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International Scientific Radio Union
U. R. S. I.

INFORMATION BULLETIN

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CONTENTS

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42, Rue des Minimes, BRUSSELS

Xth GENERAL ASSEMBLY

Hereunder copy of a circular-letter sent to the National Committees concerning the submission of report and papers to the General Assembly. It is reminded that only National Committees and Presidents of Commissions may accept papers to be submitted to the General Assembly.

Reports and papers submitted

1. *Reports of National Committees, Commissions and Sub-Commissions* :

1.1. No limits are fixed to the length of such reports.

1.2. National Committees are requested to draft separate reports on their general activities and on the activity of each of their National Commissions ; this will permit to group all the documents relating to each Commission.

1.3. The General Secretariat should appreciate to receive, as much as possible, the reports both in English and in French.

2. *Papers submitted to the various Commissions* :

2.1. We draw the attention on the resolutions taken by the Executive Committee during the Zurich meetings concerning the publications (*Inf. Bull.*, n° 65, July-Oct. 1950, p. 7-8) and particularly on the following :

2.2. Papers (Reports from National Committees and from Presidents of Commissions and Sub-Commissions not included) should be limited to 1500 words and three line drawings and should be on topics of fundamental and international interest (See 4 below).

2.3. Authors are requested to add to their papers an abstract not exceeding 50 words.

2.4. Authors who submit papers published or to be published in a scientific journal of wide distribution are asked to give all useful references concerning such publications.

2.5. In order to answer to a recommendation of the Joint Commission on Physics Abstracting appointed by the International Council of Scientific Unions, authors will be asked to use titles as explicite as possible.

3. *General remarks* :

3.1. It is reminded that the official languages of U.R.S.I. are English and French. It is desirable that the 50 words abstracts mentioned in 2.3. be drafted, when possible, in French for papers in English, and in English for papers in French.

3.2. In order to accelerate the preparation of the General Assembly and to inform as soon as possible the Presidents of Commissions of the works submitted to them, the General Secretariat should appreciate to receive *three* copies of any documents.

3.3. All documents have to reach the General Secretariat *before June 1st, 1952.*

3.4. Only the documents sent to the General Secretariat by National Committees and by Presidents of Commissions and Sub-Commissions will be accepted.

3.5. The General Secretariat cannot promise to have reproduced for the General Assembly documents which will not fulfil the above recommendations.

4. *Topics recommended by Presidents of Commissions* :

4.1. The President of *Commission V* informs us that special attention will be given to the following topics :

Cosmic and galactic noise : Atomic emission at radio frequencies. The nature of discrete sources.

Solar : changes during the solar cycle. Outbursts and corpuscular streams.

Meteors : are there interstellars meteors ?

Theoretical : Mechanism of origine of « non thermal » components of solar and cosmic noise.

4.2. The President of *Commission VI* reminds that the subjects on its programme are :

Information theory (signal analysis included).

Non-linear oscillations.

Linear circuit theory (fundamental theory of servo-mechanism included).

Antennas and waveguides (diffraction questions included).

Commission IV

We publish hereunder a letter sent on January 28, 1952, by Prof. Dr. van der Pol to all Members of Commission VI.

Dear Sir,

In connection with the Xth General Assembly of the U.R.S.I. which will take place in Sydney (Australia) from August 11th-22nd, I should like to draw your attention to the fact that the IXth General Assembly (Zurich, September 11th-22nd, 1950) accepted, amongst others, the following Resolutions concerning Commission VI :

« The following subjects will be, or will remain on the programme of Commission VI :

a) Information Theory ;

b) Non-linear oscillations ;

c) Linear circuit theory (fundamental theory of servomechanisms included) ;

d) Antennas and Wave-guides (questions of diffraction included) ».

Any contributions to the above or related subjects would therefore be very welcome, and I shall be grateful if you would

kindly send any available reports to me, if possible with copies to :

Mr. HERBAYS, Secretary of the U.R.S.I.,
42, rue des Minimes, Brussels - Belgium

before the end of June.

Thanking you in anticipation,

Yours faithfully,

(*sy*) Prof. Dr. Balth. VAN DER POL
President Commission VI.
Genève, 22, chemin Krieg.

Cooperation with the C. C. I. R.

The C.C.I.R. asks U.R.S.I. to consider the following items in the documents of the VIth Plenary Assembly of the C.C.I.R. held in Geneve in 1951. These items are mentioned in the order of the different U.R.S.I. Commissions to which they belong ; the pages mentioned are those of the present Bulletin.

COMMISSION I

QUESTION N° 54, p. 51

Standard frequency transmissions and time signals

In paragraph 13 a programme is asked for interruption of the transmissions of all standard frequency stations to permit noise measurements ; further, in paragraph 15 attention is drawn to the possible use of these transmissions for propagation studies.

COMMISSION II

STUDY PROGRAMME N° 18, p. 58

Tropospheric wave propagation

Special attention is drawn here to the importance of investigation on this subject.

COMMISSION III

RECOMMANDATION N° 57, p. 41

Production and reduction of ionospheric data: Standards, symbols and conventions

In paragraph 7 the subject is referred to U.R.S.I. and in paragraph 8 the desirability of machine techniques for the handling of ionospheric data is stressed.

RECOMMANDATION N° 59, p. 44

Exchange of information for the preparation of short term forecasts and the transmission of ionospheric disturbance warning

In paragraph 6 the attention of U.R.S.I. is directed to standardisation of the codes to be used.

RECOMMANDATION N° 69, p. 47

Prediction of solar index

In paragraph 1 attention of U.R.S.I. is drawn to the importance of the subject.

STUDY PROGRAMME N° 20, p. 59

Non-linear effetcs on the ionosphere

Co-operation with U.R.S.I. is invited and U.R.S.I. is informed of the urgency of further knowledge on the subject.

STUDY PROGRAMME N° 21, p. 60

Radio propagation at frequencies below 1500 kc/s

U.R.S.I. is invited to study the basic scientific aspects of the subject; two items are suggested.

RECOMMANDATION (DRAFT), p. 50

Absorption in the ionosphere

Collaboration with U.R.S.I. is recommended.

COMMISSION IV

STUDY PROGRAMME Nº 23, p. 61

Measurement of atmospheric radio noise

Attention of U.R.S.I. is directed towards some special aspects of the subject.

COMMISSION VI

STUDY PROGRAMME Nº 10, p. 54

Theory of communication and its practical applications

Co-operation of U.R.S.I. is asked in the definition of a practical unit of the quantity of information and the study of the measurement thereof.

INFORMATIONS

History of U. R. S. I.

We publish hereunder a letter sent to the Presidents of National Committees ; we would be most thangfull to Members of these Committees who would give their help for the drafting of this work whose aim is to make know U.R.S.I. and its activities.

January 1951.

In accordance with a recommandation taken in Zurich by the Executive Committee, the General Secretariat is drafting a historical account of U.R.S.I. activities.

In this work a chapter will be devoted to the National Committees. To draft this chapter I should very much appreciate your co-operation.

I wonder whether I could ask you to provide me, as soon as possible, with a short historical account of the activities of your Committee. This account should include :

1. The date of constitution ;

2. The list of the Presidents with dates of their chairmanship ;

3. The main activities of your Committee with, eventually, the list of the publications issued ;

In thanking you for the help you will give me and hoping a quick reply, I remain,

Yours faithfully,

The Secretary,

HERBAYS.

Proceedings of the General Assembly

Part II of the Proceedings (Vol. VIII) has been sent to the National Committees. Full text of papers for which only an abstract is published is available on request at the General Secretariat of U.R.S.I.

NATIONAL COMMITTEES

Canada

We are informed of the following appointments in the National Committee :

Dr. D. W. R. McKinley : Delegate to the Executive Committee.
M. F. T. Davies : Associated Editor to the Information Bulletin.
Dr. J. T. Henderson : Official Member of Commission I.
Dr. J. S. Marshall : Official Member of Commission II.
Mr. J. C. Scott : Official Member of Commission III.
Dr. R. E. Williamson : Official Member of Commission V.
Dr. G. Sinclair : Official Member of Commission VI.
Dr. P. Bricout : Official Member of Commission VII.

Japan

REPORT
OF THE JAPANESE NATIONAL COMMITTEE (II)

Report to Commission II

by H. Hatakeyama

1. — Scientific Activities

Since 1949, the Electrical Communication Laboratory, Ministry of Telecommunications, has continued the experimental investigation of the propagation of centimeter wave (4000 Mc/s and 2600 Mc/s) for the purpose of developing microwave communication network and obtained a large mass of observational material on both overland and oversea transmission. From winter 1949 to autumn 1950, both overland and oversea propagation of 2600 Mc/s in frequency were investigated for preliminary survey

of microwave transmission characteristics between Tsukuba and Kokubunji and over Tokyo Bay respectively.

In the fall of 1950 the propagation test relating to the determination of the sites of the experimental microwave link were undertaken between Tokyo and Ogusu (near Yokosuka) and very stable signals were received with little fading. In spring of 1951, microwave transmission experiments were conducted within optical range between high mountain terminals (Rokko and Ikoma). The same interference pattern as calculated theoretically was confirmed and caused slow fading in about a half hour period. The effective reflection coefficient of the intervened terrain was obtained approximately as 0.3.

Since May 1951 these microwave propagation tests were jointed with the simultaneous meteorelogical observations of lower atmosphere which was cooperated with the Meteorological Research Institute and the Aerological Observatory. In the oversea propagation between Hakodate and Kanita surface ducts were frequently observed and followed by increase of signal intensity beyond horizon and large signal fluctuation within optical range. In the overland propagation in summer between Tsukuba and Ikaho the moderate high inversion layer appeared during night and disappeared late in the morning. The received signal indicated appreciable large slow fading with the appearence of the inversion layer.

The VHF (200 Mc/s) transmission experiments were conducted simultaneously with the microwave test and the similar signal variation was observed, though its fading period and range were slow and small.

A routine observation of 472 Mc/s wave, emitted from Hiraiso Observatory and received at Kokubunji Observatory, has been continued since August 1951 by the Central Radio Wave Observatory, the Radio Regulatory Commission. The wave could be received with high level rarely in the morning when such meteorological conditions as small wind velocity, relatively small mixing ratio and clear sky held in the previous night. It seems that one of the causes of these abnormal propagation of UHF wave is nocturnal inversion.

A panoramic receiver, whose receiving band is from 50 to 70 Mc/s, was mounted at Inubo Observatory for the observation of the

VHF waves of VHF telecommunication lines which is now in progress.

A 80 m-pole was constructed at Kokubunji Observatory, and the vertical distributions of atmospheric temperature, humidity and wind velocity are about to be measured by means of newly designed electric meteorographs.

VHF and UHF waves (60, 100, 150, and 4000 Mc/s bands) have been used by the Broadcasting Corporation of Japan for ST-link, movable interlink, TV-experimental broadcasting and TV interlink.

In order to plan and operate the equipments for the above services, practical experiments on VHF and UHF behind one or two mountains have been carried out, and also propagation formulas around the smooth earth have been obtained.

Now they are intending to obtain data on the tropospheric propagation for the future purpose of carrying out the TV experimental broadcasting with large power, TV interlink by means of microwaves, and long distance wireless link for actual service programmes.

Radio telephone networks of the National Rural Police of Japan, covering the whole country with 30 Mc/s band VHF, are under establishment since the last year and recently have been completed in four prefectures. The National Rural Police is going to observe the propagation characteristics constantly at each relay station on mountains with some devices of meteorological observations, expecting to find relations between the meteorological conditions and the changes of radio wave intensity. The observation has begun from the summer of 1951.

