Bulletin N° 92 July-August 1955

International Scientific Radio Union

U. R. S. I.

CONTENTS

NATIONAL COMMITTEES

India

MEMBERSHIP

The membership of the National Committee given in *Information Bulletin* nº 85, pp. 8-9 is to be replaced by the following :

President : Sir K. S. KRISHNAN.

Secretary : Dr. A. P. MITRA, 10 Nohanbagan Road, Calcutta.

Members : Mr. B. V. BALIGA,
Mr. S. BASU,
Group Captain K. A. JOSEPH,
Dr. D. S. KOTHARI,
Prof. S. K. MITRA,
Mr. G. R. S. SAO,
Prof. K. R. RAMANATHAN,
Mr. T. V. RAMAMURTI,
Dr. M. B. SARWATE,
Prof. K. SCREENIVASAN.

United States of America

OFFICERS

At the regular meeting of the National Committee, May 2, 1955, the following officers were elected through June 1958 :

Chairman : H. W. WELLS.

Vice-Chairman : W. E. GORDON.

Secretary : J. P. HAGEN, Naval Research Laboratory, Washington, 25, D. C.

COMMISSIONS

Members appointed by National Committees

LETTER SENT ON JUNE 16th, 1955 TO NATIONAL COMMITTEES

I want to recall that accordingly to the modifications brought by the last General Assembly to the Rules for Commissions, the Commissions are composed as follows :

(*a*) Official Members appointed by National Committees (one for each Commission and each National Committee).

(*b*) Members appointed by National Committees and from their respective countries or by Commission chairmen ; such members keep their duties until the end of the General Assembly following their appointment. According to a decision of the Executive Committee, the lists of those Members have to be published in the *Information Bulletin*.

I should very much appreciate if you would let me know the names of the category (*b*) members appointed by your Committee or to inform me if your Committee decided not to appoint such members. In the first instance I would communicate the lists to the Commission Chairmen and publish them in the *Information Bulletin*.

I would also be thankful if you would keep me informed of any changes in the Official Members appointed by your Committee.

In thanking you,

I remain,

Yours truly,
The Secretary General,
(*sgd*) HERBAYS

Official Members

The following changes are brought to the lists of Official Members given in the *Information Bulletin*, nº 85, May-June 1954, pp. 20-29.

COMMISSION I

New Zealand : G. J. BURTT, Secretary Radio Research Committee, Dominion Physical Lab., Private Bag, Lower Hutt.

United States of America : Dr. Ernst WEBER, Head, Dept. of Electrical Engineering, Polytechnic Institute of Brooklyn, 99, Livingston Str., Brooklyn 2, N.-Y.

COMMISSION II

New Zealand : G. J. BURTT.

United States of America : Dr. J. B. SMYTH, Head, U. S. Navy Electronics Lab., San Diego 52, California.

COMMISSION III

New Zealand : G. J. BURTT.

United States of America : Dr. MILLET J. MORGAN Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire.

COMMISSION IV

New Zealand : G. J. BURTT.

Union of South Africa : Dr. F. J. HEWITT, Director, Telecommunications Lab. of the C.S.I.R., c/o Department of Electrical Engineering, University of the Witwatersrand, Johannesburg, Tv.

United States of America : Mr. ARNOLD W. SULLIVAN, Engineering and Industrial Equipment Station, Univ. of Florida, Gainesville, Florida.

COMMISSION V

New Zealand : G. J. BURTT.

United States of America : Mr. FREDERIC T. HADDOCK, Naval Research Lab., Washington 25, D.C.

COMMISSION VI

New Zealand : G. J. BURTT.

United States of America : Dr. J. B. WIESNER, Research Lab., 20 A-122 Electronics, Massachusetts Inst. of Technology, Cambridge, Mass.

COMMISSION VII

New Zealand : G. J. BURTT.

Members designated by National Committees

LISTS

According to articles 2-5 of the Rules for Commissions these are composed of Official Members and of members designated by National Committees or appointed by chairmen of Commissions.

We given hereunder a first list of members designated by National Committees.

COMMISSION I

Italy : Prof. M. BOELLA, Istituto Eletrotecnico Nazionale, Torino.

C. EGIDI.

Japan : Mr. Kei MIZOKAMI, Chief of Technical Department, Japan Broadcasting Corporation, Chiyoda-ku, Tokyo.

Mr. Shogo AMARI, Director of the Radio Research Laboratories, Ministry of Postal Services, Koganei near Tokyo.

Mr. Hiroshi SEIMIYA, Chief of the First Engineering Section, Fuji Tsushinki Seizo Co., n° 1015, Kami-Odanaka, Kawasaki, Kanagawa-ken.

Sweden : Dr. C. G. AURELL, As. Prof., Royal Inst. of Technology, Chief of Microwave Division, L. M. Ericsson Telephone Co., Stockholm.

Mr. T. GUSSING.

COMMISSION II

Italy : C. EGIDI.

F. VECCHIACCHI, Magnet Marelli, Milano.

Japan : Dr. Saburo MATSUO, Chief Engineer of Nippon Broadcasting System Inc., 1-7 Yuraku-cho, Chiyoda-ku, Tokyo,

Mr. Tetsuo KONO, Chief of Tropospheric Propagation Section, First Division, Radio Research Laboratories, Kokubunji near Tokyo.

