Bulletin N° 98 July-August 1956

International Scientific Radio Union

U. R. S. I.

CONTENTS

XIIth GENERAL ASSEMBLY

Delegates

National Committees should inform the General Arrangements Committee not latter than February 1st, 1957, of the delegates appointed by them. National Committees are recalled that the delegates they appoint should be able to bring an active cooperation in the work of the Commissions. The General Arrangements Committee will send registration forms to such delegates.

Observers

National Committees wishing to invite as observers persons of their country not appointed as delegates should, before December 15th, 1956, request the President of U.R.S.I. through the Secretary General to invite them ; this does not apply to the National Committee of the host country, which has the right to invite them itself.

NATIONAL COMMITTEES

Indian National Committee

PUBLICATIONS

We have received from the Radio Research Committee (U.R.S.I. National Committee for India) the first number of « Ionospheric Predictions » prepared by the above Committee.

With this issue the Committee initiates its fifth series of Radio Propagations publications. In this series long term ionospheric predictions are given, at present only for East Zone, but predictions for the West and the Intermediate Zones will also be included at a later date. The predictions are for foF2 and F3-4000-MUF. To obtain the maximum usable frequencies for distances less than 4000 km, nomograms such as those given in the British Prediction Instruction Manual may be used.

The Ionospheric Prediction work forms part of the programme of the Radio Propagation Unit of the Committee. This Unit has at present the following five separate series of publications : (1) RRC-A : Ionospheric Data (Monthly), (2) RRC-Sp : Special Radio Propagation Bulletins (issued from time to time), (3) RRC-S : Scientific Reports, (4) RRC-T : Technical Reports, and (5) RRC-B : Ionospheric Predictions. A sixth series on Short-term Ionospheric Predictions will also be undertaken at a later date.

Italian National Committee

MEMBERSHIP

Mario Boella, President, Professor of Electric Communications, Politecnico, Torino.

Nello Carrara, Official Member Commission VII, Director, Centro per la fisica delle microonde, and Professor of electromagnetic waves, Firenze University, Viale G. B. Morgagni 48, Firenze.

Vittorio GORI, Official Member Commission I, Director, Istituto Superiore PT., Viale Trastevere 189, Roma.

Gaetano LATMIRAL, Official Member Commission II, Professor of Electromagnetic Waves Theory, Istituto Superiore Navals, Via amm. Acton, Napoli.

Algeri MARINO, Official Member Commission VI, Professor of Electric Communications, Roma University, Via Guido d'Arezzo 14, Roma.

Carlo MATTEINI, Past President of the National Committee.

Ugo TIBERIO, Professor of Radiotechnique, Pisa University, Pisa.

Secretary-Treasurer : Dr. Alvaro DONADIO Consiglio Nazionale di Ricerihe, Piazzale delle Scienze 7, Roma.

Besides the following have been appointed as Official Members :

Commission III : Prof. I. RANZI, Facoltà di Fisica dell' Università, Firenze.

Commission IV : Prof. A. NUTTA, Via Cola di Rienzo 52, Roma.

Commission V : Prof. R. RIGHINI, Osservatorio Astrofisico di Arietri, Firenze.

Swedish National Committee

ACTIVITIES OF THE COMMITTEE

The Swedish National Committee held a full meeting in Stockholm on 27th April, 1956.

Dr. Mauritz Vos, vice-president of the Swedish Committee and Chairman of the Sub-commission II (Radio and the Troposphere) had informed the Committee that he wished to resign from his above mentioned duties. The National Committee in thanking Dr. Vos for his work in the Committee accepted his resignation and unanimously appointed Prof. Dr. Hannes Alfvén as vice-president of the National Committee and Mr. Martin Fehrm as Chariman of the Sub-commission II. Mr. Fehrm thus automatically assumes the function of Swedish Official Member to Commission II of U.R.S.I. In connection with his election as

vice-president, Prof. Alfvén expressed a wish not to remain Chairman of the Sub-Commission VII (Radioelectronics). This was agreed by the Committee, and Prof. Dr. Henry Wallman was elected new Chairman of Sub-commission VII, thus becoming also Swedish Official Member to Commission VII of U.R.S.I.

At the same meeting, reports from the seven Sub-commissions were delivered. It was also decided that a national radio scientific conference should be arranged in Stockholm in the middle of January, 1957, this being the fourth conference of this kind held in co-operation between the Royal Swedish Academy of Engineering Sciences and the Swedish Association of Engineers and Architects.

U. S. A. National Committee

JOINT MEETING OF THE U. S. A. NATIONAL COMMITTEE AND THE INSTITUTE OF RADIO ENGINEERS

(Professional Groups on the Antennas and Propagation, Circuit Theory, Instrumentation, Microwave Theory and Techniques).

The meeting was held at the National Bureau of Standards, Washington D.C. on april 30-May 3, 1956.

The following papers were read during the technical session.

Abstracts of the papers are available at the General Secretariat of U.R.S.I.

COMMISSION I

Accuracy of standards radio frequencies received at a distant point — Warren C. STICKLER, *National Bureau of Standards.*

A new method of measuring microwave pulse power — Harold A. THOMAS, *National Bureau of Standards.*

Advance in the design and application of the radio-frequency permeameter — Alvin L. RASMUSSEN, Albert W. ENFIELD, Alfred E. HESS, *National Bureau of Standards.*

Reduction of Doppler contribution to total spectral line bandwidth by a method utilizing spontaneous coherent emission — L. E. NORTON, *RCA Laboratories.*

Amplitude stabilization of a microwave signal source — G. F. ENGEN, *National Bureau of Standards.*

Performance of three-millimeter harmonic generators and crystal detectors — John M. RICHARDSON, Russell B. RILEY, *National Bureau of Standards.*

Novel Circuit for a crystal controlled variable frequency oscillator — D. MAKOW, *National Research Council, Ottawa, Canada.*

Measurement of service fields for VHF broadcasting — Robert S. KIRBY, *National Bureau of Standards.*

A survey of microwave near field measuring techniques — J. H. RICHMOND, T. E. TICE, *Ohio State University.*

A 25 000 Megacycle receiver employing a rotary frequency shifter — R. L. COSGRIFF, R. G. KOUYOUMJIAN, T. E. TICE, D. F. YAW, *Ohio State University.*

Sensivity of microwave detectors — R. L. COSGRIFF, *Ohio State University.*

COMMISSION II

The phase of the low radio frequency ground wave — J. R. JOHLER, *National Bureau of Standards.*

Back-scattering characteristics of the sea in the region from 10 to 50 kmc — J. C. WILTSE, S. P. SCHLESINGER, C. M. JOHNSON, *The John Hopkins University.*

Propagation through the troposphere — Virgil A. COUNTER, *Lockheed Aircraft Corporation.*

Ray-caustics method for anomalous-refraction propagation — Ming S. WONG, *Wright Air Development Center.*

