N 74 March-April 1952

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

INFORMATION BULLETIN

published with the financial help of the United Nations Educational, Scientific and Cultural Organization (U.N.E.S.C.O.)

CONTENTS

Published by the General Secretariat of U. R. S. I.
42, Rue des Minimes, BRUSSELS

X^th GENERAL ASSEMBLY

General Information

CIRCULAR LETTER TO NATIONAL COMMITTEES TO BE COMMUNICATED TO DELEGATES AT THE Xth GENERAL ASSEMBLY

We are hoping to be able to give in a few weeks general information concerning the organization of the Xth General Assembly. In the meanwhile, we are giving hereunder some practical information relative to living conditions in Australia.

1. Although it will be winter in August, delegates *will not* require heavy coats in Sydney and not even in Canberra. This last place is cold enough to make woollens desirable (pull-overs, etc.). A medium weight rainproof coat is enough and since heavy coats will not be required en route none need be brought. Umbrellas are seldom required in this country either; it either rains heavily or not at all. But though heavy coats should not be brought, there will also be no need in Australia for tropical or light-weight suits in August. Delegates coming by ship may need these, however, en route.

2. One Australian £ will buy what 3 $ would in the United States. Accomodation (without meals) in a good hotel is about 30 shillings (30/-) per day. A good diner costs about 10/-; fair meals can be had for half, and excellent meals for twice this. Food is plentiful and there is no rationing of any kind now. The average level of cooking is low, however, by Continental standards and visitors should make preliminary enquiries before visiting restaurants, only a few of which are beyond reproach. A bottle of wine costs about 7/6 d; a haircut 3/-. Visitors will not need to pay for much local travelling as the Australian National Commit-

tee will arrange nearly all transport. Details of weekend and local expeditions and other hospitality will follow later.

3. In many cases hotel accomodation can readily be booked through the travel agencies which many visitors will use. The Australian National Committee has reserved a number of rooms in a wellrun small hotel which is managed by Swiss, so that the staff can speak French, German and Italian. This place provides a good breakfast but no other meals; the service is excellent, however, and they will oblige with light refreshments at all reasonable hours.

Delegates who do not book their accomodation through travel agencies should get in touch with Dr. R. N. Bracewell, Radiophysics Laboratory, Chippendale, N. S. W., Australia, and state their requirements. A number of visitors may be accomodated in Sydney University Colleges and possibly in the University Club. The former accomodation will be cheap (perhaps 10/- to 15/- per day).

Accomodation in Canberra will be arranged by the Committee. It is possible that private accomodation can be provided in some cases. Delegates might indicate their preference for (*a*) 1st Class hotel; (*b*) moderate hotel; (*c*) University College; (*d*) private hospitality.

The Secretary,
E. Herbays.

Recommendations to Presidents of Commissions

1. Composition of the Commissions

It is reminded that in agreement :

(i) with articles 5, 6 and 7 of the Statutes,

(ii) with articles 1 and 2 of the Rules for Commissions,

(iii) and with the decisions adopted by the IXth General Assembly (U.R.S.I., Vol. VIII, Part. I, p. 54).

a) Commissions are appointed by the General Assembly on proposal of the Executive Committee.

b) Presidents of Commissions are elected by the General Assembly on proposal of the Executive Committee.

c) Official Members of Commissions are appointed by National Committees (one per Committee and for each Commission), Ordinary Members are elected by the Commissions ; the Official Members only having voting powers.

d) Officers of Commissions, the President not included, are elected by the Official Members.

2. Rapporteurs

2.1. It is desirable that two Rapporteurs, one English speaking and one French speaking, if possible, be nominated as soon as possible by the Presidents of Commissions for the duration of the General Assembly.

2.2. In order to facilitate such nominations, the General Secretariat will inform as soon as possible, each President of the names of National Committee delegates to the General Assembly.

2.3. Presidents of Commissions are asked to inform the Secretary of U.R.S.I. of the names of the Rapporteurs.

3. Works of Commissions

3.1. It seems useful that a programme of work be drafted before the meeting by each President of Commission in order to have it circulated at the latest at the beginning of the General Assembly.

3.2. Topics of live interest at the present time could be selected for discussion and especially those which lead to proposals for international co-operation.

3.3. The Secretary of U.R.S.I. drafted the appended memorandum in order to help the Presidents of Commissions to draft their programme of works.

For what concerns the Historical account of U.R.S.I., the Secretary started the drafting of an account for each Commission, but the work will most probably not been finished for the General Assembly. It is suggested to the Presidents of Commissions to consider the nomination of an "Historian of the Commission" to help the Secretary of the Union or a Drafting Commission which might be appointed by the next General Assembly.

3.4. Arising out of 3.2. and 3.3., working groups should be set up to formulate recommendations concerning further work or action in corporate mesures.

4. Reports, Papers, Communications, etc.

It seems advisable that :

4.1. Summaries only of Reports of Commissions to be read, the full text being circulated before the opening session of each Commission.

4.2. Progress Reports of National Committees be taken as read, those Reports will also be communicated in full text to delegates at the General Assembly.

4.3. Individuals papers should not be presented unless :

a) their authors are present,

b) those papers form convenient introduction to discussions,

c) the papers have to reach the Central Office in Brussels in time to be communicated to the Presidents of the interested Commissions.

5. Work subsequent to the sessions

5.1. Recommendations mentioned in 3.4. seem to be the logical conclusions of the work done by the Commissions. It is desirable that these recommendations be drafted both in English and in French, and handed to the Secretariat of the Assembly at the latest two days before the closing of the session.

5.2. *Any other decision* taken by the Commissions should be communicated to the Secretary of U.R.S.I.

5.3. It is desirable that the Rapporteurs should draft, both in English and in French, *short minutes of the sessions*. Those minutes ought to mention at least the subjects discussed and the conclusions of the discussions, and should be handed as soon as possible to the Secretary of U.R.S.I.

5.4. Presidents of Commissions are kindly requested to inform the Secretary of U.R.S.I. of the steps to be taken in order to fulfil the recommendations to be presented at the General Assembly (5.1.).

6. Presidents of Commissions are also requested to inform the Rapporteurs of items 5.1., 5.2. and 5.3.

Commission III

Sir Edward V. Appleton, President of Commission III, suggests the following topics for special discussion by the Commission during the forthcoming General Assembly.

1. Basic processes of electron generation and disappearance in the ionosphere.
2. Ionospheric storm phenomena.
3. Movements in the ionosphere.
4. Scattering and sporadic E ionisation phenomena in the ionosphere.
5. Eclipse phenomena in the ionosphere.
6. Ionospheric absorption.
7. Non linear effects in the ionosphere.

The Secretary,
E. Herbays.

Commission VI

On February 14th, Prof. Dr. van der Pol sent the following letter to the members of Commission VI.

Dear Sir,

Further to my note of 28th January, I should like to inform you that I have received a suggestion that the documents for the meetings of Commission VI during the Xth General Assembly should also contain *survey* papers, summarizing recent developments in the subjects on the programme.

I think this is an excellent idea, and hope that such surveys will be submitted, thus rendering the discussions more fruitful.

Yours faithfully,

(*sgd*) Balth. VAN DER POL,
President, U.R.S.I. Commission VI.

INFORMATIONS

List of Official Members of Commissions appointed by National Committees

Commission I

ON MEASUREMENTS AND STANDARDIZATION

President : Dr. J. HOWARD DELLINGER, 3900, Connecticut Avenue, N. W., Washington, 8, D. C., U. S. A.

Australia : F. J. LEHANY, Division of Electrotechnology (C.S.I. R.O.). National Standards Laboratory, University Grounds, Chippendale, N.S.W.

Canada : Dr. J. T. HENDERSON, National Research Council, Ottawa, Ontario.

France : Mr. P. ABADIE, Ingénieur en Chef, Laboratoire National de Radioélectricité, 196, Rue de Paris, Bagneux, Seine.

Great Britain : Mr. C. W. OATLEY, University Lecturer, 89, Gilbert Road, Cambridge.

Italy : Prof. F. VECCHIACCHI, Via Palestrina, 12, Milan.

Japan : Dr. Issac KOGA, Professor, Electrical Engineering Department Faculty of Engineering, University of Tokyo, Bunkyo-ku, Tokyo.

Netherlands : M. Ir. J. J. VORMER, Joh. Bildersstraat, 52, The Hague.

Sweden : Dr. Mauritz Vos, Chief Engineer, L.M. Ericsson Co, Stockholm, 32.

Union of South Africa : Mr. F. J. HEWITT, Officer-in-Charge, Telecommunications Research Laboratory of the C.S.I.R., c/o Department of Electrical Engineering, University of the Witwatersrand, Johannesburg, Tvl.

United States of America : Mr. F. J. GAFFNEY, General Manager, Polytechnic Research and Development Cy, 202, Tillary Street, Brooklyn, 1, N. Y.

Yugoslavia : Prof. A. DAMIANOVITCH, Conseil des Académies de la R.F.P.Y., Proleterskih brigada, 51, Belgrade.

Commission II

ON WAVES AND TROPOSPHERE

President : Dr. Ch. R. BURROWS, Director, School of Electrical Engineering, Cornell University, Ithaca, New York, U. S. A.

Australia : Mr. A. H. CANNON, P.M.G. Research Laboratories, 59, Little Collins Street, Melbourne, Victoria.

Canada : Dr. J. S. MARSHALL, Physics Department, McGill University, Montreal, 2, Quebec.

France : Mr. J. VOGE, Ingénieur au Département Tubes et Hyperfréquences du C.N.E.T., 149, Boulevard Bineau, Neuilly s/Seine, Seine.

Great Britain : Dr. R. L. SMITH-ROSE, Director, Radio Research Station, Ditton Park, Slough, Bucks.

Italy : M. Ing. T. GORIO, 248, Viale Trastevere, Rome.

Japan : Dr. Hisanao HATAKEYAMA, Director, Meteorological Research Institute, Mabashi, Suginami-ku, Tokyo.

Morocco : Mr. G. BIDAULT, Géophysicien, Service de Physique du Globe et de Météorologie, 2, Rue de Foucauld, Casablanca.

Netherlands : Drs. A. HAUER, Biltsestraatweg, 57, de Bilt.

Sweden : Dr. Mauritz Vos, Chief Engineer, L. M. Ericsson Co, Stockholm, 32.

Union of South Africa : Mr. F. J. HEWITT, Officer-in-Charge, Telecommunications Research Laboratory of the C.S.I.R., c/o Department of Electrical Engineering, University of the Witwatersrand, Johannesburg, Tvl.

United States of America : Dr. A. W. STRAITON, Professor of Electrical Engineering, University of Texas, Austin, Texas.

Yugoslavia : Prof. A. DAMIANOVITCH, Conseil des Académies de la R.F.P.Y., Proleterskih brigada, 51, Belgrade.

Commission III

ON WAVES AND IONOSPHERE

President : Sir Edward APPLETON, Principal and Vice-Chancellor of the University, The Old College, South Bridge, Edinburgh, (Scotland).

Australia : Dr. D. F. Martyn, Radio Research Board, Canberra Section, c/o Commonwealth Observatory, Mount Stromlo, Canberra, A.C.T.

Canada : Mr. J. C. W. SCOTT, Defence Research Board, Ottawa, Ontario.

