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# International Scientific Radio Union

## U. R. S. I.

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## INFORMATIVE PAPERS

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### S. C. A. R.

#### Special Committee on Antarctic Research

This is a new field of I.C.S.U.'s activities.

At its ninth meeting, Brussels, June 1957, the Executive Board of I.C.S.U. voted unanimously in favour of the creation of an ad hoc committee to examine the merits of further investigations in the Antarctic, a favourable decision of which would give the Bureau the full powers to act immediately, in view of the urgent necessity to avoid any delay in the commencement of the activities of a Special Committee on Antarctic Research.

The ad hoc committee, convened by Dr. N. Herlofson, met in Stockholm, September 1957. Scientific delegates from eight countries attended the meeting; with Professor Lindblad as observer for I.C.S.U., and Dr. V. Schytt, Swedish Antarctic Committee, as Secretary. The meeting concluded that there is need for continuing international organization of scientific activity in Antarctica, and recommended that I.C.S.U. establish a Special Committee to undertake this task.

The Bureau of I.C.S.U. at its meeting of New-York, September 1957, accepted this recommendation on behalf of the Executive Board, and instructed Dr. Herlofson to convene the first constituent meeting of S.C.A.R. at the earliest date possible.

The Committee met in The Hague in February. Representatives from Argentina, Australia, Belgium, Chile, France, Great Britain, Japan, Norway, U. S. A. and U. S. S. R., and I.U.G.G., I.G.U. and I.U.B.S. attended, with Col. E. Herbays as observer for I.C.S.U.

The Committee nominated to its Executive Committee : Ing. Gén. G. R. Laclavère, *President*; Professeur E. K. Bullen, *Vice-President* and Dr. V. Schytt, *Secretary*.

During the meeting the Committee drafted a provisional programme of work of which abstracts are given in Appendix 1.

The Bureau of I.C.S.U., at its last meeting, The Hague, March 3-5, 1958, endorsed these nominations, and accepted the constitution of S.C.A.R., as proposed by the Committee, in the form set out in Appendix 2.

The immediate task of S.C.A.R. is to formulate a general programme for scientific research in the Antarctic for 1959 and subsequent years, to be implemented operationally by the participating countries. In view of the urgent need to frame such a programme at the earliest possible date, a further meeting of S.C.A.R. is planned for the summer of 1958.

At its meeting held in Brussels, March 6-8, the Board of Officers of U.R.S.I. appointed Dr. L. Harang as representative of U.R.S.I.

#### APPENDIX 1

### Tentative Programme of S.C.A.R.

*(Abstracts)*

*Programme for Cosmical Physics.*

*Ionospheric Physics.*

*Routine Observations* : Vertical ionospheric soundings according to the I.G.Y. programme should be continued on a routine basis at a limited number of stations. These stations will form a part of the permanent network of ionospheric stations and they ought therefore to be continued for a number of years (a sunspot period).

*Special Observations* : Measurements of radio noise and direction finding of atmospherics should be continued as well as the observation of whistlers in collaboration with arctic observations.

#### APPENDIX 2

### Constitution of S.C.A.R.

*Membership*

S.C.A.R. is a Special Committee of I.C.S.U. charged with furthering the coordination of scientific activity in Antarctica, with a view to framing a scientific programme of circumpolar scope and

significance. In establishing its programme, S.C.A.R. will take care to acknowledge the autonomy of other existing international bodies.

The nominations to the Committee are as follows :

(a) Each country actively engaged in Antarctic research is represented by one scientific delegate.

(b) International Scientific Unions federated in I.C.S.U., which have indicated their interest in Antarctic research, may appoint one representative each to serve on the Committee.

(c) Interested International Organizations and Special Committees of I.C.S.U. may be invited to designate observers to attend meetings of S.C.A.R.

### *Constitution*

1. S.C.A.R. nominates an Executive Committee from amongst its own members to consist of a President, a Vice-President and a Secretary, each elected for a term of three years and each eligible for re-election. These nominations are subject to confirmation by the Bureau of I.C.S.U.

2. The Executive Committee is responsible to I.C.S.U. for the coordination of the scientific programme adopted by S.C.A.R.

3. In organizing the operation of the definitive scientific programme, S.C.A.R. will invite the formation of National Antarctic Committees in the participating countries, to frame and carry out an operational programme designed to implement the general scientific programme formulated by S.C.A.R.

4. S.C.A.R. may appoint ad hoc Committees for the examination of special problems.

5. The Executive Committee, with the approval of S.C.A.R., will submit its budget requests to I.C.S.U., including its estimate of the scale of contributions from the Participating Countries required to maintain the central administration. For this purpose a Finance Committee of three members will be appointed consisting of the Treasurer of I.C.S.U. ex officio, and 2 members, not members of the Executive Committee, to be appointed by S.C.A.R. The Secretary of S.C.A.R. will act as adviser to the Finance Committee.

6. The expenses of the Executive Committee of S.C.A.R. will be defrayed by S.C.A.R., but the expenses of all other members will be the responsibility of the National Committees and Scientific Unions.

7. Expenditures incurred by S.C.A.R. will be subject to control by the Treasurer of I.C.S.U.

8. In addition to his normal duties the Secretary of S.C.A.R. will keep the Secretary General of I.C.S.U. fully and promptly informed of all activities.

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MEETING OF THE BOARD OF OFFICERS  
OF U. R. S. I.  
HELD IN BRUSSELS ON MARCH 6-8, 1958

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This meeting held in the General Secretary's office was attended by all the Officers of the Board.

The following actions were reached :

1. — FINANCES

Some slight modifications were brought to the budgetary estimates adopted by the XIIth General Assembly for the fiscal years 1957-1960.

It was decided that the free distribution of publications to National Committees should be proportional to the number of votes.

2. — ORGANIZATION OF GENERAL ASSEMBLIES

2.1. — The Board proposed to define as follows the purposes of General Assemblies : (a) to provide a common meeting ground for critical discussions between scientists of various nations interested in radio-investigations ; (b) to foster radioscientific investigations requiring international cooperation by reviewing the progress made in various countries and by corresponding discussions ; (c) to promote the setting up of common nomenclatures and measurement techniques and the intercomparison of standards used in scientific radio ; (d) to disseminate knowledge resulting from those activities by suitable publication.

2.2. — The Rules for Commissions and those for Submission of reports and documents to General Assemblies were redrafted according to these aims. The draft is submitted to National Committees and Commission Chairmen for comments and suggestions.

2.3. — The Board draw the attention of the National Committees to the interest to publish, in national periodicals and news-

papers, articles describing the U.R.S.I. activities. On request, the Secretary General will forward all useful information in this respect.

2.4. — In view of organizing the General Assemblies, the Board decided to meet, at least one year in advance, with Commission Chairmen and delegates of the host National Committee. This meeting should (a) delineate the general programme of the Assembly (Commissions and Symposia); (b) make plans for joint sessions of various Commissions; (c) define the principal topics to be discussed.

Additional topics implied by further progress could be included in the programme either by correspondence with the Secretary General, or at a first administrative session of each Commission. They are expected to follow the general trend of the programme previously established.

### 3. — SHAPE OF THE GENERAL ASSEMBLIES

The Board proposed that Commission meetings should be generally organized as follows: (a) morning sessions on topics peculiar to each Commission; (b) afternoons devoted to joint sessions.

