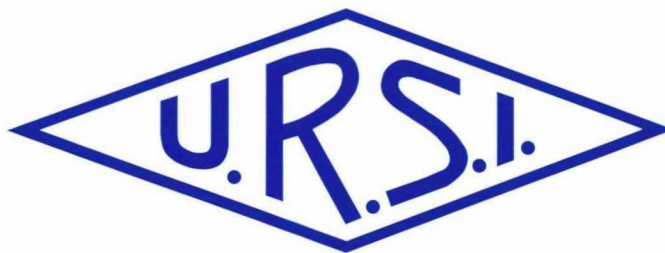


INTERNATIONAL
UNION OF
RADIO SCIENCE

UNION
RADIO-SCIENTIFIQUE
INTERNATIONALE



Toronto, Canada is the venue for the XXVIth URSI General Assembly in 1999

No 281
June 1997

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Front cover : The next URSI General Assembly will be held in Toronto, Canada, from 13 to 21 August 1999. The front cover shows the Toronto skyline. For more information about the Toronto General Assembly, please turn to page 8.

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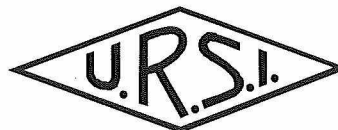
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Editorial



Dear URSI Correspondent,

You have in hand the Summer issue of your Bulletin. It is a rather administrative one in which you will find the 1996 budget summary of the Union. The Union is in good shape and very active in promoting, supporting, sponsoring or organizing conferences and other scientific events in the various fields of Radio Science covered by our ten Commissions. Having a look at the finances of our Union is also a way to take care of it.

In this Bulletin you will find the report of the business transacted within Commission B at the last General Assembly in Lille last August -



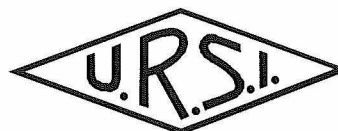
September. This completes the set of reports prepared by each Commission during the General Assembly and already published in the Spring issue of our Bulletin.

On the other hand you will observe that the scientific part is rather meager and no scientific contribution was included in this issue. However, you will find the usual announcements and sections about conferences as well as books reviewed by URSI correspondents.

I wish you a pleasant reading.

Piotr Sobieski, Editor

URSI



The URSI Board of Officers

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Commission E : Electromagnetic Noise and Interference

Chair: Prof. M. Hayakawa (Japan)
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Commission F : Wave Propagation and Remote sensing

Chair: Mr. M.P.M. Hall (UK)
Vice-Chair : Dr. Y. Furuhashi (Japan)

Commission G : Ionospheric Radio and Propagation

Chair: Prof. B.W. Reinisch (U.S.A.)
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Commission H : Waves in Plasmas

Chair: Dr. V. Fiala (Czech rep.)
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Commission J : Radio Astronomy

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Commission K : Electromagnetics in Biology and Medicine

Chair: Prof. J.C. Lin (U.S.A.)
Vice-Chair : Prof. S. Ueno (Japan)



URSI Accounts 1996

I am pleased to introduce the Balance Sheet of Income and Expenditure for the year ended 31 December 1996, which is reproduced below.

The original accounts have been audited by Van Poyer & Cie, Reviseurs d'Entreprises, Brussels at the end of March 1997.

As usual in the year of the General Assembly there is a decrease of the assets accentuated by the fact that no income from the General Assembly is incorporated in the

balance sheet, since the accounts of the General Assembly had not been financed by the end of 1996. This income will be booked in 1997, allowing URSI to build again reserves for the next General Assembly.

A constant attention to the reduction of administrative costs has allowed URSI to devote an increasing fraction of its income to scientific activities.

Overall the finances of URSI are in a satisfactory state of affairs.

Prof. P.J.B. Clarricoats, Treasurer

INTERNATIONAL UNION OF RADIO SCIENCE (URSI) BALANCE SHEET : 31 DECEMBER 1996

ASSETS	US\$	
<i>Dollars</i>		
Merrill Lynch WCMA	4,921.02	
Générale de Banque	53,794.62	
Smith Barney Shearson	663.18	
		59,378.82
<i>Belgian francs</i>		
Banque Degroof	8,086.03	
Générale de Banque	41,155.25	
		49,241.28
<i>Investments</i>		
Demeter Sicav shares	22,794.75	
Rorento Units	111,084.59	
Aqua Sicav	64,103.22	
Merrill-Lynch Short Term	24,046.99	
Smith Barney Utilities Fund	81,764.00	
Reinvestment S.B. Utilities	20,851.90	
Smith Barney Grade Bond	49,300.00	
Reinvestment S.B. Grade Bond	14,395.20	
355 Rorento units on behalf of van der Pol Fund	12,950.41	
		401,291.06
<i>Other</i>		
Petty cash		520.72
Total Assets		510,431.88
<i>Less creditors</i>		
IUCAF	16,599.15	
ISES	6,349.59	
FAGS	2,000.00	
Radio Science Press	124.26	
Audit fees	1,875.00	
		-26,948.00
Balthasar van der Pol Medal Fund (1)		-12,950.40
NET TOTAL OF URSI ASSETS		470,533.48

The net URSI Assets are represented by :	US\$	
<i>Closure of Secretariat :</i>		
Provision for Closure of Secretariat	40,000.00	
<i>Scientific Activities Fund :</i>		
Scientific Activities in 1997	80,000.00	
Publications in 1997	60,000.00	
Young Scientists in 1997	10,000.00	
Administration Fund in 1997	80,000.00	
I.C.S.U. Dues in 1997	10,000.00	
		240,000.00
<i>XXIV General Assembly Fund :</i>		
During 1997 :	0.00	
Total allocated URSI Assets		280,000.00
Unallocated Reserve Fund		190,533.48
		470,533.48

**Statement of Income and Expenditure
for the year ended 31 December 1996**

I. INCOME	US\$	
Grant from ICSU Fund and Special Contributions	300.00	
Allocation from UNESCO Subvention to ICSU	20,500.00	
UNESCO Contracts	0.00	
Contributions from National Members	185,781.19	
Contributions from Other Members	0.00	
Special Contributions	7,519.06	
Contracts	0.00	
Sales of Publications, Royalties	0.00	
Sales of scientific materials	0.00	
Bank Interest	3,567.33	
Gain on Exchange	0.00	
Other Income	19,858.62	
		237,526.20
II. EXPENDITURE		
<i>a1) Scientific Activities</i>		221,343.56
General Assembly 1996	211,737.59	
Scientific meetings: Symposia/Colloquia	7,103.78	
Working Groups/Training Courses	0.00	
Representation at scientific meetings	2,502.19	
Data Gather/Processing	0.00	
Research Projects	0.00	
Grants to Individuals/Organizations	0.00	
Other	0.00	
Less covered by UNESCO Contracts	0.00	
<i>a2) Routine Meetings</i>		26,063.53
Bureau/Executive committee	26,063.53	
Other	0	
<i>a3) Publications</i>		40,315.26

<i>5 b) Other Activities</i>		11,762.00
Contribution to ICSU	7,762.00	
Contribution to other ICSU bodies	4,000.00	
Activities covered by UNESCO Contracts	0.00	
<i>c) Administrative Expenses</i>		82,666.35
Salaries, Related Charges	57,679.41	
General Office Expenses	12,382.36	
Office Equipment	3,473.03	
Audit Fees	1,758.28	
Bank Charges	2,866.88	
Loss on Exchange	4,506.39	
		<hr/>
		382,150.70
Excess of Income over Expenditure		-144,624.50
Accumulated Balance at 1 January 1996		615,157.98
		<hr/>
Accumulated Balance at 31 December 1996		470,533.48

Rates of exchange :

1 January 1996	\$1 = 29.5 BEF
31 December 1996:	\$1 = 30.0 BEF

Observation :

The account indicated with (1) is represented by :

355 Rorento Shares : market value on 31 December 1996 (Acquisition value : US\$ 12,950.41)	19,280.72
---	-----------

Market value of investments on December 31, 1996 (\$1 = 32.00 BF) :

- DEMETER SICAV :	45,486.38	
- RORENTO UNITS (2) :	396,335.40	
- AQUA-SICAV :	79,935.22	
- M-L SHORT TERM :	20,462.00	
- SMITH BARNEY UTIL. :	101,467.98	
- SMITH BARNEY GRADE :	62,795.62	
		<hr/>
		706,482.59

(2) including the 355 Rorento of v. d. Pol Fund

APPENDIX

Detail of Income and Expenditure

I. INCOME

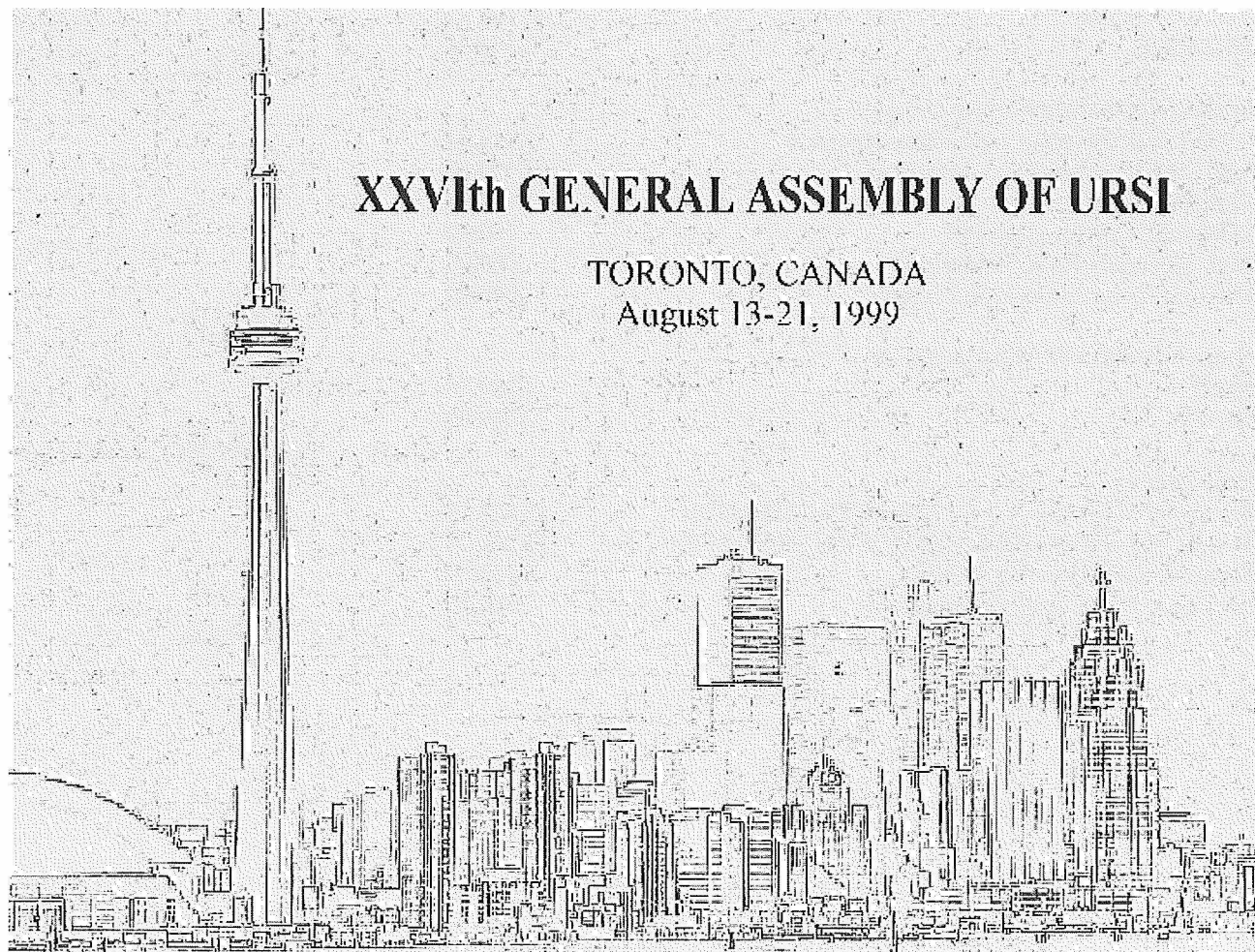
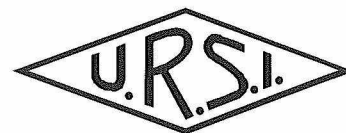
	US\$	
<i>Special Contributions for General Assembly Lille</i>		
UK Royal Society (Support YS Programme)	1,451.56	
Japanese URSI Committee (Support YS Programme)	4,000.00	
European Space Agency (Preparatrion Technical Sessions)	2,067.50	
		<hr/>
		7,519.06
<i>Other Income</i>		
Return "Loan to ISSSE'95"	5,000.00	
Interest on Smith Barney Utilities Fund	6,258.60	
Interest on Smith Barney Grade Bond	3,417.14	
Sale of ML Short Term	5,135.00	
Sale of URSI ties	47.88	
		<hr/>
		19,858.62

