

**U.R.S.I.**

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## **PROFILE OF MEMBER COMMITTEES - ITALY**

### **URSI AND ITALY SINCE GUGLIELMO MARCONI'S CHAIRMANSHIP**

by Annamaria Verga Scheggi and Claudio Egidi

Guglielmo Marconi was President of the Italian Member Committee for URSI until his death in 1937. The 6th URSI General Assembly was held in Venice-Rome from 4 to 10 September 1938. It was chaired by Professor Adm. G. Pession. The URSI President, Prof. Sir Edward Appleton, mentioned, in his main speech, the names of the major Italian scientists of the time active in the Radio Science area : Q. Majorana, G. Vallauri, L. Sacco, N. Carrara, M. Boella, Lo Surdo, I. Ranzi ; nearly all these gentlemen attended that Assembly.

After the Second World War, the Italian Committee took part in all the General Assemblies, starting with the first one in Paris (1946) and up to the most recent one in Prague (1990).

Throughout the years the main national activities were developed along the lines of the international Commissions : ionospheric propagation, e.m. fields, measurements and metrology, bioeffects, electronic and optical devices, tropospheric wave propagation and remote sensing, signals and systems.

The Italian Member Committee is an official Committee of the National Research Council (CNR) of Italy, which supplies a nominal budget allowing payment of the annual dues, and attendance of the President and Secretary of the Committee at the URSI General Assemblies.

The Committee was chaired by M. Boella until 1967-1970, by G. Barzilai from 1971 to 1981, by C. Egidi from 1984 to 1990 and by A.M. Scheggi from 1990 onwards.

On the average the Committee meets once a year.

In 1984, during the Chairmanship of Prof. C. Egidi, the 15th General Assembly was held in Florence. It was sponsored and supported by the CNR. The organization was in the hands of the "Istituto di Recerca sulle Onde Elettromagnetiche" (IROE) of CNR in collaboration with the Florence Division of the Italian Electrotechnical and Electronic Association (AEI).

The Assembly was very successful, and was attended by more than 1000 participants from all over the world. The rich scientific programme included 650 papers (including many invited ones) which covered all the areas of interest of the URSI Commissions. In addition, four Open Symposia were organized in parallel. Five volumes of abstracts were printed by the Organizing Committee. They were devoted to resp.

- Sessions of Commissions
- OS1 - Interaction of Electromagnetic Fields with Biological Systems
- OS2 - Active Experiments in Space Plasmas
- OS3 - Radio Techniques in Planetary Exploration
- OS4 - Data, Signal and Image Processing.

It has long been traditional for the delegates to prepare, after each General Assembly, individual reports concerning the development of the works discussed at that Assembly. Since 1984, however, a different policy has been preferred. In fact, during the summer of 1984, a volume had been prepared containing the national triennial activity, subdivided among the relevant URSI Commissions. It contained also a complete list of the scientific literature published during the triennium 1981-83. The volume was particularly useful, not only for recording and promoting the national activities, but also for disseminating information all over the world. In fact, around 1000 books were printed and dispatched in advance of the Florence General Assembly.

The same policy was repeated with respect to the two General Assemblies of Tel Aviv and Prague, since it was considered extremely useful to give a complete picture of the national publications, a result impossible to obtain in the context of the Review of Radio Science, which suffers space limitations, hence must limit the number of quotations.

Among the international responsibilities entrusted to Italian scientists, we mention Professor M. Boella, URSI Vice-President (1966-1969); Professor F. Fedi, Commission F Vice-Chairman and later Chairman (1981-1987); Professor S. Leschiutta, Commission A Vice-Chairman and later Chairman (1984-1990). Very recently Professor P. Bernardi was elected Vice-Chairman of the new URSI Commission K on Electromagnetics in Biology and Medicine.

## NEWS FROM THE COMMISSIONS

### COMMISSION B

*Professor Gardiol, Chairman of the Commission, has released his second Newsletter, dated October 1991. Its main contents are :*

- a summary of the situation regarding the 1992 URSI Symposium on Electromagnetic Theory (Sydney, August 17-20, 1992). The selection of papers will start in January 1992, and the authors will be informed of the decision soon thereafter.
- a report on the Scientific Programme in Prague (it appears in the present issue of the Bulletin).
- details on the Asia-Pacific Microwave Conference, held in Adelaide, Australia, on 11-13 August 1992, i.e. a few days before the Sydney Symposium.
- preliminary information on the Kyoto General Assembly, with a request for suggestions concerning topics for scientific sessions and names of conveners.
- a digest of the preparations now being made for the Review of Radio Science 1990-2 by its editor, Dr. W. Ross Stone. Each Commission will have about 70 pages at its disposal, devoted to 3 or 4 review chapters. Suggestions for topics should be sent to the Commission B editor, Professor S. Ström. His address is :

Royal Institute of Technology  
S-100 44 Stockholm  
Sweden

Professor F. Gardiol renews his request for news items suitable for future issues of his Newsletter. His address is :

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## COMMISSION G

*Professor Wernik, Chairman of the Commission, recently gave the following information to his Official Members, Past Chairmen of the Commission, Working Group Chairmen, Conveners and other interested persons.*

### "1. The Kyoto General Assembly, August 25 - September 2, 1993

1993 seems so far away but we need to start work on our programme.

In Prague we made a list of suggested topics. I did not receive any additional proposals. After consultation with Kristian Schlegel, our Vice-Chairman, the Prague list has been slightly modified as follows :

1. Broadband signals propagation in the ionosphere (C, F, G);
2. Non-linear wave theories and observations in space (H, G);
3. Recent results of coordinated campaigns;
4. Active experiments in space plasma (G, H);
5. Ionosphere - middle and lower atmosphere interactions;
6. Observations and modelling of solar-terrestrial relationships including IGBP context;
7. High-latitude ionosphere;
8. Open session and latest results;
9. Ionospheric prediction and modelling;
10. New results from coherent and/or incoherent scatter experiments;
11. Ionosonde networks and stations.

I want to call your attention to topics No 2 and 4. My feeling is that there is an overlap between them, although the first one stresses theory and the second one experiments. Any comments?

You may notice that Conveners are not named. Some of you might have received my request already but, as today, I got only one (positive) response. Any suggestions are welcome.

We also need suggestions for the Commission G tutorial. In Prague we had a very good one by P. Bauer on "The Ionosphere from Space". Some time

ago Henry Rishbeth suggested "Modelling of the Ionosphere". How about this? Who might give such a lecture?

Another item to think about is the URSI General Lecture Programme.

## 2. Scientific Meetings 1991-1993

I received requests for approval for the following meetings :

1. 5th Workshop on Scientific and Technical Aspects of MST Radar, August 6-9, 1991 at the University College of Wales, Aberystwyth;
2. Symposium on Artificial Modification of the Ionosphere, September 9-13, 1991, Suzdal;
3. International Symposium on the Middle Atmosphere, March 23-26, 1992, Kyoto;
4. International Meeting on Wave Propagation in Random Media, August 1991, Seattle;
5. Workshop on Turbulence in Space Plasmas, 1993, France.

## 3. Review of Radio Science

K.C. Yeh has kindly agreed to serve as the editor of the Commission G part.

## 4. CGH1 Wave and Turbulence Analysis Joint Working Group

In October 1990 Bob Benson, Commission H Chairman, asked me if Commission G had considered the issue in Prague of joining the CH Joint Working Group on Wave and Turbulence Analysis. Since we did not discuss this problem, I tried urgently to consult those of you who have telex. All replies (7) (except one) were positive. I also took into account the active involvement of Commission G people in the Prague Symposium on "Wave and Turbulence Analysis Technique" and concluded that there is enough interest of the Commission G community in the field to join the Working Group. The appropriate statement has appeared in the URSI Bulletin No 255 (March 1991, p.

36), as a Commission G resolution. I am happy to mention that Sunanda Basu has kindly agreed to act as a Commission G representative (F. Lefeuvre represents Commission H). The Wave and Turbulence Analysis Working Group is organizing a Workshop in 1993.

Contactperson : Professor A.W. Wernik  
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### COMMISSION K

The URSI Board, at its September 1991 meeting in Brussels, took cognizance of the results of a recent election held within the ranks of the Official Members of the new Commission K on "Electromagnetics in Biology and Medicine". Based on these results the Board made the following appointments :

Chairperson : Dr. M.A. STUCHLY  
Dept. of Electrical and Computer Engineering  
University of Victoria, P.O. Box 3055  
Victoria, BC V8W 3P6, Canada  
Tel. (1-604) 721-6029  
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Vice-Chairperson : Prof. P. BERNARDI  
Department of Electronics, University of Rome  
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## **REPORTS ON SCIENTIFIC SESSIONS AT THE PRAGUE GENERAL ASSEMBLY**

### **REPORT OF COMMISSION B**

by F. Gardiol, Vice-Chairman

Commission B experimented with a new format for its programme at the General Assembly, to implement desires expressed at the 1989 EM Theory Symposium in Stockholm. It was strongly felt that the Commission should not organize parallel sessions, so that delegates could also attend sessions organized by other Commissions and take better advantage of the very broad scope of the URSI General Assembly. It is desired to have up-to-date survey papers on main topics, together with a good number of short contributed papers, so that as many scientists as possible could attend the General Assembly and present their latest findings.

To meet these requirements, a new scheme was set up by Professor T. Senior, Commission B Chairman, in which most sessions were devoted to two closely related topics. Each half session started with a 30 minute review paper on the first topic, followed by 4 or 5 contributed papers, each one 10 or 15 minutes long, and ended with a 10 minute discussion. The second topic was covered in the same manner. Commission B organized 8 sessions, including a brief poster session, while 4 joint sessions were organized together with other Commissions. This format allowed for the presentation of 106 contributed papers, in addition to 26 invited ones. Even so, more than 150 submitted papers could not be included in the programme and had to be turned down. Whenever feasible, the Technical Programme Committee accepted at least one contribution from every institution.

General information about the sessions

Session	Topic	Conveners	Attendees
B1	Reflector Antennas	Y. Rahmat-Samii and A.D. Olver	120
B2	Poster Session	G.Y. Delisle	
B3	Time Domain Fields	E. Heyman and L.B. Felsen	
B4	Numerical Solution Techniques in Scattering	D.G. Dudley and P.M. van den Berg	70-80
B5	Analytical and Asymptotic Techniques	T.B.A. Senior and P.H. Pathak	ab. 75
B6	Microstrip and Dielectric Antennas	F.E. Gardiol and M. Ando	80
B7	Electromagnetic Inverse Scattering	K.J. Langenberg and P.C. Sabatier	
B8	Complex Media : Chirality and Fractals	D.L. Jaggard and I.V. Lindell	94
JS18	Nonlinear Electromagnetics	A. Hasegawa and H. Kikuchi	65
JS19	Optical and Microwave Interaction	T. Berceli and P.R. Herczfeld	80-90
JS22	Time Domain Metrology	N.S. Nahman and T.K. Sarkar	35-96
JS25	Millimetre Wave Integrated Circuits	A.A. Oliner and H. Shigesawa	100-120
JS27	Scattering from Random Media and Rough Surfaces	A. Ishimaru and V.I. Tatarskii	100-150

Brief description of some sessions

The main emphasis of Session B1 was on the accurate prediction of the performance of large reflector antennas. The development of shaped beams and reconfigurable reflector technology was also highlighted.

