

U.R.S.I.

TABLE DES MATIERES - CONTENTS

| | |
|--|----|
| In Memoriam | 1 |
| Jaroslav Prokop, 1931-1991..... | 1 |
| URSI Accounts 1991..... | 2 |
| Scientific Programme of the 24th General Assembly | 9 |
| URSI Awards..... | 11 |
| News from the Member Committees | 14 |
| Profile of Member Committees - Canada | 15 |
| News from the Commissions..... | 18 |
| Commission B..... | 18 |
| Commission K..... | 21 |
| Reports on URSI-Sponsored Meetings..... | 23 |
| The International Commsphere'91 Symposium..... | 23 |
| UTC Time Stop on 1 July, 1992 | 36 |
| Meeting Announcements..... | 37 |
| Beacon Satellite Symposium 1992 | 37 |
| Sub-Arcsecond Radio Astronomy and the interaction between radio and optical observations at high resolution..... | 38 |
| International Meeting for Wave Propagation in Random Media | 39 |
| 1992 Asia-Pacific Microwave Conference | 41 |

| | |
|---|----|
| Astronomy with Millimetre and Sub-millimetre Wave Interferometry | 42 |
| Very High Angular Resolution Imaging..... | 43 |
| The Eight International Conference on Antennas and Propagation | 44 |
| ICC'93, International Conference on Communications | 47 |
| URSI Radio Science Meeting and IEEE AP-S Symposium..... | 48 |
| International Microwave Conference in Brazil..... | 50 |
| 1993 International Symposium on Radio Propagation (ISRP '93)..... | 52 |
| The Third International Symposium on Antennas and EM Theory (ISAE'93) | 53 |
| Other URSI-sponsored meetings | 56 |
| Other meetings which have been brought to our attention..... | 56 |
| IUCAF's Report on the 1992 ITU World Administrative Radio Conference..... | 60 |
| Annual Report of IUWDS..... | 67 |
| From the Archives of URSI..... | 71 |
| List of Changed Addresses..... | 77 |

IN MEMORIAM

JAROSLAV PROKOP, 1931-1991

Professor Jaroslav Prokop, longtime on the teaching staff of the Faculty of Electrical Engineering of the Czech Technical University in Prague, recently passed away.

He was an acknowledged expert in the field of electromagnetic wave propagation, and in particular in the propagation of very long waves, the model of the Earth-ionosphere system and longwave radio propagation under the surface of the Earth. He recently investigated the influence of the atmosphere, rain and fog on signal reception from satellites, and the depolarisation of very-short-waves by raindrops. He also gained recognition for further developing space research within the framework of the "Interkosmos" programme.

Professor Prokop was a member of a variety of special commissions and scientific-technical boards dedicated to questions of radio, satellite, and space communication. For many years he was Official Member of Commission F of the Czechoslovak Member Committee. As Co-Chairman of the Organizing Committee he became a major figure in the so successful organization of the 23rd General Assembly in Prague.

His boundless productivity and vitality was expressed in a great number of papers, research reports, and textbooks - particularly in the university textbook "Electromagnetic wave propagation and antennas".

During his long pedagogical career he showed not only professional scientific experience, but profound humanity as well. He was very popular among his colleagues and students for his open-minded personality, his concern for the people around him, and his contagious optimism. He will be missed by all of us.

THE URSI COMMITTEE IN CZECHOSLOVAKIA

URSI ACCOUNTS 1991

The Balance Sheet and the Income and Expenditure Accounts of URSI for the year ended 31 December 1991 have been prepared by Maquet, Sambaere, Savoir & Associates, and audited by Van Poyer & Cie, Réviseurs d'Entreprises, Brussels, at the end of March 1992. They are reproduced below.

The URSI financial health can be considered as rather good for several quantitative and qualitative reasons :

- 1) by the end of 1991, the URSI assets were equal to about 1.5 times the yearly income, which is fairly close to the recommendations made by the International Council of Scientific Unions (ICSU);
- 2) the excess of income over expenditure in 1991 reflects the relative decrease in administrative expenditure and the need for building up the fund for the XXIV General Assembly in 1993;
- 3) the scientific expenditure (including the publications) now exceeds the administrative one, which is in line with the recommendations made by the Council at the General Assembly in Prague,
- 4) provisions have been made to increase the support to Young Scientists for their participation both in specific symposia in 1992 and in the XXIV General Assembly in 1993.

P. BAUER, TREASURER

INTERNATIONAL UNION OF RADIO SCIENCE
(URSI)

BALANCE SHEET : 31 DECEMBER 1991

ASSETS

| <u>Dollars</u> | | \$ |
|-----------------------|------------|------------|
| Banque Degroof | 20,802.61 | |
| Alex Brown Inc. | 2,233.33 | |
| Merrill Lynch | 10.10 | |
| Merrill Lynch WCMA | 80,243.72 | |
| Traveller cheque | 1,000.00 | |
| Bank transfers | 1,244.56 | |
| | ----- | 105,534.32 |
| <u>Belgian francs</u> | | |
| Banque Degroof | 34,362.45 | |
| Générale de Banque | 595.12 | |
| | ----- | 34,957.57 |
| <u>Investments</u> | | |
| Demeter Sicav shares | 22,104.00 | |
| Rorento Units | 120,276.33 | |
| Alpine Shares | 35,000.00 | |
| Pennzoil Shares | 51,891.24 | |
| M-L Fund | 60,019.95 | |
| Brown Fund | 10,000.00 | |
| Bank Deposits | 36,363.64 | |
| | ----- | 335,655.16 |
| Petty cash | | 446.27 |
| | | ----- |
| Total Assets | | 476,593.32 |

| | |
|------------------------------|------------|
| <u>Less creditors</u> | |
| IUCAF (*) | 17,431.94 |
| IUWDS (*) | 4,448.73 |
| Audit fees | 1,515.15 |
| Salary and social security | 5,855.03 |
| | ----- |
| | 29,250.85 |
| Balth van der Pol Medal Fund | 14,592.00 |
| | ----- |
| NET TOTAL OF URSI ASSETS | 432,750.47 |
| | ===== |

The net URSI Assets are represented by :

\$

Closure of Secretariat :

Closure of Secretariat 13,636.36

Scientific Activities Fund :

| | |
|-------------------------------|-----------|
| Scientific Activities in 1992 | 65,000.00 |
| Young Scientists in 1992 | 10,000.00 |
| | ----- |
| | 75,000.00 |

XXIV General Assembly Fund 1993 :

| | |
|------------------|------------|
| Scientific | 90,000.00 |
| Young Scientists | 40,000.00 |
| Organization | 50,000.00 |
| | ----- |
| | 180,000.00 |

Unallocated Reserve Fund

| |
|------------|
| 268,636.36 |
| ----- |
| 164,114.11 |
| ----- |
| 432,750.47 |
| ===== |

**STATEMENT OF INCOME AND EXPENDITURE
FOR THE YEAR ENDED 31 DECEMBER 1991**

| <u>I. INCOME</u> | \$ |
|--------------------------------------|------------|
| Alloc. from UNESCO to ICSU | 19,300.00 |
| Contributions from Member Committees | 214,530.52 |
| Special Contributions | 14,860.61 |
| Sales of Publications | 189.85 |
| Bank Interest | 18,634.31 |
| Gain on Exchange | 5,705.95 |
| Other Income | 14,483.74 |
| | ----- |
| Total Income | 287,704.98 |
| | ===== |

II. EXPENDITURE

| | |
|---------------------------------------|-----------|
| <u>a) Scientific Activities</u> | 58,450.63 |
| General Scientific | 2,826.15 |
| Symposia/Colloquia/Working Groups | 30,483.76 |
| Representation at Scientific Meetings | 12,564.96 |
| Grants to Organizations | 12,575.76 |
| | ----- |
| <u>b) Routine Meetings</u> | |
| Bureau/Executive Committee | 15,458.24 |
| <u>c) Publications</u> | |
| | 36,172.70 |

d) Administrative Expenses

| | | |
|---------------------------|-----------|-----------|
| | | \$ |
| | | 60,653.36 |
| Salaries, Related Charges | 39,697.97 | |
| General Office Expenses | 9,810.39 | |
| Accounting and Audit Fees | 8,862.88 | |
| Bank Charges | 2,167.30 | |
| Loss on Exchange | 114.82 | |
| | ----- | |

e) ICSU Dues

| | | |
|-------------------|--|------------|
| | | 4,580.00 |
| | | ----- |
| Total Expenditure | | 175,314.93 |
| | | ===== |

| | | |
|---|--|------------|
| Excess of Expenditure over Income | | 112,390.05 |
| Accumulated Balance at 1 January 1991 | | 329,047.43 |
| | | ----- |
| Balance at 31 December 1991 | | 441,437.48 |
| Appreciation of Belgian Franc | | (8,687.01) |
| | | ----- |
| Accumulated Balance at 31 December 1991 | | 432,750.47 |
| | | ===== |

Rates of exchange :

1 January 1991 : \$1 = 31,20 BF
31 December 1991 : \$1 = 33,00 BF

Observation :

The accounts indicated with (*) are constituted by :

- 50 % in US \$

- 50 % in Shares as indicated below :

- DEMETER SICAV
- RORENTO

Appreciation in value of investments on December 31, 1991 :

| | |
|-------------------|-------------|
| - DEMETER SICAV : | 30,844.00 |
| - RORENTO : | 250,997.00 |
| - ALPINE : | Unavailable |
| - MERRILL LYNCH | 61,178.00 |
| - PENNZOIL : | 53,073.00 |

APPENDIX

DETAIL OF INCOME AND EXPENDITURE

I. INCOME

\$

Other Income :

| | | |
|--------------|-----------|-----------|
| Hyannis 1990 | 4,297.74 | |
| IGARSS'90 | 10,186.00 | |
| | ----- | 14,483.74 |

II. EXPENDITURE

Symposia/Colloquia/Working Groups :

| | | |
|-----------------------------|-----------|-----------|
| IEEE/IGARSS'91 | 5,000.00 | |
| Radio Prop. Physics Trieste | 10,983.76 | |
| COMMSPHERE | 3,000.00 | |
| Iguazu Workshop | 9,000.00 | |
| Microwave Sign | 2,500.00 | |
| | ----- | 30,483.76 |

Grants to Organizations :

| | | |
|----------------------------|----------|-----------|
| Radio Science Press | 7,575.76 | |
| FAGS 1991 | 2,000.00 | |
| Contribution URSI to IUCAF | 3,000.00 | |
| | ----- | 12,575.76 |

Publications :

| | | |
|------------------------|-----------|-----------|
| Bulletin No 255 | 12,098.03 | |
| Bulletin No 256 | 3,883.06 | |
| Bulletin No 257 | 4,837.37 | |
| Bulletin No 258 | 4,286.30 | |
| XXIII General Assembly | 11,067.94 | |
| | ----- | 36,172.70 |

SCIENTIFIC PROGRAMME OF THE 24TH GENERAL ASSEMBLY

The Coordinating Committee of URSI (consisting essentially of the Board and the Commission Chairmen) met in Brussels on 27-28 April, 1992, and discussed the main features of the Scientific Programme with Vice-President J. Bach Andersen, Coordinator, and Professor H. Matsumoto, Associate Coordinator. The Coordinator wrote these few lines to present the programme :

"The XXIVth General Assembly of URSI takes place in Kyoto, Japan, at the well-known Kyoto International Conference Hall from August 25 to September 2, 1993. Professor T. Okoshi is heading a large group of local organizers, planning this special and exciting event which a General Assembly of URSI is. More than 10 separate halls have been reserved for the activities, which are all under one roof. As a new and unique feature, an exhibition will be displayed for part of the General Assembly.

A total of 103 sessions with oral presentation has been planned. To those are added the ten Tutorials, presentation of broad themes from each Commission, and finally three General Lectures of interest to all.

In contrast to early General Assemblies, a number of sessions are now open to contributed papers in addition to the invited ones, and one afternoon is devoted to a giant poster session with no competing sessions. Each author, invited or contributing, is required to submit a one-page A4 Abstract before February 1st, 1993

to :

Professor I. Kimura, c/o Osaka Office
Business Centre for Academic Societies Japan
10th Tabuchi Building
6-3 Matsugae-cho, Kita-ku
OSAKA 530, JAPAN
Fax (81) 6-356 6180

The abstracts will be evaluated by the conveners of the individual sessions. Further details are available in the First Announcement of the Call for Papers, which will be sent out in June 1992. The accepted abstracts will be published as submitted in the Book of Abstracts. Other publications available at the General Assembly will include Modern Radio Science 1993 (with Tutorials and General Lectures), and a renovated Review of Radio Science with review articles and a diskette with a large number of references for the three year period."

Professor H. Matsomoto gave us the following tentative titles for the General Lectures (together with potential lecturers) :

| | |
|---|----------------------|
| Time and Frequency in Communications and Navigation Systems | J. Mc. Steele (U.K.) |
| New Development and Prospect of HDTV Satellite Broadcasting | T. Nishizawa (Japan) |
| Radio and Radar Exploration from Spacecraft : Highlights of Magellan at Venus | G. Pettengill (USA) |

Similar tentative data are available for the tutorials of the Commissions, which are :

| | | |
|---|--|--------------------------|
| A | State of the art communication techniques : from radio-waves to optical fibres | S. Shimada (Japan) |
| B | Modern Concepts in Analysis, Synthesis and Measurements of Antennas | Yahya Rahmat-Samii (USA) |
| C | Overview of Mobile and Personal Communication | A. Viterbi (USA) |
| D | Optical Solitons : Physics and Applications for communications | A. Barthelemy (France) |
| E | Telecommunication at the Cross Road | D. Parlow (USA) |
| F | Results from Spaceborne Radars (ER-1, JER-1, Almaz) | E. Attema (Netherlands) |
| G | Ionospheric Modelling | D. Anderson (USA) |
| H | 40 Years of Whistler Research | R.A. Helliwell (USA) |
| J | Charm of Radio Astronomy and its protection | M. Morimoto (Japan) |
| K | Electromagnetics in Biology and Medicine | W.R. Adey (USA) |

URSI AWARDS

A letter was sent out in January 1992 to the Member Committees of URSI, the Chairmen and Vice-Chairmen of Commissions, and the former Laureates of an URSI Award, inviting nominations for the four URSI Awards to be presented next year at the occasion of the XXIV General Assembly in Kyoto.

