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International Scientific Radio Union

U. R. S. I.

CONTENTS

IN MEMORIAM

It is with deep regret that we record the sudden and untimely death of Prof. Meghnad Saha on 16th February 1956 at New Delhi. Prof. Saha's death at the age of 62 is an irreparable loss to the scientific world and to U.R.S.I. Prof. Saha's was a member of the National Committee and Official Member of Commission V of U.R.S.I.

We want to express our deepest sympathy to the Indian National Committee of U.R.S.I.

NATIONAL COMMITTEES

Canada

MEMBERSHIP

Chairman : Dr. D. W. R. McKinley, National Research Council, Ottawa.

Secretary : Mrs. J. M. A. Marshall, National Research Council, Ottawa.

Members :

Dr. J. H. Chapman, Defence Research Board, Ottawa.
Mr. A. E. Covington, National Research Council, Ottawa.
Dr. B. W. Currie, University of Saskatchewan, Saskatoon, Sask.
Mr. F. T. Davies, Defence Research Board, Ottawa.
Dr. R. C. Dearle, University of Western Ontario, London, Ont.
Dr. J. T. Henderson, National Research Council, Ottawa.
Dr. H. P. Koenig, Laval University, Quebec, P.Q.
Dr. J. S. Marshall, McGill University, Montreal, P.Q.
Dr. P. M. Millman, National Research Council, Ottawa.
Mr. J. C. W. Scott, Defence Research Board, Ottawa.
Dr. G. Sinclair, University of Toronto, Toronto, Ont.
Dr. G. A. Woonton, McGill University, Montreal, P.Q.

Commission Chairmen and Official Members of Commissions :

Commission I : Dr. J. T. Henderson.
Commission II : Dr. J. S. Marshall.
Commission III : Mr. J. C. W. Scott.
Commission V : Mr. A. E. Covington.
Commission VI : Dr. G. Sinclair.
Commission VII : Dr. H. P. Koenig.

India

The Radio Research Committee (Indian National Committee for U.R.S.I.), N.P.L. Buildings, New Delhi 12, India, has been designated as official agency in India for the reception, coordination, liaison and exchange of information relating to radio propagation.

U. S. S. R.

We have been informed by the U. S. S. R. Academy of Science that this agency had charged the U. S. S. R. Scientific Council on Radiophysics and Radiotechnique to act as National Committee of U.R.S.I. Professor Academician A. I. Berg, President, applied on behalf of this Council for the recognition of this new National Committee by U.R.S.I.

COMMISSIONS

Official Members

YUGOSLAVIA

Commission I : Dr. Josip LONTCHAR, Prof. Univ.
Commission II : Ing. Miodrag TIANITCH.
Commission III : Ing. Deyan BAITCH.
Commission IV : Prof. Alexandar DAMIANOVITCH.
Commission V : Dr. Ivan ATANASIEVITCH.
Commission VI : Prof. Maryan GRUDEN.
Commission VII : Prof. Radovan MARKOVITCH.

Commission II

On Radio and Troposphere

CANADIAN NATIONAL COMMITTEE

Canadian Commission II met on February 15, 1956, at the Radio Physics Laboratories of the Defence Research Board of Canada, Shirley Bay, Ottawa. In addition to the eight members of the Commission there were seventeen invited visitors.

Professor W. E. Gordon of Cornell University led a discussion on the basic theory of scatter propagation.

Dr. H. E. G. Neugebauer, of the new RCA-Victor Research Laboratory in Montreal, outlined plans for propagational studies to be undertaken by that organization.

Research in progress in various other laboratories was reported in nine informal papers.

Commission III

SUB-COMMISSION IIIb
ON RADIO WAVE INTERACTION

BIBLIOGRAPHIY

(Given by the Chairman of the Sub-Commission)

Prof. Enzo CARLEVARO (Napoli). — Ricerche sulla interazione a sull' autodemodulazione delle onde elettromagnetiche. *La Ricerca Scientifica,* mars 1955.

Prof. M. CUTOLO (Napoli). — La storia della girointerazione fino al congresso di Sydney. *Rivista Maritima,* mars 1955.

G. J. ATCHISON and G. L. GOODWIN (Adélaïde. Australie). — Ionospheric Self-Interactions of Radio Waves at Vertical Incidence. *Il Nuovo Cimento,* 1er avril 1955.

Prof. M. CUTOLO (Napoli). — A proposito delle esperienze sull'interazione delle radionde nelle ionosfera. *Il Nuovo Cimento,* 1er avril 1955.

Prof. BOELLA (Torino). — Sulla fluttuazione selettiva delle radionde. *Atti del Accademia delle Science di Torino,* t. 88 (1953-54).

FEJER (Johannesburg). — The interaction of pulsed radiowaves in the ionosphere. *Journal of Atmospheric and Terrestrial Physics.* 1955, t. 7.

DELOBAU, EYFRIG et RAWER (Service de prévision ionosphérique, France). — Résultats expérimentaux de transmission ionosphérique d'impulsions sous incidence oblique. *Annales des Télécommunications,* mars 1955.

IONOSPHERIC STATIONS

Germany

ADDITIONAL STATION IN SOUTH WEST AFRICA

An additional station has been planned definitely near 19° S 17°E. The equipment of that station will be similar to that used at Lindau. Definite informations will be given as soon as the details have been cleared in situ. A preparatory trip will be made to South West Africa in April-Juni 1956 so that informations will be available in July 1956.

URSIGRAMS

Permanent Committee on Ursigrams

Minutes of the meeting of the European Sub-Committee
Bagneux (Seine) France
22-24 February, 1956

(*Translation*)

The first session was open at 14.30.

Were present :

Chairman : Father LEJAY.

Members : Dr. B. BECKMANN (Germany) ;
G. RICHTER (Germany) ;
Eng. W. MENZEL (I.T.U., Geneva) ;
Eng. S. GEJER (Sweden) ;
Col. E. HERBAYS, Secretary General (U.R.S.I.) ;
Dr. H. P. Th. VAN LOHUIZEN (Netherlands) ;
Mrs. D. LÉPÉCHINSKY (France) ;
A. DELOUF (France).

The Chairman gave the welcome to the Members, particularly to Mr. S. Gejer, representing Sweden, and expressed his regrets for the absence of Mr. A. H. de Voogt due to the state of his health and also for the absence of a representative of Great Britain.

The meeting had for aim the revision of the present organization of European Ursigrams and of the decisions reached by the meeting held by the Committee on 19-21 september, 1955, whose application met with big difficulties.

1. The Sub-Committee was pleased to notice that the interchange of data between Bagneux, Darmstadt, and Nera is satisfactory ; for the time being some improvement should be brought to the Telex-link between Bagneux and Nera.

2. The Sub-Committee expressed its regrets that Japan has not yet established a second westward transmission (Nera) about 1800 (Japanese time) as recommended by the Permanent Committee at the meeting of September 1955. The Sub-Committee noticed also the lack of daily observations from Australia and New Zealand.

3. The Sub-Committee did not consider the broadcasting organization of detailed data from the centres to interested observatories, most answers to the questionnaires (sent to A.G.I. National Committees at the beginning of January 1956) have not yet reached the B.I.F.

a) B.I.F. will recall this matter to the Committees,

b) It was decided to distribute the various countries of the European region between the 3 agencies of the European Centre.

