Bulletin N° 90 March-April 1955

International Scientific Radio Union

U. R. S. I.

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XIth GENERAL ASSEMBLY

Resolutions and Recommendations (Erratum)

COMMISSION I

Inf. Bull., *87*, p. 10. — The recommended value of the velocity of electromagnetic waves in vacuum is 299792 ± 2 km/s.

XIIth GENERAL ASSEMBLY

General Arrangement Committee of the U.S.A. National Committee

Dr. J. H. Dellinger, *Chairman*,
Dr. L. V. Berkner,
Mr. F. H. Dickson,
Prof. W. E. Gordon,
Dr. J. P. Hagen,
Mr. K. H. Norton,
Mr. H. W. Wells,
Mr. A. H. Shapley,
Dr. W. W. Atwood, *Honorary Member*,
Dr. F. W. Brown, *Honorary Member*.

NATIONAL COMMITTEES

Canada

MEMBERSHIP OF THE NATIONAL COMMITTEE

Dr. D. W. R. McKinley, *Chairman.*
Mrs. J. M. Ann Marshall, *Secretary.*
Mr. B. G. Ballard,
Dr. P. Bricout, *Official Member Commission VII.*
Mr. A. E. Covington, *Official Member Commission V.*
Prof. B. W. Currie.
Mr. F. T. Davies.
Prof. R. C. Dearle,
Dr. J. T. Henderson, *Official Member Commission I.*
Dr. H. P. Koenig, *Secretary of Commission VII.*
Dr. J. S. Marshall, *Official Member Commission II.*
Dr. Peter M. Millman.
Mr. James S. W. Scott, *Official Member Commission III.*
Dr. G. Sinclair, *Official Member Commission VI.*
Prof. G. A. Woonton, *Chairman Commission VII.*

Great Britain

MEMBERSHIP

The following names have to be added to the membership printed in *Information Bulletin*, nº 89 :

Dr. F. Horner,
Mr. W. Proctor Wilson.

Sweden

A.G.I.

We are informed by the Swedish National Committee of U.R.S.I. that in order to meet the expenses for Swedish observations and expeditions during the A.G.I., the Swedish Special Committee for the A.G.I. has asked the Government for economic support. The Government has now proposed to the Diet to allow a sum of 750 000 Swedish Crowns for the purpose, and very likely the Diet will assent.

COMMISSIONS

Officiers

Errata and addendum

(*Information Bulletin*, *88*, pp. 18-20)

COMMISSION II

The Vice-Chairman is Dr. C. G. AURELL, Assistant Professor, Royal Institute of Technology, Chief of Microwave Department, L. M. ERICSSON, Telephone Co, Stockholm, Sweden.

COMMISSION III

Dr. L. V. BERKNER, Associated Universities, Inc, 350 Fifth Avenue, New York 1, has been elected as Vice-President of the Commission.

COMMISSION VII

The Vice-Chairman is Prof. Dr. J. L. H. JONKER, Philips Research Laboratories, N. V. Philips' Gloeilampfabrick, Eindhoven, Netherlands.

Great Britain

Official members

The British National Committee appointed as Official Members :

Commission I : Dr. L. ESSEN, National Physical Laboratory, Teddington, Middlesex.

Commission II : Dr. R. L. SMITH-ROSE.

Commission III : Mr. J. A. RATCLIFFE.
Commission IV : Dr. F. HORNER.
Commission V : Prof. A. C. B. LOVELL.
Commission VI : Mr. W. Proctor WILSON.
Commission VII : Professor H. S. W. Massey, F. R. S. University College, Gower Street London W. C. 1.

Commission I.
Radio Measurements and Standards

PRECISION ELECTRICAL MEASUREMENTS

(Excerpt of the *Telecommunication Journal*, n° 1, p. 24*e*, January 1955)

A symposium having as its general theme the techniques of precision electrical measurement was held at the National Physical Laboratory during 17-20 November, 1954. Twenty-six papers were read and discussed, the authors being drawn from a particularly wide field, including not only some of the principal electrical laboratories in Britain but also members of the national laboratories of Australia, South Africa and the United States, and well-known workers from Germany, Holland and Sweden.

The symposium was divided into five sessions which dealt successively with subjects that form substantial items in the work of the Electricity Division of the National Physical Laboratory and that bear more or less directly on industry. The first session was devoted to the techniques applicable to electric fields and dielectrics ; the second to magnetic fields and associated materials ; the third dealt with electrotechnical measurements ; the fourth with standard techniques for the high-voltage laboratory ; and the last with the techniques of impulsetesting.

Perhaps the most outstanding feature of the techniques for the measurement of dielectric constant and power loss discussed in the first session was the range of frequency covered.

(Source : Nature).

Commission III. — Ionospheric Radio

SUB-COMMISSION IIIb.
ON RADIO WAVE INTERACTION

Translation of a circular letter to Members of the Sub-Commission and to Chairmen of National Committees

Paris, 5 March 1955.

Dear Colleague,

At the sessions of Sub-Commission III*b* Torino, 1954 (*U.R.S.I. Inf. Bull.*, n° 85) and during the last General Assembly, it was decided to continue the investigation on radio-wave interaction, particularly on the following topics :

1. To determine the extend of the phenomenon, particularly in Western Europe ; such investigation will be carried out with the co-operation of international bodies and particularly of the European Broadcasting Union.

2. To set up experiments under conditions stated at the Torino meeting (*Inf. Bull.*, n° 85).

3. To study the relationship belween interaction and selective fading.

4. To consider C.C.I.R. Study Programmes n^{os} 60 and 61 relevant to Question n° 50.

These various topics are not limited and I would be thankful to be informed on any work carried out in your country on radio-wave interaction and on selective fading.

I would be very pleased to hear whether you will be able to co-operate to the work of the Sub-Commission or to appoint somebody who could co-operate.

Yours very sincerely.

(*sgd*) E. Picault.

Chairman Sub-Commission IIIb
7, rue Huysmans, Paris (6^{e}).

SUB-COMMISSION IIId.
ON MAGNETO-IONIC NOMENCLATURE

At The Hague Assembly a Sub-Commission was set up consisting of Mr. Ratcliffe, as Chairman, Professor Booker, Dr. Martyn, Mr. Millington, Dr. Rydbeck and Professeur Saha, to consider the question of the nomenclature in the Magneto-Ionic Theory.

The following report has been drafted by the Sub-Commission.

The Algebraic Nomenclature of the Magneto-Ionic Theory

It was agreed that the nomenclature should be essentially that introduced by Appleton (*Jour. I.E.E.*, 1932, vol. 71, p. 642). The following changes should, however, be recommended as desirable.

(*a*) The symbols x, y, z, of Appleton are liable to be confused with symbols for the coordinate axes. They should therefore be replaced by X, Y, Z. It should be especially noted that Appleton used X, Y, Z, for quite a different set of quantities, but that these have been little used by others.

(*b*) The symbol p as used by Appleton for angular frequency should be replaced by ω, which is in conformity with standard usage.

(*c*) The symbol e for the charge on the electron should represent a negative number. In Appleton's original paper e represented a positive number when the electron was considered.

(*d*) Throughout the theory of optics and electromagnetic waves there has always been doubt as to whether n or μ is the better symbol for the real part of the refractive index. No firm recommendation is made on this point. It is however agreed that one or the other symbol should be used according to the choice of the writer and the context in which he writes.

With these changes the nomenclature is therefore as follows. It is here written in non-rationalised units, with the electric and magnetic permittivity of free space expressed as ε_0 and μ_0. There is no intention to lay down what units should be used, and any expressions corresponding to those given here, but in other units, are considered acceptable.

N number density of electrons.

e charge on electron (e represents a negative number in the case of the electron).

m mass of electron.

H earth's magnetic field.

H_L longitudinal component of H, *i. e.* the component along the direction of the wave-normal.

H_T transverse component of H, *i. e.* the component perpendicular to the wave-normal.

ν frequency of collision of electrons with heavy particles.

μ (or n) real part of refractive index.

K (Greek Kappa) attenuation constant, defined so that a wave is attenuated like $E = E_0 \exp(-Kx)$.

c velocity of light in free space.

$\omega^2_0 = 4\ Ne^2/\varepsilon_0 m.$

$\omega_H = -\mu_0 eH/m.$

$\omega_L = -\mu_0 eH_L/m.$

$\omega_T = -\mu_0 eH_T/m.$

$X = \omega^2_0/\omega^2.$

$Y = \omega_H/\omega.$

$Y_L = \omega_L/\omega.$

$Y_T = \omega_T/\omega.$

$Z = \nu/\omega.$

With these symbols the results of the magneto-ionic theory for plane waves travelling in a uniform medium are given by :

$$(\mu - icK/\omega)^2 \quad \text{or} \quad (n - icK/\omega)^2$$

$$= 1 - \frac{X}{1 - iZ - \frac{1}{2}Y_T^2/(1 - X - iZ) \pm \sqrt{\frac{1}{4}Y_T^4/(1 - X - iZ)^2 + Y_L^2}}$$

Commission V. — On Radio-Astronomy

FREQUENCY ALLOCATIONS IN SWEDEN

We are informed that the Swedish National Board of Telecommunications, which is the national authority for assigning frequencies, has already reserved the channel 1400-1425 Mc/s for observations of the spectral line of neutral hydrogen. The reservation of further frequency bands for radio-astronomy will be discussed with the interested institutions.

RADIO ASTRONOMY IN SPAIN

(Excerpt of the *Telecommunication Journal*, nº 1, p. 24*e*, January 1955)

It is announced that as a result of the accession of Spain to the International Scientific Radio Union (U.R.S.I.), this country will take an active part in the activities thereof, and the first radiotelescope to be constructed entirely in Spain will be built in the Electronic Laboratories of the Faculty of Sciences in the Central University, the Director of which is Professor Balta Elias, who has been active in radio engineering from the early days of radio. The first radiotelescopa will enable studies in radio astronomy, which is growing in importance every day, to begin.

(Source : Revista de Telecomunication)

Commission VI. — On Radio Waves and Circuits

CONFERENCE ON TRANSISTOR CIRCUITS

(Excerpt of the *Telecommunication Journal*, nº 1, p. 24*e*, January 1955)

The professional group on circuit theory, the science and electronics division of the American Institute of Electrical Engineers, and the University of Pennsylvania will sponsor jointly a conference on transistor circuits, 17-18 February, 1955, at the University of Pennsylvania in Philadelphia.

Rapid strides have been made in the transistor art since the last circuits conference in Philadelphia earlier in 1954, and the 1955 conference will try to cover this broad advance. Papers dealing with current trends in linear and pulse circuit techniques will be included. As in the past, the conference will be designed primarily for engineers working actively with transistor circuits.

(Source : Proceedings of the IRE).

SYMPOSIUM ON ELECTROMAGNETIC WAVE THEORY

This symposium which will be held at the University of Michigan from June 20 to 25, 1955, is sponsored by Commission VI of U.R.S.I. and the University of Michigan together with the :

Chrysler Corporation,
Convair,
Ford Motor Company,
General Motor Corporation,
Hughes Aicraft Company,
Melpar, Inc.,
Republic Aviation Corporation,
Republic Steel Corporation,
Sylvania Electric Products, Inc.,
U. S. Air Force,
U. S. Navy,
Westhinghouse Electric Corporation.

Tentative Programme

Monday, 20 June :

Session 1 : Welcoming Addresses.

Welcoming Address by a representative of the University of Michigan.

Welcoming Address by S. Silver, University of California, Chairman of Commission VI of U.R.S.I.

Session 2 : Boundary value problems of diffraction and scattering theory (I).

On field representations in terms of leaky modes or eigenmodes, N. Marcuvitz, Polytechnic Institute of Brooklyn.

The interpretation of numerical results obtained by rigorous diffraction theory for cylinders and spheres, H. C. van de Hulst, Leiden University, Netherlands.

Creeping waves in diffraction by spheres and cylinders of finite conductivity, W. FRANZ and P. BECKMAN, University of Munster, Germany.

A method for the asymptotic solution of diffraction problems ; R. Timman, Technical University of Delft, Netherlands.

On the diffraction field near a plane-screen corner, W. BRAUNBEK, University of Tubingen, Germany.

Electromagnetic radiation patterns and sources, C. MULLER, University of Bonn, Germany.

A refinement of the WKB method and its application to the electromagnetic wave theory, I. IMAI, University of Tokyo.

Session 3 : Discussion of the papers submitted at the preceding session

TUESDAY, 21 JUNE :

Session 4 : Boundary value problems of diffraction and scattering theory (II).

Electromagnetic research at the Institute of Mathematical Sciences, New York University, M. KLINE, New York University

Edge currents in diffraction theory, P. C. CLEMMOW, Cambridge University, Great Britain.

Solutions of problems in electromagnetic wave theory on a high speed digital calculating machine, E. K. RITTER, Georgia Institute of Technology.

Asymptotic developments and scattering theory in terms of a vector combining the electric and magnetic fields, H. BREMMER, Philiph Research Laboratories, Netherlands.

On the diffraction at an open cylinder, R. MULLER, Technical Institute of Munich, Germany.

The excitation of a perfectly conducting half plane by a dipole field, A. E. HEINS, Carnegie Institute of Technology.

Critique of the variational method, D. S. JONES, Manchester University, Great Britain.

Recent developments in electromagnetic diffraction theory, C. J. BOUWKAMP, Philips Research Laboratories, Netherlands.

Session 5 : Discussion of the above mentioned papers.

WEDNESDAY, 22 JUNE :

Session 6 : Contributed papers.

THURSDAY, 23 JUNE :

Session 7 : Forward and multiple scattering.

Near-field corrections to line-of-sight propagation, A. D. WHEELON, Ramo-Wooldridge Corporation.

On the scattering of waves by an infinite grating, V. Twersky, Sylvania Electric Products, Inc.

