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OBITUARY
WALTER ERNST GERBER
1902 - 1986

It is with deep regret that we announce the death, on 29 November 1986, of Professor Walter Gerber, President of the Swiss National Committee of URSI from 1960 to 1979.

Born in 1902 in Bern, Walter Gerber obtained the Diploma of Electrical Engineer in 1925 from the Swiss Federal Institute of Technology in Zürich, and the Doctorate in Technical Sciences in 1930. He then joined the "high-telegraph direction", where he contributed to the construction and operation of the National Short-Wave Transmitter of Beromünster. Returning to Bern, he got increasingly involved with specific problems of national broadcasting, becoming the official expert on television of the Swiss PTT, in charge of the technical organization of the Swiss television network.

Since 1968, Walter Gerber lived an active retirement, travelling over the world to attend numerous commissions and committees, and performing technical mandates. A particular endeavour of his was the International Television Symposium in Montreux. A number of awards honoured his activities, both in and out of Switzerland. The Federal Institute of Technology in Zürich awarded him the title of Professor in 1970, in recognition for his teaching activities.

Professor Gerber was a well-known figure in the field of Radio Science in Switzerland, and chaired the National Committee of URSI for two decades. After that, as Honorary Chairman, he maintained a keen interest in the activities of the Committee.

F. GARDIOL

OBITUARY
G. BOGNAR
1909 - 1987

We regret to announce the death, on 7 February 1987, of Dr. G. Bognar, President of the Hungarian URSI Committee from 1966 to 1987.

Géza Bognar was born in Budapest, Hungary on 3 December 1909. He received the Diploma in Mechanical Engineering from the Technical University of Budapest in 1937.

From 1939 to 1950 he worked with the Hungarian Post Office Research Station and was engaged in high frequency measurements techniques. He joined the Telecommunication Research Institute in 1950. From that time, as Deputy Director and later as Scientific Director, he played a decisive role in the scientific and technological conduct of this Institute. He contributed most to microwave theory and techniques, and especially to long distance radio relay lines.

In recognition of his efficient work in science and its management, he was elected Corresponding Member and Full Member of the Hungarian Academy of Sciences in 1949 and 1959, respectively. He was an Honorary Member of the Polish Academy of Sciences as well.

At various times he held high positions in Hungarian scientific and governmental institutions, among which are outstanding: Deputy Secretary General of the Hungarian Academy of Sciences and Vice-President of the Hungarian Academy of Sciences. He was presiding over the international colloquia on microwave communication (MICROCOLL) and also the co-editor of "Problems of Control and Information Theory".

In the course of his professional life, he was many times awarded the highest decorations and acknowledgments.

Dr. Bognar will be remembered with affection by the URSI family.

K. Géher

THE URSI GOLD MEDALS: 1987

On the occasion of each of its General Assemblies, URSI presents three Gold Medals for outstanding contributions in the field of radio science made during a six-year period preceding the Assembly. These Medals commemorate Balthasar van der Pol, John Howard Dellinger and Issac Koga, three well-known scientists who played important roles in the affairs of URSI over many years.

The Board of Officers of URSI has recently decided to award the Medals for 1987 as follows:

Balthasar van der Pol Gold Medal

Dr. T. HAGFORS, Norway, for his major contributions to radar engineering and the theory and experimental development of the incoherent scatter techniques, and for his work as Director of some of the world's largest facilities used for incoherent scatter observations.

John Howard Dellinger Gold Medal

Dr. R. GENDRIN, France, for outstanding contributions to the study of waves of natural origin propagating in the surroundings of the Earth, and their influence on the behaviour of the magnetosphere.

Issac Koga Gold Medal

Prof. D.M. Pozar, USA, for remarkable contributions to the analytical, numerical and experimental study of printed antennas and phased arrays, and related problems in applied electromagnetics.

XXII GENERAL ASSEMBLY OF URSI

25 August - 2 September 1987, Tel Aviv, Israel

PROVISIONAL SCIENTIFIC PROGRAMME

The scientific programme of the XXII General Assembly of URSI will include General Lectures, Tutorials, Open Symposia, Joint Scientific Sessions organized by two or several Commissions, and Scientific Sessions organized by the individual Commissions. The details given below were received at the URSI Secretariat up to 24 March 1987. The dotted lines indicate that information is not yet available.

OPEN SYMPOSIUM OS1: Computer-aided design in Radio Science with emphasis on microelectronics

Convener: J. Hénaff, France.

1. Control of manufacturing tolerances by CAD and synthesis of a planar antenna array and an IC broadband feed network of microstrip lines, P. Edenhofer, FRG.
2. MICPATCH: Computer analysis of patch antennas. F.E.Gardiol, Switzerland.
3. CAD of horn antennas. A.D. Olver, UK.
4. Analysis of lossy active N-wire transmission line, W. Bandurski, Poland.
5. Coplanar E-H plane tee junction. B.N. Das, G.S.N. Raju, A. Chakraborty, India.
6. CAD by proven wave-analysis codes. U. Van Rienen, Th. Welland, FRG.
7. Effect of electron injection into MESFET substrates. S. El-Ghazaly, T. Itoh, USA.
8. Modelling of submicrometer GaAs devices. G. Salmer, R. Fauquemberge, M. Lefebvre, A. Gappy, France.
9. CAD techniques for millimetre-wave passive components. R. Sorrentino, Italy.
10. Analysis of optical waveguide discontinuities. J.B. Davies, UK.

11. The modelling of semiconductor laser diodes. R. Baets, Belgium.
12. CAD for MIC and milliMIC. S. Toutain et al., France.
13. The architecture of a microwave circuit design workstation. Gh. Hoffmann, Belgium.
14. A 3-chip decoder for CMAC/packet. B.B. Larsen, Norway.
15. CAD of microwave analog integrated circuits. Ch. Rumelhard.
16. A new approach to microcell-based IC layout design, E.S. Kuh, W. Dai, H. Chen, Xiao-Ming Xiong, USA.
17. CAD tools for MOS devices in VLSI. K. Wong, W.D. Ryan, Northern Ireland.
18. Optimal aspect ratio determination of building blocks in VLSI. S. Wimer, I. Cederbaum, I. Koren, Israel.
19. Data management in a VLSI CAD system. P. Siemienski, Poland.
20. Automatic conversion of logic equation into layout of static CMOS integrated circuits. N. Shadmi, D. Lubzens, Israel.
21. Limitation of constrained multiple PLA folding and an internal graph based algorithm. B. Bhaumik, A. Vikram, India.
22. Electron beam microscopy testing of VLSI circuits. Y.-J. Vernay, France.

OPEN SYMPOSIUM 0S2: Reconstruction, imaging and inverse scattering

Convener: Dwight L. Jaggard, USA.

A. Inverse scattering and image theory

1. Some recent methods for three dimensional inverse scattering. T.S. Angell, R.E. Kleinman, USA.
2. A unified treatment of multidimensional inverse scattering in the Born or Kirchhoff approximation. K.J. Langenberg, FRG.
3. The inverse synthesis problem: Direct and inverse solutions. W.R. Stone, USA.

4. Vector diffraction tomography using radon transform techniques in computer-assisted electromagnetic imaging. B.D. James, W.-M. Boerner, USA.
 5. Electromagnetic imaging techniques for dielectric objects. D.L. Jaggard, K. Schultz, USA.
 6. Inverse scattering SAR imaging. H. Hellsten, Sweden.
 7. Microwave imaging and identification of aircraft. D.B. Steinberg, USA.
 8. Scattering, inverse scattering and fractals. D.L. Jaggard, USA.
 9. Polarization correction and extension of Kennaugh-Cosgriff's target-ramp response to the bistatic case. B.-Y. Foo, W.-M. Boerner, USA.
 10. Optimal reception of partially polarized waves. A.B. Kostinski, W.M. Boerner, USA.
 11. Direct and inverse scattering in the time domain for a dissipative wave equation. G. Kristensson, Sweden; R.J. Krueger, USA.
- B. Image reconstruction and signal processing
1. Classification of radar signatures by autoregressive model fitting and cluster analysis. A. Malinowski, M. Michalev, N. Nedelchev, O. Yordanov, Bulgaria.
 2. Relationships between image ambiguities and object ambiguities in maximum entropy (ME) reconstruction. R.M. Bevensee, USA.
 3. Deconvolution by MIM. J. Pfleiderer, Austria.
 4. Image signal processing by the Kolmogorov complexity programme. Y-L. Ma, T-Y. Tu, C. Ma, Taiwan.
 5. Image reconstruction from incomplete data using one-dimensional deconvolution. T.H. Chu, P.C. Lee, Taiwan.
 6. 2-D signal processing for airborne radar, R. Klemm, FRG.
 7. Reconstruction from projections: A comparative study. S. Singh, USA.

C. Applications of image and reconstruction theory

1. Profile reconstruction of planetary rings. E.A. Marouf, G.L. Tyler, USA.
2. Deep space network antenna microwave antenna holography. D.J. Rochblatt, Y. Rahmat-Samii, J.H. Mumford, B.L. Seidel, D.A. Bathker, USA.
3. Computer modelling of sub-surface electromagnetic exploration. E.K. Miller, G.J. Burke, USA.
4. The inverse problem of temperature retrieval from microwave radiometric data, F. Bardati, M. Bertero, M. Mongiardo, Italy.
5. A cylindrical array for fast microwave tomography. E. Reyes, M. Ferrando, A. Broquetas, A. Elias, A. Cardama, Spain.

OPEN SYMPOSIUM OS3: Millimeter-wave techniques in telecommunications, remote sensing and radio astronomy

Convener: J.W.M. Baars, FRG.

Radio Astronomy I

Reviews:

1. Millimeter-wave astronomy with the NRAO 12-m telescope. M.A. Gordon, USA.
2. (Sub-)millimeter developments at FCRAO. P.F. Goldsmith, USA.
3. Millimeter-wave astronomy in Japan. M. Morimoto, Japan.

Contributions:

4. Fourier transform spectrometer for (sub-)millimeter radio astronomy. R.N. Martín, USA.
5. MM-array observations of Venus CO and Saturn's continuum emission. D.O. Muhleman, USA.

Electromagnetics and Technology

Reviews:

1. Electromagnetic design methods for millimeter-wave antennas. S. Cornbleet, UK.

2. Measurement and correction of the surface tolerance of large reflector antennas. C.E. Mayer, USA.
3. The IRAM millimeter-wave array project. M.J. de Jonge, France.

Contributions:

4. Polarisation effects in millimeter-wave atmospheric sounding. P. Encrenaz, France.
5. Submillimeter mixing experiments with planar Josephson-junction devices. Th. de Graauw, Netherlands.

Radio Astronomy II

Reviews:

1. Commissioning the James Clerk Maxwell Telescope (jcm2) on Hawaii. A. Webster, UK; R. Hills, USA.
2. Receiver developments for the jcm2. A. van Ardenne, Netherlands.
3. Experiences with the IRAM 30 m millimeter telescope. C. Thum, Spain.
4. (Sub-)millimeter developments at MPIfR. J.W.M. Baars, FRG.
5. Millimeter radio astronomy in Australia. B. Robinson, Australia.
6. Canadian activities in millimeter-wave astronomy. J.M. MacLeod, Canada.

Propagation and Remote Sensing

Reviews:

1. Anomalous atmospheric refraction at millimeter wavelengths. W.J. Altenhoff, FRG.
2. Atmospheric absorption at millimeter wavelengths. E.E. Altshuler, USA.
3. Imaging techniques in remote sensing. H. Essen, FRG.

Contributions:

1. 55 GHz propagation measurements on an urban mobile radio link. H.J. Thomas, UK.

2. Polarisation effects in millimeter-wave atmospheric sounding.
...
3. Use of millimeter waves in remote sensing of snow. M.T. Hallikainen, Finland.
4. Millimeter-wave imaging sensor. W.J. Wilson, USA.
5. Remote sensing of mixed-phase clouds by millimeter-wave polarimetric Doppler radar. H. Sauvageot, France.

Poster Session (programme not yet finalized)

1. A compact 86 GHz quasi optical diplexer. K. Smiles Mascarenhas, India.
2. Field plots of finline dominant and higher order modes. A.S. Omar, FRG.
3. MM-wave transmission coefficient of illuminated semiconductor panel. M.H. Rahnavard, Iran.
4. Optical figure of merit in a Ku-band Domsat system. J.Lopez Shunia, Mexico.
5. Resonators in microstrip-like transmission lines for millimeter-wave applications. S.K. Koul, India.
6. Millimeter-wave grating polarizers. D.G. Michelson, E.V. Jull, Canada.
7. Quasi-optical receiver for radio astronomy and atmospheric sounding. A. Baudry, France.
8. SIS-receiver with closed-cycle refrigerator. P. Encrenaz, France.

GENERAL LECTURES (GL)

- GL.1 New communication networks, H. Seguin, France.
- GL.2 Digital optics, J.E. Midwinter, UK.
- GL.3 Encounters with comets. R.Z. Sagdeev, USSR;
I. Axford, New Zealand.

TUTORIALS

- T.A Laser measurements 1968-1987 and beyond. W. Wolinski, Poland.
- T.B Waves and spectra: A modern perspective. L.B. Felsen, USA.
- T.C Queuing and coding in multi-user communications: Ideas, techniques and theory. S. Csibi, Hungary.
- T.D Coherent optical fiber communications. T. Okoshi, Japan.
- T.E Recent research on lightning. J. Hamelin, France.
- T.F Present and future of research on wave propagation. R.K. Crane, USA.
- T.G Some aspects of ionospheric physics relevant to ionospheric radio propagation. H. Rishbeth, UK.
- T.H Present and future trends in research in waves in plasmas. S.T. Shawhan, USA.
- T.J Radio astronomy: New horizons. J. Welch, USA.

JOINT SCIENTIFIC SESSIONS (JS)

JS.1 Precise measurements in radio astronomy (Commissions A and J)

Conveners: S. Hahn, Poland; R. Wielebinski, FRG.

1. Absolute microwave background measurements. G. Sironi, Italy.
2. Measurements of weakest sources at high frequencies. W.J. Altenhoff, FRG.
3. Clocks and systems in VLBI. B. Anderson, UK.
4. Frequency stability of millisecond pulsars. D.W. Allan, USA.
5. Accurate measurement of pulsar dispersion measure. W. Sieber FRG.