4. The Sub-Committee recommended that European Notices (ADVEU) and announcement of Alerts and Special World Intervals (SWI) should be transmitted as test and practise, as soon as possible before the A.G.I., by all agencies entrusted with this task.

At the end of the meeting the following resolutions were taken by the Sub-Committee :

A. — Generals

1. The Sub-Committee expressed its thanks to the P.T.T. Departments of West Germany, Sweden and Netherlands which have facilitate the meeting by assuming the travelling expenses of their delegates.

2. The Sub-Committee consider with satisfaction the proposal of efficient co-operation of Sweden in the broadcasting of European Ursigrams and gave a warm welcome to Mr. S. Gejer, representative of this country. It noted that a Telex-link will probably be established between Stockholm and Kiruna and that geophysic and solar data will be transmitted by telephone from Uppsala and Gothenburg to Stockholm.

In this way, most probably the following data will be transmitted by Telex from Sweden :

a) data on aurorae from Kiruna, Spitzbergen, etc. ;

b) ionospheric data from Uppsala and probably from Kiruna and Lulea ;

c) data on magnetism from Stockholm, Kiruna, Spitzbergen ;

d) solar data from Stockholm and Capri ;

e) data on solar radio noise provided by Prof. O. Rydbeck (Chalmers University, Gothenburg) ;

f) data on SID and atmospherics enhancements on 45 kc/s from Stockholm ;

g) probably data from Finland and Norway centralized in Stockholm.

The Sub-Committee requested Mr. Gejer to take steps with his Department in order to establish such centralization.

3. The Sub-Committee expressed the wish that Prof. Dr. VAN DER POL be asked to take part in the work of the Permanent Committee on Ursigrams.

B. — ORGANIZATION

1. The European Sub-Committee on Ursigrams decided that all geophysical and solar data transmitted to each of the Ursigram agencies constituting the present European Centre (Bagneux, Darmstadt and Nera) will be completely interchanged between these agencies. Messages sent to other Ursigram world centres by these three agencies will also be exchanged between them.

These three agencies will have to provide the other agencies of the « European region » with data requested for.

Arrangements will be made between Bagneux, Darmstadt and Nera in order to divide this duty on a territorial basis.

2. *Data* :

(*a*) which will be broadcasted by the Pontoise and Sainte-Assise stations and by radiotelephonic link from Hamburg, will be as follows : « Remarks in plain language » on the actual or probable situation, followed by the PROPA and PREVI (previously PROGNOSE), CHROM, CORON, SOLER, PERTU, MAGNE, FODEU, ESFRE, CORAY and (AUROR) messages, (order to be fixed more definitively) ;

(*b*) which will be transmitted to other Ursigram World Centres as « Interchange Ursigrams », such data will be that included in the

following messages : PERTU, FLARE, SOLER, ADV, CORON, MAGNE, CHROM and if needed FODEU, ESFRE, corresponding to data included in SID, FLA, SOR, ADV, COR, MAG, SPO (and possibly ION) codes established at the meeting of September 1955.

« Remarks in plain language », giving a general description of the main phenomena, will be transmitted shortly at the beginning of the Ursigram, daily in the morning and the evening. When no phenomenon is observed, « Conditions normales » (normal conditions) will be transmitted. The remarks will be drafted by the 3 European agencies and transmitted to Bagneux at the end of the morning and of the afternoon. If the agreement on the forecast included in these remarks is not complete between the 3 agencies the words « POSSIBLE » or « PROBABLE » will be transmitted respectively according as the remarks comes from one or from two agencies. These words might also be used if the agencies announce individually a date on the occurrence of a forecast event.

« Remarks » are concerned with the forecast of the observation of magnetic or ionospheric storms, the transit of an activity centre at the central meridian, etc.

— PROPA data are in particular concerned with the propagation forecasting of the preceding day, they will only be broadcast before noon,

— PREVI data concerned with propagation forecasting will only be broadcast during the evening. They will be established for communication with the following regions :

1. North America
2. South America
3. Eastern Asia
4. India
5. South Africa
6. Europe

3. In order to reduce the length of the Ursigrams, it was agreed to transmit only data from one observatory for the day concerned, priority being given to the data of a specified observatory.

If this observatory has not been able to make observations, data of one of the following observatories will be transmitted. The choice of the station will then be made on the observation quality mentioned by the observatory ; this qualification will be or is already given in the codes.

For CHROM, « priority » : Meudon, alternative : Schauinsland, Nera.

For CORON, « priority » : Pic du Midi, alternative : Wendelstein, Kunzelhöhe.

For SOLER, « priority » : Nera.

When no observation was possible in these observatories, observations of the day concerned from another observatory (e. g. American or Japanese) will be transmitted in the evening or during the following day (See also resolution 9).

— *CHROM message* will be generally transmitted at noon. However if no observation was possible during the morning, it will be given in the evening Ursigram.

The choice of the alternative observatory will be made by Darmstadt for the morning, and, if needed, by Nera for the afternoon by direct agreement with Darmstadt. Bagneux will be kept informed of the message chosen.

— For the *PERTU message*, each agency will transmit its observations to Nera ; Nera will draft the European PERTU and will transmit it to Darmstadt and Bagneux before noon and at 16 h. U.T.

— The *MAGNE message* will only include data given by Wingst Observatory which gives accurate values till 06 h. U.T. and provisional from 06 to 09 h. of the same day.

— In the *FODEU message* of the morning, critical frequencies for the 24 hours of the preceding day will be transmitted, and, if possible, for the first hours of the current day, from Poitiers and Lindau. Data from Uppsala and from a South European station will be added as soon as circumstances permitting, and will be transmitted in the morning or the evening following the day of arrival.

— In the *FODEU message* of the evening, only the values of Leidsendam (Netherlands) from 15 h. to 15 h. U.T. and the values from Casablanca (from 08 h. to 08 h. U.T.) will be transmitted.

— In the *ESFRE message*, the critical frequencies greater than 3 Mc/s for each hour of the day will be transmitted in the same conditions as FODEU.

— In the *CORAY message*, only German observations will be provisionally transmitted.

4. *Codes* used for European Ursigrams will be the following European Ursigrams eventually modified as mentioned hereunder :

CHROM, CORON, SOLER, PERTUR, MAGNE, FODEU, ESFRE, CORAY

and also the PROPA and PREVI codes deduced from the previous PROPA and PROGNOSE.

— The *CHROM code* will be modified in order to give the location of activity centres to 5°. The observation quality will be given by means of for instance a 1-3 scale. A *FLARE code* will point out the flares separately.

— The *CORON code* as recently modified by Mr. Rösch is adopted generally. As soon as coronal jets will be regularly observed, they will be noted in the Ursigrams according to a code which will be drafted in due time.

— The *SOLER code* will be modified by agreement between MMrs. Denisse and van Lohuizen.

— The *PERTU code* will be modified taking into account the suggestions (PISOL code) of Mr. van Lohuizen and the indications of the SID code.

— The *MAGNE code* will be slightly modified for what concerns the description of particular phenomena according to Mr. Bartels' suggestions (possible deleting of geant pulsations, non confirmed crochets, sudden pulses during storms, micropulses), but in accordance with the Institut de Physique du Globe.