T. Kitaoka and Y. Matsuoka made some statistical investigations on the ground inversion at Tateno (Aerological Observatory) from the results of observations made by kites and captive balloons during the past ten years, they gave a reliable knowledge on its normal states, such as the average frequencies of appearance and the average height and intensity. They also investigated statistically the other inversions in the lower atmosphere, and studied analytically the subsidence inversion often occurred on the upper surface of the migratory anticyclone and on the remarkable inversion to be explained as Föhn phenomena in the upper level.

They showed also how the ground inversion would appear, develop and disappear through the night, by results of several serial observations with captive balloons carried out through nights and days, and they noted briefly that the height and intensity of inversion become minimum at about one hour after the midnight. Recently, M. Uchikawa discussed this problem from the theoretical considerations of heat conduction in the lower atmosphere.

2. — Litterature

K. Akita. — A Device of Temperature Measurement. (in Japanese). *Proc of the semi-annual meeting of Central Radio Wave Observatory.*

M. Fukushima and K. Hirao. — A Method of Analysis of Very Short Wave Field Intensity (in Japanese). *Proc. of the semi-annual meeting of Central Radio Wave Observatory.* July, 1950, p. 11.

K. Hirao. — On slow Changes in VHF Field Intensity (in Japanese). *Proc. of the semi-annual meeting of Central Radio Wave Observatory.* July, 1950, p. 13.

K. Hirao. — Very Short Wave Field Intensity in the Diffracted Zone (in Japanese). *Proc. of the semi-annual meeting of Central Radio Wave Observatory.* July, 1950, p. 18.

K. Hirao. — Diurnal Change of VHF wave, emitted from the Yokote re'ay-station, at Kokubunji (in Japanese). *Notes on Study Work of Central Radio Wave Observatory.* March, 1950, p. 115.

T. Kitaoka and Y. Matsuoka. — Study of Temperature Inversion above Tateno. 1st Rep., Statistica' Investigation, *Journ. Aerolog. Obs.*, 3, 2, pp. 221-225, 1947.

T. Kitaoka. — Study of Temperature Inversion above Tateno. 2nd Rep., Inversion Observed on the Upper Surface of the Migratory Anticyc'one, *Journ. Aerolog. Obs.*, 3, 2, pp. 226-230, 1947.

T. Kitaoka and M. Iizuka. — Study of Temperature Inversion above Tateno, 3rd Rep., Remarkab'e Inversions to be exp'ained as Föhn Phenomena in the Upper Leve', *Journ. Aerolog. Obs.*, 3, 2, pp. 231-243, 1947.

S. Matsuo and S. Ugai. — The 2600 Mc Propagation Test, (Engl'sh Abstract). The System Deve'opment Division Report, The Electrical Communication Laboratory, N° 51.

S. Matsuo and K. Kakita. — The 4000 Mc Propagation Test. (English Abstract). *Journ. of The Electrical Communication Laboratory,* Vol. 14, N° 6.

K. Tao. — Electromagnetic Waves Radiated from a Group of Hertzian Dipoles (in Japanese). *Proc. of the semi-annual meeting of Central Radio Wave Observatory.* July, 1950, p. 5. *Report of Researches of Central Radio Wave Observatory.* Vol. 1, N° 1, 1950, p. 17.

K. Tao. — Diffraction of Electromagnetic Wave around a Mountain (in Japanese). *Proc. of the semi-annual Meeting of Central Radio Wave Observatory.* July, 1950, p. 8.

3. — Laboratories and Observatories

Electrical Communication Laboratory, Nodenkita, Kichijoji, Musashino, Tokyo. Long. 139° 34′ E, Lat. 35° 43′ N.

Central Radio Wave Observatory, Koganeishinden, Kokubunji, Musashino, Tokyo. Long. 139° 30′ E, Lat. 35° 42′ N.

Hiraiso Radio Observatory, Hiraiso, Ibaraki-Prefecture. Long. 140° 38′ E, Lat. 36° 22′ N.

Inubo Radio Wave Observatory, Inubo, Chiba-Prefecture. Long. 140° 51′ E, Lat. 35° 42′ N.

Meteorological Research Institute, Mabashi, Suginami, Tokyo. Long. 139° 39′ E, Lat. 35° 42′ N.

Aerological Observatory, Tateno, Onogawa, Ibaraki-Prefecture. Long. 140° 08′ E, Lat. 36° 03′ N.

4. — Schemes taken for the Resolutions voted by the IXth General Assembly

For 1(*a*) : The routine observations on 150 and 60 Mc/s waves between Hiraiso and Kokubunji are continued by the Central Radio Wave Observatory.

For 1(*b*) and (*c*) : The 80 m-pole and newly designed meteorograph in the Central Radio Wave Observatory are used to measure the fluctuation of meteorological elements in the lower atmosphere the period of which is greater than one minute. The oversea and overland microwave propagation tests made by the Electrical Communication Laboratory were jointed with the simultaneous meteorological observations by captive balloon.

Report of Sub-Committee V

by Y. Hagihara, Chairman

I. — Scientific and Administrative Activities

Besides the routine observations on 200 Mc/s and on about 3000 Mc/s as reported by the Sub-Committee for the World-Wide Network on the Solar Radio Emission, the following obser-

vations are now being carried out at the Tokyo Astronomical Observatory :

Solar radio emission : 100 Mc/s, 60 Mc/s ;
Polarization of the solar radio emission of high intensity : 60 Mc/s.

At the Central Radio Wave Observatory daily observation on 200 Mc/s with a transit type aerial is being carried out.

At the partial solar eclipse on September 12, 1950, the solar radio emission was observed in Tokyo and also in Hokkaido by the staffs of the Tokyo Astronomical Observatory and the Central Radio Wave Observatory.

T. Hatanaka, Tokyo Astronomical Observatory, derived a close correlation between the burst characteristics of the solar radio emission on 200 Mc/s observed at the Observatory, and the heliographic meridian transit of sunspots of types E and F. T. Hatanaka Y. Sekido, Physical Department of the Nagoya University, and Y. Miyazaki and M. Wada, Science Research Institute in Tokyo, discussed the relation between the solar radio outburst of a certain type and the abnormal increase of the cosmic ray intensities.

H. Tanaka, Research Institute of Atmospherics, discussed the method of calibration of the receiving system with special reference to the measurement of antenna temperature when the reflector is turned to empty sky. M. Oda and T. Takakura, Physical Department of the Osaka City University, compared by fitting their measurements of the daily flux of the solar radio emission on 3260 Mc/s with the relative number of sunspots. T. Takakura reported that the best fit can be attained when the sunspots in the central zone are slightly more weighted compared with others.

II. — Procedures taken on Resolutions in Zurich

Resolutions 4 and 5 : The routine observations of the solar radio emission on 200 Mc/s have been started on January 1, 1951, at the Tokyo Astronomical Observatory, University of Tokyo. Those on about 3000 Mc/s are now partly carried out at the Research Institute of Atmospherics, Nagoya University, and at the Physical Department of the Osaka City University.

The details are reported by the Sub-Committee for the World-Wide Network on the Solar Radio Emission (p. 22).

III. — List of Laboratories and Observatories

1. Tokyo Astronomical Observatory, University of Tokyo, Mitaka, Tokyo (139°32′28″ E, 35°40′18″ N). Solar Radio Emission on 60, 100 and 200 Mc/s, and polarisation on 60 Mc/s. Radio Sky Patrol on 60 Mc/s.

2. The Research Institute of Atmospherics, Nagoya University, Toyokawa (137°22′5″ E, 34°50′6″ N). Solar Radio Emission on 3750 Mc/s.

3. Physics Department, Osaka City University, Ogimachi, Osaka (135°30′36″ E, 34°42′2″ N). Solar Radio Emission on 3260 Mc/s.

4. Central Radio Wave Observatory, Kokubunji near Tokyo (139°20′ E, 35°42′ N). Solar Radio Emission on 200 Mc/s.

IV. — List of published papers

T. Hatanaka, Y. Sekido, Y. Miyazaki and M. Wada. — Solar Radio Outburst and the Increase of the Cosmic-Ray Intensities on September 20, 1950. *Rep. Ion. Res. Japan*, Vol. 5, N° 1, 1951.

T. Hatanaka, S. Suzuki and F. Moriyama. — Preliminary Report on the Solar Radio Noise at the Partial Eclipse on September 12, 1950. *Rep. Solar Eclipse Committee*, Sc. Council of Japan, p. 9, 1951.

K. Kawakami. — Solar Noise Observation during the Partial Eclipse of the Sun at Wakkanai. *Ibid.*, p. 14, 1951.

M. Oda and T. Takakura. — A Study on the Solar Noise at 3300 Mc. *Journ. Phys. Soc. Japan*, Vol. 6, 202, 1951.

H. Tanaka, M. Murase and H. Shindo. — On the Observation of the Microwave Solar Radiation. *Bull. Res. Inst. of Atmospherics*, Vol. 1, 35, 1950 (in Japanese).

Report to Commission VI, from the Japanese National Committee

by K. Morita

(1) Summary of activities on the scientific and administrative viewpoint

Meetings held on 9th July, 17th September, 5th October, and 9th November. Papers were presented and discussions were made concerning « Information theory » and « Non-linear circuit ».

There are many Japanese coming to have increasing interest on the information theory introduced by the papers written by C. E. Shannon and N. Wiener, and we recommended to the Institute of Electrical Communication Engineers of Japan to start a new study committee sponsored by the Institute, under the condition that it will keep good contact with us.

There was some discussion about the basic idea on if the circuit theory in concern with the technique in low-frequency domain should be taken up or not in our program. General trend was, at the meeting on 5th October, that much emphasis should be laid, on those subjects relating VHF and more higher frequencies.

(2) Work carried out in the field of research programs decided at Zurich

About the « Theory of Information », H. Seki studied on the possibility of an extremely narrow-band telephone communication system with a pass band of about 70 c/s, the narrowest limit of frequency band we pressume.

M. Goto made research and presented a paper on non-linear circuit, especially on the transient oscillation of a circuit with an electron tube having sharp emission saturation assuming that the tube characteristics can be expressed as a series continuation of many broken lines.

He also informed that during the war there had been a special committee on non-linear problems under the sponsorship of the Institute of Electrical Engineers of Japan, and much work was done. The interest about this problem is still maintained among Japanese and we hope to restart a study group in this field in near future.

Next on « Linear theory of Circuits » (including basic theory of servo mechanism), being excited by the development in servo mechanism engineering in western country, many Japanese now have much interest about the study into this field, and a joint committee of mechanical and electrical engineers about this problem is going to start under the sponsoreship of the Institutes.

(3) Laboratories and Observatories

1. Department of Electrical Engineering, Faculty of Engineering, Tokyo University (Tokyo).

2. Physics Institute, Faculty of Science, Tokyo University (Tokyo).

3. Institute for Science and Technology, Tokyo University (Tokyo).

4. The Institute of Industrial Science, Tokyo University (Tokyo).

5. Electrical Engineering, Applied Physics Course, Tokyo Intitute of Technology (Tokyo).

6. Research Institute of Electrical Communication, Tohoku University (Sendai).

7. Department of Physics, Faculty of Science and Engineering, Osaka City University (Osaka).

8. Department of Electrical Engineering, the First School of Science and Engineering Waseda University (Tokyo).

9. Department of Electrotechnical, Faculty of Technology, Hokkaido University (Sapporo).

10. Department of Physics, Faculty of Science, Osaka University (Osaka).

11. Institute of Scientific and Industrial Research, Osaka University (Osaka).

12. Research Division, Electrical Laboratory, Ministry of Telecommunication (Tokyo).

13. Construction and Installation Division, Plant Bureau, Ministry of Telecommunication (Tokyo).

14. Electro-Technical Laboratory agency of Industrial Science and Technology, Ministry of International Trade and Industry (Tokyo).