Measurement and analysis of instantaneous radio height-gain curves at 8.6 mm over rough surfaces, A. W. Straiton and C. W. Tolbert, University of Texas.

Measurements of the phase of signals received over transmission paths with their electrical lengths varying as a result of atmospheric turbulence, J. W. Herbstreit and M. C. Thompson, National Bureau of Standards.

Analogical conditions between electromagnetic wave propagations and trajectories of same spin particles with applications to rectifying magnetrons, J. Ortusi, Compagnie Générale de T.S.F., France.

Forward and backward scattering from certain rough surface, W. S. Ament, Naval Research Laboratories.

Cerenkow and undulator radiation, H. Motz d'Oxford University, Great Britain.

Session 8 : Discussion of the above mentioned papers.

Friday, 24 June :

Session 9 : Contributions in antenna theory.

Theory of the square loop antenna, R. W. P. King, Harvard University.

The radiation pattern and induced current in a circular antenna with a circular slit, J. Meixner, Institute of Theoretical Physics, Aachen, Germany.

Aberrations of microwave optical systems, G. Bekefi, McGill University, Montreal, Canada.

Spherical surface wave antennas, R. S. Elliott, Hughes Aircraft Company.

Application of the theory of periodic functions to antenna pattern synthesis and the problem of linear filters, J. C. Simon, Compagnie Générale de T.S.F. France.

A theoretical analysis of hte multi-element end-fire array with particular reference to the Yagi-Uda antenna, Y. Mushiake, Tohoku University, Japan.

Resolution, pattern effects, and other problems of radio telescope antennas, J. D. Kraus, Ohio State University.

Radiation from ring quasi-aerials, H. L. Knudsen, The Royal Technical University of Denmark.

Directivity, super gain, and information, G. Toraldo di Francia, Instituto Nazionale di Ottica, Italy.

Exact treatment of antenna current wave reflection at the end of a tube-shaped cylindrical antenna, E. Hallen, Royal Institute of Technology Sweden.

Session 10 : Discussion of the above mentioned papers.

SATURDAY, 25 JUNE :

Session 11 : Propagation in doubly refracting media in wave guides.

Propagation in circular wave guides filled with a gyromagnetic medium, L. R. WALKER and H. SUHL, Bell Telephone Laboratories.

The low frequency problem in the design of microwave gyrators, C. L. HOGAN, Harvard University.

Some topics in the microwave application of gyrotropic media, A. A. VAN TRIER, Philips Research Laboratories, Netherlands.

The Siesmic pulse, an example of wave propagation in a doubly-refracting medium, C. L. PEKERIS, Weizman Institute of Science, Israel.

On the electromagnetic characterization of ferromagnetic media : permeability tensors and spin wave equations, G. T. RADO, Naval Research Laboratory.

Session 12 : Discussion of the above mentioned papers.

INTERNATIONAL GEOPHYSICAL YEAR

World Days

(Excerpt from the Proceedings of the C.S.A.G.I. Meeting Rome Sept. 30-Oct. 4, 1954)

WORKING GROUP FOR WORLD DAYS

L. V. BERKNER (*Correspondent*),
M. BOELLA (C.S.A.G.I.),
S. CHAPMAN (C.S.A.G.I.),
L. HARANG (Norway),
E. HERBAYS (C.S.A.G.I.),
P. LEJAY (France),
K. MAEDA (Japon),
M. NICOLET (C.S.A.G.I.),
A. H. SHAPLEY (U. S. A.),
J. VELDKAMP (Netherlands).

SUMMARY OF WORK CARRIED OUT IN ROME

A plan for A.G.I. World Days has been formulated and adopted by C.S.A.G.I., and the calender of A.G.I. world Days has been circulated subject to final adoption at the meeting of C.S.A.G.I., September 1955.

Three regular world days, two at new moon and one near the quarter moon, have been specified each month, and include predictable events such as meteor showers and solar eclipses.

The Central Radio Propagation Laboratory, U. S. A., in cooperation with Centers in France, and Japan, will formulate predictions of geophysical disturbances. Based on solar observations of

all types, the likehood of geophysical disturbances will be notified by an ALERT five or six days in advance. When subsequent solar activity leads to prediction of a disturbance, a Special World Interval will be declared over A.G.I. communication networks about 12 hours in advance, to continue until terminated by the predicting agencies. Through this procedure, it is hoped that detailed observation and description of the world-wide morphology of auroral, magnetic and ionospheric disturbances will be possible.

The World Meteorological Intervals of ten days each are established at each equinox and solstice during the A.G.I. to provide intervals for continuous concentrated meteorological observations. Each interval includes the three regular world days during the month in which it occurs.

Time stations and Ursigram communication network will carry to all nations the alerts, announcements of special world days and pertinent solar and geophysical information. Each nation will inform the stations for which that nation is responsible. The WMO and C.C.I.R. have been asked to cooperate in extending this network and their cooperation seems assured.

REPORT ON WORLD DAYS

prepared by L. V. Berkner

1. — Introduction.

1.1. — A Committee (L. V. Berkner, Chairman ; S. Chapman ; P. Lejay and M. Nicolet) on World Days was appointed consequent at the Brussels meeting C.S.A.G.I., June 30 — July 3, 1953 to formulate the calendar of World Days in accordance with the following draft resolutions :

1. The Regular World Days, *i. e.* 2 days at new moon and 1 day at full moon (1), will be defined in advance, and circulated by the World Meteorological Organization (WMO) ; reminders will be issued by the Warning System before each occasion.

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(1) The 1953 plan has been modified as regards these two types of days ; see Section 1.4.

2. In addition there will be A.G.I. Special World Days, on the average 2 per month, chosen at shorter notice, to coincide with ;

(1) Expected unusual magnetic, ionospheric or auroral activity [1].

(2) Expected intervals of extreme magnetic quiet days [1].

(3) Launching of rockets.

(4) Days of solar eclipses.

(5) Unusual meteor showers.

These five types of days are given in ordre of their priority [1] ; (4) and (5) can be foretold, but could be omitted as World Days if too great a number of such days appeared in the same month. It is recommended that the organization to define the above special World Days shall be designated by the Ursigram Committee of U.R.S.I.

3. The Warning System will be operated through WWV, WWVH, Ursigrams, extended time systems and any other channels. Warning elements to be considered are (1) optical observations of the sun ; (2) solar radioelectric observations ; (3) visible magnetic recording ; (4) radio fade-outs ; (5) cosmic rays ; (6) beginning of a brilliant aurora. It is recommended that the warning code be established by the Ursigram Committee of U.R.S.I. in consultation with the World Meteorological Organization.

1.2. — Reports and advisory information have been received from I.U.G.G., U.R.S.I. and W.M.O. relating to the programs for World Days. Dr. G. M. Clemence, U. S. Naval Observatory, has prepared data on the three eclipses during 1957-58 ; complete data on meteor showers during A.G.I. have been received from Professor A. C. B. Lowell, University of Manchester, and from Peter M. Millman, Dominion Observatory, Ottawa ; Mr. D. H. Sadler, Superintendent of the British Nautical Almanac Office has supplied data regarding the moon.

1.3. — A tentative calendar for Regular World Days (R.W.D.) was selected at the Rome meeting. This calendar has been

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[1] The 1953 plan has been modified as regards these two types of days ; see Section 1.4.

subsequently modified in accordance with important suggestions received from the various interested scientific activities to include the greatest range of activity and control within the limitation of three or four R.W.D. each month. In selecting the Calendar for Regular World Days, the Committee has taken :

1.3.1. — Two days each month at new moon ;

1.3.2. — One day near quarter moon, with the exact date adjusted to coincide with major meteoric activity. (Of these days, four — Aug. 12, 1957 ; Jan. 4, May 5, and July 27, 1958 — fall near full moon. R.W.D. fall near the quarter during October 1957 or April and October 1958 to permit an additional control day at the time of the solar eclipses) ;

1.3.3. — Additional days of unusual meteoric activity — Jan. 3, June 9, Aug. 7, Oct. 10, Dec. 13, 1958 ; Jan. 4, 1959 — have been included ;

1.3.4. — An additional control day immediately following the Geminid showers has been included on Dec. 16, 1957 ;

1.3.5. — To prevent the interval between R.W.D. from exceeding approximately three weeks, the following R.W.D. have been added : Sept. 1, 1957 ; Feb. 26, June 9, Sept. 6, and Nov. 4, 1958 ;

1.3.6. — Days of important meteoric activity that could not be included as R.W.D. are indicated on the calendar of Table II for informational purposes with the expectation that certain types of A.G.I. activity can be concentrated upon on these days in addition to the more general observational activity on the R.W.D.

1.4. — In the place of Special World Days during intervals of predicted unusual activity, the Committee has substituted a plan for ALERTS followed by Special World Interval (S.W.I.) when the prediction service believes that disturbance seems probable. This modification of the initial proposal is made in order that observers may be forewarned by an Alert of the more than usual likelihood of the outbreak of a magnetic, auroral and ionospheric disturbance, as judged on the basis of observations

of solar activity ; it will enable observers to keep themselves and their instruments in special readiness for observation, and on the lookout in order to observe intensively should a disturbance begin unexpectedly without having been actually predicted. Should this happen, the loss of information owing to the absence of a definite prediction may be much reduced. When the state of the sun makes it appropriate, in the experienced judgment of the forecasting centers, to announce a Special World Interval, observations on an intensive scale will definitely be made during this Interval. The plan for ALERTS and SWI is based on realities of prediction during the rise of solar activity anticipated during the International Geophysical Year, and follows the recommendations of the U.R.S.I. The Committee has discontinued plans for observation during anticipated intervals of extreme quiet, since such intervals cannot be predicted with sufficient reliability.

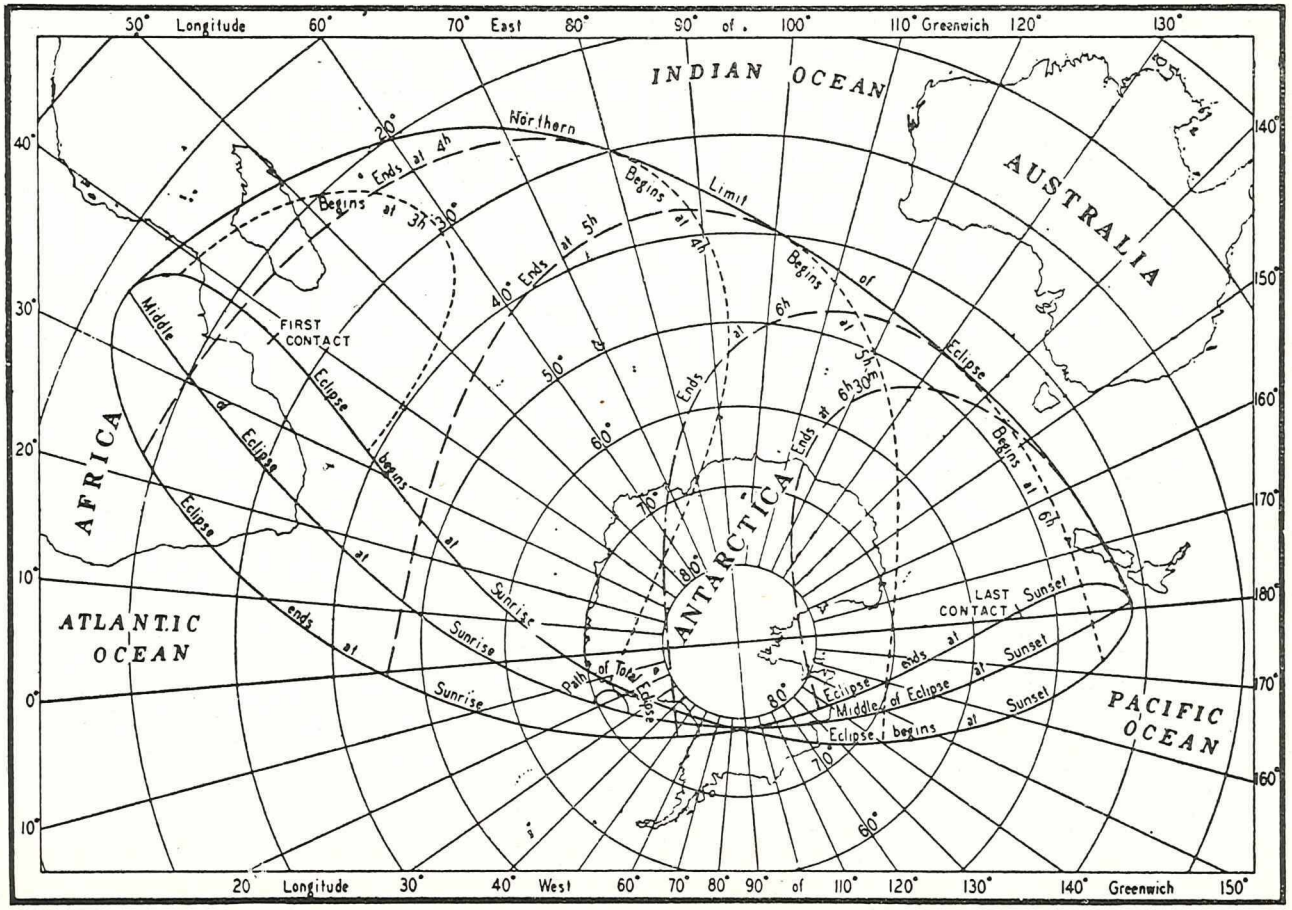
1.5. — Following the recommendations of W.M.O., the Committee has chosen six World Meteorological Intervals (WMI) of 10 consecutive days each timed quarterly at the solstices and the equinoxes during the A.G.I. These WMI are chosen so as to include the regular World Days of the same month. Hence, on three days of each WMI there will be concentration of all forms of A.G.I. observation.

