ceremony, General Lectures and Public Lecture, Tutorial and ECR Lectures, and the Scientific Program in general.

He highlighted the awardees of the YS Program and the laureates of the Student Paper Competition. An overview was given of the number of submitted and accepted papers.

There was a remark regarding the online Program Book. Due to time constraints and the summer vacation period in Japan, the scientific program included in the Program Book was an outdated version. The final version was published on the GASS 2023 website after the conference : https://www.ursi-gass2023.jp/pdf/ProgramBook.pdf

1.2 The GASS 2023 Scientific Program
Prof. Ondrej Santolik, Scientific Program Coordinator, gave an introduction to the Scientific Program. Besides onsite online and poster presentations, the program also contained pre-recorded videos which were not played during the sessions but were available for watching by the registered attendees at any time.

The Scientific Program could be accessed through the online Eventure platform program that showed the actual program day by day, room by room and through the Conference Compass mobile apps for Android and iOS, which showed the actual program, list of attendees, floor plans, and a searchable list of all presentations (oral, poster, pre-recorded).

1.3 Commission Coordinating Activities (CCA) Meetings
The Secretary General gave an overview of the topics that needed to be covered during CCA meeting 1 such as the procedure for the election of the Vice-Chairs and ECRs.
He stressed out that all candidates who stand for election have the possibility to introduce themselves and that all votes should be cast during this CCA meeting because the voting app would close right after the CCA 1 meeting is closed (7 p.m.).

1.3 Commission Budget
The Secretary General repeated the guidelines to apply for Commission support. He emphasized that it is important that the local Member Committee of where the meeting is held, is contacted to enhance the visibility of URSI. By doing this the return on investment will be improved.

Prof. Van Daele explained how the budget amounts were calculated. On top of the fixed budget of 15,000 Euro per commission, there is a variable budget which is dependent on the total number of attendees and the total papers per Commission. The budget can be used to bring Commission officers or Young Scientists to the flagship meetings.

1.4 Planning of the Flagship Meetings
The Secretary General gave an overview and timing of the URSI Flagship Meetings that will be held in the triennium 2023-2026. He invited the Commission leads to start working on the topics list and the topic conveners for AT-RASS 2024.

1.5 Proposal for Radio Science School for YS
The first edition of the Radio Science School for Young Scientists, organized by Prof. Carlo Carobbi, was held on 19 and 20 August in Sapporo just before the Opening Ceremony. Prof. Manara suggests to organize the School in two days, Saturday afternoon and Sunday morning with 6 hours of lectures during each of the Flagship meetings, so every year. The Secretary General indicated that a new committee for the next School should be formed during this GASS. It should be composed of one Chair and 10 Members, one for each commission.

2. Second Co-ordinating Committee meeting

2.1 Guidelines for Commission Officers
Prof. Van Daele presents the Guidelines for Commission Chairs, Vice-Chairs and ECRs and asks to read these carefully. The Commission Chair is responsible for the Commission budget and for the GASS commission programme. The Vice-Chair is responsible for planning and overseeing the Commission's AT-RASC programme.

The ECRs have a networking event at all Flagship meetings. The ECR committee is independent and reports to the Board. Dr. Bruce Fritz is Chair of the ECRC and is invited to attend all Board meetings. Prof. Stefan Wijnholds suggests to have the ECRs convene the sessions.

The Secretary General also advises the Commission leads to use the URSI mailing list and indicates that these are moderated by the URSI Secretariat.

2.2 AT-RASC input from Commissions
Every Commission described its planned sessions for AT-RASC in a 2/3-page PowerPoint presentation with the titles of the sessions and the convenors.

Prof. Van Daele asked to highlight the achievements of female scientists in all commissions. Prof. Uslenghi would like to see more contributions from South Africa and South America since this is an Atlantic meeting. Prof. Keith Groves is involved in a School in Africa in the near future, so that will be beneficial for URSI as well.

2.3 Any other business
The Secretary General points out that the format of AT-RASC 2024 will be on-site and that the online component will be limited.

In the discussion of highlighting female authors/convener in the program by labelling with 'WIRS', the Secretary General would rather focus on the visible (re)presentation than adding the gender. Therefore the ECRC should find at least one female General Lecturer, preferable more than one. Prof. Sana Salous will coordinate the input.

Prof. Manara asks to inform him with the names of the commission delegates for the School for Young Scientists.

2.4 Next meeting
The next Coordinating Committee meetings will be held online, the first meeting around the end of September or early October with the Secretary General and the Treasurer about the Commission budget and the second around the of end January or early February for an update in AT-RASC (submissions and programme building).

Treasurer's Report on URSI Finances

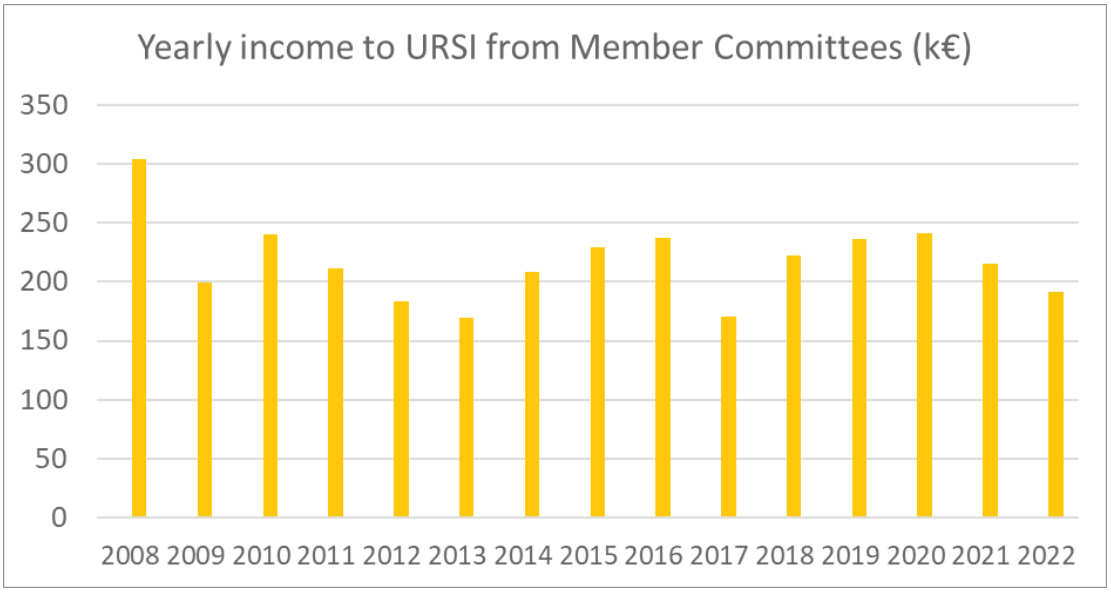
This treasurer's report of the International Union of Radio Science (URSI) covers the period of two years 2021, 2022, instead of a three-year period. This is because the previous General Assembly and Council meetings (where the previous report was presented) were postponed from 2020 to 2021.

General observations about the finances and their developments over the past years:

- The Financial Statements of the International Union of Radio Science (U.R.S.I.) as at 31 December 2022 have been audited on 26 June 2023 by EY Bedrijfsrevisoren BV, represented by partner Francis Boelens.
- The income consists mainly of membership fees from national committees and the surplus from successful Flagship meetings.
- The largest expenses are due to administration (Ghent office), support to the activities of the ten commissions, arrangements of Board and Committee meetings, and supporting flagship conference organization (including the Young Scientists programme), and URSI publications.

Due to the different character of the three flagship meetings, the expenses and income vary in a three-year life cycle of URSI:

- Atlantic Radio Science Meeting **AT-RASC** (2015, 2018, 2022, 2024, Gran Canaria) is completely organized by URSI, with total financial responsibility including expenses and income.
- Asia–Pacific Radio Science Conference **AP-RASC** (2016 Seoul, 2019 New Delhi, 2025 Sydney) is in the hands of the local organization, but URSI provides a certain financial support and receives in return free registration for the Board and Coordinating Committee members.
- URSI General Assembly and Scientific Symposium **GASS** (2017 Montreal, 2021 Rome, 2023 Sapporo, 2026 Krakow) is the main event in the life cycle of our Union. While the main financial responsibility lies with local organizers, URSI is heavily involved in technical and organizational support. The return to URSI consists of a fixed amount per registered participant plus a certain percentage of the registration fees.
- The time of pandemic, which fortunately is now over, had its adverse effect also on the scientific activities of URSI. All Flagship and Commission meetings were postponed by one year or even more. An obvious consequence is that the income and expenses in the URSI finances have not followed the expected cycle during the years 2020–2022. The disturbed rhythm of the flagship meetings was remedied by combining the AT-RASC and AP-RASC meetings into a joint AT-AP-RASC event in Gran Canaria in



2022. As to the character of the meetings, the Board have strongly worked towards organizing fully in-person meetings instead of on-line or hybrid meetings, to allow radio scientists truly come together. Indeed, the present situation looks bright in light of the number of registered participants to physically meet in Sapporo at GASS 2023.

- The income statistics from the Membership fees of the national committees to URSI are shown below. The increase of the membership fees to URSI has been kept very modest: the membership contribution payment in average has increased less than one percent per year. The yearly variation of the financial input from the membership fees is due to occasional delays of the payments by individual countries, which, on the other hand, may be compensated by the fact that the arrears sometimes appear later as cluster income in the balances. There is, however, a worrying, slightly declining trend during the two most recent years in the member committee income.

As a final remark, I express my sincere thanks to the Secretary General and officers in the URSI Headquarters for their excellent handling of day-to-day finances.

Ari Sihvola
Treasurer, URSI Vice-President

Reports of the Standing Committees

URSI Standing Committee on Publications

After the passing of Ross Stone, George Uslenghi took over as Interim Chair of the Publications Committee; he is the author of this report. At the time of the 2023 GASS, the other members of the Committee are:

Peter Van Daele, EIC of the *Radio Science Bulletin*
Kazuya Kobayashi, Interim Editor of the *Radio Science Bulletin*
Sana Salous, EIC of *Radio Science*
Henrik Wallén, EIC of the *Radio Science Letters*
Inge Lievens, Editorial Assistant for the *Radio Science Bulletin* and for the *Radio Science Letters.*

1. Radio Science Bulletin

Because of Ross Stone's long illness, the *Radio Science Bulletin* was two years behind schedule, the last issue having been published in June 2021. Thus, the *Bulletin* was in serious violation of the guidelines for indexing, which require timely publishing. After Ross Stone's death on 29 March 2023, the Board examined the possibility of bringing the *Bulletin* up to date in a short time, but concluded that this solution was not feasible, both operationally and financially. Consequently, the Board decided to discontinue publication of the *Bulletin* and accepted the offer by Kazuya Kobayashi to act as Interim Editor for the last issue of the *Bulletin*, that is presently in preparation.

The Board decided to replace the *Bulletin* with a much simpler *URSI Newsletter*, that will not be indexed and will be edited by the Secretary General with the assistance of his staff. The *Newsletter* will be distributed electronically to all member countries and individual members. It will contain informational items, such as minutes of the Board, reports of working groups, calendar of conferences, etc.

2. Radio Science

The journal *Radio Science* belongs to the American Geophysical Union and is published by Wiley.

It accepts and publishes full-length papers devoted to most areas of radio science. Its EIC is Sana Salous , sana.salous@durham.ac.uk. Since the 2021 GASS, *Radio Science* has published 65 papers in the period August-December 2021, 160 papers in the 2022 calendar year, and 129 papers in the period January-July 2023.

3. Radio Science Letters

The *URSI Radio Science Letters (RSL)* is an electronic journal owned and operated by URSI. Its purpose is to rapidly publish original and previously unpublished scientific research work in all areas of radio science, in the form of short contributions that are rigorously reviewed. The journal is open access and is published only in electronic format, one volume per calendar year. Each reviewed and accepted letter is published as soon as full editing is completed. Each published contribution is identified by volume number, year of publication, and DOI.

Contributions to the *RSL* must be in the form of manuscripts in English, not exceeding four published pages in length. An additional page will be accepted at no charge if it contains only references. In exceptional circumstances, a letter of up to six published pages which contains high-quality scientific results may be accepted with the approval of the EIC. A template and instructions for prospective authors are provided on the journal's website. Go to https://www.ursi.org, click on Publications under Documents, then on URSI Radio Science Letters, where the templates are found under INTRO. Initial submissions must be in PDF. Final submissions must also contain a source file, either *Word* or *LaTeX*. The PeerTrack manuscript management system of Allen Press (part of KnowledgeWorks Global Ltd.) is used to handle the submissions and the review and publishing process.

The *RSL* is intended to be a very rapid publication journal. The EIC promptly notifies the corresponding author of the comments in the anonymous reviews, of the Associate Editor's comments, and of the consequent disposition of the manuscript. If minor revisions are required, a revised manuscript must be submitted within thirty days of the EIC's recommendation. Any delayed submission may be considered as a new submission. Only minor changes are acceptable. If major changes are required, the manuscript will be rejected with or without a suggestion to resubmit a revised version. Plagiarism, as well as duplicate submission and publication, will result in rejection of the submission. A request for full retroactive indexing of the *RSL* has been submitted recently. Manuscripts must be submitted to: https://www.editorialmanager.com/RSL/

Authors of accepted manuscripts are expected to sign the URSI Publication Agreement as a precondition to publication. A manuscript processing charge of 175 USD

per published page or fraction thereof (reduced to 150 USD for URSI Senior Members and Fellows) is to be paid as a condition for the posting of an accepted contribution. There is no discount for pages over four.

The URSI Board has approved a special reduced rate of 100 USD per page, up to four pages, for all letters originating from presentations at conferences technically sponsored or co-sponsored by URSI, and submitted to the *RSL* by the end of the year in which the conference took place.

The published letters in the first four years of existence of the RSL are:

vol. 1 (2019)	9 letters
vol. 2 (2020)	47 letters
vol. 3 (2021)	59 letters
vol. 4 (2022)	58 letters

for a total of 173 published letters out of 224 submitted manuscripts; 17 submissions were rejected outright, and 34 submissions were withdrawn by the authors after a negative review or, in one case, for refusal to sign the copyright. Thus, the overall rejection rate over the four-year period was about 23 %. The present EIC is Henrik Wallén, henrik.wallen@aalto.fi.

4. Concluding remarks

Despite the loss of the *Bulletin*, radio scientists have two high-quality publications under URSI control for output of their scientific work: *Radio Science* for full papers, and *Radio Science Letters* for short contributions. All radio scientists are encouraged to submit their research results to these journals, and to contact the EICs for additional information.

URSI Standing Finance Committee

1. Report and recommendation of the ad hoc Finance Committee including approval of accounts 2021-2023

Prof. Paul Smith and Dr. Michael Newkirk examined the report prepared by Prof. Ari Sihvola (Treasurer) of the URSI Finances covering the period 2021-2022. They noted that the accounts had been audited by EY Bedrijfsrevisoren BV who stated that, in their opinion, the Financial Statements give a true and fair view of the financial position of URSI as of 31 December 2022.

After review of the Treasurer's comments, Prof. Smith and Dr. Newkirk noted his concern that there has been "a worrying, slightly declining trend during the two most recent years in the member committee income." In addition, during Council I, Prof. Peter van Daele (URSI Secretary-General) showed a dramatic increase in costs that was attributed to the recent spike in inflation driving the increase in cost for both labour and goods that our organization depends upon. To address these observations, we recommend the following steps be taken as soon as practical:

- Increase the Member Committee (MC) dues by 5% in 2024 and plan for an additional increase of up to a maximum of 5% in the subsequent two years. It was noted that MC dues have increased at only a modest 1% per year since 2017, and this no longer reflects the current situation;
- Encourage MCs to increase their units (i.e., to move to higher tier) in order to generate more income to cover rising operational costs;
- Revise future flagship meeting requirements to stipulate that the cost of any support to the conference by the Secretariat staff be included in the agreed conference budget (presently the cost of such support is paid out of by the Secretariat funds); and
- increase the Radio Science Letters (RSL) page charges to ensure that increased publisher and Secretariat labor costs are covered. This should be implemented as soon as practical after indexing is completed in 2023.

2. Other recommendations

URSI should continue the policy implemented in the 2023 GASS of minimising the use of on-line components in its flagship meetings, so as to contain increases in the registration fee at these meetings.

Prof. Paul Smith (Council Delegate for Australia)
Dr. Michael H. Newkirk (Council Delegate for the US)

URSI Standing Committee on Young Scientists

1. Background

The Young Scientist Awards are presented at URSI Flagship meetings : the General Assemblies of URSI, the URSI Atlantic Radio Science Conferences (AT-RASC) and the URSI Asia-Pacific Radio Science Conferences (AP-RASC) to recognize an international group of individuals who have made innovative contributions and discoveries in multidiscipline research related to electromagnetic fields and waves.

In general, the 3 URSI Flagship meetings are held in a 3-year cycle 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. Young researchers can apply for a Young Scientists Awards at any of these 3 URSI Flagship meetings. A Young Scientists Award is primarily a recognition of the scientific value of the work presented in the paper submitted by the young researcher. It links to financial support through waiving registration fees, in some cases also providing accommodation or even travel support when originating form specific and selected countries.

To qualify for an award the applicant:
- must be less than 35 years old on September 1 of the year (2023) of the URSI General Assembly and Scientific Symposium;
- should have a paper, of which he or she is the principal author, submitted and accepted for oral or poster presentation at a regular session of the General Assembly and Scientific Symposium.

Applicants should also be interested in promoting contacts between developed and developing countries. Applicants from all over the world are welcome, including from regions that do not (yet) belong to URSI. All successful applicants are expected to participate fully in the scientific activities of the URSI Flagship Meetings.

Applications are assessed by the URSI Young Scientist Committee taking account of the national ranking of the application and the technical evaluation of the abstract by the relevant URSI Commission. During the selection process, application or granted Young Scientists Awards at the occasion of previous URSI Flagship meetings are not taken into account, except in the final stage when a proper balance is sought between Commissions and geographical spreading.

2. Time schedule

25-01-23: paper submission deadline
10-02-23: extended paper submission deadline
15-03-23: technical review by URSI Commissions and conveners completed
20-03-23: ranking by URSI Commissions completed
01-04-23: ranking by URSI Member Committees completed
13-04-23: final selection by URSI Young Scientist Panel completed
15-04-23: notifications sent out
15-05-23: deadline for acceptance of Young Scientists Award

3. YS Applications

After the call for the Young Scientist Awards, 186 applications from 29 countries were received through an online application procedure.

Australia	Japan	Spain
Austria	Malta	Sweden
Belgium	Netherlands	Switzerland
Canada	Norway	Taiwan
China	Pakistan	Turkey
Croatia	Poland	Ukraine
France	Portugal	United Arab Emirates
Germany	Singapore	United Kingdom
India	South Africa	USA
Italy	South Korea	
Germany	Pakistan	USA

4. Selection process

The selection process is carried out in 4 steps:
- The Secretariat checks eligibility (1st author, age limit, submission of required documents,..).
- Then the Chair, Vice-Chair and ECRs of each of the 10 URSI Commissions were asked, to rank the applicants who submitted a paper in one of the sessions organized in their Commission, purely based on the scientific merit of the work presented in the paper.
- In parallel the Member Committees were asked to rank the applicants originating from their country based on local, practical, technical or other issues.

- The rankings by the Commissions and the Member committees were combined in a score by the Young Scientist Panel to come to a final selection, taking into account a proper balance over the 10 URSI Commissions, a proper geographical spreading as well as a gender balance. During this final step, It was always made sure that the selected awardee had a paper of significant technical value, and in some specific cases the Young Scientist Panel also considered the comments provided by the reviewers during the reviewing process for all submitted papers at the GASS 2023.

Finally, the Young Scientists Panel submitted a list of 97 awardees to the URSI Board. After careful consideration, the URSI Board approved the proposed selection and all awardees were contacted. The deadline for acceptance of the Young Scientist Award was set on 15 May 2023.

5. Young Scientist Awardees

97 applicants were as selected Young Scientists awardees and were announced on the URSI Website.

5.1 Distribution per Commission

The following table provides an overview of the distribution per Commission indicating the applications received, the selected Awardees and the acceptance rate.

Commission	Total app	Selected	Acc. Rate
A	4	3	75,0%
B	45	20	44,4%
C	11	6	54,5%
D	15	8	53,3%
E	17	9	52,9%
F	15	8	53,3%
G	31	15	48,4%
H	19	13	68,4%
J	13	7	53,8%
K	16	8	50,0%
Total	186	97	52,2%

5.2 Distribution per Region

To give a view of the geographical spread of the Young Scientist Awards, each of them is assigned to a region, as shown below. All candidates with a perfect review score of 5 were selected for an Award. This, however, does result in a relatively large number of awards going to candidates from the US.

Region	Total app.	Selected	Acc. Rate
Asia-Pacific	34	15	44,1%
China	26	12	46,2%
Europe	62	35	56,5%
India	30	12	40,0%
Middle-East and Africa	10	5	50,0%
Americas	24	18	75,0%
Total	186	97	52,2%

5.3 Gender Balanace

Based on the information provided by the applicants, the following gender balance is obtained.

Gender	Total app.	Selected	Acc. Rate
Male	130	67	51,5%
Female	56	30	53,6%
Total	186	97	52,2%

6. Follow-up of Young Scientist Selection

Names, as well as pictures, affiliations and a link to the submitted paper are available on the URSI website.

The Young Scientists certificates and ties/scarves were handed over to the Young Scientists at the GASS 2023.

Prof. Stefan Wijnholds and Prof. Peter Van Daele
Chairs of the YS Awards Panel

URSI Early Career Representative Committee (ECRC) Report 2021-2023

The early career representative committee (ECRC) is composed of early career representatives (ECRs). One of the ECRs serve as a chair of the ECRC. The ECRC was set up in GASS 2014, which was held in Beijing, with an aim to make URSI more attractive for radio scientists in the early stages of their scientific careers. For each Commission, two ECRs work together to promote the URSI and commission activities.

This report provides an overview of ECRC activities post GASS 2021 to date.

1. ECRC Meeting 2022

The COVID-19 pandemic disrupted the in-person meetings in the past. However, with the ease of travel restrictions, an in-person ECRC meeting was held on 31st May 2022 during AT-AP-RASC 2022 in Gran Canaria, Spain. The meeting was attended by different ECRs, both in-person and online. The list of meeting participants is as follows:

1. Dr. Nosherwan Shoaib, Chair ECR Committee and Senior ECR Commission A, on-site
2. Dr. Dimitrios C. Tzarouchis, ECR2 Commission B, on-site
3. Dr. Krzysztof K. Cwalina, ECR2 Commission C, online
4. Dr. Chaouki Kasmi, Senior ECR Commission E, online
5. Dr. Riccardo Trinchero, ECR2 Commission E, on-site
6. Dr. Motoharu Sasaki, Senior ECR Commission F, online
7. Dr. Sean Elvidge, Senior ECR Commission G, on-site
8. Dr. Bruce Fritz, ECR2 Commission G, on-site
9. Dr. Dario Sabbagh, ECR3 Commission G, on-site
10. Dr. Frantisek Němec, Senior ECR Commission H, online
11. Dr. Kensuke Sasaki, Senior ECR Commission K, online
12. Dr. Emily Porter, ECR2 Commission K, online

The meeting was also attended by the following URSI Board officials:

1. Prof. George (P.L.E.) Uslenghi, President URSI
2. Prof. Makoto Ando, Past President URSI
3. Prof. Peter Van Daele, Secretary General URSI

The agenda points of the meeting were as follows:

1. ECR Tutorials for URSI GASS 2023 (Japan)
2. ECR Column in the URSI Radio Science Bulletin
3. Organizing Early Career Researchers Networking Events during flagship conferences
4. Interviews with Early Career Award winners at the GASS (Issac Koga Gold Medal and Santimay Basu Prize)

Prof. P.L.E. Uslenghi, the President of URSI, started the meeting on 31st May 2022 at 12:20 hrs. He welcomed the ECRs present in Gran Canaria and those online. He explained that he is also the Editor-in-Chief of URSI Radio Science Letters. He would welcome more contributions from the ECRs to this publication.