15. Research Laboratory, Nihon Electric Company (Tokyo).

16. Matsuda Research Laboratory, Tokyo-Shibaura Electric Company (Tokyo).

17. Engineering and Monitoring Division, Radio Regulatory Administrative Office, Radio Regulatory Commission, Prime Minister's Office (Tokyo).

18. Central Radio Wave Observatory, Radio Regulatory Administrative Office, Radio Regulatory Commission Prime Minister's Office (Tokyo).

(4) List of Published papers

The papers listed under are the selected papers concerning the topics for commission VI in Japan.

Copies of papers in abbreviated form are available at the General Secretariat of U.R.S.I.

H. Seki (17) and S. Muroga (17). — Some consideration regarding encoding, decoding and recording of speech, not yet published.

M. KOTANI (2) and H. TAKAHASHI (2). — Calculation of the proper frequencies of a magnetron anode resonator, *Journal of the Physical Society of Japan*, Vol. 4, p. 65, March-April, 1949.

H. UCHIDA (6).—On the output circuit of very high frequency transmitter. *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 33, p. 1, December 1950.

H. UCHIDA (6). — Theory of distributed coupled circuit for very high frequencies. *Selected papers of the Institute of Electrical Communication Engineers of Japan*, N° 1.

Y. MUSHIAKI (6) and S. HATAKEYAMA (6). — New method for calculating the input impedance of one-wavelength antennas. *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 32, p. 22, September, 1949.

K. SIMODA (2). — The high Q cavity resonator of TE mode. *Journal of the Physical Society of Japan*, Vol. 6, September-October, 1951.

K. KUROKAWA (13), S. HAYASHI (13) and K. TAKEO (13). — Calculation of the distortion and crosstalk produced by the linear-distorted transmission circuit in FM system, *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 31, p. 10, May, 1948.

K. MIYA (18), H. WADA and M. ISHIKAWA. — All wave matching apparatus for the receiving antenna. *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 30, p. 11, November, 1948.

B. OGUCHI (12). — Resonant frequencies of semi coaxial cavity resonators, *Selected papers of the Institute of Electrical Communication Engineers of Japan*, N° 2.

S. SONODA (11) and T. MAKIMOTO (11). — On the design of the dielectric slab in wave guide phase shifters. *The Memoirs of the Institute of Scientific and Industrial Research*, VIII, 1951.

U. NOMURA (6). — On the diffraction of elec. wave by a perfectly reflecting wedge. *The Science Reports of the Research Institutes Tohoku University*, Series B (Technology), Vol. 1, 2, p. 1, N° 1.

T. IIJIMA (14). — On the electromagnetic fields in case of existence of a semi-infinite conductive circular cylinder. *Researches of the Electrotechnical laboratory*, N° 518, December, 1950.

N. YAMADA (1) and T. HOSONO (1). —Effect of the plane conductor to the coil inductance. *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 33, p. 36, February, 1950.

M. KAWAKAMI (5). — On the four series of horizontal functions and the design of electrical filter circuit having horizontal amplitude responses, *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 34, p. 46, June, 1951.

H. IMAI (16). — Cross talk theory in time division multiplex communication. *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 33, p. 41, June and p. 27, July, 1950.

Y. NAKAHARA (16). — Analysis of the crystal frequency converter. *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 34, p. 24, May, 1951.

T. KAWAHASHI (15). — Some considerations on the gain of the crystal. *The Journal of the Institute of Electrical Communication Engineers of Japan*, Vol. 33, p. 19, April, 1950.

Note. — Suffix such as ( ) at the author's name indicates the numbering of Laboratory or organization to which he belongs.

Sub-Committee for Ursigrams

by H. UYEDA, Chairman

Taking into account the experience of the Ursigram broadcast during 1932 to 1941 in Japan, attention of the Japanese Ursigram Committee was concentrated on the following subjects.

(1) *Transmitting Station.* — Central Radio Wave Observatory at Kokubunji near Tokyo.

(2) *Organisation for presentation of the data.* — Radio wave disturbance : Central Radio Wave Observatory.

Ionospheric condition : Central Radio Wave Observatory.

Solar activity : Tokyo Astronomical Observatory.

Corona : Tokyo Astronomical Observatory.

Solar radio emission : Tokyo Astronomical Observatory.

Geomagnetism : Kakioka Geomagnetic Observatory.

Cosmic Ray : Scientific Research Institute Meteorological Institute and Nagoya University.

(3) *Ursigram Codes.* — While the subjects and Ursigram Codes to be broadcasted had been preliminarily determined by our Ursigram Committee, the French draft for International Ursigram Codes were delivered to request the revision from the Chairman of the International Ursigram Committee. After full discussion thereon the Japanese Ursigram Committee made a reply concerning the subjects and codes to be broadcast. As soon as the International Ursigram Codes will be determined, they are ready for transmission.

(4) *Call sign, time and frequency for transmission.* — Call sign, time and frequencies for transmission to be permitted are as follows :

Call sign	Time	Frequency (Kc/s)
JJD	Day-time	9.175
	Night	8.000

Sub-Committee for the World-Wide Network on the Solar Radio Emission

by Y. HAGIHARA, Chairman

This sub-committee was organized for co-operating the world-wide observation of the solar radio emission on 200 and 3000 Mc/s, in accordance with the resolution made at the U.R.S.I. General Assembly in 1950. Continual communication and exchange of the results of observations are being made with the participating observers through Ir. A. H. de Voogt, Chairman, Sub-Commission V*a* of U.R.S.I. The observing stations, their frequencies, and the observing times at work at present are :

200 Mc/s : Tokyo Astronomical Observatory, University of Tokyo, Mitaka, Tokyo (139°32′28″ E, 35°40′18″ N).
0 h - 8 h U.T. every day (started on Jan. 1st, 1951).

3260 Mc/s : Physics Department, Osaka City University, Ogimachi, Osaka (135°30′36″ E, 34°42′2″ N).
Two or three hours, almost daily.

3570 Mc/s : Research Institute of Atmospherics, Nagoya University, Toyokawa, Aichi-Prefecture (137°22′5″ E, 34°50′ 6″ N).
0 h-8 h U.T. only during the co-operative observation undertaken by the Ionosphere Research Committee, that is, during a month in each season of the year, and for ten days at the times of occurrence of anomalous phenomena.

A routine observation on 3000 Mc/s is expected be started in 1952. Observed materials are collected by the Chairman of this Sub-Committee and sent to the Chairman of the Sub-Commission V*a* of the U.R.S.I. and also to the Chairman of the Commission 40, Radio-Astronomy, of the I.A.U.

(To be continued.)

COMMISSIONS

Commission VII

The Department of Social Affairs of the United Nations has issued the Volume I of the « World Cartography » which contains an article of Commander Clarence A. Burmister on « Electronics aids to surveying and mapping ». Hereafter an abstract of this paper.

« The application of the new developments in the field of position determination for sea and air navigation to surveying and mapping is outlined in this article. Commander Clarence A. Burmister, a member of the Coast and Geodetic Survey of United States of America and the author of a number of contributions to the *International Hydrographic Review*, studied the technical aspect of problems related to electronic equipment and presents a condensed analysis of the various systems recently developed, together with the results that have been achieved in each case. »

The World Cartography gives also a bibliography covering the period 1945-1950 : the part concerning electronics is the following :

The Decca Navigator System. Decca Navigator Company, Ltd., London (English).

Electronic Time Measurements. B. CHANCE, R. I. HULSIZER, E. F. MACNICHOL, Jr., F. C. WILLIAMS, McGraw-Hill Co, New York, 1949 (English, 528 pages).

Electronic Instruments. I. A. GREENWOOD, J. V. HOLDAM, D. MACREE, Jr., McGraw-Hill Co, New York, 1948 (English, 308 pages).

Geodetic Problems in Shoran, T. E. R., Ross. Department of Mines and Resources, Ottawa, Canada, 1949 (English, 90 pages).

Loran Long-Range Navigation. (Publication of the Radiation Laboratory Series by Massachusetts Institute of Technology). Edited by J. A. PIERCE, A. A. MCKENZIE, and R. H. WOODWARD. McGraw-Hill Co New York, 1948 (English, 476 pages).

The Navigators' Guide to Hyperbolic Navigation. H. N. DAVIES, Brown, Son and Ferguson, Glasgow, Scotland, 1949 (English).

Pulse Generators. G. N. GLASOE, J. V. LEBACQZ, McGraw-Hill Co, New York, 1948 (English, 728 pages).

Radar Beacons. A. ROBERTS, McGraw-Hill Co, New York, 1947 (English, 480 pages).

Radar System Engineering. L. N. RIDENOUR, McGraw-Hill Co, New York, 1947 (English, 748 pages).

Radar Aids to Navigation. J. S. HALL, McGraw-Hill Co, New York, 1947 (English, 839 pages).

Some Methods of Map-Making from Radar-Controlled Photography with Special Reference to the Employment of « G-H » for Operational Purposes (Air Survey Research Paper, n° 11). The War Office, Directorate of Military Survey, London, 1945 (English, loose leaf, Parts 1-8).

URSIGRAMS

The Sub-Committee for Ursigrams in Japan started the broadcasting of Ursigrams on December 25, 1951 by the following schedule. The Ursigram Codes used until the International Codes will be determined will be published in the next Bulletin.

Schedule of broadcasting

Ursigram Codes are transmitted every day, excluding Saturday, Sunday and National Holiday, as follows :

I. — Broadcast Station

Central Radio Wave Observatory, Radio Regulatory Commission Kokubunji, Koganeishinden, Koganeimachi, Kitatama-gun, Tokyo (35°42′ N, 139°29′ E).

II. — Call Sign, Frequency and Time

Call sign	Time (U. T.)	Frequency (kc/s)	Type of emission
JJD	1200	8000	A 1
JJD	1500	8000	A 1
JJD	2330	9175	A 1

III. — Ursigram Codes and Agencies in charge of supply

1. SPIDE (Radio Wave disturbance) Central Radio Wave Observatory.
2. IONOS (Ionospheric conditions) Central Radio Wave Observatory.
3. CHROM (Solar activity) Tokyo Astronomical Observatory.
4. CORON (Corona) Tokyo Astronomical Observatory.

5. SOLER (Solar radio emission) Tokyo Astronomical Observatory.

6. MAGNE (Geomagnetism) Kakiota Geomagnetic Observatory.

7. CORAY (Cosmic Ray) Scientific Research Institute. Meteorological Institute and Nagoya University.

IV. — Form of Message

Prefix « U.R.S.I. » shall be located at the top of Ursigram. Following the prefix, seven items shall be arranged, each of which carries a prefix in 5 letters expressing the Code applied.

SOLAR ECLIPSE OF FEBRUARY 25, 1952

Denmark

The Danish Broadcasting transmitter Kalundborg I on 245 kc/s will send out an extraordinary program consisting of an unmodulated carrier wave on February 25, from 9 to 12 a. m. Danish mean time.

