

U.R.S.I.

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## CHANGE OF ADDRESS

In October 1990, the URSI Secretariat has been transferred to the following address:

International Union of Radio Science (URSI)  
c/o University of Ghent (LEA)  
St-Pietersnieuwstraat 41  
B-9000 Ghent, Belgium.

Phone: (32) 91-643 320 and 643 321  
Fax : (32) 91-643 593.

## CHANGEMENT D'ADRESSE

En octobre 1990 le Secrétariat de l'URSI a été transféré à l'adresse suivante:

Union Radio-Scientifique Internationale (URSI)  
c/o Université de Gand (LEA)  
St-Pietersnieuwstraat 41  
B-9000 Gand, Belgique.

Téléphone: (32) 91-643 320 et 643 321  
Fax : (32) 91-643 593.



IN MEMORIAM

PROF. DR. IR. B.D.H. TELLEGEN

24 June 1900 - 30 August 1990

Bernardus Dominicus Hubertus Tellegen died suddenly during his morning walk in the woods around his house in Nuenen, at the age of over ninety years. With him we lose a prominent radio scientist, especially in circuit theory, and a great inventor with 57 patents.

He got the degree of electrotechnical engineer from Delft University in 1923 and, after his military service, he came to the Philips Research Laboratories in Eindhoven in 1924. He started his work in the group of Dr. van der Pol. In 1925 this led to a first paper by Elias, van der Pol and Tellegen on electron motion in vacuum tubes. In 1926 Tellegen found the solution of secondary emission problems in tetrodes in the introduction of a third grid in the penthode. For the next twenty years Tellegen worked in the group of Oosterhuis, one of the two physicists who started the Philips Laboratories, where his primary interest was in the building of radio receivers. There were several more papers on radio tubes, hexodes, heptodes, octodes, one together with Jonker. In 1928 the first of a series of papers on circuit theory appeared. In 1929 a paper on the production of very short waves followed (20, 10 and 5.5 cm). In 1933 it appeared that a receiver tuned to Beromünster also produced the programme of Radio Luxemburg in the background. Tellegen showed that it was not an effect of nonlinearity (cross-modulation) in the receiver, but an effect of nonlinearity in the ionosphere. It came about as the waves of Beromünster crossed the high field above Luxemburg on their way to Eindhoven. Analogous effects were studied in the following years in URSI. In 1937 and 1938 Tellegen discussed the use of negative feedback in receivers (with Cohen, Henriquez and with Haantjes). He also gave a paper (with Haantjes) on diode mixers.

Geometric configurations and duality of electrical networks were studied by Tellegen in 1941. During the war years, as it was not easy to darken the laboratories completely, it was decided to give courses in the evening, and Tellegen gave a course on network theory. In the beginning of 1948 Tellegen published a paper with a question in the title: "Are there

apart from resistances, capacities, self and mutual inductances other analogous elements thinkable?" The answer was a new network element, the gyrator with the equations  $V_1 = -S_{12}i_2$ ;  $V_2 = S_{11}i_1$ . Tellegen thought it would be possible to realise the effect in a ferroxcube with coils on mutually rectangular jøes. He told me later, that he was conscious of the fact that active elements or switches could be used in the realisation, but he found this an unelegant solution. With the advent of micro-circuits the first possibility got much attention in the USA and in the Netherlands in Voorman's thesis. The second possibility was stressed by Fettweis. Hogan at Bell Laboratories found in 1952 the realisation of short wave gyrators. He based himself expressly on the work of Tellegen, but also on the work in the Philips Laboratories (Polder, Casimir, Snoak, Beljers). Although Philips at the time had a patent exchange contract with Bell, many people were disappointed that this important step in the realisation of the gyrator had not been done in Eindhoven. According to Hogan, as many as 500 gyrators were used on one space vehicle. In 1947 Tellegen was nominated a part-time professor in network theory at Delft University. His inaugural address on "Differences between pure and applied research" gives important philosophical contributions. Under his guidance theses by Adams, Bordewijk and Duinker were produced. In 1952 Tellegen produced a part of the "Theory of Alternating Currents" by Elias and Tellegen: "Theory of electrical networks" (large format 225 pages). For it he could use his war-time course we already mentioned. In 1952 he produced "A general network theorem with applications", now generally called Tellegen's theorem. An excellent survey of it was given in the MIT Press book: "Tellegen's theorem and electrical networks" by Paul Penfield, Robert Spence and Simon Duinker, who dedicated their book to Professor Tellegen. At the New York Symposium on Circuit Theory (1952), Tellegen treated the synthesis of four poles and in 1953, he wrote a paper on the synthesis of  $2n$  poles in networks with a minimum number of elements.

From 1942 to 1952 Tellegen was Chairman of the Dutch Electronics and Radio Society that made him an honorary member in 1952. From 1946 to 1960 Tellegen was President of the Netherlands Committee of the International Scientific Radio Union. He was Vice-President of URSI from 1952 to 1957, and strongly involved in the organisation of the URSI General Assembly in The Hague in 1954. From 1957 to 1960 he was Vice-Chairman of Commission VI, especially for circuit theory. The Australian

Institute of Radio Engineers made him an honorary member in 1953. In 1954 he received the Golden Research Medal of the Royal Netherlands Institute of Engineers. The conception of the gyrator, the invention of the penthode and the discovery of the Luxemburg effect were cited as reasons for this first award of the Prize. In 1955 the I.R.E. promoted him to Fellow, for his contributions and teaching in the field of vacuum tubes and communication networks. In 1956 he was one of the first to get the degree of Scientific Advisor and Member of the Directorate of the Philips Research Laboratories. In 1960 he was elected a member of the Royal Netherlands Academy of Sciences and Arts. In 1968 he gave his farewell address as professor, with a survey of network synthesis. In 1970 Delft University gave him an honorary doctorate in Technical Sciences. In 1973 I.E.E.E. awarded him the Edison Medal, one of its major awards.

During his retirement Tellegen developed a special interest in the Second Law of Thermodynamics. He read all proofs critically, and became convinced of the possibility of exceptions to this theorem. When theoretical physicists convinced him that a really good proof needed quantum mechanics, he studied this subject too. He was an honoured guest at the Philips Laboratories till about 1986. Until that time he had not reached a final conclusion to this effort. "A career of unusual distinction" is the requirement for the Edison Medal. I hope we have shown this was the right characterisation for Tellegen.

F.L.H.M. STUMPERS

## XXIII GENERAL ASSEMBLY

Prague, Czechoslovakia, August/September 1990

### REPORT ON THE WORK OF THE DRAFTING COMMITTEE

The Drafting Committee was established by the URSI Council in Prague with the following membership:

Designated by URSI Council:	URSI Secretariat:
Prof. A.D. Olver (UK)	Mrs Y. Stevanovitch
Dr. G. Pillet (France)	
Prof. S.S. Swords (Ireland)	

It was not possible for the Drafting Committee to meet or to complete its work in Prague, because many of the administrative meetings were held at the end of the Assembly. In consequence, there was no opportunity to prepare texts, suitable for submission to the Drafting Committee, recording decisions taken or recommendations made during the meetings. Such decisions and recommendations were later extracted, in the URSI Secretariat, from reports or minutes of meetings, and submitted to the Drafting Committee. This refers, in particular, to the decisions of the URSI Council.

The Drafting Committee met in London on 20 November 1990 and agreed on the French and English texts of the resolutions and recommendations adopted during the XXIII General Assembly. These texts will be published in the December 1990 issue of the *URSI Information Bulletin* and in Volume XXII of the *Proceedings of URSI General Assemblies*.

In view of the difficulties caused by the timing of the business sessions, it is recommended that the Board of Officers give consideration to the method of recording resolutions.

The Committee noted that there are considerable variations in the style of the Terms of Reference for Commissions and recommends that the Board of Officers prepare guidelines for Commissions.



RESOLUTIONS AND RECOMMENDATIONS

OF THE COUNCIL

U.1 URSI Scientific Commissions

The URSI Council,

*noting*

- (a) that, according to Resolution C.1 (Lima, 1975), the topics covered by the Commissions should be reviewed at each General Assembly;
- (b) that, in addition, the Commissions have been invited by the present General Assembly to bring some uniformity in the wording of their terms of reference;
- (c) that Commissions A, E and F do not feel it necessary to modify their terms of reference as stated in the Annex to Resolution U.1 (Tel Aviv, 1987);

*confirms or approves*, as appropriate, the titles and terms of reference of the Commissions as given in the Annex.

Annex

1. Commission A - ELECTROMAGNETIC METROLOGY. Electromagnetic measurements and standards.

The Commission promotes research and developments in:

- (a) Measurements and standards in time and frequency, including infrared and optical frequencies;
- (b) Measurements in the time domain;
- (c) Measurements in the frequency domain;
- (d) Measurements in telecommunications;
- (e) Measurements using lasers;
- (f) Quantum metrology and electrical methods in fundamental constants;
- (g) Measurements and standards from microwaves to sub-millimetre waves.

2. Commission B - FIELDS AND WAVES. Electromagnetic theory and practice, including antennas and waveguides.

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

- (a) Time-domain phenomena;
- (b) Scattering and diffraction;
- (c) Propagation and wave guiding;
- (d) Radiation and antennas;
- (e) Inverse scattering.

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

3. Commission C - SIGNALS AND SYSTEMS.

The Commission promotes research and development in:

- (a) Telecommunication systems;
- (b) Spectrum and medium utilization;
- (c) Modulation and coding;
- (d) Signal and image processing;
- (e) Circuit theory and design;
- (f) Information theory.

The design of effective telecommunication systems requires the balance of scientific, engineering and economic factors. The Commission emphasizes research into the scientific factors, and provides expertise in other areas of radio science required for system design.

4. Commission D - ELECTRONICS AND PHOTONICS.

The Commission promotes research and reviews new developments in:

- (a) Electronic devices and applications;
- (b) Photonic devices and applications;
- (c) Physics, materials, CAD, technology and reliability of electronic and photonic devices,

with particular reference to radio science and telecommunications.

The Commission deals with devices for generation, detection, storage and processing of electromagnetic signals together with their applications, covering all frequencies, including microwave and optical domains.

5. Commission E - ELECTROMAGNETIC NOISE AND INTERFERENCE.

The Commission promotes research and development in:

- (a) Terrestrial and planetary noise of natural origin; man-made noise;
- (b) The composite noise environment;
- (c) The effects of noise on system performance;
- (d) The lasting effects of transients on equipment performance (this includes the Nuclear Electromagnetic Pulse);
- (e) The scientific basis of noise and interference control;
- (f) Spectrum utilization.

*Note:* Many of the subjects mentioned are treated under the common title: Electromagnetic Compatibility.

6. Commission F - WAVE PROPAGATION AND REMOTE SENSING

(including radio-meteorology, radio-oceanography and remote sensing of non-ionized media).

The Commission encourages:

- (a) the study of all aspects of wave propagation at all frequencies in a non-ionized environment:
  - (i) wave propagation over the Earth's surface,
  - (ii) wave propagation in, and interaction with, the neutral atmosphere,
  - (iii) wave interaction with the Earth's surface, oceans, land and ice,
  - (iv) wave propagation through, and scattering by, the subsurface medium,
  - (v) characterization of the environment as it affects wave phenomena;
- (b) the application of the results of these studies, particularly in the areas of remote sensing and communications;
- (c) the appropriate cooperation with other URSI Commissions and other relevant organizations.

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

The Commission deals with the study of the ionosphere in order to provide the broad understanding necessary for radio communications. Specifically, it includes the following areas:

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

To achieve these objectives, the Commission cooperates with other URSI Commissions, corresponding bodies of the ICSU family (IUGG, IAU, COSPAR, SCOSTEP, etc.) and other organizations (CCIR, etc.)\*

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

The goals of the Commission are:

- (a) to study waves in plasmas in the broadest sense and, in particular:
  - (i) the generation (i.e. plasma instabilities) and propagation of waves in plasmas;
  - (ii) the interaction between these waves and wave-particle interactions;
  - (iii) plasma turbulence processes and chaos;
  - (iv) spacecraft-plasma interactions;

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\*

ICSU: International Council of Scientific Unions

IUGG: International Union of Geodesy and Geophysics

IAU : International Astronomical Union

COSPAR: Committee on Space Research

SCOSTEP: Scientific Committee on Solar-Terrestrial Physics

CCIR: International Radio Consultative Committee

(b) to encourage the application of the results of these studies, particularly in the areas of solar/planetary plasma interactions, and the increased exploitation of space as a research laboratory.

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

(a) The activities of the Commission are concerned with observation and interpretation of all radio emissions and reflections from celestial objects.

(b) Emphasis is placed on:

(i) the promotion of technical means for making radio-astronomical observations and data analysis;

(ii) support of activities to protect radio-astronomical observations from harmful interference.

U.2 New Commission on electromagnetics in biology and medicine

The URSI Council,

*considering*

(a) that, in view of the ever increasing interest and activities in the field of bio-electromagnetics and its interdisciplinary character, there is a need for a truly international forum where biologists, physicians, physicists and engineers would be able to interact;

(b) that the role of URSI in establishing such an international forum has already been recognised by the community involved, and that it is now time for enlarging the involvement of URSI in this area;

(c) that Commission A Working Group on Interactions of Electromagnetic Fields with Biological Systems had been originally created to cover the metrological aspects of bio-electromagnetics, but that the scope of the Working Group had become much wider over the years;

(d) that several URSI Commissions could contribute usefully to the development of bio-electromagnetics by bringing diverse expertise in the physical, mathematical and engineering aspects;

*resolves*

1. to create a new Commission K, under the provisional title "Electromagnetics in Biology and Medicine", the precise terms of reference of which will be defined, but should include the study of interactions between electromagnetic radiation and living systems in the whole frequency spectrum and applications in medicine;
2. to designate J. Bach Andersen (Denmark) as interim Chairman of the new Commission, and M. Stuchly (Canada) as interim Vice-Chairman.

### U.3 Scientific Committee on Telecommunications

The URSI Council,

*considering*

- (a) that the URSI/CCIR/CCITT Liaison Committee had expressed the opinion that its role and status should be re-examined;
- (b) that the main activities of the Committee had concentrated in the past on the cooperation with the International Radio Consultative Committee (CCIR), one of the technical Committees of the International Telecommunications Union (ITU);
- (c) that URSI should play a role in the advancement of telecommunications science in general, and not restrict its activities to the study of topics of direct interest to the technical Committees of ITU;
- (d) that the structure of the URSI/CCIR/CCITT Liaison Committee was based excessively on voluntary action by individual scientists on the URSI side, and that the mandate of the Committee was not well defined;
- (e) that more efficiency would be achieved by establishing a Scientific Committee with precise but not too restrictive terms of reference;

*resolves*

1. to create a Scientific Committee on Telecommunications, with the following terms of reference:

" The objectives of the Scientific Committee on Telecommunications are to facilitate the cooperation between the Commissions of URSI, and also the cooperation of these with

CCIR and CCITT Study Groups for the study of scientific aspects of the telecommunications problems,

The Committee includes, among others, the Chairmen of the appropriate URSI Commissions, or their delegates, and representatives designated by CCIR and CCITT.

The Committee shall:

- (a) identify those areas which may influence the evolution of telecommunications in the long term;
  - (b) keep the URSI community informed on specific problems raised by the evolution of telecommunications;
  - (c) keep the CCIR and CCITT informed on basic scientific results of importance to telecommunications;
  - (d) assist the CCIR and CCITT in the precise formulation of questions addressed to the scientific community, and more specifically to URSI;
  - (e) by stimulating studies and symposia, prepare the URSI responses to such questions in an appropriate form".
2. to appoint L. Barclay (UK) and P. Delogne (Belgium) as Chairman and Vice-Chairman respectively of the new Committee.

#### U.4 URSI Statutes

The URSI Council,

*having examined* the proposed modifications to the URSI Statutes;  
*resolves* to approve the revised version of the Statutes with slight changes in the wording of Articles 1 and 13.

#### U.5 Honorary Presidents

The URSI Council,

*considering* that the title of Honorary President can be conferred on former members of the Board of Officers who have made notable contributions to the achievement of the objectives of the Union;

*resolves* to confer the title of Honorary President of URSI on

Professor W.E. Gordon, and  
Professor F.L.H.M. Stumpers

in recognition of the outstanding services they have given and that they continue to give to the Union.

U.6 Admission of New Members and Associate Members

The URSI Council,

*having considered* the applications submitted by the following scientific institutions:

- (a) King Abdulaziz City for Science and Technology in Saudi Arabia for full membership of the Union;
- (b) the Scientific Research Council of Jamaica, the National Science and Technology Council in Grenada and the Scientific and Technical Research Council of Turkey for associate membership of the Union;

*resolves* to accept these applications subject to these institutions satisfying the criteria of the URSI Statutes.

U.7 Network of Correspondents

The URSI Council,

*noting* the recommendations made by the URSI Standing Committee on Membership;

*resolves* that a Network of Correspondents be created within URSI according to the following scheme:

- (i) any scientist attending a General Assembly will have an opportunity to register as a correspondent for a three-year period by paying a special fee when registering for the Assembly;
- (ii) individual scientists not able to attend a General Assembly will be given the possibility of being included in the Network of Correspondents by applying direct to the URSI Secretariat and by paying the special fee;
- (iii) scientists from developing countries will be included in the Network without any charge according to a mechanism still to be devised;



- (iv) correspondents participating in the Network will be kept informed about the activities of the Union;
- (v) they will have no voting rights, but will be allowed to express their views in the Commissions on matters of a scientific nature.

U.8 URSI Finances and Membership of the Standing Finance Committee

The URSI Council,

*having considered* the recommendations contained in the Report of the Standing Finance Committee, dated 4 September 1990;

*resolves*

1. to accept the recommendations referred to above;
2. to approve the audited accounts of the Union for the years ending 31 December 1987, 1988 and 1989;
3. to publish the Report of the Treasurer and the Report of the Standing Finance Committee in Volume XXII of the *Proceedings of URSI General Assemblies*;
4. to place on record its appreciation of the outstanding services rendered to the Union by Dr. H.J. Albrecht in his capacity as Treasurer;
5. to appoint the following as members of the Standing Finance Committee for the next triennium:

Chairman: K. Géher (Hungary)

Members : C. Butler (USA)  
F. Gardiol (Switzerland)  
J.G. Lucas (Australia)  
S. Radicella (Argentina)  
F.W. Sluijter (Netherlands)  
S.S. Swords (Ireland).

U.9 URSI Publications and Membershi, of the Standing Publications Committee

The URSI Council,

*recognising* that the implementation of the recommendations contained in the Report of the Standing Publications Committee,

dated 4 September 1990, would serve a useful purpose in increasing the visibility of the Union and in disseminating widely information about its activities;

*resolves*

1. to approve the recommendations referred to above;
2. to publish the Report of the Standing Publications Committee in Volume XXII of the *Proceedings of URSI General Assemblies*;
3. to appoint the following as members of the Standing Publications Committee for the next triennium:

Chairman: P.J.B. Clarricoats (UK)

Members : S.A. Bowhill (USA)  
P. Delogne (Belgium)  
R.L. Dowden (New Zealand)  
K. Géher (Hungary)  
G. Hyde (USA)  
R. Stone (USA).

#### U.10 Standing Committee on URSI Membership

The URSI Council,

*noting* the importance of the role played by the Standing Committee on Membership over the last three years in conducting consultations on the membership structure of the Union;

*resolves*

1. to extend the terms of reference of the Committee (C.7, Lima 1975) as follows:
  - (i) to propose ways of bringing URSI to the attention of radio scientists in territories which have not yet decided to adhere to the Union;
  - (ii) to consider all questions related to the membership structure of URSI, and to report on them to the Council;
  - (iii) to examine at each General Assembly the status of the Associate Member Committees, and to submit recommendations for consideration by the Council;
2. to record its thanks to Dr. M. Petit, Chairman of the Committee, for the work performed during the past triennium, in particular for the detailed reports on the consultations

referred to above;

3. to appoint the following as members of the Standing Committee on URSI Membership for the next triennium:

Chairman: T.B.A. Senior (USA)

Members : S. Okamura (Japan)  
M. Petit (France)  
J. Shapira (Israel)  
V. Shevchenko (USSR)  
Yu-Kai Chen (China, SRS).

#### U.11 Standing Committee on Developing Countries

The URSI Council,

*having considered*

(a) the report of the Standing Committee on Developing Countries for the period 1988-1990;

(b) the proposals for future activities of the Committee;

*recognising* that URSI should pursue its efforts toward the development of telecommunications science and the training of radio scientists in developing countries;

*resolves*

1. to approve the plan of action submitted by the Committee for the triennium 1991-1993, including the publication of an *URSI Handbook on Earth-Space Propagation in the Tropics*, and the organization of two Colleges on Radio Propagation, in cooperation with the International Centre for Theoretical Physics (ICTP);
2. to appoint the following as members of the Committee for the next triennium:

Chairman: S. Radicella (Argentina)

Members : G.O. Ajayi (Nigeria)  
M.S. Assis (Brazil)  
Feng Shizhang (China, CIE)  
J.O. Oyinloye (Nigeria)  
B. Reddy (India)  
J. Voge (France).

U.12 Standing Committee on Future General Assemblies

The URSI Council,

*considering*

- (a) that the number of participants in URSI General Assemblies is increasing over the years;
- (b) that the organization of a General Assembly involves a very considerable amount of work on the part of the Local Organizing Committee, as well as the availability of suitable facilities;
- (c) that it is essential to keep the Member Committees informed of the general requirements for the organization of such a major event;

*resolves*

- 1. to ask the Committee to keep the points referred to above in mind when seeking invitations for a General Assembly;
- 2. to appoint the following as members of the Standing Committee on Future General Assemblies for the following triennium:

Chairman: T. Okoshi (Japan)

Members : J.W. Klein (Germany)

I.A. Salem (Egypt)

A.M. Scheggi (Italy)

E.M. Zhabotinskij (USSR)

V. Zima (Czechoslovakia).

U.13 International Geosphere-Biosphere Programme and World Climate Research Programme

The URSI Council,

*considering*

- (a) that URSI has a role to play in the major interdisciplinary cooperative programme launched by the International Council of Scientific Unions (ICSU) under the title: "International Geosphere-Biosphere Programme: A Study of Global Change" (IGBP);
- (b) that it would be desirable for URSI to associate itself with the World Climate Research Programme (WCRP), a joint undertaking of ICSU and the World Meteorological Organization (WMO), launched in early 1980;

- (c) that URSI can make useful contributions to these programmes, particularly in view of its expertise in radio remote sensing methods and in data handling;

*resolves*

1. to extend the terms of reference of the Committee on IGBP so as to include also the WCRP;
2. to appoint the following as members of the Committee for the next triennium:

Chairman: G. Brussaard (Netherlands)

Members : W.E. Gordon (USA)  
A. Guissard (Belgium)  
J. Gower (Canada)  
H. Hallikainen (Finland)  
N. Matuura (Japan)  
M. Petit (France)  
S. Radicella (Argentina)  
H. Rishbeth (UK)  
K. Serafimov (Bulgaria)  
P.A. Watson (UK)  
A. Wernik (Poland).

#### U.14 International Space Year (ISY)

The URSI Council,

*having considered* the report in which Prof. W.E. Gordon, Chairman of the ad hoc Group on ISY, gives an overview of the preparations for the International Space Year in 1992;

*noting* the conclusion that there seems to be no scientific role for the Unions in the ISY;

*resolves* to dissolve the ad hoc Group for the International Space Year.

#### U.15 ad hoc Group on Environmental Consequences of Nuclear War

The URSI Council,

*noting* that the scientific findings of the SCOPE-ENUWAR Project, to which the URSI ad hoc Group has contributed with a "Factual Statement on Nuclear Electromagnetic Pulse and

Associated Effects", have influenced the discussions among nuclear weapon nations, and that the scientific findings were also brought to the attention of the United Nations;

*considering* that the ad hoc Group might still have a role to play in the future;

*resolves* to maintain the ad hoc Group on Environmental Consequences of Nuclear War for the next triennium, with the following membership:

Chairman: M. Wik (Sweden)

Members : W. Graf (USA)  
D. Hansen (Switzerland)  
J. Shiloh (Israel).

#### U.16 Standing Committee on Young Scientists

The URSI Council,

*considering*

- (a) that participation of young scientists in URSI General Assemblies and Symposia, and interaction between the young and older scientists are essential to the life of the Union;
- (b) that a way of contributing to the advancement of radio science in developing countries consists in bringing young scientists from these countries to URSI meetings;
- (c) that, since 1969, the Young Scientists Programme has developed into one of the most successful ventures of the Union;

*resolves*

1. to create a Standing Committee on Young Scientists;
2. to appoint the following as members of the Committee for the next triennium:

Chairman: E.V. Jull (Canada)

Members : Feng Shizhang (China, CIE)  
D. Gjessing (Norway)  
A.P. Mitra (India)  
T. Okoshi (Japan)  
G. Pillet (France)  
R. Sagalyn (USA)

T. Simtrakarn (Thailand)  
L. Zombory (Hungary).

U.17 Committee on the Future of URSI

The URSI Council,

*recognising*

- (a) that it is desirable to follow up the conclusions and suggestions formulated by the Corsendonk Conference in March 1987;
- (b) that there is a need for some long-range planning and for an examination in depth of the structure and organization of URSI, so as to adapt them to changing conditions for the benefit of the radio science community;

*resolves*

- 1. to create a Committee on the Future of URSI;
- 2. to appoint the following as members of the Committee for the next triennium:

Chairman: E.V. Jull (Canada)

Members : P. Bauer (France)

A.L. Cullen (UK)

W.E. Gordon (USA)

J.G. Lucas (Australia)

K. Serafimov (Bulgaria)

J. Shapira (Israel)

Secretary: P. Lagasse (Belgium).

