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CANADA, CZECHOSLOVAKIA, DENMARK, FINLAND, ICELAND, etc.

Acts of the International Telecommunication and Radio Conferences. Atlantic City, 1947 (Continuation: see also United Nations, *Treaty Series*, Vols. 193 and 194)

Appendices to Radio Regulations annexed to the International Telecommunication Convention (Atlantic City, 1947)

Additional Radio Regulations

Additional Protocol to the Acts of the International Radio Conference of Atlantic City, 1947, signed by the Delegates of the European Region (with annexed documents)

Recommendations and Resolutions adopted by the International Radio Conference of Atlantic City (1947)

All signed or adopted at Atlantic City, on 2 October 1947

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Registered by the United States of America on 14 July 1954.

No. 2616. ACTS OF THE INTERNATIONAL TELECOMMUNICATION AND RADIO CONFERENCES. ATLANTIC CITY, 1947

APPENDICES TO RADIO REGULATIONS[1] ANNEXED TO THE INTERNATIONAL TELECOMMUNICATIONS CONVENTION (ATLANTIC CITY, 1947)[2]

TABLE OF CONTENTS

FIRST SERIES

[1] United Nations, *Treaty Series*, Vol. 194.
[2] United Nations, *Treaty Series*, Vol. 193, p. 189.

FIRST SERIES

APPENDIX 1

FORM OF NOTICE

For use when notifying to the International Frequency Registration Board a frequency assignment to a fixed, land, broadcasting, radionavigation land, or standard frequency station.

1. . . . . Notifying Government

2. . . . . Date of the notice

3. . . . . Reference to preliminary telegraphic notice (if any)

4. Assigned frequency in kc/s (or Mc/s).
5. Class of emission [note *a*)].
6. Bandwidth of emission in kc/s.
7. Power in kW.
8. Antenna Location
   A) Country
   B) Place
   C) Latitude and Longitude [note *b*)].
9. Directivity of Antenna [note *c*)].
   A) Azimuth of maximum radiation in degrees from true north (clockwise).
   B) Angular width of the main lobe in the horizontal plane in degrees [note *d*)].
   C) Gain in decibels (db) in direction of maximum radiation at the assigned frequency [note *e*)].
10. Call sign.
11. Class of Station [note *f*)].
12. Nature of Service [CP, CO, etc. — note *f*)].
13. Locality (or localities) or regions with which communication is established or projected [note *g*)].
14. Projected date of service or date put into service.
15. Maximum hours of use of frequency (G.M.T.) [note *h*)].
16. Length of the intended circuit in km [note *i*)].
17. Description of transmission employed [note *j*)].
18. Operating Administration or Company.

19. Postal and telegraphic address of centralizing office under whose jurisdiction the station is placed [note *h*)].
20. Remarks [note *l*]).
21. If assignment is made in accordance with a service or regional arrangement, the agreement should be identified.

. . . . . .

. . . . . .

. . . . . .
Signature

. . . . . .
Title

NOTES

a) Indicate only the symbols such as A1, F2, etc. (see article 2).

Additional information regarding the emissions should be furnished under items 17 or 20.

b) Only in degrees and minutes, except for radionavigation land stations for which the position should be given in degrees, minutes, and seconds.

c) State whether the antenna exists or is projected.

d) The angular width of the main lobe in the horizontal plane is that total angle, in degrees, within which the radiated power in any direction is not more than 6 db less than the power radiated in the direction of maximum radiation.

e) Gain to be calculated with reference to a theoretical free space half-wave dipole (see article 1).

f) Reference should be made to appendix 7.

g) When more than one locality is served list all localities ; giving the location of the control point or points in all cases.

h) The maximum hours of use of the frequency shall be taken to mean the earliest and latest hours of use of this frequency for a complete day during all schedules for a complete sunspot cycle. For example : if during one period the schedule would be 1000 to 1500 hours (G.M.T.) and for another period of 1100 to 1600 hours (G.M.T.), the information to be shown will be 1000 to 1600 hours (G.M.T.).

i) In the case of forked fixed circuits the distance to each locality should be shown. In the case of fixed networks, the maximum distance between any two stations should be shown.

In the case of emissions intended to serve a large geographical region the distance to the approximate centre of the region or the maximum and minimum distances of the extremes of the region may be furnished.

j) The information to be furnished under item 17 should include :

—in the case of telegraphy, the type of code used such as "on" "off" Morse — Frequency shift Morse — 7 unit code — Hell-Schreiber Facsimile, etc. ;

—in the case of telephony, details such as the use of single sideband one or two channel working should be given.

In the case where the assigned frequency is not actually transmitted, the reference frequency should be given here.

k) The addresses required are those to which communication should be sent on urgent matters regarding interference, quality of emissions, and questions referring to the technical operation of the circuit (see article 14).

l) Any other useful data which might assist the International Frequency Registration Board should be furnished.

APPENDIX 2

Report of an Irregularity or of an Infringement of the Telecommunications Convention or of the Radio Regulations

(See article 13, 14, 15 and 23)

Particulars concerning the station infringing the Regulations :

1. Name, if known (in BLOCK letters) [Note *a*)] . . . . . .
2. Call sign (in BLOCK letters) . . . . . .
3. Nationality, if known . . . . . .
4. Frequency used (kc/s or Mc/s) . . . . . .
5. Class of Emission [Note *b*)] . . . . . .

Particulars concerning the station, the centralizing office or inspection service reporting the irregularity or infringement :

6. Name (in BLOCK letters) . . . . . .
7. Call sign (in BLOCK letters) . . . . . .
8. Nationality . . . . . .
9. Approximate Position [Notes *c*) and *h*)] . . . . . .

Details of the irregularity or infringement :

10. Name [Note *d*)] of the station (in BLOCK letters) in communication with the station committing the irregularity or infringement . . . . . .

11. Call sign (in BLOCK letters) of the station in communication with the station committing the irregularity or infringement . . . . . .
12. Time [Note *e*)] and date . . . . . .
13. Nature of the irregularity or infringement [Note *f*)] . . . . . .
14. Extracts from ship log and other documents supporting the report (to be continued on the back of the form, if necessary) . . . . . .

Information on the transmitting station which was subject to interference [*Note g*)]:

15. Name of the station (in BLOCK letters) which was subject to interference . . . . . .
16. Call sign (in BLOCK letters) . . . . . .
17. Frequency assigned (kc/s or Mc/s) . . . . . .
18. Frequency measured at the time of the interference . . . . . .
19. Class of emission and width of the band . . . . . .
20. Receiving location (in BLOCK letters) where the interference was troublesome [Notes *c*) and *h*)] . . . . . .

21. Certificate

I certify that the foregoing report represents, to the best of my knowledge, a complete and accurate account of what took place.

Date . . . . . 19..[1]

[1] This report must be signed by the operator who has reported the infringement and countersigned by the Master of the ship or aircraft, or the officer in charge of the station in the case of an infringement reported by a station of the mobile service.
When the report originates from a centralizing office or from an inspection service it must be signed by the head of that office or service and countersigned by an official of the administration transmitting it.

INSTRUCTIONS FOR FILLING IN THIS FORM

Note *a*) Each report will refer only to one station [see Note *d*)].

Note *b*) See Article 2.

Note *c*) Applicable only to ships and aircraft; the position must be expressed either in latitude longitude (Greenwich) or by a true bearing and distance in nautical miles, or in kilometres from some well known place.

Note *d*) If both communicating stations infringe the Regulations, a separate report shall be made for each of these stations.

Note *e*) The time must be expressed as Greenwich mean time (G.M.T.) by a group of four figures (0000 to 2400). If the infringement covers a considerable period of time, the times must be shown.

Note *f*) A separate report is required for each irregularity or infringement, unless they have obviously all been made by the same person and within a short time. All reports must be forwarded in duplicate and, whenever practicable, must be typewritten. (Indelible pencil and carbon paper may be used.)

Note *g*) This information is to be given only in case of a complaint about interference.

Note *h*) In the case of land or fixed stations position must be expressed in latitude and longitude (Greenwich).

FOR USE OF ADMINISTRATIONS ONLY

1. Company controlling the installation of the station against which complaint is made . . .
. . . . . .
2. Name of operator of the station held responsible for the irregularity or infringement of the Regulations . . . . . .
3. Action taken . . . . . .

APPENDIX 3

TABLE OF FREQUENCY TOLERANCES

(See article 17)

1. Frequency tolerance is defined in article 1.

2. For ship stations, in the absence of an assigned frequency (see article 11) to a particular ship or ship transmitter the substitute for the assigned frequency is that frequency on which an emission begins.

TABLE OF FREQUENCY TOLERANCES

Frequency Bands and Categories of Stations	Tolerances (in %) applicable until January 1st 1953 to transmitters now in use and those to be installed before January 1st 1950	Tolerances (in %) applicable : –to new transmitters installed after January 1st 1950 ; –to all transmitters after January 1st 1953
1	2	3
A. *From 10 to 535 kc/s.*		
1. Fixed Stations :		
–from 10 to 50 kc/s,	0.1	0.1
–from 50 kc/s to end of band.	0.1	0.02
2. Land Stations :		
a) Coast Stations :		
–power above 200 watts,	0.1	0,02
–power below 200 watts.	0.1	0.05
b) Aeronautical Stations.	0.1	0.02
3. Mobile Stations :		
–Ship Stations,	0.3 [6]	0.1 [1]
–Aircraft Stations,	0.3	0.05
–Emergency (reserve) ship transmitters, and lifeboat, liferaft and survival craft transmitters.	0.5	0.5

Frequency Bands and Categories of Stations	Tolerances (in %) applicable until January 1st 1953 to transmitters now in use and those to be installed before January 1st 1950	Tolerances (in %) applicable : –to new transmitters installed after January 1st 1950 ; –to all transmitters after January 1st 1953
1	2	3
4. Radionavigation Stations.	0.05	0.02
5. Broadcasting Stations.	20 cycles per second	20 cycles per second
B. *From 535 to 1 605 kc/s.*		
Broadcasting Stations.	20 cycles per second	20 cycles per second
C. *From 1 605 to 4 000 kc/s.*		
1. Fixed Stations :		
–power above 200 watts,	0.01 [2]	0.005
–power below 200 watts.	0.02	0.01
2. Land Stations :		
a) Coast Stations :		
–power above 200 watts,	0.02	0.005
–power below 200 watts.	0.02	0.01
b) Aeronautical Stations :		
–power above 200 watts,	0.02	0.005
–power below 200 watts.	0.02	0.01
c) Base Stations :		
–power above 200 watts,	0.02	0.005
–power below 200 watts.	0.02	0.01
3. Mobile Stations :		
–Ship Stations,	0.05 [6]	0.02 [3]
–Aircraft Stations,	0.05	0.02 [3]
–Land Mobile Stations.	0.05	0.02
4. Radionavigation Stations :		
–power above 200 watts,	0.02	0.005
–power below 200 watts.	0.02	0.01
5. Broadcasting Stations.	0.005	0.005

Frequency Bands and Categories of Stations	Tolerances (in %) applicable until January 1st 1953 to transmitters now in use and those to be installed before January 1st 1950	Tolerances (in %) applicable : –to new transmitters installed after January 1st 1950 ; –to all transmitters after January 1st 1953
1	2	3
D. *From 4 000 to 30 000 kc/s.*		
1. Fixed Stations :		
–power above 500 watts,	0.01	0.003
–power below 500 watts.	0.02	0.01
2. Land Stations		
a) Coast Stations :	0.02	0.005
b) Aeronautical Stations :		
–power above 500 watts,	0.02	0.005
–power below 500 watts.	0.02	0.01
c) Base Stations :		
–power above 500 watts,	0.02	0.005
–power below 500 watts.	0.02	0.01
3. Mobile Stations :		
–Ship Stations,	0.05 [6]	0.02 [3]
–Aircraft Stations,	0.05	0.02 [3]
–Land Mobile Stations,	0.05	0.02
–Transmitters in lifeboats, liferafts and survival craft.	0.05	0.02
4. Broadcasting Stations.	0.005	0.003
E. *From 30 to 100 Mc/s.*		
1. Fixed Stations.	0.03	0.02
2. Land Stations.	0.03	0.02
3. Mobile Stations.	0.03	0.02
4. Radionavigation Stations.	0.02 [5]	0.02 [5]
5. Broadcasting Stations.	0.01	0.003
F. *From 100 to 500 Mc/s.*		
1. Fixed Stations.	0.03	0.01
2. Land Stations.	0.03	0.01
3. Mobile Stations.	0.03	0.01 [4]
4. Radionavigation Stations.	0.02 [5]	0.02 [5]
5. Broadcasting Stations.	0.01	0.003

Frequency Bands and Categories of Stations	Tolerances (in %) applicable until January 1st 1953 to transmitters now in use and those to be installed before January 1st 1950	Tolerances (in %) applicable : –to new transmitters installed after January 1st 1950 ; –to all transmitters after January 1st 1953
1	2	3
G. *From 500 to 10 500 Mc/s.*	0.75	0.75 Until C.C.I.R. opinion is available, no closer tolerances can be specified for this column.

NOTES REFERRING TO TABLE OF TOLERANCES

[1] It is recognized that certain countries will encounter difficulties in fitting, prior to 1953, all their ships with equipment which will satisfy the indicated tolerance ; however, it is requested that these countries complete the necessary conversion as soon as possible.

[2] The frequency tolerance of 0.02 % is maintained temporarily for fixed station transmitters now in operation using a power between 200 and 500 watts.

[3] For this category, the final date of January 1st 1953, is extended until the date when the Radio Regulations of the next Conference are put into force.

[4] In this band and for this category, it is recognized that certain countries are not sure that their equipment can satisfy a stricter frequency tolerance than that fixed for the 30-100 Mc/s band ; however, these countries will endeavour to satisfy the tolerance for the band 100-500 Mc/s.

[5] In bands E and F it is recognized that there are in service in category 4 pulse transmitters which cannot meet tolerances closer than 0.5 %.

[6] Frequency deviations are to be measured over a period not exceeding ten minutes from the commencement of an emission.

This provision, however, is applicable only to transmitters in service before January 1st, 1950 and until the replacement of these transmitters by modern equipment, and only in exclusive maritime mobile bands, and excepting such parts of these bands as are reserved for ship radiotelephony. Thereafter the frequency tolerances specified shall be adhered to during the whole period of an emission.

APPENDIX 4

TABLE OF TOLERANCES FOR THE INTENSITY OF HARMONICS AND PARASITIC EMISSIONS[1]

(See article 17)

Frequency Band	Tolerances
10 to 30 000 kc/s	The power [2] of a harmonic or a parasitic emission must be at least 40 db below the power of the fundamental, and in no case shall it be above 200 milliwatts. [3]

[1] For mobile stations, endeavour will be made, as far as practicable, to reach the figures specified.

