Bulletin N° 126 Mai-Juin 1961

U. R. S. I.

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NÉCROLOGIE

M. Jan van der Mark
1893-1961

C'est avec un profond regret que nous devons annoncer le décès de M. Jan van der Mark, conseiller au C.C.I.R., survenu le 4 mars 1961.

M. van der Mark, qui était entré au C.C.I.R. après avoir consacré de nombreuses années à la recherche, y avait occupé les fonctions de conseiller pendant près de dix ans.

Comme conseiller du C.C.I.R., où il va retrouver en 1950 le professeur van der Pol, M. van der Mark est chargé de tâches variées. Il collabore à toutes les Assemblées plénières et réunions des Commissions d'études du C.C.I.R. auxquelles il a apporté souvent l'appui de ses connaissances et de son expérience de

l'Union. Avec le Directeur du C.C.I.R., il représente cette organisation aux Assemblées Générales de l'U.R.S.I. où il prend une part active aux discussions.

En plus, M. van der Mark a fourni une aide importante à l'U.R.S.I. dans le problème complexe des attributions de fréquences pour la radioastronomie.

Nous sommes certains de nous faire les interprètes de ceux qui rencontrèrent M. van der Mark à l'U.R.S.I. en présentant l'expression de notre profonde sympathie à Madame van der Mark et à sa famille.

NECROLOGY

Mr. Jan van der Mark
1893-1961

It is with great regret that we have to announce the death on 4 March, 1961, of Mr. Jan van der Mark, Counsellor in the C.C.I.R.

Mr. van der Mark, who joined the C.C.I.R. after many years devoted to research, served as Counsellor for nearly ten years.

As Counsellor of the C.C.I.R., where Mr. van der Mark rejoined Professor van der Pol in 1950, he was given very varied duties. He took part in all the Plenary Assemblies and Study Group meetings of the C.C.I.R., to which he contributed his valuable knowledge and experience of the Union. He represented with the Director of C.C.I.R., this organization at various General Assemblies of U.R.S.I. where he took an active part in the discussions.

Moreover, Mr. van der Mark provided a most important help to U.R.S.I. in the complex problem of frequency allocations for radio astronomy.

We are sure to be the interpreter of those who met him in U.R.S.I. in offering our profound sympathy to his widow and family.

XIII[e] ASSEMBLÉE GÉNÉRALE

Compte rendu

Volume XII, Part 1, Commission I on Radio Standards and Measurements Methods est sorti de presse et a été distribué aux Comités Nationaux.

Cette partie contient des renseignements administratifs sur la Commission, quinze rapports de Comités Nationaux, les comptes rendus des séances et les résolutions adoptées par l'Assemblée Générale sur proposition de la Commission I.

Le fascicule 1, texte français, sera distribué incessamment.

Des exemplaires supplémentaires peuvent être obtenus au Secrétariat Général au prix de F. B. 140 ($ 2.8, £ 1). Le prix pour les commandes envoyées par les Comités Nationaux est de F. B. 100 ($ 2, £ 0.15.0).

XIIIth GENERAL ASSEMBLY

Proceedings

Volume XII, Part 1, Commission I on Radio Standards and Measurements Methods has been issued and distributed to National Committees.

This part contains administrative information on Commission I, fifteen National Committee Reports, the minutes of the sessions and the resolutions adopted by the General Assembly on proposal of Commission I.

Fascicule 1, French text will be distributed in the near future.

Supplementary copies are available at the General Secretariat at the price of B. F. 140 ($ 2.8 ; £ 1). For orders reaching the Secretariat through National Committees, this price is of B. F. 100 ($ 2 ; £ 0.15.0).

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

« U.R.S.I. Handbook of Ionogram Interpretation and Reduction »

du Comité des Sondages Ionosphériques à l'échelle mondiale

par W. R. PIGGOTT et K. RAWER,
Radio Research Station, Slough, Bucks ; Ionosphären-Institut, Breisach/Rh.

(see English text on page 7)

Une grande impulsion a été donnée à l'étude de l'ionosphère au cours de l'Année Géophysique Internationale. Des recherches très actives ont également été stimulées par le développement de fusées et satellites pouvant pénétrer dans les zones ionisées.

Le Handbook a été préparé par le Comité des Sondages Ionosphériques à l'échelle mondiale (WWSC) de l'Union Radio Scientifique Internationale pour satisfaire à de nombreuses demandes. Les buts de cet ouvrage sont les suivants :

1. apporter une aide au personnel chargé de l'analyse et de l'interprétation des ionogrammes (à cet effet, l'ouvrage est rédigé dans une forme facilement accessible) ;
2. permettre à ceux qui ne sont pas étroitement liés avec les grandes organisations scientifiques de procéder à des recherches utiles, à partir des données dont ils disposent ;
3. présenter les règles internationales pour l'interprétation des ionogrammes dans une forme qui aidera à résoudre les problèmes pratiques, et expliquer les raisons qui ont conduit à l'adoption de ces règles ;
4. tenir compte des variations rencontrées par les stations situées dans les régions polaires, tempérées ou équatoriales.

L'ouvrage comporte un supplément qui fournit des conseils pour la recherche des ionogrammes et qui tient compte des techniques non-normalisées applicables à des latitudes particulières ou à des stations individuelles, ainsi que des règles détaillées pour l'analyse des hauteurs vraies. Les recommandations adoptées par la réunion de l'U.R.S.I. en 1961 sont également incluses.

En conclusion, le Handbook traite en détail les problèmes de l'interprétation et de la réduction des ionogrammes et fournit une série de règles conventionnelles établies par le Comité des Sondages Ionosphériques. En son genre, il est unique.

Le « U.R.S.I. Handbook of Ionogram Interpretation and Reduction » est en vente chez Elsevier Publishing Company, Spuistraat 110-112, Amsterdam, au prix de H*fl.* 35. Une réduction est accordée pour les commandes faites par l'intermédiaire du Secrétariat Général de l'U.R.S.I.

U. R. S. I. PUBLICATIONS

U.R.S.I. Handbook of Ionogram Interpretation and Reduction

of the World Wide Soundings Committee

Edited by W. R. PIGGOTT and K. RAWER,
Radio Research Station, Slough, Bucks ; Ionosphären-Institut, Breisach/Rh.

The study of the ionosphere gained great impetus during the International Geophysical Year. Intensive research has also been stimulated by the development of rockets and satellites capable of penetrating the ionised zones.

This Handbook was prepared by the World Wide Soundings Committee (WWSC) of the International Radio Scientific Union in response to many requests. It has the following aims :

1. To assist the personnel who analyse and interpret ionograms (for this purpose it has been written in a readily understandable way).
2. To enable workers not closely connected with major scientific organisations to carry out useful research on their data.
3. To give the international rules for ionogram interpretation in a form which will help to solve the practical problems encountered, together with the detailed reasons for adopting these rules.

4. To take account of the variations encountered by stations situated in polar, temperate or equatorial regions.

There is a supplement giving much advice on ionogram research, account being taken of non-standard techniques applicable at particular latitudes or at individual stations, and of detailed rules for routine real-height analysis ; here, the recommendations of the U.R.S.I. meeting of 1961 are included.

In short, therefore, this handbook sets out to treat the problems of ionogram interpretation and reduction in full detail and gives a collection of conventional rules established by the World Wide Soundings Committee. As such, it is unique.

The U.R.S.I. Handbook of Ionogram Interpretation and Reduction is on sale at Elsevier Publishing Company, Spuistraat 110-112, Amsterdam, at the price of H*fl.* 35. A reduction is allowed for orders made through the General Secretariat of U.R.S.I.

COMITÉS NATIONAUX

Lettre du Secrétaire Général sur l'organisation de Commissions Nationales

(see English text on page 10)

Aux Présidents des Comités Nationaux

Monsieur le Président,

J'ai l'honneur de vous confirmer qu'à la dernière réunion du Comité Exécutif de l'U.R.S.I., tenue à Londres le 14 septembre 1960, lors de la XIII[e] Assemblée Générale, une motion a été adoptée, visant à inviter les Comités Nationaux à organiser en leur sein des Commissions Nationales correspondant aux Commissions scientifiques de l'Union. Cette action a conduit à une nouvelle rédaction de l'article 3 du Règlement des Commissions, dont voici le texte :

« Art. 3. — Chaque Commission est composée d'un Bureau et de Membres Officiels nommés par les Comités Nationaux. Dans des cas spéciaux, le Président d'une Commission de l'U.R.S.I. peut, avec l'approbation des Membres Officiels, désigner des membres consultatifs. Lorsqu'elles existent, il est supposé que les Présidents des Commissions Nationales seront les Membres Officiels.

Les Membres Officiels assurent la marche de la Commission pendant les périodes séparant les Assemblées. Au cours des Assemblées Générales, les Membres Officiels, ou leurs remplaçants, représentent les intérêts de leur pays dans les travaux des Commissions ».