II. EXPENDITURE

General Assembly 1996

Organization	18,779.84	
Scientific activities - officials	70,021.71	
Scientific activities - others	27,263.73	
Young Scientists	41,328.97	
MRS/RRS	54,343.34	211,737.59
<i>Symposia/Colloquia/Working Groups :</i>		
URSI 75th Anniversary (remaining expenses)	1,018.84	
NATO ASI-meeting "New Directions	1,500.00	
CLIMPARA '96	1,984.94	
COSPAR Scientific Assembly	700.00	
High Sensitivity Radio Astronomy	900.00	
IAU-164: Galactic and Extra-Galactic	1,000.00	7,103.78
<i>Contribution to other ICSU bodies</i>		
FAGS	2,000.00	
IUCAF	2,000.00	4,000.00
<i>Publications :</i>		
Printing of <i>The Radio Science Bulletin</i> (No. 275 to 278)	18,421.13	
Mailing of <i>The Radio Science Bulletin</i> (No. 275 to 277)	13,204.28	
Electronic publications & WWW	8,129.69	
Printing of New Correspondents Cards	560.16	40,315.26

Toronto General Assembly



XXVth GENERAL ASSEMBLY OF URSI

TORONTO, CANADA
August 13-21, 1999

The National Research Council of Canada and co-sponsors invite you to the XXVth GENERAL ASSEMBLY OF URSI, TORONTO, CANADA, August 13-21, 1999, to be held on the campus of the University of Toronto.

There will be a new format for the schedule of events. In the spirit of the resolutions passed at the Lille General Assembly and subsequent consultations, most of the sessions will be scheduled over one full week, from the Opening Ceremony on Sunday, August 15, to the Closing Ceremony on Saturday, August 21. The two earlier additional days, Friday and Saturday, August 13 and 14, will be fully available to all URSI Commissions for special sessions and workshops.

A full programme of scientific sessions is planned, along with industrial visits, social events, and a programme of tours and activities for accompanying persons.

Contacts for further information:

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CANADA
Tel: +1 416-978-3127
Fax: +1 416-978-4425
E-mail: balmain@waves.utoronto.ca



Lille General Assembly

BUSINESS TRANSACTED BY COMMISSIONS

COMMISSION B - FIELDS AND WAVES

Chair: Professor A. David Olver (UK)
Vice Chair: Professor Chalmers M. Butler (USA)

1. General

Commission B has had another active triennium with a format of events similar to that of previous triennia. The worldwide Commission B community is large, active, and participates regularly in international events. The study of electromagnetic theory and practice through microwaves and antennas benefits from international collaboration, and URSI provides an excellent forum for the exchange of ideas and dissemination of information. URSI has always been strongly supported by Commission B engineers and scientists. This continues in many ways. Conferences have been sponsored by both international URSI and national societies. The national sponsorships tend to go unreported but provide an important feeder of committed people for the international events. Particularly notable is the US National Committee for URSI which sponsors the annual summer APS/USNC meeting and the winter Boulder meetings. This triennium has also seen much greater interaction between electromagnetic scientist from the former Soviet Union countries and western countries. The commission B community in Russia and Ukraine is very large and URSI has contributed in the last three years to developing contacts between scientists.

2. Electromagnetic Theory Symposium

The main event which Commission B organizes between General Assemblies is the International Symposium on Electromagnetic Theory. The 15th Symposium in the series took place over four days in St. Petersburg, Russia from 23-26 May 1995. The decision to hold the 15th Symposium in Russia was made in 1992 shortly after the end of the Cold War and the collapse of the Soviet Union. This led Commission members to warmly embrace the invitation from the Russian Commission B. The organization presented considerable challenges but the results showed that it was successful, beneficial to participants and particularly rewarding to those in Russia and Ukraine who do not have adequate funds to travel to conferences.

A total of 348 participants took part in the 1995 Symposium from 33 countries with the largest contingent from the host country. The Technical Program Committee received 456 synopses which led to the final presentation of about 270 papers. There were many novel and original

presentations which were published in a 894 page proceedings. A popular feature was the invited lectures which provided a good opportunity to hear from experts.

A Young Scientist Award Program at the symposium enabled 25 young scientists to participate who would not otherwise have been able to go to St. Petersburg. Funds for the awards came partly from the Commission B triennial allocation from URSI and partly from the general registration fees. The enthusiasm of the young scientists was very evident. They fully participated and availed themselves of every opportunity to make the best use of their time to interact with other participants.

Initial plans are in place for the 1998 Electromagnetic Theory Symposium to be held in Thessaloniki, Greece, during 25-28 May 1998. Local Organizing and Technical Program Committees have been formed and are engaged in the early stages of making plans for the meeting. A new feature is a web site that has been set up for the symposium: <http://www.ursicommb.eng.clemson.edu>, <http://www.ursicommb.eng.clemson.edu>.

Proposals to host the 2001 Electromagnetic Theory Symposium were submitted by Canada, China, and Japan. The official members of Commission B elected Victoria, BC, in Canada as the venue of the 2001 symposium.

3. Meetings Sponsored by Commission B

During the triennium, Commission B sponsored a number of meetings that addressed topics within the purview of its terms of reference. A table reflecting the meetings sponsored and the mode of sponsorship is provided on the next page.

4. Terms of Reference

The Commission terms of reference have been refined over the years yet they were modified by action of the Commission at the Lille General Assembly. They are now judged to be more in tune with modern-day electromagnetics and they allude to the applications embraced by Commission activities. The amended terms of reference are listed below.

Commission B — FIELDS AND WAVES, Electromagnetic theory and applications.

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

Time-domain and frequency-domain phenomena; Scattering and diffraction; General propagation including

**Meetings Sponsored by Commission B
Budget 1994-1996: \$12,000**

<i>Details Meeting</i>	<i>Amount of Sponsorship</i>		<i>Remarks</i>
	<i>Requested</i>	<i>Approved</i>	
European Microwave Conference, 1993, 1994, 1995	\$0	\$0	Mode A
Physics and Engineering of mm and submm Waves, Kharkov, Ukraine, 7-10 June 1994	\$0	\$0	Mode A
Int. Conference on Mathematical Methods in EM Theory, Kharkov, Ukraine, 7-10 Sept. 1994	\$1,000	\$1,000	Mode B
PIMRC 94, The Hague, The Netherlands, 19-23 Sept. 1994	\$0	\$0	Mode A
Int. Conference on Computational Electromagnetics and Its Applications, Beijing, China, 1-4 Nov. 1994	\$0	\$0	Mode A
JINA-94, Nice, France, 8-10 November 1994	\$500	\$500	Mode B
Asia Pacific Microwave Conference, Tokyo, Japan, 6-9 December 1994	\$0	\$0	Mode A
Int. Conference on Antennas and Propagation ICAP, Eindhoven, The Netherlands, 1995	\$0	\$0	Mode A
URSI Symposium on EM Theory, St. Petersburg, Russia, 23-26 May 1995	\$9,000	\$9,000	Mode B
Int. Conference on Radio Science, Beijing, China, 10-12 August 1995	\$0	\$0	Mode A
Int. Workshop on Direct & Inverse EM Scattering, Turkey, 17-24 September 1995	\$0	\$0	Mode A
ISAP, Chiba, Japan, 24-27 Sept. 1996	\$0	\$0	Mode A
Grand Total:		\$10,500	

waves in specialized materials; Guided waves; Antennas and radiation; Inverse scattering.

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

5. Fellows of URSI

At the Commission B Business Meeting held on Thursday, 29 August, 1996, there was a discussion of the proposal to establish the Fellows of URSI program as proposed by the United Kingdom. The members present at the meeting were unanimous in supporting the proposal with the understanding that Fellows should be awarded for distinguished scientific contributions to URSI.

6. Election of Commission B Officers

In Commission B the Vice Chair succeeds to the Chair for the triennium to follow and the Vice Chair is elected by the member nation representatives. An election was conducted and Prof. Staffan Strom (Sweden) was elected Vice Chair, with Prof. Karl Langenberg (Germany) elected alternate vice chair.

7. Review of Radio Science

At the Commission B Business Meeting of Friday 30 August, 1996, the Review of Radio Science was discussed extensively. It was decided that

The Commission should publish review articles for the Review of Radio Science. There was a preference for broad reviews of interest to a wide readership.

The Commission should participate in the bibliography.

This was decided on a straw vote. There was a sizeable minority against participating, due to the considerable effort involved in compiling the list of references. It is suggested that consideration should be given to reducing this effort. It is also strongly recommended that future bibliographies are placed on the World Wide Web.