[2] The power here referred to is the power supplied to the antenna on the frequency of the harmonic or of the parasitic emission.

[3] The latter limiting figure refers to the mean power.

APPENDIX 5

BAND OF FREQUENCIES REQUIRED FOR CERTAIN TYPES OF RADIOCOMMUNICATION

The width of the frequency band which is necessary in the overall system, including both the transmitter and the receiver, for the proper reproduction at the receiver of the desired information, does not necessarily indicate the interfering characteristics of an emission.

For the determination of this necessary bandwidth, the following table may be considered as a guide.

In the formulation of the table, the following working terms have been employed :

B = Telegraph speed in bauds.

$\frac{N}{T}$ = Maximum possible number of black plus white elements to be transmitted per second, in facsimile and television.

M = Maximum modulation frequency expressed in cycles per second.

D = Half the difference between the maximum and minimum values of the instantaneous frequencies ; D being greater than $2M$, greater than $\frac{N}{T}$ or greater than B, as the case may be. Instantaneous frequency is the rate of change of phase.

t = Pulse length expressed in seconds.

K = An overall numerical factor which differs according to the emission and depends upon the allowable signal distortion and, in television, the time lost from the inclusion of a synchronizing signal.

TABLE OF NECESSARY BANDWIDTHS

Description and Class of Emission	Necessary Bandwidth in Cycles per Second	Examples	
		Details	Designation of Emission
I. AMPLITUDE MODULATION			
Continuous wave Telegraphy A1	BK $K = 5$ for fading circuits $K = 3$ for non-fading circuits	Morse code at 25 words per minute, $B = 20$, Bandwidth : 100 c/s Four channel multiplex, 7 unit code, 60 words per minute per channel, $B = 170$, $K = 5$, Bandwidth: 850 c/s	0.1A1 0.85A1
Telegraphy modulated at audio frequency A2	$BK + 2M$ $K = 5$ for fading circuits $K = 3$ for non-fading circuits	Morse code at 25 words per minute with 1 000 cycle tone, $B = 20$, Bandwidth :2 100 c/s	2.1A2
Commercial Telephony A3	M, for single sideband $2M$, for double sideband	For ordinary single sideband telephony, $M = 3\,000$ For high-quality single sideband telephony, $M = 4\,000$	3A3a 4A3a
Broadcasting A3	$2M$	M may vary between 4 000 and 10 000 depending upon the quality desired.	8A3 to 20A3
Facsimile Carrier modulated by tone and by keying A4	$\frac{KN + 2M}{T}$ $K = 1.5$	The total number of picture elements (black and white) transmitted per second = the circumference of the cylinder (height of picture) × number of lines per unit length × speed of rotation of cylinder in revolutions per second.	

Description and Class of Emission	Necessary Bandwidth in Cycles per Second	Examples	
		Details	Designation of Emission
		Diameter of cylinder = 70 mm. Number of lines per mm = 3.77 Speed of rotation 1 turn per second Frequency of modulation = 1 800 c/s Bandwidth : 3 600 + 1 242 = 4 842 c/s	4.84A4
Television A5	$\frac{KN}{T}$ K = 1.5 (this allows for synchronization and filter shaping) Note : This band can be appropriately reduced when asymmetrical transmission is employed.	The total number of picture elements (black and white) transmitted per second = the number of lines forming each image × number of elements per line × number of pictures transmitted per second. Number of lines = 500 Number of elements per line = 500 Number of pictures per second = 25 Bandwidth : approximately 9 Mc/s	9 000A5
	II. FREQUENCY MODULATION		
Frequency-shift Telegraphy F1	$BK + 2D$ K = 5 for fading circuits K = 3 for non-fading circuits	Four channel multiplex with 7-unit code. 60 words per minute per channel B = 170 K = 5 D = 425 Bandwidth : 1 700 c/s	1.7F1
Commercial Telephony and Broadcasting F3	$2M + 2DK$ For commercial telephony, K = 1. For high-fidelity transmission, higher values of K may be necessary	For an average case of commercial telephony with D = 15 000 M = 3 000 Bandwidth : 36 000 c/s	36F3

Description and Class of Emission	Necessary Bandwidth in Cycles per Second	Examples	
		Details	Designation of Emission
Facsimile F4	$\frac{KN}{T} + 2M + 2D$ $K = 1.5$	(See facsimile, amplitude modulation) Cylinder diameter = 70 mm Lines per mm = 3.77 Cylinder speed = 1 rps Modulation tone = 1 800 c/s D = 10 000 c/s Bandwidth: 25 000 c/s (approximately)	25F4
III. PULSE EMISSIONS			
Unmodulated pulse P0	$2\frac{K}{t}$ K varies from 1 to 10 according to the permissible deviation in each particular case from a rectangular pulse shape. In many cases the value of K does not need to exceed 6.	$t = 3 \times 10^{-6}$ $K = 6$ Bandwidth : 4×10^6 c/s	4 000P0
Modulated pulse P2 or P3	The bandwidth depends upon the particular types of modulation used, many of these being still in the development stage.	—	—

APPENDIX 6

SERVICE DOCUMENTS

(See articles 10, 11 and 20)

LIST I. INTERNATIONAL FREQUENCY LIST

1	Assigned Frequency (kc/s or Mc/s)	Dates			Call sign	Circuits		Class of station and nature of service	Class and bandwidth of emission	Description of transmission	Power in kW	Radiation Characteristics[4]			Maximum schedule of use in G.M.T.	Operating Administration or Company[3]	Postal and telegraphic address of centralizing office responsible for control of station (see art. 14)[3]	Remarks
		Of registration[1]	Of notification[1]	Of putting into service		Name, geographical position[2] of transmitting station and indication of country to which the station belongs	Locality or area(s) with which it is intended to establish communication	Length of circuit (kms)										
		2*a*	2*b*	2*c*	3	4*a*	4*b*	4*c*	5	6	7	8	9*a*	9*b*	9*c*	10	11	12	13
													Azimuth of maximum radiation of antenna, in degrees (clockwise) from true north	Angular width of main lobe in the horizontal plane, in degrees	Gain of the antenna in decibels (db) in direction of maximum radiation at the assigned frequency				

[1] For exact significance of these dates see article 11.

[2] In degrees and minutes (Meridian of Greenwich), except for radionavigation stations for which the position should be given in degrees, minutes, and seconds.

[3] Columns 11 and 12 will contain only reference numbers to lists to be printed in the front of the volume.

[4] See appendix 1.

List II. List of Fixed Stations

(Index to the List of Frequencies of fixed stations shown in List I)

Alphabetical index of stations arranged :

a) by stations

Station	Call sign [1]	Frequency kc/s *or* Mc/s
1	2	3

[1] The distinguishing call sign of each frequency must be indicated opposite this frequency.

b) by countries

Station	Call sign [1]	Frequency kc/s *or* Mc/s	Remarks
1	2	3	4

[1] The distinguishing call sign of each frequency must be indicated opposite this frequency.

List III. List of Broadcasting Stations

Part A. Alphabetical index of stations

Name of the station	Call sign	See Part B page
1	2	3

Part B. Particulars of stations

1. *LF, MF and HF broadcasting stations using AM.*

{ Name of the country / Names of the stations } in alphabetical order.

Name of the station	Call sign [1]	Frequencies kc/s	Latitude and longitude of the transmitting antenna, in degrees and minutes	Power kW	Name and address of the administration or operating agency	Remarks
1	2	3	4	5	6	7

[1] The identifying call sign of each frequency must be shown opposite that frequency.

2. *FM broadcasting stations.*

{ Name of the country / Names of the stations } in alphabetical order.

Name of the station	Call sign	Frequencies Mc/s	Latitude and longitude of the transmitting antenna, in degrees and minutes	Power kW	Name and address of the administration or operating agency	Remarks
1	2	3	4	5	6	7

3. *Television broadcasting stations.*

{ Name of the country / Names of the stations } in alphabetical order.

Name of the station	Call sign	Channel limits Mc/s	Frequencies		Latitude and longitude of the transmitting antenna, in degrees and minutes
			Television carrier Mc/s	Sound carrier Mc/s	
1	2	3	4	5	6

Power		Class of Emission		Name and address of the administration or operating agency	Remarks
Television Channel kW	Sound Channel kW	Television Channel	Sound Channel		
7	8	9	10	11	12

4. *Facsimile broadcasting stations.*

{ Name of the country / Names of the stations } in alphabetial order.

Name of the station	Call sign	Frequency Mc/s	Latitude and longitude of the transmitting antenna, in degrees and minutes	Power kW	Class of emission	Name and address of the administration or operating agency	Remarks
1	2	3	4	5	6	7	8

List IV. List of Coast and Ship Stations

Part A. Alphabetical index of coast stations

Name of the station	Call sign	See part B page
1	2	3

Part B. Particulars of coast stations

{ Name of the country / Names of the stations } in alphabetical order.

Name of the station [8]	Call sign	Emission			Service		Charges [5] [6]	Exact geographical position of the transmitting antenna [2]	Remarks [7]
		Frequencies [1] kc/s or Mc/s	Class	Power [3] kW	Nature	Hours of service [4]			
1	2	3	4	5	6	7	8	9	10

[1] The normal working frequency is printed in heavy type. In the case of duplex telephony, frequencies used for transmission and reception are indicated in conformity with 810.

[2] Meridian of Greenwich in degrees, minutes and seconds.

[3] In the case of directive antennae, indicate under the power, the azimuth of the direction or directions of maximum gain, in degrees, beginning from true north clockwise.

[4] Greenwich mean time (G.M.T.).

[5] The internal telegraph charge of the country to which the coast station is subject and the charge applied by this country to telegrams destined for adjacent countries are given at the end of the present List.

[6] If the accounts for charges are settled by a private enterprise, the name and address of such private enterprise should be stated, if necessary.

[7] Special information concerning the times for calling, for the transmission of traffic lists, and the times during which the coast station keeps watch on the various frequencies, etc.

[8] There must be indicated, for each country, the coast station or coast stations to which radiotelegrams intended for high frequency transmission to ship stations must be sent.

Part C. Particulars of ship stations

The information concerning these stations is published in two or three lines in the following order :

1st line :

—call sign, name of the ship in alphabetical order irrespective of nationality, followed by the call sign in the case of duplication of names ; in that case the name and the call sign are separated by a fraction bar ; then the service symbols (see appendix 7) ;

—power in the antenna in kW ;

—metre-amperes, between brackets, for frequency 500 kc/s.[1]

To obtain the product "metre-amperes" the actual height of the aerial in metres from the loadline is multiplied by the effective current in amperes at the base of the aerial ;

—nature of service ;

—hours of service in the form of a symbol or a reference.

Times indicated otherwise than by a symbol must be given in Greenwich mean time (G.M.T.).

2nd and 3rd lines :

—below the call sign is shown the ship charge, followed by a note to indicate the administration or private enterprise to which the accounts for charges must be addressed. In the case of change of address of the operating authority, a second note after the charge gives the new address and the date from which the change will take effect ;

—when two or more ships of the same nationality bear the same name, and also where the accounts for charges must be sent direct to the owner of the ship, the name of the shipping line or of the firm to whom the ship belongs is given by means of a note ;

—country to which the station is subject (abbreviated indication) ;

—indication of the classes of emission and frequency bands.

The bands of frequencies are indicated by means of the following abbreviations printed in heavy type :

w	=	110	to	150 kc/s
x	=	405	to	535 kc/s
y	=	1 605	to	2 850 kc/s
z	=	4 000	to	23 000 kc/s
v	=	152	to	162 Mc/s

These abbreviations are printed at the foot of every second page of the List.

These abbreviations are, if necessary, followed by references to brief notes and indications of the frequencies for which the transmitter is adjusted, the normal working frequencies being printed in heavy type, which appear at the end of the List.

[1] If the Safety of Life at Sea Conference should adopt a different system of rating the normal range of a ship station, the information published here shall conform to the system adopted by that Conference.

LIST V. LIST OF AERONAUTICAL AND AIRCRAFT STATIONS

Part A. Alphabetical index of aeronautical stations

Name of the station	Call sign	See Part B page
1	2	3

Part B. Particulars of aeronautical stations

{ Name of the country / Names of the stations } in alphabetical order.

Name of the station	Call sign	For transmission		For reception		Power [3]	Service		Charges [5] [6]	Exact geographical position of the transmitting antenna [2]	Remarks
		Frequencies [1] kc/s *or* Mc/s	Class of emission	Frequencies kc/s *or* Mc/s	Class of emission	kW	Nature	Hours of service [4]			
1	2	3	4	5	6	7	8	9	10	11	12

[1] The normal working frequency is printed in heavy type.

[2] Meridian of Greenwich in degrees and minutes.

[3] In the case of directive antennae, indicate under the power, the azimuth of the direction or directions of maximum gain, in degrees, beginning from true North clockwise.

[4] Greenwich mean time (G.M.T.).

[5] The internal telegraph charge of the country to which the aeronautical station is subject and the charge applied by that country to telegrams destined for adjacent countries are given at the end of this List.

[6] If the accounts for charges are settled by a private enterprise, the name and address of the private enterprise should be given.

Part C. Particulars of aircraft stations

The stations are arranged in alphabetical order of their call signs irrespective of nationality.

Call sign	Name of the station or mark of nationality and registration	Emission			Country	Nature of service	Charges	Name and address of the administration to which accounts must be sent	Type and make of aircraft	Remarks
		Frequencies [1] [2] kc/s *or* Mc/s	Class	Power Watts						
1	2	3	4	5	6	7	8	9	10	11

[1] The normal working frequency is printed in heavy type.

[2] The bands of frequencies are indicated by means of the following abbreviations:

a = below 415 kc/s
b = 415 to 2 850 kc/s
c = 2 850 to 25 000 kc/s
d = 118 to 132 Mc/s

List VI. List of Radiolocation Stations

Part A. Alphabetical index of stations

Name of the station	Call sign	Nature of the station	See Part B page
1	2	3	4

Part B. Particulars of stations

1. *Direction-finding stations.*

{Name of the country / Names of the stations} in alphabetical order.

Name of the station	Exact geographical position [1] of *a*) the receiving antenna of the direction-finding station *b*) the transmitting antenna of the direction-finding station *c*) the transmitting antenna of the station mentioned in column 8	Call sign	Frequencies and classes			Power	Name and call sign of the station with which communication must be established if the direction-finding station is not equipped with a transmitter	Charges	Remarks *a*) Sectors in which bearings are normally accurate and references to national or international publications other than these Lists. *b*) Hours of services, [2] etc.
			For calling the direction-finding station kc/s *or* Mc/s	For transmitting to the direction-finding station the signals necessary for taking bearings kc/s *or* Mc/s	For the transmission of the bearings by the direction-finding station kc/s *or* Mc/s	kW			
1	2	3	4	5	6	7	8	9	10

[1] Meridian of Greenwich, in degrees, minutes and seconds

[2] Greenwich mean time (G.M.T.).