Great-Britain

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

RADIO RESEARCH STATION, SLOUGH

Final Programme

I. *Stations participating and Nature of Observations at each*

Slough, Swansea, Bangor, Inverness, Singapore, Ibadan, Khartoum } *h'f* observations

Slough, Inverness, Singapore : Magnetometer observat.

Slough, Singapore, Ibadan : Absorption observat.

II. *Period and Frequency of Observations* :

A. 25th February 1952 continuous observation from 0600-1800 L.M.T.

B. 20th February to 1st March 1952, both dates included, quarter-hourly observations daily from 0600-1800 L.M.T. and hourly observations daily from 1800-0600 L.M.T. excluding *A* period.

C. 1st February to 31st March 1952 both dates included. Hourly observations excluding *A* and *B* periods.

III. *Time of Observations.* — All observations will be recorded in L.M.T. and each hourly observation will be centred on the hour. Thus, simultaneous observations will be made at all stations. L.M.T. is referred to the nearest 15° Meridian. Time should be entered on each record and a clock check made with a standard once each day.

IV. *Disposal of Records.* — All records taken at outstations, in accordance with this programme, between 1st February and 1st March both dates inclusive, should be sent or brought to Slough as soon as possible after 1st March. Those taken between 1st March and 31st March should be sent to the same place as soon as possible after the latter date.

V. — Minute by minute *h'f* records will be made at Slough in addition to the normal programme outlined above.

VI. *Oblique Incidence Measurements.* — This section refers to ancillary measurements and may be cut where necessary. The measurements will be made at Slough or in the vicinity (if necessary and possible) to avoid interference.

(*a*) Study of the nature of the received pulse pattern from New Delhi during periods A and B above.

(*b*) Measurements on long distance scatter from the direction of the eclipse track will be made on the 17 Mc/s band.

(*c*) D.F. observations made on Delhi and other suitable stations, e. g. Aden or Simonstown.

VII. *Instructions for h'f observations* :

(*a*) Always start *h'f* recording at the minimum frequency of the recorder and stop after *f*xF2 has been reached except during period A when the record should extend to the upper frequency limit of the recorder.

(*b*) During period A it will be necessary to put the date and time on the record once an hour as follows :

(i) About 0655 L.M.T. remove the outer cover of the camera.

(ii) Immediately range 5 has been recorded release motor drive and move on paper (one segment is sufficient) and re-engage drive.

(iii) Move switch marked « continuous » to position marked « manual » and back again making sure that date lights have flashed.

(iv) Replace camera cover.

(v) Repeat at hourly intervals during the A period.

This operation takes 2 or 3 seconds and there are 10 seconds available without interrupting the recording. It should be practised before 25th February.

Netherlands

A. — Long distance communication

a) It has been asked to Holland Radio and to the K.L.M. transport organization to watch their long-range communication. Data and further information has been given to them as to time and place of the February eclipse, so they know what they have to look for. Some data from ships and aeroplanes can therefore be expected. Attention is drawn to quality of communications when the eclipse starts (compare with sunset) and when the eclipse ends (compare with sunrise).

b) The same as been arranged with the P.T.T. services (NERA receiving station). They will pay special attention to receptions from India, Indonesia and Australia. Apart from that, reception check will start 15 days in advance of the eclipse and go on for 15 after that phenomenan.

c) Responsible for the coordination of long distance work is Mr. J. Houtsmuller, Prins Mauritslaan 69, The Hague.

B. — Programme of ionospheric measurements at De Bilt

a) From Frebruary 20th till March 3rd, every 10 minutes an ionospheric record will be taken.

b) 1° During the eclipse periode every ten minutes a record will be taken of the frequency range 1.4-8 Mc/s, during two hours, to begin at 8.15 hours.

2° In case 1° is impossible, because of the fact that the cutt frequency of the F2 is above 8 Mc/s, every 6 minutes, a record will be made of the normal extended frequency range.

3° The data obtained will be worked out according to the proposals.

Sweden

We are publishing a letter from Dr. Yngve Ohman, Chief of the Swedish Expedition, to Dr. L. V. Berkner, Chairman of the Special Sub-Committee.

Stockholms Observatorium
Saltsjobaden

December 29, 1951.

Dear Dr. Berkner,

Before leaving now with the Swedish solar eclipse expedition to Italy, I want to inform you about the final plans and preparations for this expedition.

The Swedish National Committee of U.R.S.I. had originally intended to send a combined astronomical and radioscientific expedition to the island Capri. It was found, however, that the electric current available on the island was not of the proper quality for the radioscientific measurements. We therefore had to split the expedition in two units, an astronomical one placed on Capri and a radioscientific one placed in Naples.

The astronomical unit has a main instrument a coronagraph with a number of auxiliary apparatus. The instrument which will be placed on Monte Solaro on Capri in an altitude above sea level of about 500 metres is intended for a general « patrol »-work comprising :

(1) Photographic and visual (photometric) observations of the green corona line.

(2) Photographic recordings of prominences.

(3) Photographic observations in H of chromospheric phenomena (with a polarizing monochromator).

(4) Direct solar photographs in the ultraviolet.

Special investigations of interesting phenomena will also be made in addition to the general patrol work. The unit will be ready for work around February 1st and the observations will be continued until about March 20th if everything works out according to our plans. I shall personally be in charge of this unit which has been organized by the Stockholm Observatory and I shall have three collaborators.

The radioscientific unit has been organized by Chalmers University of Technology in Gothenburg (Professor Rydbeck's institution). Mr. I. Svenson, assistant professor at the Chalmers University, will be in charge of this group and he will have three collaborators too.

The main instruments will be a panoramic ionospheric recorder and a solar noise recorder for the 2 metre-region. Professor E. Carlevaro of the University of Naples and Professor A. Colacevich Director of the Observatory of Capodimonte in Naples have very kindly offered their assistance in connection with selecting the best possible sites for these instruments. We shall have an intimate collaboration between the radioscientific unit in Naples and the astronomical unit on Capri.

In case you should have some important informations for us my address will be : Villa San Michele, Anacapri, Isola di Capri, Naples, Italia.

Very sincerely yours,

(*s*) Yngve Ohman.

UNESCO

World Political Events and Unesco

Abridged text of the adress made by M. Jaime Torres Bodet, Director General of Unesco, to the full Plenary Session of the General Assembly of the United Nations held at the Palais de Chaillot on November 9, 1951 (From the supplement to *Courrier of Unesco*, Vol. V, nº 1, Jan. 1952).

As I rise to speak, and to greet you on behalf of Unesco, I cannot help thinking of the day in September 1947 when, as leader of the Mexican delegation, I had honour of addressing the General Assembly for the first time. The world had just emerged from the war. Out of the ruins, amid splendid dreams, peace was striving to establish itself. The various agencies of the United Nations were in their infancy. I thought it appropriate then to emphasize that the mission of the United Nations and that of the Specialized Agencies in the common task of securing peace was basically the same.

In that belief I accepted, in the following year, the office of Director-General of Unesco. Passing thus from the service of my own country to the service of an international organization, from politics to administration, I felt that I was remaining true to the same cause — the cause of peace founded on economic and social justice and on the intellectual and moral solidarity of mankind — of peace, in short, which would depend not merely upon Governments but upon the peoples of the world.

Certainly I cannot forget the disappointment and the anxieties of the last four years. But precisely because these difficulties are piling up in the political sphere, it is imperative to reaffirm that peace is not a purely political phenomenon. It is also conditioned by economic, social, intellectual and moral factors, less spectacular than the political ones, perhaps, but not less important. The more obstacles the United Nations system encounters on

the political plane, the more desirable it is that its efficiency should be manifested in other domains, where the concrete needs and the real aspirations of men in the last resort reside.

That is exactly what the Specialized Agencies are trying to do. They set out to combat certain evils : hunger, disease, ignorance and want, faced with which every man, to whatever country or party he may belong, feels the same need for help or the same brotherly urge to help others.

Two peculiarities distinguish Unesco from the other Specialized Agencies. More than any of the others, it is directly affected by political events, and more than the others too, it is deeply committed to long-term policies. On the one hand, its standing with the public depends largely on the authority of the international order for which you are responsible, and on the other hand it is responsible to you for stimulating that international morality without which your efforts could have no lasting result.

In 1933, writers, scientists and philosophers from a number of countries were brought together by the International Institute of Intellectual Cooperation to discuss the future of civilization. They agreed on a seven point declaration, of which the first two read as follows :

« 1. The immediate future of civilization, in all its forms, is closely dependent upon the maintenance of peace, and all other circumstances of a more particular and technical nature turn upon this issue.

» 2. The future of culture, even within individual countries, is essentially bound up with certain universal factors which, in their turn, are dependent upon the organization of the human race as one moral and legal entity. »

It would be difficult to find better words to define the way in which the day-to-day administrative work of Unesco is dependent upon the political action of the United Nations.

We are constantly receiving proof of this. Every worsening of international political relations immediately reacts upon those who are carrying out our programme, accentuates their ideological differences, and threatens to destroy their aspirations towards world harmony.

* * *

Rampart of Hope

Against the rising tide of passion and fear, Unesco is erecting a rampart of security and hope by demonstrating the benefits of international intellectual co-operation. By helping scientists throughout the world to get in touch with one another, it reveals the existence of a way of thought controlled by standards of universal truth. Still better, it tries to mobilize experts in certain fields for a specific task of an international character, either by organizing national research according to an international plan, as in the case of the problems of the arid zone, or by creating international institutions like the Computation Centre, whose services are placed at the disposal of Member States. Similarly, by facilitating cultural exchanges, Unesco provides proof that every culture possesses treasures which could and should enrich humanity as a whole, and vice versa that every culture can be revivified by contact with other civilizations. In all these domains, the work carried out by Unesco has the effect of liberating and strengthening the reality of an international community of minds, which foreshadows and prepares the way for the world community of peoples.

It is not within Unesco's power to determine whether the transition from one to the other shall take place rapidly or not. That issue depends on the political rather than the technical opportunity. National frontiers must be opened to the free flow of ideas, of the persons who generate them, and of the material which arises from these ideas and helps to carry them into effect. Freedom of expression must be guaranteed, the rights of scientists, authors and artists must be assured. Then only shall we be able to measure the full extent of the power of the intellect as the organizing and unifying principle of human society.

If we want intellectual and moral factors to play their effective part in the friendship and mutual understanding of peoples, there must be a readjustement in the political sphere. First and foremost we must adequately secure the present, so that the mind, freed from preoccupation with the immediate future, can have enough perspective of time before it to recover its utmost capacities.

End to inequality

On this subject I can only agree wholeheartedly with the Secretary-General, whose twenty-year plan for peace, among its other merits, has the advantage of trying to extricate the policies of the United Nations from an atmosphere of crisis and give them back their proper dimensions in time.

Unesco's work for peace must be regarded in this broad perspective. For the task to which it summons its Member States is vast and arduous.

More than half the population of the world can neither read nor write, and is plunged in almost total ignorance. What a waste of energy ! What an opening to exploitation ! What a breeding-ground for revolt ! How can a regime of peace, that is to say, of reciprocal respect for rights, or how can peaceful progress for all, result from such inequalifies of knowledge ?

It is to the lessening of this inequality that Unesco is bending all its efforts, by carrying out its policy in two parallel directions : primary education and fundamental education.

The Universal Declaration of Human Rights proclaims in Article 26 the principle of free and compulsory primary education. Unesco is steadily endeavouring to promote the effective application of that principle. Last July, in association with the International Bureau of Education, we considered the problem as a whole at the Fourteenth Conference on Public Education. This conference, which was attended by the delegates of fifty Governments, recommended that every State in which primary education does not yet extend to the entire population of school age, should draw up as soon as possible a priority plan which, while taking into account the needs and resources of the country concerned, would provide practical measures over a period of years to ensure the steady expansion of free and compulsory schooling.

