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EDITORIAL

The present issue has been mailed rather late. The delay is due to the abundance of material, and the time it took to collect and edit the most important items. These are :

- the official text of the Resolutions and Recommendations of Council and Commissions. These texts were approved in principle in Kyoto, but had to be put in final shape by the Drafting Committee, and shown to the originators of the documents for final approval.
- the reports of the Commissions on their Scientific Programme in Kyoto. Nine out of ten Commissions have already produced this interesting information.
- the list of addresses of URSI officials.

The next issue of the Bulletin, No. 268, will depart from the previous ones. The format will change, and the issue will contain - under a single cover - the traditional Bulletin and what used to be the separate "Radioscientist". The new quarterly will be edited by Professor Lagasse, Secretary General of URSI, and Professor R.L. Dowden. Suitable details on the new set up will be given in the March 1994 issue, which will be the first one to be distributed to the new "Correspondents", in particular to those who obtained this status through registration at the Kyoto General Assembly.

J. VAN BLADEL

IN MEMORIAM

NELLO CARRARA
1900 - 1993

Professor Nello Carrara, Grande ufficiale al Merito della Repubblica, Cavaliere dei SS Maurizio e Lazaro, passed away in Florence on 5th June 1993, after a short illness.

Born in Florence on 19 February, 1900, Professor Nello Carrara studied at the Scuola Normale Superiore in Pisa, where Rasetti and Fermi were his fellow students. He obtained a degree in Physics in 1921.

He was an Assistant in Experimental Physics at the University of Pisa until 31st October 1924 when he was called to teach General Physics at the Livorno Naval College, where he remained until 15 January 1954. In the 1954/55 Academic Year he was appointed to the Chair of Theory and Technique of Electromagnetic Waves at the Naval University Institute of Naples, which he left on 1 November 1955 when the Department of Mathematical, Physical and Natural Science of the University of Florence offered him the Chair of Electromagnetic Waves, which he held until his retirement on 31 October 1970.

From 1 November 1975 he became Professor emeritus of Electromagnetic Waves at the University of Florence, and in 1980 the University awarded him an honorary degree in Electronic Engineering.

In 1946 he founded the Centre for the Study of Microwave Physics, which was recognized as a National Research Council Centre in the following year. The Centre became the Research Institute on Electromagnetic Waves (IROE-CNR) in 1968, and Professor Carrara was its director until 1970. He was then appointed President of the Scientific Council for the following four years, tenaciously cultivating its progress in an often unfavourable environment, until he developed it into one of the leading and most prestigious CNR institutes.

During his lifetime he authored more than 100 important publications. After his first works on gas and x-ray refraction, he devoted his efforts mainly to the application of physics to radio communications and electronics. Of particular importance was his work, published in 1921 in the Proceedings of the Institute of Radio Engineering, on "The detection of microwaves", as a result of which he was universally attributed the paternity of the term "microwaves", used for the first time in this work.

Since 1946 Professor Carrara's research activity has been closely connected with the development of the Microwave Centre. Of great significance are his works "Radiation pressure of centimetre waves" and "Torque and angular

momentum of centimetre electromagnetic waves”, published in Nature in 1949. He later achieved impressive results in the field of molecular spectroscopy and the use of meteoric tracks for radio communications. In the space field he collaborated on the S. Marco project, was Chairman of the Joint Satellite Studies Group (6 laboratories run by various countries working on the study of the propagation of radio waves in the ionosphere) and was a member of the International Academy of Astronautics. In the seventies his activities were oriented toward digital system application to information technique and telecommunications engineering, and in later years he acted as consultant for various leading national concerns.

He worked with others in realizing the first Italian radar during the last war and in post-war years he was fundamentally involved in the foundation of the S.M.A. company in Florence, of which he became Chairman after leaving the management of IROE, and later Honorary President.

For his activities in the field of physics and radio engineering he received various prestigious awards, among which :

- First Class Silver Medal from the Navy (1934)
- The Righi Award Gold Medal (1935)
- The Brezzi Award Gold Medal (1937)
- The “Giancarlo Vallauri” Award (1959)
- The Colombo Award Great Gold Medal of the International Institute of Communications (1966)
- The Columbus Award Gold Medal (1967)
- The Ministry of Education Gold Medal awarded to those who achieve distinction in the world of Culture and Art (1970)
- The “Meridiana d’Argento” (Silver Meridian) Award of the Italian Institute of Navigation (1989).

This list of distinctions - which illustrates a lifetime dedicated to the progress of science - perhaps does not sufficiently highlight Professor Carrara’s most outstanding merits : his great sense of humanity and ability to convey to others his love of scientific research. His fervid and successful scientific activity was always accompanied by the deepest family affections and a constant cultivation of friendships. His many friends will sorely miss him.

One can truly say of him that “Wisdom is like a tree : its fruits give life to those who eat them” (Proverbs 3,18).

A.M. SCHEGGI
CHAIR, ITALIAN MEMBER COMMITTEE

KONSTANTIN GRINGAUZ 1918 - 1993

On 10 June 1993 Konstantin Gringauz died in Moscow of a heart attack. With him disappears a pioneer in Space Research, a true giant in this field for over 40 years.

K.I. Gringauz contributed to many important experimental discoveries within the frontiers of research on the magnetospheres of Earth and other planets. His achievements in space sciences have contributed greatly to the renown of the Space Research Institute (IKI) in Moscow where he worked almost to the end of his 75th year, when he passed away.

K.I. Gringauz was born in South-east Russia in 1918. In 1947 he entered the Bureau for Rocket Development of S. Korolev, and in 1948 a V-2 rocket carried his radio probe into the upper atmosphere. In 1949, after receiving his Ph. D., he became Head of Korolev's Laboratory for Radio Technology. In 1956 he started designing instruments to measure ions in the Earth's ionosphere from a satellite to be launched during the International Geophysical Year (IGY). His hands were the last, in 1957, to touch the radio transmitter antennae of Sputnik 1 before the launch of that first artificial satellite. His plasma probes on board LUNIK 1 and 2 detected for the first time the sharp drop in the ionization density which was later identified with the plasmopause surface, located at an equatorial distance of 4 to 6 Earth radii. He also participated in many other magnetospheric and interplanetary missions such as the COSMOS, PROGNOZ, and VENERA spacecraft, and in the PHOBOS mission to planet Mars.

Despite his declining health during the last two years he was still an active Co-PI for the MAREMF electron spectrometer which will be part of the payload of the future MARS 94 mission. Konstantin Gringauz participated actively in the URSI General Assembly in Japan in 1963, where he presented his Lunik observations of the plasmopause density drop. This is also the place where he first met D.L. Carpenter, who identified this same boundary from ground-based whistler observations.

He contributed recently two chapters to a book in which he and Don Carpenter describe their historical discovery of the plasmopause. This book will be published by Cambridge University Press.

Konstantin Gringauz received the Lenin Prize in the 1960s and the COSPAR Space Science Medal in 1988 for his many important scientific achievements.

The URSI Community is sad to have lost one of its most famous and productive members.

JOSEPH LEMAIRE

PROFILE OF MEMBER COMMITTEES

SOUTH AFRICA

This text has been received from the Chair of the URSI Committee in South Africa.

"In my search for material relating to the history of South African involvement in URSI, I was at once astounded to find that the connection went back as far as 1928. Unfortunately, I could find no record that would determine who the people were at that time or the terms of reference of the Committee in these early days. According to the Golden Jubilee book of 1963, South Africa was the 12th country to affiliate to URSI of a total (in 1963) of 28. I did find a letter dated 28 March 1936, in which Professor Basil F J Schonland was requested to chair what must have been the South African URSI Committee, but which went under the title of the South African National Committee on Scientific Radio-Telegraphy. Professor Schonland must have accepted the invitation, because ten years later, the Chairman of the Research Grants Board in South Africa was to state: ... in his report, Dr Schonland had made a suggestion that the Board might consider the advisability of setting up a committee to go into the question of what radio research investigations should be started in South Africa to give effect to the request of the URSI resolution (as given hereunder) and what resources in personnel and financial support would be required .

Resolution : The Commission, having reviewed the distribution throughout the world of stations at which fundamental observations on atmospheric are now in progress, is of opinion that the extension of such was already in progress in North America and Japan and its initiation in South Africa and Japan are of essential importance."

The following rather wordy resolution was then adopted, and is repeated here because of the light it throws on the personalities at the time, the nomenclature and the current hot topics:

"The Research Grant Board has noted the resolutions passed at the International Conference of Scientific Radio Telegraphy and Telephony and is in sympathy with the idea that South Africa should play its part in undertaking experimental work towards solving problems of lightning discharge and other atmospheric phenomena. The Research Grant Board invites the Executive of the S.A. National Committee of Scientific Radio Telegraphy together with Sir Carruthers Beattie, Dr F.J. Schonland and a representative of the technical staff of the Department of Posts and Telegraphs to suggest the line along which experimental work should be conducted in such a manner as to aid the objects which the International Conference has in view."

After this, the Council for Scientific and Industrial Research (CSIR) as national adhering organisation to ICSU since 1947, was responsible for coordinating South African activities relating to ICSU and its affiliates and established a system of national committees to assist with these responsibilities. Until 1986, it was customary for Executive Members of the CSIR to serve as chairmen of these national committees. However, with the establishment of a unified SA ICSU Secretariat in 1986, it was decided to follow a more democratic and scientific approach and to give scientists a larger voice in the affairs of ICSU activities.

The Chairs of the Member Committees were accordingly selected from South African Scientists with national and international experience in their field, and it was against this background that I, somewhat to my surprise, was approached with a view to forming a new South African Member Committee for URSI in 1988.

Aware that the URSI Commissions covered far greater fields than my own ionospheric interests in Commission G, I decided to embark upon a fact finding mission to establish the extent of South Africa's involvement in the other Commissions. I was astonished to find that, to varying degrees, there was activity in all of the fields, even in the field of the bio-effects of electromagnetic radiation, which had yet to attain its own independent commission. However, it was also apparent that these Scientists were to a large extent unaware of each other and the opportunity that the URSI umbrella could provide in bringing diverse groups together. The Member Committee seemed an ideal forum to engender such mutual awareness, with the possible spin-off of productive cross-fertilisation.

In fulfillment of my task of forming a Member Committee, I approached people whom I considered representative of each of the nine URSI Commissions, with an additional representative for the area which is now covered by Commission K. It was very gratifying that everyone approached agreed immediately to assume this new responsibility. The first meeting of this Committee was in January 1989. The term of appointment was for 3 years, but when asked if they wished to continue at the end of that period, almost all agreed to do so, so the current Committee remains virtually unchanged.

To describe the activities of the current Member Committee it is perhaps best to start by stating our terms of reference. They are:

- (i) To act as the recognized South African body, representing the local community of radio scientists in the activities of the International Union of Radio Science, in terms of the requirements laid down by ICSU for the adhering bodies of ICSU Unions.
- (ii) To review research activities in South Africa in the field of Radio Science, and to facilitate the coordination of programmes in this field including the

initiation of new programmes where they appear desirable in the national interest.

- (iii) To promote on a coordinated basis the interchange of ideas and information by means of overseas visits of South African scientists, and by means of visits to South Africa by distinguished overseas scientists.

However, South Africa is currently experiencing a period of rapid change, both politically and socially, and priorities in spending have had to be re-considered. For this reason, some features of the terms of reference, in particular those referred to in items (ii) and (iii) above, that are cost intensive, enjoy reduced attention at the present time.

We have thus been focussed on co-ordinating the submissions of the South African contribution to Review of Radio Science, as well as to compile the South African National Report, which is a document summarising published and unpublished work, and is distributed to the international community at the triennial General Assemblies. It is also our responsibility to identify worthy young scientists, particularly from formerly disadvantaged communities, who could be eligible and could benefit greatly from the URSI Young Scientists Programme.

The cost of these activities, which includes a triennial meeting of the committee, the National dues to URSI, and the subvention of the National delegate to the General Assembly, amounts to an average of R16 000 per annum. The radio science community in South Africa is not large enough to sustain such expenditure, so we rely on funding supplied by the Foundation for Research and Development. The FRD also supplies the secretariat which handles the organisation of the meetings of the National Committee and provides the minutes. Our South African radio community thus owes a debt of gratitude to the FRD, and this article presents a rare opportunity to express the thanks of the Member Committee and the South African URSI community to the FRD for this welcome and indispensable financial support.

A.W.V. POOLE
PRESIDENT, MEMBER COMMITTEE IN SOUTH AFRICA

NEWS FROM THE MEMBER COMMITTEES

BELGIUM

URSI makes a systematic effort to involve the upcoming generation of radio scientists in its various activities. Our extensive Young Scientist Programme is the most obvious illustration of this endeavour. The Committee in Belgium recently launched an initiative which carries the Young Scientists policy down to the local, national level. This initiative is worth mentioning, because it could be duplicated, mutatis mutandis, by other small countries, where travel distances do not represent a serious problem.

The Belgian idea is described in the following note, written by Professor Delogne, Past President of the URSI Committee in Belgium.

“A quite interesting activity has been started by the URSI Committee in Belgium. The Committee has sixteen regular members, seven honorary members and about twenty associates. It normally holds two or three meetings a year at the Royal Academy of Science. Those meetings are traditionally organised during an afternoon. They start with a lecture on some scientific topic (which is followed by a discussion) and end with an administrative session.

The experience of the last few years has shown that the attendance to these traditional meetings was rather poor, in spite of the fact that they were open to all non-member scientists active in the various Belgian laboratories. The main reason for this is probably that people do not move easily for a programme consisting of a single scientific lecture, although distances are always small in Belgium. This matter was discussed during a meeting of the Committee and the idea was advanced to organise a yearly event involving the numerous scientists active in our various laboratories. The preference was for a Forum consisting of short lectures given by PhD students, in which they would describe their research work.

The first such Forum was held on 10 December 1993, with an Organizing Committee chaired by the incoming President of the Belgian Committee, Professor E. Schweicher, assisted by Professors A. Laloux, C. Vloeberghs and P. Van Daele. As the main purpose of the meeting was to bring young scientists together, it was not found desirable to organise parallel sessions. There were fifty-four answers to the call for papers, too much for one day. The decision was therefore made to restrict oral presentations to the twenty-seven Ph.D. students who had recently presented their thesis, or were in the terminal phase of their work. The other authors were invited to provide a written contribution, for inclusion in the Proceedings of the meeting.

The Forum'93 took place at the Royal Military Academy of Belgium in Brussels. It turned out to be a most successful event, attended by seventy-five participants. The opening address was given by General Paelinck, Rector of the Military Academy. The scientific presentations were organised in 5 sessions, each paper being limited to 15 minutes, discussion included. As the main objective was to favour contacts between individuals, short speaking times were indeed preferred, in order to leave enough time for long coffee breaks, a common lunch and a party at the end of the meeting.

Belgium has three official languages: Dutch, French, and German (the latter spoken by a small minority of the population). The country is known for its linguistic conflicts, but these are mainly a game for politicians. Belgians as individuals are generally very courteous with each other in this matter. The organizers could have decided that the working language of the Forum should be a fourth language (obviously English). Instead, it was decided that all participants should be free to use any language. As a result, it was not unusual, in the Forum, at the end of a lecture given in Dutch, to have a question raised in English and an answer provided in French.

The success of this meeting is a strong encouragement to pursue the project. The Belgian URSI Forum will be an annual event, organised cyclically by the various University Laboratories involved in the scientific areas covered by URSI.

P. DELOGNE

FINLAND

The URSI Committee in Finland has held its 14th Convention on Radio Science in Otaniemi, on 25-26 October 1993. The general topic was Wireless Communications, systems and components with, in addition, a session on Radioastronomy. Session titles were :

Integrated RF circuits	Systems
Circuits and equipments	Radio channel
Radioastronomy	DSP
Mm-wave components and subsystems	Systems for broadcasting
Services and systems	

The keynote to the Convention was given by Professor Jørgen Bach Andersen, Director of the Center for Personal Communications of Aalborg University, Denmark. Moreover, two contributions from Estonia and several papers by foreign visitors in Finland, gave this Convention some international flavour. Instead of the traditional Swedish or Finnish, most of the papers were delivered in English.

ON THE YOUNG SCIENTISTS PROGRAMME IN KYOTO

The Young Scientists Panel, having solved a host of practical problems, managed to bring a large group of young colleagues from the former USSR to Kyoto. Dr. V. Khaikin, one of the Awardees, offered to coordinate our effort in the former USSR, and was of considerable help in achieving our success in that region. He wrote the following note for the Bulletin :

“Remembering the XXIV URSI General Assembly in Kyoto

25 young scientists (Y.S.) from the former USSR (18 of them from Russia, 5 from the Ukraine, 1 from Belarus, 1 from Uzbekistan) could attend the XXIV URSI General Assembly in Kyoto. It was almost a quarter of the total Young Scientists contingent, and an unprecedented result of URSI's efforts to support Radio Science in the independent states of the former USSR.

At the unforgettable Opening Ceremony of the General Assembly the audience at Kyoto International Conference Hall welcomed the URSI Young Scientist awardees. Much preparatory work had been done under the supervision of the URSI President, Professor E.V. Jull and the Secretary General, Professor J. Van Bladel, who made sure 112 Young Scientists belonging to 40 countries could come to Kyoto. The Local Organizing Committee did its best for the atmosphere at the Conference to be warm and creative. The Y.S. in turn took an active part in the work of all ten URSI Commissions.

The Russian Young Scientists enjoyed the activities in Kyoto very much. I believe each of the Young Scientists awardees in Kyoto now feels that he or she belongs to the Radio Union. Towards the end of the Assembly we received not only the ties with the URSI emblem from President E.V. Jull, but we also acquired the spirit of the Union. I believe each of us shares the noble aims of URSI, and intends to follow them in his own scientific activity.”

VLADIMIR KHAIKIN
SPECIAL ASTROPHYSICAL OBSERVATORY
STAVROPOL, RUSSIA

REPORT ON SCIENTIFIC SESSIONS OF COMMISSIONS AT THE KYOTO GENERAL ASSEMBLY

COMMISSION A - ELECTROMAGNETIC METROLOGY

Commission A highlights at the 24th General Assembly in Kyoto were the Tutorial Lecture by Sadakuni Shimada (Advanced Technology Institute, Tokyo, Japan) on "Frontier Communication Technologies: From Radio-Waves to Optical Fibres", five sessions organized by Commission A and eight joint sessions which were held in cooperation with Commissions B, C, D, E, J and K. Ten papers of these sessions were Young Scientist Award papers. One of the three General Lectures of this General Assembly was given by J. McA Steele (National Physical Laboratory, Teddington, UK) on "Precise Time/Frequency: Its Impact on Science and Technology".

The lecture by S. Shimada described the trend in radio and lightwave communication technologies, as well as recent research topics, and considered their contribution to the future telecommunication networks. This new generation of technologies is being researched worldwide to improve the performance of telecommunication systems; it includes multibeam satellite systems, monolithic microwave integrated circuits, optical frequency division multiplexing, fading countermeasures and optical signal processing. It will become the key to the implementation of the Broadband Integrated Service/Digital Network.

In session A1 on "Communication Systems and Optical Fibres" (Conveners: K. Morita and H. Ishio, Japan) which contained six invited papers, current themes of this kind were also treated. These included a highly precise 256QAM modem with advanced fading countermeasures, the wideband characterization of the mobile radio channel and its impact on system performance, and the successful test of the ITALSAT multibeam antenna fine pointing system. One paper dealt with the advances made towards high capacity optical transmission systems. The recent progress made in work towards realizing highly coherent and wideband tunable light sources, accurate optical frequency counting and high-speed lightwave measurements was also reported.

The eight invited papers of session A2 on "Microwave/ Millimeter Wave Standards" (Conveners: S. Kashyap, Canada and T. Iwasaki, Japan) covered themes such as RF power and voltage measurements, the determination of reflection and/or scattering parameters and antenna measurements. Three of the papers dealt with the development of new broad-band coaxial or waveguide power standards, partly implementing thin-film technology to lower the time constant and to raise the effective efficiency. One paper reported the state of the art of international traceability of RF voltage. A free-field Ku-band

scatterometer for measuring the reflection and transmission of flat sheets was described. An overview of the six-port reflectometers in European national institutes of metrology (frequencies 20 MHz to 40 GHz) and a description of these systems already existing in France was given. Further papers dealt with on-wafer MMIC S-parameter measurements up to 40 GHz and thin-film technology applications for coaxial impedance standards in the higher MHz range. An optically-linked, three-loop antenna system described in a further paper measures the RF radiation characteristics from small radiating sources at frequencies from 3 kHz to 100 MHz. The session was well attended (by an average of 40 delegates).

Session A3 on "New Developments in Atomic Frequency Standards" (Conveners: K. Nakagiri, Japan and R. J. Douglas, Canada) consisted of five invited talks. In the first talk, D. Morris (Canada) reviewed the use of hydrogen masers as timekeepers and local oscillators in view of their very low frequency instability at short integrating times. A. DeMarchi (Italy) talked about recent improvements of Cs beam frequency standards and A. Clairon (France) discussed potential frequency standards based on Cs fountains and atomic traps. In traditional Cs clocks, residual phase shifts leading to an increased frequency uncertainty can be reduced by a modified Ramsey resonator.

Atomic clocks based on Cs fountains are attractive in view of their potential to reduce the instability and the uncertainty. Novel frequency standards based on laser-cooled and trapped ions and atoms are being developed in several laboratories. S. Urabe (Japan) reported on the trapping and cooling of Ca ions, whereas an optical frequency standard based on cooled and trapped Ca atoms was discussed by J. Helmcke et al. (Germany, Japan). (Reported by J. Helmcke)

Session A4 entitled Navigation Systems: "From the Sextant to GPS" (Conveners: W. J. Klepczynski, U.S.A. and F. Takahashi, Japan) was devoted to a survey of the development of navigation and position location systems from the 16th century to the present day's most sophisticated system, the Global Positioning System (GPS). The papers primarily stressed the important role that time played in these systems. The more modern systems were representative of the different radio bands utilized for navigation. Seven papers were presented which covered the Omega Navigation System, a radar navigation system, geodetic applications of the VLBI technique, the use of radio communication satellites, GPS and various interesting techniques used for position determination in the 16th and 17th centuries. (Reported by W. Klepczynski)

Session A5 on "Quantum Metrology and Fundamental Constants" (Conveners: T. Endo, Japan and B. N. Taylor, U.S.A.) consisted of eight invited papers. It gave an overview of recent developments in the realization of units by quantum metrology and fundamental constants. After an introduction by B. N. Taylor about the relationship of fundamental constants to electrical standards, four

other contributions dealt with the Josephson- and the Quantum Hall effects and their consequences to resistance and voltage measurements. This was completed by a report on the Thompson-Lampard calculable cross capacitor experiments leading to the best values of the von Klitzing constant. The two last contributions on the determination of Avogadro's constant, and on the realization of an SI Watt experiment, described the efforts made worldwide to replace, in the future, the prototype of the kilogram by a more universal definition for the unit of mass. (Reported by K. Dorenwendt)

As regards the joint sessions, a session (AB1) on "Time Domain Metrology" was held with eight invited papers (Conveners: S. M. Riad, U.S.A. and K. Itoh, Japan). Seven papers were presented; the time saved in the four-hour session was dedicated to an open forum discussion on new directions related to the topics of the session. The main themes of the session were (i) the application of time domain techniques for wideband modelling and simulation of electronic devices and structures including multilayer interconnects, packages, and multi-chip modules (MCM), and (ii) calibration techniques for wideband time domain measurements of devices under test, including de-embedding the responses of oscilloscopes, cables, connectors, launchers, and measurement fixtures. The session was well attended with an average of 50 participants from various countries. Papers were well received, with some lively discussions indicating the relevance of the chosen topics and the quality of the material presented. To conclude the open forum part of the session, those attending agreed that it is important to continue to have sessions on the topics of this session in future URSI meetings. (Reported by S. M. Riad)

The joint session AD on "Lasers: Stabilization and Applications" consisted of five invited papers and was organized by J. Helmcke, Germany and A. J. Seeds, U.K. In the first talk, J. L. Hall (U.S.A.) reviewed modern techniques of frequency stabilization of lasers, in particular semiconductor lasers and diode-pumped YAG lasers. A. Clairon (France) discussed methods for the synthesis of optical frequencies which may be of interest for the determination of laser wavelengths and the Rydberg constant. Semiconductor lasers are attractive sources of coherent radiation in high-resolution spectroscopy and coherent communication techniques, if the noise at their frequencies can be reduced. Progress in this field was reported by U. Gliese (Denmark). Frequency-stabilized lasers are also used in various other fields of fundamental physics: K. Danzmann (Germany) discussed the development of lasers to be used in gravitational wave antennas, and O. Poulsen (Denmark) reviewed high-resolution laser spectroscopy of fast relativistic ions/atoms which are used to test the theory of special relativity. (Reported by J. Helmcke)

The seven papers of joint session CA on "Recent Advances in Communications Satellite In-Orbit Testing" (Conveners: G. Hyde, U.S.A., V. Riginos, U.S.A. and B. Kastan) covered themes on spacecraft antenna mapping, test results of the

ITALSAT 20 to 50 GHz experiment, and new techniques for communications satellite testing and monitoring, including transponder techniques and checking and performing IOT/CSM functions by time-sharing techniques.

A further joint session JA with seven invited papers on "Pulsar Timing" (Conveners: D. Backer and D. W. Allan, U.S.A.) was devoted to the techniques used to time and determine the period of rotation of pulsars. Timing observations are very important because they are useful in studying their evolution, emission mechanisms and their internal structure. The papers covered the instrumentation used, a survey of pulsar objects, models for pulsars, and reference time scales for the measurements. (Reported by W. Klepczynski)

The well-attended joint session DA on "Superconductor Circuits and Devices" (Conveners: O. Vendik, Russia and S. Komiyama, Japan) contained nine papers, but only two invited and three contributed papers were presented. The first invited paper described the design of high-T_c superconductor coplanar waveguide filters made of YBCO thin-films on lanthanum aluminate, and their performance at 9.8 GHz at 77 K. The second invited paper dealt with the state-of-the-art in metrology by means of Josephson junction series arrays (JJSA), including Josephson potentiometry and developments with the aim of the hybrid integration of a JJSA and a MESFET oscillator on a common substrate. The themes of the other papers included an improved three-fluid model to investigate the microwave characteristics of high-T_c superconductors, and the development of superconducting active antennas and tunable microwave passband filters based on dielectric resonators with high-T_c films.

S. Adachi, Japan and M. Kanda, U.S.A. organized and chaired an invited joint session (AB2) on "Antenna Measurements". This session covered the timely topics of antenna measurements at millimeter wavelengths and antenna measurements for satellite communications and radio astronomy. The invited session EA on "Electromagnetic Metrology Applied to EMC" was organized by P. Degauque, France, M. Kanda, U.S.A. and K. Asatani, Japan. This session included many diversified but relevant topics for EMI metrology such as cable shielding, EM noise environment, electrostatic discharge, system EMC and EMC measurement technology. L. E. Paulsson, Sweden and M. Kanda, U.S.A., organized and chaired an invited joint session (KA) on "Exposure Assessment and Measurements in Complex Environments". This session covered ELF exposure assessments, HF-UHF exposures and transient measurements. Additional papers were presented at poster sessions. These three joint sessions were well attended and provided a forum for stimulating discussion and coordination of research in electromagnetic metrology. (Reported by M. Kanda)

U. STUMPER
CHAIR, COMMISSION A

COMMISSION C - SIGNALS AND SYSTEMS

At the Kyoto General Assembly, Commission C organised 1 tutorial lecture, 10 individual sessions with a total of 65 oral presentations and 5 joint sessions with other commissions, where there were 40 presentations. In addition, there were 24 poster presentations in five poster sessions.

The Commission C Tutorial Lecture was an "Overview of Mobile and Personal Communications" by A.J. Viterbi. In this lecture, given before a capacity audience, Dr. Viterbi traced the history and recent dramatic developments in mobile and personal communications. The various multiple access digital communication techniques were discussed. Dr. Viterbi presented the recent developments in mobile and personal communications as a culmination of the development of Solid State Electronics and Information Theory, and concluded with a glimpse of future trends.

In a session on the Synthesis and Analysis of Systems convened by B. Shishkov, there were a range of papers on random signals and systems excited by random signals. Papers included: results on algorithms for detection in a stochastic environment, techniques for the analysis of nonlinear systems described by stochastic differential equations with random signals, techniques for finding the spectral density and performance of line codes, and results on sensitivity functions for Kalman filters.

Previous General Assemblies have included sessions with results on the modelling and analysis of telecommunications networks. However, at the Kyoto General Assembly, there was for the first time a session on the design of telecommunications networks and in particular, a session on Computer-aided Telecommunication Network Design, convened by K. Geher. Telecommunications networks are very complex and their design is indeed a multidisciplinary task involving scientific, engineering and economic factors. After each paper there was lively discussion. At the end of the session, the role and the activity of the Scientific Committee on Telecommunication was presented by L.W. Barclay. It was agreed that Commission C on Signals and Systems is most interested in the radio science aspects of global telecommunication.

In a session on Picture Coding convened by P. Delogne all authors were present. The session started 20 minutes late due to a delay in the completion of the tutorial lecture, which occupied the same room. It is recommended that in future there be a short buffer period between the completion of tutorial lectures and the following sessions. In this session, there were papers on compatible coding of TV and HDTV and on filter banks and subband coding, which proved complementary, since subband coding is one possible approach to compatible coding. Both papers stressed the necessity for the coder and decoder predictors

to be strictly identical and to base their predictions on the same information, so as to avoid a drift between the coder and decoder predictions. A third paper on motion compensation for interlaced pictures, presented an appropriate approach to signal processing of interlaced pictures in areas with translational motion, in contrast to previous approaches which have not been appropriate to interlaced pictures. This is of potential impact on questions of filtering, decimation-interpolation, de-interlacing and format conversion. While picture coding techniques that have reached present maturity reduce redundancy on the basis of statistical properties, the next generation of algorithms will perform some interpretation of picture content. A paper on object-oriented analysis-synthesis coding presented such a technique to compress video-telephony signals down to 16 kbps. Mathematical morphology provides new tools which seem particularly suitable for the analysis and synthesis of pictures. A paper on the application of mathematical morphology to picture coding provided a remarkable comparison of these new techniques with the classical techniques arising from linear vector space theory, as well as an illustration of their considerable promise. The hybrid DCT coding scheme is now reaching maturity and it is almost certain that it will be the basis of digital TV and HDTV standards. The standardisation process undertaken by the Moving Pictures Experts Group (MPEG) in the framework of ISO has been accompanied by considerable research effort. This was summarised in papers on the MPEG2 prediction scheme for interlaced video signals and on the scalable video coding in the MPEG standard. The final paper in the session, presented picture coding by a finite Radon transform, a new kind of transform coding characterized by effectiveness and simple implementability.

In a session on Optical Space Communications convened by Y. Furuhashi, overviews were presented of the technological advances at a number of the laboratories around the world. A summary of the advances at NASA and the progress in Optical Communications for future missions, were presented. Overviews of the ETS-VI/LCE experimental program, the Lincoln Laboratory development of lasercom technologies and optical intersatellite communication at NASDA, were presented.

A session on Millimetre Wave Premises Communications Systems was convened by J.P. McGeehan. Results on indoor propagation experiments in the 60 GHz band and on an anti-multipath adaptive phased array for indoor use, were presented. Papers dealing with high bit-rate indoor wireless communication systems and the use of ray tracing in microcellular performance prediction, were given.

Nine papers were presented in a session on Synchronization in Telecommunications, convened by M. Moeneclaey. In fully digital receivers, the received signal is sampled using a free-running clock. Samples needed at the strobe-point or decision instant are obtained by interpolating between the available nonsynchronized samples. A survey paper was presented that

considered the performance of various interpolators. A second paper analysed and compared the performance of various estimators of the channel gain for burst-mode data transmission over frequency nonselective Rayleigh fading channels. A paper was presented that analysed the tracking performance of a chip synchronizer for optical OPPM, which contains a nonlinearity to generate a spectral line at the chip frequency. A fully digital feed-forward synchronization algorithm for the joint estimation of carrier frequency offset and symbol timing, in the case of short burst MSK transmission over a mobile channel, was presented. A paper dealing with the reception of spread-spectrum direct-sequence packets was given. The proposed demodulator stores the packet in memory. Then the packet is processed repeatedly to extract the timing and the carrier phase and frequency. Timing recovery using an arbitrary even nonlinearity to generate a spectral line at the symbol rate, was discussed. A method was proposed for iteratively computing the higher-order moments of the signal at the input to the nonlinearity. These moments are then used to compute the tracking performance. A paper studying the effect of round-off errors on the performance of RLS lattice adaptive equalizers, by both analysis and computer simulation, was presented. Feedforward carrier synchronizers need some postprocessing to avoid equivocation. Various postprocessing structures and their effect on synchronization performance: acquisition, hang-up, tracking and cycle-slipping, were considered. In the final paper in the session, two nondata-aided symbol synchronizers were derived for DS/SS signals on frequency nonselective fading channels. It was shown that for moderate and large E_s/N_0 the channel-aided algorithm performs slightly worse than the (simpler) nonchannel-aided algorithm but the situation is reversed at small E_s/N_0 .

A session entitled Digital Techniques in Broadcasting, DAB was convened by P. Shelswell. The ISDB concept and technology, a flexible and updateable system for conveying different broadcast signals to the consumer, was presented. New digital technology permits us to introduce new broadcast television signals which offer higher definition, and which are more robust when broadcast over satellite and cable systems. A paper on these developments was presented. A technical overview of digital audio broadcasting in Europe described a system for robust transmission of broadband data to mobile and portable receivers. A paper on perspectives of digital TV and HDTV satellite broadcasting at 12 GHz described some of the options available for satellite broadcasting, which are compatible with existing analogue systems. The complete broadcasting chain is not yet digital because, although most elements are available in digital form, interconnection is not developed. An optical solution was considered.

In a session on Signal Processing for Magnetic Recording, convened by J.K. Wolf, magnetic recording viewed as a communications channel was presented. Various aspects of errorcontrol techniques including coding such as trellis coding, partial response modulations and appropriate signal processings, were

presented. In a somewhat different vein, results were also presented on multilevel coded modulation for the additive Gaussian and Rayleigh fading channels.

A range of aspects of Mobile Satellite Communication Systems were presented in a session convened by S. Kato. All digital code conversion and a multi-rate speech coder for mobile satellite applications were presented. Papers on block demodulation for low earth-orbiting systems and compact antennas for mobile and personal communications, were presented. In the final paper of the session the design and networking of dynamic satellite constellations for global mobile communication systems was considered.

A session on Modelling of Signals and Systems was convened by W. Schwarz. Three of the ten scheduled papers were not presented due to the absence of the authors. Indeed, of the 3 Young Scientist Award papers in the session, only one was presented. However, this paper by Novosad on a new family of sequences for spread spectrum communications, was of high quality and was well-presented. Papers dealt with the modelling of communications systems and channels including fading and mobile channels and channels with nonlinearity and intersymbol interference. Other papers dealt with the processing and digital signal processing of signals in mobile communications. In addition to two papers on sequences for code division multiple access, there was a paper on the implementation of cryptographic systems.

P.H. WITCKE
CHAIR, COMMISSION C

COMMISSION D - ELECTRONICS AND PHOTONICS

For the XXIVth General Assembly, Commission D organized one Tutorial Session (DT) and eleven sessions covering the twelve session slots. In addition, Commission D organized a joint session DA (Superconductor Circuits and Devices) with Commission A, and one of the General Lectures, GL2, was in the area of Commission D. The topic of GL2 was "New Developments and Future Prospects of HDTV and Digital Broadcasting", and was presented by Dr. T. Nishizawa of NHK (Japan Broadcasting Corporation). The lecture described the research and development efforts that led to the present status of Hi-Vision HDTV in Japan, including systems and components. The future of HDTV and digital broadcasting was addressed. A large audience attended very enthusiastically. It should be noted that the demonstrations of Hi-Vision took place several times during the Assembly.

Commission D selected Dr. Ph. Emplit, Belgium, as the speaker for the tutorial, "Optical Solitons: Physics and Applications for Telecommunications," in Session DT. This tutorial paper on the soliton was not only timely, but also well

presented. The paper had a right amount of mix of mathematics and physics. In addition, this physical and mathematical description was presented within the context of well-defined applications. Practical limitations and problem issues have been clearly identified. The speaker has been heavily involved in the soliton research and yet presented a very coherent and unbiased assessment on the subject. The room was full and only standing room was available.

Session D1 (Active Integrated Antennas) highlighted emerging technologies on active antennas. These antennas are integrated either in a monolithic or hybrid fashion and are structurally and functionally inseparable from the microwave and millimeter-wave circuits. Often the antenna plays circuit functions such as diplexing and resonating in addition to its original mission of being a radiating element. Due to high levels of integration, the new technologies of active antenna can be applied to applications resolving a number of bottleneck issues, such as coherent high power generation for millimeter-waves where performance of individual solid state devices deteriorates and as electronic or optical beam control useful for mobile or personal communications. This session consisted of five invited papers (of which two were YS papers) and four contributed papers. Two of these contributed papers, one from Bulgaria and another from the U.S.A. were canceled as no speakers were present. The first four papers were concerned with active antennas generating power, either by a quasi-optical oscillator or by an amplifier. One of these papers dealt with a receiver. In addition, a paper reported an application of the active antenna concept for active imaging. Assessment for the use of active antenna for mobile and personal communication was presented. In this paper, a hybrid circuit approach was emphasized from the cost point of view at the present time. The last paper of the session was on the modal interaction in the waveguide FEL. Although this paper is of scientific value, the theme is somewhat outside the scope of the session. The session was organized by Prof. T. Itoh, U. S. A. and was well attended, with an approximate attendance of 50. Very lively discussions were held during the session which is hence considered very successful.

Recently, significant advances have been made on the numerical characterizations for modeling the microwave and millimeter-wave circuits. These advances are in both algorithms and utilization of computational power. Session D2 (Numerical Modeling of Microwave and Millimeter Wave Circuits) was focused on the numerical techniques for the modelling of passive microwave and millimeter wave circuits and consisted of two parts. The first part was devoted to methods operating in the frequency domain, basically integral equation and mode matching techniques. Two invited papers described recent advances in these methods. The second part of the session was devoted to time domain methods, essentially Transmission Line Matrix (TLM) and Finite Difference Time Domain (FDTD) methods. One invited paper on TLM opened this second part. From the application point of view, although a wide variety of

topics were covered, most of them were focused on the modeling of 3-D structures, which is nowadays one of the most challenging subjects of research. The session was well attended, with an average of 60 people. All scheduled papers have been presented, except the last one. The authors did not show up and did not notify their inability to attend. The session was organized by Prof. R. Sorrentino, Italy.

Advanced microelectronic devices require sophisticated processing technologies which deal with increasingly smaller size and finer resolutions. Session D3 (Physical Size Limitation in Semiconductor Devices) was organized by Prof. A. Jelenski of Poland and addressed the issues of physical size limitations encountered in these technologies. There was a good attendance of about 40 persons. Papers dealt with a number of submicron devices, mesoscopic devices and related physical phenomena which dictate the physical size limitations. Two invited speakers, Professors Hartnagel and Pavlidis, delivered very interesting talks, in particular Prof. Hartnagel, who tried to predict future developments and had a lot of questions and comments. Since only Ms. Romantseva was present among the Russian speakers to fill the gap, Prof. Jelenski presented a paper on "Semiconductor devices for submicrometer range" describing generalized models of such devices to describe properly their behaviors. The room was full and the discussion lasted even after the session was closed.

As mobile radio communications become accepted facts of life, new technologies are needed to enhance the quality and quantity of communications in this mode. Session D5 (New Technologies for Mobile Communications) was organized by Dr. Nilsson of Sweden, and Dr. A. Maloberti of France was asked to chair the session. Neither was present at the Assembly and the lead speaker, Dr. M. Mizuno of Japan, acted as session chairman. The session discussed a number of technologies toward such a goal. It contained four papers, and the topics discussed included propagation and architecture for mobile communications. The topics were very timely and well presented with high technical contents. Unfortunately, the session competed with the Tutorial Session of Commission CT by Dr. A. Viterbi, U.S.A. on mobile and personal communication. Therefore, the attendance was a sadly low number of 5 ~ 6.

Session D5, Progress in Semiconductor Lasers, was organized by Dr. A. J. Seeds of the United Kingdom. The attendance was 28. Prof. I. H. White's paper was withdrawn, with prior notice to Prof. Kimura. The three invited papers were of outstanding quality and had been carefully prepared by their authors. Significant trends were the realization of very narrow linewidth semiconductor lasers (less than 3 ~ 6 kHz, Okai, Hitachi) and interest in wavelength conversion using either amplifiers (Durhuus) or sources (Gallion). These devices permit all optical regeneration of high rate signals (up to 100 Gbit/s) at an offset wavelength, a key requirement for all-optical networks. Of the contributed papers, that by Rahnavard (Iran) was not given as the author was not present.

The paper by Edwards (Australia) on squeezed light concluded the session with lively discussions and some controversy.

Session D6 covered two time slots and dealt with device modeling. The session was organized by Prof. P. Lagasse of Belgium. In the first segment, modeling of the electronic devices was emphasized. Devices modeled include FETs, traveling wave modulators, CCD and vacuum microelectronic devices. The first paper dealt with a two-dimensional hydrodynamic energy model of high-frequency transistors. The model has been developed at the University of Lille (France) and was presented by J.C. De Jaeger. The new model takes into account the specific physical phenomena which can occur at high frequencies, namely non-stationary electron dynamic effects. The model was illustrated for the example of an InP MISFET and new heterostructure devices such as planar doped pseudomorphic HEMT's. The second paper was presented by L. Martens from the University of Ghent (Belgium). He described the use of the Integral Equation technique for the design of electronic devices and systems, and indicated the advantages of the IE-technique in comparison with other numerical techniques. The technique was illustrated for the design of multi-pin connectors for high-speed application. Other applications discussed were in the field of printed circuit boards, MMIC's, multichip modules and optical waveguides. Two- and three-dimensional quasi-static as well as full-wave software tools were presented. The third paper, presented by B. L. Ooi from the National University of Singapore, described a new technique to design microwave distributed amplifiers. This technique does not require a circuit model for the transistors and does not adopt the unilateral approach and the specification of the drain current at each stage of the distributed amplifier. It only requires the S-parameters and hence it greatly reduces the number of unknowns. It can also be used with packaged transistors. A design of 1 - 8 GHz 10 dB distributed amplifier was shown. W. Pascher from the University of Hagen, Germany, discussed the microwave analysis of a III-V electrooptic modulator by the Method of Lines in the fourth paper. The speaker showed that this numerical method can handle complex geometries with lossy dielectrics and lossy conductors. The field distribution in the cross section of a specific EO modulator was shown. From the calculations, design data for fast modulators and switches can be obtained. The fifth paper, by Y. Romantsov from the Radio Astronomy Institute of the Ukrainian Academy of Science, described the development of a Smith-Purcell FEL using vacuum microelectronics technology. A miniature open resonator design was used for the development of new amplifiers and oscillators in the millimeter and submillimeter wave bands. They are referred to as profemitrons and are highly stable and highly efficient. An accurate model has been constructed based on the joint solution of Maxwell's equations and equations of motion for resonance systems with distributed interaction. The last two paper presentations were cancelled. The second segment of the session D6 dealt with modeling of optical devices. The devices modeled include various lasers, passive optical devices as well as some phenomena in optical devices.