JS.2 Optical fiber measurements (Commissions A and D)

Convener: H.G. Unger (FRG)

1. Determination of mode field radius and microbending loss in single-mode fibers. P. di Vita, Italy.

2. Dispersion measurements in single-mode fibers. D.W. Schicketanz, USA.
3. System aspects of LP₁₁-cutoff and modal noise measurements. V. Shah, USA.
4. OTDR in single-mode fibers. M. Nakazawa, Japan.
5. Polarisation measurements in single-mode fibers. E. Brinkmeyer, FRG.
6. Measurement of mode-transition matrices for fiber-optical components in local-area networks. U. Unrau, FRG.

JS.3 Laser measurements (Commissions A and D)

Convener: W.R.C. Rowley, UK.

1. Frequency measurements of infrared lasers. A. Clairon, France.
2. The performance of the methane-stabilized laser as a frequency reference. G. Kramer, FRG.
3. Prospects for the improvement of the frequency stability and/or reproducibility of visible stabilized lasers. J. Helmcke, FRG.
4. Interferometric measurement of the frequency/wavelength of visible lasers. ...
5. Laser power measurement. A.A. Sanders, USA.

JS.4 Free field antenna gain measurement and standards
(Commissions A and B)

Convener: M. Kanda, USA.

1. Generation and measurement of fast transient fields in free space. P.D. Smith, D.M. Parkes, UK.
2. Printed dipole array fed by a slotline. Yong-Hee Lee, Jung-Woong Ra, Korea.
3. Microwave telemetric sensors for new applications. Y. Leroy, J.C. Van de Velde, D. Matton, Ph. Boyer, France.
4. Inverse problems from EM field patterns measured by using robotic system. T. Takagi, H. Echigo, Japan.
5. Characterization of electric magnetic fields inside and around dielectric bodies. S.S. Stuchly, Canada.

6. Probability density function of the observed EMI field due to random noise sources. Y. Kuga, A. Ishimaru, USA.
7. Too far for near field and too near for far field. P. Corona G. Ferrara, C. Gennarelli, Italy.
8. An overview for near-field antenna measurements. A.D. Yaghjian, USA.
9. Methodology for standard electromagnetic field measurements. M. Kanda, USA.

JS.5 Microwave metrology (Commissions A and B)

Convener: A.P. Anderson, UK.

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JS.6 Man-made noise measurements - Limits - Statistics
(Commissions A and E)

Convener: R.G. Strużak, Poland (CCIR).

1. Where the interests of URSI Commission E run parallel to those of other international organizations. F.L.H.M. Stumpers, Netherlands.
2. Man-made radio noise studies in Japan. F. Minozuma, Japan.
3. Application of synthetic aperture techniques to locating sources of electromagnetic emissions. R. Sato, H. Echigo, Japan.
4. A statistical technique for the treatment of rarely occurring impulsive noise on data bus lines. A. Bridgwood, USA.
5. Characterization of unknown RF leakage sources: Problems, solutions and practical implications. M.T. Ma, W.D. Bensema, USA.
6. Possible estimation methodologies for electromagnetic field distributions in complex environments. M. Kanda, J.P. Randa, USA.
7. A real time broadband signal-analyzer using acousto-optic bulk wave Bragg cells. A. Bandemer, FRG.
8. Techniques for locating 406 MHz interfering signals using the COSPAS-SARSAT satellite system. J.V. King, Canada.

JS.7 Antennas in plasmas (Commissions B and H)

Conveners: L.R.O. Storey, USA, K.G. Balmain (Canada)

Invited papers:

1. Antennas in linear plasmas. N. Meyer-Vernet, France.
2. High-power antennas. M.D. Grossi, USA.
3. Radiation from currents with no material supports.
S. Adachi, Japan.

Contributed poster papers:

4. Ionospheric heater beam scanning: A mobile source of ELF radiation. R. Barr, M.T. Rietveld, P. Stubbe, H. Kopka, FRG.
5. Parametric antenna system for enhanced excitation of whistlers in the ionosphere. V. Fiala, V.N. Kruchina, V.I. Sotnikov, Czechoslovakia.
6. Current distribution in bodies moving through a magnetoplasma by an integral equation method. K.J. Harker, P.M. Banks, D.J. Donahue, USA.
7. Longwave radiation from antennas in the magnetosphere.
F.J. Kelly, ...
8. Numerical simulation of antenna-plasma interactions.
J.G. Laframboise, France.
9. ELF/VLF-wave production beneath the auroral electrojet under disturbed day-night conditions. H.-P. Mauelshagen, M.T. Rietveld, H. Kopka, P. Stubbe, FRG.
10. Experimental and theoretical studies on the ponderomotive force near probes and antennas in plasmas. N. Singh, USA.

JS.8 Coupling and shielding (Commissions B and E)

Convener: E.O. Vance, USA.

1. Lightning and NEMP as noise sources aboard aircraft.
R.L. Gardner, USA.
2. Comparison of aircraft response to lightning and EMP. K.S. Lee, USA.
3. The differential geometry method for transient lens synthesis. A. Stone, USA.

4. Wave-conductor computation models. M. Ianoz, Switzerland.
5. Real shielding enclosures. R.J. Sturm, FRG.

JS.9 EM Topology (Commissions B and E)

Convener: C.E. Baum, USA.

1. Shield topology applied to interference control. E.F.Vance, USA.
2. The topological concept of a shield generalized to include grounding. T. Karlsson, Sweden.
3. Issues concerning the bounding of signals on wires behind apertures in shields. C.D. Taylor, USA.
4. Norms for bounding the response of electromagnetic systems. C.E. Baum, USA.
5. Forum: Implications of EM topology on interference control.

JS.10 Spectrum management and frequency allocation

(Commissions C, E, F, J)

Convener: R.G. Strużak, CCIR.

Chairman: R.C. Kirby, CCIR.

1. On radio spectrum, competition and collaboration. R.G. Strużak, R.C. Kirby, CCIR.
2. IUCAF and frequency allocation problems, F. Horner, IUCAF.
3. Management of the radio spectrum, R.D. Parlow, USA.
4. Spectrum conservation and coverage assessment. R.S. Sandell, UK.
5. International spectrum planning and management. R.J. Mayher, USA.
6. Frequency assignment theory; problems and solutions. F. Carmassi, C. Isola, L. Tomati, Italy.
7. Inter-service and inter-regional frequency sharing by satellite systems: Problems and some regulatory and technical solutions. R.G. Gould, USA.
8. Mathematical and computational aspects of frequency planning on an international scale. T. O'Leary, IFRB.

JS.11 Direction finding for whistlers and atmospherics
(Commissions E and H)

Convener: M. Hayakawa, Japan.

1. The goniometric triangulation of whistler-mode signals. K. Bullough, P. Jenkins, H.J. Strangeways, UK.
2. Field-analysis direction finding for whistler-mode VLF waves. M. Hayakawa, K. Ohta, T. Okada, S. Shimakura, Japan.
3. The poynting vector method of direction finding. R.L.Dowden, N.R. Thomson, New Zealand.
4. Direction finding of VLF emissions based on the measurement of time differences of signals at three stations. Y. Tanaka, M. Nishino, Japan.
5. A hyperbolic method for finding positions and extents of sferic sources and for obtaining radio pictures of lightning. D.E. Proctor, South Africa.
6. VHF-UHF interferometric direction finding and spatial reconstruction of lightning. P. Richard, A. Bondiou, A. Soulage, France.

JS.12 Communication systems performance in natural and man-made noise (Commissions C and E)

Convener: A.D. Spaulding, USA.

1. Impulsive disturbances. Smearing and desmearing filters. F.L.H.M. Stumpers, J.W.M. Bergmans, Netherlands.
2. Bit error patterns and performance of hamming codes in non-gaussian noise environments: simulation results. J.R.Herman, C.C. Dugan, USA.
3. Robust M-ary digital communications in non-gaussian noise. M. Weiss, Israel.
4. Modelling of non-gaussian noise by gaussian-gaussian mixture: Principle and performance. M. Bouvet, France.
5. Locally optimum, suboptimum, and non-parametric-detector performance in narrowband non-gaussian interference. A.D. Spaulding, USA.
6. Optimum threshold detection in dependent non-gaussian noise. A.M. Maras, UK.

JS.13 Radar and radio studies of the middle atmosphere and lower ionosphere (Commissions F and G)

Conveners: S.A. Bowhill, USA; S. Kato, Japan.

1. Coherent scatter as a tool for studying the middle atmosphere. S.A. Bowhill, USA.
2. Applications of MST radar to numerical weather prediction. T. Gal-Chen, USA.
3. Winds observed by coherent scatter radar. S. Avery, USA.
4. Gravity wave observations and theory. C.H. Liu, USA.
5. Observations of turbulence and their interpretation. J. Röttger, Sweden.
6. Relationship between gravity waves and turbulence. D. Fritts, USA.
7. Signal coding for coherent scatter radar. P.K. Rastogi, USA.
8. New technologies in coherent scatter radar. S. Fukao, Japan.

JS.14 Active experiments in space plasmas (Commissions G and H)

Conveners: R.L. Dowden, New Zealand; G. Haerendel, FRG

1. Plasma waves associated with energetic electrons outside the diamagnetic cavity during the Ampte solar wind ion releases. P.J. Christiansen, A.G. Darbyshire, A.J. Norris, L.J.C. Woolliscroft, UK.
2. Observed motions in the modified region during RF heating. Å. Hedberg, J.A. Nordling, H. Derblom, G. Wannberg, Sweden.
3. Ionospheric parameters derived from heater enhanced plasma lines. J.A. Nordling, Å. Hedberg, G. Wannberg, Sweden.
4. In situ electric field observations of complex wave bursts created by 2 Barium explosions during the critical velocity experiment, 13 May 1986. R. Pfaff, M.C. Kelley, J. Providakes, C. Swenson, R. Torbert, USA; G. Haerendel, FRG.
5. Optical observations of the dynamic heated ionosphere. P.D. Bernhardt, L.M. Duncan, C.A. Tepley, USA.

6. Artificial irregularities induced by high power HF waves at Tromsø, Norway. Santimay Basu, Sunanda Basu, H.C. Carlson, USA; P. Stubbe, FRG.
7. Omega phase and amplitude changes induced by HF heating at Tromsø, Norway. R.L. Dowden, C.D.D. Adams, New Zealand; M.T. Rietveld, FRG.
8. HF-enhanced plasma line ringing. F.T. Djuth, L.M. Duncan, USA; A. Frey, Switzerland.
9. Ionospheric modification at Arecibo -5 MHz versus 3 MHz heating. F.T. Djuth, H.M. Ierkic, M.P. Sulzer, J.A. Fejer, A.L. Newman, H.C. Carlson, USA; B. Thide, Sweden.

JS.15 Plasma instability processes (Commissions G and H)

Conveners: S. Ossakow, USA; T. Sato, Japan.

1. Plasma wave characteristics of the Earth's magnetopause. G. Haerendel, J. LaBelle, R.A. Treumann, FRG.
2. Theory and simulation of whistler waves for magnetospheric plasma. H. Matsumoto, Japan.
3. RF acceleration of electrons in space. K. Papadopoulos, USA.
4. MHD waves in the magnetosphere. K. Yumoto, Japan.
5. The theory of double layers and magnetosphere-ionosphere coupling. A.C. Das, India.
6. Theory and simulation of the Kelvin-Helmholtz instability in the high latitude ionosphere. J. Huba, USA.

JS.16 Radio waves in and from planetary and astrophysical plasmas (Commissions H and J)

Conveners: D. Jones, UK; R. Ekers, USA.

Invited papers:

1. Plasma waves in planetary magnetospheres. D.A. Gurnett, USA.
2. Nonthermal planetary radio emissions. M.L. Kaiser, USA.
3. Poster Review. D.D. Barbosa, USA.

Contributed posters:

4. Generation of the non-thermal E M continuum. C. Altman, Israel; B. Lembège, A. Roux, France.
5. A critical mechanism for the generation of the auroral kilometric radiation. E.D. Poezd, A.D. Poezd, USSR; V. Fiala, Czechoslovakia.
6. Parallel electric field and VLF chorus in the magnetospheres of Earth and Jupiter. I.M.I. Das, India.
7. Pulsed radiation from Uranus and neutron stars : A comparison of emission characteristics. D.D. Barbosa, USA.
8. ISEE3 observations for harmonic auroral kilometric radiation & terrestrial "2MHz" radiation. R.F.Benson, J.Fainberg, USA.
9. The source location of Jovian S-burst emission. F. Genova, France; W. Calvert, USA.
10. Jovian kilometric radiation. Y. Leblanc, France.
11. The source mechanism of terrestrial myriametric and Jovian kilometric radiations. D. Jones, UK.
12. Ray tracing of electrostatic and Z-mode radiation in the Earth's magnetosphere. R.B. Home, UK.
13. Observations of electromagnetic waves in the polar region of the Earth's magnetosphere. E. Ungstrup, M. Jespersen, I.B. Iverson, A. Bahnsen, Denmark.

...

JS.17 Time domain waveform measurements and applications
(Commissions A, B, C, D, E, F, G, H and J)

Chairman Morning Session: N.S. Nahman, USA.

1. Fourier optics, A. Papoulis, USA.
2. Simulation of one-dimensional electromagnetic scattering. P. Fuks, G. Larson, G. Kristensson, S. Strom, Sweden.
3. Measurement of cross talk in multiconductor transmission lines in layered dielectric media. M. Manela, T. Rahal Arabi, T.K. Sarkar, R.F. Harrington, USA; A.R. Djordjević, Yugoslavia.
4. Idealized electric and magnetic field sensors based on spherical sheet. C.E. Baum, USA.

Chairman Afternoon Session: T.K. Sarkar, USA.

1. Measurement and analysis of time domain transients. G. Casalegno, Italy.
2. The coupling of fast transients to systems. D.M. Parkes, P.D. Smith, UK.
3. Transient electromagnetic field measurement from an air-borne platform. D.V. Giri, C.E. Baum, USA.
4. The application of anharmonic frequency analysis to complex frequencies. W.R. Stone, USA.
5. Picosecond time-interval measurements using direct gated time counters. R. Pelka, Poland.

JS.18 Interaction of electromagnetic waves with biological systems (Commissions A, B and E)

Convener: J.C. Lin, USA.

Session JS.18.1 EM energy in medical diagnosis and therapy

Chairman: J.C. Lin, USA.

Co-Chairman: H.J. Schmitt, FRG.

1. Microwave noninvasive sensing of physiological signatures. J.C. Lin, USA.
2. Microwave radiometry and thermography. Y. Leroy, France.
3. Progress in magnetic resonance imaging for medical diagnosis. H. Weiss, FRG.
4. Clinical and technical advances in hyperthermia treatment of cancer. J.W. Hands, UK.
5. Discussions.

Session JS.18.2 Biological effects of EM energy

Chairman: E.H. Frei, Israel.