— The *FODEU code* will be reduced by deleting of POSIT and NEGAT and simplifying of SYMBO ; median values will be exchanged by mail or telegraph.

— The *ESFRE code* will be modified in order to give all the critical frequencies higher than 3 Mc/s (instead of « from 5 Mc/s »).

— The *CORAY code* will be provisionally maintained.

— The *PROPA code* will give the propagation qualities on various links.

— The *PREVI code* will give propagation forecast on various links according to the mode used in the present German PROGNOSE code.

— The *AUROR code* will give the auroral activity observed in high latitude stations.

5. The Sub-Committee appointed a working group as follows : MMrs. Beckmann, van Lohuizen, Delouf and Menzel (consultant)

to re-arrange the 10 above mentioned codes before April 1st, 1956. These codes will be used from June 1st, 1956.

The AUROR code will be drafted later by co-operation with the representative of Sweden.

6. The information to be transmitted from Centre to Centre (Interchange Ursigrams) will be transmitted at 12 h. U.T. and at 16 h. U.T. as follows :

at 12 h. U.T. to Washington through *Darmstadt* ;

at 16 h U.T. to Washington on one side and to Tokyo on the other side through *Nera*.

The Sub-Committee recommended that the transmissions from Nera be made in the future at a later time of the day, as soon as circumstances allows it.

7. Considering difficulties met by various Departments in the translation of data provided by the European codes into American codes (suggested by Mr. A. H. Shapley), the Sub-Committee decided that the transmissions from Centre to Centre, from the « European Centre » will be transmitted by means of the codes mentioned in resolution 4, i.e. the modified European codes. Data transmitted to Washington and Tokyo will be limited to information requested by C.R.P.L. in September 1955.

The Sub-Committee drew the attention of the working group appointed in resolution 5 on the need to establish for each of the data to be transmitted in the Centre to Centre messages, the required reductions to the European codes in deleting some groups of the codes.

8. As a rule, the ADV (Advice) American code is adopted for the A.G.I. In order to prepare the test of the European Advice (ADVEU) to be transmitted to C.R.P.L. during the A.G.I., an exchange of opinions will take place by Telex at the end of the afternoon, every day between the three European agencies (Bagneux, Darmstadt and Nera).

In order, to facilitate this enchange, a code of standard sentences will be prepared by the Working group.

A confirming telegram will be transmitted by Bagneux and Nera to Darmstadt about 10 h. U.T. the following day and generally the European ADVEU message will be transmitted at 13 h. by

Darmstadt to C.P.R.L. Moreover, in case of urgency, it will be transmitted at any time by a special NERAWASH message.

9. In the case when no solar observation is available in Europe, *American* and *Japanese* data, and these from other sources, for the missing days, will be transmitted by Nera to Darmstadt and Bagneux by means of the abbreviated *European code.*

Nevertheless :

chromospheric flares,
radio radiations burts,
S.I.D. (P.I.D.B.),
and sudden magnetic storms,

pointed out in extra-European messages will be transmitted daily in the morning by Nera to Darmstadt and Bagneux by modified European codes and will be included in the European Ursigrams. Such data will be preceded in the Ursigram by the words Washington, Tokyo, etc.

10. For what concerns the character of the phenomena for which C.R.P.L. shall have to fix Alert periods and Special World Intervals (S.W.I.) during the A.G.I., the Sub-Committee recommended that such phenomena should not be only radio propagation disturbances, but in a more general way, geophysical or solar phenomena having a general scientific interest, including unusual quiet periods.

INTERNATIONAL GEOPHYSICAL YEAR

Meeting of the U.R.S.I. special Committee

The U.R.S.I./A.G.I. will meet at Brussels, August 29-31, 1956, under the chairmanship of Sir Edward Appleton.

On the calculation of solar zenith angle

by W. J. G. Beynon and G. M. Brown,
University College of Swansea

The Mixed Commission on the Ionosphere has tabled the following recommendation (see *Proc. Mixed Comm. on the Ionosphere*, Brussels, 1954, p. 77, Resolution 2) [1] :

« The M.C.I. recommends that each ionospheric station (or the responsible organisation) should undertake the calculation of the solar zenith angles appropriate to its location. The calculations should be made for the 15th day of each month at hourly intervals from sunrise to sunset, due consideration being given to factors such as the equation of time and local time corrections »

In practice, it is found that certain difficulties arise in calculating a single set of monthly values of the solar zenith angle χ valid for all years, and in this note we discuss some of the points which arise and their bearing on ionospheric studies.

General Considerations

The basic equation is :

$$\cos \chi = \sin \Phi . \sin \delta + \cos \Phi . \cos \delta . \cos h$$

where Φ is latitude, δ solar declination, and h the hour angle of

[1] See also *U.R.S.I. Inf. Bul.*, **88**, 3-6 ; *U.R.S.I. Proceedings*, X, parts 3 and 8, 1954.

the sun measured westwards from noon. The nominal value of the hour angle (for the « mean sun ») must be corrected according to the *Equation of Time* (E.T.). Usually, in practice, a correction must alos be included to allow for any difference between local time at a station and the meridian time used. We have found it convenient to include both the local time and the equation of time corrections, in the initial stages of the calculation, by writing :

$$h = h_M + (\varepsilon + \beta)$$

where h_M is the hour angle of the mean sun from noon (reckoned positive westwards), ε is the equation of time (reckoned positive when the apparent sun is ahead of the mean sun), and β is the local time correction (reckoned positive when the time meridian is west of the station).

Since the values of δ and ε are continuously changing throughout the year, it is clear that for the highest accuracy (say one in the third place of decimals) it is necessary to calculate cos χ at hourly intervals for *each day*. This would represent a considerable amount of computation and, although not in itself an unsurmountable task, it is not at all certain that it would be justified by the accuracy of the experimental data. Furthermore, there is a year-to-year variation in both δ and ε, so that values of these quantities for any selected day in one year are not appropriate for that day in all years. This matter is discussed more fully below. Evidently some compromise has to be adopted in the calculation of cos χ.

At present nearly all ionospheric stations publish *monthly median* values of characteristics. It seems logical then to analyse these in relation to monthly median values of the appropriate function of the solar zenith angle χ. These will always occur within a day or so of the 15th day of the month. In similar manner, in dealing with *monthly mean* ionospheric data it would be logical to use monthly mean values of the appropriate function of χ. The difference between these two (namely mean and median, or mean and value for 15th of month) can be considerable owing to the day-to-day changes in δ and ε. Thus the maximum difference between monthly mean and median values of δ is about 28′ of arc, giving rise to an uncertainty of about 0.006 in cos χ (for $\chi = 45^o$) and of about 0.008 for $\chi = 75^o$. The corresponding maximum difference for ε is about 10′ of arc giving maximum uncertainties of 0.002 and 0.003 in cos χ for $\chi = 45^o$ and 75^o respectively.

Monthly median values of χ

The values of δ and ε for the 15th day of a month are close to the monthly median values, and it is therefore legitimate to employ these values, as suggested in the M.C.I. recommendation, provided they are then used in conjunction with monthly median ionospheric parameters. However, owing to the fact that the true year is not exactly 365 days, values of δ and ε are not exactly repeated each year.

