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International Scientific Radio Union

U. R. S. I.

CONTENTS

NATIONAL COMMITTEES

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Members of the National Committee for the year beginning April 1, 1957, are :

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France

INTERNATIONAL COLLOQUIUM ON PRESENT PROBLEMS ON RADIO WAVE PROPAGATION

Paris, September 17-21, 1956

An International Colloquium on Radio Wave Propagation under the auspices of the « Société des Radioélectriciens » and the French National Committee of U.R.S.I. and with the

sponsorship of the U.R.S.I. was held in the « Conservatoire National des Arts et Métiers », September 17, 21, 1956.

The opening session was held under the chairmanship of the Prince Louis de Broglie, Addresses were given by Mr. M. Rigal, President of the « Société des Radioélectriciens » and by Mr. B. Decaux, President of the French National Committee of U.R.S.I. Mrs. P. David, Professor at the « Ecole Supérieure d'Electricité » and at the «Ecole Supérieure des Télécommunications», T. J. Carroll, Professor at the Massachusetts Institute of Technology, and V. Fack, Member of the U. S. S. R. Academy of Sciences also spoken.

The topics discussed at the working sessions were as follows :

— Characteristics of ultra-short wave communications behind the horizon.
— Interpretation of the great distance tropospheric field strengths.
— Theoretical problems on tropospheric propagation.
— Fluctuation of tropospheric fields strengths.
— Meteorological effects on propagation.
— Effects of irregular obstacles on propagation.
— Theories on ionospheric propagation mechanisms.
— Experimental results on the mechanisms of ionospheric propagation.
— Ionospheric physics.
— Interaction in the ionosphere.
— Forecast of ionospheric propagation.
— Whistlers and long waves.
— Effects of meteors on propagation.

The clossing session was held under the chairmanship of Father Lejay, Member of the Institute, President of the International Scientific Radio Union. Statements were given by Mrs. Dieminger (Germany), on ionospheric problems, K. M. Siegel (U. S. A.) on wave diffraction problems, J. Santon (Great Britain) on the problems on great distance tropospheric propagation.

The colloquium was attended by 250 participants from 25 countries and 73 technical papers were read. The sessions were

held in three lecture rooms of the « Conservatoire National des Arts et Métiers ».

The papers submitted were the following.

J. Aarons (U. S. A.). — Expériences récentes de rayonnement électromagnétique à fréquence acoustique.

W. S. Ament (U. S. A.). — Réflexion et diffusion dans le cas de certaines surfaces rugueuses.

M. Anastassiades, L. Carapiperis (Grèce). — Influence des facteurs météorologiques sur la propagation des hyperfréquences (Données sur la mer d'Egée du Sud).

J. Arsac, J. C. Simon (France). — Problèmes de fluctuations en propagation lointaine.

B. R. Bean (U. S. A.). — La réfraction en surface des ondes radioélectriques, sa climatologie, son rôle dans la propagation troposphérique.

B. R. Lean, R. L. Abbot (U. S. A.). — Au sujet de l'absorption par les gaz de l'atmosphère dans la diffusion troposphérique.

W. Becker (Allemagne). — Procédés graphiques de détermination courante de la distribution verticale de la densité électronique dans les couches ionosphériques, d'après les enregistremenrs avec balayage de fréquences.

B. Beckmann (Allemagne). — Observation de diffusion-arrière avec signaux télégraphiques.

P. Beckmann (Tchécoslovaquie). — Influence des changements brutaux dans l'humidité atmosphériques sur la propagation des ondes ultracourtes à grande distance.

K. Bochenek (Pologne). — Sur certaines méthodes d'analyses des relations obtenues à l'aide de la méthode W.K.B.

M. Boella (Italie). — Quelques aspects de l'interférence entre signaux modulés due à la multiplicité des chemins de propagation (fading sélectif).

J. Bouchard (France). — Etude de la propagation ionosphérique par enregistrement hyperfin du champ des émetteurs étalons.

G. Boudouris (France). — Le problème de propagation au-dessus de la terre sphérique (terre et atmosphère homogènes) est-il définitivement résolu ?

H. Bremmer (Pays-Bas). — Comparaison des fluctuations de l'amplitude et de la phase des champs engendrés par diffusion.

G. Broussaud (France). — Quelques nouveaux types d'antennes pour des liaisons lointaines.

U. Cabessa (France). — Améliorations apportées par la réception en diversité d'espace sur des liaisons radio en visibilité optique sur mer et sur terre.

T. J. Carroll, R. M. Ring (U. S. A.). — Propagation des ondes ultra-courtes dans la zone d'ombre dans une atmosphère à constante diélectrique monotonement décroissante.

F. du Castel (France). — Divers types de fluctuations de champs troposphériques et leur interprétation physique.

F. W. Chapman (Grande-Bretagne). — La propagation des ondes radioélectriques de fréquences acoustiques.

J. Chapman (Grande-Bretagne). — Sur la forme, le spectre de fréquences et la propagation des parasites atmosphériques.

P. Chavance (France). — Résultats d'essais de propagation par diffusion troposphérique à distances moyennes.

J. H. Chisholm (U. S. A.). — Investigations expérimentales du « Scattering » angulaire et de la capacité de communication, pour un système de propagation troposphérique bien au-delà de l'horizon.

P. Clavier (France). — Calcul d'une liaison par diffusion troposphérique optimum du point de vue économique.

C. M. Crain (U. S. A.). — Les réfractomètres hyperfréquences ; leur emploi dans les problèmes de propagation radioélectrique.

M. Cutolo (Italie). — Expériences nouvelles sur l'autodémodulation des ondes dans l'ionosphère.

D. Davidson, A. J. Pote, J. B. Wiesner (U. S. A.). — Considérations concernant le choix des fréquences de service pour des liaisons au-delà de l'horizon.

J. F. Denisse, J. L. Delcroix, M. Bayet (France). — Sur la théorie des phénomènes d'interaction.

W. Dieminger (Allemagne). — Expériences de propagation sur des impulsions de fréquences variables.

H. Dinger (U. S. A.). — Les sifflements extraordinaires.

Von R. Eshleman, A. M. Peterson (U. S. A.). — L'effet de la longueur du parcours sur la durée des échos météoriques.

V. A. Fock (U. R. S. S.). — Application des intégrales complexes à certains problèmes de diffraction.

L. Golstein (U. S. A.). — Interactions d'ondes électromagnétiques de fréquence radio dans les gaz ionisés et leurs conséquences sur les phénomènes ionosphériques.

G. Goubau (U. S. A.). — Relation entre l'onde de surface et l'onde d'espace.

M. Gronlund, C. O. Lund (Danemark). — Equipement pour mesures de propagation des micro-ondes.

P. Gudmandsen, B. Larsen (Danemark). — Résultats statistiques concernant la propagation des micro-ondes.

E. Harnischmacher (Allemagne). — Quelques résultats d'observations systématiques du vent ionosphérique sur 2 MHz.

J. W. HERBSTREIT (U. S. A.). — Etude radioélectrique de la turbulence atmosphérique.

W. C. HOFFMAN (U. S. A.). — Ouverture d'antenne optimum pour les champs de diffusion.

F. HORNER (Grande-Bretagne). — L'influence de la direction sur la propagation ionosphérique des ondes très longues.

C. DE JAGER (Pays-Bas). — L'émission des explosions radioélectriques solaires.

JESSEL (France). — Mise en équations fonctionnelles des problèmes de propagation et de diffraction.

J. B. KELLER (U. S. A.). — Diffraction par des objets convexes.

E. LABIN (France). — Etude des surfaces réfléchissantes dans le domaine des ondes millimétriques.

R. E. LACY (U. S. A.). — Mesures de gain d'obstacles montagneux en Californie.

D. LÉPÉCHINSKY (France). — La théorie magnétoionique et ses résultats.

C. G. LITTLE (Grande-Bretagne). — Etude de l'absorption ionosphérique aux hautes altitudes à l'aide d'ondes radioélectriques extra-terrestres.

C. O. LUND, M. GRONLUND (Danemark). — Equipement électronique pour l'analyse statistique.

J. MEVEL (France). — Interaction de deux sphères voisines placées dans un champ d'ondes électromagnétiques. Applications.

C. M. MINNIS (Grande-Bretagne). — Une proposition pour l'amélioration des prévisions ionosphériques.

W. E. MORROW Jr. (U. S. A.). — Projet d'un système de communications troposphériques à longue distance en ondes ultra-courtes.

P. MISME (France). — De l'influence des variations brutales des masses d'air sur la propagation troposphérique.

C. L. PEKERIS, Mrs Z. ALTERMAN (Israël). — Rayonnement produit par une impulsion de courant dans une antenne verticale placée sur un sol diélectrique.

W. PFISTER (U. S. A.). — Sur la distribution de la densité électronique déterminée à l'aide de fusées.

P. POINCELOT (France). — Sur l'onde de surface de Sommerfeld.

P. POINCELOT (France). — Réflexion des signaux radioélectriques sur l'ionosphère.

K. RAWER (Allemagne). — Quelques problèmes actuels de la prévision ionosphérique.

R. RIVAULT (France). — Caractéristiques des sifflements observés au cours d'une année.

P. RIVET (France). — Analyse des conditions locales des réflexions partielles et comparaison avec la théorie de la diffusion dans l'explication des champs au-delà de l'horizon.

J. Robieux (France). — Interaction entre ondes rayonnées et ondes de surface.

J. Rybner, E. Ungstrup (Danemark). — Influence de la zone aurorale sur la propagation des ondes courtes.

D. S. Saxon (U. S. A.). — Approximation pour la diffusion des hautes fréquences par des sphères diélectriques. I. Etude théorique.

J. A. Saxon (Grande-Bretagne). — La physique de la diffusion ionosphérique des ondes ultra-courtes.

J. P. Schouten, A. T. de Hoop (Pays-Bas). — Sur la réflexion d'une onde plane par une surface rugueuse.

Z. Sakera (U. S. A.). — Etude approximative de la diffusion des hautes fréquences par des sphères diélectriques. II. Résultats.

K. M. Siegel, C. E. Schensted, I. V. Schensted (U. S. A.). — Les sections efficaces de radar des traînées météoriques.

P. Simon (France). — Taches solaires radioélectriquement actives et tempêtes ionosphériques.

J. B. Smyth, L. J. Anderson (U. S. A.). — L'importance des phénomènes de réflexion dans les communications au-delà de l'horizon.

J. L. Steinberg, I. Kazes (France). — Influence de la turbulence troposphérique sur la réception des bruits d'origine cosmique.

Mme A. Stoyko (France). — Sur la vitesse apparente des ondes courtes.

N. Stoyko (France). — Vitesse apparente de propagation des ondes très longues.

V. Twersky (U. S. A.). — Sur la théorie générale de la diffusion et de la réflexion par une surface irrégulière.

E. Vassy (France). — Influence de la propagation dans les systèmes de radio-navigation basés sur les mesures des phases.

J. Wait (U. S. A.). — Réflexion d'une onde transitoire par un milieu conducteur anisotrope.

Greece

APPOINTMENT OF A NATIONAL COMMITTEE

The Ministry of Communications and of Public Works has appointed an Hellenic National Committee on Scientifique Radio whose membership is as follows :

President : Michel Anastassiadés, Professor at The Science Faculty of the University of Athens, Director of the Ionospheric Institute of the Observatory of Athens.

Vice-Presidents :

Nicolas POULOPOULOS, Engineer E. S. E., General at the General Staff of the Hellenic Army Forces.

Stomatios NICOLIS, General Director of the Telecommunication Department at the Communications Ministry.

General Secretary : Léonide CARAPIPERIS, Professor at the Science Faculty of the University of Athens.

Members :

Basil ASLANIDÉS, Technical Director of the Hellenic Radiobroadcast.

Etienne ELEUTHERIOU, Director of the Radio Service of the Greece Telecommunication Agency.

Jean KAFFEDJAKIS, Chief Engineer at the Hellenic Broadcast.

Anastase LELAKIS, Head of the Radio Department at the Communication Ministry.

Netherlands

NEW SECRETARY

Ir P. L. M. Berkel, Dr Neher Laboratorium P. T. T. Leidschendam (Z. H.) has been appointed as Secretary of the Dutch National Committee.

COMMISSION MEMBERSHIP

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Official Members : Ir L. R. M. Vos de WAEL, Dr Neher Laboratory of the Netherlands PTT, Leischendam.

Members :

Jhr Dr Ir M. Gevers, Philips Research Labs., Eindhoven.

Ir J. J. VORMER, Central Direction Netherlands PTT, The Hague.

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Dr H. BREMMER, Philips Research Laboratories, Eindhoven.

Ir C. J. van DAATSELAER, Royal Netherlands Meteorological Institute, de Bilt.

Ir A. H. de VOOGT, Central Direction Netherlands PTT, The Hague.

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Member : Mr A. HAUER, Royal Netherlands Meteorological Institute, de Bilt.

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Ir C. A. MULLER, Radio-astronomical Observatory, Dwingelo.

Prof. dr J. H. OORT, Astronomical Observatory, Leiden.

Dr Ch. L. SEEGER, Astronomical Observatory, Leiden.

Ir A. H. de VOOGT, Central Direction Netherlands PTT, The Hague

Commission VI

Official Member : Prof. Dr C. J. Bouwkamp, Philips Research Laboratories, Eindhoven.

Members :

Ir J. W. Alexander, Philips Telecommunication Ind., Hilversum.

Dr H. Bremmer, Philips Research Laboratories, Eindhoven.

Prof. Dr J. P. Schouten, Technical University, Delft.

Dr F. L. Stumpers, Philips Research Laboratories, Eindhoven.

Prof. ir B. D. H. Tellegen, Philips Research Laboratories, Eindhoven.

Dr ir A. A. T. M. v. Trier, Philips Research Laboratories, Eindhoven.

Commission VII

Official Member : Prof. Dr Ir J. L. H. Jonker, Technical University, Eindhoven.

Members :

Ir H. J. Dirksen, Defence Research Organization, The Hague.

Mr P. H. J. A. Kleynen, Philips Research Laboratories, Eindhoven.

Dr K. S. Knol, Philips Research Laboratories, Eindhoven.

Dr C. E. Mulders, Dr Neher Laboratory, Netherlands PTT, Leidschendam.

Ir F. H. Stieltjes, Philips Research Laboratories, Eindhoven.

Dr ir A. A. T. M. van Trier, Philips Research Laboratories, Eindhoven.

U. S. A. National Committee

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

(Professional Group on Antennas and Propagation)

This meeting was held at the University of California, Berkeley, Calif. Only Commissions II, III and IV took part in this meeting. Technical sessions were held on October 11 and 12, 1956.

The following papers were read during the technical sessions.

