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UNESCO

Union Radio - Scientifique Internationale

INTERNATIONAL SCIENTIFIC RADIO UNION

U. R. S. I.

BULLETIN MENSUEL — MONTHLY BULLETIN

Juin 1948 — June 1948

INFORMATIONS

COMMISSION I I

COLLABORATION DES AMATEURS

DOCUMENTS — TRAVAUX :

INFORMATIONS

COMITE NATIONAL HONGROIS
HUNGARIAN NATIONAL COMMITTEE

Nous avons le plaisir d'annoncer aux Membres de l'U. R. S. I. la création d'un Comité National Hongrois.

Dès que nous en connaîtrons la composition, nous la publierons.

We are very pleased to inform the Members of the U. R. S. I. of the constitution of a Hungarian National Committee.

We will publish the names of its Members as soon as we know them.

COMITE NATIONAL NORVEGIEN
NORVEGIAN NATIONAL COMMITTEE

L'Académie Norvégienne des Sciences et des Lettres a constitué un Comité National Norvégien composé comme suit :

The Norvegian Academy of Sciences and Letters has constituted a National Norvegian Committe as follows :

Dr. Helmer Dahl;
Dr. Leiv Harang;
Ing. Finn Lie;
Prof. S. Rosseland;
Ing. S. Skolem;
Ing. N. J. Soberg.

COMITE NATIONAL MAROCAIN
MOROCCAN NATIONAL COMMITTEE

Ci-dessous extraits du procès-verbal de la réunion du 4 février 1948, du Comité National Marocain.

Hereafter abstracts of the meeting held on February 4th, 1948, by the National Committee of Morocco.

« Le président ouvre la séance, souhaite la bienvenue aux membres présents et rappelle les buts de l'Union Radio-Scientifique Internationale, actuellement présidée par l'illustre physicien Sir Edward V. Appleton (Grande-Bretagne), Prix Nobel de Physique pour d'importants travaux sur l'ionosphère.

» Créée en 1919 sur l'initiative du général Ferrié, l'U. R. S. I. suscite et organise les recherches nécessitant une coopération internationale. A cet effet, des Comités Nationaux assurent, dans chaque pays adhérent à l'Union, la diffusion des enquêtes et l'exécution des expériences demandées par l'U. R. S. I.

» Des Commissions spécialisées, des Sous-Commissions et des Commissions Mixtes de l'Union centralisent et analysent les résultats qui font l'objet de publication dans des comptes rendus d'assemblées générales ou dans un bulletin mensuel régulièrement diffusé aux techniciens par les soins des Comités Nationaux.

» Le secrétaire donne la liste des Commissions spécialisées de l'Union ainsi que les noms des présidents. »

Composition du Comité National Marocain.
Composition of the Moroccan National Committe.

Président : M. le Docteur Jacques Liouville, Conseiller scientifi-
Président : que du gouvernement Chérifien, Kasba des Oudaïas, Rabat.

Secrétaire : M. Georges Bidault, Géophysicien au Service de Phy-
Secretary : sique du Globe et de Météorologie, 2, rue de Foucauld, Casablanca.

Membres : MM. d'Adhemar de Lantagnac, Georges, Ingénieur à
Members : l'Energie Electrique du Maroc, Marrakech;

L'Amiral Barjot, Commandant la Marine au Maroc, Casablanca ;

Brisset, Marc, Ingénieur de la Météorologie, Chef de la Section de la Météorologie Nationale, Camp Cazès, Casablanca ;

Le Lieutenant-colonel Desblanc (représentant le Général Carpentier, Etat-major), commandant les Transmissions au Maroc, Rabat;

Le Capitaine de Frégate Duchene (Officier de Liaison de l'Amiral Barjot), Rabat ;

Gallard, Ingénieur des Transmissions Militaires

Legrand, Pierre, Ingénieur (représentant M. le Directeur de l'Office Chérifien des P. T. T.), Chef du Centre de Réception des P. T. T., avenue Biarnay, Rabat;

Pasqualini, Louis, Directeur de l'Institut Scientifique Chérifien, Rabat;

Tilloloy, Aimé, Ingénieur, Chef des Transmissions de la Météorologie Nationale, Camp Cazès, Casablanca;

Roux, Georges, Chef du Service de Physique du Globe et de Météorologie, 2, rue de Foucauld, Casablanca.

BELGIQUE — BELGIUM

Le centre de contrôle des radiocommunications des services mobiles.

Pendant la conférence d'Atlantic-City, une note décrivant le fonctionnement du C. C. R. M. a été publiée. Mais comme diverses et importantes améliorations ont été apportées depuis, particulièrement à l'installation de mesure de fréquence, le C. C. R. M. croit intéressant de publier la présente note qui donne une description succinte de l'installation telle qu'elle fonctionne actuellement.

1. — **Installation de mesure de fréquence.**

L'installation actuelle comprend trois groupes distincts :

A. — **Etalon de fréquence.** — Ce groupe dont la plupart des éléments sont de construction Marconi Instruments, comprend :

— Un oscillateur piézoélectrique sous thermostat oscillant à 250 Kc/s;
— Un générateur d'harmoniques à 1.000 Kc/s;
— Une suite de multivibrateurs à 1.000 Kc/s, 10 Kc/s, 1 Kc/s et 0,1 Kc/s;
— Une pendule synchrone;
— Un amplificateur à 100 Kc/s pour l'entrainement des multivibrateurs des groupes suivants.

B. — **Mesures en ondes moyennes.** — Ce groupe comprend :

— Un groupe multivibrateur synchronisé à 100 Kc/s et 10 Kc/s;
— Deux hétérodynes d'interpolation en moyenne fréquence ;
— Deux récepteurs RCA - CR 91;
— Les commandes pour effectuer les connexions nécessaires entre les différents éléments;
— De plus, les harmoniques du multivibrateur à 1 Kc/s du

groupe A sont introduits dans ce groupe.