1.6. Eclipse data from U. S. Naval Observatory :

1.6.1. *Total Eclipse of October* 23, 1957. — The cone of umbra will touch the earth for a very short time. The eclipse center will be off the surface of the earth, the closest approach of the axis of the shadow to the surface being approximately 21 miles.

The eclipse will however be central for all three atmospheric heights of 100 km, 200 km and 300 km. Inasmuch as the axis of the shadow never touches the earth, there will be at each instant two intersections of this axis with each of the concentric « shells » at 100, 200 and 300 km, giving in each case a double central line. Those are the columns marked $\zeta > 0$ and $\zeta < 0$ in the tables below. For observing purposes, either position is equally suitable, even though the geometry of the phenomenon may appear somewhat unusual.

TOTAL ECLIPSE OF OCTOBER 23, 1957



Geocentric conjunction occurs at 23 d 5 h 21 m 52 s 8 in Right Ascension 13 h 49 m 53 s 32, the Declination of the Sun being —11°18′44″1.

On the surface the eclipse will be total in the region bounded by the northern limit of the umbra and a section of the curve « Middle of Eclipse at Sunrise ».

U.T.	Northern Limit of Umbra		Middle of Eclipse at Sunrise	
	Latitude	Longitude from Greenwich	Latitude	Longitude from Greenwich
Limit 4h49.5	—69°31′	+18°37′	—69°31′	+18°37′
4 50	—70 27.9	+15 51.8	—69 44.1	+19 09.9
4 55	—73 10.7	+19 43.8	—71 55.2	+25 23.6
Limit 4 57.0	—72 45	+28 13	—72 45	+28 13

West longitudes are positive.

CENTRAL LINES :

U.T.	$\zeta > 0$			
	Latitude	Longitude	½ Width	Duration
	At 100 km			
Limit 4h38m.0	—64°12′	+ 7°49′	173 miles	1m08s
40	66 44	+ 0 25	189	1 14
45	70 08	— 3 41	188	1 18
50	73 00	— 3 56	182	1 20
55	75 39	— 0 55	176	1 20
5 00	—77 59	+ 7 07	173	1 19
05	79 22	+24 22	173	1 15
Limit 5 08.5	—76 45	+49 09	176	1 08

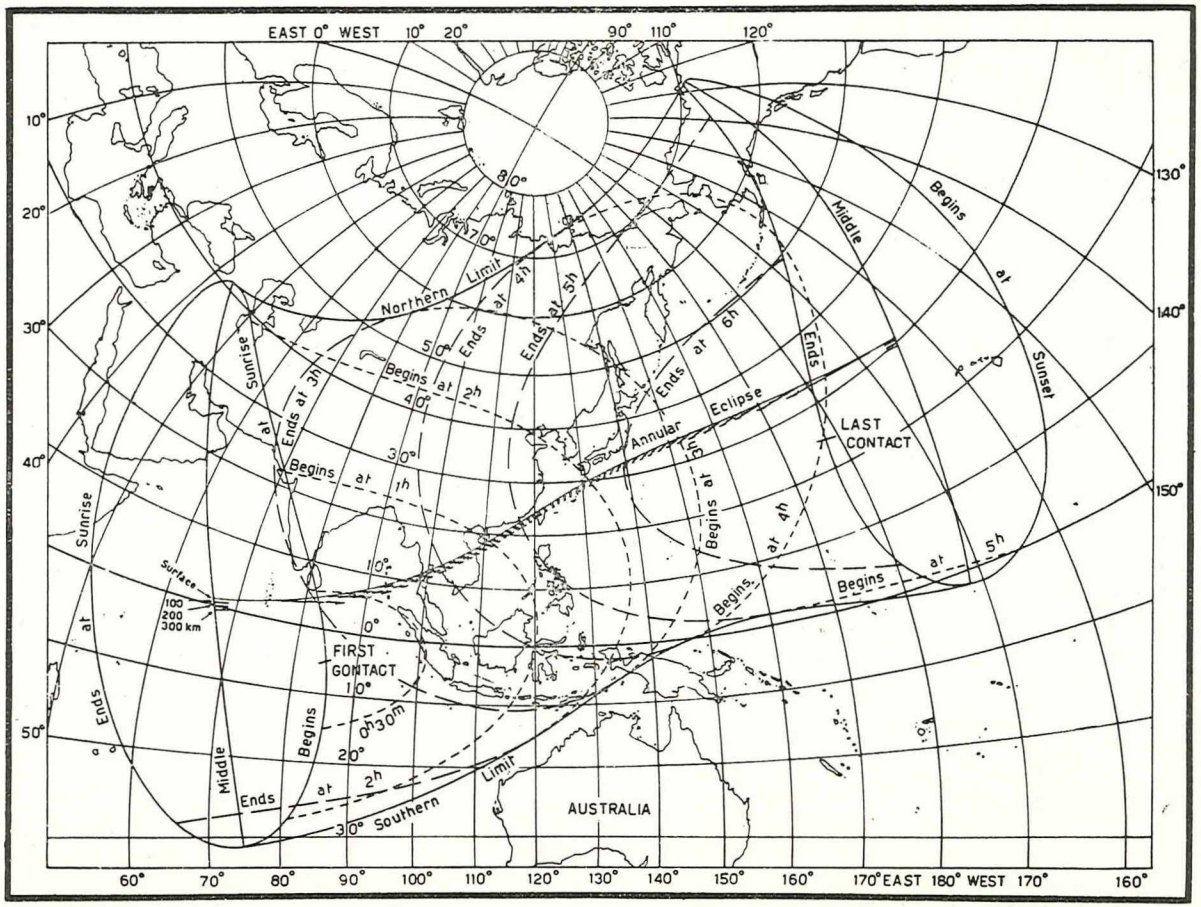
U.T.	$\zeta > 0$			
	Latitude	Longitude	½ Width	Duration
		At 200 km		
Limit 4h29m.1	—59°56′	+ 1°21′	110 miles	1m08s
30	61 35	4 45	118	1 13
35	65 15	—12 54	126	1 21
40	68 06	—16 50	126	1 25
45	70 47	—19 12	123	1 27
50	73 24	—20 23	120	1 28
55	76 02	—20 10	118	1 28
5 00	—78 42	—17 39	116	1 27
05	81 22	—10 18	114	1 25
10	83 37	+ 9 30	113	1 22
15	83 19	+50 52	112	1 16
Limit 5 17.5	—78 28	+71 51	110	1 07
		At 300 km		
Limit 4h22m.6	—56°52′	— 2°39′	87 miles	1m08s
25	59 49	—12 49	98	1 18
30	62 56	—19 35	102	1 25
35	65 33	—23 51	103	1 29
40	68 02	—27 05	102	1 32
45	70 27	—29 41	100	1 34
50	72 53	—31 47	98	1 34
55	75 23	—33 22	97	1 34
5 00	—77 57	—34 15	95	1 34
05	80 41	—33 44	94	1 32
10	83 36	—29 30	92	1 30
15	86 33	— 8 37	91	1 26
20	86 27	+68 26	90	1 20
Limit 5 24.0	—78 38	+90 12	87	1 07
		$\zeta < 0$		
		At 100 km		
Limit 4h38m.0	—64°12′	+ 7°49′	173 miles	1m08s
40	63 02	+17 15	153	1 02
45	63 19	+27 11	141	0 58
50	64 23	+34 35	139 (135)	0 57
55	65 57	+41 01	143 (130)	0 57
5 00	—68 07	+46 51	151	0 58
05	71 18	+51 44	165	1 00
Limit 5 08.5	—76 45	+49 09	176	1 08

U.T.	$\zeta < 0$			
	Latitude	Longitude	½ Width	Duration
		At 200 km		
Limit 4h29m.1	—59°56′	+ 1°21′	110 miles	1m08s
30	58 51	+ 8 07	101	1 03
35	58 18	+20 01	88	0 57
40	58 44	+27 57	84	0 54
45	59 33	+34 45	82	0 52
50	60 39	+41 00	81 (79)	0 51
55	62 01	+46 57	83 (75)	0 51
5 00	63 43	+52 47	85	0 51
05	65 48	+58 38	90	0 52
10	68 32	+64 35	96	0 55
15	72 43	+70 45	104	1 00
Limit 5 17.5	—78 28	+71 51	110	1 07
		At 300 km		
Limit 4h22m.6	—56°52′	— 2°39′	87 miles	1m08s
25	55 15	+ 9 01	75	0 59
30	54 59	+18 53	67	0 54
35	55 19	+26 20	64	0 51
40	55 58	+32 51	61	0 49
45	56 49	+38 53	60	0 47
50	57 53	+44 39	60 (58)	0 47
55	59 08	+50 17	61 (56)	0 46
5 00	—60 36	+55 52	62	0 47
05	62 20	+61 33	65	0 48
10	64 25	+67 25	68	0 49
15	67 03	+73 44	72	0 52
20	70 46	+81 01	79	0 56
Limit 5 24.0	—78 38	+90 12	87	1 07

West longitudes are positive. Values of the Half-width given in parentheses apply to the westernmost side of the corresponding central line.

1.6.2. *Annular Eclipse, April* 19, 1958. — In the eclipse of 1958, April 19, the geocentric conjunction will occur at 19 d 03 h 35 m 26 s.9 in Right Ascension 1 h 46 m 13 s 72, the declination of the Sun being + 10°58′17″.9.

ANNULAR ECLIPSE, APRIL 19, 1958



The central lines on surface and in the atmosphere at 100 km, 200 km and 300 km are given in the following table :

SURFACE

U.T.	Latitude	Longitude	Half Width	Duration
1h35m	+ 3°04'.6	— 76°06'.5	89 miles	5m12s.9
40	5 22 .2	83 38 .0	87	5 27 .0
45	7 04 .4	88 16 .3	86	5 37 .3
50	8 32 .4	91 48 .9	85	5 46 .1
55	9 52 .0	94 44 .5	83	5 53 .9
2 00	+11 05 .8	— 97 16 .0	82	6 01 .1
05	12 15 .3	99 30 .3	81	6 07 .8
10	13 21 .4	101 31 .7	80	6 14 .0
15	14 24 .6	103 23 .3	79	6 19 .9
20	15 25 .4	105 07 .2	78	6 25 .4
25	16 24 .1	106 44 .9	77	6 30 .6
30	17 20 .9	108 17 .6	76	6 35 .5
35	18 16 .0	109 46 .3	75	6 40 .1
40	19 09 .6	111 11 .9	75	6 44 .3
45	20 01 .8	112 35 .0	74	6 48 .2
50	20 52 .6	113 56 .1	73	6 51 .8
55	21 42 .1	115 15 .8	73	6 55 .0
3 00	+22 30 .4	—116 34 .5	72	6 57 .9
05	23 17 .6	117 52 .6	71	7 00 .4
10	24 03 .6	119 10 .6	71	7 02 .5
15	24 48 .5	120 28 .8	71	7 04 .3
20	25 32 .3	121 47 .5	70	7 05 .7
25	26 14 .9	123 07 .0	70	7 06 .6
30	26 56 .5	124 27 .8	70	7 07 .1
35	27 36 .9	125 50 .1	70	7 07 .2
40	28 16 .1	127 14 .2	70	7 06 .8
45	28 54 .2	128 40 .6	70	7 06 .0
50	29 31 .0	130 09 .6	70	7 04 .7
55	30 06 .5	131 41 .7	71	7 02 .9
4 00	+30 40 .7	—133 16 .2	71	7 00 .6
05	31 13 .4	134 56 .6	71	6 57 .9
10	31 44 .6	136 40 .5	71	6 54 .6
15	32 14 .1	138 29 .4	71	6 50 .9
20	32 41 .8	140 24 .1	72	6 46 .8
25	33 07 .5	142 25 .5	72	6 42 .1
30	33 31 .0	144 34 .4	73	6 36 .9

U.T.	Latitude	Longitude	Half Width	Duration
4h35m	+33°52′.0	—146°52′.2	73 miles	6m31s.3
40	34 10 .2	149 20 .3	74	6 25 .1
45	34 25 .1	152 00 .8	75	6 18 .5
50	34 36 .1	154 56 .4	76	6 11 .3
55	34 42 .3	158 11 .0	77	6 03 .5
5 00	+34 42 .5	—161 50 .4	79	5 55 .1
05	34 34 .5	166 04 .6	80	5 45 .8
10	34 14 .4	171 12 .4	82	5 35 .3
15	33 32 .3	—178 01 .6	84	5 22 .7
20	+31 24 .8	+168 11 .5	89	5 01 .6

West longitudes are positive.