COMMISSION II

Measured rain attenuation of 4.3 millimeter wavelength radio signals — C. W. TOLBERT, J. R. GERHARDT, *Electrical Engineering Research Laboratory, The University of Texas.*

Comparison of Predictions of Vector Model of microwave reflection from the ocean with experimental results — C. I. BEARD, *Applied Physics Laboratory, The Johns Hopkins University,* F. E. BROOKS, Jr., *Electric Engineering Research Laboratory, The University of Texas*

Characteristics of sea clutter at HF — R. P. INGALLS, M. L. STONE, *Lincoln Laboratory, Massachusetts Institute of Technology.*

Topics in the design of antennas for scatter — John GRANDLUND, *Lincoln Laboratory, Massachusetts Institute of Technology.*

HF field strength measurements over sea water and sea ice — Stephen J. FRICKER, William T. QUINN, Jr., *Lincoln Laboratory, Massachusetts Institute of Technology.*

The role of stratosphere scattering in radio communications — H. G. BOOKER, W. E. GORDON, *Cornell University.*

A study of propagation conditions at Vero Beach Florida — C. A. HINES, *Wright Air Development Center.*

Overwater refractive index measurements from the sea surface to 15.000 feet — C. A. HINES, *Wright Air Development Center*; C. M. CRAIN, *The University of Texas.*

Recent observations on thin and horizontally stratified elevated dielectric layers in the troposphere with implications for short wave tropospheric propagation beyond the horizon — J. R. BAUER, J. H. MEYER, J. T. PROHASKA, A. F. WILSON, *Lincoln Laboratory, Massachusetts Institute of Technology.*

A note on the effect of weather fronts on the VHF and UHF transmission beyond the horizon — D. R. HAY, J. W. B. DAY, L. A. MAYNARD, *Defence Research Board, Radio Physics Laboratory, Ottawa, Ont., Canada.*

Commission III

Motion of sporadic-E patches determined from high frequency backscatter records — Clayton Clark, Allen M. Peterson, *Radio Propagation Laboratory, Stanford University.*

Lunar tidal variations in the sporadic-E layer of the ionosphere at Stanford, California — H. Myron Swarm, *Linfield Research Institute, McMinnvill, Oregon*; R. A. Helliwell, *Radio Propagation Laboratory, Stanford University.*

Some characteristics of equatorial F-region scattering deduced from soundings made aboard a moving ship — O. G. Villard, Jr., P. B. Gallagher, *Radio Propagation Laboratory, Stanford University.*

An « unusual » solar-terrestrial relationship — Kurt Toma, *GRD, Air Force Cambridge Research Center.*

On the interpretation of long-range radio echoes from auroral ionisation — Sidney Stein, O. G. Villard, Jr., *Stanford University.*

Diurnal variations of signal level and scattering heights for VHF propagation — Albert D. Wheelon, *The Ramo-Wooldridge Corporation.*

Observations of forward scattering of 43.5 Mc/s radio waves from meteor trails over a 690 km path from Palo Alto, California to San Diego, California — T. J. Keary, H. J. Wirth, *U. S. Navy Electronics Laboratory, San Diego, Calif.*

The results of some rocket experiments for electron density distribution — James C. Ulwick, *Ionospherics Physics Laboratory, Geophysics Research Directorate, Air Force Cambridge Research Center.*

Measurements with voice transmissions by ionospheric scatter on 38.6 Mc/s, — I. H. Gerks, *Collins Radio Co,* R. M. Wundt, *Propagation Laboratory Air Force Cambridge Research Center.*

Bandwidth limitations of the ionosphere for through transmission — R. B. Muchmore, A. D. Wheelon, *GMRD, The Ramo-Wooldridge Corporation.*

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

Measurements in an aircraft for 50 Mc/s field strength along a 1500 miles path — William G. Abel, *Lincoln Laboratory, Massachusetts Institute of Technology.*

Commission IV

The effect of atmospheric noise on time-division multiplex teletype — A. W. Sullivan, *Engineering and Industrial Experiment Station, University of Florida*; R. F. Brown, *Convair, Forth Worth, Texas.*

Worldwide lightning and magnetic pulsations in the 1 to 150 c/s band — Philip A. Goldberg, *University of Oregon.*

Results from the tornado season of 1956 — Herbert L. JONES, *Oklahoma A. and M. College.*

Performance of radio systems in the presence of atmospheric noise — A. D. WATT, E. L. MAXWELL, *National Bureau of Standards, Boulder, Co.*

Estimates of external radio noise levels — R. T. DISNEY, *National Bureau of Standards, Boulder, Co.*

Whistler and dawn chorus occurrence above the auroral zone — H. W. CURTIS, M. G. MORGAN, *Darthmouth College.*

Noise whistler observations at Seattle — R. L. SMITH, R. A. HELLIWELL, *Radio Propagation Laboratory, Stanford University.*

Union of Sovietic Socialist Republics

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ON RADIO STANDARDS AND MEASUREMENTS

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Great Britain : Dr. L. ESSEN, Electricity Division, National Physical Laboratory, Teddington, Middelsex.

India : Dr. K. N. MATHUR, Director, National Physical Laboratory of India, Hillside Road, New Delhi, 12.

Italy : Prof. V. GORI, Istituto Superiore P. T., Viale Trastevere, 189, Rome.

Japan : Prof. I. KOGA, Electrical Engineering Department, Faculty of Engineering, University of Tokyo, Bunkyo-ku, Tokyo.

Morroco : Mr. ARZELIES, Professeur au Centre d'Etudes Supérieures Scientifiques, Avenue Biarnay, Rabat.

Netherlands : Ir L. R. M. Vos de WAEL, Dr Neher Laboratory, Netherlands P.T.T., St-Paulusstraat, 4, Leidschendam.

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

Norway : Eng. Helmer DAHL, Christian Michelsens Institutt, Department of Applied Physics, Nygårdsgatan, 114, Bergen.

Poland : Prof. Dr. A. JELLONEK, c/o Ing. Krystyn BOCHENEK, Polska Akademia Nauk, Palac Kultury i Nauki, Warszawa.

Spain : Ing. J. Rodriguez-Navarra de FUENTES, Instituto Geografico y Cadastral Calle del General Ibanez de Ivero. 3, Madrid.

Sweden : Lt. Col. H. BJÖRKLUND, Director, Army Signal Laboratory, Stockholm, 80.

Switzeland : Prof. Dr. H. KÖNIG, Directeur du Bureau Fédéral des Poids et Mesures, Wildstrasse, 3, Berne.

Union of South Africa : Dr. F. J. HEWITT, Director, Telecommunications Laboratory of the C.S.I.D., P. O. Box 1319, Johannesburg, Tvl.

United States of America : Dr. Ernst WEBER, Director, Microwave Research Institute, Polytechnic Institute of Brooklyn, 55, Johnson Street, Brooklyn, 1, N.-Y.

Yugoslavia : Prof. Dr. Josip LONTCHAR, c/o Prof. Ing. A. DAMIANOVITCH, Faculté d'Electrotechnique, 6, Stevana Sremca, Beograd.

COMMISSION II
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Finland : Prof. V. VÄISÄLÄ, Meteorological Institute of the University Helsinki.

France : Mr. J. VOGE.

Germany : Dr. J. F. K. GROSSKOPF, Fernmeldetechnisches Zentralamt, Rheinstrasse, 110, Darmstadt.

Great Britain : Dr. R. L. Smith Rose.

India : Dr. M. B. Sarwate, Wireless Adviser, Ministry of Communications, Government of India, New Delhi.

Italy : Prof. G. Latmiral, Istituto Superiore Navale, Via Amm. Acton, Naples.

Japan : Dr. Hisango Hatakeyama, Director, Meteorological Research Institute, Mabashi, Suginami, Tokyo.

Morocco : Mr. G. Bidault, Géophysicien, Service de Physique du Globe et de Météorologie, 2, rue de Foucauld, Casablanca.

Netherlands : Dr. A. Hauer, Koninklijk Nederlands Meteorologisch Instituut, de Bilt.

New Zealand : Mr. G. J. Burtt, Secretary, Radio Research Committee, Dominion Physical Laboratory, Private Bag, Lower Hutt.

Norway : Eng. F. Lied, Norwegian Defence Research Establishment, Division of Telecommunications, Kjeller near Oslo.

Poland : Prof. S. Mancsarski, c/o Ing. Krystyn Bochenek, Polska Akademia Nauk, Palac Kultury i Nauki, Warsaw.

Spain : Prof. F. Moran Samaniego, Faculté des Sciences de l'Université de Madrid.

Sweden : Dr. Martis, Fehrm, Director of Department Research Establishment for National Defence, Stockholm 80.

Switzerland : Dr. W. Gerber, Direction Générale des P.T.T., 6, Speichergasse, Berne.

Union of South Africa : Dr. F. J. Hewitt, Director, Telecommunications Laboratory of the C.S.I.R., P. O. Box 10319, Johannesburg, Tvl.

United States of America : Dr. J. B. Smyth, Smyth Research Associates, 3930, Fourth Avenue, San Diego, 3, Calif.

Yugoslavia : Mr. Ing. Miodrag Tianich, c/o Prof. Ing. A. Damianovitch, Faculté d'Electrotechnique, 6, Stevana Sremca, Beograd 2.

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Mr. D. LÉPÉCHINSKY, Ingénieur en Chef, Bureau Ionosphérique Français, Laboratoire National de Radioélectricité, 196, rue de Paris, Bagneux (Seine), France.

Dr. W. J. G. BEYNON, Department of Physics, University College, Singleton Park, Swansea, U. K.

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Finland : Prof. V. YLÖSTALO, Finland Institute of Technology, Helsinki.

France : R. P. P. LEJAY, Directeur du Bureau Ionosphérique Français, Laboratoire National de Radioélectricité, 196, rue de Paris, Bagneux (Seine), France.

Germany : Prof. Dr. W. DIEMINGER, Direktor, Institut für Ionosphärenforschung in der Max-Planck Gesellschaft, Lindau über Northeim, Hannover.

Great Britain : Mr. J. A. RATCLIFFE, Cavendish Laboratory, Free School Lane, Cambridge.

India : Prof. S. K. MITRA, Emeritus Professor of Physics Calcutta University, 92, Upper Circular Road, Calcutta 9.

Italy : Prof. I. RANZI, Faculté de Physique de l'Université de Florence.

Japan : Prof. Kenichi MAEDA, Institute of Electrical Engineering, Faculty of Engineering, University of Kyoto, Sagyo-ku, Kyoto.

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Norway : Dr. Leiv HARANG, Norwegian Defence Research Establishment, Division of Telecommunications, Kjeller near Oslo.

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Yugoslavia : Mr. Ing. Deyan BAITCH, c/o Prof. Ing. A. DAMIANOVITCH, Faculté d'Electrotechnique, 6, Stevana Sremca, Beograd 2.

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Yugoslavia : Prof. Ing. Al. DAMIANOVITCH, 6, Stevana Sremca, Beograd.

COMMISSION V
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Yugoslovia : Dr. Ivan ATANASIJÉVIC, Institut de Physique, Faculté des Sciences, 6, Stevana Sremca, Beograd.

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Norway : Prof. M. JENSSEN, Norges Tekniske Högskole, Trondheim.

Poland : Prof. Dr. J. LENKOWSKI, c/o and Ing. Krystyn BOCHENEK, Polska Akademia Nauk, Palac Kultury i Nauki, Warsaw.

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Sweden : Prof. Eric HALLEN, Royal Institute of Technology, Stockholm, 70.

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Yugoslavia : Prof. Maryan GRUDEN, c/o Prof. Ing. DAMIANOVITCH, 6 Stevana Sremca, Beograd.

COMMISSION VII
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Japan : Prof. Masao KOTANI, Faculty of Science, University of Tokyo, Bunkyo-ku, Tokyo.

Morocco : Mr. VALET, Ingénieur des Télécommunications, Radio Maroc, Rabat.

Netherlands : Prof. Dr. Ir. J. L. H. JONKER, Natuurkundig Laboratorium, N. V. Philips' Gloeilampenfabrieken, Kastanjelaan, Eindhoven.

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Switzerland : Dr. N. SCHAETTI, Paillard, S. A. Yverdon.

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United States of America : Dr. W. G. SHEPHERD, Institute of Technology, Department of Electrical Engineering, University of Minnesota, Minneapolis, 14, Minnesota.

Yugoslavia : Prof. Radovan MARKOVITCH, c/o Ing. A. DAMIANOVITCH, 6, Stevana Sremca, Beograd.

Commission III
On Ionospheric Radio

SUB-COMMISSION IIIb
ON RADIO WAVE INTERACTION

Letter from the President to Members of the Sub-Commission

(*Translation*)

Dear Colleague,

It seems suitable to carry out new experiments on non-linear phenomena of the ionosphere and particularly on the two following phenomena wich occur in the neighbourhood of the gyro-frequency :

1. Radio wave interaction.
2. Demodulation phenomenon of modulated waves the carrier frequency of which is near the gyro-frequency, as reported by Prof. Cutolo (Naples).

I would like very much appreciate to receive your comments on the following topics :

1. Nature and aims of experiments to be carried out.
2. Selection of dates and region to carry out the experiments.
3. Definition of values to be measured.
4. Methods to be used in laboratories.
5. Observations to be made by experimenters who have no equiped laboratory.
6. Selection of senders.

7. Wherever possible laboratories and experimenters able to take part to the experiments.

Yours sincerely,

(*sgd*) E. PICAULT
Chairman of Sub-Commission IIIb
7, rue Huysmans, Paris VI

Commission IV
On Radio Terrestrial Atmospherics

PROGRAMME OF THE GENERAL ASSEMBLY

The following topics will be discussed by Commission IV at the next General Assembly of U.R.S.I. Papers on the topics are invited and will be discussed in detail at the meeting.

1. The use ot atmospherics waveforms to investigate phenomena of radiopropagation. The report of the working party on waveforms set up under Recommendation nº 3 of The Hague General Assembly will be considered under this item.

2. The relation between the characteristics of the source and the waveforms of atmospherics.

3. Measurement and description of the characteristics of terrestrial radio noise (including the report of the working party on noise characteristics ; set up under Recommendation nº 4 af The Hague General Assembly).

4. Whistlers, VLF hiss and « dawn chorus »

(*a*) A meeting of Commission IV alone.

(*b*) A separate joint meeting with Commission III.

5. Matters concerning the I.G.Y. in particular.

Commission V
On Radio-Astronomy

PROGRAMME OF SESSIONS AT THE GENERAL ASSEMBLY

SESSION 1

Large aerials, — The large aerials at Ohio State, National Radio Observatory U. S. A., Dwingelo, Haute Provence, Manchester, Bonn, Cambridge, Nançay, Australia, etc The problems of resolving power.

SESSION 2

The technique of Reception. — Radiometers, spectrographic receivers (1420 Mc/s, 327 Mc/s, other lines), dynamic solar spectrographs, polarimeters, interferometers. The problems of high stability. Absolute measurement of flux-density.

SESSION 3 (perhaps a joint session with Commission III and IV)

Radio propagation. — The atmosphere, troposphere and ionosphere. Refraction and absorption. The effects of aurorae, corpuscular streams and meteors. Whistlers. Scintillation, the fluctuation of echoes.

SESSION 4

The sun. — Steady and transient components of the radiation. Relation to optical phenomena and other geophysical effects. Theories of the radio emission (plasma oscillations, hydromagnetic waves etc). Coordinated indices of solar activity (variability, character, classification of transients, etc.).

SESSION 5

Radio Sources and the Galaxy. Radio sources : spectra, diameters, structure, angular distribution and space distribution, observations on 1420 Mc/s.

The Galaxy. — Spectra, space distribution, distribution of the continuous monochromatic radiation (21 cm and other lines). H II regions, *Theories of the Radiation.*

SESSION 6

The planetary system. — Thermal radiation (Moon, planets) and non-thermal radiation (Jupiter, etc.). Echoes from the Moon, meteors and the possibility of echoes from the planets.

SESSION 7

Administrative session. — Frequency allocation. Protection of certain bands, the procedure for getting protection. Protection of observatories (the size of the zone requiring protection, etc.). Miscellaneous items.

Commission VI
On Radio Waves and Circuits

SUB-COMMISSION VI-3
ON ELECTROMAGNETIC THEORY

Letter to Members of the Sub-Commission

November 6, 1956.

Dear Colleagues,

Some times ago, I wrote to all the members of U. R.S.I. Sub-commission VI-3 asking for suggestions as to suitable topics for discussion at the General Assembly to be held at Boulder, Colorado, U. S. A.

After studying the suggestions submitted, it appeared there was a strong preference for the three topics listed at the last Assembly in The Hague :

1. Theory of broadband antennas including the transition region.

2. The transition from Maxwell's equations to the limiting cases of geometrical optics on the one hand and circuit theory on the other.

3. Study of guided waves including surfaces waves and the transmission through anisotropic media in waveguides.

A number of other topics were suggested, but owing to the limited time available at the General Assembly, it is not possible

to list them all for discussion. After discussing these suggested topics with Dr. Sam Silver, Chairman of Commission VI, it was decided to select the following additional topics for discussion :

4. The design of antennas for trans-horizon communication.
5. Diffraction.

A letter is being sent to the Chairman of Commission VI of all National Committees requesting that they inform me of any work on these topics being carried out in their countries.

(*sgd*) George SINCLAIR
Chairman Sub-Commission VI-3
Electrical Building University of Toronto
Toronto 5, Ontario Canada

MIXED COMMISSION ON THE IONOSPHERE

1957 Meeting

At the invitation of the U. S. A. U.R.S.I. National Committee and in accordance with the suggestion made at the 1954 meeting of the Commission at Brussels, the Fifth Meeting of the Commission will be held in New York on 14-16 August, 1957.

Having regard to the eventual availability, through the I.G.Y. of global and homogeneous ionospheric data on a magnitude never attained previously, it is suggested that the underlying theme of the Commission's Meeting should be « The global morphology of the Ionosphere ». Such an examination of present experimental data and theories might be expected to identify the gaps in our knowledge which I.G.Y. data might reasonably fill. To this end the following discussion programme is suggested :

(1) The regular world morphology of the E and F1 layers, with special reference to vertical and horizontal movements.

(2) The regular World Morphology of the F2 layer, etc.

(3) The world morphology of ionospheric irregularities.

(4) The outermost ionosphere.

(5) The planning of the reduction of I.G.Y. ionospheric data with a view to exhibiting their geophysical significance, in the light of (1), (2), (3) and (4) above.

Further suggestions for discussion at the meeting are welcomed.

Members of the Commission are invited to submit contributions of up 1500 words on any ionospheric topic likely to be of interest to the Commission.

For further information, please write to the Secretary of the Commission : Dr. W. J. G. Beynon, Department of Physics, University College of Swansea, Singleton Park, Swansea, Great Britain.