The rules for the Awards have been reproduced in extenso in the March 1992 Bulletin. It is perhaps useful to give the list of the former laureates of these Awards.

Balth. van der Pol Gold Medal

- 1963 : Sir Martyn RYLE (UK) : Application of the phase switching and aperture synthesis techniques to antennas for radio astronomy.
- 1966 : Prof. W.E. GORDON (USA) : Development of the incoherent scatter technique for ionospheric studies.
- 1969 : Dr. J.P. WILD (Australia) : Radio astronomy, including completion of a notable high-resolution radio-heliograph.
- 1972 : Dr. B.D. JOSEPHSON (UK) : Electronic effects in superconductors.
- 1975 : Prof. L.B. FELSEN (USA) : Application of ray-optical methods to studies of the propagation and diffraction of electromagnetic waves.
- 1978 : Dr. J.R. WAIT (USA) : Work on propagation of electromagnetic waves in the Earth's crust, and application of results.
- 1981 : Prof. D.S. JONES (UK) : Work on electromagnetic theory and, in particular, on the development of a number of analytical approaches.
- 1984 : Prof. W.G. FARNELL (Canada) : Work in physical electronics, in particular on microwave lenses, spin phonon interactions in solids, microwave acoustics, and acoustic microscopy.

- 1987 : Dr. T. HAGFORS (Norway) : Contributions to radar engineering and the theory and experimental development of the incoherent scatter techniques.
- 1990 : Prof. A.A. OLINER (USA) : Contributions to theory of guided waves, especially leaky waves, and novel radiating structures.

John Howard Dellinger Medal

- 1966 : Drs. J.H. CHAPMAN (Canada) : Radio wave propagation and the Alouette I topside ionosphere sounder.
- 1969 : Prof. H.M. BARLOW (UK) : Development of waveguides ; the characteristics of surface waves.
- 1972 : Prof. H. HEWISH (UK) : Advances in radio astronomy.
- 1975 : Prof. N.M. BRICE (USA) : Theory of the Earth's plasmapause and theoretical investigations of the physics of Jupiter's magnetosphere.
- 1978 : Prof. D.A. GURNETT (USA) : Investigations relating to electromagnetic and electrostatic wave propagation in the Earth's plasma environment.
- 1981 : Dr. J. FEJER (Germany) : Work on ionospheric modifications, parametric instabilities, ionospheric irregularities and incoherent scatter.
- 1984 : Mrs. I. DE PATER (Netherlands) : Work on noise of planetary origin, the magnetosphere of Jupiter, and shock waves in the magnetosphere of the Earth.
- 1987 : Dr. R. GENDRIN (France) : Study of waves of natural origin propagating in the surroundings of the Earth, and their influence on the behaviour of the magnetosphere.
- 1990 : Dr. G. SWARUP (India) : Contribution to radioastronomy and cosmology, both in observational research and in conceiving and building radio telescopes.

Appleton Prize

- 1969 : Prof. W.I. AXFORD (N.Z.) : Ionospheric and magnetospheric physics.
- 1972 : Prof. R.A. HELLIWELL (USA) : Radio wave propagation in the magnetosphere.
- 1975 : Dr. J.V. EVANS (USA) : Ionospheric physics, including application of the incoherent scatter technique.
- 1978 : Prof. P.M. BANKS (USA) : Theoretical and observational studies of the plasma flow between the ionosphere and the magnetosphere.
- 1981 : Dr. H. RISHBETH (UK) : Contributions to studies of the dynamics and structure of the ionosphere F region.
- 1984 : Prof. K.D. COLE (Australia) : Contributions to the understanding of the basic processes taking place in the magnetosphere and the ionosphere.
- 1987 : Dr. S. KATO (Japan) : contributions to the study of the ionosphere and the middle atmosphere, and in particular for the development of a highly sophisticated radar to observe the atmosphere.
- 1990 : Dr. A.V. GUREVICH (Russia) : contributions to the understanding of the non-linear properties of the ionosphere, particularly with respect to the interaction with high-power radiowaves.

Issac Koga Gold Medal

- 1984 : Dr. M. OHTSU (Japan) : Work on precise optical measurements, gas and semi-conductor lasers, including the frequency stabilization of these components.
- 1987 : Prof. D.M. POZAR (USA) : Contributions to the analytical, numerical and experimental study of printed antennas and phased arrays, and related problems in applied electromagnetics.
- 1990 : Dr. M. LOCKWOOD (UK) : study of non-thermal ionospheric plasma and ionospheric convection.

NEWS FROM THE MEMBER COMMITTEES

The Member Committee in the U.K. organizes its Ninth National Radio Science Colloquium at the University of Bradford, on 7 and 8 July 1992.

1992 is the centenary of the birth of Sir Edward Appleton in Bradford. Appleton was one of the giants of Radio Science and hence it is fitting that this year's colloquium will be held in his birthplace. There is now a thriving radio research community at the University of Bradford, which evolved from the Technical College where Appleton studied in the early years of this century. Papers will be presented in the various subject areas of the URSI Commissions. The organizers intend to include one or two pages on Appleton's work on high frequency propagation, which was internationally recognized by his Nobel Prize award.

For further details, please contact :

Dr. P. EXCELL
Dept. of Electrical Engineering
University of Bradford
BRADFORD
WEST YORKSHIRE BD7 1DP
UNITED KINGDOM
fax (44) 274-391 521

PROFILE OF MEMBER COMMITTEES - CANADA

Canada joined URSI in 1952, relatively late compared to its sister commonwealth countries Australia (1922) and New Zealand (1931). Radio research in Canada had grown rapidly during the 1939-45 war under the direction of a National Research Council (NRC) of Canada Associate Committee on Radio Research. By 1950, with many NRC radio researchers no longer in defence work, an Associate Committee on Radio Science was formed. In 1951, this became also the Canadian Committee for URSI under the chairmanship of D.W.R. McKinley, then Associate Director of the Radio and Electrical Engineering Division of NRC. The committee consisted of six senior scientists and engineers from government laboratories and departments concerned with radio science and its applications, and five radio physicists, an electrical engineer and a radioastronomer from the universities. By 1968 the size of the committee had grown to 23 members from government, universities and industry. In 1971 the size of the committee was cut in half, to consist of a Committee Chairman, a Past Chairman, a Secretary and a Chairman for each of the eight Commissions.

Canadian radio scientists quickly became involved in URSI affairs. G.A. Woonton of McGill University in 1952 became Chairman of Commission VII on radio electronics and later (1957-63) a Vice-President of URSI. Woonton also organized the 1952 McGill Symposium on Microwave Optics, the forerunner of the Triennial Commission B Symposia on Electromagnetic Wave Theory of which the next will be in Sydney, Australia in August 1992. The third such meeting was held in 1959, organized by G. Sinclair, of the University of Toronto, who became Commission VI (Radio Waves and Circuits) Chairman in 1957. Two early committee members were B.G. Ballard and J.H. Chapman. Ballard was appointed President of the National Research Council of Canada and Chapman was the first winner of the

John Howard Dellinger Gold Medal. In 1984 the Van der Pol Medal went to G. Farnell of McGill University, formerly Chairman of URSI Commission VII (now D). Others who later became URSI Medal winners, J.R. Wait, W.I. Axford and J.A. Fejer, worked early in their careers at the Radio Physics Laboratory (RPL) of the Defense Research Board in Ottawa. RPL later became the Defense Research Telecommunications Establishment and still later the Communications Research Centre. It remains the centre of radio science in the government laboratories of Canada, but since the 1960's radio science has grown elsewhere, first in the universities and later in industry.

In 1973 an NRC Bureau of International Relations was formed which became the administrative body for all the Canadian Member Committees of the international scientific and technical unions. The Canadian committee ceased to have a dual role as a government advisory committee and an URSI Committee, and became simply an URSI Member Committee. Since then, the committee has been comprised of a Chairman, a Past Chairman, a Secretary and a Chairman for each of the technical commissions. These are selected for three or six year terms with due regard for geographical, institutional and linguistic representation. Meetings are held usually once a year in Ottawa.

Joint US-Canada URSI meetings were held in Ottawa in 1953, 1962 and 1967, and the General Assembly of our Union was held in Ottawa in 1969. In 1980 the North American Radio Science Meeting and IEEE Antennas and Propagation International Symposium was held at Laval University, Quebec, and organized by J.A. Cummins and G.Y. Delisle. This was the first of a series of successful regional meetings jointly arranged by US and Canadian URSI and IEEE/AP-S. The second followed in 1985 at the University of British Columbia in Vancouver, with K.S. McCormick as conference chairman and E.V. Jull as local organizer, and the third in 1991 at the University of Western Ontario in London, Ontario under the Chairmanship of A.R. Webster. The splendid cooperation enjoyed at these meetings is an

outcome of the close relations between US and Canadian radio scientists and IEEE Antennas and Propagation Society members.

At this time, the Canadian committee is seeing its greatest participation in URSI, with the Presidency of E.V. Jull, and the Chairmanship of Commissions A and K by J. Vanier and M.A. Stuchly. The National Research Council of Canada, which was instrumental in the establishment of the Canadian National Committee and which is the adhering member for Canada in international scientific and technical organizations, has been reviewing its participation in these organizations. Its support has been critical in the past development of the Canadian National Committee for URSI and we look forward to their continuing participation over the coming years.

Canadian Committee for URSI

Chairmen

| | |
|-----------------|---------|
| D.W.R. McKinley | 1951-57 |
| J.S. Marshal | 1957-61 |
| J.T. Henderson | 1961-65 |
| R.S. Rettie | 1965-68 |
| M.P. Bachynski | 1968-71 |
| R.E. Barrington | 1971-74 |
| F.J.F. Osborne | 1974-80 |
| E.V. Jull | 1980-86 |
| P.H. Wittke | 1986- |

Secretaries

| | |
|-----------------|---------|
| J.C.W. Scott | 1951-54 |
| Ann Marshall | 1955-58 |
| D.W.R. McKinley | 1958-61 |
| P.M. Millman | 1961-63 |
| J.H. Chapman | 1966-68 |
| J.L. Locke | 1968-73 |
| J.Y. Wong | 1973-80 |
| L.H. Doherty | 1980-86 |
| R.F. Clark | 1986- |

P.H. WITTKE

E.V. JULL

NEWS FROM THE COMMISSIONS

COMMISSION B

Professor Gardiol, Chairman of the Commission, circulated his third Newsletter in March 1992. He wrote the following lines to the Official Members of the Commission :

"The programme for the Commission B Symposium on Electromagnetic Theory, to be held in Sydney, Australia from 17 to 20 August, 1992, has taken its final shape at the TPC meeting, that was held in London on 24-25 January.

I need your inputs for the next General Assembly, to be held in Kyoto from 25 August to 2 September, 1993 : please propose topics for sessions and chairs, and joint sessions with other Commissions.

Next August in Sydney, we also have to select the location of our next Electromagnetic Theory Symposium, to be held in 1995. Please think carefully about this and, should you find yourself in a position to do so, prepare an invitation. I will be pleased to provide more information about the items the invitation should cover. How about having our next Symposium somewhere in the Americas?"

The Newsletter also contains data on the major effort of the Commission in the triennium, the URSI Symposium on Electromagnetic Theory, to be held in Sydney August 17 to 20 (see Bulletins of June 1991 to March 1992). We also note a report by President Jull on the 4th International Seminar on Mathematical Methods in Electromagnetic Theory, held in the Crimea on September 18 to 23, 1991. The text appeared in the March 1992 issue of "The Radioscientist", but only part of the Bulletin readership receives that periodical, hence it is worthwhile repeating the report here, since the development of URSI activities in Eastern Europe is of great concern to our Union

"It was certainly the most unusual conference I ever attended. The organizers went ahead with it in spite of all the economic and political disruptions in the Soviet Union in the summer of 1991. Twice the dates of the conference had to be altered because the hotel rooms became unavailable. Yet the difficulties which befell the organizers seemed to simply add to the camaraderie which developed among the affected participants. The relatively small number of people involved (85) made innovation possible and the specialized nature of the meeting contributed to its effectiveness.

Eldar Veliev and Alexander Nosich of the Institute of Radiophysics and Electronics, Ukrainian Academy of Sciences in Kharkov were co-chairmen and organizers of the meeting. It was sponsored by "Test Radio", a Kharkov research and development firm headed by Valery Zhilkov. The first two meetings of this series of seminars had only Soviet participants. The third, in April 1990 had four invited foreign lecturers and adopted English as the working language. At this 1991 meeting there were invited speakers from Australia, Canada, Germany, Japan (5), Korea, Sweden, Turkey (5) and the USA. It was held in the attractive Black Sea resort city of Alushta.