U.18 Inter-Commission Working Group on Time Domain Waveform Measurements

The URSI Council,

*having considered* the recommendations contained in the Report submitted by the Inter-Commission Working Group on Time Domain Waveform Measurements;

*noting* that Dr. N.S. Nahman has expressed the wish to retire as Chairman of the Working Group;

*resolves*

- 1. to maintain the Inter-Commission Working Group on Time Domain Waveform Measurements for the period 1990-1993;

2. to place on record its appreciation of the way Dr. Nahman had conducted the activities of the Working Group since 1981;
3. to appoint T.K. Sarkar (USA) as Chairman of the Working Group.

#### U.19 Research Station for the Upper Atmosphere

The URSI Council,

*noting* the extreme importance of an ionosonde station near the eastern edge of the South Atlantic anomaly for the URSI and CCIR programmes;

*recommends* that a research station for the upper atmosphere be established in this region.

#### U.20 Sunspot Index Data Centre (SIDC)

The URSI Council,

*considering*

- (a) the importance of maintaining long-term records, now highlighted by the growing interest in the International Geosphere-Biosphere Programme (IGBP);
- (b) the regular operation and very valuable activities of the Sunspot Index Data Centre (SIDC), located at the Royal Observatory of Belgium in Brussels;

*resolves* that URSI should sponsor the Sunspot Index Data Centre, which adheres to the Federation of Astronomical and Geophysical Data Analysis Services (FAGS).

#### U.21 High Latitude Observatories

The URSI Council,

*considering* the complexity of the high latitude ionosphere, its tight coupling to the magnetosphere, the controlling influence of the interplanetary magnetic fields and of the solar wind;

*noting* that continuous monitoring, which can be provided by ground-based observatories, is required to understand the dynamic coupling processes;



*urges* the national authorities to support the installation and cooperative operation of high latitude observatories that include advanced digital ionosondes, optical instrumentation, incoherent and coherent scatter radars, and beacon satellite facilities.

#### U.22 Incoherent Scatter and MST Radars

The URSI Council,

*considering*

- (a) that IS (incoherent scatter) and MST (mesosphere-stratosphere-troposphere) radars are valuable tools for studying the atmosphere;
- (b) that due to the weak scattering processes used, the radars must transmit high powers on high gain antennas and detect small returns in a high noise environment;

*noting* that increasing spectrum congestion, resulting from the expansion and use of radio services, may cause harmful interference to the radars;

*resolves*

1. to bring this problem to the attention of the International Telecommunications Union (ITU) and its technical bodies, the International Frequency Registration Board (IFRB) and the International Radio Consultative Committee (CCIR) and, in particular, to the attention of the national telecommunications authorities, through URSI Member Committees;
2. to urge them to take reasonable measures to minimise interference problems at IS and MST radar sites;

*expresses the hope* that frequency allocations will continue and will be issued to these radars on an interference-free basis and that, if possible, interference protection zones will be established around these radar facilities.

#### U.23 Natural Noise from Lightning

The URSI Council,

*recognising* that it is possible to have, in forthcoming meteorological satellites, payloads to characterise lightning activity;

*resolves* to reiterate and update recommendation E.19 (Tel Aviv, 1987) as follows:

*considering*

- (a) that Commission E promotes scientific research in the field of electromagnetic environment, including natural noise from lightning;
- (b) that, as part of forthcoming meteorological satellites being planned by NASA, ESA and EUMETSAT, continuous recording of lightning on a world-wide basis could lead to significant improvement in long-term and short-term radio noise predictions;
- (c) that optical observations could be made with high accuracy in location, time and in amplitude level and, when correlated to radio observations, could be used as input data for propagation-based models of radio noise;
- (d) that it is expected that such studies of lightning would also contribute to the study of whistlers and might even contribute to the geophysical aspects relating to the magnetosphere and to the Earth-ionosphere waveguide and its boundaries, and to the Earth's environmental research;
- (e) that several relationships have recently been discovered between lightning and atmospheric electricity, meteorological phenomena, Earth's environmental phenomena;
- (f) that, in view of the high competence of URSI Commissions E and H, it would be a great advantage if URSI could participate in the planning of LFD data processing, data interpretation and application;
- (g) that URSI has stressed the importance of scientific data pertinent to reliable communications for our society and to geophysical studies, and agrees that a satellite-based lightning flash mapper would contribute to this objective;

*noting* that the results of such a project would be of strong interest to the International Telecommunications Union (ITU), and its technical advisory body, the International Radio Consultative Committee (CCIR);

*recommends* strongly to the organizations involved that the potentialities of the proposed lightning flash detector should be evaluated and given serious consideration for inclusion in a meteorological satellite.

U.24 Remote Sensing Laboratories

The URSI Council,

*noting* the financial problems encountered by remote sensing laboratories in small countries, and especially those in Eastern Europe;

*resolves*

1. that URSI should support, and promote actively, participation of these laboratories in international remote sensing experiments;
2. in particular, that URSI should ensure the distribution, through its regular publications, of information to workers in small countries concerning projects planned and ongoing in this area.

U.25 Protection of Frequency Bands Allocated to Space Research, Radio Astronomy and Earth Exploration

The URSI Council,

*noting*

- (a) the ever growing use and resulting congestion of the radio spectrum;
- (b) the increasing numbers of airborne and satellite services;
- (c) the increasing use of spread spectrum and broadband modulation techniques;
- (d) the increasing numbers of cases of harmful interference from services operating in adjacent bands and even from services assigned to bands far removed in frequency;
- (e) the improved state of filter and receiver technologies;

*resolves* to urge the Director of the International Radio Consultative Committee (CCIR)

1. to bring to the attention of member Administrations the urgent need to avoid harmful interference in the frequency bands allocated for space research, radio astronomy and Earth exploration, bearing in mind that passive observations in these services require noise detection at the highest sensitivity possible, and that any intended or spurious emission in the allocated bands is harmful, particularly from satellites or aircraft;

2. to initiate the steps necessary to establish appropriate technical standards towards that end.

#### U.26 Use of the Radio Spectrum

The URSI Council

*urges* the International Radio Consultative Committee (CCIR) and the administrations adhering to it to recognise the importance of the scientific use of the radio spectrum, in particular by earth exploration, radio astronomy and space research, which are vital for monitoring the natural resources of the Earth and the fragile balance of the Earth's ecosystem, and also for exploring the Universe;

*commends* the International Radio Consultative Committee (CCIR) for its continuing work

- (i) to set in place the technical framework for efficient and economical use of the radio spectrum, and
- (ii) to ensure adequate protection for the passive services from harmful interference, particularly from airborne and space transmitters;

*expresses the conviction* that the CCIR framework will ensure the rational use, conservation and protection of the scarce radio-frequency spectrum.

#### U.27 Inter-Union Commission on Frequency Allocation to Radio Astronomy and Space Science

The URSI Council,

*considering*

- (a) the request by the International Council of Scientific Unions (ICSU) that the Inter-Union Commission on Frequency Allocation to Radio Astronomy and Space Science (IUCAF), of which URSI is the parent Union, extend its terms of reference so as to cover passive remote sensing, in addition to space research and radio astronomy;
- (b) the great importance of the work performed by IUCAF in seeking allocation of appropriate frequencies of interest to the scientific community and in striving to protect such frequencies against harmful interference;

*resolves*

1. to approve the modification referred to above to the terms of reference of IUCAF;
2. to continue its financial support of the activities of the Inter-Union Commission.

U.28 XXIV General Assembly

The URSI Council,

*having considered* the invitations for the XXIV General Assembly which had been submitted by the URSI Member Committees in China (Beijing), in India and in Japan;

*resolves*

1. to accept the invitation of the Japanese URSI Committee to hold the XXIV General Assembly in Kyoto from 25 August to 2 September 1993;
2. to record its thanks to the Member Committees in China (Beijing) and in India for their invitations.

U.29 UNESCO and ICSU Subventions

The URSI Council,

*considering*

- (a) that an important part of the activities of URSI consists in the organization of international scientific symposia and other meetings, in the issuing of publications, and in its Young Scientists Programme;
- (b) that the subventions received from UNESCO and from ICSU are used to cover part of the cost of these activities;

*resolves* to convey to these organizations its warm thanks and appreciation for the valuable support thus provided.

U.30 Vote of Thanks to the Czechoslovak URSI Committee

The URSI Council

*resolves* unanimously to record its warm appreciation of the invitation extended to it by the Czechoslovak URSI Committee to hold the XXIII General Assembly in Prague. The generous hospi-

tality and the excellence of the facilities provided by the Local Organizing Committee for the scientific and administrative sessions, in particular the collection and publication in Prague of a large amount of abstracts, merit the highest praise. A special word of appreciation is offered to the Czechoslovak hosts for a most enjoyable and successful programme of social events and for their welcome to the persons accompanying the participants in the Assembly.

RESOLUTIONS AND RECOMMENDATIONS  
OF COMMISSIONS

COMMISSION A - ELECTROMAGNETIC METROLOGY

A.1 Accurate Time Comparison

Commission A,

*considering*

- (a) that the best practical method of comparing the frequency of primary frequency standards maintained in various national laboratories is by means of satellites;
- (b) that the same is valid for the comparison of time scales;
- (c) that the International Atomic Time Scale (TAI) established by the Bureau International des Poids et Mesures (BIPM) is based mainly on these time comparisons made via satellites;
- (d) that the existing satellite navigation systems such as GPS and GLONASS can provide time comparisons at the level of accuracy needed in those applications;
- (e) that the same satellite systems find scientific uses in other fields such as geodesy and geoscience;

*recommends* that the authorities responsible for the maintenance of such navigation systems should avoid, as far as it is possible, any intentional degradation of the performance of such systems that would be detrimental to their general scientific use.

A.2 Laser Diodes and Laser Diode Pumped Solid State Lasers

Commission A,

*considering*

- (a) the need of simple tunable lasers with narrow emission linewidth for metrological applications;

- (b) the low cost, long lifetime and small size of laser or laser diode pumped solid state lasers;
- (c) the availability of single frequency lasers at only wavelengths;

*expresses the opinion*

1. that the development of such lasers should be continued with the aim of obtaining laser radiation in the widest possible range of the visible and near infrared spectrum;
2. that the research into improving the spectral purity of their emission should be continued;
3. that methods of reproducible continuous frequency tuning of such lasers should be investigated.

#### A.3 Traceability of ANA Measurements

Commission A,

*considering*

- (a) that the use of automatic network analysers (ANA) for RF and microwave measurements is widespread, both in science and industry;
- (b) that there is a need to establish a widely recognised procedure for verifying the performance of these complex instruments, especially in connection with laboratory accreditation schemes;
- (c) that there is also a need for the development of transfer standards for use in calibrating ANAs;

*expresses the opinion* that research should be undertaken to develop suitable common techniques and transfer standards to enable the traceability of ANA measurements to national or international standards to be demonstrated.

#### A.4 SI Units

Commission A,

*considering*

- (a) that the SI has progressed from a system of units represented largely by standards based on artifacts to a system,



the units of which are now based mainly on physical constants;

- (b) that this evolution is very beneficial to the radio science community by providing world-wide uniformity in the realization of the electrical units;
- (c) that this progress has been made possible due to research activities on basic concepts underlying the practical realizations of often well accepted standards;

*expresses the opinion* that basic research work oriented to improving the present practical realization of the SI units be encouraged in metrological laboratories and that collaboration be encouraged between these laboratories in order to avoid unnecessary duplications and to improve, when possible, the efficiency of the work performed.

## COMMISSION B - FIELDS AND WAVES

### B.1 Symposium on Electromagnetic Theory

Commission B,

*considering*

- (a) that the URSI Symposia on Electromagnetic Theory have been held at intervals of three years for almost 40 years;
- (b) that these Symposia are major events which represent an important activity of Commission B between Assemblies;

*confirms* that the next Symposium in the series will be held in Sydney, Australia, from 17 to 20 August 1992.

### B.2 Co-sponsorship of International Conferences

Commission B,

*considering* that various forthcoming international conferences are of direct interest to the Commission;

*recommends* that URSI co-sponsor the following conferences:

- 20th, 21st and 22nd European Microwave Conferences in 1990, 1991 and 1992;
- International Symposia on Antennas (JINA) in 1990 and 1992;

- 7th and 8th International Conferences on Antennas and Propagation (ICAP) in 1991 and 1993;
- 3rd and 4th Asia-Pacific Microwave Conferences (APMC) in 1990 and 1992;
- North American Radio Science Meeting and International IEEE/AP-S Symposium in 1991;
- International Symposium on Antennas and Propagation (ISAP) in 1992.

### B.3 Inter-Commission Working Group on Time-Domain Waveform Measurements

Commission B,

*considering* the activity of the Working Group on Time-Domain Waveform Measurements during the past triennium and, in particular, the great interest encountered by the joint session held at the present General Assembly;

*recommends*

1. that the Inter-Commission Working Group on Time-Domain Waveform Measurements (IWG-TDWM) be continued;
2. that T.K. Sarkar (USA) be appointed Chairman of the Working Group.

### B.4 Timing of General Assemblies

Commission B,

*recognising* that recent General Assemblies have commenced ever later in the month of August;

*considering* the fact that a General Assembly that stretches within the month of September is inconvenient for academics from Northern America and elsewhere, who must teach classes or administer examinations;

*requests* that every effort be made to bring forward the dates of the next General Assembly in Kyoto in 1993;

*recommends* that an ad hoc Committee be established by the Board of Officers to consider preferred times for future General Assemblies.

COMMISSION C - SIGNALS AND SYSTEMS

C.1 Future Conferences and Symposia

Commission C

*recommends*

1. support for the following symposia for which information was supplied by the organizers:
  - 2nd URSI Symposium on Signals, Systems and Electronics (ISSSE'92), organized jointly by Commissions C and D;
  - 3rd International Symposium on Recent Advances in Microwave Technology (ISRAMT'91), under Mode A;
2. support for the following conferences, subject to the necessary information being supplied to the URSI Secretariat:
  - International Zurich Seminar on Digital Communication;
  - European Signal Processing Conference (EUSIPCO);
  - European Conference on Circuit Theory and Design (ECCTD);
  - Conference on Intelligence Networks;
  - Conference on Digital Signal Processing;
  - Colloquium on Microwaves (MICROCOLL).

C.2 Joint Symposia at the XXIV General Assembly

Commission C

*recommends* that the following topics be selected for Joint Symposia at the next General Assembly:

- (i) Signal Processing Antennas, with Commission B;
- (ii) Broad-band Communication and Multipoint Propagation, with Commissions F and G.

COMMISSION D - ELECTRONIC AND OPTICAL DEVICES AND APPLICATIONS

D.1 Change of Title of the Commission

Commission D,

*considering* that the concern within URSI toward telecommunications is increasing, and that the area covered by Commission D is strongly related to telecommunications;

*resolves*

1. that its activities be enhanced beyond its traditional "service Commission" character;
2. that the terms of reference be changed accordingly;
3. that the subject title of the Commission be changed from "Electronic and Optical Devices and Applications" to "Electronics and Photonics".

*Note: The new terms of reference of Commission D are given in Council Resolution U.1.*

D.2 Symposia at the 1993 General Assembly

Commission D,

*considering* the terms of its Resolution D.1;

*resolves* to change its basic policy in organizing the scientific sessions at the General Assembly from its traditional invited paper format to the one including contributed papers, the decision on whether to open all sessions, or only some of them, to be made in the course of the organizational process.

D.3 "Review of Radio Science"

Commission D,

*considering*

- (a) that the intended readership of the "Review of Radio Science" is not clearly defined;
- (b) that Commission D covers extremely wide areas of technical and scientific interest;
- (c) that, due to page limitations, it is not possible to write a comprehensive statement in the present form;
- (d) that there is no uniformity in the selection of the references to be cited;

*resolves*

1. that the text be written by invited experts, who should review selected topics of importance within the range of activities of Commission D;

2. that an expanded list of references based on the lists submitted by Official Members of the Commission and collected from the papers published in international refereed journals be compiled on a diskette dedicated to Commission D, with a format compatible with the standard PC and Macintosh computers.

#### D.4 Sponsorship of International Conferences

Commission D

*recommends* sponsorship or co-sponsorship, as appropriate, of the following meetings:

- URSI International Symposium on Signals, Systems and Electronics (ISSSE'92), Paris, 1-4 September 1992, organized jointly by Commissions C and D;
- European Conferences on Optical Communication (ECOC), in 1991, 1992 and 1993;
- European Microwave Conferences in 1991, 1992 and 1993;
- International Conference on Solid State and Integrated Circuits (ICSSIC) in Beijing, China, October 1992;
- 4th Asia Pacific Microwave Conference (APMC) in 1992.

### COMMISSION E - ELECTROMAGNETIC NOISE AND ENVIRONMENT

#### E.1 Radio Noise

Commission E,

*considering*

- (a) that CCIR Report 322-3 represents a global model of atmospheric radio noise from lightning;
- (b) that interference from other-user signals on assigned HF frequencies can impose a greater limitation on communication system performance;
- (c) that there is currently no global model of this interference;

*recommends* that an international cooperative effort be encouraged to work toward the development of a global model of the probability of occurrence of HF other-user signal interference as a function of frequency (by allocated bands),

bandwidth, time of day, season and sunspot number for omni-directional antennas and, to the extent possible, directional antennas.

## E.2 Working Groups

Commission E

*resolves* to establish the following Working Groups:

- E.1 Spectrum Management and Utilization  
Chairman: R.D. Parlow (USA);
- E.2 Non-Gaussian Noise in Communication  
Chairman: A.D. Spaulding (USA);
- E.3 High Power Electromagnetics  
Chairman: R.L. Gardner (USA);
- E.4 Terrestrial and Planetary Electromagnetic Noise  
Co-Chairmen: M. Hayakawa (Japan) and E.K. Smith (USA);
- E.5 Interaction with and Protection of Complex Electrical Systems  
Co-Chairmen: C. Baum (USA), P. Degauque (France) and M. Ianoz (Switzerland);
- E.6 Effects of Transients on Equipment  
Co-Chairmen: V. Scuka (Sweden) and B. Demoulin (France);
- E.7 Extraterrestrial and Terrestrial Meteoroelectric Environment with Noise and Chaos  
Chairman: H. Kikuchi (Japan).

## E.3 Co-sponsorship for Future Meetings

Commission E

*recommends* co-sponsorship of the following symposia:

- Zurich Electromagnetic Compatibility Symposium in 1991;
- International COMMSPHERE Symposium, 23-25 April 1991, Israel;
- Beijing Electromagnetic Compatibility Symposium, May 1992  
(subject to the necessary information being supplied by the organizers);
- Wrocław Electromagnetic Compatibility Symposium, June 1992;
- Zurich Electromagnetic Compatibility Symposium in 1993.

COMMISSION F - RADIO PROPAGATION AND REMOTE SENSING

F.1 Sponsorship of International Conferences

Commission F

*recommends* sponsorship or co-sponsorship, as appropriate, of the following conferences:

under Mode A

- International Meeting on Wave Propagation in Random Media, Seattle, USA, 1992 (URSI member: A. Ishimaru);
- Open Colloquium on Regional Factors in Predicting Radio Wave Attenuation due to Rain, Rio de Janeiro, December 1990 (URSI member: M.P.M. Hall);
- International Conferences on Antennas and Propagation (ICAP) in 1991 (York, UK) and 1993 (URSI member: M.P.M. Hall);
- Symposium on the Electromagnetic Scattering from the Ocean Surface (URSI member: J. Apel);

under Mode B

- International COMMSPHERE Symposium, Herzlia, Israel, 1991 (URSI member: J. Shapira);
- URSI Open Symposium on Wave Propagation and Remote Sensing, Malaysia, 1992 (URSI member: P.A. Watson);
- Symposium on Microwave Signatures, Munich, Germany, June 1992 (URSI member: M. Chandra);
- International Geoscience and Remote Sensing Symposium (IGARSS) in 1991 (URSI member: I.V. Lindell), 1992 and 1993.

F.2 Coordination with IGARSS'93

Commission F,

*considering* the need for efficient and economic travel planning;

*recommends* that URSI coordinates planning of the 1993 General Assembly with the International Geoscience and Remote Sensing Symposium (IGARSS) in 1993, both to be held in Japan.

COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

G.1 Working Groups

Commission G

*resolves*

1. to maintain the following Working Groups:
  - G.1 Ionosonde Network Advisory Group (INAG)  
Chairman: P.J. Wilkinson (Australia)  
Secretary: R. Conkright (USA);
  - G.2 Studies of the Ionosphere Using Beacon Satellites  
Chairman: R. Leitinger (Austria)  
Vice-Chairmen: J.A. Klobuchar (USA), T.R. Tyagi (India);
2. to maintain the former joint Working Group GH.1 on Incoherent Scatter, from which Commission H has withdrawn, as Working Group G.3, with J.M. Holt (USA) as Chairman and P.J.S. Williams (UK) as Vice-Chairman;
3. to merge Working Groups G.3 and G.4 into a new Working Group G.4 on Ionospheric Informatics, with B.W. Reinisch (USA) as Chairman, and D. Anderson (USA) as Vice-Chairman, and with the following terms of reference:

"To promote the application of information technology to the acquisition, processing, archiving and distribution of ionospheric data, and to assist in developing empirical and physical models of the ionosphere".

G.2 Joint Working Groups

Commission G

*resolves*

1. to maintain the Joint Working Group GH.2 on Computer Experiments, Simulation and Analysis of Wave Plasma Processes, with S. Ossakow (USA) as Commission G representative;
2. to form a new Joint Working Group GH.1 on Active Experiments in Plasmas, with Sa. Basu (USA) as Commission G representative;
3. to join the former Joint Working Group CH.1 on Wave Analysis under the new title CGH.1 on Wave and Turbulence Analysis.



### G.3 URSI Contribution to FAGS

#### Commission G

*recommends* to the Council that the annual contribution of URSI to the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) of US\$2,000 be confirmed, and divided between the International Ursigram and World Days Service (IUWDS) and the Solar Index Data Centre (SIDC).

### G.4 Commission G Representatives

#### Commission G

*resolves* to appoint the following representatives:

- URSI Committee on the International Geosphere-Biosphere Programme (IGBP): A.W. Wernik (Poland);
- Inter-Union Working Group on VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere: A.J. Smith (UK);
- International Reference Ionosphere (joint URSI-COSPAR): L. Bossy (Belgium).

### G.5 Sponsorship of Symposia 1991-1993

#### Commission G

*recommends* URSI sponsorship for the following Symposia during 1991-1993 in Mode B, subject to receipt of proper requests from the organizers:

- Artificial Modification of the Ionosphere, Suzdal, USSR, 1991;
- Symposium of the Beacon Satellite Working Group, Boston, USA, 1992;
- International Meeting on the Middle Atmosphere Sciences, Kyoto, Japan, 23-26 March 1992;
- International Meeting on Wave Propagation in Random Media, Seattle, USA, August 1992;
- Symposium on High Latitude Ionosphere, Fairbanks, USA, 1992.

### G.6 INAG Bulletin

#### Commission G

*recognising* the important role of the "INAG Bulletin" (Ionosonde Network Advisory Group) in maintaining the world network

of ionospheric stations and the quality of the data acquired by the network;

*recommends* that URSI continue to support financially the publication of the Bulletin for the next three years;

*expresses* its thanks to WDC-A in Boulder for the generous support it provides for the production of this Bulletin.

#### G.7 Formatting of Ionospheric Characteristics Data

Commission G,

*considering*

- (a) the need for ionospheric characteristics;
- (b) the increasing availability of digital (computer readable) ionospheric data obtained from analog and automatically scaled digital ionograms;

*recognising* that the Working Group G.4 on Ionospheric Informatics, in cooperation with the World Data Centres, developed a data format at the Lowell Workshop in July 1989, which was widely distributed and discussed;

*resolves* that ionospheric characteristics archived in the World Data Centres be formatted in the IIWG flexible database structure, and that data which have not passed a quality control be marked as such.

#### G.8 OMEGA VLF Navigation System

Commission G,

*considering* that the ionosphere below 100 km can be effectively studied using VLF CW propagation;

*noting* that this may be done using the OMEGA VLF navigation system in cooperation with the International OMEGA Association and the Japanese Maritime Safety Agency;

*recommends* the continuation of the operation of the OMEGA VLF navigation system for the continuous monitoring of the lower ionosphere.