Session B4 considered both local methods (differential equation techniques) and global methods (integral equations techniques). Present and future issue in local methods are finite elements that comply with the continuity

conditions in strongly inhomogeneous media, absorbing boundary conditions to limit the domain of discretization, and finite differences that don't require rectangular shaped elements. In the global methods, the main issues are integral equations for penetrable objects of strongly inhomogeneous composition, and the definition of the spaces where the solution is appropriately defined, together with the minimization of the error criterion to be imposed. In both parts, efficient iterative techniques for complex configurations are needed.

Session B6 was devoted to two kinds of antennas that are based on the use of dielectric structures. Microstrip antennas were covered in a comprehensive survey of analytical techniques, followed by short presentations dealing with technical aspects. The second part of the session was devoted to leaky and surface waves, gyrotropic substrates, and a survey of array antennas for direct broadcasting satellite (DBS) reception.

Session B8, on the very last day of the General Assembly, brought two newly active areas of research to the attention of a large group of URSI members. It provided a link between "buzz words" such as "chiral" and "fractal" and their application and use. Many researchers shared results during the break and participants new to the areas had the opportunity to ask questions. While it is desirable and useful to introduce the URSI community to emerging domains of activity, new concepts should be introduced early enough during the Assembly to allow adequate subsequent interaction among attendees.

### General Comments

While most Session Conveners were satisfied with the format adopted for the sessions, the latter received mixed reviews in the Commission B business meetings. Some sessions were overloaded, leaving insufficient time for discussion. It was generally agreed that 10 minutes is too short for a paper, while 15 minutes is about right. Each paper should be followed immediately by a brief

discussion period, rather than postponing the discussion period until the end of the half session. If the number of technical sessions is to be kept limited, it is difficult to accept an adequate number of the many papers submitted. Poster sessions would allow to accommodate more papers, but are not favoured by Commission B, because it may be difficult to combine a poster session with a very short oral presentation, each author introducing the topic in about 5 minutes. The Commission plans to keep exploring novel formats for its future sessions.

The General Assembly should be different from usual conferences, of which there are too many anyway. Joint sessions, general lectures and tutorials are the key to this. More review talks should be included in the sessions, so that people from other commissions or from other specialties within the same commission can learn something outside their own specialties. Review papers should be announced more clearly in the programme, and listed as such in the Book of Abstracts. The abstracts in the Book should be more uniform. They were too short to present a valid description of the topic covered, and had little value because they were written too long before the event.

URSI should retain its role as the premier organization for the examination of fundamental issues in electromagnetic theory. It holds a unique role which is quite separate from that of the IEEE or similar organizations which have some overlap in areas of interest.

## **REPORTS ON URSI-SPONSORED MEETINGS**

### **1991 NORTH AMERICAN RADIO SCIENCE MEETING AND INTERNATIONAL IEEE/AP-S SYMPOSIUM**

Co-sponsored by the Canadian and U.S. Member Committees for URSI and the IEEE Antennas and Propagation Society, the meeting ran from 24 June to 28 June, 1991 (inclusive) on the campus of The University of Western Ontario in London, Ontario, Canada. This is an annual conference usually held in the United States but, recently, in Canada every fifth year or so (1980 in Quebec City and 1985 in Vancouver). Much of the administrative work for this meeting, including the coordination of the technical papers, was done by the Conference Services of the National Research Council of Canada in Ottawa under the direction of Mrs. D. Ruest. The conference chairman was Dr. A.R. Webster of UWO and the technical programme was managed by Dr. H.G. James of CRC in Ottawa for the URSI side, and by Dr. S.J. Kubina of Concordia University in Montreal for the AP-S programme. Many other people contributed to the success of the conference.

The main programme ran from the Monday morning to the Friday morning with 15 parallel sessions for most of the time. A total of 118 sessions were conducted and 1023 papers presented, with the entire technical programme contained within the one building (Social Science) on campus. The programme itself included contributions in all URSI Commissions and a wide spectrum of topics of interest to members of the Antennas and Propagation Society. Many of the interests of the two groups overlap, of course, and a large proportion of the registered delegates opted to include both programmes. A total of 1,180 persons, a record number, registered for the main conference. Workshops and short courses organized by AP-S on the Friday attracted further registrants in addition



to those attending the main meeting ; more than 200 people attended these functions.

The plenary session consisted of two parts. The first included presentations made by the three finalists in the student paper competition sponsored by the two URSI member committees. Judging was by the Official Members of the individual Commissions on these two committees. It is hoped that this student paper competition will be continued in the future as a means to encourage the interest of young scientists in radio science. The second part contained papers presented by guest speakers ; Al Javed of Bell Northern Research in Ottawa delivered an excellent paper on the latest advances in optical applications to telecommunications entitled "Optical Transmission and Switching Technologies for Broadband Telecommunications Networks" followed by an equally compelling presentation by Richard Horttor of the Jet Propulsion Laboratory in Pasadena with the latest information from the Venus space probe in "Magellan : a Mission to Map Venus". A full house of about 500 people attended this plenary session.

The conference banquet was well attended and addresses were made by both the President of URSI (E.V. Jull) and the President of AP-S (H.E. Schrank). Certificates were presented to the finalists of the student paper competition and awards made to several people for distinguished contributions to the field.

A.R. WEBSTER

## **FIFTH WORKSHOP ON TECHNICAL AND SCIENTIFIC ASPECTS OF MST RADAR**

In the last twenty years the Mesosphere-Stratosphere-Troposphere (MST) radar has developed into the most powerful ground-based technique for probing the atmosphere in this height range. This technique has contributed significantly to the research on atmospheric dynamics (especially on small- and medium-scale), and on time-varying dynamical phenomena, such as gravity waves, turbulence, and convection. Recently the technique has started to provide inputs to numerical weather prediction experiments. Currently, even commercial radars are available and have been installed in many countries. The URSI co-sponsored Workshop on Technical and Scientific Aspects of MST Radar, which has been held four times since 1983, plays a significant role in the development of MST radar techniques as a unique conference where various technical aspects of MST radars are discussed together with their scientific aspects.

The fifth conference was held at the University College of Wales at Aberystwyth, Wales, UK, from 6 to 9 August, 1991, approximately three years after the fourth meeting in Kyoto, in December 1988. The Conference Chairman was Professor L. Thomas of the University College of Wales. Dr. Eccles, Professor S. Fukao, Professor M.F. Larsen; Professor C.-H. Liu and Dr. J. Röttger served on the Programme Committee. More than 100 participants from 15 countries presented approximately 130 papers at the conference.

The subjects discussed at the conference were meteorological applications, interpretation of radar returns from clear air, structure and dynamics of the lower and middle atmosphere at equatorial and polar latitudes, techniques for studies of gravity waves and turbulence, co-ordinated studies using MST/ST radar and other ground-based techniques, interferometry, spaced-antenna and RASS techniques, hardware design for MST/ST radars and lower troposphere

profilers, signal processing and data analysis, progress on existing or planned MST and ST radars, and so forth.

It is recognized that the conventional MST radar technique, which measures the wind velocity primarily, has reached a mature stage, and new techniques, such as the spaced-antenna technique, spatial and frequency domain interferometry, imaging Doppler interferometry, and RASS (radio acoustic sounding system), have been implemented rapidly at various MST/ST radars. These techniques are being applied to derive small-scale, second-order quantities such as divergence and vorticity of the wind field and vertical heat flux. Also, it has been reported that networks of several ST radars and lower troposphere profilers are being deployed extensively along the Pacific Equator, in the USA and in France.

The participants enjoyed the conference excursion to the newly completed MST radar site at Aberystwyth through the pretty countryside of Wales.

The Conference Digest, based upon all presentations at the conference, will be published by the end of 1991. The Sixth Workshop will be held in China (Taipei) in 1993, in conjunction with the second International School on Atmospheric Radar (ISAR).

Shoichiro FUKAO  
(RASC Kyoto University)  
Official URSI Representative

**THIRD INTERNATIONAL SYMPOSIUM ON  
RECENT ADVANCES IN MICROWAVE  
TECHNOLOGY**

The third International Symposium on Recent Advances in Microwave Technology (ISRAMT'91) was held in Reno, Nevada from August 18 to August 21, 1991. The Symposium was jointly sponsored by the University of Nevada (Electrical Engineering Department, College of Engineering), Desert Research Institute, and IEEE Northern Nevada Section in cooperation with URSI and the Electromagnetic Academy. It was supported by Martin Marietta Laboratories. The ISRAMT was started in 1986 at the University of North Dakota, Grand Forks, North Dakota, with a limited number of invited speakers. Within a short span of five years it has grown to a well established international microwave conference, as evident from the papers received from twenty countries. After the success of the 2nd ISRAMT in Beijing, China in 1989, many international organizations have shown interest in holding future ISRAMT in their countries. The locations for future ISRAMT up to the year 2000 have already been selected.

The 3rd ISRAMT was held under the chairmanship of Dr. William N. Cathey, the Associate Vice-President For Academic Affairs at the University of Nevada, Reno. The technical programme Committee, under the chairmanship of Professor Banmali S. Rawat, University of Nevada, Reno, and Dr. Krishna K. Agarwal, E-Systems, Texas, selected 146 invited and contributed papers for the conference. This included 115 regular session and 31 poster session papers. The fine conference arrangements were made under the chairmanship of Professor Bruce Johnson, University of Nevada.

The ISRAMT started on August 18 with a very informal reception in the evening for all the participants and their guests. The arrangements were flawless. The Plenary Session on August 19 at 9 a.m., started with opening remarks by

Dr. William Cathey. After these remarks, Dr. Harold Sobol, Associate Dean for Engineering Research at the University of Texas, Arlington, delivered an excellent key-note address on the "Directions in Microwave Research and Education". He focussed on the future industry requirements and the type of training the microwave engineers/researchers should go through to meet industrial needs.

After the morning coffee/tea break, the conference was broken into three parallel sessions. The morning sessions were : 1 - Microwave Solid State Devices; 2 - Ferrite Components; and 3 - Transition/Discontinuities. While Sessions 1 and 3 were equally shared by U.S. and foreign papers, Session 2 contained exclusively papers from abroad. The Session 1 focus was GaAS MES FET, Schottky Diode Analysis and Computer Modeling. Session 2 was geared toward finlines, gyrotropic structures and optically controlled resonators. The Session 3 papers discussed microstrip to coaxial transitions, waveguide to microstrip transitions, step discontinuity and FHSS simulation of microstrip T-junctions. The afternoon sessions on August 19 were : 4 - Computer aided design ; 5 - Propagation and Fields; and 6 - Measurement Techniques. All these sessions were a good combination of U.S. and foreign papers. The CAD Session included papers on finlines, microwave filters, symmetrical wave guides, broadband microwave circuits, dielectric resonators and active filter design techniques. The Propagation and Fields Session had a good variety of papers on mm-wave propagation window in the Indian Subcontinent, scattering and global numerical boundary conditions, multiple scattering by randomly distributed scatters, scattering from a perfectly conducting cylinder with axial infinite slot and scattering by a coated conducting prolate spheroid. Most of the papers in this session were from abroad. The Session 6 was again a good combination of U.S. and foreign papers. The measurement techniques discussed in this session included the simultaneous measurement of complex permittivity and permeability using 6-port technique, non-destructive measurements of

permittivity, use of a coaxial microwave sensor for material characterization, noise measurement and de-embedding measurements of microstrip discontinuities using least-square technique.