For most of the foreign guests the seminar was preceded by a tour on overnight trains from Moscow to Simferopol with a stopover at a hotel in Kharkov. This bonus trip, all expenses paid by the organizers, occurred because the hotel Yunost in Alushta had no rooms for us. In Kharkov we visited the Institute of Radiophysics and Electronics and were received by its director V.P. Shestopalov, who is well known for his work on diffraction gratings. We were shown some of the remarkable technical achievements of the institute in active and passive millimetre wave devices, remote sensing instruments and polarimetric radars. Diffraction grating specialists in the group were particularly impressed by their use in powerful diffraction radiation generators.

After this unexpected tour in the Ukraine the conference began in Alushta. The six day programme of 66 papers, including 28 one hour lectures, 18 twenty minute presentations and 20 poster papers all occurred in one room. There was plenty of open commentary, criticism and discussion. This can be the most interesting part of a meeting and too often there is not enough time for it at our large meetings in the west. The traditional strong background in applied mathematics, evident in the Ukrainian and Russian presentations, ensured that numerical solutions did not dominate. What has changed since my last conference in the Soviet Union (1971) is the ability of our Ukrainian and Russian colleagues to communicate well in English. It is now far easier to follow their talks.

Midway through the conference there was an excursion to Yalta and the palace where the 1945 agreement which divided Europe for the next 45 years, was signed. The banquet that evening included lively Ukrainian dancing with participation apparently expected of all visiting foreigners.

The organizers and sponsor are to be congratulated for a successful and enjoyable meeting. Copies of the 400 page proceedings (\$50.-) can be ordered from :

A. Nosich and E. Veliev
Institute of Radiophysics and Electronics
Ukrainian Academy of Sciences
12, Proskura St.
KHARKOV, 310085, UKRAINE
Fax (7-095)-292 6511

or :

Dr. R. Ziolkowski
Dept. of Electrical and Computer Eng.
University of Arizona
TUCSON, AZ 85721, USA
Fax (1-602)-621 8076".

PROFESSOR E.V. JULL

COMMISSION K

Professor M.A. Stuchly, Chairperson of Commission K, gives the following summary of the activities of her Commission.

First World Congress for Electricity and Magnetism in Biology and Medicine

Commission K is participating in the above Congress in Orlando, June 14-19, 1992. The Congress is organized by the Bioelectromagnetics Society (BEMS), Bioelectrical Repair and Growth Society (BRAGS), Bioelectrochemical Society (BES), and European Bioelectromagnetics Association, with two IEEE Societies : Engineering in Medicine and Biology, and Power Electronics also participating. The programme contains tutorials and plenary sessions in the mornings, five parallel platform sessions, poster sessions and exhibits in the afternoons. The session topics range from molecular devices to more traditional topics like biological effects, interaction mechanisms, modelling exposure, assessment, medical applications, to electromagnetic fields in modern society.

First Meetings of the Commission

The first meeting of Official Members of the Member Committees is to take place during the World Congress in Orlando, on Tuesday, June 16, 1992 at 5.30 P.M.. The items to be discussed are the preparations for the Kyoto General Assembly, scientific meetings that the Commission may want to sponsor, relationships with other scientific-professional organizations and other items suggested by the members.

Review of Radio Science (RRS)

In the capable hands of the Commission's Vice-Chairman, Professor Paolo Bernardi, the work on RRS has been progressing exceptionally well. The Commission will contribute the following chapters : "Diagnostic and Therapeutic Applications of Electromagnetic Fields : A diagnostic Application", J.C. Lin, "Therapeutic Applications of Electromagnetic Fields", J.W. Hand, "Biological Mechanisms of

Interactions", S.F. Cleary, "Human Exposure Assessment and Dosimetry", L.E. Paulsson.

Preparations of the disk are also underway, with the following helping Professor Bernardi : H. Korniewicz (Poland), G. D'Inzeo (Italy), D.L. Szabo (Hungary), B. Veyret (France), R. Cadossi (Italy), and J. Musil (Czechoslovakia).

Programme for the General Assembly

The following platform sessions are planned for the next Assembly. There will also be a poster session. The sessions will consist of invited and contributed papers. A call for contributions will be issued later this year and distributed through the National URSI Committees and the Conveners. The deadline for the summaries will be before February 15, 1993.

Joint Session with Commission A

Exposure Assessment and Measurements in Complex Environments

Conveners : Commission K : L.E. Paulsson (Sweden)
 Commission A : M. Kanda (USA)

Joint Session with Commission B

Computational Electromagnetics in Biology and Medicine

Conveners : Commission K : J. Lin (USA)
 Commission B : S. Hornsleth (Denmark)

Sessions

1. Electromagnetic Fields in Medical Diagnosis
 Convener : M. Saito (Japan)
2. Therapeutic Applications of Electromagnetic Fields
 Convener : B. Veyret (France)
3. Health Effects
 Convener : R. Saunders (U.K.)
 Co-Chair : D.L. Szabo (Hungary)
4. Interaction Mechanisms
 Convener : T. Tenforde (USA)

REPORTS ON URSI-SPONSORED MEETINGS

THE INTERNATIONAL COMMSPHERE'91 SYMPOSIUM

The Symposium was held in Herzlia, Israel, on December 16-19, 1991. In his Opening Address the Commsphere Chairman, Dr. J. Shapira, made the following comments :

"Commsphere is a wish-come-true. Following a modest national meeting in May 1989, an international organizing committee and a team of area coordinators brewed the idea to its fruition today. The term Commsphere was coined to express the concern about the growing "Electromagnetic Ecology" problem throughout the world, and address an imminent crisis.

The efficient usage of the transmission medium is affected by a multitude of factors - system-theoretic, technological, environmental, operational, administrative and social-political. Breaking through the apparent spectral limitations may take an interdisciplinary effort, and that is where Commsphere is aiming at.

Along with the exponential growth of the world population and of the standard of living - grows the use of electrical energy. The need for information processing boosts the technology advances in miniaturization and integration, which also follow an exponential curve. Signal levels within the processors decrease correspondingly - all of which indicate an exponentially growing gap between transmission activity - intentional or unintentional, and circuit sensitivity.

The telecommunications traffic is now growing at an incredible rate. Wireless communication offers flexibility, convenience and a saving in infrastructure, and thus becomes a commodity of great demand. This type of telecommunications shares a common transmission medium, which becomes the bottleneck on the way to further development. The various filters that affect the channeling of the messages to their desired addresses - in the frequency, time, space, code and polarization

domains, deserve an integrative study by all the communities involved, which should lead to new systems, new topologies and new operational and administrative procedures.

Technology now allows a much better exploitation of the characteristics of the propagation medium. Affordable adaptive techniques enable tracking and smoothing of the channel variations. Beneficial use of these techniques will materialize only when the propagation channel behaviour is better understood. These two communities - the propagation and the communication theorists, have yet to bridge a gap in their terminologies and thrusts of research - in order to cohere an effort toward the common goal.

This is the way Commsphere was conceived and staged. It is for all of us now to make the best use of it to advance our knowledge and mutual understanding."

The organization of the meeting was in the hands of a Committee consisting of Dr. Joseph Shapira (Conference Chairman), Dr. Uzi Timor (Technical Programme Committee Chairman) and Dr. Dan Sklarsky (Organizing Committee Chairman).

The actual running of the Conference was contracted to ORTRA Ltd., a company experienced in organizing conferences. The company financed the activities until fees and contributions came in.

The meetings were held at the five-star Dan Acadia Hotel, on the beach of Herzlia. A 220 seats auditorium conveniently hosted the conference.

The conference was attended by 222 participants (175 from Israel), and the Workshops by 146 (117 from Israel). The programme was coordinated by a team of dedicated area coordinators. A major part of the presentations were invited, with a strong emphasis on the focus of the conference.

The main highlights of the conference were mobile communication and ionospheric communication. The mobile communication was intensely discussed, including Low Earth Orbit Satellites, multiple access systems and modulation schemes, channel characterization, noise environment and frequency allocations. The ample time allocated for discussions, and the workshops, enabled in-depth mutual understanding by participants with different backgrounds, and a great deal of satisfaction expressed. That included Richard Kirby, the director of CCIR and a distinguished guest, who was very explicit in encouraging this kind of symposia. Spectrum allocation and valuing policies, a topic of supreme importance, did not receive its planned share, due to the unfortunate withdrawal of key speakers.

A general feeling of the participants was that Commsphere should become a forum, convening every two years, leading discussions across the board on all scientific aspects affecting future telecommunications. Commsphere'93 is scheduled for December 13-16, 1993, in Herzlia, Israel.

A few copies of the Proceedings are left, and are offered for sale at \$50, including air mail postage. Please address requests and cheques to the Secretariat of the Israel National Committee for Radio Science, Technion Israel Institute of Technology, Faculty of Electrical Engineering, Haifa 32000, Israel.

Mr. R.C. Kirby, Director of the CCIR and a distinguished guest, was very explicit in encouraging this type of Symposia. He gave the following address...

New Technologies and the Frequency Spectrum

"1. Introduction

It is an honour to participate in this URSI/IEEE event which links science and engineering to view the future of radio technologies and radio spectrum. While organized by the Israel National URSI

Committee, your conference gives effect to the new URSI Scientific Committee on Telecommunication set up at the Prague Assembly. URSI has supported scientific aspects of CCIR radiocommunication studies for many decades. Professor van der Pol was the first CCIR Director, and other URSI personalities play leadership roles in CCIR activities.

The theme of your conference, "The challenge of future telecommunications in the congested frequency spectrum", is a short and precise phrasing of the central problem for new radio technology and services for the decade of the 1990's. I stress the 1990's, well before the year 2000. It is not a paradox that the age of optical fibre and digital systems is also an age of increasing interest in wireless services. Advancing network transmission and switching capabilities invite greater access and complementary services by radio. National policies fostering greater service options invite competition, and radio is a competitive medium.

Digital microwave radio offers transmission rates up to 155 MBit/s and higher, for compatible, competitive, transmission in ISDN's. Very small aperture earth terminals are spawning satellite private networks and their access to public networks. Wireless access to networks by mobile and personal radio terminals for voice and computer communication is expanding rapidly. New satellite mobile system concepts propose alternatives to large parts of terrestrial networks. Digital audio broadcasting and high definition television seek world markets.

The future of these and many other telecommunication services depends upon availability of frequency spectrum. Suitable bands are largely already in use. The International Frequency Register recorded as many new frequency assignments in the decade of the 80's as in the previous history of radio. New strategies and techniques are needed for allocation of frequency bands, and for more intensive shared use of the spectrum resource. There is a role for management, but also for science.

I will speak first of the World Administrative Radio Conference (WARC) 1992 to illustrate spectrum requirements in concrete terms. Then I link radio science to the future capacity of the radio spectrum.

2. The WARC'92 frequency allocation conference.

The most important radio event in the near future, perhaps in a decade, is expected to be the World Radio Conference on frequency allocations, to be held in February, 1992, in Spain. Its genesis was in three World Conferences held in the late 1980's, where existing frequency allocations were seen to constrain future growth, new services, and use of new technology. WARC'92 is ITU's effort to adapt the international radio regulations to more rapid development of services at microwave frequencies above about 1 GHz.

Technical preparations have been carried out at the international level through CCIR. A Joint Interim Working Party consolidated this work in March 1991. Of the 283 delegates, many were from industry as part of national delegations, and from 23 private sector organizations participating in their own right. The 190 pages final report, issued 1 May, 1991, is titled "technical and operational bases" for the conference.

How does the Report preview the conference? It first recognizes the inevitability of more intensive sharing of frequency bands by different services and users; it highlights advanced principles for sharing, some based on new technology or operational techniques, as dynamic real-time frequency management. Then, it considers specific bands and services, estimating spectrum requirement and sharing possibilities.

Wide interest in the future of mobile and mobile satellite services seeks allocation in the approximate 1 to 3 GHz range. The Report considers future public land mobile telecommunications (FPLMTS), which is the radio element of universal personal telecommunication (UPT), involving both terrestrial and satellite components. The concept is a

third generation service, a follow-on to GSM and other digital mobile systems being introduced today. Expansion rates of current mobile systems are seen up to 100% per year in "a number of countries", with population penetration of 5% already exceeded in others. Service is to include not only voice, but a range of data services. Our host country is an example of 100% per year growth. More sophisticated technology and cellular architecture for such future systems will achieve greater spectrum efficiency than today's cellular mobile. Based on system models and traffic estimation, the minimum spectrum bandwidth required is estimated as at least 230 MHz, 170 MHz for mobile and 60 MHz for personal units. Equipment cost and wave propagation considerations indicate an optimum band between 1 and 3 GHz. Band sharing with fixed and possibly other services may be possible.

Private mobile radio (PMR) systems represent another major and growing segment. In the USA, 14 million private land mobile radio units represent more than three times the number in common carrier systems. Between 112 and 130 MHz bandwidth per market area is dedicated to PMR. With growth at close to 10% per year, doubling of radio units is forecast in eight years. In Europe, there are some 3.5 million units, with growth at 8% per year. Europe forecasts spectrum requirements increase of two 35 MHz bands. In Japan, since introduction of trunked mobile radio, permitting many users to share several radio channels, growth rate is 40% per year. Japan foresees the spectrum requirement for two 50 MHz bands.

Mobile satellite systems today (land, maritime and aeronautical) provide reliable safety communications and high quality telecommunication services. Presently, the only worldwide allocation is at 1.5/1.6 GHz. There are regional allocations near 800/900 MHz and 2.5/2.6 MHz. Existing INMARSAT mobile satellite systems, and the USSR Volna satellites use global coverage beams from the geostationary-satellite orbit. Several regional or national mobile satellite systems are being implemented to provide aeronautical, land,

and maritime services. Over forty such satellite systems are operating in the 1.5/1.6 GHz range. Japan is developing a mobile satellite system in the 2.5/2.6 GHz range.