COMMISSION H - WAVES IN PLASMAS

H.1 Importance of Computer Experiments and Establishment of Supercomputer Centres for Plasma Radio Science

Commission H,

*considering*

- (a) that computer experiments are yielding new and exciting results on non-linear processes in waves in space plasmas;
- (b) that these experiments demand large amount of computing time and memory on supercomputers;
- (c) that the demands of supercomputing are rapidly increasing in radio science;

*recommends* that the attention of national administrations be drawn to the importance of new computational techniques in space plasma radio science and to the desirability of establishing supercomputercentres dedicated to space plasma radio science in different parts of the world.

H.2 Sponsorship of Symposia and Meetings

Commission H,

*recommends* the co-sponsorship by URSI of the following meetings:

- Artificial Modification of the Ionosphere, Suzdal, USSR, 1991;
- 4th International School for Space Simulation, Nara, Japan, 1991 (Mode B);
- XXth International Conference on Phenomena in Ionized Gases (ICPIG), Barga, Italy, 1991 (Mode B);
- Workshop on Turbulence in Space Plasmas, Aussois, France, 1993 (Mode B);
- XXIst International Conference on Phenomena in Ionized Gases (ICPIG), Dresden, Germany, 1993 (Mode B).

H.3 Working Groups

Commission H,

*having considered* the reports submitted by its various Working Groups;

*resolves*

1. to continue the Inter-Union (URSI/IAGA) Working Group 1 on Passive Electromagnetic Probing of the Magnetosphere, under the new name "VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM)", with U. Inan (USA) as Co-Chairman for Commission H;
2. to dissolve the Inter-Union (URSI/IAGA) Working Group 2 on Wave Instabilities in Plasmas;
3. to continue the Joint Working Group CH.1 on Wave Analysis as a joint C, G and H Working Group under the new name "Wave and Turbulence Analysis", with F. Lefeuvre (France) as Co-Chairman for Commission H;
4. to withdraw participation in the Joint Working Group on Incoherent Scatter (former GH.1);
5. to continue the Joint Working Group GH.2 on Computer Experiments, Simulation and Analysis of Wave Plasma Processes, with only one Commission H Co-Chairman: H. Matsumoto (Japan);
6. to establish a new Joint Working Group GH.1 on Active Experiments in Plasmas, with P. Bernhardt (USA) as Co-Chairman for Commission H;
7. to withdraw from the Inter-Commission Working Group on Time-Domain Waveform Measurements.

COMMISSION J - RADIO ASTRONOMY

J.1 Working Group on Global VLBI

Commission J,

*considering*

- (a) the importance of high resolution astronomical imaging by the use of VLBI;
- (b) the consequent need for simultaneous observations in different parts of the world, using telescopes belonging to different VLBI networks;

*recognising* the imminence of orbiting (space) VLBI;

*resolves*

1. that a Working Group for Global VLBI be established, with the following objectices:
  - (i) to set up mechanisms to coordinate global VLBI (i.e. multi-network VLBI);
  - (ii) to promote compatibility of technology;
  - (iii) to serve as an interface to other organizations for policy issues (peer review, core programme, etc.);
2. that the Chairman of the Working Group be designated by Commission J;
3. that the membership should consist of representatives of the various VLBI networks, to be agreed between the Chairman and the Directors of the ground-based networks and to be reviewed at the XXIV General Assembly in Kyoto, Japan, in 1993.

*Note: Commission J appointed Roy Booth (Sweden) as inaugural Chairman of the Working Group.*

### J.2 Proposals for Joint Symposia at the 1993 General Assembly

Commission J

*recommends* the following subjects for Joint Symposia at the General Assembly in Kyoto, Japan, 1993:

- Imaging through Adaptive Spatial Signal Processing, with Commission B, conveners: B. Steinberg (USA) for Commission B and T. Cornwell (USA) for Commission J;
- Radio Interference to Passive Services, with Commission F, conveners: T. Gergely (USA) for Commission J and A. Gasiewski (USA) for Commission F.

### 3. Sponsorship of Symposia during 1991-1993

Commission J

*recommends* URSI sponsorship or co-sponsorship, as appropriate, for the following symposia:

- Astronomy with Millimetre and Submillimetre Wave Interferometry, Japan, 1992;
- Wave Propagation in Random Media, Seattle, USA, August 1992;
- High Resolution Imaging, Australia, July 1992;
- Space VLBI, Japan, adjacent to URSI General Assembly, August/September 1993.

J.4 "Declaration of Principles concerning Activities following the Detection of Extraterrestrial Intelligence"

Commission J,

*considering* the great importance for humankind of the possible detection of signals from extraterrestrial civilisations;

*recognising*

- (a) the general interest in the science and technology inherent in searches for signals from extraterrestrial civilisations;
- (b) the major role to be played by some radiotelescopes around the world in these searches during the coming decades;

*is sympathetic* to the intent of the document entitled "Declaration of Principles concerning Activities following the Detection of Extraterrestrial Intelligence", which is reproduced in Annex.

ANNEX

"We, the institutions and individuals participating in the search for extraterrestrial intelligence,

Recognising that the search for extraterrestrial intelligence is an integral part of space exploration and is being undertaken for peaceful purposes and for the common interest of all mankind,

Inspired by the profound significance for mankind of detecting evidence of extraterrestrial intelligence, even though the probability of detection may be low,

Recalling the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, which commits States Parties to that Treaty "to inform the Secretary General of the United Nations as well as the public and the international scientific community, to the greatest extent feasible and

practicable, of the nature, conduct, locations and results" of their space exploration activities (Article XI),

Recognising that any initial detection may be incomplete or ambiguous and thus require careful examination as well as confirmation, and that it is essential to maintain the highest standards of scientific responsibility and credibility,

Agree to observe the following principles for disseminating information about the detection of extraterrestrial intelligence:

1. Any individual, public or private research institution, or governmental agency that believes it has detected a signal from or other evidence of extraterrestrial intelligence (the discoverer) should seek to verify that the most plausible explanation for the evidence is the existence of extraterrestrial intelligence rather than some other natural phenomenon or anthropogenic phenomenon before making any public announcement. If the evidence cannot be confirmed as indicating the existence of extraterrestrial intelligence, the discoverer may disseminate the information as appropriate to the discovery of any unknown phenomenon.
2. Prior to making a public announcement that evidence of extraterrestrial intelligence has been detected, the discoverer should promptly inform all other observers or research organizations that are parties to this declaration, so that those other parties may seek to confirm the discovery by independent observations at other sites and so that a network can be established to enable continuous monitoring of the signal or phenomenon. Parties to this declaration should not make any public announcement of this information until it is determined whether this information is or is not credible evidence of the existence of extraterrestrial intelligence. The discoverer should inform his/her or its relevant national authorities.
3. After concluding that the discovery appears to be credible evidence of extraterrestrial intelligence, and after informing other parties to this declaration, the discoverer should inform observers throughout the world through the Central Bureau for Astronomical Telegrams of the International Astronomical Union, and should inform the Secretary General of the United Nations in accordance with Article XI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies. Because of their demonstrated interest in and expertise concerning the question of the

existence of extraterrestrial intelligence, the discoverer should simultaneously inform the following international institutions of the discovery and should provide them with all pertinent data and recorded information concerning the evidence: the International Telecommunications Union, the Committee on Space Research of the International Council of Scientific Unions, the International Astronautical Federation, the International Academy of Astronautics, the International Institute of Space Law, Commission 51 of the International Astronomical Union and Commission J of the International Radio Science Union.

4. A confirmed detection of extraterrestrial intelligence should be disseminated promptly, openly, and widely through scientific channels and public media, observing the procedures in this declaration. The discoverer should have the privilege of making the first public announcement.
5. All data necessary for confirmation of detection should be made available to the international scientific community through publications, meetings, conferences, and other appropriate means.
6. The discovery should be confirmed and monitored and any data bearing on the evidence of extraterrestrial intelligence should be recorded and stored permanently to the greatest extent feasible and practicable, in a form that will make it available for further analysis and interpretation. These recordings should be made available to the international institutions listed above and to members of the scientific community for further objective analysis and interpretation.
7. If the evidence of detection is in the form of electromagnetic signals, the parties to this declaration should seek international agreement to protect the appropriate frequencies by exercising the extraordinary procedures established within the World Administrative Radio Council of the International Telecommunications Union.
8. No response to a signal or other evidence of extraterrestrial intelligence should be sent until appropriate international consultations have taken place. The procedures for such consultations will be the subject of a separate agreement, declaration or arrangement.
9. The SETI Committee of the International Academy of Astronautics, in coordination with Commission 51 of the Inter-



national Astronomical Union, will conduct a continuing review of procedures for the detection of extraterrestrial intelligence and the subsequent handling of the data. Should credible evidence of extraterrestrial intelligence be discovered, an international committee of scientists and other experts should be established to serve as a focal point for continuing analysis of all observational evidence collected in the aftermath of the discovery, and also to provide advice on the release of information to the public. This committee should be constituted from representatives of each of the international institutions listed above and such other members as the committee may deem necessary. To facilitate the convocation of such a committee at some unknown time in the future, the SETI Committee of the International Academy of Astronautics should initiate and maintain a current list of willing representatives from each of the international institutions listed above, as well as other individuals with relevant skills, and should make that list continuously available through the Secretariat of the International Academy of Astronautics. The International Academy of Astronautics will act as the Depository for this declaration and will annually provide a current list of parties to all the parties to this declaration".

RESOLUTIONS ET RECOMMANDATIONS

DU CONSEIL

U.1 Les Commissions scientifiques de l'URSI

Le Conseil de l'URSI,

*notant*

- (a) qu'aux termes de la Résolution C.1 (Lima, 1975), les Commissions sont tenues de réexaminer leurs sujets d'étude à l'occasion de chaque Assemblée générale;
- (b) qu'en outre, elles ont été invitées au cours de la présente Assemblée générale à apporter plus d'uniformité dans la rédaction de leurs mandats;
- (c) que les Commissions A, E et F n'estiment pas nécessaire de modifier leurs mandats tels qu'ils figurent à l'annexe à la Résolution U.1 (Tel Aviv, 1987),

*confirme ou approuve*, selon le cas, les titres et mandats des Commissions reproduits en annexe.

Annexe

1. Commission A - METROLOGIE ELECTROMAGNETIQUE. Mesures et étalons électromagnétiques.

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

- (a) mesures et étalons de temps et de fréquence, y compris les infrarouges et le domaine optique,
- (b) mesures dans le domaine temporel,
- (c) mesures dans le domaine des fréquences,
- (d) mesures dans les télécommunications,
- (e) mesures au moyen du laser,
- (f) métrologie quantique et méthodes électriques dans le domaine des constantes fondamentales,
- (g) mesures et étalons dans la gamme allant des hyperfréquences aux ondes submillimétriques.

2. Commission B - ONDES ET CHAMPS. Théorie électromagnétique et applications, y compris les antennes et les guides d'ondes.

L'intérêt de la Commission B porte sur *les champs et les ondes*, et englobe la théorie, l'analyse, le calcul, les expériences, et leur confirmation, l'accent étant mis sur les sujets suivants:

- (a) phénomènes dans le domaine temporel,
- (b) diffusion et diffraction,
- (c) propagation et guidage des ondes,
- (d) rayonnement et antennes,
- (e) inversion de la diffusion.

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

3. Commission C - SIGNAUX ET SYSTEMES

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

- (a) systèmes de télécommunications,
- (b) utilisation du spectre et des milieux de transmission,
- (c) modulation et codage,
- (d) traitement du signal et de l'image,
- (e) théorie et conception des circuits,
- (f) théorie de l'information.

La conception de systèmes de télécommunications efficaces requiert un équilibre entre les considérations liées à l'ingénierie scientifique et les facteurs économiques. La Commission met l'accent sur la recherche scientifique et fournit l'expérience nécessaire à la conception des systèmes dans d'autres domaines de la radioélectricité scientifique.

4. Commission D - ELECTRONIQUE ET PHOTONIQUE

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

- (a) dispositifs électroniques et applications,
- (b) dispositifs photoniques et applications,
- (c) physique, matériaux, CAO, technologie et fiabilité des dispositifs électroniques et photoniques

présentant un intérêt particulier pour la radioélectricité scientifique et les télécommunications.

La Commission étudie les dispositifs pour la production, la détection, le stockage et le traitement des signaux électromagnétiques, ainsi que leurs applications à toutes les fréquences, y compris les hyperfréquences et le domaine optique.

5. Commission E - BRUITS ET BROUILLAGES ELECTROMAGNETIQUES

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

- (a) bruits terrestres et planétaires d'origine naturelle, bruits artificiels,
- (b) bruits composites ambiants,
- (c) effets des bruits sur la qualité des systèmes,
- (d) effets durables des phénomènes transitoires sur la qualité des équipements (incluant l'impulsion électromagnétique nucléaire),
- (e) base scientifique des bruits et maîtrise des brouillages,
- (f) utilisation du spectre.

Note: Nombre des sujets précités sont traités sous le titre commun de compatibilité électromagnétique.

6. Commission F - PROPAGATION DES ONDES ET TELEDETECTION (y compris la radiométéorologie, la radio-océanographie et la télédétection des milieux non ionisés).

La Commission tend à encourager:

- (a) l'étude de tous les aspects de la propagation des ondes à toutes les fréquences dans un milieu ionisé:
  - (i) propagation des ondes au-dessus de la surface de la Terre,
  - (ii) propagation des ondes dans l'atmosphère neutre et interaction des ondes avec l'atmosphère neutre,
  - (iii) interaction des ondes avec la surface de la Terre: océans, sol et glace,
  - (iv) propagation et diffraction des ondes en milieu souterrain,
  - (v) caractérisation de l'environnement en ce qu'il affecte les phénomènes ondulatoires;

- (b) l'application des résultats de ces études, en particulier dans les domaines de la télédétection et des communications;
- (c) le développement d'une collaboration appropriée avec les autres Commissions de l'URSI et les organisations concernées.

7. Commission G - RADIOELECTRICITE IONOSPHERIQUE ET PROPAGATION (y compris les communications ionosphériques et la télédétection des milieux ionisés).

La Commission s'occupe de l'étude de l'ionosphère ayant pour but la compréhension générale de ce milieu nécessaire aux radiocommunications. Elle s'intéresse plus spécifiquement aux sujets suivants:

- (a) morphologie globale et modélisation de l'ionosphère,
- (b) variations spatio-temporelles de l'ionosphère,
- (c) développement des outils et réseaux nécessaires à la mesure des caractéristiques de l'ionosphère,
- (d) théorie de la propagation radioélectrique par l'intermédiaire de l'ionosphère, et applications,
- (e) application aux radiocommunications de la connaissance de l'ionosphère.

Pour atteindre ces objectifs, la Commission collabore avec d'autres Commissions de l'URSI, les organismes concernés du CIUS (UGGI, UAI, COSPAR, SCOSTEP, etc.) ainsi qu'avec d'autres organisations internationales (CCIR, etc.)\*

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

La Commission a pour buts:

- (a) d'étudier les ondes dans les plasmas au sens le plus large et, en particulier, les sujets suivants:

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\* CIUS: Conseil International des Unions Scientifiques  
UGGI: Union Géodésique et Géophysique Internationale  
UAI: Union Astronomique Internationale  
COSPAR: Comité de Recherche Spatiale  
SCOSTEP: Comité Scientifique de Physique Solaire-Terrestre  
CCIR: Comité Consultatif International des Radiocommunications

- (i) la génération (instabilités dans les plasmas) et la propagation des ondes dans les plasmas,
  - (ii) les interactions onde-onde et les interactions onde-particule,
  - (iii) les processus de turbulence dans les plasmas et le chaos,
  - (iv) les interactions entre les plasmas et les engins spatiaux;
- (b) d'encourager l'application des résultats de ces études, en particulier dans les domaines suivants: interactions entre plasmas solaires et planétaires et utilisation accrue de l'espace comme un laboratoire de recherche.
8. Commission J - RADIOASTRONOMIE (y compris la télédétection des objets célestes).
- (a) Les activités de la Commission concernent l'observation et l'interprétation de toutes les émissions et réflexions radioélectriques en provenance d'objets célestes.
  - (b) L'accent est mis sur:
    - (i) la promotion de moyens techniques pour les observations et l'analyse des données radioastronomiques,
    - (ii) l'appui des démarches ayant pour but d'obtenir la protection des observations radioastronomiques contre les brouillages nuisibles.

U.2 Nouvelle Commission sur l'électromagnétisme en biologie et en médecine

Le Conseil de l'URSI,

*considérant*

- (a) que, vu l'intérêt croissant et la multiplication des activités dans le domaine du bio-électromagnétisme et son caractère pluridisciplinaire, un forum réellement international s'avère nécessaire pour les échanges entre biologistes, médecins, physiciens et ingénieurs;
- (b) que la communauté des spécialistes intéressés a d'ores et déjà reconnu le rôle que l'URSI jouait pour établir ce forum international, et que le temps est venu pour l'Union d'étendre son action dans ce domaine;
- (c) que le Groupe de travail de la Commission A "Interactions

entre champs électromagnétiques et systèmes biologiques, et mesures correspondantes" avait été créé à l'origine pour étudier les aspects métrologiques du bio-électromagnétisme, mais que le champ d'activité du Groupe s'est élargi au fil des années;

- (d) que plusieurs Commissions de l'URSI sont susceptibles de contribuer au développement du bio-électromagnétisme par leur expérience des différents aspects des problèmes physiques, mathématiques et d'ingénierie,

*décide*

1. de créer une nouvelle Commission K, ayant pour titre provisoire "Electromagnétisme en biologie et en médecine", dont le mandat précis reste à définir, mais comportera l'étude des interactions entre le rayonnement électromagnétique et les systèmes vivants dans tout le spectre des fréquences, ainsi que les applications en médecine;
2. de désigner J. Bach Andersen (Danemark) et M. Stuchly (Canada) respectivement comme président intérimaire et comme vice-président intérimaire.

U.3 Comité scientifique des télécommunications

Le Conseil de l'URSI,

*considérant*

- (a) que le Comité de liaison URSI/CCIR/CCITT a exprimé l'opinion que son rôle et son statut devraient être réexaminés;
- (b) que, dans le passé, l'essentiel des activités du Comité a porté sur la collaboration avec le Comité Consultatif International des Radiocommunications (CCIR), l'un des Comités techniques de l'Union Internationale des Télécommunications (UIT);
- (c) que, de manière générale, l'URSI devrait contribuer au développement de la science des télécommunications, sans se limiter à la seule étude de sujets intéressant directement les Comités techniques de l'UIT;
- (d) que, de par sa structure, le Comité de liaison URSI/CCIR/CCITT dépendait de manière excessive de la bonne volonté de scientifiques individuels associés à l'URSI, et que son mandat n'était pas suffisamment bien défini;

- (e) qu'un Comité scientifique, nanti d'un mandat précis mais pas trop restrictif, serait plus efficace,

*décide*

1. de créer un Comité scientifique des télécommunications ayant pour mandat le texte suivant:

"Le Comité scientifique des télécommunications a pour objectif de faciliter la collaboration entre les Commissions de l'URSI, mais aussi la collaboration entre ces dernières et les Commissions d'études du CCIR et du Comité Consultatif de Télégraphie et de Téléphonie (CCITT), pour l'étude des aspects scientifiques des problèmes de télécommunication.

Le Comité comprend, entre autres, les Présidents des Commissions de l'URSI concernées, ou bien leurs délégués, et des représentants désignés par le CCIR et le CCITT.

Il aura pour mission:

- (a) d'identifier les facteurs susceptibles d'influencer l'évolution à long terme des télécommunications;
  - (b) de tenir les scientifiques associés à l'URSI au courant des problèmes spécifiques posés par l'évolution des télécommunications;
  - (c) de porter à la connaissance du CCIR et du CCITT les résultats de la recherche fondamentale ayant de l'importance pour les télécommunications;
  - (d) d'aider le CCIR et le CCITT à formuler avec précision les questions adressées à la communauté scientifique, et plus spécialement à l'URSI;
  - (e) en stimulant les études et l'organisation de colloques, de préparer les réponses de l'URSI à ces questions sous forme appropriée,
2. de désigner L. Barclay (Royaume-Uni) et P. Delogne (Belgique) respectivement comme Président et Vice-Président du nouveau Comité.

#### U.4 Statuts de l'URSI

Le Conseil de l'URSI,

*ayant examiné* le projet de revision des Statuts de l'Union,  
*décide* d'approuver ce projet, sous réserve de légères modifi-



cations à la rédaction des Articles 1 et 13.

#### U.5 Présidents d'honneur

Le Conseil de l'URSI,

*considérant* qu'il a pouvoir de conférer le titre de Président d'honneur à d'anciens membres du Bureau qui ont apporté une contribution particulièrement remarquable à la réalisation des buts de l'Union,

*décide* de conférer le titre de Président d'honneur

au Professeur W.E. Gordon, et  
au Professeur F.L.H.M. Stumpers

en reconnaissance des éminents services qu'ils ont rendus et ne cessent de rendre à l'Union.

#### U. 6 Admission de nouveaux Comités Membres

Le Conseil de l'URSI,

*ayant examiné* les demandes d'admission présentées par les institutions scientifiques suivantes:

- (a) King Abdulaziz City for Science and Technology, Arabie Saoudite, comme Membre de l'Union;
- (b) le Conseil de la Recherche scientifique de la Jamaïque, le Conseil national de Science et de Technologie de Grenada, et le Conseil de la Recherche scientifique et technique de Turquie, comme Membres associés,

*décide* d'accepter ces demandes sous réserve que ces institutions satisfassent aux conditions prévues par les Statuts de l'URSI.

#### U.7 Réseau de Correspondants

Le Conseil de l'URSI,

*ayant pris connaissance* des recommandations formulées par le Comité permanent pour l'adhésion à l'URSI,

*décide* de créer comme suit un Réseau de Correspondants de l'URSI:

- (i) tout scientifique participant à une Assemblée générale de l'Union pourra s'inscrire comme correspondant pour une période de trois ans moyennant paiement d'une somme spéciale lors de son inscription à l'Assemblée;
- (ii) les scientifiques qui n'ont pas la possibilité d'assister à une Assemblée générale pourront adhérer au réseau de correspondants en s'adressant directement au Secrétariat de l'URSI pour verser la somme spéciale mentionnée en (i);
- (iii) les scientifiques de pays en développement pourront être inclus gratuitement au réseau de correspondants selon un mécanisme à définir;
- (iv) les correspondants faisant partie du réseau seront tenus au courant des activités de l'Union;
- (v) ils n'auront pas droit de vote, mais seront autorisés à émettre leur avis sur les questions de caractère scientifique au sein des Commissions.

#### U.8 Finances de l'Union et composition du Comité permanent des finances

Le Conseil de l'URSI,

*ayant pris connaissance* des recommandations formulées dans le rapport du Comité permanent des finances, en date du 4 septembre 1990,

*décide*

1. d'accepter les recommandations précitées;
2. d'approuver les comptes certifiés de l'Union pour les exercices prenant fin au 31 décembre 1987, 1988 et 1989;
3. de publier les rapports du Trésorier et du Comité des finances dans le Volume XXII des *Comptes Rendus des Assemblées générales de l'URSI*;
4. d'exprimer au Dr. H.J. Albrecht sa gratitude pour les éminents services qu'il a rendus à l'Union en sa qualité de Trésorier;
5. de désigner les personnalités suivantes comme membres du Comité permanent des finances pour les trois années à venir:

Président: K. Géher (Hongrie)

Membres : C. Butler (EUA)  
F. Gardiol (Suisse)  
J.G. Lucas (Australie)  
S. Radicella (Argentine)  
F.W. Sluijter (Pays-Bas)  
S. Swords (Irlande).

U.9 Publications de l'URSI et composition du Comité permanent des publications

Le Conseil de l'URSI,

*estimant* que la mise en oeuvre des recommandations formulées dans le rapport du Comité permanent des publications, en date du 4 septembre 1990, contribuera à augmenter le rayonnement de l'URSI en diffusant largement des informations sur ses activités,

*décide*

1. d'approuver les recommandations susmentionnées;
2. de publier le rapport du Comité permanent des publications dans le Volume XXII des *Comptes Rendus des Assemblées générales de l'URSI*;
3. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président: P.J.B. Clarricoats (Royaume-Uni)

Membres : S.A. Bowhill (EUA)  
P. Delogne (Belgique)  
R.L. Dowden (Nouvelle Zélande)  
K. Géher (Hongrie)  
G. Hyde (EUA)  
R. Stone (EUA).