It was also proposed to organize in connection with General Assemblies one or two symposia on a well defined and carefully prepared topic suitable for publication.

In addition, a Memorial Lecture by a highly qualified scientist should be organized.

The continuity of action in each Commission should be strengthened by meetings of newly elected and past Officers.

### 4. — STANDARDIZATION OF DEFINITIONS, TECHNIQUES AND SYMBOLS

It was decided to start the standardization of nomenclatures, definitions, symbols and measurement techniques by the following procedure: (a) a preliminary inquiry will be made by the General Secretariat; (b) the problem of standardization will be treated in each Commission, during General Assemblies (meeting of Official Members).

### 5. — U.R.S.I. SYMPOSIA - JOINT SYMPOSIA

In addition to U.R.S.I. Symposia in connection with General Assemblies, the Board considered the organization, under the

auspices of U.R.S.I. and other Unions, of symposia at other dates (Symposium on Radio Astronomy U.A.I.-U.R.S.I., Symposium on Fluid Flow in the Ionosphere I.C.S.U.-U.R.S.I.-I.U.G.G.-W.M.A., Symposium on Radio Meteorology U.R.S.I.-I.U.G.G.) and took action in this respect.

6. — URSIGRAMS

The Board entrusted the Central Committee of Ursigrams with the problem of pursuing the organization of World Days after the I.G.Y. termination.

7. — MISCELLANEOUS

Owing to the enlargement of U.R.S.I. on the international scientific level, the Board draws the attention of countries to the interest of their adherence to the Union.

The Board decided also that a complete list of individuals having an official function in U.R.S.I. and its Commissions and Sub-Commissions, will be published in the *Information Bulletin*.

Dr. L. Harang was nominated as U.R.S.I. representative to the Special Committee for Antarctic Research, and actions were reached in view of representing the Union at other international meetings (W.M.O. conferences, International Conference on Scientific Information). Finally, the participation of U.R.S.I. representatives to the joint symposium on Radio Astronomy organized by U.R.S.I. and I.A.U. in Paris (1958) was considered.

*The Secretary General,*

E. HERBAYS.

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## XII<sup>th</sup> GENERAL ASSEMBLY

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### Publications

Part 5 (Commission V on Radioastronomy) of Volume XI — Proceedings of the XII<sup>th</sup> General Assembly is out of press and distributed to National Committees which gave us the information asked for by our letter n° 386 of March 5<sup>th</sup>, 1957. Supplementary copies are available at the price of B. F. 200,— or \$ 2.00, or £ 1.9.0.

It is recalled that copies of Part 1 (Commission I on Radio Measurements and Standards) are available at the price of B. F. 100,— or \$ 2.00, or £ 0.14.6.

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### International Scientific Radio Union

(Reprint from *Journal U.I.T.*, March 1958, n° 3)

The twelfth general assembly of the International Scientific Radio Union was held at Boulder (Colorado), United States of America, from 22 August to 5 September, 1957, and was attended by more than 550 delegates and observers from 27 countries. The meetings of the full assembly and of the executive and organization committees were held under the chairmanship of Father P. Lejay, who was serving a second term as president of the Union. This was the first assembly since the recently constituted national committees in Austria, Greece and the U. S. S. R. were formed.

As is well known, the main functions of the Union are to promote and organize radio research requiring international co-operation, and to encourage the setting-up of such common methods of measurement as may be required for the study of any radio phenomena, whether or not these be directly associated with the earth and its atmosphere. The work is carried out by seven commissions, each

of which is concerned with specific aspects of radio research, and ranging from measurements and standards, and the use of circuits and electronics techniques to all aspects of wave propagation, and terrestrial or atmospheric noise and the important new developments in radio astronomy.

Detailed accounts of the work of each commission will be published in the « Proceedings of the General Assembly ». In the meantime, the results of this work are crystallized in the resolutions which each commission made and presented to the assembly for adoption. These resolutions are being printed in the *Information Bulletin* of the Union, which is published by the Secretary General.

Prior to the general assembly in Boulder, meetings were held in New-York of the Mixed Commission on the Ionosphere under the chairmanship of Sir Edward Appleton, and of the Joint Commission on Radiometeorology with Dr. W. E. Gordon as chairman.

At the closing meeting, Dr. L. V. Berkner was elected president, and it was decided that the next general assembly would be held in the United Kingdom of Great Britain and Northern Ireland in 1960. A revised scale of national subscriptions was introduced, and provision was made for the organization between general assemblies of international symposia on specialized subjects relating to radio scientific matters.

(Source : *Nature*.)

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## COMMISSIONS

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### Commission I

#### On Radio Measurements and Standards

Bureau International de l'Heure (B.I.H.)

#### SHORT-WAVE PROPAGATION TIME FOR DIFFERENT DISTANCES

Until June 1956, the B.I.H. adopted as value of mean apparent propagation velocity 252,000 km/s for long waves, 274,000 km/s for short waves on direct path, and 286,000 km/s for short waves on super-propagation. From July 1956, the B.I.H. uses new values obtained by discussing 6771 results of time-signals duplex reception at a number of observatories.

Ground wave propagation has been taken into account for transmission paths (between transmitter and receiver) in the range 0-100 km. A single reflection on the ionosphere has been assumed for distances between 100 and 1000 km. The following asymptotic formula has been used for evaluating the apparent short-wave propagation velocity for distances between 1000 and 40 000 km :

$$V_d = \left( 290 - \frac{a}{d + b} \right) \times 10^3 \text{ km/s}$$

where  $d$  (expressed in  $10^3$  km) is the geodetic distance between transmitter and receiver. A treatment by least square method gives the following results :

$$a = 139.41 ; \quad b = 2.90$$

The *Bulletin Horaire* edited by B.I.H. (F series, n° 10) gives the propagation times for distances in the range 100-1000 km and short wave propagation times for distances exceeding 1000 km. For calculating long wave propagation times, the B.I.H. still makes use of the mean apparent velocity  $V_1 = 252,000$  km/s.

## **Commission II**

### **On Radio and Troposphere**

#### **TROPOSPHERIC SCATTER IN AUSTRALIA**

The first experimental tropospheric scatter communication circuit in Australia has been completed at Salisbury and put into operation.

The use of the new circuit is confined at present to basic studies on wave propagation. Later, it will be used for telephone or telegraph transmission. A transmitter at Woomera is sending a continuous test signal to Salisbury, nearly 300 miles away, where a sensitive detecting system automatically records and makes a statistical analysis of the received signal strength. These signal strength records will provide information to enable Australian scientists and engineers to compare Australian communication conditions with those in the United Kingdom of Great Britain and Northern Ireland and the United States of America.

(Source : *British Communications and Electronics.*)

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## **Commission III**

### **On Ionospheric Radio**

#### **WORLD-WIDE SOUNDINGS COMMITTEE**

##### **STATUS REPORT**

First, I should like to apologize for the long interval between our last circular memorandum and this one. I.G.Y. problems have, of course, kept my colleagues and I more than fully occupied. Judging from the correspondence, others associated with the Committee must be similarly occupied.

Another well-known diversion in the intervening time was the U.R.S.I. XIIth General Assembly, held here in Boulder August 22-September 5. As Chairman of our Committee, I presented an oral report on the Committee's activities to the U.R.S.I./A.G.I. Committee which was also meeting at that time. In its report

(Beynon, December 1957) the U.R.S.I./A.G.I. Committee indicated that the W.W.S.C. should continue in being until the reconstitution of U.R.S.I. Sub-Commission IIIa, probably at the next U.R.S.I. Assembly.

