

**UNION RADIO-SCIENTIFIQUE INTERNATIONALE  
INTERNATIONAL UNION OF RADIO SCIENCE**



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

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# INTRODUCTION

## ACKNOWLEDGEMENT

The XXVIIth General Assembly of URSI was held at the Vigyan Bhavan in New Delhi, India, from 23 to 29 October 2005. In introducing this account of the records, it seems appropriate to offer the warmest thanks of the Union to:

- the Indian Committee for URSI;
- the Indian Organising Committee;
- the Coordinator and the Associate Coordinator of the Scientific Programme;
- the Chairs and Vice-Chairs of URSI Commissions, 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 the United States and the Royal Society of London.
- to the sponsors of this meeting : Council of Scientific and Industrial Research (CSIR), Govt. of India, New Delhi, India; Defence Research and Development Organization (DRDO), Ministry of Defence, Govt. of India, New Delhi, India; Department of Science and Technology (DST), Govt. of India, New Delhi, India; Indian Space Research Organization (ISRO), Govt. of India, Bangalore, India; Indian National Science Academy, New Delhi, India.

## OUTLINE OF THE ASSEMBLY

The URSI Council - which is composed of the official representatives of the Member Committees - met in New Delhi on four occasions between 23 and 29 October 2005. 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 1531 papers (815 oral communications and 716 posters of which 500 were actually presented), had been prepared for the 1131 registrants (among them 143 official “Young Scientists”). The programme consisted of 3 General Lectures, 2 Public Lecture, 10 Tutorials, 74 Commission Sessions and 30 Joint Sessions.

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

- \* Solar Power Satellites
- \* UWB Systems and Spectrum Management
- \* Impacts of Extreme Solar Disturbances on the Earth's Near-Space Environment

Two one-hour General Lectures were presented:

- \* Electronic Connectivity for Billion People
- \* 100 Years of Radio Science in India

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 role of plasmon-polaritons in the optical properties of thin metal films and nanostructures (Commission A)
- Advances in Computational Models for the Design of Planar and Compact Antennas (Commission B)
- Ultrawideband Communications; Signal Processing for Analog Smart Antennas (Commission C)
- Nanoelectronics (Commission D)
- High Power Sources and Intentional EMI: From the Generation of HPEM to their Use and Consequences (Commission E)
- Spaceborne Radar Mapping of Boreal Forests (Commission F)
- Coherent Radar Imaging (Commission G)
- Tracking Energetic Phenomena in the Solar Corona and Interplanetary Space using Radio Observations (Commission H)
- Low-Frequency Imaging (Commission J)
- Assessment of Health Effects associated with EMF by WHO, IARC and ICNIRP (Commission K)

## **LIST OF URSI OFFICERS AND OFFICERS OF MEMBER COMMITTEES**

Following the elections at the XXVIIIth General Assembly in New Delhi, India, 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.

### **HONORARY PRESIDENTS**

Prof. W.N. Christiansen (Australia)  
Prof. W.E. Gordon (USA)  
Dr. A.P. Mitra (India)  
Prof. J. Van Bladel (Belgium)

### **BOARD OF OFFICERS**

President: Prof. François Lefeuve (France)  
Past President: Prof. Kristian Schlegel (Japan)  
Vice-Presidents: Prof. Gert Brussaard (the Netherlands) (Treasurer)  
Prof. Chalmers M. Butler (USA)  
Prof. Martti Hallikainen (Finland)  
Dr. Phil Wilkinson (Australia)  
Secretary General: Prof. Paul Lagasse (Belgium)

### **SCIENTIFIC COMMISSIONS AND COMMITTEE**

Commission A:

Chair : Dr. Stuart Pollitt (U.K.)  
Vice-Chair : Dr. Parameswar Banerjee (India)

Commission B:

Chair : Prof. Lotfollah Shafai (Canada)  
Vice-Chair : Dr. Karl J. Langenberg (Germany)

Commission C:

Chair : Dr. Andreas F. Mölisch (U.S.A.)

Vice-Chair : Dr. Takashi Ohira (Japan)

Commission D:

Chair : Dr. Frédérique de Fornel (France)

Vice-Chair : Prof. Franz Kärtner (USA)

Commission E:

Chair : Prof. Flavio G. Canavero (Italy)

Vice-Chair : Mr. Christos Christopoulos (U.K.)

Commission F:

Chair : Prof. Piotr Sobieski (Belgium)

Vice-Chair : Dr. Madhukar Chandra (Germany)

Commission G:

Chair : Prof. Paul S. Cannon (U.K.)

Vice-Chair : Dr. Michael Rietveld (Norway)

Commission H:

Chair : Dr. Richard B. Horne (U.K.)

Vice-Chair : Prof. Yoshiharu Omura (Japan)

Commission J:

Chair : Prof. Richard Schilizzi (The Netherlands)

Vice-Chair : Prof. Subra Ananthakrishnan (India)

Commission K:

Chair : Dr. Frank Prato (Canada)

Vice-Chair : Prof. Guglielmo D'Inzeo

Scientific Committee on Telecommunications :

Chair : Mr. Martin P.M. Hall (U.K.)

## **STANDING COMMITTEES**

Standing Finance Committee

Chair : Prof. Susan K. Avery (USA)

Standing Publications Committee

Chair : Dr. W. Ross Stone (USA)

Standing Committee on Developing Countries

Chair : Dr. A.P. Mitra (India)

Standing Committee on Young Scientists

Chair : Prof. H. Matsumoto (Japan)

Long Range Planning Committee

Chair : Prof. U.S. Inan (USA)

Scientific Programme for the next URSI General Assembly  
Coordinator : Dr. M.K. Goel (India)  
Associate Coordinator : Prof. P.L.E. Uslenghi (USA)

## **URSI REPRESENTATIVES ON OTHER SCIENTIFIC ORGANISATIONS**

- COSPAR (Committee on Space Research):  
Dr. Z. Klos (Poland)
- FAGS (Federation of Astronomical and Geophysical Data Analysis Services):  
Dr. P. Wilkinson (Australia)
- ICSU (International Council for Science):  
Prof. F. Lefeuvre (France)  
Prof. K. Schlegel (Germany)
- ICSU Panel on World Data Centres (Geophysical and Solar) :  
Dr. D. Bilitza (USA)
- IGBP (International Geosphere-Biosphere Programme) :  
Dr. P. Bauer (France)  
Dr. A.P. Mitra (India)
- ISES (International Space Environment Service) :  
Dr. D. Boteler (Canada)(Director), R. Pirjola (Finland, Com. E), Dr. S. Pulnits (Mexico, Com. G), Dr. P. Wilkinson (Australia)
- ICG (International Committee on Global Navigation Satellite Systems  
Prof. G. Brussaard (Netherlands)
- IUCAF (Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science) : Dr. W. Van Driel (France,Com. J.)(Chairman), Prof. S.C. Reising (USA, Com. F), Dr. U. Shankar (India, Com. J), Dr. A.T. Tzoumis (Australia, Com. J), Dr. W. Swartz (USA, Com. G)
- IUGG / IAGA (International Union of Geodesy and Geophysics / International Association of Geomagnetism and Aeronomy) :  
Prof. F. Lefeuvre (France)  
Prof. K. Schlegel (Germany)
- SCAR (Scientific Committee on Antarctic Research) :  
Dr. M. Clilverd (U.K.)
- SCOR (Scientific Committee on Oceanic Research) :  
Dr. M. Chandra (Germany)
- SCOSTEP (Scientific Committee on Solar-Terrestrial Physics) :  
Prof. C. Hanuise (France)
- WHO EMF (World Health Organisation-Electromagnetic Field Programme)  
Prof. B. Veyret (France)

## MEMBER COMMITTEES

AUSTRALIA	President : Dr. P. Wilkinson
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BRAZIL	President : Prof. P. Kaufmann Secretary : Prof. M.S. Assis
BULGARIA	President : Prof. N. Sabotinov Secretary : Prof. B.B. Shiskov
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HUNGARY	President : Prof. L. Zombory Secretary : Dr. L. Nagy
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UNITED KINGDOM	President : Dr. H.J. Strangeways Secretary : Dr. R.J. Watson
USA	President : Prof. U.S. Inan Secretary : Prof. P.L.E. Uslenghi

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CHILE	President : Prof. J. May
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## **URSI SECRETARIAT**

Secretary General :	Prof. Paul Lagasse
Assistant Secretary General :	Prof. Femke Olyslager
	Dr. W. Ross Stone (Publications)
Secretary :	Ms. Inge Heleu (Executive Secretary)
	Ms. Inge Lievens (Administrative Secretary)

## **OPENING MEETING**

The Opening Ceremony was held on Sunday 23 October 2005 at the Siri Fort Auditorium.

The Ceremony started with the National Anthem of India, after which the Honorary Presidents, Officers of the URSI Board and primary speakers took their seats on stage.

Dr. A.P. Mitra, Chair of the National Organising Committee, first welcomed the attendants and the primary speakers and then gave the floor to Prof. K. Schlegel.

### **WELCOME BY THE CHAIR OF NATIONAL ORGANISING COMMITTEE**

Dr. A.P. Mitra

His Excellency Professor A.P.J. Abdul Kalam, President of India  
Mr. Kapil Sibal, Minister of Science and Technology  
Professor Kristian Schlegel, President of the International Union of Radio Science  
Professor Paul Lagasse, Secretary General of URSI  
Professor R.A. Mashelkar, President, Indian National Science Academy  
Professor Govind Swarup, Vice-Chairman of the National Organising Committee  
Professor Vikram Kumar, Chairman, Local Organising Committee  
Dr. P. Banerjee, Secretary, Local Organising Committee  
Distinguished participants , Ladies and Gentlemen,

It is a great honour to welcome the President of India – a distinguished scholar and technologist – to this XXVIIIth Assembly of the International Union of Radio Science. Over 1300 delegates have come from over nearly 60 countries, some with their spouses. We welcome their participation. This Assembly is held for the first time in India, indeed for the first time in Developing Asia and only the second time in its long history in a developing country. The ten commissions of this international body cover areas vital to the development of any country, especially those like India where a communication revolution is in full swing and offer opportunities for connectivity to remote and difficult areas, for rural upliftment and for disaster management.

The increasing use of mobile communication, the special advantages of radio remote sensing of land, ocean, atmosphere and of the extraterrestrial objects; and the interaction of the electromagnetic fields with biological systems are increasingly attracting serious attention.

India has a long history of quality research in Radio Science for over a hundred years. It started with the legendary work of Sir Jagdish Chandra Bose whose work on Production, Characterization and use of Millimeter Waves and the experiment on communication of such waves through three walls in Calcutta Town Hall was perhaps the real beginning of Radio Science.

We would like to dedicate this Assembly to the memory of this great pioneer.

As a past president of URSI and one of its Honorary Presidents, I suggest three major initiatives for the future. One is on the encouraging increasing participation from the developing countries – now covering only a few: the second is cementing a link between radio scientists and telecommunication engineers. The increasing isolation of these two communities even in the industrialized world can only slow down the progress in this area. The third is providing a mechanism for sustained participation of young radio scientists in radio science related activities in between the assemblies.

On the first I had suggested establishment in India of a Centre on Radio Science for developing Asia in association with international bodies. On the second I would suggest another discussion conference involving academia and industries of the type organized by URSI in Corsendonck in 1987.

Ladies and gentlemen, this assembly is being held outside the normal dates of August -September during a period of major national festivals – Dusserah, Diwali, Id. We hope those coming from outside this subcontinent will have a flavour of real India during this holy month.

## **ADDRESS BY THE PRESIDENT OF URSI**

Prof. K. Schlegel

Honourable President of India, Dr. Abdul Kalam,  
Minister of Science and Technology and Ocean Development, Dr. Kapil Sibal,  
Chairman of the National Organizing Committee, Dr. A. P. Mitra  
President of the Indian National Science Academy, Professor R.A. Mashelkar  
Chairman of the Local Organizing Committee, Dr. Vikram Kumar  
Convenor of the Local Organizing Committee, Dr. P. Banerjee  
Vice Chair of the National Organising Committee, Professor Govind Swarup,  
Ladies and Gentlemen,  
Dear Colleagues,

On behalf of URSI I wish to thank Professor Mitra for the warm welcome he has extended to us. We are very thankful to the National Organizing Committee and the Local Organizing Committee for having invited us to hold our 28<sup>th</sup> General Assembly here in India, in the fascinating city of Delhi.

We are indeed very proud to be in a country with such a rich scientific history. We all know that ancient Indian mathematicians introduced the concept of zero about 3000 years ago, together with the decimal system. Less well known is their pioneering work on square and cube roots, algebraic techniques and algorithms. Some science historians have even called India the “mother of our mathematics.”

Similarly remarkable are the achievements of ancient Indian astronomers, dating back to 4000-year-old Rig Veda. One of these, the famous Aryabhatta, who lived in the 5<sup>th</sup> century, propounded the heliocentric concept almost 1000 years before Copernicus. Other Indian astronomers calculated the circumference of the Earth to a remarkable accuracy, and were able to predict eclipses, and understood their nature.

Making a large step through centuries towards radio science, this subject was treated in India only a few years after the generation of electromagnetic waves was demonstrated by Heinrich Hertz, in 1888. The famous scholar Jagadis Chandra Bose experimented with radio waves in various ways from 1894 on. If URSI and its Commissions had existed in those times, Bose’s work could have been associated with at least four Commissions: with Commissions B and F, for his experiments with microwaves; with Commission D, through his invention of a solid-state detector for radio waves, in 1904; and with Commission K through his experiments of the actions of radio waves on plants. Bose’s work was continued by Sisir Kumar Mitra, whom several of our older colleagues may remember from his famous book, *The Upper Atmosphere*. Apart from his various research activities in radio science, S.K. Mitra pioneered broadcasting in India, and founded the first radio science department in this country at the University of Calcutta, in 1947. S.K. Mitra was – during his life – called the doyen of Indian radio science, a title that has now passed on to his most illustrious student, Ashesh Prasad Mitra, URSI’s esteemed Honorary President, who just spoke to you. I can only briefly touch on the numerous Indian achievements in radio science, but we are looking forward to a detailed public lecture on “100 years of Radio Science in India” on Thursday by Prof. Radhakrishnan.

Today one of the major issues of radio science in India is certainly “rural communication.” The already achieved goals and future programmes are impressive. In our first public lecture, we will have the honour to listen to Dr. Abdul Kalam, the Honourable President of India, who will give us an overview in his presentation, “Electronic Connectivity for a Billion People,” on Tuesday.

As at every General Assembly, we will hear the newest results and achievements in various areas of radio science. We are very thankful to the Scientific Programme Committee and the Coordinating Committee, which have compiled an interesting and very promising programme, and we are looking forward to the lectures. One of the

highlights will certainly be the three General Lectures, covering such interesting topics as Metamaterials, Solar Power Satellites, and Solar Disturbances in the Earth's Atmosphere. That radio science is at the forefront of science is evident from this year's Nobel Prize for Physics. It was awarded for achievements in ultra-stable frequency synthesis and measurements, a topic that clearly falls into URSI's Commission A. We can be proud that one of the Nobel Laureates, Dr. Hall, is a member of the US National Committee.

URSI's most important mission is to promote radio science, and there is no better way than to support promising young scientists in this field. Our Young Scientist programme has a long tradition. For this GA, it was possible to award a total number of 144 Young Scientists, the largest number we ever invited. From these total 144, 37 are from developing countries, 30 from India, and 29 are female. We gratefully acknowledge the support of the Japanese and US Member Committees and of the UK Royal Society.

Ladies and Gentlemen,

I have now the sad duty to record the passing of distinguished colleagues during the last triennium:

Mrs. Yela Stevanovitch of Belgium passed away on 10 August 2004 at the age of 77. Mrs Stevanovitch started with URSI in January, 1958, as an interpreter, and later became Administrative and Executive Secretary until the end of 1990. She was most dedicated to URSI, spoke six languages, and was often referred to as the walking dictionary of URSI history. Yela supported Secretary Generals and many Officers, and she will be remembered by many as a gourmet cook who ran the International Union of "Gastronomy."

Prof. Leo Felsen from the US died just four weeks ago. Professor Felsen was associated with several Commissions and had branched out into wave physics, optics, acoustics, submerged elastic structures, and seismology in some three hundred fifty publications. Professor Felsen received honorary doctorates from five universities in Denmark, Germany, Italy, Turkey, and the United States, and several distinguished awards, including URSI's Balthasar van der Pol Gold Medal.

Dr. Alain Glavieux of France, Vice-Président of Commission C in France. Prof. Dimitar Mishev of Bulgaria, former President of the Bulgarian URSI Committee. Prof. Branco Popovic of the former Yugoslavia was President of the URSI Committee in Yugoslavia.

Prof. F. Louis H.M. Stumpers of the Netherlands was a former Chairman of Commissions B, C and E, URSI Vice-President from 1975-81, and URSI Honorary President since 1990.

Prof. Stan Stuchley of Canada, who is survived by his wife Maria Stuchley, our first lady Vice-President. She was Co-founder together with Prof. J. Bach Andersen of URSI Commission K, in 1990.

Prof. Umirzak Makhmutovich Sultangazin, President of the URSI Committee in Kazakhstan, died on 23 May 2005 after long illness. He was Director of Space Research Institute in Almaty, Kazakhstan.

Prof. Vaclav Zima of Czech republic, former Vice-Chair and Chair of Commission C, and former Vice-President of URSI. Due to the efforts of Václav Zima, the URSI Committee in Czechoslovakia was restored in 1966; at that time, it was the sole member of the Eastern Alliance. Professor Zima mastered the three fundamental pillars of radio science: field theory, circuit theory and signal theory. The 1990 URSI GA was held in Prague, thanks to his initiative and efforts.

We also mourn these distinguished colleagues :

- Anthony Breed and Elisabeth Essex of Australia,
- Pierre Cugnon, P.J. Melchior and André Maenhout of Belgium
- Gunther Kesel, Hans Pöverlein and Gerhard Rose of Germany,
- B.R. Nag of India
- R. Mazar of Israel
- Guglielmo D'Ambrosio and Roberto Tiberio of Italy
- Matsuichi Yamada of Japan
- Mel Maundrell and Werner Siegfried Weiglhofer of the United Kingdom,
- William Ross Adey, Larry Brace, Nathaniel C. Gerson, Leslie C. Hale, Louis Heynick, Geoffrey Hyde, Jerome Krupp, Charles Polk, Hermann Schwan, Bob Sheldon, Charlotte Silvermann, Chen-To Tai, William Taylor, O.G. Villard and K.C. Yeh of the USA

Let us stand for a moment to pay tribute to the memory of all these friends and colleagues. Thank you.

Ladies and Gentlemen,

It is a great honour for me to preside over the 28<sup>th</sup> General Assembly and to welcome you all, particularly the great number of Indian colleagues who may be attending an URSI GA for the first time. We are very indebted to our colleagues who are mainly responsible for the organisation of this General Assembly: Professor Brussaard, Professor Behari, Dr. Banerjee, Dr Kumar and Dr. Mitra. Their efforts and the huge amount of time spent for the organisation will surely make this General Assembly a success. I also would like to acknowledge the outstanding work of our colleagues of the URSI Secretariat, Inge Heleu, Inge Lievens, Professor Paul Lagasse, Dr. Ross Stone, and Professor Femke Olyslager. They are always present in the background and contribute to the success of every GA through their great experience and dedication.

The formal inauguration of this 28<sup>th</sup> General Assembly of URSI will later be expressed by the Honourable President of India. Thank you very much!

## **ADDRESS BY THE PRESIDENT OF INDIA**

Hon'ble Sh. A.P.J. Abdul Kalam

I am delighted to participate in the inauguration of the General Assembly of the International Union of Radio Science (URSI). My greetings to the organizers, scientists, educationists, technologists and distinguished participants especially delegates coming from various parts of the planet. I particularly greet Dr. A.P. Mitra for his pioneering contribution to radio science. The domain of URSI extends throughout the solar system and out among the galaxies. I am sure that when man reaches the outermost limit of the observable universe he will be assisted by means of radio for communicating with earth from the space platform for navigation and control using electro-magnetic waves envisaged by Maxwell, J.C. Bose and Marconi about a century ago. In the eight decades of the existence of URSI, this is the first time the General Assembly is being held in New Delhi and offers an excellent opportunity to the radio scientists particularly young scientists to interact with international experts on state-of-the-art subjects. I have selected the topic "Electro Magnet Spectrum: A Friend of the Humanity".

When I see you friends, scientists and technologists of different disciplines connected with the electro magnetic spectrum, belonging to India and different countries assembled here, I am reminded of an event which took place on November 21, 1963, when I was a rocket engineer at Thumba. This was a very important day in the history of India's space programme. On that day, the first sounding rocket from India was launched from Thumba with international co-operation. The rocket and payload was integrated in the Thumba Equatorial Rocket Launching Station (TERLS).

The rocket carried the sodium vapour payload to study the upper atmospheric winds and Longmuir wave probe to study the upper atmospheric electro jet. This first experiment, paved the way for many sounding rocket experiments and TERLS was dedicated, to the international scientific community, for the unique experiments in the electro magnetic jet, as India was uniquely placed near electro magnetic equator to study electro jet and related phenomena in the ionosphere. The 1963 rocket launch from Thumba was my first experience with radio propagation and related studies. The starting of Thumba Equatorial Rocket Launching Station (TERLS) was the seeding of India's space programme. Since Prof Vikram Sarabhai was the founder for the Physical Research Laboratory at Ahmedabad which was spearheading the space research, TERLS became the laboratory for space experiments.

Here I would like to mention the contribution of Prof Vikram Sarabhai who worked on experimental cosmic ray, Dr. Homi Jegangir Bhabha who carried out research relating to cosmic radiation and Dr. Kothari who is well known for his work on ionization on matter by pressure in cold compact objects like planets. Apart from their contribution in their areas of specialization, Prof Vikram Sarabhai sowed the seeds for ISRO, Dr. Homi Jegangir Bhabha, architect of nuclear science, created the Department of Atomic Energy

and Dr. Kothari was the architect of defence science in India. We are proud of the contribution made by these three physicists in building three great scientific and technological institutions to nurture and grow science and technology in our country. Today the space programme through its sounding rocket programme and geosynchronous satellite programme is contributing for India's communication covering the major electromagnetic spectrum.

In the early days of space programme, for overseas communications, we used to have wireless communication link between Trivandrum and Mumbai for onward connectivity to the rest of the country and outside world. Similarly, in the early phase of missile programme, the communication link between Hyderabad and Chandipur, Balasore was also through wireless sets. In fact, the entire operational communication systems between Wheeler Island, Main Land, Balasore, SHAR, Down Range Ships and Car Nicobar were through HF wireless communication links. These communication facilities made me understand the value of robust noise free radio communications and the role of scientists and engineers in realizing these systems for real application.

Recently, I participated in the award ceremony of Shankar's International Children's Competition at New Delhi. There I found the visualization of a 13 year old girl named Aardhra Krishna on how the earth's civilization will look like around 3000 AD. In her imagination, the citizens are forced to migrate to Mars and have made Mars the home to a flourishing civilization. This advanced civilization, which was man made, comes suddenly under threat created by nature in the form of an asteroid of Jupiter. The asteroid from Jupiter orbit was coming towards Mars and Mars was in danger of extinction. The scientists on Mars come up with a very innovative plan of a barrage of nuclear cannons to attack the oncoming asteroid. The bombardment destroys the asteroid and the year 3000 sees a Martian civilization surviving from the fury of the nature by an innovative scientific application. What a wonderful scientific and technological thinking of the young mind? Will it all be possible without the availability of Radio science which transmits large amount of information encompassing the entire solar system? When I was admiring this imagination of the young student, a real time space experiment took place that gave some meaning to the imagination of the youth.

On 4th July 2005 one important event took place in space. That was the impact of the NASA spacecraft called deep impact smashing into the comet Tempel-I, with enough force to create football stadium sized crater with a depth of a 14 storey building. The spacecraft was navigated through a ground control system by an Indian, Shyam Bhaskaran - the deep impact travelled 431 million kms in 172 days escaping from the earth orbit and intercepted the comet at a straight distance from earth at 134 million km. The comet was orbiting around the Sun every five and half years. This is a land mark in radio communications and space exploration.

This event is an important milestone to develop standardized technique for combating asteroids which may hit the earth in future. One such large asteroid (1950 AD) is predicted with certain probability to hit the earth on March 16, 2880 AD and nearly one

third of the earth would be damaged. Like the “Deep Impact” many spacecraft will be required to be sent with high energy material particles to divert or break the asteroid to move it out of the dangerous orbit. All this is possible only if we have a reliable robust radio communication system.

One of the important areas of application of radio science in India is the discovery of binary millisecond pulsar. A pulsar is the remnant of a star which exploded, leaving behind a sphere made up of neutrons just 20 km in size but weighing more than the sun. The pulsar emits a beam of radio wave which is seen from the earth as a pulse every time it rotates. These waves are very weak, when they reach the earth. In order to detect the pulsar, one needs facilities like the Giant Meter Wave Radio Telescope (GMRT). The Tata Institute of Fundamental Research (TIFR) has built this largest Radio telescope in the world in rural area near the village of Khodad, 80 km from Pune. Because of the unique capabilities of our GMRT, scientists from all over the world, including USA and Canada, visit the centre to conduct collaborative experiments. Our scientists played a leading role in the recent discovery of a new “Binary millisecond pulsar”. Discoveries like the one that has been made by the scientists of the National Centre for Radio Astrophysics of TIFR, is an important contribution for our radio science. Particularly I greet the team lead by Prof Govind Swarup.

In many places in our planet, we experience severe earthquakes resulting in loss of life, loss of wealth and in some cases it destroys the decades of progress made by the country and its valuable civilizational heritage. India has earthquake problems periodically in certain regions. Recently, in our state of Jammu and Kashmir and the neighbouring country, there was an earth quake. US, Japan, Turkey, Iran and many other countries also suffer due to earthquakes.

Earthquake is a sub terrain phenomenon and predicting this from space observations would be a great challenge. An Earthquake phenomenon in broader sense starts to produce some precursors before the final rupture, although this precursor generating pre-rupture stage is not usually regarded as part of an earthquake. The question is whether such precursor really exists or not. So-called pre-slip envisaged in the dynamic models of earthquake source is also a good theoretical possibility but its observation appears difficult. Precise geodetic measurement by GPS may succeed in the detection of the pre-slip. It seems that electromagnetic phenomena prior to final rupture may be promising.

According to new concepts earthquakes occur when the crust reaches a critical state, emission of electromagnetic signals before final rupture is theoretically plausible, notably in the ultra low frequency (ULF) range and very low frequency (VLF) range.

It is hoped that well organized electromagnetic monitoring may provide unique observational information on the pre-slips. Atmospheric/ionospheric anomalies still remains unresolved. Post earthquake disaster recovery, communication and damage assessment are also areas where space science and communication technology can quickly make its impact. I am sure radio scientists will definitely be keen to establish the correlation between the occurrence of earthquake and the electromagnetic disturbances noticed in the specific region.

It is important to mention and acknowledge the contributions made by the Amateur radio operators called HAMs, who started using radio communication technique particularly the shortwave for long distance communication through the ionosphere during the first decade of 20th century. The experience of HAMs has been used for remote area, disaster management and emergency communication world over during the last hundred years. NASA, ISRO and other space agencies have honoured the HAMs by launching exclusive satellite for them so that they can continue to contribute in the latest trends of satellite communication. During the recent Tsunami it was a coincidence that a Government of India approved amateur radio expedition was in Andaman and was operational during the disaster and provided vital communications to the main land and Indonesia for getting latest updates on the movement of Tsunami waves and rescue operations. The contributions made by Indian HAMs in this Tsunami have been acknowledged at national and international level. Amateur radio and remote area communication are synonymous with emergency communication. It is advisable to promote this hobby to set up amateur radio stations in Panchayats offices, schools and hospitals by voluntary agencies who will be able to locate and operate the HAMs throughout the day and night, on all days. Each Panchayat must encourage this hobby and can make it as a part of the village knowledge centre. This will act as an early warning system for the village community in case of an unforeseen eventuality. At this hour, I would like to remember fondly the significant contribution of the Late Dr. Shrikant Jichkar in promoting HAMs in India.

Commercial radio communication system operates with high power, frequency diversity with large antenna to improve the reliability of communication. HAMs work with limited power under man made and natural radio interference and work in difficult circumstances. There is a lot of scope to improve narrowband communication technique multi hop HF communication to remote areas such as Antarctica and Arctic to improve the quality of HAM communication. The members of the radio science community can definitely assist the HAM operators through research in establishing low cost narrow band communication techniques.

India is in the mission of transforming into a developed country. Many developed countries are racing towards Moon and Mars which may lead to the next industrial revolution. We also have the opportunity of joining this exclusive club of nations to establish industry in Moon and Mars with our core competence in space science and technology. The technological challenges are:

- \* Manufacturing and Mining in reduced gravity.
- \* Harnessing Helium-3 in Moon for future energy, using oncoming fusion technologies.
- \* Using dry ice deposits in Moon and Mars as source of fuel rocket engine.
- \* Extending life of satellites in orbit through refueling and repairing.
- \* Using the Moon as space transportation hub.
- \* Building human habitats on the Moon, Mars and also in outer space.
- \* Above all, it is essential to establish reliable space communication systems that will work during all ionospheric disturbance and sunspot activities.

