Bulletin nº 123 October-November-December 1960

International Scientific Radio Union

U. R. S. I.

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Union Radio Scientifique Internationale
U. R. S. I.

TABLE DES MATIERES

EDITORIAL

Comme nous l'avons annoncé dans notre numéro précédent, avec le nº 123 du *Bulletin d'Information*, nous commençons la publication du Bulletin bilingue, conformément à une décision de la XIIIe Assemblée Générale.

Nous avons essayé de présenter le texte et la table des matières sous une forme aussi aisée que possible pour le lecteur ; c'est ce qui nous a conduit à publier la table des matières séparément en anglais et en français en donnant en langue originale les titres des articles qui ne sont pas traduits.

Nous ne doutons pas que cette présentation du Bulletin puisse être améliorée et nous accepterons avec reconnaissance toutes les suggestions qui pourraient nous parvenir.

* * *

As announced in our last issue, we are starting with nº 123 of the *Information Bulletin* the publication of a bilingual issue in accordance with the decisions reached at the XIIIth General Assembly.

We have done our best to give the texts and the contents in a form as easy as possible for the reader. That is the reason why we give the contents in english as well as in french in which the titles of articles non translated are printed in the original language.

We are convinced that this form can be improved and we are looking forward with gratitude to any suggestions.

NOUVELLES DE L'U.R.S.I.

Nous avons le plaisir d'apprendre à nos lecteurs l'élection du Dr L. V. Berkner, Président sortant de l'U.R.S.I., à la présidence du Graduate Research Center des E. U. A., et celle du Professeur Ch. Manneback, Trésorier de l'U.R.S.I., comme Secrétaire Perpétuel de l'Académie Royale des Sciences de Belgique.

Nous souhaitons à ces éminents membres du Bureau de l'U.R.S.I. un plein succès dans leurs nouvelles tâches.

Balthasar van der Pol

H. Bremmer et C. J. Bouwkamp, dont les noms sont bien connus dans les cercles de l'U.R.S.I., ont tenté, avec l'aide et les avis généreux de Mme van der Pol, de donner un aperçu de tout le travail scientifique de Balthasar van der Pol, notre regretté Président d'Honneur, pour autant que ce travail se découvre dans les articles publiés.

Ces articles, dont la plupart présentent un grand intérêt pour les chercheurs en radio-science, ont été publiés en deux volumes par la North-Holland Publishing Company (Amsterdam) sous le titre « Balthasar van der Pol Selected Scientific Papers ».

U.R.S.I. NEWS

We are pleased to announce to our readers the election of Dr. L. V. Berkner, Past President of U.R.S.I., as President of the Graduate Research Center (U. S. A.), and the election of Professor Ch. Manneback, Treasurer of U.R.S.I., as Perpetual Secretary of the Royal Academy of Sciences of Belgium.

We wish every success in their new charge to these two distinguished members of the Board of U.R.S.I.

Balthasar van der Pol

H. Bremmer and C. J. Bouwkamp, whose names are well known in U.R.S.I., with the kind advice and help of Mrs. van der Pol, have attempted to cover the total scientific work of Balthasar van der Pol, our late Honorary President, in so far as this work is laid down in his published papers.

These papers, most of which are very valuable to radioscientists, have been published by the North-Holland Publishing Company (Amsterdam) in two volumes under the title « Balthasar van der Pol Selected Scientific Papers ».

XIII[e] ASSEMBLÉE GÉNÉRALE

Statuts et Règlements

Des exemplaires des Statuts de l'Union, revisés à la dernière Assemblée Générale de l'U.R.S.I., ainsi que des Règlements, Règles et Instructions énumérées ci-après ont été distribués aux Comités Nationaux :

Règlement Intérieur,

Règlement des Commissions,

Règles pour les Réunions Scientifiques,

Instructions pour la publication des Monographies,

Règles pour la présentation des documents scientifiques aux Assemblées Générales.

Des exemplaires de la brochure contenant les statuts et les règlements peuvent être obtenus en s'adressant au Secrétariat Général de l'U.R.S.I.

XIIIth GENERAL ASSEMBLY

Statutes and Bylaws

Copies of the Statutes, as revised at the last General Assembly of U.R.S.I., and of the Bylaws, Rules and Instructions hereunder were distributed to the National Committees :

Bylaws,

Rules for the Commissions,

Rules for Scientific Meetings,

Instructions for the publication of Monographs,

Rules for the submission of scientific papers to the General Assemblies.

Copies of this booklet may be obtained by application to the U.R.S.I. General Secretariat.

PUBLICATIONS DE L'U.R.S.I.

Compte Rendu de la Réunion de Septembre 1959 du Comité de l'U.R.S.I. pour l'A.G.I.

Nous informons nos lecteurs que le Compte Rendu du Symposium organisé par le Comité de l'U.R.S.I. pour l'A.G.I. en septembre 1959, est sorti de presse.

Un exemplaire de cet ouvrage intitulé « Some Ionospheric Results obtained during the International Geophysical Year » a été envoyé aux Présidents des Comités Nationaux.

Ce volume, publié par Elsevier Publishing Company, est mis en vente au prix de 72 sh.

Des exemplaires peuvent être commandés par la voie des Comités Nationaux et du Secrétaire Général de l'U.R.S.I. au prix réduit de 54 sh.

U.R.S.I. PUBLICATIONS

Proceedings of the September 1959 meeting of the U.R.S.I./A.G.I. Committee

We want to inform our readers that the Proceedings of the Symposium organised by the U.R.S.I./A.G.I. Committee at Brussels, in September 1959, have been issued.

A copy of this book entitled « Some Ionospheric Results obtained during the International Geophysical Year » has been sent to each National Committee President. This volume has been published by the Elsevier Publishing Company and is on sale at the price of 72/sh. per copy.

Copies may be ordered through National Committees and the Secretary General of U.R.S.I. at the reduced price of 54/shillings.

NATIONAL COMMITTEES

Sweden

ADMINISTRATIVE REPORT BY THE NATIONAL COMMITTEE OF U.R.S.I.

GENERAL

During the period since the last General Assembly (Boulder 1957) the scientific and technical development in the radio field has been very important in Sweden. This applies to the fields of all U.R.S.I. Commissions which can be seen from the scientific and technical report from the Swedish National Committee to the XIIIth General Assembly. The Kiruna Geophysical Observatory which has been in operation since about three years contributes now to a great extent to the geophysical observations and studies in Sweden.

A short summary of the scientific and technical activities in Sweden during the period is given below.

The instrumentation for radio measurements has been increased in the scientific and industrial laboratories, thus enabling better intercomparison and standardization of measuring instruments used in scientific work.

Standard frequency transmissions have been inaugurated in the Stockholm area by the Board of Swedish Telecommunications and the Research Institute of the National Defence at the beginning of 1960 (100 Mc/s and 150 Mc/s).

Wave propagation via tropospheric scattering has been studied theoretically as well as experimentally. A research 200 km link is in operation since 1959.

For *ionospheric wave propagation* studies, there are now four permanent working sounding stations, one of which (Kiruna) is situated about 1 geographical degree north of the polar circle. Experimental and theoretical studies of the HF propagation via

ionized meteoric trails are going on. Important theoretical work in this field has been carried out.

The National Committee has been represented by its secretary, Mr. Gejer, at various meetings of the European U.R.S.I.-gram Committee. During the I.G.Y. and the I.G.C. free telex-communications were granted by the Board of Swedish Telecommunications to national and international actively cooperating parties.

In the field of *extra terrestrial radio noise*, studies of whistlers are going on. One station in Sweden is part of the international chain of atmospheric noise measuring stations established.

During 1959 a special Committee on Space Research was constituted by some of the Swedish Research Councils with Professor Lamek Hulthén as chairman and Dr. Ernst Å. Brunberg as secretary, both at the Royal Technical Institute, Stockholm. The National Committee is represented on that body.

Membership

The current list of members is given in Annex nº 1.

The ordinary members of the Committee are either appointed by the Government or elected by Scientific Academies and Institutes of Technology.

Meetings

During the period the Committee has held 5 *full meetings*, all in Stockholm, four under the chairmanship of the president, Dr. Håkan Sterky, and one under the chairmanship of the vice president, Dr. Hannes Alfvén.

The full meetings only deal with administrative questions, while technical questions are dealt with by the different sections corresponding to the U.R.S.I. Commissions.

A *Radio Scientific Conference* was held in Stockholm during the period 29th February to 2nd March, 1960. The conference was arranged jointly by the Swedish National Committee of U.R.S.I., the Royal Swedish Academy of Engineering Sciences, and the Swedish Association of Electrical Engineers. Eighty papers dealing with measuring methods, active circuits, passive circuits, antennae systems, wave propagation including whistlers, radio astronomy and electronic physics were presented and discussed.

A list of the titles and the authors of the papers is to be found in Annex nº 2.

A *Symposium on Polar Cap Absorption* was held at the Kiruna Geophysical Observatory 8th to 11th August, 1960. It was arranged on the initiative of the Director of the Observatory, Dr. Bengt Hultqvist, and attended by about 30 scientists from similar observatories all over the world. There were 24 lectures. Annex nº 3 includes the list of the titles and the authors of the lectures.

An International Astronautical Conference was held in Stockholm 15-20 August, 1960, with about 750 participants.

Stockholm, August 25th, 1960.

Håkan STERKY,
Chairman

Sven GEJER,
Secretary

ANNEX Nº 1.

Members of the Swedish National Committee of the International Scientific Radio Union

President : Dr. Håkan K. A. STERKY, Director General, Board of Swedish Telecommunications, Stockholm 16.

Vice President : Dr. Hannes ALFVÉN, Professor, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

Secretary : Mr. Sven A. GEJER, Director of Division, Board of Swedish Telecommunications, Radio Department, Stockholm 16. *Chairman, Section III.*

Ordinary Members :

Mr. Hilding E. BJÖRKLUND, Engineer-in-Chief, Electrotechnical Laboratory of Swedish Army Administration, Solna 6. *Chairman Section I.*

Mr. Erik B. ESPING, Technical Director, Board of Swedish Telecommunications, Radio Department, Stockholm 16.

Dr. Erik G. HALLÉN, Professor, Royal Institute of Technology, Valhallavägen 79, Stockholm 70. *Chairman, Section VI.*

Dr. Nicolai HERLOFSON, Professor, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

Dr. Bertil Håård, Ingenjörsaktiebolaget Elenik, Nordenflychtsvägen 62, Stockholm K.

Mr. Henrik A. Lindgren, Head of Division, Swedish Air Force Administration, Stockholm 80.

Mr. Nils-Henrik Lundquist, Head of Department, Research Institute of National Defence, Dep. 3, Stockholm 80.

Dr. Erik Löfgren, Professor, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

Dr. Dietrich Müller-Hillebrand, Professor, Institute of High-Tension Research, Uppsala. *Chairman, Section IV.*

Dr. Yngve K. Öhman, Professor, Stockholm Astronomical Observatory, Saltsjöbaden.

Dr. Lars-Olow Raab, Meteorologist, Swedish Meteorological and Hydrological Institute, Fridhemsgatan 9, Stockholm 12.

Dr. Olof E. H. Rydbeck, Professor, Chalmers Institute of Technology, Gibraltargatan 5 G, Gothenburg. *Chairman, Section V.*

Mr. Hans Fredrik Rydström, Head of Division, Swedish Admiralty, Stockholm 80.

Dr. Henry Wallman, Professor, Chalmers Institute of Technology, Gibraltargatan 5 P, Gothenburg. *Chairman, Section VII.*

Adjoined Members :

Dr. Bertil Agdur, Professor, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

Mr. Per Åkerlind, Head of Section, Board of Swedish Telecommunications, Radio department, Textilvägen 7, Stockholm 20.

Dr. Nils Ambolt, Head of Division, National Swedish Board of Shipping and Navigations, Stockholm 100.

Dr. Carl-Georg Aurell, Professor, Chalmers Institute of Technology, Gibraltargatan 5 P, Gothenburg.

Dr. Per-Olof Brundell, Royal Institute of Technology, Valhallavägen 79, Stockholm 70.

Mr. Folke Eklund, Head of Division, Research Institute of National Defence, Dep. 3, Stockholm 80.

Dr. Aina Elvius, Mrs., Lecturer, Astronomical Observatory, Uppsala.

Mr. Martin FEHRM, Director General, Research Institute of National Defence, Stockholm 80.

Mr. Torsten GUSSING, Head of Division, Research Institute of National Defence, Dep. 3, Stockholm 80.

Dr. Hein HVATUM, Chalmers Institute of Technology, Gibraltargatan 5 G, Gothenburg.

Dr. Bengt HULTQVIST, Director of Kiruna Geophysical Observatory, Kiruna.

Dr. Bengt JOSEPHSON, Head of Division, Research Institute of National Defence, Dep. 3, Stockholm 80. *Chairman, Section II.*

Mr. Hugo LARSSON, Technical Director, Svenska AB Philips, Gävlegatan 16, Stockholm.

Dr. Bertil-Anders LINDBLAD, Lecturer, Lund Astronomical Observatory, Lund.

Dr. Rune LINDQUIST, Head of Section, Research Institute of National Defence, Dep. 3, Stockholm 80.

Mr. Per-Olov LUNDBOM, Head of Division, Research Institute of National Defence, Dep. 3, Stockholm 80.

Mr. Gunnar MALMGREN, Master of Engineering, Board of Swedish Telecommunications, Radio Department, Textilvägen 7, Stockholm 20.

Dr. Harald E. NORINDER, Emeritus Professor, Torsgatan 6 B, Uppsala.

Mr. Thomas ÖVERGAARD, Director of Division, Board of Swedish Telecommunications, Stockholm 16.

Mr. Sven G. RAHMN, Senior Radio Engineer, Radio Section of Swedish Telecommunications Administration, Vallgatan 10, Gothenburg.

Mr. Carl H. VON SIVERS, Director of Sivers Laboratory, Elektravägen 53, Box 42.018, Stockholm 42.

Dr. Lennart STIGMARK, Assoc. Professor, Lund University, Lund.

Mr. Willy STOFFREGEN, Head of Uppsala Ionosphere Laboratory, Division of Research Institute of National Defence, Dep. 3, Uppsala 11.

Mr. Gustaf E. SWEDENBORG, Director of Division, Board of Swedish Telecommunications, Technical Department, Stockholm 16.

Dr. Sigvard TOMNER, Head of Research, AB Svenska Elektronrör, Lumavägen 6, Stockholm 20.

Dr. Torkel WALLMARK, 109, Littlebrook Road, Princeton, N. J., U. S. A.

Mr. Tord WIKLAND, Director, Teleutredningar AB, Framnäsbacken 18, Solna.

ANNEX N° 2.

Measuring technics.

1. BLOMQUIST, A. — Instrument for the measurement of the effective dielectric constant of the ground.
2. BERGQUIST, A. — Measurement of the dielectric constant and loss factor in the microwave range using an iris coupler.
3. ABOM, C. J. G. — Frequency stabilization of a clystron to a standard frequency.
4. ABOM, C. J. G. — Results of measurements on high precision crystal oscillators.
5. FRANK, L. — Progress report on the development of a caesium beam atomic clock.
6. TOVE, P. A. and JOHNSON, S. J. — The use of a very high frequency voltage for the accurate time measurements on radio active corpuscular radiation.

Active circuits.

7. INGVESSON, K. O. — Experimental investigation of parametric amplification at 960 Mc/s.
8. RYDBECK, O. E. H. and YNGVESSON, S. — Design considerations for a travelling-wave maser at X-band.
9. OTS, A., RYDBECK, O. E. H., TENGBLAD, R. and YNGVESSON, S. — Experiments with a three-level solid-state maser on 400 Mc/s.
10. OLSSON, A. — A non-erasing ferrite memory.
11. FANT, G. and MÖLLER, A. — A bridge stabilized LRC oscillator.
12. FANT, G. and LILJENCRANTZ, J. — Simple filters with active RC and LRC networks.
13. RISBERG, A., RENGMAN, U. and WEJNEBRING, B. — A function giving apparatus for the generation of continuous time functions.
14. LJUNGDELL, S. — A transistorized Hackar amplifier with low temperature drift.
15. JOHANSSON, I. — Measuring methods for the study of long time stability of Zener diodes.
16. ANDERSSON, L. G. — The usefulness of Zener diodes as voltage references of high stability.

Passive circuits.

17. Ljung, P. E. — Ferrite components for microwaves.
18. Thunquist, D. — The application of circle diagrams for monopulse direction finding.
19. Kristiansson, I. — A plan conductive system with a double ground plane for the formation of sum and difference.
20. Beijbom, L. — A sum and difference forming dielectric filled wave guide system for monopulse direction finding.
21. Fjällbrant, T. — A broad band phase shifter for microwave.
22. Steyskal, H. — The explanation of the field picture of double cam conductors.
23. Steyskal, H. — Dispersion curve for a strapped multicavity system.
24. Berglund, R. — A wide band transformer.
25. Möller, A. — The equivalent network of the middle ear.
26. Rengman, U. — An electrical tunable resonant circuit with big variation for 100 c/s to 10 kc/s.
27. Cederlund, C. — The reconstruction of the source of sound through anti resonance filter.

Antennae.

28. Svennérus, G. and Dahlin, S. — A paraboloid antenna with high directivity.
29. Svennérus, G. — A bisected paraboloid antenna.
30. Cassel, E. — Some broad-band antennae.
31. Müller-Hillebrand, D. and Kleine, L. — An aperiodically attenuated loop antenna and its use for study of thunderstorms.
32. Viggh, M. — Surface wave antennae.

Systems.

33. Pilsäter, B. — Some views on reliability and studies of reliability.
34. Källström, G. — Systems for transmission of angle values via a narrow band circuit.
35. Hasler, A. — A slow scan TV-system with vidicon.
36. Werner, P. A. — Narrow band TV-systems. Discussion of some technical problems.
37. Johnson, E. — A rapid, transistorized, analogy digital converter.
38. Wentzel, V. — Rapid logical circuits with transistors.
39. Fant, G., Martony, J. and Eriksson, S. — Experiences from the production of synthetical speach with resonance analog.
40. Aberg, U. — Evaluation of telephone quality through direct comparison.

41. Danielsson, K. and Hagelstein, C. H. — The reduction of bandwidth and the improvement of quality of telephone circuits in accordance with the vocoder principle.
42. Lindberg, G. — The choice of system and the description of an apparatus for correction of faults of binary data.
43. Zetterberg, L. H. — Estimating of fault correcting codes when transmitting data on a disturbed channel.
44. Olsson, I. — Correlation analyses of pulse modulated signals with a stocastic varying pulse interval.

Wave propagation.

45. Eklund, F. — Correction at height angle measurement with radar.
46. Blomquist, A. — Wind-depending fading at VHF- and UHF radio links.
47. Carlson, G. — Path attenuation and broadband properties of a scatter link at 3000 MHz.
48. Hasselrät, S. — Some registrations regarding the properties of « radar angels ».
49. Norinder, H. — The connection between lightnings and a special type of electromagnetic disturbances, so called whistlers.
50. Knudsen, E. — Multiple lightnings followed by whistlers.
51. Ungstrup, E. — Investigation of natural radio noise at audible frequencies at Godhavn, Greenland.
52. Rydbeck, O. E. H. — On the Doppler effect in dispersive, inhomogeneous media.
53. Stoffregen, W. and Derblom, H. — The variation of height and electron density of the auroral D-layer.
54. Stoffregen, W. — The surveillance of the ionosphere with the aid of back scatter.
55. Pedersen, A. — The conditions for the ionization in the D-layer during aurora.
56. Lindquist, R. — Some Swedish experiences of radio propagation via meteoric trails.
57. Ortner, J., Egeland, A. and Hultqvist, B. — A new sporadic layer providing VLF propagation.
58. Maehlum, B. — Studies carried out in Norway of the drift and structure of the ionosphere.

Radio astronomy.

59. ORHAUG, T. — Observations of radio star scintillations at high latitudes.
60. ELLDÉR, J. and HÖGLUND, B. — The measurement of the hydrogen radiation on the wavelength of 21 cm.
61. ELLDÉR, J. — The application of masers and mavars to radio astronomy.
62. ORHAUG, T. — Investigation of the radiation from the sun at 150 Mc/s.
63. LINDBLAD, B. A. — The stream of the Perseid Meteors — its construction and space structure.
64. WALLMAN, H. — Light amplifier for astronomical instruments.

Electron physics.

65. FORSHUFVUD, R. — The Pinch in effect. A break through phenomenon in transistors.
66. STRINDEHAG, O. — Resolution, contrast transmission and sensitivity of camera tubes of the vidicon type.
67. OLVING, S. and OTS, A. — An experimental investigation of the statical characteristics and of the characteristics at radio frequencies of long electron beams.
68. RYDBECK, O. E. H. and WILHELMSSON, H. — The dispersion of velocity and plasma waves in an electron beam.
69. FISCHER, M. and RYDBECK, O. E. H. — Plasma waves of the Gaussian ray.
70. AGDUR, B. — Investigation of instabilities in electron beams.
71. VALTERSSON, B. — Instabilities in electron beams in crossed fields.
72. RYDBECK, O. E. H. — Coupled waves in inhomogeneous systems.
73. RYDBECK, O. E. H. — On the coupling between space charged waves and electromagnetic waves in a resonant plasma.
74. RYDBECK, O. E. H. and THOMASSON, A. — Propagation of electromagnetic waves of sound frequencies in ionized media in the presence of strong magnetic fields.
75. DATTNER, A. and AGDUR, B. — Investigation of plasma resonance.
76. ENANDER, B. — On the propagation of microwaves in coaxial cable filled with plasma.
77. STOMBERG, A. and KRONLUND, S. — Frequency shift by means of rotatron tube.
78. WILHELMSSON, H. — On the coupling between electromagnetic waves and electron beams in a wave guide system.
79. OLVING, S. — A new field theoretical analysis of the travelling wave tube.
80. PETERSON, B. — Comparison between short and long optics of M-carcinotrones.

ANNEX N° 3.

Symposium on Polar Cap Absorption

A. — *Absorption observations.*

1. OBAYASHI, T. and HAKURA, Y. — Hiraiso Radio Wave Observatory. The average pattern of polar cap blackouts and auroral zone blackouts.
2. HOLT, O. and LANDMARK, B. — Norwegian Defence Research Establishment. Some results concerning polar cap absorption events from riometer observations in Norway.
3. COLLINS, C., JELLY, D. H. and MATTHEWS, A. G. — D. R. T. E. Ottawa. High Frequency radio wave blackouts at medium and high latitudes during a solar cycle.
4. GREGORY, J. B. — University of Canterbury, New Zealand. A paper on polar cap observations at Scott Base in Antarctica.
5. HULTQVIST, B. and ORTNER, J. — Kiruna Geophysical Observatory. The height of the absorbing layer.
6. LEINBACH, H. — University of Alaska. A paper on a daytime recovery of cosmic noise absorption observed during some of the polar cap events.
7. ORTNER, J. — Kiruna Geophysical Observatory and LEINBACH H. and SUGIURA, M., University of Alaska. The geomagnetic sudden commencement effect on polar cap absorption.

B. — *Balloon, rocket and satellite observations.*

1. BROWN, R. R. — University of California. X-rays accompanying the onset of the magnetic storm of 27 June 1960.
2. BROWN, R. R. — University of California. Solar protons from the flare of July 10, 1959.
3. EHMERT, A. and PFOTZER, G. — Max Planck Institut, Göttingen. Observations of solar cosmic rays in July 1959.
4. RAY, E. C. — State University of Iowa. Outer radiation belt and solar proton observations with Explorer VII during March-April 1960.
5. ARNOLDY, R. L., HOFFMAN, R. A. and WINCKLER, J. R. — University of Minnesota. Solar cosmic rays and soft radiation observed at 5.000.000 km from earth.
6. ROSE, D. C. — National Research Council, Canada. A paper on objectives and equipment of cosmic ray experiments using rockets during polar cap absorption events.

C. — *Solar bursts and flare observations, sporadic E and aurora.*

1. WARWICK, C. S. — National Bureau of Standards and WARWICK, J. W., High Altitude Observatory Boulder. Type IV solar radio emission and associated radio and optical events.

2. Fokker, A. D. — Netherlands Postal and Telecommunications Services. A paper on the results of continuous 24-hour solar radio patrol especially in connection with the observations of Type IV solar radio emission.
3. Hedeman, R. and Dodson Prince, H. — McMath-Hulbert Observatory, University of Michigan. Photographic observations of certain flares associated with polar cap absorption.
4. Davis, N. — University of Alaska. Polar cap aurora.
5. Herzberg, L. — D. R. T. E. Ottawa. The possible importance of nitric oxide formation during polar cap absorption events.
6. Okada, J. M. — U. S. Naval Research Laboratory. Laboratory experiments concerning polar cap injection mechanism.

D. — *Observations of VLF and VHF polar cap propagation. Theoretical considerations.*

1. Egeland, A., Hultqvist, B. and Ortner, J. — Kiruna Geophysical Observatory. Influence of the absorbing layer on VLF propagation.
2. Eriksen, K. W. and Landmark, B. — Norwegian Defence Research Establishment. Some results concerning the behaviour of long distance VLF circuits during polar cap absorption events.
3. Bailey, D. — National Bureau of Standards. Relation between Jupiter radio emissions and solar activity.
4. Obayashi, T. — Hiraiso Radio Wave Observatory. Propagation of solar cosmic ray particles through interplanetary magnetic fields and their entry into the polar ionosphere.
5. Brown, R. R. and Weir, R. — University of California. A paper on calculations of ionospheric effects produced by solar particles.
6. Singer, S. — University of Maryland. Penetration of particles into the upper atmosphere.

U. S. A.

REPORT OF THE NATIONAL COMMITTEE TO THE XIIth GENERAL ASSEMBLY

The Report of the U. S. A. National Committee has been published in a special issue of the *Journal of Research of the National Bureau of Standards*, vol. 64D, nº 6, Nov.-Dec. 1960.

Readers will find hereunder the foreword of this issue and the list of the main topics included.

Foreword

The U. S. A. National Committee Report for the period 1957-1960 represents a departure from previous reports in scope and form. The Committee decided that the concerted effort should be made by the Commissions to review the work in their fields more critically than was done heretofore. The evaluation of progress rather than a bibliographical summary and a résumé that places the status of the field in its proper perspective were set as major objectives. The members of the Commissions responded enthusiastically to the call for contributions and the objectives have been met in a large measure. We hope that the National Committee Report will itself furnish a basis for discussions at the General Assembly and it represents a step forward in the activity of the National Committee.

The National Bureau of Standards has given inestimable aid to the preparation of the Report for presentation to the General Assembly. An editorial group under Mr. Bradford Bean undertook the enormous task of uniformizing the method of referencing and of checking the references and preparing the manuscript for final printing. Time was too limited to allow for extensive editing the manuscrits and in some cases the reports are more than coverages of the period 1957-1960. However, such deviations and expensions are not without value in a first presentation of this type.

List of the main topics

COMMISSION I. — *Radio measurement methods and standards*

1. Progress in the United States during the last three years on frequency and time interval standards and measurements, E. A. GERBER.
2. Radiofrequency and microwave power measurements, G. F. ENGEN.
3. Impedance measurements and standards, G. A. DESCHAMPS.
4. Development in attenuation measurements and standards, B. O. WEINSCHEL.
5. Noise measurements and standards, B. M. OLIVER.
6. Field strength measurements, M. C. SELBY.
7. Measurements of physical quantities by radio techniques, M. C. THOMPSON.

COMMISSION 2. — *Tropospheric radio propagation*

1. Physical characteristics of the troposphere.
2. Tropospheric propagation (theories).
3. Experimental results from investigations of tropospheric propagation.
4. Radiometeorology.

COMMISSION 3. — *Ionospheric radio propagation*

1. Structure of the upper atmosphere.
2. Ionizing radiations.

3. Electron densities.
4. Satellite beacon studies.
5. Ionospheric processes.
6. Ionospheric disturbances.
7. Sporadic E and Spread F.
8. Studies of the lower ionosphere.
9. Radar studies of auroral ionization.
10. Refraction in the ionosphere.
11. Ionospheric propagation studies (General).
12. Ionospheric scatter transmission.
13. Radio reflection from meteor ionization.
14. Ionospheric propagation research with communication systems applications.