A galaxy of new services using mobile satellite systems need frequency spectrum. These may operate with geostationary and non-geostationary satellites, with spot beams or global beams. Proposed low-earth orbit (LEO) satellite systems would offer a direct personal communications capability using very low power hand-held terminals. One proposal aims toward world-wide networking of portable, hand-held subscriber units; not intended to replace high density terrestrial cellular systems, it would provide a vast network for mobile service where there is none.

The CCIR analyzed the requirements for the year 2010 for different satellite mobile systems based on administrations estimates of geographical area traffic demand, as well as ICAO and INMARSAT estimates. Estimates of maritime mobile satellite requirements are based on extensive operational data on the market for maritime telecommunication services.

Total spectrum requirements for mobile satellite service in the 1 to 3 GHz band in each direction Earth to Space and Space to Earth in the year 2010 :

| Service | Minimum Requirement | Likely Requirement |
|-----------------------------|---------------------|--------------------|
| | MHz | MHz |
| Aeronautical (R) Mobile Sat | 14.5 | 17.5 |
| Other Aeronaut Mobile Sat | 15.0 | 18.0 |
| Land Mobile Sat | 41.3 | 87.6 |
| Maritime Mobile Sat | 17.0 | 40.0 |
| Distress and Safety | 1.0 | 1.0 |

The sum of mobile satellite spectrum requirements in the year 2010 in the 1 to 3 GHz region appears to range from a minimum of 89 MHz to a "likely" requirement of 164 MHz in each direction. The spectrum required by a satellite service equals the bandwidth needed in the coverage area divided by the frequency re-use factor. Global beams are unlikely to achieve greater than 1.4 re-use factor. A spot beam system can achieve theoretically a re-use factor of 7 if each beam has equal traffic. In practice, a 24-spot beam geostationary system over North America could have a theoretical re-use factor of 3.4. A low-earth orbiting (LEO) system has been proposed to achieve a re-use factor of 6 using forty spot beams to cover North America. These figures illustrate cost tradeoffs for spectrum efficiency.

I thought it would be interesting to preview mobile services in some detail rather than to put a telescope on more than 10 services. Broadcasting, however, is a candidate for considerable spectrum for satellite transmission of high definition television and digital audio broadcasting, with their associated earth-to-satellite feeder links.

Satellite sound broadcasting by digital coding has been demonstrated to provide reception quality comparable to compact disc audio. Again, a band is suggested near the magic 1.5 GHz. Estimates of required bandwidth range from 60 to 120 MHz. This important application of spread spectrum may also be used for terrestrial broadcasting. Provision is needed also for feeder links.

Satellite wide-band HDTV aims to transmit full quality of the large screen studio image. Five candidate bands are suggested over the range from 17.3 to 25.25 GHz; transmitter power requirements would be less at the lower frequencies, and frequency re-use possibilities would be greater at the higher frequencies. Total bandwidth requirements depends upon programme requirements of different countries. Methods for calculating this are made available in contributions to the CCIR study. An overall figure of 600 MHz has been cited in some of these contributions. There remains interest in

the possible HDTV use, in the long term, of the band already allocated to satellite broadcasting at 11.7 to 12.7 GHz. Channeling in this band would require some compression of the DHTV signal, but developments in digital television suggest the feasibility of such compression without important degradation of image quality.

A potential range of new space applications seek to exploit frequency above 20 GHz for data relay satellites, space research, earth exploration satellites, and new active and passive sensor applications. More than 10 applications include proximity links for space operations, communications support for low-earth orbiting satellites, and communication bases on the moon and possibly Mars. The data relay satellites will serve a wide spectrum of needs in bands between 20 and 30 GHz. Other plans for mobile and fixed service require frequency allocations in the band 20 to 40 GHz. One might imagine less competition in these bands, less densely occupied than those below 20 GHz, where every proposal involves potential displacement or sharing with existing user services. But the bands above 20 GHz too, were already allocated in 1979 ; there are many active services and much planning for future uses.

URSI participants know the unique and enormous contribution of radioastronomy to study of physics of the universe. It depends on analysis of very weak signals. Not seen as an economic engine, radioastronomy remains defensive in the environment of telecommunications growth. New allocations are not sought in 1992, but radio astronomers wish to avoid diminishing capability of this science with more intensive use of the spectrum. They are troubled especially by spurious emissions from satellite systems. It no longer suffices to assure a site free from local radio noise ; the sky is bright with satellite emissions. CCIR makes appropriate recommendations for protection of radioastronomy, and a radioastronomy delegation will participate in the WARC.

The WARC'92 will set the template for frequency allocations for at least another decade.

3. Science and the Radio Spectrum

Looking to the future, what has radioscience to contribute to improve the telecommunications yield of the radio frequency spectrum?

Perhaps the greatest progress has been seen in coding, modulation and multiplexing. Coding has remarkably improved throughout and robustness for efficient transmission. Compression algorithms and multi-state modulation have enabled bandwidth reduction of digital microwave radio systems to achieve reliable transmission capabilities so high as to be transparent, competitive links in ISDN's. For high definition television, representing nearly a Gigabit/sec source information rate, to be transmitted in a 6 MHz bandwidth without significant degradation, seemed unlikely five years ago, and is close to reality today. But in general, improvement in bandwidth efficiency is accompanied by greater sensitivity to interference.

Increased yield of the congested spectrum has to be measured not only in terms of throughput for a single system or service, but rather throughput for an aggregate of users. Users are not necessarily synchronized or otherwise under common control. Science for improving spectrum yield for an aggregate of users is in its infancy. Cellular systems are such a design, exploiting up to now mainly geographical separation and trunking to share channels. Microwave system plans in congested area already exploit polarization orthogonality. Satellite and terrestrial microwave communication share the same frequency bands by careful attention to the geometrical dimension. Spread spectrum CDMA adds the important dimension of orthogonality in signal design.

Quite a few elements have to be considered for sharing a frequency band among several users, as performance measures for interference susceptibility of wanted signals and the interference capability of the unwanted ; propagation of both ; possibilities for orthogonalities or optimum matching of signals, and some rather complex geometry, as

in the case of non-geostationary orbits. Much of the analysis has to be in statistical terms, defining optimization as a fine balance between total throughput and reliable performance of the sharing services.

Most research for spectrum utilization naturally seeks optimum performance of a particular system or service in its environment, not aggregate yield of a parcel of spectrum. As for a farm or industry, the owner works for yield of his investment. The government might be considered the owner in the national context, but the nature of radio takes it beyond national boundaries, with the spectrum and satellite orbits regarded as an "international resource". This is an important concept for all countries, including developing ones where radio is key to telecommunications infrastructure.

Government policies, their support of spectrum management and the necessary research, are key to the capacity for growth and development of radio activities vital to national commerce, defense, and welfare. Several countries are introducing limited market approaches to national frequency management. The market approach does not yet seem appropriate internationally, in view of disparate national economies, and respect for national sovereignty in spectrum matters. URSI and the CCIR have unique opportunities to foster international scientific approaches."

The WARC'92 is now behind us. On page 60 the reader will find a report on its main results written by a radioastronomer, Dr. Robinson. Mr. Kirby has given us a list of the main decisions reached at the Conference, in the form of a postscript to his Commsphere speech :

"The World Administrative Radio Conference (WARC'92), which met at Torremolinos (Spain) 3 February - 3 March 1992, allocated new frequency bands for mobile and mobile-satellite services, satellite-broadcasting for digital sound and high definition television, short wave broadcasting, and a number of space services. More than 1400

delegates from 127 countries participated. The CCIR report "Technical and operational bases for the WARC'92", figured in most of the allocation and frequency sharing considerations. The Conference adopted some 15 Resolutions asking CCIR studies on questions for the future.

Following CCIR estimates of 230 MHz required for future public land mobile telecommunication systems (FPLMTS), and associated provision for the "satellite component" of such systems, the conference identified two bands in allocations to mobile service, 1885 - 2025 MHz and 2110 - 2200 MHz for use of FPLMTS. For the satellite component, a Resolution of the Conference identifies an uplink band 1980 - 2010 MHz, and a downlink band 2170 - 2200.

For mobile satellite services operating above 1 GHz (including low earth orbiting LEO), allocations were made in bands near 1.5, 1.6 and 2 GHz. A new worldwide primary allocation was made to Maritime Mobile Satellite Service at 1525 - 1530 MHz.

New frequency bands for HDTV were allocated to the broadcasting satellite service. In Regions 1 and 3, a band of 600 MHz was allocated at 21.4 - 22.0 GHz, in Region 2, a band of 500 MHz was allocated at 17.3 - 17.8 GHz.

Bandwidth of 40 MHz for digital satellite sound broadcasting was allocated at 1452 - 1492 MHz, except for USA. In a number of countries the allocation is on a secondary basis until the year 2007. In the USA the band 2310 to 2360 is allocated; in twelve of countries of Region 3, the band 2535 - 2655 MHz was identified for satellite sound broadcasting and complementary terrestrial broadcasting.

A number of new allocations were made to space services, including Space Research, Space Operation, and Earth Exploration, in the bands 2025 - 2110, 2200 - 2290 MHz. The band 2110 - 2120 was allocated to Space Research, for deep space (earth to space) applications. Approximately 1 GHz of bandwidth was allocated in three bands

between 25.45 and 27.5 GHz on a world-wide primary basis to the Inter-satellite service.

Additional allocations were made in the short wave band to HF broadcasting, an increase of 200 kHz below 10 MHz and 500 kHz between 10 and 19 MHz. The extension bands are subject to planning, and the single side band emission is foreseen to be introduced earlier than currently provided in radio regulations."

Mr. Kirby also gives us the list of the new CCIR studies which should result from WARC'92, and in which URSI could conceivably participate.

Among the 19 Resolutions and Recommendations of WARC'92 on future. CCIR studies a number of urgent ones cover :

1) sharing between :

- the primary allocation to the FSS (Earth-to-space) and the secondary allocations to the SRS and EESS in the band 13.75 - 14 GHz;
- the aeronautical mobile service and other terrestrial services and MSS in the band 1492 - 1525 MHz ; and the meteorological aids and METSAT services and the MSS, in the band 1670 - 1710 MHz, taking into account the needs of the radio-astronomy service in the adjacent band.
- multiservice satellites and the FSS in the frequency bands 19.7 - 20.2 GHz and 29.5 - 30.0 GHz in Region 2, and 20.1 - 20.1 GHz and 29.9 - 30.0 GHz in Region 1.
- the MSS and other services in the same frequency bands, including power limits and power flux-density as indicated in Articles 27 and 28 of the RR, while placing minimum restrictions on the services operating in these bands.

2) protection of the space services operating in the bands 2025 - 2110 MHz and 2200 - 2290 MHz from harmful interference from emissions by stations of the mobile service.

3) improvement of the efficiency and flexibility of the Plans for Regions 1 and 3 contained in Appendices 30 and 30A to the RR

and implementation of the HDTV in the 12 GHz band in the countries with high rainfall rate climatic zones.

- 4) introduction of the terrestrial digital sound broadcasting, focusing primarily on the broadcasting VHF band ; in particular, to consider the system characteristics and propagation in relation to developing compatibility criteria in the same and adjacent bands including protection of the safety services.
- 5) establishment of standards governing the operation of low-orbit systems, so as to ensure equitable and standard conditions of access for all countries and to proper world-wide protection of existing services and systems in the telecommunication network.
- 6) the broadcasting satellite (sound) service in particular :
 - i) the characteristics of GSO and non-GSO BSS (Sound) systems;
 - ii) the appropriate sharing criteria.
- 7) the spurious emissions resulting from space services transmissions.
- 8) the characteristics and requirements of wind profiler radars.

UTC TIME STOP ON 1 JULY, 1992

A positive leap second will be introduced at the end of June 1992.

The sequence of dates of the UTC second markers will be :

| | | | |
|---------------|-----|-----|-----|
| 1992 June 30; | 23h | 59m | 59s |
| 1992 June 30, | 23h | 59m | 60s |
| 1992 July 1, | 0h | 0m | 0s |

The difference between UTC and the TAI is :

from 1991 January 1, 0h UTC, to 1992 July 1, 0h UTC : UTC - TAI =
- 26 s

from 1992 July 1, 0h UTC, until further notice : UTC - TAI = - 27 s

Leap seconds can be introduced in UTC at the end of the months of December or June, depending on the evolution of UT1 - TAI.

MARTINE FEISSEL
Director, Central Bureau of IERS

MEETING ANNOUNCEMENTS

BEACON SATELLITE SYMPOSIUM 1992

6-9 July 1992, Cambridge, MA, USA

The primary topics are :

1. Satellite beacon diagnostics for artificial ionospheric modification (both chemical and by RF interaction);
2. The role of Satellite beacons in the generation and the assessment of models (electron density models, scintillation models both ionospheric and tropospheric; theoretical as well as empirical models to be considered);
3. Ionospheric and tropospheric tomography using beacon satellite data.

For additional information :

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**SUB-ARCSECOND RADIO ASTRONOMY AND THE
INTERACTION BETWEEN RADIO AND OPTICAL
OBSERVATIONS AT HIGH RESOLUTION**

20-24 July 1992, Manchester, U.K.

This meeting, sponsored by URSI's Commission J, will be held at Owens Park, a self-contained conference centre for the University of Manchester, situated 5 km south of the city centre. Scientific sessions will be held in the main hall at Owens Park and poster space will be provided in adjacent rooms.