Co-Chairman: S.W. Rosenthal, USA.

1. Biological responses to stationary and time varying magnetic fields. Th. S. Tenforde, USA.
2. Biological effects of low frequency electromagnetic fields. R.D. Phillips, USA.

3. Biological effects of RF electromagnetic fields. A.R. Adey, USA.
4. Physical mechanisms for electromagnetic interaction with biological systems. P. Bernardi, Italy.

Session JS.18.3 EM safety protection guides and rationales

Chairman: J.M. Osepchuk, USA.

Co-Chairman: M. Grandolfo, Italy.

1. Developments leading to radiofrequency protection guides in USA. D.R. Justesen, USA.
2. Microwave radiation exposure standards in USSR. B.M. Savin, USSR.
3. Eastern European RF protection guides and rationales. S. Szmigielski, Poland.
4. Western European population and occupational RF protection guides. K.H. Mild, Sweden.
5. Canadian and other national RF protection guides. Maria A. Stuchly, Canada.
6. International health criteria documents and safety guidelines for EM fields. J.H. Bernhardt, FRG.
7. Discussions.

JS.19 Wave propagation in random media (Commissions B and F)

Convener: A. Ishimaru, USA.

1. Nonlinear stochastic wave propagation. I.M. Besieris, USA.
2. Wave propagation in random continua. M.J. Beran, Israel.
3. Wave propagation in discrete scatterers. A. Ishimaru, USA.
4. Theory of cross-polarized scattering from rough surfaces. V. Celli, P. Tran, USA.
5. Panel discussion on outstanding problems and future trends. Moderator: A. Ishimaru, USA.

SCIENTIFIC SESSIONS

Commission A on ELECTROMAGNETIC METROLOGY

A.1 Time and frequency

Convener: J. Vanier, Canada.

A.1.1 Timekeeping and time transfer

1. Global timing via GPS satellite in common view. D.W. Allan, USA.
2. Elements of low-cost, operational two-way satellite time transfer. D.W. Hanson, L.B. Veenstra, USA.
3. Timekeeping at NRC in the context of accurate time transfer. J.-S. Boulanger, R.J. Douglas, Canada.
4. The time and frequency division in the INPL. W. Litman, A. Shenhar, Israel.

A.1.2 Atomic frequency standards

1. Atomic clocks: present performance and trends to future improvements and usage. R.F.C. Vessot, USA.
2. The evaluation of accuracy in cesium beam frequency standards. A. DeMarchi, Italy.
3. Clock signal characteristics in an optically pumped cesium beam frequency standard. G. Théobald, V. Giordano, A. Hamel, P. Cérez, France.
4. Cooling atoms with stimulated emission, C. Salomon, A. Aspect, J. Dalibard, A. Heidmann, France.
5. The development and application of precision timing in Israël. A. Lepek, M. Bloch, Israel.
6. Recent progress of quartz resonators and oscillators for atomic clocks. R.J. Besson, France.
7. Quartz crystal oscillator stability: Relevancé to atomic frequency standards. J.R. Vig, USA.

A.2 Recent progress in telecommunication measurements

Convener: J. Le Mézec, France.

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A.3/A.4 Microwave to sub-millimetre measurements and standards

Convener: M.W. Sinclair, UK.

1. Recent advances in electrical noise standards and measurements. D.F. Wait, USA.
2. Waveguide interferometers for impedance and power measurements at millimetre wavelengths. E.J. Griffin, UK.
3. Progress on microwave/millimetre-wave standards at the National Institute of Metrology. Xi Dexiong, China.
4. Dielectric measurements with free-space sub-millimetre four-port and six-port reflectometers. U. Stumper, FRG.
5. Measurements on dielectric materials using open resonators. R.N. Clarks, UK.

A.5 Quantum metrology and electronic methods in fundamental constants

Convener: V. Kose, FRG.

1. Impact of quantum effects on fundamental constants and electrical units. B.N. Taylor, USA.
2. Present understanding of the quantum Hall effect. L. Bliok, FRG.
3. Present state of quantum Hall resistance metrology. F. Delahaye, France.
4. Realization of the Ampere and determination of the fine-structure constant based on the gyromagnetic ratio of the proton. E.R. Williams, USA.
5. Fine-structure constant derived from quantum electrodynamics theory. T. Kinoshita, Japan.
6. The ratio of the proton mass to the electron mass and the anomalous magnetic moment of the electron. R.S. Van Dyck, USA.
7. Present state of the Josephson voltage metrology. J. Niemeyer, FRG.
8. Determination of the Volt by means of voltage balances. V. Bego, Yugoslavia.

9. The determination of the Avogadro constant. P. Seyfried, FRG.
10. The determination of the Rydberg constant. T. Hänsch, FRG.
11. Closing remarks, V. Kose, FRG.

Commission B on FIELDS AND WAVES

B.1 Solution methods in EM theory

Conveners: D.C. Chang, USA; I.V. Lindell, Finland.

1. Exact image method in electromagnetic theory. I.V. Lindell, E. Alanen, Finland.
2. Beams as basis functions for high-frequency field representations. L.B. Felsen, USA.
3. Variational methods for open waveguide discontinuity problems. D.C. Chang, E.F. Kuester, USA.
4. The method of lines for the analysis of planar microwave and optical waveguide structures. R. Pregla, FRG.
5. Modelling of electromagnetic fields by TLM. P.B. Johns, UK.
6. Time domain computations and numerical dispersions. J. Fang, X. Zhang, K.K. Mei, Y.W. Liu, USA.

B.2 Radiation and scattering: Analytical techniques

Conveners: S. Ström, Sweden; R.E. Kleinman, USA.

1. The Waterman algorithm for approximation of the transition matrix in scattering by obstacles. A.G. Dallas, USA.
2. Ill-posed and inverse problems in electromagnetics. Ch. De Mol, Belgium.
3. Boundary integral equations in time-harmonic electromagnetic scattering. R. Kress, FRG.
4. Matrix Wiener-Hopf methods in electromagnetic diffraction. S. Przeździecki, Poland.

B.3 Transients

Conveners: K.G. Langenberg, FRG; L.B. Felsen, USA.

1. New analytical techniques for transient excitations in layered media, M. Tygel, Brazil; P. Hubral, FRG.
2. Focused transient fields: objectives and strategies. L.B. Felsen, USA.
3. Electromagnetic transient beam fields. R.W. Ziolkowski, E. Heyman, ...
4. Pulse shaping for target interrogation, M. Morgan, USA.
5. Transient interrogation of targets: A critical assessment. L.B. Felsen, USA (Panel).

B.4 Radiation and scattering: Numerical techniques

Conveners: B.R. Wilton, USA; P.M. van den Berg, Netherlands

1. Boundary integral equations for dielectric bodies. R.F. Harrington, E. Arvas, USA.
2. A critical survey of the iterative methods for numerical solution of operator equations in electromagnetics. T.K. Sarkar, USA.
3. Global techniques in electromagnetic time-domain scattering. A.G. Tijhuis, Netherlands.
4. Review of progress in finite difference equation solution methods for electromagnetic wave interactions. A. Taflove, USA.

B.5 Numerical methods for inhomogeneous dielectric bodies

Convener: J.W. Strohbehn, USA.

1. Electromagnetic scattering by inhomogeneous objects and iterative solutions based on error minimization. P. van den Berg, Netherlands.
2. Numerical methods for calculations of RF absorption in inhomogeneous man models. O.P. Gandhi, USA.
3. Penetration of a focused electromagnetic pulse into a lossy medium, H.C. Chang, K.K. Mei, USA.

4. Coupling of finite and boundary element method for solving Maxwell's equations in unbounded but heterogeneous domains. K. Paulsen,...

B.6 Planar antennas

Conveners: J.R.Mosig, Switzerland;N.G. Alexopoulos, USA.

1. Microstrip antennas: A review of recent progress in France. A. Papiernik, France.
2. Microstrip antennas for space applications. L. Vegni, F. Rispoli, Italy.
- ...

B.7 Reflector antennas

Conveners: W.V.T. Rusch, USA; N.C. Albertsen, Denmark.

1. Large deployable antennas for space applications. Y.Rahmat-Samii, USA.
2. Application of the method of equivalent currents to the analysis of reflector antennas. A. Michaeli, ..., P.Balling, Denmark, W.V.T. Rusch, USA.
3. The application of incremental diffraction coefficients to the computation of reflector antenna patterns. R.A. Shore, A.D. Yaghian, USA.
4. On the theory of the synthesis of single and dual offset shaped reflector antennas.V. Galindo-Israel, W. Imbriale, R. Mittra, USA.
5. Reflector antenna technology into the 1990's and beyond. P.J.B. Clarricoats, UK.

B.8 Nonlinear electromagnetics

Conveners: A. C. Scott, J.A. Kong, USA.

1. Solitons in electromagnetics. A.C. Scott, USA.
2. Nonlinear electromagnetics in plasmas. A. Bers, USA.
3. Nonlinear electromagnetics in Josephson junctions. R.D. Parmentier, Italy.
4. Theoretical and numerical studies of solitons. P. Leth Christiansen, Denmark.

Commission C on SIGNALS AND SYSTEMS

C.1 Digital circuits and digital signal processing

Convener: A. Fettweis, FRG.

1. One-dimensional digital filtering - Past, present, future. W. Schüssler, FRG.
2. Multidimensional digital filters: Theory and applications. V. Cappellini, Italy.
3. Recent developments in adaptive digital filtering using orthogonal lattice sections. S.R. Parker, USA.
4. System designer oriented CAD for digital signal processing in VLSI. H. De Man, Belgium.
5. Aspects of the compact disc digital audio system. B.H.J. Peek, Netherlands.

C.2 Digital technologies in radio communication systems

Convener: K. Miyauchi, Japan

Chairman: M. Akaike, Japan.

1. Modulation and demodulation of multilevel signals. M. Borgne, France.
2. Adaptive equalization techniques for digital radio. T. Murase, Japan.
3. Performance of quadrature amplitude modulation for indoor radio communications. R.A. Valenzuela, USA.
4. Forward error correction technology in digital microwave radio and satellite communication systems. K. Nakamura, T. Noguchi, G. Oshima, Japan.
5. TDMA and SCPC for satellite systems. T. Muratani, Y. Yasuda, T. Mizuike, Japan.

C.3 Multiple user channels

Convener: J.K. Wolf, USA.

1. Identification models in multi-user-communication theory. G. Dueck, FRG.
2. Transmission of information of two correlated sources over an asymmetric multiple-access channel. E.C. van der Meulen, Belgium.

3. Random access communication and graph entropy. J. Körner, K. Marton, Hungary.

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C.4 Computer networks

Convener: T. Rom, Israel.

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C.5 Analog sampled-data circuits

Convener: G. Moschytz, Switzerland.

1. Digital vs analog filtering. J. Neiryneck, Switzerland.
2. Sampled-data processing for communications. C.F. Kurth, USA.
3. Designing signal-flow graphs for sampled-data filtering. L.T. Bruton, Canada.
4. VLSI switched-capacitor filters: A general purpose design approach. G.S. Moschytz, Switzerland.
5. The state-of-the-art and future prospects of switched-capacitor circuits. G.C. Temes, USA.

C.6 Distributed parameter (microwave, SAW) filters

Convener: S.C. Dutta Roy, India.

1. Rigorous field theory design of waveguide H- and E-plane distributed parameter filters for millimetre wave applications. F. Arndt, FRG.
2. The sun never sets on distributed RC networks. P. Bowron, UK.
3. SAW filter and its application to communication and signal processing. P. Das, USA.
4. Microwave filters and multiplexers. J.D. Rhodes, UK.
5. New analysis method of the nonuniform transmission lines based on the equivalent transformations of the lumped and distributed circuits. R. Sato, Y. Nemoto, Japan.

C.7 Constant envelope communication: Theory and practice

Convener: I. Bar-David, Israel.

1. ... T. Aulin, Sweden.
2. Information transfer by constant envelope signaling.
S. Shitz, Israel.
3. Digital phase modulation transmission through the mobile telephone channel. T. Maseng, Norway.
4. Continuous phase modulation with discriminator detection.
I. Kalet, Israel.
5. ... D.P. Taylor, Canada.

C.8 Packet radio communications

Convener: A. Clamtach, Israel.

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C.9 Mobile radio systems

Convener: P.A. Matthews, UK.

1. Wideband cellular radio systems: design criteria and performance examples based on the CD 900 system.
U. Langewellpott, FRG.
2. Linear modulation radio systems. J.P. McGeehan, UK.
3. Digital microcellular radio systems. R. Steele, UK.
4. Urban/suburban radio channels and their effects on system capacity. G.L. Turin, USA.
5. Satellite mobile radio systems. K.W. Yates, Australia.

C.10 Coding and cryptography

Convener: A.D. Wyner, USA.

1. Applications of combinatorial designs to communications.
S. Golomb, USA.
2. On the capacity of the spread spectrum multiple-access channel. A. Viterbi, USA.
3. Coding for spacecraft memories. J. Schwartz, USA.

4. Variable-to-fixed length codes are better than fixed-to-variable length codes for sources with memory. J. Ziv, Israel.
5. Some convergence theorems for stationary ergodic sources, with an application to data-compression. A.D. Wyner, USA.

C.11 Performance limits in communication theory and practice

Convener: J. Skwirzynski, UK.

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Commission D on ELECTRONIC AND OPTICAL DEVICES AND APPLICATIONS

D.1 Electronic materials of the future

Convener: J. Hénaff, France.

1. Metal base transistors. J.-C. Pfister, France.
2. New III-V semiconductor devices and applications. A. Christou, Greece.
3. Epitaxial growth of II-VI layers on GaAs substrates. G.T. Jenkins, UK.
4. New II-VI semiconductors and applications. J.-Y. Le Traon, France.
5. Future trends in piezoelectric materials and applications. T. Shiosaki, A. Kawabata, Japan.
6. Materials for optical fibres. H. Lydtin, H. Rau, FRG.

D.2 Quantum-well devices and their applications

Convener: H. Sasaki, Japan.

1. Optical processes in semiconductor quantum wells and superlattices and their influence on optical devices. M. Voos, France.
2. Recent progress in quantum-well lasers. A. Yariv, USA.
3. Quantum-well stark modulators and other optical devices. Y. Arakawa, Japan/USA.
4. Physics, and current state, of heterostructure hot-electron transistors. M. Heiblum, USA.

5. Electron transport in quantum heterostructures and current state of high-electron-mobility transistors. H. Sakaki, Japan.
6. Physics and prospects of resonant tunnelling diodes and related devices. M. Kelly, UK.

D.3 Photon counting and optical communications

Convener: T. Okoshi, Japan.