Amplitude fluctuations on line-of-sight transmission paths — R. B. MUCHMORE, A. D. WHEELON, *Ramo-Wooldridge Corporation.*

Propagation of 8.6 millimeter radio waves at 14 000 feet elevation — C. W. TOLBERT, A. W. STRAITON, *The University of Texas.*

The effect of superrefractive layers on 50-5000 Mc non-optical fields — E. E. GOSSARD, *U. S. Navy Electronics Laboratory*; L. J. ANDERSON, *Smyth Research Associates.*

Twilight region propagation of microwaves beamed over great and small circle paths — Thomas J. CAROLL, Rose M. RING, *Lincoln Laboratory, Massachusetts Institute of Technology.*

Line-of-sight wave propagation in randomly inhomogeneous medium — Bob M. FANNIN, *University of Texas.*

Turbulent mixing theory applied to radio scattering — Richard A. SILVERMAN, *New York University.*

The layered atmosphere and scatter propagation — W. S. AMENT, D. L. RINGWALT, *Naval Research Laboratory.*

Radio studies of atmospheric turbulence — J. W. Herbstreit, K. A. Norton, Philip L. Rice, R. B. Muchmore, M. C. Thompson, Roger Gallet, *National Bureau of Standards.*

A new technique for the study of scatter propagation in the troposphere — W. J. Heikkila, J. H. Chapman, J. E. Hogarth, *Radio Physic Laboratory, Defence Research Board, Canada.*

Troposphere scattering of microwaves — C. A. Potter, *U. S. Navy Electronics Laboratory.*

Measurements of signal levels at UHF and SHF propagated by the troposphere over paths 100 to 618 miles in length — James H. Chrisholm, James F. Roche, *Lincoln Laboratory Massachussets Institute of Technology.*

Commission III

The great solar regions of February 9-24, 1956, and their terrestrial effects — A. H. Shapley, *National Bureau of Standards.*

A theory of ionosphere forward scatter scaling laws — A. D. Wheelon, *Ramo-Wooldridge Corporation.*

Oblique incidence radio observations of meteor trails — G. R. Sugar, *National Bureau of Standards.*

Some comments on the specular theory of ionospheric scatter transmission — H. G. Booker, *School of Electrical Engineering, Cornell University.*

Ionospheric motions observed on high frequency backscatter soundings — L. H. Tveten, *National Bureau of Standards.*

Some direction-finding observations on travelling ripples in the ionosphere — W. J. Ross, *Ionosphere Research Laboratory, Pennsylvania State University.*

Methods of anlyzing fading records from spaced receivers — G. S. Sales, *Ionosphere Research Laboratory, Pennsylvania State University.*

Fading of low frequencies and the double gaussian correlogram — S. A. Bowhill, *Ionosphere Research Laboratory, Pennsylvania State University.*

Long distance high power radio propagation at frequencies exceeding the MUF — W. G. Abel, M. L. Phillips, *Lincoln Laboratory, Massachusetts Institute of Technology.*

Radioteletype transmission above the MUF — H. A. Schulke, Jr., *Signal Corps Eng. Labs.*

The communication possibilities of a new type of ionospheric scatter — Allen M. Peterson, O. G. Villard, Jr., Ray L. Leadabrand, Philip B. Callagher, *Stanford University.*

The geometry of auroral communications — Ray L. Leadabrand, Irving Yabroff, *Stanford University.*

Methods of measuring ionospheric reflection coefficient using sweep frequency equipment — H. Myron Swarm, *University of Washington*; R. A. Helliwell, *Standfort University.*

Interference measurement of small multipath delay changes — De Forest, L. Trautman, Jr., *Hughes Aircraft Company.*

A theory of long-duration meteor-echoes based on atmospheric turbulence — H. G. Booker, *School of Electrical Engineering, Cornell University.*

An experimental study of atmospheric turbulence in the lower E-region using meteor echoes of long duration — R. Cohen, *School of Electrical Engineering, Cornell University.*

The formation of sporadic E ionization and the recently discovered low latitude aspect sensitive ionization aligned with the earth's magnetic fields lines — R. L. Leadabrand, A. M. Peterson, O. G. Villard, Jr., *Stanford University*; H. M. Swarm, *University of Washington.*

Study and interpretation of low angle fluctuations from the radio star Cassiopeia as observed at Ithaca, N. Y. — B. Dueno, *College of Agriculture and Mechanic Arts, University of Porto Rico.*

On the origin of nocturnal E ionization — L. Dubin, *Air Force Cambridge Research Center.*

Evidence of a relationship between back-scatter from field-aligned ionization in the F-layer, and fluctuations in the 5577A (01) airglow — O. G. Villard, Jr., Sidney Stein, *Stanford University.*

H. F. radar with unusual characteristics — G. C. Rumi, *School of Electrical Engineering, Cornell University.*

The propagation of long waves near 100 kc/s over distances of the order of 800 km — E. R. Schmerling, *Ionosphere Research Laboratory, Pennsylvania State University.*

Characteristics of ionospherically reflected vertically incident radio waves at 75 kc/s — R. E. Houston, Jr., *Ionosphere Research Laboratory, Pennsylvania State University.*

The polarization of vertically incident radio waves at 75 kc/s — J. J. Gibbons, G. S. Levy, S. R. Butler, *Ionosphere Research Laboratory, Pennsylvania State University.*

Some feature of VLF propagation deduced from aircraft flight data — J. L. Heritage, S. Weisbrod, *Smyth Research Associates*; J. E. Bickele, *U. S. Navy Electronics Laboratory.*

The dynamo currents in the ionosphere obtained with spherical harmonic analysis and with the principle of balance of power — W. Pfister, T. J. Keneshea, *Air Force Cambridge Research Center.*

Lunar and unusual solar effects on the ionosphere — S. Matsushita, *High Latitude Observatory, University of Colorado and guest worker at the National Bureau of Standards, Boulder, Colorado. On leave from Kyoto University, Japan.*

Solar control of the ionosphere — H. FRIEDMAN, *U. S. Naval Research Laboratory.*

The D and lower E-region — J. C. SEDDON, *Naval Research Laboratory.*

The electron-density-height profiles in region F of the ionosphere — E. R. SCHMERLING, *Ionosphere Research Laboratory, Pennsylvania State University.*

Calculation of the distribution of the electron density in the ionosphere — J. M. KELSO, *Ramo-Wooldridge Corp.*

Radio echoes from auroral ionization detected at relatively low geomagnetic latitudes — R. L. LEADABRAND, A. M. PETERSON, *Standfort University.*

COMMISSION IV

Measurement of atmospheric radio noise moments — Forrest F. FULTON, Jr., William H. AHLBECK, *National Bureau of Standards.*

Variations in the statistical character of atmospheric noise — A. D. WATT, *National Bureau of Standards.*