On the programme :

| | | |
|-------------------|------|---|
| Monday 20 July | a.m. | Stellar astronomy |
| | p.m. | Galactic astronomy |
| Tuesday 21 July | a.m. | New instruments and observing methods |
| | p.m. | Measurements of fundamental quantities |
| Wednesday 22 July | a.m. | Gravitational lenses |
| | p.m. | Visits to stately home and NRAO, Jodrell Bank |
| Thursday 23 July | a.m. | Active Galactic Nuclei |
| | p.m. | AGN continued - Jets |
| Friday 24 July | a.m. | AGN continued - Other wavelengths, modelling |
| | p.m. | Cosmological implications |

On Saturday 25 July the EVN user's meeting will be held in the morning.

Each session will include one or more reviews, invited talks and contributed talks. Poster papers will be an important feature of this conference : there will be a poster review session on Thursday. The conference proceedings, which will include poster papers, will be

edited by members of the Scientific Organizing Committee and published.

Details may be obtained from :

Dr. R.E. Spencer
University of Manchester
Nuffield Radio Astronomy Laboratories
Jodrell Bank, Macclesfield
CHESHIRE SK11 9DL
UNITED KINGDOM

INTERNATIONAL MEETING FOR WAVE PROPAGATION IN RANDOM MEDIA

(Scintillation Meeting)

3-7 August, 1992, University of Washington, Seattle, Washington, USA

This meeting of the optical, radio and acoustical communities will focus on the exchange of data, ideas, insights and theoretical methods to foster communication in areas of common interest. Only problems of wave propagation in continuum random media will be addressed.

Sponsoring Agencies : Acoustical Society of America, International Commission for Optics, International Society for Optical Engineering (SPIE), International Union of Radio Science (URSI), Optical Society of America

Topics to be considered :

- statistical description of scintillation (PDF, second moment, fourth moment)
- measurements of scintillation statistics
- measurements of turbulence spectra using scintillation
- measurement of velocity using scintillation

- remote sensing using scintillation
- scintillation of waves propagating in random media upon reflection (mirror, retro-reflector, diffuse target)
- image and focal plane statistics with scintillation
- simulation of scintillation problems
- effects of turbulence profiles on scintillation statistics
- scintillation of beams, incoherent and partially coherent sources
- multifrequency scintillation
- pulse propagation in random media
- adaptive optics and scintillation
- speckle interferometry

Meeting Format

Invited review talks will be alternated with Poster Paper Sessions featuring the contributed papers. This will permit optimal interaction among the different communities.

General information can be obtained from :

Scintillation Meeting
Engineering Continuing Education
University of Washington, GG-13
4725 30th Ave. NE
Seattle, WA 98105, USA
Fax: (206) 543-2352

The Conference Chairs are V. I. Tatarskii and A. Ishimaru, and the Executive Secretary of the meeting is :

Rod Frehlich
NOAA/ERL/WPL, R/E/WPI
Boulder, CO 80303, USA
Tel. (303) 492-6776
Fax (303) 492-2468

1992 ASIA-PACIFIC MICROWAVE CONFERENCE

11-13 August 1992, Adelaide, Australia

The Conference will be held in conjunction with the fifth Australian Millimetre and Sub-millimetre Wave Symposium.

Topics for the Asia-Pacific Microwave Conference :

- Antennas and Propagation
- Biological Effects and Medical Applications
- CAD of Microwave Circuits
- Computational Electromagnetics
- Defence Applications
- Field Theory and Waveguides
- Filters, Multiplexers and Resonators
- High Power Devices and Applications
- High Temperature Superconductors
- Low Noise Receiver Technology
- Microwave Acoustics
- Microwave Industrial and Energy Applications
- Microwave Measurements and Instrumentation
- Microwave Polarimetry
- MMIC and GaAs Technology
- Optical Microwaves
- Passive Circuits
- Phased Arrays
- Remote Sensing and Measurements
- Semiconductor Devices and Measurements

Topics for the Millimetre and Sub-millimetre Wave Symposium

- Millimetre and Sub-millimetre Wave Technology
- Theoretical Studies and Models
- Applications and Systems
- Antennas and Arrays

- Astronomical Techniques and Observations
- Amplifiers and Down-converters
- Generation of mm and sub-mm Waves
- Detectors
- Components and Systems

For general inquiries concerning the Asia Pacific Conference, contact :

Dr. Don Sinnott
Microwave Radar Division
Surveillance Research Laboratory
P.O. Box 1650
SALISBURY SA 5108
AUSTRALIA
Tel. (61) 8-259 6180
Fax (61) 8-259 5200

The Conference is held just before the URSI Symposium on Electromagnetic Theory in Sydney.

ASTRONOMY WITH MILLIMETRE AND SUB-MILLIMETRE WAVE INTERFEROMETRY

5-9 October, 1992, Hakone, Japan

This meeting is sponsored by IAU and URSI's Commission J.

Topics in the Preliminary Scientific Programme :

1. Techniques for millimetre and sub-millimetre interferometry : High-precision antennas, low-noise and phase-stable receiver systems, correlators, image processing techniques, and radio seeing.
2. Millimetre and sub-millimetre interferometers and their upgrading plans : BIMA, IRAM, NMA, and OVRO Array. JCMT-CSO interferometer, SMA, AT.

3. Future plans. LMA, MMA, AT, and Space and Moon-based interferometer.
4. Scientific directions with millimeter and sub-millimeter interferometry. Sun and planets, stars, astrochemistry, protostars and proto planetary systems, star formation in the Galaxy and galaxies, central regions of galaxies, and quasars.

For more details, please contact :

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VERY HIGH ANGULAR RESOLUTION IMAGING

11-15 January 1993, Sydney, Australia

This Symposium, sponsored by IAU and URSI's Commission J, aims to provide specialists in the field of high angular resolution interferometry and imaging, from radio to optical wavelengths, with a forum for discussing instrumentation, techniques and problems. In particular, the intent is to promote the cross fertilization of ideas across the spectrum.

The principal topics to be included are :

Imaging techniques : deconvolution, self calibration, triple correlation, adaptive optics, mosaicing, bandwidth synthesis. Radio/optical comparisons : seeing, common problems and differences. The impact of technology on instrument design : detectors, aperture sizes and configurations.

Radio : sub-millimetre to metre wavelengths, instruments and linked arrays.

Optical : visual to infrared, speckle interferometry, two-aperture and multi-aperture instruments, fringe tracking, visibility amplitude and phase measurements.

Astrometry : optical and radio. Imaging results and prospects.

The Symposium will be held at the Women's College within The University of Sydney, Australia. Bed and breakfast accommodation will be available in the College at \$A40 per night (single room). There are also several hotels near the campus.

An important feature of the Symposium will be an organized tour to the Australia Telescope (AT) and the Sydney University Stellar Interferometer (SUSI). The tour will also include a visit to the Anglo-Australian Telescope at Siding Spring Observatory.

For additional details, please contact :

Dr. W.J. Tango
School of Physics A28
University of Sydney
SYDNEY, NSW 2006
AUSTRALIA

E-mail : tango@astron.physics.su.oz.au

THE EIGHT INTERNATIONAL CONFERENCE ON ANTENNAS AND PROPAGATION

30 March - 2 April 1993, Edinburgh, U.K.

The growing demands for the radio spectrum, generated by the recent rapid expansion of radio communication, radar and remote sensing systems have provided a stimulating environment for both antenna

and electromagnetic wave propagation research. New systems including the realization of truly mobile communication networks will require major advances in these fields.

It is the role of ICAP 93 to explore advancements and novel ideas which will form the basis and limitations of these systems in the next century.

The Conference enjoys co-sponsorship with the International Union of Radio Science (URSI) and covers topics within commissions B, F, G and H.

Contributions on Antenna and Propagation topics over the entire radio spectrum are welcomed in the following topic areas :

Antennas and Related Topics

- A1 Multibeam antennas
- A2 Antennas for mobile and personal communications
- A3 Remote sensing antenna systems
- A4 Numerical techniques for antenna problems
- A5 Adaptive antennas
- A6 Active antennas
- A7 Array antennas
- A8 Microstrip and conformal antennas
- A9 Wideband antennas
- A10 Reflectors and lenses
- A11 Horns and feeds
- A12 Satellite antennas
- A13 Millimetrewave and quasi optical antennas
- A14 Wire antennas
- A15 Broadcast antennas
- A16 Radomes
- A17 Frequency selective surfaces
- A18 Measurement techniques
- A19 Mechanical aspects of antennas
- A20 Transient response and time domain analysis

- A21 Radar cross sections
- A22 Teaching methods
- A23 Others

Propagation and Related Topics

- P1 Propagation factors for personal and mobile communications
- P2 Propagation factors for mobile satellite services
- P3 Remote sensing
- P4 Radio and radar meteorology
- P5 System planning
- P6 Propagation in fixed service satellite systems
- P7 Propagation via the ionosphere
- P8 Transionospheric propagation
- P9 VHF and UHF propagation
- P10 Tropospheric propagation
- P11 Millimetrewave propagation
- P12 Propagation aspects of frequency management
- P13 Propagation countermeasures
- P14 Propagation simulation
- P15 Meteorscatter propagation
- P16 Propagation in biological media
- P17 Polarimetry
- P18 Underground and subsurface propagation
- P19 Teaching methods in propagation
- P20 Others

The organizing Committee invites contributions in the form of a synopsis of approximately 500 words (one A4 sheet), indicating the appropriate topic area and key novel aspects of the paper.

The use of poster sessions to enhance presentations is an important feature of this Conference. The Organizing Committee will determine which contributions are most suitable for these poster sessions, which could also include active demonstrations, where a number of PC computers will be made available. Authors should indicate where a PC

is required, by marking their synopsis with (PC) in addition to the topic area.

Intending authors should note the following deadlines :

Receipt of synopsis - 31 July 1992
Notification of acceptance - Mid October 1992
Receipt of full typescript - 20 December 1992

Contact address :

ICAP '93 Secretariat
IEE Conference Services
Savoy Place
London WC2R 0BL
United Kingdom

ICC'93, INTERNATIONAL CONFERENCE ON COMMUNICATIONS

23-26 May, 1993, Geneva, Switzerland.

Communications - "Technology that Unites Nations" will be the theme of the 1993 International Conference on Communications. Global satellite communications, repeater-free underseas optical cables, intercontinental cellular telephone systems, over-the-border microwave links and optical fiber links - these are just some ways that modern communications engineering is serving to bring nations and peoples closer together.

While emphasis will be placed on the technologies of international communications, the ICC'93 will, like its predecessors, feature sessions reporting progress in both traditional and newly emerging areas of communications engineering, as well as offer tutorials on special topics of current interest. The following sessions are planned :

- Communications Software
- Communication Switching
- Communication Systems Engineering

- Communication Theory
- Computer Communications
- Data Communications Systems
- Interconnection within High Speed Digital Systems
- Multimedia Services and Terminals
- Network Operations and Management
- Optical Communications
- Quality Assurance Management
- Radio Communications
- Satellite and Space Communications
- Signal Processing and Communication Electronics
- Signal Processing and Recording
- Transmission Systems

Deadline for manuscripts : 31 August 1992. Complete manuscripts to be mailed to :

Dr. Thomas MITTELHOLZER
ICC'93 TPC Secretary
ISI ETF F103
ETH-Zentrum
CH-8092 ZURICH
SWITZERLAND

URSI RADIO SCIENCE MEETING AND IEEE AP-S SYMPOSIUM

27 June - 2 July, 1993, Ann Arbor, Michigan

Suggested topics for the URSI Meeting :

Commission A (Electromagnetic Metrology)

- A1. Microwave to sub-millimeter 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. Metrology for optical communication components
- A8. Noise
- A9. Materials
- A10. Impulse radar
- A11. Bioeffects and medical applications
- A12. Antenna and EM Field Metrology

Commission B (Fields and Waves)

- B1. Asymptotic methods
- B2. Canonical problems
- B3. Complex and random media
- B4. Gratings
- B5. Innovative numerical techniques
- B6. Inverse scattering
- B7. Nonlinear phenomena
- B8. Radar cross sections
- B9. Radiation
- B10. Rough surfaces
- B11. Theoretical electromagnetics
- B12. Waveguides

Commission D (Electronics and Photonics)

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

Commission E (Electromagnetic Noise and Interference)

- E1. Lightning, EMP/HEMP
- E2. Damage to systems
- E3. Intentional noise and interference
- E4. Effects of man-made noise on communication

- E5. Scientific basis for noise and interference
- E6. ULF/ELF/VLF natural and man-induced geomagnetic signatures

Commission F (Remote sensing and wave propagation-neutral atmosphere, oceans, land, ice)

- F1. Atmospheric sensing and profiling
- F2. Propagation modeling and measurements
- F3. Ocean and sea ice emission and scattering
- F4. Terrain and vegetation effects
- F5. Propagation through rain
- F6. Mobile radio propagation

Commission K (Electromagnetics in Biology and Medicine)

- K1. ELF bioeffects and mechanisms
- K2. RF and microwave interactions
- K3. Diagnostic and therapeutic applications

Inquiries may be directed to Professor T.B.A. Senior, Phone (1-313) 764-0500, Fax (1-313) 747-2106, E-mail : Senior@um.cc.umich.edu.

INTERNATIONAL MICROWAVE CONFERENCE

26-28 July, 1993, Sao Paulo, Brazil

This Conference, organized by the Brazilian Microwave Society (SBMO) and sponsored by URSI, will be held at the Centro Empresarial. A technical industrial exhibition, entitled "RF, Microwaves and Optics Exhibition", will take place in conjunction with the Conference.