Characteristics of moon have a vital implication for space science. As civilization spreads to Mars in five to eight decades, the Moon will provide the main link between earth and her scattered children. The earth's ionosphere reflects all but the shortest radio waves back to Earth. Earth's dynamic atmosphere prevents the use of lasers for communication into space. On the near airless Moon, this would not be a problem, for the Moon's sky is perennially clear to waves of all frequencies.

Thus the Moon will soon become a "Telecommunications Hub" for interplanetary communications, aiming its tightly focused laser beams to other planets and ships in space. With interplanetary communication systems located on the far side, the Moon would also shield these communication stations from the continuous radio emissions from the earth. The far side of the Moon would be the quietest place within millions of kilometers from the earth, in the sense of radio silence. The coming few decades will provide a great challenge to the radio scientists.

Since large number of radio science specialists have assembled here I would like to make the following seven suggestions to this scientific community which will be useful to the entire mankind.

- (1) There has been a revolution in communication science and technology all over the world. The result of this revolution has to reach the common man. This can be in the form of providing affordable high bandwidth tele-communication to every villager, such as mobile phones with GPRS/CDMA, satellite & FM radio and IP communication. Research is required to bring down the cost and make this revolution reach seamlessly to six billion people of the world.
- (2) The power of radio communication needs to be utilized for improving the educational standards of our rural masses. Recently, I was addressing the students of three universities in three different regions of the country from Rashtrapati Bhavan. While organizing this event I found that the connectivity to various corners in the country is yet to become seamless. The radio and space communication specialists have to work together to make high bandwidth seamless connectivity for the tele-education programmes to reach our distant villages with ease through broadband communication.
- (3) There are possibilities of co-relation between the seismic activities, electro-magnetic activity in the particular region. There is a need to have a comprehensive study on the subject. This study should also be linked with the study of other geophysical parameters relevant to an earthquake. This will be a great contribution of the radio science community to the mankind towards disaster mitigation.
- (4) India is in the process of establishing three Science centres in different parts of the country to create a scientific research cadre. The URSI can evolve a possible curriculum for study and research in the electro magnetic spectrum in these advanced centres.
- (5) I understand that the adaptive radio and software radio are among the thrust areas of wireless communication technologies. In this connection, it is essential for the radio scientists to provide a solution for getting high bandwidth communication in the wireless spectrum in a mobile environment for an optimal distance without the constraints of line of sight.

- (6) Radio scientists and technologists should continue to strive for optimum and bandwidth efficient communication techniques even when higher frequency bands like millimeter waves, sub-millimeter waves and quasi optical waves have started becoming available; there is not much congestion at this stage in this frequency band, but the ever increasing use of radio frequencies spectrum needs evolution of an allocation criteria.
- (7) Solar power satellites may become a reality in few decades. Because of its potential for transmitting large volume of power in Gigawatts, the possible electric power transmission is through microwave to the earth. Research is essential to find out the relationship of transmitting frequency with atmospheric structure.

I find that radio science embraces all areas of human activity such as provision of cost effective communication to all the citizens, education, healthcare, development, disaster mitigation, earthquake forecasting and solution to energy problem. In overall perspective, connectivity is the key for the growth of the humanity. Hence, radio scientists have a major role to play with their continuing research in promoting economic prosperity to the planet Earth through uninterrupted connectivity. My best wishes to all the participants of the General Assembly of International Union of Radio Science in their mission of making electro magnetic spectrum a friend of the humanity. May God bless you.

*Dr. Banerjee announces the Interlude Orchestra on the dais of the Opening Ceremony; meanwhile, the URSI Board of Officers and the URSI Award winners had the opportunity to personally meet with the President of India.*

## **REPORT BY THE SECRETARY GENERAL OF URSI**

Prof. P. Lagasse

Ladies and Gentlemen

It is the traditional duty of the secretary general to present a concise report of the scientific activities, the finances and the general administrative situation of the Union.

As seen from a historical perspective, it is my feeling that the high speed of change which we are currently experiencing is a distinctive characteristic of our times. Let me try to describe to you how URSI has evolved in this rapidly changing world since our previous General Assembly in Maastricht. In view of the limited time I would like to focus on a few important issues such as the evolution of our scientific publications, our interaction with ICSU and the main initiatives and decisions taken by the Board in the past triennium.

However let me first join our president Kristian Schlegel in thanking the national committee from India for organising this General Assembly. More specifically I would like to thank Dr. A.P. Mitra, Chair of the National Organising Committee, Dr. Kumar, chair of the Local Organising Committee, Dr. Banerjee, Convenor of the Local Organising Committee, Prof. Brussaard, Coordinator and Dr. Goel and Dr. Behari, Associate Coordinators of the Scientific Programme. Looking at the quality of the scientific program and taking the numbers of registrants as a first indication, it will undoubtedly turn out to be a very successful General Assembly. In his speech Dr. Kristian Schlegel rightfully recalled the significant role that India has played in the development of science in general and of radio science in particular. Looking more into the future it is fitting that twelve years after the very successful General Assembly held in Kyoto, URSI is back in Asia. Considering how Asia is currently developing as the economic powerhouse of the world and how this goes hand in hand with a rapid and innovative technological development, the twenty first century could well be on its way to become the century of Asia. More specifically India has become one of the leading nations worldwide in software and, as will be described by the Honorable President of India in a general lecture, is now well under way to offer electronic connectivity to a billion people using innovative radio technologies.

Ladies and Gentlemen

In the past years the Radio Science Bulletin has grown into a successful publication providing a much appreciated service to the radio science community. The number of scientific papers per issue has increased fourfold from an average of two per issue in 2002 to about eight per issue nowadays. In the December 2003 issue we began the publication of the reviews of radio science in the Radio Science Bulletin. Thanks to the excellent work of Phil Wilkinson as the coordinator for the reviews this has been quite successful with reviews from practically all the commissions. In my report at the previous General Assembly in Maastricht I made an appeal to submit papers for publication in the Radio Science Bulletin. Thanks to your contributions and especially thanks to the outstanding job done by Ross Stone as the editor of the Radio Science Bulletin, URSI is now on its way to publish a well respected, peer reviewed scientific journal which stimulates a useful interaction and cross fertilisation between the various commissions. To maintain and improve on the high standards we have achieved so far will be a major challenge. So please may I ask you at this General Assembly to devote enough time in the commission and committee meetings to the planning of your contribution to the Radio Science Bulletin. Next to the all important aspect of scientific content, the organisational matters will also require your attention. As the Radio Science Bulletin grows, the editorial burden becomes too large for the number of people that currently devote their time to it. I am confident that together we will find solutions to those challenges that will allow the Radio Science Bulletin to further flourish.

Mesdames et Messieurs

URSI en tant que union scientifique internationale est membre d' ICSU et l'interaction avec ICSU constitue une voie importante pour URSI pour promouvoir à travers le monde, les résultats scientifiques obtenus dans le domaine de la radioélectricité ainsi que les résolutions prises par le conseil. Ceci ne peut se faire efficacement que dans la mesure où URSI s'inscrit dans les axes stratégiques d'ICSU. En vue des changements importants qui sont intervenus durant les dernières années dans les relations entre la science, la technologie et la société, ICSU a effectué une analyse stratégique dont je tiens à mentionner quelques conclusions importantes dans le cadre de l' URSI :

Beaucoup de problèmes scientifiques importants, tels par exemple le changement de climat, sont de nature globale et demandent une approche et une collaboration internationale. Ces problèmes étant extrêmement complexes, ils nécessitent une coopération multidisciplinaire. ICSU se considère particulièrement bien placé pour sensibiliser, initier et organiser de telles recherches.

Un autre aspect important est l'interaction étroite existant entre la science et la société.

D'une part l'impact de l'application des résultats de la recherche scientifique, tels la radio-électricité ou l'Internet, sur la société est énorme; d'autre part à travers le financement et les législations réglant la recherche, la société influence fortement l'agenda de la recherche et les perspectives du chercheur.

Dans ce cadre ICSU définit ainsi sa mission:

- identifier les issues d'importance majeure pour la science et la société
- faciliter l'interaction entre les chercheurs, entre les différentes disciplines et entre les diverses nationalités
- promouvoir la participation de tous les chercheurs - indépendamment de leur race et nationalité - à la communauté de recherche internationale.
- fournir un avis scientifique indépendant pour stimuler le dialogue constructif entre la communauté scientifique, les gouvernements et la société.

Il est important pour l'URSI de s'inscrire dans cette nouvelle vision, afin de retenir son rôle et son influence dans le sein d'ICSU. Pendant les derniers trois ans un effort considérable a déjà été fait pour faire valoir les points de vue de l'URSI et de ses commissions dans le cadre d'initiatives et de plans stratégiques de l'ICSU. Il est important de poursuivre cet effort afin d'intensifier la coopération et l'interaction avec ICSU.

Ladies and Gentlemen

Having considered the importance for URSI to cooperate and interact closely with ICSU, I would like to mention the actions taken by the Board to increase the visibility of URSI. Sadly we live in an era when perception has become more important than reality. Feeling that there was a need for URSI to raise its profile in relevant circles beyond the radio science community and to significantly increase the exposure of the research in radio science, the Board has decided on a two pronged approach. First a full colour

brochure, which you have received in your registration pack, was prepared with the aim of making URSI more widely known. This brochure can for example be distributed at the various conferences which URSI is sponsoring. A second initiative consists of the production of white papers. In so far that the subject is timely and highly relevant from a scientific, economic and societal point of view, such a white paper can have a very significant impact. In view of the current oil prices and concerns about global energy supply the subject picked for the first white paper, namely solar power satellites, is certainly an excellent choice. However if URSI is to pursue this initiative of white papers we will need to develop at this General Assembly a procedure that will allow us to come to a consensus on subjects that can be somewhat sensitive or controversial.

Regarding its finances URSI is still, thanks to the careful management of the Board and supervision of the Treasurer, in relatively good shape with strong reserves. However I wish to emphasise that in general the funding from member committees and academies has a tendency to decline as globally government support for science tends to come under pressure. Let me therefore thank all the persons from various member committees for their efforts to persuade academies and governments to continue to pay the dues to URSI. The extra support received from the member committees from the USA, Japan and the UK for our Young Scientist program is also highly appreciated. Thanks to this support and thanks to the generous contribution from the member committee from India organising this GA, URSI is able to support 143 Young Scientists here. As publications in the electronic age are typically an expense, it is also my feeling that we should reflect on the fact that a careful management of our conferences will be necessary in order to maintain an equilibrium over the triennium between income and expenditure.

Finally, I would like to express my deep gratitude to all the co-workers of the secretariat, Inge Heleu, Inge Lievens, Ross Stone and Femke Olyslager for their work and dedication on which the functioning of the secretariat is relying.

Let me conclude, Ladies and Gentlemen, by stating that our union is in an excellent shape, both scientifically and financially, and that I am confident that the growing importance of radio science in the world combined with your scientific excellence will ensure a successful future for URSI. I wish you all a most interesting and fruitful General Assembly.

## **AWARDS CEREMONY**

Professor Hiroshi Matsumoto, immediate Past President, presided the third part of the Opening Ceremony, namely the Awards Ceremony. Professor Matsumoto gave the floor to Dr. van Ardenne, Chairman of the Dutch URSI Committee.

### **PRESENTATION OF THE BALTHASAR VAN DER POL GOLD MEDAL**

by Dr. Arnold van Ardenne, Chairman of the Dutch URSI Committee

Thank you very much, Professor Matsumoto, for your kind words and introduction.  
Ladies and Gentlemen,

The Van der Pol Gold Medal was initiated by the late Mrs. Petronetta Le Corbeiller (van der Pol) Posthuma in 1963 at the 14<sup>th</sup> General Assembly in Tokyo.

Mr. Balthasar Roessingh, who presented this award during the 2002 General Assembly, quoted his grandmother: “The purpose of the medal is to keep alive the memory of my husband and to stimulate, especially the younger scientists among you, to work patiently and seriously with the Officers of URSI for radio science in its widest scope”. I feel really honored with the request from URSI to present this scientific award today.

Balthasar van der Pol was a remarkable man. He was born in Utrecht in 1889. He graduated cum laude in physics from the University of Utrecht in 1916 under Professor W.H. Julius. He developed his thesis entitled “The Effect of an Ionized Gas on Electromagnetic Wave Propagation and its Flow Discharge Measurements”. The next three years were spent in England working first with John Ambrose Fleming and later under J.J. Thomas at Cambridge in the famous Cavendish Laboratories. At this time he also became a good friend of the Nobel prize-winner Sir Edward Appleton. They both shared an interest in radio waves. In September 1920 he worked at the Teyler Foundation in Haarlem. It was here he became the theoretical assistant of the great Nobel Prize Winner, Professor Lorentz for a period of three years. He was a founder member of the Netherlands Radio Society and of the Dutch Physics Society.

In 1922 Balthasar was appointed head of the Philips Research Laboratories in Eindhoven, a position he held until his retirement in 1949. He has been Professor of theoretical electricity at the Technical University of Delft from 1938 until 1949.

Since 1947 he devoted himself mainly to international activities, having accepted his election as Director of the International Radio Consultative Committee (CCIR) at Geneva. He received the Medal of Honour of the I.R.E., the Poulsen Medal of the Danish Academy of Technical Science. He was a member of the Royal Netherlands Academy of Science, corresponding member of the Academy of Science in Paris, Honorary Doctor of the Warsaw Polytechnics and of the University of Geneva and of course he was an Honorary President of URSI.

Ladies and Gentlemen,

On behalf of the Union Radio-Scientifique Internationale it gives me great pleasure to reveal the name of the person to be honoured with the Balthasar van der Pol Gold Medal 2005. The citation of URSI: For the development of new methods and solutions in electromagnetic field theory and for exceptional didactic skills. The 2005 recipient is Emeritus Professor in Electromagnetic Theory at the Helsinki University of Technology, Professor Ismo Lindell.

Thanks to the work of Ismo Lindell our understanding of the behaviour of electromagnetic fields in complex environments has significantly increased. He has shown that in this age of the computer and numerical simulations there are still numerous electromagnetic field problems, many of them of considerable practical importance that can be solved in closed form.

Whereas in many universities “Electromagnetic Laboratories” have been absorbed into larger departments or even have been closed completely Lindell has founded in 1984 a new independent and very successful laboratory on Electromagnetics. Currently the laboratory counts four Professors and in the past 20 years it has published more than 450 papers in international refereed journals.

Professor Lindell also is an outstanding essayist and teacher. He uses a concise, informative and very didactic style with an eye for every detail. He also is an historian of electrical engineering. He wrote a book on history for the general public and in many conferences his plenary talks on this subject are appreciated by the audience.

Lindell has been active within URSI as Chairman and Commission B representative of the Finnish National Committee. He assisted in many capacities in the scientific program of several URSI General Assemblies and Commission B URSI International Electromagnetics Symposia.

Taking all this together there is no doubt that Ismo Lindell is a very dignified recipient of the URSI Balthasar van der Pol Gold Medal. May I invite Professor Lindell to join me at the podium to receive the medal?

## REPLY BY PROFESSOR ISMO V. LINDELL

It is a great honour to receive the highly respected Balthasar van der Pol Gold Medal for the year 2005, bestowed to me by the Board of Officers of URSI. As one of the early pioneers in the realm of URSI, van der Pol is known to have opened many new areas of research in the theory of electric circuits and electromagnetic fields. He is probably best known through a differential equation bearing his name. The equation was born in the research of circuits containing a vacuum tube, a non-linear element, in the 1920's. He showed that such a circuit could sustain stable oscillations which are now called limit cycles. This led him to construct electric circuit models for the human heart and to study the possibility to stabilise heart's irregularities by what later has been called a pacemaker. His work closest to me has been the treatise on operational calculus written together with Hendricus Bremmer. The work carried on, with added mathematical rigor, the inspirational operational methods launched by Oliver Heaviside half a century earlier and it has given me many moments of heuristic sentiments. In my opinion, the treatise by van der Pol and Bremmer, just like the earlier work by Heaviside, deserves more attention than what has actually been given since its publication in the 1950's. Another topic of Radio Science in which I have been able to continue the work of van der Pol is one on the theory of electromagnetic images. In his article on the basic problem of radiotelegraphy dealing with a point source above a finitely conducting ground, published in 1935, he extended the classical theory associated with a perfectly conducting ground to involve an image in complex space which yielded the approximate solutions by Sommerfeld and Weyl as special cases.

The work of Balthasar van der Pol was based on the equations of James Clerk Maxwell from the 1860's. For an outsider this might appear as a source run out dry already a long time ago. However, for example, when looking all those scientists in the many sessions on metamaterials, presenting new aspects of basic physical facts, methods of fabrication and new interesting applications of materials with negative permittivity and permeability, one can't avoid sensing James Clerk and Balthasar with all the other fellows looking at us from above the clouds with a broad grin.

I wouldn't be standing here today receiving this medal without the help of other individuals. I wish to express my thanks to those standing by my side when founding the Electromagnetics Laboratory in Helsinki University of Technology, Ari Sihvola, Esko Alanen, Markku Oksanen and Keijo Nikoskinen. Also, many thanks are due to other collaborators including Ari Viitanen, Sergei Tretyakov and, in particular, Frank Olyslager, not forgetting my many students who have taught me a lot. And, of course, behind every man there is a woman reminding about one's mortality and showing the true value of the scientific ivory tower against human life. This woman, unfortunately not present here today, is my dear wife Liisa, whom I wish to dedicate this Gold Medal bearing the respected name of Balthasar van der Pol.

## **PRESENTATION OF THE JOHN HOWARD DELLINGER GOLD MEDAL**

by Professor Umran Inan, Chairman of the U.S. URSI Committee

The John Howard Dellinger Gold Medal is awarded triennially to a distinguished scientist to recognize outstanding scholarship in any of the branches covered by URSI, but preferentially in the field of radio wave propagation. Traditionally, the Chair of the United States National Committee (USNC) of URSI presents this medal, since USNC is the sponsor for this particular URSI award.

The Dellinger Award was established in 1964 in honor of the memory of former URSI Vice-President and Honorary President, John Howard Dellinger, whose career was devoted to science and public service as a leading figure in the U. S. National Bureau of Standards. He was the President of IRE in 1925 and was awarded the IRE Medal of Honor in 1938 for his discoveries of the relation between radio propagation and natural phenomena (such as solar eruptions) as well as for his leadership in the development of radio measurements and standards, and worldwide cooperation in telecommunications.

The 2005 recipient of the Dellinger Gold Medal is Professor Emeritus Bach Andersen of Aalborg University in Denmark. Professor Andersen is a person with a wide spread of scientific interests and qualifications, ranging from electromagnetic theory, antennas, propagation, and communications. His early work was in traditional electromagnetics, analyzing the dielectric rod antenna and other surface wave antennas, contributing with a physical interpretation of the radiation. His work on coupling between antennas, and decoupling of antennas through networks, led to a classic, often-cited paper on antenna diversity. His early paper on antennas in mobile communications has inspired many later works in that area. Applications of electromagnetics in communications has played a major role in his work with significant contributions including the impact of the person on the antenna characteristics, diffraction over multiple screens, propagation over inhomogeneous and rolling terrain, statistics in mobile communications, and lately the new area of multiple input multiple output systems, where joint knowledge and understanding of antennas, propagation and communications is essential. His many years of work in the area of mobile communications is collected in a new, comprehensive book, coauthored with a former student. Traditionally, there has not been much interaction between the scientific 'camps' of antennas and propagation and those of communications. Professor Bach Andersen has contributed significantly to closing of this gap. Within Europe, he has also made leading contributions to the COST programme promoting collaborative science between many European universities.

In the area of the interaction between electromagnetic fields and biological tissue, professor Andersen was involved in setting up a research programme on the so-called hyperthermia technique and is now involved in setting up new research programs in the area of mobile phones and base stations. Professor Andersen serves as a frequent invited speaker to explain electromagnetics to the biological and communication communities. One outcome of his efforts interests was his proposal to start a new Commission K on

interaction within biology and medicine while he was vice-president of URSI, a Commission that now has had a successful 10-year life.

Professor Bach Andersen is a Fellow of the IEEE and is the recipient of several prestigious awards, including the North Jutland Price of Honor, and the IEEE Millennium Medal, and has served on numerous Editorial boards and as Chairman of scientific societies and chapters.

It is my distinct pleasure and honor to present the 2005 Dellinger Gold Medal to Professor Bach Andersen for his 'For significant contributions to the theory of antenna characteristics and scattering, wave propagation over inhomogeneous areas in mobile communication, and interaction between electromagnetic fields and biological tissue'. Please join me in warm congratulations to Professor Andersen.

### REPLY BY PROFESSOR JØRGEN BACH ANDERSEN

It was a great honour, and also a happy surprise to know that I would receive the Dellinger Gold Medal. Dellinger passed away in 1962, one year after my graduation, so I have not had a chance to know him, but I am happy to know people, who knew him. I note a statement by Dellinger from 1926 that 'Radio engineers in the future would need increasingly to apply scientific principles in order to advance beyond the empirical foundation'. This has happened to an extent which probably would have surprised Dellinger, and the progress can be followed through the annals of URSI. Personally, 1962 was also my first URSI year, since I was involved with the Symposium on Electromagnetic Theory and Antennas in Copenhagen under the auspices of Commission VI (Radio Waves and Circuits), as it was called at that time, now transformed into Commission B. I had the prestigious job of being chairman of the Preprints Committee; a job I do not think is around anymore!

URSI has for me always meant a big family of friends, an international network at a time where it took more than a few clicks on a keyboard to create a contact. I was fortunate to grow up professionally in an environment, where the importance of such an international network was appreciated. This was created by Professor Hans Lottrup Knudsen at the Technical University of Denmark. There he had the foresight to organise extended visits by giants like Jim Wait, Roger Harrington, Raj Mitra and others, important influences on a young man. I spent later a year at the great Brooklyn Poly with people like Leo Felsen, Art Oliner, Alex Hessel, so I have really been fortunate. The URSI connections were instrumental for these contacts, and it is my hope that the URSI of today can support similar contacts for the young scientists of today.

It is this international atmosphere of co-operation that I see URSI as an exponent for. Furthermore, through its many Commissions there is a possibility of professional broadening, getting insights into the multiple aspects of Radio Science. I have walked my way through several Commissions, and I thank URSI deeply for honouring a commission-crawler like myself.

## **PRESENTATION OF THE APPLETON PRIZE**

by Prof. Hall Strangeways, Chairman of the U.K. URSI Committee

Dr. Didier Massonnet is one of the most influential engineers applying the new science of radar interferometry to applications in Geophysics. He is the first to publish interferograms of earthquake and volcano deformation, establishing a new technique for the study of crustal deformation. He developed one of the first interferometry radar processors that could systematically produce many interferograms from a large satellite archive. His inter-disciplinary work during the last few years has led to a new technique that may lead to better-than-meter resolution of images of Earth obtained by remote sensing.

The “story” of radar differential interferometry and Didier Massonnet’s part. In 1974 Graham at Goodyear Aerospace obtained the first interferogram from 2 airborne antennas which were located on the same airplane. This really opened up the way to topographic observations (numerical terrain modelling). Then, in the early eighties, scientists at the Jet Propulsion Laboratory (JPL), with data obtained at different times with a synthetic aperture radar (SAR) borne on the space shuttle explored successfully the possibility of topographic observations from space using different times of observation.

In 1985, Didier Massonnet, fascinated by the new opportunities offered by this technique, studied theoretically the application of differential interferometry to the detection of ground motions. This differential technique involves observation at different observing times assuming the stability of the ground scatterers with respect to time at the scale of the radar wavelength and removing, after modelling, the topographic contribution.

In 1989 the JPL scientists, using SEASAT data, tried to detect such changes, over a period of 3 days. They indeed observed a change in elevation of field surfaces probably induced by watering. However, due to a loss of coherence of the ground, the fringes decay over a period of a few days. The future of the “differential interferometry” appeared to be quite uncertain.

This disappointing result did not curb the enthusiasm of Didier Massonnet who, confident in the possibility of unscrambling many factors, made a breakthrough with the observation using ERS, launched in 1991, of the change of the ground surface induced by the “Landers earthquake” in California. The result is outstanding and communicates Didier’s enthusiasm for this work to a large scientific community.

Things then evolved very rapidly over a period of 4 years during which the technique becomes very mature. Several very important applications developed such as, in addition to earthquake monitoring, volcanic volume changes, hillsides landslides, motions of the ground induced by human activity (changes of underground water content associated with geothermy, mining activities, tunnelling etc). Simultaneously, many “perturbing effects” were identified such as those due to meteorology (storms) or to irregularities of the ionosphere which opened the way to new types of measurements. New possible applications then also come to light and development began of such determinations as coastal deformation induced by oceanic tides.

The scientific impact of Didier's work is very important notably an important paper in *Reviews of Geophysics* in 1998, 4 papers in *Nature* (including the cover illustration of 2 of them) and a memorable lecture given at the symposium celebrating the 75<sup>th</sup> anniversary of URSI in Brussels in 1995. However, perhaps the important aspect of his work is in the benefit to society of his work.

### REPLY BY DR. DIDIER MASSONET

I am both very pleased and very honoured to receive this prize presented by the Royal Society of London in honour of Sir Edward Appleton. The career of Sir Edward Appleton is characterised by his contribution to ionosphere research as well as his devotion to URSI, of which he is a past president. His role in the promotion of the International Geophysical Year is significant to any professional in the space activity, since the IGY was the real starting point of the space adventure.

I have spent all my carrier at CNES, the French Space Agency, but I started it with a one-year stay at the Jet Propulsion laboratory. There, in 1984, I participated in the exploitation of the data of the Shuttle Imaging Radar B, an L-band radar. At that time, ionosphere was not necessarily friendly, but just a "means" to obtain a blurred image due to the alteration of the radar signal during the several seconds necessary for its reconstruction! Back in France in 1985, I realised that the technique of radar interferometry, then envisioned for topographic mapping, could also be used to map displacements with millimetre accuracy. Several experiments took place with spaceborne and airborne radar, but with the launch of ESA's ERS1 satellite in 1991, a large and successful set of experiments demonstrated the technique for earthquakes, volcanoes, landslides, glacier motion etc.

Soon after, in 1994, we saw images that reflected changes not linked to ground displacements. We attributed these effects to the troposphere or the ionosphere. The main advantage of radar imaging is traditionally its insensitivity to the state of the atmosphere. As a joke we could say that after years of effort, we had succeeded in seeing clouds, water vapour and the ionosphere with an imaging radar! More seriously, we could map these phenomena with an unprecedented resolution.

It could seem unfair to receive a prize for such an exciting period of time which was in itself so rewarding. Furthermore one cannot in good faith disregard luck as an ingredient of success. In this kind of technological adventure, having the right data in the right place at the right time becomes very important. Of course it is still up to us to have the right processing ready. It is really fantastic to receive this prize and I am especially happy to receive it here in India. As for any large country, space-based information is particularly suited to India, and radar interferometry can be used for topographic mapping as well as deformation monitoring. I have wonderful memories of several training sessions

on radar interferometry organised by professor Rao from the Mumbai Institute of Technology some years ago. I remember students coming from all over India and neighbouring countries very eager to learn about it and practice it.

Finally, I am very pleased to accept the Appleton prize but, as a privileged user of such very complex objects as radar satellites, I would like to acknowledge also the huge and anonymous effort of the many engineers who built them, in various space agencies or in the space industry all over the world. Thank you.

### **PRESENTATION OF THE BOOKER GOLD MEDAL**

by Professor Thomas B.A. Senior, Chair of the Booker Committee

Henry Booker was a prominent radio scientist who served URSI in many capacities—as Commission Chair, Vice-President and Honorary President. On his retirement from the University of California, San Diego in 1978 some friends established a fund to support the attendance of a young U.S. scientist at each URSI General Assembly. The Booker Fellow this year is Dr. Fernando L. Teixeira, and if he is here today I ask that he stand up so that we may recognize him.

A few years ago the Booker Committee also established a Gold Medal to be awarded to any scientist for outstanding contributions to telecommunications. The winner of the Booker Gold Medal for 2005 is Professor Yahya Rahmat-Samii of the University of California, Los Angeles. The citation is a long one and indicative of the wide variety of his contributions to radio science. Since it is listed in your program I won't read it out. It is now my pleasure to present the award to Professor Rahmat-Samii.

### **REPLY BY PROFESSOR YAHYA RAHMAT-SAMII**

There are certain moments in one's life that spark the ultimate satisfaction. There is no doubt that today's award ceremony is such a moment, as it is held in this historically and culturally rich country of India and in the presence of her President. Your Excellency the President of India, the URSI President and Board, honored guests, ladies and gentlemen, it is with the utmost pleasure and humility that I accept the 2005 Booker Gold Medal of URSI. My relationship with the URSI community has been a journey that has encompassed creative thinking, visionary dreams, and above all, enduring friendships.