2. *Radiobeacon stations.*

Radiobeacons are arranged in two sections :

a) Maritime Service.

b) Aeronautical Service.

{ Name of the country / Names of the stations } in alphabetical order.

Name of the station	Exact geographical position of the transmitting antenna of the radiobeacon [1]	Characteristic signal of the radiobeacon	Call sign of the radiobeacon (if any)	Emission: Frequency kc/s *or* Mc/s	Emission: Class	Emission: Frequency of modulation (if any) c/s	Normal range [2]	Name and call sign of the station to which requests for the emission of beacon signals may be addressed	Calling frequency kc/s *or* Mc/s	Remarks *a*) sectors normally reliable and references to national or international publications other than these Lists ; *b*) hours or service ;[3] *c*) charges, etc. ; *d*) description of the emission
1	2	3	4	5	6	7	8	9	10	11

[1] Meridian of Greenwich, in degrees, minutes and seconds.

[2] Ranges are indicated in nautical miles for stations of the maritime service and in statute miles or kilometres for stations of the aeronautical service.

[3] Greenwich mean time (G.M.T.).

Note : The Secretary General of the Union, if he considers it necessary, will introduce in this List additional sections to cover new radiolocation systems that may be developed and used.

List VII. List of Special Service Stations

Part A. Alphabetical index of the stations

Name of station	Call sign	Nature of service	See Part B page
1	2	3	4

Part B. Particulars of stations

1. *Stations transmitting time signals.*

{ Name of the country / Names of the stations } in alphabetical order.

Name of the station	Call sign	Frequencies kc/s *or* Mc/s	Class of emission	Times of emission [1]	Method [2]
1	2	3	4	5	6

[1] Greenwich mean time (G.M.T.).
[2] General instructions concerning time signals.

2. *Stations transmitting regular meteorological bulletins.*

{ Name of the country / Names of the stations } in alphabetical order.

Name of the station	Call sign	Frequencies kc/s *or* Mc/s	Class of emission	Times of emission [1]	Remarks [2]
1	2	3	4	5	6

[1] Greenwich mean time (G.M.T.).
[2] General instructions concerning meteorological bulletins, including Code used.

3. *Stations transmitting Notices to Navigators.*

(Names of the stations by countries with the necessary particulars.)

a) Maritime service.

b) Aeronautical service.

4. *Stations transmitting medical advice.*

The information should include the name of the country, the name of the station, its call sign, frequency used, class of emission, hours of service and remarks. (Indicate whether the radiotelegram of enquiry and/or reply is chargeable and whether any charge is made for medical advice.)

5. *Stations transmitting standard frequencies.*

The frequency stability should be indicated.

GENERAL RADIOCOMMUNICATION STATISTICS

Name of Country	Administrative Year	Part I. Number of Stations																						Part II. Number of Transmitters						Part III. Traffic															
		1. Fixed Open for Service :				2. Land				3. Mobile					4. Land Radiolocation						5. Broadcasting			6. Amateur	1. With amplitude modulation		2. With frequency modulation		3. With pulse modulation		1. Fixed Service					2. Service with Ship Stations				3. Service with Aircraft Stations		
		Telegraph	Telephone	Phototelegraph	For several services	Coastal Telegraph	Coastal Telephone	Coastal Mixed	Aeronautical	Base	Ship Telegraph	Ship Telephone	Ship Mixed	Aircraft	Land	Radiobeacon Maritime Service	Radiobeacon Aeronautical Service	Radio direction-finding Maritime Service	Radio direction-finding Aeronautical Service	Radar	Other radiolocation stations	Sound	Television	Facsimile		Fixed and land stations	Mobile stations	Fixed and land stations	Mobile stations	Fixed and land stations	Mobile stations	Telegrams transmitted	Telegrams received	Phototelegrams transmitted	Phototelegrams received	Telephone conversations	Radiotelegrams transmitted by coastal stations	Radiotelegrams received by coastal stations	Telephone conversations	Medical consultations	Radiotelegrams sent by land stations	Radiotelegrams received by land stations
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41

APPENDIX 7

SERVICE DOCUMENT SYMBOLS

(See article 20 and appendix 6)

⚔	station on board a warship or a military or naval aircraft
A	automatic alarm apparatus
■	station classified as situated in a region of heavy traffic (article 33)
O	by day
●	by night
[ ]	a ship which carries lifeboats equipped with radio apparatus ; a number inside the brackets shows the number of such lifeboats
△	radio direction-finder on board a mobile station
AL	Aeronautical radionavigation land station
AM	aeronautical radionavigation mobile station
BC	broadcasting station
CF	coastal telephone station
CO	station open to official correspondence exclusively
CP	station open to public correspondence
CR	station open to limited public correspondence
CT	coastal telegraph station
CV	station open exclusively to the correspondence of a private agency
D 30°	directive antenna having maximum radiation in the direction of 30° (expressed in degrees from the true north, from 0 to 360 clockwise)
DR	directive antenna provided with a reflector
FA	aeronautical station
FAX	aeronautical fixed station
FB	base station
FC	coast station
FR	receiving station only, connected with the general network of telecommunication channels
FS	land station established solely for the safety of life
FX	fixed station
G.M.T.	Greenwich mean time
H 8	ship station of the second category carrying on 8 hours of service
H 16	ship station of the second category carrying on 16 hours of service
H 24	station having a continuous day and night service
HJ	station open from sunrise to sunset (day service)
HX	station having no specific working hours
OT	stations open exclusively to operational traffic of the service concerned

RC	non-directional radiobeacon
RD	directional radiobeacon
RG	radio direction-finding station
RM	maritime radionavigation mobile station
RT	revolving radiobeacon
SF	ship telephone station
SS	standard frequency station
ST	ship telegraph station.

APPENDIX 8

DOCUMENTS WITH WHICH SHIP AND AIRCRAFT STATIONS MUST BE PROVIDED

(See articles 20, 22, 23, 24, 28 and appendix 6)

Section I. For Stations on Board Ships Compulsorily Equipped with a Radiotelegraph Installation

1st licence provided for by article 22 ;

2nd certificates of the operator or operators ;

3rd log (diary of the radio service) in which the following are recorded as they occur, together with the time of their occurrence :

a) all communications relating to distress traffic in full,

b) urgency and safety communications,

c) communications exchanged between the ship station and land or mobile stations,

d) service incidents of all kinds,

e) if the ship's rules permit, the position of the ship at least once a day ;

4th alphabetical List of Call Signs ;

5th List of Coast and Ship Stations ;

6th List of Radiolocation Stations ;

7th List of Stations performing Special Services ;

8th Radio Regulations and Additional Radio Regulations, also such provisions of the Convention as relate to the radiocommunication service on board ship ;

9th telegraph tariffs of the countries for which the station most frequently accepts radiotelegrams ;

10th if administrations concerned consider it necessary, the Telegraph Regulations.

Section II. For other Radiotelegraph Stations on Ships

—the documents mentioned in items 1 to 5 of Section I.

Section III. For Ship Stations Equipped Solely for Radiotelephony

1st the documents mentioned in items 1 and 2 of section I ;

2nd the log (diary of the radio service) in which the following are recorded as they occur, together with the time of their occurrence :

a) a summary of all communications relating to distress, urgency and safety traffic

b) a summary of communications exchanged between the ship and land or mobile stations,

c) a reference to important service incidents ;

3rd documents containing information necessary for the operation of the service.

Section IV. For Ship Stations Equipped with Multiple Installations

1st for each station, if necessary, the documents mentioned in items 1 to 3 of section I,

2nd for only one of them, the other documents mentioned in sections I or III, as appropriate.

Section V. For Aircraft Stations

1st the documents mentioned in items 1 and 2 of section I,

2nd the log (diary of the radio service) as defined in item 3 of section I, unless administrations have adopted other arrangements for recording all information which the log should contain,

3rd the List of Aeronautical and Aircraft Stations, the List of Radiolocation Stations, or other documents containing official information relating to stations which the aircraft station may use for the execution of its service.

APPENDIX 9

MISCELLANEOUS ABBREVIATIONS AND SIGNALS TO BE USED IN RADIOCOMMUNICATIONS

(See article 29)

SECTION I. Q CODE

Introduction

1. The series of groups QRA to QUZ listed in this Appendix, is for use by all services.

2. The QAA to QNZ series are reserved for the aeronautical service and the QOA to QQZ series are reserved for the maritime services. These series are not listed in these regulations.

3. Certain abbreviations may be given an affirmative or negative sense by sending "C" or "N" respectively, immediately following the "Q" code abbreviation.

4. The meanings assigned to "Q" code abbreviations may be amplified or completed by the addition of appropriate other groups, call signs, place names, figures, numbers, etc. It is optional to fill in the blanks shown in parentheses. Any data which is filled in where blanks appear should be sent in the same order as shown in the significations.

5. Abbreviations are given the form of a question when followed by a question mark. When an abbreviation is used as a question and is followed by additional or complementary information, the question mark should follow this information.

6. Abbreviations, with numbered alternative significations, must be followed by the appropriate figure to indicate the exact meaning intended. This figure should be sent immediately following the abbreviation.

7. All time should be given in Greenwich mean time (G.M.T.) unless otherwise indicated in the question or reply.

ABBREVIATIONS AVAILABLE FOR ALL SERVICES

A. List of Abbreviations in alphabetical order

Abbreviation	Question	Answer or Advice
QRA	What is the name of your station ?	The name of my station is ...
QRB	How far approximately are you from my station ?	The approximate distance between our stations is ... nautical miles (*or* kilometres)
QRC	By what private enterprise (*or* State Administration) are the accounts for charges for your station settled ?	The accounts for charges of my station are settled by the private enterprise ... (*or* State Administration).
QRD	Where are you bound and where are you from ?	I am bound for ... from ...

Abbreviation	Question	Answer or Advice
QRE	What is your estimated time of arrival at ... (*place*) ?	My estimated time of arrival at ... (*place*) is ... hrs.
QRF	Are you returning to ... (*place*) ?	I am returning to ... (*place*) *or* Return to ... (*place*).
QRG	Will you tell me my exact frequency (*or* that of ...) ?	Your exact frequency (*or* that of ...) is ... kc/s (*or* Mc/s).
QRH	Does my frequency vary ?	Your frequency varies.
QRI	How is the tone of my transmission ?	The tone of your transmission is ... (1. Good ; 2. Variable ; 3. Bad).
QRK	What is the readability of my signals (*or* those of ...) ?	The readability of your signals (*or* those of ...) is ... (1. Unreadable ; 2. Readable now and then ; 3. Readable, but with difficulty ; 4. Readable ; 5. Perfectly readable).
QRL	Are you busy ?	I am busy (*or* I am busy with ...). Please do not interfere.
QRM	Are you being interfered with ?	I am being interfered with.
QRN	Are you troubled by static ?	I am troubled by static.
QRO	Shall I increase power ?	Increase power.
QRP	Shall I decrease power ?	Decrease power.
QRQ	Shall I send faster ?	Send faster (... words per minute).
QRR	Are you ready for automatic operation ?	I am ready for automatic operation. Send at ... words per minute.
QRS	Shall I send more slowly ?	Send more slowly (... words per minute).
QRT	Shall I stop sending ?	Stop sending.
QRU	Have you anything for me ?	I have nothing for you.
QRV	Are you ready ?	I am ready.
QRW	Shall I inform ... that you are calling him on ... kc/s (*or* Mc/s) ?	Please inform ... that I am calling him on ... kc/s (*or* Mc/s).
QRX	When will you call me again ?	I will call you again at ... hours [on ... kc/s (*or* Mc/s)].
QRY	What is my turn ? (*Relates to communication*)	Your turn is Number ... (*or according to any other indication.*) (*Relates to communication.*)
QRZ	Who is calling me ?	You are being called by ... [on ... kc/s (*or* Mc/s)].
QSA	What is the strength of my signals (*or* those of ...) ?	The strength of your signals (*or* those of ...) is ... (1. Scarcely perceptible ; 2. Weak ; 3. Fairly good ; 4. Good ; 5. Very good).
QSB	Are my signals fading ?	Your signals are fading.
QSC	Are you a cargo vessel ? (*See article 33, section V*)	I am a cargo vessel.

Abbreviation	Question	Answer or Advice
QSD	Is my keying defective ?	Your keying is defective.
QSG	Shall I send ... telegrams at a time ?	Send ... telegrams at a time.
QSI		I have been unable to break in on your transmission. *or* Will you inform ... (*call sign*) that I have been unable to break in on his transmission (on ... kc/s (*or* Mc/s)]
QSJ	What is the charge to be collected per word to ... including your internal telegraph charge ?	The charge to be collected per word to ... including my internal telegraph charge is ... francs.
QSK	Can you hear me between your signals ?	I can hear you between my signals.
QSL	Can you acknowledge receipt ?	I am acknowledging receipt.
QSM	Shall I repeat the last telegram which I sent you, *or* some previous telegram ?	Repeat the last telegram which you sent me [*or* telegram(s) number(s) ...].
QSN	Did you hear me [*or* ... (call sign)] on ... kc/s (*or* Mc/s) ?	I did hear you [*or* ... (call sign)] on ... kc/s (*or* Mc/s).
QSO	Can you communicate with ... direct or by relay ?	I can communicate with ... direct (or by relay through...).
QSP	Will you relay to ... free of charge ?	I will relay to ... free of charge.
QSQ	Have you a doctor on board [*or* is ... (name of person) on board] ?	I have a doctor on board [*or* ... (name of person) is on board].
QSU	Shall I send or reply on this frequency [*or* on ... kc/s (*or* Mc/s)] (with emissions of class ...) ?	Send or reply on this frequency [*or* on ... kc/s (*or* Mc/s)] (with emissions of class ...).
QSV	Shall I send a series of V's on this frequency [*or* ... kc/s (*or* Mc/s)] ?	Send a series of V's on this frequency [*or* ... kc/s (*or* Mc/s)].
QSW	Will you send on this frequency [or on ... kc/s (*or* Mc/s)] (with emissions of class ...) ?	I am going to send on this frequency [*or* on ... kc/s (*or* Mc/s)] (with emissions of class ...).
QSX	Will you listen to ... [*call sign(s)*] on ... kc/s (*or* Mc/s) ?	I am listening to ... [*call sign(s)*] on kc/s (*or* Mc/s).
QSY	Shall I change to transmission on another frequency ?	Change to transmission on another frequency [*or* on ... kc/s (*or* Mc/s)].
QSZ	Shall I send each word or group more than once ?	Send each word or group twice (*or* ... times).
QTA	Shall I cancel telegram number ... as if it had not been sent ?	Cancel telegram number ... as if it had not been sent.
QTB	Do you agree with my counting of words ?	I do not agree with your counting of words ; I will repeat the first letter or digit of each word or group.
QTC	How many telegrams have you to send ?	I have ... telegrams for you (*or* for ...).
QTE	What is my TRUE bearing from you ? *or*	Your TRUE bearing from me is ... degrees (at ... hours) *or*