The Commission Editor designated for the next triennium is Professor Yahya Rahmit-Samii (USA)

The Commission Editor of the bibliography is to be Professor Makato Ando (Japan).

8. The Radio Science Bulletin

Member nation representatives at the 30 August, 1996, Commission B Business discussed the Radio Science Bulletin and supported the idea of associate editors who are charged with the responsibility of finding articles of general interest to URSI. The view was expressed that administrative information pertaining to the Bulletin should go on the WWW. There was some concern that safeguards be put in place to prevent the Bulletin from becoming yet another scientific and engineering journal. And there was general agreement that a deliberate attempt be made by the editorial board to determine those topics within the expertise of a given commission that are of interest to other commissions and have a series of articles published on such topics. Wider distribution of the Bulletin was encouraged with consideration given to placing issues on the WWW.

The Commission B Associate Editor for the next triennium will be Professor J. M. Arnold, Department of Electrical and Electronic Engineering, University of Glasgow, Glasgow G12 8QQ, United Kingdom. E-mail: j.arnold@glasgow.ac.uk.

9. General Assembly

At the end of the triennium, the preparations for the Lille General Assembly took up considerable, but worthwhile, Commission B effort. Twenty convenors put together a wide ranging and comprehensive program selected from over 260 contributions submitted to the Commission B sessions—the largest number to any Commission. In addition the Commission participated in nine joint sessions. B session organization was guided by the desire to focus on fundamentals of fields and waves, while the needs of the applications-oriented commissions dictated the topics of joint sessions. Poster sessions served partially as overflow for oral sessions but many of the poster-session papers were selected because their contents were appropriate for this mode of information transfer. In numerous cases authors requested that their papers be in poster session. In general the papers in the poster sessions were of high quality. The URSI Young Scientist Programme has supported the attendance at Lille of 120 young men and women, thirty (25%) of whom are designated Com. B.

10. Recommendations

At the Commission B Business Meeting held on Thursday, 29 August, 1996, there was general discussion of the program, dates, and format of general assemblies. There is general support for the format of single sessions covering specific Commission B topics together with joint sessions covering applications and interdisciplinary topics. There was a preference expressed for more reviews by both invited and contributed authors. Commission B feels strongly that the printed program should contain the times

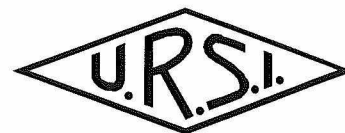
for delivery of the papers. This is essential if participants are to be able to move between sessions. There continues to be opposition in Commission B to having general assemblies that begin on a date that falls in the last two weeks of August, which point has been made repeatedly to the Council by member countries and by Commission B but which seems to have fallen on deaf ears. The general assembly attendance in recent years has been impacted by this unfortunate choice of dates, especially among those from North America who otherwise would have attended. The Commission, by a show of hands, voted overwhelmingly (about 60 to 3) for shorter duration general assemblies as proposed by the Long Range Planning Committee, with the technical program contained within one week.

Better access to e-mail and telnet facilities at general assemblies is highly desirable and should be brought to the attention of the Long Range Planning Committee and of the attention of future host committees. The hosts at Lille took a good first step by making e-mail available but the lines were long and facilities for access to telnet are not provided.

11. Communications

The Official Members were kept informed of Commission B activities during the triennium by means of three news letters reporting meetings and highlighting information relevant to Commission B.

Commission B has created a web page at URL : <http://ece.clemson.edu/cem/ursi/> which is still under development and which contains information at this stage devoted primarily to the 1998 Electromagnetic Theory Symposium.



CONFERENCE REPORTS

EMC ZURICH '97

Zurich, Switzerland, 18-20 February 1997

The 12th International Zurich Symposium and Technical Exhibition on Electromagnetic Compatibility was held from February 18 to 20, 1997 at the Swiss Federal Institute of Technology in Zurich, Switzerland.

The meeting was attended by 1029 participants from 38 countries. The exhibition included 70 exhibitor booths. Despite the growing number of international EMC conferences giving rise to a certain saturation, these numbers confirm once again the worldwide importance and the high standing of the biennial EMC Zurich Symposium. Concluding from the country of origin of the authors, participants and exhibitors, it is the most internationally oriented conference on that topic. As in the preceding years, the Symposium has been organized by the Communication Technology Laboratory of the Swiss Federal Institute of Technology Zurich (ETHZ) under the auspices of Mr. F. Rosenberg, Director-General of the Swiss Telecom PTT. Prof. Dr. P. Leuthold (Zurich) and Dr. G. Meyer (Zurich) acted again as symposium president and symposium chairman, respectively. The technical program committee was chaired by Prof. Dr. C. Paul (Lexington). A number of international and national professional organizations were cooperating, e.g. ITU, IEEE and URSI, the latter also sponsoring the participation of young scientists. With the help of the URSI Young Scientists Program four researchers from Belarus, Russia and India could be invited to attend EMC Zurich '97. The Zurich meeting of the IEEE EMC Society Board of Directors was for the first time scheduled outside of North America with the aim to increase and enhance the Board's globalization efforts. A total of 126 carefully selected technical papers were presented in 18 sessions devoted to: standards, component and subcircuit EMC, lightning and its effects (part I and II), electrostatic discharge, system EMC and radio communications, EMC instrumentation and measurement, shielding, numerical modeling for EMC, test facilities, EMC education, coupling and transmission lines, emission and immunity testing, low frequencies and power systems, circuit oriented techniques in EMC, surges and transients, EM field standards and sensors, modeling. The sessions covered virtually all EMC "hot" topics and reviewed the current status as well as future trends of EMC technology. The full text of the presentations has been made available in the symposium proceedings comprising 672 pages. An insight into the work of URSI Commission E was offered by open meetings discussing the progress in the different working groups and

identifying outstanding topics and new lines of future research. As in previous symposia the program did not exclusively address experts. An introduction to EMC technology for newcomers was offered by three tutorial lectures and workshops. The full text of these joint events has been made available in the 412-page supplement to the symposium proceedings. A strong response by the audience earned the presentations on lightning electromagnetic effects; on EMC standards (especially regarding the first year of experience with the European EMC-Directive); on test methods and theoretical EMC models and on EMC-adequate design of systems and components. It is difficult to point out general trends in the field of EMC but with the growing interest in theoretical models and numerical methods, the role of computers is becoming more and more important. As usual, the Technical Exhibition has significantly contributed to the success of EMC Zurich '97 by demonstrating the fast conversion of theoretical knowledge into state-of-the-art hard- and software. A representative inquiry showed that about 50% of the participants also attended EMC Zurich '95. 60% of the attendees visited at least one EMC conference in the past year, and 20% were present at more than one per year. Moreover, one third of the participants seems to prefer a two year rhythm, for another third there is a need for more than one symposium per year. The rest are "newcomers". 25% of the attendees rated the presented papers as "excellent", about 70% with the mark "good". Once again the inquiry clearly showed that the real value of a symposium is its role as a platform for personal contact and direct information exchange. More than 80% of the participants stated that they found solutions to current problems during the symposium and as much as 90% could at least establish valuable contacts. The inquiry also returned some very interesting suggestions for the next EMC Zurich Symposium which is planned for February 16 to 18, 1999. The call for papers of the 13th International Zurich Symposium and Technical Exhibition on EMC is scheduled for November 1997. More information about EMC Zurich may be found at our Home page at <http://www.nari.ee.ethz.ch> We also maintain a list of major recurrent EMC meetings and offer the possibility to complete it by new events. The dissemination of further information is planned for the future.

G.V. Meyer
gmeyer@nari.ee.ethz.ch

ISSS-5

Kyoto, Japan, 13-19 March 1997

The 5th International School/Symposium of Space Simulations (ISSS-5) was organized by Radio Atmospheric Science Center of Kyoto University, and co-organized by International Union of Radio Science (URSI): Commissions G and H, and Ministry of Education, Science, Sports and Culture of Japan.

Sponsors of the ISSS-5 are the followings. - International Union of Radio Science (URSI); - Society of Geomagnetism, Earth, Planetary and Space Sciences (SGEPSS); - The Japan Society for Planetary Sciences; - Japanese Committee for URSI, Science Council of Japan; - Communication Research Laboratory, Ministry of Posts and Telecommunications;

The ISSS-5 provided a unique opportunity to facilitate the interactions and collaborations among the scientists and students working on space simulations, theories, and observations. A series of lectures on space physics and tutorials on simulation codes were given along with oral and poster presentations of recent results of theoretical, observational and simulational studies.

The scientific programme consisted of sessions on micro-scale phenomena, meso-scale phenomena, macro-scale phenomena, new areas of research, and supercomputing. They are displayed on the ISSS-5 home page (<http://www.kurasc.kyoto-u.ac.jp/iss/program.html>). Observations and simulations of micro-, meso-, and macro-



The Fifth International School/Symposium for Space Simulations (ISSS-5), RASC, Kyoto University, Japan March 13-19, 1997

The ISSS-5 is also supported by Telecommunications Advancement Foundation; Hitachi Ltd.; Mitsubishi Electric Co.; NEC Corporation; Hewlett-Packard Japan Ltd.; NKK Corporation; Fujitsu Ltd. Canon Supercomputing S.I. Co.; National Aeronautics and Space Administration (NASA); U.S. Naval Research Laboratory (NRL);

The total number of scientists and students participated in the ISSS-5 is 182 from 14 different countries, Brazil(1), China(6), Czech Republic(1), France(4), Germany(6), Italy(1), Japan(113), Russia(6), South Africa(1), Sweden(4), Turkey(1), UK(3), USA(34) and Yugoslavia(1). Each number in the parentheses represents the number of participants from each country.

scale phenomena such as wave-particle interactions and magnetic reconnections under various initial and boundary conditions were presented. It has been recognized that physical processes of complex, multiscale and intermittent natures are also the targets of present and future studies. As one of the new topics in space plasma simulations, a session on dusty plasmas was held, and it has been recognized that the problems of dust-plasma interactions and interactions between collisional plasma and neutral particles need to be studied via particle simulations and also laboratory experiments.

A special session for supercomputing was also held with oral and poster presentations on the recent computer

hardware and software products by the major computer companies supporting ISSS-5, i.e., NEC Corporation, Hitachi Ltd, Fujitsu Ltd. and Hewlett-Packard Japan Ltd./ NKK Corporation. Following these presentations, a recent development of implicit particle simulations was reviewed, and a brief introduction to Fortran90 and HPF (High Performance Fortran) was given. A new development of the physics education via multi-media presentation was introduced along with demonstration using a PC and a video.

Three evening sessions from 6 p.m. to 9 p.m. were devoted to the tutorial lectures on simulation codes, such as electromagnetic and electrostatic particle codes, hybrid codes and MHD codes. A tutorial on parallel computing was also given. In spite of the heavy schedule of the scientific sessions of the days, nearly 100 participants attended the tutorial lectures.