From an early age, the cosmos and the vastness of space and the universe fascinated me. When I became exposed for the first time to the amazing postulate of Einstein that

the speed of light is the ultimate speed, and to Maxwell's discovery that all electromagnetic phenomena, including light, could be captured in four simple mathematical equations, I knew that this was the area for me to focus upon. My dream took me from the University of Tehran to the University of Illinois to the NASA/Jet Propulsion Laboratory, and then to the University of California, Los Angeles. My sincere appreciation to all these organizations, which challenged me to learn about the new frontiers in science and engineering. These organizations also created an environment in which my research could flourish.

We are at the dawn of a new millennium, bound to evolve and progress by advances in science and technology as at no time in history, science and engineering have played a central role in creating wealth, prosperity, and freedom. I strongly believe that electromagnetic phenomena and antennas are key components in this progress. This can be readily observed in this General Assembly by noticing our various URSI Commissions' contributions in the areas of wireless communications, satellite communications, remote sensing, biomedical applications, radio astronomy, nanotechnology, defense applications, etc. Henry Booker was a giant in our field, who contributed immensely to our understanding of many of these areas, in particular the ionospheric sciences and basic electromagnetics. I had the pleasure to briefly know him and his wife. I am certain that this award will forever enrich my scientific life.

There are so many individuals that I need to thank. In the spirit of the evolutionary process, I would like to thank my family, my mentors, and my past, present, and future students and colleagues. This award belongs to all of those who have shaped my scientific and personal life. May our endeavors create a better life for all the citizens of the world and, perhaps, the universe!

For our young engineers and students, I would like to quote a statement from Goddard, the father of space rocketry in the USA. He wrote, "It is difficult to say what is impossible, for the dream of yesterday is the hope of today and the reality of tomorrow." A philosophical statement by Mahatma Gandhi is also timely, as he wrote, "It is unwise to be too sure of one's own wisdom. It is healthy to be reminded that the strongest might weaken and the wisest might err."

In closing, I want to state that my association with URSI has been profoundly enriching and rewarding. May Maxwell's equations be with you! I will cherish this award forever.

## **PRESENTATION OF THE ISSAC KOGA GOLD MEDAL**

by Hiroshi Matsumoto, President of the Japanese URSI Committee

It is a great pleasure for me, as the President of the Japan Member Committee of URSI, to present the 2005 Issac Koga Gold Medal to Professor Susan C. Hagness, University of Wisconsin in USA.

I would like to start by describing briefly the rules for the Issac Koga Gold Medal. The medal is endowed to a young scientist under age 35 who has made outstanding contributions to any of the branches of science covered by the ten Commissions of the URSI. It honours the memory of the late Professor Issac Koga, who was Vice President of URSI from 1957 to 1963, President of the Union from 1963 to 1966, and Honorary President from 1981.

Professor Koga was born in Japan in 1899. He studied at the University of Tokyo, and became, first, Professor at the Tokyo Institute of Technology; later, Professor at the University of Tokyo; and finally, Dean of the Faculty of Engineering.

Professor Koga's researches covered a wide variety of topics in radio science. Particularly noteworthy among these was the invention, in 1932, of a piezo-electric crystal oscillator having an almost zero frequency-temperature coefficient. This is widely known as the Koga-cut crystal, and has been in a variety of applications, in particular to international radio communications and broadcasting.

Professor Koga was a strict educator of young students and researchers, but at the same time a warm-hearted leader. When he passed away in 1982, the URSI Japanese Member Committee proposed to establish a Gold Medal for young scientists in commemoration of Professor Koga as a great educator as well as a distinguished researcher. The first Koga Medal was awarded at the General Assembly in Florence, and this is the eighth award.

As the time is very limited, I now briefly mention the distinguished scientific achievement of Prof. Susan C. Hagness by reading the citation for the Award. The citation for the award mentions: "For contributions to the development of enhanced finite-difference time-domain methods in computational electromagnetics, and ultrawideband microwave imaging techniques for early breast cancer detection".

It is a little bit pity that she could not be here today. However, we are very pleased to learn that she bore a new baby in this Summer, and understand that she had better avoid undertaking a long international trip within the first few months after the baby's birth.

Susan, congratulations for both the Koga Medal and your new-born baby.

**REPLY BY PROFESSOR SUSAN HAGNESS**

by Professor Umran Inan

Members of the URSI community,

I am honored and humbled to have been selected as the recipient of the 2005 Isaac Koga Gold Medal. I regret that I am unable to be here with you today to receive this award in person. In August, we welcomed our first child – a baby daughter – into the world. Thus, this has been a remarkable year both professionally and personally.

Henry David Thoreau once said “Success usually comes to those who are too busy to be looking for it.” This quote aptly captures the nature of my surprise when I learned that I had been selected as this triennium’s recipient of the Koga Gold Medal.

I want to convey my profound gratitude to Wilson Pearson who prepared the award nomination materials, all of my colleagues in the USNC Commissions who supported the nomination, and the awards committee who had the difficult task of selecting the recipient from what I’m sure was an outstanding pool of candidates.

It is an exciting time for our research community. Electromagnetics is playing a pivotal role in the advancement of electrical and computer engineering technology across a broad spectrum of communications, computing, materials processing, and sensing applications. Furthermore, as the boundaries between biology, medicine, and engineering continue to blur, electromagnetics engineers are well equipped to address a variety of public health issues in need of engineering solutions. I feel very fortunate to have had the opportunity early on in my career to work on interdisciplinary problems that are extremely interesting and challenging from an academic perspective, and fundamentally and gravely important from a societal perspective.

An award such as this directly and positively reflects upon the recipient’s work environment. I am so fortunate to have had the opportunity to work with great colleagues, collaborators, and mentors. Specifically, I want to thank my fellow faculty members at the University of Wisconsin-Madison for making our institution such an enjoyable and fruitful place to work, and all past and present mentors who have provided invaluable guidance to me.

Finally, I give thanks for the support of my spouse, Tim, and dedicate this award to our daughter, Madeline. May she develop a life-long love of learning and exploring new frontiers. Thank you all for this honor.

## **VOTE OF THANKS BY THE CHAIRMAN LOCAL ORGANISING COMMITTEE**

Prof Schlegel, Prof Lagasse, Prof Matsumoto, Dignitaries on the dais, award winners, fellow researchers, distinguished guests, ladies and gentlemen,

Speaking on behalf of the entire team involved in the local arrangements, it is indeed a matter of great pride and privilege for us to be participants in this magnificent intellectual gathering. Surfing the contents of the upcoming program shows the ubiquitous nature and omnipotence of the electromagnetic radiation in all aspects of human existence. The intellectual curiosity, the technological challenges and the social responsibilities have brought us all under this roof to deliberate on the wide spectrum of issues related to production, sensing, metrology and applications of the electromagnetic spectrum.

Nearly one thousand five hundred participants from 57 countries are here today. Almost half of these are so called developing countries. We are particularly happy at the large participation from these many of which are represented perhaps for the first time in this General Assembly. We also have a large participation of the young scientists from India and 38 other countries. Here again half the countries represented by the young scientist awardees will qualify as developing countries. I must congratulate the URSI for actively encouraging such wide participation.

We are grateful to the URSI Board for agreeing to a two tier registration fee structure for the first time. This has allowed a large contingent of Indian scientists to participate in this programme. This was possible because we assured the Board that there will be considerable government funding for the General Assembly. I am very happy and grateful for the generous grants we have received from the Department of Science and Technology, Council of Scientific and Industrial Research, Department of Defence Research, Indian Space research Organization, Department of Ocean Development and others which has enabled us to organize this mega-event.

The arrangements for this General Assembly have been made by my colleagues from several Institutes particularly from Delhi. However the main role is played by the National Physical Laboratory. I must say something about the role of NPL in the field of Radio Science. The Metrology division has a long track record of maintenance and dissemination of several basic and derived standards related to the radio waves. The precision measurement of power, frequency, attenuation, impedance and noise at HF and microwave frequencies as well as dissemination of time are essential requirements for the developments in the fields of communication, meteorology, medicine, space research and industrial applications. The Radio and Atmospheric Sciences Division of NPL which has grown under the leadership of Dr A P Mitra has made significant contributions to the understanding of the electromagnetic propagation for communication and climate change and the terrestrial manifestations of the disturbances in space. These relate to the technological developments that have direct consequence on poverty alleviation, global

change and disaster forecasting. My personal interest in electronic and photonic devices prompts me to suggest that the intensity of research in this field has to be elevated to meet the stringent requirements of radio science. Research, from quantum optics to lasers and to networking, will require adapting novel aspects of nanotechnology, ULSI technology, design and simulations.

My special gratitude is to our Honourable President of India, Dr Kalam, who is a scientist, a motivator and a believer that technology is the only vehicle for global equality and human dignity. His words and actions have converted a 'dream' into a 'possibility', which we hope to transform into a 'reality' by 2020.

The mammoth task of hosting nearly 1500 participants from all round the globe, and providing them a comfortable and conducive atmosphere for intense scientific deliberations and interactions, is obviously an act of a large team. Each team member has played his own role meticulously and sincerely. I believe each of them deserves a big 'thank-you'. Still if there are any shortcomings in our hospitality, I request your indulgence and a chance to rectify.

Finally I wish to thank all the distinguished guests and the participants who have considered it worthwhile to come here so that our efforts can bear fruits. Thank you all.

*Dr. Banerjee welcomes Raja & Radha Reddy, the extraordinary Kuchipudi dancers. They have been bestowed with number of awards which includes "Padhma Bhushan" the highest award to honor a performing artist by the Government of India.*

*As a classical form of dance, drama and music, Kuchipudi enjoys a unique place among the Indian classical dance idioms. It is racy and sprightly - indicating the quest for conquering of Space and Time. With all its vigorous and vibrating leaps and turns, it is not cast in the mould of impressionism. It is ebullient, scintillating and yet has the capacity to be intensely lyrical. It is bold and sensuous in the movements of the eyes, its ethos not confined to the languorous world of pining lovers. Through their togetherness and perfect unison Raja and Radha Reddy portray the masculine vigor and lyrical charm of the classical pairs of Hindu mythology such as Shiva-Parvati, Rama-Sita and Krishna-Radha thus identifying themselves with the twin concept of Purusha and Prakriti, the male-female principle in Indian philosophy. In precise postures and refined patterns the duo re-enlivens the magnificent sculptures chiseled in the ancient temples of India.*

*After the Opening Ceremony a reception was held at the Asiad Village Tower.*

## CLOSING MEETING

### CLOSING REMARKS BY THE SECRETARY GENERAL

Prof. P. Lagasse

At the request of the President, I am pleased to announce the results of the elections of the Board of Officers and of the Chairs and Vice-Chairs of the Commissions for the next triennium.

The incoming President is Prof. François Lefevre (France) and the Vice-Presidents in alphabetical order are: Prof. Gert Brussaard (the Netherlands), Prof. Chalmers M. Butler (U.S.A.), Prof. Martti T. Hallikainen (Finland) and Prof. Phil Wilkinson (Australia).

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

Commission A:

Chair Dr. Stuart Pollitt (U.K.)

Vice-Chair Dr. P. Banerjee (India)

Commission B:

Chair Prof. Lotfollah Shafai (Canada)

Vice-Chair Prof. Karl J. Langenberg (Germany)

Commission C:

Chair Prof. Andreas Molisch (U.S.A.)

Vice-Chair Prof. Takashi Ohira (Japan)

Commission D:

Chair Dr. Frédérique de Fornel (France)

Vice-Chair Prof. Franz Kärtner (USA)

Commission E:

Chair Prof. Flavio Canavero (Italy)

Vice-Chair Prof. Christos Christopoulos (U.K.)

Commission F:

Chair Prof. Piotr Sobieski (Belgium)

Vice-Chair Dr. Madhukar Chandra (Germany)

Commission G:

Chair Prof. Paul S. Cannon (U.K.)

Vice-Chair Prof. Michael Rietveld (Norway)

Commission H:

Chair Prof. Richard B. Horne (U.K.)  
Vice-Chair Dr. Yoshiharu Omura (Japan)

Commission J:

Chair Dr. Richard Schilizzi (The Netherlands)  
Vice-Chair Prof. Subra Ananthakrishnan (India)

Commission K:

Chair Prof. Frank Prato (Canada)  
Vice-Chair Prof. Guglielmo D'Inzeo (Italy)

I would like to inform you also of a few important decisions taken by Council:

- The Council accepted the invitation of the Member Committee in the USA to organise the next General Assembly. The venue will be Chicago, 7-16 August 2008. The coordinator for the 2008 General Assembly will be Dr. Goel and the associate coordinator will be Prof. Uslenghi. Council decided for this time not to select the venue of the 2011 General Assembly.

Council approved the proposal from the Board to centralise the abstract submission and paper handling for future General Assemblies in the URSI secretariat. The aims of this change in procedure are to remove the need for relearning and reprogramming each time, to reduce the time between paper submission and General Assembly and to improve the process and ultimately reduce the cost.

- Council also approved a procedure for developing, approving and distributing URSI Position Statements and White Papers. URSI Position Statements and White Papers will be issued by URSI, following endorsement by the URSI Board of Officers and appropriate consultation of the URSI Member Committees and Commissions. They should represent, insofar as it is possible, the consensus view of all URSI Member Committees, Commissions and Board of Officers. They will be initiated and approved following the procedure which was approved by Council and which will be posted on the URSI website. Currently work on a first White Paper on Solar Power Satellites is in progress.

It has been agreed at this General Assembly that the Scientific Committee on Telecommunications should continue its activities under the leadership of Martin Hall, who accepted to continue to chair this scientific committee. It will continue as essentially a liaison committee for exchanging information, but it will require a number of enthusiastic individuals to progress the new priorities which have been defined.

As in previous General Assemblies the quality of the scientific presentations was very high. There was a good balance between contributed papers, invited papers, tutorials, general and public lectures. Here I would especially like to recall the visionary public lecture given by Dr. Abdul Kalam, President of India, who showed us how Information Technology and Radio Science can be instrumental in speeding up the development of a great nation such as India. At this point I would like to express the gratitude of the URSI

community to Prof. Brussaard the scientific coordinator, Dr. Goel the associate coordinator, the commission chairs, vice chairs and convenors who managed to put together the excellent scientific program of this General Assembly.

Allow me to conclude with some personal remarks. Before and especially during this General Assembly I have had the privilege to work closely with Dr. A.P. Mitra, Dr. Kumar and Dr. Banerjee. Thanks to their dedication to the task of organising this General Assembly and thanks to their fantastic ability to solve the problems which typically always arise during the course of such a meeting, this was a most rewarding experience for me. Since this is my first visit to India this General Assembly allowed me also to discover a fascinating nation and a very friendly people. I am sure that we will all look back with very fond memories at this General Assembly where the scientific quality of the meeting was matched by the thousand-and-one night type of banquet. May I express my deep gratitude to the National and Local organising committees who worked as a close team to make this General Assembly a success.

I look forward to welcome all of you three years from now in Chicago.

## **CLOSING REMARKS BY THE OUTGOING PRESIDENT**

Prof. K. Schlegel

Dear Colleagues, Ladies and Gentlemen,

You probably all agree that we had a busy but rewarding week here at the Vigyan Bhawan and an exciting time in India. Thanks to the exceptional efforts of our Indian hosts, we can surely state that this 28<sup>th</sup> General Assembly of URSI was a great success. This is true not only for the scientific part, but also for the social events. We had the beautiful dance performance on Sunday, two splendid dinners at the Asiad Tower Banquet Complex, and the conference banquet in the lavishly decorated gardens of the National Physics Laboratory, with several charming performances. It is certainly the first time that we had elephants at an URSI banquet! Our Indian colleagues gave us a taste of the great traditional Indian hospitality.

First of all, we have to thank the LOC, lead by Dr. Kumar and Dr. Banerjee. These two colleagues did a particularly outstanding job. They were always friendly and listened patiently to whatever complaints we had. These were solved immediately, with a smile. I think you both can relax now and take a couple of days of vacation: you certainly deserve it.

Special appreciation is also expressed to Dr. A.P. Mitra, the head of the NOC. He was always quietly acting in the background, and smoothed out any arising problem

through his influential position. We particularly thank him for his arrangements with the Honorable President of India. His presence made this GA truly exceptional. For the first time, a country's President gave an opening address and a lecture at an URSI GA. We are indeed very grateful to Dr. Kalam.

I also want to express my sincere thanks to the Scientific Programme Coordinator, Prof. Brussaard, and to the Associated Coordinator, Prof. Goel. Their efficient handling of all issues related to the scientific programme and the session structure of this General Assembly is gratefully acknowledged.

With respect to the scientific part of this GA, I also would like to express my appreciation to the session Chairs and Commission Chairs. They provided their share to the success of the scientific program and the smooth running of the sessions. Special thanks also to the speakers for our general lectures and the second public lecture. From the large audience they had, it is clear that their lectures were hot topics for many colleagues.

In addition, I am sure you will all join me in gratefully acknowledging the outstanding dedication and hard work of our URSI Secretariat during this week. The two Inges and Mrs. Marleen Van Duyse were always on duty to help you with small and larger problems. Prof Lagasse, as at every GA, carefully handled delicate matters, for instance such as the distribution of travel money to the Young Scientists and the interaction with the LOC. Dr. Stone dealt with all matter of publication issues. The Radio Science Bulletin and the Review of Radio Science are well cared for in his experienced hands. I want to express my sincere thanks to the whole URSI Secretariat, including Prof. Olyslager who could not come to Delhi, and also for their steady assistance and help during my three-year term as President. I could not have accomplished my tasks without them.

This brings me to the appreciation to my fellow Board members. I had the impression that the work within the Board always ran very smoothly and harmoniously during the last triennium: it was like a big family. I heartily thank the departing Board members, Prof Wernik, and Prof. Wittke, for their advice and assistance. Andrzej and Paul, we will miss you, but we hope that you will continue to be active in our Union.

I also warmly welcome the new Board members, and I am looking forward to a fruitful collaboration. I say that because you probably know that traditionally the past President remains a member of the Board.

Last not least, I would like to thank all participants for their oral presentations, posters and discussions. You are the backbone that makes the scientific part of the GA a success. The high quality of the science presented here is the best guarantee for further growth and success of our Union. I hope to meet many of you at our next GA in Chicago.

Ladies and Gentlemen, I thank you for the opportunity to serve as President of our Union over the past three years, which was a great honor for me. Let us now welcome our new President, Professor François Lefeuvre.

## CLOSING REMARKS BY THE INCOMING PRESIDENT

Prof. F. Lefeuvre

First of all, I would like to thank you for the great support I received from many national Committees for my election as President. It is a great honour for me and for my country. I will do my best to serve the Union. I also would like to thank Kristian Schlegel and all the officers of the past Board. I hope we will continue to work in the same spirit. Before closing the General Assembly, I would like to tell a few words about this Union and about its main objectives for next trienum.

Let us start with URSI. The important point is to have: (i) a Union at the forefront of radioscience, (ii) a Union that provides services to its members and more generally to all radioscientists, and (iii) a Union that is visible for the scientists, the national and international organisations and if possible for the public.

It is the responsibility of all URSI members, and in particular of the Commission Chairs, the national committees, the standing committees and the Board to make sure that URSI is at the forefront of radioscience. One must know where we stand. Thank you in advance for any comments and suggestions on an evaluation procedure.

It is the responsibility of all URSI members, and in particular of the Commission Chairs, the national committees, the standing committees and the Board to provide working tools and teaching tools to all radioscientists. This is already done through the URSI meetings and the URSI publications, but other initiatives may be taken such as URSI web lectures which one would like to set up in a near future.

It is the responsibility of all URSI members, and in particular of the Commission Chairs, the member committees, the standing committees and the Board to make URSI visible. Actions are in progress with the URSI leaflet, each of you must have received, and with the first URSI white paper. But one must pursue our efforts to communicate, i.e. to issue clear messages on strategic development of radioscience and to transmit those to the relevant national and international bodies.

The objectives of the URSI Union for the next trienum have practically been listed last Sunday by Professor Mitra and by the President of India. Three priorities may be defined:

- develop radiosciences in developing countries
- reduce the gap between science and application
- answer societal demands.

Radio techniques are used everywhere. The development of radioscience in developing countries is a major issue. As suggested by ICSU to all scientific Unions, programs must be set up from proposals issued by developing countries rather than from proposals issued by developed countries. In that respect, together with other Unions, URSI might wish to support Centres that are being to set up in developing countries and that aim to foster the use of radioscience for development.

Collaborations with ITU and other Unions are also important in order to reduce the gap between science and applications. I know that such collaborations are actively pursued in some commissions. But they must be reinforced in several domains. The Commission chairs and the national committees are invited to strengthen the bridges with more applied unions, for instance by organising common sessions and/or common national, regional or international meetings. When talking about regional meetings I think for instance to Europe where projects are under discussions.

With regards to answering societal demands, the task is not easy. Those of us who are used to apply statistical tests of hypotheses have experienced that if one knows how to reject an hypothesis one does not know how to accept an hypothesis. The society cannot expect answers in the form of “yes” or “no” from the scientific communities. However it can expect clear synthesis with fair “pros” and “cons” on burning and controversial subjects. This is what URSI started to do with the white paper on solar power satellite. The work is not completed, but a first step has been made. Other projects of white papers are welcome. Again, don’t be afraid to touch on burning and controversial subjects. Most new concepts and new technologies have to face the “Precautionary principle” which does not imply a binary answer in the form of “stop” or “go” but which require a careful examination of studies to be performed in order: (i) to demonstrate the technical feasibility, (ii) to better identify environmental and economical risks, and (iii) to define key parameters to be monitored at each development phase.

There is nothing new in what I said. We have to take advantage of what was done by our predecessors. We have to prepare the ground for our successors. I have just given indications on work to be done by all URSI members, and particularly by those who have specific responsibilities for next triennium.

Finally, it is my duty to officially declare the 28th General Assembly of URSI closed. I wish to everybody a good trip home to your families and to your laboratories. I express my hope to have numerous exchanges in the next three years and to see all of you in Chicago.

*Before the concluding remarks by Professor Kumar, Dr. Birgit Schlegel gave a brief address of thanks to the members of the organizing committee for the program of the accompanying persons.*

## **CONCLUDING REMARKS BY THE CHAIRMAN LOCAL ORGANISING COMMITTEE**

Prof. V. Kumar

Professor Kumar expresses how pleased he is to have been able to host an URSI General Assembly in India.

He expresses his sincere thanks to all the participants, to his Indian colleagues in the Local Organising Committee and especially to the President of India, Hon'ble sh. A.P.J. Abdul Kalam, for his cooperation at this Assembly.

The estimated attendance at this General Assembly is 1200 registrants, approximately one third of which are Indian registrants, thanks to the two-year registration fee. Thanks to the increased support of the Young Scientist Program, 113 foreign students and 30 Indian Young Scientists were able to attend this General Assembly.

Prof. Kumar wishes everybody a safe journey home and hopes to meet everybody again at the next URSI General Assembly in Chicago !

## REPORTS OF MEETINGS

### BOARD OF OFFICERS

#### Summary Report

#### **22 October 2005**

The Board reviewed the agenda of the Council meetings and the Coordinating committee meeting. The Board discussed the proposals for the next General Assembly. The Board also discussed matters concerning the opening ceremony, the Young Scientist Party and the Closing Ceremony.

#### **29 October 2005**

- The President welcomes the officers of the Board. The following assignments are decided: Treasurer and Liaison of the Board in the Young Scientists Committee: Prof. Gert Brussaard; URSI Exposure (Web Based lectures and Web site): Dr. Phil Wilkinson; URSI Exposure (Future White Papers): Prof. Martti Hallikainen.
- Prof. Femke Olyslager and Dr. W. Ross Stone are confirmed as respectively Assistant Secretary General and Assistant Secretary General on Publications.
- The budget for the Commissions is fixed at initially 9000 Euro for the triennium. The Commissions can transfer a maximum of 2000 Euro from the previous triennium if properly justified.
- The modalities for spending the extra 5000 U.S. Dollars (4170 Euro) allocated by Council to the Commissions will be decided at the Board meeting of May 2006.
- Regarding the aspect from Prof. S.M. Radicella for support for ICTP it is decided after a discussion to support two "URSI Fellowships" for a total of 3000 Euro. Further support to ICTP will only be given after a strategy has been developed in the Standing Committee for Developing Countries.
- The 2008 General Assembly will be held in Chicago, Illinois, USA on 9-16 August 2008. The contact person is Professor George Uslenghi.
- The next Board meeting will be held in Ghent on 21-23 May 2006.

## COUNCIL

### Summary Report

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

Council met on Sunday 23 October (9.00 to 12.45 a.m.), Tuesday 25 October (4.30 to 5 p.m.), Thursday 27 October (5.30 to 6.15 p.m.) and Saturday 29 October (9.00 to 11.45 a.m.).

#### 1. Membership of the Council

President : Dr. K. Schlegel

Secretary General: Prof. P. Lagasse

Australia : Dr. P. Wilkinson

Austria : Prof. R. Leitinger

Belgium : Prof. C. Vloeberghs

Brazil : Prof. P. Kaufmann

Canada : Dr. Y. Antar

China CIE : Prof. Z. Sha

China SRS : Dr. S.C. Lu

Czech Republic : Dr. O. Santolik

Denmark : Prof. P. Høeg

Egypt : Prof. E.A. Abdallah

Finland : Prof. I.V.I. Lindell

France : Dr. P.N. Favennec (alternate: Prof. M. Pyée)

Germany : Prof. K.J. Langenberg

Greece : Prof. J.N. Sahalos

Hungary : Dr. J. Lichtenberger

India : Prof. S. Ananthkrishnan

Israel : Prof. E. Heyman

Italy : Prof. G. Tofani

Japan : Prof. Y. Omura

the Netherlands : Dr. A. van Ardenne

New Zealand : Dr. C. Rodger  
 Norway : Prof. J. Trulsen  
 Peru : Prof. R. Woodman  
 Poland : Dr. T. Kosilo  
 Portugal: Ms. M.L. Mendes  
 Russia : Prof. V.E. Lyubchenko  
 South Africa : Prof. K.M. Reineck  
 South Korea: Dr. H.J. Eom  
 Spain : Dr. R. Villar Gomez  
 Sweden : Prof. S. Ström  
 Switzerland : Prof. A. Skrivervik  
 Turkey: Prof. A. Altintas  
 United Kingdom : Dr. H.J. Strangeways  
 USA : Prof. U.S. Inan

Commission A	Dr. Q. Balzano, Chair Dr. S. Pollitt, Vice-Chair
Commission B	Prof. M. Ando, Chair Dr. L. Shafai, Vice-Chair
Commission C	Prof. M. Akaike, Chair
Commission D	Prof. P. Russer, Chair Dr. F. de Fornel, Vice-Chair
Commission E	Prof. P. Degauque, Chair Prof. F.G. Canavero, Vice-Chair
Commission F	Prof. M. Hallikainen, Chair Prof. F. Sobieski, Vice-Chair
Commission G	Prof. C. Hanuise, Chair Prof. P.S. Cannon, Vice-Chair
Commission H	Dr. R.B. Horne, Chair (the Vice-Chair is the official delegate of Japan)
Commission J	Prof. M. Inoue, Chair Prof. R.T. Schilizzi, Vice-Chair
Commission K	Prof. B. Veyret, Chair Dr. F. Prato, Vice-Chair

The incoming Vice-Chairs of Commission A (Dr. P. Banerjee), Commission C (Prof. T. Ohira), Commission E (Prof. C. Christopoulos), Commission G ( Prof. M. Rietveld) and Commission K (Prof. G. D’Inzeo) attended the last Council Meeting on 29 October 2005.

The Officers of the Board, the Coordinator of the Scientific Programme and the Assistant Secretary General (Publications) attended in an advisory capacity. The Chair of the SCT, the alternate delegate of France and a Member of the Drafting Committee, the Convenor LOC and the presenters of the venue for the URSI GA 2008 also attended the meetings, partially or totally.

## 2. Establishment of temporary committees and ad hoc groups

Council approves the installation of a drafting committee with as members: Dr. Phil Wilkinson (English) and Dr. J. Hamelin (French).

Since Prof. S. Avery, Chair of the Finance Committee, is unable to attend the General Assembly, Council approves the proposal that Prof. U. Inan will chair the Finance Committee for the duration of this General Assembly.

## 3. Organisation of the XXVIIIth General Assembly

Dr. Banerjee mentions some late time additions and changes to the arrangements. He also answers the various questions from Council Members about details of the general arrangements.

Prof. Brussaard outlines the schedule of the scientific program and emphasises that a lot of people put in a tremendous amount of work to make the scientific program a success. Council approves the proposal to centralise the abstract submission and paper handling in the URSI Secretariat from the 2008 General Assembly.

## 4. Finances

The acting Chair of the Finance Committee, Professor Umran Inan, reviews the conclusion of his committee regarding the financial situation of URSI.