Several discussions involving W.W.S.C. members, consultants and observers were held during the General Assembly. In the paragraphs below I give the main points which emerged and, in addition, list some topics that seem timely for our consideration.

1. Attendance at the *Boulder discussions* included Committee members Aono, Rawer and Shapley, consultants Haubert, Mitra, Rivault, Davies, Knecht, Wright and interested observers from Spain, Italy, the Netherlands, and the U. S.

A. Discussion of scaling and tabulation problems resulted in the following expressions from the group :

(1) The conventions for identifying  $f_oF2$  given in the Committee's First Report  $/V(F)/$  and repeated in the Second Report, could be misleading in the case when  $f_oF2$  is known to be less than  $f_oF1$  (so-called « G »-phenomenon). It is stressed that this convention is only intended to apply when ambiguities are caused by the presence of F1.5 or other stratifications but not in the case where  $f_oF2$  is known to be below  $f_oF1$ .

(2) The difficulty with  $fbEs$  encountered when a « gap » in frequency exists between  $f_oEs$  and the minimum frequency of the higher layer can often be resolved by application of the principle stated in the Second Report that numerical values of  $fbEs$  should be restricted to those cases in which evidence on the ionogram or in a sequence of ionograms indicates that there definitely is blanketing. Where blanketing is present and a « gap » exists,  $fbEs$  should be scaled as « greater than »  $f_oEs$  and the appropriate descriptive letter should be appended (S, C, R, etc.). When non-blanketing Es is present, the descriptive letter G (when regular E is present) or the letter E (at night) may be used to replace a numerical value of  $fbEs$ .

(3) The practice was endorsed of recording on the  $f$ -plot all ordinary wave critical frequencies, even when, in the case of critical frequencies below  $f_oF2$ , these must be judged from high frequency portion of the cusp, provided that the usual accuracy rules are applied.

## B. — GENERAL POINTS

(1) The group desired that the Secretary General of U.R.S.I. be equipped to distribute the Committee's reports and that he be asked to publish the Second Report in the *U.R.S.I. Information Bulletin*.

(2) The group encouraged the publication of representative, unusual, and interesting ionograms in station data booklets. Also, it was felt that the distribution and publication of ionospheric data (especially  $f$ -plots) could be best accomplished in paper form as opposed to film. Priority in the publication of  $f$ -plots should be given to high, equatorial, and medium latitudes, in that order.

## C. — FUTURE WORK OF THE COMMITTEE

There was strong sentiment that the W.W.S.C. continue its action as a monitoring group during the I.G.Y. A number of suggestions were made as to the areas of monitoring. They included :

- (1) characteristics being scaled and letter usage,
- (2)  $f$ -plot presentation,
- (3) criteria used in the scaling of certain characteristics like  $f_oF1$ ,  $f_oEs$ , types of  $Es$ ,
- (4) Accuracy of ionograms, tabulated data, calibrations.

The possibility of having individual Committee members each specialize in one area of monitoring was discussed at some length but a definite conclusion on the best approach was not reached.

2. A first step in monitoring might well be to determine the degree to which the principal recommendations of the Committee have been effected. I am attaching a draft of a *questionnaire* that might be appropriate to send out to all networks and individual ionosphere stations for this purpose. If you would please complete the form by answering the questions as they apply to your stations and return it to me, a good first approximation of our effectiveness as well as a measure of the usefulness of the questionnaire will be obtained. Replies will be circulated among the Committee and correspondents, as has been our custom.

3. The first supplement to the *Atlas of Ionograms* was mailed out

in December. Additional sets of these supplement pages are available on request to the Chairman.

4. The time is very near when decisions by the various administrations on the *post-I.G.Y. network of stations* will have to be made. Shouldn't our Committee discuss this important question and make recommendations to the next meeting of the U.R.S.I./A.G.I. Committee (Edinburgh, July 1958). For your information I am attaching a copy of the recommendations of an ad hoc U.R.S.I. sub-committee that studied this question during the XIIth General Assembly.

5. On a number of occasions at the several meetings of our Committee the value of personal *visits* to ionosphere stations has been stressed. Personnel of the Geophysical Institute of Huancayo together with two C.R.P.L. members have just completed a series of visits to six of the I.G.Y. stations in South America. At the time of this writing another C.R.P.L. staff member (J. W. Wright) is visiting stations in Japan, Okinawa, Philippines, India, Africa and the Caribbean area. I hope that other W.W.S.C. members and consultants have similarly been able to visit stations to assist in maintaining the desired degree of uniformity of procedures and interpretation.

6. Since a number of us associated with the Committee may be in Europe this summer (for the U.R.S.I./A.G.I. meeting, for instance), I would like your opinions on the desirability of having a partial meeting of our group. Suggestions on time and place of such a meeting would be appreciated.

I hope with this memorandum to again accelerate the Committee's activity; therefore, I would very much like some sort of a reply, not necessarily definitive on all of the above topics, from members and consultants by 15 April.

Sincerely yours,

A. H. SHAPLEY, *Chairman*.

U.R.S.I./A.G.I. World-wide Soundings Committee.

Attachments :

To Members of Committee :

Y. AONO,

N. MEDNIKOVA,

W. PIGGOTT,

K. RAWER,

A. SHAPLEY (*Chairman*),

J. TURNER.

To Principal Consultants :

P. HERRINCK,	R. RIVAULT,
A. HAUBERT,	W. BECKER,
J. BEAGLEY,	R. WRIGHT,
J. MEEK,	K. DAVIES,
A. MITRA,	S. FUJIKI,
W. BAKER,	A. LYON,
R. KNECHT,	O. SANDOZ.

Information Copies to :

E. HERBAYS, *General Secretary*, U.R.S.I.,  
E. APPLETON, *Chairman*, U.R.S.I./A.G.I.,  
L. BERKNER, *President*, U.R.S.I.,  
W. BEYNON, *C.S.A.G.I. Reporter*.

**Recommendation of ad hoc Sub-Committee to study  
Distribution Ionospheric sounding stations after the I.G.Y.**

(U.R.S.I. Commission III)

September 3, 1957

1. The C.C.I.R. in Resolution n° 26 of the VIIIth Plenary Assembly of Warsaw 1956 has drawn the attention of U.R.S.I. to the desirability of continuing in operation after the I.G.Y. certain of the ionospheric stations *especially established* or *continued in operation solely* for the I.G.Y. program. The objective from the C.C.I.R. viewpoint is to improve propagation forecasts.

2. From the U.R.S.I. viewpoint continued operation of certain I.G.Y. ionospheric sounding stations after the I.G.Y. would also be desirable for filling gaps in the present knowledge of ionospheric morphology and disturbances.

3. In many respects the objectives stated above may be regarded as identical.

4. The U.R.S.I. therefore recommends that as many as possible of the following stations be continued in operation preferably on a 15-minute basis for not less than one year after the next minimum of the solar cycle.

<i>Arctic</i>	<i>Antarctic</i>
Alert	South Geomagnetic Pole
Thule	South Pole
Svalbard	Little America
Tromso	Terre Adelie
Bukhts Tikhaya	Weddell Sea area
Tiksi Bay	Syowa (Showa)
Providenie Bay	or Mawson
<i>Equatorial</i>	<i>Gap Fillers</i>
Natal	Tamanrasset
Talara	St. John's
Bogota	Mexico City
La Paz	Concepcion
Djibouti	Tahiti
Kodaikanal	Sao Paulo
Baguio	Tucuman
Davao (1)	Kerguelen Is.
	Macquarie Is.
	Marion Is.