1. Performance bounds and optimization for direct-detection optical communications. J. J. O'Reilly, UK.
2. Multibit/detected photon optical communications for space applications. J. Katz, USA.
3. Photon-counting optical communications receiver. K.Kikuchi, Japan.
4. Convolutional coding for the optical PPM channel. G. Prati, Italy.
5. Detectors for photon counting applications. H. Kume, K.Oba, Japan.
6. Some experiments for elucidating photon and wave aspects of light. T. Okoshi, A. Hirose, Japan.

D.4 Ultra-fast electronics

Convener: B.G. Bosch, FRG.

1. MODFET devices and circuits - Status and trends. J. Magarshack, J. Chevrier, France.
2. Hetero-bipolar transistor devices and circuits - Status and trends. M. Shur, USA.
3. Submicron silicon bipolar circuits - Status and trends. T.H. Ning, USA.
4. Gigabit silicon bipolar circuits based on non-selfaligned technology. U. Langmann, FRG.
5. Development of the concept of fast opto-electronic integrated circuits. J. Shimada, Japan.

D.5 High-speed optical detection

Convener: H. Melchior, Switzerland.

1. High-speed optical detection at visible and near infrared wavelengths. H. Melchior, Switzerland.
2. Photodetectors for optical fiber communications between 1.3 and 1.55 μm today. S. Mottet, E. Viallet, A. Scavenec, C. Boisrobert, France.

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D.6 Nonlinear optics and phase conjugation

Convener: B. Fischer, Israel.

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Commission E on ELECTROMAGNETIC NOISE AND INTERFERENCE

E.1 Lightning: PredischARGE processes and associated radiation

Convener: D.E. Proctor, South Africa.

1. VHF radio pictures of lightning. D.E. Proctor, South Africa.
2. Quasi-currents and discrete strokes in lightning. E. Williams, USA.
3. Characteristics of intracloud flashes determined from lightning strikes to an instrumented airplane, lightning radar echoes, and radio emission mapping. V. Mazur, USA.
4. Spatio-temporal analysis of lightning discharge phenomena. Ph. Richard, A. Bondiou, F. Helloco, I. Taudière, J.Y. Lojou, France.
5. ... V. Cooray, ...
6. ... Ch. Rhodes, ...

E.2 Spacecraft charging and electromagnetic effects

Convener: J. Taillet, France.

1. Review of high-altitude spacecraft operating anomalies. J.P. Catani, France.
2. The geosynchronous plasma environment. H.B. Garrett, USA.

3. An analysis of the physical mechanisms of geosynchronous satellite charging. J.E. Nanevich, USA.
4. Phenomenology of electrical discharges induced by satellite charging. J. Taillet, France.
5. Discussion of the electromagnetic coupling between the various types of discharges and the circuits of the satellite. E.P. Wenaas, USA.

E.3 Lasting effects of transients on equipment performance

Convener: V. Scuka, Sweden.

1. Performance deterioration processes in VLSI chips and methods of reliable component testing. V. Scuka, Sweden.
2. Application of norms to transient time domain waveforms. J. Ph. Castillo, USA.
3. Revelation of latent transient failures. A. Welander, Sweden.
4. EMP testing of a large underground fixed facility. K.G. Lovstrand, Sweden; J. Shilch, Israel.
5. Panel: NEMP statement and the associated SCOPE/ENUWAR results. M. Wik, Sweden.

E.4 Lightning interaction with aircraft

Convener: G.A. DuBro, USA.

1. Electromagnetic fields produced on an aircraft structure by the connexion of a lightning channel. J.L. Boulay, France.
2. Standard test procedures for indirect lightning effects to aircraft: A statement of status and views to the future. J. Anderson, USA.
3. Characterization measurement of lightning aircraft interaction. P.L. Rustan, USA.
4. Interaction of lightning electromagnetic field under direct strike conditions. C.E. Baum, USA.
5. Assessment of analysis approaches to aircraft lightning interaction. R. Perala, USA.
6. Ground simulation of lightning induced effects testing. B.J.C. Burrows, UK.

E.5 Electromagnetic phenomena related to earthquakes

Convener: T. Yoshino, Japan.

1. Electromagnetic perturbations observed at ground and on satellites during seismic events. M. Parrot, F. Lefeuvre, France.
2. On the possibility of seismogenic perturbations of fair-weather electric fields. H.H. Schloessin, Canada.
3. Historical notes on the "electric nature" of earthquakes. H.H. Schloessin, Canada.
4. After effects on electromagnetic phenomena related to earthquakes. R. Massey, USA.
5. Nonlinear interaction of an acoustic wave with the ionosphere. Minor scale experiment. E. Blanc, France.
6. Observation results of LF electromagnetic emissions as precursors of volcano eruption at Mt Mihara on 21 November 1986. T. Yoshino, I. Tomizawa, Japan.

E.6 The composite noise environment

Convener: G.H. Hagn, USA.

1. Composite non gaussian noise environments affecting telecommunications. D. Middleton, ...
2. Observations of the composite noise environment. W.R. Vincent, ...
3. Possible estimation methodologies for EM field distribution in complex environments. M. Kanda, USA.
4. An updated composite HF noise model. A.D. Spaulding, USA.

E.7 Nonlinear effects in the field of EMC/EMP

Convener: H. Kikuchi, Japan.

1. Nonlinear waves in dispersive and dissipative systems. J. Satsuma, Japan.
2. Nonlinear VLF/ELF phenomena. M. Hayakawa, Japan.
3. Soliton propagation in one- and two-dimensional transmission systems. A. Noguchi, Japan.
4. Nonlinear effects in laser plasma accelerators. S. Eliezer, Israel.

5. Characteristics and performance of nonlinear receiver structures for communication in impulsive noise. A.H. Levesque, J.R. Herman, USA.

E.8 Lightning: Cloud to ground discharges, I and dI/dt, radiation and models

Convener: J. Hamelin, France.

1. Lightning current and current derivative correlated measurements. C. Leteinturier, A. Eybert-Bérard, J. Hamelin, C. Weidman, France.
2. Correlation of lightning currents, fields and optical emission. C.E. Baum, R.L. Gardner, L. Baker, A.H. Paxton, W. Rison, USA.
3. Lightning current derivative and electric field derivative correlation. Measurements and models. C. Leteinturier, C. Weidman, J. Willet, France; E.P. Krider, USA.
4. Electromagnetic characteristics of positive ground strokes during winter thunderstorms in Japan. Z.I. Kawasaki, T. Takeuti, Japan.
5. Electric charge displacement during the descent of the leader in a case of anomalous triggered lightning. P. Hubert, C. Enianoko, G. Mouget, A. Colombet, France.
6. Characteristical features of LEMP in relation to their origin and path of propagation. V. Scuka, Sweden.

E.9 Satellite and planetary noise environment

Convener: E.K. Smith, USA.

1. Introductory comments. E.K. Smith, USA.
2. ELF/VLF noise observed beneath the ionosphere. A.C. Fraser-Smith, R.A. Helliwell, USA.
3. a) Ground-based radio observations of the Sun;
b) Space-borne observations of solar radio emissions. C.A. Dulk, USA.
4. Planetary noise with emphasis on Uranus and millimetre and submillimetre noise. S. Gulkis, USA.
5. New radio observations of planets, their satellites, and comets. W.J. Altenhoff, FRG.

6. The radio continuum cosmic noise with discussion of cosmological noise fluctuations. R. Wielebinski, FRG.
7. The spectral lines in the cosmic radio background. P. Encrenaz, France.

Commission F on RADIO PROPAGATION AND REMOTE SENSING

F.1 Remote sensing of the atmosphere

Convener: J. Goldhirsh, USA.

1. An automatic ground-based profiler of winds, temperature, and humidity. G.C. Little, USA.
2. Review of recent radar research of the atmosphere. J.P. Röttger, Sweden.
3. A strategy for measuring tropical rain from space. G.R. North, USA.
4. Recent advances in multiparameter radar for measuring precipitation. M.P.M. Hall, UK.
5. Nexrad: what is it and what will it do? D.S. Zrnić, USA.

F.2 Radio propagation effects on interference in radio-communications

Convener: M.P.M. Hall, UK.

1. Clear-air propagation aspects of interference prediction. M.P.M. Hall, UK.
2. Hydrometeor scatter aspects of interference predictions. A. Ochs, FRG.
3. Interference reduction techniques. P. Scheeren, Netherlands.
4. Aspects of hydrometeor scatter. J. Awaka, Japan; A.J. Giger, USA.
5. Effects of ground roughness in surface ducts. S.W. Marcus, Israel; L.W. Barclay, UK.

F.3 Clear-air effects on terrestrial radio communications

Convener: A.R. Webster, Canada

1. Meteorological phenomena and fading on terrestrial microwave links. J.A. Schiavone, USA.
2. Experimental microwave channel probing. M. Sylvain, France.
3. Single-frequency multipath fading and depolarization on terrestrial microwave links. R.L. Olsen, Canada.
4. Diversity and cross-polar considerations in terrestrial microwave communications systems. M. Liniger, Switzerland.
5. Tropospheric propagation effects on digital radio relay systems. R. Valentin, FRG.

F.4 Radio propagation effects in land mobile radio systems

Convener: R.W. Lorenz, FRG.

1. Statistical parameters characterising the mobile radio channel and their effects on simulation. G. Falciasecca, Italy.
2. A digital simulator for frequency-selective fading channel. K. Preuss, W. Schussler, FRG.
3. Statistical analysis of phase derivations in mobile communications; theory and experiment. J. Bach Andersen, Denmark.
4. Frequency diversity effects of frequency-hopping signals in fading channels. T. Satuwatari, M. Mizuno, Japan.
5. Land mobile satellite service: a comparison of simultaneous measurements at UHF and L-band. W.J. Vogel, J. Goldhirsh, USA.

F.5 Remote sensing of land

Convener: Å. Blomquist, Sweden.

1. Radar cross sections of rough terrain and vegetation covered terrain. E. Bahar, USA.
2. Radar measurements of soil and vegetation. Th. Le Toan, France.
3. Fine-resolution measurements of vegetation. R.K. Moore, USA.

4. Microwave remote sensing of snow and ice on land. M. Hallikainen, Finland.
5. Carabas - a new approach to SAR. H. Hellsten, Sweden.

F.6 Remote sensing of ocean

Convener: A. Guissard, Belgium.

1. Statistical description of the sea surface, with emphasis on modelisation based on the use of "internal" parameters. N.E. Huang, USA.
2. The air-sea boundary layer and in-situ measurements. R. Ezraty, France.
3. New methods for random rough surfaces scattering analysis with emphasis on the sea surface. G.S. Brown, USA.
4. Wave-wave and wave-current interaction effects in ocean remote sensing. J.F. Vesecky, USA.
5. Laboratory study of microwave reflection by swell and wind generated water surface waves. A. Lifermann, A. Ramamonjiarisoa, B. Jahne, France.
6. Considerations in SAR sensing of the ocean. R.K. Raney, Canada.

F.7 Submillimetre and optical propagation

Convener: A. Consortini, Italy.

1. Modelling atmospheric refractivity in the near-millimetre-wave range. J. Liebe, USA.
2. Submillimetre and millimetre wave scintillation in the atmosphere. R.J. Hill, S.F. Clifford, J.T. Priestley, R.A. Bollander, R.W. McMillan, USA.
3. The statistics of optical scintillation. E. Jakeman, UK.
4. Spatial coherence and imaging through the desert atmosphere. N.S. Kopeika, Israel.
5. Experimental studies of optical pulses in multiple scattering atmospheres. R.A. Elliot, USA.

Commission G on IONOSPHERIC RADIO AND PROPAGATION

G.1 Incoherent scatter studies of the ionosphere

Conveners: H. Rishbeth, UK; A. Richmond, USA.

1. Incoherent scatter principles and practice. T. Hagfors, Norway.
2. Designing incoherent scatter experiments. P.S. Williams, UK.
3. Incoherent scatter as a tool for neutral atmosphere studies. P. Bauer, France.
4. Incoherent scatter radar studies at low latitudes. R. Woodman, Peru.
5. Incoherent scatter radar studies at high latitudes. V.B. Wickwar, USA.
6. The use of incoherent scatter radar to study the thermal balance. W. Kofman, France.
7. Incoherent scatter cooperative projects in Europe. K. Schlegel, FRG.
8. Incoherent scatter progress and plans in Japan. S. Kato et al., Japan.
9. Incoherent scatter pulse coding and modulation techniques. T. Turunen, Finland.
10. Optimizing accuracy in incoherent scatter radar. R. Lehtinen, Finland.

Poster Session:

1. Conjugate measurements of electric fields. S.T. Jørgensen, Sweden.
2. Initial incoherent scatter observations of the ionosphere with the MU radar. S. Fukao et al., Japan.
3. Mid-latitude field-aligned irregularities observed with the MU VHF radar. S. Fukao et al., Japan.
4. The generation of atmospheric gravity waves (AGW) in the high-latitude ionosphere and their propagation to lower latitudes. R.D. Hunsucker et al., USA.
5. The incoherent scatter radar data base at the National Centre for Atmospheric Research. A.D. Richmond, USA.

6. Statistics of composition fits in incoherent scatter radar. M. Vallinkoski, Finland.
7. The generation and propagation of atmospheric gravity waves observed during the World-wide Atmospheric Gravity Wave Study. P.J.S. Williams, UK.
8. The incoherent scatter receiving station in the USSR. ... Tereschenko, USSR.

G.2 The high-latitude ionosphere

Conveners: T. Jones, UK; A. Wernik, Poland.

1. Ground-based and space observations of the polar ionosphere. H.C. Carlson, USA.
2. Coherent radar observations at VHF. E. Nielsen, FRG.
3. Trans-ionospheric propagation:
 - High-latitude scintillations: A review. Santimay Basu, Sunanda Basu, USA.
 - High-latitude electron content: A review. R. Leitinger, Austria.
4. Magnetometer studies. O. Raspopov, USSR.
5. Riometer and other techniques. J.K. Hargreaves, UK.

G.3 Modelling and mapping of the ionosphere

Conveners: P. Bradley, UK; B.M. Reddy, India.

1. Telecommunication requirements for ionospheric models and report on August 1986 Boulder modelling workshop. C.M. Rush, USA.
2. Mapping of ionospheric characteristics. K. Davies, USA.
3. Status and progress of the IRI and its relationship to other models. K. Rawer, FRG.
4. Dynamic ionospheric models. B.J. Watkins, S.I. Akasofu, USA.
5. Modelling the fluctuations of HF radio waves returned from the ionospheric F region. H.G. Booker, J.W. Tao, USA.
6. Daytime low-latitude ionospheric modelling. S.M. Radicella, Argentina.