100 *km*

1h35m	+ 3°49′	— 80°05′	87 miles	5m19s
40	5 46	85 59	85	5 31
45	7 21	90 04	84	5 41
50	8 44	93 18	83	5 50
55	10 01	96 01	81	5 57
2 00	+11 12	— 98 23	80	6 04
05	12 19	100 30	79	6 11
10	13 23	102 25	78	6 17
15	14 25	104 12	77	6 23
20	15 24	105 51	76	6 29
25	16 21	107 25	76	6 34
30	17 17	108 54	75	6 39
35	18 11	110 20	74	6 44
40	19 03	111 42	73	6 48
45	19 54	113 02	73	6 52
50	20 44	114 20	72	6 55
55	21 33	115 37	72	6 58
3 00	+22 20	—116 53	71	7 01
05	23 07	118 09	70	7 04
10	23 52	119 24	70	7 06
15	24 36	120 40	70	7 08
20	25 19	121 56	69	7 09
25	26 01	123 13	69	7 10
30	26 41	124 31	69	7 11
35	27 21	125 51	69	7 11

U.T.	Latitude	Longitude	Half Width	Duration
3h40m	+28°00′	—127°12′	69 miles	7m10s
45	28 37	128 35	69	7 09
50	29 13	130 01	69	7 08
55	29 48	131 30	69	7 06
4 00	+30 22	—133 02	69	7 04
05	30 54	134 38	69	7 01
10	31 25	136 18	70	6 58
15	31 54	138 03	70	6 55
20	32 22	139 53	70	6 51
25	32 48	141 49	71	6 46
30	33 11	143 53	71	6 41
35	33 32	146 05	72	6 35
40	33 51	148 26	72	6 29
45	34 06	150 59	73	6 22
50	34 18	153 46	74	6 15
55	34 26	156 50	75	6 07
5 00	+34 28	—160 16	77	5 59
05	34 23	164 11	78	5 50
10	34 08	168 51	80	5 40
15	33 36	—174 47	82	5 28
20	+32 25	+176 08	86	5 12

200 *km*

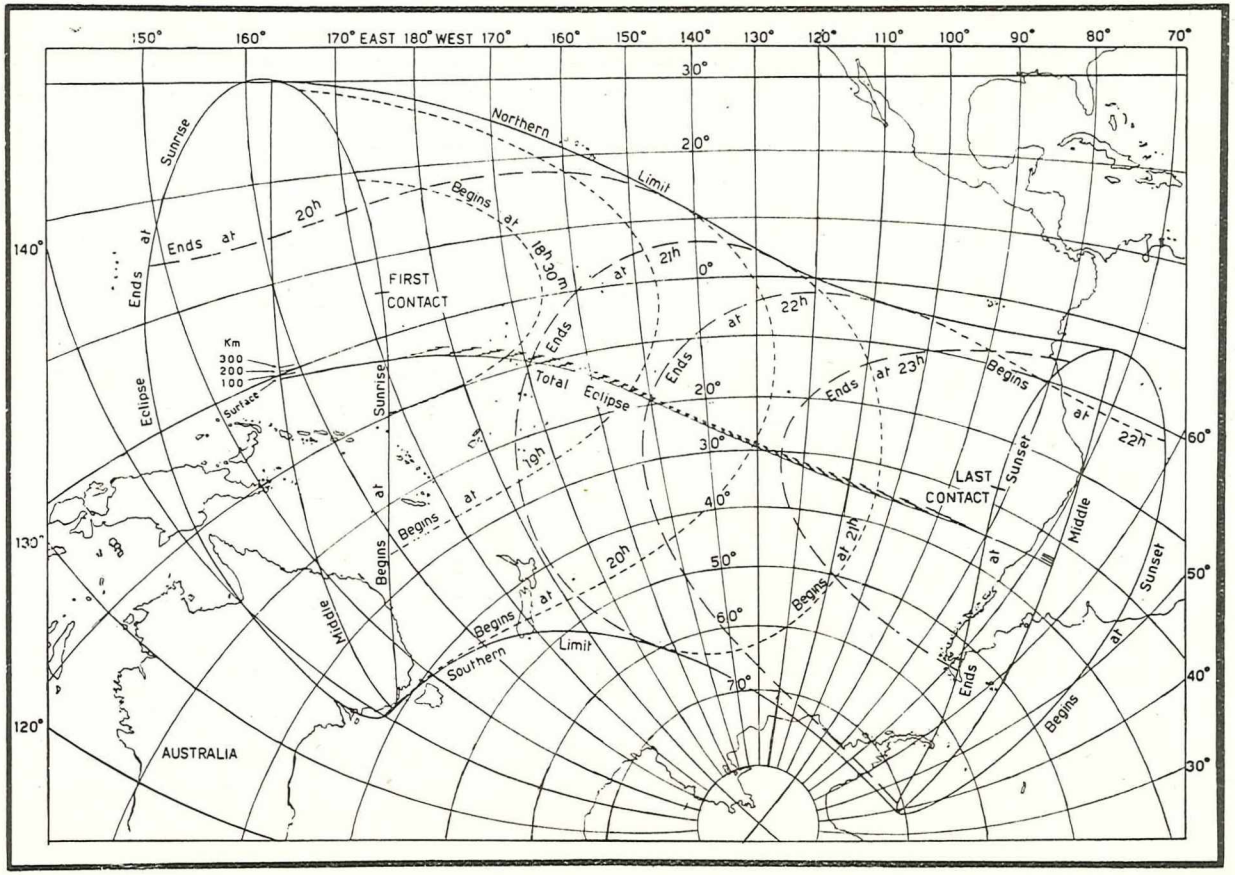
1h35m	+ 4°22′	— 83°06′	85 miles	5m25s
40	6 07	88 03	83	5 36
45	7 35	91 42	82	5 45
50	8 55	94 40	81	5 53
55	10 08	97 13	80	6 01
2 00	+11 17	— 99 26	79	6 08
05	12 23	101 27	78	6 14
10	13 25	103 17	77	6 20
15	14 25	104 59	76	6 26
20	15 23	106 34	75	6 32
25	16 19	108 04	74	6 37
30	17 13	109 29	73	6 42
35	18 06	110 51	72	6 47
40	18 57	112 11	72	6 51
45	19 47	113 28	71	6 55
50	20 36	114 44	70	6 59
55	21 24	115 58	70	7 02

U.T.	Latitude	Longitude	Half Width	Duration
3h00m	+22°10′	—117°12′	70 miles	7m05s
05	22 55	118 25	69	7 08
10	23 40	119 37	69	7 10
15	24 23	120 50	68	7 12
20	25 05	122 04	68	7 13
25	25 47	123 18	68	7 14
30	26 27	124 34	68	7 14
35	27 06	125 51	68	7 14
40	27 44	127 09	67	7 14
45	28 21	128 30	67	7 13
50	28 56	129 53	67	7 12
55	29 30	131 19	68	7 10
4 00	+30 04	—132 47	68	7 08
05	30 36	134 19	68	7 05
10	31 06	135 56	68	7 02
15	31 35	137 37	68	6 58
20	32 03	139 23	69	6 54
25	32 29	141 15	69	6 50
30	32 52	143 14	70	6 45
35	33 13	145 20	70	6 39
40	33 32	147 35	71	6 33
45	33 48	150 01	72	6 26
50	34 01	152 39	73	6 19
55	34 09	155 33	74	6 11
5 00	+34 13	—158 47	75	6 03
05	34 11	162 27	76	5 54
10	34 00	166 44	78	5 44
15	33 35	172 00	80	5 33
20	+32 45	—179 18	83	5 20
		300 *km*		
1h35m	+ 4°48′	— 85°37′	83 miles	5m29s
40	6 25	89 54	81	5 40
45	7 49	93 13	80	5 49
50	9 05	95 58	79	5 57
55	10 16	98 20	78	6 04
2 00	+11 22	—100 27	77	6 11
05	12 26	102 21	76	6 18
10	13 27	104 06	75	6 24
15	14 26	105 43	74	6 30

U.T.	Latitude	Longitude	Half Width	Duration
2h20m	15°22′	107°14′	73 miles	6m35s
25	16 16	108 41	72	6 40
30	17 09	110 03	72	6 45
35	18 01	111 22	71	6 50
40	18 51	112 39	70	6 54
45	19 40	113 53	70	6 58
50	20 28	115 06	69	7 02
55	21 15	116 18	69	7 05
3 00	+22 01	—117 29	68	7 08
05	22 46	118 40	68	7 11
10	23 29	119 50	67	7 13
15	24 11	121 01	67	7 15
20	24 53	122 12	67	7 17
25	25 34	123 24	66	7 17
30	26 13	124 37	66	7 18
35	26 51	125 51	66	7 18
40	27 28	127 07	66	7 18
45	28 05	128 25	66	7 17
50	28 40	129 45	66	7 16
55	29 14	131 08	66	7 14
4 00	+29 47	—132 33	66	7 12
05	30 18	134 02	66	7 09
10	30 48	135 35	67	7 06
15	31 17	137 12	67	7 02
20	31 44	138 54	67	6 58
25	32 10	140 42	68	6 54
30	32 33	142 36	68	6 49
35	32 54	144 37	69	6 43
40	33 14	146 46	69	6 37
45	33 30	149 05	70	6 30
50	33 43	151 36	71	6 23
55	33 53	154 21	72	6 15
5 00	+33 58	—157 24	73	6 07
05	33 58	160 50	74	5 58
10	33 50	164 47	76	5 49
15	33 32	169 33	78	5 38
20	+32 54	—175 46	80	5 26

1.6.3. *Total eclipse of October* 12, 1958. — In the eclipse of 1958, October 12, geocentric conjunction occurs at 21 h 03 m 54 s 41, in Right Ascension 13 h 10 m 13 s 92, the declination of the Sun being —7°27′09″11.

TOTAL ECLIPSE OF OCTOBER 12, 1958



CENTRAL LINE AT SURFACE

U.T.	Latitude	Longitude	Width of Path	Duration on Central Line
19h20m	— 2°56′5	—170°54′2	106 miles	2m47s
25	4 45 8	—177 47 6	112	3 07
30	— 6 16 4	+177 30 3	117	3 23
35	7 38 4	173 47 2	120	3 36
40	8 54 8	170 39 2	122	3 48
45	10 07 3	167 54 6	124	3 59
50	11 16 8	165 26 8	126	4 09
55	12 23 9	163 11 7	127	4 18
20 00	—13 29 0	+161 06 3	128	4 26
05	14 32 3	159 08 5	129	4 33
10	15 34 2	157 16 6	130	4 40
15	16 34 8	155 29 4	130	4 46
20	17 34 1	153 45 9	130	4 52
25	18 32 4	152 05 0	131	4 57
30	—19 29 5	+150 26 2	131	5 01
35	20 25 8	148 48 6	131	5 04
40	21 21 0	147 11 8	131	5 07
45	22 15 4	145 35 0	130	5 09
50	23 08 9	143 57 8	130	5 10
55	24 01 6	142 19 7	130	5 11
21 00	—24 53 3	+140 40 0	129	5 11
05	25 44 2	138 58 4	129	5 10
10	26 34 2	137 14 0	128	5 08
15	27 23 2	135 26 5	128	5 06
20	28 11 3	133 35 1	127	5 03
25	28 58 3	131 39 1	126	4 59
30	—29 44 1	+129 37 7	126	4 55
35	30 28 8	127 30 0	125	4 49
40	31 12 0	125 14 8	124	4 43
45	31 53 6	122 50 9	123	4 37
50	32 33 6	120 16 6	122	4 29
55	33 11 4	117 29 9	121	4 21
22 00	—33 46 8	+114 28 0	119	4 12
05	34 19 1	111 07 3	118	4 01
10	34 47 7	107 22 3	116	3 50
15	35 11 3	103 04 7	114	3 38
20	35 27 7	97 59 6	111	3 24
25	35 32 5	91 35 7	108	3 08
30	—35 12 1	+ 82 13 6	103	2 46
22 33.0 (Limit)	—33 39 1	+ 66 37 1	...	. ..

U.T.	Latitude	Longitude	Width of Path	Duration on Central Line
		Central Line at 100 km		
19h20m	— 3°19′	—173°58′	54 miles	2m55s
25	4 58	—179 48	56	3 14
30	6 25	+175 57	58	3 28
35	7 43	172 29	60	3 41
40	8 57	169 32	61	3 53
45	10 08	166 56	62	4 04
50	11 16	164 35	62	4 13
55	12 21	162 26	63	4 22
20 00	—13 25	+160 25	63	4 31
05	14 27	158 32	64	4 38
10	15 28	156 44	64	4 45
15	16 27	135 00	64	4 51
20	17 25	153 20	64	4 56
25	18 22	151 42	65	5 01
30	19 19	150 06	65	5 05
35	20 14	148 32	65	5 09
40	21 08	146 58	64	5 12
45	22 01	145 24	64	5 14
50	22 54	143 50	64	5 15
55	23 46	142 15	64	5 15
21 00	—24 37	+140 38	64	5 15
05	25 27	138 59	64	5 14
10	26 16	137 18	63	5 13
15	27 04	135 34	63	5 11
20	27 51	133 46	63	5 08
25	28 37	131 54	62	5 04
30	29 23	129 57	62	5 00
35	30 07	127 54	62	4 54
40	30 49	125 43	61	4 48
45	31 31	123 25	61	4 42
50	32 10	120 57	60	4 34
55	32 48	118 17	60	4 26
22 00	—33 23	+115 23	59	4 17
05	33 55	112 13	58	4 06
10	34 24	108 40	57	3 55
15	34 49	104 38	56	3 43
20	35 07	99 55	55	3 30
25	35 16	94 08	54	3 14
30	—35 07	+ 86 15	52	2 55

U.T.	Latitude	Longitude	Width of Path	Duration on Central Line
	Central Line at 200 km			
19h20m	— 3°37′	—176°31′	54 miles	3m02s
25	5 10	+178 23	56	3 20
30	6 32	174 29	58	3 34
35	7 48	171 16	59	3 47
40	9 00	168 29	60	3 58
45	10 09	166 00	61	4 09
50	11 15	163 45	62	4 18
55	12 19	161 41	62	4 27
20 00	—13 21	+159 45	63	4 35
05	14 22	157 55	63	4 43
10	15 22	156 11	63	4 50
15	16 20	154 31	64	4 56
20	17 17	152 54	64	5 01
25	18 13	151 20	64	5 06
30	19 08	149 47	64	5 10
35	20 02	148 15	64	5 13
40	20 56	146 44	64	5 16
45	21 48	145 13	64	5 18
50	22 40	143 42	63	5 20
55	23 31	142 10	63	5 20
21 00	—24 21	+140 36	63	5 20
05	25 10	139 00	63	5 19
10	25 58	137 22	63	5 18
15	26 45	135 41	62	5 16
20	27 32	133 57	62	5 13
25	28 18	132 08	62	5 09
30	29 02	130 15	61	5 05
35	29 46	128 16	61	4 59
40	30 28	126 11	61	4 53
45	31 08	123 57	60	4 47
50	31 47	121 35	60	4 39
55	32 25	119 02	59	4 31
22 00	—33 00	+116 16	58	4 22
05	33 32	113 14	58	4 12
10	34 02	109 52	57	4 01
15	34 27	106 04	56	3 49
20	34 47	101 40	55	3 35
25	34 59	96 23	54	3 20
30	—34 57	+ 89 30	52	3 02