Dr. Nosherwan Shoaib, the Chair of the Early Career Representatives Committee, then started with the first item on the agenda.

1.1 ECR Tutorials for URSI GASS 2023 (Japan)

It was observed that a few commissions have participated in ECR tutorials e.g. A, E and G are presenting the ECR tutorials in AT-AP-RASC 2022, while, the A, E, G and K have presented in GASS 2021. Dr. Shoaib invites other commissions to come forward with proposals for ECR Tutorials at GASS 2023.

1.2 ECR Column in the URSI Radio Science Bulletin (RSB)

In several Commissions, one or both ECRs serve as associate editor for the RSB. It was emphasized that ECRs shall publish ECR columns in the RSB. It was discussed that an ECR column on guidelines on how to make an effective presentation & poster may be prepared.

1.3 Organizing Early Career Researchers Networking Events during flagship conferences

The networking is an integral part of URSI to maximize its outreach and promote joint collaborations. It was discussed that ECRs will arrange an early career researchers networking event for GASS 2023.

1.4 Interviews with Early Career Award winners at the GASS (Issac Koga Gold Medal and Santimay Basu Prize)

Dr. Shoaib asked for the volunteers to interview the Issac Koga Gold Medal and Santimay Basu Prize winners. The awardees will be announced during June 2023. A set of questions

will be prepared by Dr. Shoaib and shared with the ECR volunteers to conduct the interviews. The interviews can be a podcast or a printed interview.

2. Scientific Activities

2.1 ECR Tutorials

During the triennium 2014-2017, the ECR tutorials were introduced as an essential activity of URSI flagship meetings. The ECR tutorials are of educational nature to introduce radio scientists, both early-career and more senior moving into a different field, to a particular field. As such, a 1-hour slot is considered necessary to ensure the sufficient depth. They are preferably scheduled in a "teaching track" on the day before the start of the scientific program of an URSI flagship meeting.

For AT-AP-RASC 2022, the following ECR tutorials were presented:

S. No.	Tutorial Title	ECR Name	ECR Commission
1	Metrology, Timekeeping & Navigation	Giovanna Signorile	A
2	Demystifying Machine Learning for EMC and SI/PI Applications	Riccardo Trinchero	E
3	Tomographic Techniques Applied to Space-based Ionosphere Measurements	Bruce Fritz	G

Following ECR Tutorials are scheduled for GASS 2023 to be held on 19-26 August 2023 in Sapporo, Japan:

S. No.	Tutorial Title	ECR Name	ECR Commission
1	Introduction to Electromagnetic Compatibility /Interference (EMC/I), Measurements, Regulatory Authorities & Standards	Nosherwan Shoaib	A
2	Radio Frequency Identification (RFID) Systems: from electromagnetic theory to applications	Andrea Michel	B
3	Magnetospheric plasma waves and radiation belt dynamics	František Němec	H

2.2 ECR Networking Event

The networking is an integral part of URSI to maximize its outreach and promote joint collaborations. In this context, the ECRs will organize a three hours ECR networking event on 20th August 2023 during GASS 2023 to be held on 19-26 August 2023 in Sapporo, Japan. The following ECRs will serve as networking event conveners:

1. Comm H: Dr. Claudia Martinez-Calderon <claudia@isee.nagoya-u.ac.jp> (Nagoya University, Japan)
2. Comm H: Dr. Frantisek Nemec <frantisek.nemec@mff.cuni.cz> (Charles University, Czechia)
3; Comm E: Dr. Chaouki Kasmi <chaouki.kasmi@tii.ae> (Technology Innovation Institute, UAE)
4; Comm A: Dr. Nosherwan Shoaib <nosherwan.shoaib@seecs.edu.pk> (National University of Sciences and Technology (NUST), Islamabad, Pakistan)
5. Comm C: Dr. Krzysztof Cwalina <kkcwalina@eti.pg.edu.pl> (Gdansk Tech, Poland)
6. Comm B: Dr. Dimitrios Tzarouchis <dtzarouc@gmail.com> (University of Pennsylvania, USA)
7. Comm B: Dr. Andrea Michel <andrea.michel@iet.unipi.it> (University of Pisa, Italy)

The networking session will be divided into two parts. First, the participants will be requested to briefly introduce themselves, their research work and include an interesting fact about themselves. Once we all know each other a little bit better, we will start the mixer to let everyone freely discuss around some drinks. Depending on the number of participants we can divide into smaller groups. After a predetermined time, we would encourage people to exchange groups (at the sound of a bell for example) so they can get to know a maximum number of persons. After this we can let everyone freely mix and talk at their leisure.

2.3 ECRs Involvement in URSI Flagship Meetings

It is observed with time that the ECRs are getting structurally involved in the organization of URSI flagship meetings as testified by their membership of the Scientific Program Committee of both AT-AP RASC 2022 and GASS 2023. Many ECRs have organized or co-chaired (special) sessions for these meetings. The latter appears to result in a significant number of invitations to be sent to early-career researchers, which is a great way to get them involved in URSI activities.

3. Diversity and Inclusivity

During the selection of the Young Scientist Awards, care is taken to ensure that the gender balance, geographical distribution and distribution across Commissions of the Award

recipients is consistent with the respective distributions among the applicants. To achieve this, these criteria are weighted in cases of equal suitability on scientific grounds. A report on young scientist and student paper activities at URSI GASS 2021 was published in URSI Radio Science Bulletin (RSB) in June 2021 and available at IEEE Xplore (https://ieeexplore.ieee.org/document/9829360).

N. Shoaib, "Early career representative column: Young scientist and student paper activities at URSI GASS 2021," in URSI Radio Science Bulletin, vol. 2021, no. 377, pp. 74-78, June 2021, doi: 10.23919/URSIRSB.2021.9829360.

4. URSI Radio Science School for Young Scientists:

Dr. Nosherwan Shoaib (ECR Comm A & Chair ECRC) served as a committee member to plan the URSI Radio Science School for Young Scientists that will be held in August 2023 during GASS 2023 in Sapporo, Japan. The idea of the school is to introduce a training school on inter-commission capacity building.

The school details are as follows:
Course Topic: **Electromagnetic Measurements**

Abstract:
Measurement has a fundamental role in science being the main tool to interact with and investigate the physical world. Measurement is the means through which a theory is confirmed or rejected. Test and measurements are daily carried out all over the world for conformity assessment of products to safety standards and for the implementation of new technologies. The scope of this first edition of the URSI School for Young Scientists is to present a broad view of the electromagnetic measurements adopted to investigate traditional and emerging research areas relevant to the URSI Scientific Commissions.

Relevant Scientific Commissions: A, B, C, E, F, G, H, K

Course Schedule: Saturday, August 19, 13:00-16:40/Sunday, August 20, 8:20-12:00

Course Venue: Sapporo Convention Center/Sapporo Business Innovation Center

Nosherwan Shoaib
Chair URSI-ECRC

Detailed Report on the Scientific Program

1. Structure

- Three General Lectures (Monday, Wednesday, Friday), Public Lecture (Saturday), 1 hour duration, in Main Hall A, with no parallel sessions.
- Ten Commission tutorials (Monday-Friday), 1 hour duration, in Conference Hall, no parallel sessions from the corresponding commission
- Three ECR tutorials, 1 hour duration (Comm A, B, H), in Main Hall A, on Tuesday and Thursday
- On-site talks, nominally 20 minutes including discussion, some sessions choose 10 min. duration but 20 min. granularity is mandatory. Invitationsinto<25% oforalslots
  Optional online material: pdf and/or video (seldom used by the authors).
  By Aug 2: 1136 talks, all linked to a registration.
- On-site posters, 2x2:20h poster sessions on Tuesday and Thursday in Main Hall B, refreshments. By Aug. 2: 327 onsite posters -68 orphan posters (not linked to a registration)
  Optional online material: pdf and/or video (seldom used by the authors).
- Online pre-recorded presentations, <15 min. videos, available for viewing any time during the meeting. By Aug. 2: 116 pre-recorded online videos (-69 orphans but registration still open).
- Pre-conference program: URSI School for Young Scientists (4 parts), Short Course on scikit-rf, Early Career Networking Event, WIRS chapters workshop and reception

2. Timeline

- 15 October 2022: deadline for session proposals from commissions (most of the input received by 21 October, some input later)
- 9 November: link to the test submission website on eventure-online.com sent to the commissions; 17 November: submission site active
- 7 December: linked to the meeting website on www.ursi-gass2023.jp
- 25 January 2023: first submission deadline
- 10 February: second submission deadline, 1649 papers received
- 8 March: deadline for reviewing, 1675 papers, including late submissions
- 15 March: acceptance letters sent; 1680 papers accepted
- 17 March: distribution of the rooms between commissions done, program-at-a-glance
- 29 March: distribution of sessions within commissions

- 30 April: sessions organized by the conveners and consolidated by commissions
- 5 May: notifications sent on preliminary program on eventure-online.com
- 1 June: registration deadline, several reminders sent, (by June 27: 1431 papers adopted by registered authors out of 1657)
- 2 August: “final” consolidation of the program, 1579 presentations

(- 68 unregistered posters, *-69* unregistered video presentations = *1442*)

3. Scientific sessions

Total number of 171 proposed sessions → 165 sessions implemented after submissions and acceptance, out of which 143 sessions are on the oral program, most of them also have posters or pre-recorded videos, and 22 only have posters or pre-recorded videos

- A : proposed 18 →implemented 12 with 8 oral sessions
- B : proposed 30 sessions + 5 B-lead joint sessions, → implemented 29/25 oral + 5/ 4 oral B-lead joint
- C : proposed 11 sessions → implemented 11/7 oral
- D : proposed 11 sessions → implemented 11/10 oral
- E : proposed 9 sessions + 6 E-lead joint sessions → implemented 8/6 oral + 6 oral
- F : proposed 5 sessions + 1 F-lead joint session → implemented 7 oral + 1 oral
- G : proposed 17 sessions + 4 G-lead joint sessions → implemented 17/16 oral +3 oral
- H: proposed 9 sessions + 4 H-lead joint sessions → implemented 9 oral (H02 in 9 blocks of talks) +4/3
- J: proposed 14 sessions+1 J-lead joint session → implemented 14 / 12 + 1 / 1
- K: proposed 18 sessions+4 K-lead joint sessions → implemented 17 / 16 + 4 / 4

WIRS: proposed 3sessions → 5, all WIRS sessions are joint with scientific commissions
Workshop on Radio Science and Engineering of Disaster Risk Reduction and Management

Ondrej Santolik
Scientific Program Coordinator GASS 2023

Reports on Activities of Inter-Union Organisations

IUCAF, the Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science (IAU-URSI-COSPAR and ISC)

1. Introduction

IUCAF's Annual Reports are published in the URSI Radio Science Bulletin; for 2021 see RSB #377 (June 2021). The as-yet unpublished Annual Report for 2022 can be found at https://www.nrao.edu/~hliszt/RFI/IUCAF-AnnualReport2022.docx.

2. About IUCAF

The Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science, IUCAF, originally the Inter-Union Committee on Allocation of Frequencies, was formed in 1960 by its adhering Unions, IAU, URSI, and COSPAR at the behest of URSI under the aegis of ICSU. IUCAF is online at http://www.iucaf.org.

IUCAF now operates as an Affiliated Body under the auspices of the International Science Council. Its brief is to study and coordinate the requirements of radio frequency spectrum allocations for passive radio sciences (radio astronomy, space research and remote sensing) and to make these requirements known to national/international bodies that regulate use of radio spectrum. Its terms of reference, composition and operating practices can be

found at http://www.iucaf.org/IUCAF_Terms_Of_Reference.pdf.

The IUCAF membership from the three adhering Unions is:

URSI:	Dr. Haiyan Zhang	China
	Dr. Steven Reising	USA
	Dr. Ingemar Häggström	Sweden
	Dr. Anastasios Tzioumis	Australia
	Dr. Wim van Driel	France
IAU:	Dr. Harvey Liszt (Chair)	USA
	Dr. Masatoshi Ohishi	Japan
	Dr. Adrian Tiplady	South Africa
COSPAR:	Dr. Yasuhiro Murata	Japan
Ex-officio	Dr. Vadim Nozdrin	ITU-R SG7

IUCAF is a Sector Member of the International Telecommunication Union's Radiocommunication Sector (ITU-R) with observer status at the Space Frequency Coordination Group (SFCG) where it participates in the Lunar Martian Spectrum Group. IUCAF members participate in the activities of many other national and regional spectrum management bodies as noted in the Annual Reports.

3. Preparation for the upcoming World Radiocommunication Conference WRC-23

IUCAF's main ongoing activity since 1960 has been participation as a Sector Member at the ITU-R in Geneva. Owing to its long history, IUCAF's efforts protecting radio astronomy and passive radio science are accorded a high degree of recognition.
IUCAF's work was largely devoted to crafting protective regulatory text to be incorporated in the revised Radio Regulations at the upcoming World Radiocommunication Conference WRC-23 in Dubai. IUCAF provided 21 input contributions (technical studies and draft regulatory texts) to ITU-R, and attended or will attend numerous meetings to support them:

Spectrum regulatory meetings attended remotely in 2021

03/01-03/12	Working Party 5D (IMT=Mobile Telecom)	ITU-R
04/12-04/16	Working Party 7D (Radio Astronomy)	ITU-R

05/10-05/21	Working Party 5B (Radar and airborne mobile)	ITU-R
05/20-05/21	Committee on Radio Frequencies – CORF	US NAS
05/25-06/02	Working Party 1A (Spectrum engineering)	ITU-R
06/07-06/18	Working Party 5D	ITU-R
09/16-09/23	Working Party 7D	ITU-R
10/04-10/15	Working Party 5D	ITU-R
11/03-11/12	Working Party 1A	ITU-R
11/29-12/10	Working Party 5B	ITU-R

Spectrum regulatory meetings attended in 2022 (*=remote)

02/02-02/23*	Working Party 5D (IMT=Mobile Telecom)	ITU-R
03/29-04/08	Working Party 5B (Radar/airborne mobile)	ITU-R
04/25-04/29	Working Party 7D (Radio astronomy)	ITU-R
04/26-05/05	Working Party 7B (Space research)	ITU-R
05/20-05/21*	Committee on Radio Frequencies	US NAS
06/13-06/24	Working Party 5D	ITU-R
06/28-07/07*	Working Party 1A (Spectrum engineering)	ITU-R
07/11-07/22	Working Party 5B	ITU-R
07/19-07/27	Space Frequency Coordination Group	Australia
09/27-10/05	Working Party 7B	ITU-R
09/28-10/05	Working Party 7D	ITU-R
10/10-10/21	Working Party 5D	ITU-R
11/14-11/25*	Working Party 5B	ITU-R

Spectrum regulatory meetings in 2023

03/27-04/07	CPM23-2 (WRC-23 conference preparatory meeting)	ITU-R
05/30-06/07	Space Frequency Coordination Group	Toulouse
06/12-06/23	Working Party 5D (IMT=Mobile Telecom)	ITU-R
07/10-07/21	Working Party 5B (Radar/airborne mobile)	ITU-R
10/03-10/10	Working Party 7B	ITU-R
10/05-10/11	Working Party 7D	ITU-R
11/13-11/17	Radiocommunication Assembly	ITU-R Dubai
11/20-12/15	WRC23	ITU-R Dubai
12/18-12/19	CPM27-1(WRC-27 conference preparatory meeting)	ITU-R Dubai

IUCAF's views on WRC-23 Agenda items of concern to radio astronomy were submitted to the recent ITU-R CPM23-2 meeting (see above) and are independently available at http://www.cv.nrao.edu/~hliszt/RFI/IUCAF-Views-Rev1.docx. Of special concern and the subject of IUCAF's studies were: Agenda Item 1.2 (IMT in the spectrum band 10-10.5 GHz); Agenda Item 1.4 (HIBS=IMT Base Stations on High Altitude Platforms); Agenda Item 1.10 (Wideband airborne data networks); and AI 1.13 (Space data relay satellite systems).

Accomplishing formal regulatory protection in the Radio Regulations – an international treaty that is revised through diplomacy every four years at the WRC – is a laborious and involved process. Items on the WRC agenda must be assessed for their potential impact by numerically modelling the deployment of the associated radiocommunication networks, based on characteristics provided at ITU-R that may be very unfamiliar to prospective victims of their operation. Modern radiocommunication systems are complex, using many frequency bands, equipment types (transmitters, antennas) and deployments in complex propagation environments. Once the impact of a radiocommunication system is understood, regulatory treaty text expressing constraints on the behavior of the implicated systems must be formulated and incorporated by consensus in the treaty text. Resolving differences between the proponents and victims of a new radiocommunication system can be contentious and drawn out over the entire 4-year study cycle between successive WRCs. Missing an ITU-R session or even a single argument can have serious negative consequences. The outcome of IUCAF's work will not be understood until the final moments of WRC-23.

4. Dark and Quiet Skies

As IUCAF noted in its 2017-2021 Report to Council, improved scientific access to new and existing spectrum has historically run through the radio frequency spectrum regulatory regime, by procuring and protecting spectrum allocations. But allocations to science have been static while the rest of the spectrum fills in with new radiocommunication systems using broad swaths of previously-allocated but unused spectrum. Adequate regulatory limits are not always placed on unwanted emissions from radiocommunication systems into bands intended for science.

Radio spectrum regulators have recently authorized constellations with satellites numbering in the tens to hundreds of thousands. The regulators are assiduously focused on protection of radio spectrum frequency allocations but have no remit to consider the external and environmental effects of such systems. The broadest consequences of large satellite constellations were the subject of two Dark and Quiet Skies for Science and

Society meetings[1] convened by the International Astronomical Union and the UN Office of Outer Space Affairs.

In an effort to better understand and make better understood the broader impact of radio spectrum regulatory processes, IUCAF members chaired the Radio Astronomy Working Groups at these meetings and participated in writing the Working Group Reports.

5. Acknowledgements

IUCAF is grateful for the organizational and financial support that has been given by ICS, IAU, URSI and COSPAR, especially the URSI Secretariat that so efficiently and helpfully manages IUCAF's finances and logistics. IUCAF also recognizes the support given to individual IUCAF members by their home institutions, allowing them to participate in the vital work of the committee.

Harvey S. Liszt, Chair
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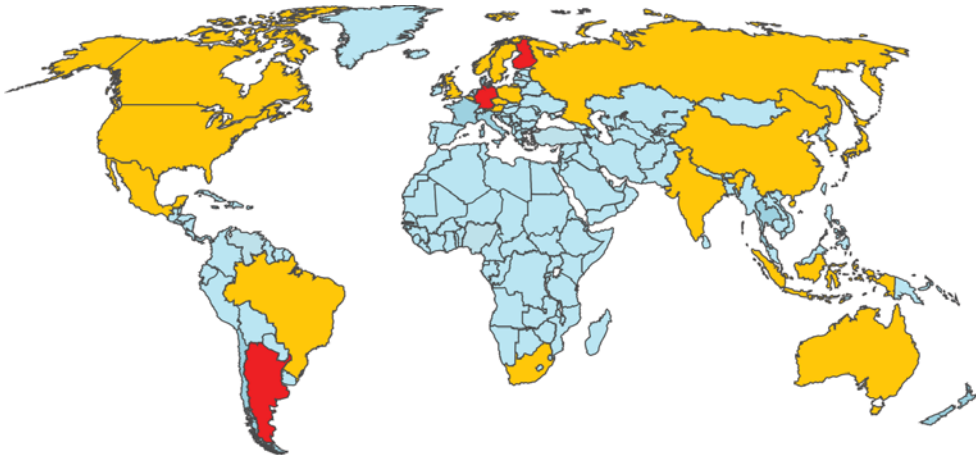
520 Edgemont Road
Charlottesville, Virginia USA 22903
iucafchair@iucaf.org

[1] Dark and Quiet Skies for Science and Society I and II:
https://www.iau.org/news/announcements/detail/ann21002/
https://www.iau.org/news/announcements/detail/ann22002/

The International Space Environment Service (ISES)

1. General Information

The International Space Environment Service (ISES) has been the primary organization engaged in the coordination of space weather services since 1962. Space weather is not new, but space weather services are becoming increasingly important as our technologies and national/international infrastructures become more vulnerable to storms in space. The growing demand for space weather services to protect our space-based and ground-based assets requires the worldwide coordination of strong partners.



ISES member states (April 2023). Yellow shows existing countries and red shows newcomers after 2020.

The ISES network of Members, Associate Warning Centers, and Collaborative Expert Centers provides space weather forecasts, warning, alerts, and environmental data to government and private-industry users around the globe.

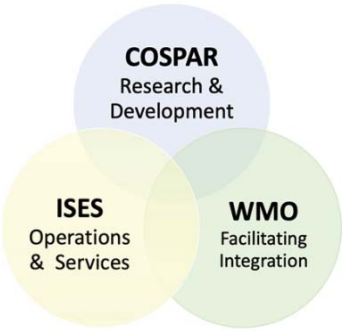
At present, ISES has 21 Regional Warning Centers (RWC) and 2 Collaborative Expert Centers. Argentine joined as RWC in 2020, Finland as RWC in 2021 and Germany as CEC in 2023.

2. Major on-going activities in ISES

These are our major action items discussed in ISES:

- Review the information gathered on probabilistic forecast methods used by ISES centers and make recommendation on possible standardization of probabilistic flare forecasts

- The space weather forecast method is not standardized in ISES RWCs and we seek the best way. The probabilistic forecasts become more popular than deterministic forecasts now. The first step to discuss the standardization of forecasts, we try to collect the information of probabilistic flare forecast used in ISES RWCs.
- Update of product catalogue as yearly action item
  Each RWC provides forecast and related information to the domestic users which can be useful also for other RWCs. We prepared the cross-list of products which RWCs provide and which one wants for the first step of data sharing among ISES members.
- Survey and discussion for utility of WMO/GMAS
  World Meteorology Organization (WMO) is one of the most important partners for ISES, which has rich experiences for terrestrial weather forecasting methods and infrastructure. The Expert Team on Space Weather (ET-SWx) in WMO includes many of ISES representatives. Global Multi-hazard Alert System (GMAS) is one of the system which WMO developed for the terrestrial weather. We continue to discuss to extend the utility for space weather field.
- Review of UN/DRR-ISC Hazard Definition & Classification Review – technical report
  United Nations Office for Disaster Risk Reduction released the UNDRR-ISC Hazard Definition and Classification Review in July 2020 and space weather is also assigned to one of the disasters in the document. ISES is required to improve the description of the document and discuss the preparedness and mitigation for the disasters.