- the committee recommends to approve the proposed budget
- the finances of URSI are healthy and the committee recommends to approve the accounts 2002-2004
- in order to more clearly show the evolution of the URSI finances, the committee recommends to present the accounts per triennium starting by the year before a General Assembly until the year after a GA
- in view of the substantial reserves of URSI the committee recommends to take new initiatives such as for example an extra budget for the commissions to support the attendance of students or Young Scientists at URSI meetings

After a debate concerning this report, following conclusions are reached:

- the accounts 2002-2004 are approved unanimously
- the URSI Board should consider taking new initiatives. As a first step, an increase in the budget of the commissions by \$5000 is approved. The Board should, after consultation with the Long Range Planning Committee stipulate the rules for spending this extra budget along the lines proposed by the finance committee
- the reserves and the income from reserves should be shown in the budget
- with the amendments described above the budget is approved

## 5. URSI Membership

After a discussion Council decides that in view of the considerable arrears the procedure mentioned in the Statutes should be applied to the Member Committee of Mexico. The Secretary General will write a letter enquiring whether the Member Committee of Mexico

wishes to apply for Associate Membership. If not, it will be considered as having resigned from the Union.

For the Member Committees of Egypt and Ukraine Council decides that the Secretary General will write a letter requesting that the arrears should be paid within six months after this General Assembly. If payment of the arrears is not received by that time, or if no application for Associate Membership is received, those Member Committees will be considered as having resigned from the Union.

## 6. Elections

Secretary General Paul Lagasse explained the voting procedure for the offices of President, Secretary General, and the four Vice-Presidents.

### *a) President*

There being only one candidate, the Council agreed to the election of François Lefeuve as President by acclamation. Prof. F. Lefeuve thanked the Council for its confidence and he assured to do his best to serve the Union.

### *b) Vice-President*

The result of the elections for Vice-President, conducted by secret ballot, was as follows (in alphabetical order) : Prof. G. Brussaard (the Netherlands), Prof. C.M. Butler (USA), Prof. M. Hallikainen (Finland) and Dr. P. Wilkinson (Australia).

### *c) Secretary General*

Prof. P. Lagasse was elected for another term by acclamation.

The President, Professor Schlegel expressed his concern about the limited number of nominations that were received for the election of the Board of Officers. He hoped that in the future the Member Committees nominate more candidates.

### *d) Commission Chairs*

According to the Statutes the Vice-Chairs automatically become Chair except in unusual cases. The Council votes that all the current Vice-Chairs become Chairs in the 2005-2008 triennium. The Commission Chairs for the 2005-2008 triennium are :

Commission A :	Stuart Pollitt (UK)
Commission B :	Lotfollah Shafai (Canada)
Commission C :	Andreas F. Molisch (USA)
Commission D :	Frédérique de Fornel (France)
Commission E :	Flavio G. Canavero (Italy)
Commission F :	Piotr Sobieski (Belgium)
Commission G :	Paul Cannon (UK)
Commission H :	Richard Horne (UK)
Commission J :	Richard Schilizzi (Netherlands)
Commission K :	Frank Prato (Canada)

*e) Commission Vice-Chairs*

Commission A : Parameswar Banerjee (India)  
Commission B : Karl J. Langenberg (Germany)  
Commission C : Takashi Ohira (Japan)  
Commission D : Franz Kärtner (USA)  
Commission E : Christos Christopoulos (U.K.)  
Commission F : Madhukar Chandra (Germany)  
Commission G : Michael Rietveld (Norway)  
Commission H : Yoshiharu Omura (Japan)  
Commission J : Subra Ananthkrishnan (India)  
Commission K : Guglielmo D’Inzeo (Italy)

7. Publications

Council approves the following recommendations by the Standing Committee on Publications :

- The following membership for the triennium 2005-2008:  
Gert Brussaard (as former SPC with experience in General Assembly related publications)  
The incoming SPC, to be appointed at this General Assembly  
Tarek Habashy (current Editor of *Radio Science*)  
Bob Hunsucker (former Editor of *Radio Science*)  
Paul Lagasse (Secretary General, ex officio)  
Ross Stone (Editor of *Radio Science Bulletin*)  
Phil Wilkinson (Senior Associate Editor for *Reviews of Radio Science*)
- that Ross Stone remain as Chair of the Committee and as Editor of the *Radio Science Bulletin*.
- that candidates for as many as two to three additional Committee members be solicited from the Commission Chairs and Council. One of these would ideally be of the Young Scientist generation. A second would ideally be someone who would be particularly interested in promoting the visibility of the *Radio Science Bulletin*.

8. Future General Assemblies

*8.1 Selection of the venue of the XXIXth General Assembly in 2008*

The Member Committees proposing to host the 2008 URSI General Assembly are: Sweden (Gothenburg), presented by Prof. S. Ström, Turkey (Istanbul), presented by Prof. A. Altintas and the USA (Chicago, Illinois), presented by Dr. P.L.E. Uslenghi.

After election, the invitation of the Committee in the US is accepted. The location of the XXIXth General Assembly will be Chicago, Illinois, USA on 9-16 August 2008.

*8.2 Selection of the venue of the XXXth General Assembly in 2011*

On recommendation of the Board Council decided to delay the election of the venue of the XXXth General Assembly until the General Assembly in 2011.

### *8.3 Preparation of Scientific Programme, and designation of a Coordinator and an Associate Coordinator for 2008*

Dr. M. K. Goel of the Indian Local Organizing Committee was proposed and accepted by the Council as the Scientific Program Coordinator for the 2008 General Assembly. Prof. George Uslenghi of the USA was accepted as the Associate Scientific Program Coordinator.

### *8.4 Selecting venues of General Assemblies 6 years in advance*

Council decided by a weighted ballot not to commit itself to selecting the venue for the 2011 General Assembly at this time.

## 9. Commissions

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

### ***Commission A - ELECTROMAGNETIC METROLOGY, Electromagnetic measurements and standards.***

The commission promotes research and development in the field of measurement standards, in calibration and measurement methodologies, and the intercomparison of such. Areas of emphasis are:

- (a) the development and refinement of new measurement techniques.
- (b) primary standards, including those based on quantum .
- (c) phenomena.
- (d) realisation and dissemination of time and frequency standards
- (e) characterisation of the electromagnetic properties of materials.
- (f) electromagnetic dosimetry.

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

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

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

- (a) Time-domain and frequency-domain phenomena;
- (b) Scattering and diffraction;
- (c) General propagation including waves in specialised media;
- (d) Guided waves;
- (e) Antennas and radiation;
- (f) Inverse scattering and imaging.

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

### **Commission C - RADIO-COMMUNICATION SYSTEMS AND SIGNAL PROCESSING**

The Commission promotes research and development in:

- (a) Radio-Communication and Telecommunication systems;
- (b) Spectrum and Medium Utilisation;
- (c) Information Theory, Coding, Modulation and Detection;
- (d) Signal and Image Processing in the area of radio science.

The design of effective radio-communication systems must include scientific, engineering and economic considerations. This Commission emphasises research into the scientific aspects, and provides enabling technologies to other areas of radio science.

### **Commission D - ELECTRONICS AND PHOTONICS.**

The Commission promotes research and reviews new development in:

- (a) Electronic devices, circuits, systems and applications;
- (b) Photonic devices, systems and applications;
- (c) Physics, materials, CAD, technology and reliability of electronic and photonic devices down to nanoscale including quantum devices, with particular reference to radio science and telecommunications.

The Commission deals with devices for generation, detection, storage and processing of electromagnetic signals together with their applications from the low frequencies to the optical domain.

### **Commission E - ELECTROMAGNETIC NOISE AND INTERFERENCE.**

The Commission promotes research and development in:

- (a) Terrestrial and planetary noise of natural origin, seismic associated electromagnetic fields;
- (b) Man-made noise;
- (c) The composite noise environment;
- (d) The effects of noise on system performance;
- (e) The lasting effects of natural and intentional emissions on equipment performance;
- (f) The scientific basis of noise and interference control, electromagnetic compatibility;
- (g) Spectrum management;

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

The Commission encourages:

- (a) The study of all frequencies in a non-ionised environment:
  - (i) Wave propagation through planetary, neutral atmospheres and surfaces;
  - (ii) Wave interaction with the planetary surfaces (including land, ocean and ice), and subsurfaces;

- (iii) Characterisation of the environment as it affects wave phenomena;
- (b) The application of the results of these studies, particularly in the areas of remote sensing and communications;
- (c) The appropriate co-operation with other URSI Commissions and other relevant organisations.

**Commission G - IONOSPHERIC RADIO AND PROPAGATION (including ionospheric communications and remote sensing of ionised media).**

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

- (a) Global morphology and modelling of the ionosphere;
- (b) Ionospheric space-time variations;
- (c) Development of tools and networks needed to measure ionospheric properties and trends;
- (d) Theory and practice of radio propagation via the ionosphere;
- (e) Application of ionospheric information to radio systems.

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

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

The goals of the Commission are:

- (a) To study waves in plasmas in the broadest sense, and in particular:
  - (i) The generation ( i.e. plasma instabilities) and propagation of waves in plasmas,
  - (ii) The interaction between these waves, and wave-particle interactions,
  - (iii) Plasma turbulence and chaos,
  - (iv) Spacecraft-plasma interaction ;
- (b) To encourage the application of these studies, particularly in the areas of solar/planetary plasma interactions, and an increased exploitation of space as a research laboratory.

**Commission J - RADIO ASTRONOMY (including remote sensing of celestial objects).**

- (a) The activities of the Commission are concerned with observation and interpretation of all radio emissions and reflections from celestial objects.
- (b) Emphasis is placed on:
  - (i) The promotion of technical means for making radio-astronomical observations and data analysis,
  - (ii) Support of activities to protect radio-astronomical observations from harmful interference.

### **Commission K - ELECTROMAGNETICS IN BIOLOGY AND MEDICINE**

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

- (a) Physical interactions of EMF\* with biological systems;
- (b) Biological effects of EMF;
- (c) Mechanisms underlying the effects of EMF;
- (d) Experimental EMF exposure systems;
- (e) Assessment of human exposure to EMF;
- (f) Medical applications of EMF.

\* Electromagnetic fields (from static to terahertz)

#### 10. Report of the Chair on the Long Range Planning Committee

The President François Lefeuvre emphasises that in the next triennium the Long Range Planning committee should play an important role. To start it should perform a Strength, Weakness, Opportunities and Threat analysis of URSI.

It should also carefully investigate whether URSI covers all the areas and activities that it needs to cover. Based on this work proposals for the future evolution of URSI should be formulated.

The Council agreed unanimously to the outgoing Chairs of the Commissions being members of the Long Range Planning Committee.

#### 11. Procedure for the preparation of URSI Statements and White Papers

In between the triennial meetings of the URSI General Assembly, at which resolutions and recommendations can be agreed upon by Council, the need can arise for URSI to issue a public statement, sometimes in rather urgent circumstances. The procedure for developing such statements, as described below, guarantees the rapid production of such statements since in practice, timeliness is usually an important factor.

For a specific issue of radio science, a White Paper presents the scientific views and opinions of URSI, and the pros and cons on the issue, in a manner that is understandable by a much wider technical – and, hopefully, even non-technical – audience, outside of URSI. White Papers should be 30 pages of text or less, with a short (no more than three-page) executive summary.

1. An URSI Member Committee, an URSI Commission, an URSI Standing Committee, or the URSI Board of Officers may request the issuance of an URSI Position Statement on a particular issue within the scope of Radio Science as outlined in Article 1 of the URSI Statutes. Any of the same entities, along with individuals, may propose to the Board the development of a White Paper. Such requests must contain all relevant details in accordance with the assessment criteria described below.
2. When urgency is not a particular problem, the URSI Board of Officers will discuss issuing such a statement or developing such a White Paper at their subsequent meeting.

3. Where an URSI Position Statement or the development of a White Paper is agreed to be necessary, the appropriate mechanism for preparing such a statement or White Paper is agreed between the URSI Secretariat and the URSI Board of Officers. This will involve interested URSI Commissions, and the merits of including other partner organizations will also be assessed.
4. Once a draft URSI Position Statement or White Paper has been prepared, the URSI Secretariat will forward this to the Officers of the Board and to the URSI Member Committees and Commissions for review.
5. All comments received by the URSI Secretariat will be either incorporated directly into the URSI Position Statement or White Paper if appropriate, or forwarded to the author(s) for consideration. The URSI Secretariat will act as a liaison throughout this process.
6. The final version of the URSI Position Statement or White Paper will be sent to the Officers of the Board for approval.
7. The Position Statement or White paper will be dated and issued by the URSI Secretariat, and the following disclaimer will be attached:

This URSI Position Statement [or White Paper] is the responsibility of the International Union of Radio Science (URSI). However, it does not necessarily reflect all the views of individual URSI Member Committees nor of its Commissions.

*Criteria for deciding on whether an URSI Position Statement or White Paper is warranted*

These criteria will be used by the URSI Board of Officers to decide whether an URSI Position Statement or White Paper is warranted and how it should be developed. The criteria should therefore be explicitly addressed in any request for URSI to develop a statement or paper.

1. Timeliness. Why is an URSI Position Statement or White Paper required now?
2. What is the target audience for this URSI Position Statement or White Paper, and what impact is it likely to have on this audience?
3. What other URSI Position Statements, URSI White Papers, URSI Recommendations, or URSI Resolutions already exist? Are there other international (and national) scientific consensus statements on this topic? Is it an area of “conflict?” What is the “added value” of this URSI Position Statement or White Paper?
4. Is it appropriate for URSI? Does URSI have the necessary expertise to produce a Position Statement or White Paper on this topic? Do other partners need to be included?
5. What is the proposed dissemination strategy, e.g. publication in the *Radio Science Bulletin*, posting on the URSI Web site, transmission to ICSU, ...?
6. Is an URSI Position Statement or White Paper necessary? Does this topic justify an URSI Position Statement or White Paper?

After discussion Council approves this procedure.

#### 11. Any other Business

The “Addendum to Statement to URSI Council from the URSI’s SCT Chair” was discussed by Council, and it was agreed unanimously that the SCT should continue with the same Terms of Reference, but with changed priorities.

It was further agreed that the new priorities should be to liaise between URSI and user/applications organisations, especially those concerned with standards. This will need development after the General Assembly, taking full advantage of the SCT website. In view of these changes, Martin Hall will be asked to prepare proposals for the Board meeting in 2006.

## CO-ORDINATING COMMITTEE

### Summary Report

The Co-ordinating Committee met on Saturday 22 October 2005 (2 to 5.50 p.m) and Saturday 29 October 2005 (2 to 4.10 p.m.).

#### **1. First Co-ordinating Committee meeting**

##### *1.1 Local arrangements for the New Delhi General Assembly (Dr. Kumar)*

Dr. Kumar refers to the booklets for the general arrangements of this General Assembly. He makes some extra remarks about late time additions and changes to the arrangements and answers all questions about the local arrangements.

##### *1.2 Scientific Programme: proposed guidelines for future General Assemblies*

Prof. P. Lagasse outlines the proposal from the Board to centralise the abstract submission and paper handling for the General Assembly at the URSI Secretariat. The aims are:

- to remove the need for relearning and reprogramming each time
- to reduce the time between paper submission and General Assembly
- to improve the process and ultimately reduce the cost

As in the past the cost will be borne by the Local Organising Committee but paid to the URSI Secretariat.

##### *1.3 Instructions to Commissions and matters for Business meetings*

Professor Lagasse instructed the Commissions Chairs about the following matters :

- review and update of the terms of reference according to developments in recent years
- scientific report (by the incoming Chairs) on the business transacted during the General Assembly (for the Records of the General Assembly and the Radio Science Bulletin)
- resolutions and recommendations

- procedure for the election of Vice-Chairs
- responsibilities of Chairs and Vice-Chairs
  - the Secretariat needs receipt for all financial transactions
  - A dedicated Associate Editor for the Radio Science Bulletin is to be appointed
- Prof. Inan proposes that a paper should only be submitted once as a simultaneous submission of a 100 word abstract for the program book plus a paper for the proceedings. This proposal is adopted but there is no consensus about the length of the paper for the proceedings. Although desirable no uniformity over the Commissions regarding the length of the paper can be reached. This means that the software for paper submission should be adaptable so as to suit the requirements of each Commission. The software should also allow one to upload an adapted paper.
- reconstitution and creation of working groups for the following triennium
- proposed supported meetings for 2005-2008
- various scientific activities, web based lectures

#### *1.4 The Young Scientist Program in New Delhi and in the future (Secretary General)*

Prof. Lagasse mentions that thanks to the generosity of various sponsors, URSI has been able to select 143 Young Scientists for this New Delhi General Assembly. He also expresses the gratitude of URSI to Prof. T.B.A. Senior and Prof. E.V. Jull for their efforts and for the outstanding job they did in managing the selection process for the Young Scientists. One of the lessons learned is that we need to perform the Young Scientist selection sufficiently in advance in order to allow them enough time to find the necessary travel support .

#### *1.5 Publications (Dr. W.R. Stone)*

Dr. Stone presents the report on Publications.

#### *1.6 URSI White Paper (input to Commissions)*

The outline of the procedure for White Papers is presented. The way to improve the URSI image was discussed during the Coordinating Committee meeting in 2004. One important point to see if the Union could make a better use of the expertise of URSI members. The first action proposed was the elaboration of white papers on subjects of societal concerns.

#### *1.7 SCT*

Martin Hall presents the report on SCT.

## **2. Second Co-ordinating Committee meeting**

The Commissions highlight the outcome of the discussions at the Business Meetings.

### *2.1 Statistics*

Prof. Brussaard presents an overview of the recorded attendance at the scientific sessions.

## *2.2 General Comments*

From this past General Assembly the following conclusions can be drawn on organisational issues:

- almost no computer problems: PowerPoint presentations went quite well in general
- there were no capacity problems in the meeting rooms
- the poster arrangements were excellent
- the preloading of the presentations went well
- there was no sufficient food of good quality for the lunches
- the transportation arrangements were very good
- finally the hospitality was great

A few lessons learned for future General Assemblies

- the size of the posters should be correctly advertised in advance to the authors
- change of lecture halls should be very clearly indicated since people tend to look just in the booklet
- there should be a notice board per Commission to clearly indicate session schedule updates
- an update on the desired size of the rooms should be worked out for the next General Assembly
- Martin Hall requests that the list of attendees should be made available at the next General Assembly
- Regarding the use of own laptops for PowerPoint presentations, it is recommended to consider the use of switchboxes at the next General Assembly. Allowing the use of own laptops should avoid problems of non-compatibility of software.
- Care should be taken that General Lectures don't go overtime delaying following sessions.

## *2.3 Book of abstracts*

Regarding the format of the papers published in the book of abstracts, all the commissions express their views.

From this the following conclusions are drawn:

- the paper handling software should be able to handle the submission of abstracts with a length of 1/2 to 5 pages plus a summary of 75 to 100 words. After the submission deadline and up to one month prior to the General Assembly, the software should allow the authors to update their papers
- the possibility of having the papers indexed by INSPEC will be looked into
- the Board will propose a general set of guidelines for paper submission that should accommodate the various requirements of the Commissions.

#### *2.4 URSI White Papers (proposals from Commissions)*

Commission K proposes that URSI should publish a White Paper on “Wireless Communication and Health”. The maximum length of this White Paper should be 30 pages. Dr. F. Prato, Commission K Chair, is willing to take on the task of producing a draft of this White Paper. This will take several months. The draft will then be sent to the other Commissions and to the Board. Commissions B, E, A and J are willing to cooperate. It is agreed that Commission K will produce a draft.

#### *2.5 Proposals from the incoming President*

The incoming President, Prof. F. Lefeuvre, proposes to make an evaluation of the URSI activities, to analyse the strengths, weaknesses, opportunities and threats for URSI and to reflect how the gap between science and application could be better bridged. The Commission Chairs will be asked to act upon the resulting recommendations. The suggestion to consider having sessions at the next General Assembly without predefined papers is also made.

## TREASURER'S REPORT ON URSI FINANCES

### 1. General overview of income and expenditure

The URSI accounts are closely linked to the General Assemblies and follow therefore a 3 years cycle. After increased expenditure on the year of the General Assembly, on the following two years we accumulate funds to cover the expenses of the next GA. Therefore no wonder that in 2002 the accounts show a deficit about 123 k€.

The revenue of the Maastricht General Assembly was paid in 2003, which was also a year with a highest income from the member dues and lowest expenditure, resulting in an excess of income over expenditure of about 178 k€.

In 2004 URSI experienced again a deficit of about 63 k€. This was due to a small income because the member committees paid only about 79% of their dues, and increased expenditures related to the preparations for the GA in India and increased activities of the Commissions.

A small deficit ~ 9 k€ over the past triennium should not harm future URSI activities and can be compensated by late paid dues.

Year	Total income (€)	Total expenditure (€)
2002	173,057	296,344
2003	320,092	142,416
2004	153,353	216,838
Total 2002-2004	646,502	655,598

The table above gives a summary of the income and expenditure over last 3 years.

### 1. Assets

The URSI assets shrunk considerably within the last 3 years, partly due to the turmoil at the stock market and unfavourable US dollar – euro exchange rate. In spite of that, the market value of investments rose slowly, but steadily.

Year	Total net assets (€)	Market value of investments (€)
2002	562,358	801,686
2003	635,886	806,331
2004	529,162	820,541
Total increase 2002-2004	-33,196	18,855

### **1. Comments on the Accounts 2002-2004**

The balance sheets for 2002-2004 are attached to this report. Here are some comments:

1. As has been mentioned, in 2004 only 79% of dues were paid. The Treasurer suggest to act upon Article 9 of the URSI Statutes and consider those member committees which have not paid their dues for more than 2 years as having resigned from URSI and give them a possibility to apply for the Associate Membership of the Union.
2. During the last triennium URSI did not receive any contribution from ICSU. Unfortunately our applications for ICSU grants failed.
3. Both ICSU and UNESCO ceased to support our Young Scientists Programme and we were forced to ask National Committees for the assistance, which will let young scientists, mainly from developing countries, attend the 2005 GA. We are grateful to the National Committees of Japan, United States, and United Kingdom for a positive response.
4. The total expenditures were lower as compared to the previous triennium 1999-2001 by about 49 k€.
5. Each Commission received a financial allocation of 9 k€ for the triennium 2002-2004.
6. The expenditures for scientific activities decreased from 331 k€ in the 1999-2001 to about 273 k€ in 2002-2004. This decline was mainly due to the lower organisation cost of the General Assembly in Maastricht as compared to that in Toronto.
7. The publication costs were higher by about 30%, apparently because the Radio Science Bulletin (RSB) is published with substantially more pages than in the past, due to the success of the RSB as an accepted place to publish, and due to the fact that we're publishing the Reviews of Radio Science in the RSB instead of as a separate book.
8. The administrative expenses were kept at a level about 212 k€, slightly lower than that in 1999-2001.

The Treasurer wants to express his sincere thanks to our Secretary General and staff of the Secretariat in Ghent for effectively handling of the day-to-day financial affairs and for the substantial help offered during the last three years in office.

Andrzej W. Wernik

Enclosure : Balance sheets of 2002, 2003, 2004

<b>INTERNATIONAL UNION OF RADIO SCIENCE (URSI)</b>	
<b>BALANCE SHEET: 31 DECEMBER 2002</b>	
<b>ASSETS</b>	<b>EURO</b>
Dollars	
Merrill Lynch WCMA	13,094.75
Fortis	15,567.72
Smith Barney Shearson	-1.45
	28,661.02
Euros	
Banque Degroof	1,814.61
Fortis	64,145.06
	65,959.67
Investments	
Demeter Sicav Shares	23,895.74
Rorento Units	117,377.87
Aqua Sicav	67,199.41
Merrill-Lynch Low Duration (305 units)	3,268.17
Massachusetts Investor Fund	290,881.14
	502,622.33
684 Rorento units on behalf of van der Pol Fund	13,078.77
	515,701.10
Petty Cash	477.35
<b>Total Assets</b>	<b>610,799.14</b>
Less Creditors	
IUCAF	30,151.12
ISES	5,211.62
	-35,362.74
Balthasar van der Pol Medal Fund	-13,078.77
<b>NET TOTAL OF URSI ASSETS</b>	<b>562,357.63</b>
<b>The net URSI Assets are represented by:</b>	
Closure of Secretariat	
Provision for Closure of Secretariat	76,001.75
Scientific Activities Fund	
Scientific Activities in 2003	33,545.60
Publications in 2003	31,449.00
Young Scientists in 2003	52,415.00
Administration Fund in 2003	67,615.35
I.C.S.U. Dues in 2003	9,434.70
	194,459.65
XXVII General Assembly 2002 Fund: During 2003 - 2004 - 2005	p.m.
Total allocated URSI Assets	270,461.40
Unallocated Reserve Fund	291,896.23
	<b>562,357.63</b>

**Statement of Income and expenditure  
for the year ended 31 December 2002**

**I. INCOME**

	EURO
Grant from ICSU Fund and US National Academy of	0
Allocation from UNESCO to ISCU Grants Programme	0
UNESCO Contracts	0
Contributions from National Members	162,116.39
Contributions from Other Members	0
Special Contributions	0
Contracts	0
Sales of Publications, Royalties	2,000.00
Sales of scientific materials	0
Bank Interest	308.06
Other Income	8,632.97
	<b>173,057.42</b>

**II. EXPENDITURE**

A1) Scientific Activities		172,060.07
General Assembly 2002	149,468.50	
Scientific meetings: symposia/colloquia	14,100.00	
Working groups/Training courses	0	
Representation at scientific meetings	8,491.57	
Data Gather/Processing	0	
Research Projects	0	
Grants to Individuals/Organisations	0	
Other	0	
Loss covered by UNESCO Contracts	0	
A2) Routine Meetings		9,652.63
Bureau/Executive committee	9,652.63	
Other	0	
A3) Publications		33,508.01
B) Other Activities		4,908.14
Contribution to ICSU	4,908.14	
Contribution to other ICSU bodies	0	
Activities covered by UNESCO Contracts	0	
C) Administrative Expenses		76,215.49
Salaries, Related Charges	55,605.16	
General Office	12,263.82	
Expenses		
Office Equipment	0	
Audit Fees	5,505.52	
Bank Charges	2,212.43	
Loss on Investments	628.56	
<b>Total Expenditure</b>		<b>296,344.34</b>

Excess of Income over Expenditure	-123,286.92
Currency translation difference (USD => EURO) - Bank Accounts	-2,042.35
Currency translation difference (USD => EURO) - Investments	-35,860.76
Currency translation difference (USD => EURO) - Others	37,613.22
Accumulated Balance at 1 January 2002	685,934.44
	<u>562,357.63</u>

**ADDITIONAL INFORMATION**

Rates of exchange

01-Jan-02	\$ 1 =	1.123
31-Dec-02	\$ 1 =	1.0483

Balthasar van der Pol Fund

684 Rorento Shares : market value on December 31, 2000  
(Aquisition Value: USD 12.476,17)

26,217.72

Market Value of investments on December 31, 2001

Demeter Sicav  
Rorento Units (1)  
Aqua-Sicav  
M-L Low Duration  
Massachusetts Investor Fund

52,389.48  
498,290.00  
76,192.55  
3,299.63  
171,514.31

801,685.97

(1) Including the 684 Rorento Shares of v d Pol Fund

**APPENDIX**

**Detail of Income and Expenditure**

**I. INCOME**

Other Income

Income General Assembly - support  
Income General Assembly - grant  
Interest on Short Term  
Interest on M-L Short  
Interest on Massachusetts Investor

4,193.20  
2,325.58  
1,814.62  
299.54  
0.03

8,632.97

**II. EXPENDITURE**

General Assembly 2002

Organisation  
Vanderpol Medal  
Expenses officials  
Young scientists

48,822.91  
1,154.09  
53,423.84  
46,067.66

149,468.50

Symposia/Colloquia/Working Groups		
Commission A	2,700.00	
Commission B	0	
Commission C	645	
Commission D	585	
Commission E	500	
Commission F	0	
Commission G	1,550.00	
Commission H	1,320.00	
Commission J	3,000.00	
Commission K	3,800.00	
		14,100.00
Contribution to other ICSU bodies		
IUCAF	0	0
Publications		
Printing 'The Radio Science Bulletin'	15,689.48	
Mailing 'The Radio Science Bulletin'	17,818.53	
		33,508.01

**INTERNATIONAL UNION OF RADIO SCIENCE  
BALANCE SHEET: 31 DECEMBER 2003**

**ASSETS**

	EURO	
Dollars		
Merrill Lynch WCMA	8,510.11	
Fortis	9,185.60	
Smith Barney Shearson	-45.35	
		17,650.36
Euros		
Banque Degroof	1,226.33	
Fortis	189,223.26	
		190,449.59
Investments		
Demeter Sicav Shares	19,193.18	
Rorento Units	94,278.51	
Aqua Sicav	53,974.91	
Merrill-Lynch Low Duration (305 units)	2,625.01	
Massachusetts Investor Fund	233,637.24	
	403,708.85	
684 Rorento units on behalf of van der Pol Fund	10,504.94	
		414,213.79