Abbreviation	Question	Answer or Advice
QTE (*cont'd*)	What is my TRUE bearing from ... (*call sign*) ?	Your TRUE bearing from ... (*call sign*) was ... degrees (at ... hours)
	or	*or*
	What is the TRUE bearing of ... (*call sign*) from ... (*call sign*) ?	The TRUE bearing of ... (*call sign*) from ... (*call sign*) was ... degrees at ... hours.
QTF	Will you give me the position of my station according to the bearings taken by the direction finding stations which you control ? (*see appendix 15*)	The position of your station according to the bearings taken by the direction finding stations which I control was ... latitude, ... longitude, class ... at ... hours. (*see appendix 15*)
QTG	Will you send two dashes of ten seconds each followed by your call sign (repeated ... times) [on ... kc/s (*or* Mc/s)] ?	I am going to send two dashes of ten seconds each followed by my call sign (repeated ... times) [on ... kc/s (*or* Mc/s)]
	or	*or*
	Will you request ... to send two dashes of ten seconds followed by his call sign (repeated ... times) on ... kc/s (*or* Mc/s) ?	I have requested ... to send two dashes of ten seconds followed by his call sign (repeated ... times) on ... kc/s (*or* Mc/s).
QTH	What is your position in latitude and longitude (*or according to any other indication*) ?	My position is ... latitude ... longitude (*or according to any other indication*).
QTI	What is your TRUE track ?	My TRUE track is ... degrees.
QTJ	What is your speed ?	My speed is ... knots (*or* kilometres per hour).
	(*Requests the speed of a ship or aircraft through the water or air respectively.*)	(*Indicates the speed of a ship or aircraft through the water or air respectively.*)
QTK	What is the speed of your aircraft in relation to the surface of the earth ?	The speed of my aircraft in relation to the surface of the earth is ... knots (*or* kilometres per hour).
QTL	What is your TRUE heading (TRUE course with no wind) ?	My TRUE heading is ... degrees.
QTN	At what time did you depart from ... (*place*) ?	I departed from ... (*place*) at ... hours.
QTO	Have you left dock (*or* port) ?	I have left dock (*or* port)
	or	*or*
	Are you airborne ?	I am airborne.
QTP	Are you going to enter dock (*or* port) ?	I am going to enter dock (*or* port)
	or	*or*
	Are you going to alight (*or* land) ?	I am going to alight (*or* land).
QTQ	Can you communicate with my station by means of the International Code of Signals ?	I am going to communicate with your station by means of the International Code of Signals.
QTR	What is the correct time ?	The correct time is ... hours.
QTS	Will you send your call sign for ... minute(s) now (*or* at ... hours) [on ... kc/s (*or* Mc/s)] so that your frequency may be measured ?	I will send my call sign for ... minute(s) now (*or* at ... hours) [on ... kc/s (*or* Mc/s)] so that my frequency may be measured.

Abbreviation	Question	Answer or Advice
QTU	What are the hours during which your station is open ?	My station is open from ... to ... hours.
QTV	Shall I stand guard for you on the frequency of ... kc/s (*or* Mc/s) (from ... to ... hours) ?	Stand guard for me on the frequency of ... kc/s (*or* Mc/s) (from ... to ... hours).
QTX	Will you keep your station open for further communication with me until further notice (*or* until ... hours) ?	I will keep my station open for further communication with you until further notice (*or* until ... hours).
QUA	Have you news of ... (*call sign*) ?	Here is news of ... (*call sign*).
QUB	Can you give me, in the following order, information concerning : visibility, height of clouds, direction and velocity of ground wind at ... (*place of observation*) ?	Here is the information requested ...
QUC	What is the number (*or other indication*) of the last message you received from me [or from ... (*call sign*)] ?	The number (*or other indication*) of the last message I received from you [or from ... (*call sign*)] is ...
QUD	Have you received the urgency signal sent by ... (*call sign of mobile station*) ?	I have received the urgency signal sent by ... (*call sign of mobile station*) at ... hours.
QUF	Have you received the distress signal sent by ... (*call sign of mobile station*) ?	I have received the distress signal sent by ... (*call sign of mobile station*) at ... hours.
QUG	Will you be forced to alight (*or* land) ?	I am forced to alight (*or* land) immediately. *or* I shall be forced to alight (*or* land) at ... (*position or place*).
QUH	Will you give me the present barometric pressure at sea level ?	The present barometric pressure at sea level is ... (*units*).
QUI	Are your navigation lights working ?	My navigation lights are working.
QUJ	Will you indicate the TRUE course for me to steer towards you (*or* ...) with no wind ?	The TRUE course for you to steer towards me (*or* ...) with no wind is ... degrees at ... hours.
QUK	Can you tell me the condition of the sea observed at ... (*place or coordinates*) ?	The sea at ... (*place or coordinates*) is ...
QUL	Can you tell me the swell observed at ... (*place or coordinates*) ?	The swell at ... (*place or coordinates*) is ...
QUM	Is the distress traffic ended ?	The distress traffic is ended.
QUN	Will vessels in my immediate vicinity [(*or* in the vicinity of ... latitude ... longitude) (*or* of ...)] please indicate their position, TRUE course and speed ?	My position, TRUE course and speed are ...
QUO	Shall I search for ... (1. Aircraft ; 2. Ship ; 3. Survival craft) in the vicinity of ... latitude ... longitude (*or according to any other indication*) ?	Please search for ... (1. Aircraft ; 2. Ship ; 3. Survival craft) in the vicinity of ... latitude ... longitude (*or according to any other indication*).

Abbreviation	Question	Answer or Advice
QUP	Will you indicate your position by ... (1. Searchlight ; 2. Black smoke trail ; 3. Pyrotechnic lights) ?	My position is indicated by ... (1. Searchlight ; 2. Black smoke trail ; 3. Pyrotechnic lights).
QUQ	Shall I train my searchlight nearly vertical on a cloud, occulting if possible and, if your aircraft is seen, deflect the beam up wind and on the water (*or* land) to facilitate your landing ?	Please train your searchlight on a cloud, occulting if possible and, if my aircraft is seen or heard, deflect the beam up wind and on the water (*or* land) to facilitate my landing.
QUR	Have survivors ... (1. Received survival equipment ; 2. Been picked up by rescue vessel ; 3. Been reached by ground rescue party) ?	Survivors ... (1. Are in possession of survival equipment dropped by ... ; 2. Have been picked up by rescue vessel ; 3. Have been reached by ground rescue party).
QUS	Have you sighted survivors or wreckage? If so, in what position ?	Have sighted ... (1. Survivors in water ; 2. Survivors on rafts ; 3. Wreckage) in position ... latitude ... longitude (*or according to any other indication*).
QUT	Is position of incident marked ?	Position of incident is marked (by ...).
QUU	Shall I home ship or aircraft to my position ?	Home ship or aircraft [1. ... (*call sign*) to your position by transmitting your call sign and long dashes on ... kc/s (*or* Mc/s) ; 2. ... (*call sign*) by transmitting on ... kc/s (*or* Mc/s) courses to steer to reach you].
QUV	What is my MAGNETIC bearing from you (*or* from ...) ?	Your MAGNETIC bearing from me (*or* from ...) was ... degrees at ... hours.
	(*This signal, in general, will not be used in the Maritime Mobile Service*)	(*This signal, in general, will not be used in the Maritime Mobile Service*)
QUX	Will you indicate the MAGNETIC course for me to steer towards you (*or* ...) with no wind ?	The MAGNETIC course for you to steer to reach me (*or* ...) with no wind was ... degrees at ... hours.
	(*This signal, in general, will not be used in the Maritime Mobile Service*)	(*This signal, in general, will not be used in the Maritime Mobile Service*)

B. List of Signals According to the Nature of Questions, Answer or Advice.

Abbreviation	Question	Answer or Advice
	Name	
QRA	What is the name of your station ?	The name of my station is ...
	Route	
QRD	Where are you bound and where are you from ?	I am bound for ... from ...
	Position	
QRB	How far approximately are you from my station ?	The approximate distance between our stations is ... nautical miles (*or* kilometres).
QTH	What is your position in latitude and longitude (*or according to any other indication*) ?	My position is ... latitude ... longitude (*or according to any other indication*)
QTN	At what time did you depart from ... (*place*) ?	I departed from ... (*place*) at ... hours.
	Quality of Signals	
QRI	How is the tone of my transmission ?	The tone of your transmission is ... (1. good ; 2. variable ; 3. bad).
QRK	What is the readability of my signals (*or* those of ...) ?	The readability of your signals (*or* those of ...) is ... (1. Unreadable ; 2. Readable now and then ; 3. Readable, but with difficulty ; 4. Readable ; 5. Perfectly readable).
	Strength of Signals	
QRO	Shall I increase power ?	Increase power.
QRP	Shall I decrease power ?	Decrease power.
QSA	What is the strength of my signals (*or* those of ...) ?	The strength of your signals (*or* those of ...) is ... (1. Scarcely perceptible ; 2. Weak ; 3. Fairly good ; 4. Good ; 5. Very good).
QSB	Are my signals fading ?	Your signals are fading.
	Keying	
QRQ	Shall I send faster ?	Send faster (... words per minute).
QRR	Are you ready for automatic operation ?	I am ready for automatic operation. Send at ... words per minute.
QRS	Shall I send more slowly ?	Send more slowly (... words per minute).
QSD	Is my keying defective ?	Your keying is defective.
	Interference	
QRM	Are you being interfered with ?	I am being interfered with.
QRN	Are you troubled by static ?	I am troubled by static.

Abbreviation	Question	Answer or Advice
	Adjustment of Frequency	
QRG	Will you tell me my exact frequency (*or* that of ...) ?	Your exact frequency (*or* that of ...) is ... kc/s (*or* Mc/s).
QRH	Does my frequency vary ?	Your frequency varies.
QTS	Will you send your call sign for ... minute(s) now (*or* at ... hours) [on ... kc/s (*or* Mc/s)] so that your frequency may be measured ?	I will send my call sign for ... minute(s) now (*or* at ... hours) [on ... kc/s (*or* Mc/s)] so that my frequency may be measured.
	Choice of Frequency and/or Class of Emission	
QSN	Did you hear me [*or* ... (*call sign*)] on ... kc/s (*or* Mc/s) ?	I did hear you [*or* ... (*call sign*)] on ... kc/s (*or* Mc/s).
QSU	Shall I send or reply on this frequency [*or* on ... kc/s (*or* Mc/s)] (with emissions of class ...) ?	Send or reply on this frequency [*or* on ... kc/s (*or* Mc/s)] (with emissions of class ...).
QSV	Shall I send a series of V's on this frequency [*or* ... kc/s (*or* Mc/s)] ?	Send a series of V's on this frequency [*or* ... kc/s (*or* Mc/s)].
QSW	Will you send on this frequency [*or* on ... kc/s (*or* Mc/s)] (with emissions of class ...) ?	I am going to send on this frequency [*or* on ... kc/s (*or* Mc/s)] (with emissions of class ...).
QSX	Will you listen to ... [call sign(s)] on ... kc/s (*or* Mc/s) ?	I am listening to ... [call sign(s)] on ... ... kc/s (*or* Mc/s).
	Change of Frequency	
QSY	Shall I change to transmission on another frequency ?	Change to transmission on another frequency [*or* ... kc/s (*or* Mc/s)].
	Establishing Communication	
QRL	Are you busy ?	I am busy (*or* I am busy with ...). Please do not interfere.
QRV	Are you ready ?	I am ready.
QRX	When will you call me again ?	I will call you again at ... hours [on ... kc/s (*or* Mc/s)].
QRY	What is my turn ? (*Relates to communication.*)	Your turn is Number ... (*or according to any other indication*). (*Relates to communication.*)
QRZ	Who is calling me ?	You are being called by ... [on ... kc/s (*or* Mc/s)].
QSC	Are you a cargo vessel ? (*See article 33, section V*)	I am a cargo vessel.
QTQ	Can you communicate with my station by means of the International Code of Signals ?	I am going to communicate with your station by means of the International Code of Signals.
	Time	
QTR	What is the correct time ?	The correct time is ... hours.
QTU	What are the hours during which your station is open ?	My station is open from ... to ... hours.

Abbreviation	Question	Answer or Advice
	Charges	
QRC	By what private enterprise (*or* State Administration) are the accounts for charges for your station settled ?	The accounts for charges of my station are settled by the private enterprise ... (*or* State Administration).
QSJ	What is the charge to be collected per word to ... including your internal telegraph charge ?	The charge to be collected per word to ... including my internal telegraph charge is ... francs.
	Transit	
QRW	Shall I inform ... that you are calling him on ... kc/s (*or* Mc/s) ?	Please inform ... that I am calling him on ... kc/s (*or* Mc/s).
QSO	Can you communicate with ... direct or by relay ?	I can communicate with ... direct (or by relay through ...).
QSP	Will you relay to ... free of charge ?	I will relay to ... free of charge.
QSQ	Have you a doctor on board [*or* is ... (*name of person*) on board] ?	I have a doctor on board [*or* ... (*name of person*) is on board].
QUA	Have you news of ... (*call sign*) ?	Here is news of ... (*call sign*).
QUC	What is the number (*or other indication*) of the last message you received from me [*or* from ... (*call sign*)] ?	The number (*or other indication*) of the last message I received from you [*or* from ... (*call sign*)] is ..,
	Exchange of Correspondence	
QRU	Have you anything for me ?	I have nothing for you.
QSG	Shall I send ... telegrams at a time ?	Send ... telegrams at a time.
QSI		I have been unable to break in on your transmission. *or* Will you inform ... (*call sign*) that I have been unable to break in on his transmission [on ... kc/s (*or* Mc/s)].
QSK	Can you hear me between your signals ?	I can hear you between my signals.
QSL	Can you acknowledge receipt ?	I am acknowledging receipt.
QSM	Shall I repeat the last telegram which I sent you, *or* some previous telegram ?	Repeat the last telegram which you sent me [*or* telegram(s) number(s) ...].
QSZ	Shall I send each word or group more than once ?	Send each word or group twice (*or* ... times).
QTA	Shall I cancel telegram number ... as if it had not been sent ?	Cancel telegram number ... as if it had not been sent.
QTB	Do you agree with my counting of words ?	I do not agree with your counting of words ; I will repeat the first letter or digit of each word or group.
QTC	How many telegrams have you to send ?	I have ... telegrams for you (*or* for ...).