Audio frequency atmospherics 10-900 cycles per second — Jules AARONS, *Air Force Cambridge Research Center.*

The sferic characterics of thunderstorms — Herbert L. JONES, *Oklahoma A. and M. College.*

A new whistler dispersion theory — R. A. HELLIWELL, T. F. BELL, R. L. SMITH, *Radio Propagation Laboratory, Stanford University.*

The application of nose whistlers to the study of the outer ionosphere — R. L. SMITH, *Radio Propagation Laboratory, Stanford University.*

Experiments on whistlers and associated atmospherics — J. H. CRARY, R. A. HELLIWELL, *Stanford University.*

On the dependence of whistler dispersion upon the geomagnetic latitude of the generating spheric — M. G. MORGAN, H. W. CURTIS, *Dalmouth College*; H. E. DINGER, *Naval Research Laboratory*; A. W. SULLIVAN, *University of Florida.*

COMMISSION V

On meteor echoes from underdense trails at very high frequencies — Morton LOEWENTHAL, *Lincoln Laboratory, Massachusetts Institute of Technology.*

The Harvard radio meteor program — Gerald S. HAWKINS, Curtis L. HEMENWAY, Fred L. WHIPPLE, *Harvard College Observatory.*

Galactic and solar radio emission as limiting background noise in systems using ionospheric and tropospheric scatering — Vernon H. GOERKE, *National Bureau of Standards.*

A compound interferometer for radio-astronomy with a single lobed radiation pattern — A. E. COVINGTON, N. W. BROTEN, *National Research Council of Canada.*

Limitations in the determination of the position of a radio star — S. MATT, *General Electric Company.*

Antenna smoothing in two dimensions — R. N. BRACEWELL, *Stanford University.*

Flux measurements of discrete radio sources at frequencies below 30 megacycles — H. W. WELLS, *Department of Terrestrial Magnetism, Carnegie Institution of Washington.*

A model for non-thermal radio source spectra — N. G. ROMAN, F. T. HADDOCK, *Naval Research Laboratory.*

Depolarization of solar radio bursts — M. H. COHEN, *Cornell University.*

Radio observations of the lunar occultation of M1 — B. F. BURKE, K. L. FRANKLIN, *Department of Terrestrial Magnetism, Carnegie Institution of Washington.*

Radio Observations of Jupiter — K. L FRANKLIN, B F. BURKE, *Department of Terrestrial Magnetism, Carnegie Institution of Washington.*

COMMISSION VI

Application of the reaction concept — V. H. RUMSEY, *University of Illinois.*

Five years of 21 cm research — Bart J. BOK, *Harvard Observatory.*

Method for accurate measurements of antenna gains — H. V. COTTONY, *National Bureau of Standards.*

Systematic errors caused by the scanning of antenna arrays : phase shifters in the main feed line — J. H. SPRADLEY, W. J. ODLUM, *Hughes Aircraft Company.*

Closely spaced transverse slots in rectangular waveguides — Richard F. HYNEMAN, *University of Illinois.*

Approximate reflection computations using a variational principle — Stephen J. FRICKER, *Lincoln Laboratory, Massachusetts, Institute of Technology.*

A constant beamwidth radiator — K. S. KELLEHER, C. GOATLEY, *Melpar, Inc.*

Perturbation method for the analysis of leaky wave antennas — L. O. GOLDSTONE, A. A. OLINER, *Polytechnic Institute of Brooklyn.*

Shaped beams from microwave lenses — C. W. MORROW, P. B. BACHMAN, T. H. WARD, *Melpar, Inc.*

The theoretical loss of antenna gain resulting from a random aperture distribution — W. C. HOFFMAN, *Rand Corporation.*

Corner reflector antenna with arbitrary dipole orientation and apex angle — R. W. KLOPFENSTEIN, *R. C. A. Laboratories.*

A circularly polarized corner reflector antenna — O. M. WOODWARD, Jr., *R. C. A. Laboratories.*

The impedance of a coil near a conductor — D. L. WAIDELICH, C. J.RENKEN, Jr., *University of Missouri.*

Measurement of scattering cross section of figures of revolution — J. HONDA, S. SILVER, F. CLAPP, *University of California.*

Scattering from finite cones — K. M. SIEGEL, *Engineering Research Institute, The University of Michigan.*

Evaluation of the field produced by slots on a wedge — C. E. SCHENSTED, A. L. MAFFETT, *Engineering Research Institute, University of Michigan,*

Second order beams of two-dimensional slot arrays — L. A. KURTZ. J. S. YEE, *Hughes Aircraft Co.*

New method of antenna coupling to a balanced two-wire line — Carlyle J. SLETTEN, *Air Force Cambridge Research Center.*

A variable polarization microwave traducer — W. A. SNYDER, *Hughes Aircraft Co.*

The resonant properties of ring circuits — F. J. TISCHER, *Hunts ville, Ala.*

The tranfer matrix in microwave circuits, with particular reference to resonant cavities — Leo YOUNG, *Westinghouse Electric Corp.*

Exact synthesis of waveguide band pass filter based on prescribed insertion loss functions — Henry J. RIBLET, *Microwave Development Labs., Inc.*

Aperture-coupled filters — F. SHNURER, J. B. TRAVIS, *General Electric Company, Advanced Electronics Center at Cornell University.*

Microwave multiplexers in strip-line — Howard C. TURNAGE, Robert B. WILDS, *Melpar, Inc.*

On the analysis of symmetrical waveguide junctions — Raymond S. POTTER, *Naval Research Laboratory.*

Losses in dielectric image lines — D. D. KING, S P SCHLESINGER, *The John Hopkins University.*

Single slab circular polarization surface wave structure — Robert C. HANSEN *Hughes Aircraft Company.*

Network computation in multimode waveguide — Leopold B. FELSEN, *Microwave Research Institute, Polytechnic Institute of Brooklyn.*

Evaluation of discontinuities in multimode circular waveguide — L. B. FELSEN, W. K. KAHN, *Microwave Research Institute, Polytechnic Institute of Brooklyn.*

Control of spurious modes in multimode waveguides by use of foam dielectric inserts — Samuel P. MORGAN, *Bell Telephone Laboratories, Inc.*

Helix waveguide — S. P. MORGAN, J. A. YOUNG, *Bell Telephone Laboratories, Inc.*

Atomic and molecular resonance devices — H. PLOTKIN, *Signal Corps Engineering Laboratory.*

Atomic and molecular frequency standards for distance measuring — Peter ANTONUCCI, *Rome Air Development Center.*

Maser — James P. GORDON, *Bell Telephone Laboratories, Inc.*

A frequency reduction technique for Maser oscillators — Walter H. HIGA, *Jet Propulsion Laboratory, California Institute of Technology.*

Gas cell type frequency standards and special techniques for linewidth-reduction and signal : noise increase — T. R. CARVER, *Princeton, N. J.*

The atomichron, an atomic frequency standard — R. T. DALY, *National Company, Inc.*

COMMISSIONS

Commission III
On Ionospheric Radio

OBSERVATION ON IONOSPHERIC ABSORPTION

The Service de Prévision Ionosphérique Militaire Français (SPIM) published the results of observations on ionospheric absorptions carried out at Dakar during 1951-1954. The results issued in form of booklets (one for each year) contain the values of the absorption decrement for various sounding frequencies.