Finally, the ISSS-5 was closed with an open discussion for the future problems and directions. A proposal was made to keep the ISSS organization and the ISSS-5 Website with additional function of Bulletin Board and Forum for further information and discussions. It has been proposed and approved by applause that the ISSS-6 will be held in Germany.

In addition to the interesting and enlightening sessions, a get-together party, a half-day bus tour to Lake Biwa Museum and Hikone Castle, and a farewell party with a short play of "Kyogen" provided opportunities to explore Japanese cultures and to foster friendship and mutual understanding among the participants.

Isamu Nagano
Japanese Official Member, Commission H
URSI Representative at ISSS-5

CONFERENCE ANNOUNCEMENTS

RADIO AFRICA '97

Nairobi, Kenya, 4-8 August 1997

The theme of the Regional Workshop On Radio-communication In Africa (Radio Africa '97) is the Development of Radio Communication in Africa.

Background

Radiowave Propagation Research Network between Africa and Latin America was established in 1987 under the External Activities Programme of the International Centre for Theoretical Physics (ICTP), Trieste in Italy.

The Regional Workshop on Radio Communication is being held as part of the activities of the network in stimulating collaboration among African Scientists working in the area of radio communication and/or related fields.

The Regional Workshop on Radio Communication in Africa (Radio Africa) is a biannual event. Radio Africa '95 was held at the Obafemi Awolowo University in Ile-Ife, Nigeria.

Objectives

The broad objectives of the Workshop are to:

- (1) Highlight advances in Radio Communication for the development of the continent.
- (2) Foster collaboration amongst African Scientists and researchers working in the area of Radio Communication.
- (3) Identify need and formulate regional joint research projects cutting across national boundaries for the solution of Radio Communication problems in Africa.

Participation

The Workshop is open to all Scientists (in Africa) working in the area of Telecommunication or related fields both from the public and private sectors. Postgraduate students may also attend

Topics

- * Radiowave Propagation
- * Spectrum Management and Utilisation
- * Development and Future trends in either Mobile, Satellite, Wireless or Maritime Communication
- * TV and Radio Broadcasting
- * Remote Sensing
- * Antennas and Feeder Systems
- * Optical Fibre Communication
- * Amateur Radio in Research and Development
- * Electromagnetic Radiation Effects on Environment and Human Beings
- * Effects of Liberalisation on the Telecommunications Industry
- * Training in the Liberalised Telecommunication Industry.

Language

The official working language will be English.

Deadlines

Abstracts should reach the conference Secretariat not later than the 30th June 1997.

Contact

Dr. D.O. Oming'o
Radio Africa '97 Secretariat
Kenya College of Communication Technology
Department of Engineering
P.O. Box 30305
Nairobi, Kenya
Phone: +254-2-891201
Fax: +254-2-891949

ESGAP 2

Lviv, Ukraine, 30 March - 2 April 1998

The first international conference on collective electromagnetic wave scattering from gases and plasmas was held in March 1994 in Aussois (France).

It gathered theoreticians as well as experimentalists using various techniques from radio to laser frequencies. Following the success of the first meeting, a second edition will be held at the Institute for Condensed Matter Physics, Lviv, Ukraine from March 30 to April 2, 1998 in Lviv (Ukraine), organized by Institute for Condensed Matter Physics of the National Academy of Sciences of Ukraine.

Topics

- Coherent scattering from space plasmas (ionosphere, magnetosphere)
- Coherent scattering from fusion plasmas (magnetic and inertial confinement)

- Collective scattering from aerodynamic flows
- Bragg scattering from atmospheric turbulence
- Scattering from condensed matter
- Theory of scattering from turbulent media.

Organisation

The Scientific committee is chaired by C. Hanuise, France. The local organizing committee is formed by I.V. Stasyuk

Contact

Dr. O. Ivankiv
Institute for Condensed Matter Physics 1
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290011 Lviv, Ukraine
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E-mail : esgap2@icmp.lviv.ua

ICT '98

Chalkidiki, Greece, 22-25 June, 1998

The International Conference on Telecommunications (ICT) is an IEEE/IEE sponsored conference addressing topics in the broad area of telecommunications. ICT has a balanced east-west character, reflecting its theme of "Bridging East and West through Telecommunications". Building on the initial success of Dubai in 1994, Bali 1995 and Istanbul 1996, ICT is in Melbourne in 1997 and in Greece with ICT'98.

Topics

- * Communications Theory
- * Microwave Circuits & Systems
- * Data Communications Systems
- * Multimedia Telecommunications
- * Teletraffic Research
- * Signal Processing
- * Multimedia Services & Terminals
- * Computer Communications
- * Optical Communications
- * Satellite & Space Communications
- * Quality Assurance Management
- * Terrestrial Radio Systems
- * Video Coding & Distribution
- * Joint Source-Channel Coding
- * Network Operating & Management
- * Mobile & Personal Communications
- * Communications Networks & Switching

Deadlines

Short Course Proposals	October 15, 1997
Submission of Papers	October 15, 1997
Notification Acceptance	January 15, 1998
Camera Ready Manuscript Due	April 1, 1998

Technical Program Co-chairs

F-N. Pavlidou, Aristotle University of Thessaloniki, Greece
F. Marvasti, King's College London, U.K.

Contact

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GR-540 06 Thessaloniki, Greece
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WWW

<http://www.athena.auth.gr/ICT98/ict98.html>

PIERS 98

Nantes, France, 13-17 July 1998

The Progress in Electromagnetics Research Symposium (PIERS 1998) will be organized by the French Chapter of the Electromagnetics Academy and will be held on 13 to 17 July 1998 at the Congress Center in Nantes, France.

PIERS provides an international forum for reporting progress and recent advances in the modern development of electromagnetic theory and its new and exciting applications.

Organisation

Chairman : J. A. Kong, USA.

General Chairman : A. Priou, France

Technical Chairman : T. Le Toan, France

Topics

- 1 Electromagnetic theory :
 - 1-1 Scattering and diffraction
 - 1-2 Inverse scattering problems
- 2 Computational techniques :
 - 2-1 Time domain methods
 - 2-2 Frequency methods
 - 2-3 Asymptotic methods
 - 2-4 Hybrid methods
 - 2-5 Massive and Parallel computation
- 3 Guided waves and propagation :
 - 3-1 Transmission lines
 - 3-2 Discontinuities
 - 3-3 Interconnects
 - 3-4 Packaging
- 4 Antennas :
 - 4-1 Antenna theory and measurements
 - 4-2 Microstrip and printed antennas
 - 4-3 Active and phased antenna arrays
 - 4-4 Reflector Antenna
 - 4-5 Conformal and smart skin antennas.
- 5 Components :
 - 5-1 Passive Microwaves and millimeter circuits
 - 5-2 Ferrite devices and measurements
 - 5-3 Photonics, non linear optics and devices
 - 5-4 Superconducting devices
- 6 Composite and complex media :
 - 6-1 Waves in composite media
 - 6-2 Random media, non linear media, fractal media
 - 6-3 Anisotropic media
 - 6-4 Bianisotropic, bisotropic and chiral media
- 7 Signal processing
 - 7-1 Wavelets in electromagnetics
 - 7-2 Neural network techniques in electromagnetics
 - 7-3 Genetic algorithms and optimization
 - 7-4 Classification techniques
- 8 Polarimetry :
 - 8-1 Polarimetric theory and applications
 - 8-2 Polarimetric radar scattering

- 8-3 Passive and active polarimetry
- 8-4 Wideband (UHF/VHF) Polarimetry (Radar, Scatterometer and SAR)
- 8-5 Topographic Interferometric Imaging Polarimetry
- 9 Remote sensing :
 - 9-1 SAR interferometry
 - 9-2 Electromagnetic Interaction with natural media
 - 9-3 Surface and volume scattering
 - 9-4 High precision measurements (altimeter, DGPS...)
 - 9-5 Microwave radiometry
 - 9-6 VHF applications
 - 9-7 TOPIF'E POL-SAR Repeat-Track (LTBL Image Overlay Interferometry)
 - 9-8 Infrasonic and Near-Infrasonic Atmospheric Pressure Change Imaging
- 10 Wireless communication systems:
 - 10-1 Dedicated antennas and arrays
 - 10-2 Channel characterization
 - 10-3 Indoor propagation.
 - 10-4 Local Area Networks
 - 10-5 Signal processing
 - 10-6 Biological effects
- 11 Measurement techniques :
 - 11-1 Medical applications
 - 11-2 Near and far fields measurements
 - 11-3 Material measurements
- 12 Other related topics

Deadlines

Abstract deadline : 1 December 1997

Acceptance notification : 31 January 1998

Registration deadline presenting authors : 1 March 1998.

Advance Program will be mailed by 15 February 1998

Contact

Scientific programme :

PIERS 1998

CESBIO/Dr Le Toan

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Fax : (33) 5 61 55 85 00

Submission of abstracts :

PIERS 1998

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URSI CONFERENCE CALENDAR

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

June 1997

Third Volga Space Plasma Physics Summer School

Nizhny Novgorod, Russia, 1-11 June 1997

Contact : Organising Committee, ISS'97, e-mail iss97@nirfi.sci-nnov.ru, web site : <http://www.wavegroup.irfi.se/Volga97/>

BIANISOTROPICS'97

International Conference and Workshop on Electromagnetics of Complex Media

Glasgow, Great Britain, 5 - 7 June 1997

Contact : Dr. W.S. Weiglhofer, Dept. of Mathematics, University of Glasgow, Glasgow, United Kingdom, Tel. +44 141-330-4124, Fax +44 141-330-4111, E-mail : tropics@maths.gla.ac.uk, web site : <http://www.maths.gla.ac.uk/~tropics/index.html>

Second World Congress for Electricity and Magnetism in Biology and Medicine

Bologna, Italy, 11 - 13 June 1997

Contact : Prof. Paolo Bernardi, Universit  "La Sapienza" di Roma, Dipartimento di Ingegneria Elettronica, Via Eudossiana 18, I-00184 Roma, Italy, Tel.: +39 6-4742647, Fax : +39 6-44585855, e-mail : bernardi@tce.ing.uniroma1.it

July 1997

Seventh International Conference on HF Radio Systems and Techniques

Nottingham, United Kingdom, 7 - 9 July 1997

Contact : HF Radio '97 Secretariat, Conference Services, Institution of Electrical Engineers, Savoy Place, London WC2R 0BL, United Kingdom, Tel. : +44 171-344 8425/5469, Fax : +44 171-240 8830, e-mail : conference@iee.org.uk (please quote HF Radio 97 in your message)

APS-URSI 97

1997 IEEE Antennas and Propagation Society International Symposium and URSI North American Radio Science Meeting

Montreal, Canada, 13-18 July 1997

Contact : Mrs. Doris Ruest, Conference Manager, National Research Council of Canada, Tel. : +1 613 933-9228, Fax: +1 613 993-7250, E-mail : doris.ruest@nrc.ca, web site : <http://www.nrc.ca/confserv/apsursi97/welcome.html>