Basing itself upon the conclusions of the Geneva conference, Unesco is now proposing to organize regional conferences, to be held every other year, at which we shall face and discuss the relevant economic, social and intellectual facts in every part of the world. The purpose of these regional conferences will be to help States in working out and putting into practice their respective national plans by pooling their experience and knowledge.

However, so long as the majority of the children of the world are denied access to primary education, we cannot ignore the mass of illiterates of all ages who have never had the advantage of such education. It is for the benefit of these outcasts, who have been reckoned for decades in hundreds of millions, that Unesco has formulated the concept of fundamental education. By fundamental education we mean that minimum of technical, moral and civic instruction without which there could be no education, science, culture or information in the most elementary sense in which modern communities understand those terms. Admittedly, in comparison to primary education, fundamental education is no more than an expedient. But it is an urgent expedient, if we do not want whole generations, in a large number of countries, to run to waste.

After several years of research, the General Conference of Unesco at its last session adopted a project which involves the setting up of a network of international centres where we shall work out, with due regard to the special needs of the various regions of the world, methods of training staff and producing the necessary material for fundamental education. The first centre was opened this year in Latin America. We estimate that to carry out this project in its entirety will take twelve years and will result in the training of about five thousand fundamental education specialists who in their turn will train teams of specially qualified teachers in their own countries.

Thus, on the two fronts of the present and the future, Unesco has taken up arms against ignorance. But the problem of education is not purely one of quantity : it is one of quality, too. The number of schools, teachers and pupils is not the only thing to be considered : the kind of education given in these schools, by these teachers, to these pupils, is still more important. For if it is possible to educate people for liberty, it is also possible to train them for servitude.

Unesco does not attempt to impose any particular ideology. On the contrary, Unesco is founded on respect for all creeds and it wants to see them all represented in its orbit. Yet in the debate between peace and war, liberty and injustice, which sets men in opposition not merely to ideas, but to men, Unesco can never be neutral. It will always be found in the service of human rights

and of international law, the establishment of which is more necessary than ever if these rights are to be guaranteed.

Value of the mind

Clearly, those who founded Unesco in 1945 did not foresee we should have to grow up in a world like that of today. They did not think that six years later the military budgets of the nations would reach a total of one hundred billions of dollars, as the Secretary-General has stated in his Report, nor that Governments would feel themselves obliged to pay more attention to the production of weapons of death and destruction than to the peaceful requirements of education, science and culture.

Nevertheless, even in this world poisoned by distrust and paralyzed by fear, Unesco works to maintain and establish peace. It works to maintain peace by demonstrating to the masses, as well as to the elite, the value that the mind can add to earthly existence. It strives to establish peace by giving to all men intellectual and moral access to the rights and responsibilities of freedom, and by promoting the triumph of the international civic spirit over individual and collective selfishness.

Mr. President and delegates, I have shown how Unesco is affected by your difficulties, shares the anxieties which at present beset you, and yet feels that it is the bearer of your highest and most exalted hopes. You will understand therefore, how very important this Session of your General Assembly is for us, and how ardently I wish you success in your deliberations. On this same site on which, three years ago, by the adoption of the Universal Declaration of Human Rights, you held out a great promise to mankind, may your labours lead the peoples of the world towards the highways of justice, of truth, and of peace.

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

Rules for Joint Commissions

Final form approved by the Executive Board at its Third Meeting in Washington, October 1952

1. Joint Commissions to study specific topics in borderline fields covering subjects appropriate to more than one Union may, with the concurrence of the Unions concerned, be set up by the Executive Board of I.C.S.U. under paragraph V.19 of the 1949 Statutes.

2.1. The Executive Board shall invite the appropriate Unions to nominate each a certain number of members to serve on such Joint Commissions.

2.2. *Membership* of a joint Commission shall not ordinarily exceed ten. The final decision on the strenght of each individual Commission rests with the Executive Board, and is subject to revision at the annual meeting of the Board.

3. The Executive Board shall designate a *Parent Union* to foster the work of each Joint Commission.

4.1. On the formation of a Joint Commission, the Parent Union shall appoint a *Provisional Secretary.*

4.2. The Provisional Secretary is responsible for obtaining the nominations to membership of the Joint Commission from the Unions concerned, and for calling the first meeting of the Commission.

5.1. The *First Meeting* of the Joint Commission shall elect a President and Secretary, both from among its members, of which at least one shall a nominate of the Parent Union.

5.2. The initial term of Office of both President and Secretary shall be three years, when both are eligible for re-election for at least one further term of three years.

5.3. A Joint Commission may continue in being for three years, counted from the date of the first session, without reference to the Executive Board. It then rests with the Executive Board to decide whether or not the Joint Commission should continue its work for at least a further period of three years. If so, it shall be mandatory for the Unions concerned to ensure adequate rotation of membership, representative of the latest advances in technique covered by the Joint Commission in question.

5.4. Each Commission Joint, on the termination of its mandate, shall either be dissolved or be replaced by a Commission of the Parent Union, if necessary with members co-opted from other Unions.

6. A Joint Commission may appoint a number of *Advisory Councillors* if it is considered that the work of the Commission requires their assistance.

7.1. *Advisory Councillors* who may attend a meeting of the Commission can receive transportation and per diem expenses only if they take the place of full members of the Commission who are unable to attend.

7.2. If a meeting of a Joint Commission should coincide with another meeting organised by the Council or one of the Unions, transportation expenses and per diem for members of the Commission can be claimed on one count only.

7.3. *Travelling expenses* are normally claimable in respect of second class railway or steamer tickets. Air transport is claimable where large distances or notable time saving are involved.

7.4. *Per Diem expenses* to members and advisory councillors attending a meeting of the Commission with the assistance of Unesco Subventions are payable according to the funds available. ordinarily for a maximum period of three days, or of five days in the case of members or advisory councillors coming from distant countries, at a rate to be determined from time to time by the Bureau.

8.1. Funds for *Regular Meetings* of a Joint Commission are available at most in alternate years.

8.2. Joint Commissions may suggest *Symposia* on topics falling within their domain, to be hold in any year. The total number of such symposia in any one year for which subventions may be allocated is however contingent on the funds available in that year from Unesco and I.C.S.U. sources.

9.1 In order that applications for subventions from Unesco may be submitted in time, each Joint Commission shall submit an advance list of meetings and symposia for scrutiny by the Bureau of I.C.S.U. on the occasion of an annual meeting of the Executive Board, for submission to the Board for its approval.

10.1. Requests for subventions from Unesco or I.S.C.U., either for regular meetings or symposia approved by the Board as in 9.1., or towards the cost of publications, shall be submitted by the Parent Union on behalf of the Joint Commission.

10.2. All subsequent dealings with Unesco or I.C.S.U. in respect of subventions are the responsibility of the Parent Union.

10.3. Minor administrative expenses of Joint Commissions will be borns by I.C.S.U. All other expenses must be approved by the Parent Union and by I.C.S.U. before being incurred.

11.1. The Parent Union is responsible to the Executive Board for the conduct of the work of any Joint Commission attached to it.

11.2. Joint Commissions shall render full reports of all meetings and other activities to the Parent Union.

11.3. The Parent Union shall submit an interim Report on the work of any Joint Commission attached to it at the annual meeting of the Executive Board ; and a summarised report of the work of its Joint Commissions triennially to the General Assembly, through its representatives designated under art. VI.25 of the 1949 Statutes.

C. C. I. R.

Recommendations made by the Committee, Questions to be studied, study programmes

Reprints from *Documents of the VIIth Plenary Assembly*, Vol. I, Geneva, 1951.

RECOMMENDATION N° 57

Production and reduction of ionospheric data: Standards, symbols and conventions

(Recommendation N° 6)

The C.C.I.R.

considering :

(*a*) That experience in the use of the symbols and conventions for their use in the presentation of the results of ionospheric soundings given in the Annexes of Recommendation N° 6 of the Vth Meeting of the C.C.I.R. and adopted simultaneously by the VIIth meeting of the International Scientific Radio Union (U.R.S.I.), has already brought forth a number of revisions, as well as some new recommendation, by the IXth Meeting of U.R.S.I.

(*b*) That still further revisions and clarifications of these Annexes in the light of more recent experience with their use have become necessary (the meeting of the C.C.I.R. International Study Group 6 has already given some thought to revision in Doc. N° 130 of Washington as welll as recognised in Doc. N° 144 of Washington the ultimate requirement for some new and less subjective way of obtaining pertinent information from ionospheric measurements).

(*c*) That some consolidation of the recommendations of the Vth Meeting of the C.C.I.R. and the IXth Meeting of U.R.S.I. is indicated.

(*d*) That is wasteful of effort and productive of confusion for the symbols, conventions, and definitions to be debated and altered at consecutive meetings of the C.C.I.R. and U.R.S.I.

(*e*) That the interchange of ionospheric data is of concern primarily to research organisations engaged in obtaining ionospheric data, and thus the standardisation of symbols and conventions can best be handled by a body such as U.R.S.I. ;

(*f*) That the volume of data now in existence is so large, and is growing so rapidly that machine methods seem to be indicated for its study, oprcessing, and storage.

recommends :

1. That the symbols and conventions for their use together with certain other matters of convention, as detailed in the seven attached Annexes, be adopted in the interchange of ionospheric data.

2. That every effort be made to improve the quality and accuracy of ionospheric soundings as rapidly as the techniques can be developed or applied, in order to encourage the scientific analysis which is needed.

3. That the equipment for ionospheric soundings should preferably meet the following minimum requirements.

3.1. Peak power : 1 kW.

3.2. Frequency range : 1 Mc/s to 20 Mc/s.

3.3. Height range over which measurements are possible : 50 km to 1000 km.

3.4. Accuracy in calibration : 10 km in height, and 0.1 Mc/s in frequency.

3.5. Length of pulses : 100 Mc/s or less.

3.6. Length of time for each observation :

— Automatic equipment : 2 minutes or less.
— Manual equipement : 15 minutes or less.

These requirements should not be construed as suggesting that is sufficient to record layer heights to the nearest 10 km and frequencies to the nearest 0.1 Mc/s, when it is both desirable and possible to be more accurate.

4. That the interchange of ionospheric characteristics should include :

4.1. Either tabulations of hourly observations by days for each month.

4.2. Or monthly median values for each hour, including as much as possible the median count.

4.3. Or both.

This recommendation should not be construed as precluding the interchange of monthly mean values of ionospheric characteristics, and in fact *mean* values (more suited to scientific studies) should be interchanged as well as *medians* (more suited to engineering studies) whenever the quality of the observations permits this.

5. That ionospheric observations should be made at least once an hour, on the hour, using local mean time corresponding to the nearest or most convenient meridian of longitude from Greenwich which is an integral multiple of 15° ; this meridian is to be clearly specified when reporting the data.

6. That, at least, data for f_oE, f_oF1, f_oF2, and (M 3000) F2 should be interchanged, and that in addition, when possible, data for fEs, h'E, h'F1, h'F2, and h'F2 should be also interchanged.

7. That the Director of the C.C.I.R. should refer this subject, as embodied in this recommendation, together with its Annexes, to the President of the U.R.S.I. (with the understanding that the U.R.S.I. will not, in its pursuit of purely scientific parts of the subject, allow itself to lose sight of the engineering objectives of this work which are of concern to practical HF radio communication) in order that the inevitable future modifications and revisions may be undertaken henceforth exclusively by the U.R.S.I.