Mr. Ichiro MURAKAMI, Vice-chief of Radio Frequency Research Section, Technical Research Laboratory, the Broadcasting Corporation of Japan, Setagaya, Tokyo.

Sweden : Dr. C. G. AURELL, Ass. Prof., Royal Inst. of Technology, Chief of the Microwave Division, L. M. Ericsson Telephone Co., Stockholm.

Dr. B. S. A. JOSEPHON, Research Inst. of National Defence, Stockholm.

COMMISSION III

Italy : P. DOMINICI.

I. RANZI.

Japan : Dr. Shogo NAMBA, Director in charge of the Research and Development Department, Kokusai Denshin Denwan Co., n° 5, 1-chome, Otemachi, Chiyoda-ku, Tokyo.

Dr. Hiroyuki UYEDA, Chief of the First Division, Radio Research Laboratories, Kokubunji near Tokyo.

Dr. Mankichi HASEGAWA, Professor of Geophysicen Kyoto University, and Chief of the Geomagnetic Station at Aso, President of the Society of Geo-magnetism and electricity of Japan.

Dr. Masao NOTUKI, Professor in the University of Tokyo, and Chief of the Solar Phenomena Section of the Tokyo Astromical Observatory, Mitaka near Tokyo.

Mr. Yuichiro AONO, Chief of the Ionospheric Propagation Section, First Division, Radio Research Laboratories, Kokubunji near Tokyo.

Dr. Ken'ichi MIYA, Chief of Electric Wave Section, Research and Development Department, Kokusai Denshin Denwa Co. nº 5 1-chome, Otemachi, Chiyoda-ku, Tokyo.

Dr. Takeshi NAGATA, Professor of Geophysics, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo.

Sweden : Prof. O. E. H. RYDBECK, Director, Research Lab. of Electronics, Chalmers Univ. of Technology. Goteborg.

Mr. W. STOFFREGEN.

COMMISSION IV

Japan : Mr. Shigetake MIROMOTO, Chief, Monitoring Activities, Radio Regulatory Bureau, Ministry of Postal Services, Minato-ku, Tokyo.

Dr. Hideo SEKI, Director in charge of the Research Section, Iwasaki Communication Apparatus Co., 2-710, Kugayamacho, Suginami-ku, Tokyo, and Lecturer in the Electrical Communication College in Tokyo.

Dr. Kanji HONDA, Professor of Applied Electricity, Physics Department, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo.

Mr. Tokuya FUJITA, Chief in the Radio Frequency Section, Technical Research Laboratory, Boadcasting Corporation of Japan, Setagaya, Tokyo.

Dr. Hiroshi SHINKAWA, Chief of Investigation Section, Research and Development Department, Kokusai Denshin Denwa Co., nº 5, 1-chome, Otemachi, Chiyoda-ku, Tokyo.

Sweden : Mr. S. GEJER, Director of Department, Royal Board of Swedish Telecommunications, Stockholm.

Mr. R. LINDQUIST, Chalmers Univ. of Technology, Göteborg.

COMMISSION V

Italy : Prof. G. RIGHINI, Observatorio Astroficiso di Arcetri, Firenza.

Japan : Dr. Takeo HATAHAKA, Professor in the University of Tokyo, in charge of the Radio-Astronomy Section of the Tokyo Astronomical Observatory, Mitaka near Tokyo.

Sweden : Dr. N. HERLOFSON.

Prof. V. OHMAN, Royal Observatory, Saltsjöbaden, Stockholm.

COMMISSION VI

Italy : M. Soldi.

G. Toraldo di Francia.

Japan : Dr. Kenzo Nagai, Professor Communication Engineering, Department of Communication Engineering, Faculty of Engineering, Tohoku University, Sendai.

Dr. Sogo Okamura, Professor of Electrical Communications, Faculty of Engineering, University of Tokyo, Bunkyo-ku, Tokyo.

Dr. Hideo Iwataka, Professor of Electrical Communications in the Waseda University, Tokyo, and Head of the Electric Wave Engineering Research Laboratory of the University.

Dr. Toshifusa Sakamoto, Professor of Electrical Communications, Faculty of Engineering, University of Tokyo, Bunkyo-ku, Tokyo.

Dr. Hidetoshi Takahashi, Asst. Professor of Physics, Faculty of Science, University of Tokyo. Bunkyo-ku, Tokyo.

Dr. Hideo Seki, Director in charge of the Research Section, Iwasaki Communication Apparatus Co., 2-710 Kugayama-cho, Suginami-ku, Tokyo, and Lecturer in the Electrical Communication College in Tokyo.

Sweden : B. Hoard, L. M. Ericsson Telephone Co., Stockholm.
Prof. M. Wallman, Chalmers Univ. of Technology, Göteborg.

COMMISSION VII

Italy : E. Gatti.

Japan : Dr. Yoshihiro Asami, Professor of Electrical Engineering, Faculty of Engineering, in the Hokkaido University and Director of the Research Institute of Applied Electricity of the University, Sapporo.