France : R. P. LEJAY, Directeur du Bureau Ionosphérique Français, Laboratoire National de Radioélectricité, 196, Rue de Paris, Bagneux, Seine.

Great Britain : Mr. J. A. RATCLIFFE, Cavendish Laboratory, Cambridge.

Italy : Prof. M. BOELLA, Istituto Elettrotecnica Nazionale, G. Ferraris, Corso Massimo d'Azeglio, 42, Torino.

Japan : Dr. Ken-ichi MAEDA, Chief of the Research Division, Electrical Communication Laboratory, Kichijyoji, Musashino City, Tokyo Prefecture.

Morocco : Dr. A. HAUBERT, Immeuble du Parc, Fedala.

Netherlands : Dr. J. VELDKAMP, Koninlijk Nederlandsch Meteorologisch Instituut, de Bilt.

Sweden : Mr. Sven GEJER, Director of Section, Royal Board of Swedish Telegraphs, Stockholm, 16.

Union of South Africa : Mr. F. J. HEWITT, Officer-in-Charge, Telecommunications Research Laboratory of the C.S.I.R., c/o Department of Electrical Engineering, University of the Witwatersrand, Johannesburg, Tvl.

United States : Dr. H. G. BOOKER, School of Electrical Engineering, Cornell University, Ithaca, N. Y.

Yugoslavia : Prof. A. DAMIANOVITCH, Conseil des Académies de la R.F.P.Y., Proleterskih brigada, 51, Belgrade.

Commission IV

ON TERRESTRIAL ATMOSPHERICS

President : Prof. H. Norinder, Institutet för Högspanningsforskning, Uppsala, Sweden.

Australia : Dr. A. L. Green, Officer-in-Charge, Ionospheric Prediction Service, 16, Wylde Street, Potts Point, N.S.W.

France : Mr. R. Rivault, Faculté des Sciences, 2, Rue de l'Université, Poitiers, Vienne.

Great Britain : Mr. F. Horner, Engineer, National Physical Laboratory, Teddington, Middlesex.

Italy : Prof. V. Gori, Istituto Superiore P. F., 189 Viale Trastevere, Rome.

Japan : Dr. Atsushi Kimpara, Professor in the Nagoya University, Director of the Research Institute of Atmospherics belonging to the Nagoya University, Ichida-cho, Toyokawa City, Aichi Prefect.

Morocco : Mr. Tilloloy, A., Ingénieur, Chef des Transmissions, Météorologie Nationale, Camp Cazes, Casablanca.

Netherlands : M. Ir. J. Bloemsma, Mient 551, The Hague.

Sweden : Prof. Harald Norinder.

Union of South Africa : Dr. B. J. Schonland, Director, Bernard Price Institute for Geophysical Research, University of the Witwatersrand, Johannesburg, Tvl.

United States : Mr. H. E. Dinger, Naval Research Laboratory, Radio 2, Bldg. 26, Room 200, Washington, 20 (D.C.).

Yugoslavia : Prof. A. Damianovitch, Conseil des Académies de la R.F.P.Y., Proleterskih brigada, 51, Belgrade.

Commission V

ON RADIO-ASTRONOMY

President : Dr. D. F. Martyn, Radio Research Board, Canberra Section Commonwealth Observatory, Mount Stromlo, Canberra, (A.C.T.), Australia.

Australia : Dr. J. L. Pawsey, Radiophysics Laboratory, University Grounds, Chippendale, N.S.W.

Canada : Dr. R. E. WILLIAMSON, David Dunlap Observatory, Richmond Hill, Ontario.

France : M. LAFFINEUR, Institut d'Astrophysique, 98, Boulevard Arago, Paris (XIIe).

Great Britain : Dr. A. C. B. LOVELL. The Quinta, Swetenham near Congleton (Cheshire).

Italy : Prof. Giorgio ABETTI, Direttore dell' Osservatorio Astronomico, Arcetri-Firenze.

Japan : Dr. Yusuke HAGIHARA, Professor, University of Tokyo, Director of the Tokyo Astronomical Observatory, Mitaka near Tokyo.

Morocco : Prof. E. VASSY, Faculté des Sciences de Paris, Physique de l'Atmosphère, 1, Quai Branly, Paris (VIIe).

Netherlands : Prof. Dr. M. G. MINNAERT, Zonnenburg, 2, Utrecht.

Sweden : Prof. Olof RYDBECK, Chalmers Institute of Technology, Gotheburg.

Union of South Africa : Mr. F. J. HEWITT, Officer-in-Charge, Telecommunications Research Laboratory of the C.S.I.R., c/o Department of Electrical Engineering, University of the Witwatersrand, Johannesburg, Tvl.

United States : Mr. A. H. SHAPLEY, Central Radio Propagation Laboratory, National Bureau of Standards, Washington, 25 (D.C.).

Yugoslavia : Prof. A. DAMIANOVITCH, Conseil des Académies de la R.F.P.Y., Proleterskih brigada, 51, Belgrade.

Commission VI

ON WAVES AND CIRCUITS

President : Prof. Dr. B. VAN DER POL, 22, Chemin Krieg, Genève (Suisse).

Australia : Dr. J. C. JAEGER. Physics Department, University of Tasmania, Hobart, Tasmania.

Canada : Dr. G. SINCLAIR, University of Toronto, Toronto, Ontario.

France : Mr. J. LOEB, Chef du Département Télécommande du C.N.E.T., 1, Avenue de la République, Issy-les-Moulineaux.

Great Britain : Mr. W. PROCTOR-WILSON, British Broadcasting Corporation, Engineering Research Department, 42/44, Nightingale Square, Balham, London S.W. 12.

Italy : Prof. Algeri MARINO, Via Guido d'Arezzo, 14, Rome.

Japan : Dr. Kiyoshi MORITA, Professor, Tokyo Institute of Technology, O-okayama, Meguro-ku, Tokyo.

Netherlands : Dr. C. J. BOUWKAMP, Goorstraat, 10, Eindhoven.

Sweden : Prof. Erik HALLEN, Royal Institute of Technology, Stockholm, 26.

Union of South Africa : Mr. F. J. HEWITT, Officer-in-Charge, Telecommunications Research Laboratory of the C.S.I.R., c/o Department of Electrical Engineering, University of the Witwatersrand, Johannesburg, Tvl.

United States : Dr. Samuel SILVER, Associate Professor of Electrical Engineering, University of California, Berkeley, California.

Yugoslavia : Prof. A. DAMIANOVITCH, Conseil des Académies de la R.F.P.Y., Proleterskih brigada, 51, Belgrade.

Commission VII

ON ELECTRONICS

President : Mr. G. LEHMANN, Ingénieur Conseil, 105, Avenue Victor Hugo, Paris (XVI^{e}).

Australia : Mr. R. E. AITCHESON, Electrical Engineering Department, University of Sydney, Sydney, N.S.W.

Canada : Dr. Pierre BRICOUT, Laval University, Quebec, P.Q.

France : Mr. G. LEHMANN.

Great Britain : Prof. J. SAYERS, The University, Edgbaston, Birmingham, 15.

Italy : Prof. Nello CARRARA, Direttore del Centro di Studio per la fisica delle microonde, Viale Morgagni, 48, Firenze.

Japan : Dr. Masao KOTANI, Professor, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo.

Netherlands : Dr. Ir. J. L. H. JONKER, Broerelaan, 12, Eindhoven.

Sweden : Prof. Hannes ALFVEN, Royal Institute of Technology, Stockholm, 26.

Union of South Africa : Mr. F. J. HEWITT, Officer-in-Charge, Telecommunications Research Laboratory of the C.S.I.R., c/o Department of Electrical Engineering, University of the Witwatersrand, Johannesburg, Tvl.

United States : Dr. J. A. MORTON, Bell Telephone Laboratories, 463, West Street, New York, 14, N. Y.

Yugoslavia : Prof. A. DAMIANOVITCH, Conseil des Académies de la R.F.P.Y, Proleterskih brigada, 51, Belgrade.

* * *

Readers are kindly requested to inform the General Secretariat of errors they would notice in the above lists.

NATIONAL COMMITTEES

Membership

CANADA

The following have been appointed members of the Canadian National Committee (See *Inf. Bull.*, n° 72, p. 6).

Dr. R. C. WILLIAMSON, David Dunlap Observatory, Richmond Hill, Ontario.

Dr. J. S. MARSHALL, McGill University, Montreal.

NETHERLANDS

President : Prof. Ir. B. D. H. TELLEGEN, Tongelresestraat, 193, Eindhoven.

Secretary : Ir. M. L. TOPPINGA, Vlakte van Waalsdorp, The Hague.

Treasurer : Prof. Dr. Ir. J. P. SCHOUTEN, Poortlandpl. 2, Delft.

Members :

Ir. J. W. ALEXANDER, Loosdrechtseweg, 146, Hilversum.
Ir. J. BLOEMSMA, Mient 551, The Hague.
Dr. C. J. BOUWKAMP, Goorstraat, 10, Eindhoven.
Dr. H. BREMMER, Markt, 35, Eindhoven.
Ir. B. VAN DIJL, Prins W. van Oranjel, 25, Naarden.
Ir. A. DE HAAS, Kanaalweg, 3, Scheveningen.
Drs. A. HAUER, Biltsestraatw., 57, de Bilt.
J. HOUTSMULLER, Prins Mauritz laan, 69, The Hague.
Dr. Ir. J. L. H. JONKER, Broerelaan, 12, Eindhoven.
Prof. Dr. M. G. MINNAERT, Zonnenburg, 2, Utrecht.
Prof. Dr. J. H. OORT, Sterrewacht, 5, Leide.
Ir. J. PIKET, Jongeneelstraat, 11, Scheveningen.
Prof. Dr. B. VAN DER POL, Chemin Krieg, 22, Geneva (Switzerland).
Dr. J. F. SCHOUTEN, Fazantlaan, 11, Eindhoven.

Dr. J. VELDKAMP, K.N.M.I., de Bilt.
Ir. A. H. DE VOOGT, Scheveningseweg, 6, The Hague.
Ir. J. J. VORMER, Joh. Bildersstraat, 52, The Hague.
Jhr. Dr. Ir. C. Th. F. VAN DER WIJCK, van Stolkweg, 1*a*, The Hague.

SWEDEN

Membership for the period 1952-1954

President : Dr. Hakan STERKY, Director General, Royal Board of Swedish Telegraphs, Stockholm, 16.

Ordinary Members :

Prof. Hannes ALFVEN, Royal Institute of Technology, Stockholm, 26.
Mr. Hilding BJÖRKLUND, Lieutenant-Colonel, Director of Army Signal Laboratory, Stockholm, 61.
Mr. Alf BRIGGE, Chief Naval Engineer, Admiralty, Stockholm, 80.
Prof. Stig EKELÖF, Chalmers Institute of Technology, Göteborg.
Mr. Erik ESPING, Director of Section, Royal Board of Swedish Telegraphs, Stockholm, 16.
Mr. Martin FEHRM, Chief of Section, Research Institute for National Defence, Stockholm, 16.
Mr. Sven GEJER (*Secretary*), Director of Section, Royal Board of Swedish Telegraphs, Stockholm, 16.
Prof. Erik HALLEN, Royal Institute of Technology, Stockholm, 26.
Mr. Hugo LARSSON, Chief of Section, Royal Swedish Air Board, Stockholm, 80.
Dr. Ferdinand LINDHOLM, The Swedish Meteorological and Hydrological Institute, Stockholm, 12.
Prof. Erik LÖFGREN, Royal Institute of Technology, Stockholm, 26.
Prof. Harald NORINDER, Institute of High Tension Research, Uppsala.
Prof. O. RYDBECK, Chalmers, Chalmers Institute of Technology, Göteborg.
Dr. Mauritz VOS (*Vice-President*), Chief Engineer, L. M. Ericsson Cy, Stockholm, 32.
Dr. Yngve ÖHMAN, Observator, Stockholm Observatory, Saltsjöbaden.