En conséquence, il entre actuellement dans les possibilités des Comités Nationaux d'organiser, s'ils le désirent, des Commissions Nationales correspondant aux sept commissions scientifiques de l'U.R.S.I. Il est supposé qu'en principe, les Comités Nationaux désigneront les Présidents des Commissions Nationales qu'ils auront formées comme Membres Officiels des Commissions de l'U.R.S.I. correspondantes. Il est bien entendu que les Comités Nationaux conservent toute liberté pour désigner les membres de

ces Commissions Nationales parmi leurs membres officiels, leurs membres associés, leurs membres consultatifs, etc.

En adoptant cette motion et en modifiant en conséquence le Règlement des Commissions, le Comité Exécutif et le Bureau n'ont eu d'autre dessein que de promouvoir le développement scientifique des Comités Nationaux, et de faciliter les relations qu'ils pourraient avoir avec les diverses Commissions de l'U.R.S.I.

Il me serait agréable d'être informé des décisions que votre Comité prendrait en cette matière.

Le Secrétaire Général,
HERBAYS.

Le 19 mai 1961.

NATIONAL COMMITTEES

Letter from the Secretary General onthe organisation of National Commissions

To National Committee Presidents

Dear Mr. President,

I have the pleasure to confirm that, at the last meeting of the U.R.S.I. Executive Committee, held on September 14th, 1960, in London, during the XIIIth General Assembly, a motion inviting the National Committees to organize National Commissions corresponding to the scientific commissions of U.R.S.I. was adopted. This action lead to a new drafting of art. 3 of the Rules for Commissions which reads as follows :

« Art. 3. — A Commission is composed of Officers and of Official Members appointed by National Committees. In special circumstances consultants may be designated by the Chairman of the appropriate U.R.S.I. Commission with the approval of the Official Members. Where they exist, the Chairmen of National Commissions will be assumed to be the Official Members.

Official Members carry on the business of the Commissions during

the period intervening between Assemblies. At the General Assembly, the Official Member, or his alternate, represents the interest of his country in the work of the Commissions ».

Consequently the National Committees actually have the possibility to organize, if desired, National Commissions corresponding to the seven scientific commissions of U.R.S.I. It is supposed that, in principle, the National Committees of U.R.S.I. will nominate the Chairmen of these National Commissions as Official Members of the U.R.S.I. corresponding Commissions. It must be understood that the National Committees have full freedom to appoint members of such National Commissions amongst their official members, their associate members, their consultants, etc.

During the discussion of such motion, and in modifying consequently the Rules for Commissions, the Executive Committee and the Board of Officers had as objective to promote the scientific development of the National Committees, to give them a greater opportunity to have relations with the Chairmen of the various U.R.S.I. Commissions.

I would appreciate to be informed of the decisions that your Committee would take in this line.

May 19, 1961.

Yours sincerely,

HERBAYS,
Secretary General.

Germany

The annual meeting of the German National Committee was held at Kleinheubach from May 24 to 27. The number of participants was 120. 42 papers on tropospheric propagation, ionospheric radio, geomagnetism and radio astronomy were presented.

The results of the elections held on May 27 at the business meeting are the following :

Chairman : Prof. Dr. W. DIEMINGER.

Secretary : Dr. H. FLEISCHER.

Chairman Commission I : Prof. Dr. U. ADELSBERGER.
Chairman Commission II : Dr. J. GROSSKOPF.
Chairman Commission III : Prof. Dr. W. DIEMINGER.
Chairman Commission IV : Prof. Dr. A. EHMERT.
Chairman Commission V : Prof. Dr. O. HACHENBERG.
Chairman Commission VI : Prof. Dr. J. MEIXNER.
Chairman Commission VII : Dr. W. VEIT.

The proceedings of the scientific sessions will be printed. Requests should be sent to Dr. H. Fleischer, Fernmeldetechnisches Zentralamt, II V, Darmstadt, Rheinstrasse 110, Germany.

COMMISSIONS

Commission III
Radioélectricité Ionosphérique

XIVe ASSEMBLÉE GÉNÉRALE
1963

Le Président de la Commission III propose qu'au cours de la prochaine Assemblée Générale, quatre des six séances soient consacrées aux quatre sujets suivants :

1. Geomagnétisme et ionosphère.
2. Distribution électronique dans l'ionosphère.
3. Orages ionosphériques.
4. Radiations ionisantes et constitution de l'atmosphère.

Le Président espère, d'ici le mois de janvier 1962, avoir demandé à des chercheurs de préparer les communications principales sur les sujets précités. Toute personne désireuse d'être sollicitée à cet effet est priée de se mettre en rapport avec lui, à l'adresse suivante : J. A. RATCLIFFE, D.S.I.R. Radio Research Station, Ditton Park, Slough, Bucks, Angleterre.

Commission III
On Ionospheric Radio

XIVth GENERAL ASSEMBLY
1963

During the General Assembly 1963, the Chairman of Commission III proposes that four out of six sessions should be devoted to the following four topics :

1. Geomagnetism and ionosphere,
2. Electron distribution throughout the ionosphere.

3. Ionosphere storms.

4. Ionising radiation and atmospheric constitution.

By January 1962 the Chairman hopes to have asked individual workers to prepare leading papers on the above mentioned subjects. Anyone who would like to be asked is requested to get in touch with him at : (J. A. RATCLIFFE), D.S.I.R. Radio Research Station, Ditton Park, Slough, Bucks, England.

BIBLIOGRAPHY

Attention of all scientists interested in Commission III activities should be called to the book entitled :

« Bibliography on ionospheric propagation of radio waves (1923-1960) » issued by the Boulder Laboratories of the NBS as Technical Note nº 84. This Bibliography was compiled by Mr. Wilhelm Nupen of the Meteorological and Geoastrophysical Abstracts, Washington, D. C. Some of the material used in this Bibliography was submitted to the Abstracts group by the Boulder Laboratories of the National Bureau of Standards. However, the vast majority of the papers referenced in the Bibliography have been written since 1950. The reader interested in a fuller coverage of ionospheric propagation of radio waves prior to 1950 is referred to Dr. L. A. Manning's bibliography entitled « A survey of the Literature of the Ionosphere », dated July 31, 1955 of the Radio Science Laboratory of Stanford University ; or « The Upper Atmosphere », by Dr. K. S. Mitra published in 1952 by the Asiatic Society, and to other standard works.

It should be pointed out that this Bibliography is the first of a series. Additional information on this subject and related topics will be coming out in future volumes. Comments on additional coverage would be welcome and should be forwarded to : Mr. Malcolm Rigsby, Editor, Meteorological and Geoastrophysical Abstracts, P. O. Box 1736, Washington 13, D. C.

Commission VI
Ondes et circuits radioélectriques
PREPARATION DE L'ASSEMBLEE GENERALE DE TOKYO 1963

(see English text on page 17)

Destinataires :

Président et Vice-Présidents de l'U.R.S.I.,
Prof. SILVER,
Dr. STUMPERS,
Prof. MARCUWITS,
Dr. WEINBERG,
Tous les Membres Officiels de la Commission VI.

GÉNÉRALITÉS

— A l'Assemblée Générale de Tokyo, nous nous efforcerons de limiter les exposés oraux aux communications données *sur invitation*,

— Les travaux de l'U.R.S.I. doivent à la fois porter sur un sujet assez général et correspondre à l'état actuel de la technique et de la science.

— Il a été suggéré de constituer des sous-commissions pour approfondir les diverses questions, en vue d'établir le programme des sessions.

Bien que notre Commission ne soit plus divisée en Sous-Commissions, le choix des trois Vice-Présidents élus à Londres est assez significatif pour que chacun d'eux reçoive les textes qui correspondent à son domaine d'intérêt et nous aide à désigner les personnalités qui seront invitées à présenter des communications.

Cette organisation sera pratiquement équivalente à la création formelle de Sous-Commissions. Les Membres Officiels sont priés dès maintenant de bien vouloir :

1° Communiquer à leur Comité National le projet de programme ci-après.

2° Faire connaître leurs suggestions et leurs objections éventuelles.

3° Me proposer les noms de personnalités susceptibles d'être invitées à présenter des rapports. Il est rappelé que les auteurs ne sont pas nécessairement des membres des Comités Nationaux.

PROJET DE PROGRAMME

Dans la situation actuelle, nous avons dressé la liste des questions envisagées. Nous savons bien que toutes ces questions ne pourront pas faire l'objet de communications à Tokyo et qu'à la suite de la présente consultation d'autres sujets seront encore proposés.

C'est seulement quand nous aurons pris connaissance du point de vue des Membres Officiels, et quand nous aurons les noms des personnalités susceptibles d'être invitées, que nous pourrons faire un choix définitif.

1. *Théorie de l'information appliquée aux canaux variables.*

4 points de vue :

— Codage-Détection.