ICPIG XXIII

XXIII International Conference on Phenomena in Ionized Gases

Toulouse, France, 17-22 July 1997

Contact : M.C. Bordage, ICPIG XXIII, CPAT, Universit ; P. Sabatier , 118 route de Narbonne,

F-31062 Toulouse, France, Tel. : +33 61-55 86 80, Fax : +33 61-55 63 32, E-mail : icpig@cpa22.ups-tlse.fr, web site : <http://icpig97.ups-tlse.fr>

August 1997

ISRAMT'97

International Symposium on Recent Advances in Microwave Technology

Beijing, China, 4-7 August 1997

Contact (North/South America & Europe) :

Prof. Banmali Rawat, Techn. Program Co-Chair, Dept. of Electrical Engineering, University of Nevada at Reno, Reno, NV 89557-0153, U.S.A., Tel. : +1-702 784-1457, Fax : +1-702 784-6627, e-mail : rawat@ee.unr.edu

Contact (Asia, Pacific Region, Africa) :

Prof. Yue Wang, Techn. Program Co-Chair, Beijing Institute of Technology, P.O. Box 327, Beijing 10081, China, Tel : +86-10 6841-6688, Fax : +86-10 6841-2889, E-mail : youanke@public.bta.net.cn

web site : <http://www.cs.unr.edu/~sushil/isramt.html>

IGARSS'97

International Geoscience and Remote Sensing Symposium

Singapore, 4 - 8 August 1997

Contact : IEEE Geoscience and Remote Sensing Society, 2610 Lakeway Drive, Seabrook TX 77586, U.S.A., Tel. : +1-713 2919222, Fax : +1-713 2919924, e-mail : tstein@phoenix.net, web site : <http://www.phoenix.net/~tstein/igarss/igarss97.html>

Radio Africa '97

Nairobi, Kenya, 4-8 August 1997

Contact : Dr. D. Oming'o, Radio Africa '97, Kenya College of Communication Technology, Department of Engineering, P.O. Box 30305, Nairobi, Kenya, Tel. : +254 2-891201, Fax : +254 2-891949

ISRP'97

International Symposium on Radiowave Propagation

Qingdao, China, 12 - 16 August 1997

Contact : Professor Zong Sha, Chinese Institute of Electronics, P.O. Box 165, 100036 Beijing, China, Tel. : +86 10-68283463, Fax : +86 10-682834 58, e-mail : ZSha@Sun.Ihep.ac.cn

ISAE'97

4th International Symposium on Antennas & EM Theory

Xi'an, P.R.China, 19-22 August, 1997

Contact : Prof. Shuxi Gong, XIDIAN University, P.O.Box 377, Xi'an, Shaanxi 710071, China, Tel: +86-29-8228200 Ext. 2662/3814, E-mail: nlam@xidian.edu.cn, web site : <http://www.xidian.edu.cn/>

September 1997

URPS'97

Urban Radiowave Propagation Symposium

Tomsk, Russia, 2 - 4 September 1997

Contact : Prof. German S Sharygin, Tomsk State Academy of Control Systems and Radioelectronics, 40 Lenin Ave., Tomsk 634050, Russia, Tel. : +7 3822-224 302, E-mail: gssh@tiasur.tomsk.su and gssh@cp.tomsk.su

November 1997

EM-Med 97

International Scientific Meeting on Electromagnetics in Medicine

Chicago, Illinois, 3-5 November, 1997

Contact : EM-Med, M/C 154, University of Illinois at Chicago, 851 South Morgan Street, Chicago, IL 60607-7053, U.S.A., Fax : +1 312 413-0024, E-mail : emmed@eecs.uic.edu, web site : <http://www.eecs.uic.edu/~emmed>

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

May 1998

EUSAR'98

European Conference on Synthetic Aperture Radar

Friedrichshafen, Germany, end of 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

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/>

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



Modern Ionospheric Science

by H. Kohl, R. Rüster and K. Schlegel
published by the European Geophysical Society
ISBN 3-9804862-1-4, Hardcover, 560 pages,
Price for EGS-members : 80 DM, 65 USD
List Price: 120 DM, 95 USD

This volume has been produced to celebrate the 50th anniversary of Ionospheric Research at the Max Planck Institute at Lindau. It contains sixteen major review papers written by leading scientists in their respective fields. All the major topic areas in Ionospheric Physics are included and these range from ionospheric radio communications, through the physics of neutral and ionized atmosphere, to magnetosphere-ionosphere coupling. The papers are in the form of in-depth reviews; however, they contain details of our current knowledge together with examples of the most recent experimental results available. The wide range of topics and the thoroughness of the reviews will make this book a standard reference text for all those interested in ionospheric research.

The book begins with an historical review of ionospheric research at Lindau, from the time the Institute was established there in 1946. The major achievements in its long and distinguished history have been highlighted. The increasing contributions of space based observations in recent years is evident. The initial interest in the ionosphere was a consequence of its use for long distance communications. This perspective is addressed in a review of Radio Communications and it is evident that the need to predict the key parameters of the ionospheric layers (and hence the MUFs) triggered much of the early work in Ionospheric Physics. The link between radio propagation (Radio Science) and ionospheric physics (Solar Terrestrial Science) has become much weaker in recent years as each of these subjects developed into separate fields of study.

The link between the Sun, the magnetosphere and the ionosphere has always been recognised. The significance of the polar ionosphere and the convection currents flowing in these regions is discussed and models of magnetosphere-ionosphere coupling are reviewed. Recent experiments employing coordinated satellite and ground based observations (many were designed at Lindau) have been a key factor in validating current theory. The ionosphere is also coupled to the lower atmosphere (i.e. the mesosphere and lower thermosphere). In the mesosphere complicated reactions with minor constituents have a significant role and these and their consequences are presented in detail. The significance of the data obtained by EISCAT and the MST radars is reviewed. The Lindau group have been very active in employing both these techniques for neutral atmosphere investigations.

An understanding of the electrodynamic coupling between the ionised and neutral atmosphere is critical in the interpretation of a range of natural phenomena. For example, in the emission of e-m waves from lightning strikes and the subsequent propagation of VLF waves far out into the magnetosphere in the so-called 'Whistler' mode. The ionospheric dynamo is a further example of the topics addressed in this review section.

The atmosphere is fluid in motion and contains waves with a great range of periods. The basic theory of atmosphere wave propagation is carefully reviewed and some of the most recent work on atmospheric gravity waves collected during the WAGS (World Atmosphere Gravity Study) period presented. A discussion of atmosphere tides is also included in this section.

Since the earliest days of ionospheric physics attempts have been made to model the diurnal and seasonal changes in the key parameters such as the electron density height distribution. The development of numerical models is discussed and the results of some of the most recent modelling studies presented. These models are now so successful that they can account for anomalous features such as the sub-auroral trough and 'Polar patches' and have become important tools for studying various coupling processes.

The ionosphere forms a giant natural laboratory for plasma physics research. Two reviews are included which address the plasma physics of the ionosphere. The first is concerned with the properties of plasma waves and irregularities which occur naturally, while the second deals with plasma instabilities stimulated by high power radio waves. A clear explanation is given of the complicated theory required to explain these phenomena. These two reviews provide an excellent overview of the topics and benefit from being placed next to each other in this volume.

Many of the interactions that occur in the ionosphere are non-linear in nature. Great care must, therefore, be taken in selecting the analysis techniques to be applied to the observational data. The problem can often be considered as an ensemble of waves and methods based on this assumption are considered in detail. Examples of these techniques applied to both ground and space based data are included.

One of the earliest applications of orbiting earth satellites was the determination of electron total content.

Tomographical techniques have been developed which enable the electron density-height structure to be determined in considerable detail. Such techniques have been validated by reference to other methods such as incoherent scatter radars. The availability of the satellites in the GPS navigation system has opened up a major new opportunity for tomographic observation. Details of the potential applications together with examples of results obtained with these new techniques are included.

Three reviews towards the end of the volume concentrate on HF radar sounding techniques for observing the ionosphere. The oldest of these, which originated in the 1920s, is the ionosonde, which has now been developed into a sophisticated instrument capable of producing maps of convection flows in addition to information regarding the electron density distribution. The HF radar technique has also been adopted for observing the backscatter returns from ionospheric irregularities. From this type of measurement the plasma drift velocity and hence the electron field can be determined. New chains of such radars (SuperDARN) have been deployed in both southern and northern hemisphere for studies of convection flows and irregularities associated with the polar cap and auroral zones. The most powerful ground based radar technique is that of incoherent scatter, since this technique yields information on many parameters, for example, the density and temperature of electrons and ions, the ion drift velocity and a number of derived parameters. The success of the system is unparalleled, although only a few such systems have been constructed because of their high cost. The volume contains a clear account of the incoherent scatter technique.

Since the early 1960s, measurements of the ionosphere and magnetosphere from spacecraft have become increasingly important. It seems fitting, therefore, that the final chapter of the book is devoted to this topic. Techniques for measuring the electric and magnetic field, electrostatic waves, ion composition, density and temperature are described in detail. Attention is also given to techniques for sampling the neutral atmosphere and upper atmospheric winds. The inclusion of the wide range of instrumentation and of examples of the data obtained makes this a particularly interesting and valuable contribution.

The book has been produced to a high standard; it has been well edited and the material clearly presented. There are numerous illustrations (many of them in colour), which include actual data sets and this adds greatly to the value of the book. The wide range of topics included reflects the development of the research programme at Lindau. Over the years this has developed from an exclusively ground based programme to one in which spaced based instruments play a major role. All the topics included in the volume have, at one time or another, featured in the Lindau programme, which reflects the breadth and strength of the Institute's activities. All the papers contain many references to key publications which further adds to the usefulness of the reviews. It is evident that this volume will become a standard reference text for anyone interested in ionospheric physics either from an experimental, data analysis or modelling standpoint.

reviewed by T B Jones

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Advanced Electromagnetism - Foundations, Theory and Applications

by T.W. Barret and D.M. Grimes

Scientific Publishing co., Singapore, 1995, 791 pages

ISBN 981-02-2095-2

The tone for this recent offering from Singapore is set by the frontispiece quotation by Pascal (1623-1662) "Nous ne savons le tout de rien" (We know everything about nothing). In Roger Penrose's brief forward he says there can be little doubt that Maxwell's Equations constitute one of the great landmarks in physical theory. He then goes on to say that we should not be deterred from seeking alternative descriptions, unconventional formulations and radical generalizations. The invited chapters (or essays) live up to the mark. Some specific topics under the category "Foundations" are : gauge theories, helicity and EM topology, mass energy equivalence, symmetries between electricity and magnetism, possible existence of the magnetic monopole, twistors, Beltrami fields, field theory explanation of photons, the Sagnac effect, and gravitation as a 4th order EM effect. Under the category "Theory", we find chapters dealing with : dyadic Green's function for bianisotropic media, covariances and invariances of Maxwell's equations, solitons and non-linear effects, energy and momentum in

classical EM, non-Abelian Stokes theorem, relativistic implications in EM and more on symmetries and conservation laws. Under the category "Applications", we find miscellaneous topics on : experiments with magnetic charge and the Ampere force, localized waves, beams, evaluation of classical field integrals, and, finally, transmission and reception of power by antennas. I believe the editors, in addition to their readable and informative preface, have collected a huge amount of food for thought. The total length of the "book" may seem excessive but is wise, in such circumstances, to give the contributors free rein to express their views. But, disappointingly, there is little cross referencing between chapters except a few brief references in the editor's preface. Unfortunate omissions are : subject index, author index, and glossary of symbols. In spite of these minor shortcomings, I would recommend purchase of this tome by science reference libraries.