Session D7 was based upon seven papers on various aspects of optical coherent communications. It accommodated three invited talks and two Young Scientist award papers from Russia and India. The attendance was about 30 and the presentations generated lengthy and fruitful discussions, especially concerning the problems of optical frequency referencing, optical phase locked loop design and associated PSK demodulator. The last invited talk was scheduled to show how the optical multicarrier resource could be engineered to be based in future telecommunication networks. It is to be noted that one presentation with co-authors from the Ukraine and the USA had no speaker and was canceled.

Session D9 reported progress on optical fiber sensors. Various types of sensors were presented and discussed (there was no session numbered D8). They include sensors for structural measurement, temperature. Also discussed were topics related to physics appropriate for a number of sensors.

Session D10 reported progress on A/D converters, which are essential components for radio science. Their speed has ever been increasing. Some of the topics were high-speed A/D converters, resonant tunneling converters, and fiber optical converter.

Session D11 (Towards Development of a Human-Like Computer) was organized by Dr. G. Matsumoto (Japan) and was attended by 25 people. The session contained two papers, one on artificial intelligence, and another one on brain science for the development of human-like computers.

Session D12 (Submicron Device Modeling for VLSI) was organized by Prof. M. Shur (U. S. A.) and reported progress on submicron devices for VLSI. A number of novel devices and device structures such as FETs, those using 2D gas and quantum well diodes were reported, as well as review talks. Some modeling and simulation techniques for these devices were discussed.

Session DA (Superconductor Circuits and Devices) was a joint session with Commission A. It was organized by Dr. O. Vendik (Russia, Commission D) and Dr. B. Komiya (Japan, Commission A). The session was chaired by Prof. H. Chaloupka (Germany). This session reported progress on superconducting devices and circuits including filters, Josephson devices and antennas. Both high Tc and low Tc devices have been covered.

There were three joint sessions in which Commission D acted as a "junior partner", namely AD, CD and ED. Session AD (Lasers: Stabilization and Applications) was organized by Professor J. Helmcke, Germany (from Commission A) and Dr. A. J. Seeds, United Kingdom (from Commission D). Session CD (Optical-Microwave Interaction Devices and Systems) was organized by Prof. M. Akaike, Japan (from Commission C) and Prof. T. Berceci, Hungary (with Dr. H. Ogawa of NTT, Japan) as the session chairman. The session was very popular and was attended by more than 40 people. Session ED

(Susceptibility of Electronic Devices to Electrical Transients and Their Response under Extreme Operating Conditions) had Dr. V. Scuka, Sweden, and Dr. B. Demoulin, France (from Commission E) and Prof. T. Itoh, U. S. A. (from Commission D) as conveners.

Commission D also has participated in the Poster Sessions. The number of papers related to the oral sessions are as follows. Two papers in D1, six papers in D2 with one cancellation, and one in D3. In addition, there were two Commission D papers in the Young Scientist Poster Sessions. They were from the Ukraine and Uzbekistan, and were tied to the D6 and D3 sessions, respectively.

T. ITOH
CHAIR, COMMISSION D

COMMISSION G - IONOSPHERE RADIO AND PROPAGATION

The Commission organized eight sessions (G1-G8), one Workshop (GW) and participated in five joint sessions (CFG, HG1-HG3, and HEG). The Commission G tutorial on Ionospheric Modeling, given by D. Anderson, attracted the attention of a responsive audience.

Sessions G1 and G8 emphasized the understanding of physical processes in the ionosphere by modeling and interpretation of the existing data base. Invited papers presented at G1 discussed issues related to polar cap plasma structures and results of coordinated observations aiming at studying gravity waves and equatorial irregularities. Invited papers and posters at G8 focused on the energetics and dynamics of the ionosphere as a part of the solar-terrestrial system.

An important problem of dynamical interaction between the neutral and ionized constituents of the middle and lower atmosphere has been discussed during session G2, followed by a workshop on the same topic.

G3 dealt with new technical and methodological aspects of coherent and incoherent scatter experiments. Scientific results of those experiments were presented at other sessions, in particular G7. This last session attracted a lot of attention in terms of the number of papers submitted and the number of people attending the session, which indicates that the problem of ionospheric irregularities continues to be an important issue.

Sessions G4 and G6 were organized by the Chairs of two Working Groups of Commission G and put the emphasis on topics of interest to those Working Groups. Session G4 dealt mainly with ionospheric models, both first-principle and data-driven models. At G6 papers on ionosonde networks, ionogram

manipulation and ionosonde applications were presented. Both sessions attracted many posters.

To allow for a presentation of late results and papers relevant to the Commission G activity, but not exactly fitting any topical session, we came up with an idea of a special "Open and Latest Results Session". The deadline for submission of abstracts to this session was five months past that to regular sessions. The idea met with a favorable response, and as expected a broad spectrum of topics was covered by oral and poster presentations.

A.W. WERNIK
PAST CHAIR, COMMISSION G

COMMISSION H - WAVES IN PLASMAS

Commission H conducted seven own scientific sessions and an additional four with other commissions. The estimated average attendance ranged from 25 to 100. Highlights from these sessions, based on material provided by the conveners - with editing and additional information from the Commission Chair during the General Assembly (R. F. Benson) as necessary - are given below:

H1. Observations and interpretations of interplanetary & planetary wave emissions (convener: R. J. MacDowall, USA)

The session contained a good mix of interplanetary and planetary radio and wave emission results, including some excellent reviews. Of particular interest were results based on the GEOTAIL, Ulysses, Akebono and Voyager spacecraft.

The impressive capabilities of the Plasma Wave Instrument on the Japanese satellite GEOTAIL were dramatically illustrated by a variety of wave signatures observed from the dayside boundary of the magnetosphere through the various plasma boundary regions extending far into the nightside magnetic plasma tail of the earth. These plasma wave observations vividly reflect the dynamic properties of the earth's space plasma environment.

Results from the Ulysses unified radio and plasma wave instrument (URAP) concerning the interplanetary medium (type III's, densities, etc.) and the Jovian magnetosphere and Io plasma torus were presented. The observations of Jovian radio emission have provided the first opportunity to determine the Jovian radio source locations using URAP's unique 3-D direction finding capabilities. All previous Jovian radio source locations were made by indirect inferences.

Observations from both within and outside the auroral kilometric radiation (AKR) source region using the plasma wave and sounder (PWS) instrument on the Akebono (EXOS-D) satellite have provided both AKR Poynting flux and

polarization measurements. These observations indicate an AKR cutoff at the local upper-hybrid frequency under some conditions.

An update on recent Voyager observations of 2 - 3 kHz emissions, which are apparently produced in the region of the heliospheric termination shock, was also presented (the heliosphere boundary represents the edge of the sun's atmosphere where it merges into interstellar space). The plasma wave instruments on Voyagers 1 and 2 first detected this strong heliospheric radio emission event in July 1992. It is believed to have been generated at or near the heliopause by an interplanetary shock produced by a period of intense solar activity in late May and early June 1991. From the known propagation speed of the shock (600 to 800 km/s) and the travel time (~ 1.1 year) it is estimated that the distance to the heliopause is in the range from about 116 to 168 AU. The observed low frequency spectral cutoff (at 1.8 kHz) indicates that the electron density in the local interstellar medium is about 0.04 cm^{-3} .

H2. Electromagnetic and electrostatic cyclotron waves in magnetospheric and laboratory plasmas: theory, simulations and experiments (conveners: D. Nunn, UK and Y. Omura, Japan)

The oral part of session H2 was changed because papers by Hayakawa, Ganguli and Romero and Koepke et al., which were withdrawn, were replaced by papers by Nishimura et al., Romashin, and Horne and Thorne.

Highlights of the session included wave observations from the Akebono satellite on electron cyclotron harmonic (ECH) radiation, and the deduction of a pancake structure for ambient electron distributions inside the plasmopause, and corresponding ECH wave results from the GEOTAIL satellite.

Papers were also presented on ion cyclotron waves in the outer magnetosphere (covering growth and ion heating), a detailed treatment of the validity of the Lorentz polarization term, and a description of modeling of electron velocity distribution functions in order to deduce the corresponding ELF/VLF electromagnetic wave spectra.

H3. Parallel electric fields in laboratory and space plasmas (conveners: E. Whipple, USA and J. Lemaire, Belgium)

This session was organized in order to bring together scientists from several disciplines to review observations and theories concerning electric fields parallel to magnetic field lines. For over forty years it has been postulated that ionospheric and magnetospheric electric fields have no component parallel to the magnetic field direction, i.e. that the electric potential is constant along geomagnetic field lines. This postulate is necessary for the use of ideal magnetohydrodynamics (MHD), a set of plasma equations which have been widely used for space plasma analysis. Although, the existence of such field

aligned E-fields has been denied (or ignored) by the “ideal MHDS modelling” community for several decades, their existence has now been found both in space observations and laboratory experiments. These space and laboratory experiments were comprehensively reviewed by C. - G. Fälthammar (Sweden) and N. Sato (Japan). A remarkable historical review on the controversial issue of Birkeland Currents, and on the still on-going debate about parallel electric fields, was presented by Tom Potemra (APL, USA). He illustrated the strong resistance of the scientific community to accept new challenging ideas and paradigms like Field Aligned Currents (FAC). Key contributed papers on various theoretical and experimented aspects were also been presented by C. Kletzing, (MPI, Germany), Carl E. McIlwain (UCSD, USA) and M. Roth (IASB, Belgium). Eight poster papers in both experimentation and theoretical aspects concerning field aligned potential drops and double layers were displayed and presented. Interesting laboratory results on Double layer experiments were presented. The resemblance between laboratory double layers and those observed in the magnetosphere is rather remarkable. This meeting has shown that the space plasma community has to learn from colleagues working in basic laboratory plasma physics. Cross fertilization of both disciplines can be achieved during symposia like this URSI - H3 symposium convened by Elden Whipple (NASA, USA) and J. Lemaire (IASB, Belgium). One of the highlights of this poster session has been to demonstrate that plasma quasi-neutrality is only a special solution of Poisson’s equation, but that it is by no means the most general one! The most general solution of Poisson’s equation was shown to be a stationary wave structure with a characteristic dimension equal to the ion - Debye length. These new results were presented by J. Lemaire (IASB, Belgium) and B. Shizgal (UBC, Canada).

In summary, this session emphasized that there is ample evidence from laboratory and space experiments, as well as from plasma kinetic theory, that the postulate that the electric potential is constant along geomagnetic field lines only holds in very special conditions. As a consequence, ideal MHD models of the ionosphere and magnetosphere should be revisited to take into account the existence of parallel electric fields.

H4. Nonlinear resonance effects produced in the F region by high-power radio waves (convener: F. Djuth, USA and A. Gurevich, Russia)

Of the 6 oral and 9 poster papers presented, the highlight was the paper by M. T. Sulzer and J. A. Fejer (USA) which provided the first convincing evidence that powerful HF wave - plasma interactions in the ionosphere are describable, at least in part, by the physics of laser plasmas. This result is of fundamental importance to plasma physics because it means that experiments similar to those performed in large fusion Laboratories can be conducted in the ionosphere to validate theoretical modeling. The great advantage of the ionospheric experiments is that the plasma interaction time, as a scaled plasma parameter, is

much longer than in the Laboratory. As a result, radar diagnostic measurements can be made in the ionosphere to isolate several specific physical processes.

H5. Computer simulation of MHD processes in space plasmas (conveners: S. T. Wu, USA and G. Chanteur, France)

A review prepared by M. Scholer emphasized the substantial advances made in our understanding of MHD processes in space plasmas since the General Assembly in Prague; especially the three-dimensional aspects of magnetic reconnection (at the magnetopause and in the geotail) and the long-standing controversial matter of intermediate shocks.

R. Grappin et al. demonstrated by 2D computations that the expansion of the solar wind strongly influences the solar wind turbulence.

The heliospheric structure was addressed through 2D simulations : Steinolfson demonstrated that the shape of the terminal shock is determined by the sub or supersonic character of the interstellar flow, and Washimi discovered a self collimation of the solar wind (due to its own toroidal magnetic field) around the solar rotation axis. S. Nozawa and H. Washimi confirmed this self collimation with 3D computations and also found the formation of an equatorial disk-shaped flow. Both features govern the structure of the heliosphere.

Sheared plasma flows in space plasmas are of common occurrence and may result in Kelvin-Helmholtz (K.H.) instability. 2D MHD computations made by A. Miura demonstrate that a velocity shear layer of finite thickness with a super-Alfvénic velocity jump at the magnetospheric boundary is unstable to the K. H. instability no matter how large a value is used for the magnetosheath sonic Mach number and that a velocity boundary layer is formed inside the magnetospheric boundary due to the tangential stress resulting from the instability. The anomalous transport induced by the K. H. instability was investigated through implicit particle simulations by M. Tanaka, who demonstrated that kinetic effects give rise to a fast plasma mixing across a velocity sheared boundary layer and quench the electrostatic K. H instability when the d.c. magnetic field is not strictly perpendicular to the flow.

H6. Whistlers and particle precipitation (conveners: H. Strangeways, UK and U.S. Inan, USA)

After a review of the salient features of the interaction of electromagnetic waves from lightning (whistlers) and energetic electrons trapped in the magnetosphere, a number of papers were presented dealing with Trimpi events (Amplitude and/or phase variations on a sub-ionospherically propagating VLF/LF radio wave caused by the whistler-induced precipitation of these electrons), lightning-induced heating and ionization of the lower ionosphere, numerical modeling of VLF scattering from ionospheric irregularities and ray tracing in a 3D

magnetospheric model including one or more 3D whistler ducts and/or fine structure. This last work indicated that when the wave frequency equals $1/2$ the electron cyclotron frequency, all of the wave energy is focused into the center of the duct.

H7. Waves in plasmas (an open session) (convener: R. F. Benson, USA)

Many Commission H papers from this General Assembly have discussed the guided propagation of radio waves along the direction of the earth's magnetic field. This type of propagation is called wave-ducting. A major feature of ducted propagation is its almost loss-free nature. The majority of the oral papers in this session dealt with this topic. Theoretical papers discussed both the ray and wave theory of ducted propagation, while experimental papers presented results based on laboratory plasma physics experiments, satellite observations of radiation from terrestrial power lines and the detection of radiation from a railway in northern Sweden. This latter radiation was detected after it had traversed the magnetosphere to the southern hemisphere, been reflected, and returned to a ground-based receiver in Finland.

Other oral papers analyzed the effects of plasma waves produced within ionospheric plasma cavities or irregularities by the mixing of different spectral components of non-monochromatic emissions from powerful ground-based and, especially, space-borne transmitters; showed that the frequency splitting of the subsidiary D resonances, first observed with the Alouette 2 satellite, depends only on the ambient magnetic field strength; explained the banded spectral features of the terrestrial hectometric radiation in terms of mode conversion processes in auroral precipitation regions; and illustrated plasma wave characteristics observed in the distant magnetotail by the GEOTAIL satellite, including spike-like features on broadband electrostatic noise (BEN) like signals.

In addition to the above oral session, 36 poster papers covering a wide variety of topics concerning waves in plasmas were presented during the common poster session.

HEG. Electromagnetic effects (earth's surface, ionosphere and magnetosphere) associated with earthquakes and volcanic eruptions (Commission H Conveners: M. Parrot, France and O. A. Molchanov, Russia; Commission E convener: T. Yoshino, Japan; Commission G convener: A. Fraser-Smith, USA)

Eleven oral and 3 poster papers were presented (the oral paper by Freund et al. was withdrawn, and was replaced by the poster paper by Pulinets et al.). They included new results obtained since the last meeting on this topic at the General Assembly in Prague. These results included ground observations of ULF waves prior to earthquakes with magnitudes greater than about 5 (primarily in the

frequency range 0.01 - 1 Hz); a statistical study of electromagnetic waves observed by low altitude Aureol-3 satellite, which detected an enhancement of wave activity in the frequency range below 800 Hz close to earthquake epicenters; a discussion of pre-earthquake ionospheric effects and a possible dirty-plasma mechanism to explain these effects; the presentation of invited papers devoted to laboratory measurements of the electromagnetic phenomena induced by rock fracture and theoretical models of electric and magnetic field generation by electrokinetic coupling (due to the interaction of a fluid through a porous medium).

HG1. Active experiments in space (Commission H convener: R. Anderson, USA; Commission G convener: P. Stubbe, Germany)

This was a very active session covering the results of wave generation during ionospheric modification experiments carried out both from the ground and in situ. The groundbased experiments included the first results from high-power obliquely incident heating waves (from Voice-of-America transmitters), the satellite (Akebono) detection of VLF signals generated from a polar electrojet current modulated by the high-power Tromsø ionospheric heater, and a comparison between oblique and vertical heating experiments carried out at Arecibo. The in situ experiments described wave emission stimulated by wave, particle and chemical injection from various orbiting spacecraft as well as electron heating (from barium cloud releases) and spacecraft/plasma interactions (from electromagnetic tethers). Two oral papers were withdrawn (Oraevsky et al. and Borisov et al.) and a presentation of wave phenomena associated with the CRESS barium releases by R. Anderson was added.

HG2 Computer experiments of nonlinear kinetic processes in space plasma (Commission H convener: H. Matsumoto, Japan; Commission G convener: H. Thiemann, Germany)

This session included 15 papers (10 oral and 5 posters) that covered computer experiments (simulations) and related theoretical work on kinetic processes in space plasmas. Kinetic processes on both micro - and macro - scales were discussed. Part of the session was devoted to theoretical results in conjunction with the latest ISTP satellite observations and ground-based active experiments. The session provided an excellent overview of different numerical simulation techniques (1D, 2D, 3D, small scale to large scale, electrostatic, electromagnetic, particle or fluid) applied to selected plasma problems (barium cloud, E-region, solar wind-magnetosphere interaction, etc.).

HG3. Nonlinear wave theories and observations in space (Commission H convener: F. Lefeuvre, France; Commission G convener: B. Thide, Sweden)

Twenty one papers (11 oral and 10 posters) were presented on nonlinear theories and observations in space. The session was introduced by a review of

observations performed in space plasmas in relation to the formation of nonlinear coherent structures (solitons, cavitons, vortices). The main emphasis was put on recent theoretical developments which focus on the relevance of these structures with regard to turbulence, generation of radiation, particle radiation, and possible contribution to diffusion and plasma entry across magnetospheric boundaries (see Pottelette and Treumann, Review of Radio Science 1990-1992, 557-567, 1993). A special paper was devoted to the pioneer work performed in that domain by Peter J. Christiansen. Further papers were presented on: strong Langmuir turbulence, VIKING observations of plasma structures, non-linear parametric interactions in space plasmas, mode conversion, wave-wave interactions possibly induced by VLF transmitters on the ground and on-board a satellite, effects of the nonlinear Lorentz force. The poster session was mainly devoted to theoretical work on the formation of nonlinear structures and on analysis techniques recently developed to characterize plasma turbulence observed in satellite experiments (for instance, use of higher order statistics, and determination of the spectrum in k vector from multi-point measurements).

The tutorial of Commission H, entitled "Forty Years of Whistlers", was given by R. A. Helliwell (USA). This stimulating presentation, covering the early history of whistler observations through the interpretation of recent controlled active experiments, was attended by about 130 persons and generated an active discussion.

R.F. BENSON
PAST CHAIR, COMMISSION H

COMMISSION J - RADIO ASTRONOMY

Survey of the sessions organized (and co-organized) by Commission J.

J1 - Digital Techniques in Radio Astronomy

Convener: Y. Chikada

An interesting approach to the astrophysical simulation was reported. It was ignited by the radio astronomers' approach to the signal processing hardware.

The audience recognised the importance of mutual stimulation between the "radio science" and the astronomy.

J3 - Global VLBI

Convener: R. Booth

The Global VLBI working group was set up at the 1990 General Assembly to address, among other things, solutions to the incompatibility of recently

developed VLBI recording/playback systems and the coordination of ground observatory involvement in the proposed space VLBI programmes. The incompatibility issue was summarised by Whitney, who also proposed solutions based mainly on copying (format translation) machines. The new correlator development for the European VLBI network (described by Schilizzi and Bos) will take account of the diversity of systems and will attempt to provide inputs for the Canadian S2 system as well as the 'standard' VLBA system and its so called Mk IV successor. It is a conventional cross-correlator based on a new CMOS chip, developed in collaboration with the Haystack observatory.

The Japanese low apogee orbit, imaging space VLBI mission was described by Hirabayashi and compared with the Russian 'exploratory', 75,000 km apogee height mission. The expected launch dates for both missions are in the 1996/97 time frame. Finally, Meier described work going on at JPL grappling with the scheduling logistics of the space missions co-observing with the world-wide ground VLBI arrays. His plea was for more ground telescope time!

J4 - Astrometric & Geodetic VLBI

Convener: Alan Whitney

Over nearly 25 years of geodetic VLBI work, both the accuracy and precision of geodetic measurements have increased by approximately a factor of 10 every 10 years. Currently the global measurement precision is approaching 1 cm in baseline length, with vertical-measurement precision of approximately 3 cm. Limitations in atmospheric measurement and modelling present the single greatest obstacle to improvements of these measurements. Much work is currently being undertaken in this area, along with instrumental improvements, with the goal of a global mm-level precision by the end of the decade. About 20 countries are actively participating in geodetic-VLBI measurements, with the number increasing rapidly.

In addition, the VLBI-derived celestial-reference frame is at the level of 1-2 milli-arcseconds, with strong effort now taking place accurately to tie the radio and optical reference frames through use of high-precision Hipparchus optical-position data. VLBI phase-referenced astrometric measurements can now be made to a precision of several tens of microarcseconds over several degrees in the sky, allowing potential detection of planetary perturbations of radio-emitting stars.

J6 - Radio & Radar Observations in the Solar System.

Convener: D. Campbell

Eight invited papers and one contributed paper were presented at the session, attended by about 60 people. An excellent review was given by E. Lellouch describing mm wave spectral observations of solar system objects. Two papers by P. Ford and G. Pettengill described some of the puzzling radar and

radiometry results from the Magellan space craft orbiting Venus, and W. Johnson described the design of the Cassini radar intended for similar observations of Titan. Results from earth-based radar observations were impressive, with J. Hannan discussing the recent discovery of radar echoes from the poles of Mercury indicating the probable presence of water ice in crater floors. N. Stacy described recent high resolution radar imaging observations of the Moon and a search for ice at the lunar poles, and S. Ostro showed high resolution radar images of the asteroid Tartatis. D. Campbell reviewed the future prospects for earth based-radar observations using the upgraded Arecibo system.

J7 - Millimeter and Submillimeter Astronomy: Instrumentation, Techniques and Observations.

Convener J. Moran

The session on millimeter and submillimeter astronomy covered all aspects of the field including instrumentation, techniques, observations and the theory of radiation processes. There were 14 invited oral contributions and 9 poster papers. Because of the enormous interest in the subject, the posters provided an essential vehicle to accommodate the participants.

Gundlach described the rapid advances in junction technology, which have been critical to the improvements in performance of SIS receivers. These devices have largely superceded receivers based on Schottky diodes. Many labs are now capable of producing niobium SIS junctions and a few are producing niobium nitride junctions which are suitable for the higher frequencies. Specific new receivers were reported on by Whyborn(345 GHz, SEST); Ogawa et al(115 GHz, Nagoya); Natale et al(45 GHz, Medicina; 350 GHz, TIGRO); and Rothermal(345 and 690 GHz, IRAM). Welch's paper described the expansion of the BIMA array from 3 to 9 elements and the new spectrometer based on the Bos chip along with the efforts at Berkeley to demonstrate that atmospheric phase errors can be calibrated by accurate measurements of sky brightness. Kawabe described the expansion of the Nobeyama array to 6 antennas, the inclusion of the 45-m telescope in this array and the development of a 2 GHz correlation spectrometer based on a custom LSI chip. Hall spoke of plans to resurface the elements of the AT to make operation at 1 GHz possible during the wintertime in Narrabri. Predmore showed results of the 15 element array receiver at 115 GHz on the FCRAO telescope and described a joint US-Mexican venture to build a 50-m radome-enclosed telescope to operate between 80 and 350 GHz. Moran described the Smithsonian submillimeter wavelength array which is expected to be operational on Mauna Kea in 1997. The antennas in this array will be arranged along the sides of Reuleaux triangles. Baars explained that the 10-m MPI-Arizona telescope on Mt. Graham will be dedicated in September 1993; initial receivers will operate at 345, 490 and 690 GHz. Dierich described the new generation of small, lightweight, wideband, stable acousto-optical spectrometers in production at Meudon Observatory.

Hasegawa described the Tokyo-NRO CO 2-1 survey made with a 60-cm telescope, which complements existing CO 1-0 surveys. Fukui reported on the ongoing CO Nagoya survey (2 4-m telescopes) which is expected to cover 1500 square degrees with 600,000 spectral observations. Dobashi and Mizuno described detailed results from this survey in the directions of Cygnus and Taurus, respectively. Radhakrishnan reported recent observations of SiO masers, cometary globules and molecular clouds made with the 10.4-m telescope of the Raman Institute. Padman reviewed the recent work on high velocity outflow in molecular clouds which has been greatly aided by the new generation of sensitive instruments. Molecular outflows may be driven by highly collimated neutral jets associated with deeply embedded objects in molecular clouds. Iwata reported on the discovery of 13 new outflow sources. Carlstrom described the latest results from the CSO-JCMT submillimeter interferometer which included CO absorption spectra from the galaxy Centaurus A.

Millimeter and submillimeter astronomy is a very active area of research where technical innovation in receivers, precise antennas, wideband digital technology, and understanding of atmospheric propagation play important roles. URSI provides a natural setting, with its various commissions, to discuss these matters.

J8 - Search for Extraterrestrial Intelligence.

Convener: K. Kellermann

Since the first radio search for radio signals from extraterrestrial civilisations in 1960, improvements in the sensitivity of receivers, the collecting area of antennas, the advent of multichannel spectrum analysers, and the development of sophisticated signal processing algorithms give an improvement in sensitivity by more than a factor of a million. Recently, timing observations of a rapidly spinning pulsar has, for the first time, demonstrated the existence of other planets, beyond our solar system. Speculation about the emergence of intelligent technically developed civilisations suggest that modern radio technology might be sufficiently sensitive to detect artificially generated microwave signals from planets located anywhere in the Galaxy.

Searches for microwave signals with frequency resolution as fine as 0.005 Hz and up to 28 million simultaneous frequency channels are in progress throughout the world. Search programs range from privately funded activities to the large NASA sponsored High Resolution Microwave Search which will investigate about 1000 nearby stars using radio astronomy and the Deep Space Network (DSN) tracking facilities in the US, Europe and Australia. A complementary search at JPL will cover the whole sky at 1-10 GHz using a 32 million channel spectrometer.

Applications of SETI searches to conventional radio astronomy, and problems connected with the discrimination between naturally occurring radio emissions

and artificially generated signals from other civilisations, were addressed in the session. Particular concern was raised about the increasing levels of terrestrial interference which limit the effectiveness of all searches.

JA - Pulsar timing.

Conveners: D. Backer (J) and D. Allan (A)

Pulsars are highly magnetised, rapidly rotating neutron stars that emit sharp beams of microwave radiation which we detect as pulses once per rotation. These objects serve as celestial clocks. These stars have a huge reservoir of angular momentum and very little friction to produce instability. The most rapidly spinning pulsars, those with millisecond periods, provide the most precise timing measurements. These measurements have precisions of a microsecond over intervals of years, and, as such, compete with the stability of international atomic time scales and our ability to locate the solar system in an inertial reference frame. This precision also allows a search for, or perhaps detection of, a stochastic background of gravitational radiation that may have been produced in the early universe.

In this session the framework of precise timing measurements including the 'relativity engineering' required to relate measurements on the moving earth of a distant clock was reviewed by S. Kopeikin. The precise timing programs at large radio telescopes around the globe were summarised by J.F. Lestrade. He also discussed curious events in the timing data from

Nançay which are attributed to refractive structures along the signal path in the interstellar medium. V. Kaspi presented the status of the longest duration timing experiment which has been conducted at the Arecibo Observatory since 1983. She proposed that the instability observed in PSR 1937+21, relative to PSR 1855+09, is most likely a result of the internal dynamics of that neutron star. The timing data were analysed with a variety of atomic time scales and earth ephemerides. The current status of atomic time scales and earth ephemerides were reviewed by G. Petit and T. Fukushima, respectively. A critical link in these precision measurements is time transfer. W Klepczynski described the operation of time transfer via the GPS system of satellites. Precise timing requires precise astrometry to remove the motion of the earth. Comparison of pulse timing reference frame (ecliptic) to that used in radio interferometry

(equatorial) was discussed by E. Formalont (presented by T. Cornwell). There is good agreement at the 0.1" level when the J2000 system is used.

JF1 - Radio Interference to Passive Systems.

Conveners: T. Gergeley (J) and A. Gaszewski (F)

Report by: B. J. Robinson (J)

This joint session dealt with the serious problem of harmful interference to passive use of the radio spectrum for passive remote sensing, space research and radio astronomy. The flux density levels of natural emissions from the earth, space and the cosmos are often 60 dB below the signals used by active radio communication services. So in-band and adjacent-band interference from active services can swamp the natural emissions.

The results of the ITU's 1992 World Administrative Radio Conference [WARC-92] in Spain were reported. At WARC-92 the majority of ITU member countries were sympathetic to the needs of scientific use of the spectrum, despite the demands of First-world countries that the spectrum should be exploited as an economic resource. Into an already full spectrum (0.5 to 3 GHz), bands had to be allocated to new satellite services such as Mobile Satellite Communications, Digital Sound Broadcasting and High Definition TV Broadcasting.

At WARC-92 Radio Astronomy achieved some significant breakthroughs, largely as a result of long-term planning in a number of countries. In contrast, the case for Passive Remote Sensing was not well prepared, and the outcome was not satisfactory. In many bands earth exploration continues to have only secondary status in the ITU Radio Regulations. This needs to be addressed at WRC-1995 and WRC-1997.

A report was given of the experiment carried out in November 1992 to assess the interference in the band 1610.6-1613.8 MHz from the Russian GLONASS navigation satellites at many radio astronomy observatories around the world. The experiment was coordinated from Jodrell Bank by British and Russian scientists. The GLONASS Administration switched off some satellites or changed their frequencies, and these changes led to significant reduction in the harmful interference to Radio Astronomy. [Footnote: Early in September 1993 the Russian Administration introduced some of these important changes on an operational basis].

GLONASS and GPR, like many radio communication systems, use spread-spectrum modulation which has a wide spread of sidebands falling slowly - as the square of $(\sin x/x)$. These sidebands cause significant interference to other services, but are not utilised in the receiver systems. A related modulation system called "continuous phase modulation" which greatly reduces the unwanted sideband levels, was discussed.

JF2 - Refractive effects on trans-atmospheric paths.

Conveners: T. Spoelstra (J) and J. Baars (F)

The range of subjects covered by the different papers was very wide. However, the coherence of the different contributions within the field discussed was well retained. Each paper offered a contribution to progress in understanding

phenomena or development of correction methods. No paper presented experimental results only.

The discussions were very lively, also with colleagues of Commissions F and G.

R.D. EKERS
PAST CHAIR, COMMISSION J

COMMISSION K - ELECTROMAGNETICS IN BIOLOGY AND MEDICINE

Commission K organized one tutorial lecture, four sessions with 35 contributions, two joint sessions with nineteen contributions, and one poster session with 34 posters. The papers in the poster session, whose subject matters and Conveners were the same as in the platform sessions, gave a coordinated presentation of the research carried out in eleven countries encompassing four continents.

The Commission K Tutorial was given by Dr. Ross Adey from the U.S.A., one of the pioneers in bioelectromagnetics, who explained various aspects and recent progress in the areas of interactions of electromagnetic fields, their biological effects, and their diagnostic and therapeutic applications. In particular, Dr. Adey drew attention to the topics of cell membranes as physical, chemical and electrical boundaries, the role of free radicals in bioeffects, and the amplification processes in cell responses.

Session K1 on Interaction Mechanisms of Electromagnetic Fields (Convener : T. Tenforde) was introduced by a discussion of the major challenge in biophysical modelling to characterize possible mechanisms by which weak electric and magnetic fields at ELF could elicit reproducible biological effects. A number of resonance models have been proposed as possible mechanisms through which biological systems could couple with extremely weak fields. A large number of nonequilibrium models have been proposed that exploit the possible existence of instable or metastable states in biological membranes that could produce an enhanced sensitivity to ELF. The demonstration of biogenic magnetite particles in the tissues of several organisms, including the human brain, provides a mechanism through which weak ELF fields could interact with tissue components via oscillatory magnetomechanical forces.

Examining a number of recent experiments, as well as some epidemiological studies, one paper suggested that ELF magnetic fields of low intensity are more effective in producing biological effects than low intensity electric fields.

One contribution discussed the tissue sites of electromagnetic field action. The main point was that cell membranes are the first site where detection of ELF and ELF-modulated RF/microwave fields occurs. Membranes are complex detectors, amplifiers and couplers of weak surface electric signals to the cell's interior. Moreover, through membranes cells communicate with neighbours by outward signals that are sensitive to imposed EM fields.

Two papers emphasized that one possible way to reveal the role of weak ELF fields in regulation of cell dynamics would be the investigation of interaction between living cells and EMF. In particular, how prolactin release and cytosolic Ca²⁺ concentration in rat clonal pituitary cells are affected by Pulsed Magnetic Fields, and the response of *Escherichia coli* AB1157 cells to weak DC magnetic field and ELF fields were discussed.

One paper - stressing that the theoretical efforts developed to understand the interaction mechanisms chiefly point in the direction of calculating the effect of the ELF exposure on the chemical activity of messenger ions - proposed a quantum mechanical approach to study the electromagnetic effects on ligand binding.

Session K2 on Health Effects (Conveners : R. Saunders and D.L. Szabo) opened with a brief overview of some of the acute responses of people to electromagnetic fields, followed by a report on the review made by an NRPB (National Radiation Protection Board) Advisory Group on Non-ionising Radiation of about 100 studies published before 1992 on the epidemiological evidence concerning exposure to electromagnetic fields and the risk of cancer. It appeared that epidemiological studies are, in any case, unlikely to provide a complete answer. Good biological evidence is required from whole animal studies and, increasingly, from cellular studies.

One contribution reviewed a number of large scale studies of carcinogenesis, drawing particular attention to the Australian study of power frequency magnetic fields on the incidence of lymphomas in transgenic mice.

One paper noted that the previously reported co-carcinogenic effect of power ELF magnetic fields on the incidence of skin tumours in mice could not be successfully replicated; in particular, it is thought that the previous results had been confounded by ambient (fluorescent) light levels.

One study on the effects of 915 MHz, modulated at various frequencies including 217 Hz, a pulse modulation frequency used in mobile communication, reported no effects on the development of gliomas in rats.

Excellent presentations of recent progress in cellular studies related to carcinogenesis were also made in two papers. They described studies of electromagnetic field effects on mitogen signalling pathways in various cell

types using real-time fluorescent techniques to monitor intracellular calcium ion levels.

Some doubts have been raised about possible effects of low frequency electromagnetic fields on pregnancy outcome. One paper reviewed the biological evidence for an effect of power ELF electric or magnetic fields on embryo and fetal development, including the results of a large scale study of rats exposed. This study concluded that, in contrast to non-mammalian species, mammalian development seemed predominantly unaffected by exposure.

In Session K3 on Electromagnetic Fields in Medical Diagnosis (Conveners : M. Saito and G.J. Beers), a first contribution examined two diagnostic techniques. The electromagnetic nerve stimulation opened new horizons for investigating nerve functions, diagnosing and treating neurological diseases. Recent development of multi-channel SQUID (Superconducting Quantum Interference Device) systems and neuromagnetic imaging techniques enabled the study of the origin of electrical brain activities; the measure of magnetoencephalographic activities in human subjects during sleep and while awake resulted in a more accurate information about the sources of neural activities than those obtained through traditional electrical measurements.

A group of papers investigated the multifrequency microwave radiometry as a tool for thermal imaging. A thermal image of tissue up to a depth of 3-4 cm. from the skin can be produced by using radiometric data at various MW frequencies by an antenna contacting the body surface. The technique has been proposed for the diagnosis of pathologies where the uniformity of body temperature is locally altered by pathological processes through a modification of the blood perfusion rate or metabolic heat generation. Another application can be thermal dosimetry in the hyperthermia treatment of sub-surface neoplastic lesions.

Two contributions dealt with imaging techniques: Magnetic Resonance Imaging in noninvasive thermometry, and electrical impedance imaging for non-invasive thermal mapping and process control during thermotherapy treatment.

In Session K4 on Therapeutic Applications of Electromagnetic Waves (Conveners : B. Veyret and C.K. Chou) the emphasis was on the variety of ways scientists all over the world are trying to find beneficial uses of electromagnetic fields. The most impressive group of papers dealt with electrochemiotherapy either defined as an electroporation method to let antitumour molecules inside cancer cells or as a technique using implanted electrodes inside the tumour to circulate a DC electric current. In both cases the examples provided were striking and both methods seem to activate the immune system in getting rid of the tumour. Some papers were concerned with either modelling or applications of microwave hyperthermia. An account of the very large European

collaboration project on tumour treatment with microwave hyperthermia was also given.

Other papers dealt with weak, low-frequency field effects on osteoporosis and nerve function restoration.

In the joint Session with Commission A on Exposure Assessment and Measurements in Complex Environments (Conveners : L.E. Paulsson and M. Kanda) 8 platform and 2 poster papers were presented. They covered a variety of phenomena within a very broad frequency range, 50 Hz - 2.5 GHz. Three main areas were emphasized: ELF exposure, mobile telephone exposure, and wideband transients.

The first paper on ELF exposure assessment gave an overview of exposure metrics and measurement techniques. It stressed the fact that our knowledge of the interaction mechanisms involved is limited and therefore leaves the choice of relevant exposure parameters as an open question. Two other papers dealt with dosimetry in terms of induced currents in the body showing a good agreement between calculated and measured currents.

The three papers on mobile telephone exposure were all experimental and showed different measurement methods of the absorbed power in models of the human head. A European laboratory for compliance tests of telephones was announced. Measurement techniques for wideband transients and measurements of transients in domestic and industrial environments were discussed in two papers. The remaining papers dealt with open field measurements and an exposure chamber for non-thermal microwave experiments.

In the joint Session with Commission B on Computational Electromagnetics in Biology and Medicine (Conveners J.C. Lin and S.N. Hornsleth) three main areas were emphasized: numerical methods for the solution of Maxwell's Equations in bioelectromagnetic problems, calculation of the EM field distribution inside human bodies in various exposure conditions, and analytical methods to calculate the electric field induced in magnetic nerve stimulation at ELF.

Numerical methods that were discussed in view of the advantages inherently well-suited to field computations in biological targets include the finite-difference time-domain (FDTD) technique, the finite element (FEM) technique, the 3D Multiple Multipole hybrid technique, and the weak form of the domain-integral equation technique.

In the area of calculation of the field distribution, a group of papers considered the problem of modeling biological bodies exposed in the near field. Near field exposure is of considerable high complexity as 1) the field distribution is extremely non-uniform in the vicinity of the source and inside the exposed

body, and 2) in many cases the action of the scattered field on the source is not small enough to be negligible.

Two papers examined the calculation of the field induced in the head of an operator of a mobile antenna and the evaluation of the energy absorption in humans exposed to electromagnetic fields in closed environments.

Three papers dealt with MW hyperthermia applicators, including computation of power deposition and heating patterns for Hexagonal arrays of interstitial antennas, and SAR distribution produced by a coaxial-slot interstitial antenna.

One paper considered the computation of the ELF magnetically induced surface current on cells, that is the current within the double layer of charges present on the cell surface.

Analysis of the induced electric field is a major step in understanding and optimising magnetic nerve stimulators. Most analyses done in the past were based on numerical techniques, and hence had serious limitations in coil optimisation. Recently, analytical techniques were developed. In this framework one paper described an analytical technique to compute induced electric fields in a homogeneous tissue cylinder that closely models the stimulation of nerves in limbs. The technique can be applied for coils of arbitrary shapes and can also be extended to axially heterogeneous tissue cylinders.

P. BERNARDI
CHAIR, COMMISSION K

NEWS FROM THE COMMISSIONS

COMMISSION B

The recent death of Professor George Sinclair (whose Obituary appeared in the previous Bulletin) prompted Vice-President Senior to write a short history of the successful Commission B Symposia on Electromagnetic Theory. The text will show that Professor Woonton was present - and actively so - at the birth of the Symposium series.

The Commission B Electromagnetic Theory Symposia

“Many Commissions now regularly schedule symposia between the General Assemblies, but the oldest by far are the Electromagnetic Theory Symposia organized by Commission B. The fifteenth in the series will be held in St. Petersburg, Russia, 23-26 May, 1995, and the Commission is now in the process of selecting the site for the 1998 symposium from the proposals submitted. If past experience is any guide, over 300 papers will be offered for presentation

and about 250 accepted. But things were not always this way, and it is interesting to look back on the earliest symposia.

Prior to the reorganization of URSI that took place at the 1975 Lima General Assembly, electromagnetics was part of Commission VI "Radio Waves and Circuits". This was one of the larger and more active of the seven URSI Commissions, and it is impossible to separate a discussion of the first few symposia from a consideration of the key people involved.

The early 1950's saw the rapid development of ray (optical) techniques, including the introduction of the concept of diffracted rays by Professor J.B. Keller, and these were finding fruitful application to antenna, scattering and microwave device problems. In North America, two people who were heavily involved in these developments were Dr. R.C. Spencer, Director of the Antenna Laboratory at the U.S. Air Force Cambridge Research Center in Bedford, Massachusetts, U.S.A., and Professor G.A. Woonton, Director of the Eaton Electronics Laboratory at McGill University in Montreal, Canada. They knew each other well and had participated in one-day meetings on ray techniques in Europe and America. At the 1952 General Assembly in Sydney, Australia, an ad hoc subcommittee for the study of information theory and microwave optics was created with Spencer as chairman, and during a weekend excursion, the idea of holding a major symposium on microwave optics came out of the conversations. Woonton agreed to host it, and established an Organizing Committee consisting of himself and Spencer, Professor G. Sinclair of the University of Toronto (and founder of Sinclair Radio Laboratories, Ltd.) and Professor S. Silver of the University of California at Berkeley. All four were active in URSI. Woonton was Chairman of Commission VII "Radio Electronics" (1952-57) and then Vice President of URSI (1957-63). Sinclair was the Commission VI Official Member for Canada (1952-60), and Silver held the same position for the U.S. (1952-54), before going on to serve as Chairman of Commission VI (1953-60), Vice President of URSI (1963-66), and then President (1966-69). Prior to the election of Professor E.V. Jull as President three years ago, Silver was the only Junior Vice President to be elected President, and throughout the 50's and 60's he was a key figure in all Commission VI activities.

