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# Editorial



Dear URSI Correspondent,

The end of 1997 is just ahead and you have in hand the last number of our Bulletin for this year.

In this issue you will find the reports about several conferences that were organised in the recent past, as well as the announcements for a few forthcoming events. Beside this, a note about Baron Marcel Nicolet summarizes the contributions of this well known scientist. You will also



find some news from Commission B as well as information about the International Geophysical Calendar.

In a more administrative part you will find the updated list of URSI Officials. Feel free to contact them when organising scientific activities. As in any body the exchange of information is an important matter in our Union.

I wish you a pleasant reading.

Piotr Sobieski, Editor

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## BARON MARCEL NICOLET 1912 - 1996

On October 8, 1996, Prof. Marcel Nicolet passed away in Uccle, where he has lived for over fifty years with his wife Alice. Born in Basse-Bodeux in the Belgian Ardennes, 26 February 1912, he graduated from University of Liège in 1934, received a Ph. D. in 1937 with a thesis entitled "Study of the spectra and composition of stellar atmospheres", and in 1945 the degree of Agrégé de l'Enseignement supérieur with a Special Ph. D. thesis entitled "Contribution to the study of the ionosphere".

He started his career as assistant at the Royal Meteorological Institute of Belgium (1935-1945), where he became head of the Radiation Division of this Institute in 1946. He was appointed Director of the Belgian Institute of Space Aeronomy in 1965.

He was Lecturer at the University of Liège since 1960, and Professor at the University of Brussels also since 1960. He was also Professor of Aeronomy and Electrical Engineering at the Pennsylvania State University, and Member of the Belgian Academy of Sciences, as well as Foreign associate of the US and French Academy of Sciences.

His whole life has been devoted to Scientific Research, first to Astrophysics and Meteorology, and since 1945 to Aeronomy. Aeronomy is a word that he contributed with Sidney Chapman to introduce in the scientific vocabulary. It is a Science born in the 40's when he and a few other scientists became interested in studying the layers of the Earth's atmosphere located above the troposphere. The contributions of M. Nicolet in this new field of Geophysics have been numerous and pioneering ones. It would be too long to enumerate them here, but an extensive list of the important contributions of M. Nicolet to Aeronomy can be found in a recent article published in EOS, Vol.78 p. 267, 1997 by the American Geophysical Union (AGU).

He has been an active member of AGU for more than thirty years, and received from this professional organisation the William Bowie Medal in 1984 (see EOS, Vol. 65, p. 428-430, 1984). Every eighteen months, the AGU continues to honour him with a "Marcel Nicolet lecture". Among the many other honours he has received from learned Societies, Academies, national and international Authorities, let me mention the Guggenheim Price from the International Academy of Astronautics (1963), the Hodgkins Medal from the Smithsonian Institution (1965), the Tsjolkovsky Medal from the Astronautical Society of former USSR in 1986, King Baudouin raised him to the rank of the nobility: he became then Baron Nicolet. He deserved so well this great honour

for the innumerable services he did to the national and international scientific community as well as to the staff employed at the Belgian Institute for Space Aeronomy.

Marcel Nicolet played a leading role in many important international organisations like the IUA, COSPAR, IUGG and specially IAGA (International Association for Geophysics and Aeronomy) which he founded in 1959 with S. Chapman and other leading scientists from all over the world. He has been President of IAGA between 1966 and 1969.

He has been General Secretary of the IGY (International Geophysical Year) and the President in a dozen of other scientific Societies or Committees. He was President of the Comité belge de l'URSI between 1963 and 1968. His impact in all these organisations has always been remarkable, indeed he was a man of decision and progress; his mind was full of new and productive ideas. The device on his coat of arms was "Haute science, humble constance".

He was known among his colleagues as a vanguard and precursor always ahead of his time; in many disciplines he has been at the frontage: the most challenging and hazardous place to be. Many years before the launch of Sputnik, he designed the pictogram shown in fig. 1 as the logo for the International Geophysical Year (IGY, 1957-58), showing an artificial satellite orbiting around the



*Logo of the International Geophysical Year (IGY, 1957-58) chosen by M. Nicolet several years before the launch of the first artificial satellite of the Earth.*

Earth. Here again he has been a daring precursor since artificial satellites of the Earth were going to become after 1957 a revolutionary tool of investigation and survey in Geophysics, in Astronomy, in Meteorology, in many other applied sciences and activities at the service to mankind. Well before rockets were used for the scientific study of the upper atmosphere, he ventured already in 1945 to investigate from a theoretical point of view the environment of the atmosphere above 100 km altitude which was still largely uncovered and of rather little concern at that time.

Marcel Nicolet who was 33 at the end of World War II, started then to investigate the problem of solar-terrestrial relationships i.e. a realm which is still "à la mode" nowadays with the International Solar Terrestrial Program (ISTP) and the current by popular Space Weather program. His

prominent discoveries of basic physico-chemical reactions and processes affecting the composition and thermal structure of the upper atmosphere made him the most respected leader in the new discipline of Space Research as early as 1949.

He published over 200 articles which remain cornerstones in Aeronomy. His contributions range over a wide spectrum of topics of which I remember only a few:

1. determination of the photoionisation and photodissociation coefficients;
2. demonstration of the importance of diffusion processes in the thermosphere;
3. analysis of the mechanism of production of infrared emissions in the atmosphere;
4. prediction of the existence of helium layer in the upper atmosphere;
5. discovery of the mechanisms producing the D-region by photoionisation of the molecule NO due to the absorption of solar Lyman Alpha line, and by impact of cosmic rays;

6. prediction of NO, NO<sub>2</sub>, HNO<sub>3</sub>, HO<sub>2</sub> and H<sub>2</sub>O<sub>2</sub> molecules in the upper atmosphere before they were observed experimentally;
7. discovery of the key importance of NO<sub>x</sub> (NO, NO<sub>2</sub>) and HO<sub>x</sub> (HO, HO<sub>2</sub>) in the upper atmosphere;
8. the key role played by the reaction between N<sub>2</sub>O and O(1D) as a source for NO in the stratosphere.

On 8 October 1996, a distinguished international scientist died who, through his dedication to the finest ideas of education and scholarship, has made one of the greatest individual contributions to the understanding of our atmospheric environment. The name of his wife Alice must be linked with his name, the two having been so happily linked throughout their marriage. The foundation Marcel Nicolet has recently be raised by his wife to award the merits of young researchers from the Belgian Institute for Space Aeronomy, that he founded in 1965 and of which he has been Director until 1977.

J.F. Lemaire.

## CONFERENCE REPORTS

### ICPP'96

Nagoya, Japan, 9-13 September 1996

The 1996 International Conference on Plasma Physics was held at the Nagoya International Conference Hall from 9 to 13 September 1996. The conference was organised by International Union of Pure and Applied Physics and co-sponsored by URSI and other academic societies.

The ICPP is held biannually and has the objectives to promote plasma sciences in the field of discharge physics, radio science, atomic energy engineering, astronomy, geophysics, electrical and electronic engineering, laser physics, fluid dynamics, numerical physics, accelerator engineering and radiation physics. In the 1996 ICPP a special emphasis was laid on the interlink among various fields such as between space and laboratory plasma physics, between astrophysical observation and laboratory experiments, and between the material science and fusion science etc.

The conference gathered 652 participants from 39 countries. Many scientists from the developing countries could participate in the ICPP 96 owing to the efforts of the Japanese local organizing committee. The papers presented

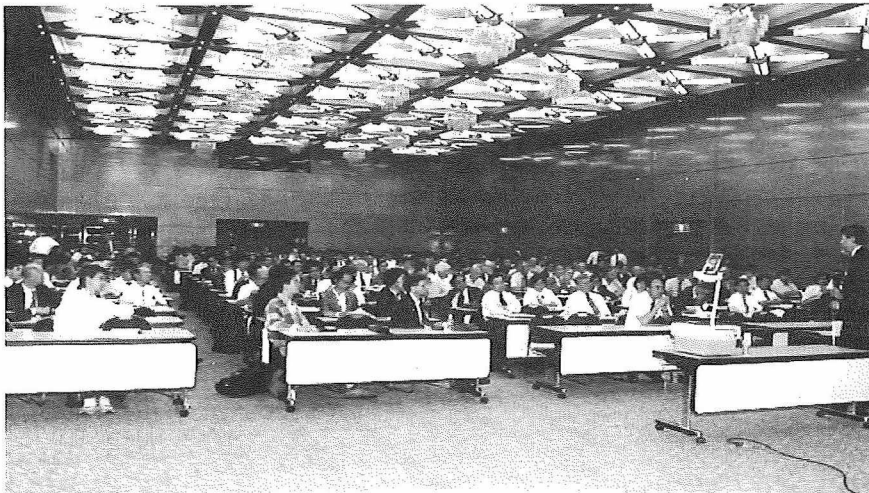


were : 10 general review papers, 41 invited papers and 570 contributed papers (which were all presented in a form of Poster).

The decision of the poster presentation of all contributed papers gave a plenty of time for the general review and invited talks stimulating active questions and discussions. The reporter himself was given an opportunity to give one of the general review paper on the recent result of plasma wave observation in geospace and could play a role of bridging the radio/space plasma physics with other plasma community.

The outcome of the conference was published in a form of Proceedings (Proceedings of the 1996 International Conference on Plasma Physics) as well as in a form of a special issue of "Plasma Physics and Controlled Fusion" from the IOP Publishing Ltd., Techno House, 1997.

H. Matsumoto



# MMET'96

Lviv, Ukraine, 10-13 September 1996

The 6th International Conference on **Mathematical Methods in Electromagnetic Theory (MMET'96)** was held on September, 10-13 in the Lviv (Ukraine) "Karpathy" hotel. The primary aim of this conference was to document new developments for electromagnetic investigation and to intensify an international co-operation in this important and growing field of physical research. The other purpose of **MMET'96** conference holding was to continue regular forum of interaction in the field of electromagnetic theory between the scientists from post Soviet independent countries and the Western scientific community.

This time the conference was organised by Karpenko Physico-Mechanical Institute of the National Academy of Sciences of Ukraine, Ukrainian URSI Commission B and Ukrainian IEEE ED/MTT/AP Chapters. It was realised in co-operation with the State University "Lviv Polytechnic", the following Institutes of the National Academy of Sciences of Ukraine: Radio Physics and Electronics, Radio Astronomy, Applied Problems of Mechanics and Mathematics as well as with URSI Commission B and the following IEEE organisations: Antennas and Propagation Society, Electron Devices Society, Microwave Theory and Techniques Society.

The **126** invited and contributed papers of more than **200** authors from **16** countries have been accepted to the Program of **MMET'96** and have been collected in the 535 pages Conference Proceedings. They cover all the traditional topics of the URSI Commission B activities and was presented in **8 MMET'96 Conference Sessions**.

Almost 100 participants from 9 countries came to Lviv and took part in the MMET'96 Conference. There were 4 plenary sessions and 13 sessions of Sections at the Conference. There were 8 invited speakers and a total number of presentations was 78. The presentations were distributed among the sessions as follows:

- Antenna Theory	6
- Computational Techniques	13
- Electromagnetic Theory	10
- Gratings and Frequency Selected Surfaces	5
- Inverse Problems	9
- Scattering and Diffraction	14
- Time Domain Methods	8
- Waveguides and Complex Media	5

According to the preliminary announcement the Technical Program Committee awarded the Prizes to the young authors for the best papers presented at the Conference. 22 young scientists of 4 countries took part in the competition. The International Jury for estimation of the presentations was approved during the Opening Ceremony of the MMET'96 Conference. The 6 winners of competition were awarded. According to decision of the Technical Program Committee the 5 young scientists from the ex-USSR countries were encouraged as well.

## Plenary Session Papers

- F. Gardiol (Lausanne, Switzerland), "Mixed potential integral equation methods for multilayered structures".  
T. Hinata (Tokyo, Japan), "Scattering of electromagnetic waves by an axially slotted conducting elliptic cylinder".  
Z. Nazarchuk (Lviv, Ukraine), "Advances of mathematical methods in electromagnetic theory at the Karpenko Physico-Mechanical Institute".  
A. Nosich (Kharkov, Ukraine), "The method of regularization in wave scattering and eigenvalue problems: foundations and review of solutions".  
A. Samokhin (Moscow, Russia), "Numerical method for solving three-dimensional scattering problems: foundations and review of solutions".  
M. Shimoda (Japan), "Application of Wiener-Hopf techniques to wave scattering problems".  
K. Tanaka (Gifu, Japan), "Guided-mode extracted integral equations: a new methods for CAD waveguide circuits".