COMMISSION 4. — *Radio noise of terrestrial origin*

1. Radiofrequency radiation from lightning discharges, A. GLENN JEAN.
2. Properties of atmospheric noise at various receiving locations, W. Q. CRICHLOW.
3. Summary of research on whistlers and related phenomena, R. A. HELLIWELL and M. G. MORGAN.
4. A summary of VLF and ELF propagation research, J. R. WAIT.
5. Hydromagnetic waves and ELF oscillations in the ionosphere, J. M. WATTS.
6. The exosphere, J. M. WATTS.

COMMISSION 5. — *Radio Astronomy*

1. University of Alabama.
2. Air Force Cambridge Research Center, Sagamore Hill Radio Astronomy Observatory.
3. U. S. Army Signal Research and Development Laboratory.
4. California Institute of Technology, Owens Valley Radio Observatory.
5. Carnegie Institution of Washington Department of Terrestrial Magnetism.
6. Cornell University.
7. Collins Radio Company.
8. University of Colorado High-Altitude Observatory.
9. Harvard University Radio Astronomy Station.
10. Hayden Planetarium.
11. University of Illinois.
12. U. S. Naval Research Laboratory, Radio Astronomy Branch.

13. The National Aeronautics and Space administration.
14. National Bureau of Standards, Boulder Laboratories.
15. National Radio Astronomy Observatory, Green Bank, West Virginia.
16. Ohio State University.
17. Rensselaer Polytechnic Institute.
18. Stanford University.
19. Yale University.
20. University of Michigan.

COMMISSION 6. — *Radio waves and circuits*

SUB-COMMISSION 6.1. — *Information Theory.*

Part 1. Information Theory and Coding, P. ELIAS.

Part 2. Random processes, P. SWERLING.

Part 3. Pattern Recognition, A. GILL.

Part. 4. Detection Theory, R. PRICE.

Part 5. Prediction and filtering, L. A. ZADEH.

SUB-COMMISSION 6.2. — *Circuit Theory.*

Circuit Theory, L. WEINBERG.

SUB-COMMISSION 6.3. — *Antennas and waveguides.*

Part 1. Diffraction and Scattering, L. B. FELSEN and K. M. SIEGEL.

Part 2. On multiple scattering of waves, V. TWERSKY.

Part 3. Antennas 1957-60, R. W. BICKMORE and R. C. HANSEN.
A bibliography of coherence theory, G. B. PARRENT, Jr.
A bibliography of automatic antenna data processing, C. J. DRANE.
Progress during the past three years in surface and leaky wave antennas, F. J. ZUCKER.

COMMISSION 7. — *Radio electronics*

1. Parametric amplifiers, P. K. TIEN and H. HEFFNER.
2. Microwave properties of ferrites, P. K. TIEN and B. LAX.
3. Progress in solid-state masers, A. SIEGMAN.
4. Low noise beam-type microwave tubes, L. SMULLIN.
5. Interaction between plasmas and electromagnetic fields, L. SMULLIN.

JOINT MEETING OF THE U. S. A. NATIONAL COMMITTEE OF U.R.S.I. AND OF THE INSTITUTE OF RADIO ENGINEERS

(Boulder, December 12, 13 and 14, 1960)

The following papers were submitted to the meetings :

COMMISSION I. — *Radio Measurement Methods and Standards*

— Atomic beam frequency standards, R. C. MOCKLER.

COMMISSION II. — *Tropospheric Radio Propagation*

— Some highlights of Commission II activities at the XIIIth General Assembly, Alan T. WATERMAN, Jr.

Refraction and absorption

— Studies of the effect of rain and water vapor on sky noise temperature at 6 Kmc, D. C. HOGG and R. A. SEMPLAK.

— Anomalous atmospheric water vapor absorption of millimeter wavelength radiation, C. W. TOLBERT and A. W. STRAITON.

— Tropospheric refraction of radio waves in the arctic region, D. J. LEESTMA and G. H. MILLMAN.

Propagation Measurements and Theories.

— Elevated duct propagation, F. C. MACDONALD.

— Measurement of fading characteristics on a knife-edge diffraction path, R. S. KIRBY and A. P. BARSIS.

— Results of bandwidth tests on the 185-mile Florida-Cuba tropospheric scatter system, R. N. KENNEDY and J. M. TRECKER.

— Simultaneous frequency-and-angle-scan experiment in transhorizon propagation, A. T. WATERMAN, Jr., J. W. STROHBEHN and D. B. COATES.

— A quantitative explanation of tropospheric and ionospheric « scatter » transmission, K. BULLINGTON.

— Correlation of monthly median transmission loss and refractive index profile characteristics, B. R. BEAN and B. A. CAHOON.

Surface effects.

— Boundary valued problems in radio wave propagation, J. B. SMYTH.

— The transmitted and reflected fields due to a plane wave incident on a dielectric half-space from a conducting half-space, R. H. WILLIAMS.

— The fields of electric dipoles in sea water, W. L. ANDERSON.

— An acoustic simulator for investigating backscatter of electromagnetic waves, A. R. EDISON and R. K. MOORE.

— Theoretical scattering coefficient for near vertical incidence from contour maps, H. S. HAYRE.

COMMISSION III. — *Ionospheric Radio Propagation*

— Selected highlights from Commission III discussions at the XIIIth General Assembly, L. A. MANNING.

Ionospheric Propagation.

— Frequency variations in vertical incidence ionospheric reflection, S. C. GOLDMAN.

— Observations of correlated fluctuations in the frequency of WWV-20 and PR-17 as received at Palo Alto, California, K. L. CHAN, O. G. VILLARD, Jr. and B. DUENO.

— Multipath propagation on transarctic HF circuits, J. ORTNER and L. OWREN.

Ionospheric Disturbances.

— Solar Terrestrial relations and arctic radio propagation during August 1959, L. OWREN.

— Increase of ionization associated with the geomagnetic sudden commencement, S. MATSUSHITA.

— The influence of polar cap absorption on HF propagation, R. D. EGAN.

— A comparison of arctic HF transmission loss and VHF riometer data, C. G. LITTLE and R. SILBERSTEIN.

— Magnetic field micropulsations in the auroral zone, W. H. CAMPBELL.

— Note on the cause of sudden ionization anomalies in regions remote from high altitude nuclear bursts, C. M. CRAIN, P. TAMARKIN.

Satellites and the Ionosphere.

— On the effect of a magnetic field on the spectrum of incoherent scattering, T. LAASPERE.

— Some properties of the total ionosphere, W. J. Ross and D. S. ANDERSON.

— Detection of satellites by their influence on the ionosphere, T. G. HAME and W. D. STUART.

— The simultaneous measurement of electron densities in the ionosphere by CW propagation and RF impedance probe techniques, J. E. JACKSON, J. A. KANE and H. A. WHALE.

— Anomalies of the geomagnetic retardation of the spin of satellite Vanguard I (1958 Heta), P. R. ARENDT.

— Ionospheric characteristic for topside sounding, S. H. GROSS.

Miscellaneous, including Low Frequency Waves and Meteors.

On coastline effects in VLF mode transmission, D. R. DOBROTT.

— Extra-low frequency slot antennas, J. GALEJS.

— Dispersion relations in infinite and bounded magneto-ionic plasmas with drift motion, H. A. FEIVESON.

— The Harvard radio meteor project, G. S. HAWKINS and F. L. WHIPPLE.

— Computer simulated meteor echoes, M. LOEWENTHAL, W. C. MASON and P. A. DUFFY.

— Studies on aspect sensitivity, layer heights, and beamwidth from auroral PPI returns, S. C. WANG.

Solar Proton Events

— The time variations of solar cosmic rays during July 1959 at Minneapolis, P. D. BHAVSAR.

— The low energy end of the cosmic ray spectrum in the July 1959 events, E. P. NEY.

— Evidence for a ring current and its implication for the radiation belts and solar cosmic rays, J. P. KELLOGG.

Ionospheric Irregularities.

— Characteristics of small-scale F-layer irregularities deduced from back-scatter soundings made with a steerable narrow-beam antenna, G. BARRY and O. G. VILLARD, Jr.

— Large-scale ionospheric irregularities observed at Boulder, Colorado, J. L. JESPERSON and R. S. LAWRENCE.

— Fading analysis of mid-latitude spread F, W. K. KLEMPERER.

— Temporal and spatial variations in low altitude spread F occurrence, R. W. KNECHT.

— Diurnal variation of spread F, R. PENNDORF.

— Random motions of the ground pattern associated with ionospheric reflections, D. G. YERG.

COMMISSION IV. — *Radio Noise of Terrestrial Origin*

— Recent advances in whistler research, R. A. HELLIWELL.

VLF and Whistler Mode Propagation.

— Propagation attenuation rates at ELF, A. G. JEAN, Jr.

— Observed low-frequency fields and propagation characteristics in arctic regions, R. W. PLUSH and A. D. WATT, and O. E. CUMMINGS.

— Mode theory of magnetic ionic duct propagation in the exosphere at low and high frequencies, H. G. BOOKER.

— VLF phase perturbation associated with meteor shower ionization, C. J. CHILTON.

— Daytime phase characteristics in the VLF band deduced from atmospheric waveforms, W. L. TAYLOR.

— Two-hop whistler mode echoes at 18.6 kc/s received at Seattle, H. R. WILLARD.

Atmospheric Noise.

— A preliminary report on field intensity changes that accompany a tornado oscillator, R. L. CASWELL, J. C. HAMILTON, R. L. CALKINS and H. L. JONES.

— Artificial lightning atmospherics, M. M. NEWMAN.

— Instrumentation for recording spectrum occupancy and radio noise levels, C. J. Roubique.

— Prediction of atmospheric noise levels from thunderstorm counts, R. C. DAVIS.

COMMISSION V. — *Radio Astronomy*

— Planetary Radio Astronomy, J. W. WARWICK.

COMMISSION VI. — *Radio Waves and Circuits*

— Selected Commission VI Highlights, K. M. SIEGEL.

— Advances in low noise amplifiers, M. CHODOROW.

Information and Circuit-theoretic Problems in Space Probing and Communication.

— Interplanetary communication system development, R. STEPHENSON.

— Communication by means of the echo satellite, S. DARLINGTON.

— Detection of deep fluctuating targets, R. PRICE.

— Implications of the Laser for space Communication, L. GOLDMUNTZ.

— Semi-coherent detection, I. S. REED.

Surface Waves.

— Surface waves at the XIIIth General Assembly, N. MARCUVITZ.

— Closed form analysis for the radiation pattern of the modulated antenna, A. ISHIMARU and G. B. BERNARD.

— Wide-band matching of impedances using active networks, R. MITTRA.

Boundary Value Problems and Scattering.

— Report on boundary value scattering problems, L. FELSEN and V. TWERSKY.

— Report on propagation in statistically inhomogeneous regions, V. TWERSKY.

— The scattering of transient electromagnetic waves by finite bodies, E. M. KENNAUGH.

— Radiation fields from a horizontal electric dipole in a semi-infinite conducting medium, A. W. BIGGS.

— Generalized Wood's anomalies on planar periodic structures, A. HESSEL and A. A. OLINER.

— Scattering by a periodically apertured conducting screen, R. B. KIEBURTZ and A. ISHIMARU.

— Echo area measurements and their interpretation, E. M. KENNAUGH.

— The shift of the shadow boundary and the scattering cross section of an opaque object, S. I. RUBINOW and J. B. KELLER.

— Diffraction by a thick screen, a step, and related axially symmetric objects, J. E. BURKE and J. B. KELLER.

— Backscattering from a wire loop, J. B. KELLER.

— Exact angular scattering on homogeneous and partially conducting spheres, D. DEIRMENDJIAN.

— A microwave analogue to the scattering of light by nonspherical particles, J. M. GREENBERG, N. E. PEDERSEN and J. C. PEDERSEN.

— Propagation in dielectric waveguides at optical frequencies, N. S. KAPANY.

Information and Circuits Theories.

— Information theory and the electromagnetic field in time variable media, D. S. BUGNOLO.

— On estimating the solution to a class of multipath problems, W. JANOS.

— Some information rate calculations for Maser amplifiers, T. E. STERN.

— Design theory of optimum negative resistance amplifiers, E. S. KUH and J. D. PATTERSON.

— Bandpass measurements of a lunar reflection circuit, R. P. INGALLA and L. E. BIRD, and J. W. B. DAY.

— A recent long-range clock synchronisation and VLF propagation experiment with airborne atomic clocks, F. H. REDER and G. M. WINKLER.

Antennas.

— Data processing antennas at the XIIIth General Assembly, R. C. HANSEN.

— Antenna patterns for maximum information rate under simple multipath conditions, D. D. MCNELIS and H. M. SWARM.

— Line source feeds for spherical reflectors, A. F. KAY.

— A high resolution rapid-scan antenna, H. V. COTTONY and A. C. WILSON.

— Arrays with variable interelement spacings, M. G. ANDREASEN.

— Optimum spherical and cylindrical arrays, L. YOUNG.

COMMISSIONS ET COMITÉS

D'après les décisions prises à la XIII[e] Assemblée Générale, les Bureaux des Commissions et des principaux Comités de l'U.R.S.I. sont composés comme suit :

COMMISSION I. — *Mesures et Etalons Radioélectriques.*

Président : U. ADELSBERGER.
Vice-Président : W. D. GEORGE.
Secrétaires : E. WEBER, M. WERTHEIMER.
Rédacteur scientifique : B. DECAUX.

COMMISSION II. — *Radioélectricité et Troposphère.*

Président : J. VOGE.
Vice-Président : J. B. SMYTH.
Secrétaires : F. DU CASTEL, J. A. SAXTON.
Rédacteur scientifique : J. A. SAXTON.

COMMISSION III. — *Radioélectricité Ionosphérique.*

Président : J. A. RATCLIFFE.
Secrétaires : W. J. G. BEYNON, D. LÉPÉCHINSKY.
Rédacteur Scientifique : W. J. G. BEYNON.

COMMISSION IV. — *Perturbations Radioélectriques d'Origine Terrestre.*

Président : R. A. HELLIWELL.
Vice-Président : R. RIVAULT.
Secrétaires : H. E. DINGER, G. FOLDES.
Rédacteur scientifique : F. HORNER.

COMMISSION V. — *Radioastronomie.*

Président : A. C. B. LOVELL.
Vice-Président : J. P. HAGEN.
Secrétaires : R. HANBURY BROWN, R. COUTREZ.
Rédacteur Scientifique : J. P. HAGEN.

COMMISSION VI. — *Ondes et Circuits Radioélectriques.*

Président : J. LOEB.

Vice-Présidents: F. L. STUMPERS, N. MARCUVITZ, L. WEINBERG.

Rédacteur Scientifique : S. SILVER.

COMMISSION VII. — *Radioélectronique.*

Président : W. G. SHEPHERD.

Vice-Présidents: R. E. BURGESS, C. W. OATLEY.

Secrétaires : M. Y. BERNARD, G. M. HATOYAMA.

Rédacteur scientifique : C. W. OATLEY.

COMITÉ DE L'U.R.S.I. POUR LA C.I.G.

Président : W. J. G. BEYNON.

Secrétaire : G. M. BROWN.

Comité pour les Recherches Radioélectriques dans l'Espace.

Président : L. G. H. HUXLEY.

Secrétaire : W. J. G. BEYNON.

Comité pour l'Attribution de Fréquences pour des Buts Scientifiques.

Président : J. A. RATCLIFFE.

Secrétaire : J. W. FINDLAY.

Comité de l'U.R.S.I. pour les Travaux du C.C.I.R.

Président : J. H. DELLINGER.

COMMISSIONS AND COMMITTEES

According to the decisions reached at the XIIIth General Assembly the Officers of the U.R.S.I. Commissions and main Committees are as follows :

COMMISSION I. — *On Radio Measurements and Standards.*

Chairman : U. ADELSBERGER.
Vice-Chairman : W. D. GEORGE.
Secretaries : E. WEBER ; M. WERTHEIMER.
Scientific Editor : B. DECAUX.

COMMISSION II. — *On Radio and Troposphere.*

Chairman : J. VOGE.
Vice-Chairman : J. B. SMYTH.
Secretaries : F. DU CASTEL ; J. A. SAXTON.
Scientific Editor : J. A. SAXTON.

COMMISSION III : *On Ionospheric Radio.*

Chairman : J. A. RATCLIFFE.
Secretaries : W. J. G. BEYNON, D. LÉPÉCHINSKY.
Scientific Editor : W. J. G. BEYNON.

COMMISSION IV. — *On Radio Noise of Terrestrial Origin.*

Chairman : R. A. HELLIWELL.
Vice-Chairman : R. RIVAULT.
Secretaries : H. E. DINGER, G. FOLDES.
Scientific Editor : F. HORNER.

COMMISSION V. — *Radio Astronomy.*

Chairman : A. C. B. LOVELL.
Vice-Chairman : J. P. HAGEN.
Secretaries : R. HANBURY BROWN, R. COUTREZ.
Scientific Editor : J. P. HAGEN.

COMMISSION VI. — *Radio Waves and Circuits.*

Chairman : J. LOEB.

Vice-Chairmen : F. L. STUMPERS, N. MARCUVITZ, L. WEINBERG.

Scientific Editor : S. SILVER.

COMMISSION VII. — *On Radio Electronics.*

Chairman : W. G. SHEPHERD.

Vice-Chairman : R. E. BURGESS, C. W. OATLEY.

Secretaries : M. Y. BERNARD, G. M. HATOYAMA.

Scientific Editor : C. W. OATLEY.

U.R.S.I.-C.I.G. Committee.

Chairman : W. J. G. BEYNON.

Secretary : G. M. BROWN.

Committee on Space Radio Research.

Chairman : L. G. H. HUXLEY.

Secretary : W. J. G. BEYNON.

Committee on Frequency Allocation for Scientific Purposes.

Chairman : J. A. RATCLIFFE.

Secretary : J. W. FINDLAY.

U.R.S.I. Committee for C.C.I.R. Work.

Chairman : J. H. DELLINGER.

Commission I
On Radio Standards and Measurements

Notice of time signal adjustment WWV/WWVH
New timing code on WWV

In order to bring the time signals of WWV/WWVH and other stations into closer agreement, a retardation phase adjustment of the time signals radiated by WWV/WWVH, is planned at 0000 UT on January 1, 1961. The retardation will be precisely 5 milliseconds.

The last time adjustment, a retardation of 20 milliseconds, was made on December 16, 1959. It is expected that such adjustments in the time signals will be made as infrequently as possible and

preferably at the beginning of each calendar year when necessary. The time signals are locked to the broadcast frequency.

In 1961 it is planned to maintain the frequency stable to 1 part in 10^{10} and at the same offset value as before, i. e., —150 parts in 10^{10} with reference to the United States Frequency Standard.

The necessity for offsetting the frequency and for adjustment of the time signals is described in :

« National Standards of Time and Frequency in the United States », *Proc. I.R.E.*, **48**, 105-106, January 1960.

« Co-Ordination of Time and Frequency Transmissions », *Journal of the I.E.E.*, **6**, n° 65, 268, May 1960.

On January 1, 1961, the National Bureau of Standards will commence a regular broadcast from WWV of a timing code which gives the day, hour, minute and second (Universal Time) and which is locked in phase to the frequency and time signals. The code is a 36 Binary Digit 100 PPS Code carried on 1000 cps modulation. A complete time frame is 1 second. The code will be broadcast for 1 minute intervals and 10 times per hour. Except at the beginning of each hour, it immediately follows the standard frequencies of 440 cps and 600 cps. The code was broadcast experimentally during the interval, April to August 1960 and is described in : « Experimental Timing Code Added to WWV Broadcasts », *NBS Technical News Bulletin*, **44**, n° 7, 114-115, July 1960.

An announcement, « Time Code on WWV », is available on request.

National Bureau of Standards
Boulder, Colorado.

Commission III

BIBLIOGRAPHY

We have received the following publications :

— Ionospheric Series A Predictions containing graphs of Predictions for short circuits in Australia and Pacific Areas.

— Ionospheric Series P Predictions, containing ionospheric predictions for point to point radio circuits.

These publications are prepared and issued by the Ionospheric Prediction Service, 5, Hickson Road, Millers Point, N. S. W., Australia.

N(h) ELECTRON DENSITY WORKING GROUP

Minutes of the Second Meeting

The second meeting of the N(h) Working Party was held at the Institute of Electrical Engineers, London, on 30th and 31st August, 1960.

There were present :

Members :

Dr. W. Becker,
Dr. G. A. M. King,
Mr. B. Maehlum,
Dr. E. R. Schmerling,
Dr. J. O. Thomas (*Chairman*),
Mr. M. D. Vickers (*Secretary*),
Mr. J. W. Wright.

Consultants :

Mr. J. Bellchambers,
Dr. S. Bowhill,
Mrs. S. Croom,
Dr. D. T. Farley,
Dr. O. K. Garriott,
Dr. J. M. Kelso,
Dr. G. H. Millman,
Mr. G. Le R. Nelms,
Miss A. R. Robbins,
Mr. A. H. Shapley,
Dr. T. E. van Zandt.

Apologies for absence were received from :

Members :

Dr. R. A. Duncan,
Dr. R. Egan,
Dr. J. E. Jackson.

The Agenda for the meeting was divided up into two parts as in the first meeting :

I. *Technical Sessions* in which Scientific papers on topics related to N(h) work were presented and discussed.

II. *Business Meetings* concerned with matters of policy.

A list of the papers read, together with brief abstracts is given in (I) and the Minutes of the business meeting are given in (II).

I. — Papers read at the Second Meeting of the N(h) Working Party, Aug. 1960

Dr. W. Becker :

I. The quiet night-time ionosphere.

Reduction to N(h) profiles of ionograms taken at frequent intervals on a few chosen quiet nights showed that even for conditions when K = 0 the F layer may undergo sudden height changes of about 60 kms. On one occasion during an a + *ve* bay disturbance the layer lifted 200 kms in less than an hour.

II. Tables of ordinary and extraordinary refractive indices, group refractive indices and $h'(f)$ curves for standard ionospheric layer models were presented in book form. These tables are available, on request, from Dr. Becker.

III. *hm*F2 deduced by a 10 point method (A note to the W.W.S.C.).

Great care would have to be exercised in using any ten point method for a direct computation of *hm*F2 because even the best ionograms stopped at least ½ % below the F2 critical frequency.

Mr. J. Bellchambers and Mr. W. R. Piggott (read by Mr. Bellchambers).

I. Some regularities in the diurnal and seasonal variations of the height of the maximum of the F2 layer over Antarctica.

At Halley Bay corrected median M factor data have been used to derive *hm*F2. For all months *hm*F2 is a maximum at 06 and a minimum at 18 L.M.T. Diurnal variation of *hm*F2 for a large number of Antarctic stations, are similar and are locked approximately to U.T.

II. The detection of semi-diurnal oscillations in the height of the F1 and F2 layers at Halley Bay. Evidence for diurnal height oscillations in the F2 layer on quiet days was presented.

Dr. K. Bowles (read by Dr. van Zandt) :

Incoherent scattering by free Electrons as a technique for studying the Ionosphere and Exosphere was presented.

The V.H.F. radar backscatter at Illinois has shown that above *hm*F2 N decreases exponentially with a scale height of 60 km. A particular night time profile for October showed that near the F layer maximum, the electron density changed little over 100 kms.

Mrs. S. CROOM :

I. N(h) results at high latitude stations.

A survey of N(h) data for a Summer and an Equinox month in Antarctic regions shows that *hm*F2 is a maximum at about 09 hours and a minimum at about 16 hours L.M.T. The electron density at constant height varies semi-diurnally with time.

II. Observations of diurnal assymetry in F2 layer ionization.

During Sept. '57, for mid F region heights the electron density at a given height is larger at 09 than it is at 15 L.M.T. This is true for all latitudes except at those near that of Panama, where for heights greater than 340 km, a large maximum develops in the afternoon.

Dr. J. P. DOUGHERTY and Dr. D. T. FARLEY (read by Dr. Farley) :

A theory of incoherent scattering of radio waves by a plasma.

1. The mean scattering cross-section for the ionosphere is equal to that which would exist if each of the electrons scattered independently with a cross-section of one half of the classical Thomson cross-section.

2. The mean Doppler broadening of the scattered signal corresponds roughly to the *speed of the ions* rather than to that of the electron and is therefore very much smaller than was previously expected.

Dr. O. K. GARRIOTT :

Doppler Shift Studies from Sputnik III.

Measurements of the ionospheric effect on Doppler shift utilizing phase locked receivers was reported. The measurements were made on the signals of Sputnik III when the satellite was at an approximate height of 175 km. Methods of

measuring electron content, horizontal gradients in electron content and the extent and magnitude of E region irregularities were given.

Dr. O. K. GARRIOTT and Dr. R. EGAN (read by Dr. Garriott) :

Comparisons of ionospheric electron content by satellite and C.3 measurements.

By comparison of the content derived from the two methods when the satellite was at 175 kms it was found that there was no significant valley between the E and F layers.

Dr. A. HIRSCH and Mr. R. KNECHT (read by Mr. Knecht) :

Evidence from N(h, t) data for horizontal velocity gradients in the F region of the ionosphere.

Analysis of N(h) profiles for a large number of months for Puerto Rico shows that dN/dt immediately after dawn rises much more rapidly than can be accounted for by electron production. It is suggested that the rise is caused by a complete reversal of the F region drift velocity at this time.

Dr. J. M. KELSO :

Rocket and satellite measurement of electron density by Space Technology Laboratories.

Using a technique described at the Brussels meeting the electron density above the equator at a height of 18,000 km was estimated to be 2×10^4 electrons/cc August 22, 1959. This value is much greater than that given by whistler observations. However, six days before this measurement there had been a large magnetic storm.

Dr. G. A. M. KING :

I. Median virtual height curves.

Once the median of a number of $h'(f)$ curves has been properly defined, it is possible to reduce this median to a median N(h) profile which is a good representation of average shape of the profiles reduced from the individual $h'(f)$ curves.

II. The use of logarithmic frequency analysis.

It is suggested that a logarithmic frequency spacing could enable matrix elements to be calculated very simply. It also gives flexibility of sampling.

III. The effects of low lying ionization.

Analysis of low frequency ionograms taken at Boulder on a few chosen nights shows that the N(h) profiles calculated from normal ionograms may be 65 km too high at a plasma frequency of 1.6 Mc/s. These errors are reduced slightly by using the residual height technique adopted as standard in the N.B.S. routine N(h) programme.

Mr. R. KNECHT :

Results of an analysis of the magnitude of post-sunset errors in N(h) profiles due to under-lying ionization.

Analysis of night-time ionograms for Puerto Rico using the Titheridge one point method shows that just after sunset the height of the F layer at a plasma frequency of 2 Mc/s would be 50 kms too great. However, four hours after sunset, this error has dropped to 20 kms and remains almost constant at that value throughout the rest of the night.

Dr. G. H. MILLMAN :

Measurements of total electron content above the F layer maximum of the ionosphere.

Using the moon echo technique values of the total electron content in the ionosphere were obtained for a series of months for Port of Spain, Trinidad. The ratio of total content to sub-peak content was found to vary from two to three during day and six to eight during the night.

Mr. G. L. NELMS :

The electron density distributions in the D and E regions, deduced from $h'(f)$ observations.

Observations of ordinary and extraordinary $h'(f)$ are used to determine the fine structure of the E layer and to determine the model which best represents the N(h) profile in the D region.

Dr. NISBET (read by Dr. Bowhill) :

Electron Densities in the Upper Atmosphere from Rocket Measurements.

The electron content has been measured during about twenty rocket flights over the Atlantic Missile Range by Faraday

rotation and dispersion methods and compared with that given by sub-peak VI soundings. After correction for horizontal electron density gradients it was found that the electron density distribution, as a function of scale height, above the peak was Chapman-like. If the thickness of the F2 maximum is defined by the difference in heights at 0.9 max. it is found that the thickness is 40 km during the day and 120 kms during the night.

Miss A. Robbins :

I. Sources of error in N(h) computations.

Use of the Titheridge method for valley determination indicates that for Slough the valley is 95 % full and that the height of the F layer at a plasma frequency just above foE is 16 kms too low. A similar analysis for Lwiro at local Noon, gives the valley as 90-95 % full and the F layer as 10 km too low.

Titheridge has also derived a method by which the measurement of one point of the $h'(f)$ extraordinary trace can give information about the ionization below f_{min}. Results of this method indicate that the uncorrected night-time N(h) curves are about 20 km too high and the electron content is 40 % too low at a plasma frequency of 2.0 Mc/s.