- Coordination Team and Pilot Project for WMO-ISES-COSPAR collaboration
  UN/COPUOS STSC issued recommendations on space weather services in February 2022, and COSPAR-ISES-WMO is required to lead space weather related activities in the document. Two representatives from each institution participated in the study at the University of Coimbra, Portugal in September 2022 for preparing a draft of the "Coimbra Declaration" which shows confirmation of the direction of the three institutions, agree on framework, consider MoU, pilot projects, regular meetings, and round tables. Following the discussion, now the first International Space Weather Coordination Forum (ISWCF) will be held in Nov. 2023 in Geneva.

Prof. Mamoru Ishii
NICT Japan and the director of ISES

COSPAR

1. COSPAR Council meeting report, Athens, Greece 16, 24 July 2022

On July 16 and 24, 2022, a meeting of the COSPAR Office was held in which I participated with the right to vote as a representative of URSI.

Presented, among others budget report for 2020 and 2022, report on the Office's organizational activities, national reports, budget proposals for 2023 and 2024 and proposals for Capacity Building workshops. In previous workshops, the workshops were significantly limited due to covid-19.

The President introduced the topic and invited the Chair of the Finance Committee Iver Cairns to report on financial matters, as detailed in the meeting documents. Iver Cairns presented the report from the Finance Committee, explaining the general budgetary context; the evolution of income and expenses over the years, with emphasis on the changes in the budgets since his last report; and the impact of the SAP on finances since the start of its implementation in 2019. COSPAR is in good financial health, but "not out of the woods yet" and needs to take a cautious approach towards management of the financial reserves in terms of financial products, while allowing further investment in some activities.

FC Chair presented the 2023 budget forecast whose assumptions are reasonable but not too strongly conservative (stable evolution of income & expenses; national contribution increases based on nominal inflation; continued effects of the SAP 2019-2023). The expected loss is very moderate for a non-Assembly year (12k€).

Korea presented a satisfactory state of preparation for the next General Assembly in 2024 in Busan. The city hosting COSPAR 2026 will be Florence, Italy.

One of the topics was the choice of the venue for the COSPAR General Assembly in 2026. Among several proposals, Florence was chosen in the voting (two votes ahead of Prague).

A major discussion was sparked by Ukraine's objections to Russia's participation and a possible official URSI announcement.

1. We are taking no action that would ban Russian scientists from COSPAR. Indeed, it is a foundational principle of COSPAR, and always will be, that we are open to all scientists, without regard to the geopolitical activities or positions of their nation.
2. We are not suspending the Russian Academy of Sciences from COSPAR.
3. We are proposing one action: **"In view of the Russian invasion of and continuing**

aggression in the sovereign nation of Ukraine, until further notice, COSPAR will not encourage or facilitate international cooperation with any governmental organization of Russia that conducts space research."

During the cold war, the connections and interactions among Soviet and western scientists was essential to achieving and preserving peace. During the depths of the cold war there were no joint space projects. With actions 1-3, we are returning to the situation that prevailed during the cold war.
I consulted this matter on an ongoing basis with prof. Piergiorgio Uslenghi, President of URSI. Based on the revision of the Bylaws, the discussion ended with the President's motion put to the vote as action 3.
The motion was adopted as 73.5% for, 23.5% after all, 2.9% abstained.

The final part of the meeting was the election of a new COSPAR president for the years 2022-2026. In a secret ballot, Pascale Ehrenfreund was elected with 54.2% of the votes against 45.8% of the votes cast for Catherine Césarsky. The two vice-presidents were Catherine Césarsky and Pietro Ubertini.

The six elected Bureau Members are Masaki Fujimoto, Petra Rettberg, Manuel Grande, Vassilis Angelopoulos, Iwona Stanislawska, and Chi Wang. Chair of the Finance Committee is Iver Cairns. The two elected Finance Committee Members are Jean-Pierre

	COSPAR 2018 (Pasad)	COSPAR 2021 (Sydney)	COSPAR 2022 (Athens)	COSPAR 2024 (Busan)
Format	In person	Virtual (partially In-person)	Hybrid (partially virtual)	In person (TBD)
Attendee	3,219 (2,778)	2,063 (1,739)	2,844 (1,932/571)	2,500 (2,250)

Number of attendees in GAs

	Category		2018 (Pasadena)	2022 (Sydney)	2022 (Athens))		2024 (Busan)				
			Final (A)	Final	Proposal	Final (B)	Proposal (A)	(A)×113%	Revised (C)	(C)-(B)	(C-B)/(B)
In Person	Full	Early	$700.00	$770.00	€ 670.00	€ 750.00	$700.00	$791.00	$770.00	($17.50)	-2.2%
		Regular	$850.00	$920.00	€ 740.00	€ 820.00	$850.00	$960.50	$880.00	$19.00	2.2%
		On-site	$950.00		€ 810.00	€ 920.00	$950.00	$1,073.50	$990.00	$24.00	2.5%
	Early Career/Retirees	Early	$175.00	$385.00	€ 160.00	€ 375.00	$175.00	$197.75	$360.00	($33.75)	-8.6%
		Regular	$225.00	$455.00	€ 180.00	€ 400.00	$225.00	$254.25	$420.00	$0.00	0.0%
		On-site	$275.00		€ 200.00	€ 450.00	$275.00	$310.75	$480.00	$7.50	1.6%
	Student	Early	$175.00	$230.00	€ 160.00	€ 250.00	$175.00	$197.75	$240.00	($22.50)	-8.6%
		Regular	$225.00	$280.00	€ 180.00	€ 295.00	$225.00	$254.25	$300.00	($9.75)	-3.1%
		On-site	$275.00		€ 200.00	€ 345.00	$275.00	$310.75	$360.00	($2.25)	-0.6%

Fee for participation in Gas

Saint-Maurice and Cristina Mandrini. The five elected Nomination Committee members are Karl-Heinz Glassmeier, Alexi Glover, Georges Meylan, Robyn M. Millan, and Ji Wu.

2. Report from COSPAR 97th Bureau Meeting and COSPAR 2nd Strategic Seminar (2024-2028), 20 to 23 March 2023, CNRS Paris, France

2.1 Information on COSPAR activity, immediate and strategic plans.

Summary of recommendations for UNOOSA (United Nations Office for Outer Space Affairs).

WG on Long-term Sustainability of Outer Space Activities – COSPAR contribution
- *Recommendations from the UN expert Group on Space Weather, that led to the inception of a COSPAR-WMO-ISES Working Group on SW.*
- *Protection of Dark and Quiet Skies*
- *Moon Village Association on sustainable lunar activities. MoU between COSPAR and MVA.*
- *Contribution from space for the UN-COSPAR Symposium on Climate Action.*

Expansion of the COSPAR Small Satellite Constellation Program with an intense focus on international cooperation.

Eu-Funded Projects. COSPAR is also part in 2 ERASMUS+ proposals. Joint effort with Panel on Education

Projects to be submitted in the nearest future
- EXPLORE Mars/Moon analogue habitat for teachers and students (in Portugal)
- STAND - Activities involving asteroids, comets, meteorites and space debris, toolkit development, relation with curricula. Teacher training on how to use the toolkit and pedagogical framework with the students

2.2 Strategic plans for 2024-2028 - New roles for COSPAR

Topic 1. STRATEGIC GOALS – new roles for COSPAR (Space Climate Initiative, Space Weather, New Age Of Space Exploration, Space Environmental Stewardship, Light pollution, Debris, Space: A Multi-Stakeholder Approach (sustainable human and robotic space exploration/utilisation, industry, policy, society)

Topic 2. COSPAR'S ROLE IN THE INTERNATIONAL SPACE SECTOR – influence and impact. Stress put to the most close cooperation with industry.

Topic 3. NEXT GENERATION COSPAR – more efficient support to education and early career scientists – capacity building

Topic 4. COSPAR'S FUTURE AND SUSTAINABILITY – financial growth and sustainability (new initiatives)
Additional education and outreach program. Particularly supported program: New opportunities for training and course conferences with 50% of the hosts' contribution.

Recommendations from the COSPAR Scientific Advisory Committee CSAC: A clear focus on cooperation with the industry. Promoting joint ventures of scientific groups with industry, also with small, young companies. The COSPAR-industrial partnership is becoming increasingly important.

More information is available at documents located at: https://drive.cbk.waw.pl/s/AZMi2TBGfEjrqnP Password: Cbkpan2023

By Prof. Iwona Stanislawska
URSI Representative on COSPAR

The International Science Council (ISC)

1. URSI as a member of ISC and the transition from ICSU

The relation between URSI and the International Science Council (ISC) together with its predecessor the International Council for Science (abbreviated as ICSU for historical reasons) was summarized in the 2017-2021 report at the previous General Assembly. ICSU had been the international umbrella organisation for pure and applied science and URSI was one of its scientific union members. In 2018, the merger of the ICSU for natural science and the International Social Science Council (ISSC) to form the International Science Council (ISC) was agreed. Consequently, URSI became a Member of ISC. ISC came into existence on July 4, 2018. The most important motivation of the merger into ISC was a recognition that collaboration across natural and social science would be indispensable for approaching the United Nation Sustainable Development Goals (SDGs) for 2030, where the societal implications of science in an interdisciplinary and even transdisciplinary context are often as important as the science itself.

The details and the significance of this transition for URSI were also explained in the 2021 report. It was observed that ICSU should support evidence driven decision making by science, but it had been a policy-based organization. For this reason, Unions (as for instance URSI) which were science based should support ICSU more strongly. When it was decided to create a Strategy Working Group (SWG) to organize the new ISC, Paul Cannon (Past President of URSI) was appointed by ICSU to be a member of this SWG. Paul Cannon strongly emphasized the need for the new Council (ISC) to provide membership benefits to the Unions and its member scientists.

At the end of 2022 ISC had 43 Full Members in Category 1 (international scientific Unions and Associations), 141 Full Members in Category 2 (academies of sciences, research councils or analogous not for-profit scientific bodies, representing a broad spectrum of scientific fields or disciplines in a country, region, territory or globally) and 40 Members in Category 3 (Affiliated Members). URSI is one of the members in Category 1.

Note that only because URSI is affiliated to ISC, does it automatically receive subscriptions paid by the Member Committees. ISC manages its affairs through a structure similar to the former ICSU (and URSI), with a Council, a Board of Officers, and a General Assembly (GA) which is organized every three years. URSI representation to ISC, to follow a previous procedure established during the ICSU period, is through the President and/or the Past-President, and more recently with the help of Vice-Presidents depending upon the specific individual initiatives.

ISC takes over the mission of ICSU and strengthens international science for the benefit of society. The mission of the ISC is to act as the global voice of (and for) science. In particular, a very important part of ISC mission reads as

- Stimulate and support international scientific research and scholarship on major issues of global concern;
- Articulate scientific knowledge on such issues in the public domain.

ISC continues to coordinate international science initiatives in specific thematic fields, such as INGSA (International Network for Governmental Science Advice), COSPAR (Committee on Space Research), SCAR (Scientific Committee on Antarctic Research), SCOR (Scientific Committee on Oceanic Research), SCOSTEP (Scientific Committee on Solar-Terrestrial Physics), IUCAF Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science) and WDS (World Data System), some of which are within the Term of Reference (ToR) of URSI.

In the context of catalyzing scientific expertise, advice and influence on issues of major concern to both science and society, the ISC mission reads as

- Speak for the value of all science- and evidence-informed decision-making;
- Bring the voice of science to the highest level of policy-making – through the United Nations and other multilateral fora.

2. The GeoUnion cluster (informal)

For historical and logistic purposes, Scientific Unions were grouped into clusters in ICSU. URSI was one of members of the GeoUnion cluster which had a common interest in earth sciences (appropriate for Commissions F, G, H and J, but not completely for the other Commissions). Generally speaking, clusters no longer exist in ISC, but an informal GeoUnion cluster has been maintained.

GeoUnions constitute a cluster and an interdisciplinary consortium of nine ISC International Scientific Unions: the International Astronomical Union (IAU), the International Cartographic Association (ICA), the International Geographical Union (IGU), the International Union of Quaternary Research (INQUA), the International Society for Photogrammetry and Remote Sensing (ISPRS), the International Union of Geodesy and Geophysics (IUGG), the International Union of Geological Sciences (IUGS), the International Union of Soil Sciences (IUSS), and the International Union of Radio Science (URSI). The GeoUnions have been sharing common interests and opinions in a variety of activities in the context of ISC and issued proposals and statements to ISC.

3. ISC Action Plan 2022-2024, as an evolution of Action Plan 2019-2021

In September 2019 and after consultation with its members, ISC published the ISC Action Plan 2019-2021, *Advancing Science as a Global Public Good*. It consists of four domains: 1: the 2030 Agenda for Sustainable Development; 2: The Digital Revolution; 3: Science in Policy and Public Discourse; 4: Evolution of Science and Science Systems. Five months into the implementation of the 2019-2021 Action Plan, the World Health Organisation declared the COVID-19 global pandemic and this strongly influenced the above action plan.

Three years after its establishment as *'the global voice for science',* ISC launched its 2022-2024 Action Plan, *Science and Society in Transition,* as an evolution of the 2019-2021 Plan. Indeed, the new triennial plan can be seen as a slight amendment of the four domains of action used in the 2019-2021 Plan. The full version can be accessed at: https://council.science/actionplan.

The ISC's 2022-2024 domains of action are the following: 1: Global Sustainability; 2: Converging Science and Technology in a Digital Era; 3: Science in Policy and Public Discourse; 4: Changing Practices in Science and Science Systems; 5: Freedom and Responsibility in Science. As an example, regarding the new structure of the plan, digital processes, which were constituting Domain 2 in the first Action Plan, are now pervasive throughout all areas of scientific concern, such that a broader framework for fast moving, inter-related science and technology in the digital era now seems more appropriate. In addition, a fifth domain subsumes the growing set of activities overseen by the ISC's Committee for Freedom and Responsibility in Science (CFRS).

4. ISC 2021-2023 Actions during the recent succession of crises: COVID-19 pandemic and the war in Ukraine

The activities, initiatives, achievements are covered in the annual ISC reports, available at: https://council.science/publications/.

In particular, the following items are highlighted:
ISC appointed the new CEO, Salvatore Aricò, succeeding Heide Hackmann.

- The ISC actively strengthened its cooperation with the United Nations system, notably through signing a Memorandum of Understanding (MOU) with the World Health Organization (WHO) and the United Nations Environment Programme (UNEP).
- ISC launched its Fellowship Program to recognize individuals for their outstanding contributions to the promotion of science as a global public good. 66 Foundation Fellows were appointed at the launch of the Fellowship Program, and the second cohort of 60 Fellows was appointed in December 2022.

- ISC launched its first two Regional Focal Points in Latin America and the Caribbeans, and Asia-Pacific to ensure that regional needs and voices are represented in the ISC's global agenda. Furthermore, ISC and Future Africa signed an agreement to support African agendas on the global stage.
- As a result of the Council's COVID-19 Outcome Scenarios Project, ISC released the "Unprecedented and Unfinished COVID-19 and Implications for National and Global Policy report" to support the shift in thinking required to achieve a more comprehensive "worldview" of pandemics and similar emergencies.
- ISC and partners organized a conference on the war in Ukraine "Responses from the European higher education and research sectors," bringing together 150 stakeholders from across Europe, with over half of them from Ukraine. The related discussions were summarized in a report including seven key recommendations for the international community to better support science systems affected by conflicts.

5. 2023 ISC Extraordinary General Assembly (on-line) and 2023 Mid-term meeting (face to face)

In May 4, 2023, ISC Extraordinary General Assembly was held on-line on the approval of a set of small amendments to the ISC Statute and Rules of Procedure to ensure the ISC's continued status as a non-profit organization. A total of 94 eligible Members have cast their vote, whereby 94 Members have approved the proposed changes. The new version of the ISC Statutes and Rules of Procedure is available on the ISC website (https://council.science/publications/statutes-and-rules-of-procedure/).

In May 9-12, 2023, the ISC Mid-term meeting "Capitalizing on synergies in Science" was held in Paris. Representatives of ISC Members and ISC Affiliated Bodies were invited to this in-person mid-term meeting in between General Assemblies, the first occasion for all ISC Members to meet since the founding General Assembly in 2018, in order to strengthen ISC Member relationships and discuss global developments for science. This was not an ISC General Assembly, and no voting was conducted. Giuliano Manara, URSI Vice-President, attended in-person. The highlights of the meeting are available at https://council.science/2023-members-programme/
https://council.science/wp-content/uploads/2020/06/Peter-Gluckman_The-Present-and-Future-of-the-ISC.pdf

In the following, the main objectives of some important sessions in the meeting are shortly summarized:

- **Session 1: The present and future of the International Science Council**
  From 2018-2021 the focus was on merger. Then the process was slowed by Covid-19 and the Ukraine crisis. ISC has now progressed beyond its merger phase and has to strengthen an influential global voice for and of science and must build its audience.

- **Session 3-1: Science Diplomacy and Science in a Time of Crisis**
  We now live in a hot conflict. ISC has been preparing to have a role in bridging matters once the acute conflict settles. ISC has been active in the issues of displaced scientists and reflecting on rebuilding shattered science systems. The message from the GA Chair of the United Nations (UN) emphasized that science is the only universal language and UN will work with ISC to establish trust in science. ISC has initiated a Global Science Policy Unit.
  Other science diplomacy issues have been generated by technological developments, such as: synthetic biology, generative Artificial Intelligence (AI), and other rapidly emerging technologies which are becoming points of diplomatic interest. Some form of international assessment process for technologies is needed. Cooperation between scientists and diplomatic personnel needs to be led by the younger generations.
- **Session 4: Increasing the ISC Presence and Regional Impact**
  Three regional focal points (Latin-America & the Caribbeans, Africa, and Asia-Pacific) were presented to show the capacity development of ISC.
  https://council.science/wp-content/uploads/2020/06/Session-4-Increasing-the-ISC-Regional-Presence-and-Impact_Petra-Lundgren.pdf
- **Session 7: ISC and the Multilateral System-Progress since the 2021 GA**
  In a world where misinformation and disinformation are ever present, knowledge brokerage driven by transdisciplinarity will both inform and transform policy decisions that ultimately improve outcomes for all. ISC has set up the Global Science Policy unit to support the activities in Group of Friends (25 countries) on Science for Action by providing timely, geographically and politically neutral and accurate scientific knowledge/information (voice of science) for the increasing inquiries from various divisions of UN as a convenor. ISC mobilizes the experts and issues, an influential and evidence based global voice of science which should be utilized in every level of decision making for better society.
- **Session 9 and 12: Constitutional Revision:(I)Governance, Elections, (2) Membership, Voting, Dues**
  Governance of ISC was discussed based upon the pre-distributed discussion paper https://council.science/wp-content/uploads/2020/06/Session-9-Constitutional-Revision.pdf.
  Opinions from URSI on this aspect were included in the letter from GeoUnions to the Board of ISC as reported in the following paragraph 6. The present Election system is better than the newly proposed selection system defined by an Election Committee. The WG proposal for revision of membership from three categories to just one category for all members, voting power and dues were discussed. The voting power of member based upon its due was not supported by the majority because it was not democratic. Moreover, the definition of just one category was opposed by the Unions (Category 1 members) because scientific opinions from the Unions may be ignored over those from nations.

In response to the comments above, ISC further revised the discussion paper and distributed on 11 August and call for the comments by 30 September. Details are included in Section 6.

- **Session 10: Launch of the Center for Science Futures**
  The Center for Science Future chaired by Mathew Denies was announced. This Center works as a think tank within ISC.
- **Session 11: The ISC and its Affiliated Bodies**
  The ISC Affiliated Bodies presented in this session to seek opportunities for engagement of ISC Members in their activities. The list of ISC affiliated bodies is available at: https://council.science/wp-content/uploads/2020/06/Session-11-The-ISC-Affiliated-Bodies.pdf
- **Session 13: ISC Fellowship Programme**
  To reach new audiences and increase the Council's visibility and credibility, the ISC launched in 2022 the ISC Fellowship Program, recognizing 123 (including 57 awarded in 2022) individuals for their outstanding contributions to the promotion of science for the global public good. The ISC Fellowship, the highest honour that can be conferred on an individual by the Council, will continue to grow in 2023, strengthening the ISC's global representation through individual excellence.
  https://council.science/wp-content/uploads/2020/06/Session-13-ISC-Fellowship-Programme.pdf

6. URSI Inputs to ISC

6.1 Disaster Risk Reduction and Management

In 2017, the URSI Council resolved to establish a joint (bilateral) ISPRS and URSI standing committee to encompass the knowledge and studies of all aspects on Environmental Monitoring and Risk Management. ISPRS initiated an inter-commission working group on Natural and Human Induced Hazards and Disasters (2019) which URSI chose to join. In the triennium 2017-2021, Paul Cannon initially led the development of this activity on behalf of the URSI Board. Through this period Geo-information for Disaster Management (Gi4DM) meetings were run by ISPRS, but there was little integration with URSI as a whole. In order to vitalize the activity in URSI, Paul Cannon proposed a parallel URSI Disaster and Risk Management WG with all URSI Commissions represented if possible. In 2020 Ondrej Santolik (who was substituted in 2021 by Giuliano Manara) was appointed as the person responsible for the ISC and GeoUnions Standing Committee on Disaster Risk Reduction. In 2022, during AT-AP-RASC Meeting in Gran Canaria, Commissions C, E, F, G, H started a new URSI Inter-Commission WG on Risk and Disaster Management. During the upcoming URSI GASS 2023 in Sapporo, an Inter-Commission Workshop on"Disaster Risk Reduction and Management" will be convened by Giuliano Manara, Madhu Chandra , Tullio Tanzi, Yasuhide Hobara and Makoto Ando, with the Contributions from Commissions: C, E, F, G, H. (cf. Workshop Program of GASS 2023).

6.2 Preparation of the ISC Distinguished Lecture Webinar Series on "Basic Sciences for Sustainable Development"

ISC continues the "Distinguished Lecture Series (DLS) on Basic Sciences for Sustainable Development" to promote the International Year of Basic Sciences for Sustainable Development. It provides valuable opportunities to understand how the other Unions run and this in turn helps the Board to develop URSI. URSI appointed Giuliano Manara to the Evaluation Committee for selecting the keynote speakers in the framework of GeoUnions. The following webinars have been already presented:

Webinar 1: "Firepower, Geopolitics and the Future: Rethinking Environmental Security", February 21, 2023 (by Simon Dalby, Canada; IGU);

Webinar 2: "Apprehending the Duality of Disaster Risk and Sustainable Development", March 21, 2023 (by Irasema Alcántara-Ayala, Mexico; IGU);

Webinar 3: "Geospatial Information-Enabled SDGs Monitoring", April 18, 2023 (by Chen Jun, China, ISPRS)

Webinar 4: "From the Theory of Ice Ages to IPCC climate projections", May 16, 2023 (by Maria Fernanda Sanchez Goñi, France; INQUA);

Two other webinars have been already programmed:

Webinar 5: "Linking mechanisms to soil functions to achieve sustainable development goals", September 19, 2023 (by Eleonora Bonifacio, Italy; IUSS);

Webinar 6: "Energy sustainability for net zero radio communications", October 17, 2023 (by Nuno Borges Carvalho, Portugal; URSI).