## Young Scientists Awards

**First prize:** *Miss. S. Sapmaz* (Turkey and Japan), "Wiener-Hopf analysis of the diffraction by a strip located at the plane interface between two media".

**Second prizes:** *Mr. V. Okhmatovsky* (Moscow), "Radiation characteristics of a phased antenna array situated under a semi-infinite dielectric slab"; *Mr. T. Senyk* (Lviv), "Evaluation of periodic Green's function and its derivation by interpolation polynomials in diffraction problems".

**Third prizes:** *Miss. S. Boriskina* (Kharkov), "CAD-oriented analysis of two types of surface-wave bandstop filters"; *Dr. S. Koshikawa* (Japan), "Plane wave diffraction by a resistive strip"; *Mr. M. Samoilenko* (Kharkov), "Method of boundary singular integral equations in diffraction by an array of strips".

The decision of the 6th International Conference on **Mathematical Methods in Electromagnetic Theory** was accepted during the MMET'96 Closing Ceremony. The main its items are as follows:

MMET'96 Conference is considered as a successful International event in the field of Radio Science and Radio Engineering; the next, 7th MMET Conference, will be held in Kharkov (Ukraine) in the next week after 1998 URSI Symposium in Thessaloniki (Greece); Professors Eldar Veliev (Chairman) and Alex Nosich (e-mail: ALEX@EMT.kharkov.ua) from the Institute of Radio Physics and Electronics of the National Academy of Sciences of Ukraine will be the key organizers of MMET'98.

As MMET'96 Chairman I would like to conclude that this Conference fulfills its tasks successfully. Most of the sessions was headed by distinguished experts in electromagnetic theory. The invited lecturers report their

most recent works. One workshop on Antenna Theory was scheduled during the Conference period for those who wish to learn deeply some latest theoretical results in this field. The Conference have convened scientists from different countries, have presented the latest state-of the-art of electromagnetic theory and have provided a forum for an international exchange of knowledge and experience. The Conference have documented new developments for electromagnetic investigation and have intensified an international co-operation in this important and growing field of physical research. In addition the MMET'96

Conference have given a good possibility to interact in field of electromagnetic theory between the ex-USSR and the Western scientific community. The four Conference days gave the opportunity to discuss the mathematical problems and methods as well as their applications to a practical realization and to design of novel electromagnetic structures. The participants obtained a good possibility to inform one another about research policies in different countries. I hope that this Conference helps to establish new joint research projects as well.

Zinoviy Nazarchuk

## EMC'96 ROMA

Rome, Italy, 17-20 September 1996

The Second International Symposium on Electromagnetic Compatibility (EMC'96 ROMA) was held at the Faculty of Engineering, University of Rome "La Sapienza", Rome, Italy, September 17- 20, 1996. The Symposium was organised by the University of Rome "La Sapienza" and Associazione Elettrotecnica ed Elettronica Italiana (AEI), sponsored by URSI - International Union of Radio Science, CNR - National Research Council, Italferr-Sis. T.A.V., and cooperated by IEEE North Italy Section and IEEE Central and South Italy Section. The International Steering Committee (ISC) was chaired by M. D'Amore, (Italy); the Vice- chairman was P. Bernardi (Italy).

More than 250 summary papers have been submitted for presentation to EMC'96 ROMA Symposium by authors of 35 different countries. Each summary has been reviewed by three members of the Editorial Board, experts in the subject of the paper and with a different nationality from that of the authors. Each main author then received a copy of the anonymous Paper Review Forms completed by the referees. A meeting of the ISC was held in Rome on February 29 - March 1, 1996, to complete the review process and define the technical programme composed by three-day oral and poster presentations plus workshops and tutorials. In the final programme 178 technical paper presentations were scheduled, 108 presentations in oral sessions, including 2 invited papers, and 70 presentations in poster sessions.

All the accepted papers were published in the Symposium Proceedings, with a maximum of 6 pages for each paper. A 894 page, two-volume proceedings resulted. Two additional volumes, containing the four Tutorials and the six Workshop notes, respectively, were also published. In order to promote a wide participation, only two parallel oral sessions have been scheduled in the technical programme. The oral presentations have been subdivided in 18 oral sessions on the following subjects: EMC Measurements - Transmission Lines - Human Exposure to EM Fields - Immunity/Emission - Communications Systems - Shielding Modelling - Protection Devices - EMC Standards - Numerical Modelling - Field Probes - Cables - Shielding

Measurements/ESD - PCBs I - PCBs II - Railway Systems/ Power Electronics - Lightning - Power Systems - Rooms & Cells.

The final programme included the invited opening session "EMC Aspects related to the European Standards on Human Exposure to EM Fields" with the participation of B. Kunsch, Chairman of CENELEC TC211. The poster presentations have been scheduled in the afternoons without overlapping with the oral sessions and have been subdivided in the following 10 sessions: EMI in Power Apparatus and Systems - Harmonics & Power Electronics - EMC Education - Antennas & Communication Systems - Electronic Devices - Biological Interactions - Measurements & Instrumentation - Lightning and EMP - EM Coupling/Transients - Computational Electromagnetics.

In order to encourage discussion and participation during the sessions, Oral Presentation Best Paper and Poster Presentation Best Paper awards of ITL 1.000.000 have been established. The best papers have been selected during the symposium by the ISC members and the session chairmen on the basis of content, presentation, and discussion of the paper. The Oral Presentation Best Paper award was given ex-aequo to the paper "Electromagnetic field coupling to shielded cables: methodology and approximations" by D.Orzan, M.Ianoz, F. Rachidi, (EPFL, Switzerland), and B. Nicoara (Polytechnic of Bucarest, Romania), and to the paper "Interconnect Model for Commercial Simulators" by I. Maio, F.G. Canavero, (Polytechnic of Turin, Italy) F. Muzio, B. Dilecce (Centro Ricerca FIAT, Italy). The paper "The influence of finite ground conductivity on characteristics of a vertical mast (monopole) antenna with elevated feeding", by P.D. Rancic, J.V. Surutka e M.I. Kitanovic (University of Nis, Yugoslavia) won the award for Poster Presentation Best Paper. In the Symposium six workshops and four half-day tutorials took place.

The six workshops have debated the hot topics listed in the following: - WS1: "Control of ELF Field", organised by Prof. R. G. Olsen (Washington State University, USA); - WS2: "European EMC Directive & its Application", organised by R. Cortina (ENEL, Italy); - WS3: "EMC



Testing & Certification”, organised by G. Santagostino (CESI, Italy); - WS4: “Protection against Lightning Electromagnetic Pulse (LEMP), organised by Prof. C. Mazzetti, (University of Rome “La Sapienza”, Italy); - WS5: “Power Electronics & EMC Effects”, organised by Dr. J. Roudet (INPG - LEG - ENSIEG, France); - WS6: “Methodologies for EMC-Adequate Design of PCB’s and Systems”, organised by Dr. W. John (Siemens Nixdorf, Germany) The four tutorials were taken on the following relevant EMC topics: - Tutorial A: “Field -Excited Multiconductor Transmission Lines” organised by Prof. M. D’Amore (University of Rome “La Sapienza”, Italy); - Tutorial B: “Personal Communication Systems: EMC and Human Health Concern” organised by Prof. P. Bernardi (University of Rome “La Sapienza”, Italy); - Tutorial C: “Numerical Methods in EMC” organised by Prof. M. Feliziani, (University of L’Aquila, Italy); - Tutorial D: “Basic EMC Measurements” organised by Dr. M. Kanda (NIST, USA).

The Symposium was accompanied by a technical exhibition with 21 exhibitors registered. A Technical Visit to the satellite and antenna test facilities of Alenia Spazio was held, attracting the interest of more than 30 participants. All the activities related to the symposium have taken place around the antique cloister inside the Faculty of Engineering building, which is located very close to the Colosseum and the archaeological areas of Rome. The Social Programme

included a welcome cocktail at the Villa Giulia and Etruscan Museum and a banquet at the Villa Miani. Interesting tours have been also organised to visit some well known tourist areas of the city (St. Peter’s basilica and Vatican Museums, Roman Forum, Christian basilicas and catacombs).

The technical programme was followed by a high number of attendees (more than 500 people) at all oral and poster sessions. Particularly, the poster sessions have been a success for the friendly atmosphere which has encouraged informal discussions among the participants.

At the end of the symposium the International Steering Committee received many appreciations for the success with regard to the high scientific level of the technical papers, workshops and tutorials, the relevant and qualified participation from industries and universities, and the friendly atmosphere in technical and social programs. Resulting from this was the decision of the ISC to continue the series with the third “Symposium EMC 98 ROMA”, that will take place on September 14-18, 1998. Interested authors are invited to submit original and unpublished papers in the areas of EMC. Prospective authors should contact the Symposium Secretariat in Milan, at the following address: EMC’98 ROMA - Attn. Daniela Fioramonti AEI Associazione Elettrotecnica ed Elettronica Italiana Ufficio Centrale Piazzale R. Morandi, 2 20121 Milano (Italy).

P. Bernardi

## ISEM’97

Braunschweig, Germany, 12 - 14 May 1997

The eighth International Symposium on Non-Linear Electromagnetic Systems was organised to cover the interdisciplinary field of research and applied electromagnetics. Previous ISEMs were held in Japan, Korea and the United Kingdom.

The objective of ISEM Braunschweig was to exchange information on various topics as: - Advanced Mathematical Methods, Computational Techniques - Material Properties and their Modelling - Microelectromechanics - Inverse Problems - Design of Magnetic Devices - Biomagnetism and Biomagnetic Applications - Non-destructive Testing and other topics of interdisciplinary interest.

ISEM Braunschweig covered the present state of the art in these fields and offered the participants the bonus of its interdisciplinary character. Scientists and engineers of many different disciplines, yet having common interests, got together to report recent achievements, the aim being to detect the analogies between their own field and fields which, at first glance, might seem completely different. They acquainted themselves with different experimental techniques and had an opportunity of learning different methods used in other fields, mainly computational methods suitable for application in their own field.

The topics ranged from micro- to macrosystems (e.g. from nanowires to high-speed trains) and also from the very

cold (superconducting materials) to the very hot state of matter (plasma). The understanding of biomagnetic signals in the femto tesla range, as well as magnetic field densities which are 15 orders of magnitude higher, were and still are of great interest and importance. Seemingly different specialisations such as non-destructive testing and biomagnetic research proved to be closely related to each other.

As there were no parallel sessions, ISEM Braunschweig offered an opportunity to take part in all oral sessions. Invited papers and tutorial lectures helped introduce the audience to the subject matter. For example, the invited papers presented at the beginning and end of the symposium were of particular interest and significance. The first talk was on progress in biomagnetism: highly precise non-contact measurements of heart and brain signals. It is to be expected that this will lead to an extension of the methods currently applied in medical diagnostics. The closing papers presented modern high-speed transport systems using the Japanese and German projects of magnetically levitated trains as examples.

Over 260 papers were presented in oral and poster sessions. The program included 22 oral presentations, eleven of which were invited talks, and four tutorial lectures. 240 poster contributions were presented in 6 poster sessions.

The conference was attended by 261 participants from 27 countries. Financial support was granted to 22 young scientists in an extended Young Scientists Programme partly sponsored by URSI, Commission A, where the final selection was made by a commission of members of the Technical Programme Committee. In order to give an opportunity for attending the conference to participants who would otherwise have been unable to participate, 35 additional students and 77 attendants from Middle and East European countries have been substituted.

The technical programme was complemented by a technical exhibition, an accompanying persons' programme and, on 15 May, the laboratory visits.

Participants were invited to visit the laboratories of the Physikalisch-Technische Bundesanstalt in

Braunschweig or in Berlin and a few selected institutes of the Braunschweig Technical University.