#### IONOSPHERIC VERTICAL SOUNDINGS QUESTIONNAIRE

The World-wide Soundings Committee was appointed by the U.R.S.I./A.G.I. Committee (Brussels, 1955) and charged with the responsibility of studying the problems of ionogram interpretation and data reduction and making such revisions of the internationally-recommended procedures as might be necessary to improve the accuracy and homogeneity of ionospheric data.

Toward this end the Committee has issued two reports (First Report of the Special Committee on World-wide Ionospheric Soundings, Oct. 10, 1956, *U.R.S.I. Bulletin* n° 99, and the Second Report of the Special Committee on World-wide Ionospheric Soundings, May 1957). At this time, the Committee would like

---

(1) This location not certain. It is understood that the Philippine Government plans an I.G.Y. station at a location to the south of Manila -- possibly at Cebu. Davao is a preferable location as it is more nearly on the magnetic equator.

to review the effectiveness of its work by considering the degree to which it has been possible for the various sounding networks and individual stations to adopt the principal recommendations contained in its two reports.

In asking these questions the Committee recognizes that not all of the recommendations may have been practicable at all stations, there being important differences among stations such as type of sounder, tolerable interference, size of station staff, etc.

YES NO

1. *Schedules* :

- (a) Soundings taken at least every 15 minutes on ordinary days ..... ..
- (b) Soundings taken at least every 5 minutes on R.W.D. and S.W.I. .... ..
- (c) Schedule is different from (a) and (b) and is as follows :  
Ordinary days .....  
R.W.D. and S.W.I. ....

2. *Presentation of Data* :

- (a) *f*-plots prepared on a daily basis ..... ..
- (b) *f*-plots prepared only for R.W.D. and S.W.I. .... ..
- (c) *f*-plots prepared only on ..... ..

3. *Ionospheric Characteristics Regularly Scaled* :

- (a) Circle those characteristics regularly scaled : *f*oF2, (M3000)F2, *h'*F2, *f*oF1, (M3000)F1, *h'*F, *f*oE, *h'*E, *f*oEs, *h'*Es, *fb*Es, types of Es, *f*-min.
- (b) Additional characteristics scaled .....

4. *Accuracy* (If answered NO, please list scaling accuracy below question.) :

- (a) F region virtual heights scaled to nearest 5 km ..... ..  
..... km
- (b) E region virtual heights scaled to nearest 2 km ..... ..  
..... km

	YES	NO
(c) F region critical frequencies scaled to nearest 1 Mc	.....	.....
..... Mc		
(d) Regular E region critical frequencies scaled to nearest .05 Mc	.....	.....
..... Mc		
(e) M factors scaled to nearest .05 of a unit	.....	.....
..... unit		

5. *Letter Usage* :

- |   |       |       |
|---|-------|-------|
| (a) Consistent with First and Second Reports of<br>W.W.S.C. | ..... | ..... |
| (b) Consistent with ..... (name of<br>document).            |       |       |

6. *Additional Work Done at Stations* :

- |   |       |       |
|---|-------|-------|
| (a) <i>h'</i> -plots prepared                 | ..... | ..... |
| (b) E-plots prepared                          | ..... | ..... |
| (c) Continuous runs (ionosphere movies) taken | ..... | ..... |
| (d) Other .....                               | ..... | ..... |

7. *Visits to Stations* (applies to networks only) :

- |  |       |       |
|--|-------|-------|
| (a) Regular program of visits in operation | ..... | ..... |
| (b) Inter-network visits made or planned   | ..... | ..... |

Please return to A. H. Shapley, Chairman World-wide Soundings Committee of U.R.S.I./A.G.I. Committee, Central Radio Propagation Laboratory, Boulder, Colorado.

**« SPIDER » RADAR**

Special radar is used to study very small meteorites which are detected by the reflection of electromagnetic waves from their trails ; this radar which is known as « spider », weaves a web in the sky in which particles are trapped, thus supplying valuable information on radio, weather and the solar system in general.

The meteorites detected are smaller than a pinhead.

It has been deduced from observations that long-distance radio signals can be intercepted when they hit meteorite trails.

With « spider » radar, signals are sent out in 6 different directions, the echoes being automatically recorded on sensitive film and paper. Data thus collected are used for tracing the paths of meteoric dust in any part of the sky.

(Source : *Boletín de orientación profesional e industrial de la Revista de Telecomunicación.*)

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## Commission IV

### On Radio Noise of Terrestrial Origin

#### STUDY OF ATMOSPHERIC RADIO NOISE AT 27 kc/s AND 100 kc/s AT DELHI

by D. K. SACHDEV

(*Indian Radio Research Committee — Council of Scientific and Industrial Research, Scientific Report n° 7*)

This is a preliminary report of observations of VLF atmospheric radio noise that are being carried out for some time at the Radio Propagation Unit of the National Physical Laboratory of India, New Delhi (28.5° N, 77° E). Measurements are currently made at two frequencies, namely 27 kc/s and 100 kc/s. Diurnal and seasonal variations of the noise are given, indicating appreciable ionospheric attenuation during daytime, and showing a summer afternoon maximum possibly associated with local thunderstorms. Noise intensity falls rapidly at the early morning hours, the « sunrise time » differing greatly from one day to another. The sunrise fall is sharper at 100 kc/s than at 27 kc/s. Long period (~ hours) fading is observed on certain nights, and is believed to be associated with disturbed conditions in the ionosphere.

Particular attention has been given to the study of sudden enhancement of atmospherics (S.E.A.) for which the observations were initially undertaken. It is found that enhancements are observed at both frequencies at the time of a solar flare; the

effect at 27 kc/s being normally larger and earlier than at 100 kc/s. However, there is no one — to — one correspondence between the S.E.A. and the solar flare. Further, cases have been observed when the S.E.A. at 100 kc/s is found to be larger than at 27 kc/s. From the present observations it is believed that transition from enhancement to fadeout occurs somewhat beyond 100 kc/s.

### RADIO PROPAGATION

(Reprint from the *Journal U.I.T.*, March 1958, n° 3)

There are signs that International Geophysical Year scientists investigating natural radio signals called «whistlers» may find a new, reliable, long-distance method of point-to-point radio communications.

By following the paths which guide whistlers on round trips through outer space, radio signals could avoid magnetic storms in the ionosphere.

Whistlers were first detected 40 years ago and linked to lightning discharge 30 years ago. But until six years ago, no basic understanding existed.

Mr. L. R. O. Storey postulated in 1952, at Cambridge University, that whistlers follow the earth's lines of magnetic force through ionized gases in the exosphere. At that time there was no real proof that there is sufficient atmospheric density to support magneto-ionic ducts above the 250-mile ionospheric altitude range.

Subsequent investigations have borne out Storey's theories. Here is what is now known :

Ionized gases from the sun are formed into magneto-ionic ducts extending 25 000-30 000 miles up. These ducts run from a magnetic coordinate in one hemisphere to the comparable coordinate in the other hemisphere. Whistlers bounce from hemisphere to hemisphere along one or more ducts at frequencies of 1000 to 30000 cycles. They are received simultaneously at points over 1000 miles apart.