U.T.	Latitude	Longitude	Width of Path	Duration on Central Line
		Central Line at 300 km		
19h20m	— 3°52′	—178°44′	54 miles	3m09s
25	5 19	+176 43	56	3 25
30	6 39	173 08	57	3 39
35	7 52	170 06	59	3 52
40	9 02	167 28	60	4 03
45	10 09	165 07	60	4 13
50	11 14	162 58	61	4 23
55	12 17	160 58	62	4 32
20 00	—13 18	+159 07	62	4 40
05	14 17	157 22	62	4 47
10	15 15	155 41	63	4 54
15	16 12	154 04	63	5 00
20	17 09	152 30	63	5 06
25	18 04	150 58	63	5 11
30	18 58	149 28	63	5 15
35	19 51	147 59	63	5 18
40	20 44	146 31	63	5 21
45	21 35	145 03	63	5 23
50	22 26	143 34	63	5 25
55	23 16	142 04	63	5 25
21 00	—24 05	+140 33	62	5 25
05	24 53	139 01	62	5 24
10	25 41	137 26	62	5 23
15	26 27	135 48	62	5 21
20	27 13	134 07	61	5 18
25	27 58	132 22	61	5 14
30	28 42	130 32	61	5 10
35	29 24	128 37	60	5 04
40	30 06	126 36	60	4 58
45	30 47	124 28	60	4 52
50	31 25	122 11	59	4 44
55	32 02	119 44	58	4 36
22 00	—32 37	+117 05	58	4 27
05	33 10	114 11	57	4 17
10	33 40	110 59	56	4 06
15	34 06	107 24	55	3 54
20	34 27	103 17	54	3 41
25	34 41	98 25	53	3 27
30	—34 44	+ 92 17	52	3 10

1.7. Meteors Streams Data. — List of Meteor Showers by M. Millman appeared in *Journal of the Royal Astronomical Society of Canada*, *48*, 193-195, 1954.

List of Meteor Showers by A.C.B. Lovell appeared in *C.S.A.G.I. Bulletin*, nº III, National Report of Great Britain.

2. — Plan for A.G.I. World Day.

2.1. Regular World Days (R.W.D.). — Regular World Days will be days of concentrated observation at stations of all types participating in the A.G.I. The program of observation during these intervals will be specified for each branch of C.S.A.G.I. investigation. When concentrated observational programs cannot be conducted on all regular world days, the day of new moon shall be as the day of first priority.

During the International Geophysical Year, special events such as launching of rockets, should be scheduled to coincide with Regular World Days, except where such observations are planned for Special World Intervals or for more general synoptic programs.

The list of Regular World Days (R.W.D.) during the International Geophysical Year is shown in Table I.

TABLE I. — *List of Regular World Days (RWD) during the International Geophysical Year (July 1957-December 1958)*

Symbols : N.M. = New Moon,
F.M. = Full Moon,
Q = Quarter.

RWD	Moon U.T.	Remarks	WMI
		June 1957 (advance trial of A.G.I.)	
Thurs. June 27 Fri. June 28 Sat. June 29	N.M. (20.53)	*Meteors* : β Taurid max.	June 21 thru. June 30
		International Geophysical Year opens July 1, 1957	
		July 1957	
Thurs. July 4	lst Q.	*Meteors* : β Taurid post-max.	
Fri. July 26 Sat. July 27	N.M. (04.28)	*Meteors* : η Aquarid max.	
		August 1957	
Mon. Aug. 12 Sun. Aug. 25 Mon. Aug. 26	Near F.M. N.M. (11.32)	*Meteors* : ζ Perseid max.	
		September 1957	
Sun. Sept. 1 Mon. Sept. 23 Tues. Sept. 24 Mon. Sept. 30	lst. Q. N.M. (19.18) lst Q.		Sept. 21 thru Sept. 30
		October 1957	
Tues. Oct. 22 Wed. Oct. 23 Thurs. Oct. 24	N.M. (04.43)	Pre-eclipse control Eclipse Post-eclipse control	

RWD	Moon U.T.	Remarks	WMI
		November 1957	
Thurs. Nov. 14	3rd Q.		
Thurs. Nov. 21	N.M. (16.19)		
Fri. Nov. 22			
		December 1957	
Fri. Dec. 13	Pre-3rd Q.	*Meteors* : Geminid max.	Dec. 15
Mon. Dec. 16		Geminid control	thru
Sat. Dec. 21	N.M. (06.12)		Dec. 24
Sun. Dec. 22			
		January 1958	
Fri. Jan. 3		*Meteors* : Quadrantid max.	
Sat. Jan. 4	Pre-F.M.	*Meteors* : Quadrantid max.	
Sun. Jan. 19	N.M. (22.08)		
Mon. Jan. 20			
		February 1958	
Mon. Feb. 10	3rd Q.		
Tues. Feb. 18	N.M. (15.38)		
Wed. Feb. 19			
Wed. Feb. 26	1st Q.		
		March 1958	
Thurs. Mar. 20	N.M. (09.50)		Mar. 20
Fri. Mar. 21			thru
Fri. Mar. 28	1st Q.		Mar. 29
		April 1958	
Fri. Apr. 18		Pre-eclipse control	
Sat. Apr. 19	N.M. (15.23)	Eclipse	
Sun. Apr. 20		Post-eclipse control	

RWD	Moon U.T.	Remarks	WMI
		May 1958	
Mon. May 5	Post-F.M.	*Meteors* : η Aquarid, etc.	
Sun. May 18	N.M. (19.00)	*Meteors* : o Cetids, etc.	
Mon. May 19		*Meteors* : o Cetids, etc.	
		June 1958	
Mon. June 9	3rd Q	*Meteors* : Arietids-Perseids	June 17
Tues. June 17	N.M. (07.59)		thru
Wed. June 18			June 26
Tues. June 24	1st Q.		
		July 1958	
Wed. July 16	N.M. (18.33)		
Thurs. July 17			
Sun. July 27	Pre-F.M.	*Meteors* : δ Aquarid max.	
		August 1958	
Thurs. Aug. 7	3rd Q.	*Meteors* : ζ Perseid	
Tues. Aug. 12		*Meteors* : Perseid max.	
Thurs. Aug. 14		*Meteors* : Perseids	
Fri. Aug. 15	N.M. (03.33)		
		September 1958	
Sat. Sept. 6	3rd Q.		Sept. 13
Sat. Sept. 13	N.M. (12.02)		thru
Sun. Sept. 14			Sept. 22
Sat. Sept. 20	1st Q.		
		October 1958	
Fri. Oct. 10		*Meteors* : Giacobinid	
Sat. Oct. 11		Pre-eclipse control	
Sun. Oct. 12	N.M. (20.52)	Eclipse	
Mon. Oct. 13		Post-eclipse control	

RWD	Moon U.T.	Remarks	WMI
		November 1958	
Tues. Nov. 4	3rd Q.		
Mon. Nov. 10			
Tues. Nov. 11	N.M. (06.34)		
Tues. Nov. 18	1st Q		
		December 1958	
Wed. Dec. 10	N.M. (17.23)	*Meteors* : Geminid	Dec. 10
Thurs. Dec. 11		*Meteors* : Geminid	thru
Sat. Dec. 13		*Meteors* : Geminid max.	Dec. 19
Wed. Dec. 17	1st Q.	Geminid control	
		January 1959	
Sat. Jan. 3	3rd Q.	*Meteors* : Quadrantid max.	
Sun. Jan. 4		*Meteors* : Quadrantid max.	
Fri. Jan. 9			
Sat. Jan. 10	N.M.		

REMARK. — *Provisional Days preceding the International Geophysical Year* (*June* 1957).

Just preceding the International Geophysical Year, commencing on June 21, 1957, a provisional WMI and 3 R.W.D. are included to provide an agreed interval for testing of procedures and final adjustment of collaborative programs.

2.2. WORLD METEOROLOGICAL INTERVALS (WMI). — The following intervals of 10 days at each solstice and equinox are designated as World Meteorological Intervals (WMI) :

From June 21 to June 30, 1957,
From Sept. 21 to Sept. 30, 1957,
From Dec. 15 to Dec. 24, 1957,
From Mar. 20 to Mar. 29, 1958,
From June 17 to June 26, 1958,
From Sept. 13 to Sept. 22, 1958,
From Dec. 10 to Dec. 19, 1958.

Remarks :

1. The interval June 21-30, 1957 is considered as a trial interval for all stations just preceding the opening of the International Geophysical Year.

2. Each WMI includes 3 RWD during which concentrated observations will be made in all branches of A.G.I. work. This schedule is shown by Table 1.

3. Throughout each W.M.I., special meteorological observations will be undertaken in accordance with separate recommendations of the C.S.A.G.I.

3. — Special World Intervals (S.W.I.).

3.1. Basic Data. — Special efforts are planned in most branches of A.G.I. work during intervals of outstanding solar, geomagnetic, ionospheric, auroral and related activity. To ensure that such disturbance shall be as fully observed as possible, a plan for ALERTS and Special World Intervals (S.W.I.) has been formulated. The S.W.I.'s should average about 4 days each month.

The C.R.P.L. Radio Warning Service, Box 178, Ft Belvoir, Virginia, U. S. A. is designated as the world warning agency ; it will have the collaboration of the French and Japanese warning centers ; the French center will act as coordinator for the several European forecasting groups. Using procedures specified in the report of the U.R.S.I.-A.G.I. Committee (see 3.2.) and in collaboration with other regional agencies, the C.R.P.L. will formulate notices of ALERTS and of the beginning and end of Special World Intervals (S.W.I.).

Notice of an ALERT will be transmitted via the A.G.I. communication networks 4 to 6 days before dates on which there is a more than ordinary probability of a major disturbance. The ALERT will simply provide a warning that there is a more than ordinary likelihood that a S.W.I. will be declared within 4 to 6 days ; it will call to readiness all those who would undertake special observations during a S.W.I.

At 05 h. U.T. of the day preceding an anticipated possibly major disturbance, C.R.P.L. will consider the latest recommendations and evidence and make the decision whether or not to announce a S.W.I. to begin 19 hours later at 0 h. U.T. If it is

decided to make such an announcement the regional centers will be at once informed and the distribution of the announcement will be made before the lapse of 7 hours. Thus the announcement will be in the hands of participating stations not less than 12 hours before the beginning of the S.W.I.

The S.W.I. will continue until terminated by notification by the warning agency to be broadcast over the warning network.

Notifications of ALERTS and declarations of S.W.I. will be supplemented by regular broadcasts and messages of pertinent solar and geophysical data.

At the onset of very great unpredicted disturbances, the S.W.I. will be declared post-facto by the predicting agency, but such post-facto declarations are expected only 2 or 3 times during the International Geophysical Year.

3.2. Procedures for S.W.I. — The C.S.A.G.I. endorses the following procedure, proposed by the Ursigrams Committee of U.R.S.I.

3.2.1. — All the radio or geomagnetic forecasting centers are invited to participate in the choosing of S.W.I. and the issuance of alerts. One center will be given the responsibility for the final designation. Before making a decision, this center will weigh carefully :

(*a*) the regular predictions of the other centers as well as its own ;

(*b*) any special recommendations or nominations which may be volunteered by other centers ;

(*c*) the responses by the other centers to specific queries about proposed designations, when there is time for such consultations.

C.R.P.L. is chosen as the central agency.

3.2.2. — The information will be sent by the designating center to the regional centers of the Ursigrams network and to any new A.G.I. centers which may be designated (*e.g.* Australia-New Zealand, South Africa, South America, U. S. S. R.). The inter-regional Ursigrams network (Paris-Darmstadt, Washington, Anchorage, Tokyo) already operates on a weekday basis and will form the core of the S.W.I. warning network.

3.2.3. — The distribution of alerts and S.W.I. designations by electrical means to A.G.I. stations becomes the responsibility of the regional centers and subcenters. It will be the responsibility of the A.G.I. National Committee in each country to ensure that efficient arrangements are made for the distribution to each of its stations.

3.2.4. — Wherever possible the alerts and S.W.I. designations should go in a direct message to the A.G.I. stations. For this the cooperation of the postal, telegraph, telephone and other government departments of the various nations, of private communications companies and especially of the W.M.O. will be enlisted. (Many such agencies already cooperate on a generous scale in the distribution of geophysical information).

3.2.5. — As a supplement to this direct network, the Ursigrams Committee will make every effort to see that this information is broadcast repeatedly in each region using the facilities, for example, of T.M.D., JJY and WWV.

3.2.6. — With rare exceptions the designating center will decide at the same Universal Time each day whether it will call for the beginning or ending of a period of alert or the beginning or ending of a S.W.I. The tentative time for this decision is 05 hours U.T.

Alerts or their cancellation will take effect immediately upon receipt of the advice by the A.G.I. station. Each S.W.I. will begin at the next epoch 00 hours U.T. ; the S.W.I. will remain in force until further advice is received by the A.G.I. station. Normally an S.W.I. will be terminated after 24 hours if the expected disturbance does not occur.

This draft plan is subject to modification prior to the International Geophysical Year as may be indicated by experience during the trials preceding the International Geophysical Year.

3.2.7. — The codes to be used will be worked out in detail in the coming months. In general, direct messages to A.G.I. stations will be in plain language to reduce the possibility of confusion. The broadcast notices will be in simple code of two or three characters. All notices will be preceded by some distinctive word or code identifying them as A.G.I. notices.