It was recently announced that ISC would be happy to continue the DLS, but it will not be able to manage after November 1st, 2023. So, GeoUnions have to decide if they are willing to manage the DLS webinars.

More information and videos of the DLS webinars can be found at the ISC website: https://council.science/current/blog/basic-sciences-webinars/

6.3 Future Scientific and Scholarly Publishing

In July 2020**,** the late W. Ross Stone on behalf of URSI, provided comments to the ISC Survey on the Future of Scientific and Scholarly Publishing, forming part of Domain 4 of the ISC Action plan 2019-2021. Related report is available at: https://council.science/publications/sci-pub-report1/

6.4 Comments for "Constitutional Revisions" proposed in the ISC Mid-term Meeting" Capitalizing on synergies in Science" on May 9-12, 2023

In the present structure of ISC, URSI belongs to the GeoUnion cluster and belongs, together with other Unions, in Category 1 Members. In the "Constitutional Revisions" discussed in the ISC Mid-term Meeting a proposal was presented for defining a single category of membership. URSI joined the other Unions of Category 1 to send an e-mail to the ISC Governing Board Members to maintain the current voting system, which guarantees that Category 1 and Category 2 members have an equal share of any vote (except for voting on matters of finance). Indeed, the Unions represent the disciplinary core of the ISC's expertise: any constitutional change that weakens or erodes their relative influence should be avoided.Another objection was to the proposal that voting in elections be proportional to the dues paid by the members. This is directly at odds with the principles of fairness, diversity, equality and inclusiveness that the ISC espouses and would, if implemented, discriminate against lower income countries, especially those in the Global South, as well as scientific Unions that are able to afford only limited membership fees. Accordingly, the Scientific Unions called on the ISC not to consider a voting system based proportionally on annual dues (other than for finance/budget issues). In response to the comments above, ISC further revised the discussion paper and distributed on 11 August.

Key changes are:
Members are classified into four categories, where current Category 3 is divided into two categories. Category 3 and Category 4 latter of which is observer status only. Voting on scientific strategy is 'one member, one vote' for members in Category 1-3 and no-vote for members in Category 4. Voting on elections, Category 1 collectively 40%, Category 2 collectively 40%, Category 3 collectively 20% and Category 4 no vote. Voting on financial matters, weighted according to Members' positions in the applicable ISC's due scale. ISC calls for the comments by 30 September .

Meetings Attended by either Makoto Ando, Peter Van Daele, Giuliano Manara or Piergiorgio Uslenghi:

- GeoUnions Steering Committee (Virtual) Feb., 2022
- ISC-GeoUnions Standing Committee on Disaster Risk Reduction (Virtual) April 7, 2022
- ISC-GeoUnions Standing Committee on Disaster Risk Reduction (Virtual) June 16, 2022
- GeoUnions Steering Committee (Virtual) Sept., 2022
- ISC-GeoUnions Standing Committee on Disaster Risk Reduction (Virtual) Sept. 12, 2022
- ISC-GeoUnions Standing Committee on Disaster Risk Reduction (Virtual) Dec. 8, 2022

- ISC Extraordinary General Assembly (Virtual) May 4, 2023
- ISC Mid-Term Meeting in Paris, 10-12 May, 2023
- ISC-GeoUnions Standing Committee on Disaster Risk Reduction (Virtual) August 3, 2023

7. Recommendations

Almost all of the ISC activities revolve around the United Nations Sustainable Development Goals (UN SDGs). National and international requirements for evidence-informed policy heightened during the Covid-19 pandemic, as governments repeatedly claimed to be "following science", with scientific understanding playing a central role in public discourse. How the enhanced standing achieved by science during the pandemic can be maintained for the future as a "new normal" in addressing other major challenges, such as the global climate risk, rather than its effect being ephemeral, is a critical issue.

a) We, therefore, recommend that the ISC-GeoUnions Standing Committee on Disaster Risk Reduction and the new URSI Inter-Commission WG on Risk and Pto contribute to ISC.
b) Council is invited to consider the specific tasks for the new URSI Inter-Commission WG on Risk and Disaster Management.
c) Council is also invited to consider the possible development of an evidence based global voice of radio science report, which can be utilized in every level of decision making for a better society.

Piergiorgio Uslenghi (President)
Makoto Ando (Immediate Past-President)
Giuliano Manara (Vice President)
Peter Van Daele, Secretary General

Scientific Committee on Antarctic Research (SCAR)

Giorgiana De Franceschi (Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy), chair of Commission G 2021-2023, has been appointed as URSI delegate to SCAR from October 2014. Within SCAR, she has been the Chief Officer 2012-2022 of the Expert Group GRAPE (GNSS Research and Application for Polar Environment, http://grape.rm.ingv.it/). GRAPE aims to intensify the international efforts to build and coordinate a robust network of collaborations to answer a variety of weather and space weather related needs at high latitudes and polar regions (Arctic and Antarctica), through ad hoc data sharing and models development.

The activity carried out since the last URSI GASS 2021 in Rome (Italy) is summarized below, thanks to the efforts within SCAR of the GRAPE community as a whole and to the URSI Commission G. Although the impact of COVID19 pandemic limited the Antarctic campaigns with the consequence of loss of useful data for studying and modelling the geospace at high latitude, the polar community reacted intensifying efforts to coordinate studies, hybrid conferences and workshops, publications.

Among the activities carried out, here the following are highlighted:

- **2022 - AGATA (Antarctic Geospace and ATmosphere research) Program Planning Group (PPG) submission to SCAR**, endorsed by the Physical Science Group through the actions promoted by GRAPE. AGATA comes from a revision of the former ReSourCE (Radio Sciences Research on Antarctic AtmospherE). AGATA PPG has been **approved by Delegates Meeting 2022**. The core membership of the PPG currently consists of colleagues from Argentina, Belgium, Brazil, Canada, China, Finland, Germany, Hungary, Italy, Korea, Norway, Russia, South Africa, Sweden, UK, Ukraine, USA. AGATA (https://www.scar.org/science/agata/home/) officers are Lucilla Alfonsi (IT), Nicolas Bergeot (BE) and the secretary Wojciech Miloch (NO), fully involved in URSI Commission G. The governance includes: 4 Working Groups (Science, Technology, Dissemination- Outreach and Capacity Building, International Coordination and Anchoring) plus an Advisory Board. The Scientific Research Program (first draft) shall be submitted for approval by the Executive Committee EXCOM (2023) and in its final version by the SCAR Delegates Meeting 2024. It is worth to note that, if approved, AGATA would be the fourth international Scientific Research Program endorsed by SCAR in these years.
- **2022 - 10th SCAR Open Science Conference** (OSC), 1-10 August 2022, Hyderabad, India, fully virtual (https://scar2022.org/). Two sessions have been organized, convened and/or co-convened by URSI Commission G members (Giorgiana De Franceschi, Lucilla Alfonsi (INGV, It), Nicolas Bergeot (ROB, Be): 1) Astronomy and geospace observations from Antarctica, 2) Radio science for Arctic and Antarctica: from the

atmosphere to the geospace. Both the sessions received a good number of contributions for a total of about 50 papers (orals and e-posters). During the OSC Plenary Session, GRAPE has been presented.

- **2022-2023** Periodic updating of the GRAPE web page also to inform and disseminate the call for papers for URSI and SCAR scientific sessions during flagship meetings (see under "Conferences").
- **2022 - SCAR Delegates Meeting**, GOA (India) 5-7 September 2022, hybrid format. Important issues, among the others, have been the discussion on the preliminary draft of the **SCAR Strategic Plan 2023-2028** and the foreseen actions for the 5th **International Polar Year 2032-2033**, 25 years after the IPY 2007-2008. The Delegates Meeting approved the AGATA Program Planning Group, lasting for two years with the scope of submitting the related Scientific Research Program in 2024. The Delegates Meeting report is available here https://www.scar.org/scar-library/reports-and-bulletins/scar-bulletins/5920-scar-bulletin-209/
- **2022 - Publication of a review paper** "Review of Environmental Monitoring by Means of Radio Waves in the Polar Regions: From Atmosphere to Geospace", Surv Geophys 43, 1609–1698 (2022). https://doi.org/10.1007/s10712-022-09734-z.
  This review shows that it is of paramount importance to perform integrated, multi-disciplinary research, making use of long-term multi-instrument observations combined with ad hoc measurement campaigns to improve our capability of investigating atmospheric dynamics in the polar regions from the troposphere up to the plasmasphere, as well as the coupling between atmospheric layers. Starting from the state of the art of understanding the polar atmosphere, this survey outlines the roadmap for enhancing scientific investigation of its physical mechanisms and dynamics through the full exploitation of the available infrastructures for radio-based environmental monitoring.
- 2023-Contribution to the **final version of the SCAR Strategic Plan 2023-2028** https://scar.org/library/scar-publications/strategic-plans/5912-scar-strategic-plan-2023-2028/ . Although the Strategic Plan focus on the essential roles Antarctica and the Southern Ocean play in the Earth's climate systems, thanks to the interactions with the SCAR President (Dr. Yeadong Kim) and the SCAR group dedicated to the plan, it was possible to include some hints on the importance of AGATA topics and on the astronomy and the Earth's upper atmosphere studies.
- 2023 GASS2023- Organization of the session G14 The high-latitude ionosphere convened by Lucilla Alfonsi, Nicolas Bergeot, Giorgiana De Franceschi, Changsup Lee (KR). The session received high-level contributions, increasing in respect to GASS2021. This is a clear indication that the efforts spent to link URSI and SCAR are giving some results. The goal will be to establish an intercommission working group within Commission G on the radio science at polar regions. Commission H and Commission J will be solicited to join also in view of the AGATA SRP.

Scientific Committee on Oceanic Research (SCOR)

1. Introduction

The Scientific Committee on Oceanic Research (SCOR) was formed by ICSU in 1957 as the first of its interdisciplinary bodies. SCOR is a non-governmental body that fosters and facilitates international cooperation in the fields of ocean science and marine technology. The Home Page of SCOR is at https://scor-int.org

2. Organization

Executive Committee
President, Sinjae Yoo (Korea)
Secretary, Peter Croot (Ireland)
Past President, Marie Alexandrine Sirce (France)
Vice-President, Ilka Peeken (Germany)
Vice-President, Bradley Moran (USA)
Vice-President, Stefano Alini (Italy)

3. SCOR Activities of Interest to URSI

Activities concerning oceans in URSI are related to remote sensing in Commission F. Present challenges include:

- Use of spaceborne and airborne microwave sensors (synthetic aperture radar (SAR), altimeter, radiometer and scatterometer) to estimate surface wind and sea state
- Use of SAR to study ocean currents, waves and , weather radar observations of Atmosphere-Sea Interface
- Use of altimetry to provide information about the topography of the world's oceans
- Use of radiometers to provide information on sea surface temperature
- Use of visible/infrared spectrometers for providing information on sea surface temperature, ocean color, algae, coral reefs and water quality
- Remote sensing related to global change and ocean-atmosphere coupling
- Remote sensing of coastal areas
- Development of new methods (e.g. GPS-based methods) for estimating ocean characteristics.

In the following various SCOR activities are listed.

4. SCOR Activities

The two main types of activities of SCOR are Working Groups and planning of long-term, large-scale international research programs.

4.1. Current Working Groups

The Working Groups are small (no more than 10 members) and short-lived (no more than 4 years), formed to address specific ocean science topics. All working groups are expected to produce a final report, organize a workshop, or otherwise make a significant contribution to advancing understanding of their topic. Their final output is often a book or a special issue of a journal.

Group: WG 167
Title : Reducing Uncertainty in Soluble aerosol Trace Element Deposition (RUSTED)
Chair(s) : Akinori Ito (Japan), Douglas Hamilton (USA), Morgane Perron (France)
Reporter : Marie-Alexandrine Sicre

Group: WG 166
Title : Developing resources for the study of Methylated Sulfur compound cycling PROcesses in the ocean (DMS-PRO)
Chair(s) : Martí Galí (Spain), Daniela del Valle (Argentina)
Reporter : Ilka Peeken

Group: WG 165
Title : Mixotrophy in the Oceans – Novel Experimental designs and Tools for a new trophic paradigm (MixONET)
Chair(s) : Aditee Mitra (UK) and George McManus (USA)
Reporter : Ilka Peeken

Group: WG 164
Title : CoNCENSUS: Advancing standardisation of COastal and Nearshore demersal fish visual CENSUS techniques
Chair(s) : Anthony Bernard (South Africa) and Rick D. Stuart-Smith (Australia)
Reporter : Enrique Montes

Group: WG 163
Title : Coupling of ocean-ice-atmosphere processes: from sea-Ice biogeochemistry to aerosols and Clouds (CIce2Clouds)

Chair(s) : Nadja Steiner (Canada) and Megan Willis (USA)
Reporter : Peter Croot

Group : WG 162
Title : Developing an Observing Air-Sea Interactions Strategy (OASIS)
Chair(s) : Meghan Cronin (USA), Sebastiaan Swart (Sweden)

Group : WG 161
Title : Respiration in the Mesopelagic Ocean (ReMO): Reconciling ecological, biogeochemical and model estimates
Chair(s) : Carol Robinson (UK), Iris Kriest (Germany), Javier Arístegui (Spain)

Group : WG 160
Title : Analysing ocean turbulence observations to quantify mixing (ATOMIX)
Chair(s) : Cynthia Bluteau (Canada), Ilker Fer (Norway), Yueng-Djern Lenn (UK)

Group : WG 159
Title : Roadmap for a Standardised Global Approach to Deep-Sea Biology for the Decade of Ocean Science for Sustainable Development (DeepSeaDecade)
Chair(s) : Kerry Howell (UK) and Ana Hilario (Portugal)

Group : WG 158
Title : Coordinated Global Research Assessment of Seagrass System (C-GRASS)
Chair(s) : J. Emmett Duffy (USA), Lauren V. Weatherdon (UK)

Group : WG 157
Title : Toward a new global view of marine zooplankton biodiversity based on DNA metabarcoding and reference DNA sequence databases
Chair(s) : Ann Bucklin (USA)

Group : WG 156
Title : Active Chlorophyll fluorescence for autonomous measurements of global marine primary productivity
Chair(s) : David Suggett (Australia) and Philippe Tortell (Canada)

Group : WG 155
Title : Eastern boundary upwelling systems (EBUS): diversity, coupled dynamics and sensitivity to climate change
Chair(s) : Ruben Escribano (Chile) and Ivonne Montes (Peru)

Group : WG 154
Title : Integration of Plankton-Observing Sensor Systems to Existing Global Sampling Programs (P-OBS)
Chair(s) : Emmanuel Boss (USA) and Anya Waite (Canada)
Group : WG 152
Title : Measuring Essential Climate Variables in Sea Ice (ECV-Ice)
Chair(s) : Daiki Nomura (Japan), François Fripiat (Germany), and Brent Else (Canada)

Group : WG 148
Title : International Quality Controlled Ocean Database: Subsurface temperature profiles (IQuOD)
Chair(s) : Catia Domingues (Australia) and Simon Good (UK) - formerly Matt Palmer (UK)

4.2. Research Programs

International research programs address the issues of the role of the ocean in global climate change. Present research programs are listed below.

GEOTRACES
GEOTRACES is an international program which aims to improve the understanding of biogeochemical cycles and large-scale distribution of trace elements and their isotopes in the marine environment. Scientists from approximately 35 nations have been involved in the program, which is designed to study all major ocean basins.

Linking Ocean-Atmosphere Interactions with Climate and People
The global and multidisciplinary research project Surface Ocean - Lower Atmosphere Study (SOLAS) was established to provide international science coordination and capacity building.

OCEAN SUSTAINABILITY UNDER GLOBAL CHANGE FOR THE BENEFIT OF SOCIETY
IMBeR – Integrated Marine Biosphere Research – is a large global research project which focuses on ocean sustainability in the context of global change. We want to understand past, present and future changes to the ocean. In particular, we want to know how we can achieve a sustainable ocean for the benefit of society.

IMBeR supports collaborative, disciplinary, interdisciplinary, transdisciplinary and integrated research that addresses key ocean science issues generated by and/or impacting society. Such research is required to provide evidence-based knowledge and guidance,

along with options for policy-makers, managers and marine-related communities, to help achieve sustainability of the marine realm under global change.
Second International Indian Ocean Expedition (IIOE-2)

The Second International Indian Ocean Expedition (IIOE-2) is a major global scientific program which will engage the international scientific community in collaborative oceanographic and atmospheric research from coastal environments to the deep sea over the period 2015-2020, revealing new information on the Indian Ocean (i.e. its currents, its influence upon the climate, its marine ecosystems) which is fundamental for future sustainable development and expansion of the Indian Ocean's blue economy. A large number of scientists from research institutions from around the Indian Ocean and beyond are planning their involvement in IIOE-2 in accordance with the overarching six scientific themes of the program. Already some large collaborative research projects are under development, and it is anticipated that by the time these projects are underway, many more will be in planning or about to commence as the scope and global engagement in IIOE-2 grows.

4.4. General Meeting

SCOR 2023 annual meeting
Guayaquil, Ecuador
Date: 17 October 2023 - 19 October 2023

5. Commission F activities related to Ocean

We have been engaged in ocean deployment of weather radars to study sea-atmosphere interaction, with limited activity in the last 3 years due to covid, but things are picking up again.

Photo of SEA-POL mounted on the 02 deck of the R/V Roger Revelle in San Diego before departing on the cruise.

A major publication in this regard is.
Rutledge, S. A., Chandrasekar, V., Fuchs, B., George, J., Junyent, F., Dolan, B., Kennedy, P. C., & Drushka, K. (2019). SEA-POL Goes to Sea, Bulletin of the American Meteorological Society, 100(11), 2285-2301.

6. Conclusions

While the topics of the current SCOR Working Groups often contain some remote sensing component, the large-scale programs, the Advisory Panel on Ocean Science and development of the ocean component of IGBP are of potential interest to URSI. The scientific publications (books and special issues of journals) by the Working Groups concentrate on narrow well-defined topics and produce new scientific knowledge; they also increase visibility of SCOR. This could be of interest to URSI. We continue to keep a tab on the activities to be engaged.

V. Chandrasekar
URSI Representative to SCOR

Scientific Committee on Solar-Terrestrial Physics (SCOSTEP)

SCOSTEP is a thematic body of the International Science Council (ISC). Its long-term objectives include promoting international interdisciplinary programs of finite duration in solar-terrestrial physics. Below is a summary of the most recent SCOSTEP activities that are relevant to the URSI community:

1) As part of the current international scientific program called PRESTO (Predictability of the Solar-Terrestrial Coupling), the SCOSTEP-UN-ISWI Workshop on PRESTO was held on May 29 – June 2, 2023, at the International Centre for Theoretical Physics (ICTP) in Trieste, Italy. Before the workshop, a one-day school was organized. Many lectures and talks involved many radio science activities, particularly related to Commission G.

2) SCOSTEP Capacity building activities.

   - SCOSTEP Online Capacity building lectures. Motivated by COVID-19 since January 2021 a series of online lectures have been organized. Given its effectiveness, such lectures continue until now. More information can be found at https://scostep.org/capacity-building-lectures/

   - SCOSTEP Visiting Scholar (SVS) Program has the objective to provide training to graduate students from developing countries in established laboratories of solar-terrestrial physics for periods of 1 to 3 months. Again, many of these opportunities involved radio science topics. A complete list of recipients as well as more details of the program can be found at https://scostep.org/svs/.

   - Space science comic Books have been designed to introduce the public, particularly young people, to several topics in Solar-Terrestrial Physics. They were originated by Prof. Yohsuke Kamide at the Solar-Terrestrial Environment Laboratory at Nagoya University in Japan, in collaboration with SCOSTEP's CAWSES program. In recent years some of these books have been translated into several languages. The current topics are: What is the Solar Wind? What is the Aurora? What is the Geomagnetic Field? What is the Sun-Climate Relationship? What is Global Warming? What is the Ozone Hole? What is the Upper Atmosphere? What are the Polar Regions? What are Cosmic Rays? They can be downloaded at https://scostep.org/space-science-comic-books/.

3) International meetings

The Solar-Terrestrial Physics (STP) International Symposia (STP-15) was organized online between February 21-25.

4) Publication

To disseminate current PRESTO activities to the wider URSI community, an article was submitted to The Radio Science Bulletin entitled "New Research Program: Predictability of variable solar-terrestrial coupling (PRESTO)" by J. L. Chau, and C. J. Rodger.

By Jorge L. Chau
URSI Representative on SCOSTEP

International Astronomical Union (IAU)

IAU and URSI actvities overlap mostly in the areas covered by the IAU Division B (Facilies, Technologies and Data Science) and URSI Commission J (Radio Astronomy). Within the IAU Division B, its Commission B4 (Radio Astronomy) bears the major topical overlap with the URSI Comm J. The organisatonal structure and descripton of this Division is given at here: https://www.iau.org/science/scientific_bodies/divisions/B/

Over the reporting period, the main actvities of IAU relevant to URSI were related to the IAU General Assembly held in Busan, Republicof Korea, August 2022. Appendices A–C present reports of IAU Comm B4 and two IAU Working Groups, the Global VLBI Alliance (GVA) and the IAU/URSI Working Group on Historical Radio Astronomy (WGHRA), which approximately cover the current URSI reporting period.
Both working groups mentioned above, GVA and WGHRA, intends to use the opportunity of sizeable presence of their membership at the URSI GASS in Sapporo in August 2023 for informal meetings. Their main goal is to discuss actions in preparation for the IAU General Assembly in Cape Town (2024) and the next URSI triennium, 2023–2026.

APPENDIX A. Short annual report 2022-2023 (March 2022 – February 2023)

1.1. Commission B4 - Organising committee
Carole A. Jackson (President)
Patrick Alan Woudt (Vice-President)
Anthony James Beasley (Advisor - Past President)
Tao An
Paula Benaglia
Alberto D. Bolatto
Melanie Johnston-Hollitt
Yuri Y. Kovalev
Harvey Steven Liszt
Thomas Anne Oosterloo
Cormac Reynolds

The commission has been pleased to welcome a number of new members this year, with membership currently standing at 554.
Commission B4 continues to support its related Working Groups, the Working Group on Historical Astronomy (B4-C3) and the (newly approved) Global VLBI Alliance (2021-2024 - http://gvlbi.evlbi.org). The Commission has been pleased to encourage and support a sizeable number of proposals for IUA GA 2024.