8. That the Director of the C.C.I.R. should draw the attention of the U.R.S.I. to the desirability of studying, and perhaps attempting, standardisation in machine techniques for the study, processing, storing and interchanging of ionospheric data.

ANNEXES I TO V

See U.R.S.I., Vol. VIII, Part I, p. 345-354.

ANNEX VI

Standard transmission curve

The international standard 3000 km transmission curve used for obtaining (M 3000)F2, as adopted in 1944 by the International Radio Propagation Conference at Washington, id defined by the following table, which gives the corrected secant Φ_0 factors for the standard 3000 km transmission curve.

Height in km	Factor	Height in km	Factor
200	4.55	500	2.69
250	4.05	600	2.40
300	3.65	700	2.20
350	3.33	800	2.04
400	3.08		

ANNEX VII

New descriptive term

The following descriptive terms are coming into use :

1. Ionosonde : equipment which is employed in making ionospheric measurements.

2. Ionogram : the record of an ionospheric sounding.

RECOMMENDATION N° 59

Exchange of information for the preparation of short-term forecasts and the transmission of ionospheric disturbance warnings

(Recommendations N^{os} 11, 13 and 16)

The C.C.I.R.

considering,

(*a*) That it is important to give Administrations and operating services (navigation, and other services) using ionosphere-propa-

gated waves the earliest possible warning of the onset of disturbances to ionospheric propagation conditions, so that they may arrange their traffic schedules accordingly.

(*b*) That it is desirable to find an easier method of drawing up a plan for the rational use of frequencies in place of the system based on long-term mean values, when the latter is temporarily unsatisfactory on account of ionospheric disturbances.

(*c*) That it would therefore be advisable for all organizations publishing ionospheric forecasts to study the technique of forecasting disturbances.

(*d*) That it is of great importance to take steps to secure the greatest possible accuracy of such forecasts and the maximum of speed in their dissemination.

(*e*) That, for the exchange and dissemination of propagation information, there are three categories of users : those who make forecasts, those who make operational use of propagation information, and those who require the information for scientific research or other purposes ; and that, to meet these different requirements, it is desirable to use the most appropriate methods of exchange in each case.

(*f*) That collaboration is desirable between Administrations or operating services and the organizations studying the characteristics of the ionosphere and deducing forecasts therefrom, with a view to checking the accuracy of the forecasts periodically.

(*g*) That provisional codes, prepared by the International Radio Scientific Union (U.R.S.I.) such as the code used in French Ursigrams, or due to organizations such as the Central Radio Propagation Laboratory (C.R.P.L.), the Arbeitgemeinschaft Ionosphäre, the Japanese Central Propagation Laboratory and other, have proved their usefulness in the dissemination of information, for the preparation of short-term fore-casts.

recommends :

1. That each country participating in radio propagation research should designate an official agency for the reception, coordination and exchange of such data and for liaison with corresponding agencies in other countries.

2. That the information required for the preparation of short-term forecasts should be centralized by the agenties mentioned in § 1, as far as possible by the most direct electrical means of communication between the centralizing agency and the various institute for solar, magnetic and other observations.

3. That, of the data thus assembled, those which are of use for forecasting within 48 hours should be disseminated in accordance with U.R.S.I. decisions by suitable available communication channel.

4. That the other data, of use for the improvement of forecasting technique in general and for other purposes, should be disseminated by ordinary post or airmail ; if they deem it of use for the organization of regional forecasts or for scientific research, interested Administrations may organize alone or preferably collectively after centralization of information, the dissemination of detailed information by radio.

5. That certain short, but regular, transmissions, giving short-term warnings of ionospheric disturbances, should be effected by long range radio stations.

6. That the attention of the U.R.S.I. should be drawn to the advantages of the fullest possible standardization of the codes to be used either for the short warnings mentioned in § 5, or for the exchange of the limited information mentioned in § 3 or the general information mentioned in § 4.

7. That Administrations should be invited to conform to the resulting codes and to make them know to their operating services.

8. That the Administration should invite these services, together with operating agenties to study the accuracy of the forecasts, to submits records and to make any suggestions which might assis the studies undertaken to improve the methods used.

9. That special attention should be paid to the comparison between forecasts and the actual behaviour of radio circuits ; it is particulary desirable that Administrations should adopt identical methods of assessing the quality of the circuits by using a suitable classification.

10. That is also desirable that a common method should be adopted to describe ionospheric perturbations, taking account of such factors as : starting time, zone affected, duration and importance of the perturbation.

RECOMMENDATION Nº 69

Prediction of solar index

(Question Nº 45)

The C.C.I.R.

considering :

(*a*) That it is desirable to have an internationally agreed prediction of smoothed relative sunspot for about six months in advance, as reflected by Question Nº 45, proposed by the International High Frequency Broadcasting Conference, Florence-Rapallo.

(*b*) That it is impraticable at present to obtain complete agreement on method of prediction.

(*c*) That is generally felt that prediction methods involving harmonic analysis are inappropriate, and that methods which can be classified under the heading of cycle matching, while very useful, are in principle somewhat arbitrary, and not always sufficiently objective.

(*d*) The appeal of newer statistical techniques involving autocorrelation, which for prediction purposes appear to be the most objective and least controversial in matter of detailed application.

recommends :

1. That the Director of the C.C.I.R. should draw the attention of the International Astronomical Union (I.A.U.) and the International Scientific Radio Union (U.R.S.I.), as well as of other international organizations concerned, to the importance of predicting solar activity and to the desirability of studying prediction methods.

2. That the Director of the C.C.I.R. should undertake to prepare six months in advance predictions of the smoothed relative

sunspot number, utilizing autocorrelation techniques and based upon :

— The Zurich relative sunspot numbers, final whenever available but provisional when final are not available ;

— The following commonly used formula for smoothed averages :

$$\overline{R_0} = \frac{\frac{1}{2}(R_{-6} + R_{+6}) + \sum_{-5}^{+5} R_k}{12}$$

where R_k is the Zurich relative sunspot number for month k, and where the subscript « o » corresponds to the month for which the smoothed number is being obtained.

3. That these predictions should be published currently in the *Journal des Télécommunications* for the benefit of the members of the I.T.U.

4. That these predictions should be made available to all interested parties as soon as available each month by an inexpensive postcard subscription service utilizing air-mail.

5. That prior to the next Plenary Assembly of the C.C.I.R., the Director of the C.C.I.R. and the various Administrations should supply their comments on these predictions, making particular reference to :

— the suitability of the use of 12-month running means ;

— the suitability of a prediction six months in advance ;

— the applicability of the predictions to their communications problems.

Appendix

Methods of Predicting Solar Index

(*a*) Harmonic Analysis

Wolf, R. — Mitteilungen über die Sonnenflecken. Natureforschende Gesellschaft in Zürich. *Vierteljahresschrift*, 1856-1865.

Fritz, H. — Die Perioden solarer und terrestricher Erscheinungen. *Vierteljahresschrift des Naturforschenden Gesellschaft in Zurich*, Heft 1, 1893. Reprinted (English Translation) *U. S. W. B. Monthly Weather Review*, 56, 401, 1928.

ALTER, D. — A New Analysis of the Sun-spot Numbers. *U. S. W. B. Monthly Weather Review*, 56, 399, 1928.

SCHUSTER, A. — On the Periodicity of Sun-Spots. *Phil Trans. Roy. Soc. London*, A. 206, 69, 1906 ; continued in *Proc. Roy. Soc. London*, 85, 50, 1910-1911.

OPPENHEIM, S. — *Met. Zeits.*, 27, 270, 1910. Uber Perioden der Sonnenflecken, *Astron. Nachr.*, 232, 369, 1932.

MICHELSON, A. — Determination of Periodicities by Harmonic Analyzer with Application of the Sunspot Cycle. *Astrophys. J.*, 38, 268, 1913.

HIRAYAMA, S. — Tokyo Sugaku-Buturi Kizi-Gaiyo, 3, nº 9.

KIMURA, H. — On the Harmonic Analysis of Sun-Spot Relative Numbers. *M. N. Roy. Ast. Soc.* 73, 543, 1913.

TURNER, H. — On the Expression of Sunspot Periodicity as a Fourier Sequence. *M. N. Roy. Ast. Soc.*, 73, 714, 1913.

LARMOR and YAMAGA. — On Permanent Periodicity in Sunspots. *Proc. Roy. Soc. London*, A. 93, 493, 1917.

YULE, G. U. — On a Method of Investigating Periodicities in Disturbed Series with Special Reference to Wolf's Sunspot Numbers. *Phil. Trans. Roy. Soc. London*, 226, 267, 1926-1927.

DOUGLASS, A. — A Study of Cycles. Carnegie Inst. of Washington, 1936.

CLAYTON, H. — The Sunspot Period. *Smithsonian Miscellaneous Collections*, 98, Nº 2, March 27, 1939.

ANDERSON, C. — A Representation of the Sunspot Cycle. *Bell System Tech. J.* 18, 292, 1939.

(*b*) CYCLE MATCHING

HALM, J. — Uber eine Neue Theorie zur Erklärung der Periodizität des Solaren Erscheinungen. *Astr. Nachr.* 156, 44, 1901.

LUDENDORFF, H. — Untersuchungen über die Haufigkeitskurve der Sonnenflecke. *Zeits. F. Astrophys.* 2, May 1931.

WALDMEIER, M. — Neue Eigenschaften der Sonnenfleckenkurve. *Astr. Mitt. Zürich*, Nr. 133, 105, 1935.

DURKEE, A. — Forecasting Sunspots and Radio Transmission Condition. *Bell Laboratories Record*, XVI, Dec. 1937.

STEWARD, J. and PANOFSKY, H. — The Mathematical Characteristics of Sunspot Variations. *Astrophys. J.*, 88, 385, 1938.

THURING, B. — Zeitlicher Verlauf der Sonnenfleckenhaüfigkeit, Fleckenherd und photospherische Stabilität. *A. N.*, 266, 97, 1938.

STEWARD, J., EGGLESTON, F. — A Prediction of the Remaining Course of the Present Sunspot Cycle. *Phys. Rev.* 55, 1102, 1939.

STEWARD, J. EGGLESTON, F. — The Mathematical Characteristics of Sunspot Variations II. *Astrophys. J.*, 91, 72, 1940.

WALDMEIER, M. — Ergebnisse und Probleme der Sonnenforschung. Leipzig. *Akad. Verlagsgesellschaft*, 120, 1941.

GLEISSBERG, W. — Probability Laws of Sunspot Variations. *Astrophys. J.*, 96, 234, 1942. Also earlier papers by W. GLEISSBERG, *Observatory*, 62, 158, 1939, 63, 215, 1940. *Pub. Istanbul University Obs.*, N° 14, 1941.

GLEISSBERG, W. — Note on the Epoch of the Next Sunspot Maximum. *Astrophys., J.*, 100, N° 1, 144, July 1944.

BRUNER, W. — Die Verteilung der Tätigkeitsherde für Sonnenflecken in der Nähe der Minimumsepochen von 1854-1943. 5. *Pub. Eidgen. Sternwarte in Zürich*, 7, Nr. 6, 42, 1943.

POLLI, S. — Analisi periodale della successione dei numeri relativi delle machie solari. *Geofisica Pura e Applicata*, vol. IX, N^{os} 3-6 (1946).

Document N° 96, of Florence-Rapallo.