The symposium was held in the Civic Hall in Braunschweig. It was organized by the staff of the Physikalisch-Technische Bundesanstalt (PTB) and sponsored by: Braunschweig Technical University, Bundesministerium für Wirtschaft (BMWi), Deutsche Forschungsgemeinschaft, Japan Society of Applied Electromagnetics and Mechanics, Helmholtz Fonds e.V., Hewlett Packard, Physikalisch-Technische Bundesanstalt, Stadt Braunschweig, URSI, WE-Heraeus-Stiftung, Deutsche Physikalische Gesellschaft.

The conference organizers met with positive reactions from the participants; in particular the benefits of the interdisciplinary character were highly appreciated.

## IRI WORKSHOP

Kühlungsborn, Germany from 27 to 30 May 1997

*The COSPAR/URSI Working Group on the International Reference Ionosphere (IRI) has held a very successful workshop in Kühlungsborn, Germany from 27 to 30 May 1997. URSI Commission G has sponsored this IRI activity. A special issue of Advances of Space Research is being prepared to publish selected papers. Below is the report on the meeting by Dr. D. Bilitza, the chairman of IRI.*

Bodo Reinisch  
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### New Developments in Ionospheric Modeling and Predictions

This workshop was held at the Institute of Atmospheric Research in Kühlungsborn, Germany from May 27 to 30. The meeting was jointly organised by the COSPAR/URSI Working Group on the International Reference Ionosphere (IRI) and by the European Union Co-operation in Scientific and Technical Research (COST) Project 251 "Improved Quality of Service in Ionospheric Telecommunication System Planning and Operation". Having this year's IRI Workshop jointly with COST in Europe provided an opportunity for a large number of European scientists to present their IRI-related studies and to participate in the IRI improvement effort. The 86 participants represented Greece (2), Czech Republic (5), UK (13), USA (8), Italy (4), France (4), Russia (9), Kazakhstan (1), Bulgaria (3), Germany (14), Poland (5), India (1), Argentina (1), Spain (4), Austria (2), Canada (1), P.R. China (1), Sweden (3), Turkey (1), Japan (2), Finland (2).

There were more than 100 presentations in 10 sessions entitled: Bottomside Ionosphere, Ionospheric Models and HF Propagation, E and D Region, Topside Ionosphere, Ionospheric Storms and Trough, Long-term Variation and Variability, Ion Composition and Plasma Temperatures,

Ion Drift and Spread-F, Posters, and Final Discussion. The first session was held in memoriam of Prof. Lucien Bossy, the long-time chairman of the IRI (1984-1992) who passed away on 21 September 1996. Selected papers from the workshop will be published as an issue of the Advances in Space Research with K. Rawer and P. Bradley as the editors.

From the application standpoint the "HF propagation" session was the most interesting. A number of European groups reported about their usage of Ionospheric models for civil and military HF applications (Bradley, UK; Cannon, DRA, UK; Levy, RAL, UK; Lundborg, FOA, Sweden). Anderson (AF Phillips Lab, USA) explained the operational Ionospheric specification and forecast models that are being used by the US Air Force. Application of IRI for altimeter data reduction in conjunction with GPS total electron content measurements was discussed by Komjathy (Canada).

Very exciting in terms of progress in improving IRI was the "Ionospheric Storm" session. Status reports were presented by Rishbeth (UK), Fuller-Rowell (NOAA, USA), Pulinets (IZMIRAN, Russia), Kutiev (Bulgaria), Bradley (UK) and several others describing their efforts to establish the typical storm time variation patterns and algorithms to represent these Ionospheric storm effects. IRI now includes a code developed by the IZMIRAN group in Moscow. Comparisons with observations presented in the storm and poster sessions showed the shortcomings of this first model attempt. As a result of the different efforts an improved description of storm effects is expected to be ready for inclusion in IRI soon.

Of the many outstanding papers and posters several were of particular interest for future improvements of IRI: - Tulunay (Turkey) continued her study of the dependence of the critical frequency foF2 on the IMF turnings; - Grebowsky (GSFC, USA) investigated the differences between AE-C, E and MSX ion density measurements and

the IRI and TDIM predictions; - Oyama (Japan) presented improvements of the IRI plasma temperature model based on his Hinotori data; - A new topside model-based on a large amount of Alouette/ISIS topside soundings (Bilitza, USA); - An empirical storm-time plasmadrift model developed by Scherliess and Fejer (USU, USA); - Several papers described improvements of the IRI electron density model in the bottom side and F1 region based on the work accomplished during the 1995 and 1996 IRI Task Force Activities at the International Centre for Theoretical Physics (ICTP) in Trieste, Italy (Radicella, ICTP, Italy; Reinisch, UML, USA; Zhang, PR China; Mosert, Argentina).

During the "Final Discussion" session the IRI Working Group initiated several projects and decide on several important improvements for the next version of IRI. In the D-region the Friedrich (Austria) and Danilov (Russia) models will be implemented and will be compared with EISCAT data (Turunen, Finland). In the E-region the

Mahajan (India) model will be used for the valley parameters. A new model for the E peak height (Kishcha, Russia) will be compared with ionosonde data (Bibl, UML, USA). With relation to the F1 region and bottomside the group strongly endorsed the Task Force Activity (TFA) at ICTP and indicated that new tables for the bottomside parameters (B0, B1) will be included in IRI as soon as they are finalised. The improved equatorial and solar activity coverage of the ICTP data base will provide considerably better IRI predictions at low latitudes. Inclusion of a plasmaspheric extension of IRI and of an ion drift model will be discussed with the model authors (plasmasphere: Gallagher, MSFC, USA; ion drift: Fejer, USU, USA). Several new members were accepted into the IRI team: B. Zolesi (ING Rome, Italy), K. Igarashi (CRL, Japan), I. Kutiev (GI, Bulgaria), and S. Watanabe (Tohoku U., Japan).

Dieter Bilitza, IRI Chair  
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## 2ND WORLD CONGRESS FOR ELECTRICITY AND MAGNETISM IN BIOLOGY AND MEDICINE

Bologna, Italy, 8-13 June 1997

The 2nd World Congress for Electricity and Magnetism in Biology and Medicine was held on June 8-13, 1997 at the Palazzo della Cultura e dei Congressi in Bologna, Italy. The Congress was jointly organized by the Bioelectromagnetics society, Society for Physical Regulation in Biology and Medicine, the Bioelectrochemical Society, and the European Bioelectromagnetics Association with the participation of URSI Commission (K) on Electromagnetics in Biology and Medicine. Professor James C. Lin, chairman of Commission K served as a member of the Board of Directors, representing the Bioelectromagnetics society. There were about 1000 registrants at the Congress. By special arrangement of the local organizers, very enjoyable evening was had by all who attended the Organ Concert held in the Basilica de S. Martino. The famous musician, Sergio Vartolo played on splendid historical 1556 organ. A Gala dinner was held in the Palazzo re Enzo, a wonderful building located in the Piazza Maggiore, the heart of the city center.

The technical program consisted of 12 plenary lectures which reviewed the continuing efforts to understand the physical and biological mechanisms of interaction, and highlighted practical applications in biology and medicine. There were 28 minisymposia on a variety of focused topics. The contributed papers were divided into four major tracks and were presented in 14 platform sessions and three poster sessions which had 297 papers scheduled. There were more than 600 papers presented at the 2nd World Congress.

A couple of reports are noteworthy. An Australian transgenic mice study was presented and discussed in detail for the first time. (It was published in Radiation Research in May of this year, shortly before the congress.) To date,

no one has yet repeated the study. There were indications that some industrial concerns may support a repeat of the study. It is a somewhat unique study and may or may not directly relate to normal humans in that it involved animals whose genes had been altered. Also, the animals were made especially susceptible to the type of cancer studied. Nevertheless, it demonstrated an interaction at the cellular telephone level and frequency that needs to be confirmed or refuted by experimentation.

Another cancer related laboratory study that did not use the 50-packet type modulation and showed no effects from the radiation. In contrast, the 50-packet radiation produced a reduction in cancers in the irradiated rats compared to sham irradiated rats. It also may indicate a potential biological reaction to cellular telephone radiation and suggest a 'protective effect, if confirmed.

A major study from Germany had shown many negative results, supplementing many negative reports from others in previous years. It was a first report from the group.

It is observed that, by tradition, the Congress does not provide any formal (official) conclusion. There was not any forum for that either. Presentations were made by many researchers. There were many divergent reports. The controversial questions such as DNA strand breaks, blood brain barrier changes, etc. at low levels are still unresolved and are awaiting replication. There were some attempts to repeat some of these experiments. It is not certain that they were direct replications.

James C. Lin  
Chairman of URSI Commission K

# HF RADIO SYSTEMS AND TECHNIQUES

Nottingham, UK, 7 - 10 July 1997

The Institution of Electrical Engineers (IEE) in the UK have, for a number of years, provided a forum for researchers from across the world who are working in the broad field of HF (2 – 30 MHz) systems. As such it one of a mere handful of conferences on the international calendar which cater for what may appear, to some, to be a particularly specialised if not archaic subject. On this occasion the seventh conference in this series was held at the East Midlands Conference Centre of the University of Nottingham over four days in July. The venue was excellent, as was the weather, and the programme, which was put together by a committee under the very able chairmanship of Mel Maundrell of the Defence Evaluation and Research Agency (DERA), covered this diverse field most comprehensively. In excess of 200 hundred delegates from sixteen countries attended: an indication of the world-wide interest in the subject. The conference programme was structured in the usual parallel session format – never ideal, particularly when, as in this case, the topics under discussion spanned so many mutually-complementary and overlapping areas. However practicality demands such solutions and delegates had, on occasions, because of the very interesting programme, to base their decisions on which session to attend almost on the toss of a coin.

The Conference opened with two Keynote Addresses: the first given by Professor S.C.Cook of the University of South Australia – himself a major contributor to the advancement of HF radio applications in the last decade. The second was by Professor L.W.Barclay, the doyen of HF propagation in the UK and the country's acknowledged expert on the international regulations as applied to the radio frequency spectrum in general. Steve Cook spoke on the role of HF communications in the information age and structured his paper in two parts: that dealing with the present activity in HF radio usage, research, development and standardization and followed it with a review of the latest HF radio networking technologies with examples from both the military and civilian sectors. The attractiveness of HF radio is clearly one of low cost and wide area coverage but this advantage may well be lost with the advent of the Low Earth Orbit (LEO) satellites which are soon to appear. However, as has so often been the case with HF systems, new applications or indeed a new appreciation of the capabilities of HF may well bring about an upsurge in both applications and interest. The outlook for HF radio, as he saw it, is bright as long as it continues to provide cost-effective solutions – the criterion of performance these days.

Les Barclay in his address provided a most comprehensive review of the processes and procedures involved in the business of radio frequency regulation, assignment and management on an international scale. The

functions of the International Telecommunication Union (ITU), as the controlling body, were reviewed and its role in satisfying the requirements and demands of the diverse community of users of the HF spectrum in an age of escalating service demand, increasing technological sophistication but declining financial resources was adroitly presented. He then reviewed recent IT Study Group activities which dealt in detail with such important topics as adaptive systems for a variety of applications such as oblique-incident sounding of the ionosphere and spread-spectrum communications. The advances in technology which have made such frequency agility possible have inevitably produced some conflict with the prevailing Radio Regulations which require all signatories to limit the amount of spectrum used to the absolute minimum while also requiring that the latest technical advances be applied. Clearly, adaptive systems are now an established feature of modern HF technology and therefore there is a need for some clarification of those Regulations. Work, we were assured, was already in progress to do just that.

The titles of the various sessions best illustrate the breadth of coverage of the Conference and so these are listed below with the number of actual sessions devoted to each topic shown in parentheses:

- Noise and Interference (2)
- Propagation and Sounding (5)
- Signal Design and Processing (5)
- System Design, Control and Management (4)
- Components and Equipment Design (2)
- EW Systems and DF (2)
- Radar (3)
- Modelling and Simulation (4)
- Antennas and Couplers (1)

In addition to the formal presentation of papers there were also a number of poster sessions covering virtually all of the above topics. These were chosen to correspond with periods in the programme when delegates found themselves operating in less formal mode, often with glass in hand and, as a result, the discussions were both lively and convivial.

The proceedings of this conference may be purchased from : The IEE, P.O.Box 96, Stevenage, Herts., SG1 2SD, United Kingdom at £81 (81 Sterling). When ordering, please quote the Publication Number 441.