The CB4 webpage can be found at https://www.iau.org/science/scientific_bodies/commissions/B4/

APPENDIX B - Commission B4 "Radio Astronomy" - Working Group "Global VLBI Alliance"

Chair: Dr. Zsolt Paragi, Joint Institute for VLBI ERIC, the Netherlands

REPORT 2022

Very long baseline interferometry (VLBI) combines a number of distant radio telescopes to provide high-spatial-resolution images in the radio band. The highest resolution and sensitivity results are achieved by coordinated observations between various networks of radio telescopes, referred to as global VLBI. The goal of the Global VLBI Alliance (GVA) is to facilitate the flow of information between the various networks to harmonize technical developments, and to promote a global user community. The ultimate goal is maximizing the science impact of VLBI.
During the year 2022 the structure of the GVA Science Forum (GVAS) has been consolidated: it attracted new members, ready to play an active role in the working group.

The role if the GVAS is to evaluate and foster the unique and complementary contribution of VLBI to astrophysical research. Its members are active scientists, not necessarily linked to any of the VLBI networks. There is a broad range of science topics that can be addressed with the VLBI technique. It has been decided to form a few thematic subgroups: Pikky Atri (ASTRON) will coordinate actions for transients (galactic/extragalactic; "slow"/"fast") and compact objects (pulsars, magnetars, stellar black holes).

- Francesca Panessa (INAF-Rome) will lead the discussion on galaxies and active galactic nuclei (AGN).
- Tomoya Hirota (NAOJ) will oversee activities in stellar/astrometry VLBI, including masers.
- Jimi Green (CSIRO) will lead VLBI techniques and instrumentation-oriented discussions on how certain science objectives could be reached and what developments are necessary (including astronomical and geodetic VLBI, as well as VLBI with the SKA1 telescopes).

With this structure we aim to initiate a community-wide discussion and we will feed back the results to various forums. These are primarily the GVA Directors Forum (GVAD), and the already existing technical forums (IVS TOW and the EVN TOG for example). We will keep the GVAS open to all IAU astronomers, and we will initiate consultations with the broader community as well.

At the end of 2022, Paco Colomer left JIVE and the Global VLBI Alliance. We are grateful for his work in kick-starting the Commission B4 GVA Working Group. As from 2023, the new lead to the GVAS and the new chair of the GVA Working Group is Zsolt Paragi (JIVE).

APPENDIX C - Inter-Union (IAU–URSI) Iau Division B Historical Radio Astronomy Working Group

Chair : Leonid Gurvits. (The Netherlands)
Vice-Chair : Tim Robishaw (Canada)

Executive Officers:
Past-chair – Richard Schilizzi (UK)
Secretary – Kenneth Kellermann (USA)
Web manager – Ellen Bouton (USA)

ANNUAL REPORT 2022

1. Purpose of the WG

The WG was first established in 2003 as an IAU Commission 40 WG, and continued as a Joint Commission B4-C3 WG through 2021. From 2021 it continued within IAU as a WG of Comm B. Since the URSI General Assembly in 2014, it has been a joint WG of the IAU and URSI. The Working Group's aims are to

– maintain an ongoing bibliography of publications relevant to the history of radio astronomy;
– collect and make publicly accessible materials (slides) or video/audio records of presentations on the history of radio astronomy;
– document the careers of deceased radio astronomers in biographical memoirs; as of today, more than 150 names are listed in the database;
– document and preserve surviving historically-significant radio telescopes and associated instrumentation.

All the materials above are accessible through theWG web site https://rahist.nrao.edu hosted by the National Radio Astronomy Observatory.
The group's work is conducted by the five members of the Executive committee, 12 members of the WG Organising Committee and 37 WG members. The WG consists of representatives of 15 countries. 14 WG members are "national/regional reporters" responsible for keeping track of developments of relevance to the WG in their respective countries or regions.

2. Events organised by the WG

2.1 The WG organised a session on "The Impact of Radio Astronomy on Technology and Society" at the URSI General Assembly in Rome, on 2 September 2021. Although this session is nominally outside the reporting here year of 2022, this session is included in the current report since it has not been reported earlier. Five talks were given at this session either in person or remotely. These were:

- The Path to a High-Speed Wireless Internet, David Skellern, RoZetta Institute, Australia;
- Jodrell Bank during the Cold War, Simon Garrington and Tim O'Brien, University of Manchester, UK;
- VLBI for Geodesy, Astrometry, and Navigation, Megan Johnson and Bryan Dorland, Naval Research Laboratory, USA;
- Deep Space Navigation – Leveraging Experience from Radio Astronomy, Les Deutsch, Joseph Lazio and Stephen Lichten, Jet Propulsion Laboratory, USA;
- Parkes Dish and the First Moonwalk, Jasper Wall, University of British Columbia, Canada.

Three of the above talks are available at the WG webpage : https://rahist.nrao.edu/HRAWG-meeting-reports.shtml.

2.2 The WG organised a session "History of Radio Astronomy in Eastern Asia" at the IAU General Assembly in Busan, Korea, on 5 August 2022. Eight talks were given in person or remotely. These were:

- Radio astronomy developments in Republic of Korea, Se-Hyung Cho, KASI, Seoul, Republic of Korea;
- Radio astronomy in Japan: 1950s – 1980s, Masato Ishiguro, NAOJ, Tokyo, Japan;
- Developments of VLBI in Japan, Hideyuki Kobayashi, NAOJ, Tokyo, Japan;
- 25 years of the VSOP/HALCA launch, Hisashi Hirabayashi, ISAS/JAXA, Sagamihara, Japan;
- History of radio astronomy in Taiwan, Paul Ho, ASIAA, Taipei, China/Taipei;
- History of radio astronomy in China: from early days to SKA and FAST, Bo Peng, NAOC, Beijing, China/Nanjing;
- History of VLBI in China, Zhiqiang Shen, ShAO, Shanghai, China/Nanjing;
- History of mm and sub-mm astronomy in China, Ji Yang, Purple Mountain Astronomical Observatory, Nanjing, China/Nanjing

All eight presentations are publicly available as audio/video recordings and sets of slides at the WG web site https://rahist.nrao.edu/HRAWG-meeting-reports.shtml.

2.3 Several members of the WG participated in preparatory activities of Scientific Organizing Committees of the following two conferences with substantial historical contents:

- "The Universe: from the Big Bang to Present Days", dedicated to the 90th birthday of Nikolai Kardashev (1932–2019), Lebedev Physical Institute, Moscow, Russia, 25–26 April 2022;
- "A Multi-facet Universe: Theory and Observations – 2022", dedicated to the 90th birthday of Yuri Pariiskii (1932–2021), Special Astrophysical Observatory, Nizhnii Arkhyz, Russia, 23–27 May 2022.

However, after the Russian military invasion in Ukraine on 24 February 2022, theWorking Group as a whole and its non-Russian members have suspended their involvement in these two events.

3. Publications

The Master List of Publications in the field of Historical Radio Astronomy can be found on the Working Group's website https://rahist.nrao.edu under the heading Resources – History of Radio Astronomy. By the time of this reporting, the Master List includes more than 320 articles published in various journals and conference proceedings through 2022.

Several books on history of radio astronomy are approaching production in 2023–2024. These books will be reported in the next annual and triennium reports.
Presentations on historical radio astronomy topics were given at a number of conferences or in conference are listed at the WG website https://rahist.nrao.edu/HRAWGtalks.shtml.

4. Radio astronomy archives

The NRAO/AUI Archives (https://www.nrao.edu/archives/) collects and provides access to institutional records of NRAO and to papers of many individual radio astronomers in both digital and traditional formats, provides supplemental electronic materials for books and articles of historic interest (https://science.nrao.edu/about/publications), and maintains the Web pages for the IAU/URSI WG on Historical Radio Astronomy (https://rahist.nrao.edu/). The CSIRO Radio Astronomy Image Archive (https://www.atnf.csiro.au/ImageArchive/index.html) is a collection of over 15,000 images that relate to the early history of radio astronomy in Australia.

5. Preservation of historical radio-astronomical equipment

5.1 The Holmdel horn antenna used by A. Penzias and R. Wilson to discover the cosmic microwave background is under the threat of destruction to make way for a proposed

housing development on the site. The WGHRA has been active in seeking solutions for the preservation of this historically important radio telescope.

5.2 Members of the WG participate in efforts to preserve historical artefacts of the W. Gordon Arecibo 300-m radio telescope of the Arecibo Observatory (Puerto Rico) after its collapse on 1 December 2020.

5.3 Members of the WG participate in securing the digital archive of the observing data and related auxiliary information from the low-frequency Ukrainian T-shaped Radio telescope UTR-2 operated by the Institute of Radio Astronomy of the Ukrainian National Academy of Sciences (RI NANU), Kharkiv, Ukraine. The telescope and its laboratory building with various operational instrumentation were heavily damaged during the occupation of the area by the Russian armed forces in the period February–September 2022. The reconstruction and archiving work began after the liberation of the area in September 2022.

Leonid Gurvits
Joint Institute for VLBI ERIC and Delft University of Technology
The Netherlands

Business transacted by Commissions

Commission A - Electromagnetic Metrology

1. Elections of Commission Officers

The election results of the new Commission Officers were announced on 23 August, 2023, after due ratification by the Council. Dr Jose Mauricio Lopez Romero (Mexico) was elected as the new Vice-Chair and Dr Ricardo Figueiredo (Portugal) was elected as the new (Early Career Representative) ECR for the next triennium 2023-26.

Former Vice-Chair, Dr. Amitava Sen Gupta, took over the position of Commission A Chair until GASS 2026. The new Vice-Chair, Dr José Mauricio López Romero, will work with the new Chair to organize various activities of the Commission A and will become the Chair at GASS 2026.

Two ECRs work with the Chair and the Vice-Chair to ensure that the Commission is attractive to their early-career peers. Dr. Giovanna Signorile will continue her term until GASS 2026. The new ECR, Dr Ricardo Figueiredo will take over the outgoing ECR of Dr. Nosherwan Shoaib and continue until GASS 2029.

2. Review of Terms of Reference

The Terms of Reference of the Commission A was reviewed during the 2nd CCA Meeting on 23 August, 2023 and some changes were proposed and agreed. The revised Terms of Reference were then submitted to the Council and were approved for the triennial term of 2023-2026. The new Terms of Reference are as the following.
The commission promotes research and development in the field of measurement standards and physical constants, calibration and measurement methodologies, improved quantification of uncertainty, continued achievement of accuracy and traceability of measurements. Areas of emphasis are:

- development and refinement of new measurement techniques and calibration standards including techniques for antennas;
- primary standards including those based on quantum phenomena and the realization and dissemination of time scales and frequency standards;
- characterization of the electromagnetic properties of materials, physical constants, and the properties of engineered materials, including nanotechnology;
- methodology of space metrology, electromagnetic dosimetry, and measurements for health diagnostics, and biotechnology, including biosensing;
- measurements in advanced communication systems and other applications.

The commission fosters accurate and consistent measurements needed to support research, development, and exploitation of electromagnetic technologies across the spectrum and for all commissions.

3. Working Group

Following the discussions at Business Meeting in GASS2014, a Working Group for Education and Training has been set up. The name and the Terms of Reference of the Working Group were introduced and new members were solicited. Before the GASS2017, the status of the Working Group was ad-hoc, but it was formally established at the GASS2017.

Name of the Working Group
Working Group for Education and Training

Terms of Reference
Electromagnetic metrology attracts students and trained specialists from a wide variety of fields, such as biophysics, electrical engineering, health sciences, materials science, physics, radio science, and statistics. The purpose of this Working Group is to promote the education of both students and actively working professionals by collecting information about available training resources on the techniques and fundamental principles involved in the work of Commission A, and to promote education in metrology by disseminating the information gathered and making it available on a public web page. At present the relevant information collected by this Working Group is hosted on the website of the Indian Radio Science Society (InRaSS) on the page https://www.inrass.in/ursi-commission-a-working-group-a-1-home-page/

Members
Chair: Demetrios Matsakis (Masterclock, USA), Vice chair: Steven Weiss (The Johns Hopkins School for Professionals, USA), Members: Ashish Agarwal (National Physical Laboratory, India), Carlo F. M. Carobbi (University of Florence, Italy), William A. Davis

(Professor Emeritus, Virginia Tech, USA), Yashiro Koyama (NICT, Japan), Tian Hong Loh (National Physical Laboratory, UK), Razvan D. Tamas (Constanta Maritime University, Romania), Amitava Sen Gupta (The NorthCap University, India), Patrizia Tavella (BIPM, France), Congsi Wang (Key Laboratory of Electronic Equipment Structure, China), , Parameswar Banerjee (Ex. National Physical Laboratory, India)

4. Technical Advisory Committee

The Technical Advisory Committee (TAC) of the Commission A was first created at the time of GASS 2014 (Beijing) following a suggestion by the Board. The mandates for the TAC are to help with comments and advice for the scientific programs for the flagship conferences and for resolutions and recommendations. It has subsequently updated thrice during the GASS 2017 (Montreal) and GASS 2021 (Rome) and the recently concluded GASS 2023 (Sapporo). The present list of members of the TAC for the triennial term of 2023-2026 is as shown.

- Amitava Sen Gupta, The NorthCap University, India
- Jose Mauricio Lopez Romero, Cinevestav, Mexico
- Nuno Borges Carvalho, Instituto de Telecomunicacoes, Universidade de Aveiro, Portugal
- Yasuhiro Koyama, NICT Japan
- Pedro Miguel Cruz, Bosch Security Systems SA, Portugal (ECR)
- Nosherwan Shoaib, National University of Sciences and Technology, Pakistan (ECR)
- Patrizia Tavella, BIPM, France
- Demetrios Matsakis, Masterclock, USA
- Tian Hong Loh, National Physical Laboratory, UK
- Wojciech Skierucha, Instytut Agrofizyki im. Bohdana Dobrzańskiego PAN w Lublinie, Poland
- Felicitas Arias, Ex BIPM, France
- Parmeswar Banerjee, Ex Amity University, India
- Ekkehard Peik, PTB, Germany
- Rowayda Sadek, Helwan University, Egypt
- Marina Gertsvolf, NRC, Canada
- Chen Kunfeng, The 41st Institute of CETC, China
- Liu Min, Beijing Orient Institute of Metrology and Test, Beijing, China
- Steven Weiss, The Johns Hopkins School for Professionals, USA
- Archita Hati, NIST, USA
- Takehiko Tanabe, NMIJ, Japan
- Emmanuel Van Lil, KU Leuven, Belgium
- Alirio de Jesus Soares Boaventura, NIST, USA
- Dominique Schreurs, KU Leuven, Belgium

5. Preparation of Future Meetings

The following URSI flagship meetings in the coming triennium: AT-RASC during 19–24 May, 2024 in Gran Canaria, Spain; AP-RASC during August 2025 in Sydney, Australia; and GASS during 15–22 August in Krakow, Poland, were briefly discussed in the CCA meetings. The focus right now is to prepare for the scientific program for the AT-RASC 2024 and is discussed in the next section. For the AP-RASC 2025 and GASS 2026, it is too soon to plan and prepare, but the overall topics will be similar to those for the forthcoming AT-RASC 2024.
Members were informed about the provision for limited amount of funding from the Commission A budget for any regional meeting or workshop. At present however, no proposals were available for support by Commission B budget. But we plan to work on this in the coming months.

6. Proposed sessions and conveners for AT-AP-RASC 2022

The following sessions will be organized at AT-RASC 2024. These were decided during GASS 2023 and a few weeks following that.

A01: Antenna and Propagation Measurement Techniques (Conveners: Tian Loh, Nuno Carvalho and Ricardo Figueiredo)

A02: Measurements in Telecommunications and Advanced Communication Systems (Conveners: Tian Loh, Nuno Carvalho and Ricardo Figueiredo)

A03: Metrological Analysis and Characterization of Material Properties (Conveners: Nosherwan Shoaib, Imran Shoaib and Takashi Shimizu)

A04: Measurements in Intelligent IoT System: Development and Applications (Conveners: Rowayda Sadek, Poonam Arora and Pedro Miguel Cruz)

A05: Electrical and Electromagnetic Metrology including Quantum Standards (Conveners: Satyakesh Dubey, Thomas Kleine-Ostmann, You Li and Diego Luna)

A06: Metrology of Electromagnetic Sensors (Conveners: Nuno Carvalho, Carlos Ortiz and Pedro Miguel Cruz)

A07: Applied Metrology in diverse areas including Medical diagnostics, Bio-sensing, Agriculture, Smart Cities etc. (Conveners: Nuno Carvalho, Wojciech Skierucha and Rowayda Sadek)

A08: Space Metrology (Conveners: Liu Min and Wang Qianjuan)

A09: Calibration, Traceability, and Inter Comparisons of Instruments and Measurements (Conveners: Joseph Achkar, Carlo Carobbi, Raul Solis and Demetrios Matsakis)

A10: Microwave and Optical Frequency Standards (Conveners: Michael Kazda, Tekehiko Tanabe, Poonam Arora and Amitava Sen Gupta)

A11: Realization and Dissemination of Time Scales and Standard Frequencies (Conveners: Jose Mauricio Lopez, Dirk Piester, Demetrios Matsakis and Ashish Agarwal)

A12: Time and Frequency Metrology, Phase Noise and Frequency Synthesis (Conveners: Archita Hati, Michael Kazda and Amitava Sen Gupta)

A13: Time & Frequency Transfer Techniques and Precision Geolocation (Conveners: Dirk Piester, Joseph Achkar, Giovanna Signorile and Parameswar Banerjee)

A14: Low-Cost GNSS Modules for Timing Applications (Conveners: Dinesh Manandhar, Anindya Bose and Amitava Sen Gupta)

A15: Precision Metrology – Training, Management, and Prospects (Conveners: Demetrios Matsakis, Steven Weiss, Parameswar Banerjee)

KA01: Methods and novel technologies for absorbed/epithelial power density assessment above 6 GHz (Conveners: Maxim Zhadobov, Paulraj Rajamani and Amitava Sen Gupta)

Commission B - Fields and Waves

Commission B held three meetings during the URSI GASS 2023 conference in Sapporo, Japan, chaired by John Volakis (Comm B Chair), assisted by Henrik Wallén (Comm B Vicechair), Andrea Michel (Comm B ECR1), and Dimitrios Tzarouchis (Comm B ECR2).
CCA-I Monday, 21 Aug 2023 approx 30 participants in total
CCA-II Wednesday, 23 Aug 2023 21 on-site + a few online participants
CCA-III Friday, 25 Aug 2023 17 on-site + a few online participants

1. Elections of Commission Officers

Three candidates were running for the position of Commission B Vicechair (2023–2026) and two candidates were running for the position of Commission B ECR (2023–2026). The electronic voting was concluded on Monday evening with votes from 26 official members.
Comm B vicechair

- **Ludger Klinkenbusch, Germany** (elected)
- Tahsin Akalin, France
- Taimoon Khan, India

Comm B ECR
- **Satheesh Bojja Venkatakrishnan, USA** (elected)
- Changjiang Deng, China

The Council meeting on Tuesday confirmed the election of Ludger Klinkenbusch and Satheesh Bojja Venkatakrishnan as incoming Vicechair and ECR, respectively.

2. Review of Terms of Reference

The Commission B terms of reference were briefly discussed in CCA-III with no changes.

3. Changes in Working Groups
The working groups were discussed in CCA-III. There are no internal Commission B working groups and no new ones were proposed. No changes were proposed for the joint working group **EB Chaos and Complexity in EM** where Ari Sihvola represent Comm B. It was decided that Comm B would like to join the working group **FCGEH Disaster and Risk Management** with Giuliano Manara as Comm B representative. Likewise, the meeting decided that Comm B would like to join the Comm E lead working group on **Spectrum Management** and later Satheesh Bojja Venkatakrishnan was appointed Comm B representative.

Comm B also decided to invite all other commission to create a joint working group on **5G/6G** with John Volakis and Ludger Klinkenbusch as Comm B representatives.

4. Commission B Technical Advisory Board (B-TAB)

Matteo Albani Italy
Makoto Ando Japan
Francesco Andriulli Italy
Amir Boag Israel
Salvatore Campione USA
Deb Chatterjee USA
Thomas Eibert Germany
George Eleftheriades Canada
Nader Engheta USA
Levent Gürel Turkey
Susan Hagness USA
Ehud Heyman Israel
Jiro Hirokawa Japan
David Jackson USA
Ludger Klinkenbusch Germany
Kazuya Kobayashi Japan
Gerhard Kristensson Sweden
Lianlin Li China
Giuliano Manara Italy
Andrea Michel Italy
Juan Mosig Switzerland
Paolo Nepa Italy
Shinichiro Ohnuki Japan
Matteo Pastorino Italy
Yahya Rahmat-Samii USA
Sembiam Rengarajan USA
Magdalena Salazar-Palma Spain
Giuseppe Schettini Italy
Lot Shafai Canada
Yury Shestopalov Sweden
Ari Sihvola Finland
Daniel Sjöberg Sweden
Paul Smith Australia
Donglin Su China
Anton Tijhuis Netherlands
Piergiorgio L. E. Uslenghi USA
John Volakis USA

Henrik Wallén Finland
Don Wilton USA
Amir Zaghloul USA
Richard Ziolkowski Australia
This list is somewhat old and will be updated by the incoming chair.

5. Preparation of Future Meetings: Flagship Meetings and EMTS

The upcoming URSI flagship meetings, AT-RASC 16–24 May 2024 in Gran Canaria, AP-RASC August 2025 in Sydney and GASS 15–22 August in Krakow, were briefly presented and discussed in CCA-II.

The next URSI Commission B International Symposium on Electromagnetic Theory (EMTS) will be held in 2025. Two proposals were submitted and presented at EMTS 2023 in Vancouver:
• Tessaloniki, Greece (Georgios Kyriakou)
• Bologna, Italy (Giuliano Manara)

The Commission B official members voted for Bologna, Italy, using e-mail voting before GASS 2023. In CCA-II, Giuliano Manara presented the latest plans for EMTS 2025 in Bologna in the second half of June. The conference venue is the University of Bologna and the estimated early bird registration fees are: 500 € (URSI/IEEE members), 600 € (non-members), 250 € (students).

Commission B plans to support EMTS 2025 with 9000 € from the commission budget, mainly to support the young scientist program.

6. Proposed Sessions and Conveners for AT-RASC 2024

The following very preliminary list of session topics was presented at the New Coordinating Committee meeting on Saturday, 26 Aug 2023. The list is based on a reordering of the GASS 2023 sessions and serves as the starting point for further refinement. Many sessions will likely have the same conveners as in Sapporo, but since no names were confirmed during the GASS 2023 the previous convener names are not included below. It is expected that the new/updated joint working groups (see above) will generate some new/updated joint sessions.