Dr. Takeo Seki, Chief of the Research Division, Electrical Communication Laboratory, Kichijoji, Musashino near Tokyo.

Dr. Shintaro Uda, Professor of Communication Engineering, Research Institute of Electrical Communication, of the Tohoku University, Sendai.

Dr. Yasushi WATANABE, Professor of Electrical Engineering, Director of the Research Institute of Electrical Communication, Tohoku University, Sendai.

Sweden : Prof. O. E. H. RYDBECK, Director, Research Lab. of Electronics, Chalmers Univ. of Technology, Göteborg.

Mr. G. SVALA, Research Department, L. M. Ericsson Telephone Co., Stockholm.

Mr. S. TOMNER, A. B. Svenska Elektroncör, Stockholm.

Prof. H. WALLMAN, Chalmers Univ. of Technology, Göteborg.

Dr. T. WALLMARK, Royal Inst. of Technology, Stockholm.

Commission III. — On Ionospheric Radio

RADIOWAVE PROPAGATION PREDICTIONS

Department of Scientific and Industrial Research, Radio Research Station. *Radio wave propagation predictions for sunspot maximum conditions* (Bulletin A, Special issue n° 2).

Letter from Dr. R. L. Smith-Rose Director : With my note of 26th October 1954 I circulated a Special Issue of Bulletin A entitled « Predictions of Radio Wave Propagation Conditions for the Sunspot Minimum Epoch 1954-1955 ».

I now circulate Bulletin A. Special Issue n° 2 containing the corresponding Predictions for the Sunspot Maximum Epoch which is expected to occur during 1957-1958.

I trust that you may find these predictions of use in connection with the forward planning of radio communications and other applications, or in the conduct of scientific research on radio wave propagation under conditions involving the ionosphere.

The forthcoming sunspot maximum epoch will coincide approximately with the International Geophysical Year, when intensive investigations of geophysical conditions, including the ionosphere, will be conducted in all parts of the world. It is hoped that the present Bulletin will be found of some use in planning some of these special investigations.

BIBLIOGRAPHY

Netherlands Postal and Telecommunications Services-Library and Documentation. The Hague, 12 Kortenaerkade. *Bibliography* (U.D.C. 551-510. 535 : 523.78). *The Effects of Solar Eclipses upon the Ionosphere* (2nd edition).

The literature is arranged chronologically in order of eclipse date. General subjects and articles of which the eclipse date could not be defined are arranged separately under the heading « Miscellaneous ».

The bibliography is concluded with an author index in which the appropriate references are designated by numbers.

In compiling this bibliography use has been made of the following sources.

1. Wireless Engineer Abstracts (from 1924).

2. Science Abstracts, Section B (from 1939).

3. Final Engineering Report on High Altitude Radio-Frequency Propagation, by L. V. Manning.

4. Report on Japanese research on radio wave propagation, vol. I, May 1946.

5. The card indices of the Library and Documentation of the Netherlands Postal and Telecommunications Service.

6. Ditto of the Technological University at Delft, Holland.

7. Ditto of the Chalmers University of Technology Göthenburg, Sweden.

8. Ditto of the Royal Netherlands Meteorological Institute at De Bilt, Holland.

9. The following journals.

(*a*) Terrestrial Magnetism and Atmospheric Electricity (from 1928).

(*b*) Journal of Geophysical Research (from 1949).

(*c*) Report of Ionosphere Research in Japan, vol. IV-VII (1950-53).

SUB-COMMISSION IIId

On Magnetic Ionic Nomenclature

The following corrections have to be brought to the nomenclature given in the *Information Bulletin* n° 90, p. 11.

Lines 21 and 13 to be read :

$\varkappa$: attenuation constant, defined so that a wave is attenuated like $E = E_0 \exp(-\varkappa x)$.

Line 15 :

$$\omega^2_0 = 4\pi N e^2/\varepsilon_0 m$$

The first part of the formula given at the bottom of the page, to be read :

$$(\mu - ic\varkappa/\omega)^2 \text{ or } (n - ic\varkappa/\omega)^2$$

Commission IV

On radio noise of terrestrial origin

The Recording of Sudden Enhancements of Atmospherics (S.E.As.)

For purposes of flare patrol

(Paper circulated by C.S.A.G.I.)

During a solar flare a large increase occurs in the free electron population of the region at a height of 60-90 km. One of the chief results is that the coefficient of reflection for very long radio waves, incident obliquely upon the base of the *D*-layer, is improved, which in turn produces large enhancements of the signals received after successive reflections from a distant transmitter.

R. Bureau (1), to whom we owe this discovery, has investigated these enhancements by continuously recording the integrated level of thunderstorm atmospherics at many different wavelengths. He found that the S.E.As. were characteristic of the spectral range 7 km to 16 km, being most pronounced at a wavelength of about 11 km (27 kc/s). There is no question of an increase in the number of atmospherics at such times ; the phenomenon is simply one of improved propagation at these wavelenghts. The reflections take place during daylight hours from a height of about 75 km, and typical S.E.As. have never been observed outside the illuminated hemisphere.