7. The CCIR data bank and problems associated with HF field-strength measurements. Th. Damboldt, FRG.
8. Available models for HF radio circuit and service planning. P.A. Bradley, UK.
9. General discussion and proposals for future activities.

Poster Session:

1. IRI profiles of electron density in relation to observations in the Asian sector. Y.V. Ramanamurty, India.
2. New research opportunities with a network of digital ionosondes. B.W. Reinisch, K. Bibl, D.F. Kitrosser, J. Buchau, USA.
3. Global mapping analyses for foF2 and fNS based on ISS-b observations. N. Matuura, T. Maruyama, S. Igi, K. Aikyo, Japan.
4. TEC observation in the Asian northern mid-latitude region and its comparisons with empirical models of the ionosphere. H. Minakoshi, Japan.
5. Examination of the International Reference Ionosphere by ISS-b data. I. Iwamoto, E. Sagawa, Japan.
6. Distribution of characteristics of auroral electron precipitation fluxes. E.G. Fontheim, J.D. Winningham; USA.
7. A study of the spatial and temporal distribution of meteor trains in the 70-120 km altitude region with reference to their use for transmission of data. H.G. Muller, T.A. Lachlan-Cope, N. Mitchell, UK.
8. Electron content modelling for radar altimetry. R.P. Leigh, UK.

G.4 The low latitude ionosphere and its effects on telecommunications

Convener: S.M. Radicella, Argentina.

1. Low latitude ionosphere: unsolved problems of interest to communication systems. E.P. Szuszczewicz, USA.
2. Equatorial spread F irregularities as seen by ground-based techniques. M.A. Abdu, Brazil.

3. Recent observations of equatorial ionospheric irregularities using the Jicamarca radar. R. Woodman, Peru.
4. Techniques to obtain Faraday electron content from polarimeter data at low and middle latitudes. N. Ortiz de Adler, R. Ezquer, Argentina.
5. The ionospheric knowledge needed for present and future telecommunication applications. B.M. Reddy, India.

Poster Session:

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G.5 Ionospheric needs for telecommunication development

Conveners: J. Aarons, USA; H. Rishbeth, UK.

1. Ionospheric models and telecommunications systems needs: Future directions. Ch. Rush, USA.
2. The role of informatics in ionospheric research. V.V. Migulin, V.N. Gubankov, T.L. Gulyaeva, USSR.
3. Future paths in ionospheric studies needed for space related programmes. A. Wernik, Poland.
4. Middle atmosphere studies needed for scientific and technological development. S.A. Bowhill, USA.
5. Discussion of cooperative programmes in ionospheric radio propagation.

Commission H on WAVES IN PLASMAS

H.1 Computer analysis of plasma waves

Convener: F. Lefeuvre, France.

Invited papers:

1. 3-D ray tracing in hot plasmas. I. Kimura, Japan.
2. Satellite interferometric measurements of auroral kilometeric radiation. M. Baumbach, USA.
3. Possibilities for multi-spacecraft interferometry measurements of terrestrial radio emission. D.A. Gurnett, USA.

4. The use of bispectral analysis in space physics. D.Lagoutte, France.
5. What will happen to the WDF, if we can find it?
K. Rönmark, Sweden.

Contributed posters:

6. The use of on-board computer analysis by satellite wave receivers. M.P. Gough, L.J. Wooliscroft, UK.
7. Anomalous polarization of whistler mode signals received at Halley, Antarctica. K.H. Yearby, A.J. Smith, UK.
8. Direction finding on whistlers using the matched filter parameter (MFPE) method. Gy. Tarcsai, Hungary; J. Lichtenberger, A.J. Smith, K.H. Yearby, UK.
9. Direction findings of half-gyrofrequency VLF emissions in the off-equatorial region of the magnetosphere and their generation and propagation mechanisms. M. Hayakawa, H. Muto Japan; M Parrot, F. Lefeuvre, France.
10. The estimation of wave energy distribution of magnetospheric VLF wave in the ionosphere by ground-based multiple electro-magnetic field components. S. Shimakura, H. Suzuki, M. Hayakawa, Japan.
11. Maximum entropy methods for wave distribution functions in warm plasmas. K. Rönmark, T. Oscarsson, Sweden.
12. Direct measurements of the sense of polarization for high frequency plasma waves. F. Lefeuvre, M. Parrot, Y. Marouan, France.
13. Wave normal direction and spectral properties of whistler mode hiss observed on the DE-1 satellite. V.S. Sonwalkar, U.S. Inan, USA.

H.2 Waves in space plasmas

Convener: R.L. Dowden, New Zealand.

Invited papers:

1. Nonlinear theory of VLF sideband stability and applications to the half harmonic problem. D. Nunn, UK.
2. Ion beam instabilities generation of broadband electrostatic noise in the plasma sheet boundary layer. C.L. Grabbe, USA.

3. Solitary wave-particle interactions and excitation of collisionless plasmas. A.J. Turski, Poland.
4. Relativistic modulation of whistler waves in presence of parallel electric field. I.M.L. Das, India.
5. Polar VLF emissions observed by ISIS satellites. T. Ondoh, Japan.
6. Substorm-associated VLF emissions in the pre-midnight sector as deduced from the ground-based and ISIS satellite measurements. M. Hayakawa, Y. Tanaka, T. Okada, Japan.
7. Direction of arrival of whistlers at Sanae Antarctica. J.M. Ladwig, A.R.W. Hughes, South Africa.
8. Automatic whistler detection and dispersion logging. C.D.D. Adams, R.L. Dowden, New Zealand.

Contributed posters:

9. Hyperfine structure of whistlers recorded digitally at Halley, Antarctica. Gy Tarscai, D. Hamar, Hungary; A.J. Smith, K.H. Yearby, UK.
10. The automatic measurement of the frequency dependence of polarization of low-latitude whistlers and the mechanism of magnetospheric propagation and ionospheric transmission. K. Ohta, H. Eguchi, M. Hayakawa, Y. Tanaka, Japan.
11. A coupling of auroral kilometric radiation to auroral noise by means of the resonant particle flux. V. Fiala, Czechoslovakia; E.D. Poezd, USSR.
12. Numerical simulation of half harmonic generation in multi-sideband simple transmissions. D. Nunn, UK.
13. Excitation of electrostatic fluctuations by thermal modulation of Alfvén waves. I. Stenflo, Sweden; P.K. Shukla, M.Y. Yu, FRG.
14. VLF spectrographic group delay at Faraday. H.J. Strangeways, UK; N.R. Thomson, New Zealand.
15. VLF periodic emission observed by GEOS 1 near equatorial plane. M. Tixier,...

H.3 Wave-induced particle precipitation

Convener: U.S. Inan, USA.

Invited papers:

1. Satellite observations of WIPP phenomena in the Earth's magnetosphere. J.B. Reagan, USA.
2. Wave-induced precipitation inferred from balloon- and ground-based measurements. T.J. Rosenberg, USA.
3. Electron parallel acceleration associated with transient ULF fluctuations at substorm onsets. A. Roux, France.
4. Wave-particle interactions and pitch angle diffusion in the magnetosphere: A theoretical perspective. M. Schulz, USA.
5. Wave-induced burst particle precipitation: An overview of recent observations of Trimpf effects. U.S. Inan, USA.

Contributed papers:

6. Burst precipitation induced perturbations in VLF amplitude and phase recorded at Halley, Antarctica. A.J. Smith, P.J. Hurren, K.H. Yearby, UK.
7. Conjugate measurements of LF and VLF transmitter signals at low and middle latitudes. Y. Tanaka, M. Nishino, M. Hayakawa, Japan; K.J.W. Lynn, Australia.
8. Auroral pulsations and associated chorus. H.J. Hansen, M.J. Scourfield, South Africa.
9. Effect of parallel electric field on particle precipitation caused by frequency modulated whistler wave injection. I.M.L. Das, India.
10. Pulsars as cosmic ray particle accelerators. K.O. Thielheim, FRG.

H.4 Computer simulation on man-made and natural phenomena in space

Conveners: H. Matsumoto, Japan; M.A. Abdalla, USA.

Invited papers:

1. A gap between theory and computer simulation in space physics. C.T. Dun, FRG.

2. Computer simulations of chemical release experiments. P.A. Bernhardt, USA.
3. Ion acceleration in the magnetosphere by broad band lower hybrid waves (LHW) and electromagnetic turbulence in the ion cyclotron range of frequencies (ICRF). T. Chang, USA.
4. Interaction of shock waves and finite amplitude upstream waves: Numerical simulations. T. Hada, USA.
5. Recent development of cometary physics by MHD simulation. T. Ogino, Japan.
6. Particle acceleration by nonlinear magnetosonic waves in space plasma by computer simulation. B. Lembège, France.
7. Computer simulations of magnetosphere-ionosphere couplings. J. Kan, USA.
8. Computer modelling of ionospheric irregularities. S.L. Ossakow, USA.
9. Recent development of MHD simulations and its application to space plasma. T. Sato, Japan.
10. Theoretical guide to future computer simulations in space plasma physics. K. Papadopoulos, USA.
11. Numerical simulations of potential structures driven by current sheets. N. Singh, USA.
12. Electrostatic potential structure responsible for auroral electron acceleration. T. Yamamoto, Japan.
13. Study of wave-particle interactions in the auroral region by computer simulation. I. Roth, USA.

Contributed posters:

14. Numerical simulation of refilling of wakes of satellites. N. Singh, USA.
15. Gravitational-acoustic waves in a magnetized ionosphere. M.P.H. Weenink, Netherlands.
16. Computer ELF/VLF radiation field induced by artificial modification in the medium latitude. Zhang Xun Lie, China.
17. Numerical simulation of the mirror instability. T. Hada, USA.
18. A novel self consistent WPI simulation (VLF) on the IBM 3090 array processor. D. Nunn, UK.

Commission J on RADIO ASTRONOMY

J.1 Radio astronomy in space

Convener: R. Schilizzi, Netherlands.

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J.2 VLBI techniques

Convener: B. Anderson, UK

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J.3 Short contributions from various observatories

Conveners: V. Radhakrishnan, India; M. Morimoto, Japan;
M. Tiuri, Finland.

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J.4 Metre wave antennas and results

Convener: G. Swarup, India.

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J.5 Sub-mm wave observations

Convener: H.P. Röser, FRG.

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J.6 Data, signal and image processing

Convener: R.H. Frater, Australia.

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JS.5 Microwave metrology

Convener: A.P. Anderson, UK.

1. On the metrology of large space antennas. Y. Rahmat-Samii, USA.
2. 3-dimensional and phase retrieval techniques for reflector antenna metrology. A.P. Anderson, UK.
3. Millimetre wave holographic metrology of the IRAM 30-m millimetre radio telescope. J.W.M. Baars, D. Morris, FRG.

4. Satellite antenna testing in Europe. N.E. Jensen,
K. van't Klooster,...
5. Antenna metrology using ultrasound or millimetre waves.
C.G. Parini, K.K. Lau, J.J.B. Clarricoats, UK.

THE CORSENDONK MEETING

1. INTRODUCTION

In the Fall of 1985, a Working Group of the International Council of Scientific Unions held a meeting in Ringberg (F.R. of Germany) to meditate on ICSU's goals and future. Inspired by this example, Dr. A.P. Mitra, President of URSI, and Prof. W.E. Gordon, Past President, proposed to hold a similar meditation session within URSI. The idea was born in September 1986 and, as the meeting was to be held well ahead of the General Assembly, the time for preparation was short. It was finally decided to meet in Corsendonk (Belgium), in a scheduled environment (a former priory) on 8, 9 and 10 March 1987. The list of participants given in the Appendix shows the presence of the Board of Officers and of representatives of the nine URSI Commissions. In addition, and very importantly, there were thirteen other participants, nine of whom representing organizations outside URSI. Three other organizations (The Popov Society, UNESCO, and the European Economic Communities) had been invited, but could not send a representative.

The meeting went well, and provided abundant food for thought. Although the implementation of concrete steps requires further consideration, as it will influence URSI's policies for many years, the Board decided to produce a summary of the discussions within two weeks of the meeting. Given this very tight schedule, this could only result in a very imperfect rendition of the discussions. The present text, based on reports produced in Corsendonk itself, lacks stylistic elegance, but has the merit of establishing quick communication with the URSI community. A much more extensive report, in the form of a booklet, is being prepared by Dr. Mitra, who hopes to make it available by 15 June 1987. In the meantime comments are welcome, and will be received gratefully by the Secretariat.

The Corsendonk sessions were divided into (1) group discussions, concentrating on Geophysics-Probing and Telecommunications respectively, and (2) Plenary sessions. The reports of the group sessions are given in Sections 2 and 3.

2. REPORT OF GROUP I (Chairman: Dr. M. Petit)

This Group was concerned with the role of URSI in geophysics and probing, i.e. with the use of electromagnetic waves for these purposes. As such areas are of interest to several other organizations, the role of URSI should be defined carefully. The Group first listened to the Chairmen of the Commissions concerned with these problems.

The Chairman of Commission A on Electromagnetic Metrology thought that the situation of his Commission was satisfactory. Regarding the cooperation with other bodies, the relations with the BIPM (Bureau International des Poids et Mesures) and the CPEM (Conference on Precision Electromagnetic Measurements) are adequate. The Commission has a representative in the Executive Council of CPEM, and a scientific body will be formed, within BIPM, with representatives of the Unions concerned (IAU, IUGG and URSI), to look after the problems of TAI (Temps Atomique International), which is now the responsibility of BIPM.

Dr. Giacomo, Director of BIPM, pointed out that URSI was the main contributor for the aspects concerning the fundamental definition of electromagnetic units.

The Chairman of Commission F on Wave Propagation and Remote Sensing mentioned that, in the field of communications, the topics dealt with by the Commission were well identified. The cooperation with Study Group 5 of CCIR (Propagation in non-ionized media) is satisfactory.

Regarding remote sensing, there are two difficulties: it is a new topic for URSI, and it is dealt with also by professional societies. Nevertheless, the Commission organized four symposia on remote sensing in the last three years, and will make an effort to inform the remote sensing users of the expertise of URSI for solving some of their scientific problems, particularly in the area of equipments.

Commission G on Ionospheric Radio and Propagation and Commission H on Waves in Plasmas have to interface carefully with IAGA (the International Association of Geomagnetism and Aeronomy of the International Union of Geodesy and Geophysics). Dr. Gendrin gave a clear presentation of the problems involved.