Symposium on Solar Eclipses and the Ionosphere

London, August 1955.

The Proceedings of this symposium which is edited by W. J. G. Beynon and G. M. Brown, is out of press. This book published by the Pergamon Press (£7 or $21.00) contains the following papers.

I. — Introduction

J. A. Ratcliffe. — A survey of solar eclipses and the ionosphere.

II. — Theoretical considerations

O. E. H. Rydbeck. — A theoretical study of E-layer behaviour during a solar eclipse.

F. Lied. — An ionospheric layer during a solar eclipse.

P. Dominici. — Some observations on the influence of a solar eclipse upon the ionosphere.

III. — Ionospheric Eclipse Results

O. E. E. Rydbeck, T. Yonezawa. — Report on recent Japanese ionospheric observations during solar eclipses.

W. Becker. — The ionosphere above Lindau during the solar eclipse on 30 June 1954.

K. Davies. — Ionospheric observations in Canada during the solar eclipse of June 30, 1954.

B. Landmark. — Ionospheric measurements in Norway during the total eclipse of June 30, 1954.

W. Stoffregen. — The solar eclipse of 30 June, 1954. Preliminary report.

J. J. Hennesey, J. S. Torres. — Experimental ionospheric observations of the solar eclipse of 20 June 1955 at Baguio City, Philippine Islands.

O. Burkard. — Temperature-controlled variations of the ionosphere during an eclipse.

M. E. Szendrei, M. W. McElhinny. — The behaviour of the E1 layer during the solar eclipse of Dec. 25, 1954.

C. M. Minnis. — The F2 layer during the eclipses of 1952, 1954 and 1955.

R. P. Lejay, J. Durand. — Comparaison des résultats des sondages ionosphériques à Bangui, Ibadan, Khartoum et Léopoldville.

J. O. Thomas, A. R. Robbins. — Movements in the F2 layer of the ionosphere during some solar eclipses.

K. Rawer. — Absorption measurements for the eclipse of June 1954.

W. R. Piggott. — Absorption measurement during an eclips.

K. Weekes. — Some observations of the lower ionosphere.

K. Weekes. — Some observations of the lower ionosphere during the solar eclipse of June 30, 1954.

E. A. Lauter. — Measurements on medium and low frequencies and of atmospheric noise during the solar eclipse of 30 June 1954.

A. Ehmert, K. Revellio. — The influence of the solar eclipse of 30 June 1954 on low-frequency atmospherics.

R. Bost. — Influence de l'éclipse du 30 juin 1954 sur la propagation des atmosphériques sur la fréquence de 27 kc/s.

R. G. Rastogi, R. M. Sheriff, N. G. Nanda. — Some measurements of the signal strenghts of radio waves reflected from the ionosphere during the solar eclipses of 30 June 1954 and 20 June 1955.

Abstracts of three papers given (1) the Royal Board of Swedish Telecommunications, (2) the Netherlands P.T.T. and (3) the Canadian Broadcasting Corporation.

Discussion of papers in Section III.

IV. — Solar Radiation and Layer Theory

C. W. Allen. — Solar sources of the ionospheric regions.

C. M. Minnis. — The origin of the E- and F1-layer ionizing radiation.

M. Waldmeier. — The aspect of the corona in front of the sun's disk.

G. Elwert. — The X-ray radiation of the solar corona and hot coronal condensations.

C. De Jager. — The distribution of Lyα radiation on the solar disk.

M. A. Ellison. — Sudden ionospheric disturbances in relation to solar flare radiations.

D. R. Bates. — Formation of the ionised layers.

Discussion of papers in Section IV.

V. — Recombination

D. R. Bates. — Recombination in the ionosphere.

K. Rawer. — A critical survey of eclipse information on recombination data.

C. M. Minnis. — The effective recombination coefficients in the E and F1 layers.

J. Sayers. — Recent laboratory studies of recombination cross section.

Discussion of papers in Section V.

VI. — Geomagnetic phenomena of eclipses

S. Chapman. — Survey of geomagnetic eclipse phenomena.

J. Egedal — On the effect on geomagnetism of solar eclipses.

T. Nagata, T. Rikitake, Y. Nagata. — The effect of a solar eclipse on the lower peat of the ionosphere and on the geomagnetic field.

Y. Kato, J. Ossaka, A. Sakurai. — Preliminary report on the effect of the solar eclipse of 20 June 1955 on the earth's magnetic field.

Discussion of papers in Section VI.

VII. — Radio Solar noise

M. Ryle. — Radio investigations of the structure of the solar corona.

J. P. Hagen. — Radial brightness distribution of the sun at 8 mm.

J. P. Wild. — Solar radio noise and the study of corpuscular streams from the sun.

M. Laffineur, P. Coupiac, B. Vauquois. — Observations radioélectriques de l'éclipse du 30 juin 1954.

T. Hatanaka, K. Akabane, F. Moriyama, H. Tanaka, T. Kakinuma. — A model for the solar enhanced region at centimeter range derived from partial eclipse observations.

A. D. Forker, J. C. De Munck, L. D. de Feiter. — Eclipse observations of solar radio frequency radiation on 200, 545, 3000 and 9100 Mc/s.

VIII. — Miscellaneous

S. D. Gossner. — The ionospheric eclipse of 23 Oct. 1957.

D. H. Menzel. — The E layer of the ionosphere : I. Physical theory (D. H. Menzel) ; II. Statistical analysis (D. H. Menzel, J. G. Wolbach, H. Glazer).

D. Lépéchinsky. — L'évaluation de la densité électronique dans la région E.

L. Vegard. — Phenomena caused by solar X rays and properties of the electric ray bundles producing the aurorae.

J. Houtgast. — The influence of the inner planets on the earth'magnetic field.

G. Piccardi. — Chemical test and the study of the upper atmosphere.

IX. — Conclusion

J. A. Ratcliffe concluding summary.

Bibliography of literature on solar eclipses and the ionosphere :

Chronological catalogue of eclipses.

Miscellaneous literature.

Book literature.

Author index of the bibliography.

URSIGRAMS

European Codes

Copies of the following codes (in French) of European Ursigrams are available at the General Secretariat of U.R.S.I. for members of National Commitees and for Scientific Organizations.

CHROM : Data on the activity on the solar disk and chromosphere.

CORON : Data on monochromatic activity of the solar corona.

SOLER : Observations on solar radio noise.

ATMOSPHERICS STATIONS

Manual of Atmospheric Stations

3rd LIST

The first and two lists published in *Bulletin*, nº 99, and 100, contained the following information :

1. Geographical coordinates.
2. Geomagnetic coordinates.
3. Characteristics measured.
4. Type of apparatus.
5. Frequencies and bandwidths.
6. Other stations of the network.
7. Operating schedule.
8. Publication of results.
9. Responsible authority.
10. Date of report.

for the following stations (1st List) :

Accra	Brest	Delhi
Aden	Brisbane	Dourbes
Angmassalik		Dunedin
	Camborne	
Bagneux	Cyprus	Dunstable
Bangui	Colombo	Durban

and for (2nd List) :

Akita	Irvinestown	Leuchars
	Ivato	
Churchill		Mabashi
	Johannesburg	Mayebashi
Falkland Is		
Fanning IS	Kerguelen	Narssacq
	Kumamoto	Nederhorst den Berg
Halifax		
Hemsby	Léopoldville	Oohira

In the following pages simular data are given for :

Bill	Maui	Rabat
Byrd Station		Rio de Janeiro
Cook	Ottawa	Saskatoon
Frobisher Bay	Panama	Singapore
Front Royal	Panska Ves	Slough
	Poitiers	Stockholm
Godhavn	Poona	
Knobe Lake	Průhonice	Tahiti

BILL

1. N 45°24′ W 75°54′
2.
3. Three moments of the radio noise.
4. U.S. National Bureau of Standards Model ARN-2.
5. Eight frequencies logarithmically spaced from 50 kc/s to 20 Mc/s.

Three-*db* noise bandwidth approximately 300 c/s at each frequency.

6. Accra, Boulder, Byrd Station, Cook, Front Royal, India, Johannesburg, Maui, Panama Canal Zone, Rabat, Rio de Janeiro, Singapore, Stockholm, Thule, Tokyo.
7. Continuous operation.
8. Quarterly by C.R.P.L.
9. International coordination : C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.
10. January 1957.

BYRD STATION

1. S 80° W 120°
2. —71.6° (1956) 336.2° (1956)
3. Mean power of the radio noise.
4. U.S. National Bureau of Standards, Model ARN-2.

5. Eight frequencies logarithmically spaced from 50 kc/s to 20 Mc/s.

Three-db noise bandwidth approximatively 300 c/s at each frequency.

6. Accra, Bill, Boulder, Cook, Front Royal, India, Johannesburg, Maui, Panama Canal Zone, Rabat, Rio de Janeiro, Singapore, Stockholm, Thule, Tokyo.

7. Continuous operations.

8. Quarterly by C.P.R.L.

9. International coordination, C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.

10. January 1957.

COOK

1. S 30°38′ E 130°24′.

2.

3. Three moments of the radio noise plus direction finding.

4. U.S. National Bureau of Standards, Model ARN-2.

5. Eight frequencies logarithmically spaced from 15 kc/s to 20 Mc/s.

Three-*db* noise bandwidth approximatively 300 c/s at each frequency.

6. Accra, Bill, Boulder, Byrd Station, Front Royal, India, Johannesburg, Maui, Panama Canal Zone, Rabat, Rio de Janeiro, Singapore, Stockholm, Thule, Tokyo.

7. Continuous operation.

8. Quarterly by C.R.P.L.

9. Australian Postmaster-General's Department.

International coordination : C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.

10. January 1957.

FROBISHER BAY

1. N 63°28′ W 67°23′

2. +75.0° (1956) 2.8° (1956)

3. Whistlers and dawn chorus.

4. Magnetic tape recording. Absolute time scale to ± 0.05 sec provided. Equipment designed by Dartmouth College.

5. Three-*db* bandwidth : 500 c/s to 16 kc/s at 19 cm/s recording speed ; to 20 kc/s at 38 cm/s recording speed (down 9 db at 25 kc/s, 13 db at 30 kc/s).

6. Thule, Godhavn, Knob Lake, Father Point, Hanover, Battle Creek, Washington, Bermuda, Gainesville, Huancayo, Cape Horn, Port Lockroy, Weddell Sea, Ottawa, Halifax.

Sferics direction finding provided by U.S. Air Force Air Weather Service stations in Newfoundland, Washington, Florida, Bermuda, and the Azores.

7. 2 minutes per hour at 35 min. past the hour.

8. Subjective results twice a month as per C.S.A.G.I. Manual.

9. Dartmouth College, Hanover, New Hampshire, U.S.A.

International coordination : Thayer School of Engineering, Dartmouth College,

10. January 1957.

FRONT ROYAL

1. N 38°56′ W 78°11′

2. +50.3° (1956) 348.8° (1956).

3. Mean voltage of the radio noise.

4. Modified communications receiver (Hammarlund « Super Pro »).

5. Six frequencies logarithmically spaced from 135 kc/s to 20 Mc/s.

Three-*db* noise bandwidth approximatively 1 kc/s.

6. Accra, Bill, Boulder, Byrd Station, Cook, India, Johannesburg, Maui, Panama Canal Zone, Rabat, Rio de Janeiro, Singapore, Stockholm, Thule, Tokyo.

7. Continuous operation.

8. Quarterly by C.R.P.L.

9. C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.

10. January 1957.

GODHAVN

1. N 69°15′ W 53°30′

2. +79.9° 32.6°

3. Whistlers and dawn chorus.

4. Magnetic tape recording. Absolute time scale good to ±0.05 sec. provided. Equipment designed by Dartmouth College.

5. Three-*db* bandwidth : 500 c/s to 16 kc/s at 19 cm/s recording speed ; to 20 kc/s at 38 cm/s recording speed (down 9 db at 25 kc/s, 13 db at 30 kc/s).

6. Thule, Frobisher Bay, Knob Lake, Father Point, Hanover, Battle Creek, Washington, Bermuda, Gainisville, Huancayo, Ottawa, Halifax, Cape Horn, Port Lockroy, Weddell Sea.

Sferics direction finding provided by U.S. Air Force Air Weather Service stations in Newfoundland, Washington, Florida, Bermuda, and the Azores.

7. 2 minutes per hour at 35 min. past the hour.

8. Subjective results twice a month as per C.S.A.G.I. Manual.

9. Prof. Jorgen Rybner, Prof. of Telecommunications, Royal Technical University of Denmark, Oster Volgade 10, G. Copenhagen, Denmark.

International coordination : Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire, U.S.A.

10. January 1957.

KNOB LAKE

1. N 54°48′ W 66°49′

2. +66.2° (1956) 3.2° (1956).

3. Whistlers and dawn chorus.

4. Magnetic tape recording. Absolute time scale good to ±0.05 sec. provided. Equipment designed by Dartmouth College.

5. Three-*db* bandwidth : 500 c/s to 16 kc/s at 19 cm/s recording speed ; to 20 kc/s at 38 cm/s recording speed (dawn 9 *db* at 25 kc/s, 13 *db* at 30 kc/s).

6. Thule, Godhavn, Frobisher Bay, Father Point, Hanover, Battle Creek, Washington, Huancayo, Cape Horn, Port Lockroy, Weddell Sea, Ottawa, Halifax.

Sferics direction finding provided by U.S. Air Force Air Weather Service stations in Newfoundland, Washington, Florida, Bermuda, and the Azores.

7. 2 minutes every hour commencing at 35 min. past the hour.

8. Subjective results twice a month as per C.S.A.G.I. Manual.

9. McGill Subartic Research Laboratory, Knob Lake, Quebec, Canada.

International coordination : Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire, U.S.A.

10. January 1957.

MAUI

1. N 20°50′ W 156°30′

2. +21.1° 269.1°

3. Three moments of the radio noise plus direction finding.

4. U.S. National Bureau of Standards Model ARN-2.

5. Eight frequencies logarithmically spaced from 50 kc/s to 20 Mc/s.

Three-*db* noise bandwitdh approximatively 300 /cs at each frequency.

6. Accra, Bill, Boulder, Byrd Station, Cook, Front Royal, India, Johannesburg, Panama Canal Zone, Rabat, Rio de Janeiro, Singapore, Stockholm, Thule, Tokyo.

7. Continuous operation.

8. Quarterly by C.R.P.L.

9. C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.

10. January 1957.

OTTAWA

1. N 45°24′ W 75°54′

2. 56.8° (1956) 351.1° (1956).

3. (*a*) Full recording of whistlers waveform.

(*b*) RMS averaged over 10 seconds converted to microvolt per metre for a 1.0 kc/s bandwidth.

4. (*a*) Vertical whip antenna, preamplifier, filter, main amplifier, clipper, magnetic tape recorder, timing and program control equipment.

(*b*) Vertical whip antenna, preamplifier, fixed tuned radio frequency meter, squaring amplifier, average detector, logarithmic converter, recording milliameter.

5. (*a*) 500 c/s to kc/s.

(*b*) 10 kc/s, bandwidth 970 c/s.

6. (*a*) Saskatoon, Halifax.

(*b*) Churchill,

7. (*a*) 2 minutes every hour, starting at 35 minutes past the hour.

(*b*) Continuous.

8.

9. Defence Research Telecommunications Establishment, Defence Research Board, Shirley Bay, Ottawa, Ontario, Canada.

10. November 1956.

PANAMA CANAL ZONE (CHIVA CHIVA)

1. N 9°02′ W 79°35′

2.

3. Mean power of the radio noise.

4. U.S. National Bureau of Standards Model ARN-2.

5. Eight frequencies logarithmically spaced from 50 kc/s to 20 Mc/s.

Three-*db* noise bandwidth approximatively 300 c/s at each frequency.

6. Accra, Bill, Boulder, Byrd Station, Cook, Front Royal, India, Johannesburg, Maui, Rabat, Rio de Janeiro, Singapore, Stockholm, Thule, Tokyo.

7. Continuous operation.

8. Quarterly by C.R.P.L.

9. Signal Corps Radio Propagation Agency, Fort Monmouth, New Jersey, U.S.A.

International coordination by C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.

10. January 1957.

PANSKA VES

1. N 50°32′ E 14°34′
2. +50.3° 98.3°
3. Continuous recording of the number of atmospherics.
4.
5. 16, 27 and 40 kc/s.
6.
7. Continuous recording during day and night.
8. Once a month.
9. Institute of Geophysics, Department of Ionosphere, Academy of Sciences, Kadenská 60, Praha 6, Vokovice, Czecoslovaquia.
10. November 1956.