Miss A. Robbins :

II. Notes on the calculation of hmF2.

Typical Errors in hmF2 deduced from N(h) profiles using the Routine method employed at Cambridge and at Slough can be summarized as follows :

	Day	*Night*
1. Assuming the nearest integral multiple of 0.1 Mc/s below foF2 is the critical frequency	−10	−10
2. Using a finite Δf	+ 4	+ 4
3. Neglect of underlying ionization by day	− 2	—
4. Neglect of E-F valley by day	+ 2	—
5. Incomplete $h'(f)$ trace	+ 2	+10
Total Error	− 4	+ 4

Dr. E. R. SCHMERLING :

I. Some regularities in N(h) data during the I.G.Y.

From a survey of all the I.G.Y. data from Huancayo, Talara, Panama and Washington, the following points of interest emerged.

1. A simple relationship exists between noon average electron densities and the length of day for each month.
2. A semi annual oscillation exists in the sun rise slope, dN/dt, which for Washington, can not be ascribed to the variation of χ, but may be related to the variation of the S_q current system.

II. The effects of vertical diffusion near the dip equator.

Near the dip equator, the electron density below the F region maximum increases exponentially with height. Under these conditions, the Ferraro diffusion term in the equilibrium equation reduces to a simple function of Dip angle, I. It then appears that the electron density at constant height increases with dip as $A(1 + BI^2)$ where B is inversely proportional to the neutral gas density. At some value of dip, however, this relationship breaks down and the electron density then decreases for increasing dip. From a consideration of dN/dt at constant height it is found that the dip angle when this failure will occur should increase with decreasing height. These qualitative deductions are in agreement with the experimental results of Croom, Robbins and Thomas.

Mr. A. H. SHAPLEY :

Present and Future extent of the world-wide $h'(f)$ soundings network.

At present the number of ionospheric V. I. observatories in operation is about 130 and it is hoped that at least this number would be in operation at sunspot minimum.

Dr. J. O. THOMAS :

The electron density distribution in the quiet ionosphere.

The variation of electron density at a series of fixed heights, with magnetic dip was presented by representative months during the I.G.Y. The following interesting points emerged.

1. In Sept. 1957, the well known maxima in the $N_h(I)$ curve move away from the equator with decreasing height.
2. In December 1957, the electron density at a given height in the F2 layer in the Northern hemisphere shows a very large maximum at 70° N.

Mr. M. D. VICKERS :

I. A semi-annual variation in ionospheric electron content.

Using N*m*F2 as a measure of the number of electrons where *k* is a constant, in a vertical column through the ionosphere, an estimate has been made of the total number of electrons in the ionosphere over the world. There appears to be 50 % more ionization in the ionosphere at the Equinoxes than at the Solstices. This may be explained qualitatively by the variation of the relative positions of the magnetic equator and the sub-solar point.

II. A relationship between *hm*F2 and M(3000) and some of its applications.

By correcting for the effect of the F1 and F1½ layers monthly mean values of *hm*F2 can be deduced from values of M factor with an accuracy of ±20 kms. The correction factor is only slightly dependent on latitude and solar activity.

Mr. J. W. WRIGHT :

Tests of various aspects of N(*h*) computing methods.

At N.B.S. Budden matrices have been calculated for an adequate number of zones of dip and total field to give complete world coverage.

Out of two years practical experience of a large N(*h*) programme, the following points are worth noting.

1. By reading *h'*(*f*) curves rounded to 1, 5 and 10 km it appears that the reading accuracy is not important provided it is random.
2. Values of *hm*F2 from the machine reduced profiles was found to be on average 10 km higher than those obtained using the 10 point Schmerling method.

3. The monthly mean average of electron density at a fixed height has been calculated and it appears that the standard deviations of the individual profile densities about the mean is almost directly proportional to the average electron density.

Dr. T. E. VAN ZANDT :

I. The U. S. Top-side Sounder.

The orbit of the satellite will be inclined at an angle of 80° to the magnetic equator, will have a useful life of six months and will make two soundings per day. The Sounder will use six sounding frequencies ; 3, 4, 5, 6, 8 and 10 megacycles and have a peak power of 10 watts.

As the electron density will not necessarily be zero at the satellite height, top-side profiles will need an extrapolation of the sub peak electron density profile as a starting density and height for the N(h) reduction process.

II. The diurnal variation of N(h) at Huancayo.

The pre-noon maximum in electron density at constant height can be explained simply in terms of recent measurements of the diurnal variation of neutral gas temperature.

II. — Minutes of the business meetings of U.R.S.I. Commission III N(h) Working Group, 30th and 31st August, 1960, London

1. The Chairman of Sub-Group A, Dr. W. Becker, (Max-Planck Institut für Aeronomie Institut, für Ionosphären-Physik, (20b) Lindau/Harz über Northeim, Hanover, Germany) reviewed the work of his group and presented a Report entitled « Accuracy of machine and manual methods of converting $h'(f)$ curves for N(h) calculations », which was circulated at the meeting.

Dr. Becker also presented papers entitled :

1) « Are the values of hm the height of maximum ionization density obtained from a sequence of $h'(f)$ records consistent ? »
2) « What is the range of scatter of hm values deduced by a ten point method and a machine method ? »
3) « The accuracy of hm approximation methods now in use. »

Dr. Becker presented and circulated in book-form : « Tables of Ordinary and Extraordinary refractive indices, group refractive indices and $h'_{o,x}$ (f) curves for standard ionospheric layer models. »

After discussion, the Report was accepted and the Chairman expressed the thanks of the Group to Dr. Becker and to the Max-Planck Institute which had borne costs of publication of the book of tables which would be invaluable for workers starting new $h'(f)$ N(h) programmes as tests of the accuracy of the method. Copies of the above are available from Dr. Becker.

2. The Chairman of Sub-Group B — Dr. E. R. Schmerling (Pennsylvania State University, State College, Pennsylvania) — presented a Report, entitled « Comparison of N(h) profiles from Ionogram Reduction with other methods ». After discussion, the Report was accepted.

3. The Chairman of Sub-Group C, Mr. J. W. Wright (National Bureau of Standards, Boulder, Colorado, U. S. A.) presented a Report, entitled « Views on the Future Nature and Extent of N(h) Computations from Ionograms.

After discussion, the Report was accepted and Mr. Wright was asked to bring the report to the notice of the Chairman of the World-Wide Soundings Committee.

4. *Availability of $h'(f)$ data* :

Mr. J. W. Wright circulated a book giving full information about $h'(f)$ data available at the World Data Centre, Boulder.

Mr. M. D. Vickers gave an account of $h'(f)$ data available at the World Data Centre, Slough.

5. *Ionogram Quality.* — The N(h) Working Group approved the standards laid down by the W.W.S.C. for the accuracy of $h'(f)$ records as adequate for present requirements. On the question of extra quality over limited frequency ranges, there were two conflicting requirements which were difficult to satisfy simultaneously. They were :

(i) Estimation of electron content up to the peak of the F layer requires high accuracy near *fo*F2.

(ii) Accurate profile shape requires the $h'(f)$ curve to be closely defined at low frequencies.

The group re-emphasized the need for ionosondes capable of receiving echoes at frequencies below the present values of f_{min}.

6. *Measurement of hm*F2. — It had been recommended in the Report to the General Assembly that *hm*F2 should be measured on a world wide scale wherever possible. At this meeting, there was continued support for the usefulness of *hm*F2. However, it appeared from satellite and rocket measurements that values of *hm*F2 derived by the Vertical Incidence Technique might be as much as 20 km below the actual maximum. This was because of the flatness of the N(h) distribution near the maximum.

It was therefore thought advisable that the symbol *hm*F2 should be kept for direct measurements of the height of the peak and that a new symbol should be used for the height derived from V I N(h) determinations.

7. *Estimate of total electron content.* — Because of the uncertainty in calculating low lying ionization and in computing *hm*F2, members were in general agreement that the publication of the sub-peak electron content n_T was to be discouraged as its accuracy as calculated by most of the routine methods was low. Because of this low accuracy, workers in rocket and satellite fields had been given misleading impressions when they compared their results of the value of electron content of the whole ionosphere with that below the F layer peak.

8. *Recommendations to Commission III of U.R.S.I.* — The Chairman indicated that recommendations were being made to U.R.S.I. by means of the Report of the N(h) Working Party to the XIIIth General Assembly, London 1960. In addition, it was agreed that the following recommendation should be presented.

The N(h) Working Group recommends to Commission III of U.R.S.I. and in particular to its World-wide Soundings Committee that a special effort should be made to cover as fully as possible the eclipse of 15th February 1960 which passes over Southern Europe. The N(h) Group would undertake the reduction of ionograms to N(h) profiles for the eclipse period and for a sufficient number of control days. These profiles would of course, be circulated to all interested parties.

9. *Routine* N(h) *work at ionospheric observatories.* — The Chairman reported that a letter had been received from the Chairman of the W.W.S.C., in which the following questions were raised :

(i) To what accuracy must h' and f be read in order to give N(h) profiles a satisfactory accuracy for present requirements ?

(ii) Do any convenient procedures exist for estimating or correcting for underlying ionization when the lower frequency on which a trace can be measured is relatively high, say 1.0, 1.5, or 2.0 Mc/s and what allowance should then be made for the possible error in the calculated profile.

The replies to these questions were discussed by the Working Group and were presented in the form of a Memorandum to the W.W.S.C., by Dr. Becker. This is reproduced below.

Memorandum to W.W.S.C. in answer to the Chairman's letter of August, 16th, 1960.

1. (i) The W.P. feels that standard accuracies adopted by the W.W.S.C. are adequate for most N(h) reduction work.

(ii) An estimate of the error in height measurement due to pulse width would be useful. This becomes of importance when comparing with other methods of estimating electron density distributions.

2. Corrections for ionization below f_{min} can be made in *certain* cases :

The following methods are suggested.

(a) Titheridge. — *J.A.T.P.*, vol. 17, 110-133, 1959.

(b) Becker. — *J.A.T.P.*, vol. 16, 67-83, 1959.

(c) Wright. — N.B.S. Report.

Methods (a) and (b) require careful measurement of the extraordinary trace above the gyrofrequency.

Method (c) proposes linearly extrapolating the $h'(f)$ trace back to 1.0 Mc/s on a logarithmic scale.

King, in a letter to your Chairman (August 15, 1960) has shown that method (c) almost completely corrects for low lying ionization during midnight hours. This method is used in the N.B.S. routine N(h) programme.

Neglect of this low lying ionization causes on average a 40 % deficit in electron content below the F layer peak at night for Slough (Robbins).

*hm*F2 and *h*(0.9 N*m*).

The general opinion of the N(*h*) Group is that, if possible, both these parameters should be calculated. However, if the W.W.S.C. decides that this is not practicable a majority of the N(*h*) W.P. favours the reduction of *hm*F2 provided that it is made clear to all users that *hm*F2 may still be below the actual maximum. This discrepancy is of great importance when an estimate of electron content below the peak is made. A minority however, favour the use of *h*(0.9 N*m*) in preference to *hm*F2. Results show that *hm*F2 averaged over ten days varied in the same way as *h*(0.9 N*m*) averaged over the same days.

The Solution of Joint Problems.

N(*h*) Group would like to enlist the co-operation of the W.W.S.C. to help in ascertaining the errors due to the following causes :

(*a*) the neglect of low lying ionization.

(*b*) the neglect of E.F. region valley.

(*c*) the accuracy of N(*h*) reduction near the F layer maximum.

The N(*h*) Group suggests that the world wide extent of these errors can be estimated if the following simple experiments are carried out. These experiments would only be of limited duration and extent. Members of the N(*h*) Group would undertake an analysis of the results of such experiments.

(A) *Low Lying Ionization.*

Two simple parameters are suggested which should indicate qualitatively the amount of ionization present below the lowest frequency observed at night.

(i) the slope of the night time F region $h'(f)$ trace near f_{min}.

(ii) the difference in the ordinary and extraordinary virtual heights at a fixed frequency above the gyrofrequency; this frequency should be as close to the gyrofrequency as possible. Its closeness is limited only by the local noise level. $1.4\, f_H$ is suggested. Titheridge's one point method can then be used to estimate the total amount of low lying ionization.

(iii) it would also be most useful if parameters for the night-time E layer could be scaled. To be of use the E layer should

show a clearly marked critical frequency and be accompanied by retardation in the F layer.

(B) *The* E-F *region valley.*

Becker has shown that E*s*-*h* traces can give, in some cases, useful information about the detailed shape of the valley between h_{max} E and *h*E*s*. The valley shape is necessary for estimating the error involved in the lower F region profile calculated using the monotonic assumption. However, the E*s*-*h* trace is only useful if its cusp is clearly separated in virtual height from the E cusp. It is suggested that if this condition is satisfied, then the E*s* trace should be tabulated (See also (A) (iii) above).

(C) *The accuracy of* N(*h*) *reduction near the* F *layer maximum.*

The technique described here is only practicable for ionograms with logarithmic frequency scales. It could however, be modified to deal with any other frequency scale.

It is suggested that theoretical ordinary and extraordinary $h'(f)$ curves be plotted by each station on the same scale as its standard ionograms. In this way, it would be easy to estimate how near the actual critical frequency the maximum frequency recorded on routine ionograms is, merely by fitting as closely as possible the theoretical to the experimental ordinary and extraordinary traces. (Hence the necessity for a logarithmic frequency scale). Such theoretical curves have been calculated by Becker. (Tables of ordinary and extraordinary refractive indices, group refractive indices and $h'_{o,x}(f)$ curves for standard ionospheric layer models, 1960) for parabolic, cosine and Epstein layers.

It is suggested that for the present purpose, a parabolic layer with three possible thicknesses (80, 110, 140 kms) is used. As the $h'(f)$ curves are dependent on the magnetic field, it would be necessary to plot four sets of curves to cover the normal frequency range, each set being limited to a usable range of 4 Mc/s.

8. The Chairman stated that this meeting would be the last for the N(*h*) Working Group, since it only had existence up to the time of the General Assembly of U.R.S.I.

9. The Chairman expressed thanks to the officers of Commission III, the Secretary General of U.R.S.I. — Colonel Herbays — and to the members of the Group for their co-operation.

10. The Chairman was pleased to be able to thank Mr. Jarvis-Smith who represented the Institution of Electrical Engineers for their hospitality.

GROUPE DE TRAVAIL SUR LA DISTRIBUTION ÉLECTRONIQUE EN ALTITUDE N(h)

Deuxième Réunion. Londres, 30 et 31 août 1960

Ci-dessous les vœux émis au cours de cette réunion :

Qualité des ionogrammes.

Le groupe de travail approuve les procédés typiques établis par le Comité des sondages à l'échelle mondiale au sujet de la précision des enregistrements $h'(f)$ comme répondant aux desiderata actuels. Concernant la question d'une précision supplémentaire sur des intervalles de fréquence limités, deux opinions contradictoires sont relevées :

(i) L'estimation du contenu électronique jusqu'à la crête de la couche F requiert une grande précision dans le voisinage de f_oF2.

(ii) La détermination précise des profils requiert une bonne détermination de la courbe $h'(f)$ aux fréquences basses.

Le groupe souligne à nouveau la nécessité d'ionosondes capables de recevoir des échos aux fréquences inférieures à la valeur actuelle de f min.

*Mesure de hm*F2.

Il a été recommandé dans le Rapport à la XIII[e] Assemblée Générale que *hm*F2 soit mesurée mondialement lorsque la chose est possible. A cette réunion, un appui continu a été réservé à la détermination de ce paramètre. Cependant, il apparaît que les mesures par fusées et satellites donnent des indications sur le fait que la valeur de *hm*F2 déduite des sondages verticaux est probablement trop basse de 20 km, en conséquence de l'aplatissement de la courbe N(h) près du maximum.

Il est donc proposé que le symbole *hm*F2 soit réservé aux mesures directes de la hauteur de crête et qu'un nouveau symbole soit utilisé pour la hauteur déduite des mesures du type VI N(h).

Estimation du contenu électronique total.

A cause de l'incertitude du calcul de *hm*F2 et de l'ionisation à basse altitude, les membres de la Commission sont généralement d'accord pour décourager la publication du contenu électronique n_T, laquelle est donnée avec trop d'imprécision par les méthodes conventionnelles. Un tel défaut a conduit les observateurs des fusées et satellites à douter de la valeur des résultats généraux dans leur comparaison du contenu total électronique de l'ionosphère au contenu électronique au-dessous du sommet de la couche F.

Recommandations à la Commission III de l'U.R.S.I.

Le Président indique que des recommandations ont été faites à l'U.R.S.I. dans le rapport du groupe de travail N(h) à la XIII^e Assemblée Générale, à Londres en 1960. De plus, le Comité est d'accord pour présenter la recommandation supplémentaire suivante.

Le Groupe de travail N(h) recommande à la Commission III de l'U.R.S.I. et, en particulier, à son Comité des Sondages à l'Echelle Mondiale, qu'un effort spécial soit apporté pour l'observation aussi complète que possible de l'éclipse du 15 février 1960 dans la région sud-européenne. Le groupe de travail N(h) entreprendra la réduction des ionogrammes en distribution N(h) en altitude pour la période de l'éclipse et pour un nombre suffisant de journées de contrôle. Les résultats seront distribués à toutes les organisations intéressées.

Travaux de routine sur N(h) *dans les observatoires ionosphériques.*

Le Président mentionne la réception d'une lettre rédigée par le Président du Comité des Sondages à l'Echelle Mondiale, dans laquelle les questions suivantes sont posées :

1. Avec quelle précision doivent être lues h' et f de manière à donner aux distributions verticales N(h) une précision satisfaisante pour les besoins actuels ?

2. Existe-t-il des procédés commodes pour estimer ou corriger les effets de l'ionisation inférieure quand la plus basse fréquence à laquelle une trace peut être mesurée est relativement élevée, par exemple 1,0, 1,5 ou 2,0 MHz, et comment peut-on estimer l'erreur possible dans les profils calculés ?

Les réponses à ces questions furent discutées par le groupe de travail, et furent présentées sous la forme d'un mémorandum au Comité des Sondages à l'Echelle Mondiale, par le Dr. Becker. Ce mémorandum est reproduit ci-après.

Mémorandum en réponse à la lettre du Président en date du 16 août 1960.

1. (i) Le groupe de travail pense que les précisions conventionnelles adoptées par le Comité des Sondages à l'Echelle Mondiale sont adéquates pour la plupart des travaux de réduction de N(h).

(ii) Une estimation de l'erreur en latitude due à la largeur d'impulsion serait utile. Cette estimation devient importante dans la comparaison des résultats avec ceux obtenus par d'autres méthodes pour estimer les distributions de densité électronique.

Les corrections pour l'ionisation en dessous de f_{min} peuvent être apportées dans certains cas.

Les méthodes suivantes sont suggérées :

a) Titheridge. — *J.A.T.P.*, vol. 17, 110-133, 1959.

b) Becker. — *J.A.T.P.*, vol. 16, 67-83, 1959.

c) Wright. — N.B.S. Report.

Les méthodes *a*) et *b*) requièrent une mesure précise de la trace extraordinaire au-dessus de la gyrofréquence. La méthode *c*) est basée sur l'extrapolation linéaire des traces $h'(f)$ jusqu'à 1,0 MHz dans une échelle logarithmique.

King, dans une lettre au Président (15-8-60), a montré que la méthode *c*) permet de corriger à peu près complètement les effets de la basse ionisation aux heures de midi.

Cette méthode est utilisée dans le programme de routine N(h) au N.B.S.

Le fait de négliger l'ionisation basse entraîne un déficit moyen de 40 % dans le contenu électronique au-dessous de la crête de la couche F, la nuit, à Slough (Robbins).

*hm*F2 et h(0,9 Nm).

L'opinion générale du groupe N(h) est que ces deux paramètres devraient être calculés, si possible.

Cependant, si le Comité des Sondages à l'Echelle Mondiale décide que la chose n'est pas praticable, la majorité du groupe N(h) favoriserait la réduction de *hm*F2 pourvu qu'il ait été affirmé que *hm*F2 est inférieur au maximum véritable. Cette différence est d'une grande importance dans l'estimation du contenu électronique

au-dessous de la crête. Une minorité des membres cependant favoriserait l'utilisation de $h(0{,}9\ Nm)$ de préférence à $hmF2$. Les résultats montrent que $hmF2$ prise en moyenne sur une période de 10 jours, varie de la même manière que $h(0{,}9\ Nm)$ prise en moyenne sur la même période.

Solution de problèmes mixtes.

Le groupe N(h) désire coopérer avec le Comité des Sondages à l'Echelle Mondiale pour étudier les erreurs dues aux causes suivantes :

1. Le fait de négliger l'ionisation basse.
2. Le fait de négliger la vallée dans la région EF.
3. L'imprécision des réductions N(h) près du maximum de la couche F.

Le groupe N(h) suggère que ces erreurs peuvent être estimées d'une façon générale sur le globe si les simples expériences suivantes sont effectuées. Ces expériences seraient seulement de durée et d'extension limitées. Les membres du groupe N(h) entreprendront l'analyse de leurs résultats.

(A) *Ionisation basse.*

Deux paramètres simples sont suggérés de manière à indiquer qualitativement la quantité d'ionisation au-dessous de la plus basse fréquence observée la nuit.

(i) La pente de la trace $h'(f)$ de la région F nocturne près de f_{min}.

(ii) La différence dans les hauteurs ordinaire et extraordinaire virtuelles à une fréquence fixe au-dessus de la gyrofréquence ; cette fréquence devrait être aussi proche de la gyrofréquence que possible. Cette proximité est limitée uniquement par le niveau de bruit normal. $1{,}4\ f_H$ est suggéré. La méthode en un point de Titheridge peut alors être utilisée pour estimer la quantité totale d'ionisation basse.

(iii) Il serait également très utile de mettre au point la réduction des paramètres pour la couche E nocturne. Pour qu'elle soit utilisable, la couche E doit montrer une fréquence critique clairement marquée et être accompagnée de retards dans la couche F.

(B) *La vallée dans la région* E-F.

Becker a montré que les traces E*s*-*h* peuvent donner dans certains cas des informations utiles au sujet de la forme détaillée de la vallée entre h_{max}E et *h*E*s*. La forme de la vallée est nécessaire pour estimer l'erreur présente dans les profils de la région F basse, profils calculés suivant l'hypothèse d'une variation monotone. Cependant, la trace E_s-*h* est seulement utile si son « cusp » est clairement séparé en hauteur virtuelle du « cusp » E. Il est suggéré que si cette condition est satisfaite, alors la trace F devrait être tabulée (voir également (A) (iii) ci-dessus).

(C) *La précision dans la réduction* N(*h*) *près du maximum de la couche* F.

La technique décrite ici est praticable seulement pour les ionogrammes dont l'échelle de fréquence est logarithmique. Elle pourrait cependant être modifiée pour s'appliquer à toute autre échelle de fréquence.

Il est suggéré que les coupes *h'*(*f*) théoriques ordinaire et extraordinaire soient construites pour chaque station dans la même échelle que les ionogrammes étalons. De cette façon, il serait aisé d'estimer l'écart entre la fréquence critique réelle et la fréquence enregistrée sur les ionogrammes de routine, en adaptant d'une manière aussi étroite que possible les traces théoriques aux traces expérimentales ordinaire et extraordinaire (nécessité d'une échelle de fréquence logarithmique). De telles courbes théoriques ont été calculées par Becker (tables d'indices de réfraction ordinaire et extraordinaire, indices de réfraction du groupe $h'_{o,x}$ (*f*) et courbes pour les modèles ionosphériques étalons, 1960) pour les couches paraboliques, en cosinus, et suivant Epstein. Il est suggéré que pour le but actuel, une couche parabolique avec 3 épaisseurs possibles (80, 110, 140 km) soit utilisée. Comme les courbes *h'*(*f*) dépendent du champ magnétique, il serait nécessaire de construire 4 séries de courbes pour couvrir l'intervalle normal de fréquence, chaque série étant limitée à un intervalle utilisable de 4 MHz.

Le Président fait remarquer que cette réunion sera la dernière du groupe de travail N(*h*) puisque le mandat du groupe arrive à expiration lors de l'Assemblée Générale de l'U.R.S.I.

U.R.S.I.-A.G.I. Committee

WORLD-WIDE SOUNDINGS COMMITTEE

Resolutions Adopted at 1960 Meetings

Breisach-London, August-September, 1960

1. — Intervals recommended for special analysis, 1959 and 1960

The following intervals have been chosen by the WWSC either because the magnetic activity was outstandingly small or because it was extremely high. These intervals are recommended for special analysis of ionograms and related data. (Days are counted from 00 h until 24 h U.T.).

(*a*) Geomagnetically quiet intervals :

1959 Dec. 31 — 1959 Jan. 2

(extremely quiet according to IUGG group on magnetic character figures)

1959 Feb. 23 — Feb. 24

1960 Apr. 19 — Apr. 22

1960 July 8 — July 9

(*b*) Geomagnetically very disturbed intervals :

1959 Feb. 25 — Feb. 26

1959 July 15 — July 19

(contains two strong disturbances with effect on cosmic ray flux)

1960 Mar. 31 — Apr. 2

2. — Electron density profile studies

A number of worthwhile analyses have been made using various electron density profile methods, and the potentialities appear to be great. The WWSC, noting that N(h) analysis techniques are still in a developing state, strongly encourages detailed analyses as special experiments at stations having suitable facilities.

3. — Determination of two parameters characterizing the electron density profile, N(h)

Discussion : Aeronomic considerations suggest that the height of maximum electron density is a most significant height parameter for the F-region. Unfortunately this can only be determined rather inaccurately by present direct (one-step) methods. Satisfying accuracy can apparently be obtained indirectly by a two-step process.

Two groups of such methods have been considered, both employing the well-tested assumption that the electron density distribution near the layer maximum can be approximated by a parabola.

In the first method one measures the height at two plasma frequencies below the critical frequency, foF2, for example by a machine or a ten-point method. With these two h-values and the observed value of foF2 the parameters of the nose-parabola can be determined, viz. a thickness parameter and the height of the maximum. In order to agree with current practice of several groups applying machine analysis of N(h) on a routine basis, the quarter-thickness of this parabola, designated qc, has been chosen as the thickness parameter (see Resolution 13). The parabolic « nose-fit » in electron density (N-fit) can be made either by machine methods (J. W. Wright) or by manual calculations (G. A. M. King) or by a simple graphical construction (A. Haubert).

In the second method, from the shape of the h'-trace one first determines the thickness parameter, qc. This can rapidly and easily be done by fitting the virtual height curves with a series of $h'f$ curves calculated for parabolas of various thicknesses, including the effects of the geomagnetic field (W. R. Piggott, W. Becker). Next a single height determination is made at 0.95 foF2, for example, by a ten-point of a machine method. The difference between that value and the height of the maximum is simply obtained from the model and is 0.6245 qc. This difference added to h(0.95 foF2) gives the desired result with sufficient accuracy.

Whichever of these methods is used the result of such a two-step estimation of the height of maximum electron density is denoted by « hc » (see Resolution 13). For methods other than by

machines, detailed instructions and tables are given in the U.R.S.I.-W.W.S.C. « Handbook for Ionogram Interpretation and Reduction ».

Because of lack of experience, only a rather small program limited in time to one year will be recommended by W.W.S.C. to the world-wide network of stations. The exact method which has been employed should be indicated by each station.

Resolution : The W.W.S.C. recommends that all stations determine the « true » height *hc* and the quarter-thickness *qc* as defined above by a two-step method or equivalent for hourly intervals on Regular World Days (three days each month). Both parameters should be tabulated, published and interchanged [1].

4. — Special work on ionograms useful for future N(h) work

Discussion : From discussions held at the N(h) Working Group as well as at the W.W.S.C., it has become apparent that for future N(h) investigations it would be important to know about some features of the ionograms which have been nearly neglected until now.

Resolution : The W.W.S.C. encourages as special scaling at stations where this is possible :

(a) Tabulation for night hours during 1961 of $f$min-x, and h'_x at $f$min-x, and h'_x at $f$min-x; the three parameters are listed in order of importance. ($f$min-x is $f$min measured for a clearly identifiable x-trace, while h'_0 is the virtual height of the x-trace and h'_o is the virtual height of the o-trace).

(b) Special efforts to measure foE at night.

(c) Special efforts to measure and distinguish total reflections from the D-region.

(d) Investigations of systematic instrumental errors of virtual heights, e.g., receiver delay, influence of pulse shape and amplitude, etc.