Reviewed by James R. Wait
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An Introduction to Electromagnetic Wave Propagation & Antennas

by Shane Cloude

Springer-Verlag, New-York, and

UCL Press Ltd. London, 1995

176 pages

ISBN 0-387-91501-X

Price : US\$ 39.00

This little book takes a rather refreshing approach to teaching electromagnetics at the undergraduate level. The stated prerequisite is a first course in electricity and magnetism. The mathematics needed is minimal because, as the author admits, vector analysis and numerical methods are never really dealt with in explicit form. The author's principal goal is to make difficult concepts more "accessible". His approach is to lean heavily on time domain methods which he describes as a "breakthrough". I think the author has met his objective fairly well. Many examples of transient responses of antennas and targets are covered in a physical manner making very idealized assumptions. There are often shown along side rigorously computed results taken from sources not always specified. However there are copious general references after each chapter "for further reading". His harking back to the early pioneers is pleasant.

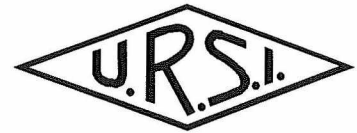
An appendix includes 5 computer codes for : the one-way advection equation, Lax modification, two-way wave

equation, reflection of plane waves from a slab, and time domain integral equation for a wire antenna. Some rather rudimentary notions of Laplace and Fourier transforms are also covered. One curious concept described is "complex wave velocity" in the transform domain.

The author's choice of topics is a personal one and he should not be faulted for omissions of material found in other introductory texts. For example the reviewer's "*Introduction to Antennas and Propagation*" (IEE London, 1986) had a similar goal to make electromagnetic concepts "accessible" but technical overlap with Cloude's book is slim. I tried to introduce the analytical methods in a self-contained and explicit fashion. Maybe readers should look at both books and form their own opinion.

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News from the URSI Community



NEWS FROM URSI MEMBER COMMITTEES

AUSTRALIA

Workshop on Applications of Radio Science

The Workshop on Applications of Radio Science 1997 (WARS'97) will be held in the Barossa Valley, Australia, 21-23 September 1997. Its main aim is to bring together Australian radio scientists in an informal environment to share information and ideas on current work. International radio scientists are also welcome. The workshop will be residential, and interaction between participants will be encouraged in every possible way. Like the first workshop in 1995 we expect it to be a pleasant and worthwhile experience for all.

Submitted papers will be reviewed and published in a Workshop Proceedings qualifying for maximum rating under the new Government guidelines.

The Proceedings will also be available for sale after the Workshop. At the workshop, papers will be presented as posters to foster discussion between authors and other delegates. During the Workshop there will also be six invited talks to focus attention on key issues facing radio science.

The workshop is sponsored by the Australian Academy of Science through the National Committee for Radio Science, which represents URSI in Australia.

Further information and a registration form are available on-line at <http://www.tip.csiro.au/events/wars97/> or by sending a request to the email address wars97@tip.csiro.au or to fax number +61 2 9372 4446.

BOOK PUBLISHED BY AN URSI CORRESPONDENT

BEAM-WAVE INTERACTION IN PERIODIC AND QUASI-PERIODIC STRUCTURES

by Levi Schächter

Springer Verlag, 1997. XIII
356 pp. 109 figs., 1 tab. (Accelerator Physics)
Hardcover DM 138,-
ISBN 3-540-61568-7

Editors : F. Bonaudi, Geneva, Switzerland and C.W. Fabjan, Geneva, Switzerland.

The main topic of this book is the interaction of electrons with electromagnetic waves, primarily, but not only, for the generation and amplification of radiation. It discusses the various methods of electron-beam generation and propagation and the basic electron-wave interaction schemes. Then an idealised picture of beam-wave interaction in a dielectric loaded waveguide is presented. Gradually the

complexity of the analysis is increased by presenting the effect of reflected waves and further by considering the beam as an ensemble of macro-particles.

The author discusses the interaction in periodic and in quasi-periodic metallic structures and the fundamentals of the beam-wave interaction in a periodic field.

The book concludes with a brief discussion of particle acceleration, including novel acceleration schemes.



1. Introduction

IUCAF, the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science, was formed in 1960 by URSI, IAU and COSPAR. Its brief is to study and coordinate the requirements for radio frequency allocations for radio astronomy, space science, and remote sensing in order to make these requirements known to the national and international bodies for frequency allocations. IUCAF operates as a standing committee under the auspices of ICSU, the International Council of Scientific Unions and is strongly supported by IAU, URSI and COSPAR. ICSU works under the umbrella of the United Nations organization UNESCO.

2. Membership

At the end of 1996 the composition of IUCAF was:

URSI	W.A. Baan, U.S.A. R.J. Cohen, United Kingdom A. van Eyken, Norway W. Keydel, Germany P. Poiares Baptista, The Netherlands K. Ruf, Germany J.B. Whiteoak, Australia
IAU	R. Sinha, U.S.A. A.R. Thompson, U.S.A. M. Ishiguro, Japan B.A. Doubinsky, Russia
COSPAR	D. Breton, France A. Gasiewski, U.S.A.

Ex Officio Advisers:

Director ITU Radio Bureau : Robert Jones, Canada

Chairman ITU Radio Board : M. Miura, Japan

During the URSI General Assembly in Lille, France, 1996 the following changes were made to the IUCAF membership sponsored by URSI: Klaus Ruf (Comm. J - Radio Astronomy) replaces Hans Kahlmann after six years of active service in IUCAF. Thank you, Hans. Three new members were added: Tony van Eyken (Comm. G - Ionospheric Radio and Propagation), and Wolfgang Keydel and Pedro Poiares Baptista (Comm. F - Wave Propagation and Remote Sensing).

IUCAF continues to maintain its network of Correspondents in 35 countries to interact with national authorities responsible for radio frequency management.

3. International scientific meetings

During the period of January 1995 to January 1996, IUCAF Members or Correspondents took part in the following meetings:

The fourth and fifth meetings of the ITU-R Task Group 1-3 on Spurious Emissions in Paris (April) and Santa Rosa, CA (October) [IUCAF 422 and 430] Two meetings

of ITU-R Working Party 7D in Nancy, France in March and Geneva in October [IUCAF 422 and 428]. The Annual Meeting of CORF, the Committee on Radio Frequencies of the USA National Research Council, in Washington, DC in February. Two meetings of CRAF, the Committee on Radio Astronomy Frequencies of the European Science Foundation, in Manchester, United Kingdom in April and Bologna, Italy in November. The URSI XXVth General Assembly in Lille, France in August [IUCAF 424]. The ICSU XXVth General Assembly in Washington, USA in September [IUCAF 427]. The 16th Annual Meeting of the Space Frequency Coordination Group SFCG-16 in Moscow, Russia, in September [IUCAF 431] The ITU-R World Telecommunication Policy Forum, Geneva, in October [IUCAF 429].

4. A description of relevant issues

a) URSI General Assembly

The URSI General Assembly has turned into a long working session for IUCAF. Two general meetings were attended by seventy or more radio astronomers and people from the remote sensing community from many countries. A special session of the General Assembly was totally dedicated to spectrum issues and well attended.

A major issue discussed during the IUCAF meeting related to the coordination proceedings in progress with Motorola's IRIDIUM. Because of an inadequate design of the satellite, IRIDIUM intends to transmit spurious emission into a radio astronomy band, which is 20 dB above the "harmful interference threshold". IUCAF issued a position statement at the end of the meeting on these Mobile Satellite Service issues [IUCAF Doc. 425]. In order to show good faith, IUCAF has expressed willingness to coordinate with IRIDIUM on behalf of the radio astronomy community. At the writing of this report no real progress has been made in reaching any coordination agreement.

Another issue discussed extensively was the use of the mm wave frequency range (frequencies above 60 GHz), that is becoming of interest for commercial use. Up till the present time, the radio astronomers have been mostly alone in using these bands. Concern was expressed about the 95 GHz Cloud Radar proposed by fellow scientists from the remote sensing community. An amicable solution has since been found on this issue (see section d.1 below). One other direct result of the URSI GA is the establishment of the "IUCAF mm Wave Working Group" on the use of frequencies above 70 GHz (see item f below).

The URSI General Assembly adopted a number of resolutions relating to radio astronomy and spectral protection and the need for "clean spectrum" for the use by radio scientists. A similar Resolution was later also adopted by ICSU during its General Assembly (see discussion below).

b) ICSU General Assembly

ICSU is the International Council of Scientific Unions and incorporates international unions as well as academies of sciences. IUCAF is a standing committee operating within the "ICSU family" under the auspices of IAU, URSI, and COSPAR. At the invitation of ICSU, the IUCAF chairman participated in the ICSU General Assembly. The chairman was invited to participate in all discussions and spoke about the needs for clean spectrum for scientific research within the Working Group on Earth and Space Sciences. This group, which mostly consisted of members of the Earth science community, expressed strong support and understanding for the fight against electromagnetic pollution to protect radio sciences.

In the Working Group, URSI and IUCAF presented the text for a new ICSU resolution on "The Need for Radio Frequency Spectrum for Radio Science". This resolution was later adopted as ICSU Resolution 1 of the XXVth GA. The final statement of this resolution "Urgently requests the Executive Board to persuade governments and the International Telecommunication Union, through the appropriate bodies, to maintain adequate protection of those spectral windows that are vital to research of the above types." ICSU has since taken action with regard to this resolution and informed all its member unions. URSI and IUCAF are currently working together to further this message.

c) ITU-R Radiocommunication Sector

c.1 ITU-R Task Group 1-3 on Unwanted Emissions

Task Group 1-3 on "spurious emissions" has held a total of five meetings at half year spacings. Of the passive users, only the radio astronomers showed serious interest in the proceedings of TG 1-3 and several IUCAF members were very active. Several IUCAF papers were contributed to the proceedings describing the presence of spurious emissions in passive bands and the serious concerns about downlinks of the space services.