The interest shown in the conference by delegates from so many countries confirmed both the ongoing viability of the HF spectrum for numerous applications while at the same time indicating that this particular IEE-sponsored conference has a special niche in the international conference calendar. Both would seem destined to attract considerable interest and attention for years to come.

Dr. Brian A. Austin

# ISRAMT'97

Beijing, China from August 4-7, 1997

The 6th International Symposium on Recent Advances in Microwave Technology 1997 (ISRAMT'97) was held in Beijing, China from August 4-7, 1997. The Chinese Institute of Electronics and the Electrical Engineering Department of the University of Nevada, Reno, USA were the main sponsors of ISRAMT'97 along with URSI, IEEE Northern Nevada Section and Beijing Section, IEEE-MMT and IEEE-AP Beijing Chapters, IEE Beijing Centre and Beijing Institute of Technology as co-operative partners. It was also supported by the National Natural Science Foundation of China.

In total 153 (71 from China, 82 from overseas) papers were selected from over 20 countries by the TPCs, of USA and China. The delegates started arriving in Beijing on August 3. Most of the delegates at Beijing International Airport were received by the members of ISRAMT'97 organising committee. The largest contingent was from neighbouring Japan. The conference was organised in the Media Centre in downtown Beijing. Actually in the past this place has been main lodging centre for media persons from all over the world. Hotel rooms were very nice and reasonably priced. The conference registration desk in the hotel was quite busy starting August 4. In all about 50 foreign and over 100 Chinese delegates attended the conference. The basic theme of ISRAMT "*exchange of scientific knowledge in a very informal and congenial atmosphere by keeping the conference small*" was certainly visible.

The ISRAMT'97 started at 9:00 am on Tuesday; August 5, 1997, with opening remarks and welcome by Profs. Lin Weigan (Symposium Chair), Sha Zong (Organising Committee Chair), Banmali Rawat (Technical Program Co-Chair) and Wang Yue (Technical Program Co-Chair). After welcome etc. the Plenary Session started with Profs. Rawat and Yue as the session chairs. In all five papers by Profs. T.K. Ishii (USA), Gao Benqing (China), Niklaus Kämpfer (Switzerland), C. Camacho-Peñalosa (Spain) and Lin Weigan (China) were presented in this session. Three papers were in the area of microwave propagation, one in remote sensing and one in microwave and millimetre wave devices to keep interest of all the participants. Three parallel sessions, Antennas I, Radar and Remote Sensing I and Computation Methods I, were scheduled in the afternoon from 2:00 to 5:30 p.m. All these sessions were good mix of Chinese and foreign, theoretical and very experimental as well as invited and contributed papers. The focus of Antennas I session was microstrip antennas while the Radar and Remote Sensing I session had papers in both applications and analysis. The Computation Method I was a good mix of the analysis of simple as well as very complex microwave geometries. In the evening the ISRAMT-97 organising committee arranged a very warm reception for all the participants. Mr. Zhou Mengqi extended hearty welcome to all the participants.

On Wednesday, August 6, 1997, again there were three parallel sessions both in the morning and afternoon. Biological Effects and Communications, MMIC and Microstrip Lines and Propagation and Measurements were the morning sessions from 8:30 am to 12.00 noon. These sessions were very balanced in terms of experimental and theoretical analysis involving several measurement techniques. Three sessions in the afternoon from 2:00 to 5:30 p.m. were: Microwave Devices and Circuits I, Microwave Components and Devices I and Electro-Optics and Materials. The main focus of Microwave Devices and Circuits session was on HEMT and other types of amplifiers. The Microwave Components and Devices I session was heavy on directional couplers. Both these sessions were balanced in terms of foreign and Chinese papers. The Electro-Optics and Materials session had all foreign papers in the area of optical filters, couplers and amplifiers. The evening was the best opportunity to hold ISRAMT-International Advisory Committee meeting after dinner. The main feature of this meeting was the approval of name change of the conference from International Symposium on Recent Advances in Microwave Technology (ISRAMT) to **International Symposium on Microwave and Optical Technology (ISMOT)** effective January 1, 2001. This is very timely decision and shows the future direction of the technology we all are living with. Also the timing is very appropriate. The future conferences are scheduled as : **1999- Malaga, Spain; 2001- Montreal or Quebec City, Canada; 2003- Ostrava, Czech Republic; 2005- Kuala Lumpur, Malaysia.** The last three conference sites are tentative at this time.

The last day of the conference, August 7, 1997 had three parallel sessions in the morning, from 8:30 am to 12:00 noon and only two parallel sessions in the afternoon from 2:00 to 5:30 p.m. Actually the third session in the afternoon was the poster session which was merged with other sessions due to some cancellations. The morning sessions were: Antenna II, Radar and Antenna, and Computation Methods II. In the Antenna II session only one paper was from abroad and it was good mixture of ground based, airborne and smart structure antennas. In the Radar and Antenna session there were five papers with almost half from abroad. It included waveguide, phase scanning type and microwave ranging systems. The afternoon sessions were: Radar, Microwave Devices and Circuits II and Microwave Components and Devices II. Most of the papers in Radar, Microwave Devices and Circuits II session were in microwave semiconductor devices area including mm wave sources. The Microwave Components and Devices II session was very balanced in foreign and Chinese papers and its main focus was phase shifters and couplers.

In the evening of August 7, 1997 the ISRAMT-97 Organising Committee threw very lavish banquet for all the

delegates, in the main ballroom of the Media Center. The Chinese dishes were delicious and a large variety too. Prof. Sha Zong thanked all the delegates for attending and contributing to the conference, Chinese Institute of Electronics and the University of Nevada, Reno, USA for sponsoring the ISRAMT-97 and URSI, IEEE Northern Nevada and Beijing Sections, IEEE-MTT and AP Beijing Chapters, IEE Beijing Center and Beijing Institute of Electronics for co-operative partnership and National

Natural Science Foundation of China for supporting the ISRAMT-97. At the end, Professor C. Camacho-Peñalosa, of the University of Malaga, Spain as Chair of ISRAMT-99. invited all the delegates to ISRAMT-99 to be held in Malaga, Spain from December 15-18, 1999. Finally the ISRAMT -97 was closed with the best wishes and safe trip back home to all the delegates and announcements of one day excursion to Great Wall of China and Ming Tombs on August 8, 1997.

Banmali S. Rawat

## ISRP'97

Qingdao, China, 12-16 August 1997

*The Secretariat received two detailed reports of this meeting, from Professors Zong Sha and Zhang Minggao. We have combined these two reports into what follows...*

The 1997 International Symposium on Radio Propagation (ISRP'97) was held in the beautiful Qingdao, China, 12-16 August 1997. It is co-sponsored by the Chinese Institute of Electronics, URSI and the IEEE Antennas and Propagation Society. It was organised by the CIE Propagation Society, the China Research Institute of Radiowave Propagation, the Institute of Electronics, and the Universities of Peking and Wuhan. It was supported by the National Natural Science Foundation of China and URSI.

Some 140 people from about 20 countries of Asia, Europe, North America, South America, Africa and Australia attended the conference. Several leaders of the Ministry of Electronics Industry and Qingdao City were present at the opening ceremony. Professors Sha Zong and A. Ishimaru chaired the conference.

Three plenary sessions were arranged for keynote speeches and chaired by Professor A. Ishimaru, Mr M.P.M. Hall, Professor B. W. Reinisch and Dr D. G. Cole. In the first keynote speech entitled *Recent Progresses in Radio Propagation Research in China*, Professor Zhang Minggao gave a comprehensive introduction about the recent progress made in China in environmental observations and research, propagation research for land mobile and personal communications, propagation research for satellite communications, research and applications of HF propagation, research on microwave and millimeter wave propagation, propagation research for radar, measurements and research on land and sea clutters, research and applications of transient EM theory, EM oil well logging, lightning location, research on propagation and scattering in complex media, and applications of radio propagation to intersystem compatibility. In the second plenary session for keynote speeches on COST 235, Dr M.P.M. Hall gave a comprehensive introduction first to COST 235, and then Dr T. Tjelta, Dr C. J. Gibbins and Professor M. O. Al-Nuaimi gave remarkable results from COST 235 on frequency selective effects and bandwidth considerations, flat-fade effects and millimeter-wave considerations, and site shielding and other interference reduction strategies. In the third plenary session for keynote speeches, Professor A.

Ishimaru made a report, *Correlations of Scattered Waves by Random Media and Applications to Remote Sensing*, covering time-frequency correlations, spatial correlations, angular correlations, and their applications to confocal imaging and object detection; Professor B. W. Reinisch made a report, a Modern Digital Ionosonde, in which application of pulse compression techniques and coherent spectral integration provide up to 36dB of processing gain and make it possible to operate the sounder in environments with high interference; Dr R. L. Olsen made a report, Application of Global Geoclimate Information from Multipath Fading on Terrestrial L-O-S Links to Other Clear-Air Propagation Effects, including the multipath fading on very-low-angle satellite links and the clear-air interference on transhorizon paths; Dr M. Boumis and Dr C. M. Huang made reports on combined measurements of cloud physical and propagation parameters and some characteristics of night-time E region backscatter echoes observed by a VHF radar, respectively.

The Programme Committee received 160 papers and accepted 139; these were included in the symposium proceedings. The accepted papers were grouped into 11 topics, which formed the sessions of the symposium. The titles and corresponding number of papers were as follows : Wave Theory (18), Radio Propagation under Ground and Water (8), Tropospheric Propagation and Radiometeorology (13), Ionospheric Physics and Propagation (22), Radio Propagation on Earth-Space Paths (7), Radio Propagation in Mobile Communications (7), Scattering, Inverse Scattering and their applications (13), EMC and Spectrum Management (10), Applications of Radio Propagation Techniques to Other Fields (12), New Techniques of Radio Propagation measurements (5), Antenna Theory and Techniques Related to Radio Propagation (12) and Keynote speeches (12).

The impressive points in the reports included those related to new ionosonde techniques, regional ionospheric modelling, effects of solar activity and equatorial anomaly, newly simplified model for atmospheric gaseous attenuation, predictions of atmospheric horizontal inhomogeneity by artificial neural network, tropical boundary layer observation, transient EM problems, radiative transfer theory, object parameter inversion, several types of antennas, etc..

The symposium was successful. The quality of most of the presentations was remarkable. The following sections highlight several exciting papers presented at the symposium.

### *1. Scattering of Radiowave*

One outstanding paper was given by Prof. A. Ishimaru from the University of Washington. He described the correlations of scattered waves by random media and applications to remote sensing. In the past, most studies of scattering by random media have been done by using the scattered intensities and the scattering cross sections as functions of scattering angles. Recent studies, however, show that there are several correlation phenomena which are interesting and sometimes unusual and give additional information useful for remote sensing.

Time-frequency correlations of scattered waves are generalised to include the relationships with the two-frequency mutual coherence function and the Wigner distribution. The correlations are expressed in average and difference times and average and difference frequencies. Parallel formulations for spatial frequencies. The relationships with the specific intensity and the flux in the radiative transfer theory are given. As an example, the Wolf effect, which is the shift of source spectrum due to the correlation effect, is shown for the turbulence case.

The angular correlations of the scattered waves and the memory effects are generalised to include the circular memory effect. Two cases are examined in detail. One is the forward scatter case when the reference transmitter and receiver are in opposite sides of the scattering medium. In this case, the correlation is insensitive to the azimuthal angular change. The other is the backscattering case when the reference receiver is close to the transmitter. In this case, the correlation is sensitive to the change of the azimuthal scattering angle. The use of this circular memory effect in object detection is discussed, and millimeter wave experiments with rough surfaces are shown to illustrate the method. Generalisations of the memory effects in three-dimensional space are also considered showing the general matching conditions for transverse wave vectors including two different frequencies.

### *2. Tropospheric Propagations*

A second outstanding paper, highlighting the COST 235 Project, was that by Mr. M.P.M. Hall from Rutherford Appleton Laboratory. COST is a European organisation promoting the coordination of science and technology. It currently comprises 25 European countries. COST 235 was set up to promote and coordinate European research in the three specific areas of: (1) frequency-selective influences of radio wave propagation medium on future communication systems; (2) flat-fade influence of the radio wave propagation medium on future millimetre-wave telecommunication system; (3) influences of the radiowave medium and terrain features on site shielding and other interference reduction strategies.