Whistler-mode propagation went beyond theory for the first time in the summer 1957 when Stanford University successfully carried out a radio experiment.

A special pulse signal was sent from N.S.S. (15.5 kc/s) at Annapolis to Cape Horn through the ionosphere and the exosphere. Both signals were received. The signals over the 20 000-mile

whistler path took 0.7 second longer and were 10-30 decibels weaker, but the variations in amplitude appeared systematic.

Mr. R. A. Helliwell, of Stanford Radio Propagation Laboratory, recently announced that « there is reason to believe that whistler-mode signals from N.S.S. may equal or exceed the direct wave in strength at points further south (of Cape Horn). If this turns out to be true, the new mode would have distinct communication possibility ».

New recording stations are now in the process of being readied at points in Argentina, Chile and Antarctica. These experiments are part of a broad investigation into whistlers as part of the I.G.Y. programme in ionospheric physics. Overall results, authorities feel, will be of value to the established radiocommunications systems.

Whistlers provide a probe into the exosphere. Hence, they furnish data on matter in space, solar storms, magnetic storms and fields and weather causes.

One result of the I.G.Y. programme may be a map of the magnetic influences surrounding the earth — a road map for future communications.

There are 30 whistler stations in the I.G.Y. programme. Stanford and Dartmouth college are each administering about a dozen for the United States National Committee for I.G.Y. and cooperating countries.

Whistlers can be received over telephone lines or a large antenna and an ordinary audio amplifier. I.G.Y. stations use a loop antenna and specially-designed wideband equipment to achieve analytical sensitivity.

Each station makes recordings at coordinated times to allow world-wide comparison of signals.

(Source : *Electronics*.)

### MEMBERSHIP

The address of Mr. G. Foldès, Secretary of the Commission, is : 5bis, rue Parmentier, Neuilly s/Seine (Seine), France (*Information Bulletin*, n° 105, p. 44).

## **Commission V**

### **On Radio Astronomy**

#### **NEW AUSTRALIAN RADIOTELESCOPE**

A new radiotelescope now operating at Fleurs, about 35 miles from Sydney, is helping scientists to solve some of the mysteries of the solar system and to study the effects of sun storms on the earth.

The telescope is equipped with 64 discs, 18 feet in diameter, and from these a continuous picture of the sun is fed into a recording machine. A complete record of solar flare-ups is obtainable through cloud and other disturbances, and across hundreds of thousands of miles of solar atmosphere.

(Source : *Unesco Features.*)

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## **Commission VI**

### **On Radio Waves and Circuits**

#### **SYMPOSIUM ON ELECTRONIC WAVEGUIDES**

The Microwave Research Institute of the Polytechnic Institute of Brooklyn, in conjunction with the Institute of Radio Engineers, is holding a Symposium on Electronic Waveguides from 8 to 10 April, 1958, in the Engineering Societies Building in New-York. The symposium will cover the interaction of electromagnetic fields and electron or plasma beams in electronic waveguides, which are taken to include open and closed waveguide regions where there may be relative motion between electromagnetic waves and charge particles. The tentative programme is divided into five sections : Fundamental progress reports ; Mode theories ; Noise theories ; Space charge waves in open and closed systems ; and Plasma waves. The final programme will undoubtedly contain other topics, depending on the interests of the participants. The symposium is open to anyone interested.

(Source : *Journal of the Institution of Electrical Engineers.*)

## Commission VII

### On Radioelectronics

#### THE TECNETRON, A NEW SEMI-CONDUCTOR DEVICE

(Reprint from *Journal U.I.T.*, March 1958, n° 3)

On 7 January, 1958, the Centre National d'Etudes des Télécommunications (C.N.E.T.) announced the creation of the tecnetron which is the latest development in transistors. This new semi-conductor device, designed and developed in France, uses the principle of field effect modulation. Its inventor, Mr. Teszner, basing himself on work done by Lilienfeld in 1928 on the phenomenon of internal fields, applied the electric field of polarization to the semi-conductor following a cylindrical surface (hence the use of a rod-shaped semi-conductor) instead of a transversal axis (semi-conductor in the form of a small plate). It appears that the tecnetron's remarkable performance is due to this original structure. In practice, a cylindrical rod with a width of 2 mm and a diameter of 0.5 mm is used, into which a hole is bored which is then filled with indium. A very original process is used in manufacturing the tecnetron, the hole (known as a « goulot ») being made by electrolysis.

The device works in a very different way from normal transistors, and more like a vacuum tube ; in this case the hole plays the same role as the control grid. Performance is particularly noteworthy in the hyperfrequencies. The tecnetrons manufactured at present operate very well up to 500 Mc/s, and it is hoped that 1000 Mc/s will be reached this year.

The tecnetron is first and foremost a voltage amplifier and not a current amplifier. It has an input impedance of several megohms.

(Source : *Radio constructeur et dépanneur.*)

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## URSIGRAMS

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### Reorganization

At the XIIth General Assembly, the Permanent Committee on Ursigrams submitted the following recommendations to the Executive Committee :

1. The Committee proposes that it be re-constituted into a Central Committee composed of members designated by region committees on Ursigrams and the U.R.S.I. Secretary General. For the present there are four such regions (Western Hemisphere, Europe, Eurasia, Far East). Until any other designations are made in this manner, the members shall be MM. Lejay, Uyeda, Shapley, Pushkov and the U.R.S.I. General Secretary. The regional committees are to be formed by members designated by National Committees of U.R.S.I. of countries participating in the Ursigram network. The details of this new committee structure will be formulated later by the Central Committee.

2. The Committee has discussed briefly the questions put to it by the U.R.S.I. Executive Committee on the subject of a proposed Permanent Service on Ursigrams associated with F.A.G.S. The concept of such a permanent service is approved in principal. Since there has been insufficient time to discuss the details of the organization and functioning of such a permanent service, it is proposed that the Central Committee be instructed to continue their discussions and to present their recommendations to the U.R.S.I. Board of Officers for action so that the work may proceed at an effective level after the end of I.G.Y.

The Executive Committee agreed with these recommendations and invited the Central Committee on Ursigrams (C.C.U.) :

- (i) to undertake its re-constitution and pursue its activities along the lines given in Recommendation 1 ;
- (ii) to continue the discussions on the adherence to F.A.G.S. of a Permanent Service on Ursigrams ;

(iii) to report on (i) and (ii) to the Board of Officers for action.

On the other hand resolution 2 of Commission V, which was adopted by the General Assembly reads as follows :

« A member of Commission V should be appointed to the Ursigram Permanent Committee ».

In accordance with Commission V resolution and after consulting the members of the C.C.U., Dr. R. Coutrez has been appointed as representative of Commission V and as provisional secretary of the C.C.U.

It should be recalled that the Official Members of the Permanent Committee on Ursigrams were :

- F. P. LEJAY (*Chairman*) (France),
  - E. HERBAYS (*Secretary General* of U.R.S.I.),
  - A. H. SHAPLEY (U. S. A.),
  - Y. UYEDA (Japan).
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## IONOSPHERIC STATIONS

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### **Publications**

The Bulletin *Valores Medianas de Caracteristicas Ionosfericas* issued by the Department of Navy of the Argentine Republic (Direccion General del Material de Comunicaciones Navales, Laboratorio Ionosferico) gives characteristics for Tucuman (26°54'S, 65°24' W) and Deception (63° S, 60°42' W).