Associated Members :

Mr. Bertil AGDUR, M. E. E., Chalmers Institute of Technology, Göteborg.
Dr. Nils AMBOLT, Royal Hydrographical Survey Office, Stockholm, 100.
Dr. Carl-Gustav AURELL, L. M. Ericsson, Cy, Stockholm, 32.
Mr. Bertil HÅÅRD, L. M. Ericsson Cy, Stockholm, 32.
Mr. Bengt JOSEPHSON, Research Institute for National Defence, Stockholm, 16.
Mr. Rune LINDQUIST, Chalmers Institute of Technology, Göteborg.
Director Arne SCHLEIMANN-JENSEN, Schleimann-Jensen Laboratories, Alingsasvägen, Johanneshov.
Mr. Carl VON SIVERS, Sivers Lab., Kristallvägen, 18, Hägersten.
Mr. Gunnar SVALA, L. M. Ericsson Cy, Stockholm, 32.
Mr. Gustaf SWEDENBORG, Director of Section, Royal Board of Swedish Telegraphs, Stockholm, 16.
Mr. Sigvard TOMNER, A. B. Svenska Elektronrör (Swedish Electron Valves Cy), Stockholm, 20.
Mr. Torkel WALLMARK, Royal Institute of Technology, Stockholm, 26.
Mr. Tord WIKLAND, Research Institute for National Defence, Stockholm, 16.
Mr. Per AKERLIND, Royal Board of Swedish Telegraphs, Stockholm, 16.

YUGOSLAVIA

Secretary : Prof. Aleksandar DAMJANOVITCH, Conseil des Académies de la R.F.P.Y., Proleterskih brigada, 51, Belgrade.

Members :

M.M. Josip LONCAR, Faculté Technique, Zagreb.
Dusan LASITCH, Ecole Polytechnique, Ljubljana.
Radovan MARKOVITCH, Faculté Electrotechnique, Belgrade.
Marjan GRUDEN, Ecole Polytechnique, Ljubljana.
Vinko ALBERT, Faculté Technique, Zagreb.
Mihailo MASIREVITCH, Institut « Nikola Tesla », Belgrade.

Prof. Damjanovitch will act as associated Editor of the *Information Bulletin* and as Official members of each of the U.R.S.I. commissions.

Reports

RESULTS OF RECENT IONOSPHERIC RESEARCHES CARRIED OUT IN INDIA

(*Summary*)

The report gives an outline of the important research works on the ionosphere and associated problems carried out in India during the years 1950-51. The problems investigated are the following :

A. — A comprehensive analysis of ionospheric data recorded at Calcutta (Lat. 22° N, Long. 88° E) in the solar half cycle January 1945 to June 1950. This consists of the determinations of the rate of electron production, effective coefficient of recombination, temperature, solar and lunar tides; studies of the abnormalities in the ionosphere and also associations of thunderstorm, meteoric shower and solar activity with ionospheric conditions.

B. — Theoretical study on ionospheric tides taking into account the variation of tidal velocity with height and time and the effect of both tides and variation of recombination coefficient on the F2 region.

C. — Theoretical studies on the origin, structure and reflecting properties of the D region of the ionosphere.

D. — Studies on sporadic E including, among other things, a worldwide survey of E*s* ionization and E*s* occurrences.

E. — Studies on sodium in the upper atmosphere with particular reference to the excitation of sodium lines in the twilight flash and in the night air-glow.

F. — Studies on the mechanism of production of nitrogen atoms in the upper atmosphere.

G. — Development of an improved pulse technique for ionospheric sounding.

H. — Rigorous theoretical treatment of the problem of propagation of radio waves through the ionosphere.

I. — Studies of the fading of short wave signals and its dependence on ionospheric condition.

J. — Studies on the polarization of down coming waves.

Introduction

Researches on the ionosphere were first started in India in 1930 at the University College of Science and Technology, Calcutta, under Professor S. K. Mitra. This was followed later at Allahabad under Professor M. N. Saha and at Banaras under Dr. S. S. Banerjee and Dr. S. R. Khastgir. The work in Allahabad was, however, discontinued after the departure in 1938, of Professor M. N. Saha to Calcutta. At present regular research programmes are being pursued at Calcutta and at Banaras only. Apart from these, routine observations with "pulse" equipments are also being taken at Madras, Bombay, Delhi and Tiruchirapalli under the auspices of All India Radio. In what follows an account is given of the important results obtained at Calcutta and at Banaras during the years 1949-51.

A. — Ionosphere over Calcutta

(Solar half cycle January 1945 to June 1950)

A comprehensive analysis has been made of ionospheric data recorded at Calcutta in the solar half cycle January 1945 to June 1950. The analysis consisted of the following :

(*a*) *Determination of ionospheric parameters.*

(i) *Rate of electron production.* — The diurnal variation curves for the rate, specially for Region F2, were found to possess a curious dip round noontime when the determinations were made on the assumption (made initially by Appleton and retained by Seaton) that the recombination coefficient (α) is the same at times equally distant from noon. When this assumption was abandoned and a more reasonable assumption made relating α to pressure and electron density, the noon time dip almost vanished.

(ii) *Effective coefficient of recombination.* — The effective coefficient of recombination (α) was determined for both day and night-time conditions for Region E for the period 1947-48, and for Region F2 for the period 1945-48. The average values were 10^{-9} cm^3/sec for Region E and 10^{-11} for Region F2. The values were variable, for both the regions the variations being much larger for Region F2. They were smaller at day-time than at night-time and smaller in summer than in winter.

(iii) *Temperature.* — Temperatures in the E and F2 regions of the ionosphere were estimated from measured values of scale height. At the E-region heights, winter and summer temperatures were 190° K and 220° K respectively on the assumption of atomic oxygen as the active gas, and 380° K and 450° K on the assumption of molecular oxygen as the active gas.

As the F2 region heights the temperature was found to vary from 700° K in winter to 1200° K in summer (for the period of high solar activity) and from 500° K in winter to 900° K in summer (for the period of low solar activity). The temperature distribution was found to become steeper in the following order : summer, equinox and winter.

(iv) *Intensity of the earth's magnetic field.* — The intensity of the earth's magnetic field at the height of the F2 region was measured on about 150 occasions. Most of the values obtained lie around the theoretical value 0.36 Gauss as calculated according to the inverse cube law. A curious seasonal variation of the magnetic field, obtained earlier by Scott, was also observed.

(v) *Solar and lunar ionospheric tides.* — Ionospheric tidal effects were isolated from the data of Calcutta. The solar tidal drift was found to consist of two predominant components — a semi-diurnal drift and a seasonal drift. The two components have nearly the same velocity.

The resultant tidal drift velocities was found to be 12 km/hr. for both summer and winter and 17 km/hr for the equinoxes. The lunar tidal harmonics at Calcutta (and also at Delhi) are shown in Table I.

TABLE I

Station	Variation of h_{max}		Variation of F2	
	Amplitude (km)	Phase of Max. (lunar hour)	Amplitude %	Phase of Max. (lunar hour)
Calcutta (22° N, 88° E)	2.0	4.0	0.5	6.0
Delhi (28° N, 77° E)	3.0	5.2	1.25	7.5

(*b*) 27-*day recurrence tendency in ionospheric abnormality.* — Search has been made for any 27-day recurrence tendency of ionospheric disturbances in the F-region to correlate F2 region abnormalities with solar disturbances. For this purpose the method adopted by Chree has been followed. Clear evidence of the existence of a 27-day recurrence period in the repetition of ionospheric abnormality has been observed.

(c) *Comparative study of ionospheric data from different parts of the world.* — A comparison of ionospheric characteristics over Calcutta with those at other places has shown the following longitude effects :

(i) The monthly average mid-day values of ionization for both E and F regions for stations situated at different latitudes, do not exactly follow the $\sqrt{\cos \chi}$ law. The region E character figure $\frac{(f\text{o}E)^4}{\cos \chi}$ decreases from equator to pole.

(ii) Stations equally distant north and south of the equator do not possess identical ionospheric characteristics.

(iii) The ionospheric characteristics at Calcutta correspond more to those at Madras than to those at Delhi. This is because the geomagnetic latitude of Calcutta is closer to Madras than to Delhi.

(d) *Association of ionospheric changes with some terrestrial and cosmic phenomena.*

(i) *Thunderstorm.* — Some association of the occurrence of sporadic E has been found with the occurrence of thunderstorms (March-July).

(ii) *Meteoric shower.* — Results of earlier observations made in this laboratory, namely, that E region ionization is abnormally increased during periods of meteoric shower, have been confirmed. Calculations for the meteor shower on August 11, 1947 showed that about 3000 meteors fell over an area of 100 metre radius during the maximum of the shower.

(iii) *Solar activity.* — Over the period of the half solar cycle under consideration significant correlation between the monthly average midday foE and Zurich sunspot numbers was obtained. A linear relation between foF2 variations and sunspot numbers has been found. This relation has been utilized in drawing a nomogram for the variation of the yearly average value of foF2 for each hour of the day.

B. — Studies on Ionospheric Tides

Martyn's theory of tides in the ionosphere has been critically studied and the theory has been extended in respect of the following :

(i) A theory has been worked out in which the F2-region is assumed to be acted upon by a tidal velocity which is a function of both height and time. Results obtained are in general agreement with Martyn's results but are more complex.

(ii) In a later work, the simultaneous effects of both tides and height variation of the recombination coefficient on the F2 region have been considered. It became apparent that the effects of recombination coefficient variation and tides are comparable and, excepting at the top of the F2 region, the effect of the former cannot be ignored. The theory has also yielded a method by which both tidal drifts and recombination coefficients can be estimated with much more precision than was possible uptil now.

C. — The D region of the Ionosphere

The origin, structure and reflecting properties of the normal D region have been studied in the light of the experimental data as obtained in England and U. S. A. for long- and very-long-waves. Investigations show that the normal D region is a bank of ionization stretching from 50 km to about 100 km where it merges with the E layer. The D region is known to be produced by ionization of O_2 at the first ionization potential. Considerations of height variations of temperature and recombination coefficient showed that in the D region the electron distribution has no maximum, though, the ion distribution has a maximum at nearly the height where the rate of ion production is maximum. Further, the concentration of ions specially at the tail of the D region is far greater than in the E layer. Detailed calculations have shown that the D region structure as deduced (which is roughly exponential) can explain the observed variation of the reflecting height with solar zenith angle, and also the frequency spectrum of reflection coefficient for long- and very-long-waves.