The Symposium on Microwave Optics was held at McGill University, June 22-25, 1953, and was co-sponsored by the Canadian and U.S. URSI Commissions VI, not Commission VI itself. For many of the participants, the Symposium was memorable as the first disclosure of Keller's geometrical theory of diffraction. A total of 68 papers were scheduled and 67 presented. The majority were solicited by personal invitation, and though the symposium was international in scope with contributions from France, the Federal Republic of Germany, the Netherlands and the U.K., most were from Canada and the U.S. It had been intended to publish the papers in a special issue of the *Canadian Journal of*

Physics, but when the publication got delayed, the Air Force Cambridge Research Center undertook the task, and published partially-edited versions of most of the papers in two reports AFCRC-TR-59-118 (I and II), Astia Document Nos. AD 211499 and 211500, in April 1959.

One of the papers at the McGill Symposium was co-authored by Mr. (later Professor) K.M. Siegel, who was Head of the Theory and Analysis Department of the Engineering Research Center at the University of Michigan. The Department was later (1957) to be known as the Radiation Laboratory, and was rapidly establishing a reputation for its theoretical and numerical work in scattering. Although Siegel was not then active in URSI, he was a close friend of Silver and Sinclair, and would become a Vice Chairman of Commission VI (1963-72) and then Chairman (1972-75). When it was suggested that there should be a symposium that focussed on theory, Siegel agreed to organize one, and a Symposium on Electromagnetic Wave Theory was held on the campus of the University of Michigan in Ann Arbor, June 20-25, 1955, under the sponsorship of URSI Commission VI. Silver was also a member of the Organizing Committee and gave the Welcoming Address at the opening meeting. One hundred papers were scheduled (99 were presented) over the 6-day meeting, most of them invited. Ten different countries were represented, and the attendance list includes most of the well-known names in electromagnetics. The registration fee was \$5 US (but \$6 at the meeting itself). It is interesting to note that parallel sessions were held only on the Wednesday morning and the Saturday afternoon, and an important (and valuable) feature of the symposium were the panel discussions held on 5 of the 6 afternoons. The papers and summaries of the discussions were published in the *IRE Transactions on Antennas and Propagation*, vol. AP-4, July 1956.

The 12th General Assembly of URSI was held in Boulder, Colorado, U.S.A. in 1957 and because of this it is not surprising that there was no symposium that year, but plans were laid for a follow-up to the Ann Arbor meeting. Consistent with the alternation between the U.S. and Canada, Sinclair agreed to organize one at the University of Toronto in Toronto, Canada. He was assisted by J.R. Wait, who was Sinclair's Ph.D. student and was, incidentally, the first to graduate (in 1951) with a Ph.D. in electrical engineering from the University of Toronto. The meeting was held June 15-20, 1959 under the sponsorship of Commission VI and was titled Symposium on Electromagnetic Theory. The format was now similar to a modern meeting, with each day given over to oral presentations, but in contrast to the present day, there were no sessions in parallel. Though most of the contributions were from North America, there were over a dozen papers from Western Europe and Japan. Both Silver and Siegel were members of the Organizing Committee and, once again, Silver gave the Welcoming Address. Whereas the Ann Arbor meeting had made no mention of the McGill Symposium as a predecessor, Silver now coupled all three meetings, and expressed the hope that in future years the symposium would

“tour through the some thirty nations who are currently members of the Union.” Edited versions of the papers were published in a 500-page supplement to the December 1959 *IRE Transactions on Antennas and Propagation*, vol. AP-7, and an interesting and quite detailed report of the Symposium was published in *Physics Today* (vol. 13, pp. 30–36, July 1960). The report was written by Dr V. Twersky and included photographs of some of the participants.

To realize Silver’s hope, the Commission established an informal symposium subcommittee having the organizers of the prior symposia as members. One of the participants at both the 1955 and 1959 symposia was Professor H.L. Knudsen of the Technical University of Denmark in Copenhagen, Denmark. He was the Commission VI Official Member for Denmark (1957-63) and secured the support of the Danish Member Committee of URSI to host the next symposium. It was held at the Technical University, June 25-30, 1962, under the chairmanship of Professor J. Rybner, who was also Chairman of the Danish Member Committee. The year prior to this Wait had spent a sabbatical leave (from NBS Boulder) with Knudsen in Copenhagen, and much of the preliminary organization was carried out by Wait and J. Bach Andersen, who was Knudsen’s graduate assistant. Indeed, Wait served as Chair of the Technical Program Committee. The complete papers were published in a two-volume book entitled “Electromagnetic Theory and Antennas” edited by E.C. Jordan (Pergamon Press, 1963) and totaling no less than 1330 pages.

The 1965 symposium was held in the Netherlands and, like so many other things at the time, came about as a result of a casual conversation. Professor R. Timman, whose interests were in water waves and ship dynamics, was a frequent visitor to Ann Arbor en route to the David Taylor Model Basin in Washington, D.C. It is reported that during one such visit Siegel suggested over dinner that Delft would be a great site for the 1965 Symposium and Timman agreed to ask the Dutch Member Committee for their support. This was forthcoming, and since Professor F.L.H.M. Stumpers was then the Chairman of Commission VI (he served in this position from 1963 to 1969), it was natural that he should chair the Organizing Committee. The symposium was held at the Technical University in Delft, September 6-11, 1965, and the papers were again published in a two-volume book “Electromagnetic Wave Theory” edited by J. Brown (Pergamon Press, 1967).

The symposia had now settled into a routine and were truly international—in their location as well as the participation. The next three were held in Stresa (Italy), Tbilisi (USSR) and London (U.K.) as indicated in Appendix 2, but the only publication resulting from them was a Special Issue of *Alta Frequenza* (vol. 38, May 1969), edited by P.J.B. Clarricoats and F. Carassa, containing some of the papers from the Stresa meeting. But there were difficulties ahead, not only for Commission VI, but for URSI as a whole. In the early 1970’s there were serious concerns whether URSI should continue as an independent union,

and if it did, what its thrust should be. Should its focus be telecommunications or geophysical problems, and in either case, what role would electromagnetic theory have? Although the decision was made (1972) to continue URSI as an independent Union of ICSU, a complete reorganization was necessary, and this was not accomplished until the 1975 Lima General Assembly.

The uncertainty had its effect on (the new) Commission B, and about this time it also lost two of its original leaders. On March 14, 1975, shortly before completing his term as Commission Chair, Kip Siegel died while testifying before a U.S. congressional committee on nuclear fusion research; and just over a year later, on November 5, 1976, Sam Silver also died. Without their leadership the symposia began to falter, and by the summer of 1976 no proposals had been received to host the 1977 Symposium. For lack of an alternative, it was decided to combine the Symposium with the joint meetings of (some Commissions of) the U.S. Member Committee for URSI and the IEEE Antennas and Propagation Society, scheduled for June 20-24, 1977 at Stanford University in Palo Alto, California. In the event, only 122 papers were submitted, and the Symposium was almost submerged in the larger activities of the other two groups.

It was evident that if the symposia were to survive, they must stand on their own, and plans were started immediately for the symposium three years later. This was held August 25-29, 1980 at the Technical University of Munich in Munich, FRG, with Professor G. Piefke as Chair of the Organizing Committee, and selected papers were published in a special issue of *Radio Science* (vol. 16, no. 6, 1981), edited by Professor A. Ishimaru. This practice has been followed ever since (see *Radio Science* vol. 19, no. 5, 1984; vol. 22, no. 6, 1987; vol. 26, no. 2, 1991; and vol. 28, nos. 5 and 6, 1993 for the last four symposia), and provides an archival record of the major presentations. It is worth noting that the Munich Symposium was the first one at which the Commission B Chair served as Chair of the Technical Program Committee, and the Commission Chair has held this position ever since.

In retrospect, the Munich Symposium marked the turning point in the fortunes of the series. Since then the interest and participation have recovered, and the symposia have re-established themselves as the premier international meeting in electromagnetics. It is again one of the main activities of a large and dynamic Commission. Instead of waiting until the preceding General Assembly to select a site, we are now doing so five years ahead to assure the availability of the best locations, and we look forward to the continued success of the symposia.

THOMAS B.A. SENIOR

Appendix 1 URSI Commission VI (later B) Chairmen

1948-52	B. van der Pol	1975-78	J. Van Bladel
1952-53	L.C. Van Atta	1978-81	L.B. Felsen
1953-60	S. Silver	1981-84	H.G. Unger
1960-63	J. Loeb	1984-87	J.B. Andersen
1963-69	F.L.H.M. Stumpers	1987-90	T.B.A. Senior
1969-72	H.M. Barlow	1990-93	F. Gardiol
1972-75	K.M. Siegel	1993-	A.D. Olver

Appendix 2 Symposia

The locations and the Chairmen of the Organizing Committees are shown. After some initial variation in the titles of the symposia, they have now become standardized as Electromagnetic Theory (abbreviated EMT) Symposia.

1953	June 22-25	Symposium on Microwave Optics (G.A. Woonton) McGill University, Montreal, Canada
1955	June 20-25	Symposium on Electromagnetic Wave Theory (K.M. Siegel) University of Michigan, Ann Arbor, U.S.A.
1959	June 15-20	Symposium on Electromagnetic Theory (G. Sinclair) University of Toronto, Toronto, Canada
1962	June 25-30	Symposium on Electromagnetic Theory and Antennas (J. Rybner) Technical University of Denmark, Copenhagen, Denmark
1965	Sept. 6-11	Symposium on Electromagnetic Wave Theory (F.L.H.M. Stumpers) Technical University of Delft, Delft, The Netherlands
1968	June 24-29	Symposium on Electromagnetic Waves (F. Carassa) University of Stresa, Stresa, Italy
1971	Sept. 9-15	Symposium on Electromagnetic Wave Theory (L.A. Weinstein) Georgian Academy of Sciences, Tbilisi, USSR
1974	July 9-12	Symposium on Electromagnetic Wave Theory (J. Brown) Imperial College of Science and Technology, London, U.K.

1977	June 20-24	Symposium on Electromagnetic Wave Theory (F.M. Tesche) Stanford University, Palo Alto, U.S.A.
1980	Aug. 25-29	Symposium on Electromagnetic Waves (G. Piefke) Technical University of Munich, FRG
1983	Aug. 23-26	Symposium on Electromagnetic Theory (M.R. Vidal) Universidad Santiago de Compostela, Santiago, Spain
1986	Aug. 25-29	Symposium on Electromagnetic Theory (T. Berceci) Hungarian Academy of Sciences, Budapest, Hungary
1989	Aug. 14-17	Symposium on Electromagnetic Theory (S. Ström) The Royal Institute of Technology, Stockholm, Sweden
1992	Aug. 17-20	Symposium on Electromagnetic Theory (G.L. James) Sydney Convention and Exhibition Center, Sydney, Australia

INFORMATION SUR UTC-TAI

On n'introduira pas de seconde intercalaire à la fin de décembre 1993.
La différence entre UTC et le Temps Atomique International TAI est :

du 1 juillet 1993, 0h UTC, jusqu'à nouvel avis : UTC-TAI = -28s.

Des secondes intercalaires peuvent être introduites à la fin des mois de décembre ou de juin, selon l'évolution de UT1-TAI. Le Bulletin C est diffusé deux fois par an, soit pour annoncer un saut de seconde, soit pour confirmer qu'il n'y aura pas de saut de seconde à la prochaine date possible.

INFORMATION ON UTC-TAI

No positive leap second will be introduced at the end of December 1993.
The difference between UTC and the International Atomic Time TAI is :

from 1993 July 1, 0h UTC, until further notice : UTC-TAI = -28s.

Leap seconds can be introduced in UTC at the end of the months of December or June, depending on the evolution of UT1-TAI. Bulletin C mailed every six months, either to announce a time step in UTC, or to confirm that there will be no time step at the next possible date.

MARTINE FEISSEL
DIRECTOR CENTRAL BUREAU OF IERS

REPORTS ON URSI-SPONSORED MEETINGS

SBMO INTERNATIONAL MICROWAVE CONFERENCE

2-5 August 1993, Sao Paulo, Brazil

The Fifth International Microwave Conference organized by SBMO, the Brazilian Microwave Optoelectronics Society, took place at the Rebouças Convention Center from August 2nd to 5th. Nearly 200 people attended 105 papers divided into 25 technical sessions plus 3 panel sessions. From this total, 25 papers were presented by Brazilians who carried out their work in Brazilian Research and Development Centres, Universities and Industries. This is a very important number, which represents the high level of research being developed in Brazil, confirmed by an International Committee of referees.

1. Opening Ceremony

After addresses by several Brazilian personalities, the keynote speech was given by Dr. Donald Schilling from Interdigital Communications Inc., and formerly from the University of New York. He gave a general overview of wireless communications and placed emphasis on Spread Spectrum technology and its application to cellular telephone. That was particularly important to the city of São Paulo, since cellular telephone services officially started by the time of the Conference, on August 2nd.

2. Panel Sessions

The first panel session entitled "Commercial Applications of Microwaves & RF", started on 3:20 p.m. and was, in a way, a continuation of the session started by Dr. Donald Schilling. More details on the present status of the wireless technology were discussed by the Chairman, Dr. Paul Khanna (USA), Dr. Franco Giannini (Italy), Antti Raisanen (Finland) and Dr. Istvan Frigyes (Hungary).

The second panel session, "Microwave Medical Applications", discussed several applications of microwaves to Medicine. This is an area which still did not receive the proper consideration from Brazilian engineers and medical doctors.

In the third panel session, "Telecommunications Activities in Latin America", the present status of Telecommunications and future plans in Brazil, Uruguay, Venezuela and particularly in the State of São Paulo were presented.

3. Technical Programme

A detailed comment on all technical sessions that were presented during the

Conference is beyond the scope of this report. Thus, only the papers related to the Conference theme and those which are important to Brazil but still did not receive the attention of the scientific community will be commented.

The most important papers directly related to the theme "Microwaves : Personal and Global", were in the publications : R-2 "Wirelessness - an emerging craze" and 0-1 "European MMIC Commercial Applications". The first made an overview of the several ways of applying wireless for transmitting voice, video and data. It also tried to show the benefits of applying the former military oriented technologies to commercial usage. The second made a balance of the European status in the application of MMIC devices to global and personal communications. It also outlined the efforts of Europe to invest in the development of components for European systems.

The applications of microwaves in medicine were among the important contributions of this Conference to medical doctors and engineers in Brazil. The paper B-1 "Biomedical Applications of Optics", introduced a new method of monitoring the blood volume contained in a patient's leg allowing the determination of small thrombosis responsible for pain while walking. The paper R-3 "The Utilization of RF/Microwaves in the Treatment of Cardiac Dysfunction", gave details of how angioplasty can be more effective when applied with microwaves. The advantage of this technique is a longer return of the patient for a new session which is rather painful : 6 to 8 months are supposed to be extended to 3 to 5 years.

The application of microwaves in agriculture also represented a theme of importance to Brazil, and was described in paper R-4 "Moisture Determination in Individual Grain Kernels and Nuts by RF Impedance and Microwave Resonator Measurements". It dealt essentially with the determination of humidity of grains in high volume storage. This is an important factor to avoid production losses.

The other papers dealt specifically with the development of optoelectronic and microwave components, semiconductor technology, antennas, radio propagation, radio astronomy, etc. More details on the technical sessions can be found in the Conference Proceedings.

4. Miscellaneous

Other features of the Conference were a short course on "Microwave Ovens", given by Dr. J. Kleber da Cumba Pinto, technical video sessions and a small Exhibition. The Conference turned out to be of great significance for Brazilian engineers. Its next venues are Beleur (1994), Rio de Janeiro (1995) and Curitiba (1996).

E. CAMARGO

THIRD INTERNATIONAL SYMPOSIUM ON ANTENNAS AND EM THEORY

6-9 September 1993, Nanjing, China

The meeting was held at Southeast University, and was attended by some 200 participants, among whom about 45 Young Scientists.

The Opening Session included a welcome address from the General Chairman and three greeting addresses from the delegates of URSI, IEEE/AP-S, and the local government. This was followed by two invited speeches :

1. Edward V. Jull, The International Union of Radio Science;
2. Saburo Adachi, Electromagnetic Imaging of Underground Objects.

Thirty nine sessions were held in four parallel rooms. In addition, three invited lectures were scheduled (of 80 minutes each), viz.

1. Roger F. Harrington, A Generalized Network Formulation for Aperture Problems;
2. Wen-Xun Zhang, A unified framework of functional methods for EM problems;
3. Tsukasa Yoneyama, Leaky NRD-guide fed planar antennas.

The programme featured 181 scheduled papers, of which 19 were invited (30 minutes each). The other papers were limited to 20 minutes. Most of the communications gave rise to interesting discussions.

About a quarter of the papers were devoted to scattering and inverse scattering, in particular in relation with complicated conducting/dielectric scatterers. Several papers covered Microstrip antennas and arrays, numerical techniques for EM problems, practical antennas and Array systems.

The social activities included technical visits to the Purple Mountain Observatory and the Nanjing Research Institute of Electronic Technology. A Chinese Young Scientists meeting was held for exchanging information and ideas.

The symposium provided accommodation for five invited scientists (who gave invited speeches and invited lectures), and their registration fees were waived, thanks to the support given by the K.C. Wong Education Foundation (Hong Kong). The registration fees were also waived for the Co-Chairs of Symposium Committees, as well as for an Indian scientist who was very active in the organization of the meeting. Three young scientists were selected to receive the URSI grants (\$500 each), namely Dr. A. Andrenko (Ukraine), Dr. V.I. Kalinichev (Russia) and Dr. A. Alphones (India).

The next Conference, ISAE'97, will be held in Xi'an, a famous ancient capital city of China.

WEN XUN ZHANG

XXI INTERNATIONAL CONFERENCE ON PHENOMENA IN IONIZED GASES

20-24 September 1993, Bochum, Germany

The *Arbeitsgemeinschaft Plasmaphysik* of the *Ruhr-University Bochum* accepted to organize the XXI ICPIG Conference in Bochum at the Ruhr University from 20 to 24 September, 1993. In conjunction with this conference an information day Plasma for Industry was offered on 19 September, to communicate the exceptional versatility and flexibility of the plasma to the industrial community.

The Organizing Committee of the conference consisted of G. Ecker (Chair), Bochum; H.F. Döbele, Essen; K. Günther, Berlin; H.-J. Kunze, Bochum; H. Schlüter, Bochum; K. Suchy, Düsseldorf; J. Uhlenbusch, Düsseldorf - Jülich; U. Arendt (Secretary), Bochum.

The International Scientific Committee in April 1992 selected in a meeting in Bad Honnef 46 invited speakers, ten were chosen for general lectures (forty minutes) and thirty-six for topical lectures (twenty-five minutes). These lectures were announced in the second announcement and at the same time a call for contributions to the poster sessions was sent out.

At the date of the conference 592 participants were registered and 444 showed up at the meeting. 493 had registered before the above deadline and their contributions were published - before the conference - in two volumes of the Proceedings with altogether 800 pages. The invited lectures and the rest of the poster manuscripts appear in a third volume of the Proceedings with about 500 pages, which will come out after the conference. These Proceedings are mailed to the participants. The day Plasma for Industry was attended by approximately 140 people from both conference and industry.

With the assistance of sponsors (Deutsche Forschungsgemeinschaft, International Science Foundation, MWF-NRW, International Union of Pure and Applied Physics, URSI) the Organizing Committee organized support for the attendance of 144 people consisting of invited speakers, the International Scientific Committee, colleagues from the East-European area and Developing Countries. The Organizing Committee also exempted 125 people from paying the registration fee of the conference. It must be mentioned that this extensive support causes substantial difficulties in balancing the financial budget of the conference.

Newspapers and radio reported on the conference favourably. Not only the Organizing Committee and the International Scientific Committee, but also many participants expressed the opinion that the invited speakers communicated valuable new information of high standard. In very few cases criticism became loud because the presentations were not well prepared and did not reach the

standard of the conference. In future meetings one should pay even more attention to the selection of colleagues who not only have the high standard required, but are also willing to spend sufficient time to the presentation. The poster sessions received much praise and were very well attended. Most papers accepted were presented and in addition late contributions could be accommodated.

During the conference the Penning Prize was awarded to Professor Dr. Yu. Raizer in recognition of his outstanding work in the field of Ionization and Plasma Physics.

A tour to the *KFA in Jülich*, with presentations, lectures and a reception, together with the conference banquet at the Casino Hohensyburg, were the highlights of the social programme.

All in all the conference operated very smoothly. A local problem was the insufficient hotel and transport situation. Many small hotels scattered over a wide area made it necessary to provide a regular bus service by the Organizing Committee during the whole conference. This turned out to be very expensive.

The contacts with Eastern Europe were time-consuming, and not only because of the unsatisfactory mail-, telephone- and fax-connections. About five hundred people of this area intended to come to the conference and asked for support through the Organizing Committee, a request which of course could not be met. There was a lot of pressure, confusion and correspondence caused by this fact.

G. ECKER
CHAIR OF THE ORGANIZING COMMITTEE

ANNOUNCEMENTS OF URSI-SPONSORED MEETINGS

SYMPOSIUM ON MICROWAVE REMOTE SENSING OF THE EARTH, OCEANS, ICE AND ATMOSPHERE

18-20 May 1994, Lawrence, Kansas, USA

The meeting has already been announced in the June 1993 Bulletin. Some additional information has been received recently. Thus, topics include:

1. Active and passive microwave sensing of land surfaces, vegetation, sea ice, soil moisture, cultural targets, continental ice, ocean waves, atmosphere, other ocean features.
2. Microwave remote sensing systems, including imaging radar, altimeters, scatterometers, radiometers, earth- and ice-probing radars.
3. Calibration of microwave remote sensors
4. Special sessions devoted to ERS-1 radar results.

Any paper dealing with application and utilization of microwaves for remote sensing will be considered. Conference language is English.

ABSTRACTS limited to one page, including figures. Original and three copies must be submitted by FEBRUARY 1, 1994, in camera-ready form. Must be large enough to be reduced by 75%. Don't include list of references; a few open literature references may be included parenthetically in text.

Contact person :

Prof. S. P. Gogineni
URSI-F Microwave Symposium
RSL, The University of Kansas
2291 Irving Hill Road
Lawrence KS 66045-2969, USA
Tel : (1-913) 864-4835, Fax : (1-913) 864-7789
E-MAIL: gogineni@glacier.rsl.ukans.edu
(copy e-mail to: graham@ardneh.rsl.ukans.edu)
OMNET: KANSAS.URSL

Authors will be notified of status of submissions on March 1, 1994, at which time registration and housing information will also be sent.

For information on Young Scientist stipends, send e-mail or fax request. International Science Foundation (Soros). Travel Grant Programme information is also available for scientists from the former USSR and the Baltic states.

BEACON SATELLITE SYMPOSIUM

9-16 July 1994, Aberystwyth, United Kingdom

This meeting has been granted URSI sponsorship, and is considered as URSI-generated. Group SSG 4-140 of the International Association for Geodesy (IAG) participates in the programme committee and is a co-sponsor of the Symposium. The venue is the University of Wales, Aberystwyth, Wales, United Kingdom, and the host is Dr. Len Kersley, Physics Department, UWA, Aberystwyth, Dyfed SY23 3BZ, fax (44) 970-622 826.

Deadline for submission of pre-registration forms : 15 December, 1993

Deadline for submission of abstracts : 31 March, 1994 (in duplicate : one copy to R. Leitingner, the other to Len Kersley).

Primary topics :

1. Ionospheric tomography
2. Electron content and scintillation data from GPS observations
3. Cooperation with space geodesy and radio astronomy
4. Ionospheric variability

Call for papers :

The programme committee will consider contributions from all areas connected to beacon satellite investigations. However, contributions from the primary topics are especially encouraged. It will probably be necessary to have a poster session. Authors who believe that their contribution is better suited for a poster than for oral presentation should indicate this preference.

R. LEITINGER

Institute for Meteorology & Geophysics, University of Graz

Halbärthgasse 1, A-8010 Graz, Austria

Tel. (43) 316-380-5257, Fax (43) 316-384-091

Telex 311662 ubgraz a, E-mail leitingner@bkfug.kfunigraz.ac.at

INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

13 - 16 September 1994, Rome, Italy

The first International Symposium on Electromagnetic Compatibility to be held in Rome represents a scientific event that will provide researchers, scientists and engineers working in the areas of theoretical or applied EMC with the opportunity to present the progress of their work and to discuss problems of current and mutual interest. Workshops, panel discussions and special sessions will be organized on stimulating topics.

Attention will be focussed on innovative research subjects of strategic interest for EMC. International standards for the industrial products and for the human exposure to electromagnetic fields will be discussed, as well as scientific and technical EMC activities supported by the Commission of the European Community.

The submission of high level papers of scientific and technical EMC topics is recommended.

Informal discussions among the participants will be encouraged with the aim of creating a friendly atmosphere of useful cooperation.

The Chair of the Symposium is M. D'Amore, and P. Bernardi is Vice-Chair.

Technical Areas

- EM Environment
- Nonlinear System Behaviour
- Transients
- ESD
- Lightning and EMP
- EM Coupling
- Lines & Cables
- Shielding
- Filters
- Immunity
- Emission
- Numerical Modelling in EMC
- Neural Networks in EMC
- CAD for EMC
- EMC in Transportation Systems
- EMC in Space
- EMC in Automation Systems
- EMC in Information Systems
- EMC in Communications Systems
- EMC in Power Systems
- EMC in Power Electronics
- EMC Related to PCB & Chip Design
- EMC in Planar Integrated Circuits
- EMC in Interconnect and Packaging Structures
- Components & Materials in EMC
- Measurements & Instrumentation
- Standards & Regulations
- Spectrum Engineering
- Human Exposure to EMC fields
- EMC Education
- EMC Management

Symposium Secretariat :

EMC'94 ROMA
Prof. Mauro Feliziani
Dept. of Electrical Engineering
University of Rome "La Sapienza"
Via Eudossiana 18, I-00184 ROMA, ITALY
Tel. (39) 6-445 85809 / 482 8380
Fax (39) 6-488 3235

INTERNATIONAL SYMPOSIUM ON ELECTROMAGNETIC COMPATIBILITY

6 - 9 March 1995, Zürich, Switzerland

The Symposium officials are :

Prof. P. Leuthold, Zürich (Symposium President); Prof. W. Zaengl, Zürich;
Prof. F.L. Stumpers, Eindhoven (Vice-Presidents); Dr. G. Meyer, Zürich
(Symposium Chairman); Prof. C.R. Paul, Lexington (Technical Programme
Chairman); Dr. B. Szenkuti, Berne (Technical Programme Vice-Chairman); Mr.
H.A. Kunz, Luterbach (Exhibition); Dr. U. Kaiser, Fribourg (Public Relations);
Prof. M. Ianoz, Lausanne (Joint Events).

Topics of the Conference :

- Electromagnetic pollution, control and enforcement
- Spectrum engineering, management and economy
- National and international cooperation in EMC
- EMC management
- Immunity of electronic systems
- Electromagnetic compatibility of communications, electric power and transport systems
- EMC hazards to ordnance and vital safety systems
- Compatibility of medical electronics
- Biological effects of EM fields
- Interference propagation, source-to-receptor coupling
- Nuclear and Lightning EM Pulse (NAMP/LEMP) impact
- Regulation, limits, standards and specifications
- Measuring methods and instrumentation, production testing
- Computers in EMC, prediction and analysis
- Design of compatible equipment, suppression methods & devices
- Special techniques : spread-spectrum, fibre optics
- EMC education
- Special case studies
- Shielding
- TEM cells and anechoic chambers

- System level EMC
- EMC in cables and transmission lines
- Numerical modelling methods
- Electromagnetic environment

Authors are required to submit the full and complete text of the paper in English, including a 100-word abstract, for review by May 15, 1994. The manuscript should not exceed 3600 words (6 pages in the final format including figures and tables). Eight copies of the paper are required by the Technical Programme Committee EMC Zurich '95, ETH-Zentrum - IKT, CH-8092 Zürich, Switzerland (send by air mail if outside Europe!).

Please note : submission of abstracts and summaries as in the past has been discontinued. Acceptance will be judged based on the full text of the paper. The format and style of this initial submission need not be the same as required for the final manuscript, but it should be essentially the complete paper and should include all figures. Upon notification of acceptance, authors will submit this text, with minor modifications, additions and deletions and changes suggested by the Technical Programme Committee for the final, camera ready manuscript.

The preliminary programme is scheduled for October 1994. Special inquiries may be directed to :

Dr. Gabriel Meyer
Symposium Chairman
ETH Zentrum - IKT
CH-8092 Zürich, Switzerland
Phone (41) 1-632 27 90, fax (41) 1-262 09 43
e-mail : gmeyer@nari.ikt.ethz.ch.

OTHER MEETINGS WHICH HAVE BEEN BROUGHT TO OUR ATTENTION

- Progress in Electromagnetics Research Symposium
11 - 15 July 1994, ESTEC, Noordwijk, The Netherlands
Contact : Mr. Bertram Arbesser-Rastburg
PIERS 1994 Technical Chairman
c/o Mrs. Gonnie Elfering, ESTEC Conference Bureau,
Postbus 299, NL-2200 AG Noordwijk, The Netherlands
Tel. (31) 1719 85056, Fax (31) 1719 85658
E-mail : aelferin@vmprofs.estec.esa.nl

- Mediterranean Electrotechnical Conference
12 - 14 April 1994, Antalya, Turkey
Contact : Prof. Önder Yüksel
MELECON '94, Middle East Technical University
Dept. of Electrical and Electronics Eng.
Ankara, TR-06531 Turkey
Fax (90) 4210 1261, E-mail : melecon@trmetu.bitnet

- International Broadcasting Convention
16 - 20 September 1994, Amsterdam, the Netherlands
Contact : IBC Convention Office
Savoy Place, London WC2R 0BL, United Kingdom
Tel. (44) 71-240 3839, Fax (44) 71-497 3633
Telex 261176 iee ldn g

- Africa Telecom (organisé par l'UIT)
25 - 29 avril 1994, Le Caire, Egypte
Pour tous renseignements :
Africa TELECOM 94 - Forum
Union internationale des télécommunications
Place des Nations, CH-1211 Genève 20, Suisse
Tél. (41) 22-730 5811, Télécopie (41) 22-730 6444
Telex 421 000 uit ch

- Benelux Workshop and Exhibition on Circuits, Systems and Signal Processing
23 - 24 March 1994, Papendal, the Netherlands
Contact : J.P. Veen, ProRISC/STW
P.O. Box 3021, NL-3502 GA Utrecht, The Netherlands
Tel. (31) 30-923 285, Fax (31) 30-961 536
E-mail : info@stw.nl, compuserve : [100271.2017]

- Symposium Technical Normative on Electromagnetic Compatibility
4 - 6 October 1994, Barcelona, Spain
Contact : S & M Consultants, Att. A.E. San Martin
Comandante Zorita 13, Dept. 411, 28020 Madrid, Spain
Tel. (34) 1-534-9950, Fax (34) 1-533-1590

- European GAAS and related III-IV Compounds Applications Symposium
28-29 April 1994, Torino, Italy
Contact : GAAS 94, c/o Dipartimento do Elettronica
Politecnico di Torino, Corso Duca degli Abruzzi 24
I-10129 Torino, Italy

- Day on Diffraction 94
30 May - 3 June 1994, St. Petersburg, Russia
Contact : Prof. V.S. Buldyrev
Institute on Physics, SPb University
1 Ulianovskaja Ave., Petrodvoretz 198904, Russia
Fax (7-812) 428-6649, E-mail : bvs@onti.phys.lgu.spb.su

- International Astronautical Congress
9 - 14 October 1994, Jerusalem, Israel
Contact : Int. Programme Committee C-Chairs :
J. Hess, Aerospace Consultant, 12782 Spring Street
Garden Grove, CA 92645, USA
Tel and Fax (1-714) 893-6849
J.J. Runavot, Dassault Aviation, B.P. 23
F-31703 Blagnac Cedex, France
Tel. (33) 6177 4096, Fax (33) 6177 4103

International Symposium on Solar Terrestrial Physics

5-10 June, 1994, Sendai, Japan

Contact person : Professor H. OYA
Department of Astronomy and Geophysics
Tohoku University, Aoba, Aramaki
Sendai 980, Japan

Conference on Precision Electromagnetic Measurements

27 June - 1 July, 1994, Boulder, CO USA

Contact person : Gwen E. Bennett, Conf. Secretary
Natl. Inst. of Standards & Technology
325 Broadway, Boulder, Colorado, USA
Tel. (1-303) 497-3295, Fax : (1-303) 497-6421

International Symposium in Electromagnetic Compatibility

28 June - 1 July, 1994, Wroclaw, Poland

Contact person : Mr. W. Moron, EMC Symposium
Box 2141, 51-645 Wroclaw 12, Poland
Tel (48) 71 481041, Fax (48) 71 483248
telex 712118 ilw pl.

Beacon Satellite Symposium

9 - 16 July 1994, Aberystwyth, United Kingdom

Contact person : Dr. R. Leitinger
Institute for Meteorology & Geophysics
University of Graz, Halbärthgasse 1
A-8010 Graz, Austria
Tel. (43) 316-380-5257, Fax (43) 316-384-091
Telex 311662 ubgraz a
e-mail leitinger@bkfug.kfunigraz.ac.at

International Geoscience and Remote Sensing Symposium - IGARSS'94

8-12 August, 1994, Pasadena, CA, USA

Contact address : IGARSS Business Office, 2610 Lakeway Drive
Seabrook TX 77586-1587 - USA
Tel. (1-713) 291.9222 Fax (1-713) 291.9224
E-mail : stein@star.harc.edu

European Microwave Conference

5-8 September 1994, Cannes, France

Contact address : 24th EuMC Conference
Nexus Business Communications Ltd.
Warwick House, Azalea Drive, Swanley
Kent BR8 8HY, United Kingdom
Tel. (44) 322-660 070, Fax (44) 322-614 989

International Seminar on Mathematical Methods in Electromagnetic Theory

7-10 September 1994, Kharkov, Ukraine

Contact address : MMET-94
Institute of Radiophysics and Electronics
Ukrainian Academy of Sciences
12 ac. Proskura st., Kharkov 310085, Ukraine

International Symposium on Electromagnetic Compatibility

13 - 16 September 1994, Rome, Italy

Contact person : Prof. Mauro Feliziani, EMC'94 ROMA
Dept. of Electrical Engineering
University of Rome "La Sapienza"
Via Eudossiana 18, I-00184 Roma, Italy
Tel.. (39) 6-445 85809/482 8380, Fax (39) 6-488 3235

International Conference on Computational Electromagnetics and its Applications

1-4 November 1994, Beijing, China

Contact person : Prof. Shizhi Li, Chairman TPC
Dept. of Electronic Engineering
Beijing Institute of Technology
P.O. Box 327, Beijing 100081, P.R. China
Tel. (86-1) 841-6688/2613, Fax (86-1) 841-2889

Journées Internationales de Nice sur les Antennes - JINA 94

8-10 November 1994, Nice, France

Contact address : Secrétariat JINA 94
CNET - PAB Centre de la Turbie
06320 LA TURBIE - France
Fax (33) 93 41 02 29, Téléx 470159 F

Asia Pacific Microwave Conference

6-9 December 1994, Tokyo, Japan

Contact person : Prof. Shizou Mizushina
Chairperson, Steering Committee
c/o REALIZE INC.
2-16-13 Yushima, Bunkyo-ku, Tokyo 113, Japan
Tel. (81) 3-3815-8590, Fax (81) 3-2815-8939

INTERNATIONAL GEOPHYSICAL CALENDAR 1994

This Calendar continues the series begun for the IGY years 1957-1958, and is issued annually to recommend dates for solar and geophysical observations which cannot be carried out continuously. Thus, the amount of observational data in existence tends to be larger on Calendar days. The recommendations on data reduction and especially the flow of data to World Data Centres (WDCs) in many instances emphasize Calendar days. The Calendar is prepared by the International Ursigram and World Days Service (IUWDS) with the advice of spokesmen for the various scientific disciplines.

The Solar Eclipses are :

- a) 10 May 1994 (annular) crosses continental U.S., passing Baja CA? Mexico, southeast AZ, south NM, Northwest TX, parts of OK, KS, MO, IL, IN, OH, northern NY, VT and NH, south ME, south New Brunswick, Nova Scotia, ends in West Africa. 94% sun covered - direct viewing not safe. Partial phases in N. America, from north Alaska, northeast to Siberia, to western edge Europe and Africa in east, and Panama and north Venezuela and Colombia in south.
- b) 3 November 1994 (total), visible in S. America beginning near where Peru, Chile and Bolivia join (totality 2.75 min, sun alt. 25 deg); totality lengthens as it moves east passing Paraguay, Argentina and Brazil (totality 4 min), crosses Atlantic, then 800 km south of Cape Town, S. Africa. Partial phases in all S. America & Central America and southern third Africa, parts of Antarctica. (Description by Dr. Jay Pasachoff.)

Meteor Showers (selected by R. Hawkes, Canada) include important visual showers and also unusual showers observable mainly by radio and radar techniques. These can be studied for their own geophysical effects or may be "geophysical noise" to other experiments. The dates are given in Note 1 under the Calendar.

Definitions :

Time = Universal Time (UT); Regular Geophysical Days (RGD) = each Wednesday; Regular World Days (RWD) = Tuesday, Wednesday and Thursday near the middle of the month (see calendar); Priority Regular World Days (PRWD) = the Wednesday RWD; Quarterly World Days (QWD) = PRWD in the WGI; World Geophysical Intervals (WGI) = 14 consecutive days each season (see calendar); ALERTS = occurrence of unusual solar or geophysical conditions, broadcast once daily soon after 0400 UT; STRATWARM = stratospheric warmings; Retrospective World Intervals (RWI) = intervals selected by MONSEE for study.

For more detailed information of the definitions, please see one of the following, or contact H. Coffey (address below) : Solar-Geophysical Data, November

issue; URSI Information Bulletin; COSPAR Information Bulletin; IAGA News; IUGG Chronicle; WMO Bulletin; IAU Information Bulletin; Journal of the Radio Research Laboratories (Japan), Geomagnetism and Aeronomy (Russia); Journal of Atmospheric and Terrestrial Physics (U.K.); EOS Magazine (AGU/USA).

Priority recommended Programmes for measurements *not made continuously* (in addition to unusual ALERT periods) :

Aurora and Airglow - Observation periods are New Moon periods, especially the 7 day intervals on the calendar ;

Atmospheric Electricity - Observation periods are the RGD each Wednesday, beginning on 5 January 1994 at 0000 UT, 12 January at 0600 UT, 19 January at 1200 UT, 26 January at 1800 UT, etc. Minimum programme is PRWDs.

Geomagnetic Phenomena - At minimum, need observation periods and data reduction on RWDs and during MAGSTORM Alerts.

Ionospheric Phenomena - Quarter-hourly ionograms ; more frequently on RWDs, particularly at high latitude sites ; f-plots on RWDs ; hourly ionograms to WDCs on QWDs ; continuous observations on solar eclipse in the eclipse zones. See **Airglow and Aurora**.

Incoherent Scatter - Observations on Incoherent Scatter Coordinated Days, and intensive series on WGIs or Airglow and Aurora Periods. **Special programmes** : Dr. J. Holt, M.I.T. Haystack Observatory, Route 40, Westford, MA 01886 USA, URSI Working Group G.5. Phone (1-617) 981-5625, e-mail AMES: "jmh@chaos. haystack.edu".

Ionospheric Drifts - During weeks with RWDs.

Travelling Ionosphere Disturbances - special periods, probably PRWD or RWDs.

Ionospheric Absorption - Half-hourly observations on RWDs ; continuous on solar eclipse days for stations in eclipse zone and conjugate area. Daily measurements during Absorption Winter Anomaly at temperate latitude stations (October-March Northern Hemisphere; April-September Southern Hemisphere).

Backscatter and Forward scatter - RWDs at least.

Mesospheric D region electron densities - RGD around noon.

ELF Noise Measurements of earth-ionosphere cavity resonances - WGIs.

All programmes - Appropriate intensive observations during unusual meteor activity.

Meteorology - Especially on RGDs. On WGIs and STRATWARM Alert Intervals, please monitor on Mondays and Fridays, as well as on Wednesdays.

GAW (Global Atmospheric Watch) -- WMO programme to integrate monitoring of atmospheric composition. Early warning system of changes in atmospheric concentrations of greenhouse gases, ozone, and pollutants (acid rain and dust particles). WMO, 41 avenue Giuseppe-Mota, P.O. Box 2300, CH-1211 Geneva 2, Switzerland.

Solar Phenomena - Solar eclipse days, RWDs and during PROTON/FLARE ALERTS.