On August 20, four morning sessions were scheduled. However, Session 10 on "Microwave Tubes" had to be cancelled due to the absence of the presenters. All these papers were from a single foreign country and most of them from the same institution. Session 7 on "Microwave Education" was a very timely and lively session. All the papers were from the USA and covered topics such as Microwave Laboratory, laboratory applications of modulation domain analysis to microwave devices, circuits graduate courses, option for engineering design education, integration of humanities-oriented skills with technical skills in microwave laboratories and phase noise characterization in the laboratory. Session 8 - "Microwave Circuits" consisted mostly of papers from the USA and included the topics of simple aided frequency acquisition method for microwave PLL, monolithic 6-bit phase shifter for active phased arrays, MMIC GaAs power amplifier, 2-10 GHz MESFET distributed amplifier, 31 GHz microwave link system and performance and study of SNR requirement at threshold detector input. Session 9 - "mm/Sub-millimetre wave technique" included the topics of sub-millimetre wave distribution parameter detectors/ converters, millimetre-wave array antenna with prebeam forming dielectric radiators, THz band development and mechanical resonance stabilization of mm-wave Fabry-Perot resonator using a vector network analyzer. The afternoon of August 20 was devoted to three large sessions. Session 11 "Antenna Systems" included papers on microstrip patch antennas, cavity-backed slot antennas, stepped dipole antennas, spherical dipole antennas, Fourier analysis of dipole antennas, scanning of antenna sidelobes and modelling of probe-fed structures for broadband antenna applications. Session 12 "Transmission Lines/Waveguides" had papers from the USA and abroad. Due to no-show, very few foreign papers were presented. The presented papers were in the area of nonlinear transmission

lines, leaky surface wave transmission lines, shielded microstrip analysis using modified finite-element formulation, transmission lines for multi-layered integrated phase arrays and optimization design for lower conductor loss in microstrip lines. In Session 13 - "Industrial/Biological Applications", most of the papers were from abroad. The papers presented included the remote sensing parameters of vegetation by radiometry, open-ended coaxial line sensors, microwave sensors for continuous monitoring of the tip location of a robot arm, road-condition sensing microwave radar and electromagnetic/thermal modelling of asphalt aggregate mixtures under microwave heating.

The evening of August 20 was reserved for a pleasantly relaxed banquet. Dr. James V. Taranik, President of Desert Research Institute in Reno was the banquet speaker. He spoke on "Spaceborne Radars for the 90's", and focussed on the radar systems for Magellan and other spacecrafts. Dr. Jon Epps, Dean, College of Engineering, University of Nevada, was the master of ceremonies. He gave some background about ISRAMT and microwave activities at the University of Nevada, and also introduced Dr. Ken Hunter, Associate VP for Research and Graduate Dean at the University of Nevada, who presented a brief history of research programs in the University. Dr. Bruce Johnson spoke about the conference organization, support from the microwave industry and local community. Professor Rawat thanked all the sponsors, supporters and the University of Nevada, Reno for their contributions.

August 21, the last day of the conference, was equally important. In the morning there were three regular parallel sessions and two poster sessions. However, due to some last minute cancellations, Sessions 15 and 16 were merged together. Session 14 "Microwave Superconducting Circuits and Systems" included many excellent papers on this emerging field, especially the topics on current and field distributions in superconducting microstrip lines, applications of HTSC thin films in MIC delay lines, hybrid high  $T_c$  superconducting microwave oscillators, microwave properties of highly oriented

YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7.8</sub> superconducting thin films and HTSC applications in microwave systems. The combined Session 15 - Passive Components/Session 16 - Optical Fibers/Opto-Electronics consisted of papers on lossy multiport planar networks, Simplified Design of Microstrip Line Compline Filters, HFSS Simulation of Finline Power Divider at Ka-band, Spurious Suppression Bandpass Filters, Modeling of Integrated Optical Components and Intensity Modulation Bandwidth in Semi-conductor Laser Diodes.

The Poster Sessions were arranged in the morning and afternoon of August 21, 1991. The 24 poster sessions papers were on a variety of topics, such as microwave propagation modes for rapid deep space, dielectric constant measurement, spectral analysis of surface skimming bulk waves, asymmetric coupled cylindrical microstrip lines, inter-digitated DC blocks/transformers in amplifier design, 12 channel PCM sound satellite broadcast receivers, and microwave applications in electron magnetic resonance.

On August 21, the main highlight of the afternoon was the workshop on "Microwave Superconductivity Applications" organized by Dr. Krishna K. Agarwal, from E-Systems, Texas, and Dr. Zhi-Yuan Shen from DuPont, Delaware. This workshop was attended by 21 participants from the U.S. and abroad. Dr. Agarwal introduced the theme of the workshop and discussed the basic physics and concepts of HTSC. Dr. Jim Bybokas from Superconductor Technology, Santa Barbara, CA spoke about the superconductivity building blocks for microwave systems while Dr. Shen discussed power splitters, combiners and other passive devices. After the coffee break, Dr. Don Butler from Southern Methodist University, Dallas, Texas, presented the HTSC microbridge mixer techniques and Dr. Jerry Fiedziuzko from LORAL Space Systems, Palo Alto, California discussed HTSC resonators, filters and channelizer. Each speaker was given 20 minutes for presentation followed by 10 minutes discussion. The discussions were very lively and showed the keen interest the



microwave community has in this emerging field. A short booklet about the workshop is under preparation and will be mailed to all the participants.

Besides these technical sessions, tours of the EE Department facilities and exhibit booths by some well known microwave companies like HP, Tektronix, Wiltron, etc. were also organized. The conference was very well received by all the participants and everyone thoroughly enjoyed the relaxed atmosphere which characterizes a smaller conference, and the opportunity to interact with each other. There were 111 participants from 13 countries including the USA, Canada, Germany, Japan, China, India, Italy, Spain, Austria, Australia, France and Korea.

With the success of the 3rd ISRAMT we are looking forward to see more participants from developing countries at the 4th ISRAMT in New Delhi, India in 1993. The ISRAMT Technical Programme Committee has brought out excellent Proceedings of the 3rd ISRAMT Conference Papers. They can be purchased by writing to :

ISRAMT Technical Programme Committee  
EE Department  
University of Nevada  
Reno, NV 89557-0153, USA  
Fax (1-702) 784-4466  
Phone (1-702) 784-6927

M. HAMID

### **THIRD BI-REGIONAL AFRICAN - LATIN AMERICAN CONFERENCE ON RADIOPROPAGATION AND SPECTRUM MANAGEMENT**

The Conference was held in Foz do Iguaçu, Brazil, September 9 - 12, 1991. It was sponsored by URSI, through the Standing Committee on Developing Countries (SCDC), and by the International Centre for Theoretical Physics (ICTP), through the Latin American - African Bi-regional Network of Radiopropagation Groups. The Conference was organized by the Brazilian Society of Microwaves. It was attended by 31 participants from Argentina, Brazil, Colombia and Nigeria. The conveners of the Conference were S.M. Radicella (Chairman, URSI-SCDC), L. Rizzo Piazza (Brazil) and M.S. Assis (Brazil). The financial support of URSI and ICTP was essential to cover the total expenses for the participation of three African scientists, and the partial expenses of ten other scientists from Argentina and Brazil.

The Programme included technical sessions on :

- Frequency spectrum management;
- Communication systems;
- Tropospheric radiopropagation, Clear air propagation, Rain effects, Global positioning systems;
- Ionospheric radiopropagation, Ionospheric modelling and ionospheric variations.

During these sessions 28 communications were presented.

Additional sessions have been dedicated to general discussions on the topics covered by the technical communications. The present time situation of radiopropagation needs and studies in the regions involved was reviewed, and the outcome of the previous Bi-regional encounters of Buenos Aires, Argentina, and Ilorin, Nigeria, was analyzed in terms of the actual results achieved. It was felt that the first two meetings had established a common language that became evident at the Foz do Iguaçu Conference. The ground is provided now for joint work to attack problems shared by different countries in Africa and Latin-

America. It was recognized also that the exchange and common adoption of techniques and methods is essential to the collaboration work to be undertaken. It was also agreed that at the next Bi-regional Conference, to be held in 1993, the technical communications must reflect the results of such joint initiatives.

During the general discussions concrete collaboration work was identified and assigned to specific Working Groups.

### 1. Spectrum management

A working Group consisting of J.E. Owolabi (Nigeria), G.O. Ajayi (Nigeria), K.Q. de Oliveira (Brazil), R. Duarte (Brazil), A. Giraldez (Argentina) and P. Marco (Argentina) was established to work on the subject under the coordination of A. Giraldez and K.Q. de Oliveira. The Working Group (WG) produced a first report that defined the basic approaches for the solution of the common problems identified. The members of the WG agreed to define common methods to : a) establish terrain data bases, b) develop adequate computerized frequency management techniques, c) establish common methods for EMC analysis for both fixed and mobile systems. The need for training activities was also identified, particularly in spectrum management for broadcasting.

The WG suggested also to hold a meeting in October 1992 to discuss the work done and the problems which came to the fore. The director of the Centro de Estudos em Telecomunicações (CETUC) of the Catholic University of Rio de Janeiro invited the group to meet at the Center facilities. The WG underlined the need for external technical support to achieve their objectives in the shortest possible time. The most appropriate step in this direction appears to be the establishment of contacts with the URSI Scientific Committee on Telecommunications.

## 2. Tropospheric radiopropagation

A Working Group was organized to discuss concrete collaboration on Rain Intensity and Rain Attenuation Measurements among groups in Nigeria, Brazil and Argentina. It consists of : G.O. Ajayi (Nigeria), I.E. Owolabi (Nigeria), M.S. Pontes (Brazil), L.A.R. Silva Mello (Brazil), C.A. Morales Rodriguez (Brazil), N. Ortiz de Adler (Argentina) and A. Giraldez (Argentina), and is coordinated by M.S. Pontes and G.O. Ajayi. The following areas of joint work were identified : a) rain intensity measurements; b) contribution to the rain height- global model of 0°C isotherm including data from Nigeria, Brazil and Argentina to complement the work being done already in Brazil and Nigeria on the subject; c) analysis of Kn band radiometer measurements in Brazil and Nigeria to improve the global model on earth-satellite rain attenuation; d) analysis of fade duration with data from Brazil and Nigeria.

Exchange of software and methods of analysis has been decided to assure the intercomparison of results. It must be noted that the CETUC of Rio de Janeiro has offered raingage equipment to be installed in Tucuman and Buenos Aires to increase the number of rain intensity measurements locations in the region. The actual installation should be done during the first half of 1992.

The WG has indicated the need of a meeting next year that should be held at the same time as the meeting proposed by the Working Group on Spectrum Management, to minimize expenses. The place of the meeting would be the CETUC facilities in Rio de Janeiro.

## 3. Ionospheric radiopropagation

A Working Group was established consisting of : J.O. Oyinloye (Nigeria), I. Batista (Brazil), L. Rizzo Piazza (Brazil), A. Mendez da Costa (Brazil), J.R. Manzano (Argentina), N.O. de Adler (Argentina), R. Ezquer

(Argentina) and M.M. de Gonzalez (Argentina). Four main topics of interest were identified :

- a) Comparison of IRI-90 with experimental data. In particular data related to F2 peak values and shape of the electron density profile near the peak will be used for the comparison. M.M. de Gonzalez will coordinate the work of this topic ;
- b) Ionospheric variability and its influence in radiopropagation predictions. The attention will be centred on the identification of the time and location of occurrence of high variability of foF2 and its possible predictability. J.O. Oyinloye will coordinate this study;
- c) Geomagnetic storm effects in the lower and upper ionosphere. The response of the D and F regions to geomagnetic storms will be studied using ionosonde and VLF data obtained in Brazil and Argentina. J.R. Manzano will coordinate this work ;
- d) Absolute Total Electron Content determination in the region of the peak of the equatorial anomaly of the ionosphere. The work will be centred on the intercomparison of the methods developed in Argentina and Brazil to overcome the uncertainties introduced by the peculiar geophysical conditions of the equatorial anomaly region. A second step will be the comparative study of TEC variations at Tucuman (Argentina) and Cachoeira Paulista (Brazil), which are located at similar geomagnetic latitudes. This work will be coordinated by I. Batista.