### *3. Ionospheric Sounding*

The third outstanding paper was given by Prof. B.W. Reinisch describing the development of a modern digital

ionosonde. This ionosonde operated like Doppler radar systems measuring angle of arrival, polarisation and spectrum as function of range. It has been deployed at 20 stations in the last few years. Digital operations control and signal processing make it possible to operate this HF radar system in a variety of modes supporting different applications, routine ionospheric sounding, real-time frequency management, channel probing, and ionospheric structure and dynamics research.

Application of pulse compression techniques and coherent spectral integration provide up to 36 dB of processing gain resulting in good signal to noise ratio for a transmitter power of only 22 W. The equivalent transmitter power required by a non-integrating sounder would be 400 KW. Careful receiver design with high third-order intermodulation characteristics and a sensitivity of -130 dBm over the frequency range from 1-40 MHz make it possible to operate in environments with high interference levels.

The timing of the sounder is locked to the GPS system with an accuracy of better than 1 microsec. Therefore bistatic sounding between Digisondes can easily be established. Since internet connectivity is provided, ionograms, scaled parameters and electron density profiles can be viewed in real-time on the world wide web.

China keeps the largest ionospheric sounding network in the world. 14 sounding stations, 12 in the mainland and 2 in Antarctica, were maintained for routine observation. Additional to vertical sounding, other methods such as oblique backscattering measuring, satellite beacon signal receiving for TEC, Ionospheric topography (CT), HF Doppler shift measuring, absorption measuring, and VLF signal measuring etc. were adopted for measuring the structure of the ionosphere.

### *4. Lightning Location*

Prof. Pan Weiyang from CRIRP developed a single-based lightning location system. This system is based on the relationship between the relative lightning spectrum and the distance, so the system can locate the position of the lightning by only one station.

Recently a multi-lightning location system was developed. This system consists of a location analyser and several auxiliary stations. Every auxiliary station can independently determine the azimuth and distance of the lightning with accuracies better than 1 and 30% respectively, and transfer the lightning information (arrival time, azimuth and field strength) to the location analyser. Then the analyser will determine the lightning position with an accuracy better than 6.4 KM within a range of 300 KM.

### *5. HF Propagation*

Mr. P.Z. Fan from Southwest Jiaotong University introduced the world-wide HF field-strength measurement campaign launched by ITU-R in October 1995. The ITU recommended that a network of new computer-controlled transmitters and receivers be installed world-wide with the characteristics described in ITU-R P.845-1. In order to collect data respective of HF propagation conditions on a world-wide scale, the nine transmitters should be located in Northern and Southern Hemispheres at mid-latitudes and in the tropics in Region 1, 2 and 3.

Some preliminary measured results carried out in Leeds (U.K.) and Changdu (China) were given.

Some papers dealt with the International Reference Ionosphere (IRI) and regional ionospheric modeling. X. Wang et al described the prediction and retrospective ionospheric modeling over Europe (PRIME) which was the development of techniques for generating retrospective and predicted maps and models of the ionosphere over Europe with improved accuracy with respect to the currently international adopted procedure. For a preliminary analysis, it results that a higher accuracy of the regional method will be obtained.

#### 6. Sand, Dust Attenuation

Dong Qingsheng et al from CRISP described their preliminary results on the effects of simulated sand and dust storm on the propagation of millimetre wave. The measuring environments included natural sand, simulated sand and dust storm in wind tunnel, smoke caused by explosion and dust cloud raised by the traveling vehicles. The measuring frequencies were 33.5, 72, and 93 GHz. Preliminary results indicated that the attenuation caused by violent explosion may be high as 8 dB or more at 33.5 GHz, and even more than 8 dB at 93 GHz. The duration of attenuation may be 5-6 seconds.

#### 7. Propagation Research for Mobile Communication

Jason P.T. Faria Jr. and Mauro S. Assis introduced their results on propagation prediction for microcellular system. The systems are characterised by microcells with a radius between 100 and 1000 metres, and base station antennas at the same height as street lights. The calculation of radio propagation loss in microcells involves two different problems :

- a) Line of sight (LOS) propagation along street;
- b) Diffraction around corners (non-LOS).

A two-way model derived from geometrical optics is used in case (a), while the geometrical theory of diffraction (GTD) is the approach applied to case (b). A computer program was developed to automate procedure for the

prediction of signal attenuation in urban microcells was developed. Although supposing an idealised street grid model this software can predict with acceptable accuracy the propagation loss in urban areas.

Zhang Minggao introduced the results of research works in China in his paper entitled "Recent Progresses in Radio Propagation in China". A large number of propagation measurements were carried out for land mobile communication. These measurements were made at 150 MHz, 450 MHz and 900 MHz in Guangzhou, Shanghai, Beijing and Zhangzhou and their neighbourhoods. Some of the existing prediction models, namely Earth model, modified plane earth model, Egli model, Longley/Rice model; the propagation curves for land in CCIR Recommendation 370 or those for rural land in CCIR report 567, and Okumura/Hata model, were accompanied with the measuring data. It is found that the Okumura/Hata model is almost consistently superior to the others.

There were many other excellent papers. The reader is referred to the symposium proceedings for a more detailed coverage of the other excellent papers that were presented. The organisers and contributing authors for the symposium are to be congratulated on a job well done. Everyone looks forward to another International Symposium on Radio Propagation in the future.

Both the reception and banquet were well-attended and skillfully organised. Almost every country which had participants grouped a team and gave performances at the banquet. Both an Accompanying Persons' programme (during the conference) and a one-day-excursion (after the conference) were organised. The ladies found themselves on the Jutting Pier surrounded with waves of Yellow Sea, and enjoyed the mixed European, Asian and American building styles on the undulating terrain. The participants and accompanying persons flew over the Laoshan Mountain by cable cars, and the strange peaks, bizarre rocks, sheer cliffs and vast green trees almost made the tourists forget return.

Zong Sha, Vice-President CIE  
Zhang Minggao, Chairman, Scientific Program  
Committee ISRP' 1997

## ISAE'97

Xi'an, China, 19-22 September 1997

The Fourth International Symposium on Antennas and EM Theory was held at the Tangcheng Hotel, and was attended by some 130 participants, about one quarter of whom were from 11 countries outside China.

The opening session included a welcome speech from General Chairman (CIE/A-S); four greeting speeches from the delegates of Xidian University (Organizer), URSI (Cosponsor), IEEE/AP-S (Cooperator), and National Natural Science Foundation of China (Supportor). This was followed by Three invited lectures: 1. Yahya Rahmat-Samii, Global Connectivity in New Millennium: From

Maxwell's Equations to Modern Antennas in Wireless Communications; 2. Ismo V. Lindell, Heaviside Operational Calculus in Electromagnetic Image Theories; 3. Chang-Hong Liang, Principle of Least Error of a Class of Probability Densities and Its Applications in Electromagnetic System.

The technical programme featured 110 scheduled papers in 22 sessions, each presentation with discussion was limited to 20 minutes. Most of the communications gave rise to interesting discussion. In addition, two parallel workshops on the topics of Communication Antennas and



Antenna Measurements were arranged respectively.

The social activities included technical visit to Xidian University; historical visit to Terra-Cotta Army—the eighth wonder of the world; and other sight-seeing programme.

The subjects of papers related to various topics covering antennas and electromagnetic theory. Among them, microstrip or printed antennas, wire antennas for communications, and electromagnetic scattering were more glaring; array theory and antenna measurements were also

conspicuous. A hardcover Proceedings involving 148 four-page articles were published by International Academic Publishers [ISBN 7-80003-397-X/TN.30].

The next conference will be combined with another series of International Symposium on Radio Propagation, based on further coordination between Antenna Society and Radio Propagation Society, both adhering to the Chinese Institute of Electronics.

Professor Wen Xun Zhang  
Official Member Commission B, for China (CIE)

## CONFERENCE ANNOUNCEMENTS

### EUSAR'98

Friedrichshafen, Germany, 25-27 May 1998

The Second European Conference on Synthetic Aperture Radar will be organised by Dornier Satellitensysteme GmbH ITG/VDE, FGAN, DLR. EUSAR was created as a forum for the international SAR community to review the status of SAR technology and discuss prospects for the future.

The success and the great acceptance of the first conference in spring 1996 has strongly confirmed the demand for such a comprehensive and regular exchange of information in this field.

In view of the continuing progress in new SAR concepts and technology developments, processing techniques, and applications, the second EUSAR conference will be held at the Graf-Zeppelin Congress Centre, Friedrichshafen/Germany, on May 25-26-27, 1998.

Conference Chairman : K.-J. Gluitz, Dornier Satellitensysteme GmbH

Vice Chairman : R. Klemm, FGAN

#### Topics

- Airborne/Spaceborne SAR Programs, Systems and Technologies
- Next Generation SAR Antennas and T/R-Modules
- Calibration Methods and Techniques
- Data Handling, Data Compression, Data Transmission
- Interferometry
- SAR System Simulation
- Moving Target Detection
- Data Processing, Image Generation and Enhancement
- Value-adding, Feature Extraction and Evaluation
- New Applications

The conference will include about 100 oral presentations in two sessions, daily poster sessions, and a small industrial exhibition.

#### The Conference Site

Friedrichshafen is the centre of one of the most beautiful regions in the south of Germany, situated directly on Lake Constance before the majestic panorama of the Swiss Alps. The place is famous for charming towns and historic castles in the middle of excellent vineyards and fruit farms.

But the district is also known for "high tech" companies in aerospace and electronics, continuing the tradition once established by Graf von Zeppelin who built here in Friedrichshafen the first airship, nick-named "big cigar", at the beginning of the century, and Claude Dornier with amphibian airplanes like the Dornier-Wal and the first wide-body aircraft Do-X.

#### Conference organisation :

R. Rompel (VDE)  
Stresemannallee 15  
D-60596 Frankfurt  
Tel. +49 69-6 30 83 81  
Fax: +49 69-6 31 52 13  
E-mail: 100145.67@compuserve.com

#### WWW

<http://www.eds.dofn.de/eusar/index.html>

# DAY ON DIFFRACTION '98

St.Petersburg, Russia, 2 - 4 June 1998

## Organisation

Faculty of Physics of St.Petersburg University  
St.Petersburg Branch of Steklov Mathematical Institute  
Euler International Mathematical Institute  
Co-sponsored by IEEE ED/MTT/AP St.Petersburg Chapter  
and URSI.

### SCIENTIFIC COMMITTEE

Prof. V.M.Babich (Russia) (Chairman)

Prof. E.V.Jull (Canada) (Secretary)

### ORGANIZING COMMITTEE

Prof. V.S.Buldyrev (Chairman)

Dr. I.V.Andronov (Secretary)

Contributions concerning wave phenomena of any kind  
and related topics are welcome!

The Working language is English

To submit a paper please send (submission via e-mail is  
highly encouraged) free format synopsis to:

Prof V.M.Babich

Steklov Mathematical Inst.

Fontanka 27, St.Petersburg 191011, Russia

Fax: +7-812-310-5377, E-mail : babich@pdmi.ras.ru

or to :

Prof V.S.Buldyrev

Inst. on Physics, St.Petersburg University

Ulianovskaja 1, Petrodvoretz 198904, Russia

Fax: +7-812-428-7240, E-mail : buld@mph.niif.spb.su

## Topics

- Mathematical problems of diffraction
- Asymptotic Methods
- Mathematical Aspects of Wave Phenomena
- Inverse Problems
- Scattering and Diffraction
- Boundary-Contact Problems
- Waveguides and Resonators
- Rays and Beams
- Waves in Non-Uniform Media
- Boundary Layers
- Nonlinear Waves
- Propagation in Random Media
- Numerical Approaches

## Deadlines

Submission of synopsis	February 15, 1998
Submission of camera-ready abstracts	April 1, 1998
Notification of acceptance	April 15, 1998
Visa support	April 15, 1998
Advance programme	April 30, 1998

## Contact

either Ivan Andronov (andronov@mph.niif.spb.su)

or Valery Grikurov (grikurov@mph.niif.spb.su)

## WWW

<http://snoopy.phys.spbu.ru/~grikurov/dd98/dd98.html>

# MSMW'98

Ukraine, Kharkov, 15-17 September 1998

This is the third International Symposium on "Physics and Engineering of Millimeter and Submillimeter Waves" organised in Kharkov since 1978 as a regular Soviet Union meeting on MM and SUBMM waves and applications. The Institute of Radiophysics and Electronics of the National Academy of Sciences of Ukraine (IRE NASU) has always been one of the major research organisations in this field. It was established in 1955 with the main task of developing MM and SUBMM wave hot-plasma diagnostics systems for Tokamak controlled fusion machines; later it was involved in the development of MM-wave radars and in-orbit communication systems.