However, the final outcome of TG 1-3 has not been favorable for the passive services. Commercial spectrum users and equipment manufacturers in the USA, Canada, and Japan forced TG 1-3 to adopt the existing standards of the USA and Canada. Proposed standards are rather lenient and do not reflect state-of-the-art engineering practices. The CEPT countries have already put in place their own standards, which are typically 20-30 dB more stringent than the USA standards. Furthermore, a sudden change of position of the USA allowed that the recommended standards for the Space Services become "design goals" until reconsidered at WRC-99. In addition, the Space Services were further exempted from the already lenient standards. An updated recommendation ITU-R SM.329 will be considered at WRC-97. *In this manner the ITU will adopt spurious emission standards that date from the 1970's, adopt them in 1997 to be enforced starting in the year 2005.*

IUCAF recognizes the support that the CEPT countries have given the passive services during the proceedings of TG 1-3. IUCAF also trusts that the "Category B" standards already in force in the CEPT countries will become the de-

facto standards, because it is unlikely that manufacturers operating in global markets will adhere to two different standards.

c.2 ITU-R Working Party 7D and 7C

Working Party 7D meets twice a year and deals with ongoing radio astronomy spectrum studies within the ITU-R. WP7D does liaison work with other Study Groups like those of the Space Services in SG 4 and 8. WP7D provides a forum to put forward new ideas and standards on protection for the radio astronomy service. Similarly WP7C works on behalf of the remote sensing community.

d) Spectrum Coordination Efforts

d.1 95 GHz Cloud Radar

The radio astronomy community have expressed reservations about the space borne 95 GHz Cloud Radar proposed by fellow scientists from the remote sensing community. Radio astronomers are intensively using the 92 - 100 GHz part of the spectrum although it is not a radio astronomy spectrum. Discussions at the URSI meeting and subsequent meetings in Geneva have produced a compromise solution, that will go forward to WRC-97 in October 1997. Only a small (100 MHz) band will be re-allocated at 94 - 94.1 GHz for active remote sensing. Since only a few satellites will operate in this band, it has been proposed that the down-looking satellite radar will be turned off when it passes overhead of an operating radio astronomy telescope. "If the sky is cloudy, the astronomers will not observe. If the sky is very clear, the cloud radar may have nothing to look at."

d.2 Mobile Satellite Services

The negotiations between IUCAF and the GLONASS administration (Russia) resulted in a plan to "clean up" the 1612 MHz RAS band from GLONASS emissions. Currently IUCAF is again actively working on protecting this band from Mobile Satellite operations like Motorola's IRIDIUM. An inadequate design of the satellites causes them to transmit into the RAS band during high traffic loading, which is unacceptable to a number of radio observatories. Besides direct discussion at various observatories, IUCAF members are also participating in the discussion fora of CEPT SE28, and ITU-R TG 1-3 on this issue. *IUCAF took the initiative to organize an more technical IUCAF-IRIDIUM meeting in Phoenix, AZ, to prepare the basis for coordination. This meeting was cancelled by IRIDIUM at the last moment. Since that time IUCAF has done great efforts to keep a united front among the astronomers, in particular because the aim of the satellite people appears to be "divide and conquer". At present there is a standoff between the two parties. Discussions with other MSS operators are ongoing.*

e) Remote Sensing Issues

The Remote Sensing community has seen a very active year in 1996. A great effort has been done to finalize requests for Earth Exploration Service allocations at various parts of the spectrum. Because the EES has been behind in its needs for spectrum, the allocation of spectrum for the EES has been placed on the agenda for WRC97. In preparation, the

international community has produced a “do-or-die” list of frequencies for active and passive remote sensing. In particular, Daniel Breton (IUCAF, France) and Guy Rochard (France) have played a critical role in establishing this list and in generating discussion on the relative validity of the various bands. Many of the items of this wish list have appeared in “Proposals for the Work of the Conference” from various national administrations. The allocations above 70 GHz have been postponed to the agenda of WRC99, which will allow further alignment with the radio astronomy needs.

During the URSIGA three new members were elected to IUCAF. These members represent various disciplines from the Earth Exploration Services. Because of these members, IUCAF will be able to better serve the remote sensing community and its interests.

f) Radio Astronomy at Frequencies above 70 GHz

The frequency range above the oxygen absorption band at 60 GHz have been allocated to various services but until recently only few (military) applications have used these high frequencies. On the other hand, the radio astronomers have used essentially all the spectrum in the various atmospheric windows up to frequencies of 1000 GHz in order to observe numerous lines from many molecules. This picture is changing rapidly as new technology is becoming available (see section d.1 above on 95 GHz Cloud Radar).

In order to prepare for the future, IUCAF has formed a “mmWave Working Group”. This group has the task to characterize the radio astronomy use of the mmwave spectrum over the last 20 years and to try to prioritize various observing bands. The objective is to be able to prepare balanced proposals by the time of WRC99 on RAS spectrum allocations above 70 GHz. The item of “Radio Astronomy allocations above 70 GHz” has been placed on the official agenda for WRC99. Indeed WRC99 is likely to be the last conference where corrections may be made to existing allocations in order to accommodate radio astronomy. In addition, ITU-R Working Party 7D will be studying the sharing of critical bands between radio astronomy and other services. This effort is done in coordination with similar efforts of the remote sensing community, in order to prepare coordinated proposals.

5. Publications and reports

- IUCAF 421 - Annual Report 1995 of IUCAF (Baan)
- IUCAF 422 - ITU-R Working Party 7D Meeting, Nancay Observatory, 25-29 March, ITU-R Task Group 1-3 at CNET, Paris, 1-4 April, 1996 (Cohen, Thompson, Baan)
- IUCAF 423 - “Keeping the Windows to the Radio Universe Open, the side effects of increased telecommunication”, ICSU Science International Newsletter No. 62, August 1996 (Baan)
- IUCAF 424 - Report of the XXVth General Assembly of URSI, Lille, France, 28 August - 5 September (Baan)
- IUCAF 425 - IUCAF Position on MSS Sharing, 8 September
- IUCAF 426 - IUCAF Position on the 95 GHz Cloud Radar, September

- IUCAF 427 - Report of the XXVth General Assembly of ICSU, Washington, 24-27 September (Baan)
 - IUCAF 428 - Report on ITU-R Working Party 7D, Geneva, 8-16 October (Thompson)
 - IUCAF 429 - ITU World Telecommunication Policy Forum on GMPCS - Global Mobile Personal Communications by Satellite, Geneva, 21-23 October (Baan)
 - IUCAF 430 - Report on the fifth Meeting of Task Group 1-3 on Spurious Emissions, Santa Rosa, CA, 23-28 October (Thompson)
 - IUCAF 431 - Report on IUCAF Participation at SFCG-16, Moscow, 24 September - 3 October (Doubinsky)
 - IUCAF 433 - Annual Report 1996 of IUCAF (Baan)
- All reports are available on the IUCAF Home Page at <http://www.naic.edu/iucaf/> All reports have been distributed to the complete IUCAF electronic mailing list.

6. Organisational matters

Finances

Generous support from URSI, IAU, and COSPAR has enabled IUCAF to make travel grants to its Members and Correspondents to ensure adequate participation at important conferences. During 1996 IUCAF was able therefore to participate actively in meetings of the Radiocommunication Sector at the meetings of TG 1-3, the URSI General Assembly, and SFCG-16 of the Space Frequency Coordination Group.

It is increasingly important that IUCAF representatives attend key spectrum meetings. Already the IUCAF members are often outnumbered by representatives advocating commercial use of the spectrum. In addition, the remote sensing community has a number of professional spectrum managers. The radio astronomy community has only one in the USA. The radio astronomers working on spectrum issues are all volunteers. Since the coordination problems are becoming more global, IUCAF has an important role to play in preserving the cleanliness of the bands allocated for passive and active scientific use. Such global efforts require an increased travel budget and the continued support of URSI, IAU, and COSPAR is essential. In addition, IUCAF Members and Correspondents have obtained substantial financial support for travel from their home institutions.

Secretariat

IUCAF has no formal Secretariat. The business is conducted from Arecibo Observatory, Puerto Rico, USA and is generously supported by the NAIC, the National Astronomy and Ionosphere Center, which provides secretarial support and access to all means of electronic communication. NAIC is operated by Cornell University under a cooperative agreement with the National Science Foundation of the United States of America.

7. General publications

A number of publications appeared during 1996 that relate to spectrum issues for the passive services. The chairman wrote an article for the August 1996 issue of *ICSU Science International*, Newsletter No 62 [IUCAF 423]. Similarly, Derek McNally of the ICSU Working Group on “Adverse

Environmental Impacts on Astronomy” wrote an article on the “Star of Tolerance” in the same issue. Hans Kahlmann submitted a report on “The Passive Use of the Frequency Spectrum” to the NATO Committee on the Challenges of Modern Society (NATO, CCMS 213, Aug 1996).

In addition, various articles and Letters to the Editor in *Nature*, *Sky and Telescope*, *Physics Today*, and some national newspapers mentioned the IRIDIUM issue and the general plight of the passive services to keep their passive spectrum clean. Various spectrum related reports and submissions have been made by IUCAF Members and associates of a more technical nature to ITU-R fora, the European Science Foundation, the USA Federal Communication Commission, and the CEPT.

A more complete list of publicly available articles is maintained at the IUCAF WWW site.

8. Conclusion

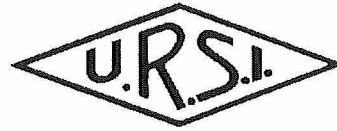
The telecommunication industry is growing extremely rapidly. For example, satellite systems for broadband data transfer to link remote computer systems have become a possibility. At present, a total of 71 of such systems have been announced at the ITU, of which 13 are from the USA alone. These systems will require uplinks and downlinks, and inter-satellite links for the more than 1000 new satellites. The spectrum is a limited and public resource that needs to be conserved and used effectively and carefully. Will the passive services be able to survive in such a competitive environment ?

The name of the ITU in itself suggests that its emphasis lies with “telecommunication”. Passive spectrum use for scientific purposes is often an afterthought. Although IUCAF worked very hard within Task Group 1-3, the Group’s final recommendations are discouraging. Manufacturers of radio equipment prevailed to allow inferior equipment to be marketed without penalty. It was said during these meetings that: “We are not going to modify the rules for all of the industry in order to protect a small number of radio astronomy observatories”.

Spectrum is becoming increasingly valuable. Certain countries have already “auctioned” parts of the spectrum in order to compensate for the cost of spectrum management and for filling the coffers of state. As a result, the paying spectrum users will consider it “a right” to transmit and not “a privilege”. Furthermore, because of financial considerations, the ITU is considering a more active role for the commercial entities in spectrum management. This raises concerns that passive spectrum use as advocated by international scientific organisations will become a secondary aspect of spectrum allocation in the future.