POITIERS

1. N 46°34′ E 0°21′.
2. 49.5° (1956) 81.8° (1956).
3. (*a*) Mean level of atmospherics and survey of SID.
   (*b*) Radio whistlers.
   (*c*) Parameters affecting oscilligraphic forms of atmospherics.
   (*d*) Direction of atmospherics centres.
4. (*a*) Recording receiver LNR.
   (*b*) Aperiodic amplifier connected to a loud-speaker and a magnetic recorder. Analysis by means of discriminators of the oscillographic form of the whistler.
   (*c*) Aperiodic dE/dt amplifier.
   (*d*) Cathode-ray direction finder.
5. (*a*) 27 kc/s (*c*) 0.05-20 kc/s
   (*b*) 0.8-10 kc/s (*d*) 27 kc/s
6. (*a*) LNR Bagneux (*b*) Kerguelen
   (*c*) Cambridge U. K.

7. (*a*) Continuous recording.

(*b*) Continuous survey during the day, automatic magnetic recording during the night, 4 min/h.

(*c*)
(*d*) } A few weeks yearly.

8. L.N.R.

9. (*a*) L.N.R. Department R.N.
196, rue de Paris, Bagneux (Seine), France.

(*b*)
(*c*)
(*d*) } Mr. R. Rivault, Annexe du L.R.N., Chemin des Sables, Poitiers (Vienne), France.

10. August 1956.

Poona

1. N 18°32′ E 73°51′.

2. 09.3° (1956) 144.6° (1956).

3. (*a*) Intensity.
(*b*) Number per minute } of atmospherics.
(*c*) Direction of arrival

4. (*a*) (*b*) T.R.F. Receivers of four long wave bands, recording cathode-ray oscillograph or telephone counters.

(*c*) Two square loop aerials and one vertical aerial and three tuned receivers and recording cathode-ray oscillograph.

5. (*a*) (*b*) 85, 125, 175, 455 kc/s ; bandwidth 10 kc/s.
(*c*) 175 kc/s.

6. —

7. (*a*) one minute at 2030, 2230, 2400.
(*b*) Three minutes at the end of every hour of the day.
(*c*) Not yet fixed.

8. Indian Journal of Geophysics and Meteorology.

9. Dr. M. W. Chiplonkar, M. Sc., D. Sc., Head of Department of Physics, University of Poona, Poona, 7, India.

10. July 1956.

PRŮHONICE

1. N 49°59′ E 14°33′

2. +49.9° 97.3°

3. Continuous recording of the number of atmospherics.

4. —

5. 27 kc/s.

6. —

7. Continuous recording during day and night.

8. Monthly.

9. Institute of Geophysics, Department of Ionosphere, Academy of Sciences, Kladenská 60, Praha 6, Vokovice, Czecoslovaquia.

10. November 1956.

RABAT

1. N 33°55′ W 06°50′

2. 38.6° (1956) 69.9° (1956).

3. Direction finding of atmospherics centres and recording of the mean level.

4. Narrow-beam direction-finder.

5. 27 kc/s.

6. Brest, Tunis, Bagneux, Trappes.

7. Continuous recording from 00 to 24 h.

8. Messages SFAZU to L.N.R. (Bagneux).
Recording transmitted to Bagneux.

9. L.N.R., Département R. N., 196, rue de Paris, Bagneux (Seine), France.

10. August 1956.

RIO DE JANEIRO

1. S 22°54′ W 43°14′.

2. —12.5° (1956) 24.2° (1956).

3. Three moments of the radio noise plus direction finding.

4. U.S. National Bureau of Standards Model ARN-2.

5. Eight frequencies logarithmically spaced from 50 kc/s to 20 Mc/s.

Three-*db* noise bandwidth approximatively 300 c/s at each frequency.

6. Accra, Bill, Boulder, Byrd Station, Cook, Front Royal, India, Johannesburg, Maui, Panama Canal Zone, Rabat, Singapore, Stockholm, Thule, Tokyo.

7. Continuous operation.

8. Quarterly by C.R.P.L.

9. Ministereo da Aeronautica, Centro Technico da Aeronautica, Sao Jose dos Campus, Brazil.

International coordination : C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.

10. January 1957.

SASKATOON

1. N 52°06′ W 106°36′.

2. +60.5° (1956) 310.4° (1956).

3. Full recording of whistlers waveform.

4. Vertical whip antenne, preamplifier, filters, main amplifier, clipper, magnetic tape recorder, timing and program control equipment.

5. 500 kc/s to 15 kc/s.

6. Ottawa, Halifax.

7. 2 minutes every hour starting at 35 minutes past the hour.

8. —

9. Defence Research Telecommunications Establishment, Defence Research Board, Shirley Bay, Ottawa, Ontario, Canada.

10. November 1956.

SINGAPORE

1. N 01°19′ E 103°49′.

2. −10.1° (1956) 172.8° (1952).

3. Field-strength of slow speed Morse signal giving 95 % intelligibility through the noise.

4. Thomas equipemnt : vertical aerial (6 m), preamplifier with 2-20 Mc/s filter, superhet receiver, signal generator, keying unit. Aural Indication of level using headphones ; manual operation.

5. 2.5, 5, 10, 15, 20 Mc/s : bandwidth 6 kc/s.

6. —

7. The 5 frequencies every hour at the hour, except 1951-June 1953, when from 0800 to 1800 h.

8. March-Nov. 1951 : D.S.I.R. Special Report nº 26 (R.R.B.). Nov. 1951 to date : data available but not published.

9. D.I.S.R., Radio Research Station, Slough, England.

10. March 1956.

SLOUGH

1. N 51º30′ W 0º36′.

2. 54.3º (1956) 83.2º (1956).

3. At L. F. average level and structure, r. m. s. calculable from data. Similar measurements will be made at H. F.

4. Automatic pen-recording of average level and structure simultaneously on two low frequencies.
H. F. equipment in course of construction.

5. 10-30 kc/s, bandwidth 300 c/s.
10 Mc/s, various bandwidths.

6. —

7. Routine results from Aug. 1953 to date, intermittently, at L. F.
A simular programme will be carried out at H. F.

8. In course of publications.

9. D.S.I.R., Radio Research Station, Slough, Bucks, England.

10. March 1956.

STOCKHOLM

1. N 59º21′ E 17º57′.

2.

3. Three moments of the radio noise.

4. U.S. National Bureau of Standards, Model ARN-2.

5. Eight frequencies logarithmically spaced from 50 kc/s to 20 Mc/s.

Three-*db* bandwidth approximately 300 c/s each frequency.

6. Accra, Bill, Boulder, Byrd Station, Cook, Front Royal, India, Johannesburg, Maui, Panama Canal Zone, Rabat, Rio de Janeiro, Singapore, Thule, Tokyo.

7. Continuous operation.

8. Quarterly by C.R.P.L.

9. The Royal Board of Swedish Telecommunications, Stockholm, Sweden.

International coordination : C.R.P.L., National Bureau of Standards, Boulder, Colorado, U.S.A.

10. January 1957.

TAHITI

1.

2.

3. Study of propagation of atmospherics, recording of the mean field strength of atmospherics.

4. Recording receivers.

5. 27 kc/s, bandwidth 1000 c/s.
5 Mc/s.

6. —

7. Continuous recording from 0 to 24 h.

8. Results transmitted to L.N.R. Bagneux.

9. Laboratoire National de Radioélectricité, Département R.N., 196, rue de Paris, Bagneux (Seine), France.

10. August 1956.

C. C. I. R.

Names and Addresses of Chairmen and Vice-Chairmen of C.C.I.R. Study Groups

Chairman	*Vice-Chairman*
S. G. I	
Colonel J. LOCHARD, Groupement des Contrôles radioélectriques, Fort du Mont-Valérien, Suresnes (Seine), France.	Prof. S. RYZKO, Politechnika Warszawska, Warszawa, R. P. de Pologne.
S. G. II	
M. P. DAVID, Ingénieur en chef du Ministère des Forces armées (Marine), Laboratoire Radio/Radar, 8, bd Victor, Paris XV^{e}, France.	M. P. ABADIE, Ingénieur en chef, Laboratoire National de Radioélectricité, 196, rue de Paris, Bagneux (Seine), France.
S. G. III	
Dr. H. C. A. VAN DUUREN, Director of Dr. Neher Laboratory, St. Paulusstraat, 4, Leidschendam, Netherlands.	Mr. A. COOK, Assistant Staff Engineer, General Post Office, London E.C.1, England.
S. G. IV	
Prof. Gén. L. SACCO, Lungotevere Flaminio 22, Rome, Italie.	Mr. G. MILLINGTON, Research Engineer, M.I.M.C.C., Marconi House, Chelmsford (Essex), England.
S. G. V	
Dr. R. L. SMITH-ROSE, C. B. E., Director of Radio Research, Radio Research Station, Ditton Park, Slough (Bucks.), England.	Mr. E. W. ALLEN, Chief Engineer, Federal Communications Commission, Washington 25 D. C., U.S.A.
S. G. VI	
Dr. J. H. DELLINGER, RCA Frequency Bureau, 1625 K Street, N. W., Washington 6 D. C., U. S. A.	Mr. D. K. BAILEY, Scientific Director, Page Communications Engineers, Inc., 710-14th Street, N. W. Washington 5 D. C., U. S. A.

S. G. VII

M. B. DECAUX, Ingénieur en chef, Laboratoire National de Radioélectricité, 196, rue de Paris, Bagneux (Seine), France.

Prof. M. BOELLA, Consiglio Nazionale delle Ricerche, I.E.N., Corso Massimo d'Azeglio 42, Turin, Ita'ie.

S. G. VIII

Mr. J. D. CAMPBELL, Sectional Engineer, Postmaster General's Depart ment, Melbourne, Australia.

Mr. G. S. TURNER, Chief, Field Engineering and Monitoring Division, Federal Communications Commission, Washington 25 D. C., U. S. A.

S. G. IX

Mr. H. STANESBY, Staff Engineer, Post Office Engineering Department, General Post Office, London E.C.1, England.

Mr. G. PEDERSEN, Chef de la Division technique, Direction générale des Postes et des Télégraphes, Copenhague, Danemark.

S. G. X

Mr. A. Prose WALKER, Director of Engineering, N.A.R.T.B., 1771 N. Street, N. W., Washington 6 D. C., U. S. A.

Mr. K. W. MILLER, Engineering Assistant to Commissioner Robert P. Bartley, Federal Communications Commission, Washington 25 D. C., U. S. A.

S. G. XI

Mr. E. ESPING, Board of Swedish Telecommunications, Stockholm.

M. G. HANSEN, Directeur du Centre technique, Union Européenne de Radiodiffusion, 4, rue de la Vallée, Bruxelles, Belgique.

S. G. XII

Mr. B. V. BALIGA, Adviser, Wireless Planning and Coordination, Ministry of Communications, New Delhi, India.

Mr. M. B. SARWATE, Wireless Adviser, Ministry of Communications, New Delhi, India.

S. G. XIII

Mr. J. D. H. VAN DER TOORN, Director General, P.T.T., 12, Kortenaerkade, The Hague, Netherlands.

Mr. N. J. SÖBERG, Engineer-in-Chief, Norwegian Telecommunication Administration, Oslo, Norway.

Prof. T. GORIO, Viale Trastevere 248, Rome, Italie.

M. R. VILLENEUVE, Ingénieur en chef, C.N.E.T., Issy-les-Moulineaux (Seine), France.

Allocation of Reports, Resolutions, Questions and Study Programmes to the Study Groups of the C.C.I.R.

Note : In this list, in conformity with the instructions of the VIIth Plenary Assembly, the Questions are followed by the relevant Study Programmes. The Study Programmes which are not derived from any Question at present under study are marked with an asterisk.

Reports and Resolutions arising directly from a Question or a Study Programme, still under study, immediately follow it; otherwise they are preceded by an asterisk.

In the list which follows the texts are arranged in order of subject.

Resolutions which do not directly concern the Study Groups have been omitted.

Document numbers given in brackets after the titles indicate the Warsaw documents as submitted to the Plenary Assembly. The accepted versions of these documents will be reproduced in Volume I.

* * *

STUDY GROUP Nº I

(Transmitters)

Chairman : Colonel J. LOCHARD (France)

Vice-Chairman : Prof. S. RYZKO (Poland)

Question nº 1 (I)	Revision of Atlantic City Recommendation nº 4.
Report nº 38	Determination of the type of emission producing minimum interference (Doc. nº 857).
Study Programme nº 2 (I)	Harmonics and parasitic emissions.

Report nº 17	Harmonics and parasitic emissions.
Study Programme nº 3 (I)	Frequency stabilisation of transmitters.
Study Programme nº 40 (I)	Methods of measuring emitted spectra in actual traffic.
Study Programme nº 82 (I)	Bandwidth of emissions (Doc. nº 846).
Question nº 18 (I)	Telegraphic distortion.
Question nº 20 (I)	Frequency-shift keying.
Study Programme nº 41 (I)	Frequency-shift keying.
Report nº 40	Frequency-shift keying (Doc. nº 819).
Study Programme nº 83 (I)	Four-frequency diplex systems (Doc. nº 776).
Question nº 74 (I)	Arrangement of channels in multi-channel telegraph systems for long-range radio circuits operating on frequencies below about 30 Mc/s.
Report nº 39	Arrangement of channels in multi-channel radiotelegraph systems for long-range circuits operating on frequencies below about 30 Mc/s (Doc. nº 778).
Question nº 75 (I)	Limitation of unwanted radiation from industrial installations.
Study Programme nº 84 (I)	Limitation of unwanted radiation from industrial installations (Doc. nº 961).
Resolution nº 20	Measurement of unwanted radiation from industrial installations (Doc. nº 904).

STUDY GROUP Nº II

(*Receivers*)

Chairman : Mr. P. DAVID (France)

Vice-Chairman : Mr. P. ABADIE (France)

Question nº 78 (II)	Choice of intermediate frequency and protection against undesired responses of super-heterodyne receivers.
Report nº 41	Choice of intermediate frequency and protection against undesired responses of super-heterodyne receivers (Doc. nº 972).
Question nº 123 (II)	Sensitivity and noise factor (Doc. nº 924).

Question nº 124 (II)	Frequency stability of receivers (Doc. nº 973).
Question nº 125 (II)	The usable sensitivity of radio receivers in the presence of quasi-impulsive interference (Doc. nº 927).
Question nº 126 (II)	Spurious emissions from receivers excluding sound-broadcast and television (Doc. nº 912).
Question nº 127 (II)	Distortion in frequency-modulation receivers due to multipath propagation (Doc. nº 928).
Question nº 128 (II)	Selectivity of receivers (Doc. nº 781).
*Study Programme nº 43 (II)	Protection against keyed interfering signals.

STUDY GROUP Nº III

(*Fixed service systems*)

Chairman : Dr. H. C. A. VAN DUUREN (Netherlands)

Vice-Chairman : Mr. A. COOK (United Kingdom)

Question nº 3 (III)	Revision of Atlantic City Recommendation nº 4.
Study Programme nº 44 (III)	Effect of interference and noise on quality of service in the presence of fading.
Study Programme nº 45 (III)	Bandwidth and signal-to-noise ratios in complete systems.
Question nº 43 (III)	Voice-frequency telegraphy on radio circuits.
Study Programme nº 46 (III)	Voice-frequency telegraphy on radio circuits.
Report nº 19	Voice-frequency telegraphy on radio circuits.
Question nº 81 (III)	Directivity of antennae at great distances.
Study Programme nº 85 (III)	Improvement obtainable from the use of directional antennae (Doc. nº 921).
Question nº 82 (III)	Interference effects of atmospheric noise on radio reception.
Study Programme nº 49 (III)	Interference effects of atmospheric noise on radio reception.

Question nº 84 (III)	Determination of the maximum interference levels tolerable in complete systems.
Question nº 94 (III)	Facsimile transmission of documentary matter over combined radio and metallic circuits.
Question nº 95 (III)	Transmission of half-tone pictures over radio circuits.
Question nº 129 (III)	The use of radio circuits in association with 5-unit start-stop telegraph apparatus (Doc. nº 818).
Study Programme nº 50 (III)	The use of radio circuits in association with 5-unit start-stop telegraph apparatus.
Report nº 42	The use of radio circuits in association with 5-unit start-stop telegraph apparatus (Doc. nº 939).
Question nº 130 (III)	Transmission of meteorological charts over radio circuits by direct frequency-modulation of the carrier (Doc. nº 645).
Question nº 131 (III)	Determination of the required interference protection ratios between various classes of emissions (Doc. nº 930).
Question nº 132 (III)	Radio systems employing ionospheric scatter propagation (Doc. nº 992).
Question nº 133 (III)	Communication theory (Doc. nº 886).
Study Programme nº 86 (III)	Communication theory (Doc. nº 888).