The recording of S.E.As. for purposes of flare patrol and immediate warnnig was described by M. Waldmeier (1949) (2). The method has been in use at the Royal Observatory, Edinburgh, since June 1949 in order (*a*) to provide a flare patrol, and (*b*) to make detailed comparisons between the development curves of flares and those of the sudden ionospheric disturbances which they generate (3).

The receiving and recording equipment described in the following pages is that which has been used successfully at Edinburgh during the past six years. It was constructed by Messrs. Morley and Duke, of Cambridge (England), based upon the designs supplied by Mr. J. A. Ratcliffe and his colleagues in the Radio Section of the Cavendish Laboratory. The following details are given with Mr. Ratcliffe's kind permission.

Aerial : Inverted L-antenna, horizontal part at height of 50 feet above ground.

Oscillator (fig. 1) : Battery operated and is calibrated for frequency in kilocycles. When connected to the receiver aerial it is used

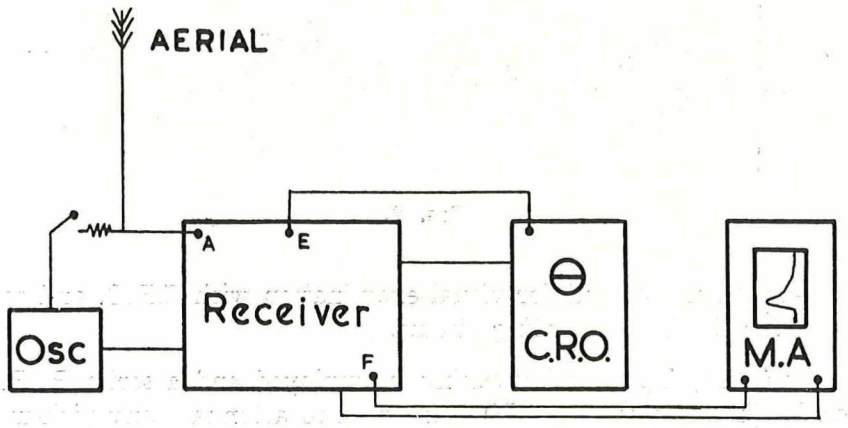

FIG. 1.

in conjunction with the C.R.O. for tuning the receiver to any desired frequency.

Cathode Ray Oscilloscope : Any standard model with variable time base.

Recording Milliammeter (M.A.) : Evershed-Vignoles type Chart Recorder, 0-1 m amp., rate of movement of paper 1 inch per hour. Time marks should be recorded once per hour from a standard clock.

Receiver : See circuit fig. 2. The receiver consists of a tuned aerial feeding into two tuned R. F. stages, with a cathode follower

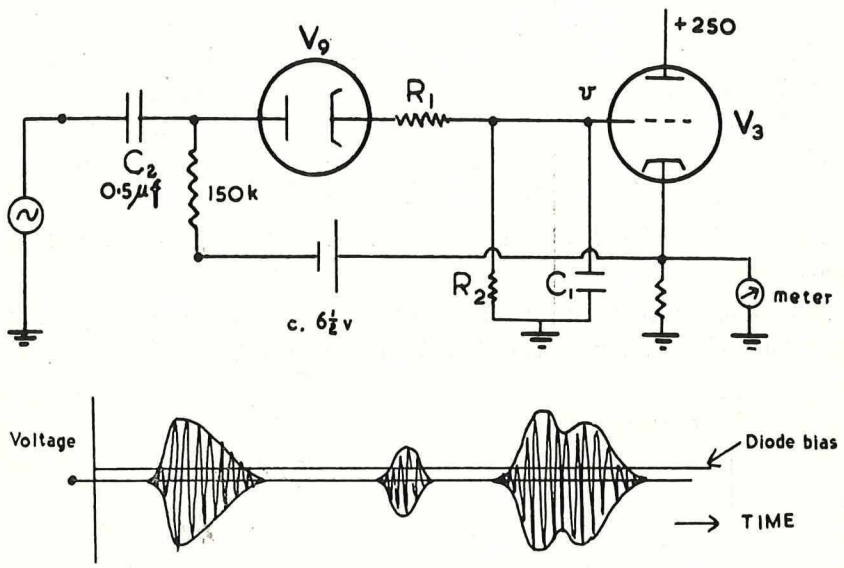

FIG. 2.

low-impedance output for visual examination with C.R.O. and to feed the detector recording circuit.

Aerial Tuning : Parallel tuning is employed and a series R. F. choke (inductance 1.25 mH) is inserted to attenuate any pick-up from local transmitters or sources of high frequency radiation, both of which can drive the first stage into non-linearity. The R. F. choke has negligible effect on frequencies in the V. L. W. band.

Tuned Stages : Conventional plate-tuned amplifiers. Overall band width 150-200 c/s at 20 kc/s.

Cathode Follower : This is directly coupled from the anode of the second R. F. stage, and the D. C. potential of the cathode should be in the neighbourhood of 100 V.

Detector Circuit : See fig. 3 and R.H.S. of fig. 2. This is an average detector with a charge time constant R_1C_1 and discharge R_2C_1. A small bias is applied to the diode sio that only signals above 1 volt approximately affect the recording.