U.10 Comité permanent pour l'adhésion à l'URSI

Le Conseil de l'URSI,

*considérant* que le Comité permanent pour l'adhésion à l'URSI a joué un rôle important au cours des trois années écoulées dans la conduite des consultations sur la possibilité d'introduire de nouvelles catégories de membres,

*décide*

1. d'étendre le mandat de ce Comité (Rés.C.8, Lima 1975) comme suit:
  - (i) proposer des moyens propres à porter les activités de l'URSI à l'attention des scientifiques radioélectriciens dans les territoires où il n'y a pas de Comité Membre de l'URSI,
  - (ii) étudier toutes les questions relatives aux catégories de membres de l'URSI et faire rapport au Conseil,
  - (iii) examiner, à l'occasion de chaque Assemblée générale, le statut des Comités Membres associés et présenter à ce sujet ses recommandations au Conseil;
2. d'exprimer sa gratitude au Dr. M. Petit, Président du Comité, pour le travail qu'il a effectué au cours des trois années écoulées et, en particulier, pour ses comptes rendus détaillés des consultations citées;
3. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président: T.B.A. Senior (EUA)

Membres : S. Okamura (Japon)  
M. Petit (France)  
J. Shapira (Israël)  
V. Shevchenko (URSS)  
Yu-Kai Chen (Chine, SRS).

U. 11 Comité permanent pour les pays en développement

Le Conseil de l'URSI,

*ayant pris connaissance*

- (a) du rapport d'activités 1988-1990 du Comité permanent pour les pays en développement;
- (b) des propositions faites par ce Comité concernant ses futures activités,

*considérant* que l'URSI doit poursuivre ses efforts en faveur du développement de la science des télécommunications et de la formation des scientifiques radioélectriciens dans les pays en développement,

*décide*

1. d'approuver le plan d'action présenté par le Comité pour la période 1991-1993, lequel prévoit la publication d'un *Manuel de l'URSI sur la propagation terre-espace dans les régions tropicales*, ainsi que l'organisation de deux cycles d'études sur la propagation radioélectrique, en collaboration avec le Centre International de Physique Théorique (CIPT);
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président: S. Radicella (Argentine)

Membres : G.O. Ajayi (Nigeria)  
M.S. Assis (Brésil)  
Feng Shizhang (Chine, CIE)  
J.O. Oyinloye (Nigeria)  
B. Reddy (Inde)  
J. Voge (France).

#### U.12 Comité permanent pour les Assemblées générales de l'URSI

Le Conseil de l'URSI,

*considérant*

- (a) que le nombre de participants aux Assemblées générales de l'Union n'a cessé de s'accroître au fil des années;
- (b) que, pour organiser une Assemblée générale, le Comité d'organisation doit engager des efforts très considérables et assurer tous les moyens logistiques appropriés;
- (c) qu'il est essentiel d'informer les Comités Membres de toutes les conditions requises pour l'organisation d'une réunion de cette envergure,

*décide*

1. de demander aux membres du Comité, lorsqu'ils sollicitent des invitations pour l'organisation d'une Assemblée générale, de garder les points susmentionnés à l'esprit;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président: T. Okoshi (Japon)

Membres : J.W. Klein (Allemagne)

I.A. Salem (Egypte)  
A.M. Scheggi (Italie)  
E.M. Zhabotinskij (URSS)  
V. Zima (Tchécoslovaquie).

U.13 Programme International Géosphère-Biosphère et Programme  
Mondial de Recherche sur le Climat

Le Conseil de l'URSI,

*considérant*

- (a) que l'Union a un rôle à jouer dans le programme de coopération inter-disciplines lancé par le Conseil International des Unions Scientifiques (CIUS) sous le titre "Programme International Géosphère-Biosphère: Etude globale de leur Evolution" (IGBP);
- (b) qu'il serait souhaitable que l'URSI s'associe au Programme Mondial de Recherche sur le Climat (WRPC), organisé conjointement par le CIUS et l'Organisation Météorologique Mondiale (OMM) et lancé dès 1980;
- (c) que l'URSI est susceptible d'apporter d'importantes contributions à ces deux programmes étant donné, plus spécialement, son expérience des méthodes radioélectriques de télé-détection et du traitement des données,

*décide*

1. d'élargir le mandat du Comité de l'URSI pour le Programme International Géosphère-Biosphère de manière à inclure aussi le Programme Mondial de Recherche sur le Climat;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président: G. Brussaard (Pays-Bas)

Membres : W.E. Gordon (EUA)  
A. Guissard (Belgique)  
J. Gower (Canada)  
H. Hallikainen (Finlande)  
N. Matuura (Japon)  
M. Petit (France)  
S. Radicella (Argentine)  
H. Rishbeth (Royaume-Uni)  
K. Serafimov (Bulgarie)

P.A. Watson (Royaume-Uni)  
A. Wernik (Pologne).

U.14 Année Internationale de l'Espace

Le Conseil de l'URSI,

*ayant pris connaissance* du rapport dans lequel le Prof.W.E. Gordon, Président du Groupe ad hoc pour l'Année Internationale de l'Espace, donne un aperçu général des préparatifs en vue de l'AIE en 1992,

*notant* que, dans la conclusion de ce rapport, il est dit qu'il ne semble pas y avoir de rôle scientifique à jouer par les Unions dans ce programme,

*décide* de dissoudre le Groupe ad hoc pour l'Année Internationale de l'Espace.

U.15 Groupe ad hoc sur les conséquences d'une guerre nucléaire pour l'environnement

Le Conseil de l'URSI,

*notant* que les conclusions scientifiques du projet SCOPE-ENUWAR, pour lequel le Groupe ad hoc de l'URSI a préparé une "Déclaration de fait sur l'impulsion électromagnétique nucléaire et ses retombées", ont influencé les discussions des nations possédant des armes nucléaires, et ont été portées à l'attention de l'Organisation des Nations Unies,

*considérant* que ce Groupe pourrait encore être appelé à jouer un certain rôle dans l'avenir,

*décide* de maintenir le Groupe ad hoc sur les conséquences d'une guerre nucléaire pour l'environnement, composé des membres suivants:

Président: M. Wik (Suède)

Membres : W. Graf (EUA)  
D. Hansen (Suisse)  
J. Shiloh (Israël).

U.16 Comité permanent pour les jeunes scientifiques

Le Conseil de l'URSI,

*considérant*

- (a) que la participation de jeunes scientifiques aux Assemblées générales et aux colloques de l'Union et que les échanges entre jeunes scientifiques et scientifiques plus âgés revêtent une importance essentielle pour la vie de l'Union;
- (b) qu'un des moyens de contribuer au progrès de la radio-électricité scientifique dans les pays en développement consiste à faire participer les jeunes scientifiques de ces pays aux réunions de l'URSI;
- (c) que, depuis 1969, le Programme des jeunes scientifiques s'est avéré être l'une des entreprises les plus fructueuses de l'Union,

*décide*

- 1. de créer un Comité permanent pour les jeunes scientifiques;
- 2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président: E.V. Jull (Canada)

Membres : Feng Shizhang (Chine, CIE)  
D. Gjessing (Norvège)  
A.P. Mitra (Inde)  
T. Okoshi (Japon)  
G. Pillet (France)  
R. Sagalyn (EUA)  
T. Simtrakarn (Thaïlande)  
L. Zombory (Hongrie).

U.17 Comité de réflexion sur l'avenir de l'URSI

Le Conseil de l'URSI,

*reconnaissant*

- (a) qu'il est souhaitable de donner suite aux conclusions et suggestions formulées par la Conférence de Corsendonk de mars 1987;
- (b) qu'il est nécessaire d'établir des plans à long terme et de procéder à un examen approfondi de la structure et de l'organisation de l'URSI, afin de les adapter à des condi-



tions en évolution, pour mieux servir les intérêts de la communauté radio-scientifique,

*décide*

1. de créer un Comité de réflexion sur l'avenir de l'URSI;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président: E.V. Jull (Canada)

Secrétaire: P. Lagasse (Belgique)

Membres : P. Bauer (France)  
A.L. Cullen (Royaume-Uni)  
W.E. Gordon (EUA)  
J.G. Lucas (Australie)  
K. Serafimov (Bulgarie)  
J. Shapira (Israël).

U.18 Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel

Le Conseil de l'URSI,

*ayant pris connaissance* des recommandations formulées dans le rapport du Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel,

*notant* que le Dr. N.S. Nahman a exprimé le désir de cesser ses activités en tant que Président du Groupe de travail,

*décide*

1. de maintenir le Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel pendant la période 1990-1993;
2. d'exprimer au Dr. Nahman sa gratitude pour la façon dont il a dirigé les activités du Groupe depuis 1981;
3. de désigner T.K. Sarkar (EUA) comme Président du Groupe de travail.

U.19 Station de recherche sur la haute atmosphère

Le Conseil de l'URSI,

*notant* l'extrême importance qu'une station ionosphérique située

à proximité du bord oriental de l'anomalie de l'Atlantique Sud revêtirait pour les programmes de l'URSI et du CCIR,

*recommande* qu'une station de recherche sur la haute atmosphère soit établie dans cette région.

#### U.20 Centre de données pour les indices de l'activité solaire

Le Conseil de l'URSI,

*considérant*

- (a) qu'il importe de poursuivre l'acquisition des séries de données à long terme, en particulier du fait de l'intérêt accru qui est actuellement porté au Programme International Géosphère-Biosphère;
- (b) que le Centre de données pour les indices de l'activité solaire (SIDC), situé à l'Observatoire Royal de Belgique à Bruxelles, maintient une activité continue et très efficace,

*décide* d'accorder le patronage de l'URSI au Centre de données pour les indices de l'activité solaire, lequel est affilié à la Fédération des Services permanents d'analyse de données astronomiques et géophysiques (FAGS).

#### U.21 Observatoires de haute latitude

Le Conseil de l'URSI,

*considérant* le caractère complexe de l'ionosphère de haute latitude, son couplage étroit avec la magnétosphère, l'influence prépondérante qu'ont sur elle les champs magnétiques interplanétaires et le vent solaire,

*notant* que la surveillance continue que peuvent assurer les observatoires au sol est nécessaire à la compréhension des processus dynamiques de couplage,

*invite instamment* les autorités nationales à fournir leur soutien à l'installation et à coopérer au fonctionnement d'observatoires de haute latitude comprenant des ionosondes numériques modernes, des instruments optiques, des radars à diffusion cohérente et à diffusion incohérente et des équipements permettant la réception des signaux de satellites à balise.

U.22 Radars à diffusion incohérente et radars MST

Le Conseil de l'URSI,

*considérant*

- (a) que les radars à diffusion incohérente et les radars MST (mésosphère-stratosphère-troposphère) constituent de précieux outils pour l'étude de l'atmosphère;
- (b) qu'étant donné les faibles processus de diffusion mis en jeu, ces radars doivent émettre de fortes puissances sur des antennes à gain élevé et détecter de faibles signaux de retour dans un environnement à niveau de bruit élevé,

*notant* que des brouillages nuisibles à ces radars peuvent être provoqués par la congestion croissante du spectre, laquelle résulte de l'expansion et de l'utilisation des services radio,

*décide*

1. de porter ce problème à l'attention de l'Union Internationale des Télécommunications (UIT) et de ses organes techniques, le Bureau International d'Enregistrement des Fréquences (IFBR) et le Comité Consultatif des Radiocommunications (CCIR) et, en particulier, des autorités nationales des télécommunications par l'intermédiaire des Comités Membres de l'URSI;
2. de les inviter instamment à prendre des mesures appropriées pour minimiser les problèmes de brouillage aux emplacements des radars à diffusion incohérente et des radars MST,

*exprime l'espoir* que les attributions de fréquences se poursuivront, que des fréquences seront attribuées à ces radars sur base primaire et que, si possible, des zones de protection contre les brouillages seront établies autour des installations.

U.23 Bruits radioélectriques d'origine naturelle dus aux décharges orageuses

Le Conseil de l'URSI,

*reconnaissant* la possibilité d'intégrer aux futurs satellites météorologiques des instruments capables de fournir des données sur les décharges orageuses,

*décide* de réitérer et de mettre à jour sa Recommandation U.19,

adoptée à Tel Aviv en 1987, comme suit:

*considérant*

- (a) que la mission de la Commission E est de promouvoir la recherche scientifique dans le domaine des bruits électromagnétiques ambiants, bruits naturels dus aux décharges orageuses inclus;
- (b) que les projets de la NASA, de l'ESA et d'EUMETSAT d'adjoindre à de futurs satellites météorologiques un système permanent d'analyse, à l'échelle du globe, de l'activité orageuse serait susceptible d'améliorer de façon significative les prévisions à court et long terme des bruits radioélectriques;
- (c) que des observations optiques de haute précision portant sur la localisation, l'heure et l'amplitude, mises en corrélation avec des observations radioélectriques, pourraient être utilisées comme données complémentaires dans l'élaboration de modèles spatio-temporels des bruits radioélectriques;
- (d) qu'il est estimé que l'étude des bruits naturels dus aux orages contribuerait également à l'étude des siffleurs, de même qu'aux aspects géophysiques concernant la magnétosphère, le guide d'ondes Terre-ionosphère et ses limites, ainsi qu'à la recherche sur l'environnement terrestre;
- (e) que plusieurs relations ont été découvertes récemment entre l'électricité atmosphérique, les phénomènes météorologiques et l'environnement terrestre d'une part, et les décharges orageuses de l'autre;
- (f) que, vu la haute compétence de ses Commissions E et H, il serait très avantageux que l'URSI participe à l'élaboration des projets portant sur le traitement, l'interprétation et l'application des données issues du détecteur de décharges orageuses;
- (g) que l'URSI a souligné l'importance de données scientifiques pertinentes afin de disposer, pour notre société, de systèmes de communications fiables et de contribuer à la recherche géophysique, et qu'elle estime qu'un instrument, monté sur satellite, de cartographie des décharges orageuses contribuerait à la réalisation de cet objectif,

*notant* que les résultats d'un projet de ce genre présenteraient le plus vif intérêt pour l'Union Internationale des Télécom-

munications (UIT) et son organe technique, le Comité Consultatif International des Radiocommunications (CCIR),

*recommande instamment* aux organisations concernées que les possibilités offertes par ce projet de détecteur de décharges orageuses soient évaluées et que son intégration à un satellite météorologique soit sérieusement examinée.

#### U.24 Laboratoires de télédétection

Le Conseil de l'URSI,

*notant* les problèmes financiers auxquels se heurtent les laboratoires de télédétection dans les petits pays, plus spécialement en Europe de l'Est,

*décide*

1. que l'URSI appuie et encourage activement la participation de ces laboratoires aux expériences de télédétection internationales;
2. en particulier, qu'elle assure la diffusion, par la voie de ses publications régulières, de renseignements sur les programmes futurs ou en cours dans ce domaine, à l'intention des scientifiques des petits pays.

#### U.25 Protection des bandes de fréquences attribuées à la recherche spatiale, à la radioastronomie et à l'exploration de la Terre

Le Conseil de l'URSI,

*notant*

- (a) l'utilisation toujours croissante et la congestion du spectre radioélectrique qui en résulte;
- (b) le nombre croissant des services utilisant des engins aéroportés et des satellites;
- (c) l'utilisation accrue de la technique d'étalement du spectre et d'autres techniques de modulation à large bande;
- (d) le nombre de plus en plus élevé de cas de brouillages nuisibles provenant de services fonctionnant dans des bandes adjacentes et, même, fonctionnant à des fréquences

éloignées;

- (e) le perfectionnement des techniques de filtrage et de réception,

*décide* d'inviter instamment le Directeur du Comité Consultatif des Radiocommunications (CCIR)

1. à attirer l'attention des Administrations Membres sur la nécessité urgente d'éviter les brouillages nuisibles dans les bandes de fréquences attribuées à la recherche spatiale, à la radioastronomie et à l'exploration de la Terre, et de tenir compte du fait que les observations passives de ces services exigent de détecter des signaux avec la plus grande sensibilité possible et que toute émission, intentionnelle ou fortuite, dans ces bandes est nuisible, particulièrement si elle provient de satellites ou d'engins aéroportés;
2. à entamer dans ce but les démarches nécessaires en vue de l'établissement de normes techniques appropriées.

#### U.26 Utilisation du spectre radioélectrique

Le Conseil de l'URSI

*demande instamment* au Comité Consultatif International des Radiocommunications (CCIR) et à ses Administrations Membres de reconnaître l'importance de l'utilisation scientifique du spectre radioélectrique, plus particulièrement pour l'exploration de la Terre, la radioastronomie et la recherche spatiale, lesquelles jouent un rôle primordial dans la surveillance des ressources naturelles et du fragile écosystème de la Terre, ainsi que dans l'exploration de l'Univers,

*adresse ses félicitations* au Comité Consultatif International des Radiocommunications pour les efforts incessants qu'il engage afin

- (i) d'établir le cadre technique permettant l'utilisation efficace et économique du spectre radioélectrique,
- (ii) d'assurer aux services passifs une protection adéquate contre les brouillages nuisibles, en particulier ceux provenant d'émetteurs aéroportés et spatiaux,

*exprime sa conviction* que les directives techniques du CCIR permettront d'assurer l'utilisation rationnelle du spectre des fréquences radioélectriques, ainsi que sa conservation et sa protection.

U.27 Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale (IUCAF)

Le Conseil de l'URSI,

*considérant*

- (a) que la demande adressée par le Conseil International des Unions Scientifiques (CIUS) à la Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale (IUCAF), dont l'URSI est l'Union mère, d'élargir son mandat de manière à ajouter la télédétection passive à la radioastronomie et à la science spatiale;
- (b) l'extrême importance des travaux de l'IUCAF dans l'obtention d'attributions de fréquences appropriées pour les besoins de la communauté scientifique et la protection de ces fréquences contre les brouillages nuisibles,

*décide*

1. d'approuver l'extension du mandat de l'IUCAF dont question ci-dessus;
2. de maintenir son assistance financière en faveur des activités de la Commission.

U.28 XXIV Assemblée générale

Le Conseil de l'URSI,

*ayant examiné* les invitations présentées par les Comités Membres de l'URSI en Chine (CIE, Pékin), en Inde et au Japon pour la tenue de la XXIVe Assemblée générale,

*décide*

1. d'accepter l'invitation du Comité japonais d'organiser la XXIVe Assemblée générale à Kyoto du 25 août au 2 septembre 1993;
2. d'exprimer ses remerciements aux Comités chinois (CIE, Pékin) et indien pour leurs aimables invitations.

U.29 Subventions de l'UNESCO et du CIUS

Le Conseil de l'URSI,

*considérant*

- (a) que l'Union consacre une part considérable de ses activités à l'organisation de réunions et de colloques scientifiques internationaux, à la production de publications et à son Programme de jeunes scientifiques;
- (b) que les subventions accordées à l'URSI par l'UNESCO et le CIUS permettent de couvrir en partie les frais de ces activités,

*décide* d'exprimer à ces deux organisations sa vive gratitude pour le précieux appui qui lui est ainsi fourni.

U.30 Remerciements au Comité tchécoslovaque de l'URSI

Le Conseil de l'URSI

*décide* à l'unanimité d'adresser sa très sincère gratitude au Comité tchécoslovaque de l'URSI pour l'invitation de tenir la XXIIIe Assemblée générale à Prague. L'accueil cordial et généreux qui a été réservé aux participants, ainsi que l'excellence des dispositions prises par le Comité local pour l'organisation des séances scientifiques et administratives et, en particulier, pour le rassemblement et la publication sur place d'un grand nombre de résumés, sont dignes des plus vifs éloges. Il exprime aux hôtes tchécoslovaques sa profonde appréciation pour la mise en oeuvre d'un programme social particulièrement agréable et réussi, ainsi que pour la chaleureuse bienvenue adressée aux personnes accompagnant les participants à l'Assemblée.



RESOLUTIONS ET RECOMMANDATIONS

DES COMMISSIONS

COMMISSION A - METROLOGIE ELECTROMAGNETIQUE

A.1 Comparaisons de temps

La Commission A,

*considérant*

- (a) que les satellites offrent la meilleure méthode pratique pour la comparaison de la fréquence des étalons primaires de fréquence qui sont maintenus dans les différents laboratoires nationaux;
- (b) qu'il en est de même pour ce qui concerne la comparaison des échelles de temps;
- (c) que l'échelle de Temps Atomique International (TAI), qui est établie par le Bureau International des Poids et Mesures (BIPM), est basée pour l'essentiel sur les comparaisons de temps effectuées au moyen de satellites;
- (d) que les systèmes de navigation par satellite existants, tels que GPS et GLONASS, sont susceptibles de fournir des comparaisons de temps ayant le niveau de précision requis pour ces applications;
- (e) que ces mêmes systèmes par satellite sont utilisés dans d'autres disciplines scientifiques, telles que la géodésie et les sciences de la Terre,

*recommande* que les autorités responsables de la maintenance de ces systèmes de navigation fassent en sorte, dans la mesure du possible, que les performances de ces systèmes ne subissent aucune dégradation intentionnelle qui pourrait nuire à leur utilisation scientifique générale.

A.2 Diodes laser et lasers à état solide pompés par diode laser

La Commission A,

*considérant*

- (a) qu'il est nécessaire de disposer de lasers accordables

simples à faible largeur de raie d'émission pour les applications métrologiques;

- (b) que les diodes laser et les lasers à état solide pompés par diode laser sont peu onéreux, ont une longue durée de vie et des dimensions réduites;
- (c) que les lasers à fréquence unique ne sont disponibles que pour quelques longueurs d'ondes seulement,

*émet l'avis*

- 1. qu'il convient de poursuivre le développement de tels lasers afin d'obtenir un rayonnement laser dans la gamme la plus large possible du spectre visible et proche infrarouge;
- 2. qu'il convient également de poursuivre la recherche visant à améliorer la pureté spectrale de leur émission;
- 3. que les méthodes d'accord continu reproductible des fréquences devraient être étudiées,

#### A.3 Raccordement des mesures effectuées au moyen d'analyseurs automatiques de réseau

La Commission A,

*considérant*

- (a) que l'utilisation d'analyseurs automatiques de réseau pour les mesures aux fréquences radioélectriques et aux hyperfréquences est largement répandue, tant dans le domaine scientifique que dans le domaine industriel;
- (b) qu'il est nécessaire de définir une méthode largement acceptée pour vérifier les performances de ces instruments complexes, plus particulièrement en relation avec les procédures d'homologation des laboratoires;
- (c) qu'il est également nécessaire de développer des normes de transfert pour l'étalonnage des analyseurs automatiques de réseau,

*émet l'avis* que des études devraient être entreprises pour développer des techniques communes et des normes de transfert appropriées.

#### A.4 Unités du Système International

La Commission A,

*considérant*

- (a) que le Système International d'unités a enregistré des progrès qui ont permis de passer d'un système d'unités représentées pour la plupart par des étalons basés sur des artefacts à un système dont les unités sont fondées principalement sur des constantes physiques;
- (b) que cette évolution est particulièrement avantageuse pour la communauté radio-scientifique en ce qu'elle assure une uniformité à l'échelle mondiale de réalisation des unités électriques;
- (c) que ce progrès a été rendu possible par l'étude des concepts fondamentaux à la base de la réalisation pratique d'étalons le plus souvent bien acceptés,

*émet l'avis* que les laboratoires de métrologie devraient être encouragés à poursuivre la recherche fondamentale tendant à améliorer la réalisation pratique actuelle des unités du Système International, mais aussi qu'ils devraient être invités à collaborer afin d'éviter les doubles emplois et d'augmenter, si possible, l'efficacité de leurs travaux.

#### COMMISSION B - ONDES ET CHAMPS

##### B.1 Colloque sur la Théorie des ondes électromagnétiques

La Commission B,

*considérant*

- (a) que les colloques de l'URSI sur la Théorie des ondes électromagnétiques se sont succédé à intervalles de trois ans depuis près de 40 ans;
- (b) que ces colloques revêtent une importance majeure et représentent l'essentiel des activités de la Commission B entre les Assemblées générales,

*confirme* que le prochain colloque de cette série aura lieu à Sydney, Australie, du 17 au 20 août 1992.

## B.2 Copatronage de conférences internationales

La Commission B,

*considérant* que certaines conférences internationales à venir présentent un intérêt direct pour la Commission,

*recommande* que l'URSI accorde son patronage aux conférences suivantes:

- les 20e, 21e et 22e Conférences européennes sur les Hyperfréquences, en 1990, 1991 et 1992;
- les Journées Internationales sur les Antennes (JINA) en 1990 et 1992;
- les 7e et 8e Conférences internationales sur les Antennes et la Propagation (ICAP) en 1991 et 1993;
- les 3e et 4e Conférences Asie-Pacifique sur les Hyperfréquences (APMC) en 1990 et 1992;
- la Conférence radio-scientifique nord-américaine et le Colloque international de la Société Antennes et Propagation de l'IEEE en 1991;
- le Symposium international sur les Antennes et la Propagation (ISAP) en 1992.

## B.3 Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel

La Commission B,

*considérant* les activités développées par le Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel et, en particulier, le grand intérêt suscité par la séance commune organisée au cours de la présente Assemblée générale,

*recommande*

1. le maintien du Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel;
2. la désignation de T.K. Sarkar (EUA) comme Président de ce Groupe.