(*c*) AUTOCORRELATION

WOLD, H. — A Study in the Analysis of Stationary Time Series. (Almquist et Wiksell) 1938.

YULE, G. U. — On a Method of Investigating Periodicities in Disturbed Series, with special reference to Wolf's Sunspot Numbers. *Phil. Trans. R. Soc.*, 226, 267, 1926-27.

MCNISH, A. G. and LINCOLN, J. V. — Prediction of Sunspot Numbers. *Trans. Amer. Geophys. Union*, 30, 673, 1949.

KENDALL, M. G. — Contribution to the Study of Oscillatory Time Series. Nat. Inst. of Economics and Social Research, Occasional Papers IX. (Camb. Univ. Press) 1946. Also publ. in Chap. 29 of Vol. 2 of Kendall's book, The Advanced Theory of Statistics, C. Griffin and Co Ltd. 1946.

WIENER, N. — Extrapolation, Interpolation and Smoothing of Statistical Time Series (Book-Technology Press, Cambridge, Mass.), 1949.

MAYOT, Marcel. — La Prévision des Taches Solaires (*Annales d'Astrophysique*, 1947).

Dradt Recommendation

(Study Group N° VI)

The C.C.I.R.

considering :

1. That a detailled knowledge of the magnitude of ionospheric absorption is necessary for the efficient use of the available frequency spectrum and for the practical design and engineering of radio broadcasting and communication circuits and services.

2. That the task of investigating ionospheric absorption and devising methods for applying the information to the problems of radio broadcasting and communication is primarily one that

must be undertaken by scientific and research organizations working on radio wave propagation.

3. That the necessary investigations would be greatly assisted if the facilities of existing high power transmitters could be made available at times for the studies.

4. That the report of the working group of Committee III at the IXth General Assembly of the U.R.S.I., Zurich, 1950, and also documents submitted to the VIth Plenary Assembly of the C.C.I.R., Geneva, 1951 (particulary documents Nos 61, 138, 139, 229, 247 of the VIth Plenary Assembly of the C.C.I.R. and Documents Nos 113 and 129 of Washington 1950 and Document No 15 submitted by Japan to the VIth Plenary Assembly of the C.C.I.R.) contain information of use to the Administrations and organization participating in these studies.

recommends :

(*a*) That Administrations and research organizations expedite theorical and practical studies of the absorption of radio waves propagated by way of the ionosphere at vertical incidence, as well as oblique incidence, with the subject of obtaining the data and results required for the efficient utilization of the available radio frequency spectrum.

(*b*) That the importance of obtaining such information in tropical regions, as well as in other part of the world, should not be overlooked.

(*c*) That all organizations participating in these studies collaborate and exchange information among themselves and with the U.R.S.I.

QUESTION No 54

Standard frequency transmissions and time signals

(Former Recommendation No 18)

(Study Group No VII)

The C.C.I.R.

considering :

(*a*) That the International Administrative Radio Conference, Atlantic City 1947, allocated frequency bands 2.5 Mc/s $\pm$ 5 kc/s

(2.5 Mc/s ± 2 kc/s in Region 1), 5 Mc/s ± 5 kc/s, 10 Mc/s ± 5 kc/s, 15 Mc/s ± 10 Mc/s, 20 Mc/s ± 10 kc/s, and 25 Mc/s ± 10 kc/s, and that the Conference requested the C.C.I.R. to study the question of the provision and operation of a world-wide standard frequency and time service.

(*b*) That this service should permit measurement with the maximum accuracy and certainty, while using simple receiving equipment.

(*c*) That it is desirable that these service should comprise carrier and modulation frequencies with identical values for all transmissions, as well as time signals of uniform type.

(*d*) That the relative merits of several possible programmes of modulation can only be determined by experiment.

(*e*) That a number of stations will be necessary to provide a world-wide service, and that their simultaneous operation may cause harmful interference, the extent of which can only be determined, and solutions found, by experiment.

(*f*) That the use of more stations than are technically necessary to provide world-wide coverage would, by producing harmful interference, diminish the utility of the service.

(*g*) That any experiments that may be made should be designed and controlled as to minimize disturbance of existing service.

(*h*) That the standardization of time is the responsibility of the International Committe of time.

(*i*) That emissions from standard frequency stations are valuable in studies of radio propagation.

(*j*) That the periodical broadcasting of information regarding propagation conditions is useful to operators of radiocommunications services.

(*k*) That it is desirable to improve the facilities for radio noise measurements.

(*l*) That there is an urgent need to put into operation additional standard frequency and time stations, perhaps in the United Kingdom and in Australia, to serve the now inadequately served areas in the world.

(*m*) That conclusions should be reached as to the form of the service and the optimum number of stations before the next C.C.I.R. meeting.

recommends :

1. That experimental emissions on 2.5, 5, 10, 15, 20 and 25 Mc/s be arranged, particularly to serve the now inadequately served areas of the world, (perhaps from additional stations in the United Kingdom and in Australia, and such other stations as the Study Group N° VII may find practical and available), to determine the effective service areas and the zones of interference with the existing emissions from WWV.

2. That the Study Group N° VII organise and control the experiments, arrange such further experiments as may seem desirable, and report through the Director of the C.C.I.R. to the Administrations concerned.

3. That the Study Group N° VII give the maximum possible consideration, within practicable limits, to the proposals of the Administrations which wish to cooperate in the establishment of this service.

4. That the initial experiments be with emissions on 2.5 and 5 Mc/s to be followed by experiments on 20 and 25 Mc/s.

5. That when sufficient information has been gained on 2.5, 5, 20 and 25 Mc/s the experiments be extended to 10 and 15 Mc/s, one frequency at a time.

6. That in arranging the experiments the maximum practical advantage be taken of properties of directional antennas, and of transmitter power adjustments, to assure good service with a minimum of interference.

7. That the Administrations consider, as in the general interest, that no new permanent stations in the standard frequency bands be notified to the I.F.R.B. pending the report of the Study Group N° VII, and that no new experimental station be notified to the I.F.B.R. without the agreement of the Study Group N° VII.

8. That the Study Group N° VII arrange for trials of various desirable modulation frequencies, including 440, 600 and 1000 kc/s, and should work out an optimum modulation programme, including time markers.

9. That the Study Group N° VII consider the possibilities of single sideband operation, with full carrier.

10. That the carrier and modulation frequencies as transmitted be maintained within ± 2 parts in 10^{-8} of their nominal values.

11. That the standard time intervals and time signals preferably take the form of pulses of 5 cycles of 1000 c/s tone repeated at intervals of one mean solar second, synchronised as nearly as possible with reference to Universal Time, with the 59th pulse in each minute suppressed.

12. That the Study Group N° VII seek the cooperation of the International Committee of Time in the provision of the time service.

13. That all standard frequency stations periodically and simultaneously interrupt their transmissions to permit measurement of natural radio noise, and that a programme be worked out in co-operation with appropriate committees of the C.C.I.R. and the U.R.S.I.

14. That a code signal giving information on radio propagation disturbances be broadcast at regular intervals.

15. That the attention of appropriate committees of the C.C.I.R. and the U.R.S.I. be drawn to the possible uses of standard frequency transmissions for propagation studies.

STUDY PROGRAMME N° 10

Theory of communication and its practical applications

(Question N° 44)

(Study Group N° III)

The C.C.I.R.

considering :

(*a*) That, in view of the increasing congestion of the radio spectrum and telecommunication circuits, it would be of advantage to discover technical methods of decreasing the bandwidth or the transmission time of a given quantity of information.

(*b*) That present studies seek only to perfect existing systems whereas recent theories seem to show that these system occupy

several times the bandwidth strictly necessary for the transmission of the required information at the required speed.

(*c*) That even with existing systems it is not possible to reduce the bandwidth to that strictly necessary because of unpredictable noise, natural and man-made interference and complex propagation conditions ; a margin of bandwidth is necessary to decrease distortion and the frequency of errors due to these phenomena.

(*d*) That is not certain that existing codes, some at least of which were not designed in the light of the phenomena peculiar to radio propagation, are making the best use of the occupied bandwidth.

(*e*) That a systematic study of such method can be made by generalizing the procedure in use for certain transmission systems and by applying the results of the general theory of communication to specific practical cases.

Unanimously decides that the following studies shall be carried out :

1. The preparation of an indexed bibliography on publications regarding the theory and general practice of communications, and detailed documentation on the characteristics of the various systems of modulation and transmission in practical use. This shall be based on the Annex to this Study Programme and shall include a summary following the title of each document. The documentation and periodic supplements shall be distribued by the Secretariat of the C.C.I.R. to all members as soon as possible.

2. The definition, in co-operation with the U.R.S.I., of a practical unit of the quantity of information applicable to all transmission systems, and the study of method of measuring this quantity.

3. The review of the various codes in use and the study of new codes leading to economy of bandwidth or transmission time, for a given quantity of information, taking into account the phenomena peculiar to radio propagation.

Note. — The above studies seem to be of interest also to the C.C.I.F. and the C.C.I.T.

Annex

The text of Question N° 44 reads as follows :

« *What technical methods may be adopted to transmit a given amount of information over a given telecommunication circuit* :

(*a*) *in a given time, using a minimum bandwidth* ;

(*b*) *with a given bandwidth, in a minimum time* ? »

This question is of obvious practical interest, and it is very important and urgent to reach a conclusion because of the increasing congestion in the radio spectrum and in transmission circuits. Although Question N° 44 is very general, it seems that, because the recent progress made in the theory of communication, an early study of the subject may lead to some immediately useful results.

During the last decade, profound changes have taken place in the conception of information, the flow of information and in the loss of information through distortion and by the presence of noise. These conception have defined in numerous technical studies, as yet incomplete, but it is an open question whether even at their present stage they do not constitude a framework which, without being final, might at least serve as a guide in attemps to make more efficient use of the spectrum, or to save transmission time. One aspect of this framework might be that shown in table I, which does not, however, attempt to present a complete classification. But there are two which may or may not be essential, and that is a matter that should be settled.

The first is the relationship between the paragraphs on the right and those on the left in Table I. This relationship tends to show that the theory of communication is concerned not with new techniques but with a new interpretation of existing techniques.

The second point is as follow : Table I does not mention the subject of transmission *quality*. That does not mean to say that the question has not be studied ; it simply seems that, on this point, the relationship between practice and the theory of communication is much more vague. A study of the possibilities of applying the theory of communication to a reduction acceptable by users, of the bandwidth or of the message transmission time must thus give precedence to the question of « transmission quality ».

TABLE I

	Usual conception		Terminology of the theory of Communication
A	Transmission and reception *a*) Power and bandwidth at the transmitter *b*) Power and bandwidth at the receiver *c*) Fading and distortion along a channel	A	Measurement of information *a*) Information emitted *b*) Information received *c*) Transmission of information
B	Modulation *a*) Modulation compression, filtering *b*) Demodulation, expansion, distortion correction	B	Change of form of information *a*) Coding *b*) Decoding
C	Message elements used in practice *a*) Pulses *b*) Pure frequencies *c*) Various types of modulation	C	Message elements *a*) Messages limited in time *b*) Messages limited in frequency *c*) Messages not limited in frequency or time
D	Studies on the structure of messages *a*) Telegraph messages - constant amplitude noise *b*) Contrasted messages - sporadic noise	D	Statistical description of common messages *a*) Messages of uniform (stationary) structure *b*) Messages of non-uniform (non stationary) structure

It would be very helpful if the telecommunication experts could prepare a two column table; one column should consist of the chapter-heading of a detailed description of the characteristics of existing telecommunication systems. In other column there should be a second list giving, for the item in the first list, the corresponding conceptions expressed in the terms of the theory of communication. For each item the pertinent bibliographical references should be given. Such a table would probably render very great service to users.