International Geophysical Calendar 1994

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

	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
							1							1	2
JANUARY	2	3	4	5	6	7	8	3	4	5+	6+	7	8	9	JULY
	9	10	11	12	13+	14+	15	10	11	12*	13*	14	15	16	
	16	17	18	19	20	21	22	17	18	19	20	21	22	23	
	23	24	25	26	27	28	29	24	25	26	27	28	29	30	
FEBRUARY	30	31	1	2	3	4	5	31	1	2	3	4	5	6	AUGUST
	6	7	8+	9+	10	11	12	7	8	9*	10*	11+	12+	13+	
	13	14	15*	16*	17	18	19	14+	15+	16*	17*	18	19	20	
	20	21	22	23	24	25	26	21	22	23	24	25	26	27	
	27	28	1	2	3	4	5	28	29	30	31	1	2	3	
MARCH	6	7	8	9	10	11	12	4	5	6*	7*	8	9	10	SEPTEMBER
	13	14	15*	16*	17	18	19	11	12	13	14	15	16	17	
	20	21	22	23	24	25	26	18	19	20	21	22	23	24	
	27	28	29	30	31	1	2	25	26	27	28	29	30	1	
	3	4	5	6	7	8	9	2	3	4+	5+	6	7	8	OCTOBER
APRIL	10	11	12*	13*	14	15	16	9	10	11*	12*	13	14	15	
	17	18	19	20	21	22	23	16	17	18	19	20	21	22	
	24	25	26	27	28	29	30	23	24	25	26	27	28	29	
	1	2	3+	4+	5	6	7	30	31	1	2	3	4	5	NOVEMBER
MAY	8	9	10*	11*	12	13	14	6	7	8*	9*	10	11	12	
	15	16	17	18	19	20	21	13	14	15	16	17	18	19	
	22	23	24	25	26	27	28	20	21	22	23	24	25	26	
	29	30	31	1	2	3	4	27	28	29	30	1	2	3	
JUNE	5	6	7	8*	9*	10	11	4	5	6*	7*	8	9	10	DECEMBER
	12	13	14	15	16	17	18	11	12	13	14	15	16	17	
	19	20	21	22	23	24	25	18	19	20	21	22	23	24	
	26	27	28	29	30			25	26	27	28	29	30	31	1995
	S	M	T	W	T	F	S	1	2	3*	4*	5	6	7	JANUARY
								8	9	10	11	12	13	14	
								15	16	17	18	19	20	21	
								22	23+	24+	25+	26+	27+	28	
								29	30	31					
	S	M	T	W	T	F	S								

11 Regular World Day (RWD)

16 Priority Regular World Day (PRWD)

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

5 Regular Geophysical Day (RGD)

10 11 World Geophysical Interval (WGI)

14+ Incoherent Scatter Coordinated
Observation Day

3 Day of Solar Eclipse

13 14 Airglow and Aurora Period

11* Dark Moon Geophysical Day (DMGD)

NOTES on other dates and programs of interest:

1. Days with significant meteor shower activity are: Northern Hemisphere Jan 3-4; Apr 21-23; May 4-5; Jun 6-11, 27-29; Aug 10-15; Oct 20-23; Nov 17-18; Dec 12-14, 22-23, 1994; Jan 3-4, 1995. Southern Hemisphere Apr 23; May 4-5; Jun 6-11, 27-29; Jul 28-29; Oct 20-23; Nov 17-18; Dec 12-14, 1994.
2. GAW (Global Atmosphere Watch) – early warning system for changes in greenhouse gases, ozone layer, and long range transport of pollutants. (See Explanations.)
3. SOLTIP (Solar connection with Transient Interplanetary Processes). Observing Program 1990-1997: solar-generated phenomena and their propagation throughout the heliosphere. (See Explanations.)
4. FLARES22 (FLare REsearch at solar cycle 22 max). Observing Program 1990-1997: basic physical processes of transient solar activity and its coupling with solar-terrestrial environment. (See Explanations.)
5. Day intervals that IMP 8 satellite is in the solar wind (begin and end days are generally partial days): 27 Dec 1993-4 Jan 1994; 9-17 Jan; 22-29 Jan; 4-11 Feb; 16-23 Feb; 28 Feb-7 Mar; 12-20 Mar; 25 Mar-1 Apr; 6-14 Apr; 19-27 Apr; 2-10 May; 14-22 May; 26 May-3 Jun; 7-15 Jun; 20-28 Jun; 3-10 Jul; 15-23 Jul; 28 Jul-4 Aug; 10-17 Aug; 22-29 Aug; 4-10 Sep; 16-22 Sep; 29 Sep-5 Oct; 11-18 Oct; 24-30 Oct; 5-12 Nov; 18-25 Nov; 1-7 Dec; 14-20 Dec; 26 Dec 1994-1 Jan 1995. Note that there will not necessarily be total IMP 8 data monitoring coverage during these intervals. (Information kindly provided by the WDC-A for Rockets and Satellites, NASA GSFC, Greenbelt, MD 20771 U.S.A.).
6. + Incoherent Scatter Coordinated Observations Days (see Explanations) starting at 1600 UT on the first day of the intervals indicated, and ending at 1800 UT on the last day of the intervals: 11-14 Jan 1994 GISMOS; 8-9 Feb PATCHES; 15-16 Mar SUNDIAL; 12-13 Apr; 3-4 May; 8-9 Jun; 5-6 Jul GISMOS; 10-16 Aug CADITS/MLTCS; 6-7 Sep; 4-5 Oct; 8-9 Nov; 6-7 Dec GISMOS; 23-27 Jan 1995 JOULE
where CADITS= Coupling and Dynamics of the Ionosphere-Thermosphere System;
GISMOS= Global Ionospheric Simultaneous Measurements of Substorms;
JOULE= Joule Heating;
MLTCS= Mesosphere, Lower-Thermosphere Coupling Study;
PATCHES= Polar Cap Patches;
SUNDIAL= Coordinated study of the ionosphere/magnetosphere;

OPERATIONAL EDITION, September 1993

FLARES22 (FLare REsearch at the maximum of solar cycle 22) - observations of basic physical processes of transient solar activity and its coupling with the solar-terrestrial environment, including times of the various solar **ALERTS**. Coordinate satellite and ground-based observations. Contact Dr. M. Machado, Department of Physics, University of Alabama, Huntsville, AL 35899, USA. Phone (1-205) 895-6676, Fax (1-205) 895-6790.

SOLTIP (Solar connection with Transient Interplanetary Processes). 1990-1995 observations and analyses of solar-generated phenomena propagating throughout heliosphere, including times following the various solar **ALERTS**. Includes Interplanetary Scintillation observations of radio galaxies and telemetry signals to/from interplanetary spacecraft; Also coordination of spacecraft IMP-8, ICE, Giotto, Sakigake, Voyager 1/2, Pioneer 10/11, Ulysses, Relict, Wind, SOHO, Galileo, and ACE. Contact Dr. M. Dryer, NOAA R/E/SE, 325 Broadway, Boulder, CO 80303, USA. Phone (1-303) 497-3978, Fax (1-303) 497-3645, SPAN E-mail address SELVAX::MDRYER.

Space Research, Interplanetary Phenomena, Cosmic Rays, Aeronomy - QWDs, RWDs, and Airglow & Aurora Periods.

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

This Calendar for 1994 has been drawn up by H.E. Coffey, of the IUWDS Steering Committee, in association with spokesmen for the various scientific disciplines in SCOSTEP, IAGA and URSI and other ICSU organizations. Similar Calendars are issued annually beginning with the IGY, 1957-58, and are published in various widely available scientific publications.

Published for the International Council of Scientific Unions and with financial assistance of UNESCO.

Additional copies are available upon request from the following persons: the IUWDS Chairman : Dr. R. Thompson, IPS Radio and Space Services, Department of Administrative Services, P.O. Box 1548, West Chatswood, NSW 2057, Australia, Fax (61) 2-414 8331, E-mail richard@ipso.ips.oz.au, or the IUWDS Secretary for World Days : Miss H.E. Coffey, WDC-A for Solar-Terrestrial Physics, NOAA E/GC2, 325 Broadway, Boulder, Colorado 80303, USA, Fax (1-303) 497-6513, E-mail 34367::hc Coffey.

BOOKS PUBLISHED BY MEMBERS OF THE URSI COMMUNITY

Analytical and Numerical Methods in Electromagnetic Wave Theory

edited by M. Hashimoto, M. Idemen and O.A. Tretyakov
572 pages, published by Science House Co., Tokyo, Japan
ISBN 4-915572-54-4 C3055

Chapter 1 : Geometrical optics of guided waves in waveguides : stationary optics for modal waves - by M. Hashimoto

Chapter 2 : Inverse scattering problems connected with cylindrical bodies - by M. Idemen

Chapter 3 : Essentials of non-stationary and non-linear electromagnetic field theory - by O.A. Tretyakov

Chapter 4 : Some diffraction problems involving modified Wiener-Hopf geometries - by K. Kobayashi

Chapter 5 : Some approximate methods related to the diffraction by strips and slits - by A.H. Serbest and A. Büyükaksoy

Chapter 6 : Matrix Wiener-Hopf factorization methods and applications to some diffraction problems- by A. Büyükaksoy and A.H. Serbest

Chapter 7 : Diffraction by an infinite set of parallel half-planes and by an infinite strip grating : comparison of different methods - by E. Lüneburg

Chapter 8 : Wavefront and complex resonance descriptions in time transient EM responses by simple geometries - by H. Shirai

Chapter 9 : Green's function-dual series approach in wave scattering by combined resonant scatterers - by A.I. Nosich

Chapter 10 : Numerical-analytical approach for the solution to the wave scattering by polygonal cylinders and flat strip structures - by E.I. Veliev and V.V. Veremey

Chapter 11 : An introduction to the Yasuura method - by Y. Okuno.

FROM THE ARCHIVES OF URSI

The Bulletins of December 1963 and December 1983 contained only routine information, and a summary of their contents would be of little interest to the reader. The other two Bulletins (published forty and twenty years ago) are more interesting.

Bulletin of December 1953

This issue contains mostly routine reports, but one of these is worth republishing, since it concerns the first meeting of the successful series organized by Commission B under the name "URSI Symposium in Electromagnetic Theory". The meeting was called "Symposium on Microwave Optics", and was held at the McGill University, Montreal, June 22 to 25, 1953.

"A highly successful symposium on Microwave Optics was held at the Eaton Electronics Research Laboratory, McGill University, sponsored by the Eaton Laboratory, the Electronics Research Directorate Air Force Cambridge Research Center (U.S.A.), URSI Commission VI for Canada, and URSI Commission VI for the U.S.A. The Symposium was well attended, including a number of persons from Europe and Algiers, and it proved to be the most stimulating to those in attendance.

The papers which were presented covered a wide range of topics, as can be seen from the title of the sessions : Scattering Theory, Electromagnetic Diffraction, Microwave Optical Systems and Aberrations, Fourier Transforms and Information Theory, Radio Lenses. In general the majority of the papers dealt with various aspects of solving boundary-value problems in which the boundaries involved have dimensions which are not small compared with the wavelengths. Although a good deal of progress was reported at the symposium, it became evident that there are still many difficult problems to be solved.

The Symposium clearly demonstrated the need for greater cooperation between investigators in this field, since it was evident there had been insufficient coordination of the efforts of people working in closely related projects. It is to be hoped that further symposia will be held in the not too distant future."

Bulletin of December 1973

The readers of previous recent Bulletins, e.g. that of September 1993, are aware of the projects of reorganization envisaged by URSI in the early seventies. The Bulletin of December 1973 contains additional information on these projects, namely certain positions defended by Commissions I (the present A), II (about

the present F), V (the present J), VI (about the present B and C) and VII (the present D). Their representatives write the following statement :

- “1. The representatives of URSI Commissions I, II, V, VI and VII met in Brussels on 27 and 28 September 1973 in order to exchange their views on the international reorganization of URSI, which had been recommended by the XVII General Assembly of the Union in 1972. The principal conclusions reached during the discussions are summarized in the present statement, which is to be transmitted to the Board of Officers of URSI.
2. The group reviewed the historical development of URSI, and of its parent International Commission, during the period 1913-1973. It was noted that the central theme of the activities of the Union had always been the scientific aspects of radio communications, including the applications, in other branches of science, of remote sensing by radio methods. However, with the introduction of allied topics such as information theory, transmission in optical fibres, electron devices, etc, URSI had, for good reasons, extended its interests beyond radio communications to certain aspects of the broader subject of communications science.
3. It was agreed
 - 3.1. that the basic objective of URSI should continue to be the stimulation of research in the field of communications and information science, including the applications of radio methods in astronomy, geophysics and other branches of science;
 - 3.2. that the scientific programme of URSI should be reoriented so as to enhance the effort devoted to communications and information science;
 - 3.3. that the necessary modifications in the scientific programmes of the Commissions, and the eventual creation of new Commissions, should result from a gradual, but rapid and controlled, evolution and not from a sudden drastic change;
 - 3.4. that the principles of the Booker-Voge suggestions provide an acceptable basis for a reorientation of the scientific activities of URSI, but that it is premature to consider the need for a change in the title of the Union;
 - 3.5. that there is a continuing need for a group of Commissions dealing with remote sensing and with the interaction of radio waves with various astronomical, biological and geophysical media, and that it does not appear to be desirable at present to cover all these activities within a single Commission on remote sensing.
4. It was noted that most of the topics suggested by Professor Booker, as being appropriate to a Union concerned with communications and information science, could be accommodated within the existing Commissions, pending the evolution of new Commissions when the need for these became apparent.

5. Several recommendations were made with particular reference to the General Assembly in 1975.
 - 5.1. The scientific sessions should place the emphasis on communications and information science.
 - 5.2. Since the field to be covered by Commission VI is already very wide and seems likely to expand, the Commission should consider the need for changes in its structure.
 - 5.3. It is intended to organize three symposia before or during the Assembly on :
 - (a) Remote sensing of the Earth's surface and its application to the needs of the developing countries;
 - (b) Applications of radio methods in the biological sciences;
 - (c) The use of satellites for educational broadcasts.
6. It was agreed that, when it appeared to be consistent with the main objective of URSI, it would be desirable to add new topics to the scientific programme of the Union.

At the present time it would be appropriate :

 - 6.1. to introduce matters relating to acoustic communications systems and to enquire from IUPAP whether there was a need for an inter-Union forum to deal with this subject;
 - 6.2. to consider giving increased attention to the applications of radio methods in biological science (see 5.3);
 - 6.3. To encourage Commission VII in developing further its interest in new electronic devices even when these are not necessarily directly applicable to the work of the other Commissions of URSI but have other implications, for example in communication science;
 - 6.4. to make greater efforts to develop cooperation between Commissions (including the creation of inter-Commission working groups) especially between those Commissions which are concerned with the basic science and those which are interested in its applications in other branches of science;
 - 6.5. to ask the Secretary General to notify the Chairmen of Commissions as soon as possible of the time and the space that will be available in Lima for the scientific sessions;
 - 6.6. to consider the possibility of opening the scientific sessions of the Assembly to participants who are not members of national delegations.
7. The group gave some consideration to the introduction of individuals as members of URSI, in addition to the present Member Committees. It was recommended that no action be taken to introduce individual membership since the advantages which would follow appear to be outweighed by the disadvantages.
8. It was recognized that URSI and other Unions had a common interest in certain branches of science and that, in such cases, it was necessary to encourage joint action and to avoid duplication of effort. It was agreed that

inter-Union Working Groups appeared to provide a satisfactory means of achieving these objectives.

9. It was noted that the Communications Society of the IEEE had made certain suggestions concerning future relations between URSI and the Society. It is recommended that the Board of Officers should give serious attention to these suggestions and that, at the same time, URSI should consider making contacts with other national organizations such as the Popov Society, the Société des Radioélectriciens, etc. which are also interested in communications and information science. It was recommended also that Member Committees should be encouraged to establish closer relations with the appropriate national professional societies.

The report is supplemented by the (most interesting) views of the individual Commissions on the future of URSI (but also on their specific tasks). We quote a few general comments :

On "individual membership"

"The proposal to have individual members in URSI has substantial merit provided that provision is made for an equitable distribution of individual members among the Member Committees of the Union.

It would be desirable to retain the Official Members in each Commission since they serve as very useful points of contact in various aspects of URSI business. Member Committees, as well as the Chairmen and Vice-Chairmen of Commission, should be able to propose individual members of Commissions. Not more than a small proportion of the members should come from any one country."

On the "splitting" of Commission VI, Chairman Siegel wrote :

"At the 1975 General Assembly in Peru, I plan to have a discussion on the possible splitting up of Commission VI into several Commissions. Among other recommendations, I will recommend that Information Theory be a separate Commission.

I would hope, at the end of the second Business Meeting of Commission VI, that VI will vote on splitting itself up into more than one Commission and that it will be in the form of a recommendation to the Board of Officers, hopefully for them to act on at their last Business Meeting in Lima.

Depending on the results in forming a new Commission, I would hope that at the following General Assembly, there would be a further splitting."

The difficult birth of our Commission K is illustrated by the following - rather negative - comment on "Radiobiology"

"URSI should include radiobiology in its programme, but there should not be a separate Commission for this subject. Many experimenters in radiobiology have biological or medical backgrounds ; they need the strong support of radio people

and they should be immersed in the Commissions rather than isolated in a separate Commission.

It would probably be preferable for one Commission to focus strongly on biological effects of electromagnetic radiation and related matters. Commission I has already been active in this field, has contacts with bio-medical people and seems to provide a logical forum for radiobiology. When appropriate, joint activities with other interested Commissions could be organized."

On the other hand, the issue contains a provisional time table of the 1975 Lima General Assembly, in which we read that an Open Symposium on "Applications of radio methods in the biological science" will be organized. In addition, the December 1973 Bulletin reports on a meeting on "Biological effects and the health hazard of microwave radiation". Thus,

"A Symposium on the above subject was held in Warsaw in September 1973 with the cooperation of URSI. It was attended by 64 participants from 14 countries and 40 papers were presented. The objective was to facilitate the exchange and evaluation of information about the dangers of microwave radiation, and to focus attention on those areas in which there is a need for additional information or for the development of new approaches."

It was recognized that it would be desirable to stimulate further international cooperation on the exchange of information, by various means, and to establish internationally recognized definitions and nomenclature applicable to the measurement techniques involved.

The World Health Organization (WHO) already coordinates work on ionizing radiation through the International Committee on Radiation Protection (ICRP) and the International Commission on Radiological Units (ICRU). It is not yet clear whether these bodies could deal also with non-ionizing radiation, or whether it would be preferable to set up a separate body having necessary specialist knowledge of electromagnetic radiation and relation and related matters. It seems probable that URSI Committee I could give valuable assistance to the body which will ultimately be responsible for this work.

In the discussions at the Symposium, a distinction was made between :

- (a) high intensity radiation capable of causing thermal effects (10-100 mW/cm³);
- (b) intermediate intensities causing weak thermal effects and some direct effects 1-20 mW/cm³);
- (c) low intensities which are unlikely to cause thermal effects (less than 1 mW/cm³);

Within each intensity level there is a need for a better understanding of many questions such as cumulative and delayed effects, sensitivity as a function of the

kind of system and its stage of development, effects related to cellular transformations, etc.

It is understood that the organizers intend later to publish the main conclusions of the Symposium. The information given above was kindly provided by Dr. Peter Weissglas of the Microwave Institute Foundation in Stockholm.

REPORT ON THE WORK OF THE DRAFTING COMMITTEE

The Drafting Committee was established by the URSI Council in Kyoto with the following membership : Professor L.W. Barclay, Dr. P. Bauer, Professor A.D. Olver, Professor J. Van Bladel.

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

Members of the Drafting Committee met in Brussels on 14 December 1993 (P. Bauer and J. Van Bladel), and in London on 22 December 1993 (L.W. Barclay, A.D. Olver and J. Van Bladel). They agreed on the French and English texts of the resolutions and recommendations adopted during the XXIV General Assembly. These texts will be published in the December 1993 issue of the URSI Information Bulletin and in Volume XXIII of the Proceedings of URSI General Assemblies.

The Committee noted that there are considerable variations in the style of the Terms of Reference for Commissions. It recommends that possible improvements in the presentation be discussed ahead of the 1996 General Assembly, for example at the 1995 meeting of the Coordinating Committee.

RESOLUTIONS AND RECOMMENDATIONS OF THE COUNCIL

U.1. URSI Scientific Commissions

The URSI Council,

noting

1. that, according to Resolution C.1 (Lima, 1975), the topics covered by the Commissions should be reviewed at each General Assembly;
2. that Commissions A, B, C, D, E, F and J do not feel it necessary to modify their terms of reference as stated in the Annex to Resolutions U.1 (Prague, 1990);
3. that Commissions G and H have requested small modifications to their terms of reference by the addition of two words (Commission G) or a comma (Commission H);
4. that there existed only a temporary version of the title and terms of reference of Commission K.

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

Annex

1. *Commission A* - Electromagnetic Metrology, Electromagnetic measurements and standards.
The Commission promotes research and developments in :
 - (a) Measurements and standards in time and frequency, including infrared and optical frequencies;
 - (b) Measurements in the time domain;
 - (c) Measurements in the frequency domain;
 - (d) Measurements in telecommunications;
 - (e) Measurements using lasers;
 - (f) Quantum metrology and electrical methods in fundamental constants;
 - (g) Measurements and standards from microwaves to sub-millimetre waves.
2. *Commission B* - Fields and Waves, Electromagnetic theory and practice, including antennas and waveguides.
The interest of Commission B is fields and waves, encompassing theory, analysis, computation, experiments, and validation. Areas of emphasis are :
 - (a) Time-domain phenomena;
 - (b) Scattering and diffraction;

- (c) Propagation and wave guiding;
- (d) Radiation and antennas;
- (e) Inverse scattering.

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

3. *Commission C - Signals and Systems.*

The Commission promotes research and development in :

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

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

4. *Commission D - Electronics and Photonics.*

The Commission promotes research and reviews new development in :

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

with particular reference to radio science and telecommunications.

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

5. *Commission E - Electromagnetic Noise and Interference.*

The Commission promotes research and development in :

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

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

6. *Commission F - Wave Propagation and Remote Sensing* (including radio-meteorology, radio-oceanography and remote sensing of non-ionized media).

The Commission encourages :

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

7. *Commission G - Ionospheric Radio and Propagation* (including ionospheric communications and remote sensing of ionized media).

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

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

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

8. *Commission H - Waves in Plasmas* (including space and laboratory plasmas).

The goals of the Commission are :

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

- (b) To encourage the application of the results of these studies, particularly in the areas of solar/planetary plasma interactions, and the increased exploitation of space as a research laboratory.
9. *Commission J - Radio Astronomy* (including remote sensing of celestial objects).
- (a) The activities of the Commission are concerned with observation and interpretation of all radio emissions and reflections from celestial objects.
 - (b) Emphasis is placed on :
 - (i) the promotion of technical means for making radio-astronomical observations and data analysis,
 - (ii) support of activities to protect radio-astronomical observations from harmful interference.
10. *Commission K - ELECTROMAGNETICS IN BIOLOGY AND MEDICINE*
- The Commission is charged with promoting research and development in the following domains :
- (a) physical interactions of electromagnetic fields with biological systems;
 - (b) biological effects of electromagnetic fields;
 - (c) interaction mechanisms;
 - (d) human exposure assessment;
 - (e) experimental exposure systems;
 - (f) medical applications.
- The Commission emphasizes its interdisciplinary character and fosters research co-operation among various disciplines.

U.2. Admission of New Members

The URSI Council,

having considered the applications for full membership submitted by the following scientific institutions :

1. the Academy of Sciences of Russia;
2. the Academy of Sciences of the Ukraine;
3. the Academy of Sciences of Uzbekistan;
4. the Korean Advanced Institute of Science and Technology;
5. the Scientific and Technical Research Council of Turkey;

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

U.3. Admission of New Associate Members

The URSI Council,

having considered the applications for associate membership submitted by the following scientific institutions :

1. the Academy of Sciences of Chile;
2. the Academy of Sciences of Belarus;
3. the Academy of Sciences of Kazakhstan;

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

U.4. Confirmation of an Associate Status

The URSI Council,

having noted the continued interest in radio science within Peru;

resolves to continue the associate membership of the URSI Committee in Peru.

U.5. Network of Correspondents

The URSI Council,

noting the recommendations of the URSI Standing Committee on Membership;

resolves to modify items (i) to (v) of Resolution U.7 of the XXIII General Assembly, which concerns the Network of Correspondents :

- (i) any scientist attending a General Assembly or an URSI Symposium will become a Correspondent for the three-year period following the Assembly, the cost financed by a special fee included in the registration fee;
- (ii) other scientists may seek inclusion in the Network of Correspondents for the same three-year period by applying directly to the URSI Secretariat and paying the special fee;
- (iii) the Board may decide to waive the special fee for a scientist in (ii) who requests this dispensation;
- (iv) Correspondents will be issued a numbered card allowing reduced registration fees at certain URSI-sponsored symposia and conferences, and will receive the Radioscientist-Bulletin;
- (v) Correspondents will have no voting rights, but will be allowed to express their views in the Commissions on matters of a scientific nature.

U.6. Standing Committee on URSI Membership

The URSI Council,

having considered the recommendations contained in the report of the Standing Committee on URSI Membership, and in particular the analysis devoted to the need to increase contacts with individual members of the URSI community;

resolves

1. to approve the recommendations of the Standing Committee on URSI Membership (see also resolution U.5);
2. to appoint the following as members of the Standing Committee on URSI Membership for the next triennium :
Chair : T.B.A. Senior (USA)
Members : F. Fedi (Italy)
 V.N. Gubankov (Russia)
 Y.N. Huang (China, SRS)
 S. Okamura (Japan)
 M. Petit (France)

U.7. URSI Finances and Membership of the Standing Finance Committee

The URSI Council,

having considered the recommendations contained in the Report of the Standing Finance Committee, dated 30 August 1993;

resolves

1. to accept the recommendations of the Standing Finance Committee;
2. to approve the audited accounts of the Union for the years ending 31 December 1990, 1991 and 1992;
3. to publish the Report of the Treasurer and the Report of the Standing Finance Committee in Volume XXIII of the Proceedings of URSI General Assemblies;
4. to place on record its appreciation of the outstanding services rendered to the Union by Dr. P. Bauer in his capacity as Treasurer;
5. to appoint the following as members of the Standing Finance Committee for the next triennium :
Chair : K. Géher (Hungary)
Members : J.G. Lucas (Australia)
 S.M. Radicella (Argentina)
 F.W. Sluijter (Netherlands)
 K. Suchy (Germany)
 S.S. Swords (Ireland)
 W.W.L. Taylor (USA)

U.8. URSI Publications and Membership of the Standing Publications Committee

The URSI Council,

having considered the remarks and recommendations contained in the Report of the Standing Publications Committee, dated 27 August 1993;

resolves

1. to approve the recommendations of the Standing Publications Committee;
2. to publish the Report of the Standing Publications Committee in Volume XXIII of the Proceedings of URSI General Assemblies;
3. to appoint the following as members of the Standing Publications Committee for the next triennium :
Co-Chairs : R.L. Dowden (New Zealand) and W.R. Stone (USA)
Members : P.J.B. Clarricoats (U.K.)
 K. Géher (Hungary)
 P. Lagasse (Belgium)
 H. Matsumoto (Japan)

U.9. Standing Committee on Developing Countries

The URSI Council,

having considered

1. the report of the Standing Committee on Developing Countries for the 1990-3 triennium;
2. the proposals for future activities of the Committee;

resolves

1. to approve the report and the proposals of the Standing Committee on Developing Countries;
2. to appoint the following as members of the Standing Committee on Developing Countries for the next triennium :
Chair : B.M. Reddy (India)
Secretary : S.M. Radicella (Argentina)
Members : G.O. Ajayi (Nigeria)
 P. Chooncharoen (Thailand)
 S. Feng (China, CIE)
 I. Kimura (Japan)
 M.S. Pontes (Brazil)
 I.A. Salem (Egypt)
 R.W. Stone (USA)
 J. Van Bladel (Belgium)
 J. Voge (France)

U.10. Standing Committee on Future General Assemblies

The URSI Council,

considering

1. that the optimal length of the scientific programme of a General Assembly has been discussed extensively in Council, but only in a preliminary way;
2. that the optimal period of the year in which to hold a General Assembly is a function, not only of local needs, but also of more general factors, such as conflicts with existing events;
3. that the choice of the venue of a General Assembly three years in advance (the present system) might discourage certain Member Committees from offering venues, because they need a longer preparation time;

resolves

1. to ask the Standing Committee on Future General Assemblies to make recommendations concerning the points referred to above;
2. to appoint the following as members of the Standing Committee on Future General Assemblies for the next triennium :

Chair : T. Okoshi (Japan)
Members : V. Fiala (Czechoslovakia)
 J.W. Klein (Germany)
 I.A. Salem (Egypt)
 A.M. Scheggi (Italy)
 J. Shapira (Israel)

U.11. Standing Committee on Young Scientists

The URSI Council,

having considered the recommendations contained in the report of the Standing Committee on Young Scientists;

resolves

1. to approve the report and the recommendations of the Standing Committee on Young Scientists;
2. to appoint the following as members of the Standing Committee on Young Scientists;

Chair : S. Feng (China, CIE)
Members : D. Gjessing (Norway)
 E.V. Jull (Canada)
 A.P. Mitra (India)
 T. Okoshi (Japan)
 G. Pillet (France)
 B. Shishkov (Bulgaria)
 J. Van Bladel (Belgium)

L. Zombory (Hungary)

U.12. Long Range Planning Committee (Committee on the Future of URSI)

The URSI Council,

having considered the report of the meeting of the Long Range Planning Committee held on 25 August 1993;

resolves :

1. to approve the report and the proposals of the Long Range Planning Committee;
2. to appoint the following as members of the Long Range Planning Committee for the next triennium :

Chair : J.B. Andersen (Denmark)

Members : P. Bauer (France)

R. Ekers (Australia)

Y. Furuhashi (Japan)

W.E. Gordon (USA)

E.V. Jull (Canada)

V. Khaikin (Russia)

J.G. Lucas (Australia)

J. Shapira (Israel)

M.A. Stuchly (Canada)

Secretary : P. Lagasse (Belgium)

U.13. Inter-Commission Working Group on Scientific Uses of the “Global Positioning System” (GPS)

The URSI Council,

considering

1. the importance of using space- and ground-based observations of GPS signals to monitor the global environment of the atmosphere;
2. the use which future spaceborne observations of the temperatures of the lower atmosphere and the electron densities of the ionosphere will make of this technique;

resolves to establish an Inter-commission Working Group on the Scientific Uses of GPS Signals.

U.14. Inter-Commission Working Group on Time Domain Waveform Measurements

The URSI Council,

having considered the report of the meeting of the Working Group on Time Domain Waveform Measurements held on 27 August 1993, and the recommendations made therein;

resolves

1. to extend the mandate of the Inter-Commission Working Group on Time Domain Waveform Measurements by another three years;
2. to re-appoint Dr. T.K. Sarkar as Chair of the Working Group.

U.15. Inter-Commission Working Group on the Middle Atmosphere

The URSI Council,

recognizing the importance of studies of the middle atmosphere for understanding the global change problems;

noting

1. that proven techniques exist for applying electromagnetic waves to investigate (i) the physics and chemistry of the middle atmosphere (ii) the coupling of the middle atmosphere to regions above and below;
2. that these topics are included in the terms of reference of both Commissions F and G;

resolves to establish an Inter-commission Working Group on the Middle Atmosphere, with the following terms of reference :

1. to coordinate within URSI and with other ICSU bodies the relevant activities for studies of the middle atmosphere;
2. to stimulate research for understanding both the dynamic processes in the middle atmosphere and the climatology of these regions, and to cover, for instance, the development and application of
 - (i) MST and related radar and radio techniques,
 - (ii) lidar and related optical techniques, and
 - (iii) satellite-borne and ground-based passive remote sensing techniques.

U.16. Committee on the International Geosphere-Biosphere Programme (IGBP)

The URSI Council,

noting

1. the numerous activities of the various Committees of the IGBP;
2. the difficulties of interfacing with these activities, but also the need to keep contact with the Programme;

resolves to re-appoint a Committee on the IGBP for the next triennium, formed as follows :

Chair : K. Raney (Canada)
Members : J.P.V. Baptista (Italy)
P. Bauer (France)
S. Fukao (Japan)
H. Hallikainen (Finland)
H. Rishbeth (UK)
P.A. Watson (UK)

U.17. Ad hoc Group on Environmental Consequences of Nuclear War

The URSI Council,

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

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

Chair : M. Wik (Sweden)
Members : W. Graf (U.S.A.)
D. Hansen (Switzerland)
J. Shiloh (Israel).

U.18. Inter-Union Commission on Frequency Allocation to Radio Astronomy and Space Science (IUCAF)

The URSI Council,

considering

1. the report of the meeting held by the IUCAF delegation on 27 August 1993;
2. the efficiency with which IUCAF defended the interests of the scientific community during the 1992 World Administrative Radio Conference (WARC), and the need for continuous vigilance in the struggle to keep parts of the radio spectrum free for scientific observations;

resolves

1. to approve the report and the recommendations contained therein;
2. to continue URSI's financial support of the activities of IUCAF;
3. to appoint the following as URSI members of the Commission :
W.A. Baan (USA)
R.J. Cohen (UK)
H.C. Kahlmann (Netherlands)
B.J. Robinson (Australia)
4. to replace, for the sake of continuity, B.J. Robinson by J. Whiteoak (Australia) as member of IUCAF if, as expected, B.J. Robinson retires from IUCAF before the next General Assembly.

U.19. Inter-Union Working Group on Adverse Environmental Impacts on Astronomy

The URSI Council,

noting

1. the need to maintain optimal conditions under which scientific space and astronomical research may be carried out;
2. the dangers represented by increasing electromagnetic interference, increasing amounts of space debris and, more recently, plans to start “advertising in space”;

resolves

1. to approve participation of URSI in the Inter-Union Working Group on Adverse Environmental Impacts on Astronomy;
2. to propose R.D. Parlow (USA, Commission E) and J. Cohen (UK, Commission J) as Members of the Working Group.

U.20. Use of the Frequency Spectrum

The URSI Council,

urges the ITU and affiliated national and regional administrations :

1. to recognize that the electromagnetic spectrum is a unique and limited natural resource, and;
2. to allocate spectrum only to those services which must use free-space propagation, and;
3. to avoid allocating spectrum in cases where other technologies, such as guided-waves, could be used.

U.21. On Free Access to Environmental Data

The URSI Council,

noting the idea growing in some quarters of considering environmental data as a market commodity;

recognizing that such consideration could be acceptable when data are to be used for a commercial purpose;

urges agencies that archive this data to warrant the access to environmental information for scientific purpose free of charge, or at marginal cost.

U.22. Importance of the Terrestrial Ionosphere/Magnetosphere System as a Plasma Laboratory

The URSI Council,

considering

1. that the terrestrial ionosphere/magnetosphere system is the most readily accessible space plasma for cost-effective in situ and remote investigation;
2. that many processes operating in this system have similar counterparts elsewhere in astrophysical plasmas;
3. that there are basic questions in plasma physics that can be better addressed in the natural plasma laboratory provided by this system than in ground-based laboratories;

resolves that the attention of national administrations be drawn to the importance of conducting controlled active experiments - both in situ and remote - in the ionosphere/magnetosphere system, with the purpose of investigating basic problems in plasma physics as well as processes giving rise to naturally occurring space phenomena.

U.23. Importance of Electromagnetic Effects Associated With Earthquakes and Volcanic Eruptions

The URSI Council,

considering

1. that various experiments from ground and space have indicated the appearance of electromagnetic (EM) emissions, plasma disturbances and other effects before, during and after earthquakes and volcanic eruptions;
2. that a physical understanding of these natural electromagnetic processes is important for possible future applications relevant to the public domain;
3. that theoretical analyses of these effects allow multi-disciplinary approaches to investigate various underground wave-generation processes, and wave propagation through stratified random media, nonlinear wave amplification, and wave steepening and dissipation in ionospheric and magnetospheric plasmas;

resolves that the attention of appropriate national scientific organizations be drawn to the importance of both ground-based and space research in this area, including the retrospective analysis of available space plasma data banks to improve EM signature identification.

U.24 .Importance of Preserving Old Geophysical Data Sets and Transforming Them to Digital Formats

The URSI Council,

considering

1. the importance of extensive continuous data sets for investigating long term trends and variations of ionospheric/magnetospheric parameters;
2. the inability to reproduce such existing data sets;

3. the imminent danger of losing some of these data sets through deterioration and/or disposal;

resolves that the attention of national administrations be drawn to the importance of preserving these data sets and transforming them into modern digital formats that will be more amenable to analysis.

U.25. XXV General Assembly

The URSI Council,

having considered the invitations for the XXV General Assembly which had been submitted by the URSI Member Committees in China (Beijing), in Egypt and in France;

resolves

1. to accept the invitation of the French URSI Committee to hold the XXV General Assembly in Lille from 28 August to 5 September 1996;
2. to record its thanks to the Member Committees in China (Beijing) and in Egypt for their invitations.

U.26. UNESCO and ICSU Subventions

The URSI Council,

considering

1. that an important part of the activities of URSI consists in the organization of international scientific symposia and other meetings, in the issuing of publications, and in its Young Scientist Programme;
2. that the subventions from UNESCO and from ICSU are used to cover part of the cost of these activities;

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

U.27. Vote of Thanks to the Japanese URSI Committee

The URSI Council,

resolves unanimously to record its warm appreciation of the invitation extended to it by the Japanese URSI Committee to hold the XXIV General Assembly in Kyoto. The generous hospitality and the excellence of the facilities provided by the Local Organizing Committee, coupled to a faultless administrative collaboration, made a deep impression on the participants. A special word of appreciation is offered to the Japanese hosts for a most enjoyable and successful programme of social events and for their welcome to the persons accompanying the participants in the Assembly.

RESOLUTIONS AND RECOMMENDATIONS OF COMMISSIONS

These resolutions and recommendations have been approved by the URSI Council at its 3 September 1993 meeting.

COMMISSION A - ELECTROMAGNETIC METROLOGY

A.1. Conference on Precision Electromagnetic Measurements (CPEM)

Commission A,

considering the revised charter for CPEM and

agreeing that the new terms are satisfactory;

recommends that URSI continue to sponsor the international Conference on Precision Electromagnetic Measurements .

A.2. Dates of Meetings

Commission A,

considering

1. the close affinity of interest between Commission A and the Conference on Precision Electromagnetic Measurements (CPEM);
2. the coincidence in 1996 of the 25th General Assembly of URSI in Lille (France) and the meeting of CPEM in Braunschweig (Germany);

recommends that the respective organizing bodies for the two meetings attempt to align the dates so that one meeting follows immediately after the other meeting.

A.3. The kilogram in the SI

Commission A,

considering

1. that the kilogram is a base unit in the SI realized by a material standard - the international prototype;
2. that it is desirable to monitor (and possibly later to define) the kilogram in terms of fundamental constants;

recommends that appropriate laboratories intensify work leading to the realization of methods which will link the kilogram to selected fundamental constants.

A.4. Optical Frequency Generation and Measurement

Commission A,

considering

1. the general trend to move to optical frequencies;
2. the interest of both research scientists and communications engineers in applying coherent detection techniques requiring frequency synthesis;
3. the availability of suitable devices and components;

recommends

1. that studies and experiments should be performed with a view toward developing coherent and tuneable sources;
2. that studies should be pursued leading to the realization of optical frequency counters;
3. that finely tuneable and stable sources should be developed to meet the needs of spectroscopic research.

A.5. Accurate Electromagnetic Field Measurements

Commission A,

considering

1. the growing public interest in the effects of electromagnetic fields on biological systems;
2. the difficulties in accurately measuring field strength in the course of studying these effects, especially in the vicinity of antennas;
3. the effect of field distortions by the biological system and by the measurement system itself;

expresses the opinion

1. that methods for accurate field strength measurements under well-defined conditions should be developed;
2. that effective models for the electromagnetic field distribution in the vicinity of radiating structures and within biological systems near these radiators should be developed;
3. that this work will hopefully assist the studies in Commission K of exposure and dosimetry standards.

COMMISSION D - ELECTRONICS AND PHOTONICS

D.1. Symposia at the 1996 General Assembly

Commission D,

noting the multi-disciplinary character of Commission D within URSI;

intends to increase the number of joint sessions with other Commissions.

D.2. Bibliographic disk produced in conjunction with the Review of Radio Science

Commission D,

considering

1. that the intended readership of the bibliographic disk is not clearly defined;
2. that Commission D covers areas of extremely wide technical and scientific endeavour;
3. that these areas are advancing extremely rapidly;
4. that there exist other easily accessible reference sources ;

resolves not to participate in the compilation of references for the next bibliographic disk.

D.3. Sponsorship of International Conferences

Commission D,

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

- URSI International Symposium on Signals, Systems and Electronics (ISSSE'95), San Francisco, 25-27 October 1995, organized jointly by Commissions C and D;
- European Conferences on Optical Communication (ECOC), in 1994, 1995 and 1996;
- European Microwave Conferences in 1994, 1995 and 1996;
- Asia Pacific Microwave Conference (APMC) in 1994, 1995 and 1996;
- 22nd International Symposium on Compound Semiconductors in 1995.

COMMISSION E - ELECTROMAGNETIC NOISE AND INTERFERENCE

E.1. Working Groups

Commission E,

considering the reports submitted by its various Working Groups;

resolves

1. to establish, with Commissions G and H, a Joint Working Group EGH.1 entitled "Electromagnetic Effects Associated with Seismic Activity", with Professor T. Yoshino (Japan) as Co-Chair for Commission E;
2. to maintain the previous Working Groups of Commission E, i.e. :
 - E.1. Spectrum Management and Utilization
Chair : R.D. Parlow (USA);
 - E.2. Non-Gaussian Noise in Communication
Chair : A.D. Spaulding (USA);
 - E.3. High Power Electromagnetics
Chair : R.L. Gardner (USA);
 - E.4. Terrestrial and Planetary Electromagnetic Noise
Chair : Z. Kawasaki (Japan);
 - E.5. Interaction with and Protection of Complex Electrical Systems
Co-Chairs : C. Baum (USA), P. Degauque (France) and M. Ianoz (Switzerland);
 - E.6. Effects of Transients on Equipment
Co-Chairs : V. Scuka (Sweden), and B. Demoulin (France);
 - E.7. Extra-Terrestrial and Terrestrial Meteorologic-Electric Environment
Chair : H. Kikuchi (Japan).

E.2. Symposia

Commission E,

considering the proposals of symposia for the next triennial period,

resolves

1. to support, in mode A, the following conferences :
 - International Symposium on Electromagnetic Environment and Consequences (EUROEM), Bordeaux, France, 1994;
 - International Symposium on Electromagnetic Compatibility, Sendai, Japan, 1994;
2. to support, in mode B, the following conferences :

- Colloque international et exposition sur la compatibilité électromagnétique, Toulouse, France, 1994;
- International Wroclaw Symposium on Electromagnetic Compatibility, Wroclaw, Poland, 1994;
- International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility, Zurich, Switzerland, 1995;
- International Wroclaw Symposium and Exhibition on Electromagnetic Compatibility, Wroclaw, Poland, 1996.

COMMISSION G - IONOSPHERIC RADIO AND PROPAGATION

G.1. Working Groups

Commission G,

resolves to maintain the following Working Groups :

- G.1. Ionosonde Network Advisory Group (INAG)
Chair : P.J. Wilkinson (Australia)
Secretary : R. Conkright (USA);
- G.2. Studies of the Ionosphere Using Beacon Satellites
Chair : R. Leitinger (Austria)
Vice-Chairs : J.A. Klobuchar (USA), T.R. Tyagi (India);
- G.3. Incoherent Scatter
Chair : J.M. Holt (USA)
Vice-Chair : P.J.S. Williams (UK);
- G.4. Ionospheric Informatics
Chair : D. Anderson (USA)
Vice-Chair : R. Hanbaba (France).

G.2. Joint Working Groups

Commission G,

resolves to maintain the following Joint Working Groups :

GH.1 on Active Experiments in Plasmas, with Sa. Basu (USA) as Commission G representative;

GH.2 on Computer Experiments, Simulation and Analysis of Wave Plasma Processes, with H. Thiemann (Germany) as Commission G representative;

CGH.1 on Wave and Turbulence Analysis, with A.W. Wernik (Poland) as Co-Chair for Commission G;

Inter-Union (URSI/IAGA) Working Group 1 on “VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM)”, with U. Inan (USA) as URSI Co-Chair;

recommends to establish, with Commissions E and H, a Joint Working Group EGH.1 entitled “Electromagnetic Effects Associated with Seismic Activity”. The Co-Chair for Commission G will be appointed later.