## B.4 Dates des Assemblées générales de l'URSI

La Commission B,

*notant* que le début des dernières Assemblées générales de

l'Union s'est situé de plus en plus tard au mois d'août, *considérant* qu'une Assemblée générale empiétant sur le mois de septembre présente quelques inconvénients pour les membres du personnel académique d'Amérique du Nord et d'ailleurs, lesquels sont appelés à donner cours et à faire passer des examens pendant cette période,

*demande* qu'il soit fait en sorte que cette date soit avancée pour l'Assemblée générale à Kyoto en 1993,

*recommande* que le Bureau de l'URSI forme un Comité ad hoc ayant pour mission d'examiner la question des dates les plus appropriées pour la tenue des futures Assemblées générales de l'Union.

## COMMISSION C - SIGNAUX ET SYSTEMES

### C.1 Colloques et conférences

La Commission C

*recommande*

1. que l'URSI accorde son soutien aux colloques suivants, pour lesquels les organisateurs ont déjà fourni tous les renseignements requis:
  - 2e Symposium de l'URSI sur les Signaux, les Systèmes et l'Electronique (ISSSE'92), organisé conjointement par les Commissions C et D,
  - 3e Colloque international sur les Progrès récents en technologie hyperfréquences (ISRAMT'91), Mode A,
2. que l'URSI accorde son soutien aux conférences suivantes, sous réserve que les renseignements requis soient fournis au Secrétariat de l'URSI:
  - Séminaire international de Zurich sur la Communication numérique,
  - Conférence européenne sur le Traitement du signal (EUSIPCO),
  - Conférence européenne sur la Théorie et la conception des circuits (ECCTD),
  - Conférence sur les Réseaux intelligents,
  - Conférence sur le Traitement numérique du signal,
  - Colloque sur les Hyperfréquences (MICROCOLL).

C.2 XXIVe Assemblée générale symposia communs à plusieurs Commissions

La Commission C

*recommande* le choix des sujets suivants pour les symposia communs à plusieurs Commissions à organiser pendant l'Assemblée générale de 1993:

- (i) Antennes à traitement de signal, en commun avec la Commission B,
- (ii) Communications à large bande et propagation multipoint, en commun avec les Commissions F et G.

COMMISSION D - DISPOSITIFS ELECTRONIQUES ET OPTIQUES  
ET APPLICATIONS

D.1 Changement du titre de la Commission

La Commission D,

*considérant* que les télécommunications font l'objet d'un intérêt accru au sein de l'URSI et que celles-ci sont étroitement liées au domaine qu'elle couvre,

*décide*

1. d'étendre son champ d'activité de manière à dépasser le rôle traditionnel de "Commission de service" qui était le sien;
2. de modifier son mandat en conséquence ;
3. de remplacer son titre actuel: "Dispositifs électroniques et optiques et applications" par le titre suivant: "Electronique et photonique".

*Note: Pour le nouveau mandat de la Commission D, voir la Résolution U.1 du Conseil.*

D.2 XXIVe Assemblée générale: séances scientifiques

La Commission D,

*considérant* les termes de sa Résolution D.1,

*décide* de modifier sa politique traditionnelle qui consistait

à organiser ses séances scientifiques à l'Assemblée générale sur base de communications invitées, et d'admettre dorénavant des communications proposées; la question de savoir si toutes ses séances ou seulement quelques-unes d'entre elles feront l'objet d'appels à communications sera tranchée en cours d'organisation.

### D.3 "Review of Radio Science"

La Commission D,  
*considérant*

- (a) que l'on ne sait pas exactement à quel public s'adresse la "Review of Radio Science";
- (b) que la Commission D couvre des domaines d'intérêt scientifique et technique extrêmement vastes;
- (c) qu'étant donné les restrictions existantes quant au nombre de pages, il n'est pas possible de produire un exposé cohérent dans la forme actuelle;
- (d) qu'il y a un manque d'uniformité pour ce qui concerne la sélection des références à citer,

*décide*

1. que le texte sera rédigé par des experts invités à préparer des exposés de synthèse sur des sujets déterminés ressortissant au domaine de la Commission D et présentant une importance particulière;
2. qu'une liste de références, constituée à partir des listes soumises par les Membres officiels de la Commission des articles publiés dans les revues internationales à comité de lecture, sera enregistrée sur une diskette consacrée à la Commission D et ayant un format compatible avec les microordinateurs classiques PC et Macintosh.

### D.4 Patronage de conférences internationales

La Commission D

*recommande* le patronage ou le copatronage, selon le cas, des conférences suivantes:

- Symposium International sur les Signaux, les Systèmes et l'Electronique (ISSSE'92), Paris, France, 1-4 septembre 1992, organisé conjointement par les Commissions C et D,
- Conférences européennes sur les Communications optiques (ECOC) en 1991, 1992 et 1993,
- Conférences européennes sur les Hyperfréquences en 1991, 1992 et 1993,
- Conférence internationale sur les Circuits intégrés et les circuits à état solide (ICSIC), Pékin, Chine, octobre 1992,
- 4e Conférence Asie-Pacifique sur les Hyperfréquences (APMC) en 1992.

## COMMISSION E - BRUITS ET BROUILLAGES ELECTROMAGNETIQUES

### E.1 Bruit radioélectrique

La Commission E,

*considérant*

- (a) que le Rapport 322-3 du CCIR présente un modèle mondial du bruit radioélectrique atmosphérique dû aux décharges orageuses;
- (b) que les brouillages causés par des signaux d'autres utilisateurs sur des fréquences allouées dans la bande HF sont susceptibles de réduire davantage encore les performances des systèmes de communication;
- (c) qu'il n'existe pas à l'heure actuelle de modèle mondial de ces brouillages,

*recommande* qu'un programme de collaboration internationale soit encouragé pour développer un modèle mondial de probabilité d'apparition de brouillages causés par des signaux HF d'autres utilisateurs, en fonction de la fréquence (par bandes allouées), de la largeur de bande, de l'heure, de la saison et du nombre de taches solaires, ceci pour des antennes omnidirectionnelles et, dans la mesure du possible, des antennes directionnelles.

### E.2 Groupes de travail

La Commission E

*décide* d'établir les Groupes de travail suivants:



- E.1 Gestion et utilisation du spectre  
Président: R.D. Parlow (EUA),
- E.2 Bruit non gaussien dans les communications  
Président: A.D. Spaulding (EUA),
- E.3 Electromagnétique de forte puissance  
Président: R.L. Gardner (EUA),
- E.4 Bruit electromagnétique terrestre et planétaire  
Co-présidents: M. Hayakawa (Japon) et E.K. Smith (EUA),
- E.5 Interactions avec les systèmes électriques complexes  
et leurs protections  
Co-présidents: C. Baum (EUA), P. Degauque (France) et  
M. Ianoz (Suisse),
- E.6 Effets des phénomènes transitoires sur les équipements  
Co-présidents: V. Scuka (Suède) et B. Demoulin (France),
- E.7 Bruits et chaos dans l'environnement météoroélectrique  
extraterrestre et terrestre  
Président: H. Kikuchi (Japon).

### E.3 Copatronage de conférences

La Commission E

*recommande* le copatronage par l'URSI des symposia suivants:

- Symposium de Zurich sur la Compatibilité électromagnétique, 1991,
- Symposium international COMMSPHERE, 23-25 avril 1991, Ismèl,
- Symposium de Beijing sur la Compatibilité électromagnétique, mai 1992 (sous réserve que les renseignements requis soient fournis par les organisateurs),
- Symposium de Wrocław sur la Compatibilité électromagnétique, juin 1992,
- Symposium de Zurich sur la Compatibilité électromagnétique, 1993.

COMMISSION F - PROPAGATION DES ONDES ET TELEDETECTION

F.1 Patronage de conférences internationales

La Commission F,

*recommande* le patronage ou le copatronage, selon le cas, des conférences suivantes:

Mode A

- Conférence internationale sur la Propagation des ondes dans les milieux aléatoires, Seattle, EUA, 1992 (membre URSI: A. Ishimaru),
- Colloque sur les Facteurs régionaux dans la prévision de l'affaiblissement des ondes radioélectriques par les précipitations, Rio de Janeiro, décembre 1990 (membre URSI: M.P.M. Hall),
- Conférences internationales sur les Antennes et la propagation (ICAP) en 1991 (York, Royaume-Uni) et 1993 (membre URSI: M.P.M. Hall),
- Symposium sur la Diffusion électromagnétique par la surface de l'océan (membre URSI: J. Apel),

Mode B

- Symposium international COMMSPHERE, Herzlia, Israël, 1991 (membre URSI: J. Shapira),
- Symposium sur la Propagation des ondes et la télédétection, Malaisie, 1992 (membre URSI: P.A. Watson),
- Symposium sur les Signatures en hyperfréquences, Munich, Allemagne, juin 1992 (membre URSI: M. Chandra),
- Symposium international de Géoscience et de télédétection (IGARSS) en 1991 (membre URSI: I.V. Lindell), en 1992 et 1993.

F.2 Coordination avec IGARSS'93

La Commission F,

*considérant* la nécessité de planifier les déplacements des scientifiques de façon efficace et économique,

*recommande* que l'URSI prenne les mesures appropriées pour coordonner les dates de l'Assemblée générale de l'URSI avec celles du Symposium international de Géoscience et de télédétection (IGARSS), réunions qui doivent se tenir toutes deux au Japon en 1993.

COMMISSION G - RADIOELECTRICITE IONOSPHERIQUE ET PROPAGATION

G.1 Groupes de travail

La Commission G

*décide*

1. de maintenir les Groupes de travail suivants:
  - G.1 Groupe Conseil du réseau d'ionosondes (INAG)  
Président: P.J. Wilkinson (Australie)  
Secrétaire: R. Conkright (EUA),
  - G.2 Etude de l'ionosphère au moyen de satellites à balise  
Président: R. Leitinger (Autriche)  
Vice-Présidents: J.A. Klobuchar (EUA),  
T.R. Tyagi (Inde);
2. de maintenir le Groupe de travail GH.1 "Diffusion incohérente", dont la Commission H s'est retirée, en tant que Groupe de travail G.3, Président: J.M. Holt (EUA) et Vice-Président: P.J.S. Williams (Royaume-Uni);
3. de fusionner les Groupes de travail G.3 et G.4 en un seul Groupe de travail G.4 "Informatique ionosphérique", Président: B.W. Reinisch (EUA) et Vice-Président: D. Anderson (EUA), avec pour mandat:  
"de promouvoir l'application des méthodes de la théorie de l'information à l'acquisition, le traitement, le stockage et la distribution des données ionosphériques, et aider au développement de modèles physiques et empiriques de l'ionosphère".

G.2 Groupes de travail communs à plusieurs Commissions

La Commission G

*décide*

1. de maintenir le Groupe de travail commun aux Commissions G et H: "GH.2 Expériences, simulation et analyse par ordinateur des processus d'ondes dans les plasmas", représentant de la Commission G: S. Ossakow (EUA);
2. de former un nouveau Groupe de travail avec la Commission H: "GH.1 Expériences actives dans les plasmas", représentant de la Commission G: Sa Basu (EUA);

3. de s'associer au Groupe de travail commun aux Commissions C et H "Analyse des ondes", sous le nouveau titre: "CGH.1 Analyse des ondes et de la turbulence".

### G.3 Contribution de l'URSI à la FAGS

La Commission G

*recommande* que l'URSI continue de verser à la Fédération des Services permanents d'analyse de données astronomiques et géophysiques (FAGS) une contribution annuelle de 2.000 dollars US à attribuer à parts égales au Service International des Ursigrammes et des journées mondiales (IUWDS) et au Centre de données pour les indices de l'activité solaire (SIDC).

### G.4 Représentation de la Commission G

La Commission G

*décide* de désigner les représentants suivants:

- Comité de l'URSI pour le Programme international Géosphère-Biosphère (ICBP): A.W. Wernik (Pologne),
- Groupe de travail inter-Unions de télédétection TBF/EBF de l'ionosphère et de la magnétosphère: A.J. Smith (Royaume-Uni),
- Ionosphère internationale de référence (URSI/COSPAR): L. Bossy (Belgique).

### G.5 Patronage de colloques 1991-1993

La Commission G

*recommande* que l'URSI patronne, en Mode B, les colloques suivants pendant la période 1991-1993, sous réserve que les organisateurs soumettent les demandes réglementaires:

- Modification artificielle de l'ionosphère, Suzdal, URSS, 1991,
- Symposium du Groupe de travail "Etude de l'ionosphère au moyen de satellites à balise", Boston, EUA, 1992,
- Conférence internationale sur les Sciences de l'atmosphère moyenne, Kyoto, Japon, 23-26 mars 1992,
- Conférence internationale sur la Propagation des ondes dans les milieux aléatoires, Seattle, EUA, août 1992,

- Symposium sur l'Ionosphère de haute latitude, Fairbanks, EUA, 1992.

#### G.6 Bulletin de l'INAG

La Commission G,

*reconnaisant* le rôle important que joue le Bulletin du Groupe Conseil du réseau ionosphérique (*INAG Bulletin*) dans le maintien du réseau mondial des stations ionosphériques et de la qualité des données acquises par celui-ci,

*recommande* que l'URSI maintienne ses contributions financières pour la publication de ce Bulletin pendant les trois années à venir,

*exprime ses remerciements* au Centre Mondial de données (WDC-A) de Boulder pour le précieux appui qu'il fournit en vue de la production de ce Bulletin.

#### G.7 Formatage des paramètres ionosphériques

La Commission G,

*considérant*

- (a) la nécessité de disposer de paramètres ionosphériques;
- (b) le nombre toujours croissant des données ionosphériques numérisées qui sont obtenues à partir d'ionogrammes analogiques et d'ionogrammes numériques dépouillés automatiquement,

*reconnaisant* que, en collaboration avec les Centres mondiaux de données, le Groupe de travail G.4 "Informatique Ionosphérique" a développé, lors de sa réunion de Lowell en juillet 1989, un format de données qui a été largement distribué et discuté,

*décide* que les paramètres ionosphériques qui sont archivés dans les Centres mondiaux de données seront formatés dans le cadre de la base de données du Groupe de travail, et que les données qui ne répondent pas à un certain critère de qualité seront signalées comme telles.

### G.8 Système de navigation TBF OMEGA

La Commission G,

*considérant* que la propagation d'ondes TBF entretenues constitue un moyen efficace pour étudier l'ionosphère en-dessous de 100 km,

*notant* que le système de navigation TBF OMEGA peut être utilisé à cet effet, en collaboration avec l'Association internationale OMEGA et l'Agence de sécurité en mer japonaise,

*recommande* le maintien du système de navigation TBF OMEGA pour la surveillance permanente de la basse ionosphère.

### COMMISSION H - ONDES DANS LES PLASMAS

#### H.1 Importance des expériences de simulation numérique et établissement de centres de superordinateurs pour l'étude des plasmas au moyen de méthodes radioélectriques

La Commission H,

*considérant*

- (a) que les expériences de simulation numérique produisent des résultats nouveaux et très intéressants sur les processus non linéaires liés aux ondes dans les plasmas spatiaux;
- (b) que ces expériences exigent des temps de calcul et des mémoires considérables des superordinateurs;
- (c) que les demandes de calculs sur superordinateurs s'accroissent rapidement dans le domaine de la radioélectricité scientifique,

*recommande* d'attirer l'attention des administrations nationales sur l'importance des nouvelles techniques de calcul dans l'étude des plasmas spatiaux au moyen de méthodes radioélectriques, ainsi que sur l'avantage qu'il y aurait à établir à cette fin des centres de superordinateurs dans les différentes parties du monde.

## H.2 Patronage de colloques et de conférences

La Commission H

*recommande* le copatronage par l'URSI des conférences suivantes:

- Modification artificielle de l'ionosphère, Suzdal, URSS, 1991,
- 4e Ecole internationale de Simulation de plasmas spatiaux, Nara, Japon, 1991 (Mode B),
- XXe Conférence internationale sur les Phénomènes dans les gaz ionisés (ICPIG), Barga, Italie, 1991 (Mode B),
- Atelier sur la Turbulence dans les plasmas spatiaux, Eussois, France, 1993 (Mode B),
- XXIe Conférence internationale sur les Phénomènes dans les gaz ionisés (ICPIG), Dresden, Allemagne, 1993 (Mode B).

## H.3 Groupes de travail

La Commission H

*ayant pris connaissance* des rapports présentés par ses différents Groupes de travail,

*décide*

1. de maintenir le Groupe de travail inter-Unions URSI/IAGA.1 "Sondage électromagnétique passif de la magnétosphère", sous le nouveau titre "Télé-détection TBF/EBF de l'ionosphère et de la magnétosphère (VERSIM)", Co-président pour la Commission H: U. Inan (EUA);
2. de dissoudre le Groupe de travail inter-Unions URSI/IAGA.2 "Instabilités des ondes dans les plasmas";
3. de maintenir le Groupe de travail commun aux Commissions C et H "CH.1 Analyse des ondes", sous le nouveau titre "Analyse des ondes et de la turbulence", en tant que Groupe de travail commun aux Commissions C, G et H, Co-président pour la Commission H: F. Lefeuvre (France);
4. de mettre fin à sa participation au Groupe de travail GH.1 "Diffusion incohérente";
5. de maintenir le Groupe de travail commun aux Commissions G et H "GH.2 Expérience, simulation et analyse par ordinateur des processus d'ondes dans les plasmas", Co-président pour la Commission H: H. Matsumoto (Japon);

6. d'établir un nouveau Groupe de travail commun aux Commissions G et H "GH.1 Expériences actives dans les plasmas", Co-président pour la Commission H: P. Bernhardt (EUA);
7. de mettre fin à sa participation au Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel.

COMMISSION J - RADIOASTRONOMIE

J.1 Groupe de travail pour l'interférométrie à très grande base à l'échelle mondiale

La Commission J,

*considérant*

- (a) que l'utilisation de l'interférométrie à très grande base revêt une grande importance dans l'imagerie astronomique à haute résolution;
- (b) qu'en conséquence, il est nécessaire de procéder à des observations simultanées dans différentes parties du monde, en utilisant des télescopes appartenant à divers réseaux,

*reconnaissant* que la mise sur orbite d'interféromètres à très grande base est imminente,

*décide*

1. qu'un Groupe de travail pour l'interférométrie à très grande base à l'échelle mondiale soit établi, avec les objectifs suivants:
  - (i) mettre en place des mécanismes pour la coordination à l'échelle mondiale de l'interférométrie à très grande base (multi-réseaux),
  - (ii) promouvoir la compatibilité des techniques,
  - (iii) servir de liaison avec d'autres organisations concernant les questions de politique scientifique;
2. que le Président du Groupe de travail soit désigné par la Commission J;
3. que le Groupe de travail comprenne des représentants des différents réseaux d'interférométrie à très grande base, à



désigner de commun accord par le Président du Groupe de travail et les Directeurs des réseaux au sol, et que la composition du Groupe de travail soit réexaminée au cours de la XXIVe Assemblée générale à Kyoto, Japon, en 1993.

*Note: La Commission J a désigné R. Booth (Suède) comme premier Président du Groupe de travail.*

## J.2 XXIVe Assemblée générale: symposia communs à plusieurs Commissions

La Commission J

*recommande* que les sujets suivants soient choisis pour l'organisation de symposia communs à plusieurs Commissions au cours de l'Assemblée générale de Kyoto en 1993:

- Imagerie par filtrage spatial adapté, avec la Commission B, organisateurs: B. Steinberg (EUA) pour la Commission B et T. Cornwell (EUA) pour la Commission J;
- Brouillages radioélectriques subis par les services passifs, avec la Commission F, organisateurs: T. Gergely (EUA) pour la Commission J et A. Gasiewski (EUA) pour la Commission F.

## J.3 Patronage de colloques 1991-1993

La Commission J

*recommande* que l'URSI accorde son patronage ou son copatronage, selon le cas, aux colloques suivants:

- Astronomie au moyen de l'interférométrie en ondes millimétriques et submillimétriques, Japon, 1992,
- Propagation des ondes dans les milieux aléatoires, Seattle, EUA, août 1992,
- Imagerie à haute résolution, Australie, juillet 1992,
- Interférométrie à très grande base dans l'espace, en conjonction avec l'Assemblée générale de l'URSI, Japon, août/ septembre 1993.

J.4 Déclaration de principe concernant les activités suivant la détection d'intelligence extraterrestre

La Commission J,

*considérant* l'extrême importance pour l'humanité de la détection éventuelle de signaux provenant de civilisations extraterrestres,

*reconnaissant*

- (a) l'intérêt général qui est porté aux disciplines scientifiques et technologiques inhérentes à la recherche de signaux provenant de civilisations extraterrestres;
- (b) le rôle primordial que certains radiotélescopes de par le monde auront à jouer dans cette recherche au cours des quelques décennies à venir,

*se déclare favorable* aux intentions qui ont présidé à la rédaction du document intitulé "Déclaration de principe concernant les activités suivant la détection d'intelligence extraterrestre".

Note: Le texte anglais original de ce document est reproduit en annexe au texte anglais de l'Avis J.4, page 42.

## 10TH INTERNATIONAL WROCLAW SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

This Symposium was organized by the Association of Polish Electrical Engineers, the Institute of Telecommunications and the Wrocław Technical University, and was held from 26 to 29 June 1990 at Wrocław University. The Symposium was co-sponsored by URSI, and supported by CCIR, CCITT and other international organizations, as well as by national associations of electrical and electronic engineers from 15 countries.

The Symposium Council was chaired by Prof. W. Majeswski, and the Scientific Programme Committee by Prof. F.L.H.M. Stumpers. The Co-Chairmen of the Symposium were Prof. D.J. Bem and Mr. J. Rutkowski, and the Organizing Committee was chaired by Mr. W. Moron.

About 280 participants from 22 countries attended the Symposium. A total of 120 papers were presented in English or in Russian, with simultaneous interpretation. The two-volume Proceedings containing the 202 papers accepted for presentation were available during the Symposium.

The Opening Address was given by Mr. M. Kucharski, Minister of Telecommunications of Poland, followed by a Message by Prof. D.J. Bem, Chairman of the Symposium. The Keynote Address entitled "Achieving Electromagnetic Compatibility by Development and Application of Standards" was delivered by Prof. R.M. Showers.

At the beginning of the Symposium a plenary session was held during which the following papers were presented:

- "Progress in the Study of EMC - Reminiscences and the Future", by Prof. F.L.H.M. Stumpers, presented by Dr. J.J. Goedbloed;
- "The Changing World of Telecommunication", by Mr. T. Irmer, Director of CCITT, presented by Dr. H. Lorke;
- "The Changing World of Radiocommunication", by Mr. R.C. Kirby, Director of CCIR.

Seventeen sessions (three in parallel) and eleven poster sessions covered many fields of electromagnetic compatibility (EMC). The core of the Symposium were invited sessions as follows:

- Biological Effects of EM Radiation, organizer: Prof. O.V. Betsky (USSR);
- EM Environment (of the Earth) above the Upper Atmosphere , organizer: Prof. K. Bullough (UK);
- EMC and EMP in Power and Plasma Processing, organizer: Prof. J.S. Chang (Canada);
- EMC in Amateur Radio Service , organizer: Mr. H. Cichon (Poland);
- EMC Standards in IEC, CISPR and CENELEC, organizer: Mr. G. Goldberg (Switzerland);
- EM Environment (of the Earth) below the Upper Atmosphere, organizer: Prof. H. Kikuchi (Japan);
- EMC in Wire Communication, organizer: Dr. H. Lorke (Germany);
- Frequency Planning - the Basic Element of Spectrum Management, organizer: Dr. A.P. Pavlouk (USSR);
- Seismogenic Emissions, organizer: Prof. T. Yoshino (Japan).

The titles of the other sessions were: EMI Reduction and Sources; Antennas and Propagation; Spectrum Management and Utilization; Grounding and Shielding; Filters and Filtering Techniques in EMC; EMI Prediction and Analysis; Spectrum Monitoring; Regulations and Standards in EMC; Immunity of Electronic Systems and Devices; EMI Measurements; ESD, Lightning, EMP; Susceptibility and Vulnerability; EMC in Power Engineering; EMC Coupling Paths.

A round table discussion on Spectrum Management Today and in the Future attracted great interest. It was organized by Mr. R. Mayher (USA) and the key speakers were Mr. T. Boe (Norway), Mr. T. Cesky (Czechoslovakia), Mr. Z. Kupczyk (Poland) and Mr. A. Pavlouk (USSR).

Mr. A.H. Radjy (IFRB) gave a very interesting presentation on CD-ROM Application in the IFRB Activities.

Three Workshops accompanied the Symposium: "EMI Measurements Fast and Time Efficient" (organized by Rohde & Schwarz Co); "EMI Measurements from Design through Precompliance" (organized by Hewlett-Packard Co.) and "Recent Changes in International EMC Compliance Regulations and Certification Activities" (organized by Amador).

A Young Scientists Programme was organized with the financial support of URSTI.

A technical exhibition was held during the Symposium with the participation of eleven companies.

There was also a literature exhibition including publications of international organizations such as URSI, IFRB, CCIR, CCITT and EBU.

During the Symposium a special computer room was available to all participants to enable programme presentations and in depth discussions.