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[1] In the preparatory work and discussions leading to this recommendation, the W.W.S.C. has had useful advice and guidance from the U.R.S.I. Commission III Working Party on N(h) Profiles ; in the development of the recommended plan the Committee was in consultation with representatives of that group.

Contributors are invited to report on this special work through the Secretary of the W.W.S.C.

5. — Separate scaling of certain Es types

Discussion : The Es types were originally introduced by the W.W.S.C. to enable the occurrence of different classes of Es to be determined, and the classes were chosen for descriptive rather than physical reasons. However, several of the W.W.S.C. types appear to have, in fact, identified particular Es phenomena. There is, therefore, some demand for regional studies of these types with numerical data. The W.W.S.C. supports such studies.

In particular the auroral type « *a* » and retardation type « *r* » in auroral and polar latitudes taken together appear to identify specific phenomena which are different and are worth analyzing separately. The same appears to be true for equatorial type « *q* » at low latitudes. However, reasons of continuity, homogeneity and the requirements of the radio propagation services require that a master table of *fo*Es be prepared which is consistent with I.G.Y. practice.

Resolution : The W.W.S.C. encourages stations in the zones where Es types « *a* », « *r* », or « *q* » are common and which have suitable facilities to tabulate *fo*Es values for :

($a1$) types « *a* » and « *r* » combined,

or ($a2$) type « *q* »,

and (b) all other types present,

and (c) the master (I.G.Y. standard) table which shows the greatest values of *fo*Es at each hour independent of type.

This division involves little additional work when the data are handled by mechanical means.

6. — Scaling of MUF (3000)

Discussion : The W.W.S.C. draws attention to the advantage of tabulating MUF(3000)F2, particularly at stations where spread F or other effects often make *fo*F2 indeterminate. The publication of these measurements from stations at which they are available is clearly desirable. Experience has shown that MUF(3000)F2 is often much easier to measure than *fo*F2 and it is particularly

valuable for radio prediction purposes. It also shows the effect of disturbance much more clearly than *fo*F2, *hm*F2 or M(3000)F2.

Resolution : Where technically desirable (e.g., where mechanical methods of data handling are used) the W.W.S.C. recognizes MUF(3000)F2 as an alternative parameter on daily work sheets instead of M(3000)F2. If this is done, the parameter M(3000)F2 should always be calculated and tabulated in the basic table of M(3000)F2 values called for in the international interchange scheme. Furthermore, the advantages of publishing the additional MUF table are stressed and it is recommended that this be done as a second priority, wherever practical. Similar considerations apply to M(3000)F1 and MUF(3000)F1.

Inventory of stations and observations

The W.W.S.C. is aware that many temporary stations are regularly operated for periods of one to several months and that the data obtained would often be valuable in world-wide or special analyses. The W.W.S.C. recommends that *fo*F2 be reduced hourly by such stations, and the tabulations circulated to WDC's. This tabulation will at the same time give useful data and serve as an inventory of the times when the station obtained useful ionograms.

8. — Selected intervals for ionogram interchange in 1959 and 1960

Discussion : A reduced scale of ionogram interchange program for 1959 and the following years until the next sunspot minimum was recommended by the U.R.S.I.-A.G.I. Committee (Resolutions nos 7 and 6, Brussels, 1959) and given in detail by the W.W.S.C. (3rd Report, Brussels, 1959, Resolution no 6). The latter resolution said, in part, « The Committee believes that the principle of ionogram interchange as planned for the I.G.Y. should be maintained. It recommends, however, that the minimum number of ionograms in the interchange should be reduced for the 1959... observing period to a level which is useful for the scientific work but at the same time can be fitted into the practical aspects of station or network operation in the future. The Committee believes that this level is about 15 to 20 days a year and that a

reasonable plan which would give a random sample plus disturbed periods is as follows :

« 1. the (one) highest priority Regular World Day each month (reckoned in U.T.), *and*

» 2. one Special World Interval (of about 3 days) during the year, selected promptly by the W.W.S.C. by correspondence, or in exceptional cases, possibly two SWI's. »

Resolution : The W.W.S.C. hereby selects the intervals for 1959 and 1960 as follows (the dates of highest priority RWD are also given for completeness ; these are taken from the International Geophysical Calendar for the respective years) :

(*a*) Ionogram Interchange dates for 1959, reckoned in U.T. :

(i) Highest priority RWD : Jan. 10 ; Feb. 18 ; March 18 ; April 15 ; May 13 ; June 17 ; July 15 ; Aug. 12 ; Sept. 16 ; Oct. 2 ; Nov. 18 ; Dec. 16.

(ii) Additional interval selected by W.W.S.C. : *July* 16-19.

Note : the period July 15-19 contains two of the severe disturbances which occurred during 1959, accompanied by several important solar flares, cosmic ray phenomena and polar cap events. Note that July 15 is included in the ionogram interchange interval since it happened to be the highest priority RWD for July on the International Geophysical Calendar.

(*b*) Ionogram Interchange dates for 1960, reckoned in U.T. :

(i) Highest priority RWD : Jan. 13 ; Feb. 17 ; March 16 ; April 20 ; May 18 ; June 15 ; July 13 ; Aug. 10 ; Sept. 21 ; Oct. 19 ; Nov. 16 ; Dec. 14.

(ii) Additional interval selected by W.W.S.C. : *March* 31-*April* 2. (3 days) *Note* : This is the most outstanding magnetic disturbance of the first part of 1960. If another exceptional event should occur before the end of 1960, a second interval may possibly be designated by the W.W.S.C.

It is again recommended that stations provide copies of their ionograms for these days (00 h to 24 h U.T.) to one or all four WDC's in the same way as was done for the I.G.Y.

9. — Recapitulation of material to be available at WDC's

Discussion : One of the main reasons why WDC's have been established is their role to accumulate all data resulting from observations so that all necessary facilities may be found for scientific workers from any country at any WDC. At present this state is not yet completely reached.

Resolution : The W.W.S.C. therefore recapitulates earlier recommendations inviting all organizations producing ionospheric sounding data for the time beginning July 1, 1957 :

(*a*) to send regularly to one or all four WDC's the hourly tabulations and monthly medians of all characteristics which have been specified for interchange,

(*b*) to inform one or all four WDC's concerning special observations which have been made by sending appropriate lists,

(*c*) to send copies of ionograms for RWD's and SWI's during the I.G.Y. and for the principal RWD and special intervals after Jan. 1, 1959 (see W.W.S.C. 3rd and 4th reports), to one or all four WDC's,

(*d*) to send to one or all four WDC's at least one copy of every station booklet of ionospheric data, if issued,

(*e*) to send to one or all four WDC's a copy of every public report and a reprint to every published paper insofar as these contain ionospheric data or data analysis ; « data » should be interpreted broadly.

Note : If material is sent to only one WDC, it should if possible be in at least four copies so that the WDC's may complete the interchange, if material is sent in only one copy, the sending organization should arrange, if possible, for the receiving WDC to make copies for the other WDC's.

10. — Summary world-wide charts of I.G.Y. results

Discussion : The W.W.S.C. considers that it would be valuable to summarize the monthly median ionospheric data obtained during the I.G.Y. preferably as contour maps at convenient intervals in U.T. or the equivalent tables. The Committee recognizes that considerable smoothing and interpolation of the original data in

time and space is necessary together with extrapolations in zones where there are gaps in the world metwork. These procedures are inevitably controversial. The Committee is aware that this type of work is already progressing at several centers.

Resolution : The W.W.S.C. recommends :

(*a*) that the main organizations with experience in the preparation of basic world-wide charts be invited to circulate any existing maps of observed values of parameters obtained for the I.G.Y. and to prepare as soon as possible world maps of *fo*F2 and M(3000)F2 at the even hours in U.T. or the equivalent tables,

(*b*) that a small working party be set up with the W.W.S.C. Secretary as convenor to collect these charts, together with comments on the discrepancies between them, and expedite intercomparison,

(*c*) that this group decide whether it is possible and desirable to prepare compromise charts,

(*d*) that this group be responsible, for preparing for publication as soon as possible the charts or tables and comments, as appropriate, mentioned in (*a*) and (*b*), and the compromise charts or tables mentioned in (*c*) if these are considered to be possible and desirable,

(*e*) that afterwards the possibility and desirability of making similar charts or tables of *h'*F, *fo*Es, *fo*F1, *fo*E be examined.

11. — Atlas of scaled ionograms

Discussion : The W.W.S.C. has received requests for further and more modern material of the sort included in the widely used volume « Atlas of Ionograms », compiled originally for the W.W.S.C. by J. W. Wright and R. W. Knecht. The new volume should show the recommended scaling of the individual ionograms and should include examples from stations set up during the I.G.Y. The new volume should be designed both as an aid for training station observers and as a guide to scientists using tables and *f*-plots. In particular the Committee wishes, by having examples in the new Atlas, to rationalize and consolidate the interpretation of abnormal types of ionograms found at high and low latitudes, for example, oblique traces and numerical indices of spread F.

Resolution : The W.W.S.C. invites its Secretary, to compile a new « Atlas of Scaled Ionograms ». The W.W.S.C. invites organizations to prepare scaled sets of typical ionograms and also scaled sets of ionograms illustrating difficulties encountered at their stations. (Such contributions should be sent to R. W. Knecht, C.R.P.L., Boulder (Colorado) U. S. A.).

12. — Performance characteristics of ionosondes

Discussion : The Committee has received many endorsements to J. W. Wright's proposal that a study be made under W.W.S.C. auspices of the desirable performance characteristic of ionosondes or other measuring equipment which may be built in the near future, for example for the Sunspot Minimum Program 1964-65. Another objective of the study would be to bring into contact with one another the scientists and engineers who are working on these problems to help assure they are abreast of all appropriate techniques. The W.W.S.C. considers that this should not be simply a study by engineers, but should involve scientists who will make use of the results of future observations.

Resolution : The W.W.S.C. establishes a Subcommittee on Future Ionosonde Characteristics and invites K. Rawer to become its chairman and J. W. Wright its secretary. It directs them to coopt known interested persons for work on this subcommittee. The W.W.S.C. invites all interested workers to volunteer to serve as members or correspondents to the subcommittee. The subcommittee is directed to keep W.W.S.C. members continually informed of progress, for instance by information copies of correspondence, and make a status report for the next W.W.S.C. meeting.

13. — Additions and changes to standard nomenclature

(*a*) M(3000)F2 instead of (M3000)F2,
M(3000)F1 instead of (M3000)F1, etc.,
MUF(3000)F2 instead of F2-3000-MUF,
MUF(3000)F1 instead of F1-3000-MUF, etc.

(*b*) *hc* — (true) height at the critical frequency ; this is an estimate of the height of maximum electron density obtained by the 2-step method described in W.W.S.C. 1960 Resolution n° 3.

(*c*) *qc* — quarter-thickness of a parabolic model layer fitted to the « nose » of the F2 layer.

COMITÉ DES SONDAGES IONOSPHÉRIQUES A L'ÉCHELLE MONDIALE

Résolutions adoptées aux réunions de 1960

Breisach-Londres, août-septembre 1960

1. — INTERVALLES RECOMMANDÉS POUR UNE ANALYSE SPÉCIALE, 1959 ET 1960

Les intervalles suivants ont été choisis par le Comité en fonction de leur activité magnétique exceptionnellement forte ou faible. Ces intervalles sont recommandés pour une analyse spéciale des ionogrammes et des données s'y rapportant (les jours sont comptés de 00 h à 24 h T.U.).

a) *Intervalles géomagnétiquement calmes* :

31 déc. 1958 — 2 janv. 1959
(extrêmement calme d'après le groupe de l'U. G. G. I. sur les nombres caractéristiques magnétiques)

23 fév. — 24 fév. 1959

19 avril — 22 avril 1960

8 juillet — 9 juillet 1960

b) *Intervalles géomagnétiquement très perturbés* :

25 fév. — 26 fév. 1959

15 juillet — 19 juillet 1959
(contient deux fortes perturbations avec effet sur la radiation cosmique)

31 mars — 2 avril 1960

2. — ETUDES SUR LES PROFILS DE DENSITÉ ÉLECTRONIQUE

Plusieurs analyses de valeurs ont été faites en utilisant diverses méthodes pour déterminer la distribution électronique en altitude, et leurs potentialités apparaissent grandes. Le Comité, notant que les techniques d'analyse de N(h) sont encore au stade de développement, encourage fortement les analyses détaillées en tant qu'expériences spéciales aux stations qui disposent des facilités souhaitables.

3. — Détermination de deux paramètres caractérisant le profil de densité électronique N(h)

Le Comité recommande que toutes les stations déterminent la hauteur « réelle » *hc* et le quart d'épaisseur *qc*, par une méthode en deux pas ou équivalente pour chaque intervalle horaire lors des Journées mondiales régulières (trois jours chaque mois). Ces paramètres devraient être tabulés, publiés et échangés.

4. — Travaux spéciaux sur les ionogrammes, d'utilité pour les travaux futurs sur N(h)

Le Comité encourage les dépouillements suivants aux stations qui en ont la possibilité :

a) tabulation, pour les heures nocturnes en 1961, de *f* min-*x*, *h'x* à *f* min-*x*, *h'o* à *f* min-*x* ; les trois paramètres sont donnés suivant leur ordre d'importance. *f* min-*x* est *f* min mesurée sur une trace *x* clairement identifiable ; *h'x* est la hauteur virtuelle de la trace *x* ; *h'o* est la hauteur virtuelle de la trace *o*.

b) effort spécial pour mesurer *fo*E la nuit.

c) effort spécial pour mesurer et distinguer les réflexions totales à partir de la région D.

d) investigations des erreurs systématiques instrumentales sur les hauteurs virtuelles, par exemple, les retards du récepteur, l'influence de la forme d'impulsion et de l'amplitude, etc.

Les collaborateurs sont invités à adresser leurs rapports au Comité par l'intermédiaire du Secrétaire.

5. — Dépouillements spéciaux de certains types de *Es*

Le Comité encourage les stations situées dans les zones où les couches *Es* du type « *a* », « *r* » et « *q* » sont abondantes et qui en ont la possibilité, à tabuler les valeurs de *fo*Es pour :

*a*1) les types « *a* » et « *r* » combinés,
ou *a*2) le type « *q* »,
et *b*) tous les autres types présents,
et *c*) à dresser la table principale (suivant les conventions de l'A.G.I.) contenant les valeurs les plus élevées de *fo*Es pour chaque heure, indépendamment du type.

Cette division n'implique que peu de travail supplémentaire lorsque les données sont déterminées par des moyens mécaniques.

6. — Dépouillement de MUF(3000)

Pour le cas où la chose est possible techniquement (par exemple lorsque l'on utilise des méthodes mécaniques de traitement des données), le Comité reconnaît MUF(3000)F2 comme paramètre alternatif à mentionner journellement, au lieu de M(3000)F2. Lorsque cela est fait, le paramètre M(3000)F2 devra toujours être calculé et tabulé suivant les conventions permettant les échanges internationaux. De plus, les avantages de publier les tables additionnelles de MUF sont soulignés, et il est recommandé que cela soit fait en seconde priorité lorsque la chose est possible. Des considérations similaires s'appliquent à M(3000)F1 et à MUF(3000)F1.

7. — Inventaire des Stations et des observations

Le Comité U.R.S.I.-C.I.G. est averti du fait que beaucoup de stations temporaires fonctionnent régulièrement dans des périodes de un à plusieurs mois et que les données de ces stations seraient souvent utiles pour les analyses spéciales ou mondiales ; il recommande que *fo*F2 soit réduit pour chaque heure par ces stations, et que les tables en soient adressées aux Centres Mondiaux. Ces tables fourniront à la fois des données utiles et serviront à l'inventaire des périodes pendant lesquelles les stations obtiennent des ionogrammes utiles.

8. — Intervalles sélectionnés pour les échanges d'ionogrammes en 1959 et 1960

Le Comité sélectionne comme suit les intervalles pour 1959 et 1960 (les dates des journées mondiales de première priorité sont données également ; elles sont tirées du Calendrier Géophysique International pour les années respectives) :

a) Dates d'échange d'ionogrammes pour 1959 (Temps Universel) :

(i) jours mondiaux de première priorité : 10 janv. ; 18 fév. ; 18 mars ; 15 avr. ; 13 mai ; 17 juin ; 15 juil. ; 12 août ; 16 sept. ; 2 oct. ; 18 nov. ; 16 déc.

(ii) intervalle additionnel sélectionné par le Comité : 16-19 *juillet*. *Note* : la période du 15 au 19 juillet contient deux des perturbations géomagnétiques les plus sévères en 1959 ; celles-ci furent accompagnées d'éruptions en carré solaires, de phénomènes de radiation cosmique et d'événements dans la zone polaire. Noter que le 15 juillet est inclus dans l'intervalle d'échange comme journée mondiale régulière de première priorité pour juillet 1959.

b) dates d'échange d'ionogrammes pour 1960 (Temps Universel) :

(i) jours mondiaux de première priorité : 13 janv. ; 17 fév. ; 16 mars ; 20 avr. ; 18 mai ; 15 juin ; 13 juil. ; 10 août ; 21 sept. ; 19 oct. ; 16 nov. ; 14 déc.

(ii) intervalle additionnel sélectionné par le Comité : 31 *mars*-2 *avril* (3 jours).

Note : Cet intervalle contient la perturbation géomagnétique la plus sévère dans la première moitié de 1960. Si un autre intervalle exceptionnel était observé avant la fin de cette année, un second intervalle pourrait être désigné par le Comité.

Il est aussi recommandé que les stations fournissent des copies de leurs ionogrammes pour ces journées (00 h à 24 h) à l'un des centres mondiaux ou tous les quatre, comme pendant l'A.G.I.

9. — Récapitulation du matériel disponible dans les Centres Mondiaux

L'une des principales raisons qui ont motivé la création des Centres Mondiaux consiste dans leur rôle conservateur de toutes les données résultant des observations, en sorte que toutes les facilités nécessaires peuvent y être trouvées par l'ensemble des chercheurs de tous pays. Mais à l'heure actuelle, cette situation n'est pas complètement réalisée. En conséquence, le Comité récapitule et rassemble les recommandations antérieures invitant tous les organismes qui procèdent à des sondages ionosphériques depuis le 1er juillet 1957 :

a) à envoyer régulièrement à tous ou partie des centres mondiaux de données, les tabulations horaires et les moyennes mensuelles de toutes les caractéristiques spécifiées pour l'échange.

b) à informer tous ou partie des centres mondiaux des observations spéciales qui ont été effectuées, en leur adressant des listes appropriées.

c) à envoyer copie des ionogrammes aux centres mondiaux, pour les journées mondiales régulières et les intervalles spéciaux de l'A.G.I., et pour la journée mondiale principale et les intervalles spéciaux après le 1er juillet 1959 (voir 3e et 4e rapport du Comité des Sondages).

d) à envoyer à tous ou partie des centres mondiaux, au moins une copie de chaque cahier de données ionosphériques s'il a été reproduit.

e) à envoyer à tous ou partie des centres mondiaux une copie de tout rapport publié ou un tiré-à-part de chaque publication, du moment qu'ils contiennent des données ou des analyses ionosphériques ; le terme « donnée » doit être interprété au sens large.

Note : Dans le cas des envois à un seul centre, il serait préférable d'adresser 4 copies afin de faciliter les échanges ; si une seule copie est envoyée, l'organisme émetteur devrait s'arranger si possible pour que le centre récepteur puisse faire des copies pour les autres centres.

10. — Cartes mondiales des résultats de l'A.G.I.

Le Comité recommande :

a) que les principales organisations ayant une expérience dans la préparation des cartes mondiales de base soient invitées à faire circuler toute carte existante de valeurs observées pendant l'A.G.I., et à préparer à bref délai des cartes pour *fo*F2 et M(3000)F2 aux heures paires U.T., ou des tables équivalentes,

b) qu'un groupe de travail restreint soit réuni par le Secrétaire du Comité pour conserver ces cartes, accompagnées de commentaires sur leurs désaccords, et pour faciliter leur intercomparaison,

c) que ce groupe décide s'il est possible ou opportun de préparer des cartes de compromis,

d) que ce groupe soit responsable de la préparation et de la publication à brève échéance des cartes, tables et commentaires mentionnés aux par. *b*) et *c*), si cette publication est possible ou opportune,

e) qu'ensuite la possibilité ou l'opportunité de préparer des tables ou cartes similaires pour *h'f*, *fo*Es, *fo*F1, *fo*E soient examinées.

11. — Atlas d'ionogrammes dépouillés

Le Comité invite son Secrétaire à préparer un nouvel « atlas d'ionogrammes dépouillés ». Il invite les organisations à préparer des ensembles d'ionogrammes typiques et également des ensembles d'ionogrammes dépouillés illustrant les difficultés rencontrées en leurs stations. Ces contributions devraient être adressées à R. W. Knecht, C.R.P.L., Boulder, Col. U. S. A.

12. — Caractéristiques des performances d'ionosondes

Le Comité établit un Sous-Comité sur les caractéristiques des ionosondes futures et invite K. Rawer comme Président et J. W. Wright comme Secrétaire. Il invite ces personnalités à coopter les personnes intéressées. Le Comité invite tous les chercheurs intéressés à travailler dans le Sous-Comité comme membres ou correspondants. Le Sous-Comité tiendra les membres du Comité au courant des progrès, en leur adressant copie de la correspondance, et fera rapport au Comité à sa prochaine réunion.

13. — Additions et changements a la nomenclature adoptée

a) M(3000)F2 au lieu de (M3000)F2
M(3000)F1 au lieu de (M3000)F1, etc.
MUF(3000)F2 au lieu de F2-3000-MUF
MUF(3000)F1 au lieu de F1-3000-MUF, etc.

b) *hc* — hauteur « vraie » à la fréquence critique ; estimation de l'altitude du maximum de densité électronique, obtenue par la méthode en deux étapes dont il est question dans la résolution 3 du Comité, 1960.

c) *qc* — quart d'épaisseur du modèle parabolique adapté au « nose » de la couche F2.

U.R.S.I. Committee on International Cooperation in Geophysics

(U.R.S.I.-C.I.G. COMMITTEE)

Introduction

The Executive Committee of U.R.S.I., at its meeting of September 2nd, 1960, decided to appoint a new Committee on International Cooperation in Geophysics to succeed to the U.R.S.I.-A.G.I. Committee.

The terms of reference and the membership of this Committee are given below as approved by the General Assembly at its Plenary Closing Session.

Terms of reference

1. To co-operate with C.I.G. in all matters relating to U.R.S.I. in the field of geophysics.
2. To co-ordinate the activities of those U.R.S.I. Commissions which are especially concerned in the field of geophysics.
3. To deal with all matters referring to the I.G.Y. formerly considered by the U.R.S.I.-A.G.I. Committee including the flow of data to W.D.Cs. and the publication of I.G.Y. and I.G.C. data in the field of radio science.
4. To integrate U.R.S.I. special programmes of research to be planned under C.I.G. and to hold meetings and symposia in conjunction with the Commissions to further scientific progress under such plans.

Membership

Professor W. J. G. Beynon (*Chairman*),
Dr Y. Aono,
Mr. Gr. M. Brown (*Secretary*),
Dr. F. Denisse,
Dr. W. Dieminger,
Professor R. A. Helliwell,
Dr. C. O. Hines,
Mr. F. Horner,
Dr. C. G. Little,
Dr. M. G. Morgan,

Dr. H. Newell,
Mr. W. R. Piggott,
Dr. N. Pushkov (or Dr. Mednikova),
Mr. J. A. Ratcliffe,
Dr. K. Rawer,
Mr. A. H. Shapley,
Mr. J. Voge.

Ex officio : President of U.R.S.I. (or nominee),
Secretary-General of U.R.S.I.

Minutes of the First Meeting

The first meeting of the U.R.S.I.-C.I.G. Committee was held at University College, London, on 12-13 September, 1960. The following members were present :

Professor W. J. G. Beynon (*Chairman*),
Dr. L. V. Berkner (*President of U.R.S.I.*),
Mr. G. M. Brown (*Secretary*),
Dr. F. Denisse,
Dr. W. Dieminger,
Professor R. A. Helliwell,
Colonel E. Herbays (*Secretary General of U.R.S.I.*),
Dr. C. O. Hines,
Mr. F. Horner,
Dr. C. G. Little,
Dr. M. G. Morgan,
Mr. W. R. Piggott,
Dr. K. Rawer,
Mr. A. H. Shapley,
Dr. H. Uyeda (representing Mr. Y. Aono).

Dr. P. M. Millman attended by invitation.

1. — Introduction

The Chairman briefly outlined the circumstances leading to the formation of the U.R.S.I.-C.I.G. Committee. Essentially, this Committee has been established to maintain liaison between U.R.S.I. and the International Committee on Geophysics (C.I.G.). The new Committee replaces the U.R.S.I.-A.G.I. Committee, now formally dissolved, and will deal with all matters previously considered by that Committee.

It was agreed that a letter of thanks should be sent to Sir Edward Appleton, expressing appreciation of the work performed by the U.R.S.I.-A.G.I. Committee. It was also agreed that Sir Edward be invited to become an Honorary Chairman of the new U.R.S.I.-C.I.G. Committee.

The Chairman presented the Terms of Reference and the Membership of the Committee, as agreed at the meeting of the Executive Committee of U.R.S.I. on September 2, 1960. A copy of these is give non p. 70. It was also noted that the Executive Committee had confirmed that the World Wide Soundings Committee, formerly a Sub-Committee of the U.R.S.I.-A.G.I. Committee, should in future be affiliated to the U.R.S.I.-C.I.G. Committee.

It was stated that Sir Edward Appleton wished to retire as U.R.S.I. representative on the Bureau of C.I.G., and that the Executive Committee of U.R.S.I. had nominated Professor W. J. G. Beynon in his place. The Committee then agreed to nominate Dr. W. Dieminger as Discipline Member for ionosphere on C.I.G. in place of Professor Beynon.

2. — Matters from the U.R.S.I.-A.G.I. Committee

The full report of the administrative matters discussed at the U.R.S.I.-A.G.I. Committee meeting held in Brussels on 1-3 September, 1959, has been published in *Information Bulletin* No. 120 (March-April, 1960), pp. 25-47. Arising from these minutes, the following points were discussed.

(*a*) *Publication of I.G.Y. Data.*

It was reported that the first volume of vertical incidence data would be published very soon. It was still not possible to make a firm decision on the publication of data for absorption, drifts and whistlers, since the flow of such data to W.D.C.s has been relatively slow. In the case of absorption, at least, the quality of the data will also need to be considered.

It was agreed that the co-ordinators for these subjects (viz : Mr. Piggott — absorption Al ; Dr. C. G. Little — absorption A.2 ; Dr. Rawer — drifts ; Dr. Morgan — whistlers), should assess the situation and endeavour to make a firm decision by January, 1961, on whether or not publication of these data is desirable. They undertook to inform the Chairman of their decision so that he

could indicate to C.I.G. at its next meeting in January 1961, how many volumes and how much data were to be published for the ionosphere discipline. It was agreed that March 31, 1961, should be the deadline for data to be received at W.D.Cs. for inclusion in the Annals.

(*b*) *Interpretative Volumes.*

It was agreed that it is still desirable to plan for the publication of interpretative volumes. However, it was felt that the preparation of these could await the publication of the data. In the case of vertical soundings, the appropriate volume might follow the symposium referred to in item 4 below.

(*c*) *Operation of World Data Centres.*

The importance of the continuing operation of the World Data Centres was stressed. With the end of the I.G.Y. certain revisions have become necessary to indicate to stations what data should be sent to W.D.C.s and what standards are to be maintained. The World Wide Soundings Committee has already made such recommendations for vertical soundings in its third report (*U.R.S.I. Information Bulletin*, No. 120, March-April, 1960, pp. 47-93), and with the widening scope of this Committee (see item 3 below) it is planned that similar revisions will be made for the other ionospheric disciplines.

3. — World Wide Soundings Committee

Mr. A. H. Shapley presented a summary report on the activities of the W.W.S.C. since the XII General Assembly. This will be published along with the report of the U.R.S.I.-A.G.I. Committee in the Proceedings of the XIII General Assembly). Resolutions formulated by the W.W.S.C. during its 1960 meetings and subsequently adopted by the U.R.S.I.-C.I.G. Committee are given at the end of this report.