— Théorie des Circuits (filtres adaptés, etc...).

— Programmes dynamiques.

— Electromagnétisme (avec Commissions II et III).

Application à l'exploration de l'Espace (notamment lors des mesures qui seront faites en novembre 1962 lors du passage de Vénus à une distance minimale de la Terre).

2. *Reconnaissance des formes.*

Introduction générale.

Applications aux machines à traduire (lettres d'imprimerie).

Applications à l'Exploration de l'Espace (notamment pour débiter une information maximale dans une largeur de bande minimale).

3. *Traitement des données.*

Problèmes de géométrie des rayonnements à la réception.

Applications à l'Exploration de l'Espace.

Cas d'une très grande quantité de données.

Circuits pour le traitement des données (à moins que la question soit renvoyée à une autre session).

4. *Ondes électromagnétiques.*

Nous ne pourrons préciser le programme qu'en fonction des résultats du Symposium de Copenhague.

Les problèmes relatifs aux milieux inhomogènes et anisotropes sont certainement au centre des préoccupations. Dans ce sens,

les Géophysiciens ont indiqué des méthodes nouvelles selon lesquelles les inhomogénéités donnent lieu à la considération de charges fictives calculables au moyen d'équations intégrales.

5. *Théorie des Graphes.*

L'étude de systèmes très complexes met en jeu la considération des relations entre de nombreuses grandeurs physiques. Il serait intéressant d'avoir un rapport sur ce sujet, qui apporterait une contribution aux calculs de propagation en milieu non homogène.

6. *Circuits non-linéaires.*

7. *Fiabilité* [1].

Il y a une relation entre cette question et la théorie des Graphes et la théorie de l'Information (Redondance des schémas).

Paris, le 9 juin 1961.

J. Loeb
Président de la Commission VI

Commission VI
On Radio Waves and Circuits

PREPARATION OF THE TOKYO GENERAL ASSEMBLY, 1963

To : the President and Vice-Presidents of U.R.S.I.,

Prof. Silver,

Dr. Stumpers,

Prof. Marcuwits,

Dr. Weinberg.

Commission VI Official Members.

General

— We shall try, at the Tokyo General Assembly, to limit contributions to invited papers.

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[1] C'est ainsi qu'on traduit en français le mot anglais « Reliability ».

— The work of U.R.S.I. must both bear on a general subject and correspond to the present state of technique and science.

— It was suggested to establish Sub-Commissions which would study the various questions in order to draft a programme of sessions.

Although our Commission is no more divided into Sub-Commissions, the choice of the three Vice-Presidents elected in London is significant enough, and it is assumed that each of them will be provided with material relevant to his field of interest and that he will help us in appointing the invited speakers.

Practically such organization will be equivalent to a formal setting up of Sub-Commissions. The Official Members are requested as soon as possible :

1) to inform their National Committees of the appended draft programme ;
2) to inform me of their suggestions and comments ;
3) to propose nominees who might be asked for presentation of reports. It is to be recalled that authors are not necessarily members of the National Committees.

Draft programme

In the present situation we drafted a list of questions. We are aware that all those items cannot be taken into consideration for presentation of papers at Tokyo, and that other topics will be proposed as a result of this consultation.

Final selection will be made only after the opinion of the Official Members and the names of possible invited speakers are available.

1. *Information theory applied to variable channels.*

4 view points :

— Codification — Detection.

— Circuit theory (adapted filters, etc.).

— Dynamic programmes.

— Electromagnetism (with Commissions II and III).

Application to space exploration (more particularly in the measurements to be done in November 1962 for Venus transit at a minimum distance of the Earth).

2. *Understanding of forms.*

General introduction.

Applications to translating machines (block characters).

Applications to space exploration (especially for issuing maximum information on minimum band width).

3. *Data processing.*

Geometry problems of radiations at reception.

Applications to space exploration.

Case of a great amount of data.

Circuits for data processing (unless this question is transferred to another session).

4. *Electromagnetic waves.*

We shall be able to determine the programme only after the results of the Copenhagen Symposium are available.

Problems relating to inhomogeneous and anisotropic media are certainly the most important. To this effect, the geophysicists indicated new methods in which inhomogeneities allow to consider fictious charges which can be calculated by integral equations.

5. *Graph theory.*

The study of very complex systems implies analyses of the relations between numerous physical quantities. It would then be interesting to have a report on this subject, which would help the calculation of propagation in inhomogeneous medium.

6. *Non-linear circuits.*

7. *Reliability.*

There is a relation between this question and the Graph theory, and the Information theory (diagram redundancy).

Paris, June 9, 1961.

J. Loeb.

Chairman, Commission VI

COMMITTEES

U.R.S.I. Committee on Space Radio Research

SYMPOSIUM ON SPACE COMMUNICATION RESEARCH

To Secretaries of National Committees of U.R.S.I.

At a meeting of the above Committee held in London in September 1960 it was agreed to hold a Symposium sometime during 1961 to discuss the scientific aspects of space radio communication problems. By arrangement with the French National Committee for Scientific Radio, it is now proposed to hold the meeting in Paris on 18-22 September 1961, and I write now to bring this Symposium to your attention.

I enclose some details ; a detailed programme will be circulated later to participants ; Attendance at the Symposium will be restricted to persons invited or approved by the National Committees of U.R.S.I., and the total number of participants is likely to be limited to about 100. If your National Committee wishes to nominate one or two delegates to this meeting or to submit a contribution for possible inclusion in the programme I should be glad if you would send full details directly to the Symposium-Secretary, Mr. F. du Castel, C.N.E.T., Issy-les-Moulineaux, Seine, France, as soon as possible and *not later than* 8 *July* next.

6 June 1961.

W. J. G. Beynon.
Secretary on U.R.S.I. Committee
on Space Radio Research.

U.R.S.I. SYMPOSIUM ON SPACE COMMUNICATION RESEARCH

Paris, 18-22 September 1961

It is planned to hold a Symposium on the scientific aspects of space radio communication problems in Paris, at the Ministère

des Postes et Télécommunications, avenue de Ségur, on 18-22 September 1961.

Organizing Committee

The following were designated by U.R.S.I. :

Dr. J. R. Pierce (*Chairman*), Bell Telephone Laboratories, Murray Hill, New Jersey, U. S. A.

Prof. V. Siforov, Academy of Sciences, Moscow, U. S. S. R.

Mr. G. M. Brown, University College of Wales, Aberystwyth, U. K.

to which have been added.

Mr. J. Voge, Centre National d'Etudes des Télécommunications, Issy-les-Moulineaux, Seine, France.

and Mr. F. du Castel (same address) : Symposium-secretary.

Programme

It is planned to organize the meeting on the lines of the procedure adopted at the 1960 General Assembly of U.R.S.I., i. e. each session will consist of the presentation of a general report on a chosen subject, followed by invited contributions and discussion. The emphasis will lie with the scientific and research problems of satellite communication.

The following is a draft programme :

Monday 18 sept. — *Satellite realization and communication* :
morning : launching and stabilization problems ;
afternoon : acquisation and tracking problems.

Tuesday 19 Sept. — *Radio communication problems* :
morning : propagation, frequency selection ;
afternoon : modulation systems.

Wednesday 20 Sept. — *Equipment* :
morning : ground equipment ;
afternoon : satellite equipement.

Thursday 21 Sept. — *Experimental results* :
morning : experimental results. Echo, Courier, Moon.

FRIDAY 22 SEPT. — *Proposed communication systems* :

morning : proposed systems. Moon relay, active and passive satellites, dipoles ;

afternoon : miscellaneous problems. Economics, problems of telephony, satellite broadcasting.

PARTICIPATION

The total number is likely to be limited to about 100. It is hoped to circulate duplicated copies of papers to all participants before the meeting, and for this purpose the Symposium-secretary will require copies of all contributions typed on thin paper by 1 August 1961.

All travel and hotel arrangements have been entrusted to Agence Friedland, place Victor Hugo, Paris, 16.

Frequency allocations

BIBLIOGRAPHY

The attention of the Inter-Union Committee on Allocations of Frequencies for Radio Astronomy and Space Research, of the U.R.S.I. Committee on Frequency Allocations for Scientific Purposes and of the U.R.S.I. Committee on Space Research is drawn to a paper on « Frequency Allocations for Space Communication. A Report of the Joint Technical Advisory Committee I.R.E.-E.I.A. », published in the *Proceedings of the I.R.E.*, Vol. 49, n° 6, June 1961, pp. 1009-1015.

SERVICES PERMANENTS

Comité Régional Européen des Ursigrammes

Le Comité National de l'U.R.S.I. des Pays-Bas a désigné M.L.D. de Feiter (station de NERA, Section Ionosphère et Radio Astronomie, Nederhorst den Berg, Pays-Bas) comme successeur à l'Ing. A. H. de Voogt au sein du Comité Régional Européen des Ursigrammes.