STUDY GROUP Nº IV

(*Ground-wave propagation*)

Chairman : Prof. L. SACCO (Italy)

Vice-Chairman : Mr. G. MILLINGTON (United Kingdom)

*Report nº 43	Review of publications on propagation (Report nº 3 modified).
*Report nº 46	Temporal variations of ground-wave field-strength (Doc. nº 834).
Question nº 134 (IV)	Ground-wave propagation (Doc. nº 826).
Study Programme nº 87 (IV)	Effects of standard tropospheric refraction on frequencies below 10 Mc/s (Doc. nº 956).

Report nº 45	Effects of standard tropospheric refraction on frequencies below 10 Mc/s (Doc. nº 936).
Study Programme nº 88 (IV)	Ground wave propagation over mixed paths (Doc. nº 962).
Report nº 47	Ground-wave propagation over mixed paths (Doc. nº 963).
Study Programme nº 89 (IV)	Ground-wave propagation over irregular terrain (Doc. nº 937).
Report nº 21	Ground-wave propagation over irregular terrain.
Report nº 44	Ground-wave propagation over irregular terrain. Addendum to Report nº 21 (Doc. nº 976).
Question nº 135 (IV)	Determination of the electrical characteristics of the surface of the earth (Doc. nº 803).

STUDY GROUP Nº V

(*Tropospheric propagation*)

Chairman : Dr. R. L. SMITH-ROSE (United Kingdom)

Vice-Chairman : Mr. E. W. ALLEN (United States)

*Report nº 48	Field-strength measurement (Doc. nº 774).
*Report nº 49	Methods of measuring field-strength (Doc. nº 774).
*Report nº 50	Methods of measuring field-strength (Doc. nº 774).
Question nº 101 (V)	Advantages to be obtained from consideration of polarisation in the planning of broadcasting services in the VHF (metric) and UHF (decimetric) bands (television and sound).
Report nº 85 [1]	Advantages to be obtained from consideration of polarisation in the planning of broadcasting services in the VHF (metric) and UHF (decimetric) bands (television and sound) (Doc. nº 949).

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[1] Question nº 101 (V) having been allocated to Study Group nº V by the VIIIth Plenary Assembly of the C.C.I.R., Report nº 85 which refers to the same subject has also been allocated to the same Study Group.

Question nº 136 (V)	Propagation data required for wide band radio systems (Doc. nº 843).
Report nº 53	Propagation data required for wide-band radio systems (Doc. nº 842).
Study Programme nº 79 (V)	Tropospheric propagation across mountain ridges.
Report nº 52	Tropospheric propagation across mountain ridges (Doc. nº 812).
Question nº 137 (V)	Measurement of field strength in the neighbourhood of obstacles (Doc. nº 770).
Question nº 138 (V)	Measurement of field strength for VHF (metric) and UHF (decimetric) broadcast services, including television (Doc. nº 772).
*Study Programme nº 55 (V)	Tropospheric propagation curves for distances well beyond the horizon.
*Study Programme nº 57 (V)	Investigation of multipath transmission through the troposphere.
Report nº 51	Investigation of multipath transmission through the troposphere (Doc. nº 702).
*Study Programme nº 90 (V)	Tropospheric-wave propagation (Doc. nº 773).
*Study Programme nº 91 (V)	Radio transmission utilising inhomogeneities in the troposphere (commonly termed « scattering ») (Doc. nº 889).

STUDY GROUP Nº VI

(*Ionospheric propagation*)

Chairman : Dr. J. H. DELLINGER (United States)

Vice Chairman : Mr. D. K. BAILEY (United States)

*Report nº 54	Long distance propagation of waves of 30 to 300 Mc/s by way of ionisation in the E and F regions of the ionosphere (Doc. nº 922).
*Report nº 55	Practical uses and reliability of ionospheric propagation data (Doc. nº 977).
*Report nº 56	Questions submitted by the I.F.R.B. (Doc. nº 980).
*Report nº 58	Exchange of information for the preparation of short-term forecasts and the transmission of ionospheric disturbance warnings (Doc. nº 676-Rev.).

*Report nº 60	Centralising agencies for the rapid exchange of information on propagation (Doc. nº 951).
*Report nº 61	Extension of the C.C.I.R. propagation curves below 300 kc/s (Doc. nº 782).
*Report nº 62	Investigation of circularly polarised emitted waves propagated via the ionosphere (Doc. nº 908).
*Resolution nº 25	Local lightning-flash counters (Doc. nº 806).
Question nº 139 (VI)	The influence of Doppler shifts on long-distance high-frequency communication using frequency-shift keying (Doc. nº 935).
*Study Programme nº 60 (VI)	Basic prediction information for ionospheric propagation.
*Study Programme nº 63 (VI)	Radio propagation at frequencies below 1500 kc/s.
Report nº 63	Radio propagation at frequencies below 1500 kc/s (Doc. nº 953).
*Study Programme nº 66 (VI)	Study of fading.
Report nº 59	Fading of HF (decametric) and MF (hectometric) signals propagated by the ionosphere (Doc. nº 856).
*Study Programme nº 92 (VI)	Choice of a basic index for ionospheric propagation (Doc. nº 679).
Report nº 57	Choice of a basic index for ionospheric propagation (Doc. nº 678).
*Study Programme nº 93 (VI)	Identification of precursors indicative of short-term variations of ionospheric propagation conditions (Doc. nº 677).
*Study Programme nº 94 (VI)	Use of special modulation on the standard-frequency transmissions for assessing the reliability of propagation forecasts (Doc. nº 840).
*Study Programme nº 95 (VI)	Ionospheric scatter propagation (Doc. nº 952).
Report nº 64	Regular long-distance transmission in the VHF (metric) band by means of scattering from inhomogeneities in the lower ionosphere (Doc. nº 909).

*Study Programme nº 96 (VI)	Measurement of atmospheric radio noise (Doc. nº 839).
Report nº 65	Revision of atmospheric radio noise data (Doc. nºs 797 and 490).
*Study Programme nº 97 (VI)	Pulse-transmission tests at oblique incidence (Doc. nº 934).
*Study Programme nº 98 (VI)	Back-scattering (Doc. nº 954).
*Study Programme nº 99 (VI)	Estimation of sky-wave field strengths on frequencies above 1500 kc/s (Doc. nº 946).
*Study Programme nº 100 (VI)	Prediction of solar index (Doc. nº 656).

STUDY GROUP Nº VII

(Standard frequencies and time signals)

Chairman : Mr. B. DECAUX (France)

Vice-Chairman : Professor M. BOELLA (Italy)

Question nº 140 (VII)	Standard-frequency transmissions and time signals (Doc. nº 836).
Report nº 66	Standard-frequency transmissions and time signals (Doc. nº 903).
Study Programme nº 101 (VII)	Standard-frequency transmissions and time signals (Doc. nº 835).
Question nº 141 (VII)	Stability of standard-frequency transmissions and time signals as received (Doc. nº 813).
Question nº 142 (VII)	Standard-frequency transmissions and time signals in additional frequency bands (Doc. nº 703).

STUDY GROUP Nº VIII

(International monitoring)

Chairman : Mr. J. CAMPBELL (Australia)

Vice-Chairman : Mr. G. S. TURNER (United States)

*Report nº 67	Frequency measurements above 50 Mc/s at monitoring stations (Doc. nº 789)
Question nº 143 (VIII)	Automatic monitoring of occupancy of the radio-frequency spectrum (Doc. nº 788).
Question nº 144 (VIII)	Measurements at mobile monitoring stations (Doc. nº 795).

Question nº 145 (VIII)	Frequency measurements at monitoring stations (Doc. nº 861).
*Study Programme nº 102 (VIII)	Field-strength measurements at monitoring stations (Doc. nº 790).
*Study Programme nº 103 (VIII)	Spectrum measurement at monitoring stations (Doc. nº 794).
Report nº 68	Spectrum measurement at monitoring stations (Doc. nº 791).

STUDY GROUP Nº IX

(Radio relay systems)

Chairman : Mr. H. STANESBY (United Kingdom)

Vice-Chairman : Mr. G. PEDERSEN (Denmark)

*Report nº 69	International wide-band radio relay systems operating on frequencies above about 30 Mc/s. Transmission of telephony and television on the same system (Doc. nº 704).
*Report nº 74	Methods for the computation of intermodulation noise due to non-linearity in radio relay systems (Doc. nº 784).
*Study Programme nº 28 (IX)	Wide-band radio systems operating in the VHF (metric), UHF (decimetric) and SHF (centimetric) bands.
Question nº 92 (IX)	Standardisation of multi-channel radiotelephone systems using time-division multiplex and operating at frequencies above about 30 Mc/s.
Report nº 70	Preferred characteristics of multichannel radiotelephone systems using time-division multiplex and operating on frequencies above about 30 Mc/s (Doc. nº 733).
Question nº 93 (IX)	Standardisation of multi-channel radiosystems using frequency-division multiplex and operating at frequencies above about 30 Mc/s.
Report nº 71	Preferred characteristics for multichannel radio systems using frequency-division multiplex and operating at frequencies above about 30 Mc/s (Doc. nº 729).

Study Programme nº 104 (IX)	Standardisation of multi-channel systems using frequency-division multiplex and operating at frequencies above about 30 Mc/s (Doc. nº 848).
Question nº 96 (IX)	Maintenance procedure for wide-band radio systems.
Report nº 72	Maintenance procedure for wide-band radio systems. Service channels (Doc. nº 798).
Report nº 73	Transmission of pilot frequencies over circuits consisting of cable paths and radio relay links (Doc. nº 853).
Question nº 97 (IX)	Hypothetical reference circuit for wide-band radio systems.
Study Programme nº 105 (IX)	Wide-band radio relay systems. Noise tolerable during very short periods of time (Doc. nº 918).
Question nº 146 (IX)	Preferred characteristics of radio relay systems for the transmission of monochrome television (Doc. nº 708).
Question nº 147 (IX)	Service channels for wide-band radio relay systems (Doc. nº 799).
Question nº 148 (IX)	Radio relay systems employing tropospheric scatter propagation (Doc. nº 916).

STUDY GROUP Nº X

(*Broadcasting*)

Chairman : Mr. A. Prose WALKER (United States)

Vice-Cnairman : Mr. K. W. MILLER (United States)

*Report nº 33	Questions nºs 14 and 15 of the C.C.I.F.
*Report nº 81	Sound recording on film for the international exchange of television programmes (Doc. nº 943).
Question nº 23 (X)	High-frequency broadcasting. Directional antenna systems.
Report nº 32	High-frequency broadcasting. Directional antenna systems.
Report nº 75	High-frequency broadcasting. Directional antennae with reduced subsidiary lobes (Doc. nº 905).

Study Programme nº 106 (X)	H. F. (decametric) broadcasting. Directional antenna systems (Doc. nº 879).
Question nº 37 (X)	High-frequency broadcasting. Justification for use of more than one frequency per programme.
Report nº 76	The minimum number of frequencies necessary for the transmission of a high-frequency broadcasting programme (Doc. nº 869).
Study Programme nº 107 (X)	High-frequency broadcasting. Directional aerial systems for reception areas of unusual size or shape (Doc. nº 863).
Study Programme nº 108 (X)	High-frequency broadcasting. Use of synchronised transmitters (Doc. nº 892)
Question nº 39 (X)	High-frequency broadcasting. Conditions for satisfactory reception.
Report nº 14	High-frequency broadcasting reception.
Question nº 149 (X)	H. F. (decametric) broadcasting. Effects of closer spacing between carrier frequencies (Doc. nº 866).
Question nº 150 (X)	Frequency-modulation broadcasting in the VHF (metric) band (Doc. nº 865).
Report nº 77	Frequency-modulation sound broadcasting in the VHF (metric) band (Doc. nº 867).
Question nº 151 (X)	Measurement of programme level in sound broadcasting (Doc. nº 882).
Study Programme nº 109 (X)	Measurement of programme level in sound broadcasting (Doc. nº 881).
*Study Programme nº 74 (X)	Standards of sound recording for the international exchange of programmes.
Report nº 78	Measurement of wow and flutter in equipment for sound recording and reproduction (Doc. nº 901).
Report nº 79	Standards of sound recording for the international exchange of programmes (Doc. nº 870).
Report nº 80	Width of magnetic tape (Doc. nº 884).
Resolution nº 30	Width of magnetic tape (Doc. nº 890).

STUDY GROUP Nº XI

(*Television*)

Chairman : Mr. E. ESPING (Sweden)

Vice-Chairman : Mr. G. HANSEN (Belgium)

Question nº 66 (XI)	Television recording.
Question nº 117 (XI)	Single value of signal-to-noise ratio for different television systems.
Question nº 118 (XI)	Colour television standards.
Report nº 83	Television systems (Doc. nº 915).
Study Programme nº 80 (XI)	Standards for video colour television signals.
Study Programme nº 81 (XI)	Standards for radiated colour television signals.
Study Programme nº 110 (XI)	Distortion of television signals due to the use of vestigial-sideband transmission (Doc. nº 948).
Question nº 119 (XI)	Ratio of the wanted to the unwanted signal in television.
Report nº 82	Ratio of the wanted to the unwanted signal in monochrome television (Doc. nº 917).
Study Programme nº 111 (XI)	Ratio of the wanted to the unwanted signal in television. Use of the offset method when there are great differences between the carrier frequencies of the interfering stations (Doc. nº 872).
Question nº 120 (XI)	Exchange of television programmes.
Question nº 121 (XI)	The transmission of monochrome and colour television signals over long distances.
Report nº 84	Requirements for the transmission of television over long distances (Doc. nº 907).
Resolution nº 32 (XI)	The transmission of monochrome and colour television signals over long distances (Doc. nº 910).
Study Programme nº 32 (XI)	The requirements for the transmission of television over long distances.
Study Programme nº 35 (XI)	Reduction of the bandwidth for television.

Study Programme nº 36 (XI)	Conversion of a television signal from one a standard to another.
Question nº 152 (XI)	Assessment of the quality of television pictures (Doc. nº 902).
Question nº 153 (XI)	Resolving power and differential sensitivity of the human eye (Doc. nº 914).

STUDY GROUP Nº XII

(Tropical broadcasting)

Chairman : Mr. B. V. BALIGA (India)

Vice-Chairman : Dr. M. B. SARWATE (India)

Question nº 102 (XII)	Interference in the bands shared with broadcasting.
Reoprt nº 89	Interference in the bands shared with broadcasting (Doc. nº 929).
Study Programme nº 112 (XII)	Short distance high frequency broadcasting in the tropical zone (tropical broadcasting) (Study Programme nº 38 modified).
Study Programme nº 113 (XII)	Interference in the bands shared with broadcasting (Study Programme nº 77 modified).
Study Programme nº 114 (XII)	Interference in the frequency bands used for tropical broadcasting (Doc. nº 982).
Question nº 154 (XII)	Best method for calculating the field strength produced by a tropical broadcasting transmitter (Question nº 69 modified).
Report nº 88	Best method for calculating the sky-wave field strength produced by a tropical broadcasting transmitter (Doc. nº 897).
Question nº 155 (XII)	Determination of noise level for tropical broadcasting (Question nº 71 modified).
Question nº 156 (XII)	Design of transmitting aerials for tropical broadcasting (Question nº 103 modified).
Report nº 86	Design of aerials for tropical broadcasting (Report nº 36 modified).

Report nº 87	Design of transmitting aerials for tropical broadcasting (Complement to Report nº 86) (Doc. nº 983).
Question nº 157 (XII)	Fading allowances for tropical broadcast transmissions (Doc. nº 804).

STUDY GROUP Nº XIII

(Mobile services)

Chairman : Mr. J. D. H. VAN DER TOORN (Netherlands)

Vice-Chairman : Mr. J. SÖBERG (Norway)

*Report nº 90	Publication of service codes in use in the international telegraph service (Doc. nº 971).
Question nº 104 (XIII)	Identification of radio stations.
Report nº 91	Identification of radio stations (Doc. nº 757).
Study Programme nº 115 (XIII)	Identification of radio stations (Doc. nº 740).
Question nº 158 (XIII)	Marine identification device (Doc. nº 749).
Report nº 92	Marine identification device (Doc. nº 814).
Question nº 159 (XIII)	Bearing and position classification for direction finding in the VHF (metric), HF (decametric) and the 2 Mc/s bands (Doc. nº 751).
Report nº 93	H. F. (decametric) and VHF (metric) direction finding (Doc. nº 752).
Question nº 160 (XIII)	Selective calling devices for use in the international VHF (metric) maritime mobile service (Doc. nº 761).
Question nº 161 (XIII)	Spurious emissions from frequency-modulated VHF (metric)maritime equipment (Doc. nº 759).
Question nº 162 (XIII)	Technical characteristics of single-sideband aeronautical mobile and maritime radiotelephone equipments (Doc. nº 758).
Question nº 163 (XIII)	Characteristics of equipments and principles governing the allocation of channels in the VHF (metric) and UHF (decimetric) land mobile services (Doc. nº 849).