G.3. Low Frequency (LF) Wind Measurements

Commission G,

considering

1. that there is an essential requirement for long-term observations of the Earth's atmosphere with a view toward investigating trends in global change which could most sensitively be recognized by the observation of upper atmosphere parameters;
2. that the inexpensive LF wind measurements made at oblique incidence are of eminent importance for continuous monitoring of the ionosphere, the upper atmosphere and the lower thermosphere;
3. that those measurements, in combination with reflection height measurements using the modulation spectrum of the transmissions, could allow calculation of the vertical profiles of the wind field parameters;

recommends that LF wind measurements be made within 150 to 400 km of LF broadcasting stations.

G.4. Bulletin of the Ionosonde Network Advisory Group (INAG)

Commission G,

recognizing the important role of the "INAG Bulletin" in maintaining the world network of ionospheric sounding stations and the quality of the data acquired by the network;

expresses its thanks to the Australian Department of the Arts and Administrative Services for the support it provides, through the Radio and Space components of the Ionospheric Prediction Services (IPS), for the production of this Bulletin.

recommends to the Council that URSI continue to support financially the publication of the Bulletin for the next three years.

G.5. Mesosphere-Stratosphere-Troposphere (MST) Radar in the Equatorial Region

Commission G

considering

1. the importance of studying the middle atmosphere as evidenced by the formation of an inter-commission working group on the subject (see resolution U.15);
2. the presence of a chain of ST radars in the equatorial region in the Pacific sector;

recommends that a high-sensitive Incoherent Scatter/MST radar be established in the equatorial region of South-East Asia to provide an anchor for this chain of radars.

G.6. Sponsorship of Symposia 1993-1996

Commission G,

recommends sponsorship by URSI of the following Symposia during 1993-1996 in Mode A or Mode B, subject to receipt of proper requests from the organizers :

- (With Commission H) Electromagnetic Scattering from Gases and Plasmas, Aussois, France, 20-25 March 1994;
- (With Commission H) Eighth International Symposium on Solar Terrestrial Physics. Dedicated to Solar Terrestrial Energy Program (STEP), Sendai, Japan, 5-10 June 1994 (Mode B) (H. Oya);
- (With Commission H) Suzdal Symposium on the Modification of the Ionosphere by Powerful Radio Waves, Uppsala, Sweden, September or October, 1994 (Mode B) (B. Thide);
- (With Commission H) STEP/GAPS (Solar Terrestrial Energy Program/Global Atmospheric and Plasma Structure) Workshop on Theory and Observations of Nonlinear Processes in the Near-Earth Space Environment, Warsaw, Poland, Spring, 1995, (Mode B) (A. W. Wernik [G], Su. Basu [G] and F. Lefeuvre [H]);
- International Reference Ionosphere (IRI) Workshop, Trieste, Italy, October 1993;
- Beacon Satellite Symposium, Aberystwyth, U.K., July 1994;
- Incoherent Scatter Workshop, Ukraine, 1995;
- COMMSPHERE 94, Eilat, Israel, December 1994;
- MST Radar Workshop, USA;
- MST Radar School, India;
- IIWG Workshop, 1994;
- Equatorial Aeronomy Symposium, Japan, 1995.

Addendum

Commission G also made recommendations leading to the creation of

1. the Inter-Commission Working Group on the Middle Atmosphere (see resolution U.15). S. Fukao (Japan) will be the Co-Chair for Commission G;
2. the Inter-Commission Working Group on Scientific Uses of the Global Positioning System (see resolution U.13). P. Høeg (Denmark) will be the representative of Commission G.

COMMISSION H - WAVES IN PLASMAS

H.1. Working Groups

Commission H,

considering the reports submitted by its various Working Groups,

resolves

1. to continue the Inter-Union (URSI/IAGA) Working Group 1 VLF/ELF Remote Sensing of the Ionosphere and Magnetosphere (VERSIM), with U.S. Inan (U.S.A.) as Co-Chair for Commission H;
2. to continue, with Commissions C and G, the Joint Working Group CGH.1 on "Wave and Turbulence Analysis", with F. Lefeuvre (France) as Co-Chair for Commission H;
3. to continue, with Commission G, the Joint Working Group GH.1 on "Active Experiments in Plasmas", with P. Bernhardt (USA) as Co-Chair for Commission H;
4. to continue, with Commission G, the Joint Working Group GH.2 on "Computer Experiments, Simulation and Analysis of Wave Plasma Processes", with H. Matsumoto (Japan) as Co-Chair for Commission H;
5. to establish, with Commissions E and G, a Joint Working Group EGH.1 on "Electromagnetic Effects Associated with Seismic Activity", with M. Parrot (France) as Co-Chair for Commission H.

H.2. Sponsorship of Symposia and Meetings

Commission H,

recommends the sponsorship by URSI of the following meetings during 1993-1996 in Mode A or Mode B, subject to receipt of proper requests from organizers:

- (With Commission G) Electromagnetic Scattering from Gases and Plasmas, Aussois, France, 20-25 March 1994 (Mode B);

- (With Commission G) Eighth International Symposium on Solar Terrestrial Physics Dedicated to Solar Terrestrial Energy Program (STEP), Sendai, Japan, 5-10 June 1994 (Mode B) (H. Oya);
- (With Commission G) Suzdal Symposium on the Modification of the Ionosphere by Powerful Radio Waves, Uppsala, Sweden, September or October, 1994 (Mode B) (B. Thide);
- (With Commission G) STEP/GAPS (Solar Terrestrial Energy Program/Global Atmospheric and Plasma Structure) Workshop on Theory and Observations of Nonlinear Processes in the Near-Earth Space Environment, Warsaw, Poland, Spring, 1995, (Mode B) (A. W. Wernik [G], Su. Basu [G] and F. Lefeuvre [H]);
- 22nd International Conference on Phenomena in Ionized Gases (ICPIG), tentatively in College Park, Maryland, USA (Summer 1995) (Mode B) (K. Suchy);
- 5th International School for Space Simulations (ISSS-5) to be held in 1995 (Mode B) (C. Dum [Germany], M. Ashour-Abdalla [USA] and H. Matsumoto [Japan]).

COMMISSION J - RADIO ASTRONOMY

J.1. Millimetre - Submillimetre Array Working Group

Commission J,

considering

1. that the time has come for millimetre / submillimetre astronomy to consider the next generation telescope, which will require high angular resolution and an order of magnitude increase in sensitivity over present day telescopes;
2. that such a telescope will be very expensive and will demand international collaboration;

recommends that URSI should establish a Working Group on the "Large Millimetre / Submillimetre Array", with the following terms of reference :

1. To study the main scientific objective for the beginning of the next century;
2. To coordinate and evaluate the "radio-seeing" data for site evaluation and observation strategy;
3. To study new designs for telescopes and instrumentation;
4. To investigate potential international partnerships.

J.2. Large Telescope Working Group

Commission J,

considering

1. the strong scientific case for a new, internationally accessible radio telescope with one to two orders of magnitude greater sensitivity than that of any existing or planned facility;
2. the need for innovative technical developments to realize such a facility at an affordable price;
3. the likely need for international collaboration to allow realization of this facility;

resolves to establish a Working Group with the following terms of reference :

1. to explore the range of scientific problems to be addressed by the instrument;
2. to discuss the technical specifications and general design considerations needed to maximize the scientific return of such a facility;
3. to identify and, in so far as possible, solve the major technical challenges to realization of an affordable radio telescope with the required sensitivity.

COMMISSION K - ELECTROMAGNETICS IN BIOLOGY AND MEDICINE

K.1. Wireless Communication

Commission K,

considering

1. that there is a rapid development of new technologies such as wireless local area networks (LAN's), cellular phones, low earth orbiting satellite communication networks (LEO's, e.g. Iridium), personal communication services (PCS), cordless telephones, etc... and that their wide spread is anticipated;
2. that there exists scientific uncertainty about potential impact on human health of electromagnetic fields from wireless communication;
3. that there is public concern about health effects of all electromagnetic systems;

recommends that broadbased research programmes should be established nationally and internationally to address the following key questions :

1. what are the interaction mechanisms, with living systems, of weak electromagnetic fields of various characteristics;
2. what biological effects - and particularly potentially harmful effects - are caused, and under what exposure conditions;
3. how to evaluate the exposures through proper measurements and dosimetric modelling.

The Commission gratefully acknowledges the promised support of Commission A in the area of the measurements, and of Commission B in the area of the dosimetric modelling.

RESOLUTIONS ET RECOMMANDATIONS DU CONSEIL

U.1. Les Commissions scientifiques de l'URSI

Le Conseil de l'URSI,

notant

1. qu'aux termes de la Résolution C.1 (Lima, 1975), les Commissions sont tenues de réexaminer leurs sujets d'étude à l'occasion de chaque Assemblée générale;
2. que les Commissions A, B, C, D, E, F, H et J n'estiment pas nécessaire de modifier leurs mandats tels qu'ils figurent à l'annexe de la Résolution U.1 (Prague, 1990);
3. que la Commission G désire modifier son mandat par l'addition de deux mots;
4. qu'il n'existait qu'une version temporaire du titre et du mandat de la Commission K;

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

Annexe

1. *Commission A* - Métrologie Electromagnétique, Mesures et étalons électromagnétiques.
La Commission tend à promouvoir les recherches et les développements dans les domaines suivants:
 - (a) mesures et étalons de temps et de fréquence, y compris les infrarouges et le domaine optique;
 - (b) mesures dans le domaine temporel;
 - (c) mesures dans le domaine des fréquences;
 - (d) mesures dans les télécommunications;
 - (e) mesures au moyen du laser;
 - (f) métrologie quantique et méthodes électriques dans le domaine des constantes fondamentales;
 - (g) mesures et étalons dans la gamme allant des hyperfréquences aux ondes submillimétriques.
2. *Commission B* - Ondes et Champs. Théorie électromagnétique et applications, y compris les antennes et les guides d'ondes.
L'intérêt de la Commission B porte sur les champs et les ondes, et englobe la théorie, l'analyse, le calcul, les expériences, et leur confirmation, l'accent étant mis sur les sujets suivants:
 - (a) phénomènes dans le domaine temporel;

- (b) diffusion et diffraction;
- (c) propagation et guidage des ondes;
- (d) rayonnement et antennes;
- (e) méthodes inverses appliquées à la diffusion.

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

3. *Commission C - Signaux et Systemes.*

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

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

La conception de systèmes de télécommunications efficaces requiert un équilibre entre les considérations liées à l'ingénierie scientifique et les facteurs économiques.

La Commission met l'accent sur la recherche scientifique et fournit l'expérience nécessaire à la conception des systèmes dans d'autres domaines de la radioélectricité scientifique.

4. *Commission D - Electronique et Photonique.*

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

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

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

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

5. *Commission E - Bruits et Brouillages Electromagnetiques.*

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

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

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

6. *Commission F - Propagation des Ondes et Teledetection*

(y compris la radiométéorologie, la radioocéanographie et la télédétection des milieux non ionisés).

La Commission tend à encourager :

- (a) l'étude de tous les aspects de la propagation des ondes à toutes les fréquences dans un milieu non-ionisé:
 - (i) propagation des ondes au-dessus de la surface de la Terre,
 - (ii) propagation des ondes dans l'atmosphère neutre et interaction des ondes avec l'atmosphère neutre,
 - (iii) interaction des ondes avec la surface de la Terre : océans, sol et glace,
 - (iv) propagation et diffusion des ondes en milieu souterrain,
 - (v) caractérisation de l'environnement en ce qu'il affecte les phénomènes ondulatoires;
- (b) l'application des résultats de ces études, en particulier dans les domaines de la télédétection et des communications;
- (c) le développement d'une collaboration appropriée avec les autres Commissions de l'URSI et les organisations concernées.

7. *Commission G - Radioelectricite Ionospherique et Propagation*

(y compris les communications ionosphériques et la télédétection des milieux ionisés).

La Commission s'occupe de l'étude de l'ionosphère ayant pour but la compréhension générale de ce milieu nécessaire aux radiocommunications.

Elle s'intéresse plus spécifiquement aux sujets suivants :

- (a) morphologie globale et modélisation de l'ionosphère;
- (b) variations spatio-temporelles de l'ionosphère;
- (c) développement des outils et réseaux nécessaires à la mesure des caractéristiques et des facteurs d'évolution de l'ionosphère;

- (d) théorie de la propagation radioélectrique par l'intermédiaire de l'ionosphère, et applications;
- (e) application aux radiocommunications de la connaissance de l'ionosphère.

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

8. *Commission H* - Ondes dans les Plasmas (y compris les plasmas spatiaux et de laboratoire).

La Commission a pour buts:

- (a) d'étudier les ondes dans les plasmas au sens le plus large et, en particulier, les sujets suivants:
 - (i) la génération (instabilités dans les plasmas) et la propagation des ondes dans les plasmas,
 - (ii) les interactions onde-onde et les interactions onde-particule,
 - (iii) les processus de turbulence dans les plasmas et le chaos,
 - (iv) les interactions entre les plasmas et les engins spatiaux;
- (b) d'encourager l'application des résultats de ces études, en particulier dans les domaines suivants : interactions entre plasmas solaires et planétaires et utilisation accrue de l'espace comme un laboratoire de recherche.

9. *Commission J* - Radioastronomie (y compris la télédétection des objets célestes).

- (a) Les activités de la Commission concernent l'observation et l'interprétation de toutes les émissions et réflexions radioélectriques en provenance d'objets célestes.
- (b) L'accent est mis sur :
 - (i) la promotion de moyens techniques pour les observations et l'analyse des données radioastronomiques,
 - (ii) l'appui des démarches ayant pour but d'obtenir la protection des observations radioastronomiques contre les brouillages nuisibles.

* CIUS : Conseil International des Unions Scientifiques
UGGI : Union Géodésique et Géophysique Internationale
UAI : Union Astronomique Internationale
COSPAR : Comité de Recherche Spatiale
SCOSTEP : Comité Scientifique de Physique Solaire-Terrestre
UIT : Union Internationale des Télécommunications
IEEE : Institution of Electrical and Electronic Engineers

10. *Commission K* - Electromagnetisme en Biologie et Medecine

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

- (a) interactions physiques entre champs électromagnétiques et systèmes biologiques;
- (b) effets biologiques des champs électromagnétiques;
- (c) mécanismes des interactions;
- (d) évaluation des expositions humaines;
- (e) systèmes d'exposition expérimentaux;
- (f) applications médicales.

La Commission met l'accent sur son caractère interdisciplinaire, et encourage la coopération des diverses disciplines de recherche qui sont de son domaine.

U.2. Admission de nouveaux Comités Membres

Le Conseil de l'URSI,

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

- 1. l'Académie des Sciences de Russie;
- 2. l'Académie des Sciences d'Ukraine;
- 3. l'Académie des Sciences d'Ouzbékistan;
- 4. le Korean Advanced Institute of Science and Technology;
- 5. le Conseil de la Recherche scientifique et technique de Turquie;

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

U.3. Admission de nouveaux Membres associés

Le Conseil de l'URSI,

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

- 1. l'Académie des Sciences du Chili;
- 2. l'Académie des Sciences de Biélorussie;
- 3. l'Académie des Sciences du Kazakhstan;

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

U.4. Confirmation du statut d'un Membre associé

Le Conseil de l'URSI,

notant l'intérêt permanent des scientifiques péruviens pour les activités de l'URSI;

décide de maintenir le statut d'associé du Comité Membre Péruvien.

U.5. Réseau de Correspondants

Le Conseil de l'URSI,

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

décide de modifier comme suit les points (i) à (v) de la Résolution U.7 de l'Assemblée Générale de Prague, qui traite du Réseau de Correspondants :

- (i) tout scientifique participant à une Assemblée générale de l'Union deviendra correspondant pour la période de trois ans suivant l'Assemblée, grâce à une cotisation incluse dans le droit d'inscription;
- (ii) d'autres scientifiques peuvent adhérer au réseau de correspondants pour la même période de trois ans, en s'adressant directement au Secrétariat de l'URSI et en versant la cotisation mentionnée en (i);
- (iii) le Bureau peut, sur demande de l'intéressé, exonérer un scientifique de la catégorie (ii) du versement de la cotisation;
- (iv) les scientifiques membres du réseau recevront gratuitement le périodique "Radioscientist-Bulletin", ainsi qu'une carte numérotée leur accordant des réductions sur les droits d'inscription à certains Symposia et Conférences parrainés par l'URSI;
- (v) les Correspondants n'auront pas droit de vote, mais seront autorisés à émettre leur avis sur les questions à caractère scientifique discutées au sein des Commissions.

U.6. Comité permanent pour l'adhésion à l'URSI

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées dans le rapport du Comité permanent pour l'adhésion à l'URSI, et en particulier de celles consacrées au désir d'augmenter les contacts individuels avec les membres de la communauté URSI;

décide

1. d'accepter les recommandations du Comité permanent pour l'adhésion à l'URSI;
2. de désigner les personnalités suivantes comme membres du Comité permanent pour l'adhésion à l'URSI pour les trois années à venir :
Président : T.B.A. Senior (EUA)
Membres : F. Fedi (Italie)
 V.N. Gubankov (Russie)
 Y.N. Huang (Chine, SRS)
 S. Okamura (Japon)
 M. Petit (France)

U.7. Finances de l'Union et composition du Comité permanent des finances

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées dans le rapport du Comité permanent des finances, en date du 30 août 1993;

décide

1. d'accepter les recommandations du Comité permanent des finances;
2. d'approuver les comptes certifiés de l'Union pour les exercices prenant fin au 31 décembre 1990, 1991 et 1992;
3. de publier les rapports du Trésorier et du Comité des finances dans le Volume XXIII des Comptes Rendus des Assemblées générales de l'URSI ;
4. d'exprimer au Dr. P. Bauer sa gratitude pour les éminents services qu'il a rendus à l'Union en sa qualité de Trésorier;
5. de désigner les personnalités suivantes comme membres du Comité permanent des finances pour les trois années à venir :
Président : K. Géher (Hongrie)
Membres : J.G. Lucas (Australie)
 S. Radicella (Argentine)
 F.W. Sluijter (Pays-Bas)
 K. Suchy (Allemagne)
 S.S. Swords (Irlande)
 W.W.L. Taylor (EUA).

U.8. Publications de l'URSI et composition du Comité permanent des publications

Le Conseil de l'URSI,

ayant pris connaissance des remarques et recommandations formulées dans le rapport du Comité permanent des publications en date du 27 août 1993;

décide

1. d'approuver les recommandations du Comité permanent des publications;
2. de publier le rapport du Comité permanent des publications dans le Volume XXIII des Comptes Rendus des Assemblées générales de l'URSI ;
3. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :
Co-Présidents : R.L. Dowden (Nouvelle Zélande) et W.R. Stone (EUA)
Membres : P.J.B. Clarricoats (Royaume-Uni)
K. Géher (Hongrie)
P. Lagasse (Belgique)
H. Matsumoto (Japon).

U.9. Comité permanent pour les pays en développement

Le Conseil de l'URSI,

ayant pris connaissance

1. du rapport d'activités 1990-1993 du Comité permanent pour les pays en développement;
2. des propositions faites par ce Comité concernant ses futures activités;

décide

1. d'approuver le rapport et les propositions du Comité permanent pour les pays en développement;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :
Président : B.M. Reddy (Inde)
Secrétaire : S.M. Radicella (Argentine)
Membres : G.O. Ajayi (Nigeria)
P. Chooncharoen (Thailand)
S. Feng (Chine, CIE)
I. Kimura (Japon)
M.S. Pontes (Brésil)
I.A. Salem (Egypte)
R.W. Stone (EUA)
J. Van Bladel (Belgique)
J. Voge (France).

U.10 Comité permanent pour les Assemblées générales de l'URSI

Le Conseil de l'URSI,

considérant

1. que la durée optimale du programme scientifique d'une Assemblée Générale a été longuement discutée au Conseil, mais seulement de façon préliminaire;

2. que la période de l'année qui se prête le mieux à l'organisation d'une Assemblée Générale dépend non seulement des conditions locales, mais aussi de facteurs plus généraux, comme la possibilité de conflits temporels avec d'autres conférences;
3. que le choix du lieu de l'Assemblée générale, effectué dans le système actuel trois ans à l'avance, peut décourager certains comités membres susceptibles de proposer l'organisation de l'Assemblée, dans la mesure où cette organisation nécessite un délai de préparation plus étendu;

décide

1. de demander au Comité de formuler des recommandations quant aux points susmentionnés;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir :

Président : T. Okoshi (Japon)
Membres : V. Fiala (Tchécoslovaquie)
J.W. Klein (Allemagne)
I.A. Salem (Egypte)
A.M. Scheggi (Italie)
J. Shapira (Israël).

U.11. Comité permanent pour les jeunes scientifiques

Le Conseil de l'URSI,

ayant pris connaissance des recommandations formulées dans le rapport du Comité permanent pour les jeunes scientifiques;

décide

1. d'approuver le rapport et les recommandations du Comité permanent pour les jeunes scientifiques;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président : S. Feng (Chine, CIE)
Membres : D. Gjessing (Norvège)
E.V. Jull (Canada)
A.P. Mitra (Inde)
T. Okoshi (Japon)
G. Pillet (France)
B. Shishkov (Bulgarie)
J. Van Bladel (Belgique)
L. Zombory (Hongrie)

U.12. Comité de réflexion sur la politique à long terme de l'URSI (Comité de réflexion sur l'avenir de l'URSI)

Le Conseil de l'URSI,

ayant pris connaissance du rapport du Comité de réflexion sur la politique à long terme de l'URSI, qui s'est réuni le 25 août 1993;

décide

1. d'approuver le rapport et les propositions du Comité de réflexion sur la politique à long terme de l'URSI;
2. de désigner les personnalités suivantes comme membres du Comité pour les trois années à venir:

Président : J. Bach Andersen (Danemark)

Membres : P. Bauer (France)

R. Ekers (Australie)

Y. Furuhashi (Japon)

W.E. Gordon (EUA)

E.V. Jull (Canada)

V. Khaikin (Russie)

J.G. Lucas (Australie)

J. Shapira (Israël)

A.M. Stuchly (Canada)

Secrétaire : P. Lagasse (Belgique)

U.13. Groupe de travail inter-Commissions sur l'utilisation scientifique du Système de Localisation Globale (GPS)

Le Conseil de l'URSI,

considérant

1. l'importance d'utiliser les signaux GPS, au sol et dans l'espace, afin d'observer l'environnement de l'atmosphère à l'échelle globale;
2. l'utilisation future de cette technique par les moyens d'observation spatiaux des températures de la basse atmosphère et des densités électroniques de l'ionosphère;

décide de créer un Groupe de travail inter-Commissions sur l'utilisation du Système de Localisation Globale.

U.14. Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel

Le Conseil de l'URSI,

ayant pris connaissance du rapport de la réunion du Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel, tenue le 27 août 1993, et des recommandations qu'il contient,

décide

1. de maintenir le Groupe de travail inter-Commissions sur la mesure des formes d'onde dans le domaine temporel pendant la période 1993-6;
2. de désigner à nouveau T.K. Sarkar comme Président du Groupe de travail.

U.15. Groupe de travail inter-Commissions sur l'atmosphère moyenne

Le Conseil de l'URSI,

conscient de l'importance de l'étude de l'atmosphère moyenne pour une meilleure compréhension des problèmes liés au changement global;

prenant en considération les techniques bien connues d'application des ondes électromagnétiques à l'étude (i) des propriétés physiques et chimiques de l'atmosphère moyenne, (ii) du couplage de celle-ci à ses régions inférieures et supérieures;

notant que ces sujets d'étude sont inclus dans les mandats des Commissions F et G;

décide de créer un Groupe de travail inter-Commissions sur l'atmosphère moyenne, avec pour tâches :

1. de coordonner au sein de l'URSI, et avec les autres organisations appartenant au CIUS, les programmes consacrés à l'étude de l'atmosphère moyenne;
2. d'encourager et stimuler les recherches consacrées à une meilleure compréhension de la climatologie et des processus dynamiques de l'atmosphère moyenne, et d'y inclure, par exemple, le développement et l'application
 - (i) des techniques Mésosphère-Stratosphère-Troposphère (MST), et des techniques radar et radio apparentées;
 - (ii) du lidar et autres techniques optiques;
 - (iii) des techniques de télédétection passive mettant en jeu une instrumentation au sol ou dans l'espace.

U.16 Comité pour le Programme International Géosphère-Biosphère (IGBP)

Le Conseil de l'URSI,

notant

1. les activités nombreuses des divers Comités de l'IGBP;

2. les difficultés que l'URSI éprouve à participer efficacement à ces activités, mais aussi son désir de conserver un contact suffisant avec le Programme;

décide de renouveler le mandat du Comité pour le Programme international géosphère-biosphère, et de le constituer comme suit pour les trois années à venir:

Président : K. Raney (Canada)
Membres : J.P.V. Baptista (Italie)
P. Bauer (France)
S. Fukao (Japon)
H. Hallikainen (Finlande)
H. Rishbeth (Royaume-Uni)
P.A. Watson (Royaume-Uni)

U.17. Groupe ad hoc sur les conséquences d'une guerre nucléaire pour l'environnement

Le Conseil de l'URSI,

considérant que le Groupe ad hoc pourrait encore être appelé à jouer un certain rôle dans l'avenir;

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

Président : M. Wik (Suède)
Membres : W. Graf (EUA)
D. Hansen (Suisse)
J. Shiloh (Israël).

U.18. Commission inter-Unions pour l'attribution de fréquences à la radioastronomie et à la science spatiale (IUCAF)

Le Conseil de l'URSI,

ayant pris connaissance du rapport de la réunion de la délégation de l'IUCAF tenue le 27 août 1993, et

notant

1. l'efficacité avec laquelle l'IUCAF a défendu les intérêts de la communauté scientifique lors de la Conférence Administrative Mondiale de 1992 (WARC);
2. le besoin permanent de lutter pour la protection des fréquences nécessaires aux observations scientifiques;

décide

1. d'approuver le rapport et les recommandations de la Commission;

2. de maintenir le soutien financier que l'URSI accorde à l'IUCAF;
3. de désigner les personnalités suivantes comme membres URSI de l'IUCAF:
 - W.A. Baan (EUA)
 - R.J. Cohen (UK)
 - H.C. Kahlmann (Pays-Bas)
 - B.J. Robinson (Australie);
4. d'assurer la continuité de l'action de la Commission en designant dès maintenant J. Whiteoak (Australie) comme remplaçant de B.J. Robinson, au cas probable où ce dernier se retirerait de l'IUCAF avant la prochaine Assemblée générale.

U.19. Groupe de travail inter-Unions sur les effets néfastes de l'environnement sur les observations astronomiques

Le Conseil de l'URSI,

notant

1. la nécessité d'assurer aux recherches spatiales et astronomiques les conditions qui leur permettent de se développer de façon optimale;
2. les dangers que représentent (a) la croissance de l'interférence électromagnétique et du nombre de débris spatiaux, (b) le projet récent de créer un système de publicité spatiale;

décide

1. d'approuver la participation de l'URSI au Groupe de travail inter-Unions sur les effets néfastes de l'environnement sur les observations astronomiques;
2. de proposer R.D. Parlow (EUA, Commission E) et J. Cohen (Royaume-Uni, Commission J) comme membres de ce Groupe de travail.

U.20. Utilisation du spectre radioélectrique

Le Conseil de l'URSI,

demande instamment à l'Union Internationales des Télécommunications (ITU) et aux administrations nationales et régionales affiliées :

1. de reconnaître le caractère unique de la ressource naturelle limitée constituée par le spectre électromagnétique;
2. de limiter l'attribution de fréquences aux services qui, pour remplir leur rôle, doivent utiliser la propagation en espace libre;
3. d'éviter d'attribuer des fréquences aux services qui peuvent utiliser d'autres technologies, par exemple celle des ondes guidées.

U.21. Sur le libre accès aux données environnementales

Le Conseil de l'URSI,

conscient de l'idée qui se fait progressivement jour, dans certains milieux, de considérer les données environnementales comme des produits de marché ;

reconnaissant que ce point de vue peut être défendable quand ces données sont utilisées à des fins commerciales ;

demande instamment aux organisations qui ressemblent ces données d'en garantir l'accès gratuit (ou du moins à prix coûtant) dès qu'elles sont utilisées à des fins scientifiques.

U.22. Sur l'importance du système ionosphère/magnétosphère terrestre comme laboratoire naturel de plasmas

Le Conseil de l'URSI,

considérant

1. que le système ionosphère/magnétosphère terrestre est, d'un point de vue économique, le plasma spatial le plus facilement accessible aux mesures in situ ou à distance ;
2. que de nombreux processus présents dans ce système trouvent leur contrepartie dans les plasmas astrophysiques ;
3. que certains problèmes fondamentaux de la physique des plasmas peuvent être mieux étudiés dans le laboratoire naturel constitué par ce système que dans les laboratoires au sol ;

recommande que l'attention des administrations nationales soit attirée sur l'importance d'effectuer des expériences actives pilotées in situ et à distance dans le système ionosphère/magnétosphère terrestre, ceci dans le but d'étudier des questions fondamentales de la physique des plasmas, et d'appréhender les processus qui donnent naissance à des phénomènes spatiaux naturels.

U.23. Sur l'importance des effets électromagnétiques associés aux tremblements de terre et aux éruptions volcaniques

Le Conseil de l'URSI,

notant

1. que diverses expériences, au sol et dans l'espace, ont montré l'existence d'émissions électromagnétiques, de perturbations dans les plasmas, ainsi que d'autres effets se produisant avant, pendant et après les tremblements de terre ;
2. qu'une compréhension physique de ces processus électromagnétiques naturels est importante en vue d'applications possibles dans le domaine public ;

3. que l'analyse théorique de ces effets repose sur des études multidisciplinaires de phénomènes comme les processus d'émission d'ondes dans le sous-sol, la propagation d'ondes dans les milieux aléatoires stratifiés, l'amplification non-linéaire de celles-ci, et leur croissance et décroissance dans les plasmas ionosphériques et magnétosphériques ;

décide d'attirer l'attention des organisations scientifiques nationales compétentes sur l'importance de la recherche dans ce domaine (au sol et dans l'espace), en particulier grâce à l'analyse rétrospective des bases de données existantes sur les plasmas spatiaux, afin d'améliorer l'identification de la signature électromagnétique.

U.24. Sur l'importance de sauvegarder les données géophysiques du passé, et de leur donner un format digital

Le Conseil de l'URSI,

ayant considéré

1. l'importance de disposer de données continues et abondantes dans l'étude des variations des paramètres ionosphériques/magnétosphériques, ainsi que de leurs tendances évolutives à long terme;
2. l'impossibilité de dupliquer de tels ensembles de données;
3. le danger imminent de perte de certaines bases de données par suite de leur dégradation, ou même de leur élimination;

décide d'attirer l'attention des administrations nationales sur l'importance de sauvegarder ces données, et de les mettre sous la forme digitale moderne qui les rendra plus adaptées à l'analyse.

U.25. XXVe Assemblée générale

Le Conseil de l'URSI,

ayant examiné les invitations présentées par les Comités Membres de l'URSI en Chine (CIE, Pékin), en Egypte et en France pour la tenue de la XXVe Assemblée générale;

décide

1. d'accepter l'invitation du Comité français d'organiser la XXVe Assemblée générale à Lille, du 28 août au 5 septembre 1996;
2. d'exprimer ses remerciements aux Comités chinois (CIE, Pékin) et égyptien pour leurs aimables invitations.

U.26. Subventions de l'UNESCO et du CIUS

Le Conseil de l'URSI,

considérant

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

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

U.27. Remerciements au Comité japonais de l'URSI

Le Conseil de l'URSI,

décide à l'unanimité d'exprimer sa très sincère gratitude au Comité japonais de l'URSI pour l'invitation de tenir la XXIV^e Assemblée générale à Kyoto. L'ensemble des participants ont été très impressionnés par l'accueil chaleureux du Comité organisateur local, ainsi que par l'excellence des dispositions administratives et matérielles prises par ce Comité. Le Conseil exprime aux hôtes japonais sa profonde appréciation pour la mise en oeuvre d'un programme extra-scientifique particulièrement agréable et réussi, ainsi que pour la qualité de l'accueil aux personnes accompagnant les participants à l'Assemblée.

RESOLUTIONS ET RECOMMANDATIONS DES COMMISSIONS

Ces résolutions et recommandations ont été approuvées par le Conseil de l'URSI en sa séance du 3 septembre 1993.

COMMISSION A - MÉTROLOGIE ÉLECTROMAGNÉTIQUE

A1. Conférence sur les mesures électromagnétiques de précision (CPEM)

La Commission A,

ayant pris connaissance des statuts révisés de la CPEM;

ayant marqué son accord sur les nouveaux statuts;

recommande que l'URSI continue à parrainer la Conférence internationale sur les mesures électromagnétiques de précision.

A2. Dates de deux conférences

La Commission A,

considérant

1. que la Commission A et la Conférence sur les mesures électromagnétiques de précision (CPEM) ont des intérêts scientifiques communs ;
2. que la XXVe Assemblée générale de l'URSI (à Lille) et la CPEM (à Braunschweig) ont toutes deux lieu en 1996 ;

recommande que les organisations responsables choisissent les dates de telle sorte que l'une des deux conférences ait lieu immédiatement après l'autre.

A3. Le kilogramme au sein du Système International (SI)

La Commission A,

considérant

1. que le kilogramme (une des unités de base du SI) est réalisé par un étalon matériel : le prototype international ;

2. qu'il est désirable de contrôler la valeur du kilogramme - et peut-être même ultérieurement de définir celle-ci - à partir de constantes fondamentales ;

recommande que les laboratoires compétents intensifient les études permettant d'établir un lien entre le kilogramme et certaines constantes fondamentales appropriées.

A4. Synthèse et mesure de fréquences dans le domaine optique

La Commission A,

considérant

1. la tendance générale vers l'utilisation des fréquences optiques ;
2. l'intérêt que les milieux de la recherche et des communications portent à l'application des techniques de détection cohérente s'appuyant sur des systèmes de synthèse de fréquences ;
3. l'existence de composants et d'appareils adéquats ;

recommande

1. de poursuivre des études et des expériences menant au développement de sources cohérentes et accordables ;
2. de poursuivre des études menant à la réalisation de fréquencesmètres couvrant la gamme des fréquences optiques ;
3. de développer des sources stables permettant un accord fin, en particulier dans le but de satisfaire aux besoins de la recherche spectroscopique.

A5. Mesures précises du champ électromagnétique

La Commission A,

considérant

1. l'intérêt croissant du public pour les effets des champs électromagnétiques sur les systèmes biologiques ;
2. la difficulté de mesurer avec précision, dans l'étude de ces effets, l'intensité du champ, en particulier au voisinage des antennes ;
3. les effets produits par les distorsions du champ dues, soit aux systèmes biologiques, soit aux systèmes de mesure eux-mêmes ;

émet l'avis

1. qu'il est nécessaire de développer, dans des conditions bien déterminées, des mesures précises du champ ;
2. qu'il est nécessaire de développer des modèles représentatifs de la distribution du champ électromagnétique (i) au voisinage des systèmes

- rayonnants (ii) au sein des corps biologiques placés à proximité de ces systèmes ;
3. qu'il est permis d'espérer que ces divers travaux aideront la Commission K dans ses études des normes d'exposition et de dosimétrie.

COMMISSION D - ELECTRONIQUE ET PHOTONIQUE

D1. Symposia à la XXVe Assemblée générale (1996)

La Commission D,

consciente du caractère multidisciplinaire de la Commission D au sein de l'URSI;

exprime l'intention d'accroître le nombre de symposia qu'elle organisera conjointement avec d'autres Commissions.

D2. Disquette bibliographique accompagnant la Review of Radio Science

La Commission D,

notant

1. que le public visé par la disquette bibliographique n'est pas clairement défini ;
2. que la Commission D couvre des domaines d'intérêts scientifique et technique extrêmement vastes ;
3. que ces domaines se développent à un rythme extrêmement rapide ;
4. qu'il existe d'autres bases de données de référence aisément accessibles ;

décide de ne pas collaborer à l'édition de la prochaine disquette bibliographique.

D3. Patronage de conférences internationales

La Commission D,

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

- Le Symposium international sur les signaux, les systèmes et l'électronique (ISSSE'95) à San Francisco (EUA), 25-27 octobre 1995, organisé conjointement par les Commissions C and D;

- Les Conférences européennes sur les communications optiques (ECOC), en 1994, 1995 et 1996;
- Les Conférences européennes sur les microondes, en 1994, 1995 et 1996;
- Les Conférences Asie-Pacifique sur les microondes, en 1994, 1995 et 1996;
- Le 22e Symposium international sur les semiconducteurs composés, en 1995.

COMMISSION E - BRUITS ET BROUILLAGES ELECTROMAGNETIQUES

E.1. Groupes de travail

La Commission E,

considérant les rapports présentés par les différents groupes de travail;

décide

1. de constituer, avec les Commissions G et H, un groupe de travail commun EGH-1 sur les "Effets électromagnétiques associés à l'activité sismique", avec pour la Commission E, T. Yoshino comme co-président;
2. de maintenir les groupes de travail de la Commission E existants, c'est à dire :
 - E.1. Gestion et utilisation du spectre de fréquences;
Président : R.D. Parlow (EUA);
 - E.2. Bruit non gaussien dans les communications;
Président : A.D. Spaulding (EUA);
 - E.3. Systèmes électromagnétique à haute puissance;
Président : R.L. Gardner (EUA);
 - E.4. Bruits électromagnétiques terrestres et planétaires;
Président : Z. Kawasaki (Japon);
 - E.5. Interactions avec les systèmes électriques complexes et protection de ceux-ci;
Co-présidents : C. Baum (EUA), P. Degauque (France) et M. Ianoz (Suisse);
 - E.6. Effets des transitoires sur les équipements;
Co-présidents : V. Scuka (Suède) et B. Demoulin (France);
 - E.7. Environnements électro-météorologiques extraterrestre et terrestre;
Président : H. Kikuchi (Japon).

2. Symposia

La Commission E,

considérant les propositions de symposia pour les trois prochaines années;

décide

1. d'apporter, en mode A, son soutien aux conférences :
 - International Symposium on Electromagnetic Environment and Consequences (EUROEM), Bordeaux, France, 1994;
 - International Symposium on Electromagnetic Compatibility, Sendai, Japon, 1994;
2. d'apporter, en mode B, son soutien aux conférences :
 - Colloque international et exposition sur la compatibilité électromagnétique, Toulouse, France, 1994;
 - International Wroclaw Symposium on Electromagnetic Compatibility, Wroclaw, Pologne, 1994;
 - International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility, Zurich, Suisse, 1995;
 - International Wroclaw Symposium and Exhibition on Electromagnetic Compatibility, Wroclaw, Pologne, 1996.

COMMISSION G - RADIOÉLECTRICITÉ IONOSPHERIQUE ET PROPAGATION

G1. Groupe de travail

La Commission G,

décide de maintenir les Groupes de travail suivants :

- G1. Groupe Conseil du réseau d'ionosondes (INAG)
Président : P.J. Wilkinson (Australie)
Secrétaire : R. Conkright (EUA);
- G2. Etude de l'ionosphère au moyen de satellites à balise
Président : R. Leitinger (Autriche)
Vice-Présidents : J.A. Klobuchar (EUA) et T.R. Tyagi (Inde);
- G3. Diffusion incohérente
Président : J.M. Holt (EUA)
Vice-Président : P.J.S. Williams (Royaume-Uni);
- G4. Informatique ionosphérique
Président : D. Andersen (EUA)
Vice-Président : R. Hanbaba (France).

G2. Groupes de travail communs

La Commission G,

décide de maintenir les Groupes de travail communs suivants :

GH1. Expériences actives dans les plasmas

Représentant de la Commission G : Sa. Basu (EUA);

GH2. Expériences, simulation et analyse par ordinateur des processus d'ondes dans les plasmas

Représentant de la Commission G : H. Thiemann (Allemagne);

CGH1. Analyse des ondes et de la turbulence

Co-président pour la Commission G : A.W. Wernik (Pologne);

Groupe de travail inter-Unions (URSI/IAGA) de télédétection TBF/EBF de l'ionosphère et de la magnétosphère (VER SIM)

Co-président pour l'URSI : U. Inan (EUA);

recommande de créer, avec les Commission E et H, un Groupe de travail commun EGH1 sur les "Effets électromagnétiques associés à l'activité sismique". Co-président pour la Commission G : à désigner plus tard.

G3. Mesures radioélectriques basse-fréquence (BF) des composantes du vent

La Commission G,

considérant

1. qu'il est essentiel de faire des observations à long terme de l'atmosphère terrestre, afin de détecter les tendances du changement global qui pourraient être particulièrement révélées par l'observation des paramètres de l'atmosphère supérieure ;
2. que les mesures - peu coûteuses - du vent à basse fréquence, faites à incidence oblique, revêtent une grande importance pour l'observation continue de l'ionosphère, de l'atmosphère supérieure et de la thermosphère inférieure ;
3. que ces mesures, combinées à celles de l'altitude de réflexion des ondes obtenues grâce à une modulation du spectre émis, pourraient permettre le calcul des profils verticaux du champ du vent ;

recommande d'effectuer des mesures BF du vent à des distances de 150 à 400km des émetteurs de radiodiffusion BF.

G4. Bulletin du Groupe Conseil du Réseau ionosphérique (INAG)

La Commission G,

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

exprime ses remerciements au Département Australien des Arts et Services administratifs pour le précieux appui qu'il fournit, par l'entremise des services spatiaux et radio IPS (Ionospheric Prediction Services), à la production de ce Bulletin ;

recommande au Conseil que l'URSI maintienne ses contributions financières à la publication de ce Bulletin pendant les trois années à venir.

G5. Radar Mésosphère - Stratosphère - Troposphère (MST) dans les régions équatoriales

La Commission G,

considérant

1. que la création d'un Groupe de travail inter-Commissions sur l'atmosphère moyenne (voir la résolution U.15) souligne à l'évidence l'importance qu'il faut attacher à l'étude de cette région;
2. qu'il existe une chaîne de radars ST dans la région équatoriale du Pacifique ;

recommande qu'un radar fonctionnant en mode MST et en mode à diffusion incohérente de haute sensibilité soit installé dans la région équatoriale du Sud-Est asiatique, et constitue l'élément-clé de cette chaîne de radars.