C. — **Mesures en ondes courtes.** — Ce groupe comprend :

— Un groupe multivibrateur synchronisé à 100 Kc/s et 10 Kc/s;
— Deux hétérodynes d'interpolation en haute fréquence;
— Deux récepteurs National HRO;
— Deux Panadaptors pour réception hanarmonique;
— Les commandes pour effectuer les connexions nécessaires entre les différents éléments.

Des précautions sont prises pour stabiliser les tensions anodiques et les tensions des filaments des hétérodynes.

L'oscillateur piézoélectrique peut être réglé par comparaison avec les signaux horaires grâce à l'horloge synchrone. Mais le C. C. R. M. préfère utiliser les émissions de fréquence étalon WWV, dont une est presque toujours suffisamment bien reçue pour obtenir un battement lent. Il est généralement facile de régler la fréquence du quartz à $\pm$ 1 ou 2 dix millioniémes près, ce qui correspond à la stabilité normale du quartz d'un jour à l'autre.

Chaque récepteur peut être connecté :

a) A l'antenne et à l'hétérodyne d'interpolation pour obtenir le battement zéro avec le signal;

b) A l'hétérodyne d'interpolation et au multivibrateur pour étalonnage;

c) A l'antenne et au multivibrateur pour obtenir un battement direct entre le signal et un harmonique du multivibrateur.

Pour les mesures courantes, la méthode employée consiste à régler l'hétérodyne au battement nul avec le signal, puis à interpoler entre les deux harmoniques voisins de 1 ou 10 Kc/s suivant la gamme de fréquence. Des tables ont été établies pour faciliter les calculs d'interpolation.

La précision obtenue avec cette méthode, quand le signal est assez fort pour donner un bon battement nul, est de l'ordre de $\pm$ 1 cent millième.

La réception panoramique s'est montrée d'un grand secours, non seulement pour l'exploration visuelle d'une bande de fréquence, mais particulièrement pour l'étalonnage, les harmoniques de 10 Kc/s étant très clairement visibles sur l'écran jusqu'à 30 Mc/s.

Les mesures de fréquence peuvent être faites dans les bandes suivantes : 225 à 515 Kc/s et de 1.500 à 30.000 Kc/s. Deux veilles en ondes moyennes, et deux en ondes courtes peuvent être faites simultanément.

2. — **Améliorations futures.**

Dans le but d'obtenir une précision plus élevée lorsque c'est nécessaire, un oscillateur à fréquence audible General Radio 1107-A a été commandé. Avec cet appareil l'interpolation en HF est évitée, et on mesure la note du battement direct entre le signal et l'harmonique le plus proche du multivibrateur à 10 Kc/s, ce qui permet une précision de l'ordre de quelques cycles. C'est en vue de cet emploi que les multivibrateurs à 100 Kc/s et 10 Kc/s ont été établis spécialement pour donner de très puissants harmoniques jusqu'à 30 Mc/s.

On ne compte pas utiliser cette méthode pour les mesures courantes car la stabilité des transmissions dans les services mobiles ne justifie pas une telle précision ; mais on a jugé indispensable que le C. C. R. M. soit capable de faire, quand il en est requis, des mesures de fréquence avec une précision supérieure à celle des mesures courantes.

3. — **Enregistrement de l'occupation réelle des bandes de fréquence.**

A diverses occasions le C. C. R. M. a été sollicité par d'importants organismes internationnaux, de procéder à une exploration systématique de certaines bandes de fréquence pour déterminer l'occupation réelle de ces bandes.

Dans le but de faciliter une telle exploration, le C. C. R. M. expérimente une méthode d'enregistrement des indications données par un récepteur panoramique pendant des périodes de temps assez longues. Un tel enregistrement donnera simultanément une indication de l'occupation en fréquence, et en durée. Dès que la période expérimentale sera terminée, un rapport spécial sera publié, décrivant la méthode employée, et les résultats obtenus.

4. — **Equipement de mesure d'intensité de champ.**

Le C. C. R. M. possède un appareil de mesure d'intensité de champ Philips permettant la mesure d'intensité de 1 microvolt/m à 1 volt/m entre 150 Kc/s et 23.000 Kc/s.

Un milliampèremètre enregistreur est commandé.

Les mesures d'intensité de champ se sont montrées très utiles dans les cas d'interférence, en particulier avec les stations de radiodiffusion en dérogation pour la surveillance du champ de différents radiophares, et pour la détermination du rayonnement d'antennes d'avion.

5. — **Conclusion.**

Comme on l'a montré plus haut, le C. C. R. M. cherche constamment à améliorer la qualité de son service. Nous espérons que les experts des services mobiles apprécieront nos efforts et qu'ils continueront à nous demander d'effectuer les mesures spéciales dont ils ont besoin comme ils l'ont fait dans le passé. Nous serons toujours heureux de les aider autant que nous le pouvons.

UNION INTERNATIONALE DE PHYSIQUE PURE ET APPLIQUEE

INTERNATIONAL UNION OF PURE AND APPLIED PHYSICS

Circulaire d'information générale - Avril 1948.

COMMISSION II

EVANOUISSEMENTS BRUSQUES
FADING

Comité National Marocain
Moroccan National Committee

8 mars 1947 :

A 12 h.30 on entend très bien Malte GFZ 11.600 Kc/s.

A 12 h. 54 après la réception du météo Portugal, l'émission de Malte a disparu. Un tour de cadran permet de constater que seuls les postes puissants sortent.
On n'entend plus FLJ Paris 8.163 - 11.394 - 17.274 Kc/s.
On n'entend plus GFA Londres 8.900 - 15.000 Kc/s.
On n'entend plus FOG Alger 11.700 Kc/s.

A 14 h. 07 on entend FLJ Paris 17.274 Kc/s R 2/9 au lieu de 7/9.

A 14 h. 16 ECH Madrid 6.300 Kc/s perce à son tour R 0 à 2/9 contre 7/9.

A 14 h. 22 toutes les émissions percent et se renforcent.

A 14 h. 27 la réception devient normale.

5 avril 1947 :

A 12 h. 15 à la prise de service on entre dans une zone de silence.