The specialised secretariat of the C.C.I.R. could, by reason of its central position, materially help in drawing up this table and perhaps, guided by the distribution of the blanks in the second column, instigate useful research.

STUDY PROGRAMME Nº 18

Tropospheric wave propagation

(Recommendation Nº 15)

(Study Group Nº V)

The C.C.I.R.

considering :

(*a*) That widespreat developments are taking place in the practical application of radio waves at frequencies above 30 Mc/s.

(*b*) That the propagation of such waves is known to be greatly influenced by the meteorological conditions in the troposphere.

(*c*) That the first step in the investigation of such propagation has been the preparation of the terms and definitions given in Recommendation Nº 54.

decides that the following studies shall be carried out :

1. That Administrations and Operating Agencies should be encouraged to made operational radio data available to national laboratories, which will co-ordinate, the radio information with meteorological data, and submit the results of their analysis to the C.C.I.R. The methods used in analysis should be described.

2. That further steps be taken to devise a suitable standard nomenclature for this subject, together with a uniform method of presenting both the radio and meteorological results. Such presentation might include the preparation of a uniform type of chart indicating the areas of sub-standard, standard and sub-refracting conditions.

Note. — National Administrations, the International Scientific Radio Union (U.R.S.I.), the World Meteorological Organization (O.M.M.) and other international radio and meteorological organi-

zations should be encouraged to pursue the investigation of the propagation of radio waves throught the troposphere as a matter of great urgency.

STUDY PROGRAMME Nº 20

Non-linear effects in the ionosphere

(Question Nº 5)

(Study Group Nº VI)

The C.C.I.R.

considering :

(*a*) That numerous examples of intermodulation and of the generation of spurious signals in the ionosphere have been observed in the very low, low, medium and hight frequency bands.

(*b*) That non-linear effects during ionospheric propagation can produce unwanted modulation of radio communications (including broadcasting).

(*c*) That these phenomena can impose limitations on the usefulness of radio communication systems and cause mutual interference between different circuits.

(*d*) That the magnitude of these phenomena may increase with the signal intensity in the ionosphere and with the complexity of the system in use.

(*e*) That there are, in particular, no quantitative data available on high frequency wave interaction.

Decides that the following studies should be carried out.

All participating Administrations and Operating Agencies should be invited to collect information on the time of occurrence, magnitude, and conditions under which non-linear effects in the ionosphere, such as wave interaction, have been or are being observed, and to co-operate with the International Radio Scientific Union (U.R.S.I.) and other appropriate international scientific bodies in the investigation.

Note. — The U.R.S.I. and other appropriate international scientific bodies should be informed that there is an urgent requirement for further fundamental information on the properties and conditions of occurrence of all forms of non-linear effects in the ionosphere, such as wave interaction.

STUDY PROGRAMME N° 21

Radio propagation at frequencies below 1500 kc/s

(Question N° 5)

(Study Group N° VI)

The C.C.I.R.

considering :

That the examination of question N° 5 has led to valuable studies of radio propagation phenomena at frequencies below 1500 kc/s, some of which are summarized in Document N° 141 of Washington, and Documents N° 69, 154, 186 of Geneva.

unanimously decide that the following study programme should be carried out :

1. The Study Group on ionospheric propagation should examine carefully the above documents and similar documents made available, and compile therefrom a co-ordinated report.

2. Administrations and laboratories having suitable facilities should undertaken work along the following lines, in order to increase available knowledge necessary to understand propagation at frequencies below 1500 kc/s.

2.1. An extended series of vertical-incidence measurements on height and characteristics on reflection (amplitude, phase and polarization) over as large a range of frequencies and geographical areas as possible.

2.2. Similar measurements at oblique incidence, to be made concurrently if practicable.

2.3. The interpretation of vertical-incidence data, in conjunction with rocket and meteor observations.

2.4. Measurement at very great distance and very low frequencies, in an effort to determine the method whereby these waves are propagated to great distances.

Notes. — The International Radio Scientific Union (U.R.S.I.) should be invited to examine basic scientific aspects of this problem such as :

1. Interpretation and correlation of vertical-incidence data with known or assumed upper-atmosphere physical characteristics of well known types.

2. Extensive study of the theoretical problems with a view to obtaining working hypotheses simplified in terms of approximations known to be valid as a result of corroborative experiments.

STUDY PROGRAMME N° 23

Measurement of atmospheric radio noise

(Questions N^{os} 9, 11, 12 and 13, Recommendations N^{os} 5 and 10, Opinion N° 2)

(Study Group N° VI)

The C.C.I.R.

considering :

(*a*) That in the interest of the organization of radio communications it is essential to carry out research on the elements required for measurement and prediction or forecasting of atmospheric interference to reception.

(*b*) That the most widely used direct method of measuring the interference value of atmospherics consists in injecting simultaneously into the receiver natural noise and suitably calibred artificial signals.

(*c*) That this method, when applied to the reception of aural telegraph signals, give useful results by measuring the signal level for which an average receiving operator makes a given proportion of mistakes.

(*d*) That it seem logical, for a transmission system involving a human factor, to apply a method involving the same human

element to the measurement of interference produced by noise.

(*e*) That, for application to other types of transmission using recorders, the method should be modified to record errors automatically, so that the result is independent of the subjective element.

(*f*) That the interference effect of atmospheric noise in radio communication can also be deduced from direct measurement of the atmospheric noise level on various frequencies.

(*g*) That it is moreover important to determine what characteristics of atmospheric noise must be known for a rational solution to the problem of noise in radio transmission.

(*h*) That a rational method would require :

1. A knowledge of the locality of storm centres in the world, their intensity and their variation in time and space.

2. A determination of the characteristics of long-range interference caused by natural electrical discharges and their variation as a function of the path between the source and the receiving station, at any time of day, in any season, and for any sunspot period.

3. The application of simplified methods of characteristing the total interference caused by world storm centres at a given place and time.

4. A knowledge of the nature of the characteristic noise parameters required for the calculation of interference caused by noise in different types of transmission (aural, automatic recording, etc.).

(*i*) That in any case it would be of advantage to collect data for the preparation of world maps of storm centres for the study of local reception conditions.

(*j*) That it would also be of general advantage to encourage the study of receiver response to impulse type interference as a function of receiver characteristics.

decides that following studies should be carried out :

1. That the existing method of direct measurement of the interference caused to aural telegraph traffic by atmospheric noise

should be continued along the present lines at a number of stations judiciously distribued throughout the world.

2. That steps should be taken with a view to applying the same method to other types of transmission, making it independent of an operator.

3. That simultaneously other method of measuring directly the atmospheric noise level should be developed.

4. That a comparison of the results obtained by the methods mentioned in 1, 2, and 3 should be carried out with a view to deciding on the most appropriate method for a future use.

5. That more apparatus for locating storm centres (e. g. narrow-beam goniometers, cathode-ray goniometers) should be put into operation and that the laboratories concerned should, through the World Meteorological Oragnization (W.M.O.), co-ordinate their research in the frequency band between 10 kc/s and 30 Mc/s, and compare the results on different frequencies.

6. That Administrations should be invited, as a matter of urgency to submit results of tests using devices for counting local (i. e. within about 20 km) lightning discharges.

7. That, based on the information obtained from 6, a specification should be drawn up, in close association with the W.M.O. of the characteristics of a lightning recorder suitable for use in meteorological stations.

8. That the W.M.O. should be asked to obtain and instal counters, having these specified characteristics, in the meteorological stations from which it would be of advantage to obtain the number of daily discharges and their distribution as regard time of day and season.

9. That experimental research should be undertaken into the form and other characteristics of atmospheric noise from distant storms.

10. That theoretical research should be undertaken on the characteristics of interference from distant lightning flashes.

11. That the study should be undertaken and encouraged of the noise characteristics at the receiver input, with a view to determining the response at the output.

12. That method should be developed for presenting all the data available on the atmospheric noise in the form of world maps and associated curves.

13. That the attention of the International Radio Scientific Union (U.R.S.I.) should be drawn to the need for conducting the research mentioned in 9 and 10 and for investigating the spectral distribution of radiated energy resulting from a lightning flash and also to the need for research in the field of extra-terrestrial noise.

14. That the investigation of man-made noise and thermal noise should be pursued by the appropriate study group.

15. That this Study Programme should be deemed to replace Recommendations 5 and 10 and Questions Nos 9, 11 (Sections 1 and 2), 12 and 13, and Opinion No 2 of the C.C.I.R.

Meeting of study Groups I and II

These two Study Groups will held a meeting in *The Hague* (Netherlands) from April 1st to 10th.

We publish hereunder the agenda of the meeting.

Agenda of Study Group I: Transmitters

(Chairman : Dr. E. Metzler)

1. Urgent Subjects

a) *Bandwidth of emissions*

Study Programme No 1.
Question No 1.

b) *Harmonics and parasitic emissions*

Study Programme No 2.
Question No 1.

c) *Frequency stabilisation of transmitters.*

Study Programme No 3.
Question No 1.

d) Frequency Shift Keying
Study Programme N° 4.
Question N° 20.

2. Further Subjects

a) Telegraphic distortion
Question N° 18.
Report N° 1.

b) Arrangement of channels in multi-channel transmitters for long-range circuits
Question N° 46.

3. Other Business

Agenda of Study Group III: Radio Systems

(Chairman : Dr. H. C. A. van Duuren)

1. Urgent Subjects

a) Bandwidth
Study Programme N° 8.

b) Theory of Communication
Study Programme N° 10.
Question N° 44.

2. Further Subjects

a) Conditions for complete systems
Question N° 3.

b) Presentation of the results of atmospheric radio noise measurements for the requirements of operational services
Question N° 11.

c) Voice frequency telegraphy on radio circuits.
Question N° 43.
Study Programme N° 9.

d) Directivity of antennas
Question N° 48.

3. Other Business

CALENDAR

1952

August 8-9, U.R.S.I., Sydney, Australia : Executive Committee, International Radio Scientific Union.

August 11-23, U.R.S.I., Sydney : Xth General Assembly, International Radio Scientific Union.

August 25-27, I.C.S.U., Canberra : Joint Commission on the Ionosphere.

August 20-28, Istanbul : VIIIth International Congress of Applied Mechanics.

August 25 to September 2, I.U.T.A.M., Istanbul : Second General Assembly, International Union of Theoretical and Applied Mechanics.

September 4-13, I.A.U., Rome : VIIIth General Assembly, International Astronomical Union.

September 4-13, I.C.S.U., Rome : Joint Commission on Solar and Terrestrial Relationship.

September 22-30, Stockholm : Conference and Exhibition of Instruments and Measurements.

September 29, I.C.S.U., Amsterdam : VIth Meeting of the Bureau.

September 30, I.C.S.U., Amsterdam : IVth Meeting Executive Board.

October 1-3, I.C.S.U., Amsterdam : VIth General Assembly International Council of Scientific Unions.

November, U.N.E.S.C.O., Paris : Seventh Session, General Conference.

1953

August 13-19, I.U.P.A.C., Stockholm : XVIIth Conference, First Physical Chemistry Congress.

1954

Summer, I.U.C.R., Europe : Third General Assembly and International Congress of Crystallography.

September, I.U.G.G., Rome : General Assembly, International Union of Geodesy and Geophysics.