G6. Patronage de colloques 1993 - 1996

La Commission G,

recommande que l'URSI parraine, en mode A ou mode B suivant les cas, les colloques suivants pendant la période 1993-1996, sous réserve que les organisateurs soumettent les demandes règlementaires :

- Diffusion électromagnétique dans les gaz et les plasmas (avec la Commission H), Aussois, France, du 20 ou 25 mars 1994;
- Huitième symposium international sur la physique des relations Soleil-Terre (avec la Commission H), dédié au programme "Couplage énergétique Soleil-Terre" (STEP), Sendai, Japon, du 5 ou 10 juin 1994, en mode B. Contact : H. Oya;
- Symposium Suzdal sur la modification artificielle de l'ionosphère à l'aide d'ondes électromagnétiques de forte puissance (avec la Commission H),

Uppsala, Suède, en septembre ou octobre 1994, en mode B. Contact : B. Thidé;

- Atelier sur la théorie et l'observation des processus non-linéaires dans l'environnement proche de la Terre (avec la Commission H). Cet atelier STEP/GAPS (Couplage énergétique Soleil-Terre, structure globale plasma - atmosphère) se tiendra à Varsovie, Pologne, au cours du printemps 1995, en mode B. Contacts : A.W. Wernik (Commission G), Su. Basu (Commission G) et F. Lefeuvre (Commission H);
- Atelier International Reference Ionosphere (IRI), Trieste, Italie, octobre 1993;
- Symposium sur les satellites à balise, Aberysthwyth, Royaume-Uni, juillet 1994;
- Atelier sur la diffusion incohérente, Ukraine, 1995;
- COMMSPHERE 94, Eilat, Israël, décembre 1994;
- Atelier Radar MST, EUA;
- Ecole Radar MST, Inde;
- Atelier IIWG, 1994;
- Symposium sur l'aéronomie équatoriale, Japon, 1995.

Addendum

La Commission a également recommandé la création

1. d'un Groupe de travail inter-Commissions sur l'atmosphère moyenne (voir la résolution U.15). S. Fukao (Japon) sera le Co-Président pour la Commission G.
2. d'un Groupe de travail inter-Commissions sur l'utilisation scientifique du Système de localisation globale (voir la résolution U.13). P. Høeg (Danemark) sera le représentant de la Commission G.

COMMISSION H - ONDES DANS LES PLASMAS

H1. Groupes de travail

La Commission H,

considérant les rapports présentés par ses différents Groupes de travail,

décide

1. de maintenir, avec les Commissions C et G, le Groupe de travail inter-Unions URSI/IAGA.1 "Sondage électromagnétique passif de la magnétosphère", sous le nouveau titre "Téledétection TBF/EFB de

- l'ionosphère et de la magnétosphère (VERSIM)". Co-président pour la Commission H : U.S. Inan (EUA) ;
2. de maintenir, avec les Commissions C et G, le Groupe de travail commun CGH.1 "Analyse des ondes et de la turbulence". Co-président pour la Commission H : F. Lefeuvre (France) ;
 3. de maintenir, avec la Commission G, le Groupe de travail commun GH.1 "Expériences actives dans les plasmas". Co-président pour la Commission H : P. Bernhardt (EUA) ;
 4. de maintenir, avec la Commission G, le Groupe de travail commun GH.2 "Expériences, simulation et analyse par ordinateur des processus d'ondes dans les plasmas". Co-président pour la Commission H : H. Matsumoto (Japon) ;
 5. de créer, avec les Commissions G et H, un Groupe de travail commun EGH.1 sur les effets électromagnétiques associés à l'activité sismique. Co-président pour la Commission H : M. Parrot (France).

H2. Patronage de colloques et de conférences

La Commission H,

recommande que l'URSI parraine, en mode A ou en mode B suivant les cas, les colloques suivants pendant la période 1993-1996, sous réserve que les organisateurs soumettent des demandes règlementaires :

- Diffusion électromagnétique dans les gaz et les plasmas. Aussois, France, du 20 au 25 mars 1994, en mode B;
- Huitième symposium international sur la physique des relations Soleil-Terre (avec la Commission G), dédié au programme "Couplage énergétique Soleil-Terre" (STEP). Sendai, Japon, du 5 ou 10 juin 1994, en mode B. Contact : H. Oya;
- Symposium Suzdal sur la modification artificielle de l'ionosphère à l'aide d'ondes électromagnétiques de forte puissance (avec la Commission G). Uppsala, Suède, en septembre ou octobre 1994, en mode B. Contact : B. Thidé;
- Atelier sur la théorie et l'observation des processus non-linéaires dans l'environnement proche de la Terre (avec la Commission G). Cet atelier STEP/GAPS (Couplage énergétique Soleil-Terre, structure globale plasma - atmosphère) se tiendra à Varsovie, Pologne, au cours du printemps 1995, en mode B. Contacts : A.W. Wernik (Commission G), Su. Basu (Commission G) et F. Lefeuvre (Commission H);
- 22e Conférence internationale sur les phénomènes dans les gaz ionisés (ICPIG), probablement à College Park, Maryland (EUA), au cours de l'été 1995 (mode B). Contact : K. Suchy;

- 5e Ecole internationale de Simulation des Plasmas spatiaux, 1995 (mode B).
Contacts : C. Dum (Allemagne), M. Ashour - Abdalla (EUA) et H. Matsumoto (Japon).

COMMISSION J - RADIOASTRONOMIE

J1. Groupe de travail pour un Grand réseau millimétrique - submillimétrique

La Commission J,

considérant

1. que l'avenir de l'astronomie aux longueurs d'onde millimétriques et submillimétriques requiert de réfléchir dès maintenant au concept du télescope de la génération prochaine, qui devra (i) être doué d'une résolution angulaire élevée (ii) être d'un ordre de grandeur plus sensible que les télescopes existants ;
2. qu'un télescope de cette nature sera très onéreux, et que sa construction exigera une forte collaboration internationale ;

recommande la création d'un Groupe de travail consacré au "Grand réseau millimétrique- submillimétrique", dont le mandat serait :

1. d'envisager les principaux objectifs scientifiques qui seront d'actualité au début du siècle prochain ;
2. de coordonner et d'évaluer les données radio nécessaires à l'évaluation du site et à la stratégie des observations;
3. d'étudier les concepts nouveaux d'instruments et de télescopes;
4. d'étudier sérieusement les possibilités de collaboration internationale.

J2. Groupe de travail pour un Grand Télescope

La Commission J,

considérant

1. que le besoin se fait jour de construire un radiotélescope accessible à la communauté internationale, et possédant une sensibilité supérieure d'un ou deux ordres de grandeur à celle des instruments existants, ou en projet;
2. que la réalisation à un prix acceptable d'un instrument de cette nature nécessitera la mise en œuvre de techniques innovantes;
3. que la réalisation de cet instrument devra probablement se fonder sur une forte collaboration internationale ;

décide de créer un Groupe de travail ayant le mandat suivant :

1. explorer le champ scientifique devant être couvert par ce télescope ;

2. discuter des spécifications techniques et des concepts généraux qui permettront d'optimiser l'efficacité de l'instrument ;
3. identifier, et même résoudre dans la mesure du possible, les problèmes techniques principaux que posera la construction d'un télescope de coût raisonnable, et possédant la sensibilité requise.

COMMISSION K - ELECTROMAGNÉTISME EN BIOLOGIE ET MÉDECINE

K1. Communications sans fil

La Commission K,

considérant

1. que de nouvelles technologies se développent rapidement, notamment celles des réseaux radio locaux, des systèmes téléphoniques cellulaires, des réseaux de satellites de télécommunication sur orbites basses (exemple : Iridium), des services de communication personnels, des téléphones sans fil, et d'autres systèmes qui, selon toute probabilité, auront une large diffusion;
2. que les effets sur la santé des champs électromagnétiques produits par les communications sans fil sont mal connus;
3. que le grand public se préoccupe des effets nocifs possibles des appareillages électromagnétiques auxquels il est exposé;

recommande que d'importants projets de recherches soient consacrés - aux échelles nationale et internationale - à l'étude des problèmes principaux, à savoir:

1. l'appréhension des mécanismes d'interaction des champs électromagnétiques faibles - de caractéristiques diverses - avec les systèmes vivants;
2. l'étude des effets biologiques de ces champs, et en particulier de leur caractère potentiellement nocif, en fonction des conditions d'exposition;
3. l'évaluation précise des taux d'exposition aux champs, basée sur des mesures et des modélisations dosimétriques pertinentes.

La Commission exprime sa reconnaissance pour le soutien que lui ont promis la Commission A, dans le domaine des mesures, et la Commission B, dans celui de la modélisation dosimétrique.

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

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J.2. Large Millemetre/Submillimetre Array

Coordinators : M. Ishiguro (Japan), R.S. Booth (Sweden)

J.3. Large Telescope

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CGH.1. Wave and Turbulence Analysis

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Co-Chair for Commission G : Prof. A.W. Wernik (Poland)
Co-Chair for Commission H : Dr. F. Lefeuvre (France)

EGH.1. Electromagnetic Effects Associated with Seismic Activity

Co-Chair for Commission E : Prof. T. Yoshino (Japan)

Co-Chair for Commission G : will be appointed later

Co-Chair for Commission H : Mr. M. Parrot (France)

FG.1. Middle Atmosphere

Co-Chair for Commission F : Prof. C.H. Liu (China, SRS)

Co-Chair for Commission G : Prof. S. Fukao (Japan)

GH.1. Active Experiments in Plasmas

Co-Chair for Commission G : Dr. Sa. Basu (U.S.A.)

Co-Chair for Commission H : Dr. P. Bernhardt (U.S.A.)

GH.2. Computer Experiments, Simulation and Analysis of Wave Plasma Processes

Co-Chair for Commission G : Dr. H. Thiemann (Germany)

Co-Chair for Commission H : Prof. H. Matsumoto (Japan)

Time Domain Waveform Measurements

Chair : Prof. T.K. Sarkar (U.S.A.)

INTER-UNION WORKING GROUPS

URSI/IAGA.1- VLF/ELF Remote Sensing of the Ionospheric and Magnetosphere (VERSIM)

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Co-Chair for Commission H : Dr. U.S. Inan (U.S.A.)

IAU-URSI-COSPAR-IUCAF- Adverse environmental impacts on astronomy

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- ABDALLAH, Prof. E.A.F., Electronic Research Institute, National Research Center, Eltahir St., DOKKI-GIZA, EGYPT, Fax : (202) 356 2820 (132)
- ADACHI, Prof. S., Dep. of Electrical Engineering, Tohoku University, Aramaki, Aoba-ku, Sendai-shi, MIYAGI 980, JAPAN, Tel. : (81) 22-263-9221, Fax : (81) 22-261-7470 (144)
- AGUILERA, Mr. R., Centro de Estudios Espaciales, Universidad de Chile, Casilla 411-3, SANTIAGO 3, CHILE, Tel. : (56) 2-556 8382, Fax : (56) 2-844 1003 (136)
- AJAYI, Prof. G.O., Electronic & Electrical Engineering, Obafemi Awolowo University, ILE-IFE, NIGERIA, Tel. : (234) 36-230972, Fax : (234) 36-231245 & (234) 1-2637043 (127, 133, 134, 144)
- AL-ATHEL, Dr. S., President, KACST, P.O. Box 6086, 11442 RIYADH, SAUDI ARABIA, Fax : (966) 1-488 3756 (145)
- ALVAREZ, Prof. H., Observatorio Radioastronomico de Paipu, Universidad de Chile, Casilla 68, SANTIAGO 16, CHILE, Tel. : (56) 2-229 4002, Fax : (56) 2-229 4101, E-mail : halvarez@das.uchile.cl (140)
- ANDERSEN, Prof. J. B., Aalborg University Centre, Institute of Electronic Systems, Fr. Bajers vej 7, DK-9220 AALBORG EAST, DENMARK, Tel. : (45) 98-15 8522, Fax : (45) 98-15 1583, E-mail : jba@kom.auc.dk (126, 128)
- ANDERSON, Dr. D., Geophysics Laboratory, HANSCOM AFB, MA 01731-5000, U.S.A. (137)
- ANDREWS, Dr. M.K., Industrial Research Limited, P.O. Box 31310, LOWER HUTT, NEW ZEALAND, Tel. : (64) 4-569-0223, Fax : (64) 4-569-0117 (133)
- ANGERAMI, Prof. J.J., Escola Politecnica, Universidad de Sao Paulo, 05503 SAO PAULO, S.P., BRAZIL (133)
- ANTAR, Dr. Y.M.M., Dept. of Electrical & Computer Eng., Royal Military College of Canada, KINGSTON, ON K7L 2W3, CANADA, Tel. : (1-613) 541-6403, Fax : (1-613) 547-3053 (130)

ARENAGA, Mr. J. R., Praça de Alvalade 1-8, Instituto de Desenvolvimento e Inspeção, das Condições de Trabalho, 1700 LISBOA, PORTUGAL, Tel. : (351-1) 795 9068, Fax : (351-1) 797 9016 (141)

ARMAND, Dr. N.A., Institute of Radioeng. & Electronics (FIRE), Russian Academy of Sciences, Vvedenskogo pl. 1, 141120 FRYAZINO (Moscow Region), RUSSIA, Tel. : (7095) 203-6078, Fax : (7095) 203-8414 (136)

ARNOLD, Dr. J.M., Dept. of Electronic & Electrical Eng., University of Glasgow, GLASGOW, G12 8QQ, UNITED KINGDOM, Tel. : (44) 41-330 4901, Fax : (44) 41-330 4907, E-mail : jma@elec.gla.ac.uk (131)

ASSIS, Prof. M.S., EMBRATEL - DDH, Rua da Assembléia, 10 - Sala 2201, 20011 RIO DE JANEIRO, R.J., BRAZIL, Fax : (55) 21-2168 685 (135)

AURINSALO, Mr. J., Telecommunications Laboratory, Technical Research Centre of Finland, Otakaari 7B, SF-02150 ESPOO, FINLAND, Tel. : (358) 0-456-5606, Fax : (358) 0-455-0115, E-mail : jouko.aurinsalo@vtt.fi (131)

AVERY, Dr. S., Electrical & Computer Engineering, University of Colorado, Campus Box 425, BOULDER, CO 80309, U.S.A., Tel. : (1-303) 492-7653, Fax : (1-303) 492-2758, E-mail : savery@hedgehog.colorado.edu (145)

AZIZ, Prof. M.E.A., 17 Shagaret-El-Dor St., ZAMALEK-CAIRO, EGYPT, Fax : (202) 346 1006 (138)

BAAN, Dr. W.A., National Astronomy & Ionosphere Center, Arecibo Observatory, P.O. Box 995, ARECIBO, PR 00613, U.S.A., Tel. : (1-809) 878-2612, Fax : (1-809) 878-1961, E-mail : willem@naic.edu (143)

BAGGALEY, Prof. W.J., Department of Physics and Astronomy, University of Canterbury, Private Bag, CHRISTCHURCH 1, NEW ZEALAND, Tel. : (64) 3-366-7001, Fax : (64) 3-364-2469, E-mail : phys051@canterbury.ac.nz (139)

- BAKER, Prof. D.C., Dept. of Electronics & Computer Eng., University of Pretoria, 0002 PRETORIA, SOUTH AFRICA, Tel. : (27) 12-420 2775, Fax : (27) 12-432 185, E-mail : duncan.baker@ee.up.ac.za (134)
- BAKHRAKH, Prof. L.D., NPO VEGA M, Kutuzovsky Prospekt 34, 121170 MOSCOW, RUSSIA (130)
- BAKOS, Prof. J.S., KFKI (Research Inst. for Particle & Nuclear Physics), Dept. of Plasma Physics, P.O. Box 49, H-1525 BUDAPEST, HUNGARY, Tel. : (36) 1-1602-067, Fax : (36) 1-1696-567, E-mail : bakos@rmki.kfki.hu (138)
- BALABANOV, Dr. B.H., ISR in Telecommunications, Hajdushka Poliana 8, 1612 SOFIA, BULGARIA (129)
- BAMGBOYE, Prof. D.K., Department of Physics, University of Ilorin, ILORIN, NIGERIA, Tel. : (234) 31-221 691 (138)
- BANERJEE, Dr. P., Assistant Director, Time & Frequency Section, National Physical Laboratory, Dr. K.S. Krishnan Road, 110 012 NEW DELHI, INDIA, Tel. : (91) 11-571 8310/578 6168, Fax : (91) 11-575 2678 (129, 131, 144)
- BAPTISTA, Dr. J.P.V. P., Wave Interaction and Propagation Section, Electromagnetics Division - ESA, P.O. Box 299, NL-2200 AG NOORDWIJK, NETHERLANDS (128, 142)
- BARBOSA, Prof. S.A.M., Instituto Superior Técnico de Lisboa, Avenida Rovisco Pais, 1096 LISBOA CODEX, PORTUGAL, Tel. : (351-1) 8417 284, Fax : (351-1) 8482 987 (130)
- BARCLAY, Prof. L.W., Dept. of Trade and Industry, Waterloo Bridge House, DRT - Room 515, Waterloo Road, LONDON, SE1 8UA, UNITED KINGDOM, Fax : (44) 71-401 8681 (128)
- BARKOVSKY, Prof. L.M., Belarussian State University, Faculty of Physics, 220050 MINSK, BELARUS, Tel. : (70172) 20 78 92, Fax : (70172) 26 59 40 (131)
- BARR, Dr. R., Atmospheric Division, National Institute of Water, and Atmospheric Research, P.O. Box 31-311, LOWER HUTT, NEW ZEALAND, Tel. : (64) 4-569-0268, Fax : (64) 4-566-6166, E-mail : srgprxb@grace.cri.nz (134)
- BASSEY, Dr. C.E., Department of Physics, University of Ilorin, ILORIN, NIGERIA, Tel. : (234) 31-221 691 (141)

- BASU, Dr. Sa., Phillips Lab., PL/GPIA 29 Randolph Road, HANSCOM AFB, MA 01731, U.S.A., Tel. (1-617) 377-3982, Fax (1-617) 377-3550, E-mail SPAN AFGL :: BASUS (142)
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- BATTAIL, Prof. M.G., Ecole Nationale Supérieure des Télécommunications, Département COM, 46, rue Barrault, F-75636 PARIS CEDEX 13, FRANCE, Tel. : (33-1) 4581 7494, Fax : (33-1) 4589 0020 (131)
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- BAUM, Dr. C.E., Phillips Laboratory, WSR Kirtland Air Force Base, 3550 Aberdeen Ave. SE, KIRTLAND AFB, NM 87117-5776, U.S.A., Tel. : (1) 505-846 5092, Fax : (1) 505-846 0417 (135)
- BAVA, Prof. E., Dip. di elettronica e dell informazione, Politecnico di Milano, Piazza Leonardo da Vinci 32, I-20133 MILANO, ITALY, Tel. : (39) 2-2399 3609, Fax : (39) 2-2399 3413 (144)
- BELYAEV, Prof. B.I., Institute of Applied Physics, Problems of BSU, Kurchatov St. 7, 220120 MINSK, BELARUS, Tel. : (70172) 78 04 09, Fax : (70172) 78 04 17 (136)
- BEM, Prof. D.J., ul. Bacciarellego 24, m. 12, 51-649 WROCLAW, POLAND, (130)
- BENCZE, Dr. P., Geodetic & Geophysical Research Institute, MTA (Hungarian Academy of Sciences), Csatkai E. u. 6, H-9400 SOPRON, HUNGARY, Tel. : (36) 99-314290 ext. 36, Fax : (36) 99-313267 (136)

- BERNARDI, Prof. P., Department of Electronics, Università "La Sapienza", via Eudossiana 18, I-00184 ROMA, ITALY, Tel. : (39) 6-4458 5855, Fax : (39) 6-474 2647, E-mail : bernardi@tce.ing.uniroma1.it (140, 141)
- BERNHARDT, Dr. P.A., Code 6794, Naval Research Laboratory, WASHINGTON, DC 20375-5000, U.S.A., Tel. : (1-202) 767-0196, Fax : (1-202) 767-0631, E-mail : bern@ppd.nrl.navy.mil (139, 142)
- BEYNON, Sir Granville, Department of Physics, University College of Wales, Penglais, ABERYSTWYTH, SY23 3BZ, UNITED KINGDOM (126)
- BIC, Mr. J.-C., CNET/PAB/RPE, 38-40, rue du Général Leclerc, F-92131 ISSY-LES-MOULINEAUX, FRANCE, Tel. : (33-1) 4529 4870, Fax : (33-1) 4529 6052 (144)
- BILIKMEN, Prof. S., Dept. of Electrical & Electronic Eng., Middle East Technical University, İnönü Bulvan, 06531 ANKARA, TURKEY, Tel. : (90) 312-210 1000 ext. 3283, Fax : (90) 312-210 1281, E-mail : bilikmen@tr metu (138)
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- BLAKE, Dr. I.F., Dept. of Electrical Eng., University of Waterloo, WATERLOO, ON N2L 3G1, CANADA, Tel. : (1) 519-885 4567 ext. 2840, Fax : (1) 519-888 4521, E-mail : iblake@claudio.uwaterloo.ca (131)
- BLOMQUIST, Mr. A., Gripgatan 4, S-581 83 LINKÖPING, SWEDEN, Tel. : (46) 13-141 383 (136)
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- BOOTH, Prof. R.S., Onsala Space Observatory, S-439 92 ONSALA, SWEDEN, Tel. : (46) 31-772 5520, Fax : (46) 31-772 5590, E-mail : roy@oso.chalmers.se (139, 140)**
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- BRAZIL, Dr. T., Dept. of Electrical & Electronic Eng., University College, Belfield, DUBLIN 4, IRELAND, Tel. : (351) 1-7061 929, Fax : (351) 1-2830 921 (135)**
- BRAUN, Dr. R., Netherlands Foundation for Research in Astronomy, Postbus 2, NL-7990 AA DWINGELOO, NETHERLANDS, Tel. : (31) 5219-7244, Fax : (31) 5219-7332, E-mail : rbraun@nfra.nl (140)**
- BREKKE, Prof. A., Nordlysobservatoriet, Universitetet i Tromsø, Postboks 953, N-9037 TROMSØ, NORWAY, Tel. : (47) 77 64 51 50, Fax : (47) 77 64 55 80 (137)**
- BRINCA, Prof. A.L. Esteves, Instituto Superior Técnico de Lisboa, Avenida Rovisco Pais, 1096 LISBOA CODEX, PORTUGAL, Tel. : (351) 1-8417 284, Fax : (351) 1-8482 987 (138)**
- BRUSTAD, Prof. T., Biofysisk avdeling, Det Norske Radiumhospital, Montebello, N-0310 OSLO, NORWAY, Tel. : (47) 2-50 60 50, Fax : (47) 2-52 55 59 (141)**
- BUTLER, Prof. C.M., Dept of Electrical and Computer Eng, Clemson University, Box 340915, 201 Riggs Hall, CLEMSON, SC 29634-0915, U.S.A., Tel. : (1) 803-656 5922 (and 2650), Fax : (1) 803-656 5910, E-mail : cbutler@eng.clemson.edu (130)**

BÜYÜKAKSOY, Prof. A., Electrical & Electronics Eng. Faculty, Technical University of Istanbul, Maslak, 80626 ISTANBUL, TURKEY, Tel. : (90) 212-285 36 32, Fax : (90) 212-285 36 79, E-mail : ee buyuk@tritu.bitnet (145)

BUZEK, Dr. O., Institute of Radioeng. and Electronics, Academy of Sciences of the Czech Rep., Chaberská 57, 182 51 PRAHA 8, CZECH REP., Tel. : (42) 2-664 11804, Fax : (42) 2-664 10222, E-mail : tp@ure.cas.cz (129)

CAETANO, Mr. A.C.M., Observatório Astronómico de Lisboa, Tapada da Ajuda, 1300 LISBOA, PORTUGAL, Tel. : (351-1) 3637 351, Fax : (351-1) 3621 722 (129)

CALDERON-CHAMOCHUMBI, Dr. C.H., Jicamarca Radio Observatory, Apartado 13-0207, LIMA 13, PERU, Tel. : (51) 14-942454, Fax : (51) 14-792155, E-mail : carlos@roj.pe (145)

CALLA, Prof. O.P.N., Sat. Comm. Area, Space Application Centre (ISRO), Jodhpur Tekra, 380 053 AHMEDABAD, INDIA, Tel. : (91) 272-429 180, Fax : (91) 272-404 563 (135, 139)

CALZOLARI, Prof. P.U., Dip. di Elettronica Informatica e Sistemistica, Università degli studi, Viale Risorgimento 2, I-40136 BOLOGNA, ITALY, Tel. : (39) 51-644 3001, Fax : (39) 51-644 3073 (133)

CANNON, Dr. P., Radio Propagation Group/Space & Comm. Dept., Defence Research Agency, P161 Building, MALVERN, WORCS, WR14 3PS, UNITED KINGDOM, Tel. : (44) 684-896 458, Fax : (44) 684-895 241 (137)

CARLEIAL, Dr. A.B., Instituto Nacional de Pesquisas Espaciais - INPE, C.P. 515, 12200 SAO JOSE DOS CAMPOS, S.P, BRAZIL, Fax : (55) 123 21-8743, E-mail : inpedae@brfapesp.bitnet (131)

CESKY, Dr. T., TESTCOM, Hvozdanská 3, 148 00 PRAHA 4, CZECH REP., Tel. : (42) 2-799 2152, Fax : (42) 2-799 2318 (134)

CHALOUPKA, Prof. H., Bergische Universität-Gesamthochschule, Fachbereich Elektrotechnik, Postfach 10 01 27, D-42097 WUPPERTAL, GERMANY, Tel. : (49) 202 439 2938, Fax : (49) 202 439 2864 (130)

- CHANDRA, Dr. M., DLR Oberpfaffenhofen, Abteilung Hochfrequenz-Physik,
Postfach 11 16, D-82230 WESSLING, GERMANY, Tel. : (49) 8153
282 313, Fax : (49) 8153 282 1135 (135)
- CHANG, Prof. D.C., College of Engineering and Applied Sciences, Arizona
State University, TEMPE, AZ 85287-5506, U.S.A., Tel. : (1-602) 965-
1722, Fax : (1-602) 965-2267, E-mail : chang@asuvox.eas.asu.edu
(145)
- CHEN, Prof. Chun-Hsiung, Dept. of Electrical Engineering, National Taiwan
University, No. 1 Sec 4 Roosevelt Rd., TAIPEI, TAIWAN, Tel. : (886)
2-363-0231, Fax : (886) 2-363-8247 (130)
- CHO, Prof. Y.K., Dept. of Electronics, Kyungpook National University,
Sankyug-dong, Puk-gu, TAEGU, SOUTH KOREA, Tel. : (82) 53-950-
5536 (131)
- CHO, Dr. S.H., Daeduk Radio Astronomy Observatory, ISSA, Daeduk Science
Town, TAEJON, SOUTH KOREA, Tel. : (82) 42-861-1505 (140)
- CHOI, Prof. S.D., Department of Electrical Engineering, KAIST, 373-1,
Kusong-dong, Yusong-gu, TAEJON, SOUTH KOREA, Tel. : (82) 42-
869 3417, Fax : (82) 42-869 3410 (136)
- CHONG, Dr. C., China Research Institute of Wave Propagation, P.O. Box 138,
453003 XINXIANG, HENAN PROVINCE, CHINA, Tel. : (86) 373-
353912 (136)
- CHOONCHAROEN, Mr. P., Post & Telegraph Department, Paholyothin Road,
10400 BANGKOK, THAILAND, Tel. : (662) 2710151 ext. 143,
Fax : (662) 2713514 (127, 134)
- CHRISOULIDIS, Dr. D.P., Dept. of Electrical Engineering, University of
Thessaloniki, 54006 THESSALONIKI, GREECE (135)
- CHRISTIANSEN, Prof. W.N., 42 The Grange, 67 Mac Gregor St., DEAKIN,
ACT 2600, AUSTRALIA, Tel. : (61) 6-281 5576 (126)
- CHUGUNOV, Dr. Yu.V., Institute of Applied Physics, Russian Academy of
Sciences, Ulianova ul. 46, 603600 NIZNIJ NOVGOROD, RUSSIA
(138)
- CIZEK, Dr. V., Institute of Radioeng. & Electronics, Academy of Sciences of
the Czech Rep., Chaberská 57, 182 51 PRAHA 8, CZECH REP.,
Tel. : (42) 2-664 11804, Fax : (42) 2-664 10222 (144)

CLARRICOATS, Prof. P.J.B., Dept. of Electronic Engineering, Queen Mary & Westfield College, Mile End Road, LONDON, E1 4NS, UNITED KINGDOM, Tel. : (44) 71-980 4811, Fax : (44) 81-981 0259, E-mail : p.j.b.clarricoats@qmw.ac.uk (126, 127)

CLOETE, Prof. J.H., Dept. of Electrical & Electronic Eng., University of Stellenbosch, 7500 STELLENBOSCH, SOUTH AFRICA, Tel. : (27) 21-808-4337, Fax : (27) 21-808-4499, E-mail : jhcloete@firga.sun.ac.za (131)

COHEN, Dr. R.J., Nuffield Radio Astronomy Laboratories, Jodrell Bank, Macclesfield, CHESHIRE, SK11 9LD, UNITED KINGDOM, Tel. : (44) 477-71321, Fax : (44) 477-71618, E-mail : rcb@star.jb.man.ac.uk (140, 142, 143)

COLOMB, Dr. F., Instituto Argentino de Radioastronomia, CC. 5, 1894 VILLA ELISA, B.A., ARGENTINA, Tel. : (54) 21-870 230, Fax : (54) 21-254 909 (139)

CONKRIGHT, Mr. R., WDC-A/STP, 325 Broadway, BOULDER, CO 80303, U.S.A. (137)

CORNEY, Mr. A.C., Industrial Research Limited, P.O. Box 31-310, LOWER HUTT, NEW ZEALAND, Tel. : (64) 4-566-6919, Fax : (64) 4-569-0515 (129)

D'AURIA, Prof. G., Dip. di Elettronica, Università "La Sapienza", Via Eudossiana 18, I-00184 ROMA, ITALY, Tel. : (39) 6-4458 5847, Fax : (39) 6-4742 647 (135)

DAMBOLDT, Dr. Th., Deutsche Bundespost Telekom / FI 34, Forschungs- und Technologiezentrum, Postfach 10 00 03, D-64276 DARMSTADT, GERMANY, Tel. : (49) 6151-83 25 48, Fax : (49) 6151-83 43 52 (144)

DANILKIN, Prof. N.P., Nemanskij Proezd, I, Korpus I, fl. 283, 123181 MOSCOW, RUSSIA, Fax : (7095) 288-9502 (137)

DARNELL, Prof. M., Dept. of Electronic Eng., University of Hull, HULL, HU6 7RX, UNITED KINGDOM, Tel. : (44) 482-465 026, Fax : (44) 482-466 666, E-mail : miked@ee.hull.ac.uk (132)

- DAVIS, Dr. M.M., Arecibo Observatory, NAIC, P.O. Box 995, ARECIBO, PR 00613, U.S.A., Tel. : (1-809) 878-2612, Fax : (1-809) 878-1861, E-mail : mdavis@naic.edu (140)
- DE JAGER, Prof. G., Dept. of Electrical Engineering, University of Cape Town, Private Bag, 7700 RONDEBOSCH, SOUTH AFRICA, Tel. : (27) 21-650-2801, Fax : (27) 21-650-3726, E-mail : erica@cerecam.uct.ac.za (132)
- DE VREEDE, Dr. J., NMI Van Swinden Labo, Postbus 654, NL-2600 AR DELFT, NETHERLANDS, Tel. : (31) 15-691500, Fax : (31) 15-612971 (129)
- DE WAGTER, Dr. C., Kliniek voor Radiotherapie en Kerngeneeskunde, Universitair ziekenhuis, De Pintelaan 185, B-9000 GENT, BELGIUM, Tel. : (32) 9-240.30.14, Fax : (32) 9-240.49.91, E-mail : dewagter@nmr.rug.ac.be (140)
- DEGAUQUE, Prof. P., Université des Sciences et Techniques de Lille 1, UFR/IEEA - Bâtiment P3, B.P. 3, F-59655 VILLENEUVE D'ASCQ CEDEX, FRANCE, Tel. : (33) 2043 4849, Fax : (33) 2043 6523 (135, 144)
- DELISLE, Dr. G.Y., INRS - Télécommunications, Université du Québec/Île des Soeurs, 16, Place du Commerce, VERDUN, H3E 1H6, QUEBEC, CANADA, Tel. : (1) 514-765-8202, Fax : (1) 514-761-8501, E-mail : delisle@inrs-teleom.quebec.ca (143)
- DELOGNE, Prof. P., Telecommunications and Remote Sensing, UCL, Bâtiment Stévin, B-1348 LOUVAIN-LA-NEUVE, BELGIUM, Tel. : (32) 10-472 307, Fax : (32) 10-472 089, E-mail : delogne@tele.ucl.ac.be (128, 131)
- DEMOULIN, Dr. B., Lille University, Electronic Dept. Bat. P3, F-59655 VILLENEUVE D'ASCQ CEDEX, FRANCE, Tel. : (33) 2043 4856, Fax : (33) 2043 6523 (135)
- DEN, Prof. Chi-Fu, Dept. of Communication Engineering, National Chiao Tung University, Ta, Hsueh Rd. No. 1001, HSIN-CHU, TAIWAN, Tel. : (886) 35-718-083, Fax : (886) 35-721-500 (134)
- DIEMINGER, Prof. Dr. W., Berlinerstraße 14, D-37176 NÖRTEN-HARDENBERG, GERMANY (126)
- DOMINICI, Prof. P., Dipartimento di Fisica, Università "La Sapienza", Piazzale Aldo Moro 5, I-00185 ROMA, ITALY, Tel. : (39) 6-4991 3979/6898 5142, Fax : (39) 6-4429 1070/6898 5112 (137)

DORENWENDT, Dr. K., Optical Division, Physikalisch-Technische Bundesanstalt, Postfach 33 45, D-38023 BRAUNSCHWEIG, GERMANY, Tel. : (49) 531-592 4010, Fax : (49) 531-592 4015 (144)

DOWDEN, Prof. R.L., Physics Department, University of Otago, P.O. Box 56, DUNEDIN, NEW ZEALAND, Tel. : (64) 3 479 7752, Fax : (64) 3 479 0964, E-mail : dowden@otago.ac.nz (127, 138)

DRANE, Prof. C., Electrical Engineering, University of Technology, P.O. Box 123, BROADWAY, NSW 2007, AUSTRALIA, Tel. : (61) 2-330-2390, Fax : (61) 2-330-2435, E-mail : cdrane@ee.uts.edu.au (131)

DUDLEY, Prof. D., Electromagnetics Laboratory, University of Arizona, ECE, Building 104, TUCSON, AZ 85721, U.S.A., Tel. : (1-602) 621-6169, Fax : (1-602) 621-8076, E-mail : dudley@ecc.arizona.edu (131)

EKERS, Dr. R.D., Australia Telescope, P.O. Box 76, EPPING, NSW 2121, AUSTRALIA, Tel. : (61) 2-868 0300, Fax : (61) 2-868 0457, E-mail : REKERS@ATNF.CSIRO.AU (128)

EL-DEEB, Prof. N.A., P.O. Box 62, MAADI-CAIRO, EGYPT, Fax : (202) 356 2820 (140)

EL-SAYED, Prof. L.A., 18 Merghany St., HELIOPOLIS-CAIRO, EGYPT, Fax : (202) 864 451 (129)

ELGARØY, Prof. Ø., Astrofysisk Institutt, Universitetet i Oslo, Postboks 1029 Blindern, N-0315 OSLO 3, NORWAY, Tel. : (47) 2-85 65 04 (139)

ELKHAMY, Prof. S., Faculty of Engineering, Alexandria University, Abou-Keer St., ALEXANDRIA, EGYPT, Fax : (203) 597 1853 (135)

EOM, Prof. H.J., Department of Electrical Eng., KAIST, 373-1 Kusong-dong, Yusong-gu, 305-701 TAEJON, SOUTH KOREA, Tel. : (82) 42-869-3436, Fax : (82) 42-869-3410, E-mail : hjeom@eekaist.kaist.ac.kr (145)

EVANS, Prof. B.G., Dept. of Electronic & Electrical Eng., Surrey University, GUILDFORD, GU2 5XH, SURREY, UNITED KINGDOM, Tel. : (44) 483-509 131, Fax : (44) 483-300 803 (131)

EVIATAR, Prof. A., Faculty of Exact Sciences, Dept. of Geophysics & Planetary Sciences, Tel-Aviv University, 69978 RAMAT AVIV, ISRAEL, Tel. : (972) 9-66 66 68, Fax : (972) 3-64 09 282 (138)

EZEKPO, Mr. S.U.B., c/o Dept. of Electronic & Electrical Eng., Obafemi Awolowo University, P.O. Box 1027, ILE-IFE, NIGERIA, Tel. : (234) 36-230290 (144)

FÄLTHAMMAR, Prof. C.G., Department of Plasma Physics, Royal Institute of Technology, S-100 44 STOCKHOLM, SWEDEN, Tel. : (46-8) 790 7685, Fax : (46-8) 24 5431 (138)

FEDI, Prof. F., Fondazione "Ugo Bordini", Via B. Castiglione 59, I-00142 ROMA, ITALY, Tel. : (39) 6-5480 5200, Fax : (39) 6-5480 4400 (127)

FEICK, Dr. R., Depto. de Electronica, Universidad Técnica Federico Santa Maria, Casilla 110 V, VALPARAISO, CHILE, Tel. : (56) 32-626 364 ext. 209, Fax : (56) 32-665 010, E-mail : rfeick@elo.utfsm.cl (132)

FENG, Prof. S., c/o Mrs. Xiaonan Zhang, Chinese Institute of Electronics, P.O. Box 165, 100036 BEIJING, CHINA, Tel. : (86-1) 826 3458, Fax : (86-1) 826 3458 (127, 142, 144)

FERENCZ, Prof. Cs., ELTE - University of Sciences Lóránd Eötvös, Department of Geophysics, Ludovika tér 3., H-1083 BUDAPEST, HUNGARY, Tel. : (36) 1-210-1089 (139)

FIALA, Dr. V., Geophysical Institute, Czech Academy of Sciences, Bocni II-1401, 141 31 PRAHA 4, CZECH REP., Tel. : (42) 2-762 548, Fax : (42) 2-762 528, E-mail : fiala@seis.ig.cas.cz (127, 138)

FIKIORIS, Prof. J.G., Electrical Eng. and Computer Science, National Technical University of Athens, 28 October 42, GR-106 82 ATHENS, GREECE, Tel. : (30) 3616-934, Fax : (30) 3647-704, E-mail : gfikio@naxos.esd.cce.ntua.gr (144)

FOPPIANO, Dr. Alberto, Depto. de Fisica de la Astmosfera y del Océano, Universidad de Concepcion, Casilla 4009, CONCEPCION, CHILE, Tel. : (56) 41-312 413, Fax : (56) 41-312 863, E-mail : foppiano@halcon.dpi.udec.cl (137)

FORGET, Mr. Philippe, Université de Toulon et du Var, LSEET, Boîte postale 132, F-83957 LA GARDE CEDEX, FRANCE, Tel. : (33) 9414 2451/16, Fax : (33) 9414 2417 (135)

FORSSELL, Prof. B., Institutt for teleteknikk, Navigasjonssystemer, Universitetet i Trondheim, N-7034 TRONDHEIM - NTH, NORWAY, Tel. : (47) 73-59-2653, Fax : (47) 73-94-4475 (132)

FÖRSTER, Dr. M., Max-Planck-Institut für Extraterrestrische Physik, Außenstelle Berlin, Rudower Chaussee 5, D-12489 BERLIN, GERMANY, Tel. : (49) 30-6392-3941, Fax : (49) 30-6392-3939 (136)

FRIESEM, Prof. A., Dept. of Electronics, Weizmann Institute, REHOVOT, ISRAEL, Tel. : (972) 8-382580 (133)

FUKAO, Prof. S., Radio Atmospheric Science Centre, Kyoto University, Uji, KYOTO 611, JAPAN, Tel. : (81) 774-33-5343, Fax : (81) 774-31-8463, E-mail : fukao@kurasc.kyoto-u.ac.jp (128, 142)

FURUHAMA, Dr. Y., Communications Research Laboratory, Ministry of Posts and Telecommunications, 4-2-1 Nukuikitamachi, Koganei-shi, TOKYO 184, JAPAN, Tel. : (81) 423-27 7456, Fax : (81) 423-27 7459 (128, 135)

GAGLIARDINI, Dr. D.A., Julian Alvarez 1218, 1414, BUENOS AIRES, ARGENTINA, Tel. : (54) 1-772-1471, Fax : (54) 1-776 0410, E-mail : postmast@caerce.edu.ar (135)

GALLAGHER, Prof. T.G., Dept. of Electronic & Electrical Eng., University College, Belfield, DUBLIN 4, IRELAND, Tel. : (353-1) 706 1844, Fax : (353-1) 283 0921, E-mail : TOMGALLA@IRLEARN.0 (141)

GAO, Prof. Y.-G., Beijing Institute of Posts and Telecommunications, BEIJING, CHINA (133)

GARAVAGLIA, Dr. M., Centro de Invest. Opticas (CIOP), CC. 124, 1900 LA PLATA, B.A., ARGENTINA, Tel. : (54) 21-840 280/842 957, Fax : (54) 21-530 189, E-mail : postmast@ciop.edu.ar (132)

GARBINI, Mr. A., Julian Alvarez 1218, 1414 BUENOS AIRES, ARGENTINA, Tel. : (54) 1-772-1471, Fax : (54) 1-776 0410, E-mail : postmast@caerce.edu.ar (143)

GARDIOL, Prof. Dr. F., LEMA, Ecole Polytechnique Fédérale, ELB-Ecublens, CH-1015 LAUSANNE, SWITZERLAND, Tel. : (41) 21-693 2670, Fax : (41) 21-693 2673, E-mail : gardiol@lemahp1.epfl.ch (131)