A 12 h. 20 on entend faiblement CTV Lisbonne 7.330 Kc/s R 2/9 au lieu de 8/9.

A 12 h. 30 on n'entend pas FLJ Paris 8.163 - 11.394 - 17.272 Kc/s;
GFA Londres 8.900 - 15.000 Kc/s;
GFZ Malte 11.600 Kc/s.

A 12 h. 32 on entend F O G Alger 11.700 Kc/s R 3/9 au lieu de 8/9.

A 12 h. 40 on n'entend pas ECH Madrid 6.300 Kc/s.

A 13 h. 20 les émissions commencent à sortir. On entend GFZ Malte 11.600 Kc/s R 2/9 au lieu de R 7/9, par contre on n'entend ni Paris ni Londres.

A 13 h. 45 F L J Paris 11.394 Kc/s perce à son tour.

A 14 h. 00 CTH Horta 16.700 Kc/s n'est pas entendu pourtant la réception se renforce notablement. Elle redevient normale à 14 h. 43.

21 mars 1948 :

A 12h. 15 les émissions faiblissent progressivement pour disparaître à 12 h. 25.
On n'entend pas FLJ Paris 8.163 - 11.394 - 17.274 Kc/s;
GFA Londres 8.900 - 15.000 Kc/s;

GFZ Malte 11.600 Kc/s;
ECH Madrid 6.300 Kc/s.

A 12 h. 50 on entend LTV Lisbonne R 2/9 au lieu de 9/9.

A 13 h. 00 on n'entend pas CTH Horta 16.700 Kc/s.

A 13 h. 29 FLJ Paris 11.394 Kc/s paraît.

A 13 h. 34 GFZ Malte paraît à son tour.

A partir de 13 h. 44 les émissions se renforcent.

A 13 h. 53 la réception redevient normale.

Communication faite par le chef de service des Transmissions Météorologiques du Maroc (Météorologie Nationale - E. C. M.) à Monsieur le Secrétaire du Comité Marocain de l'U. R. S. I.

Casablanca, le 25 mai 1948.

Objet : Zone de silence - P. I. D. B.

J'ai l'honneur de vous informer que le 21 mai 1948 une perturbation ionosphérique, à début brusque (P.I. D. B.), a été constatée au centre radio télégraphique de l'aéroport de Casablanca dont je vous donne ci-dessous les observations relevées.

Début 11 h. 20	Réception nulle sur les fréquences veillées par le centre, 5.650 Kc/s à 17.000 Kc/s.
à 12 h. 30	Liaisons avec Dakar, Orly, Alger, Lisbonne interrompues.
à Fin 14 h. 00	Liaisons avec les avions sur 6.510 Kc/s interrompues.
	La réception s'améliore progressivement.

Remarque : La station de C. N. P. 500 Kc/s est entendue sur récepteur accordé sur 6.500 Kc/s pendant la durée de l'affaiblissement total indiqué ci-dessus.

D'après les renseignements que j'ai pu obtenir la P. I. D. B. s'est également manifestée sur les enregistrements statistiques et radiogoniométriques d'atmosphériques à Rabat (Aguedal), par un renforcement sur 27 Kc/s. Les diagrammes de ces enregistrements ont été envoyés à M. Bureau, à Paris, qui ne manquera pas de donner à l'U. R. S. I. les détails du phénomène.

Collaboration des Amateurs
Amateur Co - Operation

COMITE NATIONAL BRITANNIQUE
BRITISH NATIONAL COMMITTEE

ABSTRACTS

of R. S. G. B. Bulletin. — Journal of the Radio Society of Great Britain. Vol. XXIII, nr 10, April 1948.

Scientific Observation

The British National Committee for Scientific Radio, which is a joint committee of the Royal Society and representatives of various British institutions interested in this subject, was recently invited by the International Union for Scientific Radio to undertake the organisation in this country of co-operation with Amateur Radio observers.

It is extremely gratifying that the British National Committee formed the opinion that observations by amateurs could best be organised by the R. S. G. B. and they suggested that the matter be referred to the Society by Dr. R. L. Smith-Rose (Director of Radio Research in the Department of Scientific and Industrial Research), who is a member of the British National Committee and an Honorary Member of R. S. G. B.

Discussions between Dr. Smith-Rose and Council members followed and at the beginning of this year, the Council set up a « Scientific Observations Committee » for the purpose of handling all group observational work carried out by the Membership to organise special projects suggested by the « Union Radio-Scientifique Internationale » (U. R. S. I.) and to arrange for the reception, collation and publication (or transmission) of results.

Dr Smith-Rose has kindly consented to serve on this Committee and will act as liaison officer between the Committee and the British National Committee for Scientific Radio.

Certain suggestions for observations which could suitably be made by amateurs have already been issued and are as follows :

(a) Ionospheric Propagation (M. U. F. and « skip distance » effects).

(b) Solar, meteor and auroral effects.

(c) Tropospheric Propagation.

(d) Wave interaction (« Luxembourg Effect »).

The phenomenon of the « skipped distance » effect is already well-known to amateurs and nowadays it has become possible to calculate skip distances for given frequencies from a knowledge of ionospheric conditions. Observations will be made for the purpose of checking M. U. P. predictions from known data on distances, times, frequencies, etc. Long series of observations on one station will probably provide the most valuable information.

The study of solar, aurora and meteor effects is perhaps more complex. Sunspot areas are known to be powerful emitters of short-wave receivers. Systematic records on this effect are required.

Attempts are also to be made to ascertain whether the aurora itself emits radio waves.

Many V. H. F. Workers will already have learned to recognise the effect produced by the reflection of signals from meteors. Although best heard when listening to an unmodulated carrier, the whistles can also be detected as momentary increases in signal strength during the reception of C. W. The collection of a substantial amount of observational material on this phenomenon should be of considerable scientific interest.

Five-meters workers are well acquainted with tropospheric wave propagation. In order to provide useful data on the subject, observers will be required to make simple field strength measurements of signals received from fixed transmitting stations such as the Alexandra Palace and Eiffel Tower television transmitters. These results will be considered in relation to the prevailing meteorological conditions over the path.