The Chairman stated that in view of the rapidly changing situation in ionospheric research, it might be desirable for the broad terms of reference of the W.W.S.C. to be modified and extended. It was noted that the W.W.S.C. had already concerned itself with oblique incidence soundings. The Chairman was

authorized to discuss the future activities of the W.W.S.C. with its Chairman.

4. — Symposium on Vertical Incidence Results

The Committee received a proposal from the W.W.S.C. that a symposium to discuss vertical incidence sounding results be held. It was agreed that the Chairman and the Chairman of the W.W.S.C. should have further discussions on this proposal, and if necessary take action.

5. — Sunspot Minimum Programme

It was noted that there had now been a formal proposal for a limited programme of geophysical research at the time of the next sunspot minimum epoch (1964-65). The need for such an enterprise in the radio field was foreseeen by the U.R.S.I.-A.G.I. Committee at the time of its meeting in Edinburgh in 1958 (U.R.S.I. Bulletin No 111, Sept.-Oct. 1958, p. 30), and at the present meeting there was a preliminary discussion of this Sunspot Minimum Programme (S. M. P.). It was emphasized that this should not merely be regarded as a smaller-scale version of the I.G.Y., but that full advantage should be taken of the improved and new techniques which have been, and will be, developed in the intervening years.

As a first step, it was agreed that each co-ordinator should prepare a draft statement on the kinds of experiments which ought to be undertaken in his field, with suggestions about stations and equipment. These statements should be submitted to the Ionosphere Discipline Member (Dr. Dieminger) by 1 December, 1960, so that he can prepare a report to be presented to the meeting of C.I.G. in January, 1961.

G. M. Brown,
Secretary

Resolutions

1. — Publication of data in the « Annals »

The U.R.S.I.-C.I.G. Committee recommends that the latest date for the receipt of data at World Data Centres for publication in the « Annals of the I.G.Y. » should be 31st March 1961, and urges all stations to send their data to their W.D.C. by this date.

2. — Special pulse transmissions from V.L.F. stations

The U.R.S.I.-C.I.G. Committee endorses the resolution adopted by U.R.S.I. Commission IV on « special pulse transmissions from V.L.F. stations ».

3. — Inventory of Stations and Observations (from W.W.S.C.)

The U.R.S.I.-C.I.G. Committee, being aware that many temporary stations are regularly operated for periods of one to several months and that the data obtained would often be valuable in world-wide or special analyses, recommends that *fo*F2 be reduced hourly by such stations, and the tabulations circulated to W.D.Cs. This tabulation will at the same time give useful data and serve as an inventory of the times when the station obtained useful ionograms.

4. — Recapitulation of Material to be available at W.D.Cs. (from W.W.S.C.)

The U.R.S.I.-C.I.G. Committee, noting that one of the main reasons why W.D.Cs. have been established is their role to accumulate all data resulting from observations so that all necessary facilities may be found for scientific workers from any country at any W.D.C., and that at present this state is not yet completely reached, therefore recapitulates and collects earlier recommendations inviting all organizations producing ionospheric sounding data for the time beginning July 1, 1957.

(*a*) to send regularly to one or all four W.D.Cs. the hourly tabulations and monthly medians of all characteristics which have been specified for interchange,

(*b*) to inform one or all four W.D.Cs. concerning special observations which have been made by sending appropriate lists,

(*c*) to send copies of ionograms for R.W.Ds. and S.W.Is. during the I.G.Y. and for the principal R.W.D. and special intervals after Jan, 1, 1959 (see W.W.S.C. 3rd and 4th reports), to one or all four W.D.Cs.,

(*d*) to send to one or all four W.D.Cs. at least one copy of every station booklet of ionospheric data, if issued,

(*e*) to send to one or all four W.D.Cs. a copy of every public report and a reprint of every published paper insofar as these contain ionospheric data or data analysis ; « data » should be interpreted broadly.

Note : If material is sent to only one W.D.C., it should if possible be in at least four copies so that the W.D.Cs. may complete the interchange ; if material is sent in only one copy, the sending organization should arrange, if possible, for the receiving W.D.C. to make copies for the other W.D.C.s

5. — Systematic Determination of parameters characterizing the electron density profile N(*h*) (from W.W.S.C.)

The U.R.S.I.-C.I.G. Committee recommends that all stations determine the « true » height *hc* and the quarter-thickness *qc* of the F-region for hourly intervals on Regular World Days (three days each month) by a two-step method or equivalent as detailed by the World Wide Soundings Committee (1960) ; both parameters should be tabulated, published and interchanged.

6. — Summary world charts of I.G.Y. results (from W.W.S.C.)

The U.R.S.I.-C.I.G. Committee endorses the plan of the World Wide Soundings Committee actively to co-ordinate the preparation of world contour maps of monthly median ionospheric data or equivalent tables for the I.G.Y. period and invites the co-operation of ionospheric organizations having experience in the preparation of world charts.

7. — Performance characteristics of ionosondes (from W.W.S.C.)

The U.R.S.I.-C.I.G. Committee endorses the plan of the World Wide Soundings Committee to undertake a study of the desirable performance characteristics of future ionosondes or similar measuring equipment in order that scientists and engineers working on these problems will be aided in being abreast of all appropriate techniques and urges co-operation of all ionospheric organizations in this study.

8. — Atlas of Scaled Ionograms (from W.W.S.C.)

The U.R.S.I.-C.I.G. Committee endorses the plan of the World Wide Soundings Committee to compile a new « Atlas of Scaled Ionograms » for use both as an aid for training station observers and as a guide to scientists using ionospheric tables and *f*-plots and urges ionospheric organizations to co-operate by providing suitable scaled sets of ionograms for this purpose.

Comité de l'U.R.S.I. pour la Coopération Internationale en Géophysique

(Comité U.R.S.I.-C.I.G.)

Introduction

En sa séance du 2 septembre 1960, le Comité Exécutif de l'U.R.S.I. a décidé de remplacer le Comité de l'U.R.S.I. pour l'A.G.I. par un nouveau Comité pour la Coopération Internationale en Géophysique.

Le mandat et la composition de ce Comité, qui ont été approuvés par l'Assemblée Générale en sa séance plénière de clôture, sont donnés ci-après :

Mandat du Comité

1. Coopérer avec le Comité International de Géophysique pour toutes les questions se rapportant à l'U.R.S.I. dans le domaine de la géophysique.
2. Coordonner les activités des Commissions de l'U.R.S.I. qui sont particulièrement intéressées dans le domaine de la géophysique.
3. Traiter toutes les questions se rapportant à l'A.G.I. et étudiées précédemment par le Comité de l'U.R.S.I. pour l'A.G.I., y compris la fourniture des données aux Centres Mondiaux des Données et la publication des données de l'A.G.I. et de la C.I.G. entrant dans le domaine de la radio-électricité.
4. Intégrer les programmes spéciaux de recherches de l'U.R.S.I. à établir par le C.I.G. et organiser, dans le cadre de ces programmes, des réunions et des symposia conjointement avec les Commissions pour faire progresser la science.

Composition du Comité

Professor W. J. G. Beynon (*Président*),
Dr Y. Aono,
M. G. M. Brown (*Secrétaire*),
Dr J. F. Denisse,
Dr W. Dieminger,
Professor R. A. Helliwell,
Dr C. O. Hines,
M. F. Horner,
Dr C. G. Little,
Dr M. G. Morgan,
Dr H. Newell,
M. W. R. Piggott,
Dr N. Pushkov (or Dr Mednikova),
M. J. A. Ratcliffe,
Dr K. Rawer,
M. A. H. Shapley,
M. J. Voge.

Ex officio : le Président de l'U.R.S.I. (ou son représentant), le Secrétaire Général de l'U.R.S.I.

PROCÈS-VERBAL DE LA PREMIÈRE RÉUNION

(*Résumé*)

La première réunion du Comité U.R.S.I.-C.I.G. a été tenue à Londres, University College, les 12-13 septembre 1960 pendant la XIIIe Assemblée Générale de l'U.R.S.I. Y assistaient :

Prof. W. J. G. Beynon (*Président*),
Dr L. V. Berkner (*Président de l'U.R.S.I.*),
M. G. M. Brown (*Secrétaire*),
Dr J. F. Denisse,
Dr W. Dieminger,
Prof. R. A. Helliwell,
Col. E. Herbays (*Secrétaire Général de l'U.R.S.I.*),
Dr C. O. Hines,
M. F. Horner,
Dr C. G. Little,

Dr M. G. Morgan,
M. W. R. Piggott,
Dr K. Rawer,
M. A. H. Shapley,
Dr H. Uyeda (représentant le Dr Y. Aono),
Dr P. M. Millman.

Ce nouveau Comité a pour but de remplacer le Comité U.R.S.I.-A.G.I., de maintenir les contacts entre l'U.R.S.I. et le Comité International de Géophysique, et de poursuivre les travaux déjà entamés au cours de l'A.G.I. et pendant la période ultérieure dans la partie géophysique des activités de l'Union. Les termes de référence et la composition du Comité, adoptés à la réunion du Comité Exécutif du 2 septembre 1960, furent examinés. Il fut noté que le Comité des Sondages Ionosphériques à l'échelle mondiale adhère maintenant au Comité U.R.S.I.-C.I.G. Il fut noté aussi que, suivant son désir, Sir Edward Appleton ne représentera plus l'U.R.S.I. au bureau du C.I.G. et que le Comité Exécutif a désigné le Prof. W. J. G. Beynon pour remplir cette fonction. Le Comité U.R.S.I.-C.I.G. désigna le Dr W. Dieminger comme membre du C.I.G. pour l'Ionosphère, en remplacement du Prof. Beynon.

Les questions suivantes furent envisagées à la première réunion du Comité U.R.S.I.-C.I.G. :

1. *Sujets provenant du Comité U.R.S.I.-A.G.I.*

   a) Publication des données de l'A.G.I.

   b) Publication de volumes d'interprétation.

   c) Activité des Centres Mondiaux de données.

2. *Comité des Sondages à l'échelle mondiale.*

Le rapport du Comité sera publié dans les Comptes Rendus de la XIIIe Assemblée Générale.

3. *Symposium sur les résultats de sondages verticaux.*

La question sera examinée plus en détail ultérieurement par les Présidents du Comité U.R.S.I.-C.I.G. et du Comité des sondages mondiaux.

4. *Programme du Minimum Solaire.*

Programme de recherches géophysiques limité, à entreprendre avec les moyens améliorés et de nouvelles techniques, en 1964-1965, lors du prochain minimum d'activité.

Ont été désignés comme coordinateurs des publications :

M. PIGGOTT (Absorption A1),
Dr C. G. LITTLE (Absorption A2),
Dr RAWER (vents),
Dr MORGAN (sifflements).

Les coordinateurs sont également invités à préparer des spécifications pour le Programme du Minimum Solaire et à en discuter avec le Dr Dieminger en vue de préparer un rapport à soumettre au C.I.G. en janvier 1961.

RÉSOLUTIONS

1. *Publication des données dans les Annales.*

Le Comité U.R.S.I.-C.I.G. recommande que la date limite pour la réception des données aux Centres Mondiaux en vue de leur publication dans les Annales soit fixée au 31 mars 1961, et invite expressément toutes les stations à envoyer leurs données aux Centres avant cette date.

2. *Emissions spéciales pulsées par les stations V.L.F.*

Le Comité U.R.S.I.-C.I.G. appuie la résolution adoptée par la Comm. IV de l'U.R.S.I. au sujet des émissions spéciales pulsées des stations V.L.F.

3. *Inventaire des Stations et des observations* (Comité des Sondages à l'Echelle Mondiale).

Le Comité U.R.S.I.-C.I.G. est averti du fait que beaucoup de stations temporaires fonctionnent régulièrement dans des périodes de un à plusieurs mois et que les données de ces stations seraient souvent utiles pour les analyses spéciales ou mondiales ; il recommande que *f*oF2 soit réduit pour chaque heure par ces stations, et que les tables en soient adressées aux Centres Mondiaux. Ces tables fourniront à la fois des données utiles et serviront à l'inventaire des périodes pendant lesquelles les stations obtiennent des ionogrammes utiles.

4. *Récapitulation du matériel disponible dans les Centres Mondiaux* (Comité des Sondages à l'Echelle Mondiale).

Le Comité U.R.S.I.-C.I.G. note que l'une des principales raisons qui ont motivé la création des Centres Mondiaux consiste dans leur rôle conservateur de toutes les données résultant des observations, en sorte que toutes les facilités nécessaires peuvent y être trouvées par l'ensemble des chercheurs de tous pays, mais qu'à l'heure actuelle, cette situation n'est pas complètement réalisée. En conséquence, le Comité récapitule et rassemble les recommandations antérieures invitant tous les organismes qui procèdent à des sondages ionosphériques depuis le 1er juillet 1957 :

a) à envoyer régulièrement à tous ou partie des centres mondiaux de données, les tabulations horaires et les moyennes mensuelles de toutes les caractéristiques spécifiées pour l'échange.

b) à informer tous ou partie des centres mondiaux des observations spéciales qui ont été effectuées, en leur adressant des listes appropriées.

c) à envoyer copie des ionogrammes aux centres mondiaux, pour les journées mondiales régulières et les intervalles spéciaux de l'A.G.I., et pour la journée mondiale principale et les intervalles spéciaux après le 1er juillet 1959 (voir 3e et 4e rapport du Comité des Sondages).

d) à envoyer à tous ou partie des centres mondiaux, au moins une copie de chaque cahier de données ionosphériques s'il a été reproduit.

e) à envoyer à tous ou partie des centres mondiaux une copie de tout rapport publié ou un tiré-à-part de chaque publication, du moment qu'ils contiennent des données ou des analyses ionosphériques ; le terme « donnée » doit être interprété au sens large.

Note : Dans le cas des envois à un seul centre, il serait préférable d'adresser 4 copies afin de faciliter les échanges ; si une seule copie est envoyée, l'organisme émetteur devrait s'arranger si possible pour que le centre récepteur puisse faire des copies pour les autres centres.

5. *Détermination systématique des paramètres caractérisant la distribution électronique en altitude* N(h) (Centre des Sondages).

Le Comité U.R.S.I.-C.I.G. recommande que toutes les stations déterminent la hauteur « vraie » *hc* et le quart d'épaisseur *qc* de la région F à intervalles horaires pendant les Jours Mondiaux (trois jours chaque mois) par une méthode en deux étapes ou équivalente comme indiqué par le Comité des Sondages à l'Echelle mondiale (1960) ; ces paramètres devraient être tabulés, publiés et échangés.

6. *Cartes mondiales des résultats de l'A.G.I.* (Comité des Sondages).

Le Comité U.R.S.I.-C.I.G. appuie le plan du Comité des Sondages à l'échelle mondiale pour coordonner activement la préparation de cartes mondiales des données ionosphériques moyennes mensuelles, ou de tables équivalentes pour la période de l'A.G.I. ; il invite les organismes ionosphériques ayant une expérience dans la préparation de cartes mondiales à coopérer dans ce sens.

7. *Caractéristiques des performances d'ionosondes* (Comité des Sondages).

Le Comité U.R.S.I.-C.I.G. appuie le plan du Comité des Sondages à l'échelle mondiale pour étudier les caractéristiques souhaitables des ionosondes à construire, ou des équipements similaires, en sorte que les chercheurs et les ingénieurs travaillant à ces problèmes soient pleinement avertis des techniques appropriées ; il invite toutes les organisations ionosphériques à collaborer à cette étude.

8. *Atlas d'ionogrammes réduits* (Comité des Sondages).

Le Comité U.R.S.I.-C.I.G. appuie le plan du Comité des Sondages à l'échelle mondiale en vue d'établir un nouvel « Atlas d'ionogrammes réduits » qui doit servir aussi bien à l'entraînement des observateurs que comme guide aux chercheurs utilisant les tables ionosphériques et les diagrammes-*f* ; il invite expressément les organisations ionosphériques à coopérer à ce programme en fournissant des ensembles d'ionogrammes convenablement réduits dans ce but.

Comité de l'U.R.S.I. pour les Attributions de Fréquences pour des Buts Scientifiques

CONSTITUTION DU COMITÉ

1. Le Comité a été établi par le point 16(*d*) de la Réunion du Comité Exécutif tenue le 2 septembre, « pour examiner avec les différentes Commissions les besoins en fréquences radioélectriques pour la radioastronomie et la recherche spatiale. Il sera chargé de deux missions : (1) de coordonner les besoins de l'U.R.S.I. pour la radio astronomie et la recherche spatiale, et (2) d'agir au nom de l'U.R.S.I. et du C.O.S.P.A.R. dans le Comité Inter-Unions ».

2. Les membres nommés sont :

M. J. A. RATCLIFFE (*Président*),
le Dr R. EMBERSON,
le Dr L. G. H. HUXLEY (au nom du C.O.S.P.A.R.),
le Dr V. ILYIN,
le Dr H. STERKY.

PREMIÈRE RÉUNION DU COMITÉ

Lundi 5 septembre 1960

Présents : M. J. A. RATCLIFFE (*Président*), Dr H. STERKY, Dr ILYIN (avec le Dr VITKEVITCH comme interprète), Professeur L. G. H. HUXLEY. Le Dr R. EMBERSON n'assistait pas à cette Assemblée Générale de l'U.R.S.I.

Administration.

Le Président déclare qu'il a convoqué cette réunion préliminaire pour examiner :

1) les buts du Comité pendant et après l'Assemblée Générale,

2) les relations du Comité avec les autres organismes de l'U.R.S.I.,

3) les dates des réunions du Comité.

Au cours de la discussion des points (1) et (2) ci-dessus, il est convenu qu'il était important de coordonner les activités du Comité, celles de la Commission V, et de sa Sous-Commission V*e* (pour les

fréquences pour la radioastronomie) et celles du nouveau Comité de l'U.R.S.I. pour les Recherches Radioélectriques dans l'Espace. Le Président suggère que la coordination des activités avec celles de la Commission V serait facilitée si le Dr J. W. Findlay était coopté comme secrétaire du Comité. La coopération avec le Comité pour les Recherches Radioélectriques dans l'Espace pourrait être assurée par le Professeur Huxley, Président de ce Comité.

Décisions.

Il est décidé de coopter le Dr Findlay comme Secrétaire du Comité et que, pour la prochaine réunion, deux documents seraient préparés pour exposer les attributions actuelles en :

1) radioastronomie,

2) recherches spatiales.

En particulier, il conviendrait de comparer les demandes de fréquences de l'U.A.I., de l'U.R.S.I. et du C.C.I.R. avec les attributions réelles faites à la conférence de Genève.

Il est décidé de tenir la prochaine réunion le jeudi 8 septembre à 09.00 h. Des avis seront envoyés.

DEUXIÈME RÉUNION DU COMITÉ

Jeudi, 8 septembre 1960 à 09.00, University College, Londres.

1. *Présents* : J. A. Ratcliffe (*Président*), H. Sterky (*Suède*), V. Ilyin (U. R. S. S.) (V. Vitkevitch, interprète), L. G. H. Huxley (Australie), E. Metzler (C.C.I.R.), J. W. Findlay (E. U. A., *Secrétaire*).

2. *Sous-Commission Ve de l'U.R.S.I.*

Findlay présente le rapport de la Sous-Commission Ve [1] et expose brièvement les efforts qui ont été faits en 1958 et 1959 pour obtenir la protection de fréquences pour la radioastronomie.

3. *Comité Inter-Unions.*

Ratcliffe expose le mode de travail que pourrait suivre le Comité Inter-Unions qui sera formé entre l'U.R.S.I., l'U.A.I. et le C.O.S.P.A.R. Les besoins scientifiques pourraient d'abord

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[1] Voir *C. R. Assemblées Générales U.R.S.I.*, Vol. XII, Fasc. 5.

être établis et présentés au C.C.I.R. et à la prochaine conférence de l'U.I.T. L'appui d'administrations nationales, aussi nombreuses que possible, devrait être recherché étant donné que les délégués à la Conférence de l'U.I.T. reçoivent des instructions et des renseignements des administrations.

STERKY souligne l'importance du canal passant par les administrations. Le C.C.I.R. a été très précieux en sa capacité de conseiller et à la Conférence des Plénipotentiaires tenue en 1959, il a été suggéré que le C.C.I.R. fasse des propositions à l'U.I.T. Les administrations, si elles étaient complètement au courant des besoins de la science, pourraient présenter des propositions directement à la prochaine Conférence Radio Administrative, soit individuellement, soit comme résultat d'une action coordonnée.

METZLER convient que le C.C.I.R. devrait être invité à formuler des vœux puisque ceux-ci sont transmis directement à l'U.I.T. Le contact par la voie des administrations devrait être également recherché.

4. *Fréquences pour les Recherches Spatiales.*

HUXLEY dit que la situation est résumée à la page 79 du n° 119 du *Bulletin d'Information de l'U.R.S.I.* et que ces renseignements devraient être considérés comme un document du Comité.

STERKY demande confirmation du fait que le Comité s'intéresse aux fréquences pour les *recherches* spatiales et non pas, par exemple, aux fréquences pour les systèmes de communications utilisant des véhicules de l'espace.

Le Comité est d'accord pour déclarer que cela représente ses vues.

STERKY suggère également de demander l'aide de l'I.F.R.B. (International Frequency Registration Board) pour ce qui concerne les interférences dont peuvent souffrir les différentes fréquences.

5. *Programme de travail du Comité.*

ILYIN insiste pour que le Comité accepte, pour la radio astronomie, les besoins scientifiques exprimés par le C.C.I.R. à Los Angeles en 1959 dans l'Avis n° 314 (Document 437-E revu) et prenne ces besoins comme base de ses travaux. Ce point de vue rencontre l'accord général.

RATCLIFFE explique comment sera établi le Comité Inter-Unions et il ajoute que le groupe de l'U.R.S.I. représentera les vues de l'U.R.S.I. au sein du Comité Inter-Unions. Il espère, comme l'a suggéré Ilyin, que le premier travail du Comité Inter-Unions sera d'étudier et de confirmer à nouveau les demandes scientifiques originales pour la recherche spatiale et la radio astronomie.

STERKY se déclare d'accord et rappelle au Comité les sérieuses difficultés pratiques pour obtenir l'accord de la Conférence Radio Administrative sur l'attribution de fréquences. Le Comité Inter-Unions doit se préparer à effectuer de nombreux travaux d'approche et être capable de suggérer des moyens pratiques permettant de donner satisfaction à ses désirs.

ILYIN est d'accord, il existe des difficultés mais elles pourraient être surmontées par des travaux préparatoires dans les différents pays.

6. *Projet de résolution pour l'U.R.S.I.*

RATCLIFFE demande à Sterky et à Findlay d'essayer de rédiger une résolution pouvant être adoptée par l'Assemblée Générale. METZLER attire l'attention sur l'Avis n° 36 des Actes de l'U.I.T. qui propose l'organisation d'une Conférence Administrative Extraordinaire pour examiner les besoins des Recherches Spatiales, cette réunion se tiendra, au plus tard, en 1963. Cette Conférence n'a pas encore été convoquée, mais c'est en vue de cette réunion que le Comité Inter-Unions a été envisagé.

Le Comité convient que le texte de l'Avis n° 36 soit fourni comme un document du Comité.

STERKY fait remarquer qu'il pourrait y avoir des organisations telle la Fédération Astronautique Internationale (F.A.I.) avec lesquelles le Comité Inter-Unions pourrait avoir des contacts étroits dans le cas où il représenterait complètement les besoins scientifiques.

Conclusions.

RATCLIFFE résume comme suit les conclusions de la réunion :

a) il faut obtenir les vues de la Commission V de l'U.R.S.I. concernant les besoins de la Radioastronomie ;

b) les vues du C.O.S.P.A.R. devraient être examinées par chaque Commission de l'U.R.S.I. pour voir si elles conviennent ;

c) il convient de rédiger une résolution à présenter à l'Assemblée Générale de l'U.R.S.I.

Pour la prochaine réunion (14.00 h., septembre 13, Local D-15), RATCLIFFE demande :

a) Le document sur les fréquences demandées et attribuées aux recherches spatiales (L. G. H. HUXLEY) ;

b) Le résumé sur les fréquences demandées et attribuées à la radioastronomie (E. METZLER) ;

c) L'avis nº 36 de la Conférence de l'U.I.T. (J. W. FINDLAY) ;

d) Le projet de Résolution à présenter à l'Assemblée Générale (H. STERKY et J. W. FINDLAY) ;

e) Les vues de la Commission V (J. W. FINDLAY) ;

f) Les vues des Commissions sur les propositions du C.O.S.P.A.R. pour les fréquences (L. G. H. HUXLEY).

La séance est levée à 10 h. 30.

TROISIEME REUNION DU COMITE

University College, Londres, mardi 13 septembre 1960 à 14 h. 00

Présents : J. A. RATCLIFFE (Président, Royaume-Uni), V. ILYIN (U. R. S. S.), L. G. H. HUXLEY (Australie), H. STERKY (Suède), E. METZLER (C.C.I.R.), J. VAN DER MARK (C.C.I.R.), J. W. FINDLAY (Secrétaire, E. U. A.).

Compte rendu de la deuxième réunion.

Le compte rendu est légèrement modifié, et, étant donné qu'un nouveau compte rendu doit être distribué, on convient d'incorporer les modifications dans le nouveau compte rendu.

Documents.

Les documents ci-après sont distribués au Comité :

Document A : Recommandations du C.O.S.P.A.R. et attributions de fréquences pour les recherches spatiales faites par l'U.I.T. (*Bull. Inf. U.R.S.I.*, nº 119, p. 79).

Document B : Rapport du Président de la Sous-Commission Ve pour l'Attribution de Fréquences (C. R. Assemblées Générales, U.R.S.I., Vol. XII, fasc. 5).

Document C : Avis nº 36 de la Conférence Radio Administrative, Genève 1959.

Les documents A et C sont annexés au compte rendu. Le Comité dispose également d'un projet de résolution pour l'Assemblée Générale de l'U.R.S.I.

M. RATCLIFFE signale que le Document A ne résume pas exactement les demandes du C.O.S.P.A.R. et qu'il recevra un résumé exact pour le Comité. Il a eu une conversation avec le Dr Denisse, le Professeur van de Hulst et d'autres, et il considère que l'idée de l'U.R.S.I. était que les demandes du C.O.S.P.A.R. et du C.C.I.R. pour des fréquences représentaient la position de l'U.R.S.I.

Le Dr STERKY reconnait que les vues de l'U.R.S.I. ont été obtenues. Il fait remarquer avec M. ILYIN que le Comité Inter-Unions est évidemment libre de réexaminer et probablement de modifier la demande de fréquences. Aucune forme définitive de demande ne peut être adoptée sans un examen soigneux par le Comité Inter-Unions.

Résolution pour l'Assemblée Générale.

Une grande discussion s'engage sur le projet de résolution à soumettre à l'Assemblée Générale.

Le texte de la résolution adopté finalement et soumis au Comité Exécutif est donné page 92.

Travaux du Comité Inter-Unions.

Le Dr STERKY insiste sur le genre de travail que doit faire le Comité Inter-Unions pour préparer les demandes de fréquences. Des études sérieuses doivent être faites sur le degré de protection exigé par les divers services.

M. RATCLIFFE confirme cette intervention et ajoute que certains travaux ont déjà été entrepris dans cette voie. Il demande au Dr Findlay d'envoyer au Dr Smith-Rose tous les documents en sa possession.

M. RATCLIFFE lit le projet de mandat du Comité Inter-Unions qui fait l'objet d'une discussion. On convient que ce texte peut servir de guide pour les travaux du Comité de l'U.R.S.I.

La séance est levée à 16 h. 00.

Document A

Recommandations originales du C.O.S.P.A.R. et Attributions correspondantes faites par l'U.I.T.