A joint meeting of the Symposium Council, the Scientific Programme Committee and the Organizing Committee, together with all session Chairmen was held on the last day. It was co-chaired by Prof. R. Strużak, Vice-Chairman of the Symposium Council and Mr. R.C. Kirby, Vice-Chairman of the Scientific Programme Committee. The results and organization of the Symposium were evaluated on this occasion, and future improvements were discussed.

Copies of the Symposium Proceedings are available from:

EMC Symposium  
Box 2141  
51-645 Wrocław 12  
Poland.

The 11th Wrocław Symposium on Electromagnetic Compatibility is planned for September 1992 in Wrocław in conjunction with the CISPR meeting in Poland.

W. Sega  
Technical Programme Coordinator

## THE HOLOGRAPHY TESTING OF LARGE RADIO TELESCOPES

The International Workshop "The Holography Testing of Large Radio Telescopes", organized by the Special Astrophysical Observatory of the USSR Academy of Sciences and sponsored by URSI, was held in Nizhnij Arkhyz, USSR, from 10 to 13 September 1990. Fifty scientists from seven countries, including ten young scientists, participated in the Workshop.

The presentations concerned holography measurements of the Westerbork telescope, the 45-m Nobeyama telescope, the 15-m SEST in Chile, the 30-m telescope in Spain, the Caltech sub-millimetre telescope in Hawaii, the 64-m Parks telescope, the RATAN-600 and others, as well as new holography techniques, equipment, image reconstruction and phase retrieval methods. Talks on focal plane synthesis and antenna beam correction with the phased focal arrays were given as contributions to the theme "Active optics for radio telescopes". The total number of submitted reports exceeded thirty; these will be published in the Workshop Proceedings at the beginning of 1991.

Useful plenary discussions were held on all main subjects under the chairmanship of Prof. M. Ishiguro (Japan), Prof. Y. Rahmat-Samii (USA), Prof. Yu. Pariskij (USSR), Dr. K. Wellington (Australia), Dr. J. Baars (Germany), Prof. A. Stotskij (USSR), Prof. R. Hills (UK) and Prof. J. Davis (USA).

The participants visited the RATAN-600 radio telescope, where microwave holography is applied for surface testing and correction, and the biggest 6-m optical telescope.

The Workshop social programme included excursions to the ancient Alan churches and the mountain resorts of Arkhyz and Dombay.

The Chairman of the Organizing Committee was Prof. Yu. Pariskij.

V. Khaikin

## URSI/COSPAR TASK GROUP ON THE INTERNATIONAL REFERENCE IONOSPHERE (IRI)

Symposium MC.5. Enlarged Ground and Space Data Base for  
Ionospheric Modelling. COSPAR XXVIII Plenary Meeting,  
The Hague, The Netherlands, 3-4 July 1990

This Symposium provided the forum for the annual review of IRI related activities, with special emphasis on the definition of the data requirements for the future IRI developments. About 30 papers were presented and will be published in *Advances in Space Research*, edited by K. Rawer and W.R. Piggott.

Furthermore, the latest version, IRI-90, of the IRI-code is described in a Handbook, prepared by D. Bilitza, which will be released by the National Space Science Data Centre (NSSDC) before the end of 1990.

At the final meeting of the Group, the following informal recommendations were discussed and accepted. Where found, volunteers for future tasks are noted (underlined).

### I. Electron Density

#### 1.1 Lower Ionosphere

Two sets of experimental profiles merit being worked out in model form so as to become comparable and, possibly, serve as primary inputs for the determination of the parameters of the profiles up to hmE: Friedrich has assembled (and presented at this meeting) a set of about 80 profiles measured with the Faraday technique between ground and rocket. He has obtained these from workers in different countries and hopes to receive yet a few more inputs. Friedrich intends to produce a model description. Singer's set of profiles (depending on season and solar zenith angle) was established from terrestrial radio wave propagation data on a large number of frequencies. It is hoped that Ramanamurty might take up again this set to produce an *internally consistent* set of the non-linear LAY-parameters so that the above dependences appear in *continuous* form.

The *E-peak* is the reference point for describing the profile with LAY-functions (see below).

## 1.2 Middle Ionosphere

The following "marks" are needed in order to get a sufficiently well defined profile:

*E-peak*: For foE, IRI uses the Kouris & Muggleton formula which by day agrees rather well with a simpler formula in use at CCIR; there exist, however, some differences by night (when the CCIR formula is more involved). IRI being based on Piggott's rather old radio observations in the MF-band, the behaviour by night should be reinvestigated with the now available data (Bradley).

As Bilitza has remarked, fitting the middle ionosphere profile with LAY-functions meets some difficulties at the lower border of this range where the E-peak should accurately be reproduced. They can be overcome by introducing one more constraint, namely an additional point just below the E-peak. Bilitza has written a relevant code.

*E-F-valley*: Gulyaeva's formula for the valley depth and height is a first helpful indication. Before data from different sources can be brought together, it is important to decide which true-height procedures can be taken for granted. The subject is attributed to Reinisch's URSI G.4 Group. Checking with incoherent scatter observations is felt to be crucial (Buchau).

*F1-point*: For foF1, IRI has the Ducharme-Petrie-Eyfrig formula which is applied whenever the "F1-condition" is fulfilled (Flreg = true). It depends mainly on season and latitude. This might need checking. For the corresponding height hF1, Gonzales & Radicella have replaced (at this meeting) their elder formula (depending on h'F2, a rather inconvenient parameter) by a new one that depends on foF1 and the magnetic dip. Checking is needed. Another question that arises is whether the F1-point given by these expressions is still meaningful when the F1-feature is not visible (Flres = false) (Radicella).

*h(0.5) = half-density point*: Introduced by Gulyaeva, its usefulness has meanwhile been shown. Her formula might need refurbishing in the light of more recent, worldwide data. Gulyaeva as well as Bezprozvannaya do intend to assemble more material so that latitudinal influences as well as those of solar and magnetic activity might be specified. All those having



relevant data are asked to make these accessible to them. Anderson offers his theoretically derived profiles for comparison.

*F2-peak*: The group has initiated a new discussion about foF2-maps. There exists growing interest in regional maps too, in particular for the polar caps (Thiemann & al., presented at this meeting). This subject will be considered in more detail in the forthcoming group meetings. As for hmF2 it is standard use of IRI and CCIR to derive it from M3000-maps. Due to its not negligible restrictions this procedure is more and more criticized. As early as in 1985 the group expressed its desire to assemble a data set of directly measured hmF2 values so that hmF2-maps could be established without using M3000. Incoherent scatter stations being too rare, the main input must probably come from ionograms reduced to true-height. The digital ionosonde technique should be helpful in this regard. The relevant network might soon be dense enough to start a special project (Reinisch and URSI G.4).

### 1.3 Topside

Bilitza has reminded that the description used in the present IRI is unable to reproduce the *field-aligned structure* that is in fact decisive in the equatorial belt. Rawer (at the 1989 Abingdon IRI meeting) has indicated a better description that uses the length along the fieldline as coordinate. A large enough set of equatorial cuts should allow to determine representative parameters for the "field-aligned" profile. "True depth" reduced topside profiles are needed to this end. Apart from those of the early topside sounder records in Canada and the UK more such data might now exist in Japan, USA and USSR. It is hoped that these will be made accessible to the IRI group (Bilitza).

## II. Plasma Temperatures

IRI-90 is based on an enlarged set of in-situ-probe and incoherent scatter data (Bilitza). A solar activity effect could not be included since it has different signs according to the geophysical conditions. Brace and Oyama have recently obtained data from which the dependence could possibly be deduced.

The next problem is related with effects of regional heating, in particular in the auroral zones. In the present

descriptions, the temperature pattern is too much smoothed. The moving boundary of these zones presents another problem. EISCAT might have produced relevant data (Rawer to ask Schlegel, Buchau).

### III. Ion Composition

Apart from the elder set of formulas based on different sources, IRI-90 has a code describing the Danilov-Yaichnikov model. As Brace has shown, there occur, under certain conditions, non-negligible discrepancies between both descriptions. The experimental data of a large set of USA satellites are the found in between both models. The introduction of a new scheme in which the transition heights play a major role was discussed and seems promising (Bilitza, Kutiev, Lathuillière).

### IV. Ion Drift

Kazimirovsky, mainly using ground-based radio observations, intends to produce a new Fourier-description. Incoherent scatter data should be helpful too (Bilitza to contribute a relevant code).

### Future Meetings

- September or October 1991: Workshop at Athens (Greece) on "Advances in Global/Regional Description of Ionospheric Parameters". Organizer: G. Moraitis.
- 1992 during the COSPAR XXIX Plenary Meeting at Washington, D.C. (USA): Symposium on "IRI: Verification and Future Development". Organizer: L. Bossy.

### Publications

The communications presented for discussion of IRI have been published in (ASR = *Advances in Space Research*):

#### Year    Place of Meeting

1974	Konstanz (Germany)	Methods of Measurements and Results of Lower Ionosphere Structure, Akademie Verlag, Berlin, 1-460, 1974.
1982	Ottawa (Canada)	ASR, 2, 10, 181-257, 1982.
1983	Stara Zagora (Bulgaria)	ASR, 4, 1, 1-169, 1984.
1984	Graz (Austria)	ASR, 5, 7, 1-112, 1985.

1985	Louvain-la-Neuve (Belgium)	ASR, 5, 10, 1-130, 1985.
1986	Toulouse (France)	ASR, 7, 6, 1-127, 1987.
1987	Novgorod (USSR)	ASR, 8, 4, 1-251, 1988.
1988	Espoo (Finland)	ASR, 10, 8, 1-132, 1989.
1989	Abingdon (UK)	ASR, 10, 11, 1-142, 1990.

NOTE: The 1991 meeting of IRI referred to above will take place in Athens, Greece from 1 to 4 October.

The Local Organizer is:

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Ionospheric Institute  
P.O.B. 20048  
118 10 Athens  
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Abstracts should be sent to Prof. L. Bossy, not  
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Prof. L. Bossy  
174 avenue Winston Churchill  
B-1180 Brussels  
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SERVICE INTERNATIONAL DE LA ROTATION TERRESTRE  
INTERNATIONAL EARTH ROTATION SERVICE (IERS)

ANNONCE DE DUT1

A partir du

1 janvier 1991, 0h UTC

jusqu'à nouvel avis, la valeur de DUT1 à diffuser avec les signaux horaires sera

$DUT1 = + 0,6 \text{ s}$

(Noter le changement de signe dû à l'introduction d'une seconde intercalaire le 1 janvier 1991).

ANNOUNCEMENT OF DUT1

From

1 January 1991, 0h UTC

until further notice, the value of DUT1 to be disseminated with the time signals will be

$DUT1 = + 0,6 \text{ s}$

(Note the change of sign due to the introduction of a leap second on 1 January 1991).

## INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

### DECISIONS AND RESOLUTIONS OF THE 23rd GENERAL ASSEMBLY

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Sofia, Bulgaria, 1-5 October 1990

#### Transition Measures in Relation to Statute Changes

The General Assembly *approves* the special transition measures suggested by the Standing Committee on Structure and Statutes to:

- allow the President-elect (elected in 1990) to serve until 1993 and to become President at the 24th General Assembly;
  - to request the Executive Board to appoint, as a special measure prior to the election in 1993 of a second Vice-President, an Extraordinary Vice-President, if deemed necessary;
- and
- request the representatives of the National Members elected in 1988 to extend their term until the end of the 24th General Assembly.

#### Assessment of ICSU Funded Activities

To assist the Executive Board in establishing priorities within a limited budget, the General Assembly *recommends* that the General Committee should initiate a review of the scientific quality and effectiveness of ICSU funded scientific activities and report to the General Assembly in 1993.

#### Terms of Reference for ICSU Interdisciplinary Bodies

The General Assembly *adopts* the recommendations of the General Committee that:

- the Special Committee for the International Geosphere-Biosphere Programme (IGBP) become a Scientific Committee;
- the Inter-Union Commission on the Application of Science to Agriculture, Forestry and Aquaculture (CASAF) become a Scientific Committee;
- the Standing Committee on Assessment and Priorities (SCAP)

- be terminated and that the General Committee assume responsibilities in assessment and priority-setting;
- the ICSU Press Publishing Service become a Standing Committee and be listed in the Statutes accordingly;
  - a Special Committee on Natural Disasters be established.

#### Statutes and Rules of Procedure

*Accepting* the report of the Standing Committee on Structure and Statutes as amended, with the exception that no change in Statute 28 was carried;

the General Assembly *adopts* the changes to the Statutes and Rules of Procedure contained therein.

#### Access to Data and Information

*Noting* the problems linked with access to, and sharing of, scientific data and information as indicated in the Panel discussion in Sofia, and, for example, the lack of universal access to electronic networks and the inability adequately to supply scientific books and journals to developing country scientists in appropriate language editions;

the General Assembly *recommends* that the Executive Board investigate further the possibilities of establishing a Committee to provide advice on how such problems may be resolved.

#### Central and Eastern Europe

The General Assembly *requests* the ad hoc Committee for Science in Central and Eastern Europe urgently to look into the problems affecting scientific research in the region and to prepare a programme of measures whereby ICSU might help remedy the difficulties.

#### Environment

*Noting* ICSU's very promising start in the implementation phase of the International Geosphere-Biosphere Programme (IGBP Report No 12), and the complementary accomplishments of the World Climate Research Programme (WCRP);

*acknowledging* the establishment of IGBP as an ICSU Scientific Committee;

the General Assembly *urges* National and Scientific Members further to support actively these important activities.

#### Space Debris

The General Assembly *noting* with satisfaction the studies already carried out on the hazard to space missions of impacts with space debris;

*requests* the Committee on Space Research (COSPAR) to continue this important study in the interests of astronomical and earth observation and in particular:

- a. to refine the quantification of the hazards to current and future space missions from impact with space debris;
- b. to continue strongly to urge the Space Agencies to adopt more effective ways and means of reducing the hazard in the short term and to work towards its elimination in the longer term future;

*requests* also COSPAR to maintain an overview of any activities in space which might lead to pollution of nearby space bodies by matter of terrestrial origin.

#### Multi-Wavelength Interference with Astronomical Observation

*Noting* the harmful increase in the level of electromagnetic pollution, ranging from light pollution to radio interference;

*recognizing* the impact of such pollution on Earth observation, astronomical observation and radio science;

the General Assembly *strongly urges* all concerned administrations, agencies and regulatory bodies to recognize the importance of the continuing detection of faint electromagnetic signals at all frequencies in exploring the Universe, in seeking the origins of life, in monitoring the natural resources of the Earth and the fragile balance of the Earth's ecosystem. Effective steps to reduce pollution are urgently required to restore the quality of observing conditions;

*further stresses* that the frequencies used in Earth exploration, radio astronomy and space research need urgent and specific protection from radio interference especially from telecommunications, navigation satellites and other airborne and space emissions;

*specifically requests* to that end, that the World Administrative Radio Conference in 1992 ensure the rational use, conservation and protection of the scarce radio-frequency spectrum taking into account the astrophysical significance of the spectral lines listed in Resolution A7 of the 20th General Assembly of the International Astronomical Union (IAU) (1988, Baltimore - in *IAU Information Bulletin* No 61, January 1989) and *supports* the strenuous efforts of the Inter-Union Commission on Frequency Allocations to Radio Astronomy and Space Science (IUCAF) to obtain such protection.

#### Cooperation between the Natural and Social Sciences

##### The General Assembly

*encourages* the establishment of closer working relationships between the natural sciences and social/behavioural sciences in the study of Global Change;

*notes* with satisfaction the recent recommendation of the IGBP Scientific Advisory Council that a Working Group be established jointly with the International Social Science Council (ISSC) for the study of land use change; and

*urges* that a meeting be convened to include representatives of the natural sciences and social/behavioural sciences to develop further concrete areas of cooperation, and *invites* those ICSU Unions that are also members of the ISSC (International Geographical Union (IGU) and International Union of Psychological Sciences (IUPsyS)) to take a lead in this activity.

#### Human Rights and the Scientist

In view of several statements by delegates to the 23rd General Assembly of ICSU, such as that by the representative of Bangladesh, the General Assembly *notes* the plight of scientists deprived of the right to exercise their profession because of their political beliefs, ethnic origin or religion. In many cases the liberty and even the life of scientists and other academics have been jeopardized. In the past, scientific academies and other scientific organizations have been able to intervene to reverse such situations. Often the threat of investigation of such violations of human rights has improved the fate of threatened scientists, and even resolved the problem.



Therefore, the General Assembly *requests* the Executive Board in light of the enquiry about ethical issues, to research this problem, paying attention to:

- (i) the magnitude of the problem;
- (ii) the effectiveness of different approaches taken in the past by ICSU and other scientific organizations; and
- (iii) how effective ICSU could be if it intervened in this area e.g. by focusing more attention on the terms of reference of the Standing Committee on Free Circulation of Scientists.

Finally, the Executive Board *is requested* to report to the Assembly or to the General Committee not later than 1993.

#### ISIP

The General Assembly *takes note* of the report of the Conference on International Science and its Partners (Visegrad, Hungary) and of the initial follow-up steps by the Executive Board. While many unresolved issues remain, the partnership concept met with general agreement, and was judged worthy of further exploration and pursuit. The establishment of an industrial Advisory Board was viewed with favour. It was further recognized that the partnership concept extends beyond industry to government, intergovernmental organizations and other non-governmental organizations in the technical and social sciences.

#### Human Resources in Science and Technology

We live in an era of unprecedented progress in science but the attraction of science to the younger generation seems to be lessening in some countries. Where these statistics are available they point to the danger of insufficient human resources in science and technology as the 21st century opens. ICSU should examine together with other concerned scientific bodies, the magnitude of this problem.

#### Finances

The General Assembly *adopts* the report of the Assembly Finance Committee as amended and the recommendations contained therein.

Thanks

The General Assembly *expresses* its deep gratitude to the Bulgarian Academy of Sciences and the Bulgarian Government, to Academician Bl. Sendov, Mr. P. Nedkov and their staff for the generous and excellent arrangements made for the ICSU meetings, and also *expresses* its grateful thanks to the ICSU Secretariat for the improved and excellent way in which it has ensured the efficient functioning of the meetings.

## INTER-UNION COMMISSION ON FREQUENCY ALLOCATIONS FOR RADIO ASTRONOMY AND SPACE SCIENCE (IUCAF)

*The document reproduced below was submitted by IUCAF to CCIR Interim Working Party 2/2, which met in Washington, D.C., from 8-12 October 1990.*

### FREQUENCY PROTECTION REQUIREMENTS

IUCAF 377

#### FOR THE RADIO ASTRONOMY SERVICE

#### 1. General Characteristics of the Radio Astronomy Service

Radio astronomy is a passive service, and is entirely concerned with reception of faint radio signals of cosmic origin which are generated by natural processes. The signals have the characteristics of wide-band noise. Cosmic radio signals fall into two general categories, which radio astronomers call continuum emissions and spectral line emissions. Continuum emissions are broadband and spectral line emissions are narrow band noise.

##### 1.1 Broadband - or Continuum Emissions

Continuum emissions have a broad smooth spectrum that typically extends over the whole frequency range accessible to observation, and the power flux density (p.f.d.) typically varies with frequency at a rate of up to six dB per octave. Radio astronomers need bands at intervals of about one octave in frequency to determine the spectral characteristics of different radio sources, to investigate the emission mechanisms, to map their distribution on the sky, and to study polarization, time variation, etc. The widths required for these bands are 1 to 2% of the centre frequencies. The preferred continuum bands are listed in Table I of Report 852 (for references see Appendix 1).

##### 1.2 Narrow band - or Spectral Line Emissions

Spectral line emissions are produced by changes in energy levels of atoms or molecules, and occur at discrete frequencies. Motions of the source material with respect to the earth

cause Doppler shifts in the frequencies of line radiation received at the earth, and, in particular, the general recession of distant sources shifts the spectral line frequencies towards lower values. The frequencies required for line observations are therefore determined by nature, and certain radio astronomy bands have been allocated to permit observations of the most important lines (Recommendation 314). Because of the Doppler shifts it is often desirable to extend the frequency range of observations of a radio line beyond the low frequency end of the allocated band involved. A general description of the Radio Astronomy Service, including frequencies of the most important lines, is given in Report 852.

## 2. Interference to Radio Astronomy

Because the Radio Astronomy Service uses receiving techniques only, it causes no interference to other services. Cosmic radio signals are very much weaker than the signals used by most active services. This is illustrated by the fact that although cosmic signals arrive from all directions in space, only very rarely do they interfere with communications or other services. To study cosmic signals radio astronomers have developed receiving systems of much higher sensitivity than are used by most other services, and consequently they are highly vulnerable to interference from active services. Most modern radio telescopes use receivers that are cryogenically cooled to 20 K or less to minimize the internal noise level. The sensitivity is increased by the use of long observing times and wide bandwidths to reduce the level of receiver noise fluctuations. The Radio Astronomy Service is extremely vulnerable to interference from transmitters on satellites or aircraft (§9, Art. 36).

### 2.1 CCIR Report 224

Spectral power flux densities that represent the thresholds of interference for radio astronomy are derived in Report 224. For example, in a bandwidth of 1 MHz, the threshold p.f.d. values lie in the range  $-200$  to  $-185$  dBW  $m^{-2}$  for frequencies below 1 GHz, and above 1 GHz they become more negative at approximately 20 dB per decade. The figures apply to broadband or continuum observations, but corresponding values for narrow band or spectral line observations are 10 to 18 dB higher. Note that in deriving these figures the gain of the radioastronomy antenna is assumed to be 0 dBi, so that they apply to interference entering the far sidelobes, not the main beam. Because

these threshold values are so low, it is very difficult for other services to share with radio astronomy.

## 2.2 Article 36 of the Radio Regulations

The general provisions for the Radio Astronomy Service are given in Radio Regulations Article 36. The locations of radio astronomy stations, in accordance with §3, are selected with due regard to the possibility of harmful interference to these stations. In the remote locations where radio astronomy stations are located, tropospheric scatter provides the most likely path for interference from ground-based transmitters.

In addition to interference from transmitters within the same allocated bands, radio astronomy can suffer harmful interference from transmissions by services in adjacent or nearby bands (§7). This usually occurs when an adjacent band transmitter generates a broad spectrum of sidebands which are not sufficiently well filtered and persist at a low level beyond the boundaries of the allocated band. The problem is particularly serious in cases where the transmissions come from aircraft or satellites and may therefore enter the near sidelobes of a radiotelescope antenna. The television broadcasting and radionavigation satellite services have caused harmful interference in nearby radio astronomy bands (see Report 697). The increasing use of spread-spectrum modulation poses a major threat to radio astronomy observations in adjacent bands or even well-removed bands. Harmonics of transmitters in other bands can also cause harmful interference to radio astronomy, and again this is most likely to be serious in the case of airborne or satellite transmitters.

## 3. Sharing

Sharing is examined in some detail in Report 696, and a few of the more important conclusions can be stated as follows. In general radio astronomy cannot share with any service which uses a transmitting antenna within line of sight from an observatory. The only notable exception is the case of VLBI observations sharing with space-to-earth transmissions from spacecraft within the deep space service (see Annex I of Report 696). As a result it is generally not possible to share with services using transmissions from aircraft, balloons or satellites, including uplink transmissions from aircraft to satellites. Sharing with land-based services is determined by tropospheric scatter zones, with many radio observatories sited to take

advantage of terrain protection.

#### 4. Radio Astronomy Bands

Allocations to the Radio Astronomy Service were first made in 1959, and further bands have been made available at succeeding WARC's. Major advances in instruments and data processing techniques have been made over the past two decades, and as a result the potential for further important work in any radio astronomy band has increased rather than decreased with time. Following are some brief notes on these bands in the spectral regions to be addressed by WARC'92.

##### 4.1 Radio Astronomy Requirements and Allocations in the Range 500-3000 MHz

608-614 MHz. (Primary in Region 2, secondary in Region 1, Footnote 689 in Region 3). This band is important for continuum observations and is the only allocation to radio astronomy between 410 MHz and 1400 MHz. It is particularly useful for pulsars, for which the signal strength decreases rapidly with increasing frequency. The usage of this band is increasing, and it is being implemented on the newest instruments, such as the Australia Telescope and on the Very Long Baseline Array now under construction in the U.S.A..

1400-1427 MHz. (Primary passive in all regions). The radio spectral line of neutral hydrogen at rest frequency 1420.406 MHz remains the most important single line for radio astronomy, and this band is very widely used for both line and continuum observations. With the increasing sensitivity of radio telescopes it has become possible to detect the line in galaxies at ever increasing distances. The line is observed with Doppler shifts down to 1300 MHz and below, and usage of the range 1330-1400 MHz for radio astronomy is recognized in RR Footnote 718. The band is a prime band for most radio observatories in the world.

1610.6-1613.8 MHz. (Secondary, see RR Footnote 734). This is an allocation to allow observation of the line of the OH radical at 1612.231 MHz.