It is well known that in the range of wavelengths between 200 and 2.000 metres, it is sometimes possible when listening to the unmodulated carrier of one station to hear weakly the modulation of another station operating on quite a different wavelength. On the long wavebands this is usually called the « Luxembourg Effect ». Recently, the effect has been reported on shorter waves (between 10 and 100 metres) and observations of the phenomenon on these latter frequencies should be of particular interest.

Responsability for the organisation of different parts of the above programme has been divided between certain members of the R. S. C. B. Scientific Observations Committee who for the purpose will be styled « Group Managers ».

Messrs Heightman and Blagborough will take charge of groups (a) and (d) (above); Mr. Hatch (b); and Mr. Williams (c).

It will be apparent at once that certain of the studies to be carried out will require systematic watches (daily where possible) by small groups of reliable observers who are to make and record observations with absolute regularity. Other problems, such as auroral and solar effects, will be recorded whenever observed incidentally by a member in the course of this ordinary amateur activities. It is hoped that a very large number of members will be able to give this kind of assistance.

During the early days of radio, amateurs provided valuable data concerning propagation on the higher frequencies. To-day the amateur holds a high reputation which he has justly earned. This reputation is again recognised by te fact that he is now called upon to co-operate in this important work.

The Society is confident that members will willingly assist in providing a great deal of useful information and calls upon both the B. R. S. and fully licensed members for their full support and co-operation in this undertaking.

Offers of co-operation should be made as soon as possible and details of the method of application are given elsewhere in this issue. Particular emphasis is laid on the need for regular and systematic watch by those who volunteer for the M. U. F. and Tropospheric groups.

Further to the Editorial published in this issue a cordial invitation is extended to members to participate in the work which is to be undertaken by the Scientific Observations Committee of he Society.

Members who are willing to co-operate are requested to furnish the Committee with brief details of the equipment they have available for making observations and to indicate the time they will be able to spare for such work.

Groups are being set up to study :

(a) Ionosphere Propagation (« skip-distance » effects and M. U. F.) ;

(b) Solar, aurora and meteor effects;

(c) Tropospheric Propagation ;

(d) Wave interaction.

Members are requested to state which group, or groups, they wish to joint and to forward their application to the General Secretary by not later than May 15 next. Only those who are to make regular observations should volunteer for groups (a) and (c).

It is hoped to begin systematic observations early in June.

Documents - Travaux

PAPERS - WORKS

Les documents suivants ont été reçus au Secrétariat Général pendant le mois de Mai 1948.

Les membres de l'Union, désireux d'obtenir l'un ou l'autre de ces documents sont priés de s'adresser au Secrétariat Général.

The General Secretary's Office has received during May 1948 the following documents.

Members of the Union wishing to receive some of those documents are requested to apply to the General Secretary's Office.

BELGIQUE — BELGIUM

N° B/150. — **Centre de Contrôle des Radiocommunications des Services Mobiles (C. C. R. M.).**

Rapport Mensuel Aé. 4/48 — Avril 1948.

Comme il a été dit dans le rapport de mars, le C. C. R. M. a installé des appareils de mesure de fréquence entièrement nouveaux. L'installation est maintenant terminée, mais n'a été mise en fonctionnement que peu après la mi-avril. Une description de cette nouvelle installation sera publiée.

Comme nous avons été obligés de réduire le temps consacré aux veilles, le nombre de résultats disponibles pour le présent rapport est inférieur à ce qu'il est d'habitude.

Le présent rapport comprend les résultats des mesures de fréquence effectuées à Bruxelles par le C. C. R. M. pendant le mois d'avril sur les émissions des stations suivantes :

A. — Radiophares d'aviation travaillant en ondes moyennes.

B. — Stations côtières travaillant dans les bandes de fréquence suivantes :

Ondes moyennes :

6.200 — 6.675 Kc/s
8.200 — 8.900 Kc/s

C. — Stations Aéronautiques travaillant dans les bandes de fréquence suivantes :

320 — 365 Kc/s
6.200 — 6.675 Kc/s

N° B/151. — **Centre de Contrôle des Radiocommunications des Services Mobiles (C. C. R. M.).**

Rapport Mensuel M 4/48 — Avril 1948.

Comme il a été dit dans le rapport de mars, le C. C. R. M. a installé des appareils de mesure de fréquence entièrement nouveaux. L'installation est maintenant terminée mais n'a été mise en fonctionnement que peu après la mi-avril. Une description de cette nouvelle installation sera publiée.

Comme nous avons été obligés de réduire le temps consacré aux veilles, le nombre de résultats disponibles pour le présent rapport est inférieur à ce qu'il est d'habitude.

Le rapport comprend les résultats des mesures de fréquence effectuées à Bruxelles par le C. C. R. M. pendant le mois d'avril sur les transmissions des stations suivantes :

A. Radiophare maritimes.

B. Stations côtières travaillant dans les bandes de fréquence suivantes :

365 — 485 kc/s
485 — 515 kc/s
8.200 — 8.900 Kc/s
12.300 — 13.350 Kc/s

C. — Stations de navires travaillant dans les bandes de fréquence suivantes :

415 — 515 Kc/s
8.200 — 8.900 Kc/s
12.300 — 13.350 Kc/s

Les résultats des mesures sous A et B sont présentés sous forme de graphiques, ceux sous C sous forme de tableaux.

N° B/152. — **Intitut Météorologique de Belgique. Service du Rayonnnement. Prévisions Ionosphériques.** Juillet 1948.

Table des matières :

Introduction :

Informations générales pour l'utilisation des prévisions ionosphériques.

Uccle — Fréquences critiques.

Liaisons au départ de Bruxelles.