- GARDNER, Dr. R.L., PL/WS, Phillip Laboratories, 3550 Aberdeen SE, KIRTLAND AFB, NM 87117-5776, U.S.A., Tel. : (1-505) 846-4044, Fax : (1-505) 846-0417, E-mail : gardncrr@plk.af.mil (134, 135)
- GEHER, Prof. K., Department of Telecommunication and Telematics, BME - Technical University of Budapest, Stoczek u. 2, H-1111 BUDAPEST, HUNGARY, Tel. : (36-1) 181-3500/2302, Fax : (36-1) 166-6808/181-2302, E-mail : h3683geh@ella.hu (126, 127, 131, 144)
- GELIAZKOV, Prof. I., Faculty of Physics, Sofia University, Bul. Anton Ivanov 5, 1126 SOFIA, BULGARIA (130)
- GENTIL, Mr. P., CIME-INPG, 46 av. Félix Viallet, F-38031 GRENOBLE CEDEX, FRANCE, Tel. : (33) 7657 4682, Fax : (33) 7657 4502 (132)
- GEROSA, Prof. G., Dip. di Elettronica, Università "La Sapienza", Via Eudossiana 18, I-00184 ROMA, ITALY, Tel. : (39) 6-4458 5854, Fax : (39) 6-4742 647 (130)
- GIRALDEZ, Prof. A., LIARA, avda. del Libertador 327, 1638 VICENTE LOPEZ, B.A., ARGENTINA, Tel. : (54) 1-791-5001, Fax : (54) 1-776-0410, E-mail : secyt!atina!senid.mil.ar@postmast (138)
- GJESSING, Prof. D.T., PFM (Program for Miljøovervakingsteknikk), Storgaten 6, P.O. Box 89, N-2001 LILLESTRÖM, NORWAY, Tel. : (47) 63-892660, Fax : (47) 63-892670 (127, 143, 144)
- GOLDHIRSCH, Dr. J., APL/JHU, John Hopkins Road, LAUREL, MD 20723-6099, U.S.A., Tel. : (1-301) 953-5042, Fax : (1-301) 953-5548, E-mail : julius@nansen.jhuapl.edu (136)
- GOMBEROFF, Prof. L., Depto de Fisica - Facultad de Ciencias, Universidad de Chile, Casilla 653, SANTIAGO, CHILE, Tel. : (56) 2-271 2865, Fax : (56) 2-271 3882, E-mail : lgombero@abello.uchile.cl (139)
- GONZE, Prof. R., Service de Radioastronomie, Observatoire Royal de Belgique, 3, avenue Circulaire, B-1180 BRUSSELS, BELGIUM, Tel. : (32) 2-373 02 11, Fax : (32) 2-374 98 22 (139)
- GORDON, Prof. W.E., 1400 Hermann Drive #10H, HOUSTON, TX 77004-7138, U.S.A., Tel. : (1) 713-527 6020, Fax : (1) 713-285 5143 (126, 128)
- GORGOLEWSKI, Prof. S., Katedra Radioastronomii, Uniwersytet M. Kopernika, ul. Gagarina 11, 87-100 TORUN, POLAND, (139)

- GOUGH, Dr. P.T., Dept. of Electrical Engineering, University of Canterbury, Private Bag, CHRISTCHURCH 1, NEW ZEALAND, Tel. : (64) 366-7001 ext. 7273, Fax : (64) 364-2761, E-mail : gough@elec.canterbury.ac.nz (132)
- GRAF, Dr. W., Electromagnetic Sciences Laboratory, SRI International, MENLO PARK, CA 94025, U.S.A. (128)
- GUBANKOV, Prof. V.N., Institute of Radioeng. & Electronics, Russian Academy of Sciences, Mokhovaja St. 11, 103907 MOSCOW, RUSSIA, Fax : (7095) 203 8414, E-mail : obukh@ire.msk.su (127, 145)
- GUDMANDSEN, Prof. P., Electromagnetics Institute - Bldg 348, Technical University of Denmark, DK-2800 LYNGBY, DENMARK, Tel. : (45) 4288 1444, Fax : (45) 4593 1634, E-mail : omnet.p.gudmandsen (135)
- GUILLOTEAU, Mr. S., IRAM - Voie 10, Domaine Universitaire de Grenoble, F-38406 SAINT MARTIN d'HERES CEDEX, FRANCE, Tel. : (33) 7682 4943, Fax : (33) 7651 5938 (139)
- GUISSARD, Prof. A., U.C.L. - TELE, Bâtiment Stévin, Place du Levant, 3, B-1348 LOUVAIN-LA-NEUVE, BELGIUM, Tel. : (32) 10-47 23 06, Fax : (32) 10-47 20 89, E-mail : guissard@tele.ucl.ac.be (135)
- GULDBRANDSEN, Dr. T., Physics Lab. III, Technical University of Denmark, Building 309, DK-2800 LYNGBY, DENMARK, Tel. : (45) 4288 1611, Fax : (45) 4288 2239 (129)
- HAHN, Prof. S., Warsaw University of Technology, Institute of Radioelectronics, ul. Nowowiejska 15/19, 00-665 WARSAW, POLAND, Tel. : (48) 2-663 90 56 (pr.), Fax : (48) 22-25 52 48, E-mail : hahn@ire.edu.pl (144)
- HALL, Mr. M.P.M., Rutherford Appleton Laboratory, CHILTON, DIDCOT/OXON, OX11 0QX, UNITED KINGDOM, Tel. : (44) 235 44 6650, Fax : (44) 235 44 6140/5753, E-mail : BYT@ib.rl.ac.uk (135)
- HALLIKAINEN, Prof. M., E.E. Department, Laboratory of Space Technology, Helsinki University of Technology, Otakaari 5A, SF-02150 ESPOO, FINLAND, Tel. : (348) 0451 2371, Fax : (358) 0460 224, E-mail : hallikainen@ava.hut.fi (128, 135)

- HAMELIN, Dr. J., Head of Space Division, Ministry of Industry, Post and Telecommunications and Foreign Trade, 20, Avenue de Ségur, F-75353 PARIS 07 SP, FRANCE, Tel. : (33-1) 45 64 64 48, Fax : (33-1) 45 64 64 11 (128)
- HANBABA, Mr. Rudi, CNET-LAB/PTI/SPI, Route de Trégastel, B.P. 40, F-22301 LANNION CEDEX, FRANCE (137)
- HANSEN, Dr. D., EMI Control Centre, ASEA Brown-Boveri Ltd., Corporate Res. Crbe 4, CH-5405 BADEN, SWITZERLAND, (128)
- HANSEN, Mr. O., Telelaboratory, Radio/EMC, Telecom A/S, Telegade 2, DK-2630 TAASTRUP, DENMARK, Tel. : (45) 4252 5577 ext.5510, Fax : (45) 4252 9331 (134)
- HANUISE, Mr. C., Université de Toulon et du Var, LSEET, Boîte postale 132, F-83957 LA GARDE CEDEX, FRANCE, Tel. : (33) 9414 2453, Fax : (33) 9414 2417 (136)
- HARIN, Prof. Y.S., Faculty of Applied Mathematics & Informatics, Belarussian State University, Fr. Skariny Av. 4, 220050 MINSK, BELARUS, Tel. : (70172) 26 57 04, Fax : (70172) 26 59 40 (132)
- HARTAL, Mr. O., TECHNION, P.O. Box 2250, 31021 HAIFA, ISRAEL, Tel. : (972) 4-792930, Fax : (972) 4-795329 (134, 144)
- HAYAKAWA, Prof. M., Faculty of Electro-Communications, The University of Electro-Communications, 1-5-1 Chofugaoka, Chofu-shi, TOKYO 182, JAPAN, Tel. : (81) 424-83-2161 ext. 3354, Fax : (81) 424-89-5861 (133, 134)
- HAYMAN, Dr. E., Faculty of Engineering, Tel Aviv University, Ramat Aviv, 69978 TEL AVIV, ISRAEL, Tel. : (972) 3-640 8147, Fax : (972) 3-642 3508 (130)
- HAYWARD, Mr. R.H., Herzberg Institute for Astrophysics, National Research Council of Canada, Room 1064, 100 Sussex Drive, OTTAWA, ON K1A 0R6, CANADA, Tel. : (1-613) 991-5846, Fax : (1-613) 993-6004, E-mail : rhh@hiiaras.hia.nrc.ca (143)
- HELEU, Mrs. I., URSI Secretariat, c/o INTEC, Sint-Pietersnieuwstraat 41, B-9000 GENT, BELGIUM, Tel. : (32) 9-264.33.20, Fax : (32) 9-264.35.93, E-mail : heleu@intec.rug.ac.be (126)
- HENGSTBERGER, Dr. F., Division of Production Technology, CSIR, P.O. Box 395, PRETORIA 0001, SOUTH AFRICA, Tel. : (27) 12-841-4352, Fax : (27) 12-841-2832 (129)

- HEROUNI, Prof. P.M., Radiophysics Measurements Institute, 49/4 Komitas av.,
375014 YEREVAN, ARMENIE (129)
- HIZAL, Prof. A., Dept. of Electrical & Electronic Eng., Middle East Technical
University, İnönü Bulvan, 06531 ANKARA, TURKEY, Tel. : (90)
312-210 10 00 ext. 2301, Fax : (90) 312-210 12 61, E-mail : Hizal@tr
metu (129, 134, 136)
- HJELMSTAD, Dr. J.Fr., PFM, Storgaten 6, P.O. Box 89, N-2001
LILLESTRÖM, NORWAY, Tel. : (47) 63-892663, Fax : (47) 63-
892670 and STAR Laboratory, Dept. of Electrical Engineering,
Stanford University, STANFORD, CA 94305-4055, U.S.A.,
Tel. : (1-415) 723-3931, Fax : (1-415) 723-9251 (135)
- HØEG, Dr. P., Dept. of Geophysics, Danish Meteorological Institute, Lyngbyvej
100, DK-2100 KØBENHAVN Ø, DENMARK, Tel. : (45) 3129 2100,
Fax : (45) 3118 4261, E-mail : metohoeg@uts.uni-c.dk (136, 141)
- HOLLENSTEIN, Dr. C., CRPP-EPF Lausanne, Plasmaphysik, Avenue des
Bains 21, CH-1007 LAUSANNE, SWITZERLAND, Tel. : (41) 21-
6933 471, Fax : (41) 21-7693 517 (137, 138)
- HOLT, Dr. J.M., MIT Haystack Observatory, Route 40, WESTFORD, MA
01886, U.S.A. (137)
- HOUMINER, Dr. Z., Asher Space Research Institute, Technion, Israel Institute
of Technology, 32000 HAIFA, ISRAEL, Tel. : (972) 4-293020,
Fax : (972) 4-230958, E-mail : ASZWIH@vmsa.technion.ac.il (137,
139)
- HU, Eng., D.-Z.,-Qing-Dao Research Centre, China Research Inst of Radio
Propagation, 18A Qi-dong Road, QUINGDO, CHINA (135)
- HUANG, Dr. Y.-N., Directorate General of Telecommunications, Ministry of
Transportation/Communication, 31 Ai-Kuo E. Rd, TAIPEI 106,
TAIWAN, Tel. : (886) 2-344-3604, Fax : (886) 2-356-0259 (127, 136,
144)
- HUANG, Prof. K.-C., National Kaohsiung Institute of Technology, 415 Chien
Kuang Road, 80782 KAO-HSIUNG, TAIWAN (138)
- HULTQVIST, Prof. B., President SCOSTEP, Swedish Institute of Space
Physics, P.O. Box 812, S-981 28 KIRUNA, SWEDEN, Tel. : (46) 980-
79000, Fax : (46) 980-79050 (137)

HUNTER, Dr. J., CSIRO, Division of Applied Physics, P.O. Box 218,
LINDFIELD, NSW 2070, AUSTRALIA, Tel. : (61) 2-413 7391,
Fax : (61) 2-413 7383, E-mail : jdh@dap.csiro.au (129)

IANOZ, Dr. M., Ecole Polytechnique Fédérale de Lausanne, LRE/DE,
ECUBLENS, CH-1015 LAUSANNE, SWITZERLAND, Tel. : (41) 21-
693 2664, Fax : (41) 21-693 4662 (135, 145)

IBRAHIM, Prof. M.M., Faculty of Engineering, Ain Shams University, 1
Elsaryat St., 11517 ABASIA-CAIRO, EGYPT, Fax : (202) 285 0617
(134)

IDEMEN, Prof. M., Electrical and Electronic Eng. Faculty, Istanbul Technical
University, Maslak, 80626 ISTANBUL, TURKEY, Tel. : (90) 212-285
36 22, Fax : (90) 212-285 36 79, E-mail : ee idemen@tritü.bitnet
(145)

INAN, Dr. U.S., Stanford University, Star-Lab, Durand 321, STANFORD, CA
94305, U.S.A. (142)

IRELAND, Mr. W., Industrial Research Ltd., P.O. Bo 31310, LOWER HUTT,
NEW ZEALAND, Tel. : (64) 4-569-0000, Fax : (64) 4-566-6004
(144)

ISHIGURO, Prof. M., Nobeyama Radio Observatory, Nobeyama Minamimaki-
mura, Minamisaku-gun, 384-13 NAGANO, JAPAN, Tel. : (81) 267-
63-4396, Fax : (81) 267-98-2884, E-mail : ishiguro@nro.nao.ac.jp
(139, 140)

ITOH, Prof. T., Electrical Eng. Dept., School of Eng.&Applied Science, 66-147
A ENG IV, 405 Hilgard Avenue, LOS ANGELES, CA 90024-1594,
U.S.A., Tel. : (1) 310-206-4820, Fax : (1) 310-206-4819, E-mail :
itoh@joule.ee.ucla.edu (132)

JACARD, Prof. B., Depto. de Ingenieria Electrica, Universidad de Chile, Casilla
412-3, SANTIAGO 3, CHILE, Tel. : (56) 2-698 2071 ext. 204,
Fax : (56) 2-695 3881 (131)

JAMES, Dr. G., CSIRO Division of Radiophysics, CNR Vimiera & Pembroke Roads, P.O. Box 76, MARSFIELD, NSW 2121, AUSTRALIA, Tel. : (61) 2-372-4222, Fax : (61) 2-372-4400 (130)

JONES, Prof. T.B., Department of Physics, University of Leicester, University Road, LEICESTER, LE1 7RH, UNITED KINGDOM, Tel. : (44) 533-523 561, Fax : (44) 533-523 555, E-mail : tbj@ion.le.ac.uk (145)

JONES, Dr. D.L., Department of Physics, King's College, Strand, LONDON, WC2R 2LS, UNITED KINGDOM, Tel. : (44) 71-836 5454, Fax : (44) 71-872 0201 (134)

JOYNER, Dr. K.H., Telecom Research Laboratories, 770 Blackburn Road/P.O. Box 249, CLAYTON NTH, VIC 3168, AUSTRALIA, Tel. : (61) 3-253-6315, Fax : (61) 3-253-6365, E-mail : k.joyner@trl.oz.au (140)

JULL, Prof. E.V., Department of Electrical Engineering, University of British Columbia, 2356 Main Mall, VANCOUVER, BC V6T 1Z4, CANADA, Tel. : (1) 604-822 3282, Fax : (1) 604-822 5949, E-mail : jull@ee.ubc.ca (126, 127, 128, 143)

KAHLMANN, Mr. H.C., Radiosterrenwacht Westerbork, Astron/NFRA, Schattenberg 1, NL-9433 TA ZWIGGELTE, NETHERLANDS, Tel. : (31) 5939-2421, Fax : (31) 5939-2486 (139, 143, 144)

KAISER, Prof. F., Nichtlineare Dynamik - Technische Hochschule, Institut für angewandte Physik, Hochschulstraße 4A, D-64289 DARMSTADT, GERMANY, Tel. : (49) 6151 16 5279, Fax : (49) 6151 16 3279 (141)

KALMYKOV, Prof. A.I., Institute of Radiophysics and Electronics, ul. Akademika Proskury 12, 310085 KHARKOV 87, UKRAINE, Tel. : (7-0572) 44-8397, Fax : (7-0572) 44-1105, E-mail : kalmikov%rsd.kharkov.ua@relay.ussr.eu.net (136)

KAMP, Dr. L.P.J., TU Eindhoven, Afdeling Technische Natuurkunde, Postbus 513, NL-5600 MB EINDHOVEN, NETHERLANDS, Tel. : (31) 40-474 288 (138)

KANDA, Dr. M., Electromagnetic Fields Division, National Inst. of Standards & Tech., 325 Broadway, BOULDER, CO 80303-3328, U.S.A., Tel. : (1-303) 497-5320, Fax : (1-303) 497-6665 (129)

KANGAS, Prof. J., University of Oulu, Dept. of Physics, Linnanmaa, SF-90570
OULU, FINLAND, Tel. : (358) 81-553-1369, Fax : (358) 81-553-1287
(138)

KANTOR, Dr. I.J., INPE, Instituto Nacional de Pesquisas Espaciais, C.P. 515,
12200 SAO JOSE DOS CAMPOS, S.P., BRAZIL, Fax : (55) 123 21-
8743, E-mail : inpedae@brfapesp.bitnet (136)

KARASEK, Dr. M., Institute of Radio Eng. and Electronics, Academy of
Sciences of the Czech Rep., Chaberska 57, 182 51 PRAHA 8, CZECH
REP., Tel. : (42) 2-664 11804, Fax : (42) 2-664 10222, E-mail : ure
44@ure.cas.cz (132)

KATILA, Prof. T., Laboratory of Biomedical Eng., Helsinki University of
Technology, Rakentajanaukio 2 C, SF-02150 ESPOO, FINLAND,
Tel. : (358) 0-451-3173, Fax : (358) 0-451-3182, E-mail : lkt-tk@
finhut.hut.fi (141)

KATO, Prof. S., Japan - Indonesia Forum, Rokko Building No. 2, 1-3-7
Shinkawa, Chuo-ku, TOKYO 104, JAPAN, Tel. : (81) 3-3552-7986,
Fax : (81) 3-3552-7302 (143)

KAUFMANN, Prof. P., CRAAE/LAE/EPUSP, Universidade de Sao Paulo, C.P.
8174, 01065-970, SAO PAULO, S.P., BRAZIL, Tel. : (55) 11-815
6289, Fax : (55) 11-815 6289, E-mail : kaufmann@fox.cce.usp.br
(139, 143)

KAWASAKI, Dr. Zen-Ichiro, Dept. of Electrical Eng., Faculty of Eng., Osaka
University, Yamada-Oka 2-1, Suita Osaka 565, Japan, Tel. (81) 6-877-
5111 ext4553, Fax (81) 6-875-0506, E-mail Zen@pels.pwr.osaka-
u.ac.jp (135)

KEHINDE, Prof. L.O., Dept. of Elect. & Elect. Engineering, Obafemi Awolowo
University, ILE-IFE, NIGERIA (129)

KENDERESSY, Dr. M., TKI - Research Institute for Telecommunication,
Gábor A.u.65., H-1026 BUDAPEST, HUNGARY, Tel. : (36) 1-135
3762, Fax : (36) 1-135 5560 (129)

KHABIBULIAEV, Dr. P.K., Academy of Sciences, Republic of Uzbekistan,
700000 TASHKENT, UZBEKISTAN, Tel. : (3712) 333 802,
Fax : (3712) 334 901 (145)

KHAIKIN, Dr. V., Special Astrophysical Observatory, Russian Academy of
Sciences, N. Arkhyz 3-62, 357147 STAVROPOL TER, RUSSIA,
Fax : (7-812) 315-1701, E-mail : vkh@sao.stavropol.su (128)

- KHOKLE, Dr. W.S., Director, Central Electronics Eng. Res. Institute, 333 031 PILANI, INDIA, Tel. : (91) 15951-2111, Fax : (91) 15951-2294 (133, 141)
- KIKUCHI, Prof. H., College of Science & Technology, Nihon University, 8-14, Kanda Surugadai, 1-chome, Chiyoda-ku, TOKYO 101, JAPAN, Tel. : (81) 33-293 3251 ext. 370, Fax : (81) 33-5275 8310 (135)
- KIM, Prof. S.Y., Dept. of Physics, KAIST, 373-1, Kusong-dong, Yusong-gu, TAEJON, SOUTH KOREA, Tel. : (82) 42-869 2529 (138)
- KIMURA, Prof. I., Electrical Engineering, Kyoto University, Yoshida Honmachi, Sakyo-ku, KYOTO 606, JAPAN, Tel. : (81) 75-753-5348, Fax : (81) 75-751-8201, E-mail : kimura@kuee.kyoto-u.ac.jp (127)
- KLEIN, Prof. J.W., Ruhr-Universität Bochum, Lehrstuhl für Elektronische Schaltungen, Postfach 102148, D-44780 BOCHUM, GERMANY, Tel. : (49) 234-700 3137/4507, Fax : (49) 234-709 4168 (127, 132)
- KLOBUCHAR, Dr. J.A., Research Engineer, Air Force Geophysics Lab, Ionospheric Physics - Lis, BEDFORD, HANSCOM AFB, MA 01731, U.S.A. (137)
- KNUDE, Dr. J., Copenhagen University Observatory, Øster Voldgade 3, DK-1350 COPENHAGEN K, DENMARK, Tel. : (45) 3314 1790, Fax : (45) 3315 4338, E-mail : indus@astro.ku.dk (139)
- KOLAWOLE, Prof. L.B., Department of Physics, Federal University of Technology, AKURE, NIGERIA (130)
- KOMBAKOV, Mr. N., Institute of Communications, Haidushka Poliana St. 8, 1612 SOFIA, BULGARIA (133)
- KONOVALENKO, Prof. A.A., Institute of Radioastronomy, ul. Krasnoznamennaya 4, 310002 KHARKOV 2, UKRAINE, Tel. : (7-0572) 47-1134, Fax : (7-0572) 47-6506, E-mail : rai%ira.kharkov.ua@relay.ussr.eu.net (140)
- KORNIEWICZ, Prof. H., Department of Acoustic & Electromagnetic Hazards, Central Institute for Labour Protection, Czerniakowska 16, 00-701 WARSAW, POLAND, Tel. : (48) 2-623.46.64, Fax : (48) 2-623.36.95, E-mail : korn@plwatu21 (141)
- KORNSTEIN, Prof. R., Sackler Medical School, Tel-Aviv University, 69978 RAMAT AVIV, ISRAEL, Tel. : (972) 3-6409139, Fax : (972) 3-6409113 (141)

KOSILO, Dr. T., Warsaw University of Technology, Institute of Radio-electronics, ul. Nowowiejska 15/19, 00-665 WARSAW, POLAND, Tel. : (48) 22-25 39 29, Fax : (48) 22-25 52 48 (145)

KOURIS, Prof. S., University of Thessaloniki, Dept. of Electrical Engineering, GR-540 06 THESSALONIKI, GREECE, Tel. : (30) 31-996 301, Fax : (30) 31-996 312 (136)

KÖYMEN, Prof. H., Dept. of Electrical & Electronic Eng., Middle East Technical University, İnönü Bulvan, 06531 ANKARA, TURKEY, Tel. : (90) 312 266 4307, Fax : (90) 312 266 4307, E-mail : köymen@bilkent.tk.elu (141)

KRIEZIS, Prof. E.E., Dept of Electrical Engineering, University of Thessaloniki, 540 06 THESSALONIKI, GREECE, Tel. : (30) 31 996 312, Fax : (30) 31 274 868, E-mail : epam@vergina.eng.auth.gr (130)

KRÜGER, Dr. A., Astrophysikalisches Institut Potsdam, An der Sternwarte 16, D-14482 POTSDAM, GERMANY, Tel. : (49) 331-77138, Fax : (49) 331-75105 (139)

KUHARCHIK, Prof. P.D., Vice-Rector, Belarussian State University, Head of the Radiophysics Department, Fr. Skarny av. 4, 220050 MINSK, BELARUS, Tel. : (70172) 20 67 55, Fax : (70172) 26 59 40 (141, 145)

KURAEV, Prof. A.A., Radiotechnical Institute of Minsk, P. Brovky st. 6, 220600 MINSK, BELARUS, Tel. : (70172) 39 84 98, Fax : (70172) 31 09 14 (134)

KUSTER, Dr. N., Institute for Field Theory and Highest Frequency Techniques, ETH Zurich, Gloriastraße 35, CH-8092 ZURICH, SWITZERLAND, Tel. : (41) 1-256 2810/2737, Fax : (41) 1-261 1026, E-mail : niels@ith.ee.ethz.ch (141)

KUTIEV, Dr. I., Institute of Geophysics, Ac. G. Bontchev St., bl. 3, 1113 SOFIA, BULGARIA (138)

LABUDA, Prof. A.A., Radiophysics Faculty, Belarussian State University, Kurchatov st. 1, 220120 MINSK, BELARUS, Tel. : (70172) 77 08 80 (139)

LAGASSE, Prof. P., INTEC, Sint-Pietersnieuwstraat 41, B-9000 GENT, BELGIUM, (32) 9-2643320, Fax : (32) 9-2643593 (126, 127, 128)

- LEE, Mr. P.-Y., National Committee for URSI, Ministry of Communications, Telecommunication Training Institute, 168, Minchu Road, Panchiao, 22077 TAIPEI HSIEN, TAIWAN, Tel. : (886) 2-963 9260, Fax : (886) 2-963 9453 (144)
- LEE, Prof. L.-S., Dept. of Information Engineering, National Taiwan University, No. 1 Sec. 4 Roosevelt Rd., TAIPEI, TAIWAN, Tel. : (886) 2-788-8799 ext. 2202, Fax : (886) 2-782-4814 (131)
- LEE, Dr. H.J., Director, Radio Technology Dept., ETRI, P.O. Box 12, DAEDUK SCIENCE TOWN, TAEJON, SOUTH KOREA (129)
- LEFEUVRE, Dr. F., LPCE/CNRS, 3A, av. de la Recherche Scientifique, F-45071 ORLEANS CEDEX 2, FRANCE, Tel. : (33) 38-515284, Fax : (33) 38-631234, E-mail : CNESTA::LEFEUVRE (138, 141)
- LEITAO, Prof. J.N., Instituto Superior Técnico de Lisboa, Avenida Rovisco Pais, 1096 LISBOA CODEX, PORTUGAL, Tel. : (351-1) 8417 284, Fax : (351-1) 8482 987 (132)
- LEITINGER, Dr. F., Karl-Franzens-Universität Graz, Institut für Meteorologie und Geophysik, Albärthgasse 1, A-8010 GRAZ, AUSTRIA (137)
- LESCHIUTTA, Prof. S., Dipartimento di Elettronica, Politecnico di Torino, Corso Duca degli Abruzzi 24, I-10129 TORINO, ITALY, Tel. : (39) 11-317 4782, Fax : (39) 11-564 4099 (129)
- LIGTHART, Dr. L.P., Technische Universiteit Delft, Afdeling Elektrotechniek, Postbus 5031, NL-2600 GA DELFT, NETHERLANDS, Tel. : (31) 15-786 292 (135)
- LIN, Dr. J.C., 1030 SEO, M/C 154, University of Illinois at Chicago, 851 South Morgan Street, CHICAGO, IL 60607-7053, U.S.A., Tel. : (1-312) 413-1052, Fax : (1-312) 413-0024, E-mail : U45339@uicvm.vic.edu ; and Dept. of Biomedical Engineering, CYCU Chung-Li, TAIPEI, TAIWAN, Tel. : (886) 3-456 3177 ext. 511, Fax : (886) 3-456 3160, E-mail : jcl@bmeimage.cycu.edu.tw (140, 141)
- LINDELL, Prof. I.V., Helsinki University of Technology, Electromagnetics Laboratory, Otakaari 5A, SF-02150 ESPOO, FINLAND, Tel. : (358) 0-451-2266, Fax : (358) 0-451-2267, E-mail : ismo.lindell@hut.fi (130, 144)
- LITOVCHENKO, Prof. V.G., Academy of Sciences of the Ukraine, Institute of Physics of Semiconductors, prosp. Nauki 45, 252650 KIEV 28, UKRAINE, Tel. : (7-044) 265-6290, Fax : (7-044) 265-8342, E-mail : mickle@semicond.kiev.ua (133)

LIU, Prof. C.-H., SCOSTEP, Room 324, C&SRL, University of Illinois, 1308 W. Main, URBANA, IL 61801-2991, U.S.A., Tel. : (1-217) 333-9005, Fax : (1-217) 244-5624, and National Central University, 32054 CHUNG-LI, TAIWAN, Tel. : (886) 3-425-4822, Fax : (886) 3-425-4842 (135, 142)

LUCAS, Prof. J.G., Electrical Eng. - School of Science & Technology, University of Western Sydney (Nepean), P.O. Box 10, KINGSWOOD, NSW 2747, AUSTRALIA, Tel. : (61) 47-360-828, Fax : (61) 47-360-833, E-mail : g.lucas@nepean.uws.edu.au (126, 128)

LUKIN, Prof. K.A., Institute of Radiophysics and Electronics, ul. Akademika Proskury 12, 310085 KHARKOV 85, UKRAINE, Tel. : (7-0572) 44-8349, Fax : (7-0572) 44-1105, E-mail : ire%ire.kharkov.ua@relay.ussr.eu.net (134)

MACHUSSKY, Prof. E.A., Kiev Polytechnical Institute, ul. Politekhnicheskaya 16, korp. 11, 252056 KIEV 56, UKRAINE, Tel. : (7-044) 226-2396/441-9563, Fax : (7-044) 274-0954, E-mail : niict@sovam.com (132)

MAGALHAES, Mr. A.A.S., Observatório Astronómico Manuel de Barros, Monte da Virgem, 4400 VILA NOVA DE GAIA, PORTUGAL, Tel. : (351) 2-7820 404, Fax : (351) 2-7827 253 (139)

MAGUN, Dr. A., Halen 66, CH-3037 HERRENSCHWANDEN, SWITZERLAND, Tel. : (41) 31-658 903, Fax : (41) 31-653 765 (140)

MAKARENKO, Prof. B.I., NIIRI, ul. Akademika Pavlova 271, 310054 KHARKOV 54, UKRAINE, Tel. : (7-0572) 266057, Fax : (7-0572) 264112 (130)

MANILHA, Mr. T.M.E., National Institute of Meteorology, & Geophysics, Aeroporto Rua C., 1000 LISBOA, PORTUGAL, Tel. : (351-1) 8472 890, Fax : (351-1) 8023 70 (134)

MASS, Dr. J., Radio Observatory, Hagalil St. 111, 32683 HAIFA, ISRAEL, Tel. : (972) 4-234383, Fax : (972) 4-229447 (135)

MATSUMOTO, Prof. H., Radio Atmospheric Science Centre, Kyoto University, Gokasyo, Uji-shi, KYOTO 611, JAPAN, Tel. : (81) 774-33 2532, Fax : (81) 774-31 8463, E-mail : matsumot@kurasc.kyoto-u.ac.jp (127, 128, 138, 142)

- MATUURA, Prof. N., Solar-Terrestrial Environment Laboratory, Nagoya University, Furo-cho, Chigusa-ku, Nagoya-shi, 464-01 AICHI, JAPAN, Tel. : (81) 52-783-3543, Fax : (81) 52-783-3542, E-mail : matuura@stelab.nagoya-u.ac.jp (137)
- MÄTZLER, Dr. Ch., Staffelweg 30, CH-3302 MOOSSEEDORF, SWITZERLAND, Tel. : (41) 31-654 589, Fax : (41) 31-653 765 (136)
- MAVRIDIS, Prof. L.N., Univerity of Thessaloniki, GR-54006 THESSALONIKI, GREECE, Tel. : (30) 31-996 131, Fax : (30) 31-824 273 (139)
- MAY, Prof. J., Depto. de Astronomia, Universidad de Chile, Casilla 36-D, SANTIAGO DE CHILE, CHILE, Tel. : (56) 2-229 4002, Fax : (56) 2-229 4101, E-mail : jmay@das.uchile.cl (145)
- MAZANEK, Dr. M., Dept. of Electromagnetic Field K317, Faculty of Electrical Engineering, Czech Technical University, Technická 2, 166 27 PRAHA 6, CZECH REP., Tel. : (42) 2-3322 282, Fax : (42) 2-3111 786, E-mail : mazanekm@feld.cvut.cz (135)
- MAZZA, Mr. H.F., INTI, CC. 157, 1650, SAN MARTIN - B.A., ARGENTINA, Tel. : (54) 1-753 4064, Fax : (54) 1-755 2102 (129)
- McARDLE, Dr. B., URSI Sub-Committee, Royal Irish Committee, 19 Dawson Street, DUBLIN 2, IRELAND, Tel. : (353-1) 762 570/764 222, Fax : (353-1) 762 346 (144)
- McKENNA-LAWLOR, Prof. S., Dept. of Experimental Physics, St. Patrick's College, Maynooth, CO., KILDARE, IRELAND, Tel. : (351) 1-6285 222 ext. 209, Fax : (351) 1-6289 277 (139)
- MEYER, Dr. G., ETHZ-IKT, ETH-Zentrum, CH-8092 ZÜRICH, SWITZERLAND, Tel. : (41) 1-2562 793, Fax : (41) 1-2620 943 (134)
- MICHALEV, Mr. M., Institute of Electronics, Bul. Lenina 72, 1748 SOFIA, BULGARIA (135)
- MIGULIN, Prof. V.V., Russian Academy of Sciences, Mokhovaja St. 11, 103907 MOSCOW, RUSSIA, Tel. : (7095) 334-0910, Fax : (7095) 334-0124/203-8414, E-mail : obukh@ire.msk.su (145)
- MIN, Prof. K.W., Dept. of Physics, KAIST, 373-1, Kusong-dong, Yusong-gu, TAEJON, SOUTH KOREA, Tel. : (82) 42-869 2565 (137)
- MISSOUT, Dr. G., IREQ, 1800 Montée Ste. Julie, VARENNES, PQ J3X 1S1, CANADA, Tel. : (1-514) 652-8084, Fax : (1-514) 652-8435, E-mail : missout@ireq.hydro.qc.ca (129)

MITRA, Dr. A.P., Radio Science Division, Council Scientific & Industrial Research, Hillside Road, 110 012 NEW DELHI, INDIA, Tel. : (91) 11-574 5298, Fax : (91) 11-575 2678, E-mail : apm@sirnet.ernet.in (127, 143)

MIYAUSHI, Prof. K., Dept. of Electrical Engineering, Science University of Tokyo, 1-3 Kagurazaka, Shinjuku-ku, TOKYO 162, JAPAN, Tel. : (81) 3-3260 4271 ext. 3394, Fax : (81) 3-3260 4294 (131)

MOLEBNY, Prof. V.V., NII "Kvant", ul. Dimitrova 5, 252006 KIEV 6, UKRAINE, Tel. : (7-044) 268-8249, Fax : (7-044) 227-2317/220-9646 (141)

MOORE, Prof. R.K., Radar Systems & Remote Sensing Lab., Center for Research/Univ. of Kansas, 2291 Irving Hill Road, LAWRENCE, KS 66045-2969, U.S.A., Tel. : (1) 913-864-4835, Fax : (1) 913-864-7789, E-mail : moore%turing@kuhub.cc.ukans.edu & 7418::moore (135)

MORTENSEN, Mr. E., Inst of Telecommunications/Building 343, Technical University of Denmark, DK-2800 LYNGBY, DENMARK, Tel. : (45) 4288 1566, Fax : (45) 4288 2239, E-mail : em@it.dth.dk (131)

MOSCHYTZ, Prof. G.S., ETHZ-ISI, ETH-Zentrum, CH-8092 ZURICH, SWITZERLAND, Tel. : (41) 1-632 2763, Fax : (41) 1-262 0823, E-mail : moschytz@isi.ethz.ch (132)

MOURILHE DA SILVA, Mr. P., Observatorio Nacional, R. Gal Bruce 586, Sao Cristovao, 20921 RIO DE JANEIRO, BRAZIL, Fax : (55)21-5806071 or (55)21-5800332 (129)

MROZIEWICZ, Prof. B., Instytut Technologii Elektronowej, Al. Lotnikow 32/46, 02-668 WARSZAWA, POLAND, Tel. : (48) 22-43 78 10, Fax : (48) 22-47 06 31 (133)

MUSIL, Dr. J., National Institute of Public Health, Srobarova 48, 100 42 PRAHA 10, CZECH REP., Tel. : (42) 2-6731 0578, Fax : (42) 2-6731 1236 (140)

MYUNG, Prof. H., Dept. of Electrical Engineering, KAIST, 373-1, Kusong-dong, Yusong-gu, TAEJON, SOUTH KOREA, Tel. : (82) 42-869 3443, Fax : (82) 42-869 3410 (134)

- NAKHODKIN, Prof. N.G., Academy of Sciences of the Ukraine, Kiev University, ul. Vladimirskaia 64, 252601 KIEV 33, UKRAINE, Tel. : (7044) 266 0533, Fax : (7044) 265 8342 (145)
- NANO, Prof. E., Dept. di Elettronica, Politecnico di Torino, 24 Corso Duca degli Abruzzi, I-10129 TORINO, ITALY, Tel. : (39) 11-564 4051, Fax : (39) 11-564 4099 (134)
- NESTERENKO, Prof. B.A., Academy of Sciences of the Ukraine, Institute of Physics of Semiconductors, Prospekt Nauki 45, 252650 KIEV 28, UKRAINE, Tel. : (7044) 265 6040, Fax : (7044) 265 8342, E-mail : mickle%semicond.kiev.uq@relay.ussr.eu.net (145)
- NESTOROV, Dr. G., Institute of Geophysics, Ac. G. Bontchev St. - bl. No 3, 1113 SOFIA, BULGARIA (139)
- NETO, Prof., H.C., Instituto Superior Técnico, Avenida Rovisco Pais, P-1096 LISBOA CODEX, PORTUGAL, Tel. : (351) 1-841 7284, Fax : (351) 1-848 2987, E-mail : d517%ist@inesc.inesc.pt (137)
- NEVES, Prof. C.J. da Silva, Universidade de Aveiro, 3800 AVEIRO, PORTUGAL, Tel. : (351-34) 250 85, (351-34) 381 128 (136)
- NICOLSON, Dr. G.D., Hartebeesthoek RA Observatory, FRD, P.O. Box 443, 1740 KRUGERSDORP, SOUTH AFRICA, Tel. : (27) 11-642-4692, Fax : (27) 11-642-2424, E-mail : george@bootes.hartrao.ac.za (139)
- NOEL, Prof. F., Depto de Astronomia, Universidad de Chile, Casilla 36-D, SANTIAGO, CHILE, Tel. : (56) 2-229 4002, Fax : (56) 2-229 4101, E-mail : fnoel@das.uchile.cl (130)
- NORRIS, Dr. R., Australia Telescope National Facility, CSIRO, P.O. Box 76, EPPING, NSW 2121, AUSTRALIA, Tel. : (61) 2-372-4416, Fax : (61) 2-372-4310, E-mail : rnorris@atnf.csiro.au (139)
- NOVOSAD, Dr. T., Inst. of Radio Engineering & Electronics, Academy of Sciences of Czech Republic, Chaberska 57, 182 51 PRAHA 8, CZECH REP., Tel. : (42) 2-6641 1804, Fax : (42) 2-6641 0222 (144)
- NUNN, Dr. D., Department of Electronics, University of Southampton, SOUTHAMPTON, SO9 5NH, UNITED KINGDOM, Tel. : (44) 703-595 000, Fax : (44) 703-592 865, E-mail : eli002@ibm.soton.ac.uk (139)

ÖHMAN, Mr. B., Telia Research AB/TTr, Validation, S-136 80 HANINGE,
SWEDEN, Tel. : (46) 8-707 5101, Fax : (46) 8-707 5125 (145)

OKAMURA, Prof. S., 4-12-15 Numabukuro, Nakano-ku, TOKYO 165,
JAPAN, Tel. : (81) 33-294 1551 / 388 2751 (127)

OKEKE, Prof. P.N., Dept. of Physics and Astronomy, University of Nigeria,
NSUKKA, NIGERIA (139)

OKOSHI, Prof. T., National Institute for Advanced, Interdisciplinary Research
(NAIR/MITI), 1-1-4 Higashi, TSUKUBA 305, JAPAN, Tel. : (81)
298-54-2510, Fax : (81) 298-54-2524 (126, 127)

OLSEN, Dr. R.L., Communications Research Centre, Industry Canada, P.O.
Box 11490, Station H, OTTAWA, ON K2H 8S2, CANADA, Tel. : (1-
613) 998-2564, Fax : (1-613) 998-4077, E-mail : olsen@qmail.dgrc.
doc.ca (135)

OLVER, Prof. A.D., Dept. of Electronic Eng., Queen Mary and Westfield
College, Mile End Road, LONDON, E1 4NS, UNITED KINGDOM,
Tel. : (44) 71-975 5345, Fax : (44) 81-981 0259, E-mail :
a.d.olver@qmw.ac.uk (130, 145)

OWOLABI, Prof. I.E., Dept. of Electrical Eng., University of Ilorin, ILORIN,
NIGERIA, Tel. : (234) 31-220 786, Fax : (234) 31-221 593 (135)

OYINLOYE, Prof. O., Vice Chancellor, University of Ilorin, ILORIN,
NIGERIA, Tel. : (234) 31-221 160/691 (137)

ÖZEL, Prof. M.E., Space Sciences Dept., Marmara Research Center, PK 21,
41470 GEBZE, TURKEY, Tel. : (90) 262-641 2300/3300/2165,
Fax : (90) 262-641 2309, E-mail : ozel@trmbeam.bitnet (140)

PADULA-PINTOS, Prof. V.H., CAERCEM, Julian Alvarez 1218, 1414
BUENOS AIRES, ARGENTINA, Tel. : (54) 1-772-1471, Fax : (54) 1-
776 0410, E-mail : postmast@caerce.edu.ar (133, 140, 143)

PANAYIRCI, Prof. E., Electrical & Electronics Eng. Faculty, Technical
University of Istanbul, Maslak, 80626 ISTANBUL, TURKEY,
Tel. : (90) 212-285 3561, Fax : (90) 212-285 3679, E-mail : ee paney@
tritü.bitnet (132)

- PAQUET, Prof. P., Observatoire Royal de Belgique, 3 avenue Circulaire, B-1180 BRUSSELS, BELGIUM, Tel. : (32) 2-373 02 11, Fax : (32) 2-374 98 22, E-mail : paulpaq@astro.oma.be (129)
- PARIJSKY, Prof. Y. N., Special Astrophysical Observatory, Pulkovo, 196140 ST-PETERSBURG, RUSSIA (139)
- PARLOW, Dr. R.D., US Department of Commerce, Nat. Telecom. & Inf. Admin. /Room 4099A, 14th and Const. Av. NW, WASHINGTON, DC 20230, WASHINGTON, U.S.A., Tel. : (1) 202-377 1850, Fax : (1) 202-377 4396 (134, 142)
- PARROT, Mr. M., CNRS/LPCE, 3A, avenue de la Recherche Scientifique, F-45071 ORLEANS CEDEX 2, FRANCE, Tel. : (33) 3851 5291, Fax : (33) 3863 1234 (138, 142)
- PASMOOIJ, Mr. W.A., PTT-Research, Postbus 421, NL-2260 AK LEIDSCHENDAM, NETHERLANDS, Tel. : (31) 70-332 51 31 (134)
- PATRICIO, Mr. J.F., Radio Adviser Engineer, 8^oDt^o, Rua Alferes Barrilaro Ruas 1, 1800 LISBOA, PORTUGAL, Tel. : (351-1) 8511 880, Fax : (351-1) 7263 743 (145)
- PAULSSON, Dr. L.-E., Statens Stralskyddsinstitut, Box 60204, S-104 01 STOCKHOLM, SWEDEN, Tel. : (46) 8-729 7100, Fax : (46) 8-729 7108, E-mail : lepaulsson@biovax.umdc.umu.se (129, 141)
- PAWELEC, Prof. J., ul. Brzozowa 22 m 4, 00-286 WARSZAWA, POLAND, Tel. : (48) 2-635 89 13, Fax : (48) 2-635 89 13 (134)
- PAWLOWSKI, Dr. W., Instytut Telekomunikacji, Politechnika Gdanska, ul. Narutowicza 11/12, 80-952 GDANSK - WRZESZCZ, POLAND, Tel. : (48) 58-47 15 88, Fax : (48) 58-47 19 71 (135)
- PERONA, Prof. G., Dip. di Elettronica, Politecnico di Torino, Corso Duca degli Abruzzi 24, I-10129 TORINO, ITALY, Tel. : (39) 11-564 4067, Fax : (39) 11-564 4099/4015 (138)
- PETIT, Dr. M., Ministère de l'Environnement, Division de la Recherche, 14 Boulevard Général Leclerc, F-92524 NEUILLY SUR SEINE CEDEX, FRANCE (127)
- PFLEIDERER, Prof. J., Institut für Astronomie, Universität Innsbruck, Technikerstraße 15, A-6020 INNSBRUCK, AUSTRIA (139)
- PIEKARSKI, Prof. M., Instytut Telekomunikacji i Akustyki, Politechnika Wroclawska, ul. Wybrzeze Wyspianskiego 27, 50-370 WROCLAW, POLAND, Tel. : (48) 71-20 35 29, Fax : (48) 71-20 35 29 (132)