D. — Studies on sporadic E

A survey of the world wide E*s* ionization and E*s* occurrence has been made. Of the three possible sources of E*s* ionization, (i) meteors, (ii) "runaway" electrons from thunder clouds and (iii) extra-terrestrial corpuscles, the first two sources are found to be predominantly operative in low-latitude stations and the last in high-latitude stations.

Relative amounts of scattering and reflection from sporadic E clouds have also been investigated. It has been observed that the E*s* echo contains a randomly scattered component as well as a steady reflection component. The two components are of comparable intensity.

E. — Sodium in the upper atmosphere

Studies have been made on the various excitation processes of sodium both in the twilight flash and in the night air-glow emission. It is shown that the most probable mode of production of the twilight flash is resonance excitation of neutral sodium atoms in 35-65 km region by solar radiation λ 5893, there being no significant effect of ozone screening. Examination of the excitation process of the night sky air-glow shows that the excitation must be due, at least partly, to the bombarding of the upper atmospheric regions by extra-terrestrial particles.

F. — Atomic nitrogen in the upper atmosphere

The production of atomic nitrogen in the upper atmosphere has been considered. It has ben shown that under certain conditions the dissociative recombination process has a high probability :

$$N^{+}_{2}(x') + e \rightarrow N(2P) + N(2D)$$

The reaction explains the emission of the observed atomic nitrogen lines in auroras. The above process will be predominent only in auroral regions, and, as such, atomic nitrogen is not expected to be as widely prevalent as atomic oxygen. Atomic nitrogen, therefore, may not be one of the active gases, producing any of the regular ionospheric layers by ionization.

G. — An improved "Pulse" technique for exploring the ionosphere

Experimental investigations on (*a*) tides in the ionosphere, (*b*) gradient of ionization and thickness of the E-layer, (*c*) study of split echoes, (*d*) scattered reflection in a layer of patchy ionization and reflections from closely spaced multiple layers, demand a much higher precision than what is afforded by the conventional ionosphere sounding apparatus. The conventional apparatus uses pulses of 100-200 μsec duration and a single line time base usually producing a sweep of 20 milliseconds, which limits the height measuring accuracy to the order of 10 km. A satisfactory investigation of the above-mentioned phenomenon requires an accuracy of 1 km. The height measuring accuracy could be improved by using pulses of shorter duration together with a faster time base. The frequency spectrum of a short duration pulse occupies a wider band and this reduces the accuracy of the frequency determination. This is a somewhat inherent defect of the conventional method of sounding.

An apparatus has been developed that utilises a triggered raster time base that produces twelve lines, each corresponding to 50 km or 333 μsec. Attempt was made to reduce the pulse duration to three microseconds. The transmitter utilises a pulse which can produce pulses of 2-20 μsec duration. The oscillator pulse is, however, broadened to 8-30 μsec because oscillations once excited, take a time of that order of magnitude to die out. The shorter duration demands a correspondingly higher peak power, to keep the energy per pulse packet the same as before. The transmitter is therefore designed to be able to work with a peak input of 50-100 kw. The receiver at present used possesses a 3 db bandwith of 90 kc/s and produces pulses of base width of about 15-20 μsecs The pulses as observed on the receiver oscilloscope have a triangular shape with a very well defined tip. It is therefore easy to measure heights with an accuracy of 1 km, in spite of a base width of 4 to 8 km. With the short pulses the transmitter is capable of producing it would be advantageous to use a receiver of 200 kc/s bandwidth which would produce a proportionate improvement in the accuracy of height measurement.

The accuracy of frequency measurement is retained because the receiver incorporates a frequency responsive output channel (non-responsive to amplitude variations such as are used in a frequency modulation receiver) which produces an up and down shaped pulse on the oscilloscope. The center frequency corresponds to the middle-point of this output pulse, so that the time delay for the center frequency could be accurately measured. The time delay of the adjacent frequencies can also be measured from the corresponding points. The limitations in the accuracy of the frequency measurement of the conventional method of sounding, which keeps an uncertainty as to the frequency which corresponds to the height measured from the distance between the tips of the transmitted and reflected pulses, are therefore not encountered.

The apparatus will be put into a regular operating schedule for investigation of tides and the E region gradient. The high resolution of the apparatus allows a very beautiful observation of magneto-ionic splitting and of the behaviour of the split echoes. This also may form the subject matter of a careful and critical study.

H. — Propagation of radio waves through the ionosphere

Theoretical investigations on the problem of Propagation of Radio waves in the Ionosphere have been carried out at Calcutta by Saha and his co-workers.

From the standpoint of the propagation of e. m waves, the ionosphere is a medium which is characterised by cyclotonic anisotropy, absorption and a continuously changing in homogeneity. In such a medium the propagation of an e. m. wave, specified by the field vectors ($\mathcal{E}$, $\mathcal{H}$ et $\mathfrak{D}$) is governed by the equations

$$\nabla \times \vec{\mathcal{H}} = \frac{1}{c}\frac{\partial \mathfrak{D}}{\partial t} ; \qquad \nabla \times \vec{\mathcal{E}} = -\frac{1}{c}\frac{\partial \vec{\mathcal{H}}}{\partial t} ; \qquad \vec{\mathfrak{D}} = \vec{\mathcal{E}} + 4\pi \, \mathrm{N}e\vec{\mathrm{S}}$$

(Maxwell equations)

$$\frac{d^2\vec{\mathrm{S}}}{dt^2} + \nu \frac{d\vec{\mathrm{S}}}{dt} + \frac{e}{m_0 c}\left[\vec{\mathcal{H}}_0 \times \frac{d\vec{\mathrm{S}}}{dt}\right] = \frac{e}{m_0}\vec{\mathcal{E}}$$

(Lorentz' equations)

where e, m_0, $\vec{S}$, ν and N are the charge, mass, displacement collision frequency and concentration of electrons and $\vec{\mathcal{H}}_0$ is the steady geomagnetic field. For the vertical propagation of a plane wave of pulsatance p the equation of propagation for the electric vector is :

$$\frac{d^2\vec{\mathcal{E}}}{dz^2} + \frac{p^2}{c^2}\,\varepsilon\,\vec{\mathcal{E}} = 0$$

where the elements of the tensor ε are :

$$\varepsilon_{11} = 1 - \gamma\,\frac{\beta^2 - \gamma\beta - \omega^2{}_x}{c'}, \qquad \varepsilon_{12} = -\,\varepsilon_{21} = \frac{\gamma\,(\beta - \gamma)\,\omega_z}{c'}\,;$$

$$\varepsilon_{22} = 1 - \gamma\,\frac{\beta^2 - \gamma\beta}{c'}$$

with :

$$c' = \beta\,(\beta^2 - \omega^2) - \gamma\,(\beta^2 - \omega^2{}_z), \qquad \gamma = p^2{}_0/p^2{}_v = \frac{4\,\pi N e^2}{m_0 p^2},$$

$$\beta = 1 - i\,\frac{\nu}{p} = 1 - i\delta, \qquad \vec{\omega} = \frac{e\vec{\mathcal{H}}_0}{m_0 c_p}$$

and the xz plane has been taken as the magnetic meridian with z as the vertical axis. Introducing the new dependent variables :

$$\mathrm{V} = (\mathcal{E}_x + i\rho\mathcal{E}_y)/\sqrt{1+\rho^2}, \qquad \mathrm{W} = (\mathcal{E}_x - i\mathcal{E}_y/\rho)\sqrt{1+\frac{1}{\rho^2}}$$

the equations of propagation of the two differently polarised wave become :

$$\ddot{\mathrm{V}} + (q^2{}_0 - \dot{\Phi}^2)\,\mathrm{V} = 2\,\dot{\Phi}\dot{\mathrm{W}} + \ddot{\Phi}\mathrm{W}$$

$$\ddot{\mathrm{W}} + (q^2{}_e - \dot{\Phi}^2)\,\mathrm{W} = -\,2\,\dot{\Phi}\dot{\mathrm{V}} - \ddot{\Phi}\mathrm{V}$$

where $\dot{\mathrm{V}}, \dot{\mathrm{W}},\ldots = \frac{d\mathrm{V}}{du}, \frac{d\mathrm{W}}{du},\ldots$etc., $u = \frac{p_z}{c}$, $q^2{}_0$, $q^2{}_e$ the squares of complex refractive indices of magneto-ionic theory, $\rho = \mathrm{G} - \sqrt{1+\mathrm{G}^2}$, $\mathrm{G} = \frac{\delta_c}{\gamma - \beta}$, δ_c the magnetic damping factor $\frac{\omega_x{}^2}{2\,\omega_z}$ and $\dot{\Phi} = \frac{\dot{\rho}}{1+\rho^2}$.

Assuming a Chapman or parabolic type of ion barrier and exponential variation of collision frequency, it can be shown that $\dot{\Phi}$ is negligibly small all throughout the layer except at the point $\gamma = 1$, i. e., $p^2 = p^2_0$ where it attains its maximum value $|\dot{\Phi}|_{max}$ which varies from 10^{-4} at Huancayo to 10^{-1} at Clyde River for E layer ($\nu_0' = 10^5$, half width $= 10$ km) and from 10^{-5} at Huancayo to 10^{-2} at Clyde River for F layer ($\nu_0 = 10^3$, half-width $= 50$ km) Hence we can divide this propagation into two different classes, viz.

(i) *Orthodox propagation* : In this case propagation is given by the approximate equations :

$$\frac{d^2V}{du^2} + q^2_0\, V = 0, \qquad \frac{d^2W}{du^2} + q^2_e\, W = 0,$$

which holds practically through the entire ion-layer and over the entire globe excluding a small polar belt of about 10°. In this case the solutions are approximately given by :

(O-wave) :

$$V = \frac{\mathcal{E}_x + i\rho\mathcal{E}_y}{\sqrt{1+\rho^2}} \simeq Ae^{ipt - \frac{ip}{c}\int q_0 \left[\sqrt{1 - \dot{q}^2_0/4\, q^4_0} - \dot{q}_0/2\, q^2_0\right] dz}$$

$$+ Be^{ipt + \frac{ip}{c}\int q_e \left[\sqrt{1 - \dot{q}^2_0/4\, q^4_0} + \dot{q}_0/2\, q^2_0\right] dz}$$

(*e*-wave) :

$$W = \frac{\mathcal{E}_x - i\mathcal{E}_y/\rho}{\sqrt{1+1/\rho^2}} \simeq Ce^{ipt - \frac{ip}{c}\int q_e \left[\sqrt{1 - \dot{q}^2_e/4\, q^2_e} - \dot{q}_e/2\, q^2_e\right] dz}$$

$$+ De^{ipt + \frac{ip}{c}\int q_e \left[\sqrt{1 - \dot{q}^2_e/4\, q^2_e} + \dot{q}_e/2\, q^2_e\right] dz}$$

From these solutions we can calculate the observable like path or phase retardation in the layer, the reflection coefficient and the polarisation ratio.

(ii) *Unorthodox propagation.* — In this case $\dot{\Phi}$ is not negligible and exact wave equations cannot be set up or solved. However, we can study the nature of propagation in this case by studying how $\dot{\Phi}$ varies in a $\xi\eta$ plane, where $\xi = \delta/\delta c$, $\eta = (1 - \gamma)/\delta c$ because in this plane $\dot{\Phi}$ attains its maximum value at $\xi = 1$, $\eta = 0$. Such a trajectory of the wave can be plotted for any particular station and the observable pecularities may be inferred. For stations where magnetic damping is large compared to collisional damping, region of peculiarities is reached for very large wavelengths, while for high latitude stations, peculiarities are observed near critical frequency.