Abbreviation	Question	Answer or Advice
QTV	Shall I stand guard for you on the frequency of ... kc/s (*or* Mc/s) (from ... to ... hours) ?	Stand guard for me on the frequency of ... kc/s (*or* Mc/s) (from ... to ... hours).
QTX	Will you keep your station open for further communication with me until further notice (*or* until ... hours) ?	I will keep my station open for further communication with you until further notice (*or* until ... hours).
	Movement	
QRE	What is your estimated time of arrival at ... (*place*) ?	My estimated time of arrival at ... (*place*) is ... hrs
QRF	Are you returning to ... (*place*) ?	I am returning to ... (*place*) *or* Return to ... (*place*).
QTI	What is your TRUE track ?	My TRUE track is ... degrees.
QTJ	What is your speed ?	My speed is ... knots (*or* kilometres per hour).
	(*Requests the speed of a ship or aircraft through the water or air respectively.*)	(*Indicates the speed of a ship or aircraft through the water or air respectively.*)
QTK	What is the speed of your aircraft in relation to the surface of the earth ?	The speed of my aircraft in relation to the surface of the earth is ... knots (*or* kilometres per hour).
QTL	What is your TRUE heading (TRUE course with no wind) ?	My TRUE heading is ... degrees.
QTN	At what time did you depart from ... (*place*) ?	I departed from ... (*place*) at ... hours
QTO	Have you left dock (*or* port) ? *or* Are you airborne ?	I have left dock (*or* port). *or* I am airborne.
QTP	Are you going to enter dock (*or* port) ? *or* Are you going to alight (*or* land) ?	I am going to enter dock (*or* port). *or* I am going to alight (*or* land).
QUG	Will you be forced to alight (*or* land) ?	I am forced to alight (*or* land) immediately. *or* I shall be forced to alight (*or* land) at ... (*position or place*).
QUJ	Will you indicate the TRUE course for me to steer towards you (*or* ...) with no wind ?	The TRUE course for you to steer towards me (*or* ...) with no wind is ... degrees at ... hours.
QUN	Will vessels in my immediate vicinity [(*or* in the vicinity of ... latitude ... longitude) (*or* of ...)] please indicate their position, TRUE course and speed ?	My position, TRUE course and speed are ...
QUX	Will you indicate the MAGNETIC course for me to steer towards you (*or* ...) with no wind ? (*This signal, in general, will not be used in the Maritime Mobile Service*)	The MAGNETIC course for you to steer to reach me (*or* ...) with no wind was ... degrees at ... hours. (*This signal, in general, will not be used in the Maritime Mobile Service*)
	Meteorology	
QUB	Can you give me, in the following order, information concerning : visibility, height of clouds, direction and velocity	Here is the information requested ...

Abbreviation	Question	Answer or Advice
	of ground wind at ...: (*place of observation*) ?	
QUH	Will you give me the present barometric pressure at sea level ?	The present barometric pressure at sea level is ... (*units*).
QUK	Can you tell me the condition of the sea observed at ... (*place or coordinates*) ?	The sea at ... (*place or coordinates*) is ...
QUL	Can you tell me the swell observed at ... (*place or coordinates*) ?	The swell at ... (*place or coordinates*) is ...
	Radio Direction-finding	
QTE	What is my TRUE bearing from you ?	Your TRUE bearing from me is ... degrees (at ... hours)
	or	*or*
	What is my TRUE bearing from ... (*call sign*) ?	Your TRUE bearing from ... (*call sign*) was ... degrees at ... hours.
	or	*or*
	What is the TRUE bearing of ... (*call sign*) from ... (*call sign*) ?	The TRUE bearing of ... (*call sign*) from ... (*call sign*) was ... degrees at ... hours.
QTF	Will you give me the position of my station according to the bearings taken by the direction-finding stations which you control ? (*See Appendix 15.*)	The position of your station according to the bearings taken by the direction-finding stations which I control was ... latitude, ... longitude, class ... at ... hours. (*See Appendix 15.*)
QTG	Will you send two dashes of ten seconds each followed by your call sign (repeated ... times) [on ... kc/s (*or* Mc/s)] ?	I am going to send two dashes of ten seconds each followed by my call sign (repeated ... times) [on ... kc/s (*or* Mc/s)].
	or	*or*
	Will you request ... to send two dashes of ten seconds followed by his call sign (repeated ... times) on ... kc/s (*or* Mc/s) ?	I have requested ... to send two dashes of ten seconds followed by his call sign (repeated ... times) on ... kc/s (*or* Mc/s).
QUV	What is my MAGNETIC bearing from you (*or* from ...) ?	Your MAGNETIC bearing from me (*or* from ...) was ... degrees at ... hours.
	(*This signal, in general, will not be used in the Maritime Mobile Service*)	(*This signal, in general, will not be used in the Maritime Mobile Service*)
	Suspension of Work	
QRT	Shall I stop sending ?	Stop sending.
	Urgency	
QUD	Have you received the urgency signal sent by ... (*call sign of mobile station*)?	I have received the urgency signal sent by ... (*call sign of mobile station*) at hours.
QUG	Will you be forced to alight (*or* land) ?	I am forced to alight (*or* land) immediately.
		or
		I shall be forced to alight (*or* land) at ... (*position or place*).
	Distress	
QUF	Have you received the distress signal sent by ... (*call sign of mobile station*)?	I have received the distress signal sent by ... (*call sign of mobile station*) at ... hours.

Abbreviation	Question	Answer or Advice
QUM	Is the distress traffic ended ?	The distress traffic is ended.
	Search and Rescue	
QUI	Are your navigation lights working ?	My navigation lights are working.
QUN	Will vessels in my immediate vicinity [(*or* in the vicinity of ... latitude ... longitude) (*or* of ...)] please indicate their position, TRUE course and speed ?	My position, TRUE course and speed are ...
QUO	Shall I search for ... (1. Aircraft ; 2. Ship ; 3. Survival craft) in the vicinity of ... latitude ... longitude (*or according to any other indication*) ?	Please search for ... (1. Aircraft ; 2. Ship ; 3. Survival craft) in the vicinity of ... latitude ... longitude (*or according to any other indication*).
QUP	Will you indicate your position by ... (1. Searchlight ; 2. Black smoke trail ; 3. Pyrotechnic lights) ?	My position is indicated by ... (1. Searchlight; 2. Black smoke trail ; 3. Pyrotechnic lights).
QUQ	Shall I train my searchlight nearly vertical on a cloud, occulting if possible and, if your aircraft is seen, deflect the beam up wind and on the water (*or* land) to facilitate your landing ?	Please train your searchlight on a cloud, occulting if possible and, if my aircraft is seen or heard, deflect the beam up wind and on the water (*or* land) to facilitate my landing.
QUR	Have survivors ... (1. Received survival equipment ; 2. Been picked up by rescue vessel ; 3. Been reached by ground rescue party) ?	Survivors ... (1. Are in possession of survival equipment dropped by ... ; 2. Have been picked up by rescue vessel ; 3. Have been reached by ground rescue party).
QUS	Have you sighted survivors or wreckage ? If so, in what position ?	Have sighted ... (1. Survivors in water ; 2. Survivors on rafts ; 3. Wreckage) in position ... latitude ... longitude (*or according to any other indication*).
QUT	Is position of incident marked ?	Position of incident is marked (by ...)
QUU	Shall I home ship or aircraft to my position ?	Home ship or aircraft [1. ... (*call sign*) to your position by transmitting your call sign and long dashes on ... kc/s (*or* Mc/s) ; 2. ... (*call sign*) by transmitting on ... kc/s (*or* Mc/s) courses to steer to reach you].

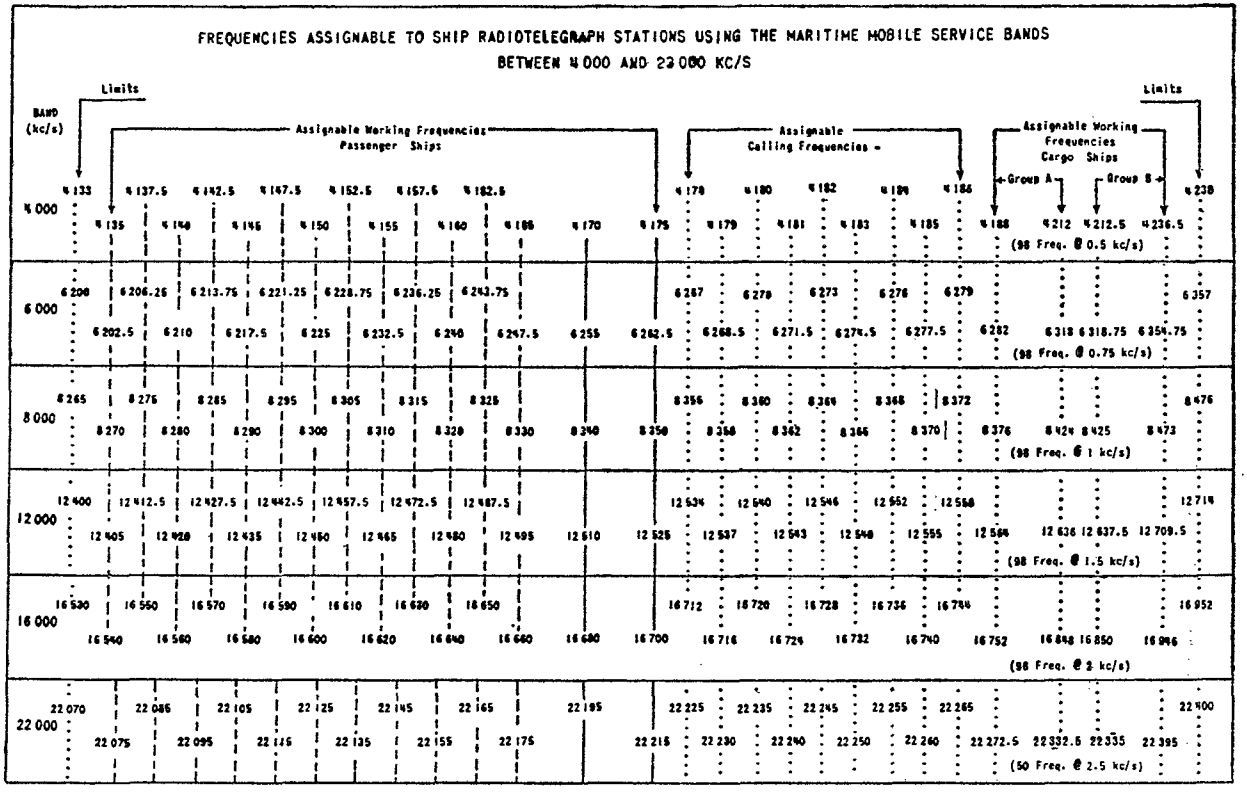
SECTION II. MISCELLANEOUS ABBREVIATIONS AND SIGNALS

Abbreviation or Signal	Definition
AA	All after ... (*used after a question mark to request a repetition*).
AB	All before ... (*used after a question mark to request a repetition*).
ABV	Repeat (*or* I repeat) the figures in abbreviated form.
ADS	Address (*used after a question mark to request a repetition*).
$\overline{AR}$	End of transmission (▬ ▬ ▬ ▬ ▬ *to be sent as one signal*).
$\overline{AS}$	Waiting period (▬ ▬ ▬ ▬ ▬ *to be sent as one signal*).
BK	Signal used to interrupt a transmission in progress.
BN	All between ... and ... (*used after a question mark to request a repetition*).
BQ	A reply to an RQ.
C	Yes.
CFM	Confirm (*or* I confirm).
CL	I am closing my station.
COL	Collate (*or* I collate).
CP	General call to two or more specified stations (*see article 32*).
CQ	General call to all stations (*see article 31*).
CS	Call sign (*used to request a call sign*).
DB	I cannot give you a bearing, you are not in the calibrated sector of this station.
DC	The minimum of your signal is suitable for the bearing.
DF	Your bearing at ... (*time*) was ... degrees, in the doubtful sector of this station, with a possible error of ... degrees.
DG	Please advise me if you note an error in the bearing given.
DI	Bearing doubtful in consequence of the bad quality of your signal.
DJ	Bearing doubtful because of interference.
DO	Bearing doubtful. Ask for another bearing later [*or at* ... (*time*)].
DP	Possible error of bearing may amount to ... degrees.
DS	Adjust your transmitter, the minimum of your signal is too broad.
DT	I cannot furnish you with a bearing ; the minimum of your signal is too broad.
DY	This station is not able to determine the sense of the bearing. What is your approximate direction relative to this station ?
DZ	Your bearing is reciprocal. (*To be used only by the control station of a group of direction-finding stations when it is addressing stations of the same group.*)
DE	Used to separate the call sign of the station called from the call sign of the calling station.
ER	Here ...
ETA	Estimated time of arrival.
ITP	The punctuation counts.
JM	Make a series of dashes if I may transmit. Make a series of dots to stop my transmission (*not to be used on 500 kc/s except in cases of distress*).
K	Invitation to transmit.
MN	Minute (*or* Minutes).
MSG	Prefix indicating a message to or from the master of a ship concerning its operation or navigation.
N	No.
NIL	I have nothing to send to you.

Abbreviation or Signal	Definition
NW	Now.
OK	We agree (*or* It is correct).
P	Prefix indicating a private radiotelegram.
PBL	Preamble (*used after a question mark to request a repetition*).
PTR	Used by a coast station to request the position and next port of call of a mobile station. (*See* 700.)
R	Received.
REF	Reference to ... (*or* Refer to ...).
RPT	Repeat (*or* I repeat) (*or* Repeat ...).
RQ	Indication of a request.
SIG	Signature (*used after a question mark to request a repetition*).
$\overline{\text{SOS}}$	Distress Signal(▬ ▪ ▬ ▬ ▪ ▬ ▪ ▪ ▪ *to be sent as one signal*).
SS	Indicator preceding the name of a ship station.
SVC	Prefix indicating a service telegram.
SYS	Refer to your service telegram.
TFC	Traffic.
TR	Used as a prefix to indicate reply to PTR.
TTT	This group when sent three times constitutes the safety signal (*see* 943).
TU	Thank you.
TXT	Text (*used after a question mark to request a repetition*).
$\overline{\text{VA}}$	End of work (▪ ▪ ▪ ▬ ▪ ▬ *to be sent as one signal*).
W	Word(s) *or* [Group(s)].
WA	Word after ... (*used after a question mark to request a repetition*).
WB	Word before ... (*used after a question mark to request a repetition*).
XXX	This group when sent three times constitutes the urgency signal (*see* 934).