Nous remercions M. de Voogt pour sa collaboration incessante et efficace au Service International des Ursigrammes, en soulignant l'important rôle qu'il a joué au sein du Comité Régional Européen.

Western Pacific Regional Committee

MEMBERSHIP

Chairman : Dr. H. Uyeda (Director, Radio Research Laboratories, Kokubunji, Tokyo, Japan).

Members :

Australia : Mr. F. E. Cook (Ionospheric Prediction Service).

India : Dr. M. K. Vainu Bappu (Director, Astrophysical Observatory, Kodaikanal).

Japan : Dr. H. Uyeda.

New Zealand : Mr. J. W. Beagley (Superintendant, Geophysical Laboratory).

National Representatives :

Burma : Mr. U. Ba Kyi.

Formosa : Dr. Fung Chein.

Hong Kong : Dr. I. E. W. WATTS.

Indonesia : Dr. Ir. SOEROTO MANGOENSOERMARTO.

Philippines : Mr. A. ALCARAZ.

Viet Nam : to be designated.

Consultants :

Dr. D. F. MARTYN, Dr. R. GIOVANELLI, Mr. S. F. SMERD, Dr. F. JACKA (Australia).

Mr. Y. N. HUANG (Formosa).

Dr. RAMANATHAN, Mr. P. R. KRISHNA RAO (India).

Mr. A. FATAH, Mr. R. KONTA (Indonesia).

Mr. Y. AONO, Dr. T. HATANAKA, Dr. K. MIYA (Japan).

Mr. R. S. UNWIN, Mr. A. L. CULLINGTON (New Zealand).

Mr. L. TOLENTINO (Philippines).

Secretary :

Mr. T. TAKIGUCHI, Radio Research Laboratories, Kokubunji, Tokyo, Japan.

INTER-UNIONS COMMITTEES

Inter-Union Committee on Frequency Allocations for Radio Astronomy and Space Science

A SURVEY OF THE FREQUENCIES ASSIGNED TO RADIO ASTRONOMY AND SPACE SCIENCE IN THE RADIO REGULATIONS

Geneva, 1959

A full Administrative Conference of the International Telecommunication Union was held in Geneva in 1959, for the purpose of reviewing the regulations, codes of procedure and frequencies allotted to the conduct of telecommunication by the transmission or reception of radio waves. The conference was attended by upwards of 700 people, including delegates from 87 member countries of the I.T.U., and representatives of international organizations including U.R.S.I., I.A.U. and C.O.S.P.A.R. The results of the conference, with its resolutions and recommendations, are embodied in the book entitled « Radio Regulations » published by the General Secretariat of the I.T.U. at Geneva. Included in this publication are the Tables of Frequency Allocations for all radio services operating within the range 10 kc/s to 40,000 Mc/s (Gc/s), which is nearly four times as wide as that of the previous allocation tables, drawn up at the Atlantic City Conference in 1947.

For the benefit of the members of the Inter-Union committee, the relevant sections of the frequency allocations are reproduced in the attached tables, for an understanding of which it is desirable to interpret some of the necessary terms used in the official publication.

World-Wide and regional allocations

For the allocation of frequencies the world has been subdivided into three Regions by arbitrary longitudinal lines, defined by a map

given on page 450 of the Radio Regulations. Broadly these regions may be described as follows :

Region 1 : Europe, Africa and North and South Atlantic Ocean.

Region 2 : The American continent, west Atlantic and eastern Pacific Oceans.

Region 3 : Asia, Australia, Indian and western Pacific Oceans.

Other areas such as Tropical Zones and European Broadcasting area, are defined as required for special purposes.

Categories of services and allocations

Where a band is allocated to more than one service, either on a world-wide or regional basis, such services are listed in the order, primary, permitted and secondary services, which have the following definitions.

Primary and Permitted services have equal rights except that, in the preparation of frequency plans, the primary service shall have the prior choice of frequencies.

Stations of a Secondary service :

(*a*) shall not cause harmful interference to stations of primary or permitted services to which frequencies are already assigned or to which frequencies may be assigned at a later date ;

(*b*) cannot claim protection from harmful interference from stations of a primary or permitted service to which frequencies are already assigned or may be assigned at a later date ;

(*c*) can claim protection, however, from harmful interference from stations of the same or other secondary services to which frequencies may be assigned at a later date.

Harmful Interference : Any emission, radiation or induction which endangers the functioning of a radionavigation service or of other safety services, or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with these Regulations.

Frequency and bandwidth

Assigned Frequency : The centre of the frequency band assigned to a station (or service).

Occupied Bandwidth : The frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 % of the total mean power radiated by a given emission.

Frequencies for radio astronomy

The following definitions may first be noted in Chapter I of the Radio Regulations :

Paragraph 74. *Radio Astronomy* : Astronomy based on the reception of radio waves of cosmic origin.

Paragraph 75. *Radio Astronomy Service* : A service involving the use of radio astronomy.

Paragraph 45. *Radiodetermination* : The determination of position, or the obtaining of information relating to position, by means of the propagation properties of radio waves.

Paragraph 54. *Radiolocation* : Radiodetermination used for purposes other than those of radionavigation.

Paragraph 58. *Radar* : A radiodetermination system based on the comparison of reference signals with radio signals reflected, or re-transmitted, from the position to be determined.

Paragraph 59. *Primary Radar* : A radiodetermination system based on the comparison of reference signals with radio signals reflected from the position to be determined.

Table I

Frequencies for the Radio Astronomy Service

No	Frequency Band	Applicable to Regions	Remarks
1	Mc/s The standard frequency guard bands at 2.5, 5, 10, 15, 20 and 25 Mc/s	1, 2 and 3	The radio astronomy service shall be protected from harmful interference from services operating in other bands in accordance with the provisions of these Regulations, only to the extent that these services are protected from each other.

No	Frequency Band	Applicable to Regions	Remarks
2	73.0-74.6	2	Administrations assigning frequencies to stations of services to which this band is allocated, should take all practicable measures to avoid harmful interference to radio astronomy observations.
3	79.75-80.25	1 and 3 (except Korea India and Japan)	In making assignments to stations of other services to which this band is allocated, administrations are urged to take all practicable steps to protect radio astronomy from harmful interference. The radio astronomy service shall be protected from harmful interference from services operating in other bands in accordance with the provisions of these Regulations only to the extent that these services are protected from each other.
4	150-153	1	As in 3 above.
5	322-329 (Deuterium line)	No allocation, but see remarks	Radio astronomy observations on the Deuterium line (322-9 Mc/s) are carried out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in their future planning of this band.
6	404-410 406-410	2 and 3 1	An appropriate continuous band within these limits shall be designated on a national or area basis.
7	606-614	1 and 3	The band may be used by the radio astronomy service until such time as it is required for use by other services (broadcasting) to which this band is allocated.
8	1400-1427	1, 2 and 3	*Exclusive allocation*, on a world-wide basis except in Albania, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia and the U. S. S. R. where the band is also allocated to the fixed service and mobile, except aeronautical mobile, service.

No	Frequency Band	Applicable to Regions	Remarks
9	1660-1690 3165-3195 4800-4810 5800-5815 8680-8700	—	These bands are used in the countries listed in 8 above for radio astronomy observations.
10	2690-2700 4990-5000	1, 2 and 3	Shared with fixed and mobile services, same provision as in 1.
11	Gc/s 10.68-10.70 15.35-15.40 19.3 -19.4 31.3 -31.5	1, 2 and 3	Shared with fixed, mobile and radio-location services with same provision as in 1.

FREQUENCIES FOR SPACE SCIENCE AND COMMUNICATIONS

Again, it will be useful to extract a few relevant definitions from the Radio Regulations (Chapter I).

Paragraph

70 *Space Service* : A radiocommunication service between space stations.

71 *Earth-Space Service* : A radiocommunication service between earth stations and space stations.

72 *Space Station* : A station in the earth-space service or the space service located on an object which is beyond, or intended to go beyond, the major portion of the earth's atmosphere and which is not intended for flight between points on the earth's surface.

73 *Earth Station* : A station in the earth-space service located either on the earth's surface or on an object which is limited to flight between points on the earth's surface.