I. — Fading of short wave signals

(*a*) Study on the intensity variation of short wave radio signals has been in progress at the Hindu University, Banaras for some years past. For this purpose Banerjee and his co-workers used signals transmitted from the various stations of the All India Radio. Their receiving equipment consisted of a vertically polarized aerial, a super-heterodyne receiver and an ink-recorder specially designed for quick recording. Important results obtained are the following :

(i) Fading pattern recorded were found to be of two types viz. random and periodic.

(ii) Very slow variations in the ionospheric heights and in the electronic density which are otherwise difficult to measure have been determined from the periodic fading patterns. The results are interpreted as due to thermal expansion of the layer and/or to its vertical movements.

(iii) Fading patterns were found to depend primarily on the condition of the ionosphere and not on the distance between the transmitter and receiver as hitherto believed. Hence, from a study of such fading patterns, short range forecasting of ionospheric disturbances and irregularities is possible for timely warning to the radio traffic.

(iv) It has been shown that for long distance transmission, diversity reception may be accomplished within a much smaller space on the ground with the vertically spaced aerial than that required for horizontally spaced ones.

(v) The fading records indicate the presence of "undulations" and irregularities in the ionosphere. Hence anomalies in the multiple reflections from the ionosphere, are explained. From these observations the location and movement of the undulations may be determined. It has been generally found that the undulations which are more pronounced in the evening hours, move from east to west at Banaras.

(vi) The possibility of the measurement of the absorption of radio waves from a study of the periodic fading patterns near the maximum usable frequency has been shown.

(*b*) Khastgir and his co-workers are also pursuing a programme of research on fading of radio signals at Banaras using practically the same method as that of Banerjee, excepting that the recording is done photographically. Important results obtained are the following :

(i) The theory that random fading may be explained in terms of the interference of waves scattered from the various diffracting centres in the ionosphere, has been examined with the following results :

For medium waves, the fading observations are consistent with the theory of random scattering in a few cases. For others there was substantial disagreement.

(ii) Regarding the periodic fading patterns, these were found to be of three types : Quick, slow, and slow with superposed secondary structure. The first was identified with the Appleton-Beynon type originating from the interference of magneto-ionic components. The second was explained as due to the "beat" effect between the singly and the doubly reflected waves from the F region or between the singly reflected waves from the E and F regions — it being assumed that the two interfering waves suffer different amounts of Doppler shifts in frequency due to vertical movement of the ionospheric layers in the evening or in early night hours. The third type was assumed to be due to a combination of the first two types.

J. — Study of polarization of down-coming waves

The polarization characteristics of the down-coming medium waves from Delhi, Lucknow and Allahabad are being studied at Banaras by Khastgir and his co-workers. Their experimental arrangement is essentially the same as that of Ratcliffe and White. Important results obtained so far are the following :

(i) It has been found that only ordinary waves with a left-handed sense of rotation are received, the extraordinary waves being absorbed.

(ii) Ordinary waves were found to be generally elliptically polarized, linear and circular polarizations being observed only in particular cases.

(iii) The ratio of the normal and abnormal components and the phase difference between them were found to vary in a random manner. For linear pattern, phase difference was usually less than $\pi/2$. For circular polarization, normal and abnormal components were equal in magnitude with a phase difference of $\pi/2$.

(iv) Contrary to the result obtained by Ratcliffe and White, circular patterns were not found to be associated with strong signals.

REPORT OF THE JAPANESE NATIONAL COMMITTEE TO COMMISSION I

by I. Koga

I. — Scientific and administrative activities

To improve the quality of standard waves (JJY and JJY2) and standard time signals the Wireless Time Signal Committee has been established since 1947, members of which are researchers at the Tokyo Astronomical Observatory and the Central Meteorological Observatory, University people, staffs of the Ministry of Telecommunication and the Radio Regulatory Agency.

Standard waves are broadcast during the whole 24 hours and these waves are suppressed for about 0.02 second every second and for about 0.2 second evrey minute throughout.

This style of transmission has been adopted by the Committee after extensive study and has been carried on since January 1st, 1951, having been utilized many times for the scientific works.

This style of transmission, that is, suppressing the standard wave completely as a time signal, is very convenient and economical for the reception, because not only the output of receiver can be made powerful enough very easily but the fastest signal can be distinctly catched even when the wave propagates through its multiple path from the transmitting station.

At present, according to our conclusion, we hope our system would be retained at least in our country to economize the cost of receiving apparata and to assure the sufficient output for many simple and inexpensive receivers, although our system is different from that recommended by the last C.C.I.R. meeting.

Improvement of quartz oscillating crystal to be used for crystal clock is being continually made by several researchers, among whom are : Prof. I. Koga and his collaborators at the Tokyo University and the Tokyo Institute of Technology, Prof. N. Takagi and his assistants at the Institute for Industrial Science of the Tokyo University. The thickness modes of vibration of a quartz plate, especially concerning those of the so-called near-by frequency, have been extensively studied, and the result will appear in near future.

II. — Procedures taken on resolutions in Zurich

For the resolution (1), The Wireless Time Signal Committee in cooperation with the Radio Regulatory Agency is studying the result of the reception in Japan of the present standard frequency transmission, and will get the result in near future.

For resolution (2), several research institutes, governmental, institutional and private, are cooperating for developing precise methods of measuring the power and are going to arrange for the exchange of the measuring apparatus in our country. But considerable time will be needed to become able to exchange those with other countries.

III. — The list of laboratories and observatories

(1) Radio Regulatory Agency, Aoyama, Tokyo.

(2) Electrical Communication Laboratory of the Ministry of Communication, Mitaka, Tokyo.

(3) Tokyo Institute of Technology, Meguro-ku, Tokyo.

(4) Institute of Industrial Science of the Tokyo University, Chiba near Tokyo.

(5) Institute of Technical Research Laboratory of the Broadcasting Corporation of Japan, Setagaya-ku, Tokyo.

(6) Mazde Research Laboratory of the Tokyo Shibaura Electric Kawasaki, near Tokyo.

(7) Radio Research Laboratory of the Nippon Electric Co, Kawasaki, near Tokyo.

REPORT OF COMMISSION VII

by T. Seki, Chairman

I. — Scientific and Administrative Activities

(1) The meetings were held on the following days. March 10, May 26 and Nov. 6, 1951, and 26 Jan. 1952.

(2) Four main sections of special study corresponding to the sections of Commission VII of U.R.S.I. were set up, and chairmen of the sections were appointed as follows : Fundamentals of Vacuum tubes : Shintaro Uda ; Fundamentals of gas discharge : Yoshihiro Asami ; Fundamentals of semi-conductors with application to radiophysics : Yasushi Watanabe ; Microwave spectroscopy : Masao Kotani.

(3) Cooperations were requested to main laboratories, institutions and research groups of electronics in Japan concerning to the activities of Commission VII.

(4) The main research activities were carried out in the field of research programs set up by the Commission VII at the last General Assembly, except in the field of gas discharge.

(5) In the field of the fundamentals of gas discharge, various problems were researched, for example, the noise and the mechanism of corona discharge, the characteristics and the conditions of high frequency breakdown, the characteristics of long arc, the mechanism of start of ignitron, the back voltage of hot cathode rectifier, the mechanism of ozonizer, the characteristics of Townsend discharge, the characteristics of surface discharge, the characteristics of spark of contact and the characteristics of thunder, but concerning the problems picked up at Zurich only some works were done.

II. — Work carried out in the field of the research programs set up in Zurich

(1) *Fundamentals of vacuum tubes* :

(*a*) Vacuum tube noise. The researches on the reduction coefficient of flicker noise by space charge, the abnormal noise of magnetron and the shot noise of klystron were carried out.

(*b*) Travelling wave tube including electron wave tubes. Various experimental travelling wave tubes were made, for example, the first one is working at 1500 V, 2 mA, 20 db gain, 200 mW output, and the second one is working at 2000 V, 7 mA, 10 db gain, 700 mW output, The attenuator of reflecting wave was improved by experimental research.

The theoretical researches on the space charge wave, caused by the collision ionization, the effect of dielectric pipe supporting the helical circuit, the effect of lateral motion of electrons, the characteristics of the double helical circuit, the amplification of travelling wave tube and the attenuation of wave by the thin, resistance film on the dielectric pipe were carried out, and useful results were obtained.

(*c*) Magnetrons : Five kinds of magnetron abnormal noise were found and the condition and the mechanism of the generation of them were investigated. The calculation formulars for the voltage and the magnetic field corresponding to the maximum power output were deduced on the assumption of the imperfect square distribution of the electric field, and the calculated values almost coincide with the experimental values. The formular for the electron admittance was also deduced.

(*d*) Other new development : Concerning the klystron, the effect of the coarseness of the mesh of the cavity gap electrode were calculated, and the experiments of microwave amplifier utilizing reflex klystron were carried out. Two types of microwave amplifier tube were newly developed. One of them utilizes the virtual cathode of the electron beam, and the other is a helical anode magnetron. The research on the electron beam commutator tube of radial beam type was carried out.

(2) *Fundamentals of gas discharge.* — The photo-ionization probability of oxygen atoms and ions were deduced by quantum mechanics, the mobility and energy of electrons and ions in high frequency field were calculated and the ionization index was analyzed. The high frequency oscillation of hot cathode low pressure discharge tube was investigated as a radio-noise, and the research on the double probe method of measuring electron temperature of high frequency plasma was done.

(3) *Fundamentals of semi-conductors with application to ratio physics.* — The effect of fluoric acid on the surface of silicon crystal was investigated by electron defraction method, and the oxide layer on the crystal was found very difficult to be removed. On the other side the rectifier action of silicon crystal was found to exist even when the oxide layer could not be detected by electron defraction. The effect of the heat treatment and the coating of insulator film on the rectifier action of semi-conductor was measured, and the rectifier action was explained by the difference of impurity concentration between the surface and the interior of the crystal.

The experiment of Pearson-Bardeen of the temperature effect on the prohibited band of crystal was explained theoretically. The P-type conduction of the coated layer of the oxide cathode was found out at high partial pressure of oxygen. The photo electric effect on the emission of oxide cathode was experimented.

The frequency characteristics and the temperature effect of inverse current and negative resistance of Germanium rectifier was measured.

Concerning the transistor the possibilities of bilateral amplifier and the suppression of noise by the negative feed back was theoretically discussed, and the transistor action of silicon P-N junction was found out experimentally.

The static and audio-frequency characteristics of silicon P-N junction was measured. The thermo-electro-motive force of homopolar semi-conductor was measured and the results was theoretically explained.

(4) *Microwave Spectroscopy.* — Many research workers in Japan are interested in microwave spectroscopy, which is a newly developed and important field of research.

In April 1951 a research committee on microwave spectroscopy was organized, financed by the Ministry of Education. The committee consists of members from 13 universities and 5 institutes, with Prof. Masao Kotani (Univ. of Tokyo) as chairman and Prof. Hiroo Kumagai (Univ. of Tokyo) as secretary. It aims at the liaison between researches in different laboratories and the promotion of the researches in this field in general. The committee includes researches on nuclear resonance absorption (radio-wave spectroscopy) also, in wich several of its members are specially interested.