SUB-COMMISSION IIIc
ON STUDY OF PROPAGATION TIME OF RADIO SIGNALS

Letter from the Chairman to the Members of the Sub-Commission

February 29th, 1956.

Dear Sir,

The series of experiments for the determination of propagation time of time signals made in 1955 has obtained some positive results. The most complete set of results has been obtained over the path between Torino (IBF) and Rugby (MSF). The elaboration of data obtained in Dec. 1954 and March 1955 has nearly been completed and for the remnant experiences is being in course. No clear dependance of the propagation time from the hour and the season has yet appeared. The data of a number of duplex measurements over the paths Washington (WWV)-Hawaii (WWVH) and Tokyo (JJY)- Hawaii (WWVH) have also been collected. For the first time during the last December's experiments MSF and IBF signals were received at Washington and it is expected that this performance could be repeated in the future.

Regarding to the future activity of the Sub-Committee the A.G.I.-U.R.S.I. Committee and the C.S.A.G.I. at the Bruxelles meeting in September 1955 recommended that the experiments should be continued in 1956. A similar opinion has been expressed by Dr. D. W. George of the N.B.S. in a report to the Chairman of the Study Group VII of the C.C.I.R.

Thus I propose the experiments would be continued in 1956 with the same program as before, i. e. on Wednesday and Friday after the 3rd Sunday of March, June, September and December, at every third hour beginning at 00.00 UT and ending at 21.00 UT. Therefore the days selected for the experiments will be :

March	21 and 23.
June	20 and 22.
September	19 and 21.
December	19 and 21.

The most importance will be attached to the measurements of WWV at Torino, Abinger and Teddington ; of IBF, MSF and WWVH at Washington ; of WWV and JJY at Hawaii ; of WWVH and eventually WWV at Tokyo. In fact the circuits of some thousand kilometers are the most interesting and we have very little information about them from the past experiments. Nevertheless the exact knowledge of the time difference between the IBF and the MSF signals would be of great help to complete the study of the results that will be obtained on the longer circuits Rugby-Washington and Torino-Washington. Thus I suggest that regular measurements on MSF signals at Torino and on IBF signals at Abinger and Teddington should possibly be continued as before.

For the future experiments the program of special IBF transmissions will be the same as in December :

from ... h 54 m to ... h 00 m on 5 Mc/s,

from ... h 14 m to ... h 20 m on 10 Mc/s.

The transmissions will be effectued at every third hour beginning at 23 h 54 m UT of the day before each scheduled date. The shape of the IBF signals will be the same as in September and December experiments and they will be arranged in time so that

they will arrive at Washington about 7 ms before the WWV signals, to avoid confusion with echoes of WWV and with WVH signals.

Yours very sincerely.

The Chairman of Sub-Commission IIIc

(sgd) M. Boella.

Reception of standard time signals on the occasion of U.R.S.I. experiments for determination of propagation time of signals

The informations on useful receptions of standards time signals collected in 1955 on the occasion of the experiments organised by the Sub-Commission IIIc of the U.R.S.I. for the determination of the propagation time of the radio signals are given in the following tables.

As « useful receptions » are intended those for which determinations of the time of arrival of the signals were possible.

The following symbols have been used in the tables :

M5, M10 for MSF signals on 5 and 10 Mc/s (MSF, Rugby, England).

W5, ... for WWV signals on 5, ... Mc/s (WWV, Washington, U.S.A.).

WH5, ...for WWVH signals on 5 ... Mc/s (WWVH, Maui, Hawaii).

J4, ... for JJY signals on 4 ... Mc/s (JJY, Tokyo, Japan).

I5, ... for IBF signals on 5 ... Mc/s (IBF, Torino, Italy).

The observations were made : at Abinger by the Greenwich Observatory ; at Teddington by the N.P.L. ; at Washington by the U.S.A. Naval Observatory ; at Boulder (Colorado) by the N.B.S. ; at Maui by the N.B.S. WWVH Station ; at Tokyo by the Astronomical Observatory ; at Canberra by the Commonwealth Observatory ; at Paris by the L.N.R. ; at Torino by the I.E.N.

May 1956.

The Chairman of Sub-Commission IIIc,

(sgd) M. Boella.

SIGNALS USEFULLY RECEIVED ON DECEMBER 1954

	Hour / Day	00	03	06	09	12	15	18	21
Torino	15				M10	M10 W10	M5 M10	M10 W10	W10
	17	M5 W5	W5 W10	W5	M5	M5 W10	M5	M5 W10	M5 W5 W10
Abinger	13	I5 W5 W10	W5	I5 W5 W10	W5	W10	W15	I5 W10 W15	W5 W10
	15	W5 W10	W5	I5 W5 W10	I5 W5	I5 W10 W15	I5 W10 W15	I5 W10 W15	I5 W5 W10
	17	I5 W5	I5 W5	I5 W5 W10	I5 W5	I5 W10	I5 W15	I5 W15	I5 W5 W10
Teddington	13	I5	W5	W5	W5			W10	W5
	15		I5 W5	I5 W5	I5 W5	I5	I5	I5	I5 W5 W10
	17				I5	I5	I5	I5	I5
Tokyo	13				WH5	WH5	WH5		
	15				WH5	WH 10	WH5		
	17				WH5	WH5	WH5		
Maui	13	W5	W5	W5		W5	W10 J15	W15	W15
	15	W10	W5	W5	W5	W5	W10	W15	W15
	17	W10	W5	W5	W5	W5 J4	W10 J5	W15	W15

SIGNALS USEFULLY RECEIVED ON MARCH 1955

	Hour / Day	00	03	06	09	12	15	18	21
Torino	23	W5		M5	M5 M10	M10	M10 W15	M10	M5 W10
	25	M5 M10 W5 W10	W5	M5	M5 M10	M5 M10	M5 M10 W15	M5 M10 W15	M5 M10 W10 W15
Abinger	23			I5	I5 I10	I5 I10 W10	I5 I10 W15	I5 I10 W15	I5 W10
	25	I5 W5 W10	W5	I5	I5	I5 I10 W10 W15	I5 W10 W15	I10 W10 W15	I5 W10 W15
Teddington	23	I5 W5		I5	I10	I10	I5 I10	I5	I5
	25	W5		I5	I5 I10	I5 I10	I5 I10	I5 I10	I5 I10
Tokyo	23		WH15	WH10 WH15		WH10	WH5	WH10	WH10 WH15
	25	WH15	WH10 WH15	WH10 WH15	WH5 WH10	WH5 WH10	WH5	WH10	WH10 WH15
Maui	23	W15		W5		W5		W15	W15
	25	W15	W5	W5	W5			W15	W15
Washington	23					WH10			
	25					WH10			
Canberra	25							M5 M10 I10 J5 WH10	