APPENDIX 10

(See article 33)



APPENDIX 11

PROCEDURE IN THE MOBILE RADIOTELEPHONE SERVICE

(See article 34)

§ 1. The following procedure is given as an example for the transmission of a radiotelegram :

1. A calls :
   Hullo B, Hullo B, this is A, this is A, radiotelegram for you, radiotelegram for you, over.
2. B replies :
   Hullo A, Hullo A, this is B, this is B, send your radiotelegram, send your radiotelegram, over.
3. A replies :
   Hullo B, this is A, radiotelegram begins from . . . . . number . . . . . number of words . . . . . date . . . . . time . . . . . address . . . . text . . . . . signature . . . . . transmission of radiotelegram ends, I repeat, radiotelegram begins from . . . . . number . . . . . number of words . . . . . date . . . . . time . . . . . address . . . . . text . . . . . signature . . . . . radiotelegram ends, over.
4. B replies :
   Hullo A, this is B, your radiotelegram begins, from . . . . . number . . . . . number of words . . . . . date . . . . . time . . . . . address . . . . . text . . . . . signature . . . . . ., your radiotelegram ends, over.
5. A replies :
   Hullo B, this is A, correct, correct, switching off.
6. A then breaks the communication and both stations resume their normal watch.

§ 2. When the station receiving is certain that it has correctly received the radiotelegram, the repetition contemplated under § 1, 4 is unnecessary, except for a collated radiotelegram. If repetition is dispensed with, station B acknowledges the receipt of the radiotelegram in the following manner :

Hullo A, this is B, your radiotelegram correctly received, over.

§ 3. (1) When it is necessary to spell out call signs, service abbreviations and words, the following table is used :

Figure to be *transmitted* *	*Letter to be transmitted*	*Word to be used*
1	A	Amsterdam
2	B	Baltimore
3	C	Casablanca

Note : At the beginning of a communication, the calling formula is spoken twice by both the calling station and the station called. It is spoken once only when communication has been established.

* Each transmission of figures is preceded and followed by the words "as a number" spoken twice.

*Figure to be transmitted**	*Letter to be transmitted*	*Word to be used*
4	D	Danemark
5	E	Edison
6	F	Florida
7	G	Gallipoli
8	H	Havana
9	I	Italia
0	J	Jerusalem
Comma	K	Kilogramme
Fraction bar	L	Liverpool
Break signal	M	Madagascar
Full stop (period)	N	New York
	O	Oslo
	P	Paris
	Q	Quebec
	R	Roma
	S	Santiago
	T	Tripoli
	U	Upsala
	V	Valencia
	W	Washington
	X	Xantippe
	Y	Yokohama
	Z	Zurich

(2) However, stations of the same country may use, when communicating between themselves, any other table recognized by their administration.

APPENDIX 12

Recommended Duplex Channeling of the Maritime Mobile Radiotelephone Bands 4 000 — 23 000 kc/s

(See article 34)

This table is a recommendation for the channels to be used by coast and ship stations in the bands allocated to the maritime mobile radiotelephone service between 4 000 and 23 000 kc/s. It is recommended to administrations for use as a guide in the choice of frequencies for their stations.

One or more series of frequencies are assigned to each coast station, which uses these frequencies associated, as far as possible, in pairs ; each pair comprising a transmitting and a receiving frequency. The series shall be selected with due regard to the areas served and so as to avoid, as far as possible, harmful interference between the services of different coast stations.

If an administration assigns frequencies other than those indicated in the table, its radiotelephone service must not cause harmful interference to radiotelephone stations of the maritime mobile service which use frequencies assigned to them from this table in accordance with these Regulations.

* Each transmission of figures is preceded and followed by the words "as a number" spoken twice.

TABLE OF TRANSMITTING FREQUENCIES (KC/S)

Bands	4 000 kc/s		8 000 kc/s		12 000 kc/s		16 000 kc/s		22 000 kc/s	
Series No.	Coast Freq.	Ship Freq.	Coast Freq.	Ship Freq.	Coast Freq.	Ship Freq.	Coast Freq.	Ship Freq.	Coast Freq.	Ship Freq.
1	4 371.9	4 066.9	8 748.9	8 198.9	13 133.9	12 333.9	17 293.9	16 463.9	22 653.9	22 003.9
2	4 379.7	4 074.7	8 756.7	8 206.7	13 141.7	12 341.7	17 301.7	16 471.7	22 661.7	22 011.7
3	4 387.4	4 082.4	8 764.4	8 214.4	13 149.4	12 349.4	17 309.4	16 479.4	22 669.4	22 019.4
4	4 395.2	4 090.2	8 772.2	8 222.2	13 157.2	12 357.2	17 317.2	16 487.2	22 677.2	22 027.2
5	4 403.0	4 098.0	8 780.0	8 230.0	13 165.0	12 365.0	17 325.0	16 495.0	22 685.0	22 035.0
6	4 410.7	4 105.7	8 787.7	8 237.7	13 172.7	12 372.7	17 332.7	16 502.7	22 692.7	22 042.7
7	4 418.5	4 113.5	8 795.5	8 245.5	13 180.5	12 380.5	17 340.5	16 510.5	22 700.5	22 050.5
8	4 426.3	4 121.3	8 803.3	8 253.3	13 188.3	12 388.3	17 348.3	16 518.3	22 708.3	22 058.3
9	4 434.0	4 129.0	8 811.0	8 261.0	13 196.0	12 396.0	17 356.0	16 526.0	22 716.0	22 066.0

APPENDIX 13

HOURS OF SERVICE FOR SHIPS IN THE SECOND CATEGORY

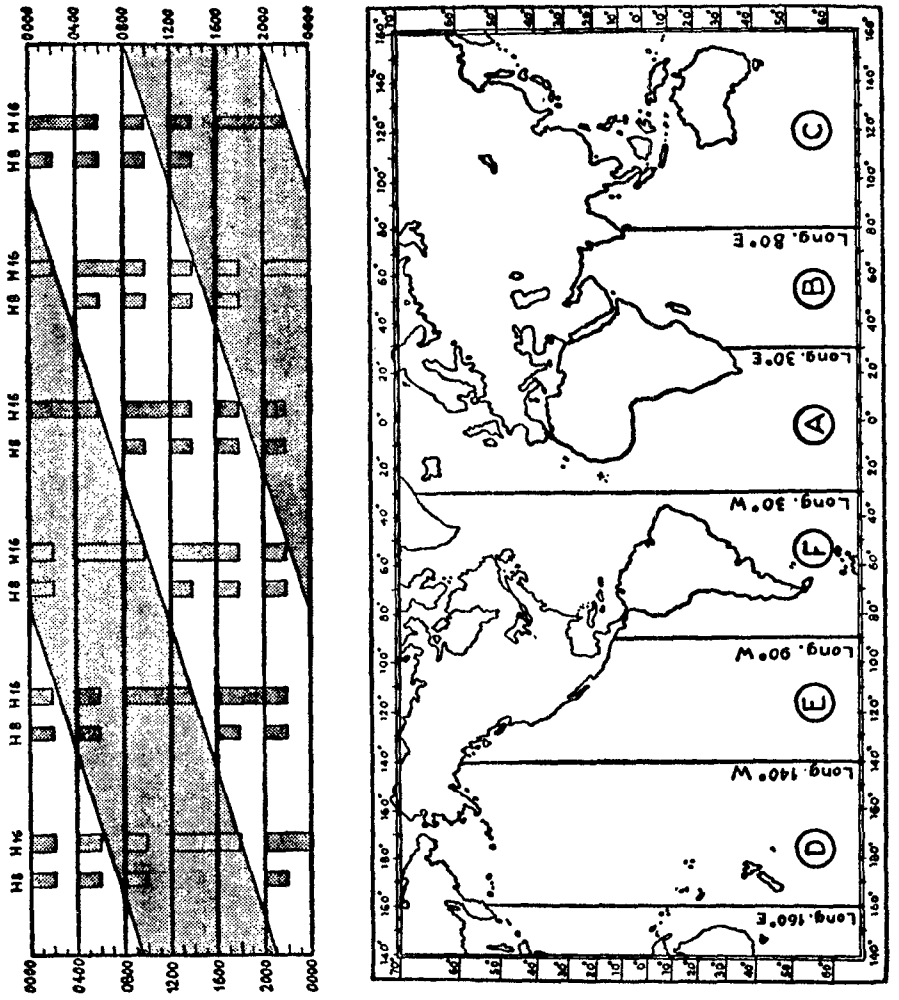
(See articles 20 and 35)

SECTION I. TABLE

Zones	Western Limits	Eastern Limits	Hours of Service (Greenwich mean (time) (G.M.T.)	
			8 hours (H8)	16 hours (H16)
A Eastern Atlantic Ocean, Mediterranean, North Sea, Baltic.	Meridian of 30° W., Coast of Greenland.	Meridian of 30° E. to the South of the Coast of Africa, Eastern limits of the Mediterranean of the Black Sea, and of the Baltic, 30° E. to the North of Norway.	from to 8h. 10h. 12h. 14h. 16h. 18h. 20h. 22h.	from to 0h. 6h. 8h. 14h. 16h. 18h. 20h. 22h.
B Western Indian Ocean, Eastern Arctic Sea.	Eastern Limit of Zone A.	Meridian of 80° E., Western Coast of Ceylon to Adam's Bridge, thence Westward round the coast of India.	from to 4h. 6h. 8h. 10h. 12h. 14h. 16h. 18h.	from to 0h. 2h. 4h. 10h. 12h. 14h. 16h. 18h. 20h. 24h.
C Eastern Indian Ocean, China Sea, Western Pacific Ocean.	Eastern Limit of Zone B.	Meridian of 160° E.	from to 0h. 2h. 4h. 6h. 8h. 10h. 12h. 14h.	from to 0h. 6h. 8h. 10h. 12h. 14h. 16h. 22h.
D Central Pacific Ocean.	Eastern Limit of Zone C.	Meridian of 140° W.	from to 0h. 2h. 4h. 6h. 8h. 10h. 20h. 22h.	from to 0h. 2h. 4h. 6h. 8h. 10h. 12h. 18h. 20h. 24h.
E Eastern Pacific Ocean.	Eastern Limit of Zone D.	Meridian of 90° W. as far as the Coast of Central America, then the West Coast of Central America and North America.	from to 0h. 2h. 4h. 6h. 16h. 18h. 20h. 22h.	from to 0h. 2h. 4h. 6h. 8h. 14h. 16h. 22h.
F Western Atlantic Ocean and Gulf of Mexico.	Meridian of 90° W., Gulf of Mexico, East Coast of North America.	Meridian of 30° W., Coast of Greenland.	from to 0h. 2h. 12h. 14h. 16h. 18h. 20h. 22h.	from to 0h. 2h. 4h. 10h. 12h. 18h. 20h. 22h.

SECTION II. DIAGRAM

Greenwich mean time (G.M.T.).



Greenwich mean time (G.M.T.).

APPENDIX 14

Specimen Form of Statement for Radiotelegram Accounting

(See article 41)

Account of radiotelegrams routed between . . . . . and . . . . . (names of the countries) through the medium

{ of the coast station of . . . . . .
{ or of coast stations . . . . . (nationality) .

during the month of . . . . . .

Date	Office of Origin	Office of Destination	Number of Words	The . . . . . Administration				Remarks
				Credits		Debits		
				fr.	cts.	fr.	cts.	

APPENDIX 15

PROCEDURE FOR OBTAINING RADIO DIRECTION-FINDING BEARINGS AND POSITIONS

(See article 44).

Section I. General Instructions

§ 1. Before calling one or more direction-finding stations for the purpose of asking for a bearing or position, a mobile station must ascertain from the List of Radiolocation Stations :

a) the call signs of the stations to be called to obtain the desired bearings or position ;

b) the frequency on which the radio direction-finding stations keep watch, and the frequency or frequencies on which they take bearings ;

c) the radio direction-finding stations which, being linked by special circuits, can be grouped with the radio direction-finding station to be called.

§ 2. The procedure to be followed by the mobile station depends on varying circumstances. Generally, the following must be taken into account :

a) If the radio direction-finding stations do not keep watch on the same frequency (whether it be the frequency on which bearings are taken or another frequency), a separate request for the bearings must be made to each station or group of stations using a given frequency.

b) If all the radio direction-finding stations concerned keep watch on the same frequency, and if they are able to take bearings on a common frequency (which may be different from the listening frequency), the mobile station must call all of them at the same time, in order that these stations may take simultaneous bearings on the same transmission.

c) If several radio direction-finding stations are grouped by means of special circuits, only one of them, the radio direction-finding control station, must be called even if all are furnished with transmitting apparatus. In that case, however, the mobile station must, if appropriate, specify in the call, by means of call signs, the radio direction-finding stations from which it wishes to obtain bearings.

§ 3. The List of Radiolocation Stations contains information relating to :

a) the type of signal and class of emission to be used for obtaining the bearings ;

b) the duration of the transmission to be made by the mobile station ; and

c) the time used by the radio direction-finding station in question, if different from Greenwich mean time (G.M.T.).

Section II. Rules of Procedure

§ 4. The following rules of procedure are based on the use of radiotelegraphy. For radiotelephony, appropriate phrases may replace the service abbreviations.

§ 5. *To obtain a bearing or course.*

(1) The mobile station calls the radio direction-finding station or the radio direction-finding control station on the listening frequency indicated in the List of Radiolocation Stations. Depending on the type of information desired, the calling station transmits the appropriate service abbreviation followed, if the radio direction-finding station is a mobile station, by the service abbreviation QTH? It indicates, if necessary, the frequency on which it is going to transmit to enable its bearing to be taken, and then awaits instructions.

(2) The radio direction-finding station called requests the calling station, by means of the appropriate service abbreviation, to transmit for the bearing. If necessary, it indicates the frequency to be used for this purpose and the number of times the transmission is to be repeated.

(3) After having changed, if necessary, to its new transmitting frequency, the calling station transmits two dashes of approximately ten seconds each, followed by its call sign. It repeats this signal as often as the radio direction-finding station requires.

(4) The radio direction-finding station determines the direction and, if possible, the sense of the bearing, and its classification [see (9)].

(5) If the radio direction-finding station is not satisfied with the operation, it requests the calling station to repeat the transmission described under (3).

(6) The radio direction-finding station transmits the information to the calling station in the following order :

a) the appropriate service abbreviation ;

b) three digits indicating the true bearing or the true course from the radio direction-finding station ;

c) class of bearing ;

d) time of observation ;

e) if the radio direction-finding station is mobile, its own position in latitude and longitude, preceded by the service abbreviation QTH.