Microwave vacuum tubes for wave-length less than 3 cm are hardly available in Japan, and this is one of the main troubles in our research.

At present the following subjects are being investigated in respective laboratories, and several remarkable results have already been obtained (Cf. the list of papers below).

Magnetic resonance absorption by ferromagnetics (Institute for Scientific Measurement, Tohoku Univ., Sendai and Institute for applied Electricity, Hokkaido Univ., Sapporo).

Magnetic resonance absorption by paramagnetics (Institute for Science and Technology, Univ. of Tokyo and Department of Physics, Univ. of Osaka).

Microwave spectroscopy of atoms (Department of Physics, Univ. of Tokyo).

Theory of microwave spectroscopy (Department of Physics, Univ. of Tokyo and Department of Physics, Univ. of Kyoto).

Radiowave spectroscopy concerning atomic nuclei (Institute for Science and Technology, Univ. of Tokyo).

Radiowave spectroscopy in relation to the structure of crystals (Institute for Science and Technology, Univ. of Tokyo; Departments of Physics in Univ. of Kyoto, Yamanashi Univ., Tokyo Univ. of Education, Univ. of Kobe, and Univ. of Nagoya).

Microwave spectroscopy of molecules (Departments of Physics of Univ. of Kyoto and Tokyo Univ. of Education; Institute for Science and Technology, Univ. of Tokyo).

III. — Main institutes and laboratories working in the field of the research programs set up in Zurich

1. Faculty of Science, Faculty of Engineering and Institute for Science and Technology, Tokyo University, Tokyo, Japan.
2. Laboratory of Production Engineering, Tokyo University, Chiba, Japan.
3. Faculty of Engineering and Electrical Communication Lab., Tohoku University, Sendai, Miyagi, Japan.
4. Faculty of Science, Faculty of Engineering and Laboratory of Industrial Science, Osaka University, Osaka, Japan.
5. Faculty of Science and Faculty of Engineering, Kyoto University, Kyoto, Japan.
6. Faculty of Engineering, Nagoya University, Nagoya, Japan.
7. Faculty of Engineering and Institute for Applied Electricity, Hokkaido University, Sapporo, Hokkaido, Japan.
8. Faculty of Engineering, Kyushu University, Fukuoka, Japan.
9. Department of Electrical Engineering, Tokyo University of Engineering, Tokyo, Japan.
10. Faculty of Science, Education University of Tokyo, Tokyo, Japan.
11. Faculty of Engineering, Yokohama University, Yokohama, Japan.
12. Faculty of Engineering, Shinshu University, Nagano, Japan.
13. Faculty of Engineering, Nippon University, Tokyo, Japan.
14. Faculty of Science and Engineering, Waseda University, Tokyo, Japan.
15. Electrical Communication Laboratory, Ministry of Telecommunications, Tokyo, Japan.
16. Electro-technical Laboratory, Ministry of Commerce and Industry, Tokyo, Japan.
17. Technical Research Laboratory, Radio Broadcasting Corporation of Japan, Tokyo, Japan.
18. Tokyo Shibaura Electric Co, Kawasaki, Kanagawa, Japan.
19. Nippon Electric Co., Kawasaki, Kanagawa, Japan.

20. Nippon Radio Co., Tokyo, Japan.
21. Central Research Laboratory, Hitachi Seisakusho Co., Tokyo, Japan.
22. Kobe Industrial Co., Kobe, Hyogo, Japan.

IV. — Main references appeared since June 1950

Abbreviations

Al. meet. : Allied great meeting of three institutes in the field of electrical engineering in Japan.

Micr. Com. : Report of Research Committee of Microwave in Japan.

Properties of Matter : Report of Research on Properties of Matter in Japan (Busseiron Kenkyu).

J.E.C.E.J. : The Journal of the Institute of Electrical Communication Engineers of Japan.

J.E.E.J. : Journal of the Institute of Electrical Engineers of Japan.

(1) *Fundamentals of Vacuum Tube*

1.1 Toyohiko Okabe, Y. Mori : Reduction of Flicker Noise by Space Charge, Ald. meet., Nov. 1951.

1.2 S. Okamura : Anomalous Noise of Magnetron, J. E. C. E. J., Vol. 8, N° 33, Aug., 1950.

1.3 Y. Taki, J. Tamiya : Noise Figure of Microwave receiver, J. E. C. E. J., Vol. 8, N° 31, June, 1950.

1.4 S. Okamura, S. Hirano : Wide Range Klystron Oscillator with Wave Guide Type Cavity, Ald. meet., May, 1951.

1.5 S. Uda and J. Ikeuchi : Gas Induction Factor of Klystron and its Effect on the Characteristics of the Tube.

1.6 T. Seki, A. Kondo, T. Jujii, J. Ikeuchi : Theory of Non-linear Distortion of Frequency Modulation of Reflex Klystron, Mic. Com., Aug., 1951.

1.7 K. Utagawa : Theoretical Researches on the travelling wave tube, J. E. C. E., Vol. 34, N° 5, May, 1951 ; Microwave Committee, Sept., 1951 ; J. E. E. J., Vol. 70, N° 737, March, 1950, Vol. 70, N° 745, Nov., 1950 ; The Materials for the Researches of the Electrical Communication Laboratory.

1.8 T. SHIMIZU : Theory of Magnetron Characteristics Considering Effect of Virtual Cathode : Ald. meet., Nov., 1951.

1.9 M. SUMI : Electron Admittance of Magnetron and Its Effect on the Load Characteristics of the Tube. Ald. meet., Nov., 1951.

1.10 Takahiro OKABE : SHF Amplification by Travelling Wave Magnetron with Helical Cathode, Mic. Com., Sept. 1951.

1.11 Takahiro OKABE : SHF Amplification Utilizing Dynamic Negative Resistance, Ald. meet., April, 1950.

1.12 T. MIYAJIMA, T. ITO, K. MIYAJI : Electron Impedance Considering Back Current, Mic. Com., Feb., 1951.

1.13 Y. KOIKE, S. NAKAYAMA : Electron Admittance of Microwave Triode, Mic. Com., Dec., 1951 and Jan., 1952.

1.14 T. SEKI, Y. NIKAIDO : Electron Gun designed by Virtual Space Charge Method, Ald. Meet., April, 1950.

(2) *Fundamentals of Gas Discharge*

2.1 K. HONDA, Y. TERADA : Pulsating Current at the initial State of Corona Discharge of a Point in the Atmosphere, Collection of Treatises of the Institute of Electrical Engineers of Japan, Vol. 2, 1950.

2.2 H. TAMAGAWA : High Frequency Discharge Characteristics in High Vacuum, Collection of Treatises of the Institute of Electrical Engineers of Japan, Vol. 2, 1950.

2.3 K. HONDA : Break Down of Highly Ionized Gas, J. E. E. J., Vol. 70, 1950.

(3) *Fundamentals of Semi-conductors with Application to Radio-Physics*

3.1 T. MUTO, S. OYAMA : Temperature Effect on the Energy Band of Electrons in the Crystal, Prop. Mat., Vol. 26, May, 1950.

3.2 Y. WATANABE, J. NISHIZAWA : Rectification Mechanism of Semiconductor, Prop. Mat., N° 31, and 33, 1950, N° 34, and 44, 1951.

3.3 K. ONO, Y. KANAI, T. TANAKA : Research on the Surface Treatment of Silicon Crystal by Electron Defraction Method, The Materials for the Researches of Electrical Communication Laboratory, N° 18, July, 1951.

3.4 Y. WATANABE : Some Circuit Considerations of the Transistor, Report of Research on Electronic Engineering, Tohoku University, 1950.

3.5 Y. WATANABE : Noise Figure of Transistor Circuits, Report of Research on Electronic Engineering, Tohoku University, 1951.

3.5 Y. WATANABE : Noise Figure of Transistor Circuits, Report of Research on Electronic Engineering, Tohoku University, 1951.

3.6 Y. Kanai : P-N Junction of Silicon, Prop. Mat., N° 36, 1951.

3.7 S. Tanuma, T. Fukuroi : Thermo-electromotive Force of Homopolar Semi-conductor, Prop. Mat., N° 38, May, 1951.

3.8 M. Hatoyama, G. Shibuya, H. Matsumoto : Characteristics of N Type Germanium Rectifier of Small Impurity Concentration, Researches of the Electro-technical Laboratory, N° 525, 1951.

3.9 M. Kikuchi : Field Effect on the Crystal Rectifier, Bulletin of the Electrotechnical Laboratory, Vol. 15, N° 7.

(4) *Microwave Spectroscopy*

Theory :

4.1 E. Ishiguro, K. Kambe and T. Usui : Spin relaxation time of chromium alum. Phys. Rev., 82, 680, 1951.

4.2 M. Mizushima : Theory of pressure broadening of spectral lines and its application to microwave spectroscopy. Phys. Rev., 83, 94, 1951.

4.3 M. Mizushima and T. Itoh : Hyperfine structure of the rotational spectra of XYZ3 type molecule where Z have electric quadrupole moment. J. Chem. Phys., 19, 739, 1951.

Absorption spectra by atoms and molecules :

4.4 K. Shimoda and T. Nishikawa : The Hyperfine Structure of Sodium by a Microwave Absorption Method. J. Phys. Soc., Japan, **6**, 512, 1951.

4.5 S. Kojima, K. Tsukada and B. Hagiwara : Microwave spectra in the neighbourhood of 10 cm. Science of Light 1, 16, 1951, in Japanese.

4.6 I. Takahashi, A. Okaya, T. Ogawa and T. Hashi : 1.5 cm Wave-length Microwave Spectroscope Memoirs, Univ. of Kyoto, Ser. A, **26**, 113, 1950.

Absorption by ferromagnetics and antiferromagnetics :

4.7 J. Itoh and T. Akioka : Ferromagnetic resonance absorption by M*o* permalloy at 2290 Mc/sec. Phys. Rev., 77, 293.

4.8 T. Hirone, H. Watanabe, J. Mizuno and N. Tsuya : On the Ferro-magnetic Absorption in Magnetite Single Crystals at 9.400 Mc/s and 4.560 Mc/s. Sci. Rep. R. I. Tohoku Univ., A2, 774, 1950.

4.9 T. Okamura, Y. Torizuka and T. Koijma : Magnetic resonance absorption in antiferromagnetic materials. Phys. Rev., 82, 285, 1951 ; full paper in Sci. Rep. RI Tohoku Univ., A3, 209, 1951.

4.10 T. Okamura and Y. Torizuka : Ferromagnetic resonance absorption in $MnOFe_2O_3$ at low temperature. Phys. Rev., 83, 847, 1951.

4.11 N. Tsuya and Y. Tachikawa : Dipolar broadening in antiferromagnetic substances. Phys. Rev., 83, 1065, 1951.

4.12 T. Okamura and T. Torizuka : Ferromagnetic resonance absorption in $NiOFe_2O_3$ and a new magnetic transition point at low temperature. Sci. Rep. RI Tohoku Univ., A3, 219, 1951.

4.13 T. Okamura, Y. Torizuka and Y. Kojima : Ferromagnetic resonance in cobalt ferrite at high temperature. Phys. Rev., 84, 372, 1951.