TABLE II

Frequencies for Space and Earth Space Services

No	Frequency Band	Applicable to Regions	Remarks
	Mc/s		
1	10.003-10.005	1, 2 and 3	Allocated on secondary basis (i. e. to standard frequency as primary service) to space and earth space services for research purposes.
2	19.990-20.010	1, 2 and 3	Allocated on secondary basis (i. e. to standard frequency as primary service) to space and earth space services for research purposes.
3	39.986-40.002	1, 2 and 3	Allocated on secondary basis to space and earth space services for research purposes. Shared with fixed and mobile services.
4	136-137	1, 2 and 3	Primary allocation for space research purposes, shared with fixed and mobile services in certain parts of the world, mainly Africa and Australia. The aeronautical mobile service will be a primary service for as long as it continues to operate in this band.
5	183.1-184.1	1, 2 and 3	Allocated to the space and earth-space services for research purposes subject to causing no harmful interference.
6	400-401	1, 2 and 3	For research purposes; primary service shared with meteorological aids, also as primary.
7	1427-1429	1, 2 and 3	For research purposes; shared with fixed and mobile, except aeronautical mobile, services. All primary services.
8	1700-1710	1, 2 and 3	For research purposes; secondary service shared with fixed and mobile primary services.

No	Frequency Band	Applicable to Regions	Remarks
9	2290-2300	1, 2 and 3	For research purposes; secondary service shared with fixed and mobile primary services.
10	5250-5255	1, 2 and 3	Secondary service, shared with radio-location as primary service.
11	8400-8500	1, 2 and 3	Secondary service, shared with fixed and mobile primary services.
12	Gc/s 15.15-15.25	1, 2 and 3	Primary service; shared with fixed and mobile, secondary services.
13	31.5-31.8	1, 2 and 3	Primary service; shared with fixed and mobile, secondary services.

Recommendations adopted by the Administrative Radio Conference, Geneva 1959

Members of the Committee will also be interested in the following Recommendations which were adopted at the Geneva (1959) Conference and which relate to Radio Astronomy and Space Communications.

Recommendation No 31 relating to the Protection of Standard Frequency Guard-Bands for Use by Radio Astronomy. The Administrative Radio Conference, Geneva, 1959,

considering :

(*a*) that interference-free reception of standard frequency and time signals in the standard frequency bands centred on 2.5, 5, 10, 15, 20 and 25 Mc/s, allocated to the standard frequency service in the Table of Frequency Allocations, is of world-wide interest;

(*b*) that these bands may be used most efficiently for the observation of cosmic radiations by radio astronomers only if they are free from appreciable energy due to emissions of services other than the standard frequency service ;

(*c*) that the bands 10 003-10 005 kc/s and 19 990-20 010 kc/s may be used for space research ;

recommends :

That administrations take all practicable measures to safeguard the standard frequency bands from any harmful interference.

Recommendation No 32 relating to the Radio Astronomy Service.
The Administrative Radio Conference, Geneva, 1959,

considering that :

(*a*) recognition has now been given to the radio astronomy service in the Regulations, and that allocations to this service are included in the Table of Frequency Allocations ;

(*b*) the radio astronomy service is devoted to the reception of extremely low-level electromagnetic radiations of extra-terrestrial origin, and needs therefore to be protected from radiations of man-made origin, to the maximum degree practicable ;

(*c*) the radio astronomy service must compete for spectrum space with other existing and expanding radio services ;

(*d*) the ability of the radio astronomy service to share frequency bands with other radio services is limited ;

(*e*) in the case of many radio astronomy service installations it would be very difficult, once they were established, to change the frequency bands being observed or locations to avoid harmful interference ;

(*f*) the radio astronomy service should be assured a reasonable degree of stability in the frequency bands allocated to it, so as to permit long-term study programmes ;

(*g*) the desired protection for the radio astronomy service in many of the bands allocated for its use will be difficult to obtain and can be achieved only on a long-term basis ;

(*h*) the provisions of the new Table of Frequency Allocations do not meet fully the stated requirements of the radio astronomy service, particularly in Band 8 and the lower part of Band 9 [1] ;

(*i*) it will assist administrations to protect the radio astronomy service if information is available showing the locations of the observatories, and those of the bands allocated in the Table of Frequency Allocations that are in use at each observatory ;

recommends that

1. administrations, when preparing for the next Administrative Radio Conference, should consider further the question of frequency allocations for the radio astronomy service ;
2. the possibility of making a firm allocation in the range 37-41 Mc/s be specially considered and that, in the meantime, when assigning frequencies to stations of other services, administrations should avoid, as far as practicable, the bands 38.0 ± 0.25 Mc/s or 40.68 ± 0.25 Mc/s, which are in use, or are proposed for use for radio astronomical observations in certain countries ;
3. administrations when drawing up frequency assignment plans should leave, as far as practicable, the band 606-614 Mc/s free for radio astronomical observations or should assign frequencies to stations of other services in this band in such a way as to afford the maximum practicable protection for the radio astronomy service ;
4. administrations should notify to the Secretary General the locations of observatories in their countries and those of the bands allocated in the Table of Frequency Allocations that are in use at each observatory ; and that the Secretary General should communicate this information to Members and Associate Members and

   draws the attention of organizations concerned with radio astronomy to the following :

   1. the relevant provisions of the Radio Regulations ;
   2. the need to maintain close co-ordination with their national administrations on matters of frequency usage ;
   3. the need to select, for observatories, sites that are as remote as possible from sources of radio interference.

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[1] Band 8 = 30 to 300 Mc/s.
Band 9 = 300 to 3000 Mc/s.

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 radio-communications 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 radiocommunication 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 radiocommunication ;

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.

REPORT OF A MEETING OF A WORKING PARTY HELD AT THE OFFICE OF U.R.S.I. IN BRUSSELS ON 27-28 MARCH 1961

PRESENT :

Dr. J. F. DENISSE, *Chairman*, I.U.C.A.F.

Prof. J. H. OORT, *President*, I.A.U.

Prof. H. C. VAN DE HULST, *President*, C.O.S.P.A.R.

Col. E. HERBAYS, *Secretary General*, U.R.S.I.

Dr. R. L. SMITH-ROSE, *Secretary General*, I.U.C.A.F.

In opening the meeting, the chairman referred to the recent sudden death of Dr. J. van der Mark, who was counsellor to the C.C.I.R. Tribute was paid to the very useful work he had done on behalf of Radio Astronomy and Space Science.

2. The meeting took note of the Constitution and Terms of Reference of the Committee as given in Doc. I.U.C.A.F./1, distributed in November 1960. At the request of Mrs. Massevitch and with the approval of Prof. Oort, Dr. V. V. Vitkevitch has been invited to represent I.A.U. instead of Mrs. Massevitch. No response has yet been received from Mr. V. Ilyin or Dr. Vitkevitch (1). All the other members had accepted the invitation to serve on the Committee.

3. — FINANCE.

a) *Administration of the funds.* — Since the Inter-Union Committee is not a special committee of I.C.S.U., it was decided that it was preferable for the three constituent bodies to pay the agreed sum annually to the credit of the Committee. It was agreed that for practical reasons it would be expedient for the Secretary General of U.R.S.I. (Colonel E. Herbays) to administer the funds on behalf of the Committee. Payments would be authorised by the Secretary General of the Committee (Dr. Smith-Rose); or in case he should not be available by the Chairman, Dr. Denisse.

b) *Budget for* 1961. — The Budgetary Estimate for 1961, adopted at the meeting of the Executive Board of I.C.S.U. at Lisbon in October, 1960, was reviewed in the light of the initial work of the Committee, and the need to make adequate provision for Secretarial expenses and representation at International meetings concerned with the allocation of radio frequencies. A revised budget for 1961 was drawn up and is set out in detail in Appendix I. It was confirmed that the contributions from I.C.S.U., U.R.S.I. and I.A.U.,

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(1) Since the meeting in Brussels, a reply has been received from Dr. Vitkevitch accepting the invitation to serve on the Committee.

had been approved by these bodies ; and it was anticipated that C.O.S.P.A.R. would also agree to make the payment described.

c) *Future Budgets.* — It was agreed that, as far as the meeting could foresee, at least the same income would be required for the years 1962 and 1963. This is to cover the expenditure involved in preparation for the Extraordinary Administrative Conference of the I.T.U. in 1963, at which the future allocations of radio frequencies for all purposes will be reviewed.

4. — Existing Frequency Allocations.

The meeting took note of Document I.U.C.A.F./4 summarizing the relevant definitions and frequency allocations included in the « Radio Regulations » of the I.T.U. (Geneva, 1959). It was noted that by definition « Radio Astronomy » is confined to reception ; but, in view of the definition of « Radar » also included, it was decided not to propose a further definition of « Radar Astronomy ».

It was also noted that the Regulations and Frequency Allocations come into force on May 1, 1961.

5. — Consultants and National representatives.

It was proposed that Dr. van der Toorn should be invited to joint the Committee as a consulting member.

The Committee agreed to draw up a list of persons who are concerned with the allocation of frequencies in various countries, and who might usefully assist as liaison between the Committee and national administrations. A preliminary list of such persons was prepared at the meeting for the use of the Secretary General.

6. — Requirements for frequency allocations for radio astronomy.

Bearing in mind the allocations made at Geneva, 1959, as listed in Table I of I.U.C.A.F./4, the following action was decided upon for the frequency bands stated :

(*a*) 150-153 *Mc/s.* — It was noted that there is no allocation in this band in Regions 2 and 3, corresponding to that made for Region 1.