The forthcoming MSMW-98 symposium will have, for the first time, English as a working language to facilitate a closer interaction between the Western and Former Soviet Union (FSU) scientists and engineers.

## Organisation

Institute of Radiophysics and Electronics of NASU, Institute of Radio Astronomy of NASU (IRA NASU), Kharkov State University, IEEE AP/ED/MTT/AES-SS Joint

Chapters of Ukraine, Ukrainian URSI Committee.

Co-sponsorship of IEEE AP, MTT, and ED Societies and URSI have been approved, and of the other international institutions is sought and expected.

Chairman : Prof. Vladimir M. Yakovenko (IRE NASU)

## Topics

- New principles of generating and receiving MM and SUBMM waves
- Electronics of MM and SUBMM waves including quantum and relativistic electronics
- Wave processes in finite-size semiconductors, solid-state structures and HTSC materials
- Problems of the theory of wave diffraction
- MM and SUBMM wave propagation
- Communications and radars; remote sensing
- MM and SUBMM wave radio astronomy
- MM and SUBMM devices based on the planar and quasi-optical transmission lines (passive and active components, antennas)
- MM and SUBMM wave spectroscopy

- MM and SUBMM wavelength instrument making for scientific research (hot-plasma diagnostics, control of technological processes)
- Biomedical applications of MM and SUBMM waves

### Deadline

Submission of 1-page abstracts : April 15, 1998

Camera-ready papers : June 5, 1998.

The authors of invited papers will be given special instructions.

### Young Scientist Travel Grants

Travel grants might be expected to help young scientists

from FSU and developing countries to attend the Kharkov symposium. The number and amount of grants will depend on the success of the on-going search for sponsors.

### Contact

Dr. Alexei A. Kostenko

Prof. Alexander I. Nosich

MSMW-98

IRE NASU

12, Ac. Proskura St,

Kharkov, 310085, Ukraine

Ph / Fax: +380 (572) 441105

E-mail: <symposium@ire.kharkov.ua>

## ANTENNAS AND PROPAGATION FOR WIRELESS COMMUNICATIONS

Westin Hotel, Waltham, MA, USA, 2-4 November 1998

Plan to attend the IEEE-APS Conference on Antennas and Propagation for Wireless Communications (APWC98) for a firsthand look at the latest technological developments in the wireless antenna industry. The purpose of this conference is to provide working engineers with an up-to-date view of problems and solutions in antennas and propagation that are relevant to the rapidly expanding wireless communications industry. Contributors worldwide are invited to submit original papers in the areas listed below.

### Topics

- Military to Commercial Technology Transition
- Trends in Architecture for Future Wireless Systems
- Base-Station and Satellite Antenna Developments
- Adaptive and Active Arrays for Wireless Applications
- Novel Antennas and Passive Array Configurations
- Multiband Operation and Polarization Characteristics
- Antennas for PCS, WLL, WLAN, RFID, LMDS, GPS
- Mobile Antennas and Vehicle Modeling
- Human Interactions with Antennas
- Indoor/Outdoor Propagation

The Conference will feature twenty minute presentations, invited papers, and an exhibition. The exhibition will

include manufacturers of antennas and related components for wireless systems and applications. Tutorial workshops will be held in the afternoon of November 4.

### Deadline

Camera-ready form : April 1, 1998, at the address given below. A signed copyright form, available at the conference Home Page (see URL below), is necessary with submission. A missing copyright form will result in rejection. It will be assumed that all submissions have been cleared by the sponsoring agency.

Acceptance notification : July 1, 1998.

### Contact

APWC98

52 Agnes Drive

Framingham, MA 01701, USA

Tel: 508 788 5152 , Fax: 508 788 6226

Email: tuli@tiac.com

### WWW

<http://www.tiac.net/users/tuli/apwc98/welcome.html>

*URSI cannot be held responsible for any errors contained in this list of meetings.*

## December 1997

### ISDRS'97 : 1997 International Semiconductor Device Research Symposium

*Charlottesville, VA, USA, 11-13 December 1997*

Contact : Prof. William C. B. Peatman, Program Chair, Department of Electrical Engineering, Thornton Hall, University of Virginia, Charlottesville, VA 22903-2442, USA, Phone: +1 (804) 979-4103, Fax: +1 (804) 924-8818, E-mail: wcp4b@virginia.edu

### MST8 : Eight International Workshop on Technical and Scientific Aspects of MST Radar

*Bangalore, India, 15-20 December 1997*

Contact : Dr. S.C. Chakravarty, Indian Space Research Organisation, ISRO Headquarters, Antariksh Bhavan, New BEL Road, Bangalore 560 094, India, Tel. +91 80-341 6271, Fax +91 80-341 9190, E-mail scc@isro.ernet.in

## March 1998

### Microwave Signatures in Remote Sensing

*Moscow, Russia, 11-13 March 1998*

Contact : Dr. Eugeny Petrov, URSI Commission F Specialist meeting, Institute of Radioengineering and Electronics, Russian Academy of Sciences, Mokhovaya Street 11, 103907 Moscow, Russia, Tel. +7-095 203-4793, Fax : +7-095 203-8414, e-mail: petrov@web.cplire.ru

### ESGAP 2

*Lviv, Ukraine, 30 March - 2 April 1998*

Contact : Dr. O. Ivankiv, Institute for Condensed Matter Physics I, Svientsitsky Str., 290011 Lviv, Ukraine, Fax : +380 322-761978 and +380 322-761158, E-mail : esgap2@icmp.lviv.ua

## April 1998

### CLIMPARA '98

*Ottawa, Ontario, Canada, 27-29 April 1998*

Contact : Dr. Roderic L. Olsen, Communications Research Centre, P.O. Box 11490, Station H, Ottawa, Ontario K2H 8S2, Canada, Tel: +1-613-998-2564, Fax: +1-613-998-4077, E-mail: rod.olsen@crc.doc.ca, <http://www.crc.doc.ca/climpara98/climpara.html>

## May 1998

### 1998 International Symposium on Electromagnetic Theory (Commission B Triennial Open Symposium)

*Thessaloniki, Greece, 25 - 28 May 1998*

Contact : Prof. Chalmers M. Butler, Chair, 1998 URSI Electromagnetic Theory Symposium, Department of Electrical and Computer Engineering, 102 Riggs Hall Box 340915, Clemson University, Clemson, SC 29634-0915, USA, Tel. +1-864 656-5922, Fax +1-864 656-7220, e-mail: cbutler@eng.clemson.edu

### EUSAR'98 : European Conference on Synthetic Aperture Radar

*Friedrichshafen, Germany, 25-27 May 1998*

Contact : Dr. Richard Klemm, FGAN-FFM, Neuenahrer Str. 20, D-53343 Wachtberg, Germany, Tel. +49 228-9435 377, Fax : +49 228-348 953, e-mail: r.klemm@fgan.de

## June 1998

### Day on Diffraction '98

*St. Petersburg, Russia, 2-4 June 1998*

Contact : Dr. Valery E. Grikurov, Dept. Math. & Comp. Phys., Inst. on Physics, St. Petersburg University, Uljanovskaia 1, Petrodvoretz, Russia, Fax : 7-812-428-7240 and 7-812-298-4436, E-mail: grikurov@mph.niif.spb.su

### MMET'98

### 1998 International Conference on Mathematical Methods in Electromagnetic Theory

*Kharkov, Ukraine, 2-5 June 1998*

Contact : MMET'98 c/o Dept. Computational Electromagnetics, IRENAS, Ulitsa Proskury 12, Kharkov 310085, Ukraine. Tel: +380-572-448595 Fax: +380-572-441105, E-mail: veliev@dut.kharkov.ua alex@emt.kharkov.ua

### International Conference on Telecommunications (ICT'98)

*Chalkidiki, Greece, 22-25 June 1998*

Contact : Dr. I. Gragopoulos, Aristotle University of Thessaloniki, Greece, E-mail :itse@egnati.ae.auth.gr

### EMC Wroclaw'98 : 14th International Wroclaw Symposium on Electromagnetic Compatibility

*Wroclaw, Poland, 23 - 26 June 1998*

Contact : EMC Symposium, Box 2141, 51-645 Wroclaw 12, Poland, Fax : +48 71-728878, e-mail: emc@ita.pwr.wroc.pl

## July 1998

### CPEM98 : Conference on Precision Electromagnetic Measurements

*Washington, DC, U.S.A., 6 - 10 July 1998*

Contact : Katherine H. Magruder, Conference Secretary, NIST, Bldg. 220, Room B162, Gaithersburg, MD 20899-0001, USA, Tel. +1-301 975-4223; FAX +1-301 926-

3972; email katherine.magruder@nist.gov., WWW site :  
http://www.eeel.nist.gov/cpem98/

#### **IGARSS'98**

#### **1998 IEEE International Geoscience and Remote Sensing Symposium**

*Seattle, Washington, U.S.A., 6 - 10 July 1998*

Contact : Tammy I. Stein, IEEE Geoscience and Remote Sensing Society, 2610 Lakeway Drive, Seabrook TX 77586, U.S.A., Fax +1 281-291-9224, Email tstein@phoenix.net

#### **32nd COSPAR Scientific Assembly**

*Nagoya, Japan, 12-19 July 1998*

Contact : COSPAR Secretariat, 51<sup>st</sup> Bd de Montmorency, F-75016 Paris, France, Tel. +33 1-4525 0679, Fax +33 1-4050 9827, E-mail : COSPAR@paris7.jussieu.fr

#### **August 1998**

#### **Vth International Suzdal Symposium on Modification of the Ionosphere by Powerful Radio Waves**

*Moscow, Russia, 26-29 August 1998*

Contact : Prof. V.V. Migulin, Vth International Suzdal Symposium, Russian URSI Committee, Russian Academy of Sciences, Mokhovaja St. 11, 103907 Moscow, Russia, Fax +7-095 334-0124

#### **September 1998**

#### **Physics and Engineering of Millimeter and Submillimeter Waves**

*Kharkov, Ukraine, 15-17 September 1998*

Contact : Dr. A.A. Kostenko, Institute of Radiophysics and Electronics, National Academy of Science of Ukraine, 12 Acad. Proskura St. Kharkov, 310085 Ukraine, Tel. & Fax +380 572-44 1105, E-mail : symposium@ire.kharkov.ua

#### **URSI Commission F Triennial Open Symposium Wave Propagation and Remote Sensing**

*Aveiro, Portugal, 22-25 September 1998*

Contact : Dr. Armando C.D. Rocha, Instituto de Telecomunicações, Universidade de Aveiro, 3810 Aveiro, Portugal, Tel. +351 34-370324, Fax +351 34-381128, E-mail : arocha@av.it.pt

#### **November 1998**

#### **IEEE-APS conference on Antennas and Propagation for Wireless Communications**

*Waltham, MA, USA, 2-4 November 1998*

Contact : Prof. Tuli Herscovici, APWC98, 52 Agnes Drive, Framingham, MA 01701, USA, Tel: +1 508 788 5152 , Fax: +1 508 788 6226, E-mail : tuli@tiac.com, http://www.tiac.net/users/tuli/apwc98/welcome.html

#### **December 1998**

#### **Asia-Pacific Microwave Conference**

*Yokohama, Japan, 8-11 December 1998*

Contact : Prof. Yoshio Kobayashi, Faculty of Engineering, Saitama University, Urawa, Saitama 338, Japan, Fax +81 48-857 2529, E-mail : yoshio@reso.ees.saitama-u.ac.jp

#### **February 1999**

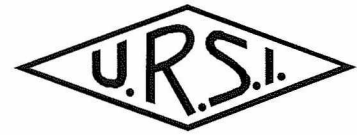
#### **EMC Zurich '99**

#### **13th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility**

*Zurich, Switzerland, 16-18 February 1999*

Contact : Dr. Gabriël Meyer, Communication Technology Laboratory, Sternwartstraße 7, CH-8092 Zurich, Switzerland, Tel. +41 1-632 2790, Fax +41 1-632 1209, E-mail : gmeyer@nari.ee.ethz.ch

# News from the URSI Community



## NEWS FROM THE COMMISSIONS

### URSI COMMISSION B YOUNG SCIENTIST AWARD

#### For Support to Attend the 1998 Electromagnetic Theory Symposium

Thessaloniki, Greece, 25-28 May 1998

#### Qualifications

Applicants must be under 36 years of age on May 25, 1998, be principal author of a paper accepted for presentation at the Symposium, and be active in research in electromagnetic theory and applications.