4.14 T. Okamura and Y. Torizuka : Microwave resonance absorption in magnetite at low temperature. Sci. Rep. RI Tohoku Univ., A3, 214, 1951.

Absorption by paramagnetics :

4.15 H. Kumagai, K. Ono, I. Hayashi, H. Abe, H. Shono, S. Tachimori, H. Ibamoto and J. Shimada : Microwave resonance absorption in manganese sulphates. Phys. Rev., 82, 954, 1951.

4.16 H. Kumagai, K. Ono, I. Hayashi, H. Abe, J. Shimada, H. Shono and H. Ibamoto : Inter-ionic distances and line width in paramagnetic resonance absorption. Phys. Rev., 83, 1077, 1951.

4.17 J. Itoh, M. Fujimoto and H. Ibamoto : Paramagnetic resonance absorption in three chlorides of copper. Phys. Rev., 83, 852, 1951.

Nuclear magnetic resonance absorption :

4.18 T. Kanda, Y. Masuda, R. Kusaka, Y. Yamagata and J. Itoh : Measurement of the F magnetic moment. Phys. Rev., 83, 1066, 1951.

4.19 Y. Kakiuchi, H. Shono, H. Komatsu and K. Kigoshi : Proton magnetic resonance absorption in hydrogen perchlorate monohydrate and the structure of oxonium ion. J. Chem. Phys., 19, 1069, 1951.

URSIGRAMS

Codes of Japanese Ursigrams

See *Inf. Bull.*, n° 73, p. 25.

Code « SPIDE » (Radio wave disturbances)

First group. — Initial sign SPIDE.

Second group. — Date and observatory.

1. 2.	Date of observation.
3. 4. 5.	Observatory (Hiraiso : 001).

Pairs of groups. — Each pair expresses the times of beginning and ending of a disturbance.

First group of pair. — Beginning of disturbance.

1. Type of disturbance	1. Sudden fade out. 3. Magnetic storm type. 5. Uncertain.
2. 3. 4. 5.	Time (hours and minutes) in U.T. of beginning of disturbance.

Second group of pair. — Ending of disturbance.

1. Type of disturbance	2. Sudden fade out. 4. Magnetic storm type. 6. Uncertain.
2. 3. 4. 5.	Time (hours and minutes) in T.U. of ending of disturbance.

Note :

(1) When the time of beginning or ending is unknown or uncertain, four figures to express the time are replaced by XXXX.

(2) When the disturbance continues from the preceding day, four figures to express the time of beginning are replaced by OOXX.

(3) When the disturbance continues to the next day, four figures to express the time of ending are replaced by 24XX.

(4) When there is no disturbance, "NIL" follows the second group.

Code « IONOS » (Ionospheric conditions)

First group. — Initial sign IONOS.

Second group. — Date observatory and general condition.

1.
2. } Date of observation.

3. Observatory by following indices.
    1. Wakkanai.
    2. Akita.
    3. Kokubunji.
    4. Yamagawa.
4. General condition of *fo*F2 by following indices.
    1. Quiet.
    2. Normal.
    3. Rather abnormal.
    4. Disturbed.
    5. Stormy(see the "Note").
5. General condition of *h'*F2 by the same indices as above.

Third group. — Values at noon.

1.
2. } Value of *fo*F2 at noon in unit of 100 kc/s.
3.

4.
5, } Value of *h'*F2 at noon in unit of 10 km.

First pair of groups starting with "O". — The lowest and highest values of *fo*F2.

First group of pair.

1. Always O.

2.–3. Lowest value of *fo*F2 in unit of 100 kc/s.

4.–5. Time in hours U.T. when *fo*F2 reaches the lowest value.

Second group of pair.

1.–3. Highest value of *fo*F2 in unit of 100 kc/s.

4.–5. Time in hours U.T. when *fo*F2 reaches the highest value.

Second pair of groups starting with "9". — The lowest and highest values of *h'*F2.

First group of pair.

1. Always 9.

2.–3. Lowest value of *h'*F2 in unit of 10 km.

4.–5. Time in hours U.T. when *h'*F2 reaches the lowest value.

Second group of pair.

1.–2. Highest value of *h'*F2 in unit of 10 km.

3.–4. Time in hours U.T. when *h'*F2 reaches the highest value.

5. Check for above two groups and two pairs of groups.

Note :

The grades of ionospheric conditions for *fo*F2 and *h'*F2 are determined by comparing the diurnal variation with the median during the preceding ten days.

Grade :

1. Fairly good coincidence (quiet).
2. Good coincidence (normal).
3. Rather good (rather normal).

4. Good coincidence in diurnal variation as a whole, but no good in detail (disturbed).
5. No coincidence in diurnal variation as a whole.

Code « COSOL »

First group. — Initial sign COSOL.

Second group. — Date and indication.

1.–2. Date of observation.
3. Ray, used for the observation, in fact always "1", because the observation at Mt. Norikura is done by green line 5303 Å only.
4.–5. Mean time of observation in hours U.T.

Following eight groups express the intensity at every position angle (north pole of the sun as origin) by the following figures.

0. Null.
1. Weak.
2. Moderate.
3. Rather strong.
4. Strong.
5. Very strong.

Third group.

1. Intensity at position angle 0°.
2. Intensity at position angle 10°.
3. Intensity at position angle 20°.
4. Intensity at position angle 30°.
5. Intensity at position angle 40°.

Fourth group :

1. Intensity at position angle 50°.
2. Intensity at position angle 60°.
3. Intensity at position angle 70°.
4. Intensity at position angle 80°.
5. Check for position angle 0° to 80° (N-E quadrant).

Fifth group.

1. Intensity at position angle 90°.
2. Intensity at position angle 100°.
3. Intensity at position angle 110°.
4. Intensity at position angle 120°.
5. Intensity at position angle 130°.

Sixth group.

1. Intensity at position angle 140°.
2. Intensity at position angle 150°.
3. Intensity at position angle 160°.
4. Intensity at position angle 170°.
5. Check for 90° to 170° (S-E quadrant).

Seventh group.

1. Intensity at position angle 180°.
2. Intensity at position angle 190°.
3. Intensity at position angle 200°.
4. Intensity at position angle 210°.
5. Intensity at position angle 220°.

Eight group.

1. Intensity at position angle 230°.
2. Intensity at position angle 240°.
3. Intensity at position angle 250°.
4. Intensity at position angle 260°.
5. Check for 180° to 260° (S-W quadrant).

Ninth group.

1. Intensity at position angle 270°.
2. Intensity at position angle 280°.
3. Intensity at position angle 290°.
4. Intensity at position angle 300°.
5. Intensity at position angle 310°.

Tenth group.

1. Intensity at position angle 320°.
2. Intensity at position angle 330°.
3. Intensity at position angle 340°.
4. Intensity at position angle 350°.
5. Check for 270° to 350° (N-W quadrant).

Code « SOLER » (Solar radio emission)

First group. — Initial sign SOLER.

Second group. — Date, station and frequency.

1.
2. } Date of observation.
3. Number of days passed since the preceding observation.
4.
5. } Station and frequency (Code N).

Third group. — Information of the general characters of the emission throughout the day.

1. Period number in which the observation was commenced (Code H_1).
2.
3. } Daily mean of the flux (French Code I_1).
4. Daily mean of the percentage of polarization (French Code P).
5. Index of variability for the day (French Code V_1).

Fourth group and the following groups (if necessary). — Each group informs the characters of the emission in each three hours period. The information given in the fourth group always reports the three hours period which was indicated by the first following three hours periods in order.

1. Hours of the effective observation during the three hours period concerned (French Code H_2).
2.
3. } Mean value of the flux (French Code I_1).
4. Mean percentage of polarization (French Code P).
5. Index of variability (French Code V_2).

Pairs of groups starting with "9". — Informations of the important bursts.

First group of pair.

1. Always 9.
2.
3.
4.
5. } Time of the beginning of the phenomenon in hours and minutes U.T.

Second group of pair.

1. Intensity of the burst (smoothed) (French Code I_2).
2. } Duration of the burst (French Code *t*).
3. }
4. Mean percentage of polarization during the burst (French Code P).
5. Type of the burst (French Code F).

Groups starting with "0". — Information of the sudden change in polarization.

1. Always 0.
2. }
3. } Time of the sudden change, in hours and minutes U.T.
4. }
5. }

Notes. — As the unit of flux, following values are used.

10^{-23} WM^{-2} $(c/s)^{-1}$ for $f < 100$ Mc/s.
10^{-22} WM^{-2} $(c/s)^{-1}$ for 100 Mc/s $\leqslant f < 1000$ Mc/s.
10^{-21} WM^{-2} $(c/s)^{-1}$ for 1000 Mc/s $\leqslant f < 10\,000$ Mc/s.
10^{-20} WM^{-2} $(c/s)^{-1}$ for 10 000 Mc/s $< f$.

Codes

(H_1) Three hours period of the day.

6. Period from 15 h. to 18 h. U.T. } the preceeding day.
7. Period from 18 h. to 21 h. U.T. }
8. Period from 21 h. to 24 h. U.T. }
1. Period from 00 h. to 03 h. U.T.
2. Period from 03 h. to 06 h. U.T.
3. Period from 06 h. to 09 h. U.T.
4. Period from 09 h. to 12 h. U.T.
5. Period from 12 h. to 15 h. U.T.

(N) Name of observing station and frequency.

01. Mitaka, 200 Mc/s.
02. Mitaka, 100 Mc/s.
03. Mitaka, 60 Mc/s.

Code « MAGNE » (Geomagnetism)

First group. — Initial sign MAGNE.

Second group. — Date and K-indices during 00-09 hours U.T.

1. }
2. } Date of observation at Kakioka.
3. K-index (preliminary) during 00-03 hours U.T.
4. K-index (preliminary) during 03-06 hours U.T.
5. K-index (preliminary) during 06-09 hours U.T.

Third group. — K-indices during 09-24 hours U.T.

1. K-index (preliminary) during 09-12 hours U.T.
2. K-index (preliminary) during 12-15 hours U.T.
3. K-index (preliminary) during 15-18 hours U.T.
4. K-index (preliminary) during 18-21 hours U.T.
5. K-index (preliminary) during 21-24 hours U.T.

Pairs of groups. — Particular phenomena.

First group of pair.

1. Type of particular phenomenon (French Code P).
2. }
3. } Time of the beginning of phenomenon in hours and
4. } minutes U.T.
5. }

Second group of pair.

1. Always X.
2. }
3. } Time of the ending of the phenomenon described in the
4. } preceding group in hours and minutes U.T.
5. }

Note. — In the pairs of groups for particular phenomena, the letter X should be used in the unknown places of time in minutes or in ten minutes.

Code « CORAY » (Cosmic ray)

First group. — Initial sign CORAY.

Second group.

1.
2. } Date of observation.
3. Always 0.
4. Observatory (Code 1).
5. Apparatus (Code 2).

Third group. — Three hours mean intensity for 0 h.-12 h. U.T. (Code 3).

1. Always 0.
2. Mean intensity for 0 h.-3 h. U.T.
3. Mean intensity for 3 h.-6 h. U.T.
4. Mean intensity for 6 h.-9 h. U.T.
5. Mean intensity for 9 h.-12 h. U.T.