An idea of the magnitude of the year-to-year variation in δ on a given day is afforded by the following figures for March 15 for the years 1947-1951. This variation is a maximum near the equinox months.

Year	δ on March 15
1947	$-2^{\circ}33'$
1948	$-2^{\circ}15'$
1949	$-2^{\circ}21'$
1950	$-2^{\circ}27'$
1951	$-2^{\circ}32'$

To within 1′ of arc values of δ are repeated four years later, but over a long period there is still a small cumulative change. For most months maximum change between successive years occurs between a leap year and the preceding year (for January and February it occurs between leap year and the succeeding year), at which time the value of δ may change by 18′ of arc. This difference roughly corresponds to the day-to-day change in δ at the equinoxes, but near the solstices is equivalent to the change in δ over 10 or 12 days. This change in δ (18′) gives rise to a maximum change in $\cos\chi$ of about 0.004 for $\chi = 45^{\circ}$ and to 0.005 for $\chi = 75^{\circ}$. For the equation of time the maximum change in successive years is only about 5′ of arc, corresponding to 0.001 in $\cos\chi$.

To obviate the necessity for calculating $\cos\chi$ for each year we, at Swansea, have taken values of δ and ε which are averages of the extreme year-to-year variations in these quantities. These are given in Table 1. The figures refer to 0 h. U.T., and in order to estimate the values at any other hour we give also the daily differences, for days near the middle of each month.

Monthly Mean values of χ

Monthly mean values of ionospheric parameters such as fE or fF1 should strictly be used in conjunction with monthly mean values of the appropriate function of χ, such as $\cos^{1/4}\chi$ or $\cos^{1/3}\chi$, and monthly mean values of absorption ($-\log\rho$) with monthly mean values of $\cos^{3/2}\chi$. In practice, the differences between $\overline{\cos^n\chi}$ and $(\overline{\cos\chi})^n$ are small, and hence it is sufficient to determine $\overline{\cos\chi}$. The determination of a monthly mean value, $\overline{\cos\chi}$, from a set of daily values involves the circulation of $\overline{\sin\delta}$ and $\overline{\cos(h_M+\beta+\varepsilon).\cos\delta}$. There is no difficulty about the former, but the latter implies a separate calculation for each hour. However, since the E.T. ε is small no significant error arises if we use $\cos(h_M+\beta+\bar{\varepsilon}).\overline{\cos\delta}$, i.e. if we use a monthly mean value of ε for each month. We are thus left with the calculation of $\overline{\sin\delta}$, $\overline{\cos\delta}$, and $\bar{\varepsilon}$ where the averages are to be taken over a month. Monthly mean values of ε, which are averages of the extreme year-to-year variations, are included in Table 1.

It is felt that the following further simplification is justified. Since the maximum range of δ is only $\pm$ 23 1/2° there is little significant difference between $\overline{\sin\delta}$ and $\sin\bar{\delta}$ in any month, and also between $\overline{\cos\delta}$ and $\cos\bar{\delta}$ for all months except those in which δ changes sign. The maximum difference in $\cos\chi$ between the values based on $\overline{\cos\delta}$ and $\cos\bar{\delta}$ is apparent in equinox months for overhead sun conditions and amounts to about 0.002. This small uncertainty can be reduced if $\cos/\bar{\delta}/$ is used in place of $\cos\bar{\delta}$. We give in Table 1 the values of $\bar{\delta}$ for each month and also for March and September the values of $/\bar{\delta}/$ (the latter to be used for $\cos\delta$ only).

It may be anticipated that use of the monthly mean values of δ and ε given in Table 1 will yield values of $\cos\chi$ having a maximum uncertainty of one-half the figures given above.

Practical considerations

Finally, it is relevant to consider the application of the calculated values since this should guide the number of significant figures which are warranted by the accuracy of the experimental data. The U.R.S.I.-A.G.I. Committee has published the following Minute (*U.R.S.I. Bulletin*, No. 94, 1955, p. 33) :

« The U.R.S.I.-A.G.I. Committee urges on all I.G.Y. ionospheric stations the need for ensuring maximum accuracy in all measurements, and in particular it is recommended that the timing of measurements such as vertical incidence critical frequencies should be accurate to within one minute. »

We find that this recommended order of accuracy in time (namely 15′ of arc in h) corresponds to a maximum uncertainty of 0.003 of 0.003 in cos χ for $\chi = 45^{\circ}$ and of 0.004 for $\chi = 75^{\circ}$, i.e. an uncertainty of up to 2 % in cos χ.

From the ionospheric side, vertical incidence critical frequencies such as fE and fF1 (to which values of cos χ find their principal applications) are normally measured, or at least published, to 0.1 Mc/s. This also represents an accuracy of some 2 to 3 %. On the other hand, theory requires consideration of $f\mathrm{E}^3$ or $f\mathrm{E}^4$ in relation to cos χ and the uncertainty of these powers of fE is thus increased to about 10 %.

In view of these practical considerations, there is clearly no justification for calculating values of cos χ for one particular epoch which are accurate to 0.001. Since the period of the forthcoming International Geophysical Year (1957-1958) falls midway between the times of extreme variations of δ and ε, i.e. midway between consecutive leap years, the values given in Table 1 will be quite adequate for the determination of cos χ at all stations. Moreover, in the intercomparison of results considerable advantage will accrue if these values of δ and ε are used by all who make these calculations.

One further point should be mentioned. In any theoretical analysis concerned with the absorption of solar radiation in the earth's atmosphere and the production of ionospheric layers it is necessary to allow for the curvature of the atmosphere. Chapman has shown that this may be effected by replacing the factor cos χ in any expression by an inverse function, designated $1/\mathrm{Ch}(x, \chi)$, where $x = (a + h)/\mathrm{H}$, a being the radius of the earth and H the atmospheric scale height at a level h above ground. The difference between cos χ and $1/\mathrm{Ch}(x, \chi)$ becomes quite considerable for values of χ greater than about 75°, and the appropriate Chapman function should then be used. Wilkes has recently published (*Proc. Phys. Soc.*, B., **67**, 304, 1954) a comprehensive table of the Chapman function for values of χ from 20° to 100°.

TABLE 1

Month	Solar déclination 00 hr. δ		Equation of time 00 hr. ε		Daily differences	
	Monthly mean	On 15th	Monthly mean	On 15th	Declin	E T
January	—20°50′	—21°17′	—2°18′	—2°19′	11′	—5′
February	—12°57′	—12°59′	—3°28′	—3°34′	20′	1′
March	— 1°59*	— 2°23′	—2°12′	—2°18′	23′	4′
	— 3°22+					
April	9°37′	9°32′	—0°5 ′	—0° 3′	21′	4′
May	18°44′	18°43′	0°51′	0°57′	14′	0′
June	23° 3′	23°17′	—0° 5′	—0° 2′	4′	—3′
July	21°14′	21°38′	—1°23′	—1°27′	—10′	—2′
August	13°48′	14°16′	—1° 0′	—1° 8′	—19′	3′
September	3° 3*	3°17′	1°11′	1° 8′	—23′	5′
	3°42+					
October	— 8°34′	— 8°17′	3°28′	3°30′	—22′	3′
November	—18°15′	—18°20′	3°43′	3°52′	—15′	—3′
December	—22°57′	—23°14′	1° 8′	1°18′	— 4′	—7′

* This value is $\overline{\delta}$ to be used in terms in sin δ.