#### Conditions

Award recipients will receive free Symposium registration and financial support to defray the cost of modest board and lodging during the period of the Symposium. Limited funds will be available to assist in payment of part of the cost of round trip travel of award recipients from developing countries.

Award recipients are expected to attend and fully participate in the activities of the Symposium. They should be interested in promoting contacts and understanding among international radio scientists, including those from developed and developing countries.

#### Deadlines and Procedures

Applications will be accepted up to January 1, 1998. Send the application form and attachments plus five copies to

Prof. Staffan Ström  
Department of Electromagnetic Theory  
Royal Institute of Technology  
S-100 44 Stockholm, Sweden  
Fax: 46-8-10 83 27  
E-mail: [staffan@tet.kth.se](mailto:staffan@tet.kth.se)

Submission by e-mail with attachments in PDF format is also possible. If necessary, applications will be accepted by fax. Receipt of applications will be acknowledged by e-mail or fax.

#### Application forms are available from the web site

<http://www.ursicommb.eng.clemson.edu>.

They can also be obtained by mail or fax from Staffan Ström at the above address.

#### Awards

Awardees will be selected by a committee and all applicants will be notified of the committee's decision on or before February 15, 1998.

**It is important that all information requested on the application form be provided.**

## NEWS FROM THE MEMBER COMMITTEES

### UNITED KINGDOM

The 13th UK National Radio Science Colloquium was held at Leicester University on the 11th and 12th September 1997. The meeting was organised by E.M. Warrington assisted by T.B. Jones and A.J. Stocker. One of the aims of these annual colloquia is to keep the registration fee and other costs as low as possible to enable young researchers to attend and discuss the results of their work.

Over the two days of the meeting 24 papers and posters were presented in seven sessions. The interests of URSI Commissions B, C, D, E, F, G and H were represented in the programme. The topics discussed included VLF scattering, whistlers, ELF generation and marine

propagation, LF, HF and microwave propagation, geophysical radars, and satellite and cellular radio systems.

An informal business meeting of the UK Panel for URSI was held during the colloquium. The UK Panel consists of officers of URSI, Chairman and Vice-Chairmen of URSI Commissions, the National Representatives of URSI Commissions and representatives of Government Organisations.

D. L.I. Jones  
Secretary, UK Panel for URSI  
david.jones@kcl.ac.uk

## BOOK PUBLISHED BY AN URSI CORRESPONDENT

### AN INTRODUCTION TO CLASSICAL ELECTROMAGNETIC RADIATION

by Glenn S. Smith

Cambridge University Press  
1997 253 x 177 mm 673 pp.

Hardback : 80 pounds ISBN 0 521 58093 5  
Paperback : 29.95 pounds ISBN 0 521 58698 4

This book provides a thorough description of classical electromagnetic radiation, starting from Maxwell's equations, and moving on to show how fundamental concepts are applied in a wide variety of examples. Throughout, the author interweaves theoretical and experimental results to help give insight into the physical and historical foundations of the subject. Mathematical and physical explanations are enhanced by a wealth of illustrations (over 300), and there are more than 140 problems. This will be an ideal textbook for advanced undergraduates and graduate students in electrical engineering and physics.

\* Very well illustrated (unlike other books at this level) - has over 330 figures, 326 line diagrams 15 half-tones 35 tables 141 exercises

\* Includes experimental results throughout, not just theory (again, unlike other books)

\* Glenn S. Smith is a highly regarded author, an URSI

Correspondent, and a Fellow of IEEE

\* Includes homework problems; solutions manual available on request for lecturers

For further information, please contact :

Harriet Millward  
Marketing Controller (Physical Sciences)  
Publishing Division  
Cambridge University Press  
Shaftesbury Road  
e-mail: hmillward@cup.cam.ac.uk  
Cambridge CB2 2RU  
United Kingdom  
Tel. +44 1223 325781  
Fax: +44 1223 315052

See <http://www.cup.cam.ac.uk> (UK server) for complete on-line catalogue - now includes search by chapter contents or series - or see <http://www.cup.org> (US server).



# International Geophysical Calendar 1998

## International Geophysical Calendar 1998 (Final)

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

	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
<b>JANUARY</b>					1	2	3				1	2	3	4	<b>JULY</b>
	4	5	6	7	8	9	10	5	6	7	8	9	10	11	
	11	12	13	14	15	16	17	12	13	14	15	16	17	18	
	18	19	20+	21+	22	23	24	19	20	21	22*	23 <sup>N</sup>	24	25	
	25	26	27*	28 <sup>N</sup>	29	30	31	26	27	28	29	30	31	1	<b>AUGUST</b>
<b>FEBRUARY</b>	1	2	3	4	5	6	7	2	3	4	5	6	7	8	
	8	9	10	11	12	13	14	9	10	11	12	13	14	15	
	15	16	17	18	19	20	21	16	17	18+	19*	20*	21	22 <sup>N</sup>	
	22	23	24	25*	26 <sup>N</sup>	27	28	23	24	25	26	27	28	29	
<b>MARCH</b>	1	2	3	4	5	6	7	30	31	1	2	3	4	5	<b>SEPTEMBER</b>
	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 <sup>N</sup>	20 <sup>N</sup>	21+	22*	23*	24+	25+	26	
<b>APRIL</b>	29	30	31	1	2	3	4	27	28	29	30	1	2	3	<b>OCTOBER</b>
	5	6	7	8	9	10	11	4	5	6	7	8	9	10	
	12	13	14	15	16	17	18	11	12	13	14	15	16	17	
	19	20	21	22*	23*	24	25	18	19+	20 <sup>N</sup>	21*	22*	23	24	
	26 <sup>N</sup>	27+	28+	29+	30	1	2	25	26	27	28	29	30	31	
<b>MAY</b>	3	4	5	6	7	8	9	1	2	3	4	5	6	7	<b>NOVEMBER</b>
	10	11	12	13	14	15	16	8	9	10	11	12	13	14	
	17	18	19	20*	21*	22	23	15	16+	17+	18*	19 <sup>N</sup>	20	21	
	24	25 <sup>N</sup>	26+	27+	28+	29	30	22	23	24	25	26	27	28	
<b>JUNE</b>	31	1	2	3	4	5	6	29	30	1	2	3	4	5	<b>DECEMBER</b>
	7	8	9	10	11	12	13	6	7	8+	9+	10	11	12	
	14	15	16	17	18	19	20	13	14	15	16*	17*	18 <sup>N</sup>	19	
	21	22	23*	24 <sup>N</sup>	25	26	27	20	21	22	23	24	25	26	<b>1999</b>
	28	29	30					27	28	29	30	31	1	2	<b>JANUARY</b>
	S	M	T	W	T	F	S	3	4	5	6	7	8	9	

13 Regular World Day (RWD)

18 Priority Regular World Day (PRWD)

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

7 Regular Geophysical Day (RGD)

12 13 World Geophysical Interval (WGI)

6+ Incoherent Scatter Coordinated Observation Day

S M T W T F S

<sup>N</sup> New Moon

26 Day of Solar Eclipse

22 23 Airglow and Aurora Period

27\* Dark Moon Geophysical Day (DMGD)



This Calendar continues the series begun for the IGY years 1957-58, 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 Centers (WDCs) in many instances emphasize Calendar days. The Calendar is prepared by the International Space Environment Service (ISES) with the advice of spokesmen for the various scientific disciplines. For some programs, greater detail concerning recommendations appears from time to time published in IAGA News, IUGG Chronicle, URSI Information Bulletin or other scientific journals or newsletters. For on-line information, see <http://www.sec.noaa.gov/ises/ises.html>.

The definitions of the designated days remain as described on previous Calendars. Universal Time (UT) is the standard time for all world days. Regular Geophysical Days (RGD) are each Wednesday. Regular World Days (RWD) are three consecutive days each month (always Tuesday, Wednesday and Thursday near the middle of the month). Priority Regular World Days (PRWD) are the RWD which fall on Wednesdays. Quarterly World Days (QWD) are one day each quarter and are the PRWD which fall in the World Geophysical Intervals (WGI). The WGI are fourteen consecutive days in each season, beginning on Monday of the selected month, and normally shift from year to year. In 1998 the WGI will be January, April, July and October.

The **Solar Eclipses** are:

- **26 February 1998 (total) eclipse** with totality visible in the Pacific Ocean from the Galapagos to Colombia and Panama, in Venezuela, in the islands of Aruba and Curacao, and across the Caribbean to the islands of Antigua, Montserrat, and Guadeloupe. Totality up to 4 min 8 s. Partial phases will be visible in the U.S. southeast of a line drawn approximately from San Diego to Chicago and as far south as northern Chile, Bolivia, and the northern half of Brazil. Partially eclipsed sunset seen from Portugal, northwestern Spain, and West Africa; partially eclipsed sunrise seen from east coast of island of Hawaii.
- **21-22 August 1998 (annular) eclipse** with annularity visible in parts of Sumatra, peninsular Malaysia, and northern Borneo. Partial phases will be visible in southern China, SE Asia, southern Japan, and extending to the south past Australia and New Zealand.

(Descriptions by Dr. Jay M. Pasachoff, Williams College (jmp@williams.edu)—Hopkins Observatory, Chair of the Working Group on Eclipses of the International Astronomical Union, based on "Fifty-Year Canon of Solar Eclipses: 1986-2035," by Fred Espenak, NASA Goddard Space Flight Center, NASA Reference Publication 1178 Revised.) See web site <http://umbra.gsfc.nasa.gov/eclipse/predictions/eclipse-paths.html>.

**Meteor Showers** (selected by R. Hawkes, Mount Allison Univ, Canada, rhawkes@mta.ca) include the most prominent regular showers. The dates for Northern Hemisphere meteor showers are: Jan 3-5 (Quadrantid); Apr 21-23 (Lyrid); May 4-6 (Eta-Aquarid); Jun 6-11 (Arietid, Zeta-Perseid); Jun 27-29 (Beta-Taurid); Aug 11-

14 (Perseid); Oct 21-23 (Orionid); Nov 16-19 (Leonid); Dec 13-15 (Geminid); Dec 22-24, 1998 (Ursid); and Jan 3-5, 1999 (Quadrantid). The dates for Southern Hemisphere meteor showers are: May 4-6 (Eta-Aquarid); Jun 6-11 (Arietid, Zeta-Perseid); Jun 27-29 (Beta-Taurid); Jul 27-Aug 2 (S. Delta-Aquarid, Alpha-Aurigid); Oct 21-23 (Orionid); Nov 16-19 (Leonid); and Dec 13-15, 1998 (Geminid). Particular attention is drawn to the Leonid shower which is expected to produce storm conditions of thousands to tens of thousands of visual meteors per hour at approximately 17 UT +/- 4 hours on November 17, 1998. The occurrence of **unusual solar or geophysical conditions** is announced or forecast by the ISES through various types of geophysical "**Alerts**" (which are widely distributed by telegram and radio broadcast on a current schedule). Stratospheric warmings (STRATWARM) are also designated. The meteorological telecommunications network coordinated by WMO carries these worldwide Alerts once daily soon after 0400 UT. For definitions of Alerts see ISES "Synoptic Codes for Solar and Geophysical Data", March 1990 and its amendments. Retrospective World Intervals are selected and announced by MONSEE and elsewhere to provide additional analyzed data for particular events studied in the ICSU Scientific Committee on Solar-Terrestrial Physics (SCOSTEP) programs.