(i) *Dépistage et télémétrie.*

Recommandation		Attribution
Fréquence	Largeur de bande	
30 à 100 Mc/s	15 kc/s	39.986 à 40.002 Mc/s secondaire
100 à 300 Mc/s	15 kc/s	136.000 à 137.000 Mc/s principale 183.100 à 184.100 Mc/s secondaire
300 à 1000 Mc/s	15 kc/s	400.000 à 401.000 Mc/s principale
1000 à 3000 Mc/s	0,1 % minimum	1427 à 1429 Mc/s principale 1700 à 1710 Mc/s secondaire 2290 à 2300 Mc/s secondaire
3000 à 10.000 Mc/s	0,1 % minimum	5250 à 5255 Mc/s secondaire
10.000 à 30.000 Mc/s	0,1 % minimum	15.150 à 15.250 Mc/s principale 31.000 à 31.800 Mc/s principale

(ii) *Pour les expériences spécifiques de télévision à haute définition, etc.*

Recommandation		Attribution
Fréquence	Largeur de bande	
300 à 1000 Mc/s	4 Mc/s	Pas d'attribution
1000 à 3000 Mc/s		Voir (i) ci-dessus

(iii) *Pour les recherches ionosphériques.*

Une fréquence dans chacune des régions suivantes :

Recommandation		Attribution
Fréquence	Largeur de bande	
5 Mc/s	2 kc/s	Pas d'attribution
10 Mc/s	2 kc/s	10.003 à 10.005 Mc/s secondaire
20 Mc/s	2 kc/s	19.990 à 20.010 Mc/s secondaire

Document C

AVIS N° 36 DE L'U.I.T.

relatif à la convocation d'une Conférence Administrative extraordinaire des Radiocommunications pour l'attribution de bandes de fréquences pour les Radiocommunications spatiales

La Conférence Administrative des Radiocommunications, Genève, 1959,

considérant :

a) que plusieurs délégations participant à la Conférence Administrative des Radiocommunications ont proposé d'attribuer des fréquences pour la recherche spatiale sur la seule base des besoins de cette recherche au cours des prochaines années ;

b) que le C.C.I.R. procède déjà à l'examen des questions techniques relatives aux radiocommunications avec et entre les véhicules spatiaux ;

c) que la Conférence Administrative des Radiocommunications a recommandé au C.C.I.R. d'étudier les questions de l'identification et du contrôle des émissions à partir de véhicules spatiaux ;

d) que jusqu'au moment où les résultats de certains programmes de recherche spatiale seront rendus disponibles, la mesure dans laquelle les services de radiocommunications spatiales et les autres services de radiocommunications peuvent se partager les fréquences ne peut être fixée avec précision ;

e) qu'il est essentiel pour l'Union de disposer d'un supplément d'expérience découlant de la recherche et des résultats des études entreprises par le C.C.I.R. et les autres organismes intéressés dans le domaine des radiocommunications spatiales, avant de pouvoir prendre des décisions concernant l'attribution définitive de fréquences pour les radiocommunications spatiales ;

et tenant compte

que l'Union est un organisme spécialisé dans le domaine des télécommunications et qu'elle doit fournir des fréquences appropriées à toutes les catégories de radiocommunications spatiales dès que le permettront les résultats des recherches et études entreprises par le C.C.I.R. et les autres organismes intéressés ;

recommande :

1. qu'une Conférence Administrative extraordinaire des Radiocommunications soit convoquée en principe pour la fin de l'année 1963, pour une durée d'environ un mois, et avec un ordre du jour qui devrait comprendre les points essentiels suivants :

1.1. examiner les progrès techniques dans l'utilisation des radiocommunications pour la recherche spatiale ainsi que les résultats des études scientifiques du C.C.I.R. et d'autres organismes intéressés ;

1.2. décider, à la lumière de cet examen, de l'attribution de bandes de fréquences essentielles pour les diverses catégories des radiocommunications spatiales ;

1.3. examiner la question de savoir si le besoin subsiste d'attribuer certaines fréquences pour la recherche spatiale, et, dans l'affirmative, prendre les mesures nécessaires à cet effet ;

1.4. si une telle action est considérée comme souhaitable, adopter de nouvelles clauses dans le Règlement des Radiocommunications pour assurer l'identification et le contrôle des émissions radio à partir de véhicules spatiaux en tenant compte des recommandations éventuelles du C.C.I.R. ;

2. que le Conseil d'Administration réexamine la situation pendant ses sessions ordinaires de 1962 et 1963, sur la base des informations reçues des Membres et des Membres Associés de l'Union, du C.C.I.R. et des autres organismes intéressés. Dans le cas où le Conseil d'Administration jugerait que des raisons suffisantes existent pour convoquer une Conférence Administrative extraordinaire des Radiocommunications, il proposera aux Membres et aux Membres Associés de l'Union, la date et le lieu de la conférence ainsi que son ordre du jour ;

et invite

les Membres et Membres Associés de l'Union qui procèdent au lancement de satellites durant cette période de recherche spatiale précédant la convocation de la Conférence Administrative extraordinaire des Radiocommunications mentionnée ci-dessus, de tenir le Conseil d'Administration et les organismes techniques correspondants de l'Union au courant des fréquences utilisées et des progrès scientifiques réalisés dans l'utilisation des radiocommunications pour la recherche spatiale.

Document D

Projet de Résolution à présenter à l'U.I.T.

La Treizième Assemblée Générale de l'U.R.S.I.

1. *considérant que* :

a) les techniques radioélectriques à appliquer dans les communications spatiales seront basées en grande partie sur des recherches effectuées en Science de l'Espace et en Radioastronomie,

b) les problèmes de l'attribution de fréquences pour les recherches radioélectriques en Radioastronomie et dans l'Espace sont étroitement liés, et

c) dans l'Avis n° 36 de la Conférence Administrative des Radiocommunications de Genève en 1956, il est suggéré qu'une Conférence Administrative des Radiocommunications Extraordinaire soit convoquée en 1963 pour examiner les problèmes des communications radioélectriques dans l'espace et l'attribution de fréquences pour les recherches spatiales ;

recommande que le Comité Inter-Union pour l'Attribution de Fréquences prenne toutes les mesures possibles pour que cette Conférence Extraordinaire ait lieu, au plus tard en 1963, et qu'elle traite également de l'attribution de fréquences tant pour la Science de l'Espace que pour la Radioastronomie ;

2. *considérant que* :

a) avant la réunion de la Conférence Administrative des Radiocommunications de Genève en 1959, les besoins en fréquences radioélectriques pour les recherches spatiales ont été formulées par le C.O.S.P.A.R. dans le Document A, et ceux de la Radioastronomie ont été formulés par le C.C.I.R. dans son Vœu n° 314,

b) et après due considération à la XIII^e^ Assemblée Générale de l'U.R.S.I.

conclut que ces documents continuent à exprimer les besoins présents en fréquences pour la Radioastronomie et la Recherche Spatiale ;

3. *considérant* :

a) qu'à la Conférence Administrative des Radiocommunications de Genève en 1959, des fréquences ont été désignées, avec différents degrés de protection, pour les Recherches en Radioastronomie et en Science Spatiale,

b) mais que plusieurs de ces attributions ne sont que pour un usage secondaire et certaines ne portent pas sur le plan mondial,

c) qu'aucune attribution ne fut mentionnée pour certaines fréquences demandées ;

conclut que l'attribution mondiale et exclusive des fréquences demandées présente encore un caractère d'urgence,

et recommande que ces besoins soient portés à l'attention des Autorités Internationales et Nationales en cause.

U.R.S.I. Committee on Frequency Allocations for Scientific Purposes

APPOINTMENT OF THE COMMITTEE

The Committee was set up by Minute 16(*d*) of the Meeting of the Executive Committee held on September 2nd., « to review with the various Commissions the requirements for radio frequencies for radio astronomy and space research. They would carry out two functions (1) to co-ordinate U.R.S.I. requirements for radio astronomy and space research, and (2) (to act as the) membership on behalf of U.R.S.I. and C.O.S.P.A.R. in the inter-Union Committee ».

The members appointed were :

Mr. J. A. RATCLIFFE (*Chairman*),
Dr. R. EMBERSON,
Dr. L. G. H. HUXLEY (on behalf of C.O.S.P.A.R.).
Dr. V. ILYIN,
Dr. H. STERKY,

FIRST MEETING OF THE COMMITTEE

9 : 30 a.m. Monday, September 5, 1960

Present : Mr. J. A. RATCLIFFE (*Chairman*), Dr. H. STERKY, Dr. V. ILYIN (with Dr. VITKEVITCH as interpreter), Professor L. G. H. HUXLEY. Dr. R. EMBERSON did not attend this U.R.S.I. Assembly.

Business.

The Chairman explained that he had summoned this preliminary meeting in order to consider :

(1) the objectives of the Committee during and after the General Assembly,
(2) the relation of the Committee to other U.R.S.I. bodies,
(3) the time of meeting of the Committee.

In discussions under headings (1) and (2) above, it was agreed that it was important to co-ordinate the activities of the Committee with those of Commission V and its Sub-Commission V*e* (on frequencies for radio astronomy) and the new U.R.S.I. Committee for Space Radio Research. The Chairman suggested that co-ordination of activities with Commission V would be achieved

if Dr. J. W. Findlay were to be co-opted to the Committee as its Secretary. Cooperation with U.R.S.I. Committee on Space Radio Research would be effected through the membership of Prof. L. G. H. Huxley, the Chairman of that Committee.

Decisions.

It was decided to co-opt Dr. Findlay to serve as Secretary of the Committee. It was decided that for the next meeting two papers should be prepared outlining the existing allocations in :

(1) Radio Astronomy,

(2) Space Research.

In particular, the requests for frequencies from the I.A.U., U.R.S.I. and C.C.I.R. should be compared with the actual allocations at the Geneva Conference.

It was decided that the next meeting would be held at 9 : 00 a. m. on Thursday, September 8th. Notices would be sent.

SECOND MEETING OF THE COMMITTEE

Thursday, September 8th, 1960, at 9 : 00 a. m.
University College, London, England

1. *Attendance* : J. A. Ratcliffe (U. K.) (*Chairman*), H. Sterky (Sweden), V. Ilyin (U. S. S. R.), V. Vitkevitch (interpreter), L. G. H. Huxley (Australia), E. Metzler (C.C.I.R.), J. W. Findlay (U. S. A.) (*Acting Secretary*).

2. *U.R.S.I. Sub-Commission.*

Findlay presented the report of Sub-Commission Ve [1] and briefly outlined the work that had been done in getting protected frequencies for radio astronomy during 1958 and 1959.

3. *The Inter-Union Committee.*

Ratcliffe outlined the procedure that the Inter-Union Committee, which would be formed from U.R.S.I./I.A.U./C.O.S.P.A.R., could follow. The scientific needs could be first established and presented to the C.C.I.R. and to the next I.T.U. Conference. Support could be requested from as many national administrations

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[1] See Proceedings *U.R.S.I. General Assembly*, Vol. XII, Part. 5.

as possible, since the delegates at the I.T.U. Conference would have to receive instructions and information from the administrations.

STERKY emphasised the importance of the channel of communications through administrations. The C.C.I.R. was very valuable in an advisory capacity and there had been a suggestion at the 1959 Plenipotentiary Conference that C.C.I.R. should make proposals to the I.T.U. Administrations, if fully informed of the needs of science, could make direct proposals to the forthcoming Administrative Radio Conference, either singly or as a result of coordinated action.

METZLER agreed that C.C.I.R. resolutions should be asked for, since these go direct to the I.T.U. The approach through administrations should also be used.

4. *Space Research Frequencies.*

HUXLEY said the position was summarised on page 76 of *U.R.S.I. Bulletin* No. 119 and that this would be produced as a Committee paper.

STERKY asked that it be confirmed that the Committee was concerned with frequencies for space *research* and not, for example, with frequencies for communication systems using space vehicles. *It was agreed* that this represented the views of the Committee.

STERKY also suggested that the services of the I.F.R.B. (International Frequency Registration Board) be requested in helping to assess the possible interference that various frequencies might suffer.

5. *Program of work for the Committee.*

ILYIN emphasised that the Committee should accept, for radio astronomy, the scientific needs as expressed by the C.C.I.R. at Los Angeles in 1959 in Recommendation No. 314 (Document 437-E revised) and take these needs as the basis for its work. This view met with general agreement.

RATCLIFFE explained how the Inter-Union Committee would be set up and said that the U.R.S.I. group would represent U.R.S.I. views on the Inter-Union Committee. He hoped, as Ilyin had suggested, that the first work of the Inter-Union Committee would

be to study and re-confirm the original scientific requests for space research and radio astronomy.

STERKY agreed, and reminded the Committee of the very serious practical difficulties of getting agreement at the Administrative Radio Conference on frequency allocations. The Inter-Union Committee must be prepared to do a great deal of preparatory work and be able to suggest practical ways in which their wishes might be met.

ILYIN agreed that practical difficulties exist but with careful work within the various countries these difficulties could be overcome.

6. *Draft Resolution for U.R.S.I.*

RATCLIFFE asked STERKY and Findlay to try to draft a resolution that the Final Assembly might pass. Metzler drew attention to *Recommendation No.* 36 of the Acts of the I.T.U. Conference which proposed an Extraordinary Radio Conference to study the needs of Space Research, to be held in late 1963. This Conference had not been convened, but this was the Conference for which the Inter-Union Group was first preparing. *It was agreed* that the Text of Recommendation No. 36 could be provided as a Committee paper.

STERKY reminded the Committee that there might be organizations like the International Astronautical Federation (I.A.F.) with which the Inter-Union Committee would have to keep in close contact, if it were to represent fully the needs of science.

7. *Conclusions.*

RATCLIFFE summarised the conclusions of the meeting as follows :

(*a*) the views of U.R.S.I. Commission V as to the needs of Radio Astronomy must be obtained ;

(*b*) the views of C.O.S.P.A.R. should be checked with each U.R.S.I. Commission to see that they were agreeable ;

(*c*) a resolution to the General Assembly of U.R.S.I. should be drafted.

For the next meeting (2 : 00 p. m. September 13th, Room D-15) Ratcliffe therefore asked for :

(*a*) the paper on the requested and allocated frequencies for space research (L. G. H. HUXLEY) ;

(*b*) the summary of requested and allocated frequencies for radio astronomy (E. METZLER) ;

(*c*) recommendation No. 36 of the I.T.U. Conference (J. W. FINDLAY) ;

(*d*) draft Resolution for the General Assembly (H. STERKY and J. W. FINDLAY) ;

(*e*) the views of Commission V (J. W. FINDLAY) ;

(*f*) the views of Commissions on the C.O.S.P.A.R. frequency proposals (L. G. H. HUXLEY).

The Committee adjourned at 10 : 30 a. m.

THIRD MEETING OF THE COMMITTEE

University College, London, England
2 : 00 p. m. Tuesday. September 13, 1960

Present : J. A. RATCLIFFE (U.K.) (*Chairman*), V. ILYIN (U .S. S. R.), L. G. H. HUXLEY (Australia), H. STERKY (Sweden), E. METZLER (C.C.I.R.), J. VAN DER MARK (C.C.I.R.), J. W. FINDLAY (U. S. A. (*Secretary*),

Minutes of 2nd Meeting.

The minutes were amended slightly, and, since new minutes were to be circulated, it was agreed that the amendments would be incorporated in the new minutes.

Documents.

The following documents were available to the Committee :

Document A : C.O.S.P.A.R. recommendations and I.T.U. allocations for frequencies for space research (From page 76 of *U.R.S.I. Bulletin No.* 119).

Document B : The report by the Chairman of Sub-Commission Ve on Frequency Allocation (Proc. U.R.S.I. Gl., Ass. vol. XII, Part 5).

Document C : Recommendation No. 36 of the Administrative Radio Conference, Geneva 1959.

The documents A, C and D are placed as annexes to these Minutes. The Committee also had before it the draft of a resolution for the General Assembly of U.R.S.I.

Mr. RATCLIFFE reported that Document A did not exactly summarise the C.O.S.P.A.R. requests and that he would obtain a correct summary for the Committee. He had talked with Dr. Denisse, Professor van der Hulst and others, and considered that the view in U.R.S.I. was that the C.O.S.P.A.R. and C.C.I.R. requests for frequencies represented the U.R.S.I. position.

Dr. STERKY agreed that the U.R.S.I. view had been obtained. He and Mr. Ilyin remarked that obviously the Inter-Union Committee could be free to reconsider and possibly change the request for frequencies. No final form for the request could be adopted until after careful work by the Inter-Union Committee.

The Resolution for the General Assembly.

Considerable discussion followed on the draft resolution which was to be submitted to the General Assembly.

The resolution, as finally agreed by the Committee and submitted to the Executive Committee, is given on page 103.

The Work of the Inter-Union Committee.

Dr. STERKY outlined the kind of work that the Inter-Union Committee must do in preparing the requests for frequencies. Careful studies must be made of the degree of protection that various services needed.

Mr. RATCLIFFE confirmed this, and said that some work of this kind had already been done. He asked Dr. Findlay to send any paper he had to Dr. Smith-Rose.

M. RATCLIFFE read the draft terms of reference of the Inter-Union Committee and these were discussed. It was generally agreed that they could serve as a guide also for the work of the U.R.S.I. Committee.

The Committee adjourned at 4 : 00 p. m.

Document A

Original C.O.S.P.A.R. Recommendations and the Corresponding Allocations by the I.T.U. From page 76 of U.R.S.I. Bulletin No 119

(i) *For Tracking and Telemetry.*

Recommendation		Allocation
Frequency	Bandwidth	
30-100 Mc/s	15 kc/s	39.986- 40.002 Mc/s secondary
100-300 Mc/s	15 kc/s	136.000-137.000 Mc/s primary
		183.100-184.100 Mc/s secondary
300-1000 Mc/s	15 kc/s	400.000-401.000 Mc/s primary
1000-3000 Mc/s	0.1 % minimum	1.427- 1.429 Mc/s primary
		1.700- 1.710 Mc/s secondary
		2.290- 2.300 Mc/s secondary
3000-10.000 Mc/s	0.1 % minimum	5.250- 5.255 Mc/s secondary
		8.400- 8.500 Mc/s secondary
10.000-30.000 Mc/s	0.1 % minimum	15.150- 15.250 Mc/s primary
		31.500- 31.800 Mc/s primary

(ii) *For specific experiments with high definition television, etc,*

Recommendation		Allocation
Frequency	Bandwidth	
300-1000 Mc/s	4 Mc/s	No allocation
1000-3000 Mc/s	4 Mc/s	See (i) above

(iii) *For ionospheric research.*
One frequency in each of the following regions.

Recommendation		Allocation
Frequency	Bandwidth	
5 Mc/s	2 kc/s	No allocation
10 Mc/s	2 kc/s	10.003-10.005 Mc/s secondary
20 Mc/s	2 kc/s	19.990-20.010 Mc/s secondary

Document C

RECOMMENDATION Nº 36

Relating to the Convening of an Extraordinary Administrative Radio Conference to Allocate Frequency Bands for Space Radiocommunication Purposes

The Administrative Radio Conference, Geneva, 1959.

considering :

(*a*) that several delegations participating in the Administrative Radio Conference have proposed to allocate frequencies for space research purposes only on the basis of the research requirements for the next few years ;

(*b*) that the C.C.I.R. has already under study technical questions relating to radiocommunication with and between space vehicles ;

(*c*) that the Administrative Radio Conference has recommended to the C.C.I.R. that the identification and control of space vehicle emissions be questions for study by the C.C.I.R. ;

(*d*) that, until the results of some space research programmes are available, the extent to which space radiocommunication services and other radiocommunication services may share frequencies, without harmful interference, cannot accurately be assessed ;

(*e*) that additional research experience and the results of studies by the C.C.I.R., and other interested organizations, relating to space radiocommunications are essential before it will be feasible for the Union to take decisions on firm frequency allocations for space radiocommunication purposes ;

and bearing in mind :

that the Union is the specialized agency in the field of telecommunications and that it is necessary for the Union to provide adequate frequency allocations for all categories of space radiocommunications as soon as the results of research and studies by the C.C.I.R. and other interested organizations make this possible ;

recommends :

1. that an Extraordinary Administrative Radio Conference be convened, in principle during the latter part of 1963 with a duration of approximately one month and with an agenda which should include the following basic items :

1.1. to examine the technical progress in the use of radio-communication for space research and the results of technical studies by the C.C.I.R. and other interested organizations ;

1.2. to decide, in the light of this examination, on the allocation of frequency bands essential for the various categories of space radiocommunications ;

1.3. to consider whether there is a continuing need for the allocation of certain frequencies for space research purposes and, if so, to take appropriate action in this regard ;

1.4. to adopt, if such action is considered desirable, new provisions revising the Radio Regulations to provide for the identification and control of radio emissions from space vehicles, taking into account possible Recommendations of the C.C.I.R. ;

2. that the Administrative Council review the situation during its 1962 and 1963 ordinary sessions on the basis of information received from Members and Associate Members of the Union, the C.C.I.R. and other interested organizations. Should the Administrative Council decide that there is sufficient justification for the convening of the Extraordinary Administrative Radio Conference in 1963, it shall recommend to Members and Associate Members of the Union the date and place for the Conference and its Agenda ;

and invites :

those Members and Associate Members of the Union which launch satellites during the period of space research before the convening of the Extraordinary Administrative Radio Conference referred to above, to keep the Administrative Council, and the relevant technical organs of the Union, informed of the frequencies used and the technical progress achieved in the use of radiocommunication for space research purposes.

Document D

Draft Resolution to be Submitted to the I.T.U.

The Thirteenth General Assembly of U.R.S.I.

1. *having considered that* :

(*a*) the radio techniques to be applied in space communication will be based to a considerable extent, on researches in Space Science and in Radio Astronomy, and

(*b*) the problems of allocation of frequencies for radio research in Radio Astronomy and in Space Research are interrelated, and

(*c*) in Recommendation No. 36 of the Administrative Radio Conference Geneva 1959, it was suggested that an Extraordinary Administrative Radio Conference be convened in 1963 to consider problems of space radio communication and the allocation of frequencies for space research ;

recommends that the Inter-Union Commitee on frequency allocation should take all possible steps to ensure that such an Extraordinary Administrative Radio Conference should be held, not later than 1963, and that it should deal also with the allocation of frequencies for research both in Space Science and in Radio Astronomy ;

2. *having considered that* :

(*a*) before the meeting of the Administrative Radio Conference, Geneva, 1959, the requirements for radio frequencies in Space Research were put forward by C.O.S.P.A.R. in Document A and those for Radio Astronomy were put forward by C.C.I.R. in C.C.I.R. Resolution nº 314,

(*b*) and after due consideration at the thirteenth General Assembly of U.R.S.I. ;

concludes that these two documents continue to state the present requirements for frequencies for research in Radio Astronomy and in Space Research ;

3. *having considered that* :

(*a*) at the Administrative Radio Conference, Geneva 1959, frequencies were assigned, with varying degrees of protection, for research in Radio Astronomy and Space Science,

(*b*) but several of these assignments were only for secondary use and some were not on a world-wide basis,

(*c*) and there was no assignment at all for some of the requested frequencies ;

concludes that world-wide exclusive assignment of the requested frequencies is still urgent ;

and recommends that this need should be brought to the attention of the appropriate International and National Authorities.

Comité pour les Recherches Radioélectriques dans l'Espace

I. — Mandat

1. Le titre du Comité est « Comité de l'U.R.S.I. pour les Recherches Radioélectriques dans l'Espace ».

2. Les buts généraux du Comité sont :

a) se tenir au courant des progrès réalisés dans les recherches radioélectriques dans l'espace et définir les intérêts et responsabilités de l'U.R.S.I. dans ce domaine ;

b) coopérer avec les Commissions de l'U.R.S.I. de façon à assurer la pleine participation de chacune des Commissions dans la partie des recherches spatiales qui l'intéresse directement ;

c) présenter au C.O.S.P.A.R., par l'intermédiaire du représentant officiel de l'U.R.S.I., des suggestions concernant les recherches radioélectriques dans l'espace ;

d) traiter toute question relative aux recherches radioélectriques dans l'espace, qui lui serait soumise par le Bureau de l'U.R.S.I. ou par le C.O.S.P.A.R.

e) diffuser les données sur les recherches radioélectriques dans l'espace, émanant de l'U.R.S.I. ou du C.O.S.P.A.R. ;

f) organiser, entre les Assemblées Générales de l'U.R.S.I., des symposia ou des réunions sur les recherches radioélectriques dans l'espace ;

g) collaborer avec le Comité de l'U.R.S.I. et le Comité Inter-Union pour l'Attribution des Radiofréquences pour la Radioastronomie et la Science Spatiale.

II. — Constitution

Art. 1. — Le Comité de l'U.R.S.I. pour les Recherches Radioélectriques dans l'Espace est établi et aboli par l'Assemblée Générale de l'U.R.S.I., sur proposition du Comité Exécutif de l'Union.

Art. 2. — Le Comité comprend :

1. le Président,
2. le Secrétaire,

3. 19 membres y compris un représentant du Secrétaire Général de l'U.R.S.I. et le représentant de l'U.R.S.I. auprès du C.O.S.P.A.R.,

4. des membres consultatifs (qui n'ont pas droit de vote).

Art. 3. — Le Président et le Secrétaire sont nommés par l'Assemblée Générale, sur proposition du Comité Exécutif. Les membres sont nommés par le Bureau de l'U.R.S.I., sur proposition du Président du Comité.

Art. 4. — Les fonctions du Comité sont celles définies dans son mandat.

Art. 5. — Les recommandations et les résolutions établies par le Comité sont communiquées au Secrétaire Général de l'U.R.S.I. et distribuées, par ses soins, aux organismes intéressés. Les rapports du Comité peuvent être publiés par le Secrétaire Général à la demande du Président du Comité.

Art. 6. — Les Commissions de l'U.R.S.I. sont invitées à traiter les sujets sur lesquels leur attention est attirée par le Comité et à en faire connaître au Comité la suite réservée.

Art. 7. — Le Comité se réunira généralement au cours des Assemblées Générales de l'U.R.S.I. Sur proposition du Président du Comité et après approbation par le Bureau de l'U.R.S.I., il peut se réunir en tout autre temps.

Art. 8. — Toutes les décisions du Comité sont prises à la majorité des voix des membres du Comité et des membres du Bureau présents ou participant au vote par correspondance. En cas de ballottage, la voix du Président est prépondérante.

Art. 9. — Le Comité peut établir des règles pour la conduite de ses travaux ; ces règles doivent être approuvées par le Bureau de l'U.R.S.I. Ces règles ne peuvent être en contradiction ni avec les termes des Statuts de l'U.R.S.I., ni avec le Règlement des Commissions.

Art. 10. — Le Comité peut participer à l'organisation et aux travaux des Assemblées Générales, en accord avec les articles 14 et 15 du Règlement des Commissions de l'U.R.S.I.

III. — Composition

Prof. L. G. H. Huxley (*Président*).
Prof. W. J. G. Beynon (*Secrétaire*),
Dr Y. Aono,
Dr J. F. Denisse,
Dr W. Dieminger,
Dr L. Essen,
Prof. R. W. Gould,
M. J. P. Hagen,
Dr A. I. Kalinin,
Prof. A. C. B. Lovell.
Dr A. P. Mitra,
M. J. Mrazek,
Dr J. R. Pierce,
Dr N. V. Pushkov,
M. J. A. Ratcliffe,
M. A. H. Shapley,
Prof. V. I. Siforov,
Prof. S. Silver,
M. J. R. Voge.

Le Secrétaire Général de l'U.R.S.I. ou son représentant.
Le représentant de l'U.R.S.I. au C.O.S.P.A.R.

PROCÈS-VERBAL DE LA RÉUNION TENUE A UNIVERSITY COLLEGE, LONDRES, LE 13 SEPTEMBRE 1960

Etaient présents :

Prof. L. G. H. Huxley (*Président*),
Prof. W. J. G. Beynon (*Secrétaire*),
Dr L. V. Berkner,
Dr W. Dieminger,
Dr J. P. Hagen,
Prof. A. C. B. Lovell,
Dr J. R. Pierce,
M. A. H. Shapley,
Prof. S. Silver,
M. J. R. Voge.

Le Prof. C. H. van de Hulst (Président du C.O.S.P.A.R.) a assisté à la réunion, sur invitation du Comité.

I. — Mandat, Constitution, Composition

Au cours de sa réunion du 2 septembre 1960, le Comité Exécutif de l'U.R.S.I. a approuvé le Mandat, la Constitution et la Composition du Comité.

II. — Représentant de l'U.R.S.I. au C.O.S.P.A.R.

Le Comité est d'accord pour que le Professeur A. C. B. Lovell continue de représenter l'U.R.S.I. au sein du C.O.S.P.A.R.

III. — Relations avec le C.O.S.P.A.R.

Le Prof. van de Hulst, Président du C.O.S.P.A.R, signale qu'au cours d'une de ses récentes réunions, le C.O.S.P.A.R. a formulé une résolution saluant la formation de Comités de Recherches Spatiales au sein des Unions Scientifiques et invitant ceux-ci à collaborer dans l'organisation de réunions. Il était évident que l'U.R.S.I. serait intimement liée à toutes les activités des trois principaux Groupes de Travail du C.O.S.PA.R. (Repérage et Télémétrie, Expériences scientifiques, Données et Publications). De plus, l'U.R.S.I., à travers son Comité des Ursigrammes, a un rôle important à jouer dans la diffusion rapide de données sur les satellites.