1. Europe.
   Bruxelles — Copenhague
   Bruxelles — Stockholm
   Bruxelles — Oslo
   Bruxelles — Rome
   Bruxelles — Madrid

2. Amérique.
   Bruxelles — Albany
   Bruxelles — Washington
   Bruxelles — San Francisco
   Bruxelles — Dorval
   Bruxelles — Sao Paulo
   Bruxelles — Santiago
   Bruxelles — Rio de Janeiro
   Bruxelles — Buenos-Ayres

3. Afrique.
   Bruxelles — Casablanca
   Bruxelles — Coquilhatville
   Bruxelles — Afrique du Sud

4. Asie.
   Bruxelles — Calcutta
   Bruxelles — Bombay

5. Océanie.
   Bruxelles — Batavia

Léopoldville — Fréquences critiques.

Liaisons au départ de Léopoldville.

1. Europe.
   Léo — Bruxelles
   Léo — Constantinople

2. Amérique.
   Léo — Albany
   Léo — New York
   Léo — San Francisco
   Léo — Buenos Ayres
   Léo — Santiago

3. Afrique.
   Léo — Le Cap

4. Océanie.
   Léo — Batavia

Emissions et réceptions centrées à Bruxelles.

Cartes par directions (de 30° en 30°) de 0° à 360° pour distances de 0,500, 1.000, 2.000. 3.000 et 4.000 km.

Cartes par heures (de 2 en 2 heures) pour distances de 0 à 4.000 km.

Emissions et réceptions centrées à Léopoldville.

Cartes et directions (de 30° en 30°) de 0° à 180° pour distances de 0,500, 1.000, 1.500 et 2.000 km.

Cartes par heures (de 2 en 2 heures) pour distances de 0 à 2.000 km.

ETATS UNIS D'AMERIQUE — UNITED STATES AMERICA

Nr B/153. — **Central Radio Propagation Laboratory, National Bureau of Standards,** F. 44 — April 1948.
Ionospheric Data.

Contents :

Terminology and Scaling Practices.

Monthly Average and Median Values of World-Wide Ionospheric Data.

Ionospheric Data for Every Day and Hour at Washington, D.C.

Ionosphere Disturbances.

American and Zürich Provisional Relative Sunspot Numbers.

Solar Coronal Intensities observed at Climax, Colorado.

Revision of Washington Critical Frequencies, October 1942 through October 1945, inclusive.

Errata.

Tables of Ionospheric Data.

Graphs of Ionospheric Data.

Index of Tables and Graphs of Ionospheric Data in CRPL - F44.

Nr B/154. — **Basis Radio Propagation Predictions for March 1948,** issued by the National Bureau of Standards, U. S. A.
February 1948.

NATIONAL BUREAU OF STANDARDS
CENTRAL RADIO PROPAGATION LABORATORY

Nr B/155. — **Terminal Report of Microwave Measurement Standards Section on Very High Frequency Field Intensity Standards,** by H. E. Sorrows, R. C .Ellenwood, W. E. Ryan.

This report includes the planning and preliminary investigation of problems relating to field ntensity standards in the V H F band from 40 to 160 megacycles per second, specifically covering the standards necessary for frequency modulation, television, and navigation aid equipment for C. C. A. It was the plan to set up standards for comparison purposes in as short a time as possible to take care of expected post-war needs. The work of the Microwave Measurement Standards Section on field intensity standards for the VHF band is terminated by this report. Equipment developed will be turned over to the Ionospheric Measurement Standards Section preparatory to their assumption of responsability for the program in this band, since the Ionospheric Measurement Section is responsible for standards in this frequency range. This report was prepared as an instruction book to aid in the transition of the work.

Nr B/156. — **Theory and Design of a Waveguide belom cut off Attenuator,** by J. J. Freeman.

The fields generated by an arbitrary current distribution exciting a piston-type attenuator are developed, and symmetric distributions exciting maximum amplitudes of the dominant mode, and minimum amplitudes of unwanted modes are investigated. The relative error in voltage measurement due to spurious modes is computed as a function of spacing between exciting and receiving coils for certain simple current distributions. The relative merits of cicular and rectangular attenua-
of spacing between exciting and receiving coils for certain simple current distributions. The relative merits of circular and rectangular attenua-
tor cross-section are discussed.

Nr B/157. — **The comparative accuracy of various exciting and proposed radio navigation systems,** by W. Q. Crichlow.

The concept of the root mean square distance error as a means of evaluating the accuracy of a navigational fix was introduced by the Operational Research Staff in the Office of the Chief Signal Officer. This concept is further expanded here to apply to the three basic types of navigation systems, namely : range, azimuthal, and hyperbolic. The factors affecting the accuracy of each type of system are analysed in a manner such that quantitative comparisons can be made of various proposed and existing navigation schemes. It is shown that, with the range and hyperbolic type systems, the base line should be as long as possible in order to obtain the greatest accuracy within a given area; but, with the azimuthal-type systems there is a particular base-line length which yields the maximum accuracy within a given area. It was also found that there is an optimum base-line angle which, in the case of hyperbolic systems, produces the maximum accuracy for a given area of coverage or conversely, a maximum area within which a specified accuracy will be obtained. A base-line angle of 60° gives the maximum accuracy with azimuthals-type systems when an optimum base-line length is used.

Using estimated values of the standard errors of position readings, the accuracies of several navigation systems have been calculated. For short-range coverage the Decca System appears to be most accurate. An rms distance error of less than 0,0082 mile or 43 feet is expected within an area of 10.000 square miles. L. F. Loran has the best estimated accuracy for consistent day and night long-range coverage. The expected rms distance errors are 3,7 miles and 5,4 miles for day and night respectively, within an area of 1.500.000 square miles.

In addition to the size of the area that can be served with a given accuracy, the shape of the service area is also of importance. Contours of constant accuracy have been plotted for the three types of systems and a direct comparison of the shapes can be readily made.

In order to evaluate the service areas completely it is necessary to determine accurately how the standard error of a navigation reading depends upon the position of the observer. To do this requires the collection of much further experimental data on radio propagation than is now available. The conclusions reached in the paper relative to the optimum systems of navigation for various purposes are based on the very meagre amount of operational propagation data now available and will probably require modification when further data become available. The results obtained in the report are presented in such a form that it is an easy matter to introduce future data and thus arrive at such modified conclusions.