The participants accepted the offer of the University of Tucuman, Argentina to hold the 4th Bi-regional African - Latin American Conference on Radiopropagation and Spectrum Management planned for 1993 in its Cultural Center.

The organizers also accepted the offer of the National Programme of Radiopropagation of Argentina partially to support the cost of the publication of the Conference Proceedings. It must be noticed that part of this cost will be covered with funds from the ICTP Latin American - African Bi-Regional Network of Radiopropagation Groups.

S.M. RADICELLA  
Chairman, Standing Committee on Developing Countries

## MEETING ANNOUNCEMENTS

### CONFERENCE ON PRECISION ELECTROMAGNETIC MEASUREMENTS

### CONFERENCE SUR LES MESURES ELECTROMAGNETIQUES DE PRECISION

#### FIRST CALL FOR PAPERS

The next CPEM, Conference on Precision Electromagnetic Measurements, will be held June 9-12, 1992 at the CNIT in Paris-La-Défense, France.

This conference, which is held every two years and whose importance and high level, confirmed by thirty years experience, are recognized throughout the world, can be considered as a forum in which scientists, meteorologists and professionals will have the opportunity to present and compare their research results on fundamental constants, standards and new techniques of precision measurements in the electromagnetic domain.

#### **Organized by :**

SEE, Société des Electriciens et des Electroniciens

BNM, Bureau National de Métrologie

#### **Sponsored by:**

Union Radio Scientifique Internationale

IEEE Instrum. & Meas. Society

US National Institute of Standards and Technology

Mouvement français pour la qualité, Section Métrologie

Comité Nat. Français de Radioelectricité scientifique

Centre National d'Etudes des Télécommunications (CNET)

**Conference Chairman:**

Claude AUDOIN, Directeur de recherche  
Centre national de la recherche scientifique (CNRS)

**Technical Programme Committee:**

Pierre GIACOMO, Directeur honoraire du BIPM  
Chairman of the scientific board of the BNM.

**Organizing Committee:**

Jean BLOUET, BNM  
22 Rue Monge. F-75005 Paris, France  
Tel: (33) (1) 46 34 48 40  
Fax: (33) (1) 46 34 48 63

**Conference Secretary:**

Ginette BONAMI, SEE  
48 Rue de la Procession  
F-75724 Paris Cedex 15-France  
Tel: (33) (1) 45 67 07 70  
Fax: (33) (1) 40 65 92 29

**TOPICS:**

The following topics will be regarded as particularly appropriate for this conference:

- realization of units and fundamental constants
- DC
- AC and high voltage
- time-frequency
- radio frequency and microwaves
- dielectrics, antennas, fields
- lasers, fibre optics
- advanced instrumentation, cryoelectronics.

The proposed papers concerned with these topics will be considered by the technical programme committee. There will also be a session on international cooperation.

**Conference language :**

The Conference language will be English. No translation will be provided.

**Proposed papers :**

Original papers that have not been previously published are solicited. Authors must request an author's kit for the preparation of a summary by returning the form attached to this call for papers. Since papers are selected on the basis of a summary (500-1000 words, and abstract 50 words), the summary must describe clearly the new and significant results and their importance. The summaries of all accepted papers will be published in the conference digest. All accepted papers must be presented at the conference by their authors, either orally or in poster session. Papers presented at CPEM'92 will be considered for publication in a special issue of the IEEE Transactions on Instrumentation and Measurement.

**Agenda :**

Latest acceptance date for the summaries is : 2 December 1991

Notification of acceptance or rejection: beginning April 1992

**For further information please write to :**

CPEM'92 – SEE 48 Rue de la Procession

75724 PARIS CEDEX 15 – FRANCE

Tel: (33) (1) 45 67 07 70 Fax: (33) (1) 40 65 92 29



**THE FIRST WORLD CONGRESS FOR ELECTRICITY AND MAGNETISM  
IN BIOLOGY AND MEDICINE**  
June 14-19, 1992, Lake Buena Vista, Florida, USA

The First World Congress for Electricity and Magnetism in Biology and Medicine is being organized by the Bioelectromagnetics Society, the Bioelectrical Repair and Growth Society, the Bioelectrochemical Society and the European Bioelectromagnetics Association. The IEEE Power Engineering Society will participate in this Congress. The URSI Commission K will co-sponsor two sessions :

"Computational Electromagnetics in Medicine"  
and "Measurements of Electromagnetic Fields".

Plenary sessions by invited speakers will be presented each morning during the period of June 15-19, 1992. Multiple afternoon technical sessions will be coordinated among the four major topics of Basic Sciences, Environment and Regulation, Medical Devices and Technology, and Medical and Clinical Applications.

Papers are being solicited for platform and poster presentation.

Authors are invited to submit papers on all topics of interest in the scholarly field of bioelectromagnetics. All abstracts will be peer reviewed.

General information about the 1992 First World Congress may be obtained from Dr. William G. Wisecup, Executive Director (phone : 1-301-663-1915 or fax 1-301-663-0043). Programme and Registration materials will be mailed in early 1992.

Technical programme inquiries may be directed to Dr. Soloman Pollack (phone 1-215-898-7808), Dr. Ben Greenebaum (phone 1-414-595-2140), Dr. Martin Blank (phone 1-212-305-3644) or by mail or fax to the :

First World Congress Office  
c/o W/L Associates, Ltd.  
120 West Church Street  
Frederick, MD 21701  
USA  
Phone (1-301) 663-1915  
Fax (1-301) 663-0043

URSI related inquiries may be directed to :

Dr. Maria Stuchly  
Dept. of Electrical and Computer Engineering  
University of Victoria  
P.O. Box 3055  
Victoria, BC V8W 3P6  
CANADA  
Phone (1-604) 721-6030  
Fax (1-604) 721-6052

Abstracts must be received by December 15, 1991.

## LIST OF FUTURE SYMPOSIA AND MEETINGS

*Details have been received concerning the following URSI-sponsored Conferences :*

International Symposium on the Middle Atmosphere Sciences

Kyoto, Japan, 23 - 26 March '92

Contact address : Professor S. Kato  
Radio Atmospheric Science Centre  
Uji, Kyoto 611, Japan  
Phone (81) 774-32.31.11  
Fax (81) 774-31.84.63  
Telex 5453662 rascku.J

College on Spectrum Management for Developing Countries

Argentina, April - May '92

Contact address : Prof. S.M. Radicella  
ICE/ICTP  
P.O. Box 586  
Trieste, Italy

Solar Terrestrial Prediction Workshop

Ottawa, Canada, 18 - 22 May 1992

Contact address : Dr. R. Thompson  
IPS Radio and Space Services  
P.O. Box 1548, Chatswood  
NSW 2057, Australia

International Symposium on Electromagnetic Compatibility

Beijing, China, 25 - 27 May '92

Contact address : EMC'92/Beijing  
c/o Prof. Zhang, Lichang  
EMC Research Section  
Northern Jiaotong University  
Beijing 1000044, China

Conference on Precision Electromagnetic Measurements  
Paris, France, 9-12 June '92

Contact address : Ms. G. Bonami, SEE  
48 rue de la Procession  
F-75724 Paris Cedex 15, France  
Phone (33) 1-4567 0770  
Fax (33) 1-4565 9229

First World Congress for Electricity and Magnetism in Biology and Medicine  
Orlando, FLA, USA, 14 - 19 June '92

Contact address : The First World Congress Office  
W/L Associates, Ltd  
120 West Church Street  
Frederick, MD 21701, USA

Terrestrial Remote Sensing with Microwaves  
Igls, Austria, 1-3 July '92

Contact address : Dr. M. Chandra  
Microwave Signature '92  
DLR, Institut : HF - Technik  
D-8031 Wessling, Germany  
Fax (49) 8153-28-1135  
telex 526 419 dlrop d

Very High Angular Resolution Imaging  
NSW, Australia, 6 - 10 July '92

Contact address : Prof. John Davis  
Dept. of Physics  
University of Sydney  
Sydney, NSW 2006  
Australia

High Latitude Ionosphere

Fairbanks, USA, 10 - 14 August '92

Contact address : Prof. R.D. Hunsucker  
Geophysical Institute, University of Alaska  
Fairbanks, Alaska 99775-0800, USA  
Phone (1-907) 474-7558  
Fax (1-907) 474-7290  
Telex 35414 geoph inst fbk  
Telemail geoph.inst.fbk

URSI Symposium on Electromagnetic Theory

Sydney, Australia, 17-20 August '92

Contact address : Dr. Graeme James, Chairman  
URSI EM Symposium '92  
Organizing Committee  
CSIRO Division of Radiophysics  
P.O. Box 76  
Epping, NSW 2121  
Australia

International Meeting on Wave Propagation in Random Media

Seattle, USA, August '92

Contact address : Prof. K.C. Yeh  
Dept. of Electrical and Computer Eng.  
University of Illinois at Urbana  
1406 West Green Street  
Urbana, Illinois 61801-2991, USA  
Phone (1-217) 333-8125

COSPAR meeting

Washington, DC, USA, 28 August - 5 September '92

Contact address : c/o American Inst. of Aeronautics & Astronautics  
370 L'Enfant Promenade SW, Washington  
DC, 20024-2518, USA  
Phone (1-202) 646-7451  
Fax (1-202) 646-7508

International Symposium on Signals, Systems and Electronics  
Paris, France, 1-4 September '92

Contact address : Mrs. Y. Stevanovitch  
Executive Secretary ISSSE'92  
Boîte postale 2, Uccle 3  
1180 Brussels, Belgium  
Phone and fax (32) 2-358.19.66

International Symposium on Antennas and Propagation  
Sapporo, Japan, 22-25 September '92

Contact address : Prof. N. Goto  
Dept. of Electrical & Electronic Eng.  
Tokyo Institute of Technology  
O-okayama, Meguro-ku  
Tokyo 152, Japan  
Phone (81) 3-726 111 ext. 2567  
Fax (81) 3-729 0691

European Conference on Optical Communication (ECOC, 1992)  
Berlin, Germany, 27 September - 1 October '92

Contact address : Dr. G. Tröller  
Secretary, ECOC'92  
Heinrich-Hertz-Institut  
Einsteinuder 37  
D-1000 Berlin 10  
Germany

Astronomy with mm and sub-mm Wave Interferometry  
Hakone, Japan, October 1992

Contact address : Prof. M. Ishiguro  
Nobeyama Radio Observatory  
Japan

Journées Internationales sur les Antennes  
Nice, France, 1992

Contact address : Dr. J.L. Guiraud  
Secrétariat JINA'92  
CNET-PAB, Centre de la Turbie  
F-06320 La Turbie, France  
Fax (33) 93-41.02.29  
telex 470159 F

European Microwave Conference '92

Contact address : Dr. A. Sihvola, Secretary EMC '92  
Helsinki University of Technology  
Electromagnetic Laboratory  
Otakaari 5A  
02150 Espoo  
Finland

Wroclaw Symposium on Electromagn. Compatibility  
Wroclaw, Poland, 1992

Contact address : EMC Symposium  
Box 2141  
51-645 Wroclaw 12  
Poland

IGARSS'92 (International Geoscience and Remote Sensing Symposium)  
Houston, USA, 1992

Contact address : Dr. A. Blanchard  
General Chairman, IGARSS'92  
Director, Space Technology and Research Centre  
Houston Advanced Research Centre  
4800 Research Forest Drive  
The Woodlands  
TX 77381, USA