The output from the cathode follower has the approximate appearance shown in fig. 2 (lower). The short atmospherics pulses are in general followed by appreciable time intervals during which there is no output. The overall time average is usually less than 1 volt. For this reason a small continuous output from a neighbouring V.L.W. station must be prevented from charging condenser C_1, and this is the purpose of the diode bias. The time constant given by the 0.5 μ F coupling condenser C_2 and 150 kohm resistor allows C_2 to regain equilibrium between atmospheric pulses, and so as C_1 charges, the diode bias remains approximately constant. The bias is the fixed voltage of 6.5-7 V produced by rectification of the 6.3 volts A.C. minus the grid-cathode bias of the recording cathode follower V_3. The voltage V on the condenser C_1 reaches equilibrium at a value given by V = Av. of positive 1/2 cycles of atmospherics pulses $\times$ R_2/R_1, assuming that the effect of the bias is negligible.

Voltage Stabiliser : This is a conventional circuit in which the neon voltage is used as a reference for controlling the output line voltage. A change in output voltages causes a change in the current of V_5 and so there is a change in current through V_6 to restore the status quo.

Tuning procedure :

(1) Pull out plug from receiver to recording milliammeter.

(2) Switch on C.R.O. and connect it to cathode follower (V_4) output E.

(3) Attach oscillator via 1/4 megohm resistor to point A with *aerial connected.*

(4) Adjust receiver gain to give reasonable level on C.R.O. screen.

(5) Adjust three tuning knobs to give maximum on C.R.O.

(6) Switch off receiver and oscillator, and reconnect recorder.

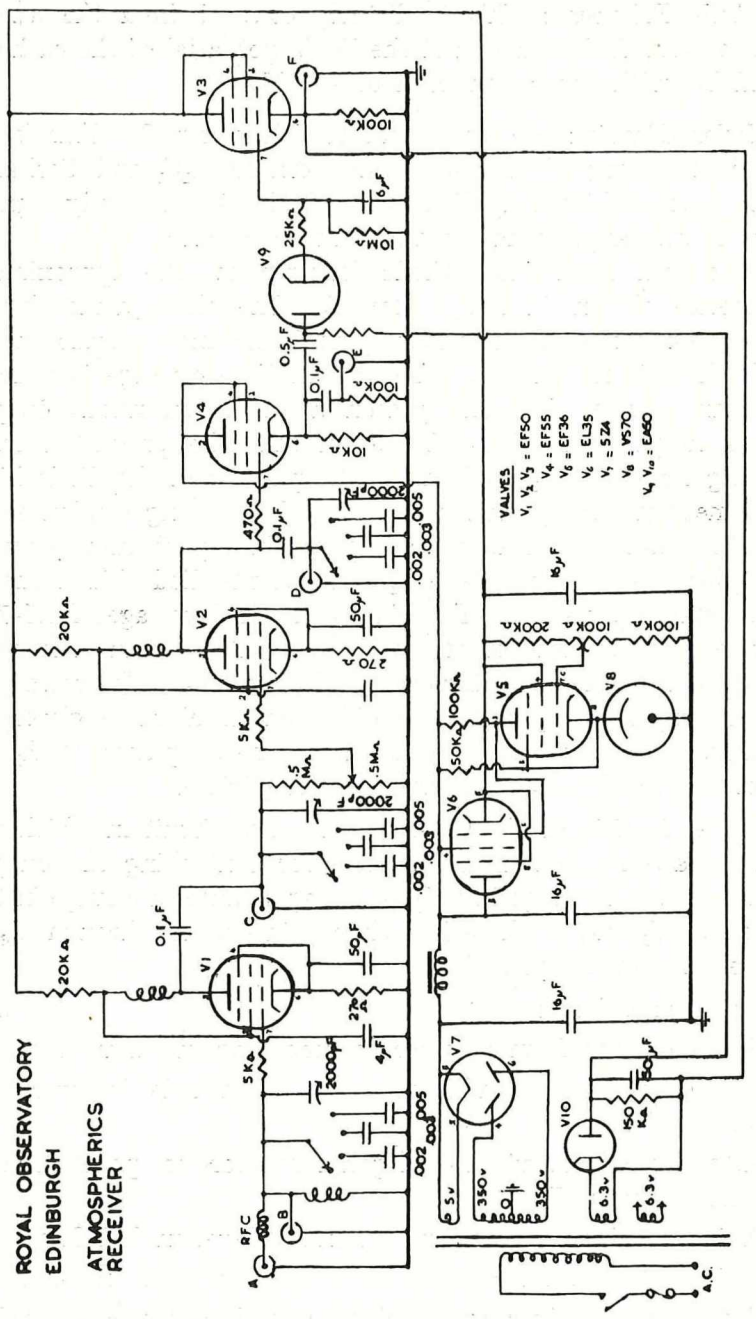
ROYAL OBSERVATORY
EDINBURGH
ATMOSPHERICS
RECEIVER
VALVES
V1, V2, V3 = EF50
V4 = EF55
V5 = EF36
V6 = EL35
V7 = 524
V8 = VS70
V9, V10 = EA50
A.C.

FIG. 3

(7) Turn receiver gain to zero.

(8) Switch on receiver after it has been off for a few minutes.

(9) Allow receiver to settle down to give proper zero and with zero adjust on the recorder bring the pen to zero position.