Short Term Deposito		50,166.04
Petty Cash		406.38
<b>Total Assets</b>		<b>672,886.16</b>
Less Creditors		
IUCAF	19,102.19	
ISES	7,449.39	
		-26,551.58
Balthasar van der Pol Medal Fund		-10,504.94
<b>NET TOTAL OF URSI ASSETS</b>		<b>635,829.64</b>
<b>The net URSI Assets are represented by:</b>		
Closure of Secretariat		
Provision for Closure of Secretariat		75,780.00
Scientific Activities Fund		
Scientific Activities in 2004	26,944.00	
Publications in 2004	39,995.00	
Young Scientists in 2004	21,050.00	
Administration Fund in 2004	64,834.00	
I.C.S.U. Dues in 2004	7,578.00	
		160,401.00
XXVII General Assembly 2005 Fund: During 2003 - 2004 - 2005		63,150.00
Total allocated URSI Assets		299,331.00
Unallocated Reserve Fund		336,498.64
		<b>635,829.64</b>

**Statement of Income and expenditure  
for the year ended 31 December 2003**

**I. INCOME**

	EURO
Grant from ICSU Fund and US National Academy of	0
Allocation from UNESCO to ISCU Grants Programme	0
UNESCO Contracts	0
Contributions from National Members	238,848.00
Contributions from Other Members	0
Special Contributions	0
Contracts	0
Sales of Publications, Royalties	0
Sales of scientific materials	109.02
Bank Interest	929.05
Other Income	80,205.76
<b>Total Income</b>	<b>320,091.83</b>

## II. EXPENDITURE

A1) Scientific Activities		13,219.40
General Assembly 2002	219.4	
Scientific meetings: symposia/colloquia	13,000.00	
Working groups/Training courses	0	
Representation at scientific meetings	0	
Data Gather/Processing	0	
Research Projects	0	
Grants to Individuals/Organisations	0	
Other	0	
Loss covered by UNESCO Contracts	0	
A2) Routine Meetings		11,936.36
Bureau/Executive committee	11,936.36	
Other	0	
A3) Publications		39,468.99
B) Other Activities		11,942.24
Contribution to ICSU	3,942.24	
Contribution to other ICSU bodies	8,000.00	
Activities covered by UNESCO Contracts	0	
C) Administrative Expenses		65,848.88
Salaries, Related Charges	51,108.85	
General Office Expenses	4,800.84	
Office Equipment	3,489.48	
Accountancy/Audit Fees	4,658.52	
Bank Charges	1,791.19	
Loss on Investments	0	
<b>Total Expenditure</b>		<b>142,415.87</b>
Excess of Income over Expenditure		177,675.96
Currency translation difference (USD => EURO) - Bank Accounts		-4,324.57
Currency translation difference (USD => EURO) - Investments		-98,913.48
Currency translation difference (USD => EURO) - Others		109,703.15
Accumulated Balance at 1 January 2003		451,688.58
		<b>635,829.64</b>

### ADDITIONAL INFORMATION

#### Rates of exchange

January 1, 2003	\$ 1 =	1.0483
December 31, 2003	\$ 1 =	0.842

EURO	
<u>Balthasar van der Pol Fund</u>	
684 Rorento Shares : market value on December 31, 2003 (Aquisition Value: USD 12.476,17)	26,552.88
<hr/>	
Market Value of investments on December 31, 2003	
Demeter Sicav	53,642.16
Rorento Units (1)	504,660.00
Aqua-Sicav	77,725.58
M-L Low Duration	2,642.57
Massachusetts Investor Fund	167,660.45
	<hr/>
	806,330.77
	<hr/>
(1) Including the 684 Rorento Shares of v d Pol Fund	

**APPENDIX**  
**Detail of Income and Expenditure**

EURO	
<b>I. INCOME</b>	
Other Income	
Income General Assembly - support YS Japan	0
Income General Assembly 2002	80,000.00
Fee Correspondents	40
Interest on M-L Short Term	165.76
Interest on Massachusetts Investor Fund	0
	<hr/>
	80,205.76
<b>II . EXPENDITURE</b>	
General Assembly 2002	
Organisation	219.4
Van der Pol Medal	0
Expenses officials	0
Young scientists	0
	<hr/>
	219.4
Symposia/Colloquia/Working Groups	
Commission A	0
Commission B	0
Commission C	0
Commission D	1,000.00
Commission E	3,000.00
Commission F	3,000.00
Commission G	1,500.00
Commission H	3,000.00
Commission J	1,500.00
Commission K	0
	<hr/>
	13,000.00

Contribution to other ICSU bodies		
FAGS 2002+2003	4,000.00	
IUCAF 2002+2003	4,000.00	
		8,000.00
Publications		
Printing 'The Radio Science Bulletin'	17,309.78	
Mailing 'The Radio Science Bulletin'	22,159.21	
		39,468.99

**INTERNATIONAL UNION OF RADIO SCIENCE (URSI)  
BALANCE SHEET: 31 DECEMBER 2004**

ASSETS	EURO	
Dollars		
Merrill Lynch WCMA	3,169.09	
Fortis	4,162.71	
Smith Barney Shearson	67.78	
		7,399.58
Euros		
Banque Degroof	617.02	
Fortis	128,185.32	
		128,802.34
Investments		
Demeter Sicav Shares	17,187.24	
Rorento Units	84,425.18	
Aqua Sicav	48,333.83	
Merrill-Lynch Low Duration (305 units)	2,350.66	
Massachusetts Investor Fund	209,219.10	
	361,516.01	
684 Rorento units on behalf of van der Pol Fund	9,407.03	
		370,923.04
Short Term Deposito		50,832.14
Petty Cash		366.75
<b>Total Assets</b>		<b>558,323.85</b>
Less Creditors		
IUCAF	9,865.71	
ISES	9,889.28	
		-19,754.99
Balthasar van der Pol Medal Fund		-9,407.03
<b>NET TOTAL OF URSI ASSETS</b>		<b>529,161.83</b>

**The net URSI Assets are represented by:**

Closure of Secretariat		90,480.00
Provision for Closure of Secretariat		
Scientific Activities Fund		
Scientific Activities in 2004	32,045.00	
Publications in 2004	60,320.00	
Young Scientists in 2004	39,585.00	
Administration Fund in 2004	64,090.00	
I.C.S.U. Dues in 2004	6,032.00	
		<u>202,072.00</u>
XXVII General Assembly 2005 Fund: During 2003 - 2004 - 2005		188,500.00
Total allocated URSI Assets		<u>481,052.00</u>
Unallocated Reserve Fund		48,109.83
		<u><u>529,161.83</u></u>

**Statement of Income and expenditure  
for the year ended 31 december 2004****I. INCOME**

	EURO	
Grant from ICSU Fund and US National Academy of	0	
Allocation from UNESCO to ISCU Grants Programme	0	
UNESCO Contracts	0	
Contributions from National Members	152,403.00	
Contributions from Other Members	0	
Special Contributions	0	
Contracts	0	
Sales of Publications, Royalties	0	
Sales of scientific materials	0	
Bank Interest	950.29	
Other Income	0	
		<u><u>153,353.29</u></u>

**II. EXPENDITURE**

A1) Scientific Activities		87,802.47
General Assembly 2005	27,720.19	
Scientific meetings: symposia/colloquia	55,634.85	
Working groups/Training courses	0	
Representation at scientific meetings	4,447.43	
Data Gather/Processing	0	
Research Projects	0	
Grants to Individuals/Organisations	0	
Other	0	
Loss covered by UNESCO Contracts	0	
A2) Routine Meetings		7,315.82
Bureau/Executive committee	7,315.82	
Other	0.00	

A3) Publications		29,159.62
B) Other Activities		7,530.23
Contribution to ICSU	3,530.23	
Contribution to other ICSU bodies	4,000.00	
Activities covered by UNESCO Contracts	0	
C) Administrative Expenses		85,029.71
Salaries, Related Charges	61,970.59	
General Office Expenses	13,126.00	
Office Equipment	3,129.57	
Accountancy/Audit Fees	5,006.38	
Bank Charges	1,797.17	
Loss on Investments	0	
<b>TOTAL EXPENDITURE</b>		<b>216,837.85</b>
Excess of Expenditure over Income		-63,484.56
Currency translation difference (USD => EURO) - Bank		-863.64
Currency translation difference (USD => EURO) -		-42,192.84
Currency translation difference (USD => EURO) - Others		66,325.73
Accumulated Balance at 1 January 2004		569,377.14
		<b>529,161.83</b>

**ADDITIONAL INFORMATION**

Rates of exchange

January 1, 2004	\$ 1 = 0.842
December 31, 2004	\$ 1 = 0.754

Balthasar van der Pol Fund

684 Rorento Shares : market value on December 31, 2004  
(Aquisition Value: USD 12.476,17)

27,277.92

Market Value of investments on December 31, 2004

	EURO
Demeter Sicav	57,145.44
Rorento Units (1)	518,440.00
Aqua-Sicav	79,094.21
M-L Low Duration	2,336.50
Massachusetts Investor Fund	163,524.80
	<b>820,540.94</b>

(1) Including the 684 Rorento Shares of v d Pol Fund

**APPENDIX****Detail of Income and Expenditure****I. INCOME**

## Other Income

Income General Assembly 2005

0

0

**II . EXPENDITURE**

## General Assembly 2005

Organisation

27,720.19

Van der Pol Medal

0

Expenses officials

0

Young scientists

0

27,720.19

## Symposia/Colloquia/Working Groups

Commission A

2,824.97

Commission B

9,000.00

Commission C

6,000.00

Commission D

6,500.00

Commission E

5,299.88

Commission F

1,750.00

Commission G

3,500.00

Commission H

3,000.00

Commission J

1,500.00

Commission K

9,000.00

Central Fund

7,260.00

55,634.85

## Contribution to other ICSU bodies

FAGS 2004

2,000.00

IUCAF 2004

2,000.00

4,000.00

## Publications

Printing 'The Radio Science Bulletin'

12,281.66

Mailing 'The Radio Science Bulletin'

16,877.96

29,159.62

## REPORTS OF THE STANDING COMMITTEES

### URSI STANDING FINANCE COMMITTEE

October, 2005

#### **Accounts for the years 2002-2005**

The Standing Finance Committee met during the 28<sup>th</sup> General Assembly in New Delhi, India, to examine and review the accounts for the last three years as submitted by the Secretary General and the Treasurer. The accounts were prepared by a professional accountant and were audited by Ernst & Young.

Prof. Susan K. Avery could not attend the GA and Prof. Umran S. Inan was asked at the General Assembly to examine the URSI finances.

#### **Report and recommendations of the Standing Finance Committee, including approval of accounts 2002-2004 and budget 2006-2008.**

The acting Chair of the Finance Committee, Professor Umran Inan, reviews the conclusion of his committee regarding the financial situation of URSI :

- the committee recommends to approve the proposed budget;
- the finances of URSI are healthy and the committee recommends to approve the accounts 2002-2004;
- in order to more clearly show the evolution of the URSI finances, the committee recommends to present the accounts per triennium starting by the year before a General Assembly until the year after a General Assembly;
- in view of the substantial reserves of URSI the committee recommends to take new initiatives such as for example an extra budget for the commissions to support the attendance of students or Young Scientists at URSI meetings.

After a debate concerning this report, following conclusions are reached :

- the accounts 2002-2004 are approved unanimously
- the URSI Board should consider taking new initiatives; as a first step, an increase in the budget of the commissions by \$5000 is approved. The Board should, after consultation with the Long Range Planning Committee stipulate the rules for spending

- this extra budget along the lines proposed by the finance committee.
- the reserves and the income from reserves should be shown in the budget
  - with the amendments described above the budget is approved.

## **URSI STANDING COMMITTEE ON PUBLICATIONS**

October, 2005

A meeting of the URSI Standing Committee on Publications was held October 25, 2005. Present at various times were Phil Wilkinson, Joel Hamelin, Frank Prato (one of the Associate Editors of the *Radio Science Bulletin*) and Ross Stone; a subsequent discussion was held with Gert Brussaard and the contents of that are incorporated.

### **Radio Science Bulletin and Reviews of Radio Science**

The meeting began with a summary of the status of the *Radio Science Bulletin (RSB)* and the *Reviews of Radio Science (RRS)*, most of the information for which was included in the report of the Publications Committee to the Council and is not repeated here. It was noted that there have recently been five to six papers per issue, with a peak of 10. Special issues have been a rich source of high-quality papers, as have the *Reviews of Radio Science*. The fact that the *RSB* is indexed and abstracted in INSPEC and that it has a significant number of high-quality papers in each issue has allowed it to gain a substantial degree of acceptance as a significant publication in the radio science field.

The problem of the Editor of the *RSB* being able to keep up with fully editing all of the increased number of submissions was discussed. A person who can help with the editing load had been identified, and she will start being used after the General Assembly.

The status of the *Reviews of Radio Science* (which are published in the *RSB*) was discussed, and found to be working very well under the leadership of Phil Wilkinson. It was noted that participation has been good by all Commissions, with the exception of Commissions A and J. Commission J has several papers in the pipeline, and it is hoped that these can be made available for publication before the end of 2006. There has not been recent response from Commission A; it is hoped that Commission A will participate in the coming triennium. The new Commission Associate Editors for the *RRS* will be appointed at this General Assembly. The original plan had called for the previous Associate Editors to carry through with the papers started under their term. However, after some discussion it was decided that the new Associate Editors should pick up all of the papers currently in process by their Commission. This will be conveyed to the new Associate Editors at the meeting with them on Friday, October 28.

There was a discussion of the PDFs used in the current production of the *RSB*. There are two issues. First, the current PDFs are apparently not searchable, either using

Acrobat's search tools or by a Web-based search engine such as Google, when the PDF is posted on the Web. Second, it would be desirable to have the *RSB* searchable by such facilities as Google Scholar. This will require solving the first problem, and also preparing a version of each issue with the papers and other elements in individual PDF files. Ross Stone will work with Inge Lievens to try to solve these problems.

There had been a request from Commission K to see if the *RSB* could be included in the PubMed indexing and abstracting service. Phil Wilkinson researched this, and learned that about 140 journals apply for inclusion in PubMed every three months, with only about 30 to 40 being accepted. Those that are accepted have a much stronger medical content than does the *RSB*. He then did some research with those working in the bio-electromagnetics field, specifically looking at what index workers in that field used when seeking bio-electromagnetic papers related to radio science (e.g., biological effects of cell phones). It was clear that most people used INSPEC for such searches, and the conclusion was that the current indexing is sufficient.

It was suggested that the Commissions be polled to see what indices and databases they use, and to see if there are any indices other than INSPEC for which it made sense to try to have the *RSB* included. It was also suggested that one member of the Publications Committee should be tasked with the ongoing responsibility of monitoring and researching ways to improve the visibility of the *RSB*, particularly looking at how it is and could be searched and referenced.

The suggestion was made that provision for including multimedia files with the Web-based version of the *RSB* should be instituted. Ross Stone will work with Inge Lievens to try to implement this.

It was suggested that consideration be given to establishing a separate Web site for the *RSB*, assuming an appropriate domain name can be obtained.

### **Radio Science**

The comments from Tarek Habashy, Editor of *Radio Science*, were reviewed. *Radio Science* continues to enjoy a favored status among the AGU publications, and is very well received within the radio science community. No problems were noted.

### **Wireless Networks**

*Wireless Networks* appears to be doing well. There was no input from *Wireless Networks*.

### **Other Matters**

The proposal received quite some time ago regarding *Advances in Radio Science* was discussed. There appears to have been a communications breakdown regarding this, and it is regretted. The consensus was that as long as the scope of interest for *Advances in Radio Science* was limited to primarily publishing the proceedings of radio science

conferences, and did not overlap the scope of *Radio Science* or of the *Radio Science Bulletin*, it should in principle be acceptable as an URSI logo publication (subject to approval by the Board, of course). However, there was also agreement that the written scope that had appeared on the *Advances in Radio Science* Web site did have overlap problems. Ross Stone has had a discussion about this with Karl Langenberg, at this General Assembly. That statement is going to be looked at, and an attempt made to resolve any issues. It is hoped that a revised statement of the scope of *Advances in Radio Science* will resolve the concerns of the Publications Committee.

It was noted that it would be useful to prepare guidelines for the use of the URSI logo, particularly in connection with publishing and for Web-related use.

The program booklet for the General Assembly was discussed, and found to be generally quite good. It was noted that the format may undergo some change, depending on the pending decision of the Coordinating Committee regarding the continuation of 100-word summaries. It was suggested that inclusion of an author index would be helpful. Also, it would be helpful to have a list (possibly in a grid similar to the schedule grid) of the sessions by Commission and day, including the titles and rooms.

### **Committee Membership**

The Committee recommended the following membership for the coming triennium:  
Gert Brussaard (as former SPC with experience in General Assembly related publications)  
The incoming SPC, to be appointed at this General Assembly  
Tarek Habashy (current Editor of *Radio Science*)  
Bob Hunsucker (former Editor of *Radio Science*)  
Paul Lagasse (Secretary General, ex officio)  
Ross Stone (Editor of *Radio Science Bulletin*)  
Phil Wilkinson (Senior Associate Editor for *Reviews of Radio Science*)

It was recommended that Ross Stone remain as Chair of the Committee and as Editor of the *Radio Science Bulletin*.

It was also recommended that candidates for as many as two to three additional Committee members be solicited from the Commission Chairs and Council. One of these would ideally be of the Young Scientist generation. A second would ideally be someone who would be particularly interested in promoting the visibility of the *Radio Science Bulletin*, as discussed above.

W. Ross Stone, Chair

## URSI LONG RANGE PLANNING COMMITTEE

URSI LRPC is an advisory function reporting to URSI Board. As such, the committee reviews and analyzes the problems potentially impacting upon the future of URSI activities and organizations and provides recommendations appropriate to the URSI, often in response to request of the Board. During this triennium, LRPC was asked to analyze the ICSU inquiry and provide an itemized list of future technical areas that should be strongly embraced by URSI community. This response was provided to the Board in the form of Response of Long Range Planning Committee for ICSU Inquiry dated March 19, 2003. The essence of the particular response is reiterated below.

### **Response to ICSU Inquiry**

LRPC look at the problems more global to URSI in contrast to Commissions and SCT that might look into problems and topics more relevant to their technical areas of interest. In this regard, a dialogue was initiated within LRPC in regard to appropriate topics and justifications that should be embraced by URSI community.

1. **Nano Technology:** This is an emerging area strongly supported by many governments for research with potential huge impacts 10 years and more down the road. Future impacts are enormous in electronics, photonics, communication, computation, biological science and even the way we conduct research. This topic embraces almost all commissions and SCT in URSI.
2. **Energy issues including Space Solar Power Systems:** This issue is not only important for future of mankind in combating depleting sources of present energy format, but also implications for communication, sensing and material, radio astronomy and environmental sciences.
3. **Environmental Issues:** URSI's interest in electromagnetic spectrum, EMI/EMC should be included in the topics particularly as a consequence of the item 2 above.

Tatsuo Itoh, Chair

## URSI STANDING COMMITTEE ON DEVELOPING COUNTRIES

The actions of the committee have been closely related to the activities carried out at and supported by the Abdus Salam International Centre for Theoretical Physics, Trieste, Italy. The Centre main objectives are to foster the growth of advanced studies and research in physics and mathematics, especially among researchers from developing countries and to create an international forum for the exchange of scientific information. In the period reported here the Aeronomy and Radiopropagation Laboratory of the Centre continued carrying out the series of yearly Schools on the use of Radio for Digital Communications and Computer Networks. These and other activities related to radio science and technology have been carried out under the agreement signed by the Centre and the International Telecommunication Union / Bureau of Development (ITU/BDT). The objective is to collaborate for the advancement of human resources and research and development capabilities in the field of telecommunication science and technology in developing countries.

The School on Radio based Computer Networking, the last of the series mentioned above, was carried out at the Abdus Salam ICTP in February 2005 and was supported also by URSI. It can be considered a joint action of the Standing Committee on Developing Countries of the Union with the other institutions involved. A short report on this activity is attached as Annex 1.

It has to be noted that the activities reported above benefited, between 2002 and 2005, more than 200 scientists and engineers from developing countries of Africa, Asia and Latin America that were exposed - both theoretically and with hand-on training- to new radio technologies for digital communications.

As pre-assembly events of the XXVIII General Assembly of URSI, to be carried out in Delhi, October 23-29, 2005, two activities have been planned that involve the interest of the Standing Committee on Developing Countries. One is the *Workshop on Rural Communication for Developing Countries* in Dehli that will be coordinated by Dr. Ashok Jhunjhunwala IITM, India, and Prof. Sandro M. Radicella, ICTP, Italy, Chair of the Standing Committee. The other one is the *Workshop on Wireless Technologies for South Asian Countries*, to be carried out in Pune, India, October 10-21, at the International Institute of Information Technology (IIIT). This activity is co-sponsored and financed by the IIIT, the Abdus Salam ICTP and the ITU/BDT and will be directed by Dr. Bharat Chaudhari of IIIT and Prof. Sandro M. Radicella.

## **ANNEX 1**

### *Brief Report on the 2005 ICTP-ITU/BDT-URSI School on Radio Based Computer Networking for Research and Training in Developing Countries*

#### **Introduction**

The School, held at the Abdus Salam ICTP in Trieste, Italy, from 7 February to 5 March 2005, was supported by the Abdus Salam ICTP, the ITU/BDT and URSI, and directed by Sandro M. Radicella and Ryszard Struzak. It gathered eighty participants from twenty-six countries. This number includes twenty-five lecturers and invited speakers. The remaining participants, young scientists, engineers, and lecturers, mostly from universities in developing countries –were selected from among more than three hundred candidates from around the world.

#### **Purpose and scope**

The school focused on application of modern cost-efficient radio-based technologies that scientists, teachers, and engineers – coming back home after the School - could adapt, develop, and disseminate further to solve practical problems in their countries. The goal was to provide the participants with knowledge and skills necessary to setup inexpensive wireless networks for campus-wide networks (and links to remote internet service providers), and for rural and remote areas, where they are most needed. The school focused on innovative solutions in design and implementation of low-cost wireless networks capable to interconnect computers and offer data, audio and video communications at distances up to several kilometres.

#### **School activities**

The school activities included tutorial lectures, practical exercises in the laboratory and in the field, review of newest technologies and equipment, and selected case studies. It was complemented by a small exposition of equipment and culminated in a round-table discussion with the participation of the lecturers and invited experts. As all the material used in the school is available at the Web, the following is reduced to general remarks only.

The lectures were to refresh theory for the participants to benefit fully from the practical exercises on WiFi, WiMax, WLANs, WANs, MANET, VSAT, VoIP, etc. They covered basics of Linux operating system and internet, as well as of microwave propagation, antennas, transmission lines, etc., and were complemented by information on regulatory and financial aspects of wireless-networking-related projects. Two presentations, (one from Germany and another from Kenya) were delivered via internet at distances of few thousand kilometres. It was a practical demonstration of capabilities and limitations of distance e-learning. Much of the time was devoted to practical hands-on sessions and step-by-step network building, design, and testing, with practically unlimited access to the laboratory. Included were practical exercises with design, build, and checking antenna,

cables, and complete wireless computer networks, indoor and outdoor, including propagation analysis.

### **Round table**

The round table gathered a number of experts. It started with transferring by Mr. Hamadoun Touré, the Director of the ITU Telecommunication Development Bureau, a specialized measuring instrument donated to the ICTP by the Rohde und Schwartz company in support of the future ICTP- ITU/BDT activity. The public lecture ‘Information society, developing countries, and the role of ITU-D’ offered by Mr. Touré inaugurated the series of expert presentations and the round table. The discussions covered a large number of topics, starting from the use of simplest FM micro-transmitters in small villages up to the new trends in satellite delivery of broadband signals, to the on-going preparations for the final session of the World Summit on Information Society.

### **Concluding remarks**

The school offered a survey of new wireless technologies for ICT. The participants learned how off-the-shelf equipment, combined intelligently with free software and do-it-yourself elements, could be used to create low-cost modern wireless communication networks. They themselves designed, built, deployed and tested radio links, transmitting computer data and multimedia contents over distances up to dozens of kilometers.

The participants in the school 2005 have joined the ‘virtual community’ of over 1500 individuals that participated in schools on radio held in the ICTP during the previous eight years. That community has accelerated significantly the dissemination of radio technology know-how around the world. The 2005 school contributed once more to advancing scientific development in academic and research institutions in Developing Countries. Details about the program of the School can be found in: [http://wireless.ictp.trieste.it/school\\_2005/index.html](http://wireless.ictp.trieste.it/school_2005/index.html)

### **Acknowledgment**

The following entities were collaborating in supporting the school in addition to the main sponsors(names in alphabetic order): *Alvarion, Italy; CEI Central European Initiative; CSTI, France; EHAS, Spain, GTZ Germany; France Telecom, France, FCC, USA; ICS-UNID; Italy; Inveneo, USA; ISF, Italy; Metrix, USA; O’Reilly Media, USA; Skylogic, Italy; Wire.less, Denmark; Rohde und Schwarz, Germany and Italy; Skylogic, Italy; STEM, India; ULA-EsLaRed, Venezuela.*

Sandro M. Radicella, Chair

## URSI STANDING COMMITTEE ON YOUNG SCIENTISTS

The call for applications for the YS Awards was announced in the *Radio Science Bulletin*, on the URSI web page and elsewhere, with a deadline for receipt by the URSI Secretariat of 15 November 2004, later changed to 15 January 2005. There were 173 applicants.

Nineteen of the applicants had received an award at least once previously. The decision was made to eliminate all previous winners unless a good case could be made for doing otherwise, e.g. the only applicant from a developing country. There were two such cases (YS from Iran and South Africa), so that only 17 of the 19 were actually eliminated, leaving 156 applicants for consideration. However, it was found out later that one of these 17 had, because of illness, not taken up their award, and it was decided to restore his eligibility.

Using 2005 nominal GDP (in USD) per capita data obtained from the web, the division between developing and developed countries was somewhat arbitrarily set at 12,000 USD, placing the Czech Republic, but not Slovakia or Hungary, among the developed countries. The 157 valid applications then broke down as follows: developing countries 75, developed countries 82.

Travel costs are paid only for YS from developing countries. The money allocated for this was 40,000 EUR from URSI, 4,900 Euros from Japan, 2,100 EUR from the UK and 4,100 EUR from the USA, totalling 51,000 EUR. Ninety percent of this, i.e. 46,000 EUR, was available, with the other 10 percent held in reserve.

At previous GAs the number of YS has never exceeded 120, but at the May 2005 URSI Board meeting the GA host country indicated that 150 YS could be accommodated. As a consequence, all applicants whose papers were accepted could be (and were) given awards, obviating any use of the ranking by the Member Committees.

One hundred forty-four YS were selected for awards, and their names were announced on the URSI web page on 13 June and in the weeks thereafter. They are distributed as follows: 67 YS from developing countries and 77 YS from developed countries and 29 of them are women. The individual travel allocations were based on the minimum air travel costs provided by URSI (AC-2 train in the case of the Indian applicants), but also taking into account the applicants' own figures. The total travel cost is 41,445 EUR.

## Procedures and Recommendations

1. The choice of the 3-member YS Panel (Senior, Jull, Gupta) worked well.
2. Forty-eight of the 173 YS applicants did not specify a Commission. Although most of these were later assigned to Commissions, there were some for whom this appears to have been done after the distribution of the abstracts, and 5 were never assigned.  
*Recommendation:* For those applications that do not list a Commission, the Secretariat should assign a Commission before any abstracts are distributed.
3. The ranking by the Member Committees worked reasonably well, and (after some prodding) most of the rankings were received within a week or two of the established deadline.  
*Recommendation:* The ranking is most important for countries with many applicants and, to be useful, all applicants should be ranked as a single group and not by Commission.
4. Only one Commission indicated which abstracts were rejected as well as those accepted. Partly as a result of this, we finished up with 9 applicants for whom there was no information about their abstracts, and who could not therefore be given awards.  
*Recommendation:* To eliminate this type of uncertainty, each Commission should communicate a decision (accept, reject or refer to another specified Commission) for every abstract it receives.
5. Although the number of applicants was higher than in 2002 (primarily due to 34 from one country—India), it was about 50 less than at the previous 3 GAs.  
*Recommendation:* Additional publicity should be given to the program.
6. Application forms for the 2008 GA should be made available to the Commission Chairs by 1 February 2007 with the expectation that the Chairs will distribute them at meetings they attend.
7. The purpose of the program is to get young radio scientists involved in URSI, but we do not know if this purpose is being achieved.  
*Recommendation:* We should check how many YS attend, for example, the next one or two GAs, and also check if there are any awardees who do not take up their award.

T.B.A. Senior, Chair

## **REPORTS ON ACTIVITIES OF INTER-UNION ORGANISATIONS**

### **IUCAF, THE SCIENTIFIC COMMITTEE ON FREQUENCY ALLOCATIONS FOR RADIO ASTRONOMY AND SPACE SCIENCE (2003 –2005)**

IUCAF was formed in 1960 by URSI, the IAU and COSPAR. Its brief is to study and coordinate the requirements of radio frequency allocations for passive (i.e., non-emitting) radio sciences, such as radio astronomy, space research and remote sensing, in order to make these requirements known to the national and international bodies that allocate frequencies. IUCAF operates as a standing inter-disciplinary committee of ICSU.