The bodies of IAGA with which URSI has common interests

are Divisions II and III (Aeronomical Phenomena and Magnetospheric Phenomena respectively). Geophysically-oriented activities of the type:

- (1) interaction between the ionosphere and, on the one hand, the thermosphere and the mesosphere and, on the other hand, the magnetosphere and the solar wind;
- (2) spatial and temporal variations of the electron content;
- (3) auroral processes and particle precipitation,

should lie, in Dr. Gendrin's opinion, under the sole responsibility of IAGA. Would lie within the pale of URSI, physico-technical topics such as:

- (1) equipments for the study of natural ionized media, e.g. antennas (ground-based or space-borne), radar systems, signal analysis, computer simulation;
- (2) the study of the perturbations of radiocommunications and radiolocation systems by the ionosphere or the magnetosphere.

Regarding the possible merger of the two URSI Commissions, a problem under discussion since the Assembly in Washington, D.C. in 1981, no consensus could be obtained. According to a suggestion made by Prof. Dowden, Chairman of Commission H, URSI should be reorganized into "international commissions", each of which would be divided into sections. Prof. Dowden would merge Commissions G and H into an "International Commission on Waves in Space Plasmas". Such international commissions would meet at URSI General Assemblies, as well as between the Assemblies, possibly at the same time and place as sister organizations.

Dr. Rishbeth, Vice-Chairman of Commission G, thought that the "ensemble" G and H should have more extensive contacts with the other Commissions, e.g. through the organization of several joint symposia at future General Assemblies.

The Chairman of Commission J on Radio Astronomy reported that there was strong support for keeping Commission J in URSI. This is a favoured place for discussion of technical projects and developments of instruments. The scientific results are discussed in IAU (International Astronomical Union). One point of concern was that young scientists seemed more interested in presenting their results in IAU symposia, rather than in URSI.

Two new developments are likely to provide Commission J in the near future with exciting topics: a) VLBI from space (project QUASAT in ESA (European Space Agency) and project RADIO ASTRON in the USSR), which will require an appropriate liaison with COSPAR (the ICSU Committee on Space Research), and b) those aspects of optical interferometry where the approach is directly inspired by the conventional radio astronomy techniques.

While a review of geodetic measurements using the VLBI technique might be useful in one of Commission J sessions, it was not felt appropriate to open Commission J to geodesists. This does not mean that the geodetic problems encountered by VLBI are outside the scope of URSI, but Commission J would not like to lose its present identity. In the same spirit, radio astronomers attending an URSI meeting do not expect to discuss the physics of pulsars there. Hence organizing joint sessions with Commission H on plasma phenomena of astronomical interest would not be successful, since the astronomers most concerned would not be present.

Group I devoted some time to points of general interest to the Union: these are mentioned in Section 5. The Group also recommended that ad hoc 'task forces', including experts taken from outside URSI, be formed to consider in depth the role of URSI in radio geodesy, the interactions of electromagnetic waves with biological systems, and remote sensing.

3. REPORT OF GROUP II (Chairman: Prof. W.E. Gordon)

The Group was concerned with URSI's role in Communications.

Prof. Gordon started the discussion by stressing the importance of the telecommunications revolution, comparing it to the invention of the printing press. The combination of satellite links, television, fiber optics and high-speed information transmission has revolutionized communication over the past two decades, and has an enormous future potential. To put this in historical perspective, it has and will have an impact on society greater than the invention of the printing press by Gutenberg, or it is equivalent to the industrial revolution. The URSI community can feel proud that radio science has been the cradle of unprecedented progress of human society in the field of information transmission, and that it helped to provide the means for understanding between

individuals, nations and states. It is clear that society needs help in putting to good use the opportunities that the new communication offers. Organizations like URSI, IEEE (Institute of Electrical and Electronics Engineers), ITU (International Telecommunications Union) and its Committees CCIR and CCITT (International Radio Consultative Committee and International Telegraph and Telephone Consultative Committee respectively), the Popov Society must provide the guidance that society needs.

The Group made a sustained effort to predict what telecommunications in the coming decades might be. With some allowances for fixing the time schedule of the development, it was generally agreed that telecommunications in the 1990's would use digital networks with computers as elements of the network and terminal equipment. They would integrate in a compatible way voice, data and video services, and would use a combination of fibre optic cables, satellite links, microwave links in high-capacity networks. The low-capacity links would include satellite links, coaxial cables, wire lines and radio links.

Given the integrated services digital network as the backbone of the high-capacity system, the Group considered the respective roles of the relevant technical societies, agencies and industry. Collaboration of URSI with the ITU, in particular is essential if URSI wants to play a role in telecommunications. In the past, although there exists an official URSI-CCIR-CCITT Liaison Committee, collaboration has mainly been informal and occurred through individuals being simultaneously active in URSI and in CCIR. Dr. Kirby mentioned that URSI could have an official representative in the CCIR Plenary Assemblies. His task would be to "collect" questions addressed by CCIR to URSI, and to initiate action within URSI. At the present time, CCIR puts much emphasis on mobile communications, satellite communication using the geostationary orbit, and changing technology in broadcasting. The radio frequency range considered by CCIR extends up to optical frequencies. The main themes of concern are the increase of the communication capacity of limited bandwidth, and the reduction of interference.

Dr. Bigi explained that, in CCITT, much attention was paid

to local networks. The trends were toward increased complexity, with Integrated Services Digital Network (ISDN) and optical fibres as major ingredients.

Mr. Bartholomé pointed out that future networks of the ISDN type will not be based exclusively on optical fibre systems. In some areas satellites will remain the adequate solution.

Prof. Gordon then asked the Commission Chairmen to define the role of their Commissions in studies related to future communications.

The Chairman of Commission F on Wave Propagation and Remote Sensing mentioned that his Commission had studied, and will continue to study, the propagation effects relevant to microwave links (use of higher frequencies and wider bandwidths, multipath effects), the exploitation of satellite links, interference between services, and mobile communications

The Chairmen of Commission C on Signals and Systems and Commission D on Electronic and Optical Devices and Applications realized that their groups carried a major weight in the increased emphasis which URSI must put on telecommunications. Commission D, in particular, will continue services to the other URSI Commissions by reviewing the new developments and technological trends. Given its interface with Professional Societies, the Commission believes that it should concentrate on specialized workshops and Tutorial Conferences suitable, for example, for scientists from developing countries.

Commission E on Electromagnetic Noise and Interference has an extensive list of study topics, and feels that it functions well. The same is true for Commission B on Fields and Waves.

The conclusion was that the inputs of the Commissions will be crucial for URSI's contribution to the communication revolution. The scope and operations of all the Commissions should be re-examined, and in particular those of Commissions C and D. The Commissions are challenged (1) to deal with higher frequencies, broader bandwidths, more crowded spectrum and increased interference, (2) to consider transmission media for radio and optical signals, hardware and software for the

network and terminal devices, (3) to anticipate and develop the scientific basis for the technology in information systems.

4. SOME EXTERNAL ACTIVITIES OF URSI

In a session chaired by Dr. Mitra, some "social" aspects of URSI's activities were discussed. Dr. Mitra first presented URSI's programme of supporting radio science in developing countries through symposia, special training courses, free distribution of publications and, most importantly, attendance of Young Scientists at URSI General Assemblies and sponsored meetings. These activities are still in their early stages, but progress is satisfactory. A few publications are on their way: a "Handbook of Radio Propagation in Tropical Countries", a new "Directory of Radio Scientists in Developing Countries", to be prepared with the help of TWAS (Third World Academy of Sciences), and a "Directory of Calibration Facilities in the Asia Pacific Region". This general area is one where URSI has a unique and important role to play. Typical problems were described by Dr. Dalafi, who said that the priority in the promotion of research in developing countries was to create a base by educating scientists. Spontaneous generation of scientists in these countries was difficult, because Universities were not in contact with advanced industrial research. Courses like those organized by the ICTP (International Centre for Theoretical Physics) and the TWAS, and fellowships in laboratories of developed countries, were of paramount importance.

The activities of the ICTP are extremely impressive. The Centre, generously supported by the International Atomic Energy Commission, UNESCO and the Italian Government, is visited by thousands of scientists every year, mostly students. They attend colleges (duration: about 1 month), workshops, short conferences, round table discussions..., in the disciplines of applied and experimental physics, physics teaching and mathematics. The activities of the TWAS, also located in Trieste, concentrate on South-South collaboration. It is imperative that URSI establish solid contacts with the Trieste group. Immediate steps should be in the areas of Young Scientists, publications, books, obtention of equipment in good working condition for developing countries. In a longer term perspective, a course on "Telecommunications science and its future" could be organized in Trieste in a few

years, as a cooperative effort of URSI and the ICTP.

The Secretary General gave a summary of the contacts of URSI with UNESCO, which happen through the offices of Dr. Kaddoura (Directorate for Science) and Mr. Ondobo (IPDC - International Programme for the Development of Communication). Support has been obtained for e.g. Young Scientists attendance at the General Assembly in Tel Aviv, and the publication of the "Handbook on Radio Propagation". The contacts are quite satisfactory.

ICSU (International Council of Scientific Unions) has been concerned for a long time with the ENUWAR programme (Environmental Consequences of Nuclear War). URSI has contributed, through a working group chaired by Mr. Wik, an extremely well received report on the effects of nuclear explosions on telecommunication systems. Mr. Wik gave a presentation of the results of the ENUWAR study, not only concerning the Electromagnetic Pulse, but in a more general perspective, including consequences such as the Nuclear Winter. The conclusion was that URSI should remain alert to possible contributions to problems of such fundamental societal importance. Two such projects are the ICSU Programme on Global Change, which will run for the rest of this century, and the celebration of the International Space Year in 1992. Prof. Gordon outlined the purpose of these efforts, to which URSI should certainly contribute. These two projects, which it would be too long to discuss here, will remain on URSI's agenda for quite a few years.

5. SOME POINTS OF GENERAL INTEREST

(a) The publications of the Union

A few participants suggested that URSI should have a Newsletter. This requires a serious analysis in terms of cost, distribution, sustained interest and availability of a devoted Editor. A failure must be avoided at all cost.

Suggestions were also made concerning URSI's major publication, the "Review of Radio Science" (RRS). Group I felt that the whole procedure for the preparation of the Review should be reconsidered. It was suggested that each Commission should subdivide its field into topics, which could be covered by a

single person having the necessary expert knowledge to write a critical review of the topic. However, the question of the mechanism for collecting the information deserves further investigation. The RRS represents an enormous human effort, and quite a few scientists involved in its production feel that its distribution is too restricted, and should be organized on a world-wide basis.

The possibility of extending URSI's publication efforts to include own periodicals was mentioned. Such an operation has obvious implications in terms of the size of the Secretariat. The participants noted with interest that the URSI Committee in Czechoslovakia was considering the publication of a Journal on "Signals, Systems and Electronics" under the URSI umbrella.

(b) Membership of the Union

It was proposed to create individual membership to strengthen the interest of the Radio community in URSI. The modalities (selection, possible fees, administration, voting rights, scientific benefits) will obviously have to be investigated carefully. The possibility of creating some sort of "industrial affiliate membership", reserved for industrial firms, was also discussed. Finally, the efficiency of the present set up based on Official Members of Commissions in the various Member Committees, was put in doubt by several participants. Some delegates suggested an alternate method, whereby the Commission Chairman would be supported by representatives selected on the level of the Commission, and not of the Member Committee.

(c) The name of the Union

This is a recurrent problem, as the word "radio" does not seem to describe adequately the activities of URSI in the eyes of most Communications people. There was a general consensus that the logo should be kept, but that the official name might contain words such as electronics, communications science, telecommunications. A few proposals: International Union of Electromagnetic and Information Sciences; International Union of Electromagnetic and Communication Sciences; International Scientific Union of Radio and Electronics; International Union of Radio and Communication Science.

(d) Working Groups

Working Groups should be formed (or maintained) only in cases where a specific task has to be fulfilled. They should not be created on the sole basis of a given scientific topic. Working Groups of restricted size may be formed to organize a well defined meeting.

(e) General Assemblies

Suggestions for topics for Open Symposia should be made by the Commissions, if possible at the end of the previous Assembly. Activities involving several Commissions should be preferred, and Commissions should be encouraged to select such areas.

The lead time for submitting papers (10 months) should be reduced, possibly to 5 months. It was felt that, in general, guidelines should be issued setting the whole procedure. Dr. Bauer, as Chairman of the Steering Group for the coordination of the scientific programme, should be asked to write a first draft of rules for consideration by the Commission Chairmen and the Board.

6. FINAL REMARKS

Notwithstanding the sketchy and imperfect nature of the preceding pages, a few conclusions can already be drawn, namely

- that URSI should reorient itself strongly towards tele-communications, as already proposed in 1975 (such a move cannot be delayed);
- that URSI must keep its unique international and inter-disciplinary character;
- that URSI should pursue, and increase, its efforts in the areas of developing countries and collaboration with CCIR and CCITT;
- that the perception of URSI outside the Union tends to be limited and in some cases inaccurate, hence efforts to correct the image of the Union are a must;
- that URSI's vocation in the "probing and geophysics" area is mostly in the area of equipment and systems;

- that the expansion of URSI's efforts and services will require a parallel expansion of its financial resources.

26 March 1987

J.V.B.

Appendix

LIST OF PARTICIPANTS

Dr. A.P. Mitra, President URSI
Prof. W.E. Gordon, Past President URSI
Dr. H.J. Albrecht, Vice-President and Treasurer URSI
Prof. A.L. Cullen, Vice-President URSI
Prof. S. Okamura, Vice-President URSI
Prof. V. Zima, Vice-President URSI
Prof. S. Hahn, Chairman URSI Commission A
Prof. J. Bach Andersen, Chairman URSI Commission B
Prof. K. Géher, Chairman URSI Commission C
Prof. W.A. Gambling, Chairman URSI Commission D
Prof. F.L. Stumpers, Chairman URSI Commission E
Prof. F. Fedi, Chairman URSI Commission F
Dr. H. Rishbeth, Vice-Chairman URSI Commission G
Prof. R.L. Dowden, Chairman URSI Commission H
Dr. R. Wielebinski, Chairman URSI Commission J
Dr. P. Bauer, Chairman Steering Group for Coordination
of URSI Scientific Programme
Dr. M. Petit, Chairman Standing Finance Committee
Mr. M. Wik, Chairman URSI Panel on ENUWAR
Mr. P. Bartholomé, representing the European Space Agency
Dr. F. Bigi, representing the International Telegraph and
Telephone Consultative Committee
Mr. C. Bremenson, representing ALCATEL
Dr. H.R. Dalafi, representing the Third World Academy of
Sciences
Dr. R. Gendrin, Vice-President of the International
Association of Geomagnetism and Aeronomy
Dr. P. Giacomo, Director of the Bureau International des
 Poids et Mesures
Dr. R.C. Kirby, Director of the International Radio
Consultative Committee

Dr. G.A. Thiele, Director of Division IV (Electromagnetics
and Radiation) of the Institute of Electrical and
Electronics Engineers

Prof. J. Van Bladel, Secretary General URSI

Prof. P. Delogne, Assistant Secretary General URSI

Mrs Y. Stevanovitch, Executive Secretary URSI.