Nr B/158. — **The Technical Factors involved in the Choice of a Carrier Frequency for a World-Wide Low Frequency Loran System,** by Kenneth A. Norton.

The paper deals with the propagational and other technical problems involved in L. F. Loran operation on carrier frequencies between 100 kc and 450 kc. The optimum frequency is determined when the distance between transmitting station is a maximum, consistent with reliable synchronization, since this maximum separation provides the highest accuracy and results in a minimum number of stations for world-wide coverage. For over-land synchronization paths, the lower frequencies in this band provide the greater separations between transmitting stations, but for over-sea synchronization paths, the higher frequencies are better, provided surface-wave synchronization is employed. Assuming that most of the synchronization paths will be over the sea, it is concluded that the higher frequencies in this band are more favorable with suface-wave synchronization than the lower frequencies for F. L. Loran operation.

It is shown in the report that the use of sky-wave synchronization should provide a navigational system with the same effective accuracy as surface-wave synchronization with the use of considerably fewer transmitting stations, especially in artic regions. The optimum frequency for this more efficient sky-wave synchronization system is probably also in the higher part of the band under consideration. It should be pointed out that a sky-wave synchronization system operating at high latitudes will be subject to interruptions due to ionospheric storms; such effects have not been evaluated in this report because of a lack of adequate data and, as a consequence, the 99 % reliability show for a sky-wave synchronization system in artic regions may be optimistic; since ionospheric storms cause a greater degradation in service on the higher frequencies, this factor should also be kept in mind when evaluating the conclusions reached in this report.

A discussion of the problem of sky-waves synchronization with J. A. Pierce of Harvard University brought out the fact that surface-wave synchronization using cycle matching techniques will probably be more accurate than sky-wave synchronization with envelope matching only when the surface waves are comparable in intensity to the sky-waves. Thus, the maximum range of a surface-wave synchronization system is effectively that at which fading becomes objectionable and cannot be increased beyond that point by the use of higher powered transmitters. This lends further ger range sky-wave synchronization system be used; the range of such systems can be increased considerably with the use of higher powered transmitters.

Mention is made of the very large improvements in accuracy which are expected with the use of a wider channel than that used in the present experimental system. It is hoped that the use of this wider channel will permit a sufficiently rapid time of rise on the pulse so that the slightly longer delayed ionospheric waves will not contaminate the surface-wave with a surface-wave synchronization system, or, alternatively, so that ionospheric-wave pulses arriving at the synchronization point after one, two, etc. reflections at the ionosphere will not overlap and thus greatly increase the synchronization errors in a sky-wave synchronization system. In selecting a frequency for a world-wide Low Frequency Loran System, it is considered to be very important that this possible requirement for a very wide channel be kept in mind.

It is important to emphasize that, although the conclusions reached in this report are based upon the best data and theories of propagation available to the author, nevertheless, this available information is not considered adequate to form a proper basis for deciding such an important question as the choise of an optimum frequency for F. L. Loran. This is due to the fact shown in the report that either night or day propagation may limit the range of a sky-wave synchronization system under particular circumstances and this leads to the requirement of a more precise knowledge of the various propagation factors in order to determine the optimum frequencies; thus, we must know with accuracy (1) the absolute values of the day and night sky-wave field intensities, as well as their variations with frequency, (2) the magnitude of the ratio (determined by measurements to be approximately equal to 10) between day and night required signal-to-average-atmospheric-noise ratios, and (3) the influence of latitude on the intensities of sky-waves (an influence well established in the standard broadcast band). This requirement of an accurate knowledge of these three factors arises since a small change in the magnitude of any one of them can shift the limitation from night to day sky-wave propagation. In view of these limitations, the conclusions reached should be considered to be tentative and, if the report serves to guide the efforts of research workers in this field, it will have served its purpose.

Nr B/159. — **Interim Report on the Measurement of Atmospheric Noise Level,** by H. A. Thomas and H. V. Cottony.

The original equipment developed by one of the authors for measuring atmospherics noise on a world-wide basis is briefly described.

At an early stage in the observational program it was realised that at many locations the noise level fell considerably below one microvolt per meter at certain times of the day and that therefore, owing to the limited sensitivity of the original equipment, measurement was not always possible.

The theoretical and experimental work which has been undertaken to improve the sensitivity of the original equipment is described. The improved equipment employs a high input impedance wide band preamplifier situated at the base of the antenna and connected to a receiver by a coaxial line: calibration is effected by inserting a voltage directly into the antenna system.

Provisional test indicate that the sensitivity of the improved equipment is adequate for the measurement of noise level down to 0,05 microvolt per meter. The possibility of error in measurement due to changes in the parameters of the system has also been greatly reduced.

The improved system offers a practical means of increasing the sensitivity of the original equipment with a minimum of alteration.

Nr B/160. — **The Field Generated by an Arbitrary Distribution within a Waveguide,** by J. J. Freeman.

Formulas are derived for the electromagnetic field generated by an arbitrary current distribution within waveguides of rectangular, circular, and coaxial cross-sections. These formulas are obtained by generalyzing analogous formulas obtained in a previous paper for cavities of the same cross-section. It is shown in two specific cases that the results agree with published formulas. Thus, the limiting case of the field from an axially directed dipole within a circular guide reduces to the free space value as the radius increases indefinitely; also, formulas for the field generated by an axial dipole in the center of a rectangular guide are identical to those derived in the literature by the Hertz potential method.

Nr B/161. — **The Microwave Frequency Standard at the Central Radio Propagation Laboratory,** by W. D. George, H. Lyons, J. J. Freeman and J. M. Shaull.