(10) Increase gain slowly to give reasonable output.

Continuous operation night and day is recommended; but it is desirable to switch off the receiver during local thunderstorms.

A typical daily pattern of the integrated intensity of atmospherics is illustrated in Ref. 3 (1953) for Edinburgh and many examples of S.E.A. are shown there. The reliability of the method is also discussed. Further information may be had from the undersigned.

M. A. Ellison.
Royal Observatory, Edinburgh 9.

REFERENCES

1. Bureau, R., 1937. — Transactions of the Edinburgh Meeting (1936 September) of the International Association of Terrestrial Magnetism and Electricity, Copenhagen. *Nature*, 139, 110.
1941. — Notes préliminaires du Laboratoire National de Radio-électricité, nos **14**, **52** and **119**.
1947. — *L'Onde Electrique*, no 239, February.
1950. — Les renforcements brusques des ondes très longues, *Proceeding of the Physical Society*, B, Vol. **63**, 122.

2. Waldmeier, M. 1949. — Der Eruptionennindikator, *Zeitschrift für Astrophysik*, 26, 205.

3. Ellison, M. A., 1950. — The Ionospheric Effects of Solar Flares, *Publications of the Royal Observatory, Edinburgh*, 1, 53.
1953. — The $H\alpha$ Radiation from Solar Flares in relation to Sudden Enhancements of Atmospherics on Frequencies near 27 kc/s, *Journal of Atmospheric and Terrestrial Physics* 4, 226.

Commission V. — Radio-Astronomy

RADIO-ASTRONOMY IN BELGIUM

A new Station

(*Translation*)

A radio-astronomical station has been recently erected at Humain under the auspices of the Royal Observatory of Belgium, with the help of the « Fond National de la Recherche Scientifique » and of Belgian personalities.

Geographical location : longitude, 5°20.8′ E ; latitude, 50°12.5′ N ; height, 295 m.

The present equipment includes two paraboloides of 6 m and 7.5 m of diameter for solar observations on metre (169 Mc/s) and decimetre (600 and 900 Mc/s) wavelengths. The receivers are of the « direct » type for decimetre wavelengths, and of the « switching » type of Dicke and of the « direct » type for metre wavelengths. The receivers will be essentially used for investigation on the quiet Sun. The accuracy attained at present, on 50 cm, is of the order of some 10^{-3} of the flux of the quiet Sun with a time constant of the order of one second for relatively long time intervals.

The Humain station is located in a favourable radio climate ; it includes working buildings and accommodations for workers ; it holds the possibility of establishing a crossed interferometre of 850 × 350 m. A laboratory at Uccle helps to build up and test radiometers. The radio researches are carried out jointly with visual researches carried out at Uccle on total and monochromatic (Hα) hight by means of the solar automatic equatorial equipment. It is expected to undertaken also at Humain measurements on centimetre wavelengths, the recording of burst and of atmospherics (connected with chromospheric flares) on 27 kc/s.

The Humain station work under the responsability of the « Service de Radioastronomie et de Physique solaire » of the « Observatoire Royal de Belgique (Uccle) ».

R. Coutrez

RADIO-ASTRONOMY

(Reprint from *Telecom. Jour*, n° 6, June 1955)

Radio astronomers have been given an opportunity by the United States Federal Communications Commission to submit views by 1 July as to whether the Commission should consider the possibility of rules to protect radio astronomy by restricting radio transmissions on certain frequencies in certain areas.

The announcement said that an international radio committee has recommended (1) that all practical protection from inter-

(1) This refers to C.C.I.R. Recommendation n° 118 (London, 1953).

ference be given to radio astronomical measurements, particularly around 1420 megacycles, and asked the astronomers for information relative to their laboratories, frequencies being observed, significance of radio astronomy, a statement on the extent to which radio interference can be tolerated, and the best locations for study.

The Commission also pointed out that equipment has been developed for radionavigational use which depends upon the reception of radio energy emitted by the sun, and that the information was being solicited from interested parties in view of this and « the possible development of other similar equipment making use of electromagnetic radiation from the sun as well as other extraterrestrial bodies ». Until rules are prepared and completed, the Commission said, there is no protection which can or will be given to radio astronomy by the F.C.C.

(Source : *Industrial Communications*).

Commission VII. — On Radio-Electronics

INTERNATIONAL SYMPOSIUM ON ELECTRICAL DISCHARGES IN GASES

April 25-30, 1955
Delft, Netherlands

(Document from I.U.P.A.P.)

An International Symposium on Electrical Discharges in Gases was held at Delft, Netherlands, from 25-30 April 1955.

The main subjects discussed were :

1. Fundamental processes.
2. Instabilities and oscillations.
3. High frequency discharges and breakdown dependency of the frequency.
4. New methods of measuring and gas discharges applied to measurements.
5. Arc discharges.
6. Spark discharges.

7. Miscellaneous (o.a. special types of discharges and Geiger Müller counters).

The field covered in the contributions way very wide and in this brief report it is not possible to go into any detail.

In his opening address H. B. Dorgelo (Delft) gave a short survey of the open questions in gas discharge physics which would be discussed during the Symposium.