URSI ACCOUNTS

In accordance with the recommendations of the URSI Standing Finance Committee, the practice of publishing the accounts of the Union annually in the *URSI Information Bulletin* is being continued.

The Balance Sheet and the Income and Expenditure Accounts of URSI for the year ended 31 December 1986 are reproduced below. The original accounts have been audited by Van Poyer & Co, Réviseurs d'Entreprises, Brussels.

The assets held in Belgian francs have been converted to US dollars using the UNESCO exchange rate valid at 31 December 1986 (\$1 = 42 BF).

INTERNATIONAL UNION OF RADIO SCIENCE (U.R.S.I.)

BALANCE SHEET : 31 DECEMBRE 1986

ASSETS

	\$	\$
<u>Dollars</u>		
551000 - Banque Degroof (restricted)	857,26	
551400 - Bank of America	32.240,81	
	-----	33.098,07
<u>Belgian Francs</u>		
550100 - Banque Degroof	22.998,83	
550200 - Société Générale de Banque	620,95	
	-----	23.619,78
<u>Investments :</u>		
551300 - Merrill lynch (1)	54.361,45	
551301 - Merrill Lynch (2)	41.661,09	
512100 - Philip Morris shares	17.721,79	
512101 - Demeter Sicav shares	17.367,43	
512102 - Rorento Units	160.588,12	
512100 - Merrill Lynch Shares	110.000,00	
513000 - Bank Deposit	35.714,29	
	-----	437.414,17
<u>Petty Cash and Stamps :</u>		
570100 - Petty Cash	107,62	
570200 - Stamps	290,64	
	-----	398,26
<u>Sundry Debtors</u>		
286000 - Deposit RTF	292,86	
427050 - Merrill Lynch Federal Tax	10.000,00	
490000 - URSI Ties Fund	1.588,25	
	-----	11.881,11
Total Assets		506.411,39
		=====
<u>Less creditors</u>		
427010 - IUCAF (*)	4.830,06	
427030 - IUWDS (*)	2.700,91	
	-----	7.530,97
489300 - Pension Fund	6.658,57	
427000 - Balth van der Pol Medal Fund (*)	11.239,07	
427040 - Yearly Auditing	1.190,48	
	-----	19.088,12
NET TOTAL OF URSI ASSETS		479.792,30
		=====

INTERNATIONAL UNION OF RADIO SCIENCE (U.R.S.I.)

BALANCE SHEET : 31 DECEMBRE 1986

The net URSI Assets are represented by \$ \$

Allocated Reserve Fund :

120000 - General	25.000,00	
121000 - Closure of Secretariat	87.851,30	

		112.851,30

Scientific Activities Fund :

489000 - Scientific Activities in 1987	35.300,00	
427020 - Young scientists in 1987	8.000,00	

		43.300,00

XXII General Assembly Fund :

489201 - Scientific	58.300,00	
489202 - Organization	33.000,00	
489100 - Unallocated Reserve Fund	232.341,00	

		479.792,30
		=====

INTERNATIONAL UNION OF RADIO SCIENCE (U.R.S.I.)

BALANCE SHEET : 31 DECEMBRE 1986

Income and Expenditure Account ended 31 December 1986

INCOME :	\$	\$
700000 - Sale of publications		557,45
740000 - Contributions from Member Committees		141.198,71
740100 - Allocations :		
- from T.W. Academy	3.000,00	
- from Belgian Ministry of Education	3.571,43	
- from UNESCO (Radio Handbook)	9.428,57	
- from ICSU	21.733,00	
- from R.S. of London (Y. Sc.)	1.488,10	

		39.221,10
<u>Interest and dividends (net)</u>		
754000 - Belgian francs	1.794,64	
754100 - US Dollars	15.876,40	

		17.671,04

Total income		<u>198.648,30</u>

EXPENDITURE :

Scientific Activities :

601500 - Meetings, Symposia, etc...		
- Infrared and Millimeter Waves	500,00	
- Solar Maximum Analysis	1.000,00	
- CPEM	2.088,00	
- Asia-Pacific Microwaves	8.000,00	
- EMC	1.500,00	
- Beacon Satellite	2.653,36	
- COSPAR RS	677,81	
- EGS	1.000,00	
- Ionospheric Modeling	1.000,00	
- EMT	3.000,00	
- Microwaves Signatures	2.500,00	
- Ionospheric Modifications	1.500,00	
(including \$ 7.000,00 Young Scientists)	-----	
		25.419,17
615000 - Meeting of board		6.232,95
615112 - Coordinating Committee		8.932,33
602300 - Printing URSI Bull, nb 235 to 238		9.523,33

INTERNATIONAL UNION OF RADIO SCIENCE (U.R.S.I.)

BALANCE SHEET : 31 DECEMBRE 1986

Income and Expenditure Account ended 31 December 1986

EXPENDITURE (suite)	\$	\$
601600 - Subventions :		
- IUCAF	1.250,00	
- SCOSTEP	1.000,00	
- FAGS 1985 & 1986	4.000,00	
	-----	6.250,00
602000 - XXII Assy - Scientif.		393,51
602010 - XXII Assy - Admin.		580,99
615111 - Scientific travel		7.604,69
615113 - Representation of URSI		5.022,17
615114 - Radio Handbook		5.937,84

Total Expenditure : Scientific Activities		75.896,98
<u>Administration :</u>		
620201 - Salaries and social security		60.245,50
Office Expenses :		
610000 - Rent, light, Heating	2.857,14	
612400 - Stationery, Office Supplies	1.247,60	
612510 - Postage	3.256,62	
612520 - Phone	1.608,14	
613000 - Social and accounting fees	6.479,81	
613350 - Bank charges	1.854,12	
613500 - Insurances	1.143,83	
615100 - Entertainment	375,14	
615101 - Miscellaneous	693,88	
615110 - Administrative Travel	4.462,07	
	-----	23.978,35
Total Expenditure : Administration		84.223,85
613900 - I.C.S.U dues for 1985 and 1986		7.595,55
756000 - Difference of Exchange		(6.003,58)

Total Expenditure		161.712,80
Excess of Income over Expenditure		35.935,50

		<u>198.648,30</u>

INTERNATIONAL UNION OF RADIO SCIENCE (U.R.S.I.)

BALANCE SHEET : 31 DECEMBRE 1986

Balance in hand on 1 january 1986	407.666,24
Gain on appreciation of Belgian franc	35.190,56

Revised balance on 1 january 1986	442.856,80
Excess of income over expenditure	36.935,50

Balance in hand on 31 December 1986	479.792,30
	=====

Rates of exchange :

1 january 1986 : \$ 1 = 51,00 BF

31 december 1986 : \$ 1 = 42,00 BF

Observation :

The accounts indicated with (*) are constituted by :

- 40% in RORENTO UNITS,
- 60 % in US \$.

Appreciation in value of investments on 31 december 1986 :

- RORENTO UNITS :	222.229,29
- DEMETER SICAV SHARES :	18.291,43
- PHILIP MORRIS SHARES :	18.572,50

INTERNATIONAL SYMPOSIUM ON LARGE-SCALE PROCESSES
IN THE IONOSPHERIC-THERMOSPHERIC SYSTEM

NCAR, Boulder CO, 2-5 December 1986

I was the URSI representative on the Programme Committee of this Symposium, which was ably organized by A.D. Richmond of NCAR and V.B. Wickwar of SRI. The Symposium was held to publicize the newly-commissioned NCAR Incoherent Scatter Radar Database, which holds a selection of data acquired by several incoherent scatter radios in the Americas and in Europe during the last twenty years. The database is managed by R. Barnes, who provided on-line demonstrations, under the direction of A.D. Richmond. Papers are to be published in a special issue of Annales Geophysicae. The great interest shown by the scientific community, coupled with the convenient juxtaposition with the AGU Fall Meeting, ensured a busy programme and good attendance. The particularly well-produced and informative programme booklet listed 75 oral papers, 30 poster papers, and 97 participants from 10 countries (there were only a few missing participants and cancelled papers). The programme included several reviews and many contributed papers on radar, optical and spacecraft techniques. It covered well the up-to-date science and the status of current and future international programmes. Poster session was held during the afternoon refreshment breaks. A useful open meeting of the URSI Incoherent Scatter Working Group, chaired by V.B. Wickwar, took place during the Symposium. The only regret was that the heavy programme tended to curtail discussion. Grateful thanks are due to NCAR, and in particular to A.D. Richmond and K. Drake for their organization of this event, which amply fulfilled the objectives. I hope that URSI will continue to sponsor such events.

Henry RISHBETH
Vice-Chairman,
URSI Commission G

SYMPOSIUM ON MICROWAVE SIGNATURES IN REMOTE SENSING, MSRS 87

An International Symposium on Microwave Signatures in Remote Sensing, MSRS 87, was held from 19 to 22 January 1987 at Chalmers University of Technology, Göteborg, Sweden. The Symposium was organized by the Swedish URSI Committee and was jointly sponsored by the International Union of Radio Science (URSI), the Swedish Board for Space Activities, the Swedish Defence Research Institute and Chalmers University of Technology.

This Symposium was the fourth in a series of meetings (Berne, Switzerland (1974), Lawrence, Kansas, USA (1981) and Toulouse, France (1984)) and it was intended for specialists working with theoretical or experimental aspects of radar backscatter and microwave emission from the surface of the earth, including oceans, ice and land.

There were about 90 participants from 16 countries, and about 60 papers were presented.

The focus was on scientific aspects of the microwave interaction with water, ice, snow, ground surfaces and vegetation, and its implications for the interpretation of results from passive and active earth sensing systems. Papers dealing with active radio systems for observation of sea, ice and snow had been considered of special interest. The importance of this subject area grows as ERS-1 and other radar satellites approach.

The programme was arranged to cover topics in the following fields:

- Systems and radar altimetry
- Ocean
- Interaction and modelling
- Vegetation
- Snow and ice
- Solid ground
- New methods.

The contributions to the Symposium clearly indicate that microwave remote sensing has a large potential in many fields of application. However, the interaction between microwaves and remote sensing objects is complicated, and in most of the

papers, the need was pointed out for further research in order to provide for a more efficient use of future microwave remote sensing systems.

Abstracts of the papers presented are contained in the abstracts volume of MSRS 87, International Symposium on Microwave Signatures in Remote Sensing.

The need for international exchange of information among experts in this subject area is increasing and it is the hope of the organizers that this Symposium will stimulate further conference activities in the series of URSI Commission F meetings on remote sensing.

°
Ake Blomquist

Folke Eklund

ANNOUNCEMENTS OF MEETINGS AND SYMPOSIA

INTERNATIONAL WORKSHOP ON IONOSPHERIC INFORMATICS

The International Workshop on Ionospheric Informatics will be held in Novgorod, USSR, from 25 to 29 May 1987. It is being sponsored by URSI, co-sponsored by COSPAR and organized by the Academy of Sciences of the USSR.

The Second Circular for this Workshop lists the following invited papers:

- Synthesis of ionospheric electron density profiles with Epstein function, K. Rawer
- Task-oriented computerized system for vertical-incidence sounding ionograms reduction, G.M. Emelianov
- Real time electron density profiles from ionograms, B.W. Reinisch, R.R. Gamache, Wong Shakim and L.McNamara
- Review of incoherent scatter radar information (speaker to be nominated by URSI Commission G)
- Incoherent scatter method contribution into ionospheric informatics, V.I. Taran
- Transionospheric sounding - recent achievement in the information system of the ionosphere radio sounding, N.P. Danilkin, V.V. Migulin, Yu.V. Kushnerevsky, I.I. Ivanov
- Data bank of the ionosphere satellite ISS-b measurements, N. Matuura
- Solar and aeronomical controlling parameters determining state of the ionosphere, G.S. Ivanov-Kholodny
- Use of orthogonal polynomials for correlating F-region parameters with sunspot numbers for prediction purposes, U.C. Upreti, S. Aggarwal, M.M. Gupta, B.M. Reddy
- Expansion of fields of the ionospheric characteristics by natural orthogonal functions, N.I. Dvinskikh
- Experimental data on electron density and temperature at heights below 200 km and their synopsis in the computer-accessible empirical ionospheric model, Yu.K. Chasovitin
- Natural versus man-made ionospheric disturbances, J.A. Klobuchar and M. Mendillo
- Ionospheric models of second generation - current state and prospect, V.N. Polyakov.

A number of contributed papers have already been received by the Programme Committee.

The Proceedings of the Workshop will be published in the COSPAR Journal "Advances in Space Research" by Pergamon Press.

For further information, contact

Dr. T.L. Gulyaeva
IZMIRAN
142092 Troitsk
Moscow Region, USSR.
Telephone: 232-19-21
Telex: 412623 SCSTP SU

WORLD IONOSPHERE-THERMOSPHERE STUDY (WITS) WORKSHOP

Vancouver, Canada, 15 August 1987

Scientific Objectives of WITS

The aim of WITS is to study the energetics, dynamics and chemistry of the various neutral and ionized species in the region of the atmosphere between approximately 100 km to 1000 km and their couplings to upper and lower regions of the atmosphere. The goal is toward developing a global instructive model of the physical and chemical processes in the ionosphere-thermosphere including wide ranges of spatial and temporal scales.

The following major areas of activity can be anticipated:

Global Ionosphere-Thermosphere Dynamics

Under this heading come many inter-related studies including inputs of energy from the sun (via EUV radiation), from the solar wind (via polar electrodynamic processes), from the magnetosphere generally (by energetic particles), from the lower atmosphere (via tides, planetary scale and acoustic gravity waves), and from meteorites. Also included are the dynamic and aeronomical interactions between ionized and neutral species in the region. These studies should incorporate the asymmetries of the geomagnetic field vis a vis the asymmetries of the thermosphere and atmosphere generally.

Ionospheric Irregularities

Ionospheric inhomogeneities are created in a wide range of temporal and spatial scales. These include field-aligned irregularities in equatorial and polar regions, irregularities caused by acoustic gravity waves (e.g. TIDs), hydromagnetic waves and a variety of plasma instabilities. The source of energy and the conditions and mechanisms of formation and their differing manifestations in different parts of the globe need further elucidation.