The radio spectrum is a finite resource and the ever-increasing pressure for frequency bands by so-called active spectrum users, whose applications emit electromagnetic radiation, can lead to harmful interference within the bands used for passive radio science, thereby degrading the quality of the acquired data. The active spectrum users are often not very eager to take the proper measures to protect passive scientific measurements from their radio emissions down to the recommended levels given by the International Telecommunication Union, ITU. Also, new telecommunication technologies (like Ultra-wide Band and Power-line Transmissions) are constantly emerging, and their potentially harmful effects on our scientific experiments need to be studied. Powerful Space Solar Power Systems now under study elsewhere are also of great concern to radio astronomy and other passive radio services.

IUCAF maintains strong relations with its three founding Unions, a vital part of which is the delegation of members into IUCAF. The strength of its link with URSI is reflected in the fact that most IUCAF chairmen have been URSI representatives, and most IUCAF members are very active within URSI. The regular funding that IUCAF receives from the Unions is crucial for its ability to fulfil its brief; it is used essentially to support travel to the numerous international spectrum regulation meetings that IUCAF members need to attend.

Since the 2002 URSI General Assembly, IUCAF members participated in 31 international meetings, mainly of the ITU – notably the month-long World Radiocommunication Conference, WRC-2003. IUCAF co-organised the RFI2004 Workshop on Mitigation of Radio Frequency Interference in Radio Astronomy in 2004, and the Second Summer School in Spectrum Management for Radio Astronomy in 2005. IUCAF also participates actively in the work of the URSI Scientific Commission on Telecommunication, SCT.

ICSU completed its first ever review of IUCAF in May 2004, within the framework of its Priority Area Assessment on Scientific Data and Information. It recommended that “the IAU, URSI and COSPAR organize a joint meeting to define specific procedures and actions that will ensure that IUCAF becomes a truly interdisciplinary committee that has the necessary expertise to coordinate the efforts of *all* the passive radio sciences in frequency management matters.” IUCAF has been working actively towards strengthening its links with other passive radio science communities and defining a concerted strategy in common spectrum management issues.

Further information about IUCAF, its current activities and its membership can be found on the IUCAF website <http://www.iucf.org>, and also in its annual reports, which are published in the URSI Radio Bulletin.

Wim van Driel (France, Chair from June 2003)  
Darrel T. Emerson (United States, Chair until June 2003)

## **BUSINESS TRANSACTED BY COMMISSIONS**

### **COMMISSION A - ELECTROMAGNETIC METROLOGY**

Chair: Dr. Q. Balzano

Vice Chair: Dr. S. Pollitt

#### **I. Commission A Business Meeting 1, Monday 24 October 2005**

Dr. Balzano called the meeting to order at 18:00. Those present introduced themselves giving their name and affiliation, and added their details to the list of participants. 6 voting members were present.

##### *I.1 Approval of agenda*

Dr. Balzano proposed an agenda for the meeting that was accepted unanimously.

##### *I.2 Election of new Vice Chair*

The Chairman had received 9 ballot papers by mail prior to the meeting. Messrs Van Lil and Davis were asked to confirm their ballots, which they did. The other voting members voted by paper ballot at the meeting. The ballots were counted and recounted by the Chairman and Vice Chairman. The result was:

Dr. P. Banerjee	20
Prof. C. Davis	19

##### *I.3 Report on Commission A activities and 1<sup>st</sup> Council Meeting of the XXVIII GA*

The Chairman reported on the activity of the previous three years, specifically on the support given to meetings and conventions, to the Solar Power Satellite (SPS) project, to the Scientific Committee on Telecommunications (STC) and to Commission K. (More detail can be found at [www.ursi.org/India05/ComTriReports/ComAtrirep](http://www.ursi.org/India05/ComTriReports/ComAtrirep).)

The Chairman also reported on the 1<sup>st</sup> Council Meeting held on 23 October 2005, including the following items: paper handling for future General Assemblies, the financial report, a position paper on SPS, the report of the STC and the venues for the 2008 General Assembly.

##### *I.4 Activity Report of members*

The members present reported no activities of relevance or requiring discussion.

### *I.5 First discussion of future activities of Commission A*

There was substantial discussion about the future of Commission A. The sense of those present was that activities of other Commissions are intruding upon the domain of Commission A.

Those present agreed that the Terms of Reference of Commission A needed to have a sharper focus. It was noted that measurement papers were being presented in other Commissions' programmes. It was proposed that Commission A should propose to Council that the Terms of Reference should be amended from 'Measurement' to 'Measurement Methodology and Calibration'. In future any paper dealing with methods of measurement and calibrations should be presented in Commission A only.

### *I.6 Commission A Terms of Reference*

Dr Pollitt undertook to draft a 'straw man' revised Terms of Reference which took the previous discussion into account, and to table it for discussion at the 2<sup>nd</sup> Business Meeting.

### *I.7 AOB*

No other business was tabled. The Chairman adjourned the meeting at 19:20.

## **II. Commission A Business Meeting 2, Wednesday 26 October 2005**

Dr Pollitt deputised for Dr Balzano and chaired the Business Meeting. Dr Pollitt called the meeting to order at 18:00. Those present introduced themselves giving their name and affiliation, and added their details to the list of participants. 9 voting members were present.

### *II.1 Approval of agenda*

Dr Pollitt proposed an agenda for the meeting that was accepted unanimously.

### *II.2 Topics of discussion*

Those present identified the need for a Web-site to share and communicate the activities of Commission A. Dr Davis kindly offered to host a Web-site for Commission A. All members of the Commission are expected to contribute to the site. Dr Mishra kindly offered to host a list-server for Commission A.

Commission H had asked Commission A to discuss:

- 1) The continuation of the SPS ICWG
- 2) Intercommission session on SPS.

Those present unanimously agreed to support Commission H's proposal. Dr Marvin was asked and agreed to continue as Commission A's representative.

The Dr Tobar drew members' attention to the AP-RAC'07 to be held in 2007 in Australia.

### *II.3 Terms of Reference*

Dr Pollitt presented a 'straw man' Terms of Reference:

- 1) Primary standards, including those based on quantum phenomena, for electromagnetic measurements
- 2) Time and frequency realisation and measurements
- 3) Calibration and measurement methodology to support the development and exploitation of electromagnetic technologies, including telecommunications.
- 4) Characterisation of electromagnetic properties of materials.
- 5) Electromagnetic dosimetry.

There was discussion on the frequency band covered by Commission A; there was consensus in retaining the present range from DC to optical frequencies. There was agreement that the Commission should emphasize the development and refinement of new measurement techniques. It was also proposed and accepted that there should be reference to measurement intercomparisons and standardisation.

Dr. Pollitt agreed to capture the discussion and modify the 'straw-man' Terms of Reference accordingly and to present a summary at the 3<sup>rd</sup> Commission A Business Meeting

#### *II.4 AOB*

No other business was tabled. The Vice Chairman adjourned the meeting at 19:00.

### **III. Commission A Business Meeting 3, Friday 28 October 2005**

Dr. Balzano called the meeting to order at 18:00. Those present introduced themselves giving their name and affiliation, and added their details to the list of participants. 6 voting members were present.

#### *III.1 Approval of Agenda*

Dr. Balzano proposed an agenda for the meeting that was accepted unanimously.

#### *III.2 Review of notes of the 1<sup>st</sup> Business Meeting*

Dr Balzano presented the notes of the 1<sup>st</sup> Business Meeting which were accepted without amendment by those present.

#### *III.3 Report of the 2<sup>nd</sup> Business Meeting*

Dr. Pollitt summarised the discussions that took place at the 2<sup>nd</sup> Business Meeting.

#### *III.4 Report of Council Meetings II and III*

Dr. Balzano reported that Council had approved the appointment of Vice Chairs at Council Meeting II, and confirmed that Dr Banerjee is the new Vice Chair of Commission A.

Dr. Balzano also reported the results of election for URSI President, Secretary General and Vice-Presidents and the venue for the 2008 General Assembly (Chicago, USA) which had been determined at Council Meeting III. He also reported on the publication of RSR and RSB and noted that there had not been a contribution from Commission A.

#### *III.5 Discussion of proposed new Terms of Reference*

Dr. Pollitt presented the revised 'straw man' Terms of Reference' and the discussion

which followed led to the final draft detailed in the next section.

### *III.6 Final draft of the new Terms of Reference for Commission A*

Those members present agreed that the following final draft should be presented to Council and Council's approval sought for the changes.

#### *Commission A: Electromagnetic Metrology (Electromagnetic Measurements and Standards)*

The Commission promotes research and development in the field of measurement standards, in calibration and measurement methodologies, and the intercomparison of such.

Areas of emphasis are:

- 1) The development and refinement of new measurement techniques.
- 2) Primary standards, including those based on quantum phenomena.
- 3) Realization and dissemination of time and frequency standards.
- 4) Characterization of the electromagnetic properties of materials.
- 5) Electromagnetic dosimetry.

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

### *III.7 AOB*

Dr. Pollitt on behalf of members of Commission A thanked Dr. Balzano for his excellent chairmanship of Commission A over the three-year period up to and including the XXVIII General Assembly. No other business was tabled. The Chairman adjourned the meeting at 19:00.

## **COMMISSION B - FIELDS AND WAVES**

Chair: Dr. Makoto Ando

Vice Chair: Dr. Lot Shafai

Commission B Business meetings were held by Dr. Makoto Ando (Chair) on the following three days:

Meeting 1: Monday, October 24th, 18:00-19:30h

Meeting 2: Wednesday, October 26th, 18:00-19:00h

Meeting 3: Friday, October 28th, 18:00-19:10h

The following issues were discussed and decided upon.

## **I. Triennial Activity 2002-2005**

Dr. Ando reported on:

- the Triennial Activity for 2002 – 2005. The report will be posted on the URSI website.
- the 2004 International Symposium on Electromagnetic Theory (EMTS 2004): a special section in Radio Science was published in Fall 2005
- Preparations made for GA 2005
- Sponsorship of conferences related to Commission B.

## **II. Election of Vice-Chair**

The voting was held for the incoming Commission B Vice-Chair 2005 – 2008. The successful candidate was K. Langenberg.

## **III. Terms of Reference**

The Terms of Reference were reviewed and discussed. Two minor changes were accepted and approved by the Board (attached). It was agreed other recommendations for changes, suggested at the GA Business meeting, be refined and drafted by the Adhoc Group, (Staffan, Ando and Shafai) into a proposal for discussion at the next EMT symposium, and be proposed to the Board at the next GA.

### *New Terms of Reference*

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

- (a) Time-domain and frequency-domain phenomena;
- (b) Scattering and diffraction;
- (c) General propagation including waves in specialized media;
- (d) Guided waves;
- (e) Antennas and radiation;
- (f) Inverse scattering and imaging.

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

## **IV. Next General Assembly 2008**

Paper submission was discussed and agreed upon, that a centralized electronic submission and review system be used. It was also agreed on that a one time submission of a paper (up to four pages), plus an abstract in the specified format, be used in the program.

Three proposals were placed by Commission B colleagues for holding GA 2008: 1. Gothenberg, Sweden, 2. Chicago, USA, 3. Istanbul, Turkey.

It was agreed to support all three. The submission from Chicago, was selected by the Board, to hold XXIX GA on August 7–16, 2008.

## **V. Preparation for the 2007 EMTS in Alexandria**

A brief presentation was made by Dr. El-Khamy chair of the Alexandria local organizing committee. The suggested dates were May 7–12, 2007. It was pointed out that, the timing may not be convenient for some countries, because of the university term. It was suggested to consider moving it one week later to May 14–17.

The conference will be chaired by Dr. L. Shafai, and assisted by the Commission B-Technical Advisory Board (B-TAB) and the International Advisory Group (IAG) consisting of Dr. El-Khamy LOC Chair, Dr. Y. Antar, Dr. M. Iskander, Dr. A. Kishk, Dr. A. Zaghloul, Dr. Abdel Razik Sebak, Dr. Atafll Sherbeni, Dr. Ozlem Kilic, Prof. E. Heyman, Prof. R. Ziolkowski, Prof. Y. Rahmat-Samii, Dr. R. Stone, and Dr. P. Uslenghi.

Two suggestions were made by the IAG to Dr. El-Khamy:

1. Security, that the local organizers consider some limited, special security arrangements to make visitors feel more comfortable.
2. Number of attendees be carefully re-estimated, by checking the statistics of previous conferences in Alexandria.

Dr. Ando reported on the schedule for EMTS, using the following time table from EMTS 2004 in Pisa.

- 1<sup>st</sup> Circular of EMTS 2004, July 2001
- 1<sup>st</sup> Call For Papers, July 2002
- URSI-GA, Maastricht, August 2002
- TPC formation, October 15, 2002
- Call For Papers draft, November 17, 2002
- Special Sessions & Convener, May 12, 2003
- Deadline for YSA application, November 1, 2003
- Deadline for 3-page summaries, November 15, 2003
- TPC meeting 2-days, January 9-10, 2004
- Notification to authors, January 15, 2004
- Pre-registration, March 15, 2004
- Plenary Session Speaker, February 20, 2004
- Final Program on website, April 20, 2004

## **VI. Discussion of future EMTS**

Procedure for selecting the venue for 2010 EMT-S was decided, allowing for the voting after GA.

- 1) Preliminary Proposal for 2010 EMT-S Venue: 2005.06.05, GA-3 months
- 2) Review by Adhoc Committee to select 2 or 3 proposals: 2005.06.30, GA-2 months
- 3) Final Proposals (2 or 3) and ballot forms sent out: 2005.07.10, GA-1 month
- 4) Vote by Letter Ballot (Final Prop. Only): 2005.07.20 – 2005.09.10
- 5) Short Presentation at 2005 URSI GA: 2005.10.23-29

- 6) Minor revisions as per feed back from discussion at GA: GA + 2weeks
- 7) Final Vote at GA Commission B Business meeting: 2005.10.23-29, GA + 1 month
  - 1<sup>st</sup> (5 Nov. - 25 Nov.)
  - 2<sup>nd</sup> (27 Nov. - 17 Dec.)
- 8) Announcement to official members etc.: GA + 2 months
 

Advantages of the new procedure, is that the official members receive the following, useful information before voting.

  - 1) The 2008 GA Venue.
  - 2) The name of the Commission B Vice-Chair, who will serve as the Chair for 2010 EMTS.
  - 3) Proposals would be improved by reflecting the comments made at the GA meeting.

Three presentation of the proposals to host the 2010 EMTS were made.

- Toulouse, FRANCE
- Hiroshima, JAPAN
- Berlin, GERMANY

## **VII. Technical Advisory Board**

Commission B will continue with Technical Advisory Board (B-TAB)

Paper statistics are as follows:

- 2005 GA Com B papers 244 (Oral 90 + Poster 129 + 25)
- 2002 GA Com B papers 252 (Oral 77 + Poster 175) / Total 1523(O782, P741)
- 1999 GA Com B papers 355 (Oral 111 + Poster 244) / Total 1704(O934, P770)
- 2004 EMTS papers 421/464
- 2001 EMTS papers 215/275
- 1998 EMTS papers 290/470

## **VIII. Inter-Commission Working Group (IWG) for Solar Power Satellites (SPS)**

Guidelines for the production of the URSI Position Statement and White Papers were discussed.

Prof. Y. Rahmat-Samii will represent COM B in Solar Power Satellite Systems. Next White Paper possibly on “biological effects of electromagnetic fields ??”. SCT had an open meeting during the GA, and will continue as the ITU Liaison.

## **IX. URSI Publication**

Commission B Editor for RRB and RSB 2005-2008 will be, Prof. K. Langenberg (incoming Vice-Chair)

## **X. Publication Committee Membership**

Should include one young scientist, someone who will enhance the URSI visibility.

## **XI. Commemoration of scientific achievements**

Prof. Uslenghi said a few words about Prof. Tiberio and his achievements. Prof. Heyman said a few words about Prof. Felsen and his achievements.

## **XII. Other business**

### *XII.1 EM-Prize committees*

2002-2005: C.E. Baum, C.M. Butler (Chair), K.J. Langenberg, T.B.A. Senior, and S. Ström

2005-2008: M. Ando, C.M. Butler, K.J. Langenberg, T.B.A. Senior, L. Shafai and S. Ström (Chair)

### *XII.2 2003 Prize*

The 2003 Prize was announced on 15 September 2001 and entries were due on 15 January 2003. Only 2 received, neither in accordance with the objective. No prize was awarded (see June 2003 RSB)

### *XII.3 2004 Prize*

The 2004 Prize was announced on 15 September 2002 and entries were due 15 January 2004. Six received. The paper by L. Klinkenbusch (Germany) selected. The Prize was presented at a meeting in Germany.

### *XII.4 2005 Prize*

The 2005 Prize was announced on 15 February 2004 (see March 2004 RSB). Entries were due 15 January 2005. Only 1 application was received.

### **XII.5 URSI Board of Officers**

Election results for the URSI Board of Officers, Triennium 2005-2008

President:	Prof. F. Lefevre (France)
Vice-Presidents:	Prof. G. Brussaard (Netherlands)
	Prof. C. Butler (USA)
	Prof. M.T. Hallikainen (Finland)
	Prof. P.J. Wilkinson (Australia)
Past President:	Prof. K. Schlegel (Germany)
Secretary General:	Prof. P. Lagasse (Belgium)

## COMMISSION C - RADIO-COMMUNICATION SYSTEMS AND SIGNAL PROCESSING

Chair: Prof. M. Akaike (Japan)  
Vice Chair: Dr. A.F. Molisch (USA)

### I. Business Meetings

#### *I.1 Welcome to URSI General Assembly in New Delhi*

The Commission held open business meetings on 24th, 26th, and 28th, October, 2005. The following persons were present at least at one meeting, but mostly at several: Masami Akaike (Chair); Takashi Ohira, Makoto Taromaru, Japan; Said E-El-Khamy, Egypt; Claude Vloeberghs, Belgium; Naurice Bellangen, France; Alain Sibille, France; Jacques Palicot, France; Marian S. Piekarski, Poland; Paul Wittke, Canada; Sana Salous, UK; Blagovest Shishkov, Bulgaria; Jose Leitao, Portugal; Paul Walter Baier, Germany; V. E. Lyulchenko, Russia; Hendrik Schoneich, Germany; Viacheslav Potapov, Russia

At the opening of the first business meeting, the Chair welcomed everyone to the meeting and attendees introduced themselves. The Chair then reported briefly the activity of Commission C in this triennium and set the scene.

#### *I.2 Election of the next Vice-Chair*

Two candidates, S.E. El-Khamy(Egypt) and T. Ohira (Japan), for the next Vice-Chair were nominated. T. Ohira was elected as a result of 30 points to S.E. El-Khamy of 24 points.

#### *I.3 Commission Editor for the new Radio Science Bulletin*

T. Ohira agreed to serve as Commission Editor for RSB (incorporating RRS).

#### *I.4 Review of the Terms of Reference*

The Terms of Reference was discussed on the business meeting on 28th October. Since the Terms of Reference were changed to the existing ones three years ago, we agreed to continue as they are:

*“Radio-Communication Systems and Signal Processing”*

The Commission promotes Research and Development in:

- a. Radio-Communication and Telecommunication Systems;
- b. Spectrum and Medium Utilization;
- c. Information Theory, Coding, Modulation and Detection;
- d. Signal and Image Processing in the area of radio science.

The design of effective radio-communication systems must include scientific, engineering and economic considerations. This Commission emphasizes research into the scientific aspects, and provides enabling technologies to other areas of radio science.

#### *I.5 Role of National Representatives of "C"*

Further enhancement of the national and international activity of Commission C should strongly be prompted for the next triennium. While National Representatives are desired to have close contact with Commission C, Commission C also is encouraged to try to cooperate with radio scientists in each country in parallel to National Representatives.

#### *I.6 The program for the next General Assembly*

The program of the next General Assembly will focus the sessions on mobile radio communications, including wireless access and ultra-wide-band access, and image processing. Since the field of Commission C is very broad, cooperative organization of sessions with other Commissions is necessary.

For organizing the next General Assembly held in Chicago, a wide contact with american scientists in the field of Commission C will be solicited. A list of leading scientists in USA based upon the international conferences held in USA so far will be helpful.

#### *I.7 Other business*

Further discussions will be made on the following points:

- (1) Necessity for the steering committee to assist chair,
- (2) Representative of Commission C for SCT,
- (3) Future Terms of Reference, as it is or the commission split and renamed,
- (4) Competition, cooperation, and/or interaction with other international conferences and organizations.

## **II. Review of General Assembly**

Commission C organized two tutorials, nine C sessions, and two joint sessions. Among two joint sessions, two sessions were led by Commission C. Since the technical field that Commission C deals with is wide and has relating parts with other Commissions, such joint sessions show characteristic feature of Commission C. Close contact/collaboration henceforth with other Commissions will be further encouraged. The discussions among the presenters and audience were quite active, which reflects a wide interest to technical subjects of Commission C.

The following are the sessions organized by Commission C:

#### **Tutorials:**

- Ultrawideband (UWB) Communications and Ranging, presented by Huan-Bang Li (Proxy of R. Kohno),
- Signal Processing for Analog Smart Antennas, Takashi Ohira,

**Other sessions:**

- C1:** Affordable Wireless Communications for Rural Areas, organized by Ashok Jhunjhunwala,
- C2:** Analog Smart Antennas, organized by Takashi Ohira,
- C3:** Beyond 3G and 4G Wireless Communications,” organized by Hitoshi Yoshino,
- C4:** Ultrawideband Systems, organized by Alain Sibille,
- C5:** Advances in Signal Processing towards Fully Reconfigurable Radio Systems, organized by Jacques Palicot,
- C6:** Trend in Millimeter-Wave Wireless Access Systems and Their Technologies, organized by Hiroyo Ogawa,
- C7:** Radio Science for the Ubiquitous Network Society, organized by Shozo Komaki
- C8:** Multiantenna Systems,” organized by Surenda Prasad,
- C9:** Radio Resource Management and Spectrum Efficiency, organized by Cengiz Evci and Bernard Fino,
- CB:** Antennas for Wireless Systems and Mobile, organized by Gerhard Kristensson, and Buon Kiong Lau,
- CBA:** Measurement of Wireless Channels, organized by Reiner Thomae (C and A), and Girish Kumar (B),
- CP1:** Propagation for Terrestrial Mobile Systems, organized by Pretti Vainikainen
- CP2:** Advanced Technologies for RF/Optical Circuits and Systems, organized by Woo-Young Choi
- CP3:** Coding, Modulation, Equalization, and Detection, organized by Convener: Makoto Taromaru
- CP4:** Recent Advances in Radio Communication Technology and Signal Processing Technology, organized by Convener: Yukihiro Kamiya
- CP5:** General Poster Session Commission, organized by Masami Akaike

**COMMISSION D - ELECTRONICS AND PHOTONICS**

Chair: Prof. P. Russer (Germany)

Vice Chair: Dr. F. de Fornel (France)

Commission D Business meetings were held by Pr. Peter Russer (Chair) on the following two days:

Meeting 1: Monday, October 24th, 18:00-19:30h

Meeting 2: Wednesday, October 26th, 18:00-19:00h

The following issues were discussed and decided upon.

### **1. Triennial Activity for 2002 – 2005**

Professor Peter Russer reported on:

1. The growing importance of wireless and optical communication technology has led to continued strong interest in the activities of Commission D, “Electronics and Photonics”.

Commission D has continued the successful policy of providing technical co-sponsorship to a number of meetings of interest to Commission D while focusing financial sponsorship on the established International Symposium on Signals Systems and Electronics, ISSSE, jointly sponsored with Commission C. For this triennium we also provided financial sponsorship to the 2004 Asia-Pacific Radio Science Conference (AP-RASC’04).

2. 2004 International Symposium on Signals, Systems and Electronics (ISSSE’04) in Linz, Austria

The 6th International Symposium on Signals, Systems, and Electronics, ISSSE 2004, was held in Linz, Austria on August 10-13, 2004. ISSSE is an international symposium held once every three years. This symposium is organized and sponsored by the International Union of Radio Science (URSI), Commissions C and D.

After the review of nearly 130 submissions, 89 were accepted for presentation. Authors came from more than 20 countries, thereof 63% from Europe, 29% from Asia, and 8% from North America. During the symposium two best papers have been awarded.

3. The following conferences were supported by Commission D:
  1. MMET’02, Int. Conf. on Mathematical Methods in Electromagnetic Theory, Kiev, Ukraine, 10-13 September 2002,
  2. Getting the Most out of the Radio Spectrum, London, U.K., 24-25 October 2002,
  3. ISMOT 2003 - 9th Int. Symp. On Microwave and Optical Technology, Ostrava, Czech Republic, 11-15 August 2003,
  4. 11th MICROCOLL, Budapest, Hungary, 10-11 September 2003,
  5. CAOL 2003, Int. Conference on Advanced Optoelectronic and Lasers, Alushta, Crimea, Ukraine, 16-20 September 2003,
  6. Telecom 2003 & JFMMA, Marrakech, Morocco, 15-17 October 2003,
  7. MSMW’04, Fifth Int. Kharkov Symposium on Physics and Eng of Microwaves, Millimeter- and Submillimeter-Waves, Kharkov, Ukraine, 21-26 June 2004,
  8. ISSSE’04, International Symposium on Signals, Systems and Electronics, Linz, Austria, 10-13 August 2004
  9. AP-RASC 04: 2004 Asia-Pacific Radio Science Conference, Beijing, China, 20-23 August 2004,
  10. ISMOT 2005 - 10th International Symposium on Microwave and Optical Technology, Fukuoka, Japan, 22-25 August 2005,
  11. CAOL 2005, Int. Conference on Advanced Optoelectronic and Lasers, Yalta, Crimea, Ukraine, 12-17 September 2005,

## **2. New Chair and Vice Chair for 2005-2008**

Two candidates were presented :

- Franz Kaertner, Full Professor, Department of Electrical Engineering and Computer Science, M.I.T., Cambridge, MA, U.S.A.
- Hiroyo Ogawa, Director of Yokosuka Radio Communication Research Center, National Institute of Information and Communications Technology

Voting was held for the incoming Commission D Vice-Chair 2005 – 2008. The successful candidate was Franz Kaertner.

## **3. Appointment of Commission D Editor for Review of Radio Science**

The Commission D Editor for RRB will be, Prof. F. Kaertner(incoming Vice-Chair)

## **4. Appointment of Commission D Associate Editor for Radio Science Bulletin**

The Editor RSB for the triennium 2005-2008 will be Professor S. Tedjini.

## **5. Terms of Reference**

The Terms of Reference were reviewed and discussed.

*Considering:*

1. That nanoscale devices and quantum devices are of growing interest in research;
2. That this development has to be considered in the terms of reference of the Commission D.
3. That the complete spectrum of frequencies from low frequencies up to the optical region has to be considered.

*Resolve*

1. That the terms of reference have to be modified on item (c) after “electronic and photonic devices” in adding: *down to nanoscale including quantum devices* has been added; and
2. That the expression *covering all frequencies, including those in the microwave and optical domains* has been replaced by *from the low frequencies to the optical domain*.

The new terms of reference shall be (changes marked in italic):

The Commission promotes research and reviews new development in:

- (a) Electronic devices, circuits, systems and applications;
- (b) Photonic devices, systems and applications;
- (c) Physics, materials, CAD, technology and reliability of electronic and photonic devices *down to nanoscale including quantum devices*, with particular reference to radio science and telecommunications.

The Commission deals with devices for generation, detection, storage and processing of electromagnetic signals together with their applications *from the low frequencies to the optical domain*.

Termes de référence de la Commission D

Les nouveaux termes de référence devraient être : (changements indiqués en italique):

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

- (a) Dispositifs électroniques, circuits, systèmes et applications;
- (b) Dispositifs photoniques, systèmes et applications;
- (c) Physique, matériaux, CAO, technologie et fiabilité des dispositifs électroniques et photoniques *jusqu'à l'échelle nanométrique incluant les dispositifs quantiques* présentant un intérêt particulier pour la radioélectricité scientifique et les télécommunications.

La Commission étudie les dispositifs pour la production, la détection, le stockage et le traitement des signaux électromagnétiques, ainsi que leurs applications *des basses fréquences au domaine optique*.

## **6. Scientific Program of Next General Assembly**

Next General Assembly 2008:

Paper submission was discussed and agreed upon, that a centralized electronic submission and review system be used. It was also agreed on that a one time submission of a paper (up to four pages), plus an abstract in the specified format, be used in the program.

Few scientific sessions were proposed for the next general assembly

- Nanoelectronics and Nanophotonics.
- Nanovacuum technology
- Joint commission on SPS
- Terahertz technology
- Metamaterials
- Joint session D-A-B(?)-C(?) simulation and characterization of mixed signals
- Microwave Photonics
- Reconfigurable surfaces
- RFIDs Radio Frequency Identifier
- Organic Devices
- UWB Components

## **7. White Paper on Solar Power Satellites**

Commission D studied the report on the Solar Power Satellites. The problems of this technology open many fields of study for electronics and the photonic one.