The report describes the equipment set up in 1945 at the National Bureau of Standards to generate standard microwave frequencies and to make microwave frequency measurements, tests and calibration. All frequencies are derived from, or measured directly, in terms of the National primary standard of frequency, the absolute accuracy of which is known at all times to better than 1 part in 100 million. Highly constant oscillators of narrow tuning range are mixed with the multiplied standard frequencies making available an 8 % bandwidth at output center frequencies of 29.7, 89.1, 237.3 and 801.9 Mc/s. Harmonics of these output freqencies, generated by silicon-crystal multipliers, give continuous coverage of the range from 342 to somewhat above 30.000 Mc/s with a known accuracy of 1 part in 10 million or better. In this range a total of over 870 fixed frequencies of approximately 1 % separation, entirely generated from the primary standard and accurate to 1 part in 100 million, are also made available. Measurements are normally made at controlled temperature and humidity in a shielded room. Absolute accuracy of calibration is usually considerably less than that of the reference frequencies, being limited by the operating band-pass characteristics and dial mechanism for frequency meters, or by the short time frequency changes of oscillators under test. Instructions in the operation and maintenance of the equipment are given. Detailed descriptions, circuit diagrams and photographs of the individual units are also included.

Nr B/162. — **Prediction of Annual Sunspot Numbers,** by A. G. Mc Nish and J. V. Lincoln.

Nr B/163. — **Preliminary Instructions for Obtaining and Reducing Manual Ionospheric Records,** by A. H. Morgan.

Contents :

I. Standard Practices for Manual Ionosphere Observations.
1. Circumstances of Observations.
2. Time of Observation.
3. Frequency Intervals.
4. Recording Procedure.

Nr B/164. — **Survey of Meteorological Instruments used in Tropospheric Propagation Investigations,** by D. L. Randall and M. Schulkin.

Table of Contents :

d) Meteorological Reflectors and Repeaters.
C. Airplane System.
D. Turbulence Measurements Aloft.

VII. Rainfall Measuring Instruments.
A. Use of Data in Radio Propagation Problems.
B. Rainfall Measuring Devices.
1. Ferguson-type Weighing Rain Gauge.
2. Tipping Bucket Rain Gauge.
3. Rate-of-Rainfall Indicator.
C. Water Droplet-size Measuring Instruments.
1. Soot-coated Slides.
2. Water-sensitive Dye-coated Surfaces.
3. Vaseline-coated Surfaces.
4. Optical Scattering Devices.
5. Photographic Method.
D. Liquid-water-content Measuring Instruments.
1. General Electric Cloud Meter.
2. The M. I. T. Capillary Colletor.
3. Liquid Water Collecting Cylinders.
4. General Electric Cloud Analyser.

VIII. Methods of Exposing Instruments.
A. Captive Balloons and Kites.
1. Radiosonde Method.
2. Wiredsonde Method.
a) WSC System;
b) NRSL System;
c) Bendix-Friez System;
d) NBS System.
B. Location of Wiredsonde Exposures.
C. Airplane or Autogyro.
D. Tower Installations.
1. Tower at Rye.
2. The Oakhurst 400 ft Meteorological and Radar Tower.

IX. Recording Instruments.
A. Friez Radiosonde Recorder.
B. Leeds and Northrup High Speed Recorder (Speedomax).
C. Leeds and Northrup Micromax Recorder.
D. Brown Instrument Company D. C. Potentiometer Recorder (Electronik).
E. General Electric High Speed Photoelectric Recorder.
F. Esterline-Angus Recorder.
G. Tagliabue Celectray Recorder.
H. Recorder Comparisons.

X. Conclusion.

XI. References.

Nr B/165. — **Average Radio Ray Refraction in the Lower Atmosphere,** by M. Schulkin.

The average refractive bending of radio-frequency rays has been calculated from actual radio-frequency refractive index distributions with height as computed from mean radiosonde data. The maximum possible bending occurs for rays passing entirely through the atmosphere and arriving or departing tangentially at the earth's surface. The range of this total angular ray bending extends from 11 milliradians (mr) (0,63°) at Fairbanks, Alaska, in April, to 18 mr (1,10°) at San Juan, Puerto-Rico, in July, and is about 14 mr (0,80°) at Washington, D.C., in October. About 90 % of the ray bending occurs in the lowest 10 km. of the atmosphere. These results are compared with the ray bending compted from the 4/3 effective earth's radius approximation.

Nr B/166. — **Sunspots and Very High Frequency Radio Transmission,** by Kenneth A. Norton.

Nr B/167. — **High Frequency Radio Propagation Charts for Sunspot Minimum and Sunspot Maximum, prepared for the Provisional Frequency Board, International Telecommunications Union.**

Nr B/168. — **Some Methods for General Prediction of Sudden Ionospheric Disturbances,** by A. H. Shapley and J. V. Lincoln.

This report describes the methods of predicting sudden ionospheric disturbances (SID) which are applied in the recently inaugurated SID prediction service of CRPL.

A rigorous statistical treatment of the phenomena has not been attempted. Such a study has been passed. The new prediction service was undertaken at the request of the Army and Navy communication services because of the large number of service interruptions being experienced.

Nr B./169. — **Observations of the Solar Corona at Climax,** 1944-1946, by W. O. Roberts and A. H. Shapley.

The intensity of emission lines of the coronal spectrum at 5- degree intervals around the solar limb as observed at the High Altitude Observatory at Climax, Colorado, is tabulated herein for 5303 A for the period August 1945 through November 1946 ; for 6374 A for April 1944 through November 1946; for 6704 A for December 1944 through November 1946. Similar tables for 5303 A for the period August 1942 through July 1945 appeared in an earlier report by Roberts, Shapley and Hodder.

With the present report, all of the detailed reductions of the Climax observations through November 1946 have been published ; subsequent data are published monthly in CRPL-F reports « Ionospheric Data ».

Nr B/170. — **Comparison of Predictions of Atmospheric Radio Noise with Observed Noise Levels,** by E. L. Shultz.

Two years data from 16 atmospheric radio-noise measurements stations show sufficient consistencies in the relationship of the noise level and the geographic location of the observing station to indicate that a linear latitude trend approaches a definition of that relationship. The data on 2,5 and 5 Mc. during night hours show a fair agreement with the United States Army Signal Corps predictions (RPU-140). An even closer agreement exists between the observed data and a linear latitude relationship for each frequency. The average noise level for the northern hemisphere exhibits a variation, seasonal sine wave with an amplitude of about three units, superposed on a general decreasing trend for the past two years at the rate of about four units per year.