SIGNALS USEFULLY RECEIVED ON JUNE 1955

	Hour / Day	00	03	06	09	12	15	18	21
Torino	22	M5 W10 W5 W15	W10 W15 W5 M5	M10 W10 M5 W15	M10 W15 W10	M10 W15	W15 W10	W15 M10 W10	W15 M5 M10 W10
	24	W15 W10 M5 W5?	W10 M5 W5	M10 M5	M10	M10 W15	W15 M10	M10 M5	W15 M10 M5
Abinger	22	I5 W5 W10 W15	I5 W5 W5 W10 W15	I5 I10 W10 W15	I5 I10 W10 W15	I5 I10 W15	I5 W15	I5 I10 W15	I5 W10 W15
	24	I5 W10	I5 W5 W10	I5 I10 W10	I5 I10 W10	I5 I10 W15	I10 W15	I5 I10 W15	I5 I10 W15
Teddington	22	I5 W10 W15	W10	I10 W10 W15	I10 W10	I10 W15	I10 W15	I10 W15	I5 W10
	24	I5 W5 W10	I5 W5 W10	I5 I10	I10	I10	I10	I5 I10 W15	I5 I10 W15
Paris	22	W5 M5 I5	W5 M5 I5	M5 I5	M5 I5 I10	M5 I5 I10	M5 I5 I10	M5 I5 I10	M5 I5
	24	W5 M5 I5	W5 I5 I10 M2.5	M5 I5 I10	M5 M10 I5 I10	M5 M10 I5 I10	M5 M10 I5 I10	M5 I5 I10	M5 I5

SIGNALS USEFULLY RECEIVED ON JUNE 1955 (*continued*)

	Hour / Day	00	03	06	09	12	15	18	21
Tokyo	22			WH10	WH5 WH10	WH5 WH10	WH5 WH10	WH10	
	24			WH10	WH5 WH10	WH5 WH10	WH5 WH10	WH10	WH10
Maui	22	W15	W10 W15	W5 W10 W15	W5 W10 W15 J4	W10	W15	W15	W15 W20
	24	W15 W20	W15 W20	W5 W10	W5 J5			W15	W15
Washington	22		WH10	WH10	WH10	WH10			
	24			WH10	WH10	WH10			
Boulder	22			W10 W15 WH10 WH15	W10 WH10	W10 WH10	W10 W15 WH10 WH15		
	14		W10 WH10	W5 WH5	W5 WH5	W10 WH10	W10 WH10		
Canberra	22		W10 WH10 WH15	W5 W10 WH5 WH10 WH15	W5 W10 WH5 WH10 WH15	WH5 WH10 WH15	J4 J8 J10 WH5 WH10	I10 J4 J10 WH5 WH10	I10 J10
	24	W10 WH10 WH15	WH15	I10* M10* W10 WH10 WH15	W5 W10 WH5 WH10	J4 W10 WH5 WH10 WH15	J4 J5 WH5 WH10	I10 M10 WH10	I10 M5 M10

* By the long route.

SIGNALS USEFULLY RECEIVED ON SEPTEMBER 1955

	Hour / Day	00	03	06	09	12	15	18	21
Torino	21	M5 W5 W10	M5 W5 W10	M5 M10 W5	M10		M10 W15	M10	M5 W10
	23	M5 W5 W10	M5 W5 W10	M5 M10 W5	M10	M10 W15	M10	M10 W10	M5 W10
Abinger	21	I5 W10	I5 W5 W5	I5 W5	I5 I10	I5 I10 W10 W15	I5 I10 W15	I10 W15	I5 W10 W15
	23	I5 W5 W10	I5 W5	I5 W5	I5 I10	I10 W10 W15	I10 W15	I5 I10 W15	I5 W10 W15
Teddington	21	W5 W10	I5 W5	I5 W5	I10	I10 W10	I10 W20	I10 W15 W20	I5 W10 W15
	23	I5 W5 W10	I5 W5	W5	I10	I10 W10	I5 I10 W10	I10 W10	I10 W10
Tokyo	21	WH15	WH15	W10 WH15	WH5 WH10	W10 WH5 WH10	WH5	WH5 WH10	WH15
	23	W15 WH15	WH15	WH10 WH15	WH5 WH10 WH15	WH5 WH10	WH5 WH10	WH10	W15 WH15
Maui	21	W15 W20	W10 W15	W5 J10	W5 J4	W10		W15	W15 W20
	23	W15 W20	W5 W10 W15	W5	W2.5 W5 J2.5 J5			W15	W15 W20

SIGNALS USEFULLY RECEIVED ON SEPTEMBER 1955 (*continued*)

	Hour / Day	00	03	06	09	12	15	18	21
Washington	21		WH10	WH10					
	23		WH10	WH10					
Canberra	21			WH10 WH15	J10 WH10	J8 J10 W10 WH10	J10 WH10	I10 WH10	I10 J10
	23			W10 WH10 WH15	WH5 WH10	J8 W5 W10 WH10	J8 WH5 WH10	I10 J4 J8 WH10	I10

Commission IV

On Radio Noise of Terrestrial Origin

LIST OF STATIONS

In view of helping radio workers interested in investigation connected to the field of Commission IV, U.R.S.I. is intended to publish a complete list of stations and observations carrying out measurements and observation on radio noise of terrestrial origin.

The information that will be published includes :

1. Name of the station,
2. Geographic location,
3. Geomagnetic location,
4. Characteristics measured or observed,
5. Type of apparatus,
6. Frequenties and bandwiths included in observations,
7. Other stations of there network (where applicable),
8. Operating schedule,
9. Publication of data,

10. Responsible authority and mailing address,
11. Date of report.

In order to reach some uniformity with the various lists issued by the Special Committee for the International Geophysical Year (C.S.A.G.I.) the geomagnetic coordinates will be plotted on the basis of a dipole with North Pole at 78°30′, 69° W, coordinates adopted by the International Association of Geomagnetism and Aeronomy.

Item 7 is intended to cover systems where cooperation between two or more stations is essential to the measurement as, for example, in a direction finding network or whistlers stations designed to make complementary observations on the same whistlers.