Fundamentals

Electromagnetic theory
Scattering and diffraction
High-frequency and hybrid methods
Propagation and scattering: advances, trends and new applications

Mathematical methods in electromagnetics
Mathematical modelling of EM problems

Antennas

Antenna theory, design, and measurement
Millimeter-wave antennas/5G communications and beyond
Vehicular and automotive RF links

Computational electromagnetics

Advanced algorithms in computational electromagnetics
Integral equation, hybrid, and fast methods
Theory and applications of characteristic modes
Quantum techniques for electromagnetics
Inverse scattering and imaging
Electromagnetic methods for direct and inverse scattering involving stratified media

Machine Learning

Machine Learning and Optimization Techniques in Electromagnetics: new trends and novel applications
Stochastic methods and machine learning for electromagnetics

Materials and surfaces

Electromagnetics of time-varying scatterers and materials
Materials in electromagnetics
Metamaterial concepts for electromagnetics
Innovations in electromagnetics and photonics
Nanoscale Electromagnetics: Theory and Applications
Waves in nonlinear and inhomogeneous media
Additive Manufacturing, Novel composites and Metastructures
Reconfigurable Intelligent Surfaces (RIS) and their Applications

Other topics

Women Contributions to Radio Science
Open Session

Commission B led joint sessions

BC: Integrated communications, sensing and computing for beyond-5G communications
BD: Wireless technologies for extreme environments
BE: Near-field wireless systems for communications and sensing
BK1: AI/ML applications to biomedical technologies
BK2: Innovative antennas for biomedical applications

7. Other Business

During the CCA meetings, updates from the GASS 2023 activities, URSI Radio Science School for Young Scientists, and EMTS 2023 were presented.

Commission C - Radio-communication Systems and Signal Processing

1. Elections of Commission Officers

1.1 Vice Chair elections
Two candidates applied for the Vice-Chair position (2023-2026):
Peter Vouras (USA)
Haijun Zhang (China CIE)
Result: Peter Vouras has been elected as the new Vice-Chair.

1.2 Junior Early Career Representative (ECR) elections
Four candidates applied for the ECR position (2023-2026):
Sangeeta Bhattacharjee (India)
Xuesong Cai (Sweden)
Samuel Pinilla (United Kingdom)
Li You (China CIE)
Result: Sangeeta Bhattacharjee has been elected as the new ECR.

2. Review of Terms of Reference

The updated list of the Terms of Reference of Commission C is:

Information theory, coding, modulation & detection
Massive Multi-Input Multi Output antenna systems
Waveform for radar & communications
Smart radio-communications: cognitive radio, software defined radio
Reconfigurable intelligent surfaces
Radar, sonar, navigation systems & positioning
Artificial intelligence and machine learning
Energy efficient communications and power transfer
Security & privacy in communications
Quantum communications
Wireless networks
6G and future high frequency radio systems
Integrated Sensing and Communications
Non Terrestrial networks

3. Any changes/confirmation in Working Groups and other organizations

The following working group was discontinued starting from GASS 2023:

1. Quantum communications
   Chair : Y. Louet (France), Member: A. Tarable (Italy)

The following working groups were retained during GASS 2023:

1. Efficient & Green Wireless Comm
   Co-chairs: Pape Abdoulaye Fam (Senegal) & S. Tsukamoto (Japan)
2. Joint FCGEH working group: Risk and Disaster Management
   Chair: T. Tanzi (France, Commission F) Participants Commission G: C. Cesaroni (Italy), A. Ippolito (Italy)

Following 3 new working groups were set up during GASS 2023:

1. Integrated Sensing and Communications
   Chair: Shobha Sundar Ram (India), Member: Sangeeta Bhattacharjee (India)
2. Synthetic Apertures
   Chair: Peter Vouras (USA), Member: Raghu G. Raj (USA)
3. AI/ML/DL for wireless systems and networks
   Chair: Krzysztof Cwalina (Poland)

4. Technical Advisory Committee

There was no change in the TAC during GASS 2023. But the TAC will be reconstituted and updated by year end. Current TAC is as follows:
Martin O'droma: Ireland
Fortunato Santucci: Italy
Xavier Neyt: Belgium
Alain Sibille: France
Sana Salous: UK
Roman Marsalek (Czech Rep)
Robert Bultitude (Canada)
Prof. Makoto Taromaru (Japan)

5. Appointment of Associate Editor for Radio Science Letters

From Commission C, Raghu G. Raj (USA) will serve on the editorial board of Radio Science Letters as Assocaite Editor

6. Appointment of Representative for the Radio Science School for Young Scientists

From Commission C, Krzysztof Cwalina (Poland) will serve Representative for the Radio Science School for Young Scientists

7. Identification of meetings to be supported (cfr. Commission budget)

So far (11 September 2023), no other meeting has been proposed for the two upcoming years to be supported by Commission C

8. Preparation of Future Meetings

It is a little soon to precisely list the sessions for AP-RASC 2025 and GASS 2026. Nevertheless, following topics will certainly be featured in the program of both meetings based on the new working groups created:
- Emerging technologies in radar and communications
- Synthetic apertures
- Integrated sensing and communications
- AI/ML for radar and wireless communications
- Wireless power transfer
- Security and privacy in wireless communications
- 5/6G technologies

9. Proposed sessions and conveners for AT-RASC 2024

The following sessions will be organized at AT-RASC 2024. These were decided during GASS 2023. However, we expect more session proposals through an open call as well:

1. Emerging Technologies for Radar & Communications -Kumar Vijay Mishra (kvm@ieee.org), Amir Zaghloul (amir.i.zaghloul.civ@army.mil
2. 6G and future wireless systems - Haijun Zhang (haijunzhang@ieee.org), Satoshi Tsukamoto (tsukamoto@comm.ee.tut.ac.jp), Sangeeta Bhattacharjee (sangeeta.Bhatta@gmail.com)
3. Wireless Power Transfer - Satoshi Tsukamoto (tsukamoto@ieee.org), Yves Louet (yves.louet@centralesupelec.fr)
4. Satellite Systems & positioning - Sanat K Biswas (sanat@iiitd.ac.in), Amitava Sen Gupta (sengupta53@yahoo.com)
5. Low-Cost GNSS Receivers - Dinesh Manandhar (dinesh@csis.u-tokyo.ac.jp), Anindya Bose (abose@phys.buruniv.ac.in)
6. Reconfigurable intelligent surfaces - Kumar Vijay Mishra (kvm@ieee.org), Alberto Tarable (alberto.tarable@cnr.it)
7. Artificial Intelligence for Communications (in cooperation with COST ACTION CA20120 INTERACT) -Krzysztof Cwalina (kkcwalina@eti.pg.edu.pl), Kumar Vijay Mishra (kvm@ieee.org), Hiren KD Sarma (hiroo135@yahoo.co.uk)
8. Integrated sensing and communications – Shobha Sundar Ram (shobha@iiitd.ac.in)
9. High-dimensional feature processing – Peter Vouras (synthetic_aperture_twg@ieee.org)

10. Point-cloud processing and sensor fusion with lidar/radar/camera - Peter Vouras (synthetic_aperture_twg@ieee.org), Shobha Sundar Ram (shobha@iiitd.ac.in)
11. Radio localization, timing, and navigation (in cooperation with COST ACTION CA20120 INTERACT) - Krzysztof Cwalina (kkcwalina@eti.pg.edu.pl), Piotr Rajchowski (piorajch@pg.edu.pl)
12. Data-driven signal processing – Peter Vouras (synthetic_aperture_twg@ieee.org)
13. Adaptive Reconfigurable Receivers – Peter Vouras (synthetic_aperture_twg@ieee.org)
14. Distributed and multistatic sensing – Raghu G. Raj (raghu.raj@nrl.navy,mil)
15. Advances in ORAN - Sangeeta Bhattacharjee (sangeeta.Bhatta@gmail.com), Peter Vouras (synthetic_aperture_twg@ieee.org)
16. Non-terrestrial networks - Alberto Tarable (alberto.tarable@cnr.it)

10. Other Business

None

Commission D - Electronics and Photonics

Commission D held three Commission coordinating activity meetings on August 21 Monday, 5:30 pm-6:30 pm, 23 Wednesday, 5:30 pm-6:30 pm, and 25 Friday, 5:30 pm-6:00 pm, in Sapporo Convention Center, Svenue of the URSI-GASS 2023.

1. Elections of Commission Officers

We have two candidates for a vice chair and three for an early carrier representative as follows.

Vice-chair candidacies:
Tashin Akalin, Lille University, France
Hossein Asghari, Loyola Marymount University, United States

ECR candidacies:
Giacomo Paolini, University of Bologna, Italy
Sangyeop Lee, Tokyo Institute of Technology, Japan
Jayakrishnan Methapettyparambu Purushothama, Heriot-Watt University University, United Kingdom

In the first CCA meeting, we received the presentations from the candidates. Finally, the Council decided to name Prof. Akalin as a vice chair and Prof. Paolini as an ECR based on the voting results.

2. Review of Terms of Reference

Commission D carefully reviewed the current Terms of Reference (ToR) and discussed the revision during the first and second CCA meetings and the official member email circulation. The current ToR is well organized, but it found redundancy in the covered fields that would be merged. Thus, the Commission D will update the ToR as follows.

1. Nanotechnologies and nanoelectronics systems that push beyond current frontiers;
2. Microwave, millimeter wave, terahertz, and photonics devices, circuits and systems and their applications;
3. Wireless devices, circuits and systems;
4. Combined and hybrid photonic and electronic devices and systems;
5. Optoelectronic systems, plasmonics, and electro-optics;
6. Photonic signal processing schemes, regardless of frequency of signal processed;
7. Physics, theoretical modeling, and numerical simulation of all of the above.

For expressions to the researchers outside of the URSI, the hot topic research fields are denoted in the website, not included in the ToR as follows:

- The Commission focuses on electronics and photonics devices, circuits and systems as well as emerging technologies such as 6G and beyond, optical wired and wireless communications, artificial intelligence, IoT sensors, energy harvesting, wireless power transfer, quantum technologies, and other new applications of electronics and photonics for the purpose of implementing either previously unattainable functionalities or for improving the performance of current electronic-only or photonic-only technologies.

3. Any changes/confirmation in Working Groups and other organizations

Commission D discussed the working group formation and the lack of a photonics-based working group. The Commission decided to update the formation of working group D1, to keep the structure of working group D2 as is, and to establish a new working group D3 related to photonics.

D.1 RFID Technologies and Privacy of Data
Chair: Dr. S. Tedjini (France);
email: smail.tedjini@lcis.grenoble-inp.fr
Vice-Chairs: Dr. G. Marrocco (Italy); Alessandra Costanzo (Italy); Valentina Palazzi (Italy)
email: marrocco@disp.uniroma2.it; alessandra.costanzo@unibo.it; valentina.palazziunipg.it

D.2 Wireless Power Transfer Technologies and Applications
Chair: Dr. N. Shinohara (Japan);
email: shino@rish.Kyoto-u.ac.jp
Vice-Chair: Dr. A. Georgiadis (UK);
email: apostolos.georgiadis@ieee.org

D.3 Photonic signal processing, real-time instruments and biomedical imaging
Chair: Hossein Asghari
email: mohammadhossein.asghari@lmu.edu
Vice Chair: Günter Steinmeyer (Germany)
email: steinmey@mbi-berlin.de

4. Technical Advisory Committee

Commission D discussed the availability of a technical advisory committee (TAC) and decided to establish it. The TAC makes comments and advice for

- scientific programs of flagship conferences;
- workgroups in the Commission;

- Resolutions and Recommendations;
- technical issues in related activities.

Eligibility of TAC members was also decided. The TAC is organized by the members of
Chair: Immediate Past-Chair
Members: Past Chairs, past ECRs, and the personnel who are named by the TAC Chair.

Commission D TAC is established with the following organization;
Chair: Prof. Naoki Shinohara (Japan)
Member: Apostolos Georgiadis (UK), Hossein Asghari (USA), Arnaud Vena (France)

5. Preparation of Future Meetings/Identification of meetings to be supported (cfr. Commission budget)

The costs to be budgeted for flagship conferences were discussed in the first CCA meeting. There will be 18,840 Euros for two members to attend AT- and AP-RASC and four members to attend GASS. The expected budget for Commission D will be approximately 19,900 Euros based on the number of submitted papers in AT-AP-RASC2022 and GASS2023, as shown in the Council meeting. Three officials are in Europe during the 2023-2026 period in Commission D, and thus, the budget will be matched to our activities. Commission D decided that the use of the budget would be discussed on an individual basis.

6. Proposed sessions and conveners for AT-RASC 2024

Commission D discussed the sessions proposed in the AT-RASC 2024. The tentative list of sessions with the convenors is as follows:

D01: Convergence of photonics and radio systems towards 6G
A. Stohr, T. Kaji
andreas.stoehr@uni-due.de, kaji@nict.go.jp
D02: Photonic Signal Processing, Real-time Instruments and Biomedical Imaging
H. Asghari and TBD
mohammadhossein.asghari@lmu.edu, TBD
D03: Electronic and photonic devices, circuits and systems for THz Communications
T. Akalin, K. Takano
tahsin.akalin@univ-lille.fr, ktakano@rs.tus.ac.jp
D04: Wireless power transfer and energy harvesting
N. Shinohara, G. Paolini
shino@rish.kyoto-u.ac.jp, giacomo.paolini4@unibo.it
D05: RFID and wireless sensing
S. Tedjini, V. Palazzi
smail.tedjini@lcis.grenoble-inp.fr, valentina.palazzi@unipg.it

D06: Microwave photonics applications
S. Iezekiel, H. Murata
iezekiel.stavros@ucy.ac.cy, murata@elec.mie-u.ac.jp
D07: Electronics and photonics technologies for smart transport systems
U. Mankong, T. Umezawa
ukrit.m@cmu.ac.th, toshi_umezawa@nict.go.jp
D08: Recent Advances in Electronics and Photonics (Open Session)
A. Kanno, T. Akalin
kanno.atsushi@nitech.ac.jp, tahsin.akalin@univ-lille.fr

The Commission D have a plan to hold joint session with the Commission K, as follows:

KD01: RF wearable devices (TBD)
M. Colella, G. Paolini
micol.colella@uniroma1.it, giacomo.paolini4@unibo.it
KD02: Smart IoT for Body Area Network (TBD)
H. Tanaka, H. Anzai (TBD)
hitanaka@hiroshima-cu.ac.jp, anzai@nitech.ac.jp

Commission E - Electromagnetic Environment and Interference

1. Elections of Commission Officers

There were four available candidates for the position of Vice Chair: Dr. Chaouki Kasmi (France), Prof. Yasuhide Hobara (Japan), Dr. Suraya Mubeen (India) and Dr. Andrew S. Podgorski (Poland). The vote was cast online and the results transmitted by the URSI board. Dr. Chaouki Kasmi was declared elected as the Vice Chair ofCommission E for the upcoming triennium.

For the position of second Early Career Representative, three candidates were available: Dr. Flávio Miguel da Silva Jorge (Portugal), Dr. Fernando Albarracin (Colombia), Dr. Islem Yahi (France). The vote was also cast online and Dr. Flávio Miguel da Silva Jorge was declared elected as the second Early Career Representative of Commission E for the upcoming triennium.

The Early Career Representative of the last triennium, Prof. Riccardo Trinchero, agreed to also serve as Early Career Representative for the upcoming triennium.

2. Review of Terms of Reference

The current Terms of Reference are as follows:

Commission E promotes research and development in:

- Terrestrial and planetary noise of natural origin, seismic-associated electromagnetic fields;
- Man-made electromagnetic environment;
- The composite noise environment;
- The effects of noise on system performance;
- The effects of natural and intentional emissions on equipment performance;
- The scientific basis of noise and interference control, electromagnetic compatibility;
- Spectrum management.

However, during the commission meetings in GASS 2021 (Rome), several members expressed their mixed feeling about these terms. The terms chosen, although they basically contain the main aspects of Commission E, are not very contemporary and may not be very attractive and meaningful to new generations of researchers. We have therefore asked the Technical Advisory Committee to work on updating these terms, taking into account the suggestions made during the commission E meetings.

The work group dedicated to the formulation of the new Terms of Reference agreed on what the following text.

The Commission deals with the study, modelling and characterization of:
- electromagnetic noise of natural origin;
- man-made electromagnetic noise, both intentional and unintentional;
- complex electromagnetic systems and environment;

by using measurement, deterministic, statistical, stochastic and machine learning techniques. Further, the Commission promotes research and development in:
- the effects of noise on system performance;
- electromagnetic eavesdropping and EM cybersecurity;
- hardware and software techniques for the suppression and mitigation of electromagnetic interference;
- the scientific basis, standardization and metrology of electromagnetic compatibility;
- the efficient use and management of radiofrequency spectrum.

3. Any changes/confirmation in Working Groups and other organizations

The subject of Electromagnetic Environment and Interference is of concern within many disciplines of Radio Science. This is reflected in a number of working groups with focus on particular topics. These are outlined below with the names of contact persons and, where available, a brief description of the relevant topics. The scope of working groups is the study of particular scientific subjects. Typical activities of the working groups include the organization of sessions for various conferences, workshops, and meetings. A number of Working Groups have been established to provide focus on a number of activities relevant to the topics of Commission E. These are outlined below, together with the relevant contact persons.

3.1 E1. Terrestrial and Planetary Electromagnetic Noise Environment

Co-Chairs: C. Price (Israel), Y. Hobara (Japan), A.P. Nickolaenko (Ukraine), and K. Hattori (Japan)

This WG deals with the study on the characteristics of natural electromagnetic noise taking place not only in the terrestrial, but also in the planetary environment. The most well-known EM noise is the atmospheric radio noise from the lightning discharges (so-called sferics in a wide frequency range from DC to VHF). Some examples of topical subjects on sferics are (1) monitoring of global lightning activity as studied by high frequency noise and Shumann resonance phenomena in the ELF band and (2) ELF transients related with the optical emissions in the mesosphere due to the lightning. Higher frequency

lightning emission provides us with the information on the fine structure of lightning electrical structure, while lower frequency noise provides us with the macroscopic nature of lightning. The noise coming from the ionosphere/magnetosphere will be discussed as well; micro pulsations in the ULF range, VLF/ELF emissions and HF emissions due to the plasma instabilities in the space. The radio noise environment on other planets is also of interest to this group. We are particularly interested in using natural EM observations in monitoring, detecting and forecasting natural hazards, such as thunderstorms, severe weather, space weather and seismic events.

Contacts: cgprice@gmail.com, hobara@ee.uec.ac.jp, hattori@earth.s.chiba-u.ac.jp, sashanickolaenko@gmail.com

3.2 E2. Intentional Electromagnetic Interference
Co-Chairs: Richard Hoad (UK) and W. Radasky (US)

This WG studies the area of intentional electromagnetic interference (IEMI), which is defined by the IEC as the "Intentional malicious generation of electromagnetic energy introducing noise or signals into electric and electronic systems, thus disrupting, confusing or damaging these systems for terrorist or criminal purposes."

Aspects of these studies include:
the electromagnetic threat weapons and their characteristics, the coupling to electronic systems through both radiated and conducted transients, the vulnerability of equipment and systems including jamming, denial of service, upset and damage, the use of detectors to recognize and to mitigate attacks, and the protection of equipment and systems.

Contacts: rhoad@qinetiq.com, wradasky@aol.com

3.3 E3. High Power Electromagnetics
Co-Chairs: R.L. Gardner (U.S.A) and F. Sabath (Germany)

The objective is to encourage research in high power electromagnetics (HPE). The technical area of HPE consists of the physics and engineering associated with electromagnetic sources where nonlinear effects associated with high-field regions (and air breakdown) must be included in the analysis and design. This includes (but is not limited to) EMP simulators, high-power narrowband and meso-band sources and antennas, and hyperband (impulse) sources and antennas. It also includes the environment near lightning channels and in nuclear EMP source regions. In some cases it includes the high field regions on, or in targets because of local field enhancement.
Contacts: Robert.Gardner@GTRI.GaTech.edu, Frank.Sabath@t-online.de

3.4 E4. Lightning Discharges and Related Phenomena
Chair: V. A. Rakov (USA) and T. Morimoto (Japan)

The lightning discharge is one of the two natural sources of electromagnetic interference (EMI), the other one being the electrostatic discharge. Electric and magnetic fields generated by lightning represent a serious hazard to various systems, particularly those containing sensitive electronics. This WG focuses on the characterization of lightning and its interaction with engineering systems and with the environment, as well as on lightning detection and testing. It covers all aspects of lightning research, including observations, field and laboratory experiments, theoretical studies, and modeling.
Contacts: rakov@ece.ufl.edu, morimoto@ele.kindai.ac.jp

3.5 E5. Interaction with, and Protection of, Complex Electronic Systems
Co-Chairs: I. Yahi (France), C. Kasmi (France) and R. Trinchero

This working group studies the various electronic and electromagnetic aspects related to the interaction with, and protection of, complex electronic systems. The focus is the analysis of the various coupling paths and their associated transfer functions into complex electronic systems, as formalized in the framework of electromagnetic topology. Analytical, numerical, and measurement techniques are used to characterize the electromagnetic fields and currents in a complex environment. In the analysis, special attention is placed on the emergence of new technologies, and the inclusion of advanced materials and communication systems.
Contacts: islem.yahi@tii.ae, Chaouki.kasmi@tii.ae, riccardo.trinchero@polito.it

3.6 E6. Spectrum Management
Co-Chairs: J.P. Borrego (Portugal), Flavio Miguel da Silva Jorge (Portugal)

The E6 focus is on sound scientific spectrum management for improved utilization of the radio frequencies for protection wireless communications service and radio sciences. The goal is to assure further development of radio sciences and communication services, unobstructed by potential radio interference due to unwanted energy in the form of out-of-band and in-band encroaching and deleterious in-band and out-of-band emissions. The electromagnetic spectrum is treated as a limited natural resource with a multitude of competing demands for access to it and use of it. Spectrum management seeks innovative means and technologies for adequate co-existence of all of them taking into account the need of protection of new and incumbent wireless and wired communication services, systems and equipment, with special focus on science services and those that use passive technologies.
Contacts: jose.borrego@anacom.pt, Flavio.Jorge@ext.esa.int, flaviojorge@ua.pt

3.7 E7. Electromagnetic Compatibility in Wired and Wireless Systems
Co-Chairs: F. Rachidi (Switzerland), V. Deniau (France) and F. Gronwald (Germany)

The intensive use of the electromagnetic spectrum for communications has resulted in issues of compatibility and interoperability between different users. In addition the continual increase in operating frequency of products and higher frequency sources of disturbances (such as Ultra-Wide Band systems) resulted in an increase of potential EMC problems in communication systems and the use of power lines for carrying data is adding to interference problems. Potential remedies are also addressed.
Contacts: farhad.rachidi@epfl.ch, frank.gronwald@uni-siegen.de, virginie.deniau@univ-eiffel.fr,

3.8 E8 Stochastic Techniques in EMC
Co-Chairs: L. Arnaut (UK), S. Pignari (Italy), and R. Serra (Netherlands)
Contacts: l.arnaut@qmul.ac.uk, luk.arnaut@nottingham.ac.uk, sergio.pignari@polimi.it, r.serra@tue.nl

Commission E: Joint Working groups

3.9 EB Chaos and Complexity in EM
Co-Chairs: G. Gradoni (UK), and A. Sihvola (Finland)

Wave complexity underpinned by fully developed, partial and transient chaos is becoming permanent in multi-component electromagnetic systems operating at electrically large scales. Statistical methods have been developed to tackle those systems and their specific engineering structures occurring in electromagnetic compatibility, electronics circuits as complex sources of radiated emissions, wireless communications including massive MIMO systems, etc. Recent studies in wave chaos have attracted researchers in electromagnetic theory and universal statistical properties have been used to study large electromagnetic systems without solving the full-wave problem. Hybrid methods combining full wave algorithms with newborn statistical methods are emerging in the EM wave modeling arena. System specific components need detailed treatment while deformed and irregular parts of EM environments can be treated statistically because of their mixing behavior. Furthermore, statistical sources can be treated through semi-classical as well as random matrix theories. Novel theoretical models have been developed describing fields through complicated electromagnetic environments – including electromagnetic reverberation chambers - also accounting for coupling through apertures and including losses at both microwave and mmWave regimes, as well as complex placement of wires and cables within EM environments. Uncertainties arising within cabling and radiating systems can be described through the polynomial chaos method.
Contacts: Gabriele.Gradoni@nottingham.ac.uk, ari.sihvola@aalto.fi

3.10 EHG Solar Power Satellite
Chair: H. Matsumoto (Japan), Co-Chair for Commission E: J. Gavan (Israel), Co-Chair for Commission H: K. Hashimoto (Japan)
Contacts: gavan@hit.ac.il

3.11 GEH Seismo Electromagnetics (Lithosphere-Atmosphere-Ionosphere Coupling)
Co-Chair for Commission G: S. Pulinets (Russia), Co-Chair for Commission E: M. Y. Hobara (Japan), Co-Chair for Commission H: H.Rothkaehl (Poland)
Contacts: pulse@rssi.ru, hobara@ee.uec.ac.jp

3.12 GJFEH Interdisciplinary Space Weather
Co-Chair for G: I. Stanislawska (Poland), Co-Chair for J: R. Fallows (Netherlands)
Contacts: fallows@astron.nl

3.13 URSI/IAGA VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM)
Chair for URSI (Commissions E,G,H): M. Clilverd (UK), IAGA Chair: J. Bortnik (USA)
Contacts: jbortnik@gmail.com,

4. Technical Advisory Committee

The major role of the Technical Advisory Committee (TAC) of Commission E is supposed to advise Commission Officers on essential issues relevant to the Commission, to help make up scientific programs of URSI flagship conferences, to promote contributions to the flagship conferences, and to help review the contributed papers.