Nr B/171. — **Electronic Phase Meter,** by E. F. Florman and A. Tait.

An improved form of direct-reading audio-frequency phase meter is described.

The phase between two sinusoidal voltages is measured by converting them to square waves through two separate channels of amplifier-limiters. A direct comparison of these square waves gives a measure of the phase between the original voltages. Two methods of comparing the square waves are described, one involves their direct addition in a circuit having two tubes with a common plate resistor, while in the other method the square waves are used to produce voltage « pikes » which in turn control a « trigger » type unambiguous phase-indicating circuit.

Tests on this phase meter show that it records and indicates unambisguously the phase between two input voltages from 0 to 360 degrees to a sensitivity of 0,5 degree, over a range of frequencies from 10C to 5.000 c/s and for a voltage range of 1 to 30 volt. The relationship between phase-meter readings and phase is linear. A 72-hour stability test on the instrument showed that the maximum drift after the first 15 minutes of warm-up was approximately = 1.6 degrees while the maximum rate of drift was 0,25 degree per hour.

Nr B/172. — **The Variability of Sky-Wave Field Intensities at Medium and High Frequencies,** by Newbern Smith and M. B. Harrington.

A summary of the time distribution of received radio field intensities at frequencies ranging from 770 to 15.310 kc., recorded at the National Bureau of Standards and cooperating laboratories, is given. The study was made for the purpose of obtaining a factor that could be applied to the median required field intensity assuring transmission a given percentage of the time. Deviations from the median values showed no appreciable dependence upon frequency or distance, except in the case of auroral-zone paths, particularly in winter. It was found that multiplying the required field intensity by a factor of 2 would usually assure adequate intensities on 90 % of the days.

GRANDE-BRETAGNE — GREAT BRITAIN

Nr B/173. — **Department of Scientific and Industrial Research, Radio Division, National Physical Laboratory. Bulletin A. — Nr 17.**

Predictions of Radio Wave Propagation Conditions for July 1948.

Contents :

Ordinary Ray Critical Frequencies F2 Zone E, I, W.
M. U. F. Factors for 3.000 km. F2 Zone E, I. W.
Maximum Usable Frequencies for 4.000 km. Zone E, I, W.
Optimum Working Frequencies :

Zone E	Zone I	Zone W
Lat. 70° N.	Lat. 70° N.	Lat. 70° N.
Lat. 60° N.	Lat. 60° N.	Lat. 60° N.
Lat. 50° N.	Lat. 50° N.	Lat. 50° N.
Lat. 40° N.	Lat. 40° N.	Lat. 40° N.
Lat. 30° N.	Lat. 30° N.	Lat. 30° N.
Lat. 20° N.	Lat. 20° N.	Lat. 20° N.
Lat. 10° N.	Lat. 10° N.	Lat. 10° N.

Lat. 0°	Lat. 0°	Lat. 0°
Lat. 10° S.	Lat. 10° S.	Lat. 10° S.
Lat. 20° S.	Lat. 20° S.	Lat. 20° S.
Lat. 30° S.	Lat. 30° S.	Lat. 30° S.
Lat. 40° S.	Lat. 40° S.	Lat. 40° S.

Nr B/174. — **Department of Scientific and Industrial Research. Radio Research Board. Radio Division. National Physical Laboratory. Bulletin B. — Nr 16. May 1948.**

Monthly Bulletin of Ionospheric Characteristics.
Falkland Islands for February 1948.
Slough and Fraserburgh for March 1948.

Contents :

Terminology ;
Note on Ionospheric Absorption Measurements ;
Units and Abbreviations.
Tables :
I. Noon Ionospheric Characteristics — Slough.
II. Monthly Mean Ionospheric Characteristics — Slough.
III. Median Hourly Values of Absorption — Slough.
IV. Hourly Values of hm in km for Region F. — Slough.
V. » » » ym/ho » » » — »
VI. » » » fF2 in Mc/s — Slough.
VII. » » » fEs in Mc/s — Slough.
VIII. Noon Ionospheric Characteristics — Fraserburgh.
IX. Monthly Mean Ionospheric Characteristics — Fraserburgh.
X. Hourly Values of hm in km for Region F. — Fraserburgh.
XI. » » » ym/ho for Region F. — Fraserburgh.
XII. » » » fF2 in Mc/s — Fraserburgh.
XIII. » » » fEs in Mc/s — Fraserburgh.
XIV. Noon Ionospheric Characteristics — Falkland Islands.
XV. Monthly Mean Ionospheric Characteristics — Falkland Islands.
XVI. Hourly Values of hm in km for Region F. — Falkland Islands.
XVII. » » » ym/ho » » » — »
XVIII. » » » fF2 in Mc/s — Falkland Islands.
XIX. » » » fEs in Mc/s — Falkland Islands.

The observing stations are :
Slough, Bucks, England. Lat. 51° 30' N., Long. 0° 34' W.
(Frequency sweep of recorder 0,5 Mc/s to 16,5 Mc/s in 5 minutes.)
Fraserburgh, Aberdeenshire, Scotland, Lat. 57°39' N., Long. 2°6' W.
(Frequency sweep of recorder 2,2 Mc/s to 16,0 Mc/s in 1 minute.)
Port Stanley, Falkland Islands, Lat. 51° 42' S., Long. 57° 51' W.
(Frequency sweep of recorder 2,2 Mc/s to 16,0 Mc/s in 1 minute.)

Nr B/175. — **Department of Scientific and Industrial Research. Radio Research Board. Radio Division. National Physical Laboratory.**

and

Nr B/176. — **Monthly Bulletin of Radio Atmospheric Noise.**
Bulletin C — Ns 4. Measurements for March 1947.
Bulletin C — Nr 5. Measurements for April 1947.

Contents for both nrs 175 and 176.

Definitions and Location of Observing Stations.
Table I. — Tatsfield.
Table II. — Aden.
Table III. — Accra (no measurements available for this month).
Table IV. — Delhi.
Table V. — Calcutta.
Table VI. — Colombo.
Table VII. — Fanning Island