For the time being U.R.S.I. has complete (stations noted (*) or partial information on the following stations :

List of Stations

Accra*
Aden*
Aldergrove
Anchorage
Angmagssalik

Bagneux*
Balboa
Banaras
Bangui*
Bermuda
Bologna
Boulder
Brest*
Brisbane
Bunia
Byrd Lane

Camborne*
Cambridge*
Churchill
College

Colombo*
Columbia
Cyprus*

Darwin
Delhi*
Dixon Is.
Dourbes*
Dunedin*
Dunstable*
Durban*

Elisabethville
Enköping

Falkland Is*
Father Point
Fanning Is*
Flin Flon
Frobister Bay
Front Royal

Gainesville
Godhavn

Halifax
Hanover
Helsinki
Hemsby*

Irvinestown*
Ivato*

Johannesburg*

Kerguelen*
Key West
Kiruna
Knob Lake

Léopoldville*
Leuchars*
Lund

Mabashi*
Maui
Mont Joly
Murmansk

Narsassuak*
Narssaq*
Nerderhorst den Berg*
Nome*

Oohira*
Ottawa

Poitiers*
Poona*
Port Stanley

Rabat*
Resolute Bay
Rio de Janeiro

Seagrove
Seattle
Singapore*
Slough*
Stanfort

Tahiti*
Tatsfield*
Thule
Tortosa

Toyokawa*
Trappes*
Tromsö
Tunis*

Unalaska
Uppsala

Vahsel Bay*
Vigna di Valle

Washington
Wellington*

Yakutsk

U.R.S.I. would be thankfull to National Committees and readers of the Information Bulletin who would provide information on the stations mentioned in the above list or inform us of stations not include in the list.

The Secretary General.

Commission VI
On Radio Waves and Circuits

REPORT OF THE MICROWAVE COMMUNICATION RESEARCH COMMITTEE IN JAPAN

The Microwave Communication Research Committee has issued in December 1955 a volume which is a summarized report of the subjects presented to the committee. When the committee started in 1952, there were only few laboratories carrying out the research on the problems of microwaves in Japan, while at present, many transmission lines of public telephone and television and the communication system of power companies are operated on multichannel microwave transmission systems. As the members of the committee included professors of several colleges, engineers of the operation companies and manufacturers, it is

quite natural, under the conditions above stated, that the reports include a wide field of microwave applications, for instance, microwave propagation, wave guide technic, oscillators and amplifiers.

The contents of the report, 51 papers in all, are arranged approximatively by the following succession :

1. Circuits and parts,
2. Electron Tubes,
3. Antennas and Propagation,
4. Microwave systems, and Network,
5. List of mircrowave tubes made in Japan.

1. — Circuits and Parts

The characteristics of some cylindical substances in a rectangular wave guide — Nobuyoshi Kato, Toyosaku Isobe.

Shunt reactive elements on the surface wave transmission line — Hidenari Uchida, Shigeo Nishida.

Waveguide type variable impedance circuits and its applications for Rieke diagram — Nobuyoshi Kato, Toshiyuki Sakai.

Formulas for calculating the equivalent L, C, R values of the klystron cavity — Kazue Fujisawa.

On a new method of observing electromagnetic fields at microwave frequencies by the use of test paper — Toshifusa Sakamoto, Taro Hasegawa.

A new measuring method of dielectric constant by a variable impedance circuit — Nobuyoshi Kato, Tosbhiyuki Sakai.

Measurements of attenuation constant of TE_{01} circular wave guide — Ken'ichi Noda, Akira Konose.

Q measurements of one-line cavities by a magic-tee — Junzo Hirano.

A new microwave frequency standard by quenching oscillator control — Norikazu Sawaki, Tsusomu Honma.

A new microwave AFC employing a dual-mode cavity resonator and a ferrite — Syuiti Hayashi.

Negative feedback at frequency modulation — Tono Osake, Tsutomu Monoi.

Mikrowellen Diskriminator — Hisayoshi Yanai, Yasuhiko Tani, Nobuko Tako.

A S.W.R. Meter for a coaxial waveguide (H_{01} mode) — Kunihiro Suatake, Mamoru Matumoto.

The revolving type standing-wave meter — Michio Nakano, Ainosuke Osimoto.

Eine Messebrücke für Höchfrequenzen — Hisayoshi YANAI, Nobuko TAKO, Tamio SHIRATORI.

A variable standard of reflection and transmission coefficients constructed from a matched magic tee — Toshio MAKIMOTO, Shigeru YOKOUSHI, Shinobu SONODA.

A calorimetric measurement of low level microwave power at 4000 Mc — Toshifusa SAKAMOTO, Toshio UTSUNOMYA.

Wide-band microwave transducer — Michio NAKANO.

A new waveguide attenuator element utilizing corrugated metallic surface combined with resistance card — Kiyoshi MORITA, Kunihiro SUATAKE.

Waveguide delay equalizer — Bun'ichi MORITA, Ken'ichi NODA.

Waveguide branching filter — Ken'ichi NODA.

Bandpass filter utilizing degenerate cavities — Saburo KUMAGAI, Torahiko SUGIURA.

Power loss at the contact surface waveguide flanges — Rensuke USUI, Takashi KITSUREGAWA.

2. — ELECTRON TUBES

Propagation of space-charge in a accelerated electron beam — Masaki HIGUCHI.

Noise in a divergent or convergent flow of an electron beam — Masaharu OKOCHI, Hiizu MAEDA.

A note on the frequency multiplication by intermittent oscillations — Sogo OKAMURA, Tomonao HAYASHI.

Hight-frequency electronic admittance of planar electron tubes with very close electrode-spacing — T. SEKIGUCHI.

Hollow beam electron gun with a control needle in its cathode center — Shintaro UDA, Hideo SEKIMOTO.

The electron gun for hollow beam — Elizi SUGATA, Masazumi TERADA.

Characteristic impedance of the helix surrounding with coaxial dielectric cylinder — Kanehisa UDAGAWA.

Some considerations on the design of helix type traveling wave amplifiers — Atsumi KONDO, Jiro KOYAMA, Karusaburo KAWAZURA, Isao YANAOKA, Masaaki HIGUCHI.

Low noise traveling wave tube ECL-1138 — Jiro KOYAMA, Masaaki HIGUCHI, Kurasaburo KAWAZURA.

Traveling wave tubes as frequency multipliers — Shintaro UDA, Kozo KAMIRYO, Yuko SHIBATA.

On the manufacturing technique of traveling-wave tube and klystron — Kinnosuke SATO.

Recent researches on traveling wave tubes in Tokyo Shibaura Electric Co — Msanobu AIURA, Yasushi MIZUKAGA, Kensi KAKIZAKI, Yoshihiko SAWAYAMA.

On the performance characteristics of the multi-resonator magnetrons — Masao NISHIMAKI.

A tunable magnetron for 6000 Mc band — Sogo OKAMURA, Hisayoshi YANAI, Sumiko TAMIYA.

Magnetron for P. P. M. multichannel communication in 7000 Mc band — Shigeru NAKAJIMA, Yoshio YASUOKA, Kei SHIOWAWA, Takayuki MAEYAMA, Tetsuo AKIOKA.

Parameters stipulating oscillations of small reflex klystrons — Kenichi SATO, Tasuo MUROMATSU, Mitsuo KAMIHARA, Tomoyuki UNOTRO.