\+ This value is $/\overline{\delta}/$ to be used in terms in cos δ.

The authors wish to acknowledge with gratitude the helpful comments they have received from Sir Edward Appleton and Dr. V. C. Reddish of the University of Edinburgh.

Scientific Programme of the French Participation

(Received April 14, 1956)

(*Translation*)

NOVEMBER 1955

Administrative Organization

The scheme of the French participation to the International Geophysical Year has been drafted by the

Comité National Français pour l'Année Géophysique

191, Rue Saint-Jacques, Paris 5e

appointed by the Académie des Sciences (French agency adhering to the International Council of Scientific Unions). This Committee, whose Chairman is Father P. Lejay and the Secretary, M. J. Coulomb, acts for the time being as consultant scientific agency. The following are responsible for the various items :

World Days	: Father Lejay.
Meteorology	: Mr. Viaut.
Ozone	: Mr. Vassy.
Terrestrial Magnetism	: Mr. Coulomb.
Aurora and Night-sky	: Mr. Barbier.
Ionosphere	: Father Lejay.
Cosmic Rays	: Mr. Leprince-Ringuet.
Solar Activity	: Mr. d'Azambuja.
Longitudes	: Mr. Danjon.
Physical Oceanography	: Mr. Gougenheim.
Glaciology	: Mr. Bauer.
Seismology	: Mr. Rothe.
Gravimetry	: Father Lejay.
Publication	: MMrs. Danjon and Coulomb.

The

Comité Central des Expéditions Scientifiques

191, Rue Saint-Jacques, Paris, 5e

appointed by the Centre National de la Recherche Scientifique has been entrusted with the administration of operations. This Committee, under the chairmanship of Father Lejay, entrusted

several sub-committees with the administration of the various expeditions. Sub-Committee chairmen are :

Antarctica	: Mr. P. E. Victor.
Longitudes	: Mr. Danjon.
Sahara studies	: Mr. Lagrula.
Oversea expeditions	: Mr. Combes.
Physical Oceanography	: Mr. Gougenheim.
Southern lands	: Mr. Richert.

Alphabetical list of French stations

(Only stations carrying ionospheric or connected observations are reported).

Most of the I.G.Y. French stations are operating at present but their equipment and activities will be increased sometimes in a large way. Major exceptions are both stations in Terre Adélie : Pointe Géologie and Plateau, which will be equipped by an expedition leaving France in October 1955, another exception is the Tahiti-Orstrom station in course of organization.

In the section giving the activities of the various stations, the following abbreviations are used :

IV. Aurora and Night-Sky.
V. Ionosphere.
VI. Solar Activity.
VIII. Longitudes and Latitudes (Time signals).
A. Atmospherics.

On the other hand, a serial number has been given to each station, stations being at first listed in alphabetical order.

The serial number is given each time the station is mentioned in the report.

List

3. Alger-La Bouzaréah (VIII).
8. Bangui (V, A).
9. Bizerte (V).
11. Brest (A).

12. Casablanca (V).
15. Champfleury (V).
19. Dakar (V).
23. Djibouti (V).
32. Kerguelen-Port aux Français (IV, V, A).
37. Nançay (VI).
43. Noumea (V).
46. Paris-Bagneux (A).
47. Paris-Domont (V).
48. Paris-Meudon (VI).
49. Paris-Observatoire (VIII).
53. Poitiers (V, A).
55. Rabat (V, A).
57. Saint-Michel l'Observatoire (V, A).
59. Tahiti-Orstrom (V).
60. Tahiti-Papeete (VI).
61. Tamanrasset (V).
62. Tananarive-Observatoire (VIII).
63. Tananarive (V).
64. Terre-Adélie-Pointe Géologie (IV, V).
66. Tunis (A).

The Bureau Ionosphérique Français, Paris-Bagneux, will take part to the prediction of Special World Intervals (SWI) and will co-operate to the transmission of information during the International Geophysical Year.

Geographical List of French Stations

CARRYING IONOSPHERIC OBSERVATIONS AND DETERMINATIONS OF LONGITUDES AND LATITUDES

NB. Northern Subauroral Belt :

Number		Latitude	Longitude	Height
47.	Paris-Domont	N 49°01′	E 2°19′	
49.	Paris-Observatoire	N 48°50′11″2	E 0h19m20s93	67 m
46.	Paris-Bagneux	N 48°48′	E 2°19′	
48.	Paris-Meudon	N 48°48′	E 2°15′	162 m

Number		Latitude	Longitude	Height
11.	Brest	N 48°27′	W 4°25′	
37.	Nançay	N 47°23′	E 2°11′	
15.	Champfleury	N 47°18′	E 3°04′	
53.	Poitiers	N 46°35′	E 0°19′	
NC. Northern Minauroral Belt :				
57.	Saint-Michel l'Observatoire	N 43°55′	E 5°43′	580 m
9.	Bizerte	N 37°12′	E 9°48′	
66.	Tunis	N 36°50′	E 10°14′	
3.	Alger-La Bouzaréah	N 36°48′04″8	E 0h12m08s38	345 m
55.	Rabat	N 34°00′	W 6°50′	
12.	Casablanca (Ionosphere)	N 33°36′	W 7°38′	
61.	Tamanrasset	N 22°48′	E 5°31′	1395 m
CE. Equatorial Belt :				
19.	Dakar (Ionosphère)	S 14°06′	W 17°04′	
23.	Djibouti	N 11°33′	E 43°09′	
8.	Bangui-Observatoire	N 4°36′	E 18°35′	
59.	Tahiti-Orstrom			
60.	Tahiti-Papeete	S 17°29′	W 149°29′	
62.	Tananarive-Observatoire	S 18°55′00″	E 3h10m12s	1381 m
63.	Tananarive (Ionosphere)	S 18°55′	E 47°33′	
SC. Southern Minauroral Belt :				
43.	Nouméa (Ionosphere)	S 22°16′	E 166°26′	
SB. Southern Subauroral Belt :				
32.	Kerguelen-Port aux Français	S 49°21′	E 70°13′	
SA. Southern Auroral Region :				
64.	Terre-Adélie - Pointe Géologie	S 66°40′	E 140°01′	

Scientific Programme of the various stations

3. *Alger-La Bouzaréah.*

VIII. Longitudes.

Time Signals : reception.

8. *Bangui.*

V. Ionosphere.

— Routine ionospheric soundings every hour and at least every 15 minutes during 3 hourly periods around sunset and sunrise (Height : 100 km). The sounding schedule will be increased to 12 every hour during World Days.
— Panoramic soundings at a schedule of 6 every minute for the study of fast phenomena during solar eclipses and major ionospheric disturbances indicated by routine soundings.

— Continuous recording and measurement of ionospheric absorption by means of vertical incidence pulses on two frequencies (about 2 and 3 Mc/s) and reception on circularly polarized aerial.

— Measurements of ionospheric winds by Mitra's method using a pulse transmitter and three receivers distant of some hundred metres. The recording will be made either by a single cathode ray oscillograph or by a three traces oscillograph by means of an electronic switch. Frequencies used will be about 2 and 5 Mc/s in order to separate E region winds from F region winds. Study of diurnal variations of the direction and strength of winds.