(*b*) 322-329 *Mc/s* (*Deuterium band*). — The Committee were informed of the discussions which had taken place in London and Paris with the N.A.T.O. authorities, who are operating in this band. It was decided that Dr. Denisse and Dr. Smith-Rose should accept an invitation to continue these discussions with a view to finding an arrangement acceptable to N.A.T.O. which could assist radio astronomy observations in Europe. It was considered that this frequency band is important both for possible measurements of the Deuterium line, and as a continuum band.

(*c*) 406-410 *Mc/s* (*Region* 1) : 404-410 *Mc/s* (*Regions* 2 *and* 3). — It was decided to enquire from the U.S. members, the reason for the difference in the allocations in Regions 1, and in 2 and 3.

It was further decided that members of this working group should approach the national administrations in Belgium, France, Holland and the United Kingdom, with a view to obtaining a more certain reservation of the band 406-410 Mc/s which is in use and undergoing development for radio astronomy observations, particularly in these countries.

(*d*) 606-614 *Mc/s*. — In order to secure a more exclusive allocation of this band for future radio astronomy observations, it was proposed that the Inter-Union Committee should make a Recommendation to the forthcoming European Broadcasting Conference at Stockholm (May/June 1961). The proposed Recommendation for transmission to C.C.I.R. is reproduced as Appendix II. The Recommendation could, with advantage, be communicated also to the appropriate national administrations by members of the committee.

It was decided to enquire as to the position of radio astronomy in this band in U. S. A. (Region 2).

7. — Frequencies for Space Research.

The working group noted the allocations for space research made at Geneva (1959) and summarized in Table II of Doc. I.U.C.A.F./4.

It was agreed to press strongly for an exclusive allocation of the band 136-137 Mc/s, which is now in use at a large number of earth satellite tracking stations throughout the world. A proposed Recommendation to give effect to this is attached as Appendix III.

It was agreed that Prof. van de Hulst would communicate this Recommendation to the forthcoming meeting of C.O.S.P.A.R. in Florence, and invite comments thereon.

8. — Project West Ford.

The working group reviewed the situation of this project (formerly termed « Needles ») as known to the members present. The information is contained in the documents listed in Appendix IV.

It appears from these documents and relevant correspondence that the first test belt is scheduled to be launched very soon at a date not yet disclosed. A committee has been formed by the Space Science Board of the National Academy of Sciences of U. S. A. to collect facts about the interference caused to both optical and radio astronomy. W. Liller urges, on behalf of this committee, co-operation in optical observations of this test belt ; in particular by means of fast wide photoelectric photometer and polarimeters ; but visual observations may also be used.

9. — General.

It was decided that the Secretary General of the Inter-Union Committee should prepare a suitable paper drawing attention to the existence and work of the Committee, and should communicate this paper formally to national frequency allocation authorities. It was hoped that members of the Committee would be able to follow this up by direct personal approach.

10. — Date and Place of next meeting.

It was proposed that a meeting of the full Inter-Union Committee should be arranged to be held in London on 19th and 20th of October ; and that this should be preceded by a second meeting of the present working party on Wednesday, 18th October, 1961.

11. — Acknowledgement.

The Chairman, Dr. Denisse, expressed the gratitude of the working party for the facilities provided by U.R.S.I. on the occasion of this meeting.

APPENDIX I

Budgetary Estimates for 1961

RECEIPTS.	$	
I.C.S.U. grant	6 500	
U.R.S.I., I.A.U. and C.O.S.P.A.R. contributions at 2 500 each	7 500	
	14 000	
EXPENDITURES.		
1. *Secretarial Expenses* :		
Secretary General, Honorarium	2 500	
Secretarial assistance and expenses	1 500	
		4 000
2. *Meetings* :		
Working Group meetings	1 000	
Meeting of the I.U.C.A.F.	4 000	
Organizational expenses of above	500	
		5 500
3. *Representation* :		
At international meetings, e. g. I.T.U. and C.C.I.R.	3 500	
Individual travelling expenses	1 000	
		4 500
		$ 14 000

27 March 1961.

APPENDIX II

Recommendation to the European Broadcasting Conference

STOCKHOLM, MAY/JUNE 1961

Considering that :

(*a*) Radio Astronomy is now a recognised service in the field of Telecommunications ; (P. 10 Radio Regulations, Geneva 1959).

(*b*) the International Council of Scientific Unions (I.C.S.U.) has formed an Inter-Union Committee on Frequency Allocations for Radio Astronomy and Space Science ;

(*c*) this Committee comprises representatives of the International Scientific Radio Union (U.R.S.I.), the International Astronomical Union (I.A.U.) and the International Committee on Space Research (C.O.S.P.A.R.) ; and has the power to appoint additional members as expert consultants ;

(*d*) the function of the Committee is to formulate the requirements for frequency channels, and conditions of protection thereof, of those engaged in Radio Astronomy (and also in space science) ;

(*e*) the requirements described in (*d*) should be brought to the attention of the International Radio Consultative Committee (C.C.I.R.) and the International Telecommunication Union by the Secretary General of the Inter-Union Committee ;

(*f*) in the Radio Regulations (Geneva, 1959), the allocations for Radio Astronomy are, with one exception, on a shared basis with other services ;

(*g*) that the band of frequencies 606-614 Mc/s has been allocated in Regions 1 and 3 to Radio Astronomy until such time as it is required for use by other services to which this band is allocated (footnote 332, p. 77, Radio Regulations, Geneva 1959) ;

(*h*) in Recommendation No 32 (Radio Regulations, Geneva 1959) paragraph 3 requests that « administrations when drawing up frequency assignment plans should leave, as far as practicable, the band 606-614 Mc/s free for radio astronomical observations or should assign frequencies to stations of other services in this band in such a way as to afford the maximum possible protection for the radio astronomy service » ;

The Inter-Union Committee described in (*b*) and (*c*) above *recommends that* : in the planning of European Television Stations in Broadcasting Band V (582-960 Mc/s), the use of the frequency band 606-614 Mc/s should be avoided, so as not to hinder the present development and use of radio astronomy in this band.

Note :

In modern radio astronomy in the above frequency band, the incoming flux which can be detected in the principal lobe of a radio telescope is of the order of 10^{-20} watts/m^2 for a bandwidth of 1 Mc/s. Assuming that interfering radiation is being received

from the direction of a side lobe at a sensitivity of 40 db below that of the main lobe, the relevant value of the flux would be 10^{-16} W/m^2. This corresponds to a field strength of 0.2 microvolts/m, or 14 *db* below 1μV/m.

Reference to the revised propagation curves for Bands IV and V which will be made available to the European Broadcasting Conference, shows that if a radio observatory is not to suffer interference for more than 1 % of the time, a 1 kilowatt transmitter on the ground must be at least 500 kilometers from the observatory.

A broadcasting (television) station with an effective radiation of 1000 kW from an aerial at a height of 300 m above the ground would need to be situated at over 800 km from the observatory to give the same freedom from interference. If this distance is reduced to less than 650 km, the radio astronomer will suffer interference for more than 50 % of the observation time.

APPENDIX III

Draft Recommendation to the C.C.I.R. and I.T.U. Geneva

Considering that :

(*a*) the International Council of Scientific Unions (I.C.S.U.) has formed an Inter-Union Committee on Frequency Allocations for Radio Astronomy and Space Science ;

(*b*) this Committee comprises representatives of the International Scientific Radio Union (U.R.S.I.), the International Astronomical Union (I.A.U.) and the International Committee on Space Research (C.O.S.P.A.R.) ;

(*c*) the function of the Committee is to formulate the requirements for frequency channels, and conditions of protection thereof, of those engaged in space science (and also in radio astronomy) ;

(*d*) the requirements described in (*c*) should be brought to the attention of the International Radio Consultative Committee (C.C.I.R.) and the International Telecommunication Union by the Secretary General of the Inter-Union Committee ;

(*e*) the band of frequencies 136-137 Mc/s has been allocated for space research purposes, but on a shared basis with the aeronautical mobile service (see footnotes 275, 279, 280 and 281, p. 66, Radio Regulations, Geneva, 1959) ;

(*f*) a world-wide network of tracking stations for artificial earth satellites has been installed at great expense and is now in operation in the band 136-137 Mc/s ;

(*g*) it is essential that the important and urgent work carried out by these tracking stations should not be impaired by interference from transmissions used by fixed and mobile services ;

(*h*) the research work in which these stations are involved will form the basis of future radio communications using earth satellites ;

The Inter-Union Committee described in (*a*) and (*b*) above *Recommends that* :

(1) the band of frequencies 136-137 Mc/s should be allocated for the exclusive use of space research for satellite tracking purposes ;

(2) arrangements should be made for present users of this band to be allocated other frequencies, so as to afford the maximum possible protection to space research and communications in the band 136-137 Mc/s ;

(3) national administrations should arrange their services in such a way as to afford the maximum practicable protection for satellite tracking stations using the band 136-137 Mc/s.