On the generator of centimeter waves by two-beams velocity-type frequency multiplier — Yukito MATSUO.

3. — ANTENNAS AND PROPAGATION

Biconical horn with path length lens — Shintaro UDA, Yasuto MUSHIAKE, Hiroshi MORI, Saburo ADACHI.

New type microwave antenna covers — Kinji MATSUMOTO.

Refraction index of pseudo-dielectric made on an array of conducting rods — Kiyoshi MORITA, Toshio SEKIGUCHI.

Result of a measurement of SHF propagation — Toshikazu KAWAKAMI.

4. — MICROWAVE SYSTEMS AND NETWORK

Microwave television relay repeater using traveling wave tubes — Norikazu Sawazaki, Keiji SUZUKI.

Reflex relay system using traveling-wave tubes — Norikazu SAWAZAKI.

Microwave equipment for the Tokyo-Osaka telephone and television link — Isao SOMEYA, Nobutaka TANAKA.

Microwave communications in Japan — Takeo SEKI, Isao SOMEYA.

2000 Mc PTM multichannel systems used for the radio links of electric power companies — Nobutaka TANAKA.

5. — LIST OF MICROWAVE TUBES MADE IN JAPAN

Microwaves tubes in Japan — Atsumi KONDO.

SUB-COMMISSION VI-3

ON ELECTROMAGNETIC THEORY (ANTENNAS AND WAVEGUIDES)

The membership issued previously (*Inf. Bull.*, *95*, 16-17) should be completed by the following names :

Prof. H. H. BATLOW (England).

Prof. Ph. CLEMMOW (England).

Prof. E. HALLÉN (Sweden).

IONOSPHERIC STATIONS

Publication

The monthly Bulletin *Ionospheric Data* issued by the P.T.T. Department of Switzerland will not be issued for the months May and June 1956.

INTERNATIONAL GEOPHYSICAL YEAR

The Ionosphere I. G. Y. Program in the Arctic

by A. H. SHAPLEY

(Report Submitted to the Arctic Conference, Stockholm, May 22-25, 1956)

Especially in the higher latitudes, the ionospheric program is closely bound to those planned for Aurora and Geomagnetism. The three should be considered to supplement one another in all respects. In some particulars there are also close ties between the ionosphere program and some experiments in cosmic rays and in rocket explorations.

It is obvious that great attention will be placed on the behaviour of the ionospheric region in the vicinity of the auroral zone, with the many complex disturbance phenomena which are recognized but rather poorly delineated and little understood. The I.G.Y. will provide the first opportunity to study phenomena in any detail inside the auroral zone. A feature of the station plans is the chance to observe the ionosphere from at or near the north pole during the long polar days and polar nights and to make important studies, relating to photoionization, recombination and transport. Studies of hemisphere symmetry will be possible with the data from the comprehensive Antarctic program. In this connection it is pleasing to note that ionospheric stations are planned at or very near both geographic poles and both geomagnetic poles.

The principal experiments in the ionospheric program are the following :

1. *Vertical Soundings.* — This is the backbone of the program and involves a record number of at least 37 stations in the arctic regions. It is important here that as much attention be given to the difficult problems of observing procedures and ionogram

reduction as to installation of new stations. It is imperative that sufficient observations be taken, as ionospheric conditions change rapidly and significantly in high latitudes. Special care should be taken to minimize the confusing effects of « spread echoes» and of unusually high and changing absorption by appropriately planning the details of observing procedures. It is also important that reductions be according to methods specially fitted to the needs of high latitudes. These matters are gone into in great detail in the Septembre 1955 report of the U.R.S.I./A.G.I. Special Committee on High Latitudes (*Inf. Bull.*, *96*, 43-61).

The analysis of the vertical soundings from the arctic network will, of course, include the study of median diurnal curves of E and F2 critical frequencies as a function of geomagnetic latitude, geomagnetic longitude and magnetic dip ; probably the data can usefully be separated by quiet and disturbed days and by season. One can also look forward to maps of mean characteristics over the polar cap and examine seasonal differences and also differences between quiet and disturbed days. The station network is probably fine enough to attempt to draw maps of instantaneous contours of F2 ion density and sporadic E and absorption. These will be especially valuable for comparisons with auroral result. It may be possible to track in this way the slow drift of clouds of ionization at E and F region heights. The I.G.Y. data will provide a tremendous amount of information for the study of discontinuous phenomena such as storms and fadeouts, and should result in much progress in studies of solar control, geomagnetic control, universal time control, and time lags as a function of latitude.

2. *Absorption.* — In and near the auroral zone the changes in absorption are very large and very rapid. The pulse reflection technique has severe limitations at stations in this region because observations will be missed during complete blackouts, including some of the periods of greatest interest. It is therefore important that stations using pulse techniques supplement these observations with measurements of the absorption of cosmic radio noise on an appropriate frequency, say 30 Mc/s. This technique is also better suited to small observing stations and produces a measurement which can be more easily interpreted in terms of the physical phenomena involved. It is gratifying to see that the network

of these stations planned for I.G.Y. now numbers more than fifteen. It should be a standard experiment at every high latitude ionosphere station.

3. *Drifts.* — Drift measurements at high latitudes are most difficult to interpret. The I.G.Y. program is in a sense exploratory, with sampling at various latitudes and longitudes. While it may be that measurements made by the same method will be comparable, the science has not yet progressed to the point where results by two different methods can be joined. The I.G.Y. data should be most valuable for this purpose. Plans reported to C.S.A.G.I. thus far call for measurements by the pulse reflection method, by radio star scintillations, and by radar observations of meteor ionization.

4. *Atmospheric Noise.* — The measurement of atmospheric noise is a world program which has about 8 stations in the arctic region. Observations are planned at high frequencies, and at low frequencies, and in some cases provision is made for direction-finding of the noise centers. It is noted that observations of spherics are planned at least for one arctic station, Spitzbergen.

5. *Whistlers.* — This fast-growing field of ionospheric physics is also represented in the arctic I.G.Y. program. This is particulary appropriate in view of the strong association of some phenomena, such as dawn chorus and hiss, with specialized features of magnetic or auroral phenomena. The network is largely concentrated in the western hemisphere, but important check points will be operating in high latitudes elsewhere.

6. *Miscellaneous Experiments.* — Other important programs which involve the arctic regions are backscatter, forward scatter, oblique incidence experiments and measurements suitable for tidal studies : these provide valuable supplements to the more comprehensive programs described above.

Resolutions on Ionosphere and on Arctic Telecommunications for I.G.Y. Messages adopted by the Arctic Conference

V.1. — The C.S.A.G.I. Arctic Conference, taking into account the presently available estimates of direction and rate of drift

of the several drifting stations in the Arctic Sea planned to be equipped for ionospheric vertical soundings, observes that the distribution of stations would be more uniform and more suitable for the ionospheric program if the sounding station proposed for U.S.A. Ice Floe Station A could instead be put on U.S.A. Ice Floe Station B.