La prochaine réunion du C.O.S.P.A.R. est prévue pour la période du 7 au 18 avril en Italie. Une partie de cette réunion sera consacrée à la discussion du sujet « Repérage optique et radioélectrique et Télémétrie » — sujet qui présente un intérêt évident pour l'U.R.S.I.

IV. — Sujets de symposia

Le Comité a assez longuement discuté des sujets possibles pour des symposia sur la recherche spatiale et les conclusions auxquelles il est parvenu sont résumées ci-dessous :

a) *La recherche spatiale et les communications.*

Le Dr L. V. Berkner évoque la réunion spéciale de l'U.I.T. qui se tiendra en 1963 et au cours de laquelle les aspects de la

recherche spatiale reliés aux communications seront discutés. Il est important que les problèmes associés aux communications spatiales soient résolus sur une base scientifique et technique et l'U.R.S.I., en sa qualité de conseiller scientifique du C.C.I.R., pourrait aider à organiser un symposium sur ces problèmes.

Il est décidé que le Comité organisera, en automne 1961, un symposium sur les aspects de la recherche spatiale reliés aux communications. Il est ensuite décidé qu'un groupe composé du Dr J. R. Pierce (convener), du Prof. V. I. Siforov et d'une autre personnalité discutera des détails du programme et de l'organisation de ce symposium. (Il est entendu que les Professeurs Beynon et Lovell s'occuperont de trouver une personnalité britannique pour compléter ce groupe). Le C.O.S.P.A.R. sera tenu au courant de tous les plans concernant ce symposium et il est suggéré que la réunion pourrait être coordonnée avec la conférence prévue par les Nations Unies sur la Recherche Spatiale.

b) Transmission des données et projets d'expériences spatiales.

Le Dr Berkner souligne également l'importance des problèmes relatifs à l'obtention de données maxima, dans un temps minimum, à partir de véhicules spatiaux. Sur les très grandes distances, des facteurs tels que la limitation de puissance et la variabilité du milieu peuvent décider des informations qui seront reçues et celles-ci, à leur tour, entraîneront des répercussions sérieuses sur les plans de base des expériences.

Il a été décidé que le Comité considérerait l'opportunité d'une réunion, en 1962 éventuellement, qui discuterait les problèmes de cette nature. Le groupe suivant a été désigné pour examiner les détails de la question : Dr V. Ilyin (U. R. S. S.), Prof. S. Silver (U. S. A., convener), Prof. W. J. G. Beynon et une autre personnalité des Etats-Unis (Le Dr J. P. Hagen a été invité à suggérer le nom du troisième membre de ce groupe).

c) Expériences à réaliser avec des véhicules spatiaux.

Le Prof. Silver déclare que le Space Science Board des Etats-Unis a discuté récemment une proposition visant à l'organisation d'une réunion ayant pour objet d'examiner les expériences qui peuvent être faites, ou qui devraient l'être, avec des véhicules spatiaux. Il semble que ce sujet soit approprié pour une réunion

du C.O.S.P.A.R. et il est décidé que le Dr Hagen se mettra en rapport avec le C.O.S.P.A.R. à cet effet.

V. — Date de la prochaine réunion

Il est décidé que la prochaine réunion du Comité se tiendra dans le cadre du symposium sur les communications prévu pour l'automne 1961.

W. J. G. Beynon,
Secrétaire.
19 Septembre 1960

Committee for Space Radio Research

I. — Terms of reference

1. The name of the Committee is « U.R.S.I. Committee for Space Radio Research ».

2. The general objectives of the Committee are :

(*a*) to keep under review the progress of space radio research and to assess the interests and responsibilities of U.R.S.I. in this field ;

(*b*) to cooperate with the U.R.S.I. Commissions in order to ensure the full participation of each Commission in those aspects of space research that directly concern it ;

(*c*) to make appropriate suggestions to C.O.S.P.A.R. concerning space radio research through the official U.R.S.I. representative on C.O.S.P.A.R. ;

(*d*) to deal with any questions relating to space radio research and referred to the Committee by the Board of Officers of U.R.S.I. or by C.O.S.P.A.R. ;

(*e*) to disseminate information on space radio research received from within U.R.S.I. or from C.O.S.P.A.R. ;

(*f*) to organize, between U.R.S.I. Assemblies, symposia or meetings on space radio research ;

(*g*) to cooperate with the U.R.S.I. Committee and the Inter-Union Committee on the Allocation of Radio Frequencies for Radio Astronomy and Space Research.

II. — Charter

Art. 1. — The U.R.S.I. Committee for Space Radio Research is established and abolished by the U.R.S.I. General Assembly, on proposal of the Executive Committee of the Union.

Art. 2. — The Committee comprises :

1. the Chairman,
2. the Secretary,
3. 19 Members together with a Representative of the Secretary General of U.R.S.I. and the Representative of U.R.S.I. on C.O.S.P.A.R.,
4. consultants (who are not entitled to vote).

Art. 3. — The Chairman and the Secretary are appointed by the General Assembly on proposal of the Executive Committee. Members are appointed, on recommendation by the Chairman of the Committee, by the Board of Officers.

Art. 4. — The functions of the Committee are as stated in its terms of reference.

Art. 5. — Recommendations and resolutions reached by the Committee are communicated to the Secretary General of U.R.S.I. and distributed by him to the relevant organizations. Reports of the Committee may be published by the Secretary General on the advice of the Chairman of the Committee.

Art. 6. — U.R.S.I. Commissions are invited to deal with subjects brought to their attention by the Committee and to report to the Committee.

Art. 7. — The Committee will usually meet during U.R.S.I. General Assemblies. On proposal of the Chairman and subject to the approval of the Board of Officers of U.R.S.I., it may meet at any other time.

Art. 8. — All decisions of the Committee are taken by a majority of members and of Officers of the Board present or participating in a postal vote. In the event of a tie, the Chairman casts the deciding vote.

Art. 9. — The Committee may draft rules for the conduct of its own work ; these rules must be approved by the Board of Officers. Such rules must not be repugnant either to the terms of the Statutes of U.R.S.I. or to the Rules for U.R.S.I. Commissions.

Art. 10. — The Committee may participate in the planning and work of the General Assembly in accordance with arts. 14 and 15 of the Rules for U.R.S.I. Commissions.

III. — Membership

Prof. L. G. H. Huxley (*Chairman*),
Prof. W. J. G. Beynon (*Secretary*),
Dr. Y. Aono,
Dr. J. F. Denisse,
Dr. W. Dieminger,
Dr. L. Essen,
Prof. R. W. Gould,
Dr. J. P. Hagen,
Dr. A. I. Kalinin,
Prof. A. C. B. Lovell,
Dr. A. P. Mitra,
Mr. J. Mrazek,
Dr. J. R. Pierce,
Dr. N. V. Pushkov,
Mr. J. A. Ratcliffe,
Mr. A. H. Shapley,
Prof. V. I. Siforov,
Prof. S. Silver,
Mr. J. R. Voge,

The Secretary General of U.R.S.I. or his representative.
The representative of U.R.S.I. on C.O.S.P.A.R.

MINUTES OF MEETING AT UNIVERSITY COLLEGE, LONDON ON 13 SEPTEMBER 1960

The following were present :

Professor L. G. H. Huxley (*Chairman*),
Professor W. J. G. Beynon (*Secretary*),
Dr. L. V. Berkner,
Dr. W. Dieminger,
Dr. J. P. Hagen,
Professor A. C. B. Lovell,

Dr J. R. PIERCE,
Mr. A. H. SHAPLEY,
Professor S. SILVER,
Mr. J. R. VOGE.

Professor VAN DE HULST (President of C.O.S.P.A.R.) attended by invitation.

I. — Terms of Reference, Charter, Membership

It was reported that the U.R.S.I. Executive Committee at its meeting on 2 September 1960 had agreed on the Terms of Reference, Charter and Membership of the Committee. A copy of these is appended to these minutes.

II. — U.R.S.I. Representative on C.O.S.P.A.R.

The Committee agreed that Professor A. C. B. Lovell should continue to act as U.R.S.I. representative on C.O.S.P.A.R.

III. — Relationship with C.O.S.P.A.R.

Professor van de Hulst, President of C.O.S.P.A.R., stated that at a recent meeting C.O.S.P.A.R. had formulated a resolution welcoming the formation of Space Research Committees within the Scientific Unions, and inviting the cooperation of such Committees in the planning of meetings. It was clear that U.R.S.I. would be closely concerned in all the activities of the three main Working Groups of C.O.S.P.A.R. (Tracking and Telemetry, Scientific Experiments, Data and Publications). U.R.S.I. also had an important part to play through its URSIgram Committee in the rapid dissemination of information on satellites.

The next meeting of C.O.S.P.A.R. was planned for 7-18 April 1961 in Italy. Part of this meeting would be devoted to a discussion of « Optical and radio tracking and telemetry » — a subject of clear interest to U.R.S.I.

IV. — Subjects for Symposium

The Committee discussed at some length, possible subjects for future symposia on space research and the following summarises the conclusions reached.

(*a*) *Space Research and Communications.*

Dr. L. V. Berkner referred to the special I.T.U. meeting to be held in 1963 at which the communication aspects of space research will be discussed. It was important that the problems associated with space communications should be resolved on a scientific and technical basis, and U.R.S.I., as scientific advisers to C.C.I.R., could help by organising a symposium on such problems.

It was agreed that the Committee should organise a symposium in the autumn of 1961 on the communication aspects of space research. It was further agreed that a group consisting of Dr. J. R. Pierce (Convenor), Professor V. I. Siforov together with one other nominee should discuss the detailed programme and organisation of this symposium. (It was decided that Professors Lovell and Beynon should endeavour to secure a suitable nominee from the United Kingdom to complete the group). C.O.S.P.A.R. will be informed of any plans for this symposium and it was suggested that the meeting might perhaps be coordinated with the planned United Nations meeting on Space Research.

(*b*) *The transmission of information and the design of space experiments.*

Dr. Berkner also outlined the important problems attached to obtaining the maximum information in the minimum time from a space vehicle. At very great distances factors such as power limitation and variability of the intervening medium may govern the information that can be gained and these in turn will have important repercussions on the basic design of the experiments undertaken.

It was agreed that the Committee should consider the desirability of a meeting, possibly in 1962 to discuss problems of this nature. The following group was nominated to discuss the question further : Dr. V. Ilyin (U. S. S. R.), Professor S. Silver (U. S. A.) (Convenor) Professor W. J. G. Beynon with one other nominee from the U. S. A. (Dr. J. P. Hagen was invited to suggest the third member of the group).

(*c*) *Experiments to be performed with space vehicles.*

Professor Silver stated that recently the U. S. Space Science Board had discussed a proposal for a meeting on the subject of the experiments which can, or should be done with space vehicles. This

appears to be a suitable topic for a C.O.S.P.A.R. meeting and it was agreed that Dr. Hagen should communicate with C.O.S.P.A.R. on this matter.

V. — Date of next meeting

It was agreed that the next meeting of the Committee should be held in conjunction with the Communications Symposium planned for the autumn of 1961.

W. J. G. BEYNON.
Secretary,
19 September 1960.

PERMANENT SERVICES

I.W.D.S.

INTERNATIONAL GEOPHYSICAL CALENDAR FOR 1961

1. — Purpose

The accompanying International Geophysical Calendar 1961 designates some special days and intervals for special attention for geophysical experiments and analysis. The Calendar serves to encourage world-wide coordination of observation or analysis of those geophysical phenomena which vary significantly during the course of a year. These phenomena are mainly in the scientific disciplines dealing with the earth's atmosphere. In some experiments, such as the routine measuring of variations of the earth's magnetic field, the observing and analysis programs at observatories are carried out at a uniform level throughout the year ; in these cases the Calendar is not needed. However, in many other experiments (e.g., rocket experiments), it is not practical or meaningful to carry out the same program on each and every day. Here the Calendar can provide a useful mechanism for coordination. Experimenters will know that their colleagues in other laboratories and in other disciplines will tend to also carry out experiments on the days or intervals marked on the Calendar. In this way, results of experiments may be more easily and usefully compared.

In some scientific fields, international scientific organisations have made specific recommendations for programs to be done on days or intervals marked on the calendar. In others, the arrangements are informal or self-evident. Some examples are given below, along with the criteria for selection of dates.

2. — Regular World Days (R.W.D.)

These are 3 consecutive days each month. They always come in the middle or just after the middle of the month and include where possible the times of equinox and solstice. They come in

the middle of the week-Tuesday, Wednesday and Thursday. The groups of R.W.D. are evenly spaced through the year so far as it is practical. They include wherever possible days of solar eclipse and meteor showers. One R.W.D. each month (always Wednesday) is designated the R.W.D. of highest priority.

The R.W.D. are intended for experiments or observational programs or analysis programs which as a practical matter can be done only about 10 % of the time and should be spaced through the year. Further it is suggested that whenever there are no special reasons for selecting some other days, the R.W.D. be used for unusual or special experiments. This applies perhaps particularly to scientific fields in atmospheric geophysics, including aspects of cosmic rays, meteorology, airglow, ionosphere, geomagnetism, aeronomy. Examples in Ionospheric Physics are : oblique incidence pulse transmission and reception ; absorption measurements by pulse reflection technique ; extended observing schedule for whistlers and V.L.F. emissions ; vertical sounding observing schedule faster than normal ; more detailed reduction of vertical sounding ionograms by *f*-plot, *h'*-plot, etc. ; hourly reduction from ionograms of F-region true height parameters « *hc* » and « *qc* ».

The R.W.D. with highest priority are for work which can be undertaken for only one day each month. All of the foregoing examples apply if the rate of 3 days per month is not necessary or proves to be too heavy. A specific example is the recommended program for 1959 and onwards of exchange of copies of original ionograms in ionospheric vertical sounding work, made by the U.R.S.I.-A.G.I. Committee ; this recommends that ionograms for the highest priority R.W.D. each month (and also one disturbed period each year) be sent to World Data Centers for Interchange.

3. — Regular World Intervals (R.W.I.)

These are 10 consecutive days in each quarter year, selected to include the three R.W.D. of the month and also the times of the equinox or solstice. If possible they include days of solar eclipses and meteor showers. The selections have also tried to avoid week-end days and in addition holidays which are widely observed.

The R.W.I. are intended for experiments which for practical reasons cannot be carried on continuously, but for which statistics of seasonal variations are especially needed. Ionospheric drift

and high atmosphere wind measurements are two examples. Schedules for interchange of sample detailed data in several disciplines have made use of the R.W.I. In some network observational programs, both the R.W.I. and R.W.D. are used, in order to get the variations throughout the year but with improved statistics at the equinoxes and solstices.

4. — World Meteorological Intervals (W.M.I.)

The W.M.I. are 10 consecutive days each quarter year, but displaced one month from the equinoxes and solstices. They are intended to cover the times of marked seasonal change in certain meteorological phenomena which tend to come about a month after the equinoxes and solstices. They have been chosen through W.M.O. and COSPAR channels as the 16th through the 25th of January, April, July and October, with January and October designated by COSPAR as the more important ones.

The W.M.I. now are primarily periods for carrying out synoptic meteorological rocket programs, with stations obtaining atmospheric profiles up to 50 kilometers or more, at least once daily during the 10-day intervals. The W.M.I. have also been used during and since the I.G.Y. for balloon sounding programs either with special instruments or launchings to unusually high balloon altitudes.

5. — International Rocket Weeks (I.R.W.)

These have been chosen for 1961 by COSPAR as (I) February 12 to 18 and (II) July 16 to 22. I.R.W.-I includes the time of the total solar eclipse of February 15 and is intended for study of solar effects. I.R.W.-II was selected for study of (northern hemisphere) summer atmospheric structure.

The I.R.W. provide two periods during the year when rocket studies of the atmosphere and of the sun will be on as nearly a synoptic basis as is possible at this stage of the science and technology. More detailed recommendations by Working Group 2 of COSPAR, J. Bartels, Chairman, appear in the *COSPAR Information Bulletin.*

6. — Other Special Days

The 1961 Calendar marks the days of solar eclipses-February 15 (total) and August 11 (annular). Some special programs may be

expected to be carried out in appropriate parts of the world to study eclipse effects on the earth's atmosphere. It is especially important that the record of solar activity during and near the times of eclipses be as full as possible. Many solar activity observatories issue specially detailed reports of their observations on eclipse days to assist the interpretation of the geophysical efforts. Ionospheric stations customarily increase their observing programs on eclipse days even if the magnitude of eclipse at their location is small.

Also shown on the 1961 Calendar are days when meteor shower activity is unusually high. Geophysicists using meteor techniques often enhance their observing programs on these days. Attention is also called to these days in case ionization produced by meteors may account for unusual effects in other geophysical experiments.

7. — Special Intervals not appearing on 1961 Calendar

The International Geophysical Calendar marks only those dates which can be selected long in advance, either by general agreement or, in the case of eclipses and meteor showers, by reliable long-term prediction. Periods of great magnetic, auroral and ionospheric disturbance are also of great geophysical interest and world-wide coordination of observation is clearly desirable. This is also done under the auspices of the International World Day Service, in close collaboration with the U.R.S.I. Central Committee on U.R.S.I.-grams, in the program for the immediate designation of *Geophysical Alerts* and for selection on a current basis of *Special World Intervals* (*S.W.I.*). Arrangements for receipt of such information by telegram or radio broadcast can be made, as may be practical, with one of the solar-geophysical Regional Warning Centers, whose telegraphic addresses are as follows : (Western Hemisphere) AGIWARN WASHINGTON (U. S. A.); (Western Pacific) AGI KOKUBUNJI (Japan); (Eurasia) NIZMIR MOSCOW (U. S. S. R.); (Western Europe) either IONOSPHARE DARMSTADT (G. F. R.) or GENTELABO PARIS (France) or AGI NEDERHORSTENBERG (Netherlands). The meteorological telecommunications network coordinated by W.M.O. carries such information once daily soon after 1600 U.T. Description of the GEOALERT and S.W.I. plan can be obtained from these centers or from the I.W.D.S. Secretary. Many geophysical stations increase

their programs or carry on special experiments during disturbed periods ; the GEOALERT and S.W.I. program serves to coordinate this on a world-wide basis and is especially useful for stations not near the auroral zones where the beginning of a major disturbance may not be immediately apparent from local observations.

The I.W.D.S., in close collaboration with the U.R.S.I. Central Committee on U.R.S.I.grams, also fosters arrangements for prompt notification of major solar flare events which have important and sometimes long lasting geophysical effects. These notifications are also done through the Regional Warning Centers.

8. — Calendar Records

A summary record of significant solar and geophysical events is being prepared as a Calendar Record for the I.G.Y. period and also for 1959. This work is now under I.W.D.S. auspices. If these volumes prove to serve a useful purpose, similar Calendar Records may be compiled for 1960 and 1961.

9. The International World Day Service (I.W.D.S.) was established in 1958 by the International Council of Scientific Unions (I.C.S.U.) and is administered by the International Scientific Radio Union (U.R.S.I.), 7, Place Emile Danco, Brussels 18, Belgium. The I.W.D.S. Steering Committee consists of A. H. Shapley (U.R.S.I.), M. Nicolet (International Union of Geodesy and Geophysics — I.U.G.G.,) and J. F. Denisse (International Astronomical Union — I.A.U.) with R. Coutrez (U.R.S.I.) as Secretary. The I.W.D.S. obtains nominal support from the I.C.S.U. Federation of Astronomical and Geophysical Services (F.A.G.S.). Mr. Shapley serves as spokesman for I.W.D.S. and its correspondent to other I.C.S.U. groups such as the International Committee on Geophysics (C.I.G.) and the Committee on Space Research (COSPAR).

The International Geophysical Calendar for 1961 has been drawn up by A. H. Shapley and J. V. Lincoln in consultation with U.R.S.I., I.U.G.G. and I.A.U., both directly and through the C.I.G. and C.O.S.P.A.R. Recommendations also have come from representatives of the W.M.O. and from interested individual scientists. A similar Calendar was issued for 1960 along the lines of the calendars for the I.G.Y. and I.G.C. 1959 issued under the auspices of the I.C.S.U. Special Committee for the International Geophysical Year (C.S.A.G.I.), and described in the I.G.Y. Instruction Manual for World Days and Communications, I.G.Y. Annals Vol VII, Pergamon Press, 1959.

A. H. Shapley, for the I.W.D.S.
Steering Committee
Boulder, Colorado, U. S. A.
September 27, 1960.

International Geophysical Calendar 1961

Issued November 1960 by the International World Day Service
under the auspices of U.R.S.I.

1961 JANUARY 1961

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	(17)	(18)	(19)	20	21
22	23	24	25	26	27	28
29	30	31				

1961 FEBRUARY 1961

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
(12	13	(14)	[15]	(16)	17	18) **
19	20	21	22	23	24	25
26	27	28				

1961 MARCH 1961

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	(21)	(22)	(23)	24	25
26	27	28	29	30	31	

1961 APRIL 1961

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	(18)	(19)	(20)	21	22
23	24	25	26	27	28	29
30						

1961 MAY 1961

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	(16)	(17)	(18)	19	20
21	22	23	24	25	26	27
28	29	30	31			

1961 JUNE 1961

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	(20)	(21)	(22)	23	24
25	26	27	28	29	30	

1961 JULY 1961

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
(16	17	(18)	(19)	(20)	21	22)
23	24	25	26	27	28	29
30	31					

1961 AUGUST 1961

S	M	T	W	T	F	S
			2	3	4	5
6	7	8	9	10	[11]	12
13	14	(15)	(16)	(17)	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

1961 SEPTEMBER 1961

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	(19)	(20)	(21)	22	23
24	25	26	27	28	29	30

1961 OCTOBER 1961

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	(17)	(18)	(19)	20	21
22	23	24	25	26	27	28
29	30	31				

1961 NOVEMBER 1961

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	(14)	(15)	(16)	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

1961 DECEMBER 1961

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	(19)	(20)	(21)	22	23
24	25	26	27	28	29	30
31						

1962 JANUARY 1962

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	(16)	(17)	(18)	19	20
21	22	23	24	25	26	27
28	29	30	31			

(17) Regular World Day (RWD)

(18) RWD with highest priority

21 Day with unusual meteor shower activity

[15] Day of solar eclipse

[16 17 18 19...] World Meteorological Interval (WMI)

[14 15 16 17...] Regular World Interval (RWI)

(12 13 14 15...) International Rocket Week (IRW)

Notes : (*) WMI in January and October considered most important

(**) Feb. 15, 1961 : RWD with highest priority

C. C. I. R.

Supplementary world maps of F2 critical frequencies and maximum usable frequency factors

In response to C.C.I.R. Study Programme 60 and Recommendation 176, D. H. Zackarisen of the Boulder Laboratories of the National Bureau of Standards has edited in N.B.S. Technical Note nº 2-2 « Supplementary world maps of F2 critical frequencies and maximum usable frequency factors ».

Technical Note 2-2 supplements Technical Note 2 and together they present F2-layer material for all months of the year.

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

Report of the XIIth Meeting of the Executive Board held at Lisbon 19th-22nd October 1960

The twelfth meeting of the Executive Board of I.C.S.U. took place in the building of the Academy of Sciences, Lisbon, starting on 19th October 1960 under the Chairmanship of Sir Rudolph Peters, President of I.C.S.U. In addition to the officers, there were present 19 Board members from 13 unions with a number of invited participants (7) and observers (4) from other international bodies and committees.

At the opening meeting, members of the Board were welcomed by Professor H. A. Ferreira on behalf of the Academy of Science. He referred to the wide scope of scientific research covered by the activities of the Union. Portugal had played its part in this, particularly in Antarctic and Oceanic Research, following the lead set by its early explorers, as a result of which several, relatively remote islands are now provinces of the country. In his reply, the President, Sir Rudolph Peters explained how I.C.S.U. co-operates with Unesco in consolidating scientific work on an international scale.

1. — Publications

Among the more important subjects which were discussed was that of the present and future position of the I.C.S.U. Review. The I.C.S.U. Publications Office was established in London following a decision taken at the Xth meeting of the Executive Board in 1958. At the recent meeting in October 1960, the Editor (the late Sir Harold Spencer Jones) reported that vol. 2, nº 1, 2 and 3 of the I.C.S.U. Review had been published and that nº 4 was in the press. The latter would include an account of the history of

I.C.S.U. from 1918 to 1946 prepared by the Editor. It was planned to extend this in a future issue to cover the period 1946 to the present time. Detailed reports of meetings of I.C.S.U. are also published in the Review to supplement the summaries given in the Year Books.

The Editor reported that some 1500 copies of each issue of the Review were provided under the I.C.S.U. block subscription to national and scientific members of the Union. Some International Scientific Unions had asked for an increased number of copies, and the cost at which these could be supplied was for discussion by the Executive Board.

At the meeting of the Board, however, doubt was expressed by some members as to whether the Review was achieving its purpose as a scientific magazine intended to publicise the activities of I.C.S.U. While the chairman and others thought it was premature to change a policy, which was started only two years ago, the meeting decided that publication should cease and the London Office be closed, unless the Editorial Advisory Committee found that satisfactory arrangements, including finance, could be made for its continuation. The Board authorized the officers to consider the matter in the light of any additional information which might be forthcoming, and to take the necessary action at their meeting on or about 15th December 1960.

2. — Finance

The detailed Financial Statement for the year ended 31st December 1959 had already been published, and this was supplemented by reports from the Finance Committee presented at the meeting of the Executive Board. Unfortunately, Colonel Herbays, the Treasurer of I.C.S.U. was prevented by illness from being in attendance. Some doubt was expressed as to whether the income of the Union was sufficient to enable it to carry out its responsibilities adequately, particularly in promoting the development of pure science along rational lines and in acting as the parent body for international Unions in many disciplines. It should be able to support such Unions in emergencies and also to establish new projects. While such special Committees as SCAR, SCOR and COSPAR must initially be supported by I.C.S.U. funds, the

intention is, that after the preparatory stages, such bodies should become self-supporting.

The Finance Committee recommended that when I.C.S.U. is invited to send a representative to a scientific meeting, the representative should, if possible, be chosen so as not to involve any expense to I.C.S.U. It was agreed that special provision would be necessary to send up to three members to the meeting of the Board in Canberra.

When considering the future budget, the need was emphasised to publicise adequately the objectives of I.C.S.U. particularly among scientists throughout the world. It was explained that such publicity, to be effective, requires the co-operation of experts and involves expenditure. The Board agreed to authorize the Bureau to raise, from the Union's assets if necessary, funds up to $ 10,000 for the General Assembly which will be held in London in September 1961.

3. — Special Committees

Reports on the activities of the Special International Committees were presented as follows :

C.I.G. — General G. R. Laclavère (*Secretary General*).
S.C.O.R. — Dr. G. Böhnecke (*Secretary*).
S.C.A.R. — General Laclavère.
COSPAR — Professor H. C. Van De Hulst (*President*).
I.B.P. — Professor G. Montalenti.

An informal meeting of C.I.G. was held in August 1960 at Helsinki. Among the future programmes of Geophysical Research, it was proposed to have an international study programme during the period 1964-66, similar to the I.G.Y., but on a reduced scale. It was considered that the W.D.Cs. had proved useful and should be continued as permanent repositories of geophysical data.

A revised constitution was proposed for S.C.O.R., with a recommendation that countries actively engaged in oceanographic research should appoint their members by 1st January 1961.

The fourth meeting of S.C.A.R. was held in Cambridge in August-September 1960 : the work conducted by the committee was reviewed and found to be very satisfactory. It was pointed out that S.C.A.R. does not make recommendations in conflict with those of Unions ; for example, the Ionospheric observation work recommen-

ded by U.R.S.I. in Antarctic regions is facilitated by the activities of S.C.A.R.

Following the successful symposium held at Nice in January 1960, the national membership of COSPAR has grown to 15 or more. Joint commissions with U.R.S.I. and I.U.G.G. have been formed ; and an *ad-hoc* committee has reported to the governing bodies of U.R.S.I., I.A.U. and COSPAR on the division of responsibilities of these bodies in fields of common interest. The next meeting of COSPAR is planned for 7-18th April, 1961, probably in Italy. The topics for discussion will be restricted on this occasion to radio and optical tracking, geodetic and ionospheric applications, telemetry and data recovery. It is recommended that a committee should be set up to consider the « International Reference Atmosphere » and to compile tables of data up to extended heights.