3.2.8. — The relationships to be used for prediction of S.W.I. will include the classical ones associating large magnetic storms with the meridian passage of large sunspot regions and also the relationship more recently demonstrated between flare, coronal and radio noisy regions and magnetic activity ; the 27 day recurrence tendency is not expected to be particularly strong in 1957-58. If an unpredicted magnetic storm occurs, an S.W.I. will be notified only if it is an intense storm.

3.2.9. — The S.W.I. notification, where possible, should be supplemented by the provision of :

(*a*) Systematic forecast of magnetic activity.

(*b*) Regular summary descriptions of magnetic activity observed in the immediate past, and

(*c*) Regular summary descriptions of the degree of solar (especially solar flare) activity observed in the immediate past.

(*d*) Selected results of magnetic, ionospheric, solar, auroral, cosmic ray and meteorological observations during S.W.I., communicated promptly to the regional centers. These results should be distributed by air mail. This information should be given the same distribution as the S.W.I. designations. They should, however, be prepared by each of the regional centers separately and distributed once a day or as needed within their region.

3.2.10. — Trials of S.W.I. designations will be started as soon as solar activity takes a significant upswing and to have the scheme in full operation by July 1956, so that the methods can be revised, if necessary on the basis of experience.

3.3. S.W.I. Center at C.R.P.L. :

3.3.1. — The headquarters will be at C.R.P.L.'s forecasting center at Ft Belvoir, about 20 miles from Washington. This facility is manned continuously. It is from here that short term radio propagation forecast are prepared and issued every six hours, and other forecasts issued once daily and twice weekly. The present equipment includes a visual magnetograph, field intensity recorders, a direction finder, and a C3 ionospheric sounder. There is also a teletype (T.W.X.) installation and direct access to solar information. Currently the center has a staff of 11.

3.3.2. — The basic information on which S.W.I. selections would be made would be those now systematically collected for the radio forecasts plus whatever additionnal coverage is provided by the A.G.I. program. From the North America network there is magnetic data from Belvoir, Cheltenham and Anchorage, ionospheric data from about six selected U. S. and Canadian stations in middle and high latitude, radio propagation data from several monitoring or communications agencies, solar observations from all U. S. observatories with solar patrols.

Further, there is available the summary Ursigram daily from Paris-Darmstadt and, via Anchorage, from Tokyo, giving in brief summary the similar data from Europe and Japan, as well as forecasts from Europe. A moderate expansion of this up-to-the-minute data collection during the International Geophysical Year may prove useful, although the forecasters should not be overwhelmed with data.

3.3.3. — The forecasting center staff includes three professional scientists with backgrounds in physics, astronomy, etc... and several year's experience in radio propagation forecasting, sun-earth relationships, etc. They operate under general supervision of the Boulder C.R.P.L. headquarters, and their work would be monitored closely from Boulder, especially the interpretation of solar activity, inasmuch as there are many experienced solar physicists at Boulder both in C.R.P.L. and in the High Altitude Observatory.

3.3.4. — The forecasters use only demonstrated methods, the practical application of correlations and analyses which have appeared in the literature ; in general, this involves the assessment of the kind and degree of activity, that there will be an associated terrestrial effect when the solar region is most favorably situated with reference to the earth. A typical situation is as follows : A solar region appears at the east (oncoming) limb. From the limb observations (corona and prominences) and from the observations, during the next one or two days, of spots, flares, radio noise, plages, magnetic fields, etc., the forecasters judge the kind and degree of activity of the region and, if it is sufficiently outstanding, issue an ALERT. If the activity is maintained for the next 4-6 days as the region rotates towards the center of the visible solar disk, the forecaster may (after advice from and consultation

with his colleagues in other regional centers) call for an S.W.I. to begin just before the most probable time for a terrestrial effect associated with this kind of solar activity. If the terrestrial effect does occur, the forecaster will terminate the S.W.I. two, three or four days later, after the disturbance has run its course. If there is no significant terrestrial effect, the forecaster will terminate the S.W.I. after about 24 hours. The ALERT will be rescinded when the solar activity subsides, or when the active region nears the west (offgoing) limb.

3.3.5. — In the selection of S.W.I. during the International Geophysical Year the forecasters will compare their own forecasts together with those received from forecasting centers in Alaska, France and Japan, and will request and encourage these centers to amplify their forecasts and make nominations for S.W.I. to C.R.P.L. on their own initiative. The forecasters will be strongly guided by these nominations and will be instructed to re-examine the data when these nominations differ from their own and to resolve cases of apparently equal likelihood of disturbance in favor of the majority. When there is sufficient time, the forecasters will advise the other centers of any delemna at the time of the regular daily teletype contact and will ask for further opinions or reasons for nominations. Similarly whenever possible, the forecasters will initiate such consultations. It is unlikely that there will be any large difference in technique for S.W.I. selection the discussions are expected rather to concentrate on interpreting the basic data and resolving contradictory evidence.

3.3.6. — The World Warning Service will be handled on a regional basis, in view of the limited broadcast facilities available. There will be three varieties of warning distributions :

(*a*) Regular repeated summary broadcasts (like WWV) ;

(*b*) Special A.G.I. broadcasts ; and

(*c*) Direct multiple-address teletype messages.

(*a*) Broadcasts on WWV, WWVH, JJY, etc. must necessarily be very short. The quiet time on WWV, if available for this (and this is not certain), is 10 seconds in each 5 minutes. One scheme would be to use one break for S.W.I. announcements, and another to give forecasts of magnetic activity and a report

on current activity. Each announcement should be prefaced by A.G.I. in some distinctive tone. The announcement itself would be at most 4 characters. The problem of getting the announcements to the transmitters and on the air is not inconsiderable, but may be soluble in the case of WWV and WWVH. For carrying out such a scheme, the active cooperation of large communication agencies would be needed. Presumably JJY could also handle this type of announcement.

(*b*) Special broadcasts have been the preferred scheme for Europe and there has been discussion of increasing the number of broadcasts beyond the present two-per-workday. Presumably the broadcasts would give not only S.W.I. designations and the forecasts and current state of magnetic activity, but also the short version of the Ursigram. The same might be indicated for the Americas for the benefit of very isolated parties, such as in the Antarctic, although no arrangements have as yet been made for appropriate transmitter time.

(*c*) Short telegrams giving the data in (*b*) will be sent to at least some A.G.I. stations which are tied in with one of the teletype (or T.W.X.) network. This scheme is in use now very effectively in distributing C.R.P.L. radio forecasts. The messages cannot be over long since in many instances delivery will be by local telephone. This method gives much more flexibility than the WWV-type warnings.

3.3.7. — The occurrence of an unexpected disturbance not covered by a S.W.I. would be communicated to A.G.I. stations in the Americas by the regular or by a special summary teletype Ursigram. Also a scheme is under consideration whereby a station would broadcast the Belvoir K-index with only 0 to 3 hours time lag, or alternatively broadcast whether a magnetic storm of a certain grade was in progress.

3.3.8. — The S.W.I. scheme will have its full value only if there is a supplementary distribution of important current data by mail. Scientific stations must not be burdened with any more radio schedules than is imperative for their current work. For economy of their time and convenience as well as economy of the radio spectrum, and scientific and other budgets, broadcasts

and telegrams must be kept as short as possible... and only include information which will be used in 48 hours at most. It is essential that details go by mail and preferably on a regular schedule. C.R.P.L. does this now once a week in plain text and Paris and Darmstadt distribute their coded messages every week or month.

4. — Warning Broadcast Network

The world warning service will be organized on a regional basis. Existing regional centers are already interconnected on a daily world teletype service. Regional warning distribution will be accomplished by four methods of distribution :

(*a*) Regular repeated broadcast summaries (such as WWV, MSF, JJY, etc.),

(*b*) Special scheduled A.G.I. broadcasts,

(*c*) Direct multiple address teletype,

(*d*) Local telephone and telegraph.

It will be the responsibility of the A.G.I. National Committee in each country to ensure that efficient arrangements are made for the distribution of warnings, geophysical data and notices, and other necessary information to each of its stations.

The U.R.S.I.-A.G.I. Committee is requested to recommend appropriate codes for transmission of warnings and geophysical data prior to Oct. 1, 1955.

5. — Warning Magnetic Variographs.

There is a real probability in view of the present state of the prediction that warnings of some really great geophysical disturbances will not be given. It is especially important that concentrated observation be initiated during such intervals. Therefore, following recommendations of U.R.S.I. and I.U.G.G., ionospheric and auroral stations would be equipped or closely related with a magnetic warning system consisting of a magnetic variograph capable of providing instantaneous alarm that is arranged to give immediate notice in the event of very great disturbances.

6. — Resolutions.

6.1. — The C.S.A.G.I. invites the attention of the WMO to the plans for distribution of ALERT warnings and Special World

Interval declarations during the International Geophysical Year, and asks the WMO for its cooperation in distributing the necessary information to all possible nations over the communication networks available to the WMO.

6.2. — The C.S.A.G.I. requests the U.R.S.I. to provide detailed information on the exact nature of the solar and geophysical information that will be distributed, and the proper scale of distribution by each class of Ursigram during the International Geophysical Year.

6.3. — The C.S.A.G.I. invites the attention of the C.C.I.R. to the plans for distribution of ALERT warnings and Special World Interval declarations, together with the need for fast communication of certain geophysical and solar information during the International Geophysical Year. The C.C.I.R. is requested to solicit the cooperation of the communication networks of the several nations to ensure fast world wide coverage during the International Geophysical Year.

7. — Calendar of Regular World Days (R.W.D.) and World Meteorological Intervals (W.M.I.) during the International Geophysical Year.

The calendar of R.W.D. and W.M.I. during the International Geophysical Year is appended to the Bulletin.

Longitudes and Latitudes

(Excerpt from the Proceedings of the C.S.A.G.I. Meeting, Rome Sept. 30-Oct. 4, 1954)

Working Group for Longitudes and Latitudes

A. Danjon (*Correspondent*),
P. Tardy (*Secretary*) (C.S.A.G.I.),
M. Boella (C.S.A.G.I.),
Sir Harold Spencer Jones (C.S.A.G.I.),
J. N. Adkins (U. S. A.),
N. T. Bobrovnikoff (U. S. A.),

J. Böhm (Czechoslovakia),
P. Bourgeois (Belgium),
R. Carrasco (Spain),
B. L. Gulatee (India),
J. Hopmann (Austria),
P. Lejay (France),
K. Mader (Austria),
D. Nikolic (Yugoslavia),
F. Zagar (Italy).

Summary of work carried out in Rome

The program which was established in 1953 at the Brussels Meeting has been revised and extended.

It is expected that during the A.G.I. regular observations will be made at 35 principal stations. In addition a small number of temporary stations will be added.

The program of lunar observations presented by Dr. Markowitz has been discussed and adopted. About 20 stations are necessary.

Plans are being made for the publication of instructions to astronomers and radioelectricians.

REPORT ON LONGITUDES AND LATITUDES

prepared by A. Danjon

(*Excerpl*)

1. — The C.S.AG.I. has considered :

(1) the draft resolutions adopted at its Brussels Meeting (June 30, July 3, 1953) ;
(2) the national reports presented to its second Meeting ;
(3) the letter of Wm Markowitz « The photographic Moon Position Program for the International Geophysical Year ».
(4) the resolutions adopted by the Sub-Commission IIIc of U.R.S.I. (See Appendix) with a letter of M. Boella.
(5) the resolutions adopted by the Working Group of Longitudes and Latitudes of the I.U.G.G. ;

and has adopted a program which is planned to give a more precise determination of the astronomical coordinates of the participating observatories and of the variations of these coordinates. The results of these studies, when examined in the future, will give a more precise knowledge of the instantaneous coordinates of the observatories. It will result in :

(*a*) Improvement of the determination of terrestrial time,

(*b*) More precise determination of the irregularities of earth's rotation,

(*c*) An improvement of star catalogues.

The present method of determining longitudes is very inadequate, as it is affected by the following errors :

(*a*) Instrumental and observational errors,

(*b*) Fluctuations of the instantaneous axis of terrestrial rotation,

(*c*) Vertical fluctuations of observation stations due to : the lunar solar effect, other periodic or non-periodic terrestrial phenomena and notably thermal effects, and important geological changes,

(*d*) Uncertainties as to the duration of propagation of time signals,

(*e*) Errors in the star catalogues,

(*f*) Abnormal refraction effects.

In addition to the cited astronomical observations, an auxiliary lunar observation campaign is envisaged (by the Markowitz method), which has the double aim :

(*a*) To improve certain tabular data on lunar movement as well as the definition of uniform time ;

(*b*) To determine, for the observatories participating in these observations, the variation between the vertical and the normal to a conventional ellipsoidical surface.

2. — Recommendations.

The C.S.A.G.I. recommends that :

2.1. Stations :

2.1.1. — Astronomical observations should be intensified during the International Geophysical Year by all the observatories associated with the B.I.H. (the International Time Office).

2.1.2. — A certain number of other well equipped stations should be organized in all parts of the world where no observatories exist, and particularly near the equator and in the southern hemisphere.

2.2. Nature of the observations :

2.2.1. — Each observatory (stations of 2.1.1. and 2.1.2.) should proceed as far as possible simultaneously for the observations of time and latitude.

2.2.2. — The duration of these observations should cover a time interval at least equal to the Chandler period (about 430 days).

2.2.3. — Observations made at all the stations should refer to the same fundamental catalogue, no matter what instruments are employed.

2.3. Instruments :

2.4. Radio Transmissions :

2.4.1. — For the longitude operation, use should be made of time signals both of the new high-precision type (WWV, etc) and the classical type, with the condition that their irregularity during each emission must be maintained below 1 millisecond ;

2.4.2. — Numerous direct and precise determinations of the mean propagation time (during the period of about one minute) of time signals should be made before and during the International Geophysical Year, using both existing emissions and special two-way circuits between suitable points. The variations of these propagation-times from one region to another, as well as the variations in time itself and with wavelength, should be thoroughly studied. In every case the same frequency must be utilized in both directions in each determination.