Workshop on Turbulence in Space Plasmas

Aussois, France, February '93

Contact address : Dr. Lefeuvre, LPCE/CNRS  
avenue de la Recherche Scientifique 3A  
F-45071 Orléans Cédex 2, France  
Fax (33) 3863 0086

International Conference on Antennas and Propagation

Edinburgh, UK, 30 March - 2 April '93

Contact address : IEE Conference Department  
Savoy Place, London WC2R OBL, UK  
Phone (44) 71-240.18.71  
Fax (44) 71-497.36.33

Space VLBI

Japan, August - September

Contact address : Professor M. Morimoto  
Nobeyama Radio Observatory (NRO)  
Nobeyama, Minamisaku  
Nagano 384-12, Japan

Zurich Symposium on Electromagn. Compatibility

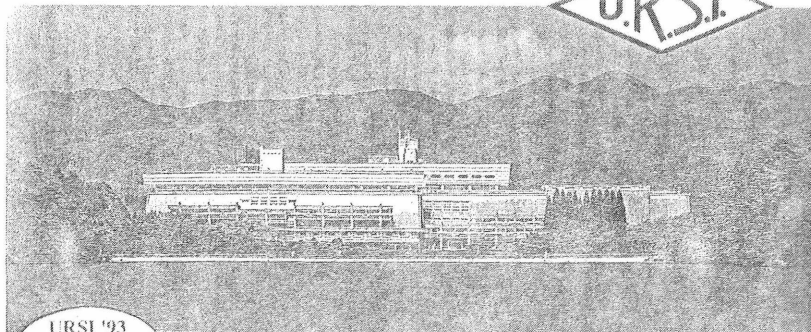
Zurich, Switzerland, 1993

Contact address : Dr. G. Meyer  
ETH-Zentrum - IKT  
8092 Zurich, Switzerland  
Phone (41) 1-256-2788  
Fax (41) 1-262-0943  
telex 817379

URSI General Assembly : see Preliminary Announcement on next pages.



PRELIMINARY ANNOUNCEMENT



# XXIV GENERAL ASSEMBLY OF THE INTERNATIONAL UNION OF RADIO SCIENCE (URSI)

Kyoto International Conference Hall, Kyoto, Japan  
25 August - 2 September, 1993

**AREAS COVERED BY THE SCIENTIFIC PROGRAMME :**

- Electromagnetic Metrology*
- Fields and Waves*
- Signals and Systems*
- Electronics and Photonics*
- Electromagnetic Noise and Interference*
- Wave Propagation and Remote Sensing*
- Ionospheric Radio and Propagation*
- Waves in Plasmas*
- Radio Astronomy*
- Electromagnetics in Biology and Medicine*

**President :** Prof. E. V. Jull  
**Vice-Presidents :** Prof. J. Bach Andersen  
Dr. P. Bauer  
Prof. R. L. Dowden  
Prof. T. Okoshi  
**Secretary General :** Prof. J. Van Bladel  
**Address for Correspondence :**

Prof. I. Kimura  
c/o Osaka Office, Business Center  
for Academic Societies Japan  
10th Tabuchi Bldg.  
6-3 Matsugae-cho, Kita-ku,  
Osaka 530, Japan

**TEL : +81-6-356-6041**  
**FAX : +81-6-356-6190**

.....✂.....  
If you are interested in receiving further information, please send this form to the address above.

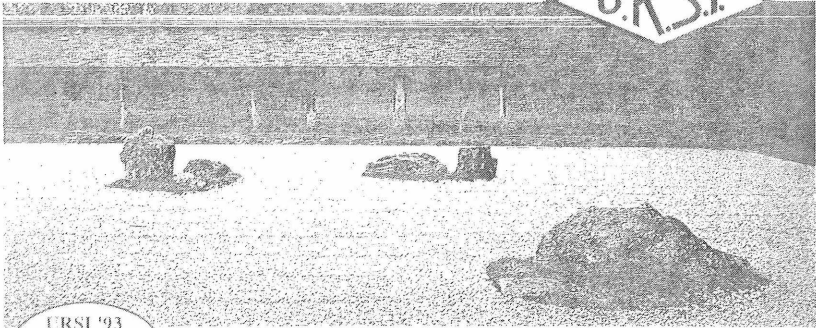
Surname/First name .....

Affiliation .....

Address .....

I intend to contribute a paper to the scientific program : (Yes) (No)

ANNONCE PRELIMINAIRE



XXIVe ASSEMBLEE GENERALE  
DE L'UNION RADIO-SCIENTIFIQUE  
INTERNATIONALE (URSI)

Kyoto International Conference Hall, Kyoto, Japan  
25 août - 2 septembre, 1993

DOMAINES COUVERTS PAR LE PROGRAMME SCIENTIFIQUE :

- Météorologie électromagnétique*
- Ondes et champs*
- Signaux et systèmes*
- Electronique et photonique*
- Bruits et brouillages électromagnétiques*
- Propagation des ondes et télé-détection*
- Radio-électricité ionosphérique et propagation*
- Ondes dans les plasmas*
- Radioastronomie*
- Electromagnétisme en biologie et en médecine*

Président : Prof. E. V. Jull  
Vice-Présidents : Prof. J. Bach Andersen  
Dr. P. Bauer  
Prof. R. L. Dowden  
Prof. T. Okoshi

Secrétaire général : Prof. J. Van Bladel  
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10th Tabuchi Bldg.  
6-3 Matsugae-cho, Kita-ku,  
Osaka 530, Japan

TEL : +81-6-356-6041  
FAX : +81-6-356-6190



Si vous désirez recevoir des informations supplémentaires, renvoyez ce formulaire à l'adresse ci-dessus.

Nom/Prénom .....

Etablissement .....

Adresse .....

J'ai l'intention de contribuer au programme scientifique : (oui) (non)

## INTERNATIONAL GEOPHYSICAL CALENDAR 1991

### EXPLANATIONS

This Calendar continues the series begun for the IGY years 1957-1958, and is issued annually to recommend dates for solar and geophysical observations which cannot be carried out continuously. Thus, the amount of observational data in existence tends to be larger on Calendar days. The recommendations on data reduction and especially the flow of data to World Data Centres (WDCs) in many instances emphasize Calendar days. The Calendar is prepared by the International Ursigram and World Days Service (IUWDS) with the advice of spokesmen for the various scientific disciplines. For some programmes, greater detail concerning recommendations appears from time to time published in IAGA News, IUGG Chronicle, URSI Information Bulletin or other scientific journals or newsletters.

The definitions of the designated days remain as described on previous Calendars. Universal Time (UT) is the standard time for all world days. Regular Geophysical Days (RGD) are each Wednesday. Regular World Days (RWD) are three consecutive days each month (always Tuesday, Wednesday and Thursday near the middle of the month). Priority Regular World Days (PRWD) are the RWD which fall on Wednesdays. Quarterly World Days (QWD) are one day each quarter and are the PRWD which fall in the World Geophysical Intervals (WGI). The WGI are fourteen consecutive days in each season, beginning on Monday of the selected month, and normally shift from year to year. In 1992 the WGI will be March, June, September and December.

The Solar Eclipses are :

- a) 4-5 January 1992 (annular) begins at N11 E137, crosses Central Pacific Ocean (crossing Oceania, then Philippines, Japan, extreme coast of N.E.

- Asia, N. Australia, and W. coast of N. America), ends at N33 W118; maximum duration 12 minutes).
- b) 30 June 1992 (total) begins at S35 E35, crosses South Atlantic Ocean (crossing Central S. America, then S.W. Africa); ends at S51 E39; maximum duration 5 minutes 20 seconds;
  - c) 23-24 December 1992 (partial), greatest eclipsing in the Arctic region; also in E. China, Korea, Japan, extreme E. of U.S.S.R., and S.W. Alaska; maximum phase 0.84.

Meteor Showers (selected by R. Hawkes, Canada) include important visual showers and also unusual showers observable mainly by radio and radar techniques. The dates for Northern Hemisphere meteor showers are : Jan 3-4 (Quadrantid); Apr 21-23 (Lyrid); May 3-6 (Eta-Aquarid); Jun 5-11 (Arietid, Zeta-Perseid); Jul 27-29 (Beta-Taurid); Aug 10-14 (Perseid); Oct 21-22 (Orionid); Nov 17-18 (Leonid); Dec 12-14 (Geminid); Dec 22-23, 1992 (Ursid); and Jan 3-4, 1993 (Quadrantid). The dates for Southern Hemisphere meteor showers are : Apr 23 (Pi-Puppis); May 3-6 (Eta-Aquarid); Jun 5-11 (Zeta-Perseid, Beta-Taurid); Jul 27-29 (S. Delta-Aquarid); Oct 21-22 (Orionid); Nov 17-18 (Leonid); and Dec 12-14, 1992 (Geminid).

The occurrence of unusual solar or geophysical conditions is announced or forecast by the IUWDS through various types of geophysical "Alerts" (which are widely distributed by telegram and radio broadcast on a current schedule). Stratospheric warmings (STRATWARM) are also designated. The meteorological telecommunications network coordinated by WMO carries these world-wide Alerts once daily soon after 0400 UT. For definitions of Alerts see IUWDS "Synoptic Codes for Solar and Geophysical Data, Third Revised Edition 1973" and its amendments. Retrospective World Intervals are selected and announced by MONSEE and elsewhere to provide additional analyzed data for particular events studied in the ICSU Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) programmes.

Recommended Scientific Programmes / Operational Edition

*The following material was reviewed in 1991 by spokesmen of IAGA, WMO and URSI as suitable for coordinated geophysical programmes in 1992.*

Airglow and Aurora Phenomena - Airglow and auroral observations operate with their full capacity around the New Moon periods. However, for progress in understanding the mechanism of many phenomena, such as low latitude aurora, the coordinated use of all available techniques, optical and radio, from the ground and in space is required. Thus, for the airglow and aurora 7-day periods on the Calendar, ionosonde, incoherent scatter, special satellite or balloon observations, etc., are especially encouraged. Periods of approximately one weeks' duration centred on the New Moon are proposed for high resolution of ionospheric, auroral and magnetospheric observations at high latitudes during northern winter.

Atmospheric Electricity - Non-continuous measurements and data reduction for continuous measurements of atmospheric electric current density, field, conductivities, space charges, ion number densities, ionosphere potentials, condensation nuclei, etc.; both at ground as well as with radiosondes, aircraft, rockets; should be done with first priority on the RGD each Wednesday, beginning on 1 January 1992 at 0000 UT, 8 January at 0600 UT, 15 January at 1200 UT, 22 January at 1800 UT, etc. (beginning hour shifts six hours each week, but is always on Wednesday). Minimum programme is at the same time on PRWD beginning with 15 January at 1200 UT. Data reduction for continuous measurements should be extended, if possible, to cover at least the full RGD including, in addition, at least 6 hours prior to indicated beginning time. Measurements prohibited by bad weather should be done 24 hours later. Results on sferics and ELF are wanted with first priority for the same hours, short-period measurements centred around the minutes 35-50 of the hours indicated. Priority

Weeks are the weeks which contain a PRWD; minimum priority weeks are the ones with a QWD. The World Data Centre for Atmospheric Electricity, 7 Karbysheva, Leningrad 194018, USSR, is the collection point for data and information on measurements.

Geomagnetic Phenomena - It has always been a leading principle for geomagnetic observatories that operations should be as continuous as possible and the great majority of stations undertake the same programme without regard to the Calendar.