Papers are solicited describing original work on the topics :

- Medical and Industrial Applications
- Microwave and Millimetre wave Integrated Circuits

- Optical and SAW Devices & Techniques
- Microwave Measurements
- Computer Aided Design
- Microwave Techniques in Radar and ECM
- Remote Sensing and Radio Astronomy
- Wireless Communications
- Active and Passive Devices and Components
- Microwave Radio Propagation
- Antennas and Arrays
- Microwave Superconductivity
- GaAs Monolithic Circuits
- Packaging Techniques
- Field Theory and Guided Waves
- Microwave and Optics Education
- Satellite Communications
- Optical Communications

A selection of invited speakers will highlight important and developing areas. The deadline for the receipt of papers is 31 December 1992.

All mail including the papers must be sent to the Steering Committee Secretary :

Paulina Cardoso
IMT-Escola de Engenharia Maus
Estrada das Lagrimas, 2035
09580 S. CAETANO DO SUL - SP
BRAZIL

1993 INTERNATIONAL SYMPOSIUM ON RADIO PROPAGATION (ISRP '93)

August 18-21, 1993, Beijing, China

The symposium is organized by the CIE Propagation Society (CIE/RP-S). It is the follow up of the 1988 International Symposium.

OBJECTIVE

The objective of the symposium is to provide an international forum for the presentation of the recent research results of radio propagation and to promote international communication and co-operation in this field.

TOPICS

Papers on any topic of radio propagation are welcome. The topics listed below are especially proposed :

- (1) Wave propagation theory (transient electromagnetic field, antenna radiative field, waves in random media, anisotropic media, analytic and numeric methods, etc.)
- (2) Tropospheric propagation and radiometeorology
- (3) Earth - space radio propagation
- (4) Ionospheric propagation and ionospheric physics
- (5) Waves, in plasmas
- (6) LF, VLF and ELF Propagation
- (7) Radio sounding of the earth environment
- (8) Propagation problems in remote sensing
- (9) Inverse scattering and imaging
- (10) Laser beam propagation

ABSTRACTS

Prospective authors are invited to submit 3 copies of the abstract. The abstracts should mention the title of the paper, author's name, address and a text of about 300 words in length, and must be sent to :

Professor Zong Sha
China Research Institute of Radiowave Propagation
P.O. Box 138/93, Xinxiang, Henan 453003
China

Prospective authors should note the following deadlines :

| | |
|--------------------------------|--------------|
| Receipt of abstract | Nov. 30 1992 |
| Notification of acceptance | Dec. 30 1992 |
| Receipt of photo-ready summary | Mar. 30 1993 |

**THE THIRD INTERNATIONAL SYMPOSIUM ON ANTENNAS
AND EM THEORY (ISAE'93)**

September 6-9, 1993, Nanjing, P.R. China

The organization of the meeting is in the hands of the following officials :

General Chairman : Lang JEN

SYMPOSIUM

Chairman : Lang JEN

Co-Chairman : Edward V. JULL

Vice-Chairmen : Li-Quan HE

Chen-Li YANG

Secretary General : Wen-Xun ZHANG

Deputy Secretary General : Chong-Zhou SUN

Fu-Zhen QU

Xiao-Ping TANG

INTERNATIONAL ADVISORY COMMITTEE

Chairman : Hung-Chia HUANG

Co-Chairmen : J. VAN BLADEL

Yu-Kuan MAO

ORGANIZING COMMITTEE

Chairman : Chu-Fang XIE

Co-Chairmen : W. Ross STONE
Li-Quan HE

TECHNICAL PROGRAMME COMMITTEE

Chairman : Wen-Xun ZHANG
Co-Chairmen : David C. CHANG
F.M. LANDSTORFER
Naoki INAGAKI

Papers are accepted in the following areas :

- A-1 Theoretical electromagnetics
- A-2 Analytic and numerical techniques
- A-3 Rays and asymptotic techniques
- A-4 Electromagnetic transients
- A-5 Non-linear EM Waves
- A-6 EM Fields in complex media
- A-7 Electromagnetic missiles
- A-8 Biological electromagnetics

- B-1 Scattering and diffraction
- B-2 RCS computation and reduction
- B-3 Inverse scattering and imaging
- B-4 Gratings and frequency selective surfaces
- B-5 EM Theory applied to antennas
- B-6 Antenna CAA/CAD
- B-7 Antenna pattern synthesis

- C-1 Guided waves and discontinuities
- C-2 EM modelling for MIC
- C-3 Cavities and resonators
- C-4 EM coupling and excitation
- C-5 EM-elastic wave interaction
- C-6 Electromagnetic environment
- C-7 Polarimetrics

- D-1 Wire antennas
- D-2 Slot antennas
- D-3 Microstrip antennas
- D-4 Monolithic integrated antennas
- D-5 Reflector antennas
- D-6 Lens antennas
- D-7 Feeds and radiating elements

- E-1 Wideband antennas
- E-2 Ultra low sidelobe antennas
- E-3 Conformal antennas
- E-4 Active antennas
- E-5 Superconducting antennas
- E-6 Mobile antennas
- E-7 Satellite antennas
- E-8 MMW and Sub-MMW antennas

- F-1 Phased arrays
- F-2 Digital beam forming
- F-3 Adaptive and signal processing antennas
- F-4 Antennas in matter
- F-5 Antenna measurement and metrology
- F-6 Near-field measurement and theory
- F-7 Scattering measurement and compact range

G Others

The deadline for submission of camera-ready papers is February 5, 1993. Please submit to :

Professor Wen Xun ZHANG
Chairman of TPC, ISAE'93
Southeast University
NANJING 210018
P.R. CHINA
Fax (86) 25-713 019

As a reminder, other URSI-sponsored meetings which are held in the near future

- Microwave Signature 1992, 1-3 July, Igls-Innsbruck, Austria (see Bulletin of June 1991). Contact address :
Kongreßzentrum IGLS (Ms. Beck)
Postfach 553
A-6021 Innsbruck, Austria

- 11th International Wroclaw Symposium and Exhibition on Electromagnetic Compatibility, 2-4 September, 1992. Contact address :
ORBIS Congress Bureau
Krakowskie Przedmiescie 13
P.O. Box 146
00-950 Warsaw, Poland

- Int. Symposium on Electromagnetic Theory, 17-20 August 1992, Sydney, Australia (see Bulletin of March 1992).

- Int. Symposium on Antennas and Propagation, 22-25 September 1992, Sapporo, Japan.

- Int. Symposium on Signals, Systems and Electronics, 1-4 September 1992, Paris, France (see Bulletin of June 1991).

Other meetings which have been brought to our attention

- Systèmes et Services à Petits Satellites, 29 juin à 3 juillet 1992, Arcachon, France. Contact address :
Groupe Europa
40, Bd. des Récollets
BP 4406
F-31405 Toulouse Cedex, France
Tel. (33) 61-32 66 99
Fax (33) 61-32 66 00

- IEEE International EMC Symposium, 17-21 August 1992, Anaheim, CA, USA.
- Sixth European Signal Processing Conference, 24-27 August 1992, Brussels, Belgium.
- 1992 Step Symposium - COSPAR Colloquium, August 24-27, 1992, John Hopkins University. For additional information, U.S. Step Coordination Office, USRA Code 610.3, NASA/Goddard Space Flight Center, Greenbelt, MD 20771, USA.
- Second International Workshop on Radar Polarimetry, 8-10 September, 1992, Nantes, France. Contact address :
La Chanterie
C.P. 3003
F-44087 Nantes Cedex 03
France
- Astronomy from Large Databases II, 14-16 September 1992, Haguenau, France. Contact address :
Ms. Chantal Bruneau
Observatoire Astronomique
11, rue de l'Université
F-67000 Stasbourg, France
Tel. (33) 88-35 82 16
Fax (33) 88-25 01 60
E-mail :
bruneau@frccsc21.bitnet
bruneau@ccsmvs.u-strasbg.fr.internet
- Missions, Technologies et Conception des Véhicules Mobiles Planétaires, 28-30 September 1992, Toulouse Labège, France, organisé par le CNES.
- Intelligence artificielle, robotique et automatique, appliquéer à l'espace, 30 September - 2 October 1992, Toulouse Labège, France, organisé par le CNES.

- International Standards Serving World Trade, 50th IEC General Meeting, 28 September - 10 October 1992, World Trade Centre, Rotterdam, The Netherlands. Contact address :

World Trade Centre
Mr. R.E. Gerritsen
Rotterdam, The Netherlands
Tel. (31) 15-690 185
Fax (31) 15-690 242

- IEEE Bipolar/Bi CMOS Circuits and Technology Meeting, 5-6 October 1992, Marriott City Centre Hotel, Minneapolis, MN, USA. Contact address :

Conference Coordination Services
6611 Countryside Drive
Eden Prairie
MN 55346, USA
Tel. (1-612) 934-5082
Fax (1-612) 934-6741

- 1992 International Aerospace and Ground Conference on Lightning and Static Electricity, 6-8 October 1992, Atlantic City, N.J., USA. Contact address :

FAA Technical Center
ACD 230 (1992 Lightning Conference)
Atlantic City International Airport
New Jersey 08405

- 11th International Conference on Microwave Ferrites, 16-20 October 1992, Alushta, Crimea. Contact address :

Chairman of IOC
Dr. Sc. Mikhailovskiy L.K.
Moscow Power Engineering Institute
105835 Moscow, E-250
Krasnokazarmennaya 14, RUSSIA
Tel. (7095) 362-5532 and 362-7534
Fax (7095) 361-1620, 362-8938 and 176-3464
Telex 411610 su mei
E-mail postmaster Cmei.msk.su

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- IEEE Regional Symposium on Electromagnetic Compatibilty, 2-5 November, 1992, Tel Aviv, Israel.

- Real-time embedded processing for space applications, 3-6 November, 1992. Les Saintes-Maries-de-la-Mer. Organized by CNES. Registration at :
 - Active Communication International
 - 2 rue Emile Pelletier
 - F-31082 Toulouse, France
 - Tel. (33) 6214 1112
 - Fax (33) 6214 1508

- 1992 IEEE International Electron Devices Meeting, 13-16 December 1992, San Francisco, USA. Deadline for Abstracts : 6 July 1992. Contact address :
 - M. Widerkehr
 - IEDM, Suite 610
 - 1545 18th Street
 - Washington, DC 20036, USA
 - Tel. (1-202) 986-1137

IUCAF'S REPORT ON THE 1992 ITU WORLD ADMINISTRATIVE RADIO CONFERENCE

The importance of the WARC'92 for the Radio Science community has been repeatedly discussed in the Bulletin, and in particular in the June and December 1991 issues. It is interesting to note the summary, on pp. 51-52 on the June 1991 Bulletin, of some "areas where frequency allocations at WARC'92 could put scientific applications in jeopardy". It is satisfying to report now that the frequency allocations that have been made in these areas have not put any scientific applications in jeopardy.

Introduction

The 1992 World Administrative Radio Conference (WARC'92) of the ITU was held in Spain from 3 February to 4 March 1992. It was the first "general" WARC held since 1979, and allocated frequencies below 3 GHz and above 13.75 GHz for a number of new and planned telecommunication and broadcasting technologies. These included satellite communication systems, digital sound broadcasting from satellites and wide-band high-definition television broadcasting from satellites.

Role of IUCAF in WARC'92

IUCAF was charged by ICSU, URSI, IAU and COSPAR to advance the interests of space research, radio astronomy and earth exploration in the decisions made by WARC'92. Its brief is to study and coordinate the requirements of these scientific services for radio frequency allocations, and to make these requirements known to the national and international bodies responsible for frequency allocations. IUCAF also takes action aimed at ensuring that harmful interference is not caused to the scientific services, operating within the allocated bands, by other

radio services (particularly for radio transmissions from aircraft or space vehicles).

There was a strong IUCAF delegation to WARC'92 comprising :

For URSI : Ir. H.C. Kahlmann (Netherlands)

Dr. B.H. Grahl (Germany)

Dr. B.J. Robinson (Australia)

For IAU : Professor G. Swarup (India)

Dr. A.R. Thompson (USA)

Dr. B.A. Doubinski (Russia)

The IUCAF ex officio advisers, Dr. R.C. Kirby (Director, CCIR) and Mr. W.H. Bellchambers (Chairman, IFRB), were also present through WARC'92.

Several IUCAF correspondents were also present : Dr. T. Gergely (USA), Dr. R.S. Roger (Canada), Dr. R. Sinha (India).

This team was large enough to cover the many sub-committees and working groups set up by the WARC Plenary Committee to address the wide range of topics falling within the competence of WARC'92 regarding frequency allocations, regulatory matters, recommendations and resolutions.

Preparatory work by IUCAF :

The extensive preparatory work done by IUCAF paid handsome dividends at WARC'92, and the scientific position on all issues was clearly understood by the Conference. The technical basis of the WARC was a report from CCIR drawn up at a Joint Interim Working Party (JIWP) in Geneva in March 1991 (see URSI Information Bulletin, June 1991). IUCAF played a notable role at the JIWP, and at the preceding Interim Working Parties of CCIR Study Group 2 (Washington, October, 1990; Geneva, February, 1991).

In the 18 months before WARC'92, IUCAF also acted to generate and distribute many preparatory documents to its 10 Members and 34 Correspondents.

IUCAF Input Documents to WARC'92

At the start of the WARC, two IUCAF documents were distributed by the ITU to the 1500 delegates from 125 countries. These were : "The Need for Passive Bands in the Radio Spectrum" (WARC Doc. 84-E) and "Interference and Radio Astronomy" (WARC Doc. 88-E). These documents were distributed in French, English and Spanish.

IUCAF also drew the attention of the WARC to Resolutions A1, A2 and A3 from the XXIst General Assembly of IAU (Buenos Aires, 1991). Only the English language texts of the Resolutions were available in Torremolinos.