Fourth groupe. — Three hours mean intensity for 12 h.-24 h. U.T. (Code 3).

1. Mean intensity for 12 h.-15 h. U.T.
2. Mean intensity for 15 h.-18 h. U.T.
3. Mean intensity for 18 h.-21 h. U.T.
4. Mean intensity for 21 h.-24 h. U.T.
5. Check for third and fourth groups.

Fifth group.

1.
2.
3. } Mean percentage of the day.
4. Classification of phenomena (Code 4).
5. Check for fifth group.

If the 4th figure of the 5th group is 0, following groups should be omitted and 5th figure of this group should be replaced by Y or Z (Code 5).

Sixth group.

1.
2.
3. } Time of beginning of unusual phenomena in hours and ten minutes U.T.
4.
5. } Time interval from the beginning to maximum or minimum in ten minutes.

When the disturbance continues to next day, last two figures of 6th group are expressed by 99.

Seventh group.

1. 2. } Percentage of maximum or minimum deviation.
3. 4. 6. } Time of maximum or minimum in hours and ten minutes U.T.

When the disturbance continues to next day, initial two figures of 7th group are expressed by 00.

Eight group.

1. 2. } Duration of the effect in hours.
3. 4. } Time of ending in hours U.T.
5. Y or Z (Code 4).

Codes

(1) Observatories.

1. Scientific Research Institute, Tokyo.
2. Meteorological Institute, Tokyo.
3. Nagoya University, Nagoya.

(2) Apparatus.

1. Counter telescope (no shielding, 85°).
2. Counter telescope (no shielding, 22°).
3. Nishina type ionization chamber (10 cm lead).
4. Counter telescope (no shielding).
5. Counter telescope (15 cm lead).
6. Counter telescope (no shielding, 40°).
7. Counter telescope (no shielding, 12°).
8. Neutron detector.

(3) Daily mean value is expressed by figure 5, and the deviation

for the three hours period from the daily mean value is described as follows.

....
....
....
7. 2 %.
6. 1 %.
5. 0 %.
4. —1 %.
3. —2 %.
....
....
....

The scale unit of the deviation for the data observed by Nagoya Univ. by apparatus in Code 2 should be doubled.

(4) Classification of unusual phenomena.

0. Calm.
1. Increase.
2. After effect of increase.
3. Decrease.
4. After effect of decrease.

(5) Y. Data of other observatory will be continued.

Z. End of all kinds of cosmic ray code.

Note. — Letter X is used in case of no observation.

IONOSPHERIC SOUNDING STATIONS

See *Information Bulletin*, nº 67, p. 8-12 ; nº 68, p. 19-21 ; nº 72, p. 20-23.

Denmark

Station at Godhavn, Greenland.

Station erected and controlled by the Danish National Committee of U.R.S.I.

Automatic Ionosphere Recorder kindly placed at the station's disposal by National Bureau of Standards, U.S.A.

Location : Latitude, 69° 14′ 51″ N.
Longitude, 53° 32′ 33″ W.

Automatic recording.

Frequency range : 1-25 Mc/s.

Pulse peak power : 10 kW.

Recurrence frequency : 50 per second.

Sweeping : 18 seconds.

Length of pulse : 50 microseconds.

Measurement : Normally 5 times per hour.

Time used : 45° W.

Aerials : Two vertical delta aerials, center pole 23 meter steel tube. Transmitter aerial plane magnetic E-W, receiver aerial plane magnetic N-S.

Working since : 1st November, 1951.

France

The Ivato Station (*Inf. Bull.*, nº 72, p. 23) is now in permanent service.

Netherlands

Station De Bilt (Holland).

Geographic Latitude and longitude : 56° 06′ 1 N, 5° 10′ 6 E.

Geomagnetic latitude and longitude : 53° 8 N, 89° 6 E.

Total magnetic force at ground level : 0.473 c.g.s. units.

Magnetic dip : 67° 20′.

Frequency sweep : 1.4-16 Mc/sec, automatic recording.

Frequency band swept once per half hour. Time of sweep 7 minutes.

Approximate peak pulse power 10 kW. Rhombic aerials used for transmitter and receiver. Upper height limit of recorder 800 km.

* * *

The Central Laboratory of the Netherlands Postal and Telecommunications Services has taken into use an ionospheric observatory at Leidschendam, 10 km NE from The Hague.

The observatory will be used for special investigations in ionospherics, control and improvement of prediction technique and reception of standard-frequencies and time-signals.

The hourly ionospheric records and other routine-measurements will be continued at the Royal Netherlands Meteorological Institute at De Bilt.

Correspondance relative to the Leidschendam observatory should be directed to :

Netherlands Postal and Telecommunications Services, HQ, Radio Laboratory, 11, Kortenaerkade, The Hague, Holland.

The exact position of the Leidschendam observatory is :

Geogr. Lat.	52° 05′.3 N.
Geogr. Long.	4° 23′.2 E.
Geomagn. Lat.	+ 54°.0.
Geomagn. Long.	+ 88°.7.
Magn. dip.	67°.4.
Magn. Force	0.473 cgs on earth level. 0.413 cgs at 300 km height.

JOINT COMMISSION ON THE IONOSPHERE

Hereunder copy of a letter to the Members of the Commission.

23rd February 1952.

Dear Colleague,

Third Meeting of Mixed Commission on the Ionosphere. August 25-27th 1952. Canberra, Australia.

On 24th September last we circulated a preliminary notice concerning the next meeting of our Commission (1), which is to be held at Canberra, Australia, immediately following the Xth General Assembly of U.R.S.I. Arrangements for the Canberra Meeting are now well in hand and a travelling and subsistence grant has been made by the Executive Committee of I.C.S.U.

We hope that there will be a good overseas contingent at this Meeting and in this connection we would like to call your attention to paragraph 2 of the preliminary notice which reads "The decisions to hold both the U.R.S.I. Assembly and the Mixed Commission Meetings in Australia were made, inter alia, as a gesture of appreciation of the extremely important advances in the field of radio and ionospheric research which have been made during recent years by the Australian workers. Accordingly it is hoped that as many members as can possibly do so, will attend these Meetings in Australia, and thus ensure the success of this tribute to our Australian colleagues".

Topics which have been suggested for consideration at the Canberra Meeting include :

(*a*) The conductivity of the ionosphere.

---

(1) *Inf. Bull.*, nº 71, p. 23-24.

(*b*) Recent experimental evidence concerning recombination and its application to the ionosphere.

(*c*) Plasmas in magnetic fields.

(*d*) Region F2 anomalies.

(*e*) International Geophysical Year problems.

(*f*) Ionospheric observations during the Solar Eclipse of 25th February 1952.

Further suggestions for discussion at the Meeting will be welcomed. Meanwhile, as a member of the Commission, you are invited to submit contributions of up to about 1500 words on one or more of the above topics, or on any ionospheric topic likely to be of interest to the Commission. Since such contributions will materially contribute to the success of our discussions at Canberra, it is hoped that you will be able to respond to this invitation. We shall then arrange for such contributions to be duplicated and circulated to all members of the Commission before the August Meeting. It would be appreciated if you could please let the Secretary know as soon as possible whether you will send a contribution — if the MSS itself is then submitted before the end of May, this will give time for duplicating and circulation before the Meeting. It may be added that we are also inviting short contributions from various non-members of the Commission.

Yours very sincerely,

E. V. Appleton, *Chairman.*
W. J. G. Beynon, *Secretary.*

C. C. I. R.

C.C.I.R. Study Groups V, VI and XI will meet in Stockholm from 15 to 27 May, 1952. Hereunder agenda of the meetings.

STUDY GROUP V (TROPOSPHERIC PROPAGATION)

(Chairman : Dr. R. L. SMITH-ROSE)

1. (*a*) To report on the present state of knowledge of tropospheric wave propagation in its applications to communication, broadcasting and television.

(*b*) To make appropriate recommendations on the subject of radio wave propagation which would also be of immediate use to the European V.H.F. Conference.

The principal points are :

Study Programme No 17 : Tropospheric propagation curves for distances well beyond the horizon.

Study Programme No 18 [1] : Tropospheric wave propagation.

2. The remaining items on the programme of Study Group No V :

Study Programme No 19 : Measurement of field strength of radio signals.

Report No 3 : Review of publications on propagation (tropospheric).

Report No 4 : Methods of measuring field strength.

Report No 5 : Measurement of field strength (respective merits of the two main types of equipment now in use).

---

[1] *Inf. Bull.*, no 73, p. 58.

Report No 6 : Measurement of field strength (merits of a standard noise generator as the source of the locally generated signal).

3. Any other business.

STUDY GROUP VI (IONOSPHERIC PROPAGATION)

(Chairman : Dr. J. H. Dellinger)

1. *Urgent Subjects.*

(*a*) *Question No* 50 : Practical uses of radio propagation data.

(*b*) *Question No* 52 : Allowances for fading.

(*c*) *Study Programme No* 24 : Study of fading.

2. *Additional Urgent Subjects.* — (To be established by correspondence).

3. *The remaining subjects on the programme of Study Group VI.*

4. *Other Business.*

STUDY GROUP XI (TELEVISION)

(Chairman : Mr. E. B. Esping)

1. To make appropriate recommendations on the subject of television, which may also be of use to the European V.H.F. Conference.

The work will be based on the consideration of :

Question No 67 : Ratio of the wanted to the unwanted signal in television. In relation to this question, Study Programmes Nos 17 and 18, being studied by Study Group No V should be borne in mind.

2. The remaining items on the programme of Study Group No XI :

Question No 64 : Television standards.

Question No 65 : Assessment of the quality of television pictures.

Question No 66 : Television recording.

Question No 68 : Resolving power and differential sensitivity of the human eye.

Study Programme N° 32 : The requirements for the transmission of television over long distances.

Study Programme N° 33 : Television field frequency.

Study Programme N° 34 : Picture and sound modulation.

Study Programme N° 35 : Reduction of the bandwidth for television.

Study Programme N° 36 : Conversion of a television signal from one standard to another.

Study Programme N° 37 : Black and white and colour television,

Report N° 15 : Television systems.

3. Any other business.

WORLD METEOROLOGICAL ORGANIZATION (W. M. O.)

We publish hereunder a resolution of the Second Session of the Executive Committe of the W.M.O. which met in Lausanne (Switzerland) in October 1951. This resolution has been taken with reference to a resolution of the Joint Commission on Radio-meteorology during its second session (*U.R.S.I.*, *Inf. Bull.*, n° 70, July-August, 1951, p. 11.)

RESOLUTION 20 (Ec-II)

Referring matter of collaboration with the International Radio Scientific Union to the Commission for Aerology.

The Executive Committee,

Considering that the International Radio Scientific Union (U.R.S.I.) communicated to the World Meteorological Organization the following Resolution passed by the Joint Commission on Radio-Meteorology at its second session in Brussels, August 1951 :
" The Joint Commission on Radio-Meteorology, recognizing
" the need for wide distribution of the results of sferics' observa-
" tions, recommends that the World Meteorological Organization
" make arrangements to ensure the publication and regular
" distribution of such results ".

Decides that the above Resolution be referred to the President of the Commission for Aerology for consideration and recommendations, and,

Directs the Secretary-General to bring this Resolution to the attention of the Secretary of the International Radio Scientific Union and the President of the Commission for Aerology.