STUDY GROUP Nº XIV

(Vocabulary)

Chairman : Prof. T. GORIO (Italy)

Vice-Chairman : Mr. R. VILLENEUVE (France)

*Resolution nº 5	Means of expression. Definitions, vocabulary, graphical and letter symbols.
*Resolution nº 34	Definitions of certain basic words used in the International Telecommunication Convention (Doc. nº 989).
*Report nº 94	Means of expression (Doc. nº 988).
Question nº 72 (XIV)	Decimal classification.
Report nº 37	Decimal classification.
Report nº 95	Decimal classification (Doc. nº 990).

QUESTIONS SUBMITTED TO OTHER CONSULTATIVE COMMITTEES

(Art. 7, para. 2, International Telecommunication Convention, Buenos Aires, 1952)

(a) Submitted to the C.C.I.T. :

Question nº 109	The use of radio circuits in association with 5-unit start-stop telegraph apparatus: Signals other than those specified by the International Telegraph Alphabet nº 2.
Question nº 110	The use of radio circuits in association with 5-unit start-stop telegraph apparatus : The maximum tolerable signal error rates.

(b) Submitted to the C.C.I.F. :

Question nº 111	Signal amplitudes in individual channels of multi-channel telephone systems
Question nº 112	Information required on the transmission characteristics of line systems for use in the design of wide-band radio relay systems.

A. G. I.

The Annals of the I.G.Y.

The Bureau of C.S.A.G.I. and the Advisory Committee on Publications have decided on publication of the Annals of the International Geophysical Year.

There is a Board of Associate Editors for the Annals consisting of the Reporters for the various disciplines of the C.S.A.G.I. The Annals will provide a means for publication of material on all aspects of the I.G.Y. In principle, Volume I will be devoted to a historical description of the First and Second Polar Years and to a general presentation of the International Geophysical Year together with its list of stations. Volume II will consist of all the official documents of the C.S.A.G.I. Volume III will contain chapters from the ionospheric and auroral manuals and will be the first volume to appear. The other volumes will appear consecutively to assure rapid distribution.

Each I.G.Y. National Committee will receive a free subscription and will be able to purchase additional copies of the Annals at a price at least 25 % below the normal cost. Pergamon Press will publish the Annals of the I.G.Y. and is to establish direct contact with the National Committees.

Each member of C.S.A.G.I. will receive a free subscription to the Annals. Members of U.R.S.I. National Committees may obtain copies of the Annals of the I.G.Y. at the reduced by ordering through the General Secretary of U.R.S.I.

In order to secure rapid publication of the Annals in accordance with C.S.A.G.I. regulations, texts must be supplied in French or English to the C.S.A.G.I. General Secretary who, after examining them, will place them at the disposal of the C.S.A.G.I. Editor for printing.

I.G.Y. News

ADDRESSES OF WORLD DAY REGIONAL AND ASSOCIATE REGIONAL WARNING CENTRES AND NATIONAL CONTACTS AS AT PRESENT REPORTED

Argentina : Servicio Meteorologico Nacional, Paseo Colon 317, Buenos Aires. Cable : AGI BUENOS AIREA.

Australia (ARWC) : Dr. W. G. BAKER, Ionospheric Prediction Service, 5 Hickson Road, Millers Point, Sydney, New South Wales. Cable : IPSO SYDNEY.

Belgium : Dr. M. NICOLET (Intérim), Institut Royal Météorologique, 3, Avenue Circulaire, Uccle. Cable : CSAGI SEC.

Bolivia : Ing. Antonio BERTHIN, Laboratorio de Fisica Cosmica, Universidad de San Andres, La Paz. Cable : INGEOMIL-LA PAZ.

Brazil : J. C. Junquiera SCHMIDT, Servicio de Meteorologia, Praca 15 de Novembre, Edificio de Pesiquas, S. Ano, Rio de Janeiro. Cable : JUNQUIERO-RIO.

Canada : Ionosphere Station, Department of Transport, c/o Radio Propagation Laboratory, Shirley Bay, Ottawa.

Chile : Dr. Ubalda MATASSI e I., Casilla 717, Santiago. Cable : METEO-SANTIAGO.

Colombia : Capitan de Fragata Augusto O. PORTO, Comando Armada, Carr 10, 16-30, Bogota. Cable : COMDEARC BOGOTA.

Czechoslovakia : Dr. Jiri MRAZEK, Institute of Geophysics of the Czechoslovakian Academy of Sciences, Kladenská, 60, Praha Vokovice.

Denmark : The Danish Meteorological Institute, Copenhagen. Cable : METOBS, COPENHAGEN.

Ecuador : Dr. Alfredo SCHMIDT, Observatorio Astronomico, Quito.

Egypt : Mr. H. A. LOTFY, Chief, Telecommunications Division, Meteorological Department, Koubri El Koubba, Cairo. Cable : Mr. LOTFY, WEATHER CAIRO.

Eire : Dr. M. DOPORTO, Director, Meteorological Service, 44 Upper O'Connel-Street, Dublin. Cable : METEO DUBLIN.

Finland : Mr. H. W. SALTIN, Finnish Meteorological Office, Vuorikatu 24, Helsinki. Cable : OFKL Helsinki.

France (RWC) : A. DELOUF, Bureau Ionospherique Français, 196, rue de Paris, Bagneux (Seine). Cable : GENTELABO, PARIS.

German Federal Republic (RWC) : Herr RICHTER, Fernmeldetechnisches Zentralamt (FZP), Darmstadt, Rheinstrasse 110. Cable : IONO-SPHERE DARMSTADT.

Great Britain : R. L. SMITH ROSE, Department of Scientific and Industrial Research, Radio Research Station, Ditton Park, Slough, Bucks.

Guatemala : Francis GALL, Secretario del Comite Nacional del A.G.I., Avenida de las Americas 6-76, Zona 13, Guatemala. Cable : AGI-GUATEMALA.

Iceland : Mr. Eysteinn TRYGGVASON, Vedurstofan, Reykjavik. Cable : METEO REYKJAVIK.

India : Mr. S. BASU, Director General of Observatories, Lodi Road, New Delhi 3. Cable : METEORS NEW DELHI 3.

Italy : Prof. Maurizio GIORGI, Comitato Nazionale Italiano A.G.I., Consiglio Nazionale delle Ricerche, Piazzale delle Scienze 7, Roma. Cable : CORICERCHE-AGI-ROMA.

Japan (RWC) : Dr. Hiroyuki UYEDA, Radio Research Laboratories, Ministry of Postal Services, Kokubunji P. O., Kitatama-gun, Tokyo. Cable : AGI KOKUBUNJI (formerly DEMPA KOKUBUNJI).

Mexico : Sr. Ing. Carlos NUNEZ A., Jefe del Departamento de Asuntos Internacionales, Direccion General de Telecomunicaciones de la-S.C.O.P., Av. Universidad y Xola, México, D. F. Cable : TELESCOP 13-1 AGI-MEXICO.

Morocco : M. HAUBERT, Chef de la station de sondages ionosphériques, Institut scientifique chérifien, Avenue Biarnay à Rabat. Cable : IONOSONDE RABAT.

Netherlands (RWC) : H. P. Th. VAN LOHUIZEN, General Direction P.T.T. Room C 113, Kortenaerkade, 11 The Hague. Cable : AMSTERDAM 12308.

Norway : Forsvarets Forskninginstitutt avd. Telekommunikation, Kjeller pr., Oslo.

Pakistan : Mr. M. S. HIDAYETULLA, Regional Director, Regional Meteorological Centre, Karachi Airport. Cable : CARE WEATHER KARACHI.

Peru : Ing. Alberto A. GIESECKE, Jr. (acting), Istituto Geofisico de Huancayo, Apartado 46, Huancayo. Cable : MAGNITIC-HUANCAYO.

Rhodesia and Nyasaland : Director of Federal Meteorological Services, P. O. Box 8066, Causeway, Salisbury, S. Rhodesia.

Spain : Mr. Emilio NOVOA, Chef du Département des Services Généraux, Direccion general de telecomunicacion, Servicios Generales, Madrid.

Sweden : Sven GEJER, The Royal Board of Swedish Telecommunication, Brunkebergstorg 2, Stockholm.

Switzerland : Prof. Dr. Ing. Jean LUGEON, Directeur de la Station Centrale Suisse de Météorologie, Kräbühlstrasse 58, Zurich 7/44.

U. S. S. R. (RWC) : N. V. PUSHKOV, Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation, Moscow. Cable : NIZMAR, MOSCOW.

Union of South Africa : Mr. J. A. KING, Weather Bureau, Private Bag 97, Pretoria. Cable : MET PRETORIA.

U. S. A. (RWC and WWA) : Mr. Roger C. MOORE, I.G.Y. World Warning Agency, National Bureau of Standards, Box 178, Ft. Belvoir, Virginia, U. S. A. Cable : AGIWARN WASHINGTON.

(ARWC) : Mr. M. E. NASON, North Pacific Radio Warning Service, National Bureau of Standards, Box 1119, Anchorage, Alaska. Cable : BUSTAN ELMENDORF AFB ALASKA.

(ARWC Antarctica) : Scientific Officer-in-Charge, Little America, Antarctica, c/o National Academy of Sciences, 2101 Constitution Avenue, N. W. Washington 25, D. C. Cable : NARECO, WASHINGTON.

Note : The selection of one of the three Regional Warning Centres in the Western European Region depends largely on communication facilities. The following have been proposed to date :

The Hague	: Egypt, Iceland
Paris	: Eire, Italy, Morocco, Spain
Darmstadt	: Finland

ANTARCTICA

1. The C.S.A.G.I. Secretariat has received the following communication.

« The Belgian Antarctic Station will be located in the neighbourhood of 20° Longitude. According to the latest information it is planned that the landing would take place in Breid Bay between 22° E and 23° E. »

2. The Secretary of the French National Committee reports :

Antarctic Expedition to Terre Adelie 1955-1957

Leader : Robert GUILLARD

« Dumont d'Urville base : the setting up of this base was completed several weeks ago and scientific observations have been undertaken. The last telegram received gives 21°2 below zero Centigrade as minimum temperature and +5° as maximum and an average of —11°4. Winds reached a force of 65 meters/second during the second fortnight of October. Eight days of snow fall and eight days of wind driven snow were recorded.

» Charcot Station : during the first days of October a party of seven men with six vehicles, under Robert Guillard's leadership left Dumont d'Urville Base to transport the necessary material for the installation of Charcot station. The first phase of this expedition was completed at the end of October by charting 30 km of marginal zone, and carrying 35 tons of supplies at 40 km into the interior. After an eight days stay at the base to put supplies in order, the party left at the beginning of November. »

3. Press reports show :

From Argentina vessels sailed for the Antarctic on 26th November, an ice breaker, a transport and two hydrographic ships. They will establish a new base on Thule Island in the Sandwich Islands group and continue exploration in the Weddell Sea.

The number at the U.S. base at the South Pole was increased to eighteen on 26th November. The temperature was 17° below zero Fahrenheit.

The number at the U.S. base at the South Pole was increased to eighteen on 26th November. The temperature was 17° below zero Fahrenheit.

Three flights made by U.S. aircraft from McMurdo Sound have revealed extensive snow-free areas within 350 miles of the South Pole. Two of the bare areas, Plunket Point at the junction between Mill and Beardmore Glacier and another on the north east side of Mill Glacier are believed to afford potential airfield sites.

Landing conditions at McMurdo Sound have been responsible for damage to Globemaster aircraft.

MEETING OF BUREAU

On 5th and 6th December at Brussels there was a meeting of the Bureau. Dr. L. V. Berkner was unable to be present and was represented by Dr. J. W. Joyce. Professors V. V. Beloussov and J. Coulomb attended by special invitation. Colonel E. Herbays was present during discussions of financial items and Professor G. Laclavère during discussions on Publications, and World Data Centres.

2. The main items discussed were :

The Central I.G.Y. organisation. Replies from National Committees and C.S.A.G.I. members.

Finance.

World Data Centres.

Regional Conferences.

World Day Communications.

3. Discussion of the World Data Centre problem resulted in the following program :

By end of January 1957 :

(i) Details of data flow to be finalised with Reporters.

(ii) Discussions with Unions and National Committees on the Centres to be completed.

During February 1957 :

The routine of data to the various World Data Centres to be discussed with National Committees.

Draft Regulations for conducting the business of World Data Centres A and B to be mutually agreed between National Committees of U.S.A. and U.S.S.R.

Mid-March 1957 :

Meeting to finalise outstanding details.

Coordinator will initiate appropriate correspondance.

WORLD DAYS AND COMMUNICATIONS

1. The Reporter for World Days and Communications has visited the Coordinator in Brussels and the following action is being taken.

2. A series of circular letters from Reporter and Coordinator jointly issued from Brussels and numbered WW-1, 2, etc. has been started. WW-1 on 28-11-56 endeavours to finalise the assignment of countries to Regional Warning Centres and the nomination of National Contacts. WW-2 and WW-3 despatched 10-12-56 will respectively circulate a revised edition of Barcelona Document N° 38 and the Barcelona Resolutions on World Days and Communications.

WW-1, 2 and 3 were addressed to National Committees. Future letters will be sent to National Contacts where known and otherwise to National Committees ; to members of the C.S.A.G.I. Bureau ; to Reporters in disciplines I to VII and XI ; to Adjoint Secretaries and to certain other persons or institutions particularly concerned.

3. WW-4 dated 12-12-56 circulated copies of the *Draft* Manual for World Days and Communications which has been prepared at C.R.P.L. Boulder under the direction of the C.S.A.G.I. Reporter. Owing to the present state of information it will be necessary to issue periodic supplements amending the Draft Manual. At the appropriate time the Manual will be printed in definitive form but a flow of supplements is expected to continue during the I.G.Y.

4. National Contacts or Committees are being invited in WW-4 to report to the C.S.A.G.I. Reporter at Boulder, Colorado the number of Draft Manuals and Supplements required for immediate distribution in their countries. When the Manual is printed it is expected that there will be both English and French versions and that additional copies will be provided on a repayment baiss.

5. Other letters in the WW series may be expected to cover information of interest to the address list outlined above.

6. Another series of letters RWC-1, 2, etc. issued by the World Warning Agency will be used for conveying information of particular concern to Regional Warning Centres.

U. S. A. SATELLITE COMPUTATION PROGRAM

The President has received the following communication from Dr. Joseph Kaplan of the U.S.A. National Committee.

« I am writing to inform you of the establishment of two satellite orbit-data computation programs.

» The first program calls for the establishment by the Naval Research Laboratory of a computing and analysis center in Washington, D. C., to handle information provided by the radio tracking system. The second program calls for the establishment of a similar computing center by the Smithsonian Astrophysical Observatory at Cambridge, Mass., for data received from the optical and visual observations programs. It is expected that these programs will permit the solution of several problems involved in satellite orbite determinations.

» The first problem concerns acquisition of the satellite, to be done by radio tracking and by teams of visual observers. Associated with the problem of acquisition is the gathering of preliminary data on the satellite's location in space. This early data, gained during the first few revolutions of the satellite, will be fed into high-speed electronic computers. The results will establish an approximate satellite orbit, permitting observers throughout the world to train their instruments on the satellite, and also permitting the precision Schmidt cameras to make photographic measurements of the satellite's position.

» The second step, which involves both the radio and photographic observation stations, will be to process the extensive subsequent data in order to compute the orbit accurately.

» The third phase of these programs involves the analysis of the precise orbit data. Such analysis will yield important scientific information in a number of areas : the density of the upper atmosphere, possible calculations of the mass-distribution and shape of the earth through analyses of orbit perturbations, and geodetic determinations.

» All three aspects of the orbit computation and data analysis problem require the use of high-speed electronic computers. In the acquisition period, speed is a most important factor if the further precise observations and determinations are to be undertaken promptly. In the precise orbit computation and data, analysis periods, large quantities of data requiring complicated lengthy calculations are generated, requiring high-speed computing centers.

» The Naval Research Laboratory has responsibility for the radio tracking program under the direction of Dr. John P. Hagen. The radio tracking system, called Minitrack, consists of a transmitter in the satellite issuing a 20-50 milliwatt signal at a frequency of 108 Mc/s and a series of ground station receivers using precision, multiple antenna arrays and extensive electronic installations. The expected precision of observations is about three minutes of arc under normal conditions, with improvement to a precision of 20 seconds of arc for observations at small zenith angles or for night time operation. A chain of ten stations, running principally north and south, are to be established. Present plans call for the following sites : Santiago, Chile ; Antofasta, Chile ; Lima,

Peru ; Quito, Ecuador ; Australia ; Antigua, B.W.I. ; Havana, Cuba ; Fort Stewart, Georgia ; Washington, D. C. ; and San Diego, California.