Several Commission E members volunteered to contribute to the previously constituted TAC, which is now composed by the following colleagues:

Philippe Besnier France - philippe.besnier@insa-rennes.fr
Luk Arnaut (United Kingdom) - l.arnaut@qmul.ac.uk
Gabriele Gradoni (United Kingdom) - Gabriele.Gradoni@nottingham.ac.uk
Jose Borego (Portugal) - jose.borrego@anacom.pt
Sergio Pignari (Italy) - sergio.pignari@polimi.it
Frank Gronwald (Germany) - frank.gronwald@uni-siegen.de
Yasuhide Hobara (Japan) - hobara@ee.uec.ac.jp
Virginie Deniau (France) - virginie.deniau@univ-eiffel.fr
Felix Vega (United Arab Emirates) - felix.vega@tii.ae

5. Preparation of Future Meetings/Identification of meetings to be supported (cfr. Commission budget)

Commission E will support the following meetings in the current triennium:

- Fourth URSI Atlantic Radio Science Conference (URSI AT-RASC), May 19th – 26th, 2024, to be held in the ExpoMeloneras Convention Centre, Gran Canaria, Spain.
- 2025 URSI Asia-Pacific Radio Science Conference (AP-RASC 2025), August 2025, Sydney, Australia
- XXXVI URSI General Assembly and Scientific Symposium (URSI GASS), August 15th – 22nd 2026, Krakow, Poland.

5. Proposed sessions and conveners for AT-RASC 2024

It is proposed to use the following structure as a basis for the next AT-RASC 2024. Of course, the short courses, tutorials, and workshops will be updated according to current topics of interest. Proposed sessions and conveners, at the time of writing, then include the following:

5.1 Sessions of Commission E only

- E01: EMC Analytical, Numerical and Machine Learning Modeling in complex systems (Riccardo Trinchero, Christophe Guiffaut, Chaouki Kasmi)
- E02: EMC Measurement techniques (Carlo Carobbi, Ramiro Serra)
- E03: Stochastic/Statistical Techniques in EMC (Luk Arnaut, Sebastien Lalléchère, Chaouki Kasmi, Sergio Pignari)
- E04: HPEM, Intentional EMI (Felix Vega, Nicolas Mora)
- E05: EMC and EMI in Wired and Wireless Communications (Virginie Deniau, Frank Gronwald)
- E06: Time Reversal in Electromagnetics (Sebastiene Lallechere, Farhad Rachidi, Marcos Rubinstein)
- E07: Lightning and related phenomena (Farhad Rachidi, Marcos Rubinstein, Takeshi Morimoto)
- E08: Electromagnetic interference at PCB, package, and chip level: Signal and Power Integrity (Francesco de Paulis, Riccardo Trinchero)
- E09: Open session (Chaouki Kasmi, Carlo Carobbi)

Joined Sessions organized by Commission E:

- EAB1: Wave Chaos of Complex Systems (Gabriele Gradoni, Steve Anlage, Luca Bastianelli)
- EACFJ1: Spectrum management and Utilization (José Pedro Borrego, Flavio Miguel da Silva Jorge)
- EBC1: Wave modelling of novel wireless systems (Gabriele Gradoni, Luca Bastianelli)
- EC: EM Security of Cyber-physical systems and Wireless Technologies (Yuichi Hayashi, Chaouki Kasmi, Virginie Deniau)
- EFGH1: Natural Electromagnetic Noise and Radio Sensing Applications in Terrestrial Planetary Environments (Yasuhide Hobara, Colin Price, Martin Fullekrug, Tomoo Ushio)
- EJGF1: Machine learning and signal processing to analyze and mitigate EMI (Virginie Deniau, Riccardo Trinchero, Kevin Vinsen, Kaushal Bush, Hariharan Krishnan, Paolo de Matthaeis)

Commission F - Wave Propagation and Remote Sensing

1. Elections of Commission Officers

Chair Motoyuki Sato (Japan)
Vice-Chair Slawomir J. Ambroziak (Poland)
Senior ECR Fikadu Dagefu (USA)
ECR2 Gargi Rakshit (India)

2. Review of Terms of Reference

We had some discussion on the Terms of Reference, such as:" perhaps, we should, reconsider reintroducing the expression 'electromagnetic interaction", but we had no conclusion in this moment. We will continue discussing.

3. Any changes/confirmation in Working Groups and other organizations

A new working group was proposed:

F.3 Environmental Sensing for Disaster Management based on Communication and Remote Sensing Systems (NEW)
Chair: Ambroziak Slawomir, Thomas Kürner, Sana Salous, Yasuhide Hobara, Motoyuki Sato, Madhu Chandra, Tullio Tanzi, Tobias Rommel

4. Technical Advisory Committee

5. Preparation of Future Meetings/Identification of meetings to be supported (cfr. Commission budget)

6. Proposed sessions and conveners for AT-RASC 2024

Tentative proposal:

- Remote Sensing Image Processing with Deep Learning (Si-Wei Chen, Le-Yuan Fang)
- Remote sensing of precipitation (Venkata Chandrasekar, Tomoo Ushio)
- Remote Sensing of Earth and Planetary Atmospheres (Animesh Maitra, Tomoo Ushio)
- Subsurface sensing/ GPR (Motoyuki Sato, Lorenzo Capineri)
- COST CA20120 INTERACT: Measurement & Modelling of Radio Waves Propagation for Indoor Communications (Sławomir J. Ambroziak, Kamran Sayrafian)
- Radio Frequency Interference (RFI) Issues in Microwave Remote Sensing (Paolo de Matthaeis, Albin Gasiewski)
- Geophysical parameter retrieval
- Ground-base measurement
- Environmental Sensing for Disaster Management based on Communication and Remote Sensing Systems (Madhu Chandra)
- Open session (Motoyuki Sato)
- Deep learning in Artificial Electromagnetic Materials (Willie Padilla, Dimitris Tzarouchis, Pedro Cruz)

Commission G - Ionospheric Radio and Propagation

The report was not received.

Commission H - Waves in Plasmas

1. Elections of Commission Officers

The call for nominations for the new Commission H Vice Chair and new Early Career Representative was initially sent out by the outgoing Commission H Chair on 24 January 2023.

Two candidates were nominated for Commission H Vice Chairs.
These were (in alphabetical order): Patrick Galopeau (France) and Robert Marshall (USA)

After the election closed on Monday 21 August 2023, and following the confirmation from the URSI Council meeting on Tuesday 22 August 2023, the result was announced.
The Results:

Patrick Galopeau	33
Robert Marshall	30

As the voting is done through a ranking process, the candidate with the smallest number is successful. As such, Robert Marshall was elected the new Commission H Vice Chair.

There were also two candidates for Commission H Early Career Representative role: David Hartley (USA) and Kuldeep Singh (UAE)

The Results:	David Hartley	22
	Kuldeep Singh	41

Thus, David Hartley was elected the new Early Career Representative.

Note that the Commission H Early Career Representative role elected at the URSI GASS 2021 (Rome) resigned due to the Russian invasion of Ukraine. The "senior" Commission H Early Career Representative, František Němec (Czechia), agreed to stay on for the next triennium.

2. Review of Terms of Reference

The goals of the Commission are:

- To study waves in plasmas in the broadest sense, and in particular :
  the generation (e.g. plasma instabilities), propagation, and detection of waves in plasmas,
  wave-wave and wave-particle interactions,
  plasma turbulence and chaos,
  spacecraft-plasma interaction,

instabilities, heating, and diagnostics of laboratory plasmas;
- To encourage the application of these studies, particularly in the areas of solar/planetary plasma interactions, space weather, and an increased exploitation of space as a research laboratory.

During our business meetings there were no proposed changes to above mentioned text. However, František points out that Commission H website says the last goal is listed as: "instabilities, heating, and diagnosis of laboratory plasmas", we think the word "diagnosis" should be "diagnostics", which is how Commission H people describe our goals.

3. Any changes/confirmation in Working Groups and other organizations

There were a limited number of reports received in the last 2 years (full reports were received from the Working Group of URSI and IAGA: VLF/ELF remote Sensing of the Ionosphere and Magnetosphere (VERSIM) and the Working Group of Commissions G and H on Active experiments in Space Plasmas). The out-going Commission H chair believed this was due to the continuing impact of COVID-19, and that some kindness should be extended to the unresponsive working group. However, before the 2021 GASS the H co-chair of the Working Group of Commissions E, H, and G on Solar Power Satellites (K Hashimoto) indicated a lack of activity. As far as we can tell this working group should now be disbanded. Also, the Commission H co-chair of the Working Group of Commissions H and J: Computer Simulations in Space Plasma told the incoming Commission H chair to disband the working group (note, Commission J also suggested it should be disbanded at the last URSI Council meeting during the 2023 Sapporo GASS).

The other working groups with named Commission H representatives are given on the website. These are:

VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM)
URSI Co Chair (Commissions E, G, H): Claudia Martinez-Calderon (Japan), IAGA Co Chair: Frantisek Nemec (Czech Republic)
NOTE the change in the URSI co-chair for VERSIM.

Active experiments in Space Plasmas
Co-chair for Commission H: Mike Kosch (South Africa)
NOTE. The Active Experiments working group is missing from the Commission G and H websites. We are unclear why!

Working Group of Commissions E, G, and H: Seismo-Electromagnetics (Lithosphere-Atmosphere-Ionosphere Coupling)
Co-chair for Commission H: Hannah Rothkaehl (Poland)

Working Group of Commissions E, F, G, H and J on RFI Mitigation and Characterization
Co-chair for Commission H: Hannah Rothkaehl (Poland)

Working Group of Commissions H, G, and E: Radio Diagnostics of Space Weather Plasma Processes
Co-chair for Commission H: Mauro Messerotti (Italy)

4. Technical Advisory Committee
Some time ago Commission H decided that this committee would be formed of:
(1) Past Chairs of Commission
(2) Past Early Career Representatives
(3) Current Candidates for Vice-Chair and ECR which were not elected this time
(4) Current GASS Commission H Session conveners and tutorial/general lecturers

The members are:

1. Past Chairs
Robert Benson <robert.f.benson@nasa.gov>
Gordon James <james@phys.ucalgary.ca>
Uman Inan <UINAN@ku.edu.tr>
Richard Horne <r.horne@bas.ac.uk>
Yoshiharu Omura <omura@rish.kyoto-u.ac.jp>
Ondrej Santolik <os@ufa.cas.cz>
János Lichtenberger <lityi@sas.elte.hu>
Jyrki Manninen <Jyrki.Manninen@oulu.fi>

2. Past ECRs
Wen Li <wenli77@bu.edu>

3. Current Candidates for Vice-Chair and ECR which were not elected this time
Patrick Galopeau < patrick.galopeau@latmos.ipsl.fr>
Kuldeep Singh <Singh.kdeep07@gmail.com>

4. Current Commission H Session conveners and tutorial/general lecturers
Jyrki Manninen <jyrki.manninen@oulu.fi>
Craig J. Rodger <craig.rodger@otago.ac.nz>
Vania Jordanova <vania@lanl.gov>
David Hartley <david-hartley@uiowa.edu>
Yoshi Miyoshi <miyoshi@isee.nagoya-u.ac.jp>
Yoshiya Kasahara <kasahara@is.t.kanazawa-u.ac.jp>
Jean-Francois Ripoll <jean-francois.ripoll@cea.fr>

Mauro Messerotti <mauro.messerotti@inaf.it>
Tomoko Nakagawa <nakagawa@tohtech.ac.jp>
Drew Turner <drew.lawson.turner@gmail.com>
Katariina Nykyri <katariina.nykyri@erau.edu>
David Malaspina <David.Malaspina@Colorado.edu>
Xiangning Chu <chuxiangning@gmail.com>
Hui Zhang <h.zhang@sdu.edu.cn>
Philippe Escoubet <philippe.escoubet@esa.int>
Vikas Sonwalkar <vssonwalkar@alaska.edu>
Amani Reddy <areddy1@alaska.edu>
Paul Bernhardt <pabernhardt@alaska.edu>
Robert Moore <moore@ece.ufl.edu>
Yohei Miyake <y-miyake@eagle.kobe-u.ac.jp>
Esa Kallio <esa.kallio@aalto.fi>
Ivana Kolmašová <iko@ufa.cas.cz>
Claudia Martinez-Calderon <claudia@isee.nagoya-u.ac.jp>
Miroslav Hanzelka <mha@ufa.cas.cz>
Pietro Zucca <zucca@astron.nl>
Natchimuthuk Gopalswamy <natchimuthuk.gopalswamy-1@nasa.gov>
Rob Pfaff <robert.f.pfaff@nasa.gov >
Mike Kosch <mkosch@sansa.org.za>
Hanna Rothkaehl <hrot@cbk.waw.pl>

5. Preparation of Future Meetings/Identification of meetings to be supported (cfr. Commission budget)

We intend to support the 11th VERSIM Workshop in Colorado, planned for October 2024.

We would also like to support the 12th Workshop, but the timing and location of that are as yet unclear - 2026 or 2027 would be the most likely dates, and hence care needs to be shown around the timing of the URSI GASS in 2026.

6. Proposed sessions and conveners for AT-RASC 2024

This is the current list as of 6 September 2023. Almost all the sessions are confirmed with at least one convener agreed, but in some cases extra conveners are being sought.

- **H01: Open Session**
  Craig Rodger (University of Otago, New Zealand)
  Robert Marshall (University of Colorado Boulder, USA)

- **H02: Plasma waves, wave-particle interactions, and their multifold effects on the radiation belts**
  David Hartley (University of Iowa, USA)
  Ondrej Santolik (Academy of Sciences of the Czech Republic, Czechia)
  Vania Jordanova (Los Alamos National Laboratory, USA)
  Yoshizumi Miyoshi (University of Nagoya, Japan)
- **H03: Machine learning techniques and their application to plasma waves**
  Drew Turner (Johns Hopkins Applied Physics Laboratory, USA)
- **H04: Recent advances in geospace research from multi-point observations**
  Jyrki Manninen (University of Oulu, Finland)
  Jean-Francois Ripoll (CEA, France)
  Yoshiya Kasahara (Kanazawa University, Japan)
- **H05: Radio diagnostics of space weather plasma processes**
  Mauro Messerotti (University of Trieste, Italy)
- **H06: Computer simulations in space plasmas**
  Esa Kallio (Aalto University, Finland)
  Yohei Miyake (Kobe University)
  esa.kallio@aalto.fi, y-miyake@eagle.kobe-u.ac.jp
- **H07: Analysis of natural boundary layers in terrestrial and planetary environments: Macro/micro scale kinetic approaches**
  Hui Zhang (Shandong University, China)
  h.zhang@sdu.edu.cn
- **H08: Turbulence and Instabilities in Space Plasmas**
  Alexander Pitňa (Charles University, Czechia)
  alex@aurora.troja.mff.cuni.cz
- **H09: Tribute to Craig Kletzing - his fascination with plasma waves and the upcoming TRACERS mission**
  David M. Miles (University of Iowa)

  Note: this is not really a session, but rather a special Commission H lecture to celebrate a recently deceased colleague. Craig Kletzing gave one of General Lectures at the 2022 AT-AP-RASC meeting, was the PI of the magnetic field plasma wave instrument on NASA's Van Allen Probes flagship mission, and a leading light in the Commission H community. He died shortly before the 2023 URSI GASS. Given the strong URSI link, we ask for a special session in the programme by which Craig's colleague Dave Miles (the new PI of Craig's TRACERS mission) provides a tribute talk. Only 1 "abstract" should be accepted, which is Dave Miles. So a bit like a general lecture, or tutorial talk, but a Commission H single speaker presentation.

H-led joint sessions

- **HG01: Active Experiments in Space and Laboratory Plasmas**
  Robert Moore (University of Florida, USA)
  Mark Golkowski (University of Colorado Denver, USA)
- **HG02: Observations of near-Earth space from Small Satellites and Suborbital Platforms**
  Robert Marshall (University of Colorado Boulder, USA)
  Bruce Fritz (U.S. Naval Research Laboratory, USA)
  David Malaspina (University of Colorado Boulder, USA)
- **HGE01: Atmospheric, ionospheric, magnetospheric, and high energy effects of lightning discharges**
  Ivana Kolmašová (Charles University, Czechia)
  Martin Fullekrug (University of Bath, UK)
  Ningyu Liu (University of New Hampshire, USA)
- **HGE02: Meet the HGE Experts - Presentations**
  František Němec (Charles University, Czechia)
  Bruce Fritz (U.S. Naval Research Laboratory, USA)
  Riccardo Trinchero (Politecnico di Torino, Italy)
- **HGE03: Meet the HGE Experts - Panel Discussion**
  František Němec (Charles University, Czechia)
  Bruce Fritz (U.S. Naval Research Laboratory, USA)
  Riccardo Trinchero (Politecnico di Torino, Italy)
- **HJ01: Radio emission from the Sun, Heliosphere, and Planets**
  Pietro Zucca (ASTRON Netherlands Institute for Radio Astronomy, Netherlands)

APPENDIX ONE

Working Group of URSI and IAGA: VLF/ELF remote Sensing of the Ionosphere and Magnetosphere (VERSIM)

Co-chair for URSI Commissions H and G: Mark Clilverd (UK)
Co-chair for IAGA: Andrei Demekhov (Russia); Report received from Mark Clilverd

The VLF-ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM) working group has remained very active over the reporting period. The group's email list continues to be around 100 people. Regular updates, job adverts, and conference information is provided to the email group by the group leaders (particularly Andrei).

The primary activity of the working group during the reporting period was the 10th VERSIM meeting, held in the Sodankylä Geophysical Observatory, Finland, in November 2022. The meeting, lasting 5 days, was held at the same location where the meetings began in 2004. Approximately 40 people attended in person, with a significant proportion being in their early career stage. For the first time in VERSIM history, a VERSIM school was undertaken just prior to the main meeting. This is seen as a key area for future development of the VERSIM community. The feedback from the meeting has been very positive, and the co-chairs would particularly like to thank the principal organiser, Jyrki Manninen, and all of the other members of the organizing committee for making the workshop such a success. The co-chairs acknowledge that some members of the VERSIM community were unable to attend in any form at all, due to current geopolitical circumstances.

VERSIM has also continued to produce and circulate their annual report at the end of each calendar year. The report show-cases the activities of the working group, with summary input from many of the institutes involved in VERSIM, highlighting recent scientific findings and the latest data collection initiatives. The activity of the VERSIM Journal Club is also promoted in the annual report, publicising its active and supportive nature for early career scientists. The club's talks are either from students themselves on topics of personal interest, or from senior members of the VERSIM community on VERSIM-related, or space-science related, areas.

The VERSIM community and working group continues to flourish, regularly proposing science topic areas and providing convenors for both URSI and IAGA meetings.

Note that during the 2023 URSI GASS in Sapporo the URSI co-chair, Mark Clilverd (UK), stepped down after 9 years of service. He was replaced by Claudia Martinez-Calderon (Japan).

Working Group of Commissions G and H on Active experiments in Space Plasmas
Report by Co-Chair for Commission H: M. Kosch (South Africa)

The Covid pandemic made travel difficult or impossible since 2020, which had a negative impact on research that required travel to various ionospheric modification facilities. However, the HAARP, EISCAT and SURA ionospheric modification facilities continued with their scientific experiments successfully. In the period 2021 to the present, EISCAT Heating produced 30 publications, about half compared to the previous period. At this time, there is no plan to discontinue operations at any of these facilities. Construction of the new EISCAT-3D VHF incoherent scatter radar facility began in late 2022 in three locations in northern Fenno-Scandinavia and it is hoped operations may begin in late 2023.

In 2022, two important papers were published:

"Review of environmental monitoring by means of radio waves in the (Ant)Arctic: from atmosphere to geospace" by L. Alfonsi et al., Surveys in Geophysics, 43, GEOP-D-22-00038, https://link.springer.com/article/10.1007/s10712-022-09734-z, 1609-1698, 2022.

"History of the Tromsø ionosphere heating facility" by M.T. Rietveld and P. Stubbe, Hist. Geo Space. Sci., 13, 71–82, https://doi.org/10.5194/hgss-13-71-2022, 2022.

Commission J - Radio Astronomy

The Commission J business meetings (Commission Coordination Activities, CCAs) at the URSI GASS 2023 in Sapporo, Japan were held on August 21, 23 and 25, 2023 and were held in hybrid format to facilitate participation by interested people who were not able to participate in the conference in person.