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## JOINT COMMISSIONS

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### Joint Commission on Solar and Terrestrial Phenomena Relationship

#### NINTH REPORT

##### CONTENTS

##### *Introduction.*

New techniques for solar observation.

W. O. ROBERTS : New methods and instruments of solar observations.

Intrinsic study of solar phenomena.

M. A. ELLISON : The observation of solar flares 1954-1957.

J. RÖSCH : Les phénomènes de la couronne dans l'ensemble de l'activité solaire.

Origin and analysis of the various solar radiations.

R. TOUSEY : Observation of the solar ultraviolet spectrum from rockets.

H. FRIEDMAN : Photoelectric measurements of solar X-rays and ultraviolet radiation.

F. S. JOHNSON : The solar constant.

Effect of the solar electromagnetic radiation on the ionosphere.

R. MICHARD : Le contrôle de l'ionosphère par le rayonnement solaire de courtes longueurs d'onde.

P. SIMON : Application des observations radioélectriques solaires à l'étude des relations solaires-terrestres.

Solar corpuscular radiation and Geomagnetism.

W. R. PIGGOTT, C. W. ALLEN : Observational aspects of solar corpuscular radiation.

V. C. A. FERRARO : Theoretical studies relating to solar corpuscular streams and geomagnetic storms.

Night sky radiation.

M. KOOMEN : Observations of the night airglow from rockets.

Cosmic rays.

J. HEIDMANN : Rayonnement cosmique et physique solaire et interplanétaire.

Sun and Meteorology.

P. BERNARD : Le Soleil et la Météorologie.



## INTERNATIONAL GEOPHYSICAL YEAR

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### I. G. Y. News

#### Solar observations during the first six months of the International Geophysical Year

(By the C.S.A.G.I. Reporter for Solar Activity.)

In a recent paper (*Nature*, 180, 1173, 1957) M. A. Ellison has drawn attention to some interesting characteristics of the recent solar activity. Among these can be mentioned : Very high sunspot numbers which have been contributed mainly by the occurrence of large numbers of small and medium-sized spot groups. Giant F-type sunspots have been noticeably few. As a consequence of this, giant (3+) solar flares have been less frequent than the high sunspot numbers would lead one to expect. Another unusual feature has been the continued appearances of occasional spots in high latitudes.

#### THE SOLAR FLARE PATROL

According to information presented by Dr. L. d'Azambuja (December not yet complete) 4646 reports of flares of importance 1 or more have been presented to the Data Centre C in Meudon. Many of these concern one and the same object. For importance 1— the corresponding figure is 4001. This shows a very satisfactory cooperation in the study of these phenomena. Not less than 42 stations have taken part in this patrol. The numbers observed by the different stations are presented in Table 1. From this Table it may be inferred that noticeable differences in the importance classification appear. (For a detailed comparison the effective patrol hours are of course needed) The Reporter recommends therefore that the rules presented in the Instruction Manual should be followed as closely as possible and that the importance classification be based on real measurements of area and with some sort of a control of the intensity thresholds.

PATROL OF SUDDEN DISAPPEARANCES

The Table 2 shows the sudden disappearances reported to Meudon for the same period. The participation is not quite satisfactory here and it is recommended that the different solar stations take more interest in this important work.

OTHER SOLAR OBSERVATIONS

Similar summaries are not yet available for other phenomena but will be communicated later.

TABLE I. — *Monthly numbers of Solar Flares communicated to Centre C, Meudon, during the second half of 1957*

	July		August		Sept.		Oct.		Nov.		Dec.	
Abastumani.....	25	3	43	3	32	1	34	7	24	5		
Alma Ata .....							4	0	14	0		
Arcetri .....	13	0	11	0	14	3	19	3	2	1	12	0
Arosa .....							18	0			15	0
Athens .....	20	20	9	41	18	27	4	23	8	7	7	7
Capri F .....	150	20	114	26	90	22	146	53	83	30	23	3
Capri S .....	54	41	57	36	60	30	38	32	9	11	18	9
Carter .....	4	3										
Climax .....	1	4	3	10	24	73	13	38	11	24		
Crimea .....	37	4	32	10	41	1	17	5	13	2	7	0
Dunsink .....	1	1	4	0	1	0	4	0	1	0	0	0
Edinburgh .....	3	1	3	1	7	0	1	3	1	0	2	1
Herstmonceux ...	5	5	5	2	12	0	0	2	2	0	4	2
Honolulu .....	45	40	13	29	47	27	7	13	12	12	15	10
Huancayo .....	0	1	7	8	20	9	16	6	17	11		
Istanbul .....	48	8	29	2	36	7	25	10	9	5		
Kanzelhöhe .....	9	0	11	0	12	0	2	0	4	0	6	0
Kharkov .....	21	0	23	0	4	0	14	0	5	0		
Kiev KO .....	26	0	38	1	24	0	17	0	5	0		
Kiev KY .....	7	1	9	0	10	0	11	4	1	0		
Kodaikanal .....	1	0	1	0	8	0	0	0	1	0	1	0
McMath .....	22	12	8	21	19	6	11	7				
Meudon .....	14	0	14	0	12	10	11	9	5	0	7	2
Mitaka .....	3	3	63	0	22	0	44	2	37	0	51	0
Mount Wilson ...	27	83	30	71	46	88	24	15	4	11	11	20

	July		August		Sept.		Oct.		Nov.		Dec.	
Moscow .....	50	2	23	3	16	0	5	1	9	0		
Nera .....	4	0	4	0	10	1	7	0	1	0	6	0
Nizmir .....	29	15	20	8	7	4	11	2	9	3		
Nizamiah .....	2	0	4	0	15	0	11	3	2	1	7	3
Ondrejov .....	46	11	45	9	77	17	53	12	4	1	25	4
Ottawa .....	2	1	24	61	13	65	6	22	8	14	7	11
Pic du Midi .....			34	0	18	0	22	0				
Sac. Peak .....	19	145	20	128	57	440	10	159	13	137	21	166
Saltsjöbaden .....	4	0	7	0	5	0						
Schauinsland .....	6	9	36	34	27	9	26	18	0	0	18	6
Sydney .....	19	64	13	35	47	58	56	109	49	160		
Tachkent .....	30	6	27	7	37	2	20	2	13	1		
Ucele .....	35	11	57	93	80	60	53	34	37	19	34	13
Utrecht .....	9	0	4	0	3	0	4	0	4	0	3	0
U. S. Navy .....	48	83	25	74	39	91	57	174	17	85	46	75
Wendelstein .....	5	0	14	0	38	0	50	0	41	0	40	0
Zurich .....	11	0	27	0	32	0	54	0	8	0	6	0

For each month flares equal to or greater than importance I are given to the left whereas flares of importance I— are given to the right.

TABLE II. — *Monthly numbers of Sudden Disappearances communicated to Centre C, Meudon, during the second half of 1957*

	July		August		Sept.		Oct.		Nov.		Dec.	
Capri F .....			7		4		3		3			
Capri S .....	1		4		2		4		3		3	
Crimea .....			1									
Mitaka .....			15		1				5		4	
Meudon .....	10		9		4		3				6	
Nizamiah .....									1			
Ottawa .....					1							
Sac Peak .....	2		1		2		1		3			
Sydney .....			3		2							
Ucele .....	1		5		4		3		1		4	
U. R. S. S. ....			3									

## Report on Activities of World Warning Agency

(Extract from R.W.C. 44 issued by C.S.A.G.I. Reporter for World Days and Communications.)