In the session on fundamental processes H. S. W. Massey (London) discussed cross sections of various types of reactions playing an important role in gas discharges. H. D. Hagstrum (Bell Telephone) described measurements of electron ejection from metals by positive ions in which the back ground pressures were near 10^{-10} mm Hg. Coverage of the surface with one or more monolayers had a profound effect. A. von Engel (Oxford) drew the attention to the importance of internal radiation in gas discharges. The papers by C. Grey Margan and J. Dutton (Swansea) dealt with measurements of the growth of ionization currents as a function of time and d (the latter with constant E/p). G. Francis (Oxford) discussed the growth of a single electron avalanche, taking account of the retarding effect of the positive ions remaining almost stationary in the gas.

Some processes in electronegative discharges were described by L. F. Boyd and J. B. Hasted (London). J. A. Smit (Utrecht) showed some results of renewed measurements of excitation functions of Hg. The influence of the electron density on the probability of forbidden transitions was described by L. Herman (Paris). F. J. de Heer (Amsterdam) gave some results of the charge exchange determination for positive ions and atoms in the energy region of 2.5, 10 and 25 keV. A paper on controlled sputtering of single crystals was given by G. K. Wehner (Ohio).

Chr. van Geel (Delft) opened the session on stability and oscillations of gas discharges with a discussion on the influence of the internal self-induction and after-effect on the stability. A number of papers dealt with the oscillations in low pressure mercury discharges. E. Rohner (Zürich) discussed in more detail the low frequency oscillations, Jh. J. J. van Boort and M. Klerk (Philips) the high frequency oscillations in such discharges. M. A. Townsend (Bell Telephone) described a hollow cathode discharge with a falling characteristic in the abnormal glow region.

A review of the three types of microwave breakdown-diffusion controlled, attachment controlled and wall controlled breakdown was given by S. C. Brown (Cambridge, Mass.). The behaviour of breakdown in the transition regions was discussed. Measurements of high frequency breakdown in irradiated parallel plate gaps were presented by W. A. Prowse (Durham). R. Carruthers (Harwell) drew the attention to the skin effect in high frequency discharges, Mlle M. Chenot (Paris) discussed the polarization effects being produced in high frequency discharged in the pressure range below 0.05 mm Hg. W. Fucks (Aachen) reported on the dependency of gas breakdown on pre-breakdown current and frequency.

M. A. Biondi (Westinghouse) described new methods of measurement developed for the study of gas discharges, such as the microwave, the low intensity spectrographical and ultrasensitive optical absorption techniques. With the microwave absorption technique electron densities have been measured from 10^7 up to 10^{11} cm^{-3}, the low intensity spectrographical measurements make use of time sampling techniques to detect very weak emission from excited particles. With the ultrasensitive optical absorption technique studies of the helium metastable state have been made.

In a paper by W. Fucks (Aachen) several examples were given of the application of gas discharges to measurements in other physical problems a.o. oscillation measurements with the aid of the corona discharge and the recording of shock waves. In this session C. H. Hertz (Lund) described a new type of gas filled amplifier tube and N. E. Andersson (Lund) showed how one can use the positive point corona for a fast hygrometer.

With a paper on the plasma's of thermal arcs W. Lochte-Holtgreven (Kiel) opened the session on arc discharges. For the four unknown quantities in the Saha-equation only three equations are available, so one quantity must be measured. The temperature may be derived from the Inglis-Teller or the Holtsmark theory, giving the influence of microfields on spectral lines. L. A. King (E.R.A.) proposed a purely thermal theory for the transition from low to high current arcs. H. Schirmer (Osram) calculated from the energy balance equation for the column the electrical conductivity in high pressure X^e discharges and W. Elenbaas (Philips) discussed the behaviour of high pressure

discharges in X^e-Hg mixtures. W. Finkelnburg (Siemens) reported on measurements of arc discharges with very low maintainance voltages and very high temperatures. Papers on the cathode-drop and the anode-drop have been read respectively by P. Schulz (Karlsruhe) and K. H. Höcker (Stuttgart). H. Maecker (Siemens) discussed the importance of selfmagnetic compression in high current arcs. Current limitations in low pressure Hg discharges have been discussed by P. C. Thonemann (Harwell), and E. O. Johnson (R.C.A.) described the four discharge modes of externally heated hot cathode arcs. A. Mayr (A.E.G.) reported on work done on the stability of arcs for switching purposes and D. Th. J. ter Horst (K.E.M.A.) on current zero phenomena in high current a.c. arcs. M. Hoyaux (A.C.E.C.) described the use of Ledrus' plasmograph to the design of industrial rectifiers. Measurements on arcs with quickly varying length were discussed by W. Rieder (Wien). M. Laporte (Paris) reported work on high power flash tubes. The potential distribution in magnetic arcs discharges was discussed by J. Kistemaker (Amsterdam).