» Data from these Minitrack stations, and from others, the U.S. National Committee for the I.G.Y. hopes other countries will establish, will be radioed to the Naval Research Laboratory computation center in Washington, D. C.

» The Smithsonian Astrophysical Observatory has responsibility for the optical and visual observation programs under the direction of Dr. Fred L. Whipple. The most precise optical observations will be made using a modified Schmidt camera developed at the Smithsonian Astrophysical Observatory. Continuous strip film will simplify the problem associated with following the satellite. To provide accurate time, crystal clocks calibrated against WWV will give a signal for photography simultaneous with the passage of the satellite and will provide a timing accuracy of one one-thousandth of a second. Before the Schmidt cameras can be employed, however, the path of the satellite must be known to a precision of about three degrees. The radio system will provide this information, but to provide for the chance of radio failure in the satellite, a network of organized volunteer observers will be used. These teams will be stationed throughout the world in the satellite's latitude band-width and will maintain a steady watch on the satellite.

» The Schmidt precision camera program envisages the establishment of at least 12 stations around the world. Present plans call for the following sites : New Mexico, Florida, Spain, South Africa, Japan, Hawaii, the Netherlands Antilles, Australia, and Argentina. Other sites in South America and in the Middle East are also under consideration. Data from these visual and optical-photographic programs will be relayed to the Smithsonian Astrophysical Observatory computation center at Cambridge, Massachusetts, for analysis.

» I know that this information will be of interest to you, to the C.S.A.G.I., and to the many participating I.G.Y. countries. »

C.S.A.G.I. REGIONAL CONFERENCE

A joint C.S.A.G.I./C.S.A. (the Scientific Council for Africa South of the Sahara) conference will be held from February 11 to 15,

1957, at Bukavu in the Belgian Congo, to coordinate I.G.Y. plans for Africa South of the Sahara.

Dr. S. P. Jackson has prepared a report on a tour undertaken on behalf of the C.S.A.G.I. Adjoint Secretary for Southern Africa which will serve as a basis for the meeting agenda.

The Commission for Technical Cooperation in Africa South of the Sahara (C.C.T.A.) is organizing the conference ; the postal address of the C.C.T.A. Secretariat in Africa is B. P. 5175, Bukavu.

The C.S.A.G.I. will be represented by its General Secretary.

CONTRIBUTIONS TO THE I.G.Y. EFFORT

The President has written on 17th December.

« The enhancement of effort in geophysical observation by many countries throughout the I.G.Y. will be heightened by further concentration in certain special regions and during certain intervals. These include the Regular World Days and World Meteorological Intervals, according to a calendar now definitively established and circulated. In addition the special intervals include the Alerts and Special World Intervals, which are to be fixed and notified throughout the world during the course of the I.G.Y. itself, with reference to the state of the sun. This is one of the most distinctive features of the I.G.Y. enterprise ; its execution is a task of immense and detailed organisation, as any attentive reader of the relevant I.G.Y. manual will perceive. This draft manual has been produced under the direction of Mr. A. H. Shapley, C.S.A.G.I. Reporter for World Days, and his colleagues in the Central Radio Propagation Laboratory, a department of the U.S. National Bureau of Standards ; this organisation also provides the I.G.Y. World Warning Agency at Fort Belvoir. The aid it is affording in preparing the plans and providing the draft manual and its supplements (and also in many other ways) is an outstanding example of one of the most admirable aspects of the I.G.Y. enterprise — the contributions made freely and generously by individual nations on behalf of the great cause shared in common — the I.G.Y. »

C. S. A. G. I.

Documents received at the General Secretariat of U.R.S.I.

Alerts and S.W.I. Philosophy, Methods and Standards, A. SHAPLEY and R. C. MOORE, November 26, 1956.

C.S.A.G.I. Barcelona resolutions on World Days and Communications, Nov. 28, 1956.

Interchange Codes, A. H. SHAPLEY, Nov. 29, 1956.

Codes (From the Draft I.G.Y. Manual on World Days and Communications, Nov. 27, 1956) (See p. 79).

I.G.Y. World Warning Agency Newsletter, Dec. 19, 1956.

Current Information for Regional Warning Centers, Dec. 7, 1956.

Trials Weeks to Test I.G.Y. Communications, Beginning January 10-16, 1957, Dec. 7, 1956.

Draft Manual for I.G.Y. World Days and Communications, Dec. 7, 1956.

I.G.Y. World Warning Agency Newsletter, Jan. 11, 1957.

Resolutions on Assistance to I.G.Y. communications, Jan. 17, 1957.

A.G.I. Codes for Interchange Messages

I. — Alerts and Special World Intervals

A. — Definition

(1) A period of « Alert » will be declared when there is an unusually active solar region on the sun's disk. The Alert will remain posted until the activity subsides or until the region passes to the invisible solar hemisphere. The Alert serves notice that the probability of solar flares occurring is heightened. It also warns that there is a strong possibility that a geomagnetic disturbance will take place in the days following, and that a « Special World Interval » will be invoked.

(2) A « Special World Interval » (SWI) will be called on 8-hour notice when there is a strong possibility that a significant geomagnetic disturbance will commence within the 24 hours following the start of the interval. The interval will be terminated when the disturbance has subsided, or in 48 hours in case the forecast disturbance does not materialize.

B. — Wide-spread Dissemination of Alert and SWI Notifications

(1) Primary distribution of notifications of Alerts and Special World Intervals will be made using the world-wide meteorological networks. In some cases, notifications will be sent by direct wire from the I.G.Y.-World Warning Agency at Ft. Belvoir, Virginia, U.S.A. or via one of the I.G.Y. Regional Warning Centers. The message format to be used for transmission of notifications is now definitive. The texts of the various messages which may be sent are listed below with their meaning. It is recommended that all stations cooperating in the International Geophysical Year effort become thoroughly familiar with the texts of these messages and their meaning.

Text of Messages	Meaning
AGI Geophysical Year warning N° ... : Alerts starts immediately 02/1600	A state of ALERT commences from 1600 hrs U.T. of the 2nd of the month.

AGI Geophysical Year warning N° ... : Special World Interval starts at 30/0001	A Special World Interval is declared and becomes operative from 0001 hrs U.T. of the 30th of the month.
AGI Geophysical Year warning N° ... : $\frac{\text{ALERT}}{\text{SWI}}$ continues 31/1600	A state of Alert or the duration of a SWI, as appropriate, continues. The message notifying the continuation has been originated at 1600 hrs U.T. in the 31st day of the month.
AGI Geophysical Year warning N° ... : ALERT finishes immediately 03/1600	A state of Alert finishes immediately. The message notifying the finish has been originated at 1600 hrs U.T. on the 3rd day of the month.
AGI Geophysical Year warning N° ... : SWI finishes at 05/2359	A Special World Interval that has been current will finish at 2359 hrs U.T. in the 5th day of the month.

Note :

1. All times given in th warning messages are U.T.

2. Occasions may arise when there will be no interval between the ALERT warning and the declaration of the SWI. In such cases the ALERT warning and the declaration of the SWI will be combined in the message issued at 1600 U.T. (GMT) as follows :

> « AGI Geophysical Year Warning N° ... : Alert starts immediately 02/1600 ; and Special World Interval starts at 03/0001. »

3. Similarly occasions may arise when a SWI will finish but the Alert will continue for some days after the finish of the SWI. In such cases also a combined message will be issued as follows :

> « AGI Geophysical Year Warning N° ... : SWI finishes at 05/2359 ; ALERT continues. »

Arrangements for the delivery of these messages should be made by the project director in charge of a station with either his local meteorological office or the regional center.

(2) It is planned to have notifications broadcast on WWV, in Morse code twice hourly at 19* and 49* minutes after the hour following the radio propagation announcement according to the following code.

(*a*)	AGI-AAAAA	indicating state of Alert.
(*b*)	AGI-EEEEE	indicating no state of Alert.
(*c*)	AGI-SSSSS	indicating SWI will begin at 0001 U.T. of following day.
(*d*)	AGI-(three extra long dashes)	indicating SWI in progress.
(*e*)	AGI-TTTTT	indicating SWI terminates at 2359 U.T. of same day.

Similar broadcasts will be made by radio stations WWVH (Hawaii), LOL (Argentina) and JJY (Japan) if practicable.

Other broadcast stations are expected to carry the notifications. The details of frequencies and schedules will appear in later supplements. Chief among these will be the very low frequency broadcasts recommended in Resolution V. 5 of the Stockholm Arctic Conference. Also of importance are the new special high frequency broadcasts mentioned in the report to C.S.A.G.I. of the Japanese National Committee and the broadcast understood to be planned by U.S.S.R. and India.

II. — Interchange Codes

(*Solar, geomagnetic, ionospheric data summaries*)

Reports are divided into three categories :

(1) Scout observations, made once daily at any given observatory, of slowly-varying solar phenomena such as sunspots and coronal intensities.

(2) Patrol observations where observations are continuous or at frequent intervals. In some cases the period covered by the patrol is all that is important, such as solar flare patrol ; in others, an index or summary is given for observations during the period covered by the patrol, such as for solar radio noise or geomagnetic variation.

(*) Check later supplements to I.G.Y. World Days Manual for possible changes in the times.

(3) Distinctive events such as flares, solar radio outbursts, SID which are described separately.

A. — Sunspots

Code words : USSPA, USSPE, USSPI ; where :

U (standing for interchange) *SunSPot* code *A*

U (standing for interchange) *SunSPot* code *E*

U (standing for interchange) *SunSPot* code *I*

Symbolic forms :

USSPA	JJTII	*aaabc*	*eefff*	QXXYY	*ghijk*
USSPE	JJTII	*aaabc*		QXXYY	*ghijk*
USSPI	JJTII	*aaabc*		QXXYY	*lhijk*

Key :

JJ = Greenwich date of observation

T = Time of observation in tenths of the Greenwich day

II = Observatory indicator

aaa = Relative sunspot number for date (some observatories may give R + 600 if observation quality is good ; R + 300 if fair, and R is poor)

b = General activity index for disk, scale of 1 (small) to 5 (great) activity

c = General activity index for limb — 1-5

ee = Serial number of spot group (assigned by reporting observatory on the basis of observations on preceding days)

fff = Area of spot group in millionths of solar hemisphere

Q = Quadrant (heliographic coordinates) containing the spot group :

1 = NE 4 = NW
2 = SE 3 = SW

XX = Angular *meridian distance*, in degrees

YY = Heliographic latitude, in degrees

g = Importance of group, scale 1, 2, 3

h = Number of passages of group across solar disk (1st passage, 2nd passage, etc.)

i = Number of days group observed since limb passage or first appearance on disk

j = Brunner classification of region, A = 1, B = 2, etc.

k = Spot count; (0 means 10 or greater)

l = Importance of group combined with stage of evolution :

1-2-3 growing center
4-5-6 period of maximum growth
7-8-9 waning center

B. — Coronal Intensities

Code word : UCORO, where *U* stands for interchange ; CORonal intensities, Code *O* (other codes may be supplied later)

Symbolic form :

UCORO JJTII *abqqq cddee* — and additional groups like *cddee*

Key :

JJ = Greenwich date of observation

T = Time of observation in tenths of the Greenwich day

II = Observatory indicator

a = Line observed ; 1 = green (λ5303), 2 = red (λ6374), 3 = red (λ6702), 0 = yellow (λ5694) .

b = Scattered light intensity (a mesure of observation quality)

1 = weak (<30 millionths) or observation high quality
2 = moderate (30-60 millionths) or observation moderate quality
3 = strong (>60 millionths) or observation low quality

qqq = Quadrants of limb for which values are given in message :

1 = NE 4 = NW
2 = SE 3 = SW

if all four quadrants, insert 999 ; if fewer than three quadrants, complete group with X's

c = Latitude (divided by 10) of intensity reported in *dd*

dd = Intensity measured (millionths) at latitude indicated by *c* (if intensity > 99, see note 3 below)

ee = Intensity measured (millionths) at next succeeding 5° position angle — proceeding N-E-S-W (if intensity > 99, see note 3 below)

Note 1 : Always give observations in order of increasing position angle, i.e. N-E-S-W. A group giving intensity at equator is usually necessary to avoid ambiguity.

Note 2 : Usually only enough measurements will be given to outline the intensity peaks and usually only for East Limb, green and yellow line.

Note 3 : If intensities are greater than 99 millionths, then either :

(*a*) if it is obvious from the sequence of measurements, drop the hundreds digit — e.g. 154 is coded 54.

(*b*) if the meaning of the procedure of (*a*) will not be clear, give only a single measurement in the 5-character group, using 3 digits and an « X ». The « X » follows the measurement if the latitude is a multiple of 10 degrees ; the « X » precedes the measurement if the latitude is 5 degrees farther along in position angle.

Example :

S10°, Intensity 65	16589	
S15°, Intensity 89		
S20°, Intensity 105	2105X	
S25°, Intensity 140	2X140	
S30°, Intensity 110	3110X	
S35°, Intensity 95	3X095	

C. — Time Intervals when Flare Patrol in Operation

Code word : UPATA, which comes from *U* and *PATrol* code *A*

Symbolic form :

UPATA JJUII $H_1H_1T_1H_2T_2$ (and additional groups like $H_1H_1T_1H_2T_2$)

Key :

JJ = Greenwich date of observation

U = Overall quality of observations ; 1 (poor) to 3 (good)

II = Observatory indicator

$H_1H_1T_1$ = Time of beginning of patrol period in hours and tenths, U.T.

H_2T_2 = Time of end of patrol period, in hours and tenths, U.T. *with tens digit suppressed*

D. — Flares or Subflares

Code word : UFLAR, which comes from *U* and FLAre, Code *R* (other codes may be supplied later)

Symbolic form :

UFLAR JJUII QXXYY PHH*mm* RDDDZ (and additional groups like PHH*mm*)

Key :

JJ = Greenwich date of observation

U = Quality of observation

II = Observatory indicator ; if several observatories involved in report, use XX

QXXYY = heliographic position of flare, or of region containing subflares, same as USSP-codes

P = Indicator that time which follows (including precision of time or duration measurements) is :

1 = Beginning of flare (end of flare was observed)

2 = Beginning of flare (end of flare *not* observed)

3 = First observation of a flare in progress (end of flare was observed)

4 = First observation of a flare in progress (end of flare *not* observed)

5 = (see key to « R », below)

6 = Time of maximum of flare

7 = Time of secondary maximum of flare

8 =

9 = Nominal time of beginning of a subflare

HH*mm* = Time in hours and minutes, Universal Time (if no duration is given — see « R », below — the importance of the flare is indicated by inserting for HH as follows :
if importance 3, increase the hour by 60
if importance 2, increase the hour by 30
if importance 1 or 1 minus, insert the actual hour

R = *Always a* 5 ; this is a special indicator to tell that this group gives the duration and a more precise importance of the flare

DDD = Duration of flare in minutes (with a precision as indicated by whether the indicator (P) for beginning time is 1, 2, 3 or 4

Z = Importance of flare on scale of 1, 2, 3 ; except that :
importance 1 plus = 7
importance 2 plus = 8
importance 3 plus = 9
subflare = 0 though group normally not given in such cases.

Note : As many times as are significant may be given to describe a flare, in order of increasing value of the time indicator P ; thus several flares or subflares can be given for the same region without ambiguity, and also flares in several regions.