The band 1610-1626.8 MHz is a primary allocation to Aeronautical Radionavigation. Radio astronomy observations suffer high levels of interference (70% of the time) from the existing series of GLONASS global navigation satellites, whose carrier frequencies are spread across the band and whose side-

bands spread wide because of the spread-spectrum modulation in the U.S. the band is shared with the radiodetermination service, and by a special arrangement emissions in vicinity of radio astronomy observatories will be restricted on a timesharing basis to minimize interference to radio astronomy (see Report AH/2). In Region 1 an RDSS service is proposed, LOCSTAR; RDSS in Region 1 has a secondary status, and must not interfere with the Radio Astronomy Service (RR FN 734E)

1660-1670 MHz. (Primary). Two lines of the OH radical with frequencies 1665.402 and 1667.359 MHz, occur in this band. This band is also widely used for continuum measurements. Plans for both the RADIOASTRON VLBI satellite of the Soviet Union and the Japanese VSOP radio astronomy satellite include receivers for use of this band (see section 5). The band 1660.0-1660.5 MHz is shared with the land mobile satellite service (Report BG/8). Spurious emissions from GPS and GLONASS satellites cause harmful interference in the 1660-1670 MHz band.

1718.1-1722.2 MHz. (Secondary, see RR Footnote 744). This is again an allocation to a line of the OH radical at 1720.530 MHz. Sharing with the primary-allocated fixed and mobile services is feasible in most cases with some local coordination. A filter is installed in the GMS satellite to protect the radio astronomy band from sidebands of the VISSR transmissions.

*Note* that it is important to be able to observe all four OH lines in the bands listed above, since different lines predominate under different physical conditions in astronomical sources of emission.

2290-2300 MHz. Although radio astronomy has no frequency allocation in this band it is widely used in conjunction with the deep space band at 8400-8450 MHz for VLBI observations and for geodetic studies. For further details see Annex 1 to Report 696. See also §5.

*Note:* Report AH/2 discusses the 2nd harmonic of RDSS at 2.5 GHz. The second harmonic of the 2483.5-2500.0 MHz down-link signal from the satellites may cause harmful interference to radio astronomy observations in the 4800-4990 MHz and 4990-5000 MHz radio astronomy bands. The expected spectral power flux density of the down-link signal at the Earth's surface is  $-181 \text{ dB (Wm}^{-2}\text{Hz}^{-1}\text{)}$ , so that the second harmonic radiation from the RDSS satellite should be 75 dB below the fundamental to be tolerable to radio astronomy.

2655-2690 MHz (Secondary) and 2690-2700 MHz (Primary). In the first of these bands the primary allocations include the broadcasting satellite service. Since radio astronomy cannot share with line-of-sight transmissions, the band is useful so long as it remains largely unused by the broadcast satellite service. The allocation in the 2690-2700 MHz band is too narrow, and radio astronomy observations could suffer from interference from satellite transmissions in the adjacent broadcasting satellite band.

#### 4.2 Radio Astronomy Requirements and Allocations in the Range 12-24 GHz

12.18 GHz (No allocation). An important spectral line of methanol is centred on 12.178 GHz (Recommendation 314). This band is allocated to many services (incl. Satellite Broadcasting Service). Radio astronomy observations of this line are being carried out as rapidly as possible before Satellite Broadcasting uses this band. The primary band of interest is 12.14-12.19 GHz.

14.47-14.50 GHz (Secondary). This allocation to radio astronomy provides protection for observations of the line of formaldehyde molecule for which the rest frequency is 14.488 GHz. This is an important line for observations of galactic sources.

15.35-15.40 GHz (Primary, passive). This is a primary allocation used mainly for high resolution mapping of sources in the continuum.

22.21-22.50 GHz (Primary). This band contains the important line of the water molecule at rest frequency 22.235 GHz. Some protection for red-shifted observations in the range 22.01-22.21 GHz is provided by Footnote 874.

22.81-22.86 GHz and 23.07-23.12 GHz. These two bands, which contain lines of ammonia, are not allocated to radio astronomy but RR Footnote 879 urges protection of observations of these unique non-metastable lines.

23.60-24.00 GHz (Primary, passive). This is an important band assigned exclusively to passive services, and is used for observations in the continuum and important lines of the ammonia molecule.



#### 4.3 Radio Astronomy Bands above 30 GHz

Radio astronomy has numerous important allocations in the range above 30 GHz. Spectral line observations become relatively more important because of the rapid increase with increasing frequency of the number of molecular lines studied. For a list of the most important spectral lines see Report 852 or Recommendation 314. This list includes spectral lines extending to 810 GHz, which is about the high frequency limit of current radio astronomy activity.

#### 5. Very Long Baseline Interferometry (VLBI)

In Very Long Baseline Interferometry signals from radio sources are received by an array of two or more very widely-spaced antennas and are combined to form images with very high angular resolution. Hydrogen maser frequency standards at the antenna locations allow phase coherence to be maintained, and the signals are recorded on magnetic tape and played back simultaneously at the data reduction location to form interferometer fringes. The locations of the antennas may be several thousand km apart, and the scale of the angular structure revealed as small as one ten-thousandth of an arcsecond. The technique is applicable only to the observation of very small, bright objects such as the cores of quasars or maser line sources. The technique allows the relative positions of the antennas to be determined with an accuracy of one or two centimetres, and has become of great importance for geodetic studies. The technique is also used for measurements of the motion of the earth's axis and for comparing celestial and atomic time. Antennas are regularly on different continents. The countries currently participating in VLBI are Australia, Brazil, Canada, China, Finland, India, Italy, Japan, France, Germany, Netherlands, South Africa, Spain, Sweden, United Kingdom, U.S.A., U.S.S.R. It is therefore essential to maintain protected bands on a worldwide basis (see Report 696 Annex 1).

A further development of VLBI is the combination of signals from one or more antennas in earth orbit with those from antennas on the ground. This has the effect of both increasing the baseline lengths, and varying the baseline orientations as the space-borne antennas orbit the earth. Radio astronomy satellites carrying such antennas are under development in both the U.S.S.R. and Japan, and will be launched by the middle of this decade. The bands that are planned to be used in these two orbiting VLBI systems are those centred on 327 MHz, 1665 MHz,

4995 MHz, and 23.8 GHz. The first three of these bands are shared with the Fixed and Mobile Services, but over most parts of the radio astronomy satellite orbits interference from these services should not be serious, since for VLBI systems the threshold levels for interference are about 40 dB higher than the general values mentioned in section (2.1).

## 6. The Shielded Zone of the Moon

The side of the moon remote from the earth provides a location well shielded from transmissions from the earth and low-orbit satellites, and is therefore an interference-free site for scientific observations of natural radio emissions. The use and preservation of this environment are the subject of Report 539 and Recommendation 479. Some transmissions in the Space Research, Space Operations and other services involved in development and maintenance of lunar bases will be unavoidable in the shielded zone. Preferred frequencies for such transmissions, taking account of the needs of both radio astronomy and the development services, is a subject for studies by the CCIR. Lunar development leading to use of the shielded zone is likely to be initiated within this decade.

## 7. References

*"Views of the European Science Foundation Committee on Radio Astronomy Frequencies concerning frequency allocations for the Radio Astronomy Service in the bands above 0.3 GHz and in preparation for the World Administrative Radio Conference - 1992"*, ESF-CRAF Secretariat, Netherlands Foundation for Research in Astronomy, P.O. Box 2, 7990 AA Dwingeloo, The Netherlands.

*"Views of the National Academy of Sciences' Committee on Radio Frequencies concerning frequency allocations for the passive services in preparation for the World Administrative Radio Conference - 1992"*, National Academy of Sciences, Washington D.C., U.S.A.

IUCAF 377 - APPENDIX 1

CCIR STUDY GROUP 2 DOCUMENTS OF RELEVANCE TO WARC-92

(Radio Astronomy Service)

Report 852 (Characteristics of the radio astronomy service and preferred frequency bands)

The report provides a general description of the service. It contains a section on frequency considerations. Table I lists allocated frequency bands that are preferred for continuum observations, and Table II provides a listing of frequencies associated with spectral lines of the greatest importance to radio astronomy.

Report 224 (Interference protection criteria for the radio astronomy service)

The report contains tables (I and II) of the interference levels which cause harmful interference to radio astronomy continuum and line observations. They are applicable for terrestrial transmitters operating outside the main beam of a radio astronomy antenna. Harmful levels for antenna arrays and interferometers are also discussed.

Recommendation 314 (Protection for frequencies used for radio-astronomical measurements)

Based on Reports 852 and 224, the document recommends protection for bands containing rest frequencies and Doppler-shifted frequencies of the astrophysically most important spectral lines as recommended by the International Astronomical Union. It recommends that administrations should take all practical steps to minimise emissions (including harmonic radiations and other spurious emissions) occurring within the frequency bands to be protected for radio astronomy. Emissions from aircraft, spacecraft and balloons are highlighted as particularly serious sources of interference to radio astronomy. (See Radio Regulations Article 36, §9).

Recommendation 611 (Protection of the radio astronomy service from spurious emissions)

It is recommended that, with regard to satellites in the geostationary orbit, administrations should take into account, to the maximum extent practicable, the objective of the radio astronomy service to be able to obtain measurements free from harmful interference when observing at 5 degrees or more from the orbit. The recommendation is based on Reports 224 and 697.

Report 696 (Feasibility of frequency sharing between radio astronomy and other services)

The report contains a quantitative examination of sharing, and includes a consideration of the protection criteria and the application of these criteria to geographical sharing. Examples of sharing problems are described. The extreme difficulty of sharing with a space service or with a terrestrial service involving airborne transmitters is emphasized.

Report 697 (Interference to the radio astronomy service from transmitters in other bands)

The report discusses harmful interference due to transmitters which do not share the same band as the radio astronomy service (classified as band-edge interference and interference from harmonic and intermodulation signals). Table I lists the services in adjacent bands which could affect radio astronomy observations, while Table II lists the services that could cause harmonic interference. Interference from geostationary satellites is highlighted.

Recommendation 517 (Protection of the radio astronomy service from transmitters in adjacent bands)

Based on Reports 697 and 224, this document recommends that practical solutions to the band-edge interference problem be sought and proposals be considered at the next competent WARC.

Report 539 (The protection of radio astronomy in the shielded zone of the Moon)

This deals with the protection of frequencies for radio

astronomical measurements in the shielded zone of the Moon. The report is relevant because IWP 2/2 is asked to study sharing criteria for possible new space services operating at frequencies of 20 GHz and above. These services may affect the possibilities for radio astronomy in the shielded zone.

The report is also important because the Space Frequency Coordination Group has indicated that ITU/RR/Art.29, concerning the shielded zone, is a topic for consideration by WARC 1992.

Recommendation 479 (Protection of frequencies for radio astronomical measurements in the shielded zone of the Moon)

A document, based on Report 539, recommending that in planning the use of the radio spectrum, account should be taken of the need to provide for radio astronomy observations in the shielded zone of the Moon.

New Report AH/2 (Doc.2/1046) (Coordination between the radio astronomy service and the Radio Determination Satellite Service at frequencies near 1612 MHz)

The RDSS system being developed in the U.S. (where RDSS has a primary allocation) proposes a sharing scheme based upon a combination of geographical coordination and time-sharing. The scheme has not yet been tested in practice.

MEETINGS OF CCIR (STUDY GROUP 7) AND  
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SPACE FREQUENCY COORDINATION GROUP  
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Preparations are in top gear for the ITU World Administrative Radio Conference (WARC) in Spain in February 1992. WARC 92 will reallocate the radio spectrum between 500 and 3000 MHz, find a band above 12.5 GHz for wide RF-band High Definition TV Broadcasting from satellites, and allocate bands above 20 GHz for new space applications.

In the band 500-3000 MHz the proposed new services include:

- \* Direct sound broadcasting from satellite (CD quality),
- \* A world-wide system of public correspondence with aircraft,
- \* Future public land-mobile telecommunications,
- \* Low-orbit satellites (bands below 1 GHz).

WARC 92 will also consider the use for space operations and space research of the shared bands 2025-2110 MHz and 2200-2290 MHz, and sharing by radiodetermination satellites of the bands 1610-1626.5 MHz and 2483.5-2500 MHz.

The WARC 92 agenda impinges directly on the current use of the radio spectrum for space research, earth exploration, radio astronomy, meteorology and other radio science areas.

The technical basis for the frequency allocations at WARC 92 are being set by the CCIR in a series of Interim Working Parties (IWP) held between October and December 1990. The reports of the specialist IWP's will then be merged at a CCIR Joint Interim Working Party in March 1991.

CCIR Study Group 7 (previously 2) held its IWP meeting in Silver Spring, Maryland from 8-12 October 1990. The IWP dealt with 57 Documents, the major inputs being from USA, Canada, France, Japan, USSR, CCIR, ESA, IUCAF and URSI.

The 70-page output document from the IWP (identified as IWP 2/2) concentrated on four substantive areas:

- \* The 2 GHz region of the spectrum and its use by space radio communication services,
- \* New space service applications above 20 GHz,

- \* Requirements and protection criteria for radio astronomy,
- \* Requirements and protection criteria for passive and active sensors in the space research and earth exploration satellite services.

The new space applications include communication links between space stations in low earth orbit, and between spacecraft in geostationary orbit and those in orbit around the Earth, Moon and Mars, as well as bases on the Moon and Mars. A further new application is wide-band down links for real-time radio astronomy data acquired by orbiting VLBI stations.

In the previous week some of the vital ground work for IWP 2/2 has been laid by a meeting of the Space Frequency Coordination Group in Gaithersburg, Md. This was attended by representatives of all space agencies and two delegates from IUCAF.

B.J. ROBINSON  
Chairman, IUCAF.

## ANNOUNCEMENTS OF MEETINGS AND SYMPOSIA

### 9th INTERNATIONAL ZURICH SYMPOSIUM AND TECHNICAL EXHIBITION ON ELECTROMAGNETIC COMPATIBILITY

The 9th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility will be held in Zurich, Switzerland, from 12 to 14 March 1991. The Symposium is organized by the Institute for Communication Technology of the Swiss Federal Institute of Technology Zurich with the cooperation of several organizations, including URSI and the International Radio Consultative Committee (CCIR). The President of the Symposium is Prof. Dr. P. Leuthold, and the Chairman of the Technical Programme Committee is Prof. Dr. R. Showers.

The programme of the Symposium features 18 sessions, in which over 130 papers will be presented reflecting the recent results of EMC science and technology, tutorial lectures, special workshops about selected areas of concern to the EMC engineer and manager, and Open Meetings of URSI Commission E on Electromagnetic Noise and Interference.

The titles of the sessions are as follows: Noise and reception; Transmission lines; Conducted vs radiated tests; Layered media; Line transients and coupling; Screening; Computer-aided spectrum engineering; Lightning; Emission testing; Biological effects; Lightning and nuclear EMP; Product ESD and immunity; Numerical modelling in EMC; Power and data-line transients; Absorbers and filters; Theory of EMC; Power systems; System EMC.

The URSI Commission E Open Meetings are organized by Dr. J. Hamelin, Chairman of Commission E and are scheduled on Monday 11 March 1990. The purpose of these meetings is to discuss progress in the Working Groups of Commission E, and to outline outstanding topics and new lines of research for the future. Prior to the discussions, synopses will be presented. The topics are as follows:

- Spectrum management and utilization (R.D. Parlow);
- Non-Gaussian noise in communication (A.D. Spaulding);
- High power electromagnetics "HPE" (R.L. Gardner);



- Terrestrial and planetary EM noise (M. Hayakawa, E.K.Smith);
- Interaction with and protection of complex electrical systems (C.E. Baum, P. Degauque, M. Ianoz);
- Effect of transients on equipment (V. Scuka, B. Demoulin);
- Extraterrestrial and terrestrial meteorologic-electric environment with noise and chaos).

For further information contact the Organizing Committee of the Symposium at the following address:

EMC Zurich '91  
ETH Zentrum-IKT  
CH-8092 Zurich, Switzerland.

Phone: (41) 1 256 2788  
Fax : (41) 1 262 0943  
Telex: 817379 ehg ch.

INTERNATIONAL COMMSPHERE '91 SYMPOSIUM

22-25 April 1991, Herzlia, Israel

Theme and Scope

Future telecommunication increasingly depends on the congestion of the transmission medium. Spectrum allocation has reached its limits in face of growing demand for communication services, and novel approaches become key to future development. Transmission localization, coordination and networking for proposed communication systems need an integrative system effort, encompassing appropriate network architecture, and optimization of the signal processing in the frequency, time, propagation, modulation and coding domains along with social and national interests and international coordination.

The COMMSPHERE Symposium is intended to focus on ways to develop telecommunication and other electronic services into the next century, avoiding further saturation of the congested transmission medium.

About the Symposium

This Symposium is a gathering of leading scientists,

industrialists and spectrum allocation specialists, aimed at interdisciplinary exposure and discussion of achievements, constraints, challenges and strategies. It is expected to breed better mutual interaction, trends of development of these services, and to support international cooperation.

The Symposium is supported by the International Union of Radio Science (URSI), the International Radio Consultative Committee (CCIR) and the IEEE Communication Society.

The Symposium is structured into three days of plenary sessions, each culminating on one aspect. The presentations and discussions have been carefully selected by the team of session organizers, to reflect the focus of the Symposium and the quality of the discussion. Five workshops will then explore in depth different aspects on the fourth day, and reassemble to a concluding plenary panel.

Most presentations are invited. Active workshop participation is, however, encouraged and should be addressed to the secretariat or to the workshop organizers.

#### Sessions

##### PROPAGATION MODELLING AND SIGNAL PROCESSING

Organizer: Prof. L.B. Felsen (Polytechnic University, N.Y., USA)

1. L.B. Felsen (Polytechnic University, N.Y., USA): Phase Space Concept for Combined Treatment of Propagation, Diffraction and Signal Processing.
2. E. Heyman (Tel Aviv University, Israel): Direct Time Domain Modelling of Short Pulse Propagation and Diffraction.
3. H. Bertoni, L.R. Maciel, H. Xia and J. Nal (Polytechnic University, N.Y., USA): Modelling Statistical Properties of UHF Propagation in Urban Environment.
4. A.J. Levy (CNET, France): Fine Structures of the Urban Mobile Propagation Channel.
5. L.J. Nickisch (Mission Research Corp., USA): Non-uniform Motion and Extended Media Effects on the Mutual Coherence Function: an Analytic Solution for Spaced Frequency, Position and Time.

##### MODELLING OF THE COMMUNICATION CHANNELS

Organizer: Dr. Seymour Stein (SCPE Inc., USA)

1. S. Stein (SCPE Inc., USA): Introduction.

2. P. Kartaschoff, J. Ruprecht, J.P. deWeck, P. Merki and E. Zollinger (Swiss PTT, Switzerland): Wideband Radio Channel Modelling and Measurements.
3. J.B. Andersen (Aalborg University, Denmark): Propagation Parameters and Bit Errors for a Fading Channel.
4. A.G. Brusentsov and V.Y. Kontorovich (Leningrad Bonch Bruevich Electrotechnical Communication Institute, USSR): Radio Channel Modelling Based on Dynamic System with Random Structure.

#### FUTURE TELECOMMUNICATION ARCHITECTURES

Organizer: Prof. F.L.H.M. Stumpers (Netherlands)

1. L. Weaver, K. Gilhousen, I. Jacobs, R. Padovani and A. Viterbi (Qualcomm Inc., USA): When is CDMA the Best Multiple Access Technique?
2. F.L.H.M. Stumpers (Netherlands): European Radio Communication Development in the 90's and Beyond.
3. D. Goodman, or Holzman (Rutgers University, USA): Research Activities for 3rd Generation Systems.

#### MULTIPLE ACCESS TECHNIQUES IN CELLULAR RADIO

Organizer: Dr. A. Viterbi (Qualcomm Inc., USA)

1. A. Viterbi (Qualcomm Inc., USA): Power Control for a Cellular CDMA Channel.
2. L.H. Ozarov, A.D. Wyner (AT&T Bell Labs, USA) and S. Shamai (Technion, Israel): Capacity Consideration for TDMA Cellular Mobile Radio.
3. D. Keshet, E. Zehavi (Technion, Israel): On Multipath Combining Techniques for CDMA Systems.
4. T. Maseng (Norway): Digital Phase Modulation in Cellular Mobile Telephone Systems.
5. L. Zetterberg (Royal Institute of Technology, Sweden): On Error Propagation in Adaptive Receivers for Mobile Radio.
6. N. Livneh<sup>\*</sup>, R. Meidan<sup>\*\*</sup>, M. Ritz<sup>\*</sup> and G. Zilbershatz<sup>\*</sup>  
<sup>\*</sup>Rafael, Israel, <sup>\*\*</sup>Motorola, Israel): Frequency Hopping CDMA for Cellular Radio.

#### PERSONAL COMMUNICATION NETWORKS OF THE FUTURE

Organizer: Mr. A. Salmasi (Qualcomm Inc., USA)

1. A. Salmasi (Qualcomm Inc., USA): Recent Development in North American Markets.
2. D.L. Schilling (CCNY, USA), L.B. Milstein (UCSD, USA), R.L. Pickholtz (George Washington University, USA)

and F. Miller (Millcom Inc., USA): Future Personal Communication and Spread Spectrum Management.

#### BANDWIDTH EFFICIENT MODULATIONS

Organizer: Prof. I. Kalet (Tel Aviv University, Israel)

1. Arie Reichman (Israel): Phase Estimation and Data Decoding for Trellis Coded Modulation.
2. Arne Svenson (Sweden): Recent Advances in Continuous Phase Modulation (CPM).
3. A. Trachtman, I. Kalet, S. Shamai (Israel): Discriminator Detection, New Results.
4. Burt Zaitzberg (USA): Quantization Noise in QAM over Compensating Channels.
5. E. Zehavi (Technion, Israel): Recent Work on Trellis Coding.
6. Ya'ir Be'eri (Technion, Israel): Lattice Codes.

#### CRITERIA FOR THE SPECTRUM RESOURCE VALUE AND ITS MANAGEMENT POLICIES

Organizer: Prof. R. Parlow (NTIA, USA)

1. R. Parlow (NTIA, USA): Introduction.
2. R.C. Kirby (CCIR): New Technologies and Frequency Spectrum.
3. R. Jones (Department of Communication, Canada): Spectrum Management Revenue Generation in Canada.
4. S.I. Cohn (CTO Inc., USA): Techniques for Dimensioning and Valuing the Radio Spectrum.

#### METHODS AND TOOLS FOR SPECTRUM MANAGEMENT AND MONITORING

Organizer: Prof. R.G. Strużak (CCIR, (Poland))

1. T. Cesky (Czechoslovakia): Trends in National Spectrum Management.
2. R. Lefort (Thomson CSF, France): Developments in Spectrum Monitoring.
3. V. Nedelchev (Rohde & Schwarz, Germany): Radio Monitoring and Spectrum Management Today and Tomorrow.
4. W. Segal: Terrain Models in Spectrum Management.

#### NON INTENDED RADIATION AND THE NOISE ENVIRONMENT

Organizer: Dr. E. Freeman (SFA Inc., USA)

1. E. Freeman (SFA, USA): Trends in Urban Noise in the 200 to 950 MHz Band over the Past 40 Years.
2. F.L.H.M. Stumpers (Netherlands): Vector Field Measurement and its Application.

## Workshops

The Workshops will run in parallel for half a day. Summarizing statements will then be presented to a plenary session by the workshop organizers, and discussed by a panel.

### A NEW DAWN FOR IONOSPHERIC COMMUNICATIONS

Organizer: Dr. H. Solcher (US Army CECOM, USA).

The Workshop will address the new advances in the field that open opportunities to increased capacity and more reliable channel.

1. N. Blaunstein (IZMIRAN, USSR): Foreshortening Scattering on the Middle Latitude Routes from Disturbed Ionospheric Area.
2. H. Solcher, F.J. Gorman (US Army CECOM, USA): Correlation Analysis of Ionospheric Parameters at Midlatitudes.
3. I.H. Keroub (Israel): Synergistic Progress Obtainable in the T.E.C. Regional Modelling by the Combined Use of Low-altitude Polar Orbiting Satellite Beacons and GPS Transmissions.
4. I.H. Keroub (Israel): Multitechnique Investigation of the Ionospheric Phenomenology: Importance, Feasibility and Expected Trends.

### MODELLING OF THE PROPAGATION CHANNEL IN MOBILE AND PERSONAL COMMUNICATION

Organizer: Dr. J. Shapira (Israel)

The Workshop will address the modelling of the different environments (e.g. urban, suburban, in-building, etc.), pertinent measurement parameters and methodology and interpretation of measurements. The establishment of an international working group will be discussed.

P. Kartaschoff (Swiss PTT, Switzerland)

A. Levy (CNET, France)

J.B. Andersen (Aalborg University, Denmark)

H. Bertoni (Polytechnic University, N.Y., USA).

### INTEGRATED MODELLING OF SOURCE RADIATION, PROPAGATION, DIFFRACTION AND SIGNAL PROCESSING

Organizer: Prof. L.B. Felsen (Polytechnic University, N.Y., USA)

This Workshop is intended to explore in depth various integrated approaches to modelling the source-environment-

receiver chain facing specialists in urban and terrestrial communication, remote sensing, target scattering and identification, imaging in biological materials, and related disciplines. The Workshop format will combine oral presentation of contributions and extensive discussions.