Stations equipped for making magnetic observations, but which cannot carry out such observations and reductions on a continuous schedule are encouraged to carry out such work at least on RWD (and during times of MAGSTORM Alert).

Ionospheric Phenomena - Special attention is continuing on particular events which cannot be forecast in advance with reasonable certainty. These will be identified by Retrospective World Intervals. The importance of obtaining full observational coverage is therefore stressed even if it is possible to analyze the detailed data only for the chosen events. In the case of vertical incidence sounding, the need to obtain quarter-hourly ionograms at as many stations as possible is particularly stressed and takes priority over recommendation (a) below when both are not practical.

For the vertical incidence (VI) sounding programme, the summary recommendations are : (a) all stations should make soundings on the hour and every quarter hour; (b) on RWDs, ionogram soundings should be made at least every quarter hour and preferably every five minutes or more frequently, particularly at high latitudes; (c) all stations are encouraged to make f-plots on RWDs; f-plots should be made for high latitude stations, and for so-called "representative" stations at lower latitudes for all days (i.e. including RWDs and

WGI) (Continuous records of ionospheric parameters are acceptable in place of f-plots at temperature and low latitude stations); (d) copies of hourly ionograms with appropriate scales for QWDs are to be sent to WDCs; (e) stations in the eclipse zone and its conjugate area should take continuous observations on solar eclipse days and special observations on adjacent days. See also the recommendations under Airglow and Aurora Phenomena.

For the incoherent scatter observation programme, every effort should be made to obtain measurements at least on the Incoherent Scatter Coordinated Observation Days, and intensive series should be attempted whenever possible in WGIs or the Airglow and Aurora Periods. The need for collateral VI observations with not more than quarter-hourly spacing at least during all observation periods is stressed. Special programmes : Dr. J. Holt, M.I.T. Haystack Observatory, Route 40, Westford, MA 01886 USA, URSI Working Group G.5. Phone (617) 981-5625, e-mail address : AMES::"jmh@chaos.haystack.edu".

For the ionospheric drift or wind measurement by the various radio techniques, observations are recommended to be concentrated on the weeks including RWDs.

For travelling ionospheric disturbances, propose special periods for coordinated measurements of gravity waves induced by magnetospheric activity, probably on selected PRWD and RWD.

For the ionospheric absorption programme half-hourly observations are made at least on all RWDs and half-hourly tabulations sent to WDCs. Observations should be continuous on solar eclipse days for stations in eclipse zone and in its conjugate area. Special efforts should be made to obtain daily absorption measurements at temperate latitude stations during the period of Absorption Winter Anomaly, particularly on days of abnormally high or

abnormally low absorption (approximately October-March, Northern Hemisphere; April-September, Southern Hemisphere).

For back-scatter and forward scatter programmes, observations should be made and analyzed on all RWDs at least.

For synoptic observations of mesospheric (D region) electron densities, several groups have agreed on using the RGD for the hours around noon.

For ELF noise measurements involving the earth-ionosphere cavity resonances any special effort should be concentrated during the WGIs.

It is recommended that more intensive observations in all programmes be considered on days of unusual meteor activity.

Meteorology - particular efforts should be made to carry out an intensified programme on the RGD -- each Wednesday, UT. A desirable goal would be the scheduling of meteorological rocketsondes, ozone sondes and radiometer sondes on these days, together with maximum-altitude rawinsonde ascents at both 0000 and 1200 UT.

During WGI and STRATWARM Alert Intervals, intensified programmes are also desirable, preferably by the implementation of RGD-type programmes (see above) on Mondays and Fridays, as well as on Wednesdays.

Solar Phenomena - observatories making specialized studies of solar phenomena, particularly using new or complex techniques, such that continuous observation or reporting is impractical, are requested to make special efforts to provide to WDCs data for solar eclipse days, RWDs and during PROTON/FLARE ALERTS. The attention of those recording solar noise spectra, solar magnetic fields and doing specialized optical studies is particularly drawn to this recommendation.



FLARES22 (FLAre RESearch at the maximum of solar cycle 22) - 1990-1995 world-wide Solar-Terrestrial Energy Programme (STEP) project. Aimed at understanding basic physical processes of transient solar activity and its coupling with the solar-terrestrial environment, including times of the various solar ALERTS. Coordinates satellite and ground-based observations. Observational campaigns are driven by specific scientific objectives rather than observations per se. Satellites include SOLAR-A, GRO, CORONAS, WIND, GEOTAIL, ULYSSES, etc. Programme will focus on international collaboration of data analyses and theoretical work via electronic mail and workshops. For more information, contact Dr. M. Machado, Department of Physics, The University of Alabama in Huntsville, Huntsville, AL 35899 USA. Phone (1-205) 895-6676, Fax (1-205) 895-6790, SPAN E-mail address is SSL::MACHADO or SOLAR::MMACHADO.

SOLTIP (Solar connection with Transient Interplanetary Processes). Programme within the SCOSTEP STEP (Solar-Terrestrial Energy Programme) project : 1990-1995. Its focus is on remote and in situ observations and analyses of solar-generated phenomena and their propagation throughout the heliosphere, including times following the various solar ALERTS. Desired goals include : (1) interplanetary scintillation observation of remote radio galaxies as well as telemetry signals to/from interplanetary spacecraft; (2) coordination of Earth-orbiting spacecraft such as IMP-8 in the solar wind and solar-orbiting spacecraft such as ICE, GIOTTO, SAKIGAKE, VOYAGER 1/2, PIONEER 10/11, ULYSSES, RELICT, WIND, SOHO, Galileo, and ACE. Contact is Dr. M. Dryer, NOAA R/E/SE, 325 Broadway, Boulder, CO 80303 USA. Phone (1-303) 497-3978, Fax (1-303) 497-3645, SPAN E-mail address SELVAX::MDRYER.

Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy - Experimenters should take into account that observational effort in other

disciplines tends to be intensified on the days marked on the Calendar, and schedule balloon and rocket experiments accordingly if there are no other geophysical reasons for choice. In particular it is desirable to make rocket measurements of ionospheric characteristics on the same day at as many locations as possible; where feasible, experimenters should endeavour to launch rockets to monitor at least normal conditions on the Quarterly World Days (QWD) or on RWDs, since these are also days when there will be maximum support from ground observations. Also, special efforts should be made to assure recording of telemetry on QWD and Airglow and Aurora Periods of experiments on satellites and of experiments on spacecraft in orbit around the Sun.

The International Ursigram and World Days Service (IUWDS) is a permanent scientific service of the International Union of Radio Science (URSI), with the participation of the International Astronomical Union and the International Union of Geodesy and Geophysics. IUWDS adheres to the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) of the International Council of Scientific Unions (ICSU). The IUWDS coordinates the international aspects of the world days programme and rapid data interchange.

- This Calendar for 1992 has been drawn up by H.E. Coffey, of the IUWDS Steering Committee, in association with spokesman for the various scientific disciplines in SCOSTEP, IAGA and URSI and other ICSU organizations. Similar Calendars are issued annually beginning with the IGY, 1957-58, and are published in various widely available scientific publications. They are published for the International Council of Scientific Unions and with financial assistance of UNESCO. Additional copies are available upon request from the following persons :

the IUWDS Chairman :

Dr. R. Thompson  
IPS Radio and Space Services  
Department of Administrative Services  
P.O. Box 1548  
Chatswood, NSW 2057, Australia  
Fax (61) 2-414 8331  
E-mail address is richard@ipso.ips.oz.au)

or the IUWDS Secretary for World Days :

Miss H.E. Coffey  
WDC-A for Solar-Terrestrial Physics  
NOAA E/GC2  
325 Broadway  
Boulder, Colorado 80303, USA  
Fax (1-303) 497-6513  
E-mail address is 9555::hcoffey.

# International Geophysical Calendar 1992

(See other side for information on use of this Calendar)

	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
				1	2	3	4				1	2	3	4	
JANUARY	5	6	7*	8*	9	10	11	5	6	7	8	9	10	11	JULY
	12	13	14	15	16	17	18	12	13	14	15	16	17	18	
	19	20	21	22	23	24	25	19	20	21	22*	23*	24	25	
	26	27+	28+	29+	30	31	1	26	27	28	29	30+	31+	1+	
FEBRUARY	2	3	4*	5*	6	7	8	2+	3+	4+	5+	6	7	8	AUGUST
	9	10	11	12	13	14	15	9	10	11	12	13	14	15	
	16	17	18	19	20	21	22	16	17	18	19	20	21	22	
	23	24	25	26	27	28	29	23	24	25	26*	27*	28	29	
MARCH	1	2	3	4*	5*	6	7	30	31	1	2	3	4	5	
	8	9	10	11	12	13	14	6	7	8	9	10	11	12	SEPTEMBER
	15	16	17	18	19	20	21	13	14	15	16	17	18	19	
	22	23	24	25	26	27	28	20	21	22+	23*	24*	25	26	
	29	30+	31+	1*	2*	3+	4	27	28	29	30	1	2	3	
APRIL	5	6	7	8	9	10	11	4	5	6	7	8	9	10	OCTOBER
	12	13	14	15	16	17	18	11	12	13	14	15	16	17	
	19	20	21	22	23	24	25	18	19	20	21*	22*	23	24	
	26	27	28	29*	30*	1	2	25	26	27+	28+	29	30	31	
MAY	3	4	5+	6+	7	8	9	1	2	3	4	5	6	7	NOVEMBER
	10	11	12	13	14	15	16	8	9	10	11	12	13	14	
	17	18	19	20	21	22	23	15	16	17	18*	19*	20	21	

21	22	23 +	24**	25 +	26	27
28	29	30				
S	M	T	W	T	F	S

20	21	22	23	24*	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14*	15	16
17	18	19	20*	21*	22	23
24	25	26 +	27 +	28	29	30
31						
S	M	T	W	T	F	S

1993  
JANUARY

14 Regular World Day (RWD)

15 Priority Regular World Day (PRWD)

18 Quarterly World Day (QWD)  
also a PRWD and RWD

1 Regular Geophysical Day (RGD)

9 10 World Geophysical Interval (WGI)

27+ Incoherent Scatter Coordinated  
Observation Day

4 Day of Solar Eclipse

1 2 Airglow and Aurora Period

7 \* Dark Moon Geophysical Day (DMGD)

**NOTES on other dates and programs of interest:**

- Days with unusual meteor shower activity are: Northern Hemisphere Jan 3-4; Apr 21-23; May 3-6; Jun 5-11; Jul 27-29; Aug 10-14; Oct 21-22; Nov 17-18; Dec 12-14, 22-23, 1992; Jan 3-4, 1993. Southern Hemisphere Apr 23; May 3-6; Jun 5-11; Jul 27-29; Oct 21-22; Nov 17-18; Dec 12-14, 1992.
- SOLTIP (Solar connection with Transient Interplanetary Processes). Observing Program 1990-1995: solar-generated phenomena and their propagation throughout the heliosphere. (See Explanations.)
- FLARES22 (FLAre RESearch at solar cycle 22 max). Observing Program 1990-1995: basic physical processes of transient solar activity and its coupling with solar-terrestrial environment. (See Explanations.)
- Day intervals that IMP 8 satellite is in the solar wind (begin and end days are generally partial days): 29 Dec 1991-6 Jan 1992; 10-19 Jan; 23-31 Jan; 4-12 Feb; 16-25 Feb; 29 Feb-8 Mar; 13-21 Mar; 26 Mar-3 Apr; 7-15 Apr; 20-28 Apr; 3-10 May; 15-22 May; 28 May-3 Jun; 9-16 Jun; 22-29 Jun; 5-12 Jul; 17-24 Jul; 30 Jul-6 Aug; 12-19 Aug; 25-31 Aug; 7-12 Sep; 19-25 Sep; 1-8 Oct; 14-21 Oct; 26 Oct-2 Nov; 8-15 Nov; 21-28 Nov; 3-11 Dec; 16-24 Dec; 28 Dec 1992-5 Jan 1993. Note that there will not necessarily be total IMP 8 data monitoring coverage during these intervals. (Information kindly provided by the WDC-A for Rockets and Satellites, NASA GSFC, Greenbelt, MD 20771 U.S.A.)
- + Incoherent Scatter Coordinated Observations Days (see Explanations) starting at 1600 UT on the first day of the intervals indicated, and ending at 1600 UT on the last day of the intervals: 27-29 Jan 1992; 30 Mar-3 Apr CADITS/MLTCS; 5-6 May; 23-24 Jun; 30 Jul-5 Aug CADITS/MLTCS; 22-23 Sep SUNDIAL; 27-28 Oct; 23-26 Nov GISMOS; 26-27 Jan 1993.