- PILIPOVICH, Prof. V.A., Institute of Electronics of ASB, Lagoyski Tarcet 22, 220841 MINSK-90, BELARUS, Tel. : (70172) 65 61 51, Fax : (70172) 65 25 41 (133)
- PILLER, Dr. O., Aeckerli, CH-1715 ALTERSWIL, SWITZERLAND, Tel. pr. : (41) 37-442 703 (129)
- PILLET, Dr. G., CNET/DICET, 38 rue du Général Leclerc, F-92131 ISSY-LES-MOULINEAUX, FRANCE, Tel. : (33) 1-4529 5020, Fax : (33-1) 4529 6052 (127)
- PINCHUK, Dr. A., MPB Technologies, 151 Hymus Blvd., POINTE CLAIRE, PQ H9R 1E9, CANADA, Tel. : (1-514) 694-8751, Fax : (1-514) 695-7492 (133)
- PIRJOLA, Dr. R., Finnish Meteorological Institute, Department of Geophysics, P.O. Box 503, SF-00101 HELSINKI, FINLAND, Tel. : (358) 0-1929-505, Fax : (358) 0-1929-539, E-mail : risto.pirjola@fmi.fi (134)
- POLITCH, Dr. J., TECHNION I.I.T., Dept. of Electrical Engineering, P.O. Box 2250, 32000 HAIFA, ISRAEL, Tel. : (972) 4-794573 (129)
- PONTES, Prof. M.S., PUC/RIO, CETUC, Av. Delfim Moreira 830/101, 22441-000 RIO DE JANEIRO, BRAZIL, Tel. : (55) 21-529 9255, Fax : (55) 21-294 5748, E-mail : m s pontes@cetuc.puc-rio.br (127)
- POOLE, Dr. A.W.V., Dept. of Physics and Electronics, Rhodes University, P.O. Box 94, 6140 GRAHAMSTOWN, SOUTH AFRICA, Tel. : (27) 461 31-8111/8460, Fax : (27) 461 25049, E-mail : phap@ruchem.ru.ac.za (145)
- PROTONOTARIOS, Prof. E., Faculty of Electrical Eng., National Technical University of Athens, Zografou, GR-15773 ATHENS, GREECE, Tel. : (30) 1-7793 988, Fax : (30) 1-7757 501, E-mail : venieris@theseas.ntua.gr (131)
- QUIJANO, Prof. A., Calle 48 y 116, 1900 LA PLATA, B.A., ARGENTINA, Tel. : (54) 21-243 709, Fax : (54) 21-250 804, E-mail : quijano@cetad.edu.ar (131)

- RA, Prof. J.W., Dept. of Electrical Engineering, KAIST, 373-1, Kusong-dong, Yusong-gu, TAEJON, SOUTH KOREA, Tel. : (82) 42-869 3414, Fax : (82) 42-869 3410 (145)
- RADECKI, Dr. K., Warsaw University of Technology, Institute of Radioelectronics, ul. Nowowiejska 15/19, 00-665 WARSZAWA, POLAND, Tel. : (48) 22-25 39 29, Fax : (48) 22-25 52 48 (129)
- RADICELLA, Prof. S.M., International Centre for Theoretical Physics, ICE/ICTP, P.O. Box 586 (Via Beirut 7), I-34100 TRIESTE, ITALY, Tel. : (39) 40 224 0331, Fax : (39) 40 224 163, E-mail : rsandro@itsictp.bitnet (126, 127, 136)
- RAJI, Prof. T.I., Dept. of Electronic and Electrical Eng., Ladoke Akintola University of Technology, P.M.B. 4000, OGBOMOSO, NIGERIA, Tel. : (234) 36-233 349 (132)
- RANEY, Dr. R.K., Canada Centre for Remote Sensing, D.G.O., Room 435, 588 Booth Street, OTTAWA, ON KIA 0Y7, CANADA, Tel. : (1-613) 947 1812, Fax : (1-613) 947 1383 (128, 143)
- RANVAUD, Dr. R.D.P.K.C., Instituto Nacional de Pesquisas Espaciais - INPE, C.P. 515, 12200 SAO JOSE DOS CAMPOS, S.P., BRAZIL, Fax : (55) 123 21-8743, E-mail : inpedae@brfapesp.bitnet (132)
- RASH, Dr. J.P.S., Department of Physics, University of Natal, K. George V Avenue, 4001 DURBAN, SOUTH AFRICA, Tel. : (27) 31-816-1401, Fax : (27) 31-261-6550, E-mail : rash@ph.und.ac.za (137, 138)
- RASKMARK, Mr. P., Institute of Electronic Systems, Aalborg University Center, Fr. Bajersvej 7, DK-9220 AALBORG, DENMARK, Tel. : (45) 9815 8522, Fax : (45) 9815 6740 (140)
- RAZIN, Prof. V.A., Scientific Research Radiophysical Institute, (NIRFI), Lyadov St. 25/14, 603600 NIZNIJ NOVGOROD, RUSSIA (139)
- REDDY, Dr. B.M., Head, Radio Science Division, National Physical Laboratory, Dr. K.S. Krishnan Road, 110 012 NEW DELHI, INDIA, Tel. : (91) 11-578 7657, Fax : (91) 11-572 1436 (127, 136, 138, 143, 144)
- REINECK, Prof. K.M., Dept. of Electrical Engineering, University of Cape Town, Private Bag, 7700 RONDEBOSCH, SOUTH AFRICA, Tel. : (27) 21-650-2801, Fax : (27) 21-650-3726, E-mail : erica@cerecam.uct.ac.za (141)

- REINISCH, Dr. B.W., University of Lowell, 1 University Avenue, LOWELL, MA 01854, U.S.A. (136)
- REMIZOV, Prof. L.T., Institute of Radioeng. & Electronics, Academy of Sciences, Vvedenskogo pl. 1, 141120 FRYAZINO (MOSCOW REGION), RUSSIA (134)
- RESTIVO, Prof. F. de Oliveira, Faculty of Engineering, University of Porto, Rua dos Bragas, 4099 PORTO CODEX, PORTUGAL, Tel. : (351-2) 317105, Fax : (351-2) 319125 (133)
- RIAD, Prof. S., Electrical Engineering, Virginia Tech, BLACKSBURG, VA 24061-0111, U.S.A., (1) 703-231-4463, Fax : (1) 703-231-3362, E-mail : sriad@vtvml.cc.vt.edu (130)
- RICHARDS, Prof. J.A., University College, Australian Defence Force Academy, CANBERRA, ACT 2601, AUSTRALIA, Tel. : (61) 6-268-8592, Fax : (61) 6-268-8443, E-mail : j-richards@adfa.edu.au (135)
- RIEDLER, Prof. W., Institut für Nachrichtentechnik & Wellenausbreitung, Technische Universität, Infeldgasse 12, A-8010 GRAZ, AUSTRIA, Fax : (43) 316-463 697 (135, 136)
- RISHBETH, Dr. H., Rutherford Appleton Laboratory, CHILTON, DIDCOT/OXON, OX11 0QX, UNITED KINGDOM, Tel. : (44) 235-446 496 / 703-592 073, Fax : (44) 703-585 813, E-mail : phr011@ibm.southampton.ac.uk (128, 143)
- ROBINSON, Dr. B.J., IUCAF, P.O. Box 256, MILSONS POINT, NSW 2061, AUSTRALIA, Tel. : (61) 2-868 0222, Fax : (61) 2-868 0220 (143)
- RÖDSRUD, Ms. E., PFM, (Program for Miljøovervakingsteknikk), P.O. Box 89, N-2001 LILLESTRÖM, NORWAY, Tel. : (47) 63-892661, Fax : (47) 63-892670 (144)
- RUDNER, Mr. S., Swedish Defence Research Establishment, Dept. of Information Technology, P.O. Box 11 65, S-581 11 LINKÖPING, SWEDEN, Tel. : (46) 13-11 80 00 (133)
- RUIZ, Prof. M.S., Facultad de Ciencias Fisicas, Departamento de Fisica Aplicada III, Universidad Complutense de Madrid, Ciudad Universitaria, 28040 MADRID, SPAIN, Tel. : (34) 1-394-4388, Fax : (34) 1-394-4688, E-mail : msancho@fis.ucm.es (141)
- RYAN, Prof. W.D., Dept. of Electrical & Electronic Eng., The Queen's University, BELFAST, BT7 1NN, UNITED KINGDOM, Tel. : (44) 232-245133 ext. 4052, Fax : (44) 232-667023 (133)

RYCROFT, Prof. M.J., College of Aeronautics, Cranfield Institute of Technology, CRANFIELD, BEDFORD, MK43 0AL, UNITED KINGDOM, Tel. : (44) 234-752707, Fax : (44) 234-750780 (143)

SAHALOS, Prof. J., Department of Physics, University of Thessaloniki, 54006 THESSALONIKI, GREECE, Tel. : (30) 31-998 161, Fax : (30) 31-333 997, E-mail : sahalos@olymp.ccf.auth.gr (129, 134)

SAITO, Prof. M., Faculty of Medicine, Institute of Medical Electronics, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, TOKYO 113, JAPAN, Tel. : (81) 3-3812-2111 ext. 3563, Fax : (81) 3-3812-2111 ext. 3568 (141)

SALAMA, Dr. C.A.T., Dept. of Electrical Eng., University of Toronto, TORONTO, ON M5S 1A4, CANADA, Tel. : (1) 416-978 8658, Fax : (1) 416-978 7423, E-mail : salama@vrg.utoronto.ca (132)

SALEH, Prof. N., Dean, Faculty of Engineering, Ain Shams University, 1 Elsaryat St., 11517 ABASIA-CAIRO, EGYPT, Fax : (202) 285 0617 (131)

SALEM, Prof. I.A., 17 Elkobba St. - HELIOPOLIS, 11341 CAIRO, EGYPT, Tel. : (202) 258 0256, Fax : (202) 356 2820 (127, 130, 144)

SARKAR, Dr. T.K., Dept. of Electrical and Computer Eng., Syracuse University, 121 Link Hall, SYRACUSE, NY 13244-1240, U.S.A., Tel. : (1) 315-443 4936, Fax : (1-315) 443 2583 (142)

SAUNDERS, Dr. R.D., National Radiological Protection Board, CHILTON, DIDCOT, OXON, OX11 0RQ, UNITED KINGDOM, Tel. : (44) 235-831 600, Fax : (44) 235-833 891 (141)

SCAIFE, Prof. B.K.P., URSI Sub-Committee, Royal Irish Academy, 19 Dawson Street, DUBLIN 2, IRELAND, Tel. : (353) 1-7021 738/9, Fax : (353) 1-772 442 (129, 130)

SCANLAN, Prof. J.O., Dept. of Electronic & Electrical Eng., University College Dublin, Belfield, DUBLIN 4, IRELAND, Tel. : (353) 1-706 1907/693 244, Fax : (353) 1-283 0921/830 921 (131, 134)

SCHALWIJK, Prof. J.P.M., TU Eindhoven, Faculteit Electrotechniek 13.33, P.O. Box 513, NL-5600 MB EINDHOVEN, NETHERLANDS, Tel. : (31) 40-47 35 15 (131)

SCHEFTE, Dr. H., Fiskarfjärdsstranden 26, S-127 41 SKÄRHOLMEN, SWEDEN, Tel. : (46) 8-710 5684 (132)

SCHEGGI, Prof. A.-M., Istituto di Ricerca sulle Onde Elettromagnetiche, IROE/CNR, Via Panciatichi 64, I-50127 FIRENZE, ITALY, Tel. : (39) 55-42351, Fax : (39) 55-410893 (127, 144)

SCHLEGEL, Dr. K., Max-Planck-Institut für Aeronomie, Postfach 20, D-37189 KATLENBURG-LINDAU, GERMANY, Tel. : (49) 5556 401 468, Fax : (49) 5556 979 240, E-mail : schlegel@linax1.dnet.gwdg.de (136)

SCHMINKE, Dr. W., Thomcast AG, EKT, CH-5300 TURGI, SWITZERLAND, Tel. : (41) 56-793140, Fax : (41) 56-331146 (133)

SCHNIZER, Prof. B., Institut für Theoretische Physik, Technische Universität Graz, A-8010 GRAZ, AUSTRIA (130)

SCHWEICHER, Prof. E., Leerstoel Radar en Optica, Koninklijke Militaire School, Renaissancelaan 30, B-1040 BRUSSELS, BELGIUM, Tel. : (32) 2-735.51.52 ext. 2420, Fax : (32) 2-735.24.21 (143)

SCUKA, Prof. V., Uppsala University, Institute of High Voltage Research, Husbyborg, S-752 28 UPPSALA, SWEDEN, Tel. : (46) 18-532703, Fax : (46) 18-502619, E-mail : viktor.scuka@hvi.uu.se (133, 134, 135)

SEBASTIAN, Prof. J.L., Dpto. Fisica Aplicada III, Facultad de Ciencias Fisicas, Universidad Complutense de Madrid, 28040 MADRID, SPAIN, Tel. : (34) 1-394-4393, Fax : (34) 1-394-4688, E-mail : jlsf@fis.ucm.es (129, 131, 132, 133, 134, 136, 137, 138, 140, 145)

SEEBER, Mr. R., P.O. Box 44242, 2104 LINDEN, SOUTH AFRICA, Tel. : (27) 21-782-1352 (136)

SEEDS, Dr. A.J., Dept. of Electronic & Electrical Eng., University College London, Torrington Place, LONDON, WC1E 7JE, UNITED KINGDOM, Tel. : (44) 71-387 7050 ext 3972, Fax : (44) 71-387 4350, E-mail : a.seeds@eleceng.ucl.ac.uk (133)

SEMCHENKO, Prof. I.V., Gomel State University, 246699 GOMEL, BELARUS, Tel. : (70172) 57 75 20 (145)

SENIOR, Prof. T.B.A., Radiation Laboratory, Electrical Eng. & Computer Science Dept., University of Michigan, 4072 E. Eng. Building, ANN ARBOR, MI 48109-2122, U.S.A., Tel. : (1) 313-764 0500, Fax : (1) 313-747 2106, E-mail : tom.senior@um.cc.umich.edu (126, 127)

- SENISE, Prof. J.T., Instituto Maua de Tecnologia, Sociedade Brasileira de Micro Ondas, Estrado das Lagrimas, 2035 SAO CAETANO DE SUL, BRAZIL (130)
- SERBEST, Prof. H., Dept. of Electrical & Electronic Eng., Cukurova University, Balcali, 01330 ADANA, TURKEY, Tel. : (90) 322-338 6868, Fax : (90) 322-338 6326, E-mail : serbest@trcuniv (131)
- SEVERCAN, Prof. M., Dept. of Electrical & Electronic Eng., Middle East Technical University, İnönü Bulvan, 06531 ANKARA, TURKEY, Tel. : (90) 312-210 1000 ext. 2351, Fax : (90) 312-210 1261, E-mail : severcan@vm.cc.meu-cdu.tr (133)
- SEXTON, Prof. M.C., URSI Sub-Committee, Royal Irish Committee, 19 Dawson Street, DUBLIN 2, IRELAND, Tel. : (351) 21-276 871 ext. 2713, Fax : (351) 21-271 698 (136, 138, 144)
- SHA, Prof. Z., Chinese Institute of Electronics, P.O. Box 165, 100036 BEIJING, CHINA, Tel. : (86) 1-826 3458, Fax : (86-1) 826 3458 (144)
- SHALTOU, Prof. M.A.M., National Research Institute, of Astronomy & Geophysics, HELWAN, EGYPT, Fax : (202) 782 683 (139)
- SHAPIRA, Dr. J., President, QUALCOMM Israel, 73 Hanitah Street, 32446 HAIFA, ISRAEL, Tel. : (972) 4-327 372, Fax : (972) 4-225 592, E-mail : jshapira@qualcomm.com (127, 128, 144)
- SHILOH, Dr. J., Pulsed Power and EMP Section, RAFAEL Armament Development Authority, HAIFA, ISRAEL (128)
- SHIMADA, Dr. S., Fujitsu Laboratories Ltd., 1015 Kamikodanaka, Nakaharaku, 211 KAWASAKI, JAPAN, Tel. : (81) 44-754-2608, Fax : (81) 44-754-2580 (129)
- SHIN, Prof. Sang Y., Dept. of Electrical Engineering, KAIST, 373-1, Kusong-dong, Yusong-gu, TAEJON, SOUTH KOREA, Tel. : (82) 42-869 3420, Fax : (82) 42-869 3410 (133)
- SHISHKOV, Prof. B.B., Inst. of Applied Mathematics & Informatics, Technical University of Sofia, P.O. Box 104, 1618 SOFIA, BULGARIA, Tel. : (359) 2-56 61 23, Fax : (359) 2-87 78 70 (128, 131)
- SHUHOUD, Prof. W.A., 48 Alkhalifa Almaamoun St., Manshiet Albakry-CAIRO, EGYPT, Fax : (202) 356 2820 (136, 144)

- SHUR, Dr. M., Dept. of Electrical Engineering, University of Virginia, Thornton Hall, CHARLOTTESVILLE, VA 22903-2442, U.S.A., Tel. : (1-804) 924-6109, Fax : (1-804) 924-8818, E-mail : ms8n@virginia.edu (133)
- SIFOROV, Prof. V.I., Institute of Information & Transmission Problems, Academy of Sciences, ul. Ermolovoy 19, 103051 MOSKVA, RUSSIA (132)
- SIHVOLA, Dr. A., Electromagnetics Laboratory, Helsinki University of Technology, Otakaari 5 A, SF-02150 ESPOO, FINLAND, Tel. : (358-0) 451 2261, Fax : (358-0) 451 2267, E-mail : ari.sihvola@hut.fi (144)
- SINHA, Mr. B.K., Programme Director, SAMEER, Centre for Electromagnetics, CIT Campus, 2nd Cross Road, Taramani, 600 113 MADRAS, INDIA (130, 134)
- SITENKO, Prof. A.G., Academy of Sciences of the Ukraine, Institute for Theoretical Physics, ul. Metrologicheskaya 14b, 252143 KIEV 143, UKRAINE, Tel. : (7-044) 266-5362/9123/9190, Fax : (7-044) 266-5998, E-mail : ositenko@gluk.apc.org (138)
- SKELLERN, Prof. D.J., Electronics Dept., Macquarie University, Building EGA, SYDNEY, NSW 2109, AUSTRALIA, Tel. : (61) 2-805 9145, Fax : (61) 2-805 9128, E-mail : daves@mpce.mq.edu.au (132, 133, 143)
- SLAVOVA, Prof. J., Technical University of Sofia, W. Gladstone u. 7, 1421 SOFIA, BULGARIA (132)
- SLUIJTER, Prof. F.W., Afdeling Natuurkunde, Technische Universiteit Eindhoven, Den Dolech 2, Postbus 513, NL-5600 MB EINDHOVEN, NETHERLANDS, Tel. : (31) 40-47.42.88, Fax : (31) 40-44.52.53 (126, 137, 144)
- SMITH, Dr. A.J., British Antarctic Survey, High Cross Madingley Road, CAMBRIDGE, CB3 0ET, UNITED KINGDOM, Tel. : (44) 223-61188, Fax : (44) 223-62616, E-mail : U_AJS@vaxc.nerc-bas.ac.uk (142)
- SORRENTINO, Prof. R., Istituto di Elettronica, Univ. di Perugia, I-06100 PERUGIA, ITALY, Tel. : (39) 75-585-2658, Fax : (39) 75-585-2654, E-mail : sorrent@ipguniv.unipg.it (132)

SPASOV, Dr. A., Bulgarian URSI Committee, bld Lenina 72, 1113 SOFIA,
BULGARIA (143)

SPAULDING, Dr. A.D., US Dept. of Commerce, NTIA/ITS/S3, 325 Broadway,
BOULDER, CO 80302-3328, U.S.A., Tel. : (1) 303-4975201,
Fax : (1) 303-4973680 (134)

St. MAURICE, Dr. J.-P., Dept. of Physics, University of Western Ontario,
LONDON, ON N6A 5B9, CANADA, Tel. : (1-519) 661-3778,
Fax : (1-519) 661-2033, E-mail : stmaurice@canlon.physics.uwo.ca
(136, 138)

STEWART, Prof. J.A.C., Dept. of Electrical & Electronic Engineering, Ashby
Building, Stranmillis Road, BELFAST BT9 5AH, UNITED
KINGDOM, Tel. : (44) 232-245133 ext. 4064, Fax : (44) 232-667023
(133)

STOKKE, Mr. K.N., Statens Teleforvaltning, Parkveien 57 - Postboks 2592
Sollie, N-0203 OSLO 2, NORWAY, Tel. : (47) 22-55.55.30 (134)

STONE, Dr. W.R., Chief Scientist of Expersoft, 1446 Vista Claridad, LA
JOLLA, CA 92037, U.S.A., Tel. : (1-619) 459 8305(24hr), Fax : (1-
619) 459 7140, E-mail : 71221.621@compuserve.com (127)

STRØM, Prof. S., Dept. of Electrmagnetic Theory, Royal Institute of
Technology, S-100 44 STOCKHOLM, SWEDEN, Tel. : (46) 8-790
8195, Fax : (46) 8-108 327, E-mail : staffan@tet.kth.se (131)

STUBKJAER, Dr. K., Electromagnetics Institute - Bldg 348, Technical
University of Denmark, DK-2800 LYNGBY, DENMARK, Tel. : (45)
4288 1444, Fax : (45) 4288 1634, E-mail : ks@emi.dth.dk (132)

STUCHLY, Prof. M.A., Dept. of Electrical and Computer Eng., University of
Victoria, P.O. Box 3055, VICTORIA, BC V8W 3P6, CANADA,
Tel. : (1-604) 721-6029, Fax : (1-604) 721-6052, E-mail : maria.stuchly
@ece.UVic.ca (128, 140)

STUMPER, Dr. U., RF Standards Lab, Physikalisch-Technische Bundesanstalt,
P. O. Box 3345, D-38023 BRAUNSCHWEIG, GERMANY, Tel. : (49)
531-592-2220, Fax : (49) 531-592-9292, E-mail : ustumper@
v2403.bs.pfb.de (129, 142)

STUMPERS, Prof. F.L.H.M., Elzentlaan 11, NL-5611 LG EINDHOVEN,
NETHERLANDS (126)

STURM, Dr. R., Wehrwiss. Dienststelle der Bundeswehr, für ABC-Schutz,
Postfach 1320, D-29633 MUNSTER, GERMANY, Tel. : (49) 5192 12
6103, Fax : (49) 5192 12 6155 (134)

SUCHY, Prof. K., Institut für Theoretische Physik II, Universität Düsseldorf,
Universitätsstraße 1, D-40225 DÜSSELDORF, GERMANY,
Tel. : (49) 211-311 2746, Fax : (49) 211-311 3117 (126, 138)

SULTANGAZIN, Prof. U.M., Academy of Sciences, Republic of Kazakhstan,
Shevchenko Street 28, 480021 ALMA-ATA, KAZAKHSTAN (145)

SUN, Prof. W.-S., Dept. of Physics and Astronomy, National Central
University, 32054 CHUNGLI, TAIWAN, Tel. : (886) 3-425-4960,
Fax : (886) 3-425-1175 (139)

SWORDS, Dr. S.S., URSI Sub-Committee, Royal Irish Academy, 19 Dawson
Street, DUBLIN 2, IRELAND, Tel. : (353) 1-762 570 and 1-764 222,
Fax : (353) 1-762 346 (126)

SZABO, Dr. L.D., F. J. Curie Inst. for Radiobiology, Anna u. 5, H-1221
BUDAPEST, HUNGARY, Tel. : (36) 1-226-5331, Fax : (36) 1-226-
6551 (141)

SZEMEREDY, Dr. P., ELTE - University of Sciences Lóránd Eötvös,
Department of Geophysics, Ludovika tér 2, H-1083 BUDAPEST,
HUNGARY, Tel. : (36) 1-134 3953 (134)

TADA, Prof. K., Dept. of Electrical Eng., University of Tokyo, 7-3-1 Hongo,
Bunkyo-ku, TOKYO 113, JAPAN, Tel. : (81) 3-3812-2111 ext. 6677,
Fax : (81) 3-5684-3645 (133)

TAPPING, Dr. K.F., Herzberg Institute of Astrophysics, National Research
Council Canada, Box 248, PENTICTON, BC V2A 6K3, CANADA,
Tel. : (1-604) 493-2277, Fax : (1-604) 493-7767, E-mail : ktapping@
dreo.nrc.ca (139)

TARTARA, Prof. G., Dip di Elettronica e Informazione, Centro di Studio sulle
Telecomunicazioni, Spaziali del CNR/Politecnico di Milano, Piazza
Leonardo da Vinci 32, I-20133 MILANO, ITALY, Tel. : (39) 2-2399
3576, Fax : (39) 2-2399 3413 or 3587 (131)

TAYLOR, Dr. W.W.L., NASA Headquarters, Code M-8, WASHINGTON, DC
20546, U.S.A., Tel. : (1-202) 453-2961, Fax : (1-202) 426-6111 (126)

- TENG, Mr. Y.-C., Directorate General of Telecommunications, MOTC, P.O. Box 91-84, 10098 TAIPEI, TAIWAN, Tel. : (886) 2-344-3685, Fax : (886) 2-392-8143 (129)
- TESHIROGI, Dr. T., Communications Research Laboratory, Ministry of Posts and Telecommunications, 4-2-1 Nukuikitamachi, Koganei-shi, TOKYO 184, JAPAN, Tel. : (81) 423-27 7515, Fax : (81) 423-27 6692 (130)
- THIEMANN, Dr. H., Arbeitsgruppe Weltraumphysik und -Technologie, W-7800 FREIBURG, Germany, Tel. (49)761-31243, Fax (49)761-281260 (142)
- THOMPSON, Dr. D.C., NZ Meteorological Service, 30 Salamanca Road, WELLINGTON, NEW ZEALAND, Tel. : (64) 4-472 9379, Fax : (64) 4-473 5231 (135)
- THOMPSON, Dr. R.J., IPS Radio and Space Services, P.O. Box 5606, WEST CHATSWOOD, NSW 2057, AUSTRALIA, Tel. : (61) 2-41 48325, Fax : (61) 2-41 48331, E-mail : richard@ips.oz.au (143)
- THOMSON, Dr. D.J., AT&T Bell Laboratories, Room 2C-360, 600 Mountain Avenue, MURRAY HILL, NJ 07974, U.S.A., Tel. : (1-908) 582-6877, Fax : (1-908) 582-2379, E-mail : djt@research.att.com (132)
- TIMOR, Dr. U., Dept. of Electrical Eng., Technion I.I.T., 32000 HAIFA, ISRAEL, Tel. : (972) 4-294672 (-3), Fax : (972) 4-323041 (131)
- TITHERIDGE, Dr. J.E., Department of Physics, University of Auckland, Private Bag 92019, AUCKLAND 1, NEW ZEALAND, Tel. : (64) 9-373 7599 Ext. 8866, Fax : (64) 9-373 7445, E-mail : j.titheridge@aukuni.ac.nz (137, 144)
- TLAMICHA, Dr. A., Astronomical Institute, Czech Academy of Sciences, 251 65 ONDREJOV, CZECH REP., Tel. : (42) 2-881 611, Fax : (42) 2-881 611, E-mail : astsun@csearn.bitnet (139)
- TOFANI, Prof. G., Osservatorio Astrofisico di Arcetri, Largo Enrico Fermi 5, I-50125 FIRENZE, ITALY, Tel. : (39) 55-2752 217, Fax : (39) 55-220039 (139)
- TONNING, Prof. A., Institutt for Fysikalsk elektronikk, Universitetet i Trondheim, N-7034 TRONDHEIM NTH, NORWAY, Tel. : (47) 73-59.44.09, Fax : (47) 73-59.14.41 (130)
- TRAINOTTI, Prof. V., Zufriategui 4380, 1603 VILLA MARTELLI, ARGENTINA, Tel. : (54) 1-761 0081/31, Fax : (54) 1-761 3063 (130)

TRETYAKOV, Prof. O.A., Kharkov University, pl. Nezaleznosti 4, 310077
KHARKOV 77, UKRAINE, Tel. : (7-0572) 457163/457257, Fax : (7-
0572) 476506, E-mail : rai%ira.kharkov.ua@relay.ussr.eu.net (131)

TRULSEN, Prof. J., Institutt for teoretisk astrofysikk, Universiteter i Oslo,
Postboks 1029 Blindern, N-0315 OSLO, NORWAY, Tel. : (47) 22-
85.65.40, Fax : (47) 22-85.65.05 (138)

TULUNAY, Prof. Y., Dept. of Aeronautical Eng., Middle East Technical
University, İnönü Bulvarı, 06531 ANKARA, TURKEY, Tel. : (90)
312-210 1000 ext. 2433/4, Fax : (90) 312-210 1100, E-mail :
y.tulunay@trme.tu (137)

TUOMI, Prof. T., Optoelectronics Laboratory, Helsinki University of
Technology, Otakaari 1, SF-02150 ESPOO, FINLAND, Tel. : (358) 0-
451-3120, Fax : (358) 0-465-077 (132)

TURSKI, Dr. A., ul. Krochmalna 3 m 419, 00-864 WARSZAWA, POLAND,
Tel. : (48) 22-26 98 02, Fax : (48) 22-26 98 15 (138)

TURUNEN, Dr. T., Geophysical Observatory, SF-99600 SODANKYLÄ,
FINLAND, Tel. : (358) 693-619 811, Fax : (358) 693-619 875 (136)

TYAGI, Dr. T.R., Radio Science Division, National Physical Laboratory, Dr.
K.S. Krishnan Road, 110 012 NEW DELHI, INDIA, Fax : (91) 11-575
2678 (137)

UNGSTRUP, Prof. E., Geophysics Department, Niels Bohr Institute,
Haraldsgade 6, DK-2200 COPENHAGEN N, DENMARK, Tel. : (45)
3532 0584/0602, Fax : (45) 3582 2565, E-mail : eu@osiris.gfy.ku.dk
(138, 144)

URPO, Prof. S., Metsähovi Radio Research Station, Helsinki University of
Technology, Otakaari 5 A, SF-02150 ESPOO, FINLAND, Tel. : (358)
0-451-2235, Fax : (358) 0-460-224, E-mail : seppo.urpo@hut.fi (139)

UZUNOGLU, Prof. N.K., Dept. of Electrical Eng. and Computer Science,
National Technical University of Athens, 28th October 42, GR-106 82
ATHENS, GREECE, Tel. : (30) 1-3616 908, Fax : (30) 1-3647 704, E-
mail : nouzou@leon.nraps.ariadne-t.gr (141)

VAN BLADEL, Prof. J., Pr. G. De Smetlaan 22, B-9831 DEURLE, BELGIUM,
Tel. : (32) 9-282.44.88, Fax : (32) 9-264.35.93, E-mail : heleu@intec.
rug.ac.be (127, 128)

VAN DAELE, Prof. P., INTEC, Sint-Pietersnieuwstraat 41, B-9000 GENT,
BELGIUM, Tel. : (32) 9-2643334, Fax : (32) 9-2643593, E-mail :
vandaele@intec.rug.ac.be (126)

VAN DE CAPELLE, Prof. A., Afdeling Mikrogolven en Lasers, Kardinaal
Mercierlaan 94, B-3001 HEVERLEE, BELGIUM, Tel. : (32) 16-22 09
31, Fax : (32) 16-22 18 55, E-mail : antoine.vandecapelle@esat.
kuleuven.ac.be (130)

VAN DE ROER, Dr. Th.G., Technische Universiteit Eindhoven, Afdeling
Electrotechniek, Postbus 513, NL-5600 MB EINDHOVEN,
NETHERLANDS, Tel. : (31) 40-473 602 (133)

VAN DEN BERG, Prof. P., Technische Universiteit Delft, Afdeling
Electrotechniek, Postbus 5031, NL-2600 GA DELFT,
NETHERLANDS, Tel. : (31) 15-786 254 (130)

VAN ECK, Prof. J.L., Electronique Industrielle, Université Libre de Bruxelles,
50, av. F.D. Roosevelt, B-1050 BRUSSELS, BELGIUM, Tel. : (32) 2-
650 28 29, Fax : (32) 2-647 71 08 (132)

VAN GEMERT, Prof. M.J.C., Academisch Medisch Centrum, Laser Centrum -
IWO 007, Meibergdreef 9, NL-1105 AZ AMSTERDAM,
NETHERLANDS, Tel. : (31) 20-566 43 86 (141)

VESZELY, Dr. G., Department of Electromagnetic Theory, BME - Technical
University of Budapest, Egy J. u. 18, H-1111 BUDAPEST,
HUNGARY, Tel. : (36) 1-166-5011, Fax : (36) 1-166-6808 (130)

VEYRET, Dr. B., Laboratoire PIOM - ENSCPB, Université de Bordeaux 1, F-
33405 TALENCE CEDEX, FRANCE, Tel. : (33) 5637 0728,
Fax : (33) 5684 6631 (141)

VICH, Dr. R., Institute of Radio Eng. and Electronics, Academy of Sciences of
the Czech Rep., Chaberská 57, 182 51 PRAHA 8, CZECH REP.,
Tel. : (42) 2-664 11804, Fax : (42) 2-664 10222 (131)

VILKOTSKY, Prof. M.A., Institute of Applied Physics, Problems of BSU,
Kurchatov st. 7, 220120 MINSK, BELARUS, Tel. : (70172) 77-24-00,
Fax : (70172) 78-04-17 (130)

- VILLAR, Dr. R., Consejo Superior de Investigaciones Cientificas, Instituto Electronica de Comunicaciones, Serrano 144, 28006 MADRID, SPAIN, Tel. : (34) 1-562 5083, Fax : (34) 1-563 1371, E-mail : villar@iec.csic.es (145)
- VLOEBERGHS, Prof. C., Chaire des Télécommunications, Ecole Royale Militaire, av. de la Renaissance 30, B-1040 BRUSSELS, BELGIUM, Tel. : (32) 2-735 51 52, Fax : (32) 2-735 24 21, E-mail : vloeberghs@RMA-brussels.rtt.be (133, 143)
- VOGE, Mr. J., 5, avenue Albert Bartholomé, F-75015 PARIS, FRANCE (127)
- VOKURKA, Prof. J., Faculty of Electrical Eng., Czech Technical University, Technická 2, 166 27 PRAHA 6, CZECH REP., Tel. : (42) 2-332 2030, Fax : (42) 2-311 1786 (130)
- WAGEN, Dr. J.-F. O., Swiss PTT Telecom, Mobile Communications Group FE42, CH-3029 BERN, SWITZERLAND, Tel. : (41) 31-338 32 07, Fax : (41) 31-338 51 74, E-mail : wagen_j@vptt.ch (145)
- WALLIN, Prof. P., E.E.Department, Laboratory of Metrology, Helsinki University of Technology, Otakaari 5 A, SF-02150 ESPOO, FINLAND, Tel. : (358) 0-451-2280, Fax : (358) 0-460-224 (129)
- WANG, Dr. Y., Dept. of Computer Science, Beijing University, 100871 BEIJING, CHINA (132)
- WANG, Dr. W.-K., Physics Laboratory - Institute of Physics, Academie Sinica of ROC, 11529, NANKANG, TAIWAN, Tel. : (886) 2-782-3075, Fax : (886) 2-783-4187 (140)
- WANG, Prof. B., Shangai University of Science and Technology, No 27, Lane 764, Changle Road, 200040 SHANGHAI, CHINA (140)
- WATSON, Prof. P.A., Dept. of Electrical Eng., University of York, HESLINGTON/YORK, Y01 5DD, UNITED KINGDOM, Tel. : (44) 904-430 000, Fax : (44) 904-433 433 (128, 136)
- WEISSGLAS, Prof. P., Accretia AB, Gamla Brogatan 36-38, 1 tr, S-111 20 STOCKHOLM, SWEDEN, Tel. : (46) 8-229 050, Fax : (46) 8-205 751 (145)

- WERNIK, Prof. A.W., Space Research Centre, Polish Academy of Sciences, ul. Bartycka 18A, 00-716 WARSAW, POLAND, Tel. : (48) 22-41 00 41 Ext. 69, Fax : (48) 22-41 17 81/37 65 64, E-mail : cbkpan@plearn.bitnet Attn. A.W.Wernik (137, 141)
- WIELEBINSKI, Prof. R., Max-Planck-Institut für Radioastronomie, Auf dem Hügel 69, D-53121 BONN, GERMANY, Tel. : (49) 228-5251, Fax : (49) 228-525229 (143)
- WIK, Mr. M., Defence Material Administration, FMV, Department of Electronics, S-115 88 STOCKHOLM, SWEDEN (128)
- WILKINSON, Dr. P.J., Ionospheric Prediction Service, P.O. Box 5606, CHATSWOOD, NSW 2057, AUSTRALIA, Tel. : (61) 2-414-8339(w) and 969-7377(pr.), Fax : (61) 2-414-8340, E-mail : phil@ips.oz.au (136, 137, 138)
- WILLIAMS, Dr. P.J.S., Dept. of Physics, University College of Wales, ABERYSTWYTH, SY23 3BZ, UNITED KINGDOM (137)
- WILLIAMSON, Prof. A.G., Dept. of Electrical & Electronic Eng., University of Auckland, Private Bag 92019, AUCKLAND 1, NEW ZEALAND, Tel. : (64) 9-373-7999, Fax : (64) 9-373-7461, E-mail : ag.williamson@aukuni.ac.nz (130)
- WINNBERG, Dr. A., Chalmers Institute of Technology, Onsala Space Observatory, S-439 92 ONSALA, SWEDEN, Tel. : (46) 300-606 53 (140)
- WITTKE, Prof. P.H., Dept. of Electrical Eng., Queen's University, KINGSTON, ON K7L 3N6, CANADA, Tel. : (1) 613-545 2927, Fax : (1) 613-545 6500, E-mail : wittke@qucndee.ee.queensu.ca (131)
- WOLF, Prof. D., Institut für Angewandte Physik, Universität Frankfurt, Robert-Meyer-Straße 2-4, D-60054 FRANKFURT, GERMANY, Tel. : (49) 69-798 2390, Fax : (49) 69-798 8510 (131)
- WOODMAN, Dr. R.F., Jicamarca Radio Observatory, Instituto Geofisico del Peru, Apartado 13-0207, 13 LIMA, PERU, Tel. : (51) 14-942454, Fax : (51) 14-792155, E-mail : ron@roj.pe (145)
- WU, Dr. S., Beijing Astronomical Observatory, Chinese Academy of Sciences, 100080 BEIJING, CHINA, Tel. : (86) 1-281968 (139)
- WU, Prof. Y., Dept. of Electronic Eng., Tsinghua University, 100084 BEIJING, CHINA, Tel. : (86) 1-256-7733 ext. 5063, Fax : (86) 1-256-4176 (131)

WU, Prof. T.-S., Dept. of Electrical Engineering, National Cheng Kung University, Ta, Hsueh Rd. No. 1, TAINAN, TAIWAN, Tel. : (886) 62-757-575 ext. 62330, Fax : (886) 62-345-482 (132)

YAMADA, Dr. M., KDD R & D Laboratories, 2-1-15, Ohara, Kamifukuoka-shi, SAITAMA 365, JAPAN, Tel. : (81) 492-66-7304, Fax : (81) 492-66-7510, E-mail : myamada@kddlabs.co.jp (144)

YAMPOLSKY, Prof. Y.M., Institute of Radioastronomy, ul. Krasnoznamenaya 4, 310002 KHARKOV 2, UKRAINE, Tel. : (7-0572) 44-8579, Fax : (7-0572) 44-6506, E-mail : rai%ira.kharkov.ua@relay.ussr.eu.net (137)

YANG, Dr. X., National Institute of Metrology, 18 Bei Shan Huan Dong Road, 100013 BEIJING, CHINA (129)

YELL, Mr. R.W., National RF & Microwave Standards, c/o R.S.R.E., St. Andrews Road, GREAT MALVERN, WORCS, WR14 3PS, UNITED KINGDOM, Tel. : (44) 684-894 893, Fax : (44) 684-895 547 (130)

YOSHINO, Prof. T., Univ. of Electro-Communications, 1-5-1 Chofugaoka Chofu, TOKYO 182, Japan, Tel. (81) 424-83-2161 ext 3351, Fax (81)424-89-5861 (142)

YUN, Prof. S.W., Dept. of Electronics Engineering, Sogang University, Mapo-gu, SEOUL, SOUTH KOREA (132)

YUPHO, Mr. K., Director General, Post & Telegraph Department, Paholyothin Road, 10400 BANGKOK, THAILAND, Tel. : (662) 2710151-60, Fax : (662) 2713512 (145)

ZEDDAM, Mr. A., CNET, LAA/ELR/DNP, Route de Trégastel / B.P. 40, F-22301 LANNION CEDEX, FRANCE, Tel. : (33) 9605 3938, Fax : (33) 9605 1137 (134)

ZHABOTINSKIJ, Prof. M.E., Institute of Radioeng. & Electronics, Academy of Sciences, Mokhovaja St. 11, 103907 MOSKVA, RUSSIA, Fax : (7095) 203 8414, E-mail : obukh@ire.msk.su (133)

ZHANG, Prof. X., Wuhan Ionospheric Observatory, Wuhan Institute of Physics,
P.O. Box 415, WUCHANG - HUBEI, CHINA (138)

ZHOU, Dr. S., Beijing University of Science & Technology, Department 5,
100083 BEIJING, CHINA (130)

ZOLIN, Prof. V.F., Institute of Radioeng. and Electronics, Russian Academy of
Sciences, Mokhovaja St. 11, 103907 MOSCOW, RUSSIA,
Fax : (7095) 203-8414, E-mail : obukh@ire.msk.su (141)

ZOMBORY, Prof. L., Department of Microwave Telecommunications, BME -
Technical University of Budapest, Goldmann Gy. tér 3., H-1111
BUDAPEST, HUNGARY, Tel. : (36) 1-181-3963, Fax : (36) 1-108-
0808, E-mail : h340zom@ella.hu (128, 133, 144)