(7) As soon as the calling station has received the result of the observation, if it is considered necessary to obtain confirmation, it repeats back the message. The radio direction-finding station then confirms that the repitition is correct or, if necessary, corrects it by repeating the message. When the radio-direction-finding station is sure that the calling station has received the message correctly, it transmits the signal "end of work." The calling station repeats this signal as an indication that the operation is finished.

(8) In the absence of information to the contrary, the calling station assumes that the sense of the bearing was determined. If the radio direction-finding station has not determined the sense, it indicates this in the information transmitted, or reports the bearing and its reciprocal.

(9) According to its estimate of the accuracy of the observation, the radio direction-finding station classifies the bearing in one of the three following classes :

Class A : bearings which the operator may reasonably consider to be accurate to within $\pm$ 2° (two degrees) ;

Class B : bearings which the operator may reasonably consider to be accurate to within ± 5° (five degrees) ;

Class C : bearings which the operator may reasonably consider to be accurate to within ± 10° (ten degrees).

§ 6. *To obtain a position determined by two or more radio direction-finding stations organized as a group.*

(1) If the calling station wishes to be informed of its position by a group of radio direction-finding stations, it calls the control station as is indicated in § 5 (1) above, and requests a position by means of the appropriate service abbreviation.

(2) The control station replies to the call and, when the radio direction-finding stations are ready, requests, by means of the appropriate service abbreviation, the calling station to transmit. When the position has been determined, it is transmitted by the control station to the calling station in the form indicated in § 5 (6).

(3) According to its estimate of the accuracy of the observation, the control station classifies the position in one of the three following classes :

Class A : positions which the operator may reasonably expect to be accurate to within 5 nautical miles ;

Class B : positions which the operator may reasonably expect to be accurate to within 20 nautical miles ;

Class C : positions which the operator may reasonably expect to be accurate to within 50 nautical miles.

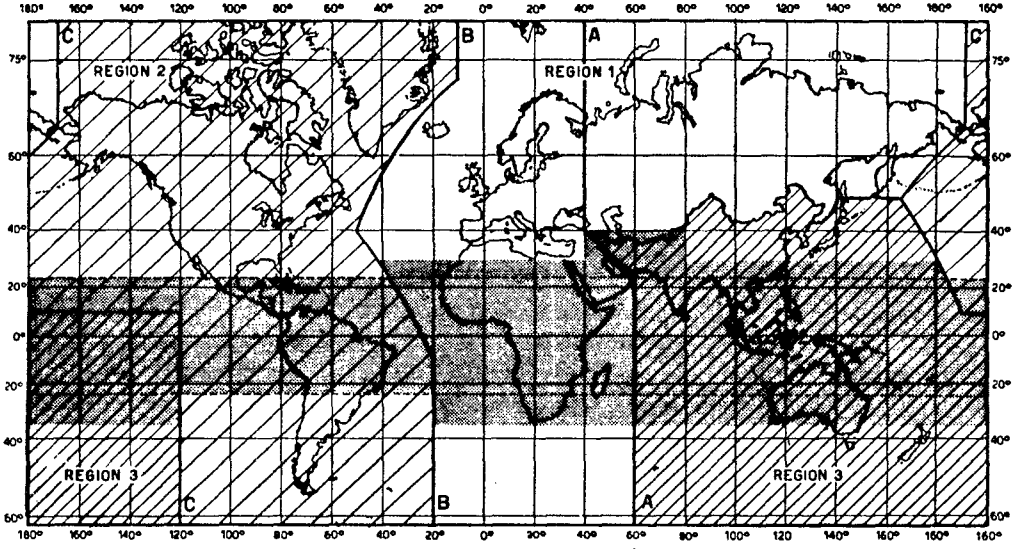
§ 7. *To obtain simultaneous bearings from two or more radio direction-finding stations organized as a group.*

On a request for bearings, the control station of a group of radio direction-finding stations proceeds as indicated in § 6 above. It finally transmits the bearings as observed by each station of the group, each bearing being preceded by the call sign of the station which observed it.

APPENDIX 16

CHART OF REGIONS AS DEFINED IN TABLE OF FREQUENCY ALLOCATIONS

(See **100** to **106** and **252**)



The shaded part represents the tropical zone as defined in **252**

SECOND SERIES

APPENDIX A

STUDIES OF RADIO PROPAGATION

Recognizing the dependence of efficient assignment and utilization of radio frequencies upon full use of radio propagation data, the countries, members of the Union, shall endeavour to promote the establishment and operation of a world-wide system of observation stations to obtain data on ionospheric, radio noise, and other phenomena affecting radio propagation, and also to provide for the study, coordination and dissemination of radio propagation data and predictions.

APPENDIX B

STANDARD FREQUENCY AND TIME BROADCASTS

1. The countries, members of the International Telecommunications Union, recognize that a standard frequency broadcast service available to all parts of the world is essential for maximum economy in the use of the radio frequency spectrum, the efficient operation of the telecommunication services and for the functioning of several activities of the I.T.U.

The countries, members of the I.T.U., recognize that this service may also be useful for other activities outside the Union. The addition of time signals superimposed on these same broadcasts is also highly useful and should be included, if possible.

2. To this end, administrations will endeavour to provide on an international basis a coordinated system of standard frequency broadcasts. As regards time signals, recognizing the work already in hand by various countries aiming at the common distribution by radio of time signals and standard frequencies, the countries, members of the I.T.U. recognize that contact is to be established as soon as possible with the International Committees of Time to promote coordination on an international basis.

APPENDIX C

INTERNATIONAL MONITORING

The International Radio Conference at Atlantic City (1947),

Recognizing:

1. The desirability of a coordinated service of monitoring on a world-wide basis for the purpose of undertaking such measurements of frequencies, field strengths, band widths of emissions, and other characteristics as may be required by the International Frequency Registration Board (I.F.R.B.) for the efficient conduct of its duties;

2. The desirability of the adoption of uniform standards of measurement technique at all monitoring stations participating in such a service ;

3. The desirability that, except for monitoring under private arrangements, all monitoring stations of one country, which participate in such an international monitoring service, should report and transmit their results through one national centralizing office ;

4. The desirability that this office should receive all requests for monitoring originating in the I.F.R.B., or in similar offices of other countries or international organizations concerned, and should forward the results to the I.F.R.B. as well as to the administrations or organizations which have requested the monitoring ;

5. The desirability that the I.F.R.B. should be aware of the standards used in each monitoring station, so that it may usefully compare the results furnished by different monitoring stations and determine whether these results meet the needs of the I.F.R.B. ;

6. The desirability of establishing monitoring stations in such special locations as may be required to provide the I.F.R.B. with comprehensive information ;

7. The possibility that individual monitoring stations, in conformity with the desires of the administration concerned, may not participate in the whole field of monitoring, but may operate only within a limited part of the field ;

8. The possibility that administrations may not be able to undertake, through the monitoring stations under their control, all monitoring requested by the I.F.R.B. or by other administrations ;

Recommends :

a) That, until a coordinated service of monitoring, on a worldwide basis, with generally agreed technical standards of measurements, can be better organized, administrations and organizations should endeavour, as far as they consider practicable, to undertake such monitoring as may be requested by the I.F.R.B., or by administrations of countries, members of the I.T.U., or by other international organizations operating within the framework of the I.T.U., taking into careful consideration points mentioned in paragraphs 1 to 8 above ;

b) That administrations and organizations which are able to undertake such monitoring should inform the Secretary General of the names and locations of the stations under their control which may participate, and the addresses to which requests for monitoring should be sent.

ADDITIONAL RADIO REGULATIONS.[1] SIGNED AT ATLANTIC CITY, ON 2 OCTOBER 1947

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[1] Came into force on 1 January 1949, by virtue of the deposit of instruments of ratification with respect to the International Telecommunication Convention and pursuant to the provisions of article 13 thereof, between countries, territories or groups of territories as listed in footnote 1 on p. 189 of Volume 193 of the United Nations *Treaty Series*, with the exception of the Governments of Canada and the United States of America, which, pursuant to paragraphs I and V, respectively, of the Final Protocol (United Nations, *Treaty Series*, Vol. 193, p. 299), do not accept the obligations of the said Additional Radio Regulations.

ARTICLE 1

APPLICATION OF THE TELEGRAPH AND TELEPHONE REGULATIONS TO RADIOCOMMUNICATIONS

2001 § 1. The provisions of the Telegraph and Telephone Regulations and the Protocols annexed thereto are applicable to radiocommunications insofar as the provisions of the Radio Regulations[1] do not provide otherwise.

2002 § 2. (1) With the exceptions mentioned in the following articles, radiotelegrams are drawn up and treated in accordance with the provisions of the Telegraph Regulations for telegrams.

2003 (2) The use of groups of letters from the International Code of Signals is permitted in radiotelegrams in the maritime mobile service.

2004 § 3. Since the word RADIO or AERADIO, as the case may be, is always included in the list of stations and in the address of a radiotelegram, as part of the name of the land station, this word must not be given as a service indication at the beginning of the preamble in the transmission of a radiotelegram.

ARTICLE 2

ADDRESS OF RADIOTELEGRAMS

2005 § 1. (1) The address of radiotelegrams destined for mobile stations must be as complete as possible and must include :

2006 *a*) name or designation of the addressee, with supplementary particulars, if necessary ;

2007 *b*) name of the ship station or, in the case of aircraft stations, its call sign, as shown in the appropriate list of stations ;

2008 *c*) name of the land station through which the message is to be forwarded, as it appears in the appropriate list of stations.

2009 (2) However, the name and call sign required under **2007** may be replaced, at the risk of the sender, by particulars of the passage made by such mobile station, indicated by the names of the ports or airports of departure and of destination, or by any equivalent indication.

2010 (3) In the address, the name of the mobile station and that of the land station, written as they apear in the appropriate lists of stations are, in all cases and irrespective of their length, each counted as one word.

[1] United Nations, *Treaty Series*, vol. 194.

2011 § 2. (1) Mobile stations not supplied with the International List of Telegraph Offices may add to the name of the telegraph office of destination,

—the name of the territorial subdivision, or
—the country of destination, or
—both of the above,

if it is doubtful whether, without such addition, the message could be correctly routed without difficulty.

2012 (2) In that case the name of the telegraph office and the supplementary particulars are counted and charged for as a single word. The land station operator receiving the radiotelegram retains or deletes these particulars, or further amends the name of the office of destination as is necessary or sufficient for forwarding the radiotelegram to its proper destination.

ARTICLE 3

TIME OF HANDING-IN OF RADIOTELEGRAMS

2013 § 1. In the transmission of radiotelegrams originating in a mobile station, the date and time of handing-in at this station are given in the preamble.

2014 § 2. The time of handing-in is indicated in Greenwich mean time (G.M.T.) from 0 to 24 h. beginning at midnight, and is always expressed and transmitted by means of four figures (0000 to 2400).

2015 § 3. Administrations of countries situated outside zone A (appendix 13 to the Radio Regulations) may, however, authorize ship stations passing along the coasts of their countries to use zone time for giving, in a group of four figures, the time of handing-in. In that case the group must be followed by the letter F.

ARTICLE 4

CHARGES FOR RADIOTELEGRAMS

Section I. General Full-rate Radiotelegrams

2016 § 1. The charge for a radiotelegram originating in and/or intended for a mobile station comprises, according to circumstances :

2017 *a*) the ship or aircraft charge or charges accruing to the mobile station of origin or destination, or to both of these stations ;

2018 *b*) the land station charge (see **2026**) accruing to the land station or stations which participate in the transmission ;

2019 *c*) the charge for transmission over the general telecommunication network, reckoned in accordance with the ordinary rules ;

2020 *d*) the charges for accessory services requested by the sender.

2021 § 2. (1) The land station charge and the ship or aircraft charge are fixed on the basis of a word rate, pure and simple, with no minimum charge, except in the case provided for in article 5 of these Regulations.

2022 (2) The maximum land station charge is sixty centimes (0 fr. 60) per word ; the maximum ship or aircraft charge is forty centimes (0 fr. 40) per word. Administrations shall notify to the Secretary General of the Union the rates fixed by them.

2033 (3) Each administration, however, reserves to itself the right to fix and authorize land station or aircraft station charges higher than the maximum charges indicated in **2022** in the case of land or aircraft stations which are exceptionally costly on account of their installation or working.

2024 (4) The minimum charge as for five words, mentioned in **172** and **173** of the Telegraph Regulations (Cairo Revision, 1938) is not applicable to the radiotelegraph portion of the route over which a radiotelegram is transmitted.

2025 § 3. (1) When a single land station is used as an intermediary between mobile stations, only one land station charge is collected. If the land station charge applicable to traffic with the mobile station of origin is different from that applicable to traffic with the mobile station of destination, the higher of these two charges is collected. In addition, a land telegraph charge may be collected equal to that indicated in **2028** and **2029** as applicable to transmission over the telecommunication network.

2026 (2) When, at the request of the sender, two land stations are used as intermediaries between two mobile stations, the land station charge of each station is collected and also the telegraph charge for the section between the two stations.

2027 § 4. The retransmission service and charges are governed by article 9 of these Regulations.

2028 § 5. (1) Where radiotelegrams originating in or destined for a country pass through land stations of that country, the telegraph charge applicable to the transmission over the internal telecommunication system of that country is, in principle, reckoned on the basis of a word rate, pure and simple, without collection of a minimum charge. This rate is notified in gold francs to the Secretary General of the Union by the administration to which the land stations are subject.

2029 (2) When, by reason of the fact that its internal telecommunication system is not operated by the Government, a country has to apply a minimum charge, it must inform the Secretary General of the Union, which shall note the amount of this minimum charge in the appropriate list of stations, following the indication of the rate per word. In the absence of such note, the charge to be applied is the word rate pure and simple, without a minimum.

2030 § 6. Additional charges collected by mobile stations for multiple radiotelegrams (see **2091**) and radiotelegrams to be delivered by post (see **2092**) are the maximum charges fixed by the Telegraph Regulations.

2031 § 7. The country on whose territory is established a land station serving as intermediary for the exchange of radiotelegrams between a mobile station and another country, is considered, as far as the application of telegraph charges is concerned, as the country of origin or destination of the radiotelegrams, and not as a transit country.

2032 § 8. (1) For the purpose both of transmission and of international accounting, the word count of the office of origin is decisive in the case of radiotelegrams destined for mobile stations, and that of the mobile station of origin is decisive in the case of radiotelegrams originating in mobile stations.

2033 (2) Nevertheless, when a radiotelegram is expressed wholly or partly either :

—in one of the languages of the country of destination (in the case of radiotelegrams originating in mobile stations), or

—in one of the languages of the country to which the mobile station is subject (in the case of radiotelegrams destined for mobile stations),

and when the radiotelegram contains combinations or alterations of words contrary to the usage of that language, the office or the mobile station of destination, as the case may be, has the right to recover from the addressee the amount of the charge not collected. Where payment is refused, the radiotelegram may be withheld.