## RECOMMENDED SCIENTIFIC PROGRAMS

### FINAL EDITION

(The following material was reviewed in 1997 by spokesmen of IAGA, WMO and URSI as suitable for coordinated geophysical programs in 1998.)

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

**Atmospheric Electricity.** Non-continuous measurements and data reduction for continuous measurements of atmospheric electric current density, field, conductivities, space charges, ion number densities, ionosphere potentials, condensation nuclei, etc.; both at ground as well as with radiosondes, aircraft, rockets; should be done with first priority on the RGD each Wednesday, beginning on 7 January 1998 at 0000 UT, 14 January at 0600 UT, 21 January at 1200 UT, 28 January at 1800 UT, etc. (beginning hour shifts six hours each week, but is always on Wednesday). Minimum program is at the same time on PRWD beginning with 14 January at 1800 UT. Data reduction for continuous measurements should be extended, if possible, to cover at least the full RGD including,

in addition, at least 6 hours prior to indicated beginning time. Measurements prohibited by bad weather should be done 24 hours later. Results on sferics and ELF are wanted with first priority for the same hours, short-period measurements centered around the minutes 35-50 of the hours indicated. Priority Weeks are the weeks which contain a PRWD; minimum priority weeks are the ones with a QWD. The World Data Centre for Atmospheric Electricity, 7 Karbysheva, St. Petersburg 194018, USSR, is the collection point for data and information on measurements.

**Geomagnetic Phenomena.** It has always been a leading principle for geomagnetic observatories that operations should be as continuous as possible and the great majority of stations undertake the same program without regard to the Calendar. Stations equipped for making magnetic observations, but which cannot carry out such observations and reductions on a continuous schedule are encouraged to carry out such work at least on RWD (and during times of MAGSTORM Alert).

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

For the **vertical incidence (VI) sounding program**, the summary recommendations are: (a) All stations should make soundings on the hour and every quarter hour; (b) On RWDs, ionogram soundings should be made at least every quarter hour and preferably every five minutes or more frequently, particularly at high latitudes; (c) All stations are encouraged to make f-plots on RWDs; f-plots should be made for high latitude stations, and for so-called "representative" stations at lower latitudes for all days (i.e., including RWDs and WGIs) (Continuous records of ionospheric parameters are acceptable in place of f-plots at temperate and low latitude stations); (d) Copies of all ionogram scaled parameters, in digital form if possible, be sent to WDCs; (e) Stations in the eclipse zone and its conjugate area should take continuous observations on solar eclipse days and special observations on adjacent days. See also recommendations under Airglow and Aurora Phenomena.

For the **incoherent scatter observation program**, every effort should be made to obtain measurements at least on the Incoherent Scatter Coordinated Observation Days, and intensive series should be attempted whenever possible in WGIs, on Dark Moon Geophysical Days (DMGD) or the Airglow and Aurora Periods. The need for collateral VI observations with not more than quarter-hourly spacing at least during all observation periods is stressed.

*Special programs include:*

CADITS/MLTCS — Coupling and Dynamics of the Ionosphere-Thermosphere System/Mesosphere, Lower-Thermosphere Coupling Study — combined local E and F

region measurements, including vector velocities, with 15 minute time resolution. Latitudinal coverage may be sacrificed to meet this goal. (Contacts are: Casandra Fesen - fesen@tides.dartmouth.edu and Roberta Johnson - rjohnson@dexter.sprl.umich.edu);

DATABASE — Incoherent Scatter Database — emphasis on broad latitudinal coverage of the F region (Anthony van Eyken - tony@eiscat.no);

POLITE — Plasmaspheric Observations of Light Ions in the Topside Exosphere — global coordinated measurements of topside light ions. Simultaneous optical observations of neutral hydrogen and helium are highly desirable where possible (Phillip Erickson - pje@hyperion.haystack.edu);

WLS — Wide-Latitude Substorm Dynamics (John Foster - jcf@hyperion.haystack.edu).

**Special programs:** Dr. Anthony P. van Eyken, EISCAT Scientific Association, Ramfjordmoen, N-9027 Ramfjordbotn, Norway. Tel. +47 77692166; Fax +47 77692380; e-mail: tony@eiscat.no; URSI Working Group G.5.

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

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

For the ionospheric absorption program half-hourly observations are made at least on all RWDs and half-hourly tabulations sent to WDCs. Observations should be continuous on solar eclipse days for stations in eclipse zone and in its conjugate area. Special efforts should be made to obtain daily absorption measurements at temperate latitude stations during the period of Absorption Winter Anomaly, particularly on days of abnormally high or abnormally low absorption (approximately October-March, Northern Hemisphere; April-September, Southern Hemisphere).

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

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

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

It is recommended that more intensive observations in all programs be considered on days of unusual meteor activity. **Meteorology.** Particular efforts should be made to carry out an intensified program on the RGD — each Wednesday, UT. A desirable goal would be the scheduling of meteorological rocketsondes, ozone sondes and radiometer sondes on these days, together with maximum-altitude rawinsonde ascents at both 0000 and 1200 UT.

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

**Global Atmosphere Watch (GAW)** The World Meteorological Organizations (WMO) GAW integrates

many monitoring and research activities involving measurement of atmospheric composition. Serves as an early warning system to detect further changes in atmospheric concentrations of greenhouse gases, changes in the ozone layer and in the long range transport of pollutants, including acidity and toxicity of rain as well as of atmospheric burden of aerosols (dirt and dust particles). Contact WMO, 41, avenue Giuseppe-Motta, P.O. Box 2300, 1211 Geneva 2, Switzerland.

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

**ISCS (International Solar Cycle Studies).** Program within the SCOSTEP (Scientific Committee on Solar-Terrestrial Physics): 1998-2002. Its focus is on observations and basic research directed toward understanding the underlying and resulting processes associated with the rising and maximum phase of a solar cycle. Contacts are S.T. Wu, Univ of Alabama, Huntsville Dept. Mech. Eng. & Ctr. for Space Plasma & Aeron. Res., Huntsville, AL 35899 USA, (205)895-6413, Fax (205)895-6328, wu@cspar.uah.edu, and V. Obridko, IZMIRAN, Solar Physics Department, 142092 Troitsk, Moscow, Russia, 095-344-0926, Fax 095-334-0124, obridko@lars.izmiran.troitsk.su.

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

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

This Calendar for 1998 has been drawn up by H.E.

Coffey, of the ISES 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.

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Additional copies are available upon request to ISES Chairman, Dr. R. Thompson, IPS Radio and Space Services, Department of Administrative Services, P.O. Box 5606, West Chatswood, NSW 2057, Australia (FAX number (61)(2)9414 8331; e-mail richard@ips.gov.au), or ISES Secretary for World Days, Miss H.E. Coffey, WDC-A for Solar-Terrestrial Physics, NOAA E/GC2, 325 Broadway, Boulder, Colorado 80303, USA (FAX number (303)497-6513; e-mail hcoffey@ngdc.noaa.gov).

The calendar is available on-line at <http://www.sec.noaa.gov/ises/ises.html>.

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

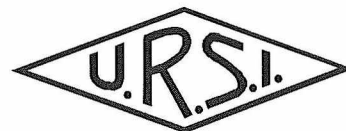
1. Days with significant meteor shower activity are: Northern Hemisphere 3-5 Jan; 21-23 Apr; 4-6 May; 6-11, 27-29 Jun; 11-14 Aug; 21-23 Oct; 16-19 Nov; 13-15, 22-24 Dec 1998; 3-5 Jan 1999. Southern Hemisphere 4-6 May; 6-11, 27-29 Jun; 27 Jul-2 Aug; 21-23 Oct; 16-19 Nov; 13-15 Dec 1998. These can be studied for their own geophysical effects or may be "geophysical noise" to other experiments. Particular attention is drawn to the Leonid shower which is expected to produce storm conditions of thousands to tens of thousands of visual meteors per hour at approximately 17 UT +/- 4 hours on 17 Nov 1998.

2. Global Atmosphere Watch (GAW) — early warning system for changes in greenhouse gases, ozone layer, and long range transport of pollutants.

3. ISCS (International Solar Cycle Studies) Observing Program 1998-2002: SCOSTEP Study of processes associated with the rising and maximum phase of the solar cycle.

4. + Incoherent Scatter Coordinated Observations Days starting at 1600 UT on the first day of the intervals indicated, and ending at 1600 UT on the last day of the intervals: 20-21 Jan DATABASE; 23-27 Mar MLTCS/CADITS; 27-29 Apr WLS; 26-28 May POLITE; 23-24 Jun DATABASE; 18-19 Aug DATABASE; 21-25 Sep MLTCS/CADITS; 19-21 Oct WLS; 16-19 Nov POLITE; 8-9 Dec DATABASE where CADITS = Coupling and Dynamics of the Ionosphere-Thermosphere System (Contacts are C. Fesen — fesen@tides.dartmouth.edu; R. Johnson — rjohnson@dexter.sprl.umich.edu); DATABASE = Incoherent Scatter Database (A. van Eyken — tony@eiscat.no); MLTCS = Mesosphere, Lower-Thermosphere Coupling Study (Same contacts as CADITS); POLITE = Plasmaspheric Observations of Light Ions in the Topside Exosphere (P. Erickson — pje@hyperion.haystack.edu); WLS = Wide-Latitude Substorm Dynamics (J. Foster — jcf@hyperion.haystack.edu).

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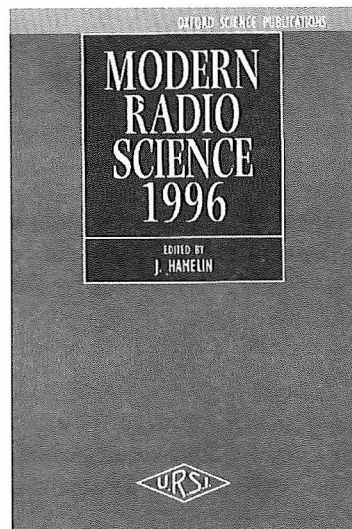
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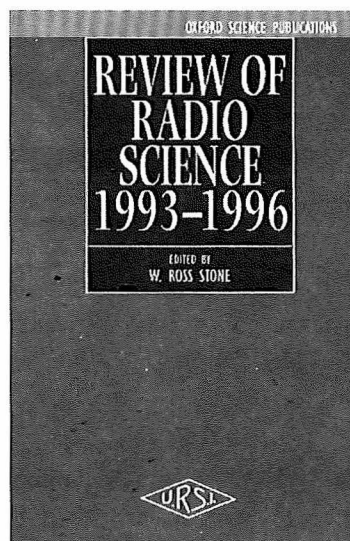


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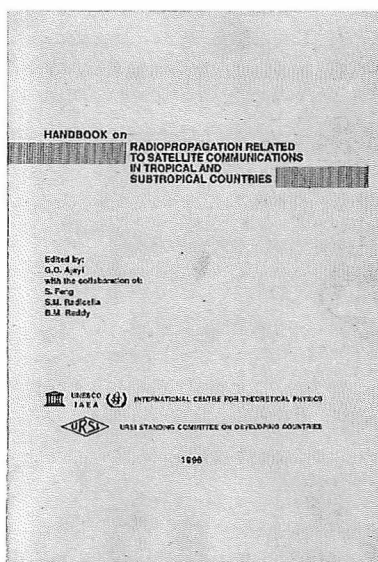


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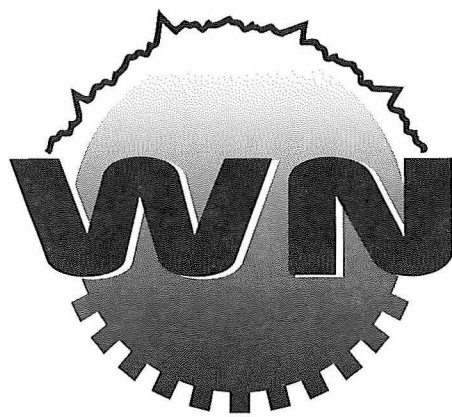
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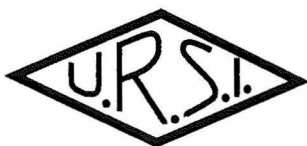
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