A proposal from I.B.P. that I.C.S.U. should launch an « International Biological Project » was discussed by the Executive Board. It was decided that the plan for this Project must be worked out in more detail before it could be given further consideration.

4. — Inter-Union Committees

(*a*) *Solar-Terrestrial Relationship.*

To replace the former Joint Commission on Solar and Terrestrial Relationships, it was proposed that an Inter-Union Commission should be formed between I.A.U., I.U.G.G. and U.R.S.I. A draft constitution was presented, and it was expected that the membership would be settled shortly. In particular, it was hoped that the I.A.U. would be in a position to appoint a convener to organize a meeting of the Inter-Union Commission in association with the XIth General Assembly of the I.A.U. in Berkeley in August 1961.

(*b*) *Allocations of Radio Frequencies for Radio Astronomy and Space Science.*

At the meeting of the International Telecommunication Union at Geneva in 1959, action was begun to obtain formal reservations and protection of bands of frequencies required for radio astronomy and space research. At the General Assembly of U.R.S.I. in

London, informal discussions were held between representatives of I.A.U., U.R.S.I. and COSPAR, and it was proposed to form an Inter-Union Committee for this purpose. The Executive Board of I.C.S.U. approved this proposal subject to a maximum expenditure from I.C.S.U. of $ 6500 per annum. Details of the membership and of the terms of reference are given elsewhere. It was recommended that so far as possible a small group of 3 or 4 members should conduct all the preliminary work, confining the meetings of the full committee to perhaps once a year. It would moreover be essential to ensure that the committee was represented by the chairman or secretary-general, and perhaps by a qualified consultant, at all appropriate meetings of C.C.I.R. and I.T.U. at which the subject of allocation of radio frequencies was under discussion.

5. — Future Meetings

The next General Assembly of I.C.S.U. will be held in London from 25th-28th September, preceded by an Executive Board meeting 19th-23rd September 1961.

12th December 1960.

R. L. Smith-Rose.

CONSEIL INTERNATIONAL DES UNIONS SCIENTIFIQUES

XII[e] Réunion du Comité Exécutif (Lisbonne du 19 au 22 octobre 1960)

Résumé

Le Dr. R. L. Smith-Rose, Président de l'U.R.S.I., qui a été nommé membre du Comité Exécutif de l'I.C.S.U. par la dernière Assemblée Générale de l'Union a établi les rapports ci-dessus dont nous extrayons les points ci-après intéressant particulièrement l'U.R.S.I.

1. *Relations entre les phénomènes solaires et terrestres.*

Pour remplacer l'ancienne Commission Mixte sur les Relations entre les phénomènes solaires et terrestres, il a été formé, entre l'U.A.I., l'U.G.G.I. et l'U.R.S.I., une Commission Inter-Unions. On a exprimé le vœu que cette commission puisse organiser un symposium en relation avec la XI[e] Assemblée Générale de l'U.A.I. à Berkeley en août 1961.

2. *Attributions de fréquence radioélectriques pour la Radio-Astronomie.*

Le Comité Exécutif a approuvé la proposition introduite par l'U.R.S.I. de constituer un Comité Inter-Union (U.A.I., U.R.S.I. et COSPAR) pour représenter auprès de l'Union Internationale des Télécommunications les besoins et intérêts de la radio-astronomie et des sciences spatiales. Il a autorisé une subvention annuelle de $ 6500 et a recommandé que les travaux préliminaires soient entrepris par un petit groupe de 3 à 4 membres et de ne prévoir, au maximum, qu'une réunion annuelle de tout le Comité. Il considère toutefois comme essentiel que le Comité soit représenté par son président ou son secrétaire général et peut-être par un membre consultatif qualifié, à toutes les réunions du C.C.I.R. et de l'U.I.T. où serait discutée l'attribution de fréquences.

COMITÉ INTER-UNIONS POUR L'ATTRIBUTION DE FRÉQUENCES POUR LA RADIOASTRONOMIE ET LA SCIENCE SPATIALE

Au cours de la XIII[e] Assemblée Générale, les Présidents de l'U.R.S.I., de l'U.A.I. et du COSPAR ainsi que les représentants de ces organisations se sont mis d'accord pour proposer à l'I.C.S.U. la création d'un Comité Inter-Unions pour l'Attribution de Fréquences pour la Radioastronomie et la Science Spatiale, l'U.R.S.I. en étant l'Union mère.

Le mandat et la composition du Comité Inter-Unions, qui ont été proposés par les représentants sus-mentionnés et adoptés par le Comité Exécutif, sont donnés ci-après :

MANDAT

a) Etudier les besoins en canaux de fréquence et pour la protection des fréquences radioélectriques pour les recherches dans les domaines de la radioastronomie et des sciences spatiales ;

b) Coordonner les besoins des trois corps constituants qui peuvent établir des comités spéciaux dans ce but ;

c) Rédiger des propositions pour les attributions de fréquences pour satisfaire ces besoins ;

d) Porter ces propositions à l'attention des autorités nationales intéressées dans les attributions de fréquences avec l'aide des membres nationaux qui peuvent établir, dans ce but, des comités nationaux mixtes ;

e) Prendre les mesures nécessaires pour que les propositions figurent à l'ordre du jour de l'U.I.T. ;

f) Prendre toute autre mesure paraissant nécessaire, conformément aux règles du Conseil International des Unions Scientifiques, pour que ces propositions rencontrent un accueil favorable auprès du C.C.I.R. et de l'U.I.T. ;

g) Toute communication officielle du Comité au C.C.I.R. ou à l'U.I.T. sera envoyée, au nom des trois organisations, par le Secrétaire Général dn Comité Inter-Unions pour l'Attribution de Fréquences pour la Radioastronomie et la Science Spatiale.

COMPOSITION

U.R.S.I.	U.A.I.	C.O.S.P.A.R.
R. Emberson	J. F. Denisse, Président	J. P. Hagen
V. Ilyin	Mr. V. Vitkevitch	L. G. H. Huxley
J. A. Ratcliffe	J. Oort	A. P. Mitra
H. Sterky	A. Unsöld	H. C. van de Hulst

Secrétaire Général : R. L. Smith-Rose.

INTER-UNION COMMITTEE ON FREQUENCY ALLOCATIONS FOR RADIO ASTRONOMY AND SPACE SCIENCE

At the XIIIth General Assembly, with mutual agreement of the Presidents of U.R.S.I., I.A.U., and COSPAR and of representatives of these organizations, it was agreed to propose to I.C.S.U. the appointment of an Inter-Union Committee on Frequency Allocations for Radio Astronomy and Space Science, with U.R.S.I. as parent Union.

The terms of reference and membership of this Inter-Union Committee, as proposed by the above group and adopted by the Executive Committee, are as follows :

TERMS OF REFERENCE

(*a*) To study the requirements for frequency channels and radio frequency protection for research in the fields of radio astronomy and space science ;

(*b*) To co-ordinate these requirements for the three constituent bodies which may set up special committees for this purpose ;

(*c*) To formulate proposals for frequency allocations which are adequate to meet these requirements ;

(*d*) To bring these proposals to the attention of the appropriate national frequency allocation authorities with the assistance of the national member bodies which may establish joint national committees for this purpose ;

(*e*) To initiate necessary action to get these proposals placed on the agenda of the I.T.U. ;

(*f*) To initiate such other action as is deemed appropriate under the charter of I.C.S.U. to ensure favourable action on these proposals by the C.C.I.R. and I.T.U. ;

(*g*) To note that any formal communication from the Committee to C.C.I.R. or I.T.U. will be sent on behalf of the three bodies by the Secretary General of Inter-Union Committee on Frequency Allocations for Radio Astronomy and Space Science.

Membership of the Inter-Union Committee

U.R.S.I.	I.A.U.	C.O.S.P.A.R.
R. Emberson	J. F. Denisse, *Chairman*	J. P. Hagen
V. Ilyin	Mr. V. Vitkevitch	L. G. H. Huxley
J. A. Ratcliffe	J. Oort	A. P. Mitra
H. Sterky	A. Unsöld	H. C. van de Hulst

R. L. Smith-Rose : *Secretary General.*

COSPAR

From the Minutes of the First Meeting of the COSPAR Bureau

Stockholm, August 11-13, 1960

5. — Working Groups

Taking into account various requests for changes in the membership of the Working Groups, the following resolution was passed.

Res. 8. The COSPAR Bureau requests the Executive Council to review the membership of the Working Groups by correspondence well in time before the next full COSPAR Meeting.

Working Group 1 on Tracking and Telemetering.

In the absence of the Chairman of Working Group 1, Professor V. A. Ambartsumian, the President reported on the discussions he had with him on 12th May 1960 and on the subsequent matters of interest to Working Group 1 which had reached the COSPAR office.

(*a*) Participation of COSPAR in the work of C.C.I.R. : COSPAR applied for admission to C.C.I.R. in a consultative capacity and this has now been accepted. COSPAR's interest will be most directly in Study Group IV on Space Systems and Study Group VI on Ionospheric Propagation. It is expected that the problems of frequency allocation will be handled mainly by COSPAR Working Group 1.

(*b*) Early planning for the 1963 Extraordinary Administrative Radio Conference of the I.T.U. : Official contact has been taken up just prior to the Ordinary Administrative Conference of the I.T.U. in Geneva in 1959 and COSPAR obtained admittance as an Observer on the basis of reciprocity. The President said that planning for the 1963 Conference should start in 1961 and that the forth-

coming meeting of the U.R.S.I. in London would form a good background for this planning.

(*c*) The President reported that a tracking coordination committee for Western Europe has been established at a European Space meeting in London.

(*d*) The COSPAR Secretariat has drawn the attention of the satellite lauching countries to resolution 6 of the Nice Report. In line with this resolution, the telemetry code and calibrations of I.O.T.A. 1959 have been received from the U. S. and distributed by the Secretariat.

(*e*) The COSPAR Secretariat has invited comments of the President of I.A.U. Commission 22 — Dr. V. V. Fedensky to resolution 7 of the Nice Report (Survey of orbiting components). No reply has so far been received.

(*f*) With regard to resolution 8 of the Nice Report, the COSPAR Secretariat has communicated this to the Director of Harvard Observatory.

The meeting then passed the following resolution on this subject :

Res. 9. The COSPAR Bureau recommends adherence to the system of designation of space vehicles initiated by the Harvard Observatory and instructs its President to communicate this resolution to Harvard Observatory with the request that in the vent of any proposed change this may be done and communicated through COSPAR.

(*g*) The President expressed the desirability of direct news items from the U. S. S. R. for the *COSPAR Bulletin*. Professor Blagonravov said that he was prepared to give a list of rocket launchings for the first half of 1960, and handed this list to the President.

Working Group 3 *on Data and Publications.*

Professor A. P. Mitra reported on the work of Working Group 3 since the Nice Meeting as follows :

1. « At the Nice Meeting, 1960, Working Group 3 made certain recommendations, which were later accepted by the COSPAR General Assembly (Resolutions 14-20). These resolutions were intended to improve procedures for exchange of launching and orbital data and make the results available to all space scientists.

Suggestions were made about the communication arrangements to be adopted, and the name SPACEWARN was given to the Warning network. There was also a resolution for the COSPAR to undertake some special publications.

2. *SPACEWARN* (Resolution 16) : One of our most important resolutions concerned arrangements for an international channel for rapid communication of information needed for tracking and other observational purposes. It was resolved that the World Days (AGIWARN) network utilised for this purpose during the I.G.Y. continue to serve under the name of the SPACEWARN network. It was further recommended that I.W.D.S. be requested to continue to coordinate these satellite rapid communications and the nations responsible for the Satellite Regional Warning Centers continue to support this phase of their work.

It is still too early to make a proper assessment of the SPACEWARN operation. We have asked the I.W.D.S. (Dr. Shapley) to provide a report (in accordance with the Nice recommendations), the report has, however, not yet been received. While a proper evaluation of this network must await report from Dr. Shapley and from the users, the following statements can be made even now :

(i) There is every indication that the four Satellite Regional Warning Centers will continue to be supported indefinitely by the nations responsible for them.

(ii) Satellite launching messages are reported to have been communicated fairly rapidly in general. W.D.C.-C, for instance, reports that launching messages have been received from S.R.W.C. at Darmstadt for all space research satellites launched during 1960, and such messages including orbital data arrived, with one exception, within two days after launch.

(iii) It is felt that the present communication arrangements need further extension so as to enable a wider geographical coverage and quicker distribution of information. Asia, Africa and Europe are not at present adequately covered by the SPACEWARN, although in Europe many individual arrangements exist between the tracking centers and the launching and computing agencies. To improve the situation, particularly in these areas, I had a short meeting with Dr. Muller, French COSPAR Delegate, and

Mr. Delouf of the Bagneux Warning Center, and another meeting with Dr. Pressey in England. As a result of these discussions the following suggestions are made :

(*a*) It would be useful to add to the present network the services of Slough and Bagneux, so that distribution of warning messages and of orbital informations are shared by Darmstadt, Paris and London.

(*b*) A more extensive coverage in Europe, Asia, and Africa can be achieved if Bagneux agrees to add to its daily URSIgram broadcast coded information on satellite orbital elements. This arrangement has been agreed to by Dr. Muller and Mr. Delouf in principle.

6. — Relations with other organizations

United Nations.

The President reported that he had communicated the resolution containing the offer of COSPAR services to the U.N. on January 21st, 1960, and that shortly after, this had been acknowledged by the Under-Secretary General.

I.T.U. and *C.C.I.R.*

(*a*) COSPAR holds a permanent observer status with I.T.U. on the basis of reciprocity.

(*b*) COSPAR has been accepted in a consultative status to C.C.I.R.

(For further details see Working Group 1 points (*a*) and (*b*).)

I.C.S.U. and the International Scientific Unions.

The President said that the relations with I.C.S.U. are close and that he has been invited to be present at the Executive Board Meeting in Lisbon in October 1960.

The Bureau, reviewing the general situation concerning the Unions, passed the following resolution :

Res. 21. The COSPAR Bureau recognising that the fullest possible coordination of the work of COSPAR with the work of the International Scientific Unions is desirable, welcomes the formation of committees within U.R.S.I.

and within I.U.G.G. to improve such coordination and invites the Secretaries of the Unions and its Commissions or Associations to communicate as far in advance as possible to the COSPAR Secretariat planned dates, places and subject matters of meeting in order that meeting dates and places of COSPAR and its Working Groups may be chosen in the best possible manner.

I.A.U.-U.R.S.I.

The President reported that there is an I.A.U.-U.R.S.I.-COSPAR Ad-Hoc Committee of which he is the President. The task of this committee is to report to I.A.U., U.R.S.I. and COSPAR on a clearer division of fields of interest and responsibilities of these organizations. The committee will meet once before the U.R.S.I. meeting in September 1960 and then dissolve. A draft outline of division of responsibilities of I.A.U., U.R.S.I. and COSPAR was available as one of the working papers of the meeting, and after some discussion, the following resolution was passed :

Res. 22. The COSPAR Bureau endorses the views put forward by its President in the draft report of the I.A.U.-U.R.S.I.-COSPAR Ad Hoc Committee concerning the delineation of the tasks of these bodies in regions of mutual interest. In particular, it wishes to emphasize the importance of a continued vigilance in matters concerning frequency allocation for space research.

I.W.D.S.-C.C.U.

Following the request of the Secretary General of U.R.S.I. for two COSPAR representatives to the I.W.D.S./C.C.U. Committee, one for rockets and one for satellites :

Res. 23. The COSPAR Bureau appoints Professor Mitra as the COSPAR representative to the advisory committee to the I.W.D.S./C.C.U. for rocket and satellite research.

A. G. I.

Publications

Les publications ci-après se rapportant à l'A.G.I. sont disponibles au Secrétariat Général de l'U.R.S.I. :

Consiglio Nazionale delle Ricerche — Anno Geofisico Internazionale, nos 1 à 27 (février 1957 à avril 1959).

Publications

The following publications relevant to the I.G.Y. are available at the General Secretariat of U.R.S.I. :

Consiglio Nazionale delle Ricerche — Anno Geofisico Internazionale, nos 1 to 27 (February 1957 to April 1959).

RÉUNIONS SCIENTIFIQUES INTERNATIONALES
INTERNATIONAL SCIENTIFIC MEETINGS

Date	Endroit — Location	Sujet — Subject	Organisateur — Organizer
1961			
February 15-17	Philadelphia	International Solid State Circuits Conference	Mr. Tudor R. Finch, Bell Telephone Laboratories, Murray Hill, New Jersey.
March 20-23	New-York	International Convention of the Institute of Radio Engineers.	Mr. E. K. Gannett, Institute Headquarters, 1, East 79th Street, New-York 21, N. Y.
Mai 29-Juin 3	Amsterdam	5me Congrès du Groupe Européen de Spectroscopie Moléculaire.	Mr. D. H. Zyp, Président du Comité Organisateur c/o Laboratoire de Chimie Inorganique, Université d'Amsterdam, Amsterdam, Pays-Bas.
Juin 5-10	Lyon	5me Colloque International de Spectroscopie.	Groupement pour l'Avancement des Méthodes Spectrographiques, 1, rue Gaston Boissier, Paris, XVe.
June 8-18	Finland	General Assembly of the International Organisation for Standardization (Members only).	American Standards Association, 70, East 45th Street, New-York 17, N.-Y.

Date	Endroit — Location	Sujet — Subject	Organisateur — Organizer
June 26-28	London	European Symposium on Space Technology.	Secretary, British Interplanetary Society, 12, Bessborough Gardens, London, S. W. 1.
June 26-28	Teddington, U. K.	Symposium on the Control of Noise	Director National Physical Laboratory, Teddington, Middlesex, U. K.
Août 2-5	Montréal, Canada	21me Conférence de l'Union Internationale de Chimie Pure et Appliquée.	Dr. Rudolf Morf, Secretaire, c/o Sandoz Ltd, Bâle 13, Suisse.
Août 6-12	Montreal	18me Congrès International de l'Union International de Chimie Pure et Appliquée.	Prof. Leo Marion, c/o National Research Council, Ottawa 2, Ontario, Canada.
August	Berkeley, California	11th General Assembly of the the International Astronomical Union.	Dr. D. H. Sadler, General Secretary of I. A. U. c/o Royal Greenwich Observatory, Herstmonceaux Castle, Sussex, U. K.

Date	Endroit — Location	Sujet — Subject	Organisateur — Organizer
September 4-9	Belgrade, Yugoslavia	3rd International Session of the International Association for Analogue Computations.	Dusan Strujic, Président, Comité Yougoslave de l'Electronique, des Télécommunications, de l'Automatisme et de la Technique Nucléaire, Decanska 14/IV, Belgrade, ou Av. Franklin D. Roosevelt 50, Brussels, Belgium.
September 4-9	Munich	5me Conférence Internationale sur les Phénomènes d'Ionisation dans les Gaz.	Dr. P. Schulz, Lichttechn. Institutes der Techn. Hochschule, Karlsruhe, Allemagne.
September 5-8	Teddington U. K.	Symposium on Machine Translation of Languages and Applied Language Analysis.	Dr. A. M. Uttley, National Physical Laboratory, Teddington, Middlesex, U. K.
October 15-	Washington D. C.	2nd International Congress on Vacuum Science and Technology and General Meeting of the International Organisation for Vacuum Science.	Mr. W. M. Welch, Chairman, Congress Committee and Vice-President, 1515, Sedgwick Street, Chicago 10, Ill.
November 8-11	Atlanta, Ga.	4th Conference on Applied Meteorology.	Executive Secretary, American Meteorological Society, 45, Beacon Street, Boston 8, Mass., U. S. A.

BIBLIOGRAPHIE

Union Internationale des Télécommunications

Ce document, issu des travaux de la Conférence de plénipotentiaires, Genève, 1959, a pour objet de faciliter les relations et la coopération entre les peuples par le bon fonctionnement des télécommunications tout en reconnaissant pleinement à chaque pays le droit souverain de les réglementer. Les pays et groupes de territoires qui deviennent parties à la Convention constituent l'Union internationale des télécommunications.

La présente Convention abroge et remplace, à partir du 1er janvier 1961, la Convention internationale des télécommunications de Buenos Aires, 1952, dans les relations entre les gouvernements contractants.

Cette publication d'environ 190 pages traite des questions suivantes :

1. Composition, objet et structure de l'Union.
2. Application de la Convention et des Règlements.
3. Relations avec les Nations Unies et les organisations internationales.
4. Dispositions générales relatives aux télécommunications.
5. Dispositions spéciales aux radiocommunications.
6. Définitions.
7. Disposition finale.
8. Protocole final de la Convention.
9. Protocoles additionnels à la Convention.
10. Résolutions, Recommandations et Vœu.

La Convention internationale des télécommunications est donc la charte de base de l'U.I.T. De ce fait, elle constitue un document de référence très utile pour tous ceux qui s'intéressent au développement des télécommunications à l'échelle mondiale. Elle est éditée en trois langues séparées (française, anglaise et espagnole) et son prix de vente a été fixé à 5.— *francs suisses* l'exemplaire. Ce prix comprend l'emballage et les frais de port pour envoi par la poste ordinaire dans le monde entier.

Règlement des radiocommunications, Genève 1959.

Cet ouvrage, issu des travaux de la Conférence administrative des radiocommunications, Genève 1959, entrera en vigueur le premier mai 1961 en remplacement du Règlement des Radiocommunications d'Atlantic City (1947). Il constitue un document de référence indispensable à tous ceux qui s'intéressent aux radiocommunications à l'échelle mondiale et plus particulièrement aux Compagnies d'exploitation, aux constructeurs, aux techniciens et aux amateurs.

Cette publication d'environ 750 pages traite, entre autres, des questions suivantes :

1. Terminologie.

a) Termes et définitions.

b) Désignation des émissions.

2. Fréquences.

a) Règles générales d'assignation et d'emploi des fréquences.

b) Répartition des bandes de fréquences entre 10 kHz et 40 GHz.

c) Dispositions spéciales relatives à l'assignation et à l'emploi des fréquences.

3. Notification et enregistrement des fréquences.

4. Mesures contre les brouillages.

a) Caractéristiques techniques des appareils et des émissions.

b) Contrôle international des émissions.

c) Brouillage et essais.

d) Procédure contre les brouillages nuisibles.

e) Rapports sur les infractions.

5. Dispositions administratives concernant les stations.

6. Personnel des stations du service mobile.

7. Conditions de fonctionnement des services mobiles.

8. Détresse, alarme, urgence et sécurité.

9. Radiotélégrammes et conversations radiotéléphoniques.

10. Stations et services divers.

a) Stations d'amateur.

b) Stations expérimentales.

c) Service de radiorepérage.

d) Services spéciaux.

11. Appendices au Règlement des radiocommunications (26 appendices relatifs à diverses matières, par exemple Tableau des tolérances de fréquence, Code Q, Abréviations et signaux divers, Codes SINPO et SINPFEMO, Tableau d'épellation des lettres et des chiffres, Cartes des Régions prévues au Tableau de répartition des bandes de fréquences, Plan d'allotissement de fréquences aux stations côtières radiotéléphoniques fonctionnant dans les bandes exclusives du service mobile maritime entre 4000 et 2300 kHz — Appendice 25 — et plan d'allotissement de fréquences pour le service mobile aéronautique et renseignements connexes — Appendice 26).

12. Règlement additionnel des radiocommunications.

13. Protocole additionnel au Règlement des radiocommunications.

14. Résolutions.

15. Recommandations.

Ce Règlement a été édité en trois langues séparées (française, anglaise et espagnole) et son prix de vente a été fixé à 19.— *francs suisses* l'exemplaire. Ce prix comprend l'emballage et les frais de port pour envoi par la poste ordinaire dans le monde entier.

Ces publications sont en vente au Secrétaire Général de l'U.I.T., Palais Wilson, Genève, Suisse.

Commission Electrotechnique Internationale

Publication 43. *Deuxième édition.* — Recommandations pour wattheuremètres à courant alternatif.

Cette publication est en vente au Bureau Central de la C.E.I. au prix de Fr. S. 8.— l'exemplaire, plus frais de port.

* * *

Nous signalons aux lecteurs de langue française l'ouvrage du Professeur P. Baudoux de l'Université de Bruxelles et membre du Comité National Belge :

Volume I. — Lois fondamentales, Milieux, Systèmes, Circuits.

Volume II. — Electromagnétisme, Electrostatique, Propagation Dunod, Paris et Presses Académiques Européennes, Bruxelles.

BIBLIOGRAPHY

International Telecommunication Union

International Telecommunication Convention, Geneva, 1959.

This document, the fruit of the work done at the Plenipotentiary Conference (Geneva, 1959) is intended to facilitate relations and cooperation between peoples by promoting efficient telecommunication, while acknowledging the sovereign right of individual countries to manage their own telecommunication services. The countries and groups of territories which accede to the International Telecommunication Convention make up the International Telecommunication Union.

From 1 January, 1961, the Geneva Convention abrogates and replaces the International Telecommunication Convention of Buenos Aires (1952), in relations between contracting governments.

The volume runs to about 190 pages. It deals with :

1. Composition, Functions and Structure of the Union.
2. Application of the Convention and Regulations.
3. Relations with the United Nations and International Organizations.
4. General Provisions relating to Telecommunications.
5. Special Provisions for Radio.
6. Definitions.
7. Final Provisions.
8. Final Protocol to the Convention.
9. Additional Protocols.
10. Resolutions, Recommendations and Opinion.

Hence the Convention is the basic charter of the Union. It represents, as such, an exceedingly useful reference document for all those interested in the development of telecommunication on the world level. It appears in three languages, separately (English, Spanish and French), and costs 5.— *Swiss francs* a copy, carriage by ordinary mail to any part of the world included.

International Telecommunication Union

Radio Regulations (*Geneva,* 1959).

This work, the fruit of the activities of the Administrative Radio Conference (Geneva, 1959) will come into force on 1 May, 1961, when it will replace the Atlantic City Radio Regulations (1947). It represents an

essential reference document for all those interested in world-wide radio communications, and specially operating agencies, manufacturers, engineers and amateurs.

It runs to some 750 pages, and includes such things as :

1. Terminology.

a) Terms and Definitions.

b) Designation of Emissions.

2. Frequencies.

a) General Rules for the Assignment and Use of Frequencies.

b) Frequency Allocations, 10 kc/s to 40 Gc/s.

c) Special Rules for the Assignment and Use of Frequencies.

3. Notification and Registration of Frequencies.

4. Measures against Interference.

a) Technical Characteristics of Equipment and Emissions.

b) International Monitoring.

c) Interference and Tests.

d) Procedure when Harmful Interference occurs.

e) Reports of Infringements.

5. Administrative Provisions for Stations.

6. Personnel of Mobile Service Stations.

7. Working Conditions in the Mobile Services.

8. Distress, Alarm, Urgency and Safety.

9. Radiotelegrams and Radiotelephone Calls.

10. Miscellaneous Stations and Services.

a) Amateur Stations.

b) Experimental Stations.

c) Radiodetermination Service.

d) Special Services.

11. Appendices to the Radio Regulations (twenty-six appendices dealing with a variety of subjects, for example, the Table of Frequency Tolerances, the Q Code, Abbreviations and Miscellaneous Signals, SINPO and SINPFEMO Codes, Phonetic Alphabet and Figure Code, Charts of Regions as defined in the Radio Regulations, Frequency Allotment Plan for Coast Radiotelephone Stations operating in the Exclusive Maritime Mobile Bands between 4000 and 23.000 kc/s — Appendix 25 — and Frequency Allotment Plan for the Aeronautical Mobile Service and Related Information — Appendix 26),

12. Additional Radio Regulations.

13. Additional Protocol to the Radio Regulations.

14. Resolutions.

15. Recommendations.

The Regulations appear in three separate editions (English, Spanish and French), and will cost 19.— *Swiss francs* per copy. This figure includes carriage by ordinary mail to any part of the world.

These publications are available at the I.T.U. General Secretariat, Palais Wilson, Geneva, Switzerland.

International Electrotechnical Commission

Publication 43. *Second edition.* — Recommendations for alternating-current watthour meters.

This publication is on sale at the Central Office of the IEC, at the price of Sw. Fr. 8.— per copy, plus postage.