Attendees – on site
Douglas Bock (outgoing Chair), Stefan Wijnholds (incoming Chair, notes on CCAs on August 21 and 23), Jacki Gilmore (outgoing ECR), Danielle Fenech (ECR, notes on CCA on August 25), Takaya Akuhori, Ewan Barr, Ross Burns, Wim van Cappellen, Linjie Chen, Xuelei Chen, Aaron Chippendale, David DeBoer, Sean Dougherty, Philip Edwards, Wael Farah, Bi-Qing For, Alyson Ford, Guillermo Gimenez de Castro, Yashwant Gupta, Leonid Gurvits, Gregory Hellbourg, Shinji Horiuchi, Hiroshi Imai, Melanie Johnston-Hollitt, Hideyuki Kobayashi, Yuri Kovalev, Alex Kraus, Kokei Kurukara, Joseph Lazio, Bin Li, Liroy Lourenco, C. Luywang, Dave MacMahon, Nivedita Mahesh, Hiroshi Matsuo, Viswesh Marthi, Leah Morabito, Yasuhrio Murata, Masatoshi Ohishi, Rikuto Omae, Anna Scaife, Jan-Willem Steeb, Hongming Tang, Nithyanandan Thyagarayan, Masato Tsubai, Tasso Tzioumis, Yuri Uno, Yu Wang, Gundolf Wieching, Ivy Wong, David Woody, Yihua Yan, Shinara Yoshiura, Haiyang Zhang, Xiaohang Zheng

Attendees – online
Mohammed Darwish, Assaf Horesh, Christopher Risacher

1. Elections of Commission Officers

During the first CCA, the candidates for the election of Vice-Chair and ECR were given the opportunity to introduce themselves. After these introductions, the Official Members of the Member Committees could cast or alter their vote. These votes were validated and counted by the URSI Secretariat.

Prof. Yashwant Gupta (NCRA, India) was elected Vice-Chair for a 3-year term starting at the end of the GASS 2023. Dr. Mohammed Darwish (NRIAG, Egypt) was elected as ECR for a 6-year term starting at the end of the GASS 2023.
Prof. Stefan Wijnholds became the new Chair and Danielle Fenech remained ECR.
We are grateful for the efforts by Douglas Bock and Jacki Gilmore over the last six years as, respectively, (Vice-)Chair and ECR.

2. Triennium report

The triennium report was presented to the attendees by Douglas Bock.
An explanation was given about the composition of the Commission budget, which consists of a fixed part to support the Commission Officers and a variable part based on the number of contributions to the scientific program of the flagship meetings (AT-RASC, AP-RASC, GASS).

3. Review of Terms of Reference

The Terms of Reference (ToR) of Commission J were reviewed and approved unaltered. The ToR of Commission J therefore remain:

The activities of the Commission include:
- Observation and interpretation of cosmic radio emissions from the early universe to the present epoch, and
- Radio reflections from solar system bodies.

Emphasis is placed on:
- The promotion of science-driven techniques for making radio-astronomical observations and data analysis;
- Support of activities to protect radio-astronomical observations from harmful interference.

4. Meeting format

Within Commission J, the format of future meetings (online, hybrid, physical) was heavily debated. Douglas Bock briefly introduced the topic, recognising both the advantages and disadvantages of the hybrid meeting format for URSI flagship meetings. The attendees provided the following comments and advice:
- Variations are possible on the hybrid theme. Instead of full-interactive, there are cheaper options like streaming the sessions and offering a Slack channel to answer questions.
- Making the meeting accessible to people that are not able to come to the meeting (mainly due to cost) is important (low-income countries), but also women (pregnancy, childcare during traveling, often during the weekend).
- Learn from experience from other societies.
- Streaming as a minimum.
- A low-threshold form of online participation could also raise interest with people who are new to URSI that then may decide to attend in person in the future, i.e., this option does not just pull people away from the meeting.

- A hybrid component helps participants who need to cancel due to visa issues.
- It is about facilitating, not professional grade movie recording.

The various scenarios for providing an online component to a physical meeting were discussed with the board. The URSI secretariat will look at the possibilities available at the venue of the AT-RASC 2024 and the budgetary implications. These will be presented to the Board to take a decision on the possibilities for remote participation and the associated conference fee structure.

5. Updates and status of Working Groups

Inter-Union (URSI-IUA) Working Group Historical Radio Astronomy
Leonid Gurvits gave a presentation on the activities of this Working Group.
In his General Lecture, Ron Ekers mentioned Jocelyn Bell, who should have received a Nobel Prize. Are there more examples? If you know an example, please let the Working Group know. Should we perhaps organise a session on the efforts by people "behind the scenes" of the major discoveries?

Working group leadership for the triennium 2023-2026:
Chair: R. Schilizzi (UK)
Vice-Chair: L. Gurvits (Netherlands)
Past Chair: R. Wielebinski (Germany)
Secretary: K. Kellermann (USA)

Inter-Union (URSI-IUCAF) Working Group on Radio Science Services
Masatoshi Ohishi gave a presentation on the activities of this Working Group on behalf of the current chair, Harvey Liszt.
IUCAF is advised to investigate the impact of the Genesis project, for which people are currently being hired.
The IUCAF website is quite old. It would be nice if it would provide updates on ongoing activities and be accessible for interested people. People who are interested are referred to Harvey Liszt.

Working group leadership for the triennium 2023-2026:
Co-Chair for IUCAF and URSI: H. Liszt (USA)

Inter-Commission (EFGHJ) Working Group on RFI mitigation and characterisation
No activity, perhaps contact organisers of the RFI workshop series to activate this Working Group again? Link to dark and quite skies Working Group and other related Working Groups of IAU?
After the GASS, the Commission E Working Group on Spectrum Management was

transformed into an Inter-Commission (EBCFJ) Working Group led by Flavio Miguel da Silva Jorge. This Working Group is co-chaired by Kaushal Buch and Tasso Tzioumis on behalf of Commission J. Flavio Miguel da Silva Jorge also became a co-chair of the Working Group on RFI mitigation and characterisation on behalf of Commission E and has taken up the coordination between these two Inter-Commission Working Groups.

Working group leadership for the triennium 2023-2026:
Co-Chair for Commission E: Flávio Miguel da Silva Jorge (Portugal)
Co-Chairs for Commission F: D. Le Vine (USA) and A.K. Mishra (South Africa)
Co-Chair for Commission G: T. Bullett (USA)
Co-Chair for Commission H: H. Rothkaehl (Poland)
Co-Chairs for Commission J: R. Bradley (USA)

Inter-Commission (GJFEH) Working Group on Interdisciplinary Space Weather
This Inter-Commission Working Group is led by Commission G. On behalf of Commission J, the Working Group is co-chaired by Pietro Zucca.

Working group leadership for the triennium 2023-2026:
Co-Chair for Commission G: I. Stanislawska (Poland)
Co-Chair for Commission J: P. Zucca (The Netherlands)
Co-Chair for Commission H: J. Lichtenberger (Hungary)

Inter-Commission (GJ) Working Group on Radioastronomy and ionosphere
After a continuing successful series of joint sessions, a new Inter-Commission Working Group was created on Radioastronomy and ionosphere. Maaijke Mevius is co-chair of this Working Group on behalf of Commission J.

Working group leadership for the triennium 2023-2026:
Co-Chairs for Commission G: C. Cesaroni (Italy) and A. Krankowski (Poland)
Co-Chair for Commission J: M. Mevius (Netherlands)

6. Technical Advisory Committee

Commission J currently does not have a Technical Advisory Committee (TAC). Please contact Stefan Wijnholds if you are interested in contributing to the TAC or have questions about it.

7. Feedback on the GASS 2023

Discussions and feedback gathered from the attendees to the CCA on Friday:

- In general, people enjoyed the (in-person) meeting, sessions and presentations were of good quality in general. It was noted that there were not many questions from the audience in some sessions, can discussion be stimulated?
- Some people felt that there were too many parallel sessions. Like at the AT-RASC 2022, we had three Commission J sessions running in parallel for several conference days. The impression is that three parallel sessions is too much. However, attracting more people while limiting the number of parallel sessions will mean that more presentations need to be presented during a poster session. A quick show of hands suggests that for ~50% of the participants, the decision to participate in an URSI flagship meeting would be sensitive to whether their work would be scheduled as oral or poster presentation.

Commission K - Electromagnetics in Biology & Medicine

The Coordinating activities meetings for Commission K were held on Monday, Wednesday and Friday – August 21, 23 and 25, from 17:30 to 18:30 Sapporo time.

Prof. Koichi Ito, Chair of Commission K 2021-2023, led the first two meetings and turned over the last meeting to Francesca Apollonio, Chair for the 2023-2026 triennium. Part of the members was on site and part on-line, reaching however an adequate number of attendees close to 30 in average for the three meetings.

1. Elections of Commission Officers

Commission K held the election for Vice Chair during the 1st meeting. Two have been the nominations:
- Lars Ole Fichte (Helmut Schmidt University, Germany)
- Maxim Zhadobov (IETR / CNRS, France)

During the first CCA meeting the candidates presented shortly themselves. Election results were ratified at Council Meeting 2 on Tuesday, 22 August. 24 Official Members voted (first choice: 1 point, second choice: 2 points, …).
We are pleased to announce that Lars Ole Fichte was elected Vice Chair of Commission K for the 2023-2026 triennium. We thank all the candidates for their generous offer to lead the Commission.

2. Results of Election of Early Career Representative

Commission K also held the election for Early Career Representative. Two young scientists were nominated including:
- Kun Li (Japan)
- Declan O'Loughlin (Ireland)

During the first CCA meeting the candidates presented shortly themselves. Election results were ratified at Council Meeting 2 on Tuesday, 22 August. 24 Official Members voted (first choice: 1 point, second choice: 2 points, …).

We are pleased to announce that Kun Li was elected new Early Career Representative for the 2023-2026 triennium. We thank all the candidates for their generous offer to lead the Commission.

3. Review of Terms of Reference

After discussing at the 2nd Commission Coordinating Activities Meeting, we submitted the finalized updates on the Terms of Reference to the URSI Secretariat.

The final version in English is as follows:
Commission K is charged with promoting research and development in the following domains:

- Physical interaction of electromagnetic fields (from static to optical) with biological systems;
- Biological and health effects of electromagnetic fields;
- Effects of electromagnetic fields due to human activity on ecosystems, biodiversity, and planetary health;
- Biological mechanisms of the effects associated with exposure to electromagnetic fields;
- Electromagnetic exposure systems, dosimetry and tissue-equivalent models;
- Monitoring and assessing the exposure to electromagnetic fields;
- Diagnostic and therapeutic applications of electromagnetic fields;
- Healthcare and rehabilitative applications of electromagnetic fields.

The final version in French is as follows:
La Commission a pour tâche de promouvoir les recherches et les développements dans les domaines suivants:

- Interactions des champs électromagnétiques (des champs statiques au domaine optique) avec les systèmes biologiques au niveau de la physique;
- Effets biologiques et sur la santé des champs électromagnétiques;
- Effets des champs électromagnétiques générés par l'homme sur les écosystèmes, la biodiversité et la santé de la planète;
- Mécanismes à la base des effets biologiques des champs électromagnétiques;
- Systèmes expérimentaux d'exposition aux champs électromagnétiques, dosimétrie et modèles équivalents à des tissus;
- Suivi et évaluation de l'exposition aux champs électromagnétiques;
- Applications diagnostiques et thérapeutiques des champs électromagnétiques;
- Applications des champs électromagnétiques dans les soins de confort et la réadaptation physique et fonctionnelle.

4. Any changes/confirmation in Working Groups and other organizations

For the moment Commission K has not set up any Working Group, but at the last Coordinating Committee meeting of Saturday 26 August it has received an invitation by Comm B which decided the following:

Comm B would like to invite all commissions to create/discuss a joint working group on "5G/6G" (John Volakis and Ludger Klinkenbusch). Commission K is in favour of joining this WG.

5. Technical Advisory Committee

Commission K has defined in the past one Committee which helps the Officers in leading the activities of the Commission. This Committee is the Technical Advisory Committee (TAC) which is actually composed by the present Officers plus:

• Koichi Ito (Japan) <immediate past Chair>
• Kensuke Sasaki (Japan) < immediate past ECR >
• Michal Cifra (Czech Republic)
• Raquel Conceição (Portugal)
• Lourdes Farrugia (Malta)
• Lena Kranold (Switzerland)
• Niels Kuster (Switzerland)
• Alexandre Legros (Canada)
• Micaela Liberti (Italy)
• Lluis Mir (France)
• Puyan Mojabi (Canada)
• Azadeh Peyman (UK)
• Frank Prato (Canada)
• Masao Taki (Japan)
• Vijayalaxmi (USA)
• Jianqing Wang (Japan)
• Joe Wiart (France)
• Tongning Wu (China)
• Maxim Zhadobov (France)

6. Preparation of Future Meetings/Identification of meetings to be supported (cfr. Commission budget)

The Commission anticipates providing support to URSI centered meetings in the coming triennium. As funds permit, this includes young scientist support to attend the flagship meetings. Funds permitting, we may also support relevant conferences such as BioEM, the IEEE IMBioC, the IEEE AP-S/URSI.

7. Report and comments on the scientific program of the Commission for the current GASS

Commission K organized 17 scientific sessions, 4 joint sessions led by Commission K for a total of 154 papers submitted. Moreover, it organized a Tutorial inviting prof. A.

Costanzo from Alma Mater Studiorum Università di Bologna, Italy on the topic "Energy-Autonomous Wearable Sensors for Biomedical Sensing". The talk had a very good attendance.

The list of GASS sessions includes:

day	session	Conveners	Chairs	Attendees
23 Aug	K01	F. Poullettier de Gannes, M Simko	L M Mir, C Consales* (*in place of F Apollonio)	28
22 Aug	K02	F Apollonio, M Cifra	F Apollonio, L M Mir	30
23 Aug	K03	L M Mir, F Apollonio	L M Mir, F Apollonio	20
22 Aug	K04	L M Mir, C Consales	L M Mir, C Consales	30
21 Aug	K05	A Legros, N Kuster, M Liberti	N Kuster, F Apollonio	50
24 Aug	K06	K Yamazaki, I Laakso, Y Diao	K Yamazaki, I Laakso, Y Diao	20
26 Aug	K07	T Wu, K Li, G Sacco	K Li, G Sacco	20
21 Aug	K08	J Keshvari, K Sasaki	K Sasaki, Y Shimizu	40
25 Aug	K09	J Wiart, T Onishi, T Samaras	J Wiart, T Onishi;	29
23 Aug	K10	J Karpowicz, S Y Sachiko, S D'Agostino	J Karpowicz, S Y Sachiko, S D'Agostino	24
22 Aug	K11/K13	L Farrugia, K Saito, K Grenier, E Porter	L Farrugia, S Kazuyuki	40
23 Aug	K12	M Colella, S Y Sachiko, A Hirata	M Colella, S Y Sachiko	20
26 Aug	K14	J Gomez-Tames, A Kiourti, K Ito	Gomez-Tames Jose, Rodriguez-Duarte David Orlando	20
21 Aug	K15/1-2	N Tomoaki, E A Rashed, E Porter	N Tomoaki, I Laakso	50
22 Aug	K15/3	N Tomoaki, E A Rashed, E Porter	N Tomoaki, I Laakso	40
24 Aug	K16	L Farrugia, L Caramazza	L Farrugia, L Caramazza	43
25 Aug	K17/1-2	K Ito, K Kuroda, Y Zheng	K Kagayaki, K Daisuke	30

List of the Joint Sessions

day	session	Conveners	Chairs
21 Aug	KA	J Wiart, K Sasaki	J Wiart, K Sasaki
23 Aug	KB/1-2	P Mojabi, S Kidera, S Bojja Venkatakrishnan, E Topsakal	S Kidera, S Bojja Venkatakrishnan
24 Aug	KB/3	P Mojabi, S Kidera, S Bojja Venkatakrishnan, E Topsakal	S Kidera, S Bojja Venkatakrishnan
25 Aug	KD	L Mucchi, H Tanaka, D Anzai	H Tanaka, D Anzai
24 Aug	KE/1-2	J Wang, T Hikage, C Carobbi	W Jianqing
25 Aug	KE/3	J Wang, T Hikage, C Carobbi	W Jianqing

8. Proposed sessions and conveners for AT-RASC 2024

The first proposal for sessions for AT-RASC 2024 is as follows:

	Title	Proposed conveners
K01	Biological effects and related exposure systems for RF/MMW EMF	TBD, L Fichte
K02	Modeling molecular and cellular targets in bioelectromagnetics studies	M Cifra, L Caramazza
K03	Monitoring and manipulating cells and tissues with EM Fields	LM Mir, F Apollonio
K04	Characterization of dielectric and thermal parameters in tissues and cells	L Farrugia, E Porter, K Grenier
K05	Dosimetry & Exposure Assessment	I Laakso, K Li, M Zhadobov, K Sasaki, G Sacco
K06	Monitoring EMF Exposure from emerging technologies	J Wiart, M Zhadobov
K07	EMF occupational assessment of exposure: measurements and numerical dosimetry	J Karpowicz, S D'Agostino, G Schmidt
K08	Biomedical applications of EMF	M Liberti, L Farrugia, R Conceição
K09	Non invasive for brain stimulation	M Colella, A Cassarà
K10	Healthcare and Rehabilitative Applications	K Ito, A Kiourti, J Gomez-Tames
K11	Innovative EMF based biomedical applications	L Farrugia, L Caramazza, E Porter
K12	Open Session	Comm K Officers

Index	Title	Proposed conveners
KB	Electromagnetic Biomedical Imaging	P Mojabi, R Conceição, K Shouhei, E Porter
KD1	RF wearable devices for body area network: from numerical modeling to manufacturing	M Colella, G Paolini
KD2	Smart IoT for body area network	D Anzai, T Hiroshima

The proposal for a Tutorial is the following :

Index	Title	Proposed conveners
K	Telediagnostic and Telemedicine	L O Fichte, TBD

9. Contact information for new Commission K Officers (2023-2026)

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10. Other business
None

Resolutions and Recommendations of the Council

U.1. Membership dues

The URSI Council,

Considering,

1. that the previous Council's decisions specify that Member dues shall be adjusted for inflation each year;
2. that annual inflation in many Member Committees has been in the range of 5 % to 10 % over the past triennium;
3. that Member Committee dues have increased at only a modest 1% per year since 2017, and this no longer reflects the current situation;

resolves

that URSI shall increase the membership dues by 5% for 2024 dues and a maximum of 5% for both the 2025 and 2026 membership dues.

U.2. Membership Status of Argentina, Bulgaria, Chile, Greece, and Singapore

The URSI Council,

Considering,

1. that Argentina, Bulgaria, Chile, Greece, and Singapore are currently Associate Members of URSI;
2. that URSI received a request from Argentina, Bulgaria, Chile, Greece, and Singapore requesting their wish to continue their current status;
3. that URSI would like to continue relations with them;

resolves

to maintain Argentina, Bulgaria, Chile, Greece, and Singapore as Associate Members of URSI.

R.3. Membership Status of Iraq and Ukraine

The URSI Council,

Considering,

1. that Iraq and Ukraine are currently Associate Members of URSI;
2. that URSI would like to continue relations with them;

resolves

to maintain Iraq and Ukraine as Associate Members of URSI.

U.4. Resolution on the continuation of the Strengthening of the URSI-ITU Inter-Union Working Group

The URSI Council,

considering

that at this URSI General Assembly a report was provided to Council describing work carried out in producing a draft of the Terms of Reference and working principles,

resolves

that the Board shall continue to work on the formation of this URSI-ITU Inter-Union Working Group that will:

1) encourage awareness of, contribution to, and participation in ITU-R Study Group and Working Party activities, and;
2) stimulate and coordinate studies, collaborations, and symposia that will address relevant ITU-R questions by promoting direct communications between URSI Scientific Commissions and ITU-R Study Groups, Working Parties and other relevant sub-ordinate groups.

U.5. 37th General Assembly and Scientific Symposium

The URSI Council,

Having considered the invitations for the 37th General Assembly and Scientific Symposium that have been submitted by the URSI Member Committees from Canada (Ottawa and Vancouver), China SRS (Taipei) and Singapore,

resolves

a. To accept the invitation of Singapore to hold the XXXVIIth General Assembly in Singapore in August 2029;
b. To record its thanks to the Member Committees of Canada and China SRS for their invitations.

U.6.Vote of thanks to the Japanese Member Committee

The URSI Council,

resolves unanimously to convey to the Japanese Member Committee its warm thanks and appreciation for the organization of the XXXVth General Assembly and Scientific Symposium in Sapporo.

Résolutions et Recommandations du Conseil

U.1. Cotisations des membres

Le Conseil de l'URSI,

considérant,

1. que les décisions du Conseil précédent précisent que les cotisations des membres doivent être rajustées en fonction de l'inflation chaque année;
2. que l'inflation annuelle dans de nombreux comités membres a été de l'ordre de 5 % à 10 % au cours de la dernière période triennale;
3. que les cotisations des comités membres n'ont augmenté que d'un modeste 1 % par année depuis 2017, ce qui ne reflète plus la situation actuelle;

décide,

que l'URSI augmentera les cotisations de ses membres de 3,5% par an sur la prochaine période triennale.

U.2. Statut de membre de l'Argentine, de la Bulgarie, du Chili, de la Grèce et de Singapour

Le Conseil de l'URSI,

considérant,

1. que l'Argentine, la Bulgarie, le Chili, la Grèce et Singapour sont actuellement membres associés de l'URSI ;
2. que l'URSI a reçu une demande de l'Argentine, de la Bulgarie, du Chili, de la Grèce et de Singapour lui demandant de maintenir son statut actuel ;
3. que l'URSI souhaite poursuivre ses relations avec eux ;

décide,

de maintenir l'Argentine, la Bulgarie, le Chili, la Grèce et Singapour comme membres associés de l'URSI.

U.3. Statut de membre de l'Iraq et de l'Ukraine

Le Conseil de l'URSI,

considérant,

1. que l'Iraq et l'Ukraine sont actuellement membres associés de l'URSI;
2. que l'URSI souhaite poursuivre ses relations avec eux;

décide,

de maintenir l'Irak et l'Ukraine comme membres associés de l'URSI.

U.4. Résolution sur la poursuite du renforcement du Groupe de travail inter-Unions URSI-UIT

Le Conseil de l'URSI,

considérant

qu'à cette Assemblée Générale un rapport a été fourni décrivant le travail mené pour produire une version préliminaire des Termes de Référence et des principes de travail, décide

que le Bureau continuera à travailler sur la constitution de ce Groupe de Travail Inter-Union URSI-UIT qui :

1. encouragera la reconnaissance du Groupe d'Etude UIT-R et de ses activités, ainsi que les contributions et la participation à ce Groupe et à ses activités ;
2. stimulera et coordonnera les études, les collaborations et les symposiums qui concerneront des questions relevant de UIT-R, par la promotion de communications directes entre les Commissions Scientifiques de l'URSI et les Groupes d'Etude UIT-R, les Groupes de Travail et autres sous-groupes pertinents.

U.5. 37ème Assemblée Générale et Symposium Scientifique

Le Conseil de l'URSI,

ayant examiné les invitations à l'organisation de la la 37ème Assemblée Générale et Symposium Scientifique qui ont été soumises par les Comités Nationaux de l'URSI du Canada (Ottawa et Vancouver), de la Chine SRS (Taipei) et de Singapour,

décide,

1. d'accepter l'invitation du Comité National de l'URSI de Singapour à organiser la 37ème Assemblée Générale à Singapour en août 2029 ;
2. de remercier les Comités Nationaux de l'URSI du Canada et de la Chine SRS pour leurs invitations.

U.6. Vote de remerciements au Comité national du Japon

Le Conseil de l'URSI,

décide à l'unanimité de transmettre au Comité national du Japon ses remerciements chaleureux et son appréciation pour l'organisation de la XXXVème Assemblée Générale et Symposium Scientifique à Sapporo.