where CADITS= Coupling and Dynamics of the Ionosphere-Thermosphere System;  
GISMOS= Global Ionospheric Simultaneous Measurements of Substorms;  
MLTCS= Mesosphere, Lower-Thermosphere Coupling Study;  
SUNDIAL= Coordinated study of the Ionosphere/magnetosphere;

## CCIR PREPARATIONS FOR WARC'92

*The 1992 World Administrative Radio Conference has an agenda which is of considerable importance for the URSI community. We are aware, for example, of the concerns of the Radioastronomers (see IUCAF reports in the December 1990 and June 1991 Bulletins). The CCIR is obviously much involved in this problem, and we thought that excerpts from a recent article by Dr. Struzak presenting the CCIR position would be of interest to our readers :*

### "Introduction

Since the very beginning of radio, intergovernmental conferences have been used to negotiate, allocate and regulate the access to the common resources of the radio frequency spectrum. Later, the geostationary satellite orbit was included. At the first conferences, under deliberation were all relevant legal, political, economic and technical issues together. Under the pressure of the growing number of radio services and increasing competition, the conferences became more and more cumbersome, time consuming and costly. It became more and more difficult to reach any agreement within the limited conference time and budget. In seeking a solution, the members of the International Telecommunication Union came to the conclusion that the conferences could be shorter, cheaper and more effective if the technical issues were dealt with separately, during the periods between the conferences.

There were three major arguments for such a solution. One was that reaching agreement on technical issues usually requires engineering studies and/or measurement campaigns which cannot be performed within the limited conference time and budget. Another one was that, most often, technical matters can be agreed upon independently of legal and/or political issues negotiated at the conference. The third argument was that non-governmental bodies (operating agencies, private industrial entities and scientific organizations), which normally

are not allowed to participate in the intergovernmental conferences, could contribute in a very efficient way within the new structure. As a consequence, the International Radio Consultative Committee (CCIR) was established in 1927.

### WARC'92 Preparation

The conference preparation has always been one of the main CCIR responsibilities. Since 1982, the CCIR has provided technical bases for some eight world and regional radio conferences. Plans for the broadcasting-satellite service in the 12 GHz band and their feeder links, produced by world and regional conferences in 1977, 1983 and 1988, were based on propagation information, sharing criteria, and system characteristics developed by the CCIR. The WARC-ORB (1985, 88) used CCIR technical bases for its work on geostationary-satellite orbit and spectrum utilization. The CCIR provided the technical bases for the WARC-Mobile conferences held in 1983 and 1987, for High Frequency Broadcasting in 1984, 1987, and for the African Region Television Broadcasting Conference, 1986, 89.

These were specialized conferences, limited in scope and not authorized to revise existing spectrum allocation agreements. On the other hand, many countries consider that these allocations constrain the future growth of existing services, development of new services, and/or application of new technology. Finally, the Plenipotentiary Conference (Nice, 1989) resolved to hold a special World Administrative Radio Conference in Spain in 1992 (WARC'92), and to invite the CCIR "... to prepare the technical and operational bases for the Conference..."

The bulk of the work for WARC'92 was done by working parties, which gathered 370 experts and prepared eight partial reports on the basis of 290 input contributions. The partial reports were used by the Joint Interim Working Party (JIWP) WARC'92 Chairman and the CCIR Secretariat, in consultation

with all JIWP officers, to elaborate a consolidated draft CCIR report to the conference. This draft was disseminated for comments, among all Administrations and organizations participating in CCIR work. The JIWP WARC'92 met in Geneva in March 1991 to consider the draft and the comments submitted, and to produce the final report. About 280 delegates attended that meeting. They represented a number of Administrations, 14 international organizations and 23 recognized private sector entities. The meeting produced the final results of the common preparatory work done for the WARC'92.

### Results

The summary results of the CCIR preparation for WARC'92 are presented in the CCIR Report "Technical and Operational Bases for the World Administrative Radio Conference 1992". It is beyond the scope of the present text to discuss all its particulars. Instead, we will review only major issues. Chapter 1 of the CCIR Report is an introduction, Chapter 2 deals with general principles and criteria of frequency sharing, when two or more radio communication services utilize the same frequency band. As most of the usable spectrum is already exploited, many new services have to arrange frequency sharing with the existing ones. Table 1 shows some sharing techniques. Of them, the greatest potential and flexibility are associated with the dynamic real-time spectrum management techniques. Here, the frequency, time, and power radiated are dynamically changed to follow the current spectrum needs and availability. Adaptive antenna arrays, which can track the wanted signal and reject unwanted ones automatically, even in a changing environment, can be added to that category.



Table 1 : Examples of frequency sharing techniques

Frequency separation	Time separation	Power level separation
Channeling plans	Duty cycle control	Site selection Physical barriers
Dynamic real-time spectrum management	Dynamic real-time spectrum management	Dynamic real-time spectrum management
Coding : spread spectrum FDMA compression	Coding : spread spectrum TDMA compression	Antenna pattern discrimination Polarization discrimination

Chapter 3 discusses technical aspects of definitions for certain new space services above 20 GHz. Data relay satellites and proximity links for space operations, communications support for low-earth orbiting (LEO) satellites, geostationary satellites, and communication bases on the Moon and possibly Mars are examples. Definitions of Very Long Baseline Interferometry, VLBI, and Space VLBI are proposed. The VLBI is a technique for determining the direction of a radio source with an extreme precision, used in radio astronomy and spacecraft navigation. It exploits amplitude and phase relationships of the signal received by a network of receiving stations, widely spaced over the Earth and/or in space. If at least one of the VLBI stations is in space, this is a Space VLBI system.

Chapter 4 summarizes the characteristics and sharing criteria of the new space service applications that may be considered for new frequency allocations above 20 GHz. Some of them are listed in Table 2.

Table 2 : Estimated spectrum requirements of new space service applications above 20 GHz.

Application	Bandwidth	Frequency
Data relay satellites and proximity links	700 MHz	20-30 GHz
Expanded space research service applications	> 10 GHz	20-40 GHz
New earth exploration satellite service applications	> 2 GHz	> 20 GHz
New passive sensor applications	> 2 GHz	59-164 GHz
New active sensor applications	1 GHz	35 GHz
Inter-satellite links	200 MHz	23 GHz
Communication with manned space vehicles	400 MHz	> 20 GHz

Chapter 5 presents compatibility considerations relevant to the possible extension of the HF broadcasting allocations into spectrum at present exploited by other services, which would then be displaced. The chapter summarizes the sharing constraints, service-by service, and protection criteria.

Chapters 6 and 7 deal with the characteristics and sharing criteria of the new broadcasting-satellite services. There are the digital sound and high tech definition television (HDTV) transmissions. Satellite sound broadcasting by digital coding, aimed at fixed, vehicular and portable reception, can provide quality comparable to high fidelity compact disc audio. The HDTV objective is to deliver to the viewers the full quality of the large screen studio image. Various service concepts are presented. Table 3 gives the estimated spectrum requirements of these services. There remains an interest in the possible use of the 11.7 to 12.7 GHz bands already allocated to satellite broadcasting for HDTV.

Table 3 : Estimated spectrum requirements of new broadcasting satellite services.

Service	Bandwidth	Frequency
BSS Sound	60-120 MHz	1.5 GHz
BSS-HDTV	600 MHz	17.3-25.5 GHz

Chapters 8 to 11 summarize the characteristics and sharing criteria of various new applications/systems in mobile and mobile/satellite services, and estimate spectrum requirements and sharing possibilities. Future public land mobile telecommunication systems (FPLMTS) involve both terrestrial and satellite components and will integrate voice and data transmission. A dominant feature of FPLMTS is a pocket-size portable terminal usable anywhere over the world. Adaptation to the needs of developing countries has also been pursued. Based on system models and traffic estimation, the minimum required spectrum bandwidth is 230 MHz : 170 MHz for mobile and 60 MHz for personal units, see Table 6. Equipment cost and wave propagation considerations indicate that a frequency allocation between 1 and 3 GHz is suitable for FPLMTS. Band sharing with fixed and possibly other services may be possible only if there is suitable geographic separation between the services.

Private mobile radio (PMR) : in Europe, there are some 3.5 million units in use, in the USA 14 million. The yearly growth rate is about 8% in Europe, 10% in the USA, and 40% in Japan. Spectrum needs depend on region and may be of the order of 100 MHz in Europe. Mobile satellite systems present the most extensive and diversified set of new services seeking frequency spectrum in the approximate range of 1 to 3 GHz. These may operate with geostationary and/or non-geostationary satellites, with spot beams or global antenna beams. Geostationary satellites provide maritime aeronautical and land mobile communications as well as distress and safety services. The estimated spectrum requirements in the 1 to 3 GHz frequency band is shown in Table 4. Proposed low-earth orbit (LEO) satellite systems would offer a direct personal communications capability. LEO systems for two-way data communication and positioning to be operated below 1 GHz, and terrestrial aeronautical public correspondence systems are also seeking additional spectrum, as shown in Table 4.

Table 4 : Estimated spectrum requirements of mobile and mobile-satellite service applications.

Service	Bandwidth*	Frequency
Future public land mobile telecommunication systems	230 MHz	1-3 GHz
Private mobile radio**	100 MHz	1-3 GHz
Aeronautical Mobile Sat. (R)	2x17.5 MHz	1-3 GHz
Other Aeronautical Mobile Sat.	2x18.0 MHz	1-3 GHz
Land Mobile Sat.	2x87.6 MHz	1-3 GHz
Maritime Mobile Sat.	2x40.0 MHz	1-3 GHz
Distress and Safety (Sat.)	2x1.0 MHz	1-3 GHz
Low-Earth Orbit systems below 1 GHz	5 MHz	100-500 MHz
Aeronautical Public Correspondence (terrestrial)	2x5 MHz	1-2 GHz

\* = likely requirement ; \*\* = different requirements in different regions

Chapters 12 to 17 present technical considerations of the allocation of the specific frequency bands to specific services in connection with the agreements at the earlier conferences. Covered are fixed satellite service (Earth-to-space) in the band of 14.5-14.8 GHz, space operations and space research services in the bands of 2025-2110 MHz and 2200-2290 MHz, radio-determination-satellite service in the band of 1.6-2.5 GHz, wind profiler meteorological radars. Included are also sharing considerations concerning services that may be affected by changes to the table of frequency allocations below 3 GHz (Chapter 16) and above 10 GHz (Chapter 17).