Final Acts of WARC'92

The "Final Acts" of WARC'92 were signed on 3 March 1992 by the Heads of Delegations of the 125 countries represented. They thus constitute an international treaty (even though the final printed "Acts" for the band 1 GHz to 3 GHz were not distributed until March 20).

Allocations made by WARC'92 are :

(a) Space Research :

WARC'92 made primary allocations to Space Research in the following frequency bands :

2025-2110 MHz : Space Research (Earth-to-Space, Space-to-Space)

2110-2120 MHz : Space Research (Deep Space, Earth-to-Space)

2200-2290 MHz : Space Research (Space-to-Earth, Space-to-Space)

31.8-32.3 GHz : Space Research (Deep Space, Space-to-Earth)

34.2-34.7 GHz : Space Research (Deep Space, Earth-to-Space)

37.0-38.0 GHz : Space Research (Space-to-Earth*)

40.0-40.5 GHz : Space Research (Earth-to-Space)

In the band 137-138 MHz, Space Research is now required to share with Low Earth Orbit Mobile Satellites (Space-to-Earth).

(b) Earth Exploration

An Allocation from 156 to 158 GHz was made at WARC'92 to Earth Exploration Satellites for passive probing of the atmosphere. This allocation is needed to support water vapour content measurements by providing a window region outside the 183 GHz water vapour band.

In the band 1670-1675 MHz, meteorological aids and meteorological satellites (space to earth) will now have to share with "Public Correspondence with Aircraft " (aeronautical stations-to-aircraft). From 1675-1710 MHz in the Americas the meteorological service will have to share with mobile satellite communications (earth-to-space). However, satellite communications shall not cause harmful interference to, nor constrain the development of, the meteorological satellite and meteorological aids services.

From 1 January 2000, in the band 13.75-14.0 GHz, the earth exploration and space research services will be secondary to feeder links for the fixed satellite service.

(c) Radio Astronomy

Overall the position of radio astronomy was significantly improved by decisions of WARC'92. Some radio astronomy bands affected were :

- 150.05-153 MHz : Mobile satellite communications now have a nearby allocation (137-138 MHz) in the space-to-earth direction.

The band 37.0-38.0 is also to be used for the downlinks for data from Space Very Long Baseline Interferometer (VLBI) stations. A secondary allocation of 74-84 GHz was also made for future wideband space VLBI programmes.

Sidebands of wide-band modulation (such as spread-spectrum modulation) could interfere at 150.05-153 MHz, and the satellite downlinks are required to take all practicable steps to protect radio astronomy. Uplinks from mobile stations to the satellites in the band 148-150.05 MHz could also interfere; these can be controlled by coordination within national boundaries.

- 406.1-410 MHz : This radio astronomy band could also receive interference from out-of-band emissions by satellite communication downlinks now allocated at 400.15-401 MHz. The downlinks are required to take all practicable steps to protect radio astronomy.
- 1400-1427 MHz : Out-of-band emissions from digital modulation on CD-quality sound broadcasting satellites was of great concern for the prime passive band below 1427 MHz. Protracted discussions (until the last hours of the WARC conference) ultimately led to an allocation to broadcasting satellite (and complimentary terrestrial broadcasting) between 1452 and 1492 MHz. The 25 MHz gap between 1427 and 1452 MHz should allow for the filtering needed to prevent the digital signals causing interference below 1427 MHz.
- 1610.6-1613.8 MHz : Radio astronomy observations in this important band have suffered severely from interference from GLONASS navigation satellites. At WARC'92 there were proposals for a new allocation to satellite communications uplinks in the band, and downlinks in the adjacent band 1613.8-1626.5 MHz. This was another area which was not resolved until the last hours of the WARC. The new allocations are :
 - Upgrade radio astronomy to primary status in the band 1610.6-1316.8 MHz.
 - Require that no harmful interference to radio astronomy be caused by stations of the radiodetermination and mobile-satellite services.
 - Stress that emissions from space or airborne stations can be particularly serious sources of interference to radio astronomy.

- Restrict the radiated power from mobile stations to -15dBW/4 kHz in all the lower part of the band 1610-1626.5 MHz (required for GLONASS navigation).
- 1660-1660.5 MHz : This band was allocated world-wide to uplinks of Land Mobile Satellite communications. In some countries (Australia, Brazil, Mexico, USA) a footnote was inserted at WARC'92 which allows for any sort of satellite uplinks, which compounds the problem introduced at WARC-MOB'87 to allow aircraft mobile stations to use the band.
- 2670-2690 MHz : A long-standing secondary allocation in this band has been restricted by a primary allocation to broadcasting satellites. The situation has been improved by WARC'92 which deleted the broadcasting satellite allocation and substituted (from 1st January 2005) earth-to-space links of mobile satellite communications (which can share with radio astronomy if there is effective local coordination). Broadcasting satellites are still authorized in the adjacent band 2655-2670 MHz.

Recommendations and Resolutions of WARC'92

The WARC passed a number of recommendations and resolutions which relate to interference likely to be caused by new systems, and recommended further study (mainly by CCIR) of sharing criteria. Some of these recommendations and resolutions are :

Resolution GT-PLN/1 : this resolves that the next competent WARC should investigate raising meteorological satellites and earth-exploration satellites to full primary status in the band 401-403 MHz.

Resolution GT-PLN/2 : this resolves that the CCIR should study, as a matter of urgency, appropriate sharing criteria for sound broadcasting satellites (in both geostationary and elliptical orbits).

Resolution COM4/1 : this resolves that the CCIR conduct the necessary studies with regard to technical compatibility between the primary allocation to the fixed-satellite service (earth-to-space) and the

secondary allocations to space research and earth-exploration satellites in the band 13.75-14 GHz.

Resolution COM4/2 : this resolves that the CCIR continue, as a matter of urgency, studies to protect the space services operating in the bands 2025-2110 MHz and 2200-2290 MHz from harmful interference by the mobile service.

Resolution COM4/3 : this invites the CCIR to review the possibility of assigning frequencies to some space missions in bands above 20 GHz, and possibly reducing the allocations to the space services in the 2 GHz band.

Resolution COM4/7 : this resolves that the next competent WARC should consider the existing allocations in the 8-20 GHz range to earth-exploration satellites and space research, with a view to establishing common worldwide primary allocations to these services. It also resolves that the next competent WARC provides up to 1 GHz of frequency spectrum around 35 GHz for use by space-based active earth sensors. The CCIR is invited to carry out the necessary studies.

Resolution COM4/X : this resolves that the CCIR undertake sharing studies in the use of the band 1675-1710 MHz in ITU Region 2 by meteorological satellites, meteorological aids and the mobile satellite service.

Recommendation 66 : This recommends that the CCIR study, as a matter of urgency, spurious emissions resulting from space services transmissions in all frequency bands. It requests a report from CCIR to the next competent WARC with a view to including spurious and out-of-band emissions limits in the Radio Regulations, principally for the protection of the radio astronomy and other passive services.

Recommendation GT-PLN/A : This invites the CCIR to continue to study, as a matter of urgency, the characteristics and requirements of wind profiler radars at frequencies near 50 MHz, 400 MHz and 1000 MHz. The CCIR is invited to make recommendations as to the

technically suitable bands and frequency sharing criteria for compatibility with services that may be affected. At WARC'92 there was particular concern about harmful interference to the COSPAS-SARSAT satellite safety systems in the band 402-406 MHz from wind profiler radars near 400 MHz.

Further work by IUCAF :

In view of the many questions put to CCIR on sharing of frequency bands and on spurious and unwanted emissions, IUCAF needs to continue its interaction with the CCIR studies and its coordinating role in countries where IUCAF has Members or Correspondents.

Further work by URSI :

The many Resolutions and Recommendations of WARC'92 for CCIR to conduct sharing studies need to be considered carefully by URSI. Many of the issues raised concern Commissions E and J in particular.

DR. B.J. ROBINSON
Chairman
31 March, 1992

ANNUAL REPORT OF IUWDS

The readers of the Bulletin are referred to the March 1991 issue for generalities on the International Ursigram and World Days Service. The specific items in the IUWDS Report for 1991, recently received from Dr. R. Thompson, are :

1. The Ottawa Solar-Terrestrial Predictions Workshop in 1992

IUWDS has sponsored a series of scientific workshops to bring together scientists, forecasters of the solar-terrestrial environment, and the users of those forecasts. Previous workshops in this series have been held in Boulder (1979), Meudon (1984) and Sydney (1989).

The next workshop will be held during May 18-22, 1992 in Ottawa, Canada. Preparations for the meeting, being arranged by the Associate

Regional Warning Centre in Ottawa, are well underway. The meeting will place great emphasis on the users of solar-terrestrial predictions. This emphasis has resulted in the inclusion of a "users day" within the scientific programme. The meeting will be structured around four working groups, viz. solar, magnetospheric, ionospheric, and geomagnetic working groups.

A second circular has been produced and distributed to scientists. The circular gives publication details as well as information about travel to Ottawa. Details can be obtained from :

Dr. R.L. COLES
Geophysics Division
Geological Survey of Canada
1 Observatory Crescent
OTTAWA, ON K1A 0Y3
CANADA

2. Data Exchange with China

Following the admission of China to IUWDS, data exchange links have been established between China and the other Regional Warning Centres. The Chinese centre is based on an IUWDS committee bringing together all interested parties within China. The committee is chaired by Professor Li Qibin and consists of the following institutes ; Beijing Astronomical Observatory ; Yunnan Observatory ; Purple Mountain Observatory ; Institute of Geophysics ; Peking University ; Centre of Space Science and Applied Research ; China Institute of Radiowave Propagation ; and Wuhan Physics Institute. Beijing Astronomical Observatory is the communications centre responsible for receiving IUWDS data and delivering it to groups in China.

3. Introduction of Revised Geoalert Code

The geoalert code plays an important role in distributing IWDS forecasts amongst IUWDS Warning Centres and to users. A revised version of the code has been produced and is now being implemented by Warning Centres. The new code will be more easily generated and processed by computer.

4. E-mail Data Exchange

IUWDS Warnings Centres have made increasing use of electronic mail networks for the exchange of data. Use of such networks have made it possible to exchange data of a more complex nature than that contained within the codes able to be exchanged by telex. Examples of such data include solar images of various kinds, output from radiospectrograph observations, magnetometer traces, and ionograms. The trend towards the use of electronic networks will increase in the future, eventually replacing the existing code data exchange. Coordination of the introduction of this data exchange will be a prime task of IUWDS at its coming meeting in Ottawa during May 1992.

5. Publication of Prediction-Related Papers

The IUWDS Workshops have provided an important outlet for scientific papers of a "predictions" nature. However, IUWDS is keen to encourage the publication of such papers in the wider scientific literature. To this end, at the recommendations of IUWDS, Pierre Lantos (of the IUWDS Meudon Centre) and Gary Heckman (of the IUWDS Center in Boulder) have been appointed to the editorial panel of the journal "Pageoph, pure and applied geophysics". Information about publication in the Journal has been circulated to all IUWDS Centres.

6. IUWDS Co-Sponsorship of Session of COSPAR Congress

IUWDS has accepted an invitation by COSPAR to co-sponsor a meeting at the 1992 COSPAR Congress. The title for the meeting is "Solar Particle Events and Deep Space Missions", a subject which highlights the importance of the data exchange coordinated by IUWDS. Several IUWDS people have also been appointed to the programme committee of this meeting.

It is perhaps useful to give some information on the Regional and Associate Regional Warning Centre, the addresses of which are :

Dr. P. Suessman, Regional Warning Centre, Forschungsinstitut der DBP, P.O. Box 5000, W-6100 Darmstadt, Germany.

Dr. Z. Klos, Associate Regional Warning Centre, Space Research Centre, Ordonna-21, 01-237 Warszawa, Poland.

Dr. P. Lantos, Regional Warning Centre, Ursigrammes DASOP, Observatoire de Paris, F-92195 Meudon Principal Cedex, France.

Dr. B.M. Reddy, Associate Regional Warning Centre, Deputy Director, National Physical Laboratory, Hillside Road, New Delhi 110012, India.

Dr. R. Coles, Associate Regional Warning Centre, Geophysics Division, Geological Survey of Canada, 1 Observatory Crescent, Ottawa, ON K1A 0Y3, Canada.

Prof. Li Qibin, Regional Warning Centre, Beijing Astronomical Observatory, Chinese Academy of Sciences, Beijing 100080, China.

Mr. P. Triska, Associate Regional Warning Centre, Geophysical Institute, Bocni II, 141 31 Praha 4 - Sporilov, Czechoslovakia.

Dr. A. Danilov, Regional Warning Centre, Hydrometeorological Service, 6 Pavlika Morozova St., Moscow, Russia.

Dr. K. Marubashi, Regional Warning Centre, Communications Research Laboratory, Radio Science Division, Min of Posts and Telecommunications, 2-1, Nukui-Litamachi 4-chome, Koganei-shi, Tokyo 184, Japan.

Mr. G. Heckman, Regional Warning Centre, Space Environment Services Center, SEL/SESC/R/E/SE2 NOAA, NOAA, 325 Broadway, Boulder CO 80303, USA.

Dr. R. Thompson, Regional Warning Centre, IPS Radio and Space Services, P.O. Box 1548, Chatswood NSW 2057, Australia.

These Centres have reported on their 1991 activities in the #14, March 1992 IUWDS Newsletter, published by Dr. R. Thompson.