(4) care should be taken to ensure that transmitters used for space research in this band do not radiate harmful interference on the third harmonic which is within the band used for radio astronomy near 408 Mc/s.

APPENDIX IV

Project West Ford

The information available on this Project (formerly termed « Needles »), is contained in the following documents.

1. W. E. Morrow, Jr. — « Orbital Scatter Communication ». Paper presented at U.R.S.I. General Assembly, London 1960.

2. W. E. Morrow, Jr. and D. C. MacLellan. — « Properties of Orbiting Dipole Belts » M. I. T. Lincoln' Laboratory Report N. P. O. - 2, Revision 1, 1st November, 1960.

3. H. C. VAN DE HULST and L. VOLDERS. — « Preliminary Conclusions of the Study of the Interference with Optical Astronomy which may be caused by the Needle Communication Belts ». Submitted to I. A. U., 17th October, 1960 ; and reproduced as I.U.C.A.F./2.
4. W. LILLER. — Report on « The Effects of Project West Ford on Optical Astronomy » (undated, probably January 1961).
5. Resolution VI of Commission V, adopted at the U.R.S.I. General Assembly, London, 1960. Published in *U.R.S.I. Information Bulletin*, No 122, P. 20.
6. A Resolution transmitted (6th March, 1961) by the Belgian National Committee of Astronomy to the Royal Academy of Belgium, deploring the project which will be detrimental to astronomical research in both optical and radio fields.
7. In addition to providing the above references, Prof. van de Hulst read correspondence from W. Liller (28th February, 1961) on the effects on optical astronomy, and from F. Kerr (19th January, 1961) on the effects on radio astronomy.

C. C. I. R.

Commission d'Etudes nº IV. — Systèmes Spatiaux

Réunion préliminaire

A l'invitation de l'Administration des Etats-Unis d'Amérique, la réunion envisagée aura lieu à Washington, D. C., du lundi 12 mars au vendredi 23 mars 1962 inclus.

L'objet de cette réunion intérimaire étant d'élaborer des propositions en vue de la Xe Assemblée plénière du C.C.I.R. (qui se déroulera à la Nouvelle Delhi du 17 janvier au 15 février 1963), il est à prévoir que tous les sujets figurant au programme de la Commission d'études nº IV seront examinés à Washington. L'ordre du jour détaillé dépendra, toutefois, des contributions qui seront disponibles au moment de la réunion.

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Nous tenons à informer nos lecteurs qu'à l'avenir, tous les documents relatifs à la radioastronomie seront publiés en tant que documents de la Commission d'études nº IV. Systèmes Spatiaux.

C. C. I. R.

Study Group IV on Space Systems

INTERIM MEETING

At the invitation of the United States Administration, this meeting will take place in Washington, D. C., from Monday 12th March to Friday 23rd March, 1962 inclusive.

As the purpose of this interim meeting will be to prepare proposals for the Xth Plenary Assembly of the C.C.I.R. (to be held in New Delhi from 17th January to 15th February 1963), it is anticipated that all items on the programme of Study Group IV will be discussed in Washington, although the detailed agenda will, of course, depend on the contributions available for discussion at that time.

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We want to inform our readers that, in future, all documents relating to Radio astronomy will appear as documents of Study Group n° IV on Space Systems.

I. C. S. U.

Special Committees

C.O.S.P.A.R.

U.R.S.I. Report to C.O.S.P.A.R. meeting at Florence, April 1961

At the XIIIth General Assembly held in London in September 1960, the International Scientific Radio Union (U.R.S.I.) established the « U.R.S.I. Committee on Space *Radio* Research ». The terms of reference of this Committee include the following objectives :

(*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 U.R.S.I. Commissions in order to ensure the full participation of each Commission in those aspects of space radio research that directly concern it ;

(*c*) to make appropriate suggestions to C.O.S.P.A.R. concerning space radio research ;

(*d*) to deal with any question 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 Scientific Research.

It is to be noted that throughout these terms of reference the emphasis is on space *radio* research since it is the radio aspects of space research which are of special interest to U.R.S.I. The

membership includes representatives of all those U.R.S.I. Commissions which may be expected to be concerned in space research.

The Chairman of the Committee is Professor L. G. H. Huxley (Australia) and the Secretary, Professor W. J. G. Beynon (U. K.).

The Committee met during the London Assembly and discussed possible subjects for future symposia on space radio research (*U.R.S.I. Inf. Bull.*, 123, 107). Special consideration was given to two topics :

(i) The communication aspects of space research. It was felt that both the research and practical aspects of space communication should be resolved on a sound scientific basis. These matters are relevant to the I.T.U. meeting to be held in 1963 and U.R.S.I., as scientific advisors to C.C.I.R., could help by organizing a symposium on such problems. A small group of members with Dr. J. R. Pierce of Bell Telephone Laboratories, U. S. A. as convenor, and including Professor V. I. Siforov of the U. S. S. R., was appointed to discuss the detailed program and arrangements for such a meeting. It is probable that this meeting will be held in Europe later this year or early next year.

(ii) The Committee also gave some consideration to 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 obtained and these factors will, in turn, have important repercussions on the basic design of the experiments undertaken. A small sub-committee under the Chairmanship of Professor S. Silver of the U. S. A. was invited to consider the desirability of a meeting on this topic. This may take place in 1962.

The interest of radio scientists, and thus of U.R.S.I., in the activities of the C.O.S.P.A.R. Working Groups on « Tracking and Telemetry » and on « Scientific Experiments » is obvious, but it is worth adding that U.R.S.I., through its Ursigram Committee, is also concerned with Space-Warn in the rapid dissemination of information on satellites and is thus concerned also in C.O.S.P.A.R. Working Group 3. During the London General

Assembly a joint half-day session of all Commissions was devoted to a general discussion of space radio research.

There is one other matter to report from U.R.S.I. in respect to space research. This is that Commission I of U.R.S.I. (on « Radio Standards ») is considering the question of the synchronization of time standards at various locations on the earth for the purpose of satellite tracking. The full report on this problem is not yet available but some preliminary discussion indicates that such high precision synchronization may best be effected using LF or VLF transmissions and it is suggested that U.R.S.I. should encourage international cooperation in the monitoring of such signals so that the transmission path changes of LF and VLF signals shall be known as soon as possible.

April 1961.

W. J. G. Beynon.

Special Committee on Antarctic Research

S.C.A.R.

Abstracts from the Proceedings of the 4th Meeting, Cambridge, August-September 1960

(*S.C.A.R. Bulletin*, nº 7, January 1961)

Review on Ionospheric Studies submitted by W. R. Piggott

A. — *Ionosphere.*

The actual data obtained during the I.G.C. 1959 is not, as yet, available. Preliminary reports suggest that the situation is not very satisfactory. An appreciable part of the I.G.Y. network has either stopped work or changed to a minimum schedule which is to small for serious research to be carried out efficiently. In particular, a number of important stations have only obtained ionograms at hourly intervals. Although hourly reduction initially is sufficient for most purposes, more frequent soundings are needed for detailed research.

The ionospheric phenomena appear to be dominated by move-

ments of ionization, both vertically and horizontally, and special experiments are needed to find out the directions of these movements. This calls for a temporary group of relatively closely spaced stations. It is important to try to use several techniques since the movements of a layer are often different from the drift of the ionization, and also since different methods are useful at different levels of magnetic activity. It is probable that a backscatter equipment, placed well outside the auroral zone in the Weddell Sea area, would give a general survey of major layer movements in that zone very economically, though in general this technique is difficult to use at high latitudes.

In view of the limited effort available, there are considerable advantages to be gained by concentrating efforts in particular areas, keeping, of course, a skeleton network in being for general morphological studies. Much useful work could also be done economically by summer expeditions planned to solve particular zonal problems disclosed by the I.G.Y. survey.

The following abstracts from the W.W.S.C. Third Report (Brussels 1959) apply particularly to the Antarctic group of stations:

SECTION V. — *Ionospheric Vertical Soundings after* 1959

The Committee considers that the present stage in the development of the subject calls for special attention to :

(*a*) The maintenance of an adequate network of stations to provide accurate data for geophysical and propagational studies on a world-wide basis ;

(*b*) The concentration of stations, and the maintenance of particularly intense programmes of observation and reduction, in zones where close networks of stations provide the possibility of resolving particularly important ionospheric problems by regional study, and the re-allocation of stations to zones where active research is progressing.

The Committee stressed the importance of maintaining new stations and of making a special effort in sunspot minimum years and stated :

« It is clear that the requirements of space research will involve a considerable new effort in ionospheric soundings which was not anticipated before the I.G.Y. ».