V. Atmospherics.

— Locating of centres of atmospherics by means of continuous directional recordings. Narrow beam direction finder.

— Study of propagation of atmospherics on decimetre and kilometre (11 km) wavelengths by means of recordings of the periodicity and mean field strength.

— Study of sudden ionospheric disturbances.

9. *Bizerte.*

V. Ionosphere.

— Observation of ionospheric normal characteristics by means of a standard sounder every hour and twice every hour during World Days.

— Measurement of absorption of waves reflected by the ionosphere by means of a standard sounder at 7 frequencies by the British method, at noon every day and three times a day during World Days.

11. *Brest.*

V. Atmospherics.

— Locating of centres of atmospherics by means of continuous directional recording. Narrow beam direction-finder.

12. *Casablanca.*

V. Ionosphere.

— Usual ionospheric soundings every hour and at least every 15 minutes during three hourly periods before and after sunrise and sunset (height : 100 km). The periodicity of sounding will be increased to 12 per hour on World Days.

— Study of great distance propagation of VHF by ionospheric scatter. Measurements are expected on the field of a 10 kW Dutch transmitter operating on a frequency of about 50 Mc/s.

15. *Champfleury.*

V. Ionosphere.

— Current ionospheric soundings every hour and at least every 15 minutes during three hourly periods before and after sunrise and sunset (height : 100 km). The periodicity of sounding will be increased to 12 every hour on World Days.

— Panoramic soundings at a schedule of 6 every minutes to allow investigation of fast phenomena during solar

eclipses and major ionospheric disturbances observed by normal soundings.

— Continuous recording and ionospheric absorption measurement by means of vertical incidence pulses at two frequencies (about 2 and 3 Mc/s), reception on circularly polarized aerial.

— Ionospheric winds measurements by means of Mitra's method with a pulse transmitter and 3 receivers distant of some hundred metres. The recording will be made either on the self cathode ray oscillograph or on a three trace recorder by means of an electronic switch. Frequencies used are about 2 and 5 Mc/s in order to separate E-region winds from F-region winds. Study of diurnal variations of wind direction and strength.

19. *Dakar.*

V. Ionosphere.

— Observation of normal ionospheric characteristics by means of a standard recorder every hour and every 30 minutes during World Days.

— Measurement of absorption of waves reflected by the ionosphere by means of a standard sounder on 7 frequencies by the British method, at noon every day and three times every day on World Days.

— Panoramic sounding to investigate rapid drifts, apparently vertical in the ionosphere, ionospheric disturbances and scatter by means of a panoramic sounder. On World Days continuous observation during 24 or 30 hours.

— Observation of ionospheric winds by means of the fading method for three aerials with a 10 kW fixed frequency pulse transmitter and a special receiver. Harnischmacher automatic measurement device. Observation every 2 hours on World Days.

— Oblique incidence soundings with frequency sweep between Dakar and Paris-La Martinière.

— Backscatter. Observation of certain characteristics (MUF) on 2000 km horizontal distance with a 100 kW transmitter pulse receiver (3-30 Mc/s) with a rhombic

aerial, every hour and every 30 minutes on World Days.

— Possibly VHF propagation at great distance by ionospheric scatter. Measurements are expected on the field of a transmitter at Yaoundé.

23. *Djibouti.*

V. Ionosphere.

— Observation of normal ionospheric characteristics by means of a standard recorder every hour and every 30 minutes during World Days.

— Measurement of absorption of waves reflected by the ionosphere by means of a standard sounder on 7 frequencies by the British method, at noon day every and three times every day on World Days.

— Observation of ionospheric winds by means of the fading method for three aerial with a 10 kW fixed frequency pulse transmitter and a special receiver. Harnischmacher automatic measurement device. Observation every 2 hours on World Days.

— Fixed frequency oblique incidence sounding for analytical studies of propagation conditions at great distance. 50 kW fixed frequency pulse transmitter with omnidirectional aerial. Possible reception at Bizerte, Dakar, Tahiti and Tananarive. Continuous operation on World Days.

— Possible VHF propagation experiment at great distance by ionospheric scatter. Measurements are expected on the field of a transmitter at Yaoundé.

32. *Kerguelen - Port-aux-Français.*

IV. Aurora.

— Metre wavelength radar with aerial with variable azimuth angle and angle of sight. The setting up of this equipment is under study. It would be used to investigate auroral radio echoes and meteors. Possible observations :

— Accurate location in azimuth-distance of reflecting ionized regions.

— Observation of the general distribution and of the

motion of the ionized regions on a large ionospheric area up to 1200 km from the station.

V. Ionosphere.

— Observation of normal ionospheric characteristics by means of a standard recorder every hour and every 30 minutes during World Days.

— Measurement of absorption of waves reflected by the ionosphere by means of a standard sounder on 7 frequencies by the British method, at noon every day and three times every day on World Days.

— Panoramic sounding to investigate rapid drifts apparently vertical in the ionosphere, ionospheric disturbances and scatter by means of a panoramic sounder. On World Days continuous observation during 24 or 30 hours.

— Observation of ionospheric winds by means of the fading method for three aerials with a 10 kW fixed frequency pulse transmitter and a special receiver. Harnischmacher automatic measurement device. Observation every 2 hours on World Days.

— Fixed frequency oblique incidence sounding for the analytical investigation of propagation conditions at great distances. Fixed frequency 50 kW pulse transmitter with omnidirectional aerial. Reception at Pointe Géologie and Ivato. Continuous operation on World Days.

A. Atmospherics.

— Locating of centres of atmospherics by means of continuous directional recordings. Cathode ray and narrow beam direction finders.

— Studies on propagation of atmospherics on decametre, kilometre (11 km), myriametre (57 km) wavelengths by means of the recording of the periodicity and mean field.

— Studies on whistling atmospherics. Recording of whistlers on magnetic tape at regular intervals.

— Investigation on sudden ionospheric disturbances.

37. *Nançais.*

VI. Solar Activity.

— Locating of radio active centres on the sun area and investigation on their structure. 169 Mc/s interferometer with 16 to 32 aerials on a 1600 m EW base. The definition will be 3′ of arc. The equipment will be continuously operating and measurements will be carried out about local noon.

— Continuous survey of the total solar radiation (8 hours every day) with a radiometer on 169 Mc/s.

43. *Nouméa.*

V. Ionosphere.

— Observation of normal ionospheric characteristics by means of a standard recorder every hour and every 30 minutes during World Days.

— Measurement of absorption of waves reflected by the ionosphere by means of a standard sounder on 7 frequencies by the British method, at noon every day and three times every day on World Days.

46. *Paris-Bagneux.*

A. Atmospherics.

— Locating of atmospherics centres by means of continuous directional recording. Cathode ray direction-finder and narrow beam direction-finder.

— Investigation on the propagation of atmospherics at decametre (60 m and 1050 m), kilometre (5, 11, 24 and 35 km), myriametre (57 and 70 km), by means of recording of periodicity and mean field.

— Investigation on sudden ionospheric disturbances.

47. *Paris-Domont.*

V. Ionosphere.

— Continuous recording and ionospheric absorption measurements by means of vertical incidence pulses on two frequencies (about 2 and 3 Mc/s), reception on circularly polarized aerial.