FROM THE ARCHIVES OF URSI

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

From the Bulletin of May - August 1952

This issue contains mostly routine matters. Under the heading UNESCO we read

"UNESCO has asked its Member States to apply an international arrangement ensuring the safe and expeditious transit across frontiers of delicate physical standards. The scheme is designed to prevent such instruments from being delayed or damaged during customs inspection.

From time to time, research laboratories making delicate scientific measurements need to exchange instruments, for purposes of comparison, with similar laboratories in other countries. The apparatus concerned may be metric, optical, electrical or magnetic standards, such as interferometers, quartz piezo-electric resistance standards, or quartz horizontal magnetometers. If these very delicate instruments are to reach their destination undamaged, they must be handled with extreme care during customs inspection in both exporting and importing countries.

The arrangement proposed by UNESCO provides for the inspection of these instruments to be made in the laboratories themselves, under competent supervision, rather than in customs depots at national frontiers or terminals."

The Ionosphere Research Committee in Japan gave a preliminary report on the Solar Eclipse of 25 February 1952.

From the Bulletin of May - June and July - August 1962

The May issue announces the creation of the van der Pol Gold Medal, thanks to a generous gift from Mrs. van der Pol. We also note a report on the IUCAF meeting held in Amsterdam in April 1962, at which the perennial problem of frequencies and interference was discussed,

together with frequencies for Space Research and the danger associated with Project West Ford, the belt of reflecting needles mentioned in the March 1992 Bulletin. West Ford is also the object of a report by a Working Party of the Royal Society, which analyzes the dangers of the project for (1) Radio Astronomy, (2) Optical Astronomy.

In the July issue we note an extensive report on the meeting of the European Regional Committee on Ursigrams, held in London in June under the chairmanship of Dr. Smith-Rose. The Committee approved the creation of the IUWDS and discussed (1) the functioning of the European Network, (2) provisions for the IQSY (International Quiet Sun Year), (3) cooperation with ESRO (European Space Research Organization) and the Spacewarn network, (4) the Cosmic Ray Sounding Chain.

From the Bulletin of June 1972

1972 was the year of the General Assembly in Warsaw. The Board of Officers met in March, and discussed, in particular, the finances of the Union, which were severely affected by the 1971 devaluation of the dollar. Thus,

"Decisions were made on the allocation of funds for the year 1972. Expenditure will be \$45,000 for the General Assembly, \$18,000 for other scientific activities in 1972, and \$31,000 on administration; these amounts follow the budget recommendations made by the XVI Assembly in 1969, after making allowance for the devaluation of the dollar.

It will be proposed to the XVII Assembly to limit expenditure on the XVIII Assembly to \$30,000 by cancelling¹ the meeting of the Coordinating Committee in 1974 and by avoiding the cost of

1 The meeting of the Coordinating Committee (i.e. of the Board together with the Commission Chairmen) held in preparation of a General Assembly was cancelled as proposed in the text. Thanks to an improved situation these meetings were reactivated in 1986.

publication of an expensive volume such as *Progress in Radio Science* or *Review of Radio Science*. The funds saved will be used for other scientific activities during the years 1973 - 1975.

It was noted that the devaluation of the dollar implied a reduction of about 14% in the income of URSI from the annual contributions paid by Member Committees."

The Board also discussed the status of the IUCSTP (the Inter-Union Commission in Solar-Terrestrial Physics), and recommended that ICSU recognize this Commission as a Special Committee (the present SCOSTEP), charged with the planning and coordination of the IMS (the International Magnetospheric Study), together with a limited number of other short-term projects.

Particularly important was the long report (9 pages) of the group on IUGG/URSI relations and structural changes. The group consisted of V.A. Troitskaya and G.D. Garland for IUGG, W. Dieminger and C.M. Minnis for URSI. It formulated the following recommendations :

"I. Recognizing

- (a) that, within ICSU, the Unions must carry the main responsibility for the stimulation and coordination of long-term research requiring international cooperation ;
- (b) that when several phenomena in science are closely interrelated, they should be jointly investigated within a single Union;
- (c) that, in consequence of b), studies of phenomena relating to the following branches of science should each be concentrated in one Union :
 - A. Both the internal and external geomagnetic fields, the study of which cannot be separated from the physics of the solid and fluid Earth; the gaseous environment of the Earth including both the ionosphere and the magnetosphere;
 - B. The generation, propagation and detection of electromagnetic radiation in ionized and non-ionized media and in mechanical structures;

(d) that certain aspects of A and B are themselves closely interconnected;

recommends

that, in consequence of d), the stimulation and coordination of research in the fields referred to in A and B should be the responsibility of the same Union.

II. *recognizing*

(a) that responsibility for the fields referred to in Recommendation I is at present divided between IUGG and URSI,

recommends

1. that IUGG and URSI should jointly agree to establish a new Union with responsibility for :
 - A. both the internal and external components of the geomagnetic field and the gaseous environment of the Earth, including both the ionosphere and the magnetosphere;
 - B. the generation, propagation and detection of electromagnetic radiation in ionized and non-ionized media and in mechanical structures;
 - C. the branches of geophysics that are not covered by A, but are at present the responsibility of IUGG;

recognizing further

(b) that the range of subjects covered by A, B and C is very broad, that the methods used to study them differ greatly from one field to another and that, in consequence, the components of the Union should be autonomous;

recommends

2. that provision be made in the Statutes of the new Union for appropriate autonomy to be given to the components of the Union.

III. recognizing

- (a) that many of the studies covered by A, B and C are related to each other and to the physics of planets other than the Earth;
- (b) that studies relating to B have applications in branches of science other than geophysics and astronomy, as at present;

recommends

that the new Union referred to in Recommendation II should establish the necessary internal structure, and also appropriate relations with groups of scientists outside the Union, with the objective of encouraging new developments and extensions of its activities.

IV. recognizing

- (a) that there is a need to make one ICSU body responsible for the organization of all international meetings concerned with A and B;

recommends

1. that this responsibility be given to the Union referred to in II which should act as necessary in consultation with IAU and IUPAP;
2. that the interval between meetings designed to cover the broad aspects of A and B should not be less than two years;
3. that, when necessary, meetings on more specialized subjects should be organized between the meetings mentioned in IV.2.

V. recognizing

- (a) that the ICSU Unions alone should be responsible for making decisions on long-term programmes of research;
- (b) that a Special Committee is the appropriate ICSU body for the organization of a closely coordinated short-term programme requiring the cooperation of several Unions and the direct participation of specially formed national bodies;

recommends

1. that IUCSTP be recognized by ICSU as the Special Committee for the IMS;
2. that its terms of reference be limited to the planning and coordination of the IMS;
3. that the present Provisional Statutes of IUCSTP be modified accordingly, including the specification of 31 December 1977 as the date on which the Special Committee will be terminated."

The Board also made the following awards :

Balthasar van der Pol Gold Medal to *Dr. B.D. Josephson*, University of Cambridge, U.K., for his studies of electronic effects in superconductors.

J. Howard Dellinger Gold Medal to *Professor A. Hewish*, University of Cambridge, U.K. for his contributions to advances in radioastronomy.

*The Council of the Royal Society of London, following consultation with the URSI Board of Officers, has made the following award for an outstanding contribution to studies in ionospheric physics : the Appleton Prize to *Professor R.A. Helliwell*, Stanford University, California, U.S.A., for his investigations of radio wave propagation in the magnetosphere.*

Finally this issue also contains a status report, by D.T. Farley on the Incoherent Scatter Studies of the Ionosphere.

From the Bulletin of June 1982

This issue was very short, encompassing reports on the 25th Anniversary of the Ionospheric Station at Dourbes, Belgium, and on a meeting of the World Meteorological Organization Committee on Atmospheric Science. We also note an article by C.M. Minnis on "URSI, Belgium and the Ionosphere : 1882 - 1922".

LIST OF CHANGED ADDRESSES OF URSI OFFICERS

Amendments to the List published in No 259 (December 1991) of the URSI Information Bulletin are listed below. An alphabetical index of these amendments with names and addresses is given in paragraph 6.

1. Board

Changes of address :

Professor A.L. CULLEN : new faxnumber

Professor R.L. DOWDEN : sabbatical leave (till end October '92)

2. Member Committees

New Officials :

AUSTRALIA : President : Prof. D.J. SKELLERN

EGYPT : President : Prof. I.A.M. SALEM

Secretary : Prof. W.A. SHUHOUD

Changes of address :

CHINA (CIE) : Secretary : Prof. Zong SHA

CHINA (SRS) : Secretary : Dr. Yinn-Nien HUANG

ITALY : Secretary : Prof. E. BAVA

NEW ZEALAND : President : Dr. J.E. TITHERIDGE

RUSSIA : President : Prof. V.V. MIGULIN

SWEDEN : Secretary : Mr. B. ÖHMAN

U.S.A. : Secretary : Dr. C.M. RUSH

3. Commissions

Commission A on Electromagnetic Metrology

CANADA : Dr. J. VANIER (Chairperson)

EGYPT : Prof. L. EL-SAYED

RUSSIA : Prof. P.M. HEROUNI

SOUTH AFRICA : Dr. F. HENGSTBERGER

SWEDEN : Dr. D.L.-E. PAULSSON

Commission B on Fields and Waves

BELGIUM : Prof. A. VAN DE CAPELLE

EGYPT : Prof. I.A. SALEM

NETHERLANDS : Prof. P. VAN DEN BERG

RUSSIA : Prof. L.D. BAKHRAKH

SOUTH AFRICA : Prof. J.H. CLOETE

SWEDEN : Prof. S. STRØM

Commission C on Signals and Systems

EGYPT : Prof. N. SALEH

NETHERLANDS : Prof. J.P.M. SCHALWIJK

RUSSIA : Prof. V.I. SIFOROV

SOUTH AFRICA : Prof. D.C. BAKER

U.S.A. : Dr. A.D. WYNER (Vice-Chairperson)

Commission D on Electronics and Photonics

AUSTRALIA : Prof. D.J. SKELLERN

EGYPT : Prof. E.A.F. ABDALLAH

FINLAND : Prof. T. TUOMI

ITALY : Prof. P.U. CALZOLARI

NETHERLANDS : Dr. Th.G. VAN DE ROER

SOUTH AFRICA : Prof. J.S. VERMAAK

SWEDEN : Dir. of Research S. RUDNER

USA : Dr. J.W. MINK

Commission E on Electromagnetic Noise and Interference

BRAZIL : Prof. J.J. ANGERAMI

EGYPT : Prof. M.M. IBRAHIM
FRANCE : Dr. J. HAMELIN (Chairperson)
RUSSIA : Prof. L.T. REMISOV
SOUTH AFRICA : Dr. C.K. PAUW

Commission F on Wave Propagation and Remote Sensing

EGYPT : Prof. S. ELKHAMY
RUSSIA : Dr. N.A. ARMAND
SOUTH AFRICA : Mr. R. SEEBER
SWEDEN : Mr. A. BLOMQUIST

Commission G on Ionospheric Radio and Propagation

CHINA (SRS) : Dr. Yinn-Nien HUANG
EGYPT : Prof. W.A. SHUHOUD
ITALY : Prof. P. DOMINICI
NEW ZEALAND : Dr. J.E. TITHERIDGE
POLAND : Prof. A.W. WERNIK (Chairperson)
POLAND : Dr. E. WODNICKA
RUSSIA : Prof. N.P. DANILKIN
SOUTH AFRICA : Dr. J.P.S. RASH

Commission H on Waves in Plasmas

CHINA (SRS) : Prof. Kuang-Chi HUANG
EGYPT : Prof. M.E.A. AZIZ
ITALY : Prof. G. PERONA
NETHERLANDS : Dr. L.P.J. KAMP
RUSSIA : Dr. Y.N. CHUGUNOV
SOUTH AFRICA : Dr. J.P.S. RASH
U.S.A. : Dr. W.W.I. TAYLOR

Commission J on Radio Astronomy

AUSTRALIA : Dr. R.D. EKERS (Chairperson)(correction E-mail)
EGYPT : Dr. B.B. BAGHOUZ
ITALY : Prof. G. TOFANI
NETHERLANDS : Ir. H.C. KAHLMANN
SOUTH AFRICA : Dr. G.D. NICOLSON

SWEDEN : Dr. A. WINNBERG

Commission K on Electromagnetics in Biology and Medicine

CANADA : Prof. M.A. STUCHLY (Chairperson)(has now E-mail)

EGYPT : Prof. N.A. EL-DEEB

INDIA : Dr. W.S. KHOKLE

ISRAEL : Prof. R. KORNSTEIN

RUSSIA : Prof. V.F. ZOLIN

SOUTH AFRICA : Prof. K.M. REINECK

SWEDEN : Dr. D.L.-E. PAULSSON

4. Standing Committees

ad hoc Group on Environmental Consequences of Nuclear War

Mr. M. WIK (Sweden) (new address)

Scientific Committee on Telecommunications

Dr. L.W. BARCLAY (addition faxnumber)

5. Working Groups

E.1. Spectrum Management and Utilization

Dr. R.D. PARLOW (USA) (new faxnumber)

E.2. Non-Gaussian Noise in Communication

Dr. A.D. SPAULDING (USA) (new faxnumber)

E.5. Interaction with and Protection of Complex Electrical Systems

Dr. C.E. BAUM (USA)

E.7. Extraterrestrial and Terrestrial Meteor-electric Environment with Noise and Chaos

Prof. H. KIKUCHI (Japan) (new faxnumber)

Time Domain Waveform Measurements (joint working group)

Prof. T.K. SARKAR (USA) (new address)

6. Alphabetical list with addresses

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SHUHOUD, Prof. Wael Aboul, 48 Alkhalifa Almaamoun St., Manshiet Albakry-CAIRO, EGYPT.

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