### Conclusions

The CCIR preparatory work for WARC'92 was done in a record time of eleven months, from June 1990, when the Administrative Council set up the conference agenda, to May 1991, when the report was distributed. The report summarizes the CCIR findings. It represents the best technical and operational expertise on the issues relevant to the conference agenda, available within the administrations and organizations participating in the work of the CCIR at the time of its approval.

In the meantime, with rapidly and continuously developing technology in highly competitive market, further progress has been made in many directions. For example, a month after the JIWP WARC'92 meeting, a new HDTV system was demonstrated which needs only a single 6 MHz channel, in place of 70 or 140 MHz required by wide RF-band HDTV systems demonstrated earlier. To achieve such a spectacular result, a new compression algorithm was used. The CCIR report does not cover such aspects, as well as others, on which the technical information available was incomplete. However, through a cooperative effort, a common position has been reached, satisfying all parties involved. Decisions on frequency allocations and sharing arrangements will be made largely by consensus among the participating delegations at the WARC'92. The CCIR preparatory work was the first important step towards such a consensus.

#### References

1. CCIR Report Technical and Operational Bases for the World Administrative Radio Conference 1992, ITU, Geneva 1990, 190 pages;
2. Kirby R.C. : Radio Horizons ; presented at the IEEE International Conference on Communications (ICC), Denver, Colorado, 24 June 1991;
3. Heller J.A., Paik W.H. : The DigiCipher HDTV Broadcast System ; 17th International Television Symposium, Montreux, 13-18 June 1991, V. Broadcast Sessions, Pages 595-600. "

## FROM THE ARCHIVES OF URSI

*Excerpts from the Bulletins of ten, twenty, thirty and forty years ago.*

The November-December 1951 issue contains mostly routine administrative announcements. One item concerns the distribution of cheap didactic material to Developing Countries. This initiative resurfaces periodically, but regularly vanishes into oblivion because of various practical difficulties. The ICSU Committee for the Teaching of Science is now making a fresh attempt to activate such a programme. In the 1951 Bulletin is shown how the UNESCO Gift Coupons could be used to buy "radio" equipment and parts from a variety of sources in 25 countries.

In the November-December 1961 Bulletin we find an interesting article by D.H. Dellinger, Honorary President of URSI, who had a long time association with our Commission on Measurements and Standards. Dr. Dellinger quotes items from a 1924 meeting of that Commission, where the emphasis was on frequency measurements, and where items were discussed such as multi-vibrators, parallel-wire measurements of wavelength, frequency measurements from measured or calculated C and L, radiofrequency alternators, piezo-electric frequency standards, dissemination of standard frequencies, and comparison of national frequency standards. The 1961 issue contains, in addition, material on the World Day Services (IWDS) and the International Geophysical Calendar 1962, the activities of the Inter-Union Committee on Radio-Meteorology (with a report written by J.S. Marshall), the Special Committee on Antarctic Research, and the contacts of the Unions with UNESCO, a topic which remains of current interest. In 1961 we read that talks with UNESCO people showed that :

- ICSU must learn to deal with government problems, and not remain a purely academic body, lest it becomes a "museum piece";
- UNESCO wished to help FAGS in its activities;

- UNESCO wished to help develop space research, science teaching, the rationalisation of international scientific meetings, and the exchange of scientists.

The December 1971 Bulletin contains a remarkable article on "Some Fundamental Considerations concerning ICSU and the Unions" by the much respected former President of URSI, Professor S. Silver. Parts of this lucid article are reproduced in extenso, because they remain so germane to the evolution of our Union, and are of particular interest to the members of our newly created Long Range Planning Committee.

*Professor Silver writes the following on the objectives of the Unions in general :*

"The customary formulation of the objectives of a Union is the following :

- (1) to promote the advancement of the scientific field;
- (2) to promote international cooperation in research;
- (3) to promote the exchange of ideas and information on an international scale.

Although this formulation is a laudatory one, it is insufficient as a justification for a Union or as a definition of its purpose. All these objectives can be served, in some sense, by professional societies in which membership is available on an individual, personal basis. The IEEE, for example, although it is based in the USA, is developing a strong and significant international membership. It is certainly as effective as any International Union, and possibly even more so, in fulfilling objectives (1) and (3) as stated above. The argument that the Unions are concerned with science while the IEEE is concerned with engineering is not only false but is based on an outmoded view of science which is no longer appropriate and is certainly not conducive to the fulfilment of our objectives.

There is another component of human affairs that gives the Unions a special justification for their existence. We frequently indulge in the idealistic cliché that science is apolitical and is not concerned with national identities and national interests. In an ultimate abstract sense this is perhaps true. But, as a human activity, the pursuit of science or any other branch of knowledge is strongly

conditioned by national interests and political forces of tremendous dimensions. This has become particularly significant with the advent of large-scale national commitments to, and investments in, research and development in every field of science and technology. Scientists and engineers and the work they do have become national commodities in a very decisive way. We can not, purely on our own initiative, link up readily and easily with anyone anywhere in the world in order to carry out a collaborative project, or even to exchange information regarding our work. Collaboration becomes even more difficult when experiments require simultaneous participation by workers in a number of countries and when equipment must be standardised or be moved across national frontiers.

The International Unions, by virtue of the fact that their members are bodies designated by the national academies of science, or their equivalents, can serve as intermediaries between the interests of individual scientists and of political bodies. In addition, the Academies are not themselves governmental agencies and hence, in their relations with the Unions, they can maintain an apolitical posture. But also, by virtue of the fact that the Academies are bodies that have an accepted status in relation to their governments, their support of agreements and recommendations entered into by the Unions is accepted more readily by governments. Thus the Unions can deal more effectively than can the professional societies with the political constraints that arise in the course of international cooperation and collaboration in research. This is not to say that scientific affairs can not, or could not, be conducted differently ; I am merely describing the situation as I see it.

The singular role of an International Union that I have just identified is understandable in fields such as geophysics, geography, communications, climatology and meteorology; in all these, there are important phenomena of such a scale of magnitude that it is necessary to cross national boundaries when investigating them. In the field of communications, there may also be the inverse



problem of how to keep electromagnetic waves from crossing national boundaries and from interfering with the communication systems of neighbouring countries.

What is less clear, or at least is not immediately evident, is the place of the Unions in fields such as mathematics, physics, chemistry, circuit theory, electronics, and so on. International congresses and meetings on such topics can certainly be organised, under many auspices, so as to serve objectives (1) and (3); in these fields, objective (2) is not particularly pertinent because, in the main, the work hardly demands international cooperation and collaboration. But here also, an International Union can serve a special purpose : by giving its support to an international symposium, it can help to lower the political barriers to the exchange of information and can often facilitate the attendance, at international meetings, of persons from the countries whose Academies adhere to it.

There is yet another service that a Union can render. As a general rule, neither international nor national meetings are designed to make a critical assessment of the "state of the art" in a given field. Meetings of professional societies are most commonly set up so that members of the societies can present their latest work. The character and structure of a meeting varies from one organization to another and it is not possible to make an absolute characterization of meetings of professional societies. But, whatever the subject, I think that there is a place and a need for critical appraisals and distillations of the vast number of developments made in a given field around the world, and for the identification of those lines of endeavour that are most interesting and promising. To accomplish this, we need an international forum which scientists of as many nationalities as possible will support and accept. This critical forum is what a Union can provide and its realization ought to be, in my opinion, one of a Union's most important objectives and functions.

Of course there are many other aspects of a science or a technology whose proper consideration, under the auspices of an International Union, facilitates the exchange of ideas and the advancement of the field. Among them are terminology, systems of units, primary and secondary standards, and procedures for calibration; on all of these aspects, common understanding and international agreement are certainly desirable, if not absolutely essential. In these areas too, an International Union can and should function effectively.

Besides the Unions, there are other international scientific and technical organizations, of a semi or wholly-governmental nature, that deal with practical issues underlying international agreements regarding technological operations. Cases in point are the CCIR and the other components of the ITU. The CCIR directs itself to making engineering analyses of problems relating to radiocommunication systems and it submits these analyses and the consequent recommendations to the ITU which is the organization in the framework of which intergovernmental agreements are made. These agreements relate to operational problems and issues such as the protection of specified frequency bands for scientific purposes, the allocation of frequencies among the various types of communication systems in different parts of the world, and the setting of limitations on the power and directivity of transmitters so as to avoid interference across national boundaries. Naturally such activities sometimes call for objective scientific studies, and supporting data, that are internationally acceptable and the Unions are often capable of providing advice and information of this kind. Some of us have made considerable efforts, on behalf of URSI, to provide such a service to CCIR and it is a fact that the Union has done a very much needed job and has given valuable assistance to the CCIR in fulfilling its particular responsibilities.

Lastly I suggest that a Union can and should perform an educational function in bringing science and technology to the notice of all the peoples of the earth.

While this is explicitly the duty of UNESCO, the Unions should both participate in and give support to the programmes of UNESCO and should help to marshal the capabilities and abilities of those who can assist in these programmes. The URSI Young Scientists Scheme in connection with the XVI General Assembly in Ottawa was motivated largely, so far as I was concerned, by such considerations."

*Professor Silver furthermore had opinions on the interdependence of scientific disciplines (in particular with respect to the re-orientation of URSI's goals, the object of heated discussions at the time).*

"In addition to the peculiarities of human behaviour from which none of us is free, there is a more fundamental problem which arises from the interdependence of virtually all the sciences. There is truly no way to define areas of scientific endeavour that are absolutely unrelated and are completely separable from each other. Even the often-made distinction between "pure" and "applied" science is a delusion because what one mind discovers in the spirit of pure research, another more versatile and imaginative mind puts to use for a technological development in another field of science. What determines whether a given topic is the primary concern of one organization or of another is the vigour with which the topic is pursued by those associated with the different organizations.

The early development of ionospheric and magnetospheric research in URSI is attributable to the fact that radio scientists, in studying the propagation of electromagnetic waves, were forced to investigate the different media through which they passed. During the years when radio waves provided the only means of probing the upper atmosphere and the influence of a geomagnetic field on it, URSI was the principal forum for discussing the ionosphere and the magnetosphere. In these fields, and in radioastronomy also, radio wave propagation became transformed, from being the centre of interest, into a special tool for research."

*On the life of Committees and Commissions Professor Silver had this to say :*

"An Inter-Union Commission should be what its name implies ; it should not have a membership over and above that representing the participating Unions. In particular, it should not have a body of national members; in order to avoid conflicts of opinion, national influences on its activities should be exercised through the parent Unions which provide the normal channels.

If there are compelling reasons for having direct national membership, this should be achieved by establishing the appropriate type of ICSU Committee, and not under the auspices of the Unions.

I feel strongly that all the Committees set up by ICSU and also the Inter-Union Commissions should be terminated automatically after a period agreed upon in advance by the appropriate parent body. This rule need not completely preclude renewal and reconstitution but, if applied, it would at least insure a review and reconsideration of the scientific problems and needs, and of the purposes of the organization.

I have advocated the same principle for the Commissions of URSI because, after a number of years, the Commissions increasingly assume the role of permanency and the Union tends to become a collection of independent scientific units rather than an integrated scientific body. How we identify the subdivisions of radio science will vary from time to time; when this ceases to be so, we shall indeed be working in a dead field."

*The issue contains also an extensive report on the decisions of the World Administrative Radio Conference of 1971 which effected Radio Astronomy. The readers of the Bulletin are well-aware of the permanence of these problems, in particular with respect to WARC 1992 (see e.g. the December 1990 and June 1991 issues).*

The December 1981 Bulletin contains mostly routine announcements.

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*Note : An alphabetical index of names, with addresses and page references, is given at the back of this Bulletin.*

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#### E.6. Effects of Transients on Equipment

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