### 1. — SUMMARY OF AGIWARN DECISIONS AND GEOMAGNETIC DISTURBANCES FOR THE PERIOD JUNE 28, 1957-JANUARY 1, 1958

During this first six months of the I.G.Y. eighteen geomagnetic disturbances, thirteen beginning suddenly, were recorded :

Six storms were outstanding (A-index for the most severely disturbed 24-hours period greater than 80 ; five of the six greater than 100 and one of these five greater than 200) ;

Five storms were moderate (A-index for the severest portion between 35 and 55) ;

Seven storms were minor (severe portion A-index less than 25 or length of disturbance less than 24 hours).

In this same interval sixteen periods of Alert totalling 72 days were declared. Fifteen of the eighteen geomagnetic disturbances occurred during nine of the Alerts. During the other seven Alert periods no geomagnetic activity of storm intensity occurred.

Seven Special World Intervals totalling 16 days were declared during the six month period. Five of the seven Intervals were begun prior to the start of disturbances while two were complete failures.

#### I.G.Y. World Data Centre B2. Change of address

Professor N. Pushkov, Director of W.D.C. B2, reports that the Centre has been transferred from Vatutenki to Moscow in order to speed up correspondence and to be more convenient for visitors. The new address is : I.G.Y. W.D.C.-B2, Ulitza Chkalova 64, Moscow 4, U.S.S.R.

It will continue to collect data in disciplines III, IV, V, VI and VII.

Coordinator requests that this change may be widely circulated to I.G.Y. stations and institutions pending the issue of an amendment to the C.S.A.G.I. Guide to I.G.Y. W.D.Cs. Address labels in Russian are being prepared for issue.

## Meetings of C.S.A.G.I. Bureau and Advisory Committee on Publications

The Advisory Committee on Publications and C.S.A.G.I. Bureau held meetings in Uccle from 24 to 27 February 1958. C.S.A.G.I. Reporters for Solar Activity and for World Days and Communications attended meetings of the A.C.P. Coordinator joined the Bureau during discussions of I.G.Y. Data collection.

### Report of Outstanding Event

(Forwarded by C.S.A.G.I. Reporter for Ionosphere.)

B. N. Bhargava, Director-General of Observatories, India, reports that a number of geophysical phenomena were observed at Kodaikanal Observatory almost simultaneously on 8 February 1958. They were followed by a very severe magnetic storm on 11 February.

Particulars for 8 February :

- (i) *Solar radio emission* (200 Mc/s) : *Minor bursts* between 0349 hrs  $\pm 2$  mts (U. T.) and 0417 hrs  $\pm 2$  mts (U. T.) with a major burst at 0406 hrs  $\pm 2$  mts (U. T.).
- (ii) *Dellinger Fadeouts* : There were two fadeouts on the day. The first one starting at 0407 hrs  $\pm 2$  mts (U. T.) lasted for 21 mts while the second starting at 0437 hrs  $\pm 2$  mts (U. T.) lasted for 131 minutes.
- (iii) *Geomagnetic crochet* : A geomagnetic crochet was recorded at 0406 hrs (U. T.) reaching maximum amplitude at 0410 hrs (U. T.). The amplitude of the crochet was about 14.

And for 11/12 February, a severe magnetic storm :

- 11 February. 0124 to 1213 G.M.T. Sudden commencement, amplitude D 3, H 80, Z 35. Degree of activity Severe (range above 400  $\gamma$ ). Ranges D 20, H 813, Z 316.
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# INTERNATIONAL UNIONS

## International Astronomical Union

### SYMPOSIUM ON THE LARGE-SCALE STRUCTURE OF THE GALACTIC SYSTEM

#### Proceedings

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## **International Union of Pure and Applied Physics**

### **EXECUTIVE BOARD**

Has been appointed as follows for the period 1957-1960 :

*President* : E. AMALDI (Rome).

*Past Presidents* : N. F. MOTT (Cambridge, U. K.); M. SIEGBAHN (Stockholm).

*Vice-Presidents* : J. DE BOER (Amsterdam), R. B. BRODE (Berkeley), M. KOTANI (Tokyo), J. H. VAN VLECK (Cambridge), G. HERZBERG (Ottawa), A. JOFFÉ (Leningrad), E. RASMUSSEN (Copenhagen), H. STAUB (Zurich), F. C. A. TRENDELENBURG (Erlangen), J. WEYSSENHOFF (Kracow).

*Secretary General* : P. FLEURY (Paris).

The Executive Board appointed : A. MARÉCHAL (Paris), as Assistant Secretary.

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## BIBLIOGRAPHY

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### *International Electrotechnical Commission*

*Publication 71, Second Edition.* — Recommendations for insulation co-ordination.

This publication is on sale at the Central Office of the I. E. C., at the price of Sw. Fr. 6,— per copy, plus postage.

*Publication 96-1, First Edition.* — Recommendations for Radio-frequency cables. Part I : General requirements and measuring methods.

This publication is on sale at the Central Office of the I. E. C., at the price of Sw. Fr. 7.50 per copy, plus postage.

I. E. C. Publication 96, Recommendations for Radio-frequency Cables, of which Part I, General requirements and measuring methods, has just been issued. It applies to flexible or semi-flexible radio-frequency cables of coaxial or twin conductor types with dielectric of solid, air-spaced, or semi-airspaced types of thermoplastic low-loss polymeric resin or thermosetting compound, or mineral material, designed for use in radiocommunication equipment and in electronic devices employing similar techniques.

The object of Part I is to lay down uniform requirements for judging the electrical, climatic and mechanical properties of radio-frequency cables and to describe test methods. It contains the following sections : General ; Electrical tests, Climatic and Mechanical Robustness tests ; Marking.

An Appendix to Part I describing additional methods of measurement is being prepared.

The detailed construction and characteristics for each type of cable will be laid down in Part II of Publication 96, which will be issued later.

This Publication is the second I. E. C. Publication to be issued dealing with radio-frequency cables, Publication 78 which was issued in 1956, laying down values of characteristic impedance and associated diameters.

As in the case of all other I. E. C. Publications dealing with components for electronic equipment, Publication 96 is to be used in conjunction with Publication 68, Basic Climatic and Mechanical Robustness Testing Procedure for Components.

L. ROBIN. — Fonctions sphériques de Legendre et fonctions sphéroïdales.

In three parts. (Collection technique et scientifique du C.N.E.T. ; Paris 1957.) In French.

This book, written in view of applications, contains a systematic study of the Legendre functions of a general type. It is intended to mathema-

ticians, physicists, research-engineers, and contains an extended set of useful formulas, with indication, in each case, of their validity domain.

Part I is already available (35 + 201 pp.) The Legendre functions are introduced by means of the coordinate-separation technique applied to the Laplace or Helmholtz equation in spherical coordinates. The polynomials  $P_m$ , the corresponding functions of the second kind, the associate functions  $P_m^n$  and  $Q_m^n$ , the spherical harmonics are successively studied in detail. Attention is drawn upon the functions of the first kind  $P_m^{-n}$  of negative order which may play an important role in the applications. Parts II and III will soon follow. In particular, part III will contain notions on the spheroidal functions, a generalisation of the spherical ones. New results are described in this book, together with new simplified demonstrations of known results. The preface has been written by Prof. Henri Villat.