It gives an opinion favorable for the deepening of this technology and the publication of this White Paper.

## COMMISSION E - ELECTROMAGNETIC NOISE AND INTERFERENCE

Chair: Prof. F. Canavero (Italy)  
Vice Chair: Prof. C. Christopoulos (UK)

### I. Terms of reference

After some discussion, Commission E voted the following amended version of ToR: “*Commission E - ELECTROMAGNETIC NOISE AND INTERFERENCE*”.

The Commission promotes research and development in:

- (a) Terrestrial and planetary noise of natural origin, seismic associated electromagnetic fields;
- (b) Man-made noise;
- (c) The composite noise environment;
- (d) The effects of noise on system performance;
- (e) The lasting effects of natural and intentional emissions on equipment performance;
- (f) The scientific basis of noise and interference control, electromagnetic compatibility;
- (g) Spectrum management.

Also, during the discussion, the issue of changing the title of the commission was brought up. The Chair was charged to make a proposal for the next GA. During the business meetings in Chicago, this proposal will be discussed and voted, and finally ratified by the Board.

### II. Working Groups

The Commission E activities are based on the work conducted by the working groups (WG). After some discussion, Commission E voted the following amended list of WG.

#### *II.1 Working Groups 2005-2008*

##### E.1. Terrestrial and Planetary Electromagnetic Noise Environment

Co-Chairs : M. Hayakawa (Japan), A.P. Nickolaenko (Ukraine) and C. Price (Israel), K. Hattori (Japan);

##### E.2. Intentional Electromagnetic Interference

Co-Chairs : W. Radasky (USA) and M. Bäckström (Sweden);

##### E.3. High Power Electromagnetics

Co-Chairs : C.E. Baum (USA) and R.L. Gardner (USA);

##### E.4. Lightning Discharges and Related Phenomena

Chair : Z. Kawasaki (Japan);

##### E.5. Interaction with, and Protection of, Complex Electronic Systems

Co-Chairs : J. Nitsch (Germany) and J-P. Parmentier (France);

##### E.6. Spectrum Management

Chair : T. Tjelta (Norway);

E.7. Geo-Electromagnetic Disturbances and Their Effects on Technological Systems

Chair : A. Viljanen (Finland);

E.8. Electromagnetic Compatibility in Wire and Wireless Communication Systems

Co-Chairs : J. Gavan (Israel) and A. Zeddani (France);

### *II.2 Joint Working Groups*

Also, Commission E designated its representatives to WG jointly operated with other Commissions. A list follows:

Inter-commission working group on Solar Power Satellites

Co-Chair for Commission E: Zen Kawasaki (Japan)

EGH. Seismo Electromagnetics (Lithosphere-Atmosphere-Ionosphere Coupling)

Co-Chair for Commission E : M. Hayakawa (Japan)

### **III. Sponsorship of Conferences**

The following meetings have been supported in the past triennium either in mode A (without financing) or in mode B (with financing):

- EMF and Cardiac Pacemakers and Defibrillators, Paris, France, 25 October 2002, mode A
- EMC Zurich 2003, Zurich, Switzerland, 18-20 February 2003, mode B
- 2003 IEEE Int. Symp. On Electromagnetic Compatibility, Istanbul, Turkey, 11-16 May 2003, mode B
- Telecom 2003 & JFMMA, Marrakech, Morocco, 15-17 October 2003, mode A
- WARS04 (Workshop on Applications of Radio Science) conference 2004, Hobart, Tasmania, Australia, 18-20 February 2004, mode A
- EMC'04 Sendai - 2004 International Symposium on Electromagnetic Compatibility, Sendai, Japan, 1-4 June 2004, mode A
- EMC Wroclaw 2004, Wroclaw, Poland, 29 June - 1 July 2004, mode B
- AP-RASC 04: 2004 Asia-Pacific Radio Science Conference, Beijing, China, 20-23 August 2004, mode A
- Radar 2004, Toulouse, France, 19 - 21 October 2004, mode A
- EMC Zurich 2005, Zurich, Switzerland, 15-17 February 2005, mode B
- Telecom 2005 & JFMMA, Rabat Morocco, 23-25 March 2005, mode A
- VIth International Symposium on Electromagnetic Compatibility and Electromagnetic Ecology, St. Petersburg, Russia, 21-24 June 2005, mode B
- ICEAA'05, International Conference on Electromagnetics in Advanced Applications, Torino, Italy, 12-16 September 2005, mode A
- Microwave, Radar and Remote Sensing, Kiev, Ukraine, 19-21 September 2005, mode A

The chair is charged to collect as much as possible of the requests for support from National Representatives, in order to be able to plan a budget for future years.

#### **IV. Vice Chair Election**

Prof Christos Christopoulos (University of Nottingham, UK) was elected as Vice-Chair. He will also serve as the Commission E Editor of the Radio Science Bulletin.

### **COMMISSION F - WAVE PROPAGATION AND REMOTE SENSING**

Chair: Prof. M. Hallikainen (Finland)

Vice Chair: Prof. P. Sobieski (Belgium)

The Commission held three Open Business Meetings respectively on 24, 26 and 28 October 2005 all chaired by Prof. M Hallikainen.

#### **I. Meeting A**

##### *I.1 Agenda*

The proposed agenda is approved by the attendees as is.

##### *I.2 Credentials*

14 members representing Commission F National Committees are present or represented at the meeting.

##### *I.3 Election of Vice-chair for 2005-2008.*

Four candidates have proposed to act as incoming Commission F Vice Chair: alphabetically:

- Prof M. Chandra (Germany),
- Prof Inggs (South Africa),
- J-J. Isnard (France)
- Prof Mazanek (Czechia).

After verification of the validity of the credentials, the ballots already received by mail before the deadline are checked and reconfirmed by the voting representatives. Ballot forms are distributed to members who have not yet expressed their vote by mail. Each voting member has to attribute points to the candidates following their preference: 2 points for the first one, 1 point for the second one, 0 points for the next ones.

The results of the ballot are: 19 voters have expressed their vote as follows

- Prof Chandra : 24 points
- Prof Inggs : 12 points
- J.J Isnard : 5 points
- Milos Mazanek : 16 points.

The Commission confirmed its wish that Prof. Piotr Sobieski would become Chairman at the conclusion of the General Assembly. {The URSI Council subsequently confirmed the appointment of Prof. M. Chandra as vice-chair}.

#### *I.4 Commission F 2005 General Assembly Program*

a. Commission F organised ten oral sessions of invited and contributed papers as follows:

- F01 - Satellite and terrestrial propagation (10 announced papers, 0 no-show = 10)
- F02 - Propagation and scattering in vegetation (10 announced papers, 1 no-show = 9)
- F03 - Mobile and personal access radio propagation (7 announced papers – 1 no-show = 6)
- F04 - Mobile and indoor propagation (7 announced papers- 1 no-show 6)
- F05 - Scattering and diffraction effects in remote sensing (7 announced papers- 4 no-show = 3)
- F06 - Global Remote Sensing (7 announced papers)
- F07 - Urban Remote Sensing (7 announced papers- 2 no-show ; 2 moved to F08= 5)
- F08 - Novel sensors and data fusion (10 announced papers - 2 no-show = 8)
- F09 - Microwave remote sensing of the cryosphere (7 announced papers- 1 no-show = 6)
- F10 - Remote sensing of atmosphere and ocean (10 announced papers- 2 no-show +1 added= 9)

as well as the three Inter-commission sessions :

- FG - Signal degradation by ionosphere and troposphere (7 announced papers- 1 no-show = 6)
- BCF - Propagation models and Maxwellian approach to smart antennas
- GF1 - Atmosphere-ionosphere sounding by using global navigation satellite systems.

The tutorial FT had to be changed in last minute due to the unavailability of C. Schmuilius. This tutorial has been given by P. Pampaloni and S. Paloscia. The Commission F community is very thankful to them for this rush replacement.

Also a large poster session totalling 48 Commission F announced papers and 9 intercommission announced papers has been spread by the LOC over two days with discussion periods of two hours. In this poster session 17 of the accepted poster papers did no-show.

b. The chairman summarises the guidelines, that were given to the convenors before the GA, and those he distributed to all sessions chairman at the GA. He reminded to stick with the announced schedule: no anticipation if earlier or no-show, shorten coffee-breaks if later.

The chairman also prepared forms with a short questionnaire handed to all session chairman who have been requested to fill in their reports immediately at the end of the session. The attendance statistics showed that commission F sessions were followed in

average by around 30 to 50 persons with higher numbers for inter-commission sessions (around 50) and the tutorial (around 60).

*1.5 Requests from Coordinating Committee and Council and response to co-ordination committee and the publication committee.*

Prof. Hallikainen first expresses his thanks to those having contributed to Commissions F contributions to RRS. Incoming Vice-Chair Dr. M Chandra is appointed as RRS/RSB editor for Commission F. For the future, the following suggestions for topics are mentioned: polarimetric interferometric radar and/or radiometric techniques; propagation problems related to the use of higher frequencies; articles in relationship with the International Polar Year to be held in 2007; similarly as in July 2006 ISPRS (Photogrammetry) is organised, scientists concerned by this field could be requested to write an article in RSB; dynamic properties of the troposphere with implications on telecommunications systems.

Also, following a request to have representatives of commission F to the URSI publication committee: Steve Reising and Ian Glover accept to volunteer join this committee head by Ross Stone.

## **II. Meeting B**

### *II.1 Discussion of terms of reference*

After a short discussion it is approved to clarify sub item (a,ii) by changing it as follows: (a)(ii) *wave interaction with the planetary atmospheres, surfaces (including land, ocean and ice), and subsurfaces,*

### *II.2 Inter-assembly meetings*

Sponsorship modes: A (no financial support), B (financial support), C (loan , very rarely)

a. Meetings since last GA

i. List of “A” meetings: about 20 meetings (moral sponsorship) see triennium report

ii. List of “B” meetings: 6 meetings (see triennium report)

## **III. Meeting C**

### *III.1 Proposed meetings for next triennium: 2006-2007*

#### III.1.a Commission F Open symposia:

Volunteers for organising: during the discussion up to four proposals to organize one of the two open symposia are made, well distributed geographically. The chair reminds the tradition to turn from country to country, and displays the list of all previous open symposia organised in the last three decades. He thanks very much the four candidates asking them their preferences:

i. Garmisch Germany: preference for open symposium;

ii. Brazil may 2007: preference for open symposium;

iii. India: preference for open symposium, either remote sensing;

iv. South Africa in Cape Town: preference for remote sensing.

**Decision:**

- Commission F Open Symposium: after presentation by the candidates of the possibilities and advantages of their respective proposals, a vote is made as follows: 13 for Brazil; 4 for Germany.
- Commission F specialist Meeting on remote sensing: after presentation by the candidates of the possibilities and advantages of their respective proposals, a vote is made as follows: 14 for Cape Town; 1 for India.

**III.1.b Other anticipated supported (type A) meetings**

- MicroRAD2006 28 feb-03 Mar, San Juan Puerto Rico
- 36<sup>th</sup> COSPAR
- IGARSS2006
- IGARSS2007
- AP-RASC2007
- ISMOT-2007
- ISAP'2007 20-24-Aug Niigata Japan
- IGARSS'2008 Boston 7-11 July 2008
- MicroRAD 2008 dates (??)
- COMITE 2007 Prague ?Sept 2007
- EUSAR 2006 Jan 22-27 ; Lihue, Hawaii, USA

**III.1.c Other anticipated supported (type B) meetings**

- Commission F Open Symposium (see above)
- Commission F specialist Meeting on remote sensing (see above)
- AP-RASC07 (in addition for sponsorship "A")
- ClimDiff 2007

**III.2 Commission F proposals for sessions and organisation at 2008 URSI GACChicago**

The commission was content with the organisation of the sessions in 2005, as well as by the chosen topics. For the next GA several new topics are proposed: sub-millimetric and terahertz propagation (Mazanek+Chandra as possible co-convenors), Cryosphere (Marco Tedesco + Richard Kelly as possible co-convenors; polarimetric methods in radar and remote sensing (Chandra), data fusion from different satellites; special scaling issues in remote sensing; dynamic effects in the troposphere and mitigation techniques (B. Arbesser as possible convenor); interference problems and mitigation techniques.

The members wish to keep a full 4 page paper on CD (with some flexibility on the number of pages) plus a short abstract to be included in the program.

A proposal for a tutorial in the field of wave propagation should be proposed in 2008 as the tutorial in 2005 related to remote sensing of the vegetation. Also a public lecture for members of other commissions should be proposed at the mid-term co-ordinating committee to be held in spring 2007.

### *III.3 Inter-commission working groups*

III.3.a The WG automatically end at the GA and must be renewed by resolution

- i. FG Ionosphere/Atmosphere RS using satellite systems: continues
- ii. GF Middle atmosphere
- iii. as several members express their concern about the problems related to the solar power satellite (SPS) project, commission F will continue to participate to the WG, if such a WG will continue to exist, and S Reising is appointed as commission F representative. Note there is a chance this will be a WG from all commissions and a White Paper would be produced.
- iv. Commission F agrees also to participate to inter-commission sessions related to the previous topic (on SPS) at GA2008 : by getting at least 1 commission F paper voicing the opinion of the commission.

III.3.b SCT

suspended

### *III.4 Representatives to other organisations*

III.4.1 SCOR

Commission F interests will be looked after by the vice-chair M. Chandra

III.4.2 IUCAF

For the triennium 2005-2008: Steven Reising is appointed to represent Commission F interests.

III.4.3 COSPAR

For the triennium 2005-2008: Bertram Arbesser is appointed to represent Commission F interests.

### *III.5 Publications and publicity*

- a. Radio Science Bulletin (see above)
- b. Information dissemination
  - i. The chairman mentions that the Commission F Home page was established in 2002 in connection of URSI Home Page
  - ii. Some problems of email mailing lists are reported and the vice chair will take care of having a reliable data base.
  - iii. The important to get email list from other colleagues addresses (outside URSI Comm F) is also mentioned
  - iv. Some specific list for Young Scientists should be welcomed either

### *III.6 Any other business*

The commission expresses by means of applause its warm thanks to Prof. M Hallikainen for the work done for the past 3 years as the Chair of the commission.

## COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

Chair: Prof. C. Hanuise (France)

Vice Chair: Prof. P.S. Cannon (UK)

### I. Business Meeting 1: Monday, 24 October 2005

#### *I.1 In Memoriam*

The business meeting commenced with a brief moment remembering past friends of Commission G. They were: L.H. Brace, A. Breed, E. Essex, M. Maundrell, P.J. Melchior, U. Sultangazin, C. Sutton, M. Yamada, K.C. Yeh

#### *I.2 Election of Commission G Vice-Chair for 2005-2008*

Four candidates were nominated: Jorge Chau, Anthea Coster, Michael Rietveld, Bruno Zolesi. Voting slips were distributed to the Commission G national delegates and, including votes cast during the assembly, Michael Rietveld was the successful candidate and Bruno Zolesi was second.

Subsequently, the URSI Council endorsed Michael Rietveld as the Vice-Chairman of Commission G for 2005-2008.

#### *I.3 Terms of reference*

The terms of reference of Commission G were reviewed and it was decided that no amendment was necessary.

#### *I.4 Commission G triennial report*

The report on commission G activities during the past triennium was prepared by the Chairman Christian Hanuise and published well in advance of the General Assembly.

#### *I.5 Commission G Working Groups and Joint Working Groups*

All Working Groups triennium reports were included in the Commission triennium report. These reports are the responsibility of the lead commission representative. A very brief verbal report was provided at the Business Meeting.

- G.1. Ionosonde Network Advisory Group (INAG). Chair: Terence. Bullet (USA), Vice-Chair: Christopher. Davies (United Kingdom), INAG Editor: P. Wilkinson (Australia) Recommend continuing with Lee-Anne McKinnell (SA) replacing C Davies as Vice-Chair
- G.2. Studies of the Ionosphere Using Beacon Satellites. Chair: R. Leitinger (Austria), Vice-Chairs: J.A. Klobuchar (USA; until October, 2004); P. Doherty (USA, since October, 2004) and P.V.S. Rama Rao (India). Recommend continuing.

- G.3. Incoherent Scatter. Chair: Chair: W. Swartz (USA), Vice-Chair: J.P. Thayer (USA). Recommend continuing with Ingemar Häggström (Sweden) as Vice-Chair.
- G.4. Ionospheric Research to Support Radio systems. Chair: P. Wilkinson (Australia); Co-Chair: M. Angling (UK). Recommend continuing – see record of third business meeting.
- GF. Middle atmosphere. Co-Chair for Commission G: J. Röttger (Germany), Co-Chair for Com. F: C. H. Liu (China, SRS). Recommend continuing with the same officers.
- FG: Atmospheric Remote Sensing using Satellite Navigation System. Co-chair for Commission G: C. Mitchell (UK). Co-Chair for Commission F. Bertram Arbesser-Rastburg. Recommend continuing with the same officers.
- HGEJ: Supercomputing in Space Radio Science Working Group. Commission G required a representative but one could not be found at this meeting.
- Inter-commission Working Group on Solar Power Satellite. Co-Chair for Commission G: M. Rietveld (Norway). Decision for continuing rests with URSI board.

#### *1.6 Publications*

The Chair, C Hanuise, on behalf of the Commission, thanked Paul Cannon as the Commission G editor and Vice-Chair for Reviews of Radio Science, for his hard work. Paul Cannon in turn thanked the authors for their hard work and excellent reviews. Commission G had five reviews accepted during the triennium and more than met its quota.

- The Lower Ionosphere: Abandoned by Communication, to be Re-discovered by Aeronomy, M. Friedrich, June 2004.
- Progress in Radio Ray Tracing in the Ionosphere, JA Bennett, PL Dyson, RJ Norman September 2004.
- New Techniques and Results From Incoherent Scatter Radars, R. Robinson, December 2004.
- Radio occultation techniques for probing the ionosphere, N. Jakowski, Awaiting publication.
- Long-term trends in different ionospheric layers, J. Bremer, Awaiting publication.

Michael Rietveld, the incoming vice-chair of Commission G, accepted to act as the Commission G editor for the new Radio Science Bulletin and Reviews of Radio Science.

#### *1.7 Commission G resolutions*

There were no Commission G resolutions.

#### *1.8 Discussion on GA 2005 organisation and programme*

Submission of abstracts. The subject of the length of Commission G abstracts and papers (1 versus 4 papers) was discussed, as it was at the last GA. There was once again a

general agreement on having a one-step only submission. A one page extended abstract with a short (~100 word abstract) for incorporation in the conference booklet was deemed preferable.

### *I.9 Proposals for sessions in 2008*

A call for proposals was made.

### *I.10 SCT*

At the last GA M. Hall was tasked to re-activate the Scientific Committee on Telecommunications (SCT). SCT: Patrick Lassudrie Duchesne (France) was confirmed as the Commission G representative to SCT and he explained that there had again been limited activity during the last triennium and promised to report back later in the week.

## **II. Business Meeting 2: Wednesday, 18 August 2002**

This business meeting was a joint meeting between commissions G and H.

### *II.1 Joint Working Groups 2002-2005*

Activities during the past triennium and recommendations for future activities were reviewed and presented for the joint Commissions G and H working groups and activities.

- GH1 Active experiments in Space Plasmas: Co-Chair for Commission G: Sa. Basu (USA), Co-Chair for Commission H: T.Leyser / B. Thidé (Sweden). Recommend continuing with Commission G representative as Dr Keith Groves (USA) as Commission G Co-Chair. The meeting expressed its thanks to Santimay Basu for the long and dedicated service that he has given leading this WG.
- GHC Wave and Turbulence Analysis: Co-Chair for Commission G: D. Hysell (USA), Co-Chair for Commission H: T. Dudok de Wit (France), Co-Chair for Commission C: G Kubin (Austria) Recommend discontinuing as the work of the working group is completed.
- EGH: Seismo-Electromagnetics. Co-chair for Commission G: S. Pulnits (Russia). Recommend continuing with the same officers.
- HGEJ: Supercomputing in Space Radio Science. Co-chair for Commission G: A. Barakat, USA. See record of 3<sup>rd</sup> business meeting.

Commission G and H also coordinate the reports from certain other Groups which fall under the aegis of both URSI and another union. Further, Commissions G and H make recommendations to the URSI Board in respect to the URSI representation to these Union.

- URSI-COSPAR on International reference Ionosphere (IRI). Chair: B.W. Reinisch (USA), Vice Chair for COSPAR: Martin Friedrich (Austria), Vice Chair for URSI: Lida Triskova (Czech Republic); Secretary: D. Bilitza (USA). Recommend continuing with same officers.
- URSI/IAGA VLF/ELF remote Sensing of the Ionosphere and Magnetosphere (VERSIM), URSI Rep: M. Parrot (France). Recommend continuing with Janos Lichtenberger (Hungary) as representative.

## *II.2 Commissions G and H resolutions*

There were none.

## *II.3 Proposed URSI Representatives*

Commissions G and H recommended the following external representatives from within their own ranks:

- CAWES (Climate and Weather of the Sun-Earth system): Sunanda Basu.
- COSPAR (Committee on Space Research): Dr Z. Klos for a second term.
- FAGS (Federation of Astronomical and Geophysical Data Analysis Services): Phil Wilkinson
- ICSU Panel on World Data Centres (Geophysical and Solar) : Dr. D. Bilitza (USA)
- ISES (International Space Environment Service): Dr. S. Pulinetz (Russia)
- SCAR (Scientific Committee on Antarctic Research) : Dr. M Clilverd (UK)
- SCOSTEP (Scientific Committee on Solar-Terrestrial Physics) : Christian Hanuise (Fr)

Commissions G and H assumed that the following members from Commissions G and H would continue in the following roles:

- ICSU (International Council for Science) : Prof. K. Schlegel (Germany)
- IUGG / IAGA (International Union of Geodesy and Geophysics/International Association of Geomagnetism and Aeronomy): Prof. H. Matsumoto (Japan).

## *II.4 Joint Programme for 2005-2008*

There was no discussion.

## *II. 5 Other business*

There was no other business.

## **III. Business Meeting 3: Friday, 28 October 2005**

### *III.1 Opening Comments*

The outgoing Chair, Christian Hanuise, thanked the Commission for the support they have given to him during his tenure and especially for the assistance given by the incoming Chair, Paul Cannon. The incoming Chair, Paul Cannon, then acknowledged the work put by Christian Hanuise and thanked him for his efforts and expressed the pleasure he had working with him, as well as expressing his pleasure at being the new Chair. Paul Cannon then took over chairing the meeting and the Commission.

### *III. 2 Commission G sessions for GA 2008*

The incoming Chair, Paul Cannon presented a list of proposed sessions (and in some cases convenors), a subset of which will form basis for the 2008 General Assembly. It will cover, as much as possible, all interests within Commission G and will involve convenors from younger scientists and various countries. A detailed discussion followed. Paul Cannon pointed out that based on the 2005 GA only eleven oral and 1.5 poster

sessions would be possible and this list would consequently need to be rationalised. For reference the sessions appropriate to the 2005 GA are given at Appendix A.

### III.2.a Proposed Sessions for 2008 GA

- Imaging of the ionosphere – measurements, modelling and validation (Wilson - agreed).  
- multiple data type assimilation
- Beacon satellite studies of the ionosphere (TBD) - including tomography but not scintillation studies
- Tomography – new opportunities (Leitinger - agreed)
- Small scale structures and radio scintillation (TBD) – to include CNOFS results (hopefully)
- Ionospheric density profiles – measurements and models (Reinisch and Bilitza, agreed)
- Radar remote sensing of the ionosphere (Lestera agreed) - including coherent backscatter meteor radars and associated science
- Meteors (TBD).
- Ionosonde data analysis and techniques (McKinnell, agreed)
- The latest and greatest from incoherent scatter radars – methods and results (Swartz and Häggström- agreed)
- Ionospheric and radio wave propagation implementations of geostorms and super storms (Shirochkov, agreed & TBD)
- Improving radio systems through radio science (Angling, agreed and TBD)
- Open session and latest results (Hanuise, agreed)
- GH - Ionospheric modification by high-power radio waves (Groves, agreed and TBD from Commission H)
- GF - Degradation of navigation systems by the ionosphere and troposphere (Coster, agreed, Arbesser-Rastburg for F agreed)

The following sessions with other commissions have been variously proposed:

- FG - Atmosphere-Ionosphere sounding by using global navigation satellite systems (TBD)
- JGH - Low frequency astronomy and the ionosphere – problems and opportunities (post meeting note – Commission J has agreed a session that could include this topic)
- HG - Radio frequency observations in space (TBD)
- HGE - Lightning effects on the ionosphere and magnetosphere (TBD)
- Inter-union - Solar Power Satellites (TBD)

The following suggestion was made for the Commission G tutorial at GA 2008:

- Ionospheric Mapping and Forecasting Using Assimilative Techniques. Dr Brian Wilson of the USA has agreed to give the talk.

### III.2.b Suggestions for commission G General Lecture at GA 2005:

There were no suggestions.

### III.3 URSI Sponsored Meetings

The following meetings were noted as being or likely to be sponsored by URSI,

#### Commission G.

- . Advanced School on Space Weather, ICTP, Trieste, Italy, S. M. Radicella , 2 May 2006
- . Characterising the Ionosphere, 12-16 June 2006, Fairbanks, Alaska, USA – sponsorship already agreed
- . IRI, COSPAR 16-23 July, Beijing, China, 2006 (3 half-day sessions)
- . IRI, Workshop, Buenos Aires, Argentina 16-20 Oct 2006,
- . IRI Workshop, Prague, Czech Republic, Summer 2007
- . Ionospheric Radio Systems and Techniques, 18-21 July 2006, London, UK
- . Workshop on the future of ionospheric research for satellite navigation and positioning: its relevance for developing countries, ICTP, Trieste, Italy, 27 November – 8 December, 2006, S.M. Radicella and R. Leitinger
- . Vertical coupling in the atmosphere – ionosphere system, Bulgaria, 2006.
- . AP-RASC'07, Perth, Western Australia, Aug/Sep 2007 – sponsorship already agreed
- . Beacon Satellite Symposium, 2007

#### *III.4 Working Groups*

##### HGEJ: Supercomputing in Space Radio Science Working Group

After consultation and after discussion at this meeting Commission G has decided to withdraw from this WG.

##### G.4 Ionospheric Research to Support Radio Systems

With the election of Phil Wilkinson to URSI Vice President he expressed a desire to withdraw from the chair of this WG. Dr Matthew Angling was elected in his place but no replacement vice-chair could then be identified. Chair Commission G was given authority to appoint as appropriate before the next GA. (Chairs note; Dr Chris Coleman from Australia has kindly agreed to fulfil this role).

#### *III.5 Publications*

The incoming Vice-Chair, M. Rietveld was confirmed as the Commission G editor for the new Radio Science Bulletin, incorporating the Review of Radio science. Contributions are requested.

#### *III.6 Review of GA 2005*

The General Assembly was considered quite successful for Commission G. The discussions after papers were particularly animated and beneficial. Several sessions attracted well over 100 scientists, many from other commissions.

#### *III.7 Resolutions*

There were no resolutions from Commission G.

## **IV. Appendix A: Sessions held at the 2005 General Assembly**

### *IV.1 Sessions organized by Commission G or with Commission G leading:*

- G01a and b Imaging of the Ionosphere (Wilson/Codrescu/Mitchell)
- G02a and b Ionospheric Effects on Radio Systems (Chandra/Lassudrie)
- G03 Density profiling and validation (Foster/Bilitza)
- G04 Open Session (Wilkinson/Wu)
- G05 and b Small Scale structures (Decameter and less in the ionosphere (St Maurice/ Chau)
- GF1a and b Atmosphere-Ionosphere sounding by using global navigation satellite systems (Jakowski and Spalla)
- GHJ Novel Ground-Based Radio Techniques for studying the sun-earth plasma environment (Hanuise/Thidé/Butcher)
- Posters - Two sessions - General Poster session (Cannon/Zolesi) plus those associated with the oral sessions

### *IV.2 Sessions organized by other Commissions*

- HG1 Radio Frequency Observations in Space (Reinisch/James)
- HG2 Ionospheric Modification By High-Power Radio Waves (Leyser and Basu)
- HG3 Dusty Plasmas and Laboratory Plasmas (Ganguly/Havnes/Mareev)
- HGE Ionospheric Effects on Lightning (Blanc/Price and Su)
- HGCJ Diagnostic of Media Fluctuations with Radio Methods (DeWilt/Wernik)
- EGH Seismo-Electromagnetics (Hayakawa/Pulinets/Molchanov)
- FG Degradation by Ionosphere and Troposphere (Arbesser-Rastburg /Coster/Leitinger)

## **COMMISSION H - WAVES IN PLASMAS**

Chair: Prof. U. Inan (USA)

Vice Chair: Dr. R. Horne (UK)

### **I. Business Meeting 1: Monday 24 October 2005**

#### *I.1 Election of Commission H Vice Chair for 2005-2008*

The chair, Umran Inan, announced that two candidates stood for election, Yoshiharu Omura and Ondrej Santolik. After counting voting slips returned by the Commission H national delegates, and those cast at the GA, Yoshiharu Omura was elected as Vice-chair, subject to confirmation at the URSI Council meeting.