An increasing number of spectrum issues faces the passive and active scientific spectrum users and IUCAF has its work cut out for many years to come. IUCAF continues to provide information to the community via email exploders and using presentations at various scientific meetings. Within the telecommunication race, IUCAF has a critical role that is becoming more global each day.

W.A. Baan, Chairman



1. Introduction

The International Space Environment Service (formerly named the International Ursigram and World Days Service IUWDS) is a joint service of URSI, IAU and IUGG and a permanent service of the Federation of Astronomical and Geophysical Data Services (FAGS), provides rapid information to the world community to assist in the planning, coordination and conduct of scientific and other work affected by the sun-earth environment.

Three basic mechanisms have been selected to accomplish this program. Firstly, ISES prepares the International Geophysical Calendar each year. This calendar gives a list of "World Days" which scientists are encouraged to use for carrying out their experiments. The calendar is prepared for ISES by the World Data Center-A for Solar Terrestrial Physics in Boulder, USA. The calendar is distributed widely to the scientific community and is also published in a number of Journals and other publications.

Secondly, there is the International Ursigram Service for assisting those who need a specific state of solar activity, earth atmosphere or magnetosphere at the time of their experiment. Both programs are designed to be very flexible and can be easily adjusted to fit the needs of the scientific community.

Thirdly, ISES arranges Solar Terrestrial Prediction Workshops bringing together scientists, solar terrestrial forecasters, and users of forecasts to advance the science of forecasting. Such workshops were held in Boulder (1979), Meudon near Paris (1984), Leura near Sydney (1989), and Ottawa (1992). Each workshop resulted in a collection of papers - the Workshop Proceedings - being published and becoming important reference material for the field.

In addition, on behalf of COSPAR, each month ISES summarises the status of satellite orbits around the earth and of space probes in the interplanetary medium in the Spacewarn Bulletin. Future launches are announced, actual launches are reported, new satellites receive an international designation, decays in the earth atmosphere are predicted and announced, and finally series of satellites useful for international participation are listed. This bulletin is produced by the World Data Center-A for Rockets and Satellites located at the Goddard Space Flight Center in Greenbelt, USA.

Indications are that the new solar cycle - Cycle Number 23 - will be of large amplitude, at least comparable to the recent near record cycles. This level of activity, combined with the increasing sensitivity of modern technology, has emphasised the relevance and importance of the services co-ordinated by ISES.

2. The International Ursigram Service

The International Ursigram Service operates through a number of Regional Warning Centres (RWC) scattered all around the world. Warning Centres are located in : Beijing (China), Boulder (USA), Moscow (Russia), Paris (France), New Delhi (India), Ottawa (Canada), Prague (Czech Republic), Tokyo (Japan), Sydney (Australia) and Warsaw (Poland).

In its own geographic area, each RWC collects all the data and reports available concerning the state of the sun-earth environment. In some cases, these come from observatories operated directly by the Regional Warning Centre. In many cases, they are gathered from regional scientific institutes and universities.

These data and reports are coded according to the ISES code book and distributed daily, on request to users and to other RWCs. Data exchange is generally via a daily, or more frequent, message sent either by electronic mail or by facsimile transmission. Electronic transfer of data is also used to relay larger image files.

Information transmitted through the ISES network is analysed by Regional Warning Centres which produce a number of "summary" reports and forecasts. The "Geoalert", a forecast of solar-geophysical conditions for the next few days, is a particularly important one of these reports. Each RWC prepares its own forecast ("Geoalert") and sends it to the World Warning Agency (WWA) in Boulder each day. The WWA then issues a Geoalert which is distributed worldwide each day at 0300 UT through the ISES network. Many RWCs also relay the WWA Geoalert to users within their own region.

3. Publications

The International Geophysical Calendar is distributed free of charge throughout the world. The present distribution is approximately 2000 copies produced at a nominal cost.

The Spacewarn Bulletin is also distributed free of charge throughout the world and the information is now available through an electronic bulletin board system.

The Geoalerts and the abbreviated Calendar records are published monthly in "Solar and Geophysical Data" produced and distributed by World Data Center-A for Solar Terrestrial Physics in Boulder, USA.

The daily Geoalerts and Ursigram messages, distributed daily by telex, are "real-time" information. These are obsolete after a few days and only a summary is printed as the "ISES Alert Periods" in the Solar-Geophysical Data Books published by World Data Center-A. However, the production and distribution of Ursigrams is a very

important part of the current expenses of the RWCs. This expense is borne by the host institutions.

The ISES Code Book has been updated and reprinted in a loose leaf format. Further updates occur on a regular basis as new codes are introduced or existing ones are changed. The updates are supplied to RWCs for distribution as required.

4. Recent ISES Activities

4.1 The 1996 Solar Terrestrial Predictions Workshop

ISES has sponsored four previous predictions workshops - Boulder in 1979; Paris in 1984; Sydney in 1989; and Ottawa in 1992. The purpose of the meetings is to bring together scientists who study the solar terrestrial environment, forecasters who predict conditions, and the users of forecasts. By getting these people together ISES expects to improve the quality of forecasts and their value to the user community.

A fifth predictions meeting was held in January 1996 in Hitachi, Japan. This meeting was arranged by the local ISES Regional Warning Centre operated by the Japanese Communications Research Laboratory. The meeting brought together 137 people from 18 nations, participating in an interesting program of talks, poster sessions, and group discussions. As with previous meetings, the Workshop focused on several "Working Groups" representing important elements of solar terrestrial forecasting. For this meeting, the working groups were Solar/Interplanetary Predictions; Magnetospheric/Geomagnetic Predictions; Ionospheric Predictions; and Radiation/Space Applications.

As with previous meetings, papers from the Workshop are being collected into a publication - the Workshop Proceedings. This serves as valuable reference material for all of those people interested in the solar terrestrial environment and its prediction. The proceedings from the

Japanese meeting will be available in mid 1997 and will be distributed widely in the scientific and user community.

4.2 ISES Steering Committee Meeting

Along with the Hitachi Workshop, two meetings of ISES Warning Centres were held. The first was a two-day workshop, especially for forecasters, in which each RWC presented a report of its activities and its plans for the coming years. There were also sessions devoted to the manner in which ISES data exchange should evolve in this era of the World Wide Web. This "forecasters" meeting took place before the main workshop and provided useful input to it.

A meeting of the ISES Steering Committee took place during the Hitachi Workshop. The meeting discussed possible changes to the format of the Predictions Workshop as well as the best timing and venue for the next meeting.

4.3 Change of Name for the Organisation

An important decision of the Steering Committee in January 1997 was to adopt a new name - The International Space Environment Service (ISES) to replace the former name the International Ursigram and World Days Service (IUWDS). The change was prompted by the need to better reflect its activities as the international group co-ordinating the provision of space environment services. After approval from parent organisations, the new name came into effect in April 1996.

4.4 ISES Home Page on the Web

ISES has a home page on the Web and this contains information about ISES and its Warning Centres, copies of the ISES code book, and references to the home pages of ISES centres. The page is a good way to navigate the Web to obtain space environment services. The address for the page is: <http://www.sec.noaa.gov/ises/ises.html>

Richard Thompson

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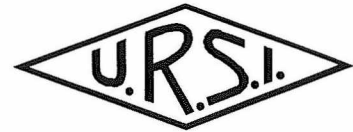
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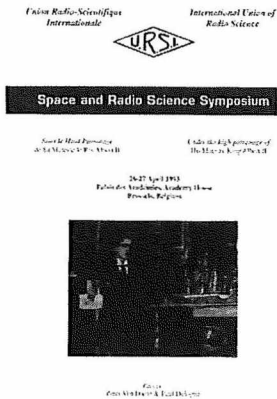
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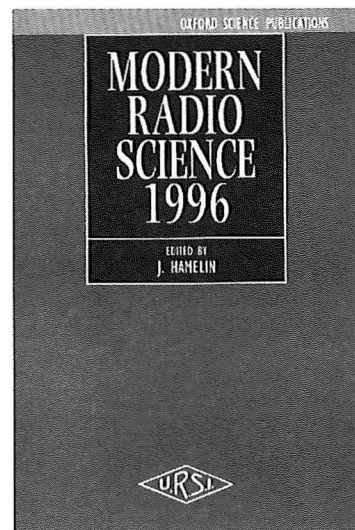
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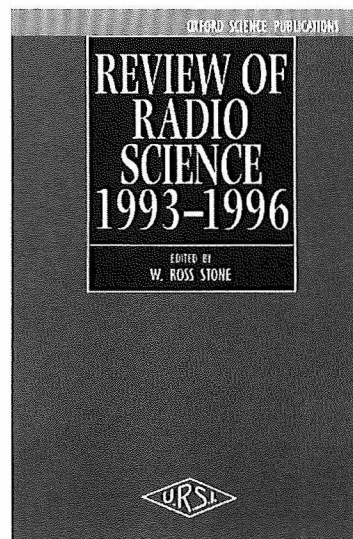


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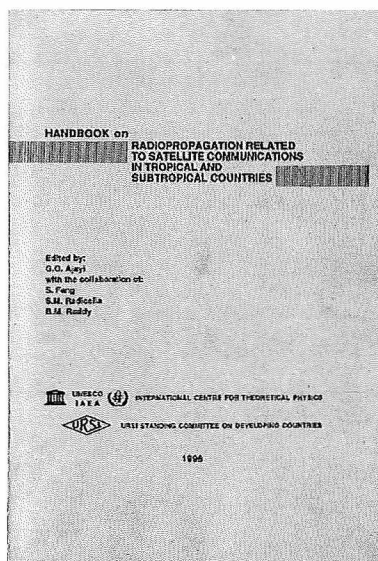


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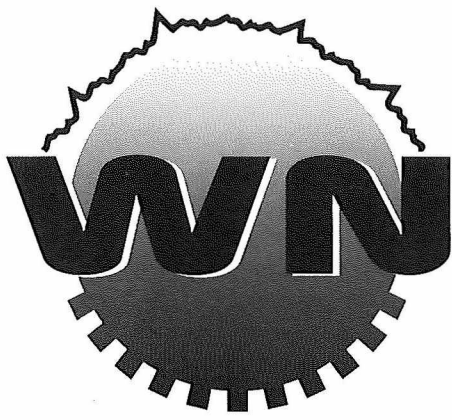
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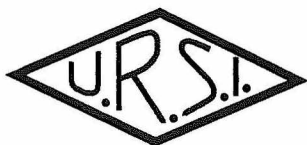
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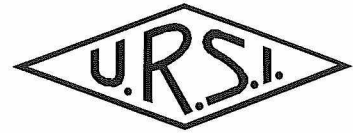
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