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## CALENDAR OF INTERNATIONAL MEETING

Date	Place	Meeting, Subject	Address queries to
1958 Spring	Utrecht, Netherlands	European Seismological Commission (I.G.G.U.).	G. Laclavère, Secretary General I.G.G.U., 30, avenue Rapp, Paris 7, France; Elie Peterschmitt, Secretary of Commission, Strasbourg, France.
May 6-9	Brussels, Belgium	Colloquium on Optics in Metrology (I.U.P.A.P.).	Mr. P. Mollet, Comité Belge d'Optique, 128, rue du Sport, Gand, Belgium; I.U.P.A.P., 3, boulevard Pasteur, Paris 15 <sup>e</sup> .
May 19-23	London, U. K.	International Convention on Microwave values.	Institution of Electrical Engineers, Savoy Place, London, W. C.2, U. K.
June 2-7	Brussels, Belgium	International Conference on Solid State Physics in Electronics and Telecommunications.	Dr. M. Desirant, Honorary General Secretary, Société Belge de Physique, 18, rue de Philippeville, Loverval, Belgium.
June 9-12	Idem	International Academic Union, Meeting.	International Academic Union, Palais des Académies, 1, rue Ducale, Bruxelles.

Date	Place	Meeting, Subject	Address queries to
June 9-13	New-York	4th International Automation Congress and Exposition; 1st Military Automation Exposition; International Conference on Cybernetics.	International Automation Exposition and Congress, c/o Richard Rimbach Associates, Management, 845 Ridge Avenue, Pittsburgh 12, Pennsylvania, U.S.A.
June 9-21	Harrogate, U. K.	International Standardization Organization, General Assembly, and Meetings of Council and Technical Committee.	I.S.O. General Secretariat, 1, rue de Varembé, Geneva, Switzerland.
June 23-28	Leyden, Netherlands	Colloquium on Physics of Very Low Temperatures (I.U.P.A.P.).	Prof. C. J. Garter, Department of Experimental Physics, State University of Leyden, Nieuwsteg 18, Leyden, Netherlands.
June 30-July 5	Geneva, Switzerland	2nd C.E.R.N. Conference on High Energy Nuclear Physics, European Organization for Nuclear Research.	C.E.R.N., Geneva, Switzerland.
July 5-11	Paris, France	Colloquium on Radioactivity, I.U.P.A.P.	Prof. F. Netter, C.E.N.; B. P. n° 2 Gif-sur-Yvette, Seine-et-Oise, France.
July 8-18	Stockholm, Sweden	International Electrotechnical Commission (I.E.C.), General Meeting.	I.C.E., 5, rue de Varembé, Geneva, Switzerland.

Date	Place	Meeting, Subject	Address queries to
July 14-18	Idem	International Standardization Organization (I.S.O.). Technical Committee on Acoustics, Meeting.	I.S.O. General Secretariat, 1, rue de Varembe, Genève, Suisse.
	London, U. K.	International Union of Biological Sciences, 13th General Assembly.	Dr. G. Montalenti; Secretary, I.U.B.S., Istituto di Genetica, Università, Via Mezzocannone, 3, Naples, Italy.
August 11-13	St-Andrews, Scotland	International Mathematical Union, 3rd General Assembly.	Mr. F. Smithies, Mathematical Institute, 16 Chambers Street, Edinburgh 1, Scotland.
August 13-20	Moscow, U. S. S. R.	International Astronomical Union, 10th General Assembly and Symposia on the Rotation of the Earth and Atomic Time Standards and on the Hertzprung-Russell Diagram.	Prof. P. Th. Oosterhoff, General Secretary of I.A.U., Leiden Observatory, Leiden, Netherlands.
August 18-23	Rochester, New-York	International Conference on Semi-conductors (I.U.P.A.P.).	Dr. M. H. Hebb, Conference Secretary, General Electric Research Laboratory, P. O. Box 1088, Schenectady, New-York.

Date	Place	Meeting, Subject	Address queries to
August 25-29	Geneva, New-York	Colloquium on Electronic Properties of Metals at Low Temperatures (I.U.P.A.P.).	Prof. P. Fleury, Secretary General I.U.P.A.P., 3, boulevard Pasteur, Paris 15 <sup>e</sup> , France. — Dr. M. D. Fiske, General Electric, Company, P. O. Box 1088, Schenectady, New-York.
August 27-Sept. 3	Glasgow, Scotland	British Association for the Advancement of Science, 120th Annual Meeting.	The Secretary, B.A.A.S., Burlington House, London W1, U. K.
	Paris, France	Symposium on Radio-Astronomy (U.R.S.I. and I.A.U.).	Prof. P. Th. Oosterhoff, General Secretary I.A.U., Leiden Observatory, Leiden, Netherlands.
September 1-7	Vienna, Austria	4th International Congress of Biochemistry (I.U.B.).	Prof. O. Hoffmann-Ostenhof, 1, Chemisches Institut der Universität, Währingerstrasse, 42, Vienna IX, Austria.
September 3-9	Berlin, Germany	International Federation of Electron Microscope Societies, International Congress.	Dr. T. F. Anderson, The School of Medicine, The Eldridge Reeves Johnson Foundation for Medical Physics, 612 Maloney Building University of Pennsylvania, Philadelphia 4, Pennsylvania, U. S. A.

Date	Place	Meeting, Subject	Address queries to
September 3-10	Namur, Belgium	2nd International Congress for Cybernetics.	International Association for Cybernetics, 13, rue Basse-Marcelle, Namur, Belgium.
September 9-23	Geneva, Switzerland	World Meteorological Organization, 3rd Session of the Congress.	W.M.O., Campagne Rigot, 1, avenue de la Paix, Geneva, Switzerland.
Sept. 25-October 5	Washington, D. C., U. S. A.	I.C.S.U., 10th Meeting of the Executive Board, 19th Meeting of the Bureau, 8th General Assembly.	Dr. Atwood, National Research Council-National Academy of Sciences, Washington D. C. or Secretariat I.C.S.U., Paleis Noordeinde, The Hague, Netherlands.
November 16-23	Washington, D. C. U. S. A.	International Conference on Scientific Information.	Dr. Burton Atkinson, Executive Secretary, N.A.S./N.R.C., 2101. Constitution Avenue, Washington 25, D. C., U. S. A.
	Paris, France	Unesco, General Conference, 10th Session.	Unesco, 59, Avenue Kléber, Paris 16 <sup>e</sup> .

Date	Place	Meeting, Subject	Address queries to
December 26-31	Washington, D. C., U. S. A.	American Association for the Advancement of Science, An- nual Meeting.	Dr. R. Taylor, A.A.A.S., 1515 Massachusetts Avenue, N. W., Washington 5, D. C., U. S. A.
Undecided	Birmingham, U. K.	Colloquium on High Energy Nuclear Physics (I.U.P.A.P.).	Prof. P. Fleury, Secretary Gene- ral, I.U.P.A.P., 3, boulevard Pasteur, Paris 15 <sup>e</sup> .
	Amsterdam, Nether- lands or Paris	Meeting of Commission on Sym- bols, Units, and Nomenclature (I.U.P.A.P.).	Idem.
1959 April 1	U. S. A.	C.C.I.R. International Telecom- munications Union-11th Ple- nary Assembly.	I.T.U., Palais Wilson, Geneva, Switzerland.