### *1.2 Discussion on GA 2005 Organisation and Programme*

The chair, Umran Inan, thanked the local organisers and noted that they had a difficult time organising this assembly. He also thanked the incoming chair, Richard Horne, for his help in organising the sessions, and the session convenors.

The submission of abstracts was discussed, as it was at previous GAs. It was felt that the current system of submitting a 1 page abstract, followed by a 4 page extended abstract and a 100 word summary was excessive. Commission H (along with Commission G) has always regarded the 4 page extended abstract as optional. The general feeling was to continue with a 1 page abstract and 100 word summaries and keep the extended abstract as optional.

The issue of internet access was raised, and requested that wireless access be made available at the next GA.

### *1.3 Terms of Reference*

The terms of reference were reviewed and it was decided to simplify the wording. It was also decided to include a reference to space weather to reflect the important role that wave-particle interactions play in controlling the flux of energetic particles in the radiation belts which cause satellite damage. The terms of reference are now:

The goals of the Commission are :

- (a) To study waves in plasmas in the broadest sense, and in particular :
  - (i) the generation ( i.e. plasma instabilities) and propagation of waves in plasmas,
  - (ii) the interaction between these waves, and wave-particle interactions,
  - (iii) plasma turbulence and chaos,
  - (iv) spacecraft-plasma interaction ;
- (b) To encourage the application of these studies, particularly to solar/planetary plasma interactions, space weather, and the exploitation of space as a research laboratory.

### *1.4 Meeting Support*

Over the last 3 years Commission H has provided support for 6 meetings in mode A (moral support, no funding), and 7 in mode B where funds up to Eu 1,500 have been provided for individual meetings. In total Eu 7,750 has been provided and there is a balance of Eu 2,130. The chair proposed that this money is carried forward and added to new funds in the next triennium as there will probably be additional meetings related to the International Polar Year.

### *1.5 Publications*

The Chair, Prof U Inan, thanked the incoming chair, Richard Horne, for acting as editor for Reviews of Radio Science. During the last 3 years Commission H has been the most productive with 6 review papers published or in press. Richard Horne thanked the authors for their hard work.

The incoming vice chair, Yoshi Omura, agreed to act as the new editor for Commission H for Reviews of Radio Science and Radio Science Bulletin.

<b>Title</b>	<b>Author</b>	<b>Status</b>
Remote sensing of the plasmasphere	Carpenter, D.	Published March 2004.
Solar power satellites	Matsumoto, H.	Special issue Sept 2004
Kinetic and nonlinear processes in space plasmas	Lembege et al.	Published Sept. 2005
Use of RF waves in space propulsion systems	Bering et al.	Published Sept. 2004.
The CLUSTER fleet explores waves in the magnetosphere: chosen illustrations	Decreau et al.	Published Dec. 2005
Space weather effects on communications satellites	Koons and Fennel	Published March 2005

### *1.6 URSI White Papers*

URSI has adopted the idea of issuing white papers on important topics relevant to URSI science where it can provide sound scientific information and an open forum for discussion. The first white paper will be on solar power satellites (SPS), led by Professor Matsumoto (former URSI president and Comm H). This white paper was supported by Commission H. So far, other suggestions for a white paper include the effects of mobile phones on human health.

### *1.7 Commission H Resolutions*

There were no Commission H resolutions.

### *1.8 Proposals for H-led Sessions in 2008*

A call for H led sessions for GA 2008 was made, for discussion at BM3 (see below).

### *1.9 Other business*

Three venues had been proposed for GA 2008, Chicago (USA), Istanbul (Turkey) and Goteborg (Sweden). The final decision will be made by a vote at the URSI Council meeting later in the week.

## **2. Business Meeting 2: Wednesday 26 October 2005**

This was a joint meeting between Commissions H and G.

### *2.1 Joint Working Groups 2002-2005*

Activities during the past triennium and recommendations for future activities were reviewed and presented for the joint Commissions G and H working groups and activities.

- GH1: Active experiments in Space Plasmas: Co-Chair for Commission G: Sa. Basu (USA), Co-Chair for Commission H: B. Thide (Sweden). Recommend continuing with Commission G representative (and Co-chair) as Dr Keith Groves (USA), and

Commission H representative as Dr. Ruzhin (Russia). The meeting expressed its thanks to Santimay Basu for the long and dedicated service that he has given leading this WG.

- GHC Wave and Turbulence Analysis: Co-Chair for Commission G: D. Hysell (USA), Co-Chair for Commission H: T. Dudok de Wit (France), Co-Chair for Commission C: G Kubin (Austria) Recommend discontinuing as the work of the working group is completed.
- EGH: Seismo-Electromagnetics. Co-chair for Commission G: S. Pulnits (Russia), Co-chairs for Commission H: M. Parrot (France) and O. A. Molchanov (Russia). Recommend continuing with the same officers.
- HGEJ: Supercomputing in Space Radio Science. Co-chair for Commission G: A. Barakat, USA, Co-chair for Commission H: Y Omura (Japan). Recommend continuing with the same Commission H representative, but Commission G will withdraw.
- *ABDFGHJK*: An inter-commission working Groups on Solar Power Satellites: Co-chair for Commission G: M Rietveld (Germany), Co-chair for Commission H: N. Shinohara (Japan). Recommend continuing with the same officers.

Commissions G and H also coordinate the reports from certain other Groups which fall under the aegis of both URSI and another union. Further, Commissions G and H make recommendations to the URSI Board in respect to the URSI representation to these Union.

- URSI-COSPAR on International reference Ionosphere (IRI). Chair: B.W. Reinisch (USA), Vice Chair for COSPAR: Martin Friedrich (Austria), Vice Chair for URSI: Lida Triskova (Czech Republic); Secretary: D. Bilitza (USA). Recommend continuing with same officers.
- URSI/IAGA VLF/ELF remote Sensing of the Ionosphere and Magnetosphere (VERSIM), URSI Rep: M. Parrot (France). Recommend continuing with J. Lichtenberger (Hungary) as representative for Commissions G and H.

### *2.2 Commission G and H Resolutions*

There were none.

### *2.3 Proposed URSI Representatives to Organisations*

Commissions G and H recommended the following external representatives from within their own ranks:

- CAWES (Climate and Weather of the Sun-Earth system): Sunanda Basu.
- COSPAR (Committee on Space Research): Dr Z. Klos for a second term.
- FAGS (Federation of Astronomical and Geophysical Data Analysis Services): Phil Wilkinson
- ICSU Panel on World Data Centres (Geophysical and Solar): Dr. D. Bilitza (USA)
- ISES (International Space Environment Service): Dr. S. Pulnits (Russia)
- SCAR (Scientific Committee on Antarctic Research): Dr. M Clilverd (UK)

- SCOSTEP (Scientific Committee on Solar-Terrestrial Physics): Christian Hanuise (France)

Commissions G and H assumed that the following members from Commissions G and H would continue in the following roles:

- ICSU (International Council for Science): Prof. K. Schlegel (Germany)
- IUGG / IAGA (International Union of Geodesy and Geophysics/International Association of Geomagnetism and Aeronomy): Prof. G. Lakhina (India).

#### *2.4 Joint Programme for 2005-2008*

There was no discussion.

#### *2.5 Other Business*

There was no other business.

### **3. Business meeting 3: Friday 28 October 2005**

#### *3.1 Opening Remarks*

The outgoing chair, Umran Inan, thanked the commission for their support, and thanked the incoming chair for his help over the last triennium, and especially over the organisation of the sessions for the GA. The incoming chair, Richard Horne, thanked the outgoing chair for the work that he had done, and for his advice and help – he had been a good teacher. He also welcomed Yoshi Omura as new vice chair, which had been confirmed at the URSI Council meeting. Richard Horne then took over chairing the meeting.

#### *3.2 Proposed Sessions for GA 2008*

URSI Council decided that the next GA will be in Chicago 2008. The chair pointed out that at this GA there were 11 half day H led sessions plus a 1.5 day poster session and that for planning purposes we should assume that GA 2008 will have a similar number of sessions. As a guide, the session titles and number of papers at GA 2005 are given in the table below.

#### *3.3 Sessions at GA 2005*

Several new sessions were proposed for GA 2008 including (with suggested convenors):

- H1: Boundary layers: kinetic mechanisms (B. Lembege, G. Lakhina)
- H2: Wave effects on the radiation belts (J. Albert, R. Horne)  
Including radiation belt remediation
- H3: Waves and coherent structures in space plasmas (J. Pickett, Y. Omura)
- H4: Multi-point measurements of space plasmas (O. Santolik, M. Andre)
- H5: Waves and Dynamics of the Plasmasphere (B. Fraser, H. Laakso)
- H6: Acceleration and Heating by Plasma Waves (R. Bingham, T. Chang)  
Including tokamaks and lab plasmas
- H7: Open session & latest results (R. Horne, Y. Omura)

Several joint sessions were also discussed:

- HG: Active Radio Frequency Space Experiments (B. Reinisch, G. James, Ruzhin)
- HG: Dusty Plasmas and Laboratory Plasmas (G. Ganguly, Havnes, Mareev)
- HX (inter-union): Solar Power Satellites (H. Hashimoto)
- GH: Ionospheric Modification By High-Power Radio Waves (Groves from Commission G, suggest T. Leyser and S. Basu, B. Thide for Comm H)
- HGE: Effects of Lightning on the Ionosphere and Magnetosphere, (Suggest M. Blanc, Price, V. Pasco)
- HGE: Seismo Electromagnetics (M. Parrot, O. Molchanov)

It was suggested that the open session should be on the first day to encourage full attendance. In this GA there were 11 H led sessions which meant they had to be restricted to half day sessions. There was a feeling that fewer but longer sessions might be more appropriate at the next GA.

### *3.4 Suggestions for H Tutorial Lecture for GA 2008*

Three people were suggested including Don Gurnett, Umran Inan and Gordon James.

<b>Session at GA 2005</b>	<b>papers</b>
H1. Microscopic processes in boundary layers	7 oral + 9 poster
H2. Radiation belts and the Plasmasphere	10 oral + 11 p
H3. Waves and coherent structures in space plasmas	7 oral + 15 p
H4. Multi-point measurements	10 oral + 0 p
H5. Open session & latest results	7 oral + 11 p
HG1. Radio-frequency observations in space	10 oral + 15 p
HG2. Ionospheric modification by high-power radio waves	10 oral + 10 p
HG3. Dusty plasmas and laboratory plasmas	7 oral + 6 p
HGCJ. Diagnostics of media fluctuations with radio methods	7 oral + 12 p
HGE. Ionospheric effects of lightning	7 oral + 3 p
HADFBJK. Solar Power Satellites	7 oral + 2 p

### *3.5 Requests for URSI Meeting Sponsorship*

Several meetings have requested Commission H support during the next triennium, including:

- Radio Science Symposium for A Sustainable Humanosphere, March 20-21, 2006, Kyoto, Japan (Mode A)
- ISROSES: International Symposium on Recent Observations and Simulations of the Sun-Earth System, September 18-22, 2006, Bulgaria, (Mode B)
- IRI Workshop, October 16-20, 2006, Buenos Aires, Argentina (Mode B)

- COSPAR Meeting July. 17-23, 2006, Beijing, China ( Mode B)
- VLF Workshop, Sodankyla, Sept 2006.
- The 8th International School/Symposium for Space Simulations (ISSS-8): 2008, USA (Mode B)

URSI Council had approved the carry forward of unused funds to the next triennium as proposed by the outgoing chair.

### *3.6 Publications*

In accordance with tradition, the new vice chair, Yoshi Omura, agreed to take over as editor for Commission H of Radio Science Bulletin, incorporating Reviews of Radio Science. There are 4 review papers being written, but additional reviews papers would be sought. Additional suggestions include J. Holweg on coronal heating, M. Reiner and J. L. Bougeret on solar radio emissions, and R. Benson on IMAGE results and A. Cairns on wave heating in tokamaks.

### *3.7 Review of GA 2005*

It was felt that the GA had been a good meeting. Although the number of US attendees was less than in previous years, the number of papers submitted had increased over GA 2002. There had only been 2 oral talks where the authors could not attend, but these were filled with other talks. Attendance varied between 40-90 people but some sessions had over 100 including members from other commissions. The Commission H tutorial was very well attended. The room size was more than adequate, and the coffee facilities by each room were excellent. It was expected that the next GA in Chicago would have a much higher US attendance.

## **COMMISSION J - WAVES IN PLASMAS**

Chair: Prof. M. Inoue (Japan)  
 Vice Chair: Prof. R. Schilizzi (Netherlands)

### **1. First Business Meeting: 24 October 2005**

#### *1.1 Election of Vice-Chair*

Two candidates were nominated for the position of Vice-Chair, Professor Subramaniam Anathkrishnan of the National Centre for Radio Astrophysics in Pune, India, and Professor Thibaut Le Bertre of the CNRS in France. A vote was held amongst the Official Members

which resulted in the election of Professor Ananthakrishnan. Professor Ananthakrishnan accepted the position of Vice-Chair of Commission J.

### *1.2 Discussion of Issues Arising from the Meeting of the Coordinating Committee for the General Assembly*

The proposed guidelines for abstract and paper submission for future General Assemblies were discussed. Commission J members agreed that only one abstract should be requested that would serve for the selection of papers and for printing in the Program Book. Submitting a full paper should be optional.

### *1.3 URSI White Paper Policy and Solar Power Satellites*

Following considerable discussion, Commission J members felt strongly that any URSI White Paper must be a balanced scientific exposition of the topic under consideration. The current draft White Paper on SPS was not felt to fulfill these criteria.

### *1.4 Budget*

Professor Inoue reviewed the activities and budget expenditures of the previous triennium. It was noted that very few proposals had been received for URSI support for meetings, or for travel support for young scientists to the General Assembly. It was agreed that a more active policy should be followed for the next triennium.

### *1.5 Resolutions*

Professor Inoue informed Commission members about the follow up to URSI Resolutions from GA2002 of interest to Commission J. He invited proposals for new Resolutions to be presented at this GA.

### *1.6 IUCAF*

The Commission approved the nomination of Dr Uday Shankar (Radio Research Institute, Bangalore, India) to succeed Dr Yashwant Gupta as one of the three URSI members on IUCAF. The Commission also approved extension of the terms of the other IUCAF members, Dr Tasso Tzioumis (ATNF, Australia) and Dr Wim van Driel (Paris Observatory), for the coming triennium.

It was noted that Commission G planned to nominate an IUCAF representative before the IUCAF meeting on 27 October.

## **2. Second Business Meeting: 26 October 2005**

### *2.1 URSI White Paper on Solar Power Satellites*

Professor Inoue distributed copies of the draft White Paper to members of the Commission. Further discussion of the draft White Paper was postponed until the Third Business Session.

### *2.2 SCT*

Professor Inoue reported on URSI Council discussions on the future role of the SCT. It

has been decided that the SCT will continue at a low level to promote cross-commission interaction. It will be disbanded at GA2008 if no activity has taken place.

### *2.3 IAU Working Group of the History of Radio Astronomy*

Professor Govind Swarup described the activities of the IAU WG, and suggested that Commission J funds be used to partially support travel by Commission J representatives to WG meetings. The Commission strongly supports the work of the IAU WG, and authorized the Commission Chair to investigate whether travel support of this nature is within the remit of URSI. Professor Swarup is prepared to act as Commission J contact person for the IAU WG.

### *2.4 Commission J Resolutions*

No Resolutions were proposed to be submitted by Commission J at this GA.

### *2.5 Editor for Radio Science Reviews*

Nominations were called for the position of Editor for Radio Science Reviews. Professor Ray Norris (ATNF, Australia) was nominated and accepted the position. The following reviews were noted:

- Fibre optics in radio astronomy” – McCool et al, in press
- Advances in Radio Astrometry” – Fomalont and Kobeyashi, under revision
- Calibration of High Frequency Telescopes” – to be commissioned

It was agreed that the Editor would obtain the approval of the Commission Chair and Vice-Chair before commissioning any further articles.

### *2.6 US Senior Review of Astronomy*

Professor Don Backer informed Commission members of the background and mandate of the Senior Review panel established by the National Science Foundation to provide advice on US national facilities for astronomy.

### *2.7 Working Groups*

#### **Leap Second**

Following a splinter meeting of the Leap Second WG, it was decided to discontinue the WG, since it is not of direct interest to URSI.

#### **Global VLBI**

The Commission decided to continue the WG for the next triennium.

### *2.8 Budget 2002-2005*

Professor Inoue invited proposals for travel support for a small number of individual participants in this URSI GA, to be finalized at the Third Business Meeting.

### **3. Third Business Meeting: 28 October 2005**

#### *3.1 Report on the 27 October URSI Council Meeting*

Professor Schilizzi reported the decisions of the Council meeting on the venue of next GA, Chicago, and the election of the URSI President for the next triennium, Professor F. Lefeuvre. He also reported on the continuing Council discussions on the Solar Power Satellite System White Paper. Following this report, Commission members discussed SPS at length. It was concluded that all statements in the White Paper and Appendices advocating SPS should be removed, and that considerable revision of the remainder of the material was required for this paper to reach the standard expected from URSI. The Commission Chair and Vice-Chair were mandated to make this position clear at the next Council Meeting.

#### *3.2 General Assembly 2008*

Possible topics for Commission J at the next General Assembly are:

- 1) Observatory Reports
- 2) Phased arrays in radio astronomy
- 3) Signal processing
- 4) Calibration and imaging techniques
- 5) Future large telescopes
- 6) RFI mitigation (together with Commission E)
- 7) High Frequency radio astronomy
- 8) Cosmic Microwave Background
- 9) Virtual Observatories and Large Surveys
- 10) Radio astronomy in Space

A selection will be made at the appropriate time during the triennium after consultation with Commission members via email. In addition, splinter meetings for IUCAF, GVWG, and VSOP-2 need to be planned, as well as proposals for the Commission J Tutorial and a General Lecturer.

#### *3.3 Budget 2002-2005*

Travel support for three participants (Aaron Chippendale, Wei Wang, and Aaron Parsons) was approved.

## **COMMISSION K - ELECTROMAGNETICS IN BIOLOGY & MEDICINE**

Chair: Dr. B. Veyret (France)

Vice Chair: Dr. F. Prato (Canada)

This report is based on the conclusions from the two business meetings of Commission K that were held in New Delhi.

## 1. New Delhi General Assembly in New Delhi

### 1.1 Scientific Sessions

Ten scientific sessions were organised, including three sessions shared with Commissions A, B, and E:

Session	convenors	topic
K1	D’Inzeo	mechanisms
K2	Behari/Korenstein	biological effects
K3	Lin/Chiang	mobile telephony
K4a	Ueno/Prato	medical diagnosis
K4b	Ueno/Prato	medical applications
K6	Karpowicz/Hietanen	occupational medicine
KT	Vecchia	public health
KAE	Neubauer/Faraone	dosimetry
KB	Wiert/Taki	modelling
KE	Morrissey/Calcagnini	EMC

During the sessions, 80 talks were given and 47 posters, which are good numbers in view of the difficulty in organising the sessions and in travelling to New Delhi.

### 1.2 YS Program

Six young scientists took part in the work of Commission K.

### 1.3 Election Vice-Chair

There were four candidates to the position of Vice-Chair of the commission:

- Jitendra BEHARI, New Delhi, Indai
- Guglielmo D’Inzeo, Rome, Italy
- Rafi Korenstein, Tel-Aviv, Israel
- Niels Kuster, Zurich, Switzerland

Professor Guglielmo D’Inzeo was elected. He will become the next chair of commission K at the next General Assembly in Chicago.

## 2. Publications

Several papers have been published in the « Bulletin of Radio Science ». They were edited by the vice-chair Frank Prato :

- N Shupak et al. *Therapeutic Uses of Pulsed Magnetic-Field Exposure: A Review*. **Dec 2003**. 9-32
- S Engström. *Physical Mechanisms of Non-Thermal Extremely Low Frequency Magnetic-Field Effects*. **Dec 2004**. 95-106

- A Ahlbom, M Feychting, S Lönn. *Mobile phones and tumor risk: Interpretation of recent results (Sep 2005)*.
- J Lin. *Review on BBB permeability and exposure to ELF and RF (in press)*.

### 3. Other activities

- The links between Commission K and the SCT have been strong. Most of the contacts were established with WHO (International EMF Project)
- Several meetings of the national representative of Commission K were organised at various international scientific meetings.
- A major scientific meeting was organised jointly by the commission K, WHO, and ICNIRP<sup>1</sup> in Seville, Spain, in May 2004. More than 250 participants attended the meeting and commission K organised two sessions on medical applications, and MRI and TMS<sup>2</sup>.
- The following scientific meetings have been sponsored by Commission K:
  1. *EMF and Cardiac Pacemakers and Defibrillators*, Paris, France, 25 October 2002.
  2. *JINA 2002*, Nice, France, 12-14 November 2002.
  3. *APMC'02: Asia-Pacific Microwave Conference*, Kyoto, Japan, 19-22 November 2002.
  4. *EMC Zurich 2003*, Zurich, Switzerland, 18-20 February 2003.
  5. *ISMOT 2003 - 9th Int. Symp. On Microwave and Optical Technology*, Ostrava, Czech Republic, 11-15 August 2003.
  6. *International NIR Workshop and Symposium*, ICNIRP/URSI(K)/WHO, Seville, Spain, 20-24 May 2004.
  7. *MSMW'04*, Fifth Int. Kharkov Symposium on Physics and Eng of Microwaves, mm and Submm Waves, Kharkov, Ukraine, 21-26 June 2004.
  8. *EMC Wroclaw 2004*, Wroclaw, Poland, 29 June - 1 July 2004
  9. *AP-RASC 04: 2004 Asia-Pacific Radio Science Conference*, Beijing, China, 20-23 August 2004.
  10. *Radar 2004*, Toulouse, France, 19 - 21 October 2004.
  11. *JINA-04*, Nice, France, 8-10 November 2004.
  12. *EMC Zurich 2005*, Zurich, Switzerland, 15-17 February 2005.
  13. *CEFBIOS 2005 - Coherence and electromagnetic fields in biological systems*, Prague, Czech Republic, 1-4 July 2005.
  14. *ISMOT 2005 - 10th International Symposium on Microwave and Optical Technology*, Fukuoka, Japan, 22-25 August 2005.
  15. *International Workshop on Electromagnetic Fields at the Workplaces*, Warsaw, Poland, 5-7 September 2005.

### 4. Resolutions

No new **resolution** was proposed by Commission K.

## 5. White paper

Commission K has worked on the draft of the SPS white paper and has improved the document mainly as far as the health chapter was concerned. It did not give an opinion on the technology and the legitimacy of the project itself.

A new white paper entitled “wireless communications and health“ was proposed to be written under the leadership of Commission K.

## 6. Terms of reference

In order to clarify the existing text a new formulation of the items was given:

- (a) physical interaction of *electromagnetic fields*\* with biological systems;
- (b) biological effects;
- (c) mechanisms underlying the biological effects;
- (d) experimental exposure systems;
- (e) assessment of human exposure;
- (f) medical applications.

\* (*frequency range from static to terahertz*)

- (a) interaction des champs électromagnétiques\* avec les systèmes biologiques au niveau de la physique ;
- (b) effets biologiques ;
- (c) mécanismes à la base des effets biologiques ;
- (d) systèmes expérimentaux d'exposition ;
- (e) évaluation de l'exposition des personnes ;
- (f) applications médicales.

\* (*domaine de fréquence du statique aux terahertz*)

<sup>1</sup> International Commission on Non Ionizing Radiation Protection

<sup>2</sup> stimulation magnétique transcrânienne

## RESOLUTIONS AND RECOMMENDATIONS OF THE COUNCIL

### U.1 Regional Coordination Initiatives

The URSI Council:

*Considering*

1. The existing initiatives, under the aegis of URSI national Member Committees, of Radio Science regional co-ordination (e.g. in North America, Asia-Pacific and Europe); and
2. That these initiatives are fully in accord with the URSI objectives; and
3. That these regional co-ordination committees would facilitate both the organisation and publicising of URSI activities and the dissemination of its recommendations and resolutions about scientific matters to national and supranational bodies

*Resolve*

To welcome and to encourage these initiatives.

*Recommend*

To the URSI national Member Committees to keep the URSI Board informed of the advancement of these initiatives.

### U.2 Solar Power Satellite

The URSI Council,

*Considering*

1. That meeting the world's energy needs, without considerable negative environmental effects, is one of the major challenges to sustainable development; and
2. The potential interest in collecting the Sun's energy in space and transmitting it through electromagnetic waves (microwaves) to the ground, and feeding it to the terrestrial

power grid; and

3. That preliminary studies performed by radio scientists have evaluated the feasibility of Solar Power Satellite systems for such purposes, identifying potential benefits and problems;

*Resolves*

That URSI sees its role as providing the necessary scientific background and a fair and open forum on the technical issues of Solar Power Satellite systems; and

*Recommends*

That the *URSI White Paper on Solar Power Satellite Systems* should be used as a reference to undertake world-wide coordinated studies to investigate the potential of Solar Power Satellites as an alternative energy source, taking into account all relevant scientific aspects, the environmental and societal impact, the impact on other radio services, and the technical and economic feasibility.

### **U.3 XXIXth General Assembly**

The URSI Council,

*Having considered* the invitations for the XXIXth General Assembly which had been submitted by the URSI Member Committees in Sweden (Göteborg), Turkey (Istanbul) and the USA (Chicago, Illinois);

*resolves*

1. to accept the invitation of the American URSI Committee to hold the XXIXth General Assembly in Chicago, Illinois from 7 to 16 August 2008;
2. to record its thanks to the Member Committees in Sweden and in Turkey for their invitations

### **U.4 Vote of Thanks to the Indian URSI Committee**

The URSI Council,

*resolves* unanimously to convey to the Indian URSI Committee its warm thanks and appreciation for the organisation of the XXVIIIth General Assembly in New Delhi.

## RÉSOLUTIONS ET RECOMMANDATIONS DU CONSEIL

### U.1 Initiatives de coordination régionale

Le Conseil de l'URSI

*Considérant :*

1. L'existence d'initiatives, sous l'égide de Comités nationaux membres de l'URSI, de coordination régionale en Radio Science (par exemple en Amérique du Nord, en Asie-Pacifique et en Europe) ; et
2. Que ces initiatives participent pleinement des objectifs de l'URSI ; et
3. Que ces comités de coordination régionale devraient faciliter à la fois l'organisation et l'information des activités scientifiques de l'URSI et la diffusion de ses recommandations et résolutions auprès des instances nationales et supranationales ;

*Décide*

D'accueillir favorablement et d'encourager ces initiatives.

*Recommande*

Aux Comités membres concernés de tenir informé le Bureau de l'URSI de l'évolution de ces initiatives.

### U.2 Centrales solaires en orbite

Le Conseil de l'URSI,

*Considérant*

1. Que satisfaire les besoins énergétiques mondiaux, sans effets négatifs importants sur l'environnement, est un des enjeux majeurs du développement durable ; et
2. Des avantages potentiels à collecter l'énergie solaire dans l'espace, la transmettre au moyen d'ondes électromagnétiques (micro-ondes) au sol, et ainsi alimenter le réseau électrique terrestre ; et
3. Que des études préliminaires réalisées par des spécialistes en radio-sciences ont évalué

la faisabilité de Centrale solaire en orbite répondant à de tels principes, identifiant les avantages et inconvénients ;

*Décide*

Qu'il est du rôle de l'URSI de mettre à disposition les éléments scientifiques nécessaires et d'organiser un débat honnête et ouvert sur les enjeux techniques des Centrales solaires en orbite ; et

*Recommande*

Que le *Livre blanc de l'URSI sur les Centrales solaires en orbite* soit utilisé comme une référence pour entreprendre des études coordonnées à l'échelle mondiale et examiner les potentialités des Centrales solaires en orbite comme source d'énergie alternative, prenant en compte tous les aspects scientifiques, les impacts environnementaux et sociétaux, les impacts sur les autres services « radio », et la faisabilité technique et économique.

### **U.3 XXIXth Assemblée Générale**

Le Conseil de L'URSI,

*Ayant examiné* les invitations pour la XXIXe Assemblée générale soumises pour les comités membres de l'URSI en la Suède (Göteborg), la Turquie (Istanbul) et aux Etats-Unis (Chicago, Illinois);

*Décide*

1. d'accepter l'invitation du comité américain de l'URSI pour organiser la XXIXe Assemblée générale à Chicago, Illinois de 7 à 16 août 2008;
2. d'adresser aux comités membres en la Suède et en la Turquie ses remerciements pour leurs invitations.

### **U.4 Remerciements au Comité indien de l'URSI**

Le Conseil de l'URSI,

*décide* à l'unanimité de transmettre au comité indien ses vifs remerciements et son appréciation pour l'organisation de la XXVIIIe Assemblée générale à New Delhi.