It is important to note that WITS provides opportunities for participation at different technological levels for all countries of the world. Many WITS projects can be accomplished only with performance of experiments in developing countries. This applies particularly to equatorial and Southern Hemisphere regions.

We envisage that the goals of WITS will be best achieved by specified well-focused projects conducted in well-planned multi-technique campaigns followed by workshops of various kinds.

Scope of the Workshop

The purpose of the Workshop is to identify outstanding problems and to plan for new WITS projects. There will be invited review papers, reports of on-going projects, and contributed idea papers for new projects. A panel discussion session will follow the presentations. During the Workshop, Working Groups will be formed to formulate recommendations. Two additional evening sessions will be held in the week following the Workshop to discuss these recommendations. (Tentative time: 18 and 20 August evenings).

Submission of Abstracts

Brief abstracts for idea papers for new WITS projects should be submitted to:

Prof. C.H. Liu
Department of Electrical and Computer Eng.
University of Illinois
1406 W.Green Street
Urbana, IL 61801, USA.

The deadline for submission is 15 April 1987.

Information about the Current Status of WITS

At its July 1986 meeting in Toulouse, France, the Council of SCOSTEP approved World Ionosphere-Thermosphere Study as one of its future programmes. The formal implementation of the Programme is expected by July 1987 when the intensive observational period of WITS is scheduled to begin. Meanwhile, the Steering Committee of WITS has been established with the following membership:

K.D. Cole and C.H. Liu, Co-Chairmen
H. Carlson, G.S. Ivanov-Kholodny, S. Kato, A.P. Mitra,
and J. Rottger.

Currently, three projects have been proposed as possible WITS projects. They are:

- Global Ionosphere-Thermosphere Coupling and Dynamics (GITCAD), Coordinators: M.A. Biondi, R.W. Smith, V. Wickwar
- Lower Thermosphere Coupling Study (LTCS), Coordinator: J. Forbes
- World Acoustic-Gravity Wave Studies (WAGS), Coordinators: P. Argo, R. Hunsucker.

17th EUROPEAN MICROWAVE CONFERENCE

The 17th European Microwave Conference will be held at the Ergife Palace Hotel in Rome, Italy, from 7 to 10 September 1987. It is supported by the Fondazione "Ugo Bordonni", in co-operation with IEE, EUREL, IMPI, URSI and IEEE.

A Workshop dealing with "Present and future terrestrial and satellite microwave communications for fixed and mobile services" is planned for 11 September.

The Chairman of the Technical Programme Committee is Dr. F. Fedi, Director of the Fondazione "Ugo Bordonni" and

Chairman of URSI Commission F on Wave Propagation and Remote Sensing.

All areas of microwaves will be considered. Special emphasis will be placed on the advanced applications of:

- Radiocommunication Terrestrial Systems
- Communication Satellite Systems
- Radar
- Remote Sensing
- Mobile Radio Systems
- New Technologies.

The Management Committee will award an EuMC Microwave Prize of S.F. 1000 to the author(s) presenting the best paper at the Conference.

For further information, contact:

Microwave Exhibitions and Publishers Ltd
90 Calverley Road
Tunbridge Wells
Kent TN1 2UN
United Kingdom.

THE IMPACT OF VLBI ON ASTROPHYSICS AND GEOPHYSICS

IAU Symposium No 129

This Symposium will be held from 10 to 15 May 1987 in Cambridge, Massachusetts, USA. The Chairman of the Scientific Organizing Committee is Dr. J. Moran.

The scientific programme of the Symposium will cover all aspects of VLBI research. In particular, the impact of VLBI on the fields of astrometry and geodesy, which do not appear explicitly in the title of the symposium, will be a major focus of the conference. The topics to be discussed include the following:

I. Extragalactic Sources

Superluminal motions; jets; active galactic nuclei; polarization measurements; normal galaxies; low-frequency variables; gravitational lenses; surveys.

II. Galactic Sources

Masers; stars and x-ray objects; pulsars; interstellar scattering; galactic center.

III. Astrometry and Distance Measurements

Supernovae as distance indicators; masers as distance indicators; reference frames; solar system measurements; relativistic effects; catalogues.

IV. Geodesy and Geophysics

Universal time; polar motion; nutation; regional crustal motions; continental drift; worldwide coordination of geophysical VLBI.

V. Instrumentation and Techniques

New arrays; processors; atmospheric propagation; millimetre wavelength VLBI; TDRSS experiments; data analysis and image enhancement.

VI. Future Instrumentation

RADIOASTRON; QUASAT; Japanese Space VLBI; Low-Frequency Space Array.

The symposium will consist of invited review talks and contributed papers, which will be presented in either oral or poster sessions. There will be an oral summary of the poster papers.

Information concerning the meeting organization can be obtained by contacting the Chairman of the Scientific Organizing Committee or the Chairman of the Local Organizing Committee:

James M. Moran, SOC Chair
Tel: 617/495-7477

Mark J. Reid, LOC Chair
Tel: 617/495-7470

Harvard-Smithsonian Center for Astrophysics
60 Garden Street
Mail Stop 42
Cambridge, MA 02138
USA.

INTERNATIONAL URSIGRAM AND WORLD DAYS SERVICE

REPORT FOR 1986

1. INTRODUCTION

According to its terms of reference, the International Ursigram and World Days Service (IUWDS) is a permanent service of URSI, IAU and IUGG which "aims to provide information rapidly to the world scientific community to assist in the planning, coordination and conduct of scientific work in relevant disciplines".

Two basic mechanisms have been selected to accomplish this programme. Firstly, IUWDS 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. 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 programmes are very flexible and can be adjusted to fit the needs of the scientific community.

In addition, on behalf of COSPAR, each month IUWDS summarizes the status of satellite circulation 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.

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: Boulder (USA), Darmstadt (FRG), Moscow (USSR), Paris (France), New Delhi (India), Prague (Czechoslovakia), 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 data come from observatories operated directly by the Regional Warning Centre. In many cases, they are gathered from regional scientific institutes and universities. The data accessible by IUWDS are very diverse and much is highly regarded by the scientific community. The types of data include: spectroheliograms and filtergrams; observations of magnetic field structures on the sun; quiet sun emission from radio to X-ray wavelengths; reports of flares observed by a wide variety of methods; solar radio and X-ray bursts; the flux of solar particles recorded by satellites, by riometers in the polar cap and by neutron monitors; geomagnetic activity as measured by 3-hourly K indices and by reports of sudden storm commencements; ionospheric data giving critical frequencies of the F and E layers; and cosmic ray data and reports of Forbush decreases.

These data and reports (about 150 data sets from around 100 Institutes or Observatories) are coded according to the IUWDS code book and distributed daily, on request to users and currently to other RWCs. Data exchange is generally via a daily, or more frequent, telex message. In the last few years, new modes of communication have developed. Some of these such as electronic mail and facsimile transmission will be incorporated into IUWDS data exchange as appropriate.

The present schedule of interchange messages between RWCs is illustrated in Figure 1.

Information transmitted through the IUWDS network is analyzed by Regional Warning Centres which produce a number of "summary" reports and forecasts. A particular important one of these is the "Geoalert" - a forecast of solar-geophysical conditions for the next few days. Each RWC prepares its forecast ("Geoalert") and these are sent each day to the World Warning Agency (Boulder) which issues a daily Geoalert. This is distributed all around the world daily at 0300 UT through the IUWDS network and through the WMO (World Meteorological Organization) network. Many RWCs also relay the WWA Geoalert to users within their region.

In addition the IUWDS network is used for the prompt distribution of the preliminary values of the International Sunspot Number which is prepared monthly at the Uccle Observatory. IUWDS also relays the geomagnetic "aa" indices which are computed each week at Meudon from two antipodal stations. IUWDS also contributes by supplying the Uccle Observatory and

the "Institut de Physique du Globe" (Paris) with some of the raw data reports which are required for the preparation of the various indices.

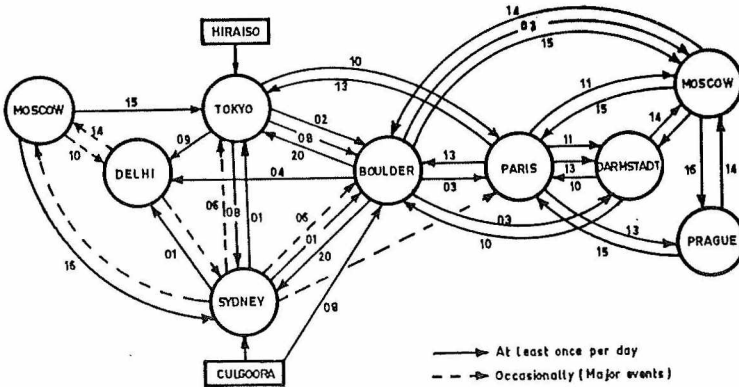


Figure 1 : Daily Schedule of Interchange Messages between RWCs

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. Approximately 600 copies are produced.

The *Geoalerts* and the abbreviated Calendar records are published monthly in "Solar and Geophysical Data" which is distributed to 2000 users.

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 Geoalert or Abbreviated Records. 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 IUWDS code booklet is updated and reprinted occasio-

nally. The last edition was made in 1973 at a cost of US\$3000. This has been followed by several partial updatings made at very low cost.

4. IUWDS ACTIVITIES DURING 1986

IUWDS held a meeting of its steering committee during the July COSPAR/SCOSTEP Congress in Toulouse, France. One of the important functions of the meeting was to select a new Chairman of IUWDS to replace Dr. Paul Simon who has retired. Dr. Simon served as IUWDS Chairman for many years and the organisation is deeply indebted to him for efforts on its behalf. The steering committee selected Dr. Richard Thompson as its new Chairman. Dr. Thompson is the head of the IUWDS Regional Warning Centre at IPS Radio and Space Services in Sydney, Australia.

The Steering Committee meeting also included a discussion of the recent developments at each of the Regional Warning Centres. The common theme of these developments was the upgrading of the communications between centres and their users. This involves the introduction of new communications technology such as electronic mail and facsimile. A number of centres have also automated the distribution of their data through the telex system. Also, the use of IUWDS codes has been improved by the development of computer-based decoding programmes. The centre at Boulder has introduced a new data transmission system called SELDADS II. This system allows their users to obtain access to data in many ways including via a satellite.

The meeting discussed and adopted a number of new codes. These codes were made necessary by the availability of new kinds of data or by improvements in the understanding of the solar phenomena which influence the sun-earth environment. The need for a general update of the IUWDS codebook was also discussed by the meeting. In particular, it was decided that the codes should be structured to be decodable by computer with greater efficiency.

The Steering Committee decided that another STP Workshop should be held in 1989 in Sydney, Australia. This workshop follows the very successful predictions workshops in Boulder (1979) and Meudon (1984).

The printing of the "Proceedings" from the 1984 Meudon

STP Workshop is being coordinated by the Boulder RWC. These should be available towards the end of 1986 or early in 1987.

The present list of IUWDS officers and representatives is as follows:

IUWDS Steering Committee and Directing Board

Chairman:	R. Thompson	RWC Sydney
IUWDS Secretary/ Secretary for Ursigrams:	G. Heckman	WWA Boulder
IAU Representative:	E.A. Tandberg-Hanssen	NASA/MSFC
IUGG Representative/ Secretary for World Days:	H. Coffey	NOAA Boulder
URSI Representative:	L.McNamara	Andrew Antennae, Adelaide
D. Cole	RWC Sydney	
J. Hirman	WWA Boulder	
S.I. Avdiushin	RWC Moscow	
A.D. Danilov	RWC Moscow	
N. Matuura	RWC Tokyo	
H. Mori	RWC Tokyo	
Th. Damboldt	RWC Darmstadt	
Z. Klos	ARWC Warsaw	
P. Triska	ARWC Prague	
B.M. Reddy	ARWC New Delhi	
J. Vette	WDC-A Rockets and Satellites	
P. Lantos	RWC Paris.	

R. Thompson
Sydney Regional Warning Centre
IPS Radio and Space Services
PO Box 702
Darlinghurst 2010
Australia.

December 1986

LIST OF URSI OFFICERS AND OFFICERS OF MEMBER
COMMITTEES: AMENDMENTS

1. Member Committees

CANADA

President: Prof. P.H. Wittke, Department of Electrical
Engineering, Queen's University, Kingston,
Ontario K7L 3N6, Canada.

GERMAN D.R.

President: Prof. Dr. habil. C.-U. Wagner, Zentralinstitut
für Astrophysik, Rosa-Luxemburgstrasse 17a,
Potsdam, GDR 1590.

FRANCE

President: Prof. B. Picinbono, Laboratoire des Signaux et
Systèmes, Ecole supérieure d'électricité,
Plateau du Moulon, F-91190 Gif-sur-Yvette,
France.

ISRAEL:

Secretary: Dr. J. Politch, POB 2250, Haifa 31021, Israel.

2. URSI Commissions

Commission B on Fields and Waves

Israel: Dr. E. Heyman, Faculty of Engineering, Tel Aviv
University, Ramat-Aviv, Tel Aviv, Israel.

Commission E on Electromagnetic Noise and Interference

Canada: Prof. T.J. Pavlasek, Department of Electrical
Engineering, McGill University, Montreal, Quebec,
Canada.

Commission F on Wave Propagation and Remote Sensing

Canada: Dr. J.F.R. Gower, Institute of Ocean Sciences,
POB 6000, Sidney, B.C. V8C 4B2, Canada.

Commission H on Waves in Plasmas

Israel: Prof. C. Altman, Faculty of Physics, Technion,
Haifa 32000, Israel.

Commission J on Radio Astronomy

Canada: Dr. T. Landecker, Dominion Radio Astrophysical
Observatory, P.O.Box 248, Penticton, B.C. V2A 6K3,
Canada.

3. Change of Address

Ing. A.M. Andreu, President CORCA, Julian Alvarez 1218,
(1414) Buenos Aires, Argentina.

Prof. Ing. F. Fedi, Director of Research, Fondazione "Ugo
Bordoni", Via B. Castiglione 59, I-00142 Roma, Italy.

Prof. V.H. Padula-Pintos, Executive Secretary, CORCA,
Julian Alvarez 1218, (1414) Buenos Aires, Argentina.

Dr. T.K. Sarkar, Department of Electrical and Computer
Engineering, Syracuse University, Link Hall, Syracuse,
N.Y. 13210, USA.

4. Correction to the Alphabetical List appearing in "URSI
Information Bulletin", No 239.

Page 81: add at the bottom of the page:

JØRGENSEN, Dr. T. Stockflet, Geophysics Department, Danish
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