— Measurements of ionospheric winds by Mitra's method using a pulse transmitter and three receivers distant of some hundred metres. The recording will be made either by a single cathode ray oscillograph or by a three traces oscillograph by means of an electronic switch. Frequencies used will be about 2 and 5 Mc/s in order to separate E region winds from F region winds. Study of variations of the direction and strength of winds.

48. *Paris-Meudon.*

VII Solar activity.

— Continuous survey of the total solar radiation with 225 and 550 Mc/s radiometers.

49. *Paris-Observatoire.*

VIII. Longitudes.

— Time signals : transmission and reception (duplex links).

53. *Poitiers.*

V. Ionosphere.

— Usual ionospheric soundings every hour and at least every 15 minutes during three hourly periods before and after sunrise and sunset (height : 100 km). The periodicity of soundings will be increased to 12 per hour on World Days.

— Oblique incidence soundings with frequency sweep between Poitiers and Paris-Bagneux.

— Study of great distance propagation of VHF by ionospheric scatter. Measurements are expected on the field of a 10 kW Dutch transmitter operating on a frequency of about 50 Mc/s.

A. Atmospherics.

— Localisation of centres of atmospherics by means of a cathode ray direction finder.

— Investigation on the propagation of atmospherics on kilometre (5 et 11 km) wavelengths by means of recording of periodicity and mean field strength.

— Investigation on whistling atmospherics. Recording of whistlers on magnetic tape at regular intervals.

— Study of sudden ionospheric disturbances.

55. *Rabat.*

V. Atmospherics.

— Locating of centres of atmospherics by means of continuous directional recording. Narrow beam direction-finder.

— Investigation on the propagation of atmospherics on kilometre (11 km) wavelengths by means of recording of periodicity and mean field strength.

— Study of sudden ionospheric disturbances.

57. *Saint-Michel l'Observatoire.*

V. Ionosphere.

— Measurement of ionospheric absorption by means of continuous recording of galactic noise between 4 and 10 Mc/s.

VI. Solar activity.

— Study of flares in connection with ionospheric disturbances.

59. *Tahiti-Orstrom.*

V. Ionosphere.

— Observation of normal ionospheric characteristics by means of a standard recorder every hour and every 30 minutes during World Days.

—Measurement of absorption of waves reflected by the ionosphere by means of a standard sounder on 7 frequencies by the British method, at noon every day and three times every day on World Days.

— Panoramic sounding to investigate rapid drifts apparently vertical in the ionosphere, ionospheric disturbances and scatter by means of a panoramic sounder. On World Days continuous observation during 24 or 30 hours.

— Observation of ionospheric winds by means of the fading method for three aerials with a 10 kW fixed frequency pulse transmitter and a special receiver. Harnischmacher automatic measurement device. Observation every 2 hours on World Days.

— Possibly observation of echo polarization in order to reach better understanding on Es-layer echoes of echoes from scattering regions, by means of a 10 kW fixed frequency pulse transmitter and a two channel receiver. Regular operation about 3 hours every day on World Days.

60. *Tahiti-Papeete.*

VI. Solar activity.

— Continuous survey of the total solar radiation with a 169 Mc/s radiometer.

61. *Tamanrassel.*

V. Ionosphere.

— Current ionospheric soundings every hour and at least every 15 minutes during three hourly periods before and after sunrise and sunset (Height : 100 km). The periodicity of sounding will be increased to 12 every hour on World Days.

— Panoramic soundings at a schedule of 6 every minutes to allow investigation of fast phenomena during solar eclipses and major ionospheric disturbances observed by normal soundings.

— Possibly ionospheric winds measurement by Mitra's method using a pulse transmitter and 3 receivers distant of some hundred metres. The recording will be made either on the same cathode ray oscillograph or on a three traces recorder by means of an electronic switch. Frequencies used will be about 2 and 5 Mc/s in order to separate E region winds from F region winds.

— Study of diurnal variations of the direction and strength of winds.

62. *Tananarive-Observatoire.*

VIII. Longitudes.

Time Signals : transmission and reception.

63. *Tananarive.*

V. Ionosphere.

— Observation of normal ionospheric characteristics by means of a standard recorder every hour and every 30 minutes during World Days.

— Measurement of absorption of waves reflected by the ionosphere by means of a standard sounder on 7 frequencies, every day at noon and 3 times a day on World Days.

— Observation of ionospheric winds by the method of fading of three aerials with a 10 kW fixed frequency pulse transmitter and a special receiver. Harnischmacher automatic device. Observation every 2 hours on World Days.

66. *Tunis.*

V. Atmospherics.

— Locating of atmospherics centres by means of continuous directional recording. Narrow beam direction finder.

— Study of atmospherics propagation on kilometre (11 km) wavelengths by means of recording of periodicity and mean field strength.

— Investigation on sudden ionospheric disturbances.

I. — World Days — Alerts

In accordance with decisions of the Ursigram Committee of the International Scientific Radio Union (U.R.S.I.), le Bureau Ionosphérique Français, (B.I.F.) will be a part of the « European Ursigram Centre ». In connection with Darmstadt and The Hague, B.I.F. will co-operate to the collecting of information from West-European and African observatories, to the transmission to the three other « Centres » (U.S.A., U.R.S.S. and Japan) of data

needed for alerts forecasting and for the broadcasting such data to interested agencies.

The Paris-Meudon Observatory will co-operate in the collecting of solar data for the « European Ursigram Centre ».

The Pic-du-Midi Observatory will co-operate to collect the data on solar corona for the « European Ursigram Centre ».

Antarctica

Expedition in Terre Adélie

It is expected to establish a main base at Pointe Géologie and an auxiliary station on the glacial cap at 200-300 km from the main base. Both stations will be located on 140° E meridian chosen by C.S.A.G.I. On the other hand, they are located inside the auroral circle but on each side of the south surface magnetic pole. Particularly the Plateau station will be established between the surface pole and the geomagnetic pole.

The Pointe Géologie station can be connected for the study of auroras to the station of Resolute Bay at Canada, which is located about at the same geomagnetic latitude and on the same line of force.

IV. *Aurora and Night-Sky.*

Metre wavelength (75 Mc/s) radar connected to a rotary aerial for investigating on radio echoes, auroral shapes and meteors.

— Accurate azimuth-distance delimitation of reflecting ionized regions.

— Observation of the general distribution and of the motion of ionized regions on a large ionospheric area to 1200 km from the station.

— With a rotation of 1 round every second, observation of transitory phenomena such as changes of the aurora structure, or the drift velocity of ionized regions.

— Systematic observations on a year interval for the statistical analysis.

— Comparison of observations with observations carried out with the same equipment in other stations such as

Jodrell Bank (Great Britain), Kiruna (Sweden), Mawson (Australia) and perhaps Macquarie Is. (Australia).

V. Ionosphere.

— Ionospheric soundings with an equipment built at the Bureau Ionosphérique Français. Routine soundings expected every hour. Soundings every 15 minutes from two hours before sunrise to one hour after, and from one hour before sunset to two hours after in order to investigate the effects of the sun on the production of ionized layers. On World Days (RWD) not coincident with World Meteorological Intervals (WMI) soundings will be made every 5 minutes, stopping radio transmissions and radio soundings.