2.4.3. — The U.R.S.I. experiments, in its attack on this subject, should be encouraged, and later similar efforts should be made regularly every three months.

2.4.4. — Determinations requiring very high precision of propagation-time of the signals should be made between certain stations, and they should be compared with results deduced from

ionospheric soundings, in order to improve the knowledge of wave propagation.

2.4.5. — In view of the above, the importance of establishing other permanent or temporary stations emitting time signals of the new type in the regions at present poorly covered (in particular in the U. S. S. R., India, South Africa, Australia, New Zeeland, and in South America) must be called to the attention of the interested governments, through the intermediary of the C.C.I.R. or directly by the International Geophysical Year National Committees, or by any other means possible.

3. — Stations and Equipment.

3.1. List of proposed standard astronomical stations :

(*a*) Permanent observatories associated with the Bureau International de l'Heure.

Belgrade, Buenos-Aires, Greenwhich, Hamburg, Mount Stromlo, Moscou, Neufchatel, Ottawa, Paris, Potsdam, Rio de Janeiro, Tokyo, Uccle, Washington, Zikawei, Irkoutsk, Kharkov, Leningrad, Nikolaieff, Riga, Tachkent.

Total : 21 stations.

(*b*) Permanent observatories which (it is hoped) will be equipped for and participate in the plan of observatories.

Heidelberg, Turin, Algiers, Cape of Good Hope, Tananarive, Ksara, San Fernando, Madrid, Dehra Dun, Vienna, Milan, Lwiro (Kivu, Belgian Congo) and Wellington.

Total : 13 stations.

Temporary observatories requiring both astronomical and radioelectric equipment.

Curacao, San Diego, Hawaii, Amsterdam Island, Tahiti.

Total : 5 stations.

Complete total : 39 stations.

3.2. Equipment required for stations participating in the international plan.

Essentially :

(*b*) Several good quality quartz clocks ;

(*c*) Radiotelegraphic receiving equipment providing for quasi-continuous reception, with adequate precision, of the radio emissions used by the other stations of the world network. This last condition requires the presence of an adequate staff.

Naturally every national observatory that so wishes can take part in the plan, though it may not fully meet this specification. Every facility will be given, especially as regards the fixed hours of emission of hourly signals, and the determination of the most probable values of the propagation times over the relevant paths. But such stations will be regarded as operating for their own purposes, and their results will not be discussed and published along with those of the principal stations.

4. — Preparation of more precise instructions.

More precise instructions will be prepared both for the astronomical observations and for the radiotelegraphic reception. A first draft will be prepared by small committees, and submitted by correspondence to the members of the working group. The small committee for radiotelegraphic reception has the following members :

M. Decaux (*Chairman*), MM. Boella, Lejay, Miyadi, Walgate (*Members*).

Appendix

Resolutions adopted by Committee IIIc of U.R.S.I. concerning the study of the propagation time of time signals

Members of the Committee : M. Boella (*Chairman*) R. P. Lejay, Smith-Rose and Vormer.

Also present : Davies, Decaux, Egidi, Fleischer, Helwitt, Kirby, Koga, Krishnan, Scheive and Vos de Wael.

Adopted Resolutions :

(1) The Sub-Commission considers that it would be desirable to use for measurement of longitude during the International Geophysical Year transmissions of time signals of the modern type or, if these are not available, transmissions of the classical type of signals, for which the irregularities can be maintained below one millisecond.

(2) The Sub-Commission considers that there is no transmitter of this type and of adequate power in large areas of the world in particular, between Europe and Japan and in the Southern Hemisphere.

(3) The Sub-Commission therefore considers that it would be desirable to establish some more transmissions of the modern type or, if this is not possible, to improve the transmissions of the greatest possible number of stations emitting the classical type of signals. The Sub-Commission recommends particularly that such arrangements be made in Australia, South America, South Africa, and India, such that measurement may be made by duplex transmissions between stations of various pairs in the two hemispheres.

(4) An experimental program of measurements of the time of propagation of time signals by duplex transmissions, and lasting for one week, will be carried out if possible before the end of 1954 between the stations WWVH, WWV, MSF, IBF, and JJY. The Chairman of the Sub-Commission will arrange the detail of this program in good time.

(5) If this experiment results in favorable conclusions, such a program will be repeated every 6 months and extended so far as practicable. The observations will be made more frequently during the International Geophysical Year, according to a program to be arranged later.

(6) The Sub-Commission recommends that these resolutions be communicated to I.U.G.G., I.A.U. and C.S.A.G.I.

It is proposed that the following delegates should be elected as permanent additional members of the Sub-Commission : H. Fleischer (Germany), I. Koga (Japan), K. S. Krishnan (India).

Circular letter from Prof. M. Boella, September 22, 1954

Dear Sir,

In view of the world-wide operation of longitudes to be held on the occasion of the 1957-58 International Geophysical Year (A.G.I.), the opportunity for a study of the propagation time of time signals has been considered and recommended by the

Special Committee of the International Geophysical Year (C.S.A.G.I.) during its meeting in Brussels July 1953 (*Bulletin of Information* nº 2).

During the last U.R.S.I. General Assembly at The Hague, August 1954, the Sub-Commission IIIc suggested that an experimental program of measurements of propagation time of time signals should be carried out, if possible before the end of 1954 (See above).

I propose that these experiments be carried out in the week beginning on Dec. 13 and ending on Dec. 18th, 1954.

Dterminations of mean time difference between the signals received from far stations and the signals locally emitted, averaged over a period of time of about one minute, should be undertaken at points in proximity of WWV, MSF, IBF, JJY and WWVH transmitting stations.

Determinations should possibly be made between minute 50 and minute 20 at every three hours U.T., i. e. at 23.50-00.20, 02.50-03.20, 05.50-06.20 U. T. and so on, in order to include the rest periods in the transmission from M.S.F. (min. 15 to 20, every hour) and from WWVH (min. 00 to 04 of every hour). This could help to discriminate different signals on the same frequencies.

Determinations should be made on every frequency on which signals from far stations can usefully be received (5, 10, 15, 20 Mc/s).

Each determination should result from the mean of at least 10, or preferably 30 or more, observations, as far as possible for successive seconds. As shown by previous experiments undertaken by the writer, a standard deviation of 0.15 milliseconds may be expected for the mean value of a series of 10 observations. Thus we can expect, for the same case, that the deviation will exceed 0,5 millisecond only in 0,5 % of cases.

For comparison of time signals, the use of a cathode-ray tube oscilloscope, either by visual observation or with photographic recording, seems to me to be highly preferable, in order to avoid errors produced by atmospherics, interference and variations of the amplitude of the signals. Photographic recording seems most desirable, in spite of the greater time required for the reduc-

tion of data (1), in a research of the kind the present experiments are concerned with.

In order to obtain uniformity in the reduction of data, in the case of very distorted forms of received signals, I suggest that the peak-point of the first cycle whose amplitude (deviation from zero-line) is greater than 1/3 of the maximum amplitude should conventionally be taken to be the front of the pulse.

The time difference between the signals received from far stations and the local signals should be indicated as positive when the first signals are in delay with respect to the second ones.

Stations I.B.F. will provide for special transmissions on 5 Mc/s from minute 00 to minute 20, every three hours, beginning at 00.00 U.T. I.B.F. signals can be distinguished from the others through the different type of marking the beginning of the minute, consisting of a series of 6 time pulses at the second 00 instead of the suppressed 59th pulse of the minute.

It is desirable that JJY station should arrange special transmissions on 5 and 10 Mc/s for the week considered, every three hours, this could be done, for instance, in two periods of 15 minutes each one (from 50 m to 20 m) respectively for 5 and 10 Mc/s if both frequencies could not be broadcast simultaneously.

The object of the present experiments should be to reveal the magnitude of the variations of the mean propagation time of signals during the day and from day to day.

The results of the determinations in the form of values of the mean time difference between distant and local signals, averaged over a period of about 1 minute at every three hours, should kindly be sent to the writer (c/o Istituto Elettrotecnico Nazionale ; Corso Massimo d'Azeglio, 42, Torino, Italy) in order to calculate the propagation time of signals over different circuits.

(*signed*) M. Boella.

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(1) A well trained operator can read from 30 to 60 photograms per hour, according as the pulse shape is more less disturbed and distorted.

Solar Activity

(Except from Proceedings of the C.S.A.G.I. Meeting, Rome, Sep. 30-Oct. 4, 1954).

Working Group

The membership of the Working Group was as follows :

Sir Harold Spencer Jones (*Correspondent*),
A. Danjon (C.S.A.G.I.),
M. Nicolet (C.S.A.G.I.),
G. Abetti (Italy),
J. Bartels (Germany),
N. T. Bobrovnikoff (U. S. A.),
P. Bourgeois (Belgium),
M. Cimino (Italy),
A. H. de Voogt (Netherlands),
T. Gold (Great Britain),
J. Hopman (Austria),
T. Nagata (Japan),
K. R. Ramanathan (India),
A. Romana (Spain),
A. H. Shapley (U. S. A.),
J. A. Simpson (U. S. A.),

Summary of Work

The C.S.A.G.I. has discussed the various aspects of solar activity which are of importance through their influence on geophysical phenomena, and has prepared a series of recommendations for the guidance of solar observers. Their aim is to encourage further observations in certain directions, and the coordination and standardization of data, and to ensure the rapid dissemination of information about important solar flares and radio-noise outbursts to institutions concerned with the various fields of geophysical observations.

The C.S.A.G.I. has adopted 23 resolutions on Solar Activity.

Report

prepared by Sir Harold Spencer Jones

(*Excerpt*)

1. — General Remarks.

1.1. Introduction. — The sun is now at its minimum activity. Several high latitude spots have appeared during recent months, so that the new cycle may be said to have already commenced. During the International Geophysical Year the activity will be somewhere near maximum. The maximum of the last cycle was unusually high and it is now to be expected that the next maximum will be as high. However, sunspots will be numerous, and many will be associated with solar flares, accompanied by high ultra-violet emission, causing radio fade-outs. The particle emission will also be high ; when spots are near the central meridian, magnetic and ionospheric disturbances are likely to occur, and bright auroral displays will be frequent. In general, however, there is no recurrence after 27 days of disturbances associated with large spots.

Because so many geophysical phenomena are related to sunspot activity it is important that the sun should be kept as far as possible under continuous observation by the various solar observatories. The normal coverage is reasonable complete as there is a co-operative arrangement between the various observatories to watch the Sun during specified hours, when weather conditions permit. But spells of cloudy weather result in the coverage being incomplete.

It is accordingly desirable that during the International Geophysical Year, the normal hours of watching at each observatory should be extended. The hours of observing in Western Europe should be continued until after eastern stations in America have started observing ; the western stations in America should carry on until after observations can start in Japan, Australia and New Zealand. India will provide a link between these stations and these in Western Europe.

1.2. Sunspots.

1.3. Magnetic fields and polarities of sunspots.

1.4. Solar flares.

1.5. The corona.

1.6. Solar Ultraviolet emission.

1.7. Solar Radio Emission. — The observation of solar radio emissions of both centimetre and metre wavelengths should be made at as many stations as possible. In convenience in intercomparisons of results, it would be advantageous if a series of common observing wavelengths could be agreed between the various observing stations. The records should be provided with time marks to facilitate intercomparisons. Dynamic spectra covering a wide range of frequencies give additional information not obtainable from observations at definite fixed frequencies or wavelengths and it is hoped that several stations will use this type of observation. Observations of the polarisation of the radiation are also required. The location of sources of solar radio noise by the use of interferometer methods is desirable.

2. — Resolutions.

1. C.S.A.G.I. recommends that, for the coordination of solar and geophysical phenomena, a recurrence period of 27 days should be employed. The Carrington period will continue to be used, as hitherto for purely astronomical purposes.

2. C.S.A.G.I. recommends that weekly reports of the various aspects of solar activity, along the general lines of the reports issued by the Bureau of Standards and the High Altitude Observatory at Boulder, should be prepared by Western Europe, Australia and or Japan, to provide rapid dissemination of information of importance for various geophysical observations. The regions concerned should arrange for a center to which information should be sent and which should be responsible for the preparation of the reports. Daily telegrams should be restricted to essential and urgent information.

3. C.S.A.G.I. recommends that the monthly reports of solar activity, at present being prepared by various centers, which contain more complete and more accurate data, should be continued and given appropriate distribution for purposes of the International Geophysical Year.

4. C.S.A.G.I. recommends that, during the International Geophysical Year, in order to ensure as complete a coverage as possible of solar observations throughout the day, consideration should be given to the extension of normal watching periods in longitudes where stations are few. It is desirable that the hours of watching in Western Europe should be continued until after eastern stations in America have started observing, and that western stations in America should continue watching until after observations have started in Japan, Australia and New Zealand. The International Astronomical Union is requested to formulate, in co-operation with the institutions concerned, an extended program of solar activity patrol during the International Geophysical Year.

7. C.S.A.G.I. notes with satisfaction that an improved system of flare classification is under consideration by the International Astronomical Union.

10. C.S.A.G.I. recommends that institutions equipped for the study of chromospheric flares should consider the installation of an S.E.A. (sudden enhancement of atmospherics) recorder, on a frequency of about 27 kc/s. Such recorders, which are simple in construction, give a visual indication of the beginning of a flare, thereby enabling observations to be secured outside the normal patrol periods of the relationships between solar flares and the enhancement of atmospherics.

13. C.S.A.G.I. recommends that solar observatories should consider the installation of equipment for obtaining a general picture of the intensity of the magnetic fields of the sun, on the general plan of the technique developed by Babcock at Mt Wilson, and that where such equipment is installed measurements should be made two or three times a day.