E. — Solar Radio Noise, code A

Code word : URANA where *U* stands for interchange, *RAN* for *RA*dio *N*oise, code *A*

Symbolic form :

URANA JJXII *aabbc ddefg hiiii jkkkk* (*hiiii jkkkk... aabbc...*)

Key :

JJ = Greenwich date of observation

X = Table of frequency depending on II :
1 = less than 50 Mc/s
2 = 50 to 150 Mc/s
3 = 150 to 300 Mc/s
4 = neighborhood of 500 Mc/s
5 = neighborhood of 1500 Mc/s
6 = neighborhood of 3000 Mc/s
7 = neighborhood of 10,000 Mc/s
8 = neighborhood of 35,000 Mc/s

II = Observatory indicator

aa = U.T. hour nearest beginning of period of observations reported in *b* through *k* immediately following

bb = U.T. hour nearest ending of period of observations reported in *c* through *k* immediately following

c = Number of 5 digit groups following which refers to observations between *aabb*

dd = Median flux for whole period reported, in tenths of quiet sun ; if greater than 9.9 then :

01 = 10 to 19 times quiet sun
02 = 20 to 29 times quiet sun
. . . . . .
. . . . . .
. . . . . .
09 = 90 to 99 times quiet sun
00 = > 100 times quiet sun

e = Variation in median flux in interval reported :

0 = less than 10 per cent change in median flux level from hour to hour
1 = 10 to 25 per cent change
2 = 26 to 55 per cent change
3 = 56 to 100 per cent change
4 = over 100 per cent change
X = uncertain

f = Burst classification :

0 = 0-5 bursts per hour
1 = 5 to 100 bursts per hour
2 = 100 to 500 bursts per hour
3 = more than 500 per hour

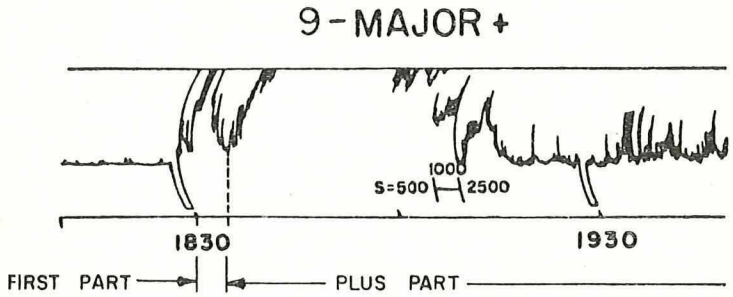
g = Burst amplitude :

1 = 0 to ½ time median flux
2 = ½ to 1 times median flux
3 = 1 to 3 times median flux
4 = 3 to 5 times median flux
5 = 6 to 9 times median flux
6 = 10 to 19 times median flux
7 = 20 to 29 times median flux
8 = 30 to 39 times median flux
9 = > 39 times median flux

h = Key to time of outstanding phenomenon : Ref. Ap. J. **118**, 169, 1953

9 = major plus*
8 = major
7 = onset of noise storm
6 = noise storm ends
5 = minor plus*
4 = minor
3 = group
2 = series
1 = rise in base level

* for type 9 and 5 there will be four time groups ; begin and end for « first part » and begin and end for « plus part » ; use XXXX for end of « plus » if unknown at time of message.



iiii = U.T. of beginning of phenomenon
j = Always X
kkkk = U.T. end of phenomenon

E. — Solar Radio Noise (*cont'd*), Code B

Code word : URANB where *U* stands for interchange ; *RAN* for *RA*dio *N*oise, code *B*.

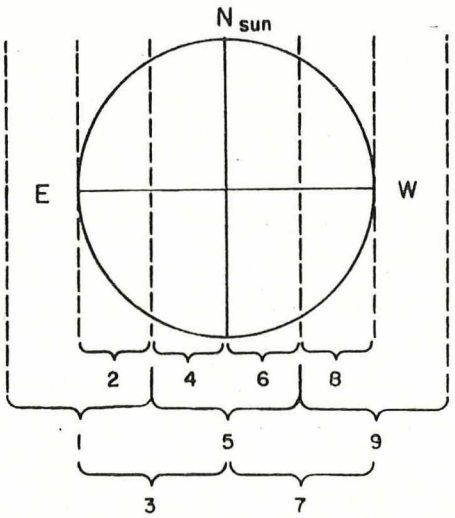
Symbolic form :

URANB JJXII *abbbb*

Key :

JJXII as in URANA

a = Burst source : See Sketch



bbbb = U.T. when burst source identified

F. — Sudden Ionospheric Disturbances

Code word : USIDA, where *U* stands for interchange ; *SID* for *S*udden *I*onospheric *D*isturbance code *A*.

Symbolic form :
USIDA JJXII *ahhhh cddef*

Key :

JJ = Greenwich date of observation
X = Number of phenomena reported
II = Observatory indicator
a = Type of phenomenon :
1 = typical S-SWF
2 = slow S-SWF
3 = G-SWF
4 = SEA
5 = SPA
6 = SCNA
7 = several methods
hhhh = U.T. of beginning of phenomenon

c = Importance :

0 = 1 minus	7 = 1 plus
1 = 1	8 = 2 plus
2 = 2	9 = 3 plus
3 = 3	

dd = Duration in minutes

e = Reliability of time :

6 = nominal time

7 = first observation

8 = beginning time less certain than 2 minutes

9 = beginning time accurate to nearest 2 minutes or less

f = Always an X

G. — Magnetic Activity Indices

Code word : UMAGA, which comes from *U* and *MA G*netic activity code *A*

Symbolic form : *UMAGA* JJTII *aakkk kkkkk* PHH*mm*

Key :

JJ = Greenwich date of *beginning* of 24-hour period reported

T = Time indicator for U.T. hour of beginning of 24-hour period :

0 = 00	4 = 12
1 = 03	5 = 15
2 = 06	6 = 18
3 = 09	7 = 21

II = Observatory indicator

aa = A*k*-index for Greenwich date JJ (hundreds digit omitted) (note this is *not* the 24-hour period reported, unless T is 0)

kkkkkkkk = K indices for the 24-hour period reported

P = An indicator telling that the time reported in HH*mm* is :
1 = storm end
6 = gradual storm beginning
7 = storm sudden commencement (SC)
8 = very marked storm SC

HH*mm* = Time of phenomenon indicated by P (in U.T.)

H. — Alert and SWI Advice

Code word : ADV for *ADV*ice

Symbolic form :

ADV*aa bbccc* (FORTE) *dddde*

Key :

aa = Warning center giving advice :

AN — Anchorage	NE — Nederhorst
BE — Belvoir	PA — Paris (BIF)
BO — Boulder	ST — Stockholm
DA — Darmstadt	SY — Sydney
MO — Moscow	KO — Kokubunji

bb = Type of notification :
AL — alert
IN — Special World Interval (SWI)

ccc = Advice :
REG — begin
CON — continue
FIN — finish
NIL — no alert

FORTE = Indicates center feels probability is great (added for this purpose only)

dddd = U.T. advice given

e = Always a Z

II. — Other Codes (mostly regional)

A. — Calcium Plages

Code word : PLA for *PLA*ge

Symbolic form :

PLA*aa bbbcd eeefg gghhh iiijk* (three code groups for each plage region reported)

Key :

aa = Observatory : MC = McMath-Hulbert
WL = Mt. Wilson

bbb = Observation date in tenths of Greenwich day

c = Quality of observation : 1 = very poor to 5 = excellent

d = days elapsed since last PLA report from this observatory (never less than 1 ; 9 stands for 9 or more days)

eee = Serial number of plage region

f = Activity : 1 = small
2 = moderate
3 = great
0 = no observation of activity

ggg = Latitude (1 = north ; 2 = south) and degrees (two digits)

hhh = Central meridian distance (3 = east ; 4 = west) and degrees (two digits)

iii = Area in millionths divided by 100

j = Intensity : coded as $2n$-1, where n is intensity, scale 1 (faint) to 5 (very bright) ; e.g., intensity 4 is coded as 7

k = Check, units digit of sum of preceding 14 digits

B. — All-Purpose Ionospheric Code for Hourly Values

Code word : ION for *ION*osphere

Symbolic form :

ION*aa bbbbb ccdee fgggh ijjjk* (plus additional groups like *fgggh ijjjk*) ION*aa*

Key :

aa = Station indicator :

PO — Pole Station	AR — Cape Adare
LA — Little America	AN — Anchorage
WD — Weddell Sea	BE — Belvoir
KX — Knox	AD — Adak
BD — Byrd	etc.

bbbbb = Ionospheric characteristic reported :

FOTWO	— *fo*F2	HIFTO	— *h'*F2
FOFON	— *fo*F1	HIFFF	— *h'*F
FOEEE	— *fo*E	HIEEE	— *h'*E
FOESS	— *fo*E*s*	HIESS	— *h'*E*s*
EFBES	— *fb*E*s*	EFMIN	— *f*-min
		MUFTO	— (M3000)F2
		MUFON	— (M3000)F1

cc = Beginning date of observations reported (use Standard Meridian Time)

d = Type of values :

X — hourly values within a 24-hour period

9 — monthly median values

8 — values at 6-hour intervals (for a period of more than 24 hours starting on date *cc*). *Note* : In reporting a week's data, start with 00 hours on Monday

ee = Number of groups of data of characteristic *bbbbb* which follow

f = Even hour indicator ; (table 1)

TABLE I

Coding Hour of Observation (f and i)

Coded as	If coded in *first* group of pair (i. e. « *f* ») hour is	If coded in *second* group of pair (i. e. « *i* ») hour is
0	00	01
1	02	03
2	04	05
3	06	07
4	08	09
5	10	11
6	12	13
7	14	15
8	16	17
9	18	19
0	20	21
1	22	23

ggg = Value

h = Symbol (list A, below)

List A

Numerical Coding for Letter Symbols

The following numbers are used as the final digit of each group to indicate symbols which explain doubtful or missing values.

Cided as	Symbol
X	none
1	A
2	B
3	C
4	D
5	E
6	F
7	L
8	I
9	T
0	any other

i = Odd hour indicator (see table in *f*)

jjj = Value

k = Symbol (see list A in *h*)

Sample messages :

Reporting a 24-hour period of *fo*E beginning 09 Standard Meridian Time :

IONBD FOEEE 19X07 4XXXX 4011X 50159 5013X
6014X 60138 7012X IONBD

A weekly report of *fo*F2 (October 22, 1956 is a Monday) :

IONWD FOFTO 22828 00306 30226 6061X 90306
00306 3025X 6064X 90346 00246 30300 6066X
9035X 0041X 3030X 6070X 90329 00208 3020X
6061X 9040X 00286 30296 6062X 9044X 00276
3023X 6056X 9041X IONWD

A monthly report of (M3000)F2 :

IONKX	MUFTO	01924	0031X	0031X	1031X	1031X
2032X	2032X	3033X	3033X	4036X	4036X	5035X
5035X	6034X	6034X	7034X	7035X	8035X	8035X
9034X	9034X	0033X	0032X	1031X	1031X	IONKX

C. — Forecast Codes

1. — *Short Term Forecast* (radio propagation conditions)

ST*abb* *ccdde* *effgh*

a = A-Atlantic (NARWS) ; P-Pacific (NPRWS)

bb = Greenwich date to which forecast portion (number) of first forecast statement (letter and number) applies

cc-ff = Forecast statements, e.g. « N4 » (letters are coded as follows : N = 7 ; U = 5 ; W = 3) for Greenwich interval to which forecasts apply

cc	=	NARWS, 0000-0600 U.T. ;	NPRWS, 1900-0300 U.T.
dd	=	0600-1200	0300-1100
ee	=	1200-1800	1100-1900
ff	=	1800-2400	always 00

g = Always a zero

h = Check, units digit of sum of preceding 11 digits

2. — *Medium Term Forecast* (radio propagation conditions)

MT*abb* *cdefg*

a = A-Atlantic (NARWS) ; P-Pacific (NPRWS)

bb = Greenwich date to which first twelve-hour forecast applies

c = Forecast quality figure : NARWS, 0000-1200 U.T. ; NPRWS, 1800-0600 U.T.

d = FOT forecast for *c* : 1 = low ; 2 = normal ; 3 = high

e = Forecast quality figure : NARWS, 1200-2400 U.T. ; NPRWS, 0600-1800 U.T.

f = FOT forecast for *e* : 1 = low ; 2 = normal ; 3 = high

g = Check, units digit of sum of preceding 6 digits.

3. — *Advance Forecast* (radio propagation conditions)

AD*abb* *ccddd* *dddde* *ffggh* (*ffggh...*)

a = A-Atlantic, P-Pacific
bb = Date of beginning of seven-day period to which forecast applies
cc = Date of ending of seven-day period to which forecast applies
ddddddd = Forecast quality figures
e = Check, units digit of sum of preceding 11 digits
ff = Date of beginning of disturbed period
gg = Date of ending of disturbed period
h = Check, units digit of sum of preceding 4 digits

D. — Radio Propagation Indices
(principally for use of forecast centers)

1. — *Preliminary Quality Figures*

(*a*) *Daily* :

PQ*abb* *cdefg*

a = A-Atlantic, P-Pacific
bb = Greenwich date of beginning of 24-hour period
c = PDQ (preliminary quality figures) for U.T. period

		NARWS, 1800-2400	NPRWS, 0300-1100
d	=	0000-0600	1100-1900
e	=	0600-1200	1900-0300
f	=	1200-1800	always 00

g = Check, units digit of sum of preceding 6 digits

(*b*) *Weekly* :

NA*abb* *cdefg* repeated six times

a = A-Atlantic, P-Pacific
bb = Greenwich date of first *cdefg* group
c = Preliminary quality figure for U.T. period

		NARWS 0000-0600	NPRWS 0300-1100
d	=	0600-1200	1100-1900
e	=	1200-1800	1900-0300
f	=	1800-2400	0000-2400
g	=	0000-2400	units digit of sum of preceding four digits

VII. — List of Observatory Indicators (II)

Indicator	Observatory	USSPA	UCORO	UPATA	UFLAR	URANA	USIDA	UMAGA	ADV
01	Arcetri	×	×	×	×	×			
02	Cambridge					×	×		
03	Sydney	×		×	×				
04	Greenwich	×					×		
05	Huancayo						×	×	
06	Kharkov	×		×	×				
07	Kodaikanal	×	×	×	×	×			
08	McMath	×		×	×		×		
09	Mt. Wilson	×		×	×				
10	Meudon	×		×	×				
11	Ondrejov	×		×	×	×			
12	Edinburgh			×	×				
13	Tashkent	×		×	×				
14	The Hague	×							
15	Zurich	×							
16	Kanzehohe	×	×	×	×				
17	Schauinsland	×	×		×				
18	Wendelstein	×	×		×				
19	Stockholm	×		×	×				
20	San Miguel, Argentina	×		×	×		×		
21	Tortosa	×		×	×	×			
22	Capri (Swedish)	×	×	×	×				
23	Fredericksburg, U. S. A.							×	
24	Wingst							×	
25	Belvoir, U. S. A.							×	×
26	Kakioka	×						×	
27	College, Alaska							×	
28	Chambon-la-Forêt							×	
29	Tamanrasset							×	
30	Arosa		×						
31	U. S. Naval Observatory	×			×				
32	Sacramento Peak		×	×	×				
33	Boulder					×	×		
34	Climax		×	×	×				
35	Norikura		×						
36	Pic-du-Midi		×						
37	Helwan, Egypt			×	×				
38	Hiraiso						×		
39	Kokubunji								×

Indicator	Observatory	USSPA	UCORO	UPATA	UFLAR	URANA	USIDA	UMAGA	ADV
40	Sitka, Alaska							×	
41	Meudon					×			
42	Nanking	×		×	×				
43	Shangaï	×		×	×				
44	Kumming	×		×	×				
45	Marcoussis					×			
46	NERA					×	×	×	
47	Potsdam					×			
48	Nizamiah, India			×	×				
49	Rome	×							
50	Tonanzintla, Mexico			×	×				
51	Mitaka			×	×	×			
52	Potts Hill, Australia					×			
53	Utrecht, Netherlands			×	×				
54	Carter Obs., New Zealand	×		×	×				
55	Manila	×							
56	Cornelle Univ., U. S. A.					×			
57	Ottawa			×	×	×			
58	Alert, Canada					×			
59	Baguio, Philippines		×	×	×				
60	Moscow			×	×	×			
61	Wellington	×		×	×				
62									
63									
64	Uccle, Belgium	×		×	×				
65									
66	Lwiro, Belgian Congo					×			
67	Humain, Belgium					×			
68									
69									
70									
71	Lindau						×		
72	Darmstadt						×		×
73	Neuershausen						×		
74	Casablanca						×		
75	Bagneux						×		
76	Kerguelen						×		
77	Poitiers						×		
78	Anchorage						×	×	×
79	Krasnaya Pakhra, U. S. S. R.	×		×	×				

Indicator	Observatory	USSPA	UGORO	UPATA	UFLAR	URANA	USIDA	UMAGA	ADV
80	Irkutsk, U. S. S. R.	×		×	×				
81	Leidsendam								
82	Kiev, U. S. S. R.	×		×	×				
83	DeBilt								
84	Lvov, U. S. S. R.	×							
85	Simeiz, U. S. S R			×	×				
86	Voroshilov, U S S R.	×		×	×				
87	Kislovodsk, U. S. S. R.	×	×	×	×	×			
88	Alma-Ata, U. S. S. R.		×	×	×				
89	Abastumani, U. S. S. R.			×	×				
90	Pulkovo, U. S. S. R.					×			
91	Gorky, U. S. S. R.					×			
92	Simferopol, Crimea					×			
93	Jodrell Bank, U. K.					×			
94	Cape of Good Hope			×	×				
95	Belgrade	×				×			
96	Skopje, Yugoslavia			×	×				
97	Ljubljana, Yugoslavia	×							
98	Zagreb, Yugoslavia	×							
99	Pilar, Argentina	×							

Copies of the codes are available at the General Secretariat of U.R.S.I.

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