V.2. — The C.S.A.G.I. Arctic Conference recommends that all possibilities be explored towards completing the ionospheric vertical sounding network as follows :

1. There is a gap of 7 degrees in geomagnetic latitude between the line of stations along the 10° E meridian headed by Murmansk and Tromsö (67° N) and the station planned at Longyeartown, Spitsbergen (74° N). As this gap includes the maximum of the auroral zone, a station on Bear Island (71° N) would be a very important addition to this chain.

2. The chain of stations along the auroral zone maximum itself would be greatly improved by an additional station in the large longitude gap to the west of about 150° W. In this connection, the Arctic Conference feels that possible locations which would help to fill the gap between sub-auroral stations and stations well within the auroral zone in these longitudes are either (*a*) the vicinity of Wrangel Island (or alternatively Cape Schmidt) or (*b*) the region of Taymir.

V.3. — The C.S.A.G.I. Arctic Conference calls the attention of National Committees to the following remarks in the report of its working group on the Ionosphere : « Additional cosmic radio noise absorption observations would be very desirable from any location near the auroral zone. The cosmic radio noise technique seems better suited for a study of auroral zone absorption then the pulse reflection method. Further, it is well adapted for operation at small observing stations as an auxiliary experiment to vertical soundings. It would be of special value if the chain of such absorption stations in Alaska could be duplicated at other geomagnetic longitudes. »

V.4. — The C.S.A.G.I. Arctic Conference recommends that a continuing Working Group on Arctic I.G.Y. Communications be established to develop a plan for telecommunication alternatives

and to coordinate the arrangements for putting the plan into operation. This Continuing Working Group is to be composed of representatives from Canada, U.S.A., Sweden, U.S.S.R. and any other country involved in the Arctic program for the I.G.Y. Subject to confirmation by The National Committees involved, the membership will be : S. Gejer (Chairman), G. S. Vorobiaff, J. H. Meek and F. H. Dickson. The Group is requested to keep C.S.A.G.I. advised of the progress of its work, including a proper report to the 1956 Barcelona meeting.

The Continuing Working Group on Arctic I.G.Y. Communications will endeavour to solve the difficulties of communication in the Arctic and pay special attention to :

(*a*) prompt distribution to I.G.Y. stations of notifications of Alerts and S.W.I.,

(*b*) prompt forwarding of warnings of impending auroral displays from one of the auroral warning stations to all other auroral stations,

(*c*) the regular reporting of data summaries by I.G.Y. stations to Regional World Day centres,

(*d*) the distribution of data summaries by Regional World Day Centres to many I.G.Y. stations, and

(*e*) other communications needed for operation and coordination of the I.G.Y. program in the Arctic region.

The Group will take into account that to achieve the necessary reliability of communications there must be a plan for alternate routing of message in case the primary links are interrupted.

V.5. — In view of the difficulty of obtaining reliable and rapid communications in The Arctic, and the requirements of I.G.Y. stations for prompt notifications of Alerts and Special World Intervals and for a minimum summary of auroral observations, and in view of the need to have two or three alternate channels for the distribution of this information in case of failure of the primary channel, the C.S.A.G.I. Arctic Conference recommends that there be short daily broadcasts of such information on a fixed schedule by one or more high powered longwave broadcasting stations. The Conference solicits the assistance of the National Committees of countries having such facilities, in arranging for such broadcasts.

V.6. — The C.S.A.G.I. Arctic Conference endorses the tentative plans of the Scandinavian and U.S.S.R. I.G.Y. committees to arrange for direct radio communication between arctic stations of the Scandinavian chain on the one hand and the U.S.S.R. chain of stations (through Barentsburg) on the other hand. Other nations having stations within the auroral zone are encouraged to arrange such radio contacts if such contacts are useful for the outcome of the results of observations during the I.G.Y.

V.7. — The C.S.A.G.I. Arctic Conference, considering the need to achieve the best possible telecommunications during the I.G.Y., invites the telecommunication administrations and agencies of the different countries to consider favourably the requests of National Committees for assistance in arranging facilities for the rapid communications needed for the successful conduct of the I.G.Y. Arctic program, not only within the country itself but also for relays and for links between regional centres, and that these agencies allow such messages to be sent as service messages without cost to the scientific programs.

V.8. — The C.S.A.G.I. Arctic Conference recommends that members of the Continuing Working Group on Arctic Communications meet jointly, as may be possible, with representatives of the appropriate telecommunication administrations and agencies so that the problems of Arctic I.G.Y. communications can be approached on a broad basis and the detailed arrangements be facilitated.

Documents received

Handbook for radiation recording counter (Type MU 4), Cinema-Television Ltd, London.

Cosmic radiation neutron intensity monitor, Prof. J. A. Simpson.

C. C. I. R.

Documents received

Deviations and adjustments of standard frequencies and time signals of stations WWV, Washington D.C., and WWVH, Maui T. H., of the National Bureau of Standards-October-December, 1955).

Deviations and adjustments of standard frequencies and time signals of station ZUO of the Union Observatory of Johannesburg (October 1955- March, 1956).

WORLD METEOROLOGICAL ORGANIZATION

List of Meetings in 1956-1957

(For information only — Not an official notification)

Date and Place	Name and Purpose of Meeting
1956	
16-18 July Geneva	*W.M.O. Panel on Water Resources Development.*
End October Zurich	*Working Group on Atmospherics of the Commission for Aerology (C.Ae.).* Observations of atmospherics during the the International Geophysical Year 1957-1958.
16-30 October Hamburg	*Second Session of the Commission for Maritime Meteorology (C.M.M.).*
1957	
About 8 January Las Palmas (Canary Islands)	*Third Session of Working Group on Meteorological Telecommunications of Regional Association I.* Review of the meteorological telecommunication network in Africa; (transmission of weather data through national and sub-continental broadcasts).
About 15 January Las Palmas (Canary Islands)	*Second Session of the Regional Association I (Africa).*
14-26 January Washington	*Second Session of the Commission for Climatology (C.Cl.).*
18 June Paris	*Second Session of the Commission for Aerology (C.Ae.).*
18 June Paris	*Second Session of the Commission for Instruments and Methods of Observation (C.I.M.O.).*
3-23 September Geneva	*Ninth Session of the W.M.O. Executive Committee.*

Date and Place	Name and Purpose of Meeting
Beginning October Paris	*Second Session of the Commission for Bibliography and Publications* (*C.B.P.*). Report of the Working Group on Terminology. Meteorological Lexicon and multilingual Vocabulary. Questions concerning meteorological bibliographies.
21 October (provisional) (town not yet fixed)	*Second Session of the Regional Association III* (*South America*).

Geneva, 1st June 1956.