The greatest efforts to improve the operation of existing stations, and to add special additional programmes, are needed in two zones :

The Weddel Sea — South Africa area, which contains the zone where the magnetic dip is abnormally small and the phenomena correspondingly simple.

The Ross Sea-New Zealand area, which contains the opposite extreme.

I.G.Y. studies show two major gaps in the existing programme :

(*a*) The measurements of absorption, particularly the dense types associated with storms, is very inadequate. It is probably too late now to attempt to study Type 3 absorption with riometers in the Southern Hemisphere, but a special effort is needed to make riometer studies of storm absorption (Type 2).

(*b*) Measurements of ionospheric drift on both sides of Antarctica are badly needed. These are very difficult to obtain in years of large magnetic activity, and special efforts should be made in the next few years.

It is probable that gaps in the network could be partly covered by using special techniques, for example, oblique incidence soundings between suitably spaced stations, though very little practical experience has as yet been obtained. These measurements have usually been used for communication problems only.

Analyses already completed show that there are special advantages in establishing, if possible, ionospheric measurements at the following positions :

(*a*) At or near « Norway » station.

(*b*) A station in the Bellingshousen Sea area, possibly near lat. 76° S, long. 88° W.

(*c*) A station in South Georgia or the South Sandwich Islands.

(*d*) A station near lat. 85-80° S, long. 20-40° W to link the South Pole with the Weddel Sea group of stations.

(*e*) The re-establishment of the station at Marion Island.

Where several sites are possible, there are special advantages in putting stations near conjugate points of stations in the Northern Hemisphere. Active work is progressing at present on conjugate point studies of whistlers, blackout, and sporadic E.

Recommendations of the Working Group on Upper Atmosphere Physics

Ionosphere :

(*a*) That the need to regard ionospheric observation in the Antarctic as a research rather than a routine be stressed to all concerned ;

(*b*) That Ionograms, taken not less frequently than at quarter hourly intervals, should be obtained at all ionospheric stations ;

(*c*) That special effort be made to operate ionospheric stations in the Weddel Sea and Ross Sea chains as full stations ;

(*d*) That special effort be made to deploy riometers in the Antarctic ;

(*e*) That special effort be made to deploy ionospheric drift measuring equipment at several stations in the Antarctic ;

(*f*) That the recommendations of IPS on the desirable minimum network of ionospheric sounding stations for prediction purposes be sought and adopted.

Recommendations of the Working Group on World Magnetic Survey

Interdiscipline co-operation :

(*a*) That S.C.A.R. draws attention to the very great benefits to be derived from close co-operation between those working on different aspects of upper atmosphere physics at the one station.

Sunspot minimum programme.

(*a*) That S.C.A.R. supports specific upper atmosphere research projects which call for a measure of international co-operation in the Antarctic. Some such projects are of particular importance around the time of solar activity minimum since they will complement I.G.Y. projects. In this connexion, the importance of associated Arctic studies should not be overlooked.

In view of the time needed to construct equipment, train operators and deploy the equipment in the Antarctic, it is desirable that plans for any special projects during sunspot minimum -- the sunspot minimum programme — should be discussed as soon as possible ;

(*b*) That among other projects for the sunspot minimum programme should be a standardized all-sky camera auroral programme timed as follows :

(i) the initial discussion, planning and design to be completed by the end of the fifth S.C.A.R. meeting ;

(ii) construction of equipment to be completed during 1962 ;

(iii) rigorous field testing to be carried out during 1963 ;

(iv) the equipment to be operated throughout 1964 and 1965.

Analysis of existing data from the Antarctic reveals that standardization of observational technique is essential. The proposed network should cover the region centred on lat. 75° S, long. 135° E, and of radius approximately 35°.

The project should be co-ordinated by the convenor of the Working Group on Upper Atmosphere Physics ;

(*c*) That during 1964 and 1965 other equipment available for auroral observation (e. g. photometers, radars, etc.) be used to supplement this main project. However, no standardization (apart from appropriate calibration) of these equipments is envisaged ;

(*d*) That, during the period 1961 to 1963 inclusive, auroral observatories in the Antarctic concentrate their efforts on particular research projects of interest to individual workers.

Bibliography

We call the attention of our readers to the following papers published in I.C.S.U. Review, V. 3, N° 2, April 1961 :

J. A. VAN ALLEN. — Current work on geomagnetically trapped corpuscular radiation.

R. L. SMITH-ROSE. — The allocation of radio frequencies for scientific research.

S. CHAPMAN. — I.G.Y. world magnetic survey.

M. G. S. MINNAERT. — Cooperative programme in solar research.

H. WEXLER and D. S. JOHNSON. — Meteorological satellites.

J. VELDKAMP. — The activity of the geomagnetic field.

ASSOCIATION INTERNATIONALE DE CYBERNÉTIQUE

Communiqué

Le IIIe Congrès International de Cybernétique organisé par l'Association Internationale de Cybernétique, se tiendra à Namur (Belgique) du 11 au 15 septembre 1961.

Les travaux seront répartis autour de cinq thèmes faisant chacun l'objet d'une section de travail.

1. — Les fondements et les méthodes de la Cybernétique.
2. — Les machines sémantiques.
3. — L'automation : aspects techniques.
4. — L'automation : aspects économiques et sociaux.
5. — La Cybernétique et la Vie.

Une conférence générale inaugurale sera prononcée par M. Georges Villiers, Président du Conseil National du Patronat français.

Des conférences générales suivies de discussion seront données :

— Le 12 septembre, par le Dr Henri Laborit, Directeur du Laboratoire d'Eutonologie de la Section des Recherches Physio-biologiques de la Marine Nationale, Paris : « Cybernétique et Biologie ».

— Le 13 septembre, par M. Gordon A. Pask, System Research Ltd, Richmond : « Cybernetic of Evolution and Self-Organisation ».

— Le 14 septembre, par M. François Bonsack, Professeur à l'Ecole Polytechnique Fédérale, Zurich, « Variabilité et spécificité ».

Pour de plus amples informations prière de s'adresser au « Secrétariat de l'Association Internationale de Cybernétique, A. S. B. L., Rue Basse Marcelle, no 13, Namur (Belgique) »,

BIBLIOGRAPHIE

Liste des voies d'acheminement des communications téléphoniques internationales, 1961.

Ce document, comprenant six fascicules, a fait l'objet d'une édition trilingue (française, anglaise et espagnole). Le prix de vente d'une collection des six fascicules trilingues a été fixé à 17,05 francs suisses ; toutefois, ces fascicules peuvent également être livrés séparément au prix suivant :

Fascicule I : Liste des voies en Europe = 7,55 francs suisses.

Fascicule II : Liste des voies en Afrique = 1,90 franc suisse.

Fascicule III : Liste des voies en Amérique = 2,35 francs suisses.

Fascicule IV : Liste des voies en Asie = 1,70 franc suisse.

Fascicule V : Liste des voies en Océanie = —.55 franc suisse.

Fascicule VI : Liste des voies intercontinentales = 3.— francs suisses.

Ces prix comprennent l'emballage et les frais de port pour envoi par la poste ordinaire dans le monde entier.

Graphique en couleurs indiquant la répartition des bandes de fréquences entre 10 *kHz et* 40 *GHz*, Genève 1959.

La présentation de ce nouveau graphique est analogue à celle du graphique déjà publié par le Secrétariat général de l'U.I.T. en application du Règlement des radiocommunications d'Atlantic City 1947.

Ce document a fait l'objet de trois éditions séparées en français, en anglais et en espagnol. Le prix de vente d'un exemplaire a été fixé à 3,55 francs suisses ; ce prix comprend l'emballage et les frais de port pour envoi par la poste ordinaire dans le monde entier.

BIBLIOGRAPHY

The List of International Telephone Routes, 1961, has just appeared.

The List comprises six booklets, and appears in a single three-language edition (English, Spanish and French). The cost of one set of six booklets will be 17.05 Swiss francs, but the booklets can be obtained separately, as follows :

Booklet I : List of routes in Europe = 7.55 Swiss francs.

Booklet II : List of routes in Africa = 1.90 Swiss franc.

Booklet III : List of routes in America = 2.35 Swiss francs.

Booklet IV : List of routes in Asia = 1.70 Swiss franc.

Booklet V : List of routes in Oceania = 0.55 Swiss franc.

Booklet VI : List of intercontinental routes = 3.00 Swiss francs.

These figures include carriage to any address throughout the world, by ordinary mail.

Coloured Chart showing the frequency allocation between 10 *kc/s and* 40 *Gc/s* (Geneva, 1959).

It is very similar in general form to the chart issued by the I. T. U. General Secretariat in accordance with the Atlantic City Radio Regulations (1947).

There are three editions, one in English, one in Spanish, and one in French. The price per copy is 3.55 Swiss francs, carriage paid to any address by ordinary mail.