In the session on spark discharges J. M. Meek (Liverpool) gave an account of the present theoretical pictures of the spark mechanism together with a summary of the main features of the growth of corona and spark discharges as observed experimentally. That the theoretical interpretation of the sparking phenomena is still uncertain followed from the ensuing discussion after this and the paper read by H. Raether (Hamburg) on the electron avalanche and its development. L. H. Fisher (New-York) showed the results of measurements of the formative time lag in several gases as a function of the overvoltage. W. Weizel (Bonn) and R. F. Saxe (London) described oscillographic methods of measuring spark breakdown with exposures of the order of 10^{-10} s. W. Köhrmann (Hamburg) reported on precision measurements of breakdown in air. Some properties of the spark channel were discussed by J. D. Craggs (Liverpool). C.E.R. Bruce (E.R.A.) gave an account on the long electrical discharge.

In a theoretical paper G. Ecker (Bonn) gave a statistical description of ensembles with collective interaction. T. Kahan (Paris) gave some results of his calculation on the absorption of the electromagnetic wave in weak ionized gases, and M. Bayet (Toulouse)

his results of the calculation of the electron velocity distribution function in weakly ionized homogeneous plasmas.

Three papers dealt with Geiger Müller counters. P. Mortier (Gent) discussed the velocity of the discharge propagation. The influence of bromine on the current pulse in counters was described by P. F. Little (Oxford). T. J. Lewis (London) showed a circuit for Geiger counter operation without dead time effects.

Diamagnetic resonance of free electrons in a nitrogen glow discharge, maintained in a 3 cm resonance cavity, was shown by C. Mac Lean and G. J. W. Kor (Delft). Measurements on the after-current of N*e*-A discharges, giving the cross-section of the ionization of A by metastable N*e* atoms, were demonstrated by P.C.T.v.d. Laan and A. W. van Wagensveld (Delft). M. T. Vlaardingerbroek (Delft) gave a demonstration of the measurements of *h. f.* breakdown-voltage in N*e* in which special attention was drawn to the influence of impurities. H. Hölscher (Delft) showed some examples of the destabilisation of glow discharges by varying the series resistance and parallel capacitance.

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

Bureau

At the General Assembly, Oslo, August 9-12, 1955, the following were elected as Officers of the Bureau :

President : L. V. BERKNER.

Vice-Presidents : K. S. KRISHNAN,
P. LEJAY.

Secretary General : A. V. HILL.

Treasurer : E. HERBAYS.

Members : A. ENGELHARDT,
A. STOLL.

The retiring President is : Prof. B. LINDBLAD.

U. R. S. I. - A. G. I.
SPECIAL COMMITTEE

Meeting, Brussels 8-10 September, 1955

AGENDA

1. Minutes of U.R.S.I.-A.G.I. Committee Meeting at The Hague, August 1954.
2. Matters arising from minutes.
3. Report on Rome Meeting of C.S.A.G.I. (September 1954).
4. Discussion of radio observations during the A.G.I.

(i) Vertical incidence *h'f* recordings.
(ii) Vertical incidence absorption measurements.
(iii) Ionospheric drift measurements.
(iv) Other ionospheric observations (back, forward scatter, etc.).
(v) Rocket soundings.
(vi) Observations in Polar and Equatorial zones.
(vii) Atmospheric and terrestrial noise observations.
(viii) Radio-meteorological observations.
(ix) Radio-astronomical observations.
(x) Meteor observations.
(xi) Radio reflections from aurorae.
(xii) Propagation time of radio signals (longitude determinations).

5. Analysis, presentation of data, publication of results.
6. World days.
7. Other matters.

W. J. G. Beynon.
Secretary.

IONOSPHERIC STATIONS

Spain

On March 26, 1955, in the presence of the Air Minister and of Father Lejay, President of U.R.S.I. a complete ionospheric station was inaugurated at the Ebre Observatory (Tortosa), which celebrated its 50th anniversary.

BIBLIOGRAPHY

International Electrotechnical Commission.

65-I. Safety requirements for electric main-operated amplifiers. First edition.

65-II. Safety requirements for independent loudspeakers. First edition.

The two appendices to Publication 65, Safety requirements for electric mains-operated radio receiving apparatus, contain amendments and additions to Publication 65 and it is essential to be in possession of Publication 65 in addition to the Appendices. Other appendices are in preparation and eventually it is intended to issue a single publication containing these appendices bound with the main specifications.

These publications are on sale at the Central Office of the I.E.C., 39 route de Malagnou, Geneva, Switzerland, at the price of Sw. Fr. 4, per copy, plus postage.

75. I.E.C. Specification for porcelain insulators for overhead lines with a nominal voltage of 1000 Volts and upwards. Sw. Fr. 6 per copy, plus postage.

International Telecommunication Union.

Supplement nº 1 to the list of Broadcasting Stations. 13th Edition (1954).

This supplement contains information concerning the broadcasting stations of which the frequencies appear in Supplement nº 2 (30 September 1954) and in Supplement nº 3 (31 December 1954) to the 2nd edition of the Radio-Frequency Record (1954).

It is divided into three parts :

Part A. — Alphabetical Index of Stations.

Part B. — Particulars of stations (new stations and stations the particulars of which have been modified).

Part C. — Deletions.

C.C.I.R. — *Bibliography on Communication Theory.* Supplement nº 2, June 1955.

Unesco Middle East Science Cooperation Office.

List of Scientists in Iran.

List of Scientists in Iraq. (8, Sh. El Salamlik, Garden City, Cairo).