— Panoramic soundings with a periodicity of 6 every minute allowing investigations on fast phenomena during solar eclipses and major ionospheric disturbances observed on standard soundings.

— Tests on oblique reflection and scatter transmission from Terre Adélie to Macquarie Is. Pulses from the aurora radar will be recorded at the Australian Station of Macquarie Is by means of an equipment provided by SPIM.

— Ionospheric absorption will be measured by reception and continuous recording of galactic noise between 25 and 30 Mc/s. The apparatus is being built by the Ecole Normale Supérieure.

Resolutions adopted by the Third Plenary Session of C.S.A.G.I.

REMARKS

Resolutions on Longitude and Latitude

Inf. Bull., *95*, 83-84

We are informed that in the last sentence, concerned with signals transmitted by Annapolis, wavelengths referred to are myriametre wavelengths (e.i. more than 10 000 m).

JOINT COMMISSIONS

Joint Commission on Study on Solar and Terrestrial Relationships

The proceedings of the meeting held in Dublin, September 1955, is out of press ; the following papers submitted to the meeting are published.

1. Niveau moyen des atmosphériques, des ondes décamétriques aux ondes myriamétriques (par R. Bureau).

2. The 27 day recurrence tendency of geomagnetic activity (par A. D. Fokker).

3. Solar corona and geomagnetic activity (par Y. Hagihara).

4. The relation between solar asymmetry in radio emission from flares and geomagnetic activity (par J. S. Rey et V. A. Hugues).

5. On the suspected influence of Venus on the magnetic activity on Earth (par J. Houtgast).

6. Les variations séculaires de l'activité solaire et leur répercussion sur la terre (par F. Link).

7. Deux tests chimiques pour l'étude des phénomènes cosmiques, solaires et terrestres (par G. Piccardi).

BIBLIOGRAPHY

World Distribution of Thunderstorm Days. — Part 2 : Tables of Marine Data and World Maps, WMO/OMM, n° 21, TP, 21,

which is the continuation and completion of the information given in the document referred to in our letter G.VI./188 of 8th February 1954.

This publication consists of :

(*a*) 70 pages of tables, giving the number of thunderstorm days for maritime areas throughout the world ;

(*b*) thunderstorm frequency distribution charts for :

— the entire year ;

— each season ;

— each month.

This volume may be obtained from : The Secretariat of the World Meteorological Organisation, 1, Avenue de la Paix, Geneva, Switzerland. Price : Swiss francs 9. (Including postage).

International Electrotechnical Commission.

Publication 78. First edition. *Characteristic impedances and dimensions of radio-frequency of coaxial cables.*

Publication (50(07). Second edition of the *International Electrotechnical Vocabulary.* Group 7. Electronics.

Publication 82. First edition. *Recommendations for ballasts for fluorescent lamps.*

Second supplement to Publication 61, *International Recommendations regarding Lamp Caps and Holders together with Gauges for the Control of Interchangeability.*

These publications are on sale at the Central Office of the I. E. C., 1, rue Varembé, Geneva, Switzerland, at the price of Sw. Fr. 2, per copy, plus postage for publication 78 ; Sw. Fr. 12, per copy, plus postage, for publication 50(07) ; Sw. Fr. 6, per copy, plus postage, for publication 87 and Sw. Fr. 3, per copy, plus postage for the supplement to publication 61.

Bibliography of Scientific Publications of South India (India, Burma, Ceylon), n° 12, July-Dec. 1954, Insdoc, National Physical Laboratory, New-Delhi.

Author Index covering lists n° 7 to 12 of Scientific Papers published in the Middle East, 1951-1955, Middle East Science Cooperation Office,8, Sh. El. Salamlik, Garden City, Cairo.

Abstracts of scientific and technical papers published in Egypt and papers received from Afghanistan, Cyprus, Iracq, Lebanon, Pakistan, Sudan and Syria, National Research Council of Egypt, Cairo, vol. 2, nº 1, Jan. 1956 and nº 4, April 1956.

Bulletin of the Scientific and Technical Documentation Centre, National Research Council of Egypt, Cairo, vol. 2, nº 3, March 1956.

U.R.S.I. PUBLICATIONS

Price List

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4th Gen. Ass., 1931, volume III	100.—	0.14. 6	2.00
5th Gen. Ass., 1934, volume IV	100.—	0.14. 6	2.00
6th Gen. Ass., 1938, volume V	150.—	1. 1. 6	3.00
7th Gen. Ass., 1946, volume VI	150.—	1. 1. 6	3.00
8th Gen. Ass., 1948, volume VII	250.—	1.15. 6	5.00
9th Gen. Ass., 1950, volume VIII :			
Part I (Administration)	300.—	2. 3. 0	6.00
Part II (Papers)	350.—	2.10. 0	7.00
the two Parts	600.—	4. 6. 0	12.00
10th Gen. Ass., 1952, volume IX :			
Part 1 (Administration)	75.—	0.11. 0	1.50
Part 2 (Measurements & Standards)	50.—	0. 7. 3	1.00
Part 3 (Troposphere)	65.—	0. 9. 6	1.30
Part 4 (Ionosphere)	80.—	0.11. 6	1.60
Part 5 (Terrestrial Atmospherics)	40.—	0. 5. 6	0.80
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Part 8 (Electronics)	50.—	0. 7. 3	1.00
the series of 8 parts	450.—	3. 5. 0	9.00
11th Gen. Ass., 1954, volume X :			
Part 1 (Measurements & Standards)	60.—	0. 8. 8	1.20
Part 2 (Troposphere)	100.—	0.14. 6	2.00
Part 3 (Ionosphere)	200.—	1. 9. 0	4.00
Part 4 (Atmospherics Terrestr. Orig.)	60.—	0. 8. 8	1.20
Part 5 (Radio-Astronomy)	125.—	0.18. 0	2.50

	Belgian Fr.	£ sh. d.	$
Part 6 (Waves and Circuits)	150.—	1. 1. 6	3.00
Part 7 (Electronics)	150.—	1. 1. 6	3.00
Part 8 (Administrative Proceed.)	100.—	0.14. 6	2.00
the series of 8 parts	850.—	6. 0. 0	17.00
Special Reports :			
N° 1. — On Solar and Galactic Radio Noise	out of print		
N° 2. — On Tidal Phenomena in the Ionosphere	50.—	0. 7. 3	1.00
N° 3. — On Discrete Sources of Extra Terrestrial Radio Noise	75.—	0.11. 0	1.50
N° 4. — On the Distribution of Radio Brightness on the Solar Disk .	Out of print in English Available in French		
N° 5. — On Interstellar Hydrogen.	100.—	0.14. 6	2.00
Proceedings of the Meetings of the Mixed Commissions :			
Ionosphere :			
1st meeting, 1948	100.—	0.14. 6	2.00
2nd meeting, 1950	150.—	1. 1. 6	3.00
3rd meeting, 1952	200.—	1. 9. 0	4.00
4th meeting, 1954	300.—	2. 3. 0	8.00
the series of 4 volumes	700.—	5. 0. 0	14.00
Radio-Meteorology :			
1st meeting, 1948	25.00	0. 3. 6	0.50
2nd meeting, 1951	out of print		
3rd meeting, 1954	25.00	0. 3. 6	0.50