14. C.S.A.G.I. recommends that institutions possessing equipment suitable for the investigation of the magnetic field of the Sun by other methods should make such measurements at intervals throughout the International Geophysical Year.

17. C.S.A.G.I. notes with satisfaction that consideration is being given by the Netherlands to the setting up of solar noise recorders near the ionospheric stations at Paramaribo and Hollandia. In order that a continuous record of solar radio

radiation should be obtained, the establishment of a solar noise station on Hawaii or on Tahiti is to be desired. C.S.A.G.I. recommends that the possibility of establishing such a station should be considered by the National Committees of the U. S. A. and France.

18. C.S.A.G.I. recommends that, in the formulation of plans for observation of solar radio emissions during the International Geophysical Year, consideration should be given to the technique developed by C.S.I.R.O., Sydney, for obtaining dynamic spectra of solar noise bursts. As this technique gives information not otherwise available, it is important that an adequate coverage in longitude to provide observations throughout each 23 hours should be achieved.

19. C.S.A.G.I. notes with interest that the two provisional indices for solar radio-emission proposed by U.R.S.I. will be thoroughly investigated in order to be brought into use before the International Geophysical Year.

21. C.S.A.G.I. recommends that all observatories participating in the solar activity program during the International Geophysical Year should report promptly to the A.G.I. network for Special World Intervals preliminary summaries of their patrol observations. The occurrence of important flares or radio noise outbursts should in addition be communicated by telephone or telegram. Summaries of other observations should be communicated as may be arranged by the observatory and the regional centers of the A.G.I. network.

INTERNATIONAL ASTRONOMICAL UNION

IXth General Assembly

Circular Letter to National Committees

Dear Sir

The General Secretary of the International Astronomical Union informed me that the ninth General Assembly of this Union will be held in Dublin, from August 29 to September 5, 1955.

Members of U.R.S.I. and of National Committees who are not members of the International Astronomical Union will be warmly welcome to this meeting.

In order to facilitate registration, members of National Committees wishing to attend the Assembly are required to inform me through their respective Committees of their name and address.

Officers of the Board, Chairmen of Commissions and Sub-Commissions and Official Members of Commissions may inform me directly.

I would very much appreciate to receive such information before May 15th.

Yours sincerely,

The Secretary General,
(*sgd*) HERBAYS.

JOINT COMMISSIONS ON SOLAR AND TERRESTRIAL RELATIONSHIP

Eight Report

(Edited by M. D'Azambuja, Président of the Commission, Observatoire de Meudon (S.-&-O.), France).

Contents

UNESCO

Unesco Coupon Scheme

Enquiries concerning Unesco Coupons should be addressed to the Unesco Coupon Office, 19, Avenue Kléber, Paris 16e, France.

UNESCO COUPONS facilitate the purchase of books, educational films and scientific material from other currency areas, and travel to other countries for educational and cultural purposes.

Unesco is often asked by the representatives of certain soft-currency countries why coupons are not available in their country. In most cases the reason is that the government is unable or unwilling to pay Unesco for the coupons distributed in their country in a currency which is acceptable to Unesco. Since Unesco's main expenditure is in U. S. dollars, pounds sterling and French francs, the Organization normally accepts payments only in one of these currencies. Some countries, however, find it difficult to obtain any of these currencies. On the other hand, if Unesco were to accept miscellaneous non-convertible currencies in payment for coupons, the Organization would very quickly accumulate large amounts of currencies which it would not use; this would soon paralyse the entire work of the Organization.

Consequently, in spite of its desire to help the greatest number of Member States in the procurement of educational materials from other countries, Unesco is unfortunately not able to make coupons available to all those who need them.

By 1 January 1955, thirty-eight countries were participating in the Unesco Coupon Scheme for books, films, scientific material and travel; $ 6 500 000 worth of coupons had been put into circulation and $ 4 000 000 worth of coupons had been redeemed by Unesco.

By a resolution of the seventh session of the Unesco General Conference, the Director-General was authorized to request all suppliers of material paid for with Unesco Coupons to grant

Unesco handling charges at the time of redemption of coupons. Considerable discussion concerning the continuation of this practice took place at the eighth session of the General Conference. It was decided by the General Conference that the resolution of the seventh session should be maintained.

German Federal Republic

The German Federal Republic, which had formerly limited its co-operation in the Coupon Scheme to the purchase and supply of publications, is now a full participant in the Unesco Coupon Scheme for books, films, scientific material and travel.

The following agencies have been designated to handle Film, Scientific Material and Travel Coupons in the Federal Republic :

Film Coupons

Distributing body : Institut für Film und Bild, Leopoldstrasse 175, München 23.

Coupons for Scientific Material

Distributing body : Deutsche Forschungsgemeinschaft, Frankengraben 40, Bad Godesberg bei Bonn.

Travel Coupons

Distributing body : Deutscher Akademischer Austauschdienst, Nassestrasse 11, Bonn.

Cashing agencies : Süddeutsche Bank, Frankfurt-am-Main (and all branches).

Norddeutsche Bank, Hamburg (and all branches).

Rheinisch-Westfälische Bank, Düsseldorf (and all branches).

Berliner Diskonto Bank, Berlin (and all branches).

Czechoslovakia

Orders for books should no longer be sent to Orbis, Prague, but to the following address : Artia, V^e^ Smečkăgh, Prague 2.

Change of Address

Germany :

The Börsenverein deutscher Verleger — und Buchhändler — Verbände is now at the following address : Grosser Hirschgraben 17/19, Frankfurt-am-Main.

New Rapid Distribution Service Introduced by Italy

The Italian National Commission for Unesco has for the past six months been operating a new service for the distribution of Unesco Book Coupons by registered letter, payable on delivery. The purchaser is given by the postman a receipt from the National Commission for the exact equivalent in lira of the amount of coupons, calculated at the official rate of exchange ; he hands this sum to the postman in payment for his coupons. This new service is extremely fast, since coupons are despatched during the same day as requests are received. This means that the purchaser may obtain his coupons within 24 hours of requesting them. The amount of coupons which can be delivered this way is limited to 30 000 lira.

National distributing bodies which are interested in adopting a similar procedure are invited to consult either Unesco or the Commissione nazionale dell'Unesco, Villa Massimo, Via di Villa Massimo, Rome.

Travel Coupons

The names of the 20 countries participating in the Travel Coupon Scheme will be found in the table on page 70. Edition nº 3 of the explanatory leaflet, « Introducing the Unesco Travel Coupon » dated January 1955, will indicate full details of the allocating, issuing and cashing agencies in all the countries concerned.

The following material is available upon request from the Unesco Coupon Office :

— explanatory leaflet *Unesco Coupons* (with separate Addendum sheets on Book Coupons, Film Coupons, Coupons for Scientific Material) ;

— explanatory leaflet *Introducing the Unesco Travel Coupon* ;

— Unesco labels ;

— Specimen coupons ;

— Order forms for book orders.

New $ 1 000 Coupon

Unesco has recently put into circulation a new denomination of the Unesco Coupon $ 1 000. Distributing bodies which require a stock of this new coupon should apply to Unesco.

Important Notice for Suppliers (Redemption of Unesco Coupons)

Suppliers are reminded that coupons should not be presented to banks. They should be sent direct to Unesco, 19 Avenue Kléber, Paris, France, for redemption, except in the following countries where they may be cashed at the national redemption office indicated :

Country	National redemption office
Austria	Bankhaus Pinschoff and Company, Spiegelgasse 3, Vienna.
Egypt	Unesco Science Co-operation Office, 8 Sh. el Salamlik, Garden City, Cairo.
German Federal Republic	Deutsche Forschungsgemeinschaft, Frankengraben 40, Bad Godesberg bei Bonn.
India	Unesco Science Co-operation Office, C.S.I.R. Building, Old Mill Road, New Delhi.
Indonesia	Unesco Science Co-operation Office, Djalan Diponegoro 76, Jakarta.
Italy	Banca d'Italie, Via Nazionale, 91, Rome.
Japan	Society for the Promotion of Science, (Nihon Gakujutsu Shinko-kai), Ueno Park, Daito-ku, Tokyo.
Netherlands	Stichting Grafisch Exportcentrum, N. Z. Voorburgwal 58/60, Amsterdam-C.
United States of America	Unesco NewYork Office, Room 2201, U. N. Building, NewYork 17, N. Y.

Countries Participating in Unesco Coupon Scheme

Country	Book Coupons	Film Coupons	Scientific Material Coupons	Travel Coupons
Austria	×	—	—	—
Belgium	×	×	×	×
Burma	×	×	—	—
Cambodia	×	×	×	×
Canada	×	×	—	×
Ceylon	×	×	×	—
Chile	×	×	×	—
Cuba	—	—	—	×
Czechoslovakia	×	—	—	—
Egypt	×	×	×	—
El Salvador	—	—	—	×
France	×	×	×	×
German Federal Republic	×	×	×	×
Hungary	×	—	—	—
India	×	×	×	—
Indonesia	×	×	×	—
Iran	×	—	—	—
Iraq	×	—	×	—
Israel	×	—	—	×
Italy	×	—	—	—
Japan	×	×	×	×
Laos	×	×	×	×
Mexico	×	—	—	×
Monaco	×	×	×	×
Netherlands	×	—	—	×
New Zealand	—	×	—	—
Pakistan	×	×	×	—
Saar	×	—	×	×
Sweden	×	×	×	—
Switzerland	×	×	×	×
Thailand	×	×	×	—
Turkey	×	—	—	—
Union of South Africa	×	×	×	—
United Kingdom	×	×	×	×
United States of America	×	×	×	×
Urugay	—	—	—	×
Viet-Nam	×	×	×	×
Yugoslavia	×	—	—	—

INTERNATIONAL RADIO CONSULTATIVE COMMITTEE (C.C.I.R.)

VIIIth Plenary Assembly of the C.C.I.R.

(Excerpt of the *Telecommunication Journal*,
nº 1, p. 21*e*, January 1955)

In consultation with the Director of the C.C.I.R., the Administration of Posts and Telegraphs of the People's Republic of Poland has fixed the dates of the VIIIth Plenary Assembly of the C.C.I.R., to be held in Warsaw, as 23 August-27 September, 1956 (inclusive).

(Source : Official communication)

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REPORT OF THE CONFERENCE ON THE PHYSICS OF THE IONOSPHERE held at the Cavendish Laboratory Cambridge, 6-9 September 1954.

CONTENTS

The Conference on the Physics of the Ionosphere was devoted mainly to a discussion of four topics and an introductory paper was given by a well known authority in each subject, surveying the existing state of knowledge in the field. These authors have also contributed a summary of the conclusions as to future trends which can be drawn from the discussions which took place at the Conference.

The subjects are as follows :

Part 1 : The Lowest Ionosphere. Introductory paper by Professor A. H. WAYNICK.

Part 2 : Irregularities and Movements in the Ionosphere. Introductory paper by Mr. J. A. RATCLIFFE.

Part 3 : The F2 Layer. Introductory paper by Dr. D. F. MARTYN.

Part 4 : The Mathematics of Wave Propagation through the Ionosphere. Introductory paper by Dr. K. G. BUDDEN.

Each of these papers is supported by a number of papers by authors from Belgium, France, Germany, the United States and Great Britain.

Copies are available at The Physical Society, 1 Lowther Gardens, Prince Consort Road, London SW. 7, at the price of £ 2 (25 *sh to Members*), *postage* 1 *s.*

International Electrotechnical Commission, 39, route de Malagnou, Geneva, Switzerland.

First Supplement to Publication nº 67 : Dimensions of Electronic Tubes and Valves. First edition. Part I : Bases. Price : S. Fr. 2, plus postage.

Nº 70-2 (First edition). Specification for capacitors for power systems (Part II). Price S. Fr. 3.75 plus postage.

Nº 34 (5th edition). I.E.C. Recommendations on determination of efficiency of rotating electrical machinery (excluding efficiency of traction motors). Part II. Price S. Fr. 5, plus postage.

When the fifth edition of this publication was published in 1953, the work on the section dealing with the determination of efficiency has not been completed. It was decided, therefore, to publish this section at a later date as Part II of the recommendations.

The present publication contains part II of these recommendations and deals only with methods of determining efficiency. It contains schedules of losses to be taken into account when calculating the efficiency of the three following types of electrical machinery :

— D.C. motors and generators ;

— polyphase induction motors and induction generators ;

— polyphase synchronous machines and generators.

Explanatory notes of the different items are included in each schedule.

N° 56. I.E.S. Specification for alternating current circuit breakers. Chapter II Rules for normal load conditions. Part I. Rules for temperature-rise (2nd Edition). Price : S. Fr. 5, plus postage.

This Publication forms Part I of the second chapter of the complete revised I.E.C. rules for A.C. Circuit-Breakers, the first chapter of which was issued in 1954 as I.E.C. Publication N° 56-1.

The publication includes a table of recommended Rated Normal Currents, definitions of Rated Normal Current, Rated Frequency, Rated Supply Voltage of a shunt connected auxiliary circuit, Rated Frequency of an A.C. auxiliary circuit, and temperature-rise.

The temperature rise rules and tests described in this publication are : Temperature rise test of the main circuits, temperature rise tests on shunt connected auxiliary circuits, temperature measurement of circuit-breaker parts under test, ambient temperature and measurement of the resistance of the main circuits.

A table showing the values of allowable temperature rises for the different parts of a circuit-broaker, including the oil for oil circuit-breakers and water for the arc extinction chambers of circuit-breakers with water break is given at the end of the publication.

N° 73. I.E.C. Recommendations regarding the colour of push-buttons. Price : S. Fr. 1.50, plus postage.

This publication gives recommendations for the colours of push-buttons used for the starting and stopping of electric motors or other electrical apparatus and installations.

The recommendations were drawn up taking into account the results of an inquiry conducted by the International Labour Office and published in the January-March 1952 issue of their review « Occupational Safety and Health ».

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