1. V.D. Gusev and S.M. Golinski (Moscow State University, USSR): A New Approach to the Problem of Wave Propagation in Inhomogeneous Stratified Media.
2. V.A. Adrianov and V.M. Smirnov (Institute of Radio Engineering and Electronics, USSR): Restoration of the Height Profile of the Tropospheric Refraction Index from Satellite Signal Measurement Data.

#### EFFICIENT MODULATION TECHNIQUES FOR FUTURE TELECOMMUNICATION SYSTEMS

Organizers: Dr. A. Viterbi (Qualcomm, USA) and Prof. I. Kalet (Tel Aviv University, Israel).

In the era of modulation for digital satellite transmission for HDTV and digital cellular radio, greater emphasis is placed on digital modulation for both bandwidth and power efficiency. Differences and similarities between the modulation techniques for power efficiency and for bandwidth efficiency will be discussed and their implications highlighted.

#### NON INTENDED RADIATION: OBSERVATION, COMPUTATION AND MONITORING

Organizer: Dr. E. Freeman (SFA Inc., USA)

The Workshop will address interference and EMC issues pertaining the medium congestion.

1. Yasuo Seki (Tokyo University of Agriculture and Technology, Japan): Degradation of Shielding Effectiveness due to E Field Resonance in Quasi-Near Field.
2. A. Tsaliovich (AT&T Bell Labs., USA).
3. J. Gavan (Israel): Analysis of Single-Tone Spurious Effects in Non Saturated Radio Communication Receiver.

#### SPECTRUM MANAGEMENT TOOLS

Organizer: Prof. R.G. Strużak (CCIR (Poland))

This Workshop will focus on spectrum planning, management and monitoring tools. It will include oral presentations, demonstration of equipment and extensive discussions.

1. T. Cesky (Czechoslovakia): Demonstration of a Microcomputer-Based Spectrum Management System.
2. R.G. Strużak (CCIR): Demonstration of some Spectrum Management Related Software from CCIR.
3. V. Nedelchev (Germany): Demonstration of some Modern Equipment for Radio Monitoring from Germany.
4. R. Lefort (France): Demonstration of some Modern Equipment for Radio Monitoring from France.

Venue

The Symposium will be held in a resort hotel on the beach, in the resort area of Herzlia, 12 km north of Tel Aviv, and less than 30 minutes drive from Lod International Airport.

Symposium Chairman: J. SHAPIRA  
Technical Programme Chairman: U. TIMOR  
Organizing Committee Chairman: D. SKLARSKY

International Organizing Committee:

I. Bar-David	Israel	R.G. Strużak	Poland
E.R. Freeman	USA	F.L.H.M. Stumpers	Netherlands
O. Hartal	Israel	U. Timor	Israel
D. Rosen	Israel	A. Viterbi	USA
J. Shapira	Israel	M. Wik	Sweden.
D. Sklarsky	Israel		

Symposium Secretariat: ORTRA Ltd  
Kaufman 2  
P.O.Box 50432  
Tel Aviv 61500  
Israel.  
Phone: (972) 3 664 825  
Fax : (972) 3 660 952

Dr. J. Shapira Phone: 619-587 1121\*150  
Fax : 619-452 9096

Dr. U. Timor Phone: (972) 4 794 788.

3rd SYMPOSIUM ON ARTIFICIAL MODIFICATION OF THE IONOSPHERE

The Symposium on Artificial Modification of the Ionosphere will be held at Suzdal, USSR from 9 to 13 September 1991. The Symposium is sponsored by URSI Commissions G (Ionospheric Radio and Propagation) and H (Waves in Plasmas), and the Honorary Chairman is Professor V.V. Migulin. This is the third Symposium in the URSI series started at Suzdal in 1986.

Information on the scientific programme is available from:

Prof. V.V. Migulin  
USSR Academy of Sciences  
Institute of Radioengineering and Electronics  
Prospekt Marksaa 18  
Moscow 103907  
USSR

or

Prof. W.E. Gordon  
Rice University  
Space Physics and Astronomy Department  
Houston, Texas 77251  
USA.

Information on local arrangements may be obtained from:

Dr. G.S. Bochkarev  
IZMIRAN  
142092 Troitsk  
Moscow Region  
USSR.

1991 NORTH AMERICAN RADIO SCIENCE MEETING

AND

INTERNATIONAL IEEE/AP-S SYMPOSIUM

Final Call for Papers

The 1991 North American Radio Science Meeting, sponsored by the USNC and CNC for URSI, and the International IEEE/AP-S Symposium, sponsored by the IEEE Antennas and Propagation



Society (AP-S), will be held jointly at the Social Sciences Building of The University of Western Ontario, London, Ontario, from 24 to 28 June 1991. The technical sessions for the North American Radio Science Meeting and the International IEEE/AP-S Symposium will be coordinated to provide a comprehensive and well-balanced programme. Authors are invited to submit papers on all topics of interest to the AP-S and URSI membership. Suggested topics are listed below.

Suggested Topics for AP-S

1. Adaptive and signal processing antennas
2. Antenna measurement and metrology
3. Antenna theory
4. Biomedical applications
5. Broadband and multifrequency antennas
6. Computer-aided antenna design
7. Electromagnetic theory
8. Feed and radiating elements
9. Frequency-selective surfaces
10. Imaging radars
11. Inverse methods
12. Microstrip antennas
13. Microwave components
14. Microwave materials in antenna applications
15. Millimeter and submillimeter waves
16. Millimeter-wave antennas
17. Monolithic active array techniques
18. Multiple beam antennas
19. Near-field measurement and theory
20. Numerical methods
21. Phased arrays
22. Polarimetrics
23. Propagation
24. Reflector antennas
25. Remote sensing
26. Scattering and diffraction
27. Time domain methods
28. Other.

Suggested Topics for URSI

Commission A (Electromagnetic Metrology)

- A1 Microwave to submillimeter measurements and standards
- A2 Quantum metrology and fundamental constants
- A3 Time and frequency
- A4 High- $T_C$  superconductors at high frequency
- A5 Time domain metrology
- A6 Metrological problems with EMC and EM pollution
- A7 Noise
- A8 Materials
- A9 Impulse radar
- A10 Bioeffects and medical applications

Commission B (Fields and Waves)

- B1 Radar cross section and target recognition
- B2 Scattering by complex objects, and random media
- B3 Theoretical and computational electromagnetics
- B4 Inverse scattering
- B5 Transient fields
- B6 Analytical and asymptotic techniques

Commission C (Signals and Systems)

- C1 Coding and modulation
- C2 Spread spectrum systems
- C3 Error-correcting codes
- C4 Signal processing in communications

Commission D (Electronics and Optical Devices and Applications)

- D1 Opto-electronic techniques, sensors, materials
- D2 Superconductivity
- D3 Optical fibres
- D4 Laser measurements
- D5 High frequency and high-speed devices and circuits
- D6 Advanced materials and processing

Commission E (Electromagnetic Noise and Interference)

- E1 Natural impulsive and spectral noise
- E2 Man-made EM environment

Commission F (Wave Propagation and Remote Sensing)

- F1 Coastal radar and mapping of sea and ice
- F2 Space-based imaging radar (ERS-1, Radarsat)
- F3 Microwave scattering signatures for remote sensing
- F4 Clear air microwave propagation
- F5 Rain effects
- F6 Mobile and indoor radio channel modelling
- F7 MTS radar
- F8 Radio meteorology and radio oceanography

Commission G (Ionospheric Radio and Propagation)

- G1 Radio studies of the high-latitude ionosphere
- G2 Ionospheric modelling and propagation
- G3 Coupling of upper atmospheric regions

Commission H (Waves in Plasmas)

- H1 Nonlinearities in the ionosphere/magnetosphere
- H2 Waves in laboratory and ionospheric plasmas
- H3 Electron beam and mass injection into the ionosphere
- H4 EM beam-forming in the ionosphere

Commission J (Radio Astronomy)

- J1 Submillimeter receivers
- J2 Focal plane arrays
- J3 Space based long baseline interferometry
- J4 Aperture synthesis techniques
- J5 Signal processing and VLSI
- J6 Computational limits in astronomy
- J7 Precise measurements and interference
- J8 Pulsar timing properties and problems
- J9 Magellan and COBE satellite results.

Deadline: All summaries and abstracts must be received before 4 January 1991.

General enquiries regarding the conference may be directed to Mrs D. Ruest, Conference Services Coordinator, National Research Council Canada, (613) 993 9009, Fax: (613) 957 9828.

Technical programme enquiries may be directed to:  
Dr. S. Kubina (AP-S), (514) 848 3093 or Dr. H.C. James (URSI),

(613) 998 2230.

Prizes will be awarded for the three best papers presented by graduate students at the North American Radio Science Meeting in London, Canada. The prizes will be provided by the US National and Canadian National Committees for URSI. From papers submitted by 4 January 1991, three finalists will be selected, who will present their papers during the Radio Science Meeting.

*Remarque: Le texte français de l'annonce ci-dessus a été publiée dans le numéro de septembre 1990 du "Bulletin d'Information de l'URSI".*

URSI INTERNATIONAL SYMPOSIUM ON  
ELECTROMAGNETIC THEORY

The 14th URSI International Symposium on Electromagnetic Theory will be held in Sydney, Australia, from 17 to 20 August 1992. This Symposium is held triennially by URSI Commission B on Fields and Waves. Since its inception in 1953 it was quickly established as a major international forum covering all areas of electromagnetic theory. This 14th triennial meeting marks the first time the Symposium has been held in the Southern hemisphere.

Review papers or contributions concerning new methods and/or applications are invited in all areas of electromagnetic theory.

Contributions

When considering a contribution for possible inclusion in the technical programme, authors should prepare a title and full page synopsis in English (the working language of the Symposium). References and/or figures can be included if desired. Whatever material is submitted, it should explain clearly the content and relevance of the proposed contribution. The time allocated for each paper will be 20 minutes for the presentation plus a maximum of 10 minutes for discussion and

questions. If your paper is accepted then you will be asked to prepare a camera ready manuscript for inclusion in the Proceedings of the Symposium.

*Please note that authors whose papers are accepted must intend to present their paper in person otherwise it should be withdrawn.* Once papers have been accepted, it is considered unprofessional behaviour of authors to fail to contact the Symposium organizers if changed circumstances prevent their attendance. In the past, this practice has caused unnecessary disruption to the programme.

#### Deadlines

Receipt of synopsis	1 November 1991
Notification of acceptance	13 March 1992
Receipt of camera ready manuscript	1 June 1992.

#### Fax and mailing address

Graeme James	Phone: (61) 2-868 0222
Chairman	Telex: 26230 ASTRO
URSI EM Symp. '92 Organizing Committee	Fax : (61) 2-868 0400 (61) 2-868 0220.
CSIRO Division of Radiophysics	
P.O.Box 76	
Epping, N.S.W. 2121	
Australia.	

#### THE WORLD SPACE CONGRESS

This historic Congress will convene in Washington, D.C. from 28 Aug. to 9 September 1992. Thousands of scientists, engineers, administrators and other leaders of space will journey from around the world to exchange results, share ideas, develop strategy, compare programmes and plan the future of space into the 21st century.

This event combines the 43rd Congress of the International Astronautical Federation (IAF) and the 29th Plenary Meeting of the Committee on Space Research (COSPAR) of the International Council of Scientific Unions (ICSU), the first joint

meeting of these two groups.

Hosted and organized by the American Institute of Aeronautics and Astronautics (AIAA), the World Space Congress will be held under the auspices of the National Academy of Sciences (NAS), and the National Aeronautics and Space Administration (NASA).

The United Nations views the World Space Congress as a strong encouragement for international cooperation in space science and applications for the betterment of humanity.

#### Scientific and Technical Programme

The scientific and technical programme of the Congress will consist of invited and contributed papers dealing with progress on an international scale, in space sciences, technology and applications.

Dr. G. Horneck (Germany) chairs the International Programme Committee for COSPAR. COSPAR sessions will be devoted to space studies of:

- Earth, moon, planets and small bodies of the solar system
- Upper atmosphere and space plasmas in the solar system
- Solar physics, galactic and extragalactic astrophysics
- Life in space, its origin, evolution and function within our solar system and beyond
- Gravity-related phenomena in materials and fluid sciences.

Dr. K. Doetsch (Canada) and Dr. L. Perek (Czechoslovakia) co-chair the International Programme Committee for IAF and will plan sessions covering:

- Space exploration including a return to the Moon and Mars
- Space transportation and space stations
- Space communications, space safety and rescue, earth observation from space and SETI
- Space education
- Space technology disciplines including astrodynamics, propulsion, power, materials and structures, automation and robotics; space science disciplines including life sciences, telescience and microgravity.

A COSPAR/IAF Programme Committee will also plan joint lectures in areas of common interest. Sessions of special interest to developing countries are planned in cooperation

with the United Nations Outer Space Affairs Division.

The Call for Papers will be issued in July 1991.

Information available from:

The World Space Congress  
c/o American Institute of Aeronautics  
and Astronautics  
370 L'Enfant Promenade, S.W.  
Washington D.C. 20024-2518, USA.  
Phone: (1) 202-646 7451  
Fax : (1) 202-646 7508.

## LIST OF FUTURE SYMPOSIA AND MEETINGS

*Note: Events marked by an asterisk are sponsored or co-sponsored by URSI.*

9th International Zurich Symposium and Technical Exhibition  
on Electromagnetic Compatibility\*  
Zurich, Switzerland, 12-14 March 1991.

Contact address: EMC Zurich '91  
ETH Zentrum-IKT  
CH-8092 Zurich  
Switzerland.  
Phone: (41) 1-256 2788  
Fax : (41) 1-262 0943  
Telex: 817379 ehg ch.

4th International School for Space Simulation\*  
Kyoto, 25-30 March, Nara, 2-6 April 1991.

Contact Address: Prof. H. Matsumoto  
Radio Atmospheric Science Centre  
Kyoto University  
Gokanosho, Uji-shi 611  
Japan.  
Phone: (81) 774-332  
Fax : (81) 774-318 463  
Telex: 5453665 Rascku J.

7th International Conference on Antennas and Propagation  
(ICAP '91)\*  
York, United Kingdom, 15-18 April 1991.

Contact address: Conference Services  
The Institute of Electrical Engineers  
Savoy Place  
London WC2R 0BL, United Kingdom.  
Phone: (44) 71-240 1871 Ext.222  
Fax : (44) 71-240 7735  
Telex: 261176 IEE LDN G.



International COMMSPIHERE '91 Symposium\*  
Herzlia, Israel, 22-25 April 1991.

Contact address: ORTRA Ltd  
Kaufman 2  
P.O.Box 50432  
Tel Aviv 61500  
Israel.  
  
Phone: (972) 3-664 825  
Fax : (972) 3-660 952  
Telex: 361142 OR TRL.

XVI General Assembly of the European Geophysical Society (EGS)  
Wiesbaden, Germany, 22-26 April 1991.

Contact address: Local Organizing Committee EGS  
Max-Planck Institut für Aeronomie  
D-3411 Katlenburg-Lindau  
Germany.  
  
Phone: (49) 5556 4011  
Fax : (49) 5556 401 240  
Telex: 965527 aerli d.

International Symposium on Analogies in Optics and Micro-  
electronics  
Eindhoven, Netherlands, 2-3 May 1991.

Contact address: Prof. W. van Haeringen  
Physics Department  
Eindhoven University of Technology  
P.O.Box 513  
NL-5600 MB Eindhoven  
Netherlands.

International Symposium on Recent Advances in Microwave  
Technology\*  
Reno, Nevada, USA, 22-25 May 1991.

Contact address: Dr. Banmali S. Rawat  
Chairman, ISRAMT Advisory Committee  
Department of Electrical Engineering and  
Computer Science  
University of Nevada-Reno  
Reno, Nevada 89557-0030  
USA.

Phone: (1) 702-784 6927  
Fax : (1) 702-784 1300.

International Geoscience and Remote Sensing Symposium  
(IGARSS'91)\*

Espoo, Finland, 3-6 June 1991.

Contact address: IGARSS'91 Congress Team  
P.O.Box 227  
SF-00131 Helsinki  
Finland.

Phone: (358) 0-176 866  
Fax : (358) 0-654 987  
Telex: 122783 arcon sf.

1991 National Radio Science Meeting and International IEEE/AP-S  
Symposium

London, Ontario, Canada, 24-28 June 1991.

Contact address: Mrs D. Ruest  
Conference Services Coordinator  
National Research Council Canada  
Ottawa, Ontario  
Canada K1A 0R6.

Phone: (1) 613-993 9009  
Fax : (1) 613-957 9828.

XXth International Conference on Phenomena in Ionized Gases  
(ICPIG)\*

Barga, Italy, 8-12 July 1991.

Contact address: Dr. V. Palleschi  
Istituto di Fisica Atomica e Molecolare  
Via del Giardino 7  
I - 56127 Pisa, Italy.

Phone: (39) 50-543 456  
Fax : (39) 50-589 048.

5th Workshop on Scientific and Technical Aspects of MST Radars\*  
Aberystwyth, United Kingdom, 6-9 August 1991.

Contact address: Prof. L. Thomas  
Department of Physics  
University College of Wales  
Aberystwyth, SY23 3BZ, United Kingdom.

20th General Assembly of the International Union of Geodesy  
and Geophysics (IUGG)

Vienna, Austria, 11-24 August 1991.

Contact address: Prof. P. Steinhauser  
Zentralanstalt für Meteorologie und Geodynamik  
Hohe Warte 38  
A-1190 Vienna, Austria.

European Conference on Optical Communication (ECOC'91)\*  
Paris, France, 9-12 September 1991.

Contact address: Ms G. Bonami  
SDSA  
65 av. Edouard Vaillant  
F-92100 Boulogne-Billancourt  
France.  
Phone: (33) 1-4608 5661  
Fax : (33) 1-4608 2312  
Telex: 633018 F.

3rd Symposium on Artificial Modification of the Ionosphere\*  
Suzdal, USSR, 9-13 September 1991.

Contact address: Dr. G.S. Bochkarev  
IZMIRAN  
142092 Troitsk  
Moscow Region, USSR.

6th World Telecommunication Forum, Part 2: Technical Symposium  
Geneva, Switzerland, 10-15 October 1991.

Contact address: Forum '91 Secretariat  
International Telecommunication Union  
Place des Nations  
CH-1211 Geneva 20  
Switzerland.  
Phone: (41) 22-730 5680  
Fax : (41) 22-740 1013  
Telex: 421000 uit ch.

International Conference on Computation in Electromagnetics  
London, United Kingdom, 26-27 November 1991.

Contact address: CEM'91 Secretariat  
Conference Services  
The Institute of Electrical Engineers  
Savoy Place  
London WC2R 0BL  
United Kingdom.

Phone: (44) 71-240 1871 Ext. 222  
Fax : (44) 71-240 7735  
Telex: 261176 IEE LDN G.

6th International Conference on Mobile Radio and Personal  
Communications  
Warwick, United Kingdom, 9-12 December 1991.

Contact address: MRPC'91 Secretariat  
Conference Services  
The Institute of Electrical Engineers  
Savoy Place  
London WC2R 0BL  
United Kingdom.

Phone: (44) 71-240 1871 Ext. 222  
Fax : (44) 71-240 7735  
Telex: 261176 IEELDN G.

International Symposium on the Middle Atmosphere Sciences\*  
Kyoto, Japan, 23-26 March 1992.

Contact address: Prof. S. Kato  
Radio Atmospheric Science Centre  
Uji, Kyoto 611  
Japan.

Phone: (81) 774-32 3111  
Fax : (81) 774-31 8463  
Telex: 5453665 Rascku J.

International Symposium on Electromagnetic Compatibility  
Beijing, China, 25-27 May 1992.

Contact address: EMC'92/Beijing  
c/o Prof. Zhang, Linchang  
EMC Research Section  
Northern Jiaotong University  
Beijing 100044  
China.

Symposium on Microwave Signatures\*  
Munich, Germany, June 1992.

Contact address: Institut für Hochfrequenztechnik  
Deutsche Forschungsanstalt für Luft- und  
Raumfahrt  
D-8031 Oberpfaffenhofen  
Germany.  
Phone: (49) 8153 280  
Fax : (49) 8153 281135.

Conference on Precision Electromagnetic Measurements (CPEM'92)\*  
Paris, France, 9-12 June 1992.

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.

High Resolution Imaging\*  
Sydney or Narrabri, Australia, July 1992.

Contact address: Prof. John Davis  
Department of Physics  
University of Sydney  
Sydney N.S.W. 2006  
Australia.

IEEE/AP-S International Symposium, URSI Radio Science Meeting  
and Nuclear EMP Meeting  
Chicago, USA, 18-25 July 1992.

Contact address: Prof. P.L.E. Uslenghi  
1992 IEEE/AP-S/URSI/NEM Symposium Chair  
Department of EECS (m/c 154)  
The University of Illinois at Chicago  
Box 4348  
Chicago, Illinois 60680  
USA.  
Phone: (1) 312-996 5487 (direct)  
(1) 312-996 3433/3 (dept.)  
Fax : (1) 312 413 0024.

14th URSI International Symposium on Electromagnetic Theory\*  
Sydney, Australia, 17-20 August 1992.

Contact address: Graeme James  
Chairman  
URSI EM Symp.'92 Organizing Committee  
CSIRO Division of Radiophysics  
P.O.Box 76  
Epping, NSW 2121  
Australia.  
  
Phone: (61) 2-868 0222  
Fax : (61) 2-868 0400  
(61) 2-868 0220  
Telex: 26230 ASTRO.

The World Space Congress (43rd Congress of the International  
Astronautical Federation and 29th Plenary Meeting of COSPAR)  
Washington, D.C., 28 August - 9 September 1992.

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

International Meeting on Wave Propagation in Random Media\*  
Seattle, USA, August 1992.

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

URSI International Symposium on Signals, Systems and  
Electronics (ISSSE'92)\*  
Paris, France, 1-4 September 1992.

Contact address: Mrs. Y. Stevanovitch  
Executive Secretary, ISSSE'92  
Boîte postale No 2, Uccle 3  
1180 Brussels  
Belgium.  
Phone: (32) 2-358 19 66  
Fax : (33) 1-4095 7015.

International Symposium on Antennas and Propagation (ISAP'92)\*  
Sapporo, Japan, 22-25 September 1992.

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

Astronomy with Millimeter and Submillimeter Wave Interfero-  
metry\*

(probably) Hakone, Japan, October 1992.

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

Workshop on Turbulence in Space Plasmas\*  
Aussois, France, beginning of 1993.

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

Space VLBI\*

Japan, adjacent to XXIV General Assembly of URSI.

Contact address: Prof. M. Morimoto  
National Astronomical Observatory  
Japan.



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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.1 Spectrum Management and Utilization  
Chairman: Dr. R.D. Parlow (USA)
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- G.1 Ionosonde Network Advisory Group (INAG)  
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- G.2 Studies of the Ionosphere Using Beacon Satellites  
Chairman: Prof. R. Leitinger (Austria)  
Vice-Chairmen: Dr. J.A. Klobuchar (USA)  
T.R. Tyagi (India)
- G.3 Incoherent Scatter  
Chairman: Dr. J.M. Holt (USA)  
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- G.4 Ionospheric Informatics  
Chairman: Dr. B.W. Reinisch (USA)  
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Commission H - Waves in Plasmas

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J.1 Global Very Long Baseline Interferometry (VLBI)  
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*(provisional title)*

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- CGH.1 Wave and Turbulence Analysis  
Co-Chairman for Commission H: Dr. F. Lefeuvre (France)
- GH.1 Active Experiments in Plasmas  
Co-Chairman for Commission G: Dr. Sa. Basu (USA)  
Co-Chairman for Commission H: Dr. P. Bernhardt (USA)
- GH.2 Computer Experiments, Simulation and Analysis of Wave  
Plasma Processes  
Co-Chairman for Commission G: Dr. S. Ossakow (USA)  
Co-Chairman for Commission H: Prof: H. Matsumoto (Japan)
- Time Domain Waveform Measurements  
Chairman: Prof. T. Sarkar (USA)

INTER-UNION WORKING GROUPS

- URSI/IAGA.1 VLF/ELF Remote Sensing of the Ionosphere and  
Magnetosphere (VERSIM)  
Co-Chairman for Commission H: Dr. U. Inan (USA)  
Co-Chairman for Commission G: Dr. A.J. Smith (UK)

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- FAGS (Federation of Astronomical and Geophysical Data Analysis  
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- IUWDS Steering Committee (International Ursigram and World  
Days Service):  
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- COSPAR (Committee on Space Research):  
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SCOR (Scientific Committee on Oceanic Research):

*to be designated by Commission F*

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CPEM (Conference on Precision Electromagnetic Measurements):

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