2034 § 9. The total charge for radiotelegrams is collected from the sender, with the exception of :

2035 *a*) express charges to be collected on delivery (see **542** of the Telegraph Regulations, Cairo Revision, 1938) ;

2036 *b*) the charges applicable to inadmissible combinations or alterations of words, observed by the office or mobile station of destination [see **2033**] which are collected from the addressee.

2037 § 10. Mobile stations must be acquainted with the tariffs necessary for charging for radiotelegrams. However, they are authorized, where necessary, to obtain such information from land stations ; rates furnished by land stations are expressed in gold francs.

2038 § 11. The land station or ship or aircraft charges for radiotelegrams concerning stations not yet included in the appropriate list of stations are fixed, as part of its duties, by the office which collects the charge. The ship or aircraft charges pertaining to radiotelegrams intended for mobile stations the names or call signs of which are replaced by the indication of the route followed or by any other equivalent indication (see **2009**), are also fixed, as part of its duties, by the office which collects the charge. They are the normal rates notified by the administration in question or, in the absence of such notification, they are the maximum charges prescribed in **2022**.

2039 § 12. (1) No new rate, and no modification either general or of detail relative to tariffs shall become effective until 15 days after its notification by the Secretary General of the Union (excluding the day of dispatch) and shall not be applied until the 1st or 16th of the month, whichever date next follows the expiration of this period.

2040 (2) Nevertheless, for radiotelegrams originating in mobile stations, modifications of tariffs are not applicable until a month after the periods laid down in **2039**.

2041 (3) The provisions of **2039** and **2040** admit no exception.

Section II. Reduced-rate Radiotelegrams

A. Radiotelegrams of Immediate General Interest.

2042 § 13. No charge for radio transmission in the mobile service is made for radiotelegrams of immediate general interest, which fall within the following classes :

2043 *a*) distress messages and replies thereto ;

2044 *b*) messages originating in mobile stations notifying the presence of icebergs, derelicts and mines, or announcing cyclones and storms ;

2045 *c*) messages announcing unexpected phenomena threatening air navigation or the sudden occurrence of obstacles at airports ;

2046 *d*) messages originating in mobile stations notifying sudden changes in the position of buoys, the working of lighthouses, devices connected with buoyage, etc. ;

2047 *e*) service messages relating to the mobile service.

B. Meteorological Radiotelegrams.

2048 § 14. (1) The term "meteorological radiotelegram" denotes a radiotelegram consisting solely of meteorological observations or meteorological forecasts, which is sent by an official meteorological service or by a station in official relation with such a service, and addressed to such a service or to such a station.

2049 (2) Meteorological radiotelegrams must bear the paid service indication = OBS = before the address. This paid service indication is the only one admitted.

2050 (3) If requested, the sender must affirm that the text of his radiotelegram complies with the above conditions.

2051 § 15. (1) Land station and ship or aircraft charges applicable to meteorological radiotelegrams are reduced by at least 50 per cent in all relations.

2052 (2) For land stations, the date on which this provision is put into force is fixed by agreement between the administrations and operating companies on the one hand, and the official meteorological services concerned on the other hand.

C. CDE Radiotelegrams.

2053 § 16. Radiotelegrams in secret language which pass over the telecommunication channels of countries belonging to the extra-European system are called CDE radiotelegrams.

2054 § 17. (1) The radiotelegraph charge for CDE radiotelegrams is reduced in the same proportion as the telegraph charge for such radiotelegrams.

2055 (2) In traffic between ship stations, direct or through the intermediary of a single coast station of a country of the extra-European system, radiotelegrams in secret language are considered as CDE radiotelegrams, and the rate to be charged shall be reduced in the same proportions as apply to CDE radiotelegrams in the extra-European system.

2056 (3) The reduction granted is always applicable to the charges, if any, for radiotelegraphic retransmission.

D. Press Radiotelegrams.

2057 § 18. (1) The land station and ship or aircraft charges are reduced by 50 per cent for press radiotelegrams originating in a ship or aircraft station and destined for places on land. These radiotelegrams are subject to the conditions of acceptance laid down in articles **77** and **78** of the International Telegraph Regulations (Cairo Revision, 1938). For those which are addressed to a destination in the country of the land station, the telegraph charge to be collected is one-half of the telegraph charge applicable to an ordinary radiotelegram.

2058 (2) Press radiotelegrams destined for a country other than that of the land station are subject to the press rate in force between the country of the land station and the country of destination.

ARTICLE 5

RADIOMARITIME LETTERS AND RADIO AIR LETTERS

2059 § 1. Each administration may organize a service of radiomaritime letters between ships at sea and its coast stations, and radio air letters between aircraft in flight and its land stations. Such correspondence is transmitted by radio between the ships or aircraft and the land stations. They may be forwarded on the land section :

2060 *a*) wholly or partly by post (ordinary or airmail) ;

2061 *b*) exceptionally by telegraph, in which case delivery is subject to the periods of delay fixed for letter telegrams of the European or extra-European systems.

2062 § 2. Radiomaritime letters and radio air letters do not admit of any radio retransmission in the mobile service.

2063 § 3. Radiomaritime letters and radio air letters must be exchanged only with places in the country in which the land station is situated, unless other arrangements have been made with the administrations concerned. In that event, an additional charge may be collected in accordance with the agreement between these administrations.

2064 § 4. Radiomaritime letters bear the paid service indication = SLT = and radio air letters the paid service indication = ALT =. These indications precede the address.

2065 § 5. (1) Other paid service indications which may be admitted are :

= RPx = = PR = = GP = = GPR = = PAV =

2066 (2) Where the transmission over the land section is exceptionally performed by telegraph, the only paid service indications which may be admitted are :

= RPx = = GP = = TR = = LX = = Redirected from x =

2067 § 6. The address must enable delivery to be effected without enquiry or requests for information. Registered or abbreviated addresses are admitted when, exceptionally, radiomaritime letters and radio air letters are forwarded telegraphically on the land section.

2068 § 7. As a general rule, the text is subject to the regulations applicable to letter telegrams, namely :

2069 *a*) When asked to do so by the office of origin, the sender must sign a declaration that the text is expressed in plain language in one and the same language, and that it bears no meaning other than that which appears on the face of it. The declaration must indicate the language used.

2070 *b*) Exceptionally, proper names, names of firms, and expressions denoting goods or brands of goods are admitted in a language other than that in which the radiomaritime letter or radio air letter is written.

2071 *c*) The usual signs of punctuation of the Morse code are admitted.

2072 *d*) If numbers written in figures, commercial marks or abbreviated expressions are used in the text, the number of these words or groups reckoned in accordance with the normal rules of charging must not exceed one-third of the total number of chargeable words in the text, including the signature. For this evaluation a radiomaritime letter or radio air letter is always considered as comprising at least 20 words, even if the actual number is less than 20.

2073 § 8. (1) The ship or aircraft charge for radiomaritime letters and radio air letters is fixed at 2 fr. 50 up to 20 words. For each word in excess of twenty : 0 fr. 125.

2074 (2) The land station charge up to 20 words and the charge per word in excess shall be determined by the administrations concerned subject to a maximum of 4 francs for the first and 0 fr. 20 for the second. The land station charge must include the postal charge (by ordinary letter) due for routing in the country to which the land station is subject.

2075 (3) The following charges are added where applicable :

2076 —charges due for authorized accessory services and, if necessary, the further charge mentioned in **2063** ;

2077 —the telegraph charge when, exceptionally, transmission on the land section is by telegraph.

2078 § 9. Radiomaritime letters and radio air letters rank for radio transmission after ordinary radiotelegrams on hand. Those which have not been transmitted within 24 hours of handing-in are sent concurrently with ordinary radiotelegrams.

2079 § 10. The normal rules of accounting as regards radiocommunications are applicable to radiomaritime letters and to radio air letters, in accordance with the provisions of **2073** and **2074**.

2080 § 11. (1) When a radiomaritime letter or a radio air letter fails to reach its destination due to the failure of the postal service, only the charges in respect of the services not carried out are refunded.

2081 (2) Reimbursement of charges is admitted in the cases provided in **842**, **859**, and **862** of the Telegraph Regulations (Cairo Revision, 1938).

ARTICLE 6

SPECIAL RADIOTELEGRAMS. PAID SERVICE INDICATIONS

2082 § 1. The following special radiotelegrams are admitted provided the administrations concerned accept them :

2083 1st Press radiotelegrams originating in mobile stations and destined for the land.

2084 2nd Meteorological radiotelegrams (= OBS =).

2085 3rd Greetings radiotelegrams (subject to the conditions laid down in article 86 of the Telegraph Regulations, Cairo Revision, 1938).

2086 4th Paid service advices, except those requesting a reply by post. These are forwarded, as far as practicable, by the same route as that of the original radiotelegram. In the case of diversion (for example, in case of interruption or where the mobile station proceeds beyond the range of the land station which has acted as intermediary for the transmission of the original radiotelegram) they bear the indication "dévié" and particulars of the route followed by the original radiotelegram. All paid service advices are admitted over the general telecommunication network.

2087 5th Urgent radiotelegrams and deferred radiotelegrams but only over the general telecommunication network.

2088 6th Radiotelegrams with prepaid reply. The reply voucher issued on board a mobile station gives the right to send a radiotelegram to any destination, but only from the mobile station which issued the voucher, and only up to the value of the voucher.

2089 7th Collated radiotelegrams.

2090 8th Radiotelegrams with notification of delivery destined for mobile stations, but only as far as concerns the notification to the telegraph office of origin of the date and time at which the land station has transmitted the radiotelegram to the mobile station of destination.

2091 9th Multiple radiotelegrams.

2092 10th Radiotelegrams to be delivered by express or by post (direction ship or aircraft to land).

2093 11th De luxe radiotelegrams (subject to the conditions laid down in article 63 of the Telegraph Regulations, Cairo Revision, 1938).

2094 12th Radiotelegrams to be retransmitted by a station of the mobile service at the sender's request (= RM =).

2095 13th Radiomaritime letters and radio air letters.

2096 14th Radiotelegrams to be delivered to the addressee in person.

2097 15th Radiotelegrams to be delivered unsealed.

2098 § 2. In addition the following paid service indications are admitted in radiotelegrams :
= GP =, = GPR =, = TR =, = TFx = (direction ship or aircraft to land), = Jx = (direction land to ship or aircraft), = Redirected from x = (only when the charge for forwarding can be collected), = Day =, = Night =

2099 § 3. Radiotelegrams are not admitted as letter telegrams. Radiotelegrams to follow the addressee at the request of the sender are not admitted.

ARTICLE 7

PERIOD OF RETENTION OF RADIOTELEGRAMS AT LAND STATIONS

Section I. Radiotelegrams Destined for Ships at Sea

2100 § 1. (1) The sender of a radiotelegram destined for a ship at sea may specify the number of days during which the coast station may hold the radiotelegram.

2101 (2) In that case, the sender writes before the address the paid service indication = Jx = (x days) specifying the number of days (ten at the most) exclusive of day of handing-in of the radiotelegram.

2102 § 2. (1) When it has not been possible to transmit within the prescribed period a radiotelegram bearing the paid service indication = Jx =, the coast station informs the office of origin, which notifies the sender. The latter may ask, by paid service advice telegraphic or postal, addressed to the coast station, that his radiotelegram be cancelled as regards the section between the coast station and the ship station, or kept for a further period of not more than seven days to be transmitted to the ship station. Failing such a request, the radiotelegram is treated as undelivered three days after the despatch of the advice of non-transmission. The office of origin is immediately advised if the coast station transmits the radiotelegram during the above mentioned three days. The same applies when the coast station transmits the radiotelegram during the further period which may be requested by the sender.

2103 (2) When a ship station to which is addressed a radiotelegram not bearing the paid service indication = Jx = has not notified its presence by the morning of the fourth day following the date of handing-in, the coast station informs the office of origin, which then notifies the sender. The latter may request, by means of paid service advice telegraphic or postal addressed to the coast station, that his radiotelegram be cancelled as regards the section between the coast station and the ship station, or held until the end of the tenth day, counting from the day following the day of handing-in. Failing such a request, the radiotelegram is treated as undelivered at the end of the seventh day counting from the day following the day of handing-in. The office of origin is immediately advised if the coast station transmits the radiotelegram between the fourth and seventh days from the day following the day of handing-in. The same applies when the coast station transmits the radiotelegram during the period which may have been requested by the sender.

2104 § 3. On the morning of the day following that on which a radiotelegram is treated as undelivered the coast station advises the office of origin in order that coast station and ship station charges may be refunded to the sender.

2105 § 4. The lapse of any of the periods mentioned in **2102** and **2103** is ignored if the coast station is sure that the ship station will soon come within its range.

2106 § 5. (1) On the other hand, the lapse of those periods is not awaited when the coast station is sure that the ship station being in course of a voyage either has definitely left its range of action or will not enter it. If it believes that no other coast station of the administration or of the private enterprise to which it is subject is or will be in touch with it, the coast station cancels the radiotelegram as far as concerns the section between itself and the ship station and informs the office of origin which notifies the sender. In the contrary case, the coast station forwards the radiotelegram to the coast station believed to be in touch with the ship station, provided, however, that no additional charge results therefrom.

2107 (2) The coast station which carries out the redirection by wire, alters the address of the radiotelegram by placing after the name of the ship station that of the new coast station charged with the transmission and inserting at the end of the preamble the service instruction "redirected from x Radio" which must be transmitted throughout the course of the radiotelegram.

2108 (3) If, within the limits of the requisite period of retention of radiotelegrams, the coast station which has redirected a radiotelegram to another coast station is subsequently in a position to transmit the radiotelegram direct to the mobile station of destination, it does so by inserting the service

instruction "ampliation" before the preamble. It shall then transmit to the coast station to which the radiotelegram had been redirected a service notice informing the latter of the transmission of the said radiotelegram.

2109 § 6. When a radiotelegram cannot be transmitted to a ship station owing to the arrival of the latter in a port near the coast station, the latter station may, according to circumstances, forward the radiotelegram to the ship station by other means of communication, at the same time informing the office of origin by service advice of the delivery. In this case the coast station charge is retained by the administration to which the coast station is subject and the ship charge is refunded to the sender by the administration to which the office of origin is subject.

Section II. Radiotelegrams Destined for Aircraft Stations in Flight

2110 § 7. (1) Radiotelegrams intended for aircraft in flight must be sent by land stations with the least possible delay. When the land station is certain that the aircraft station cannot be reached, it immediately informs the office of origin by service advice, so that the land station and aircraft charges, and any charges for special services not performed, may be refunded to the sender.

2111 (2) When, however, a radiotelegram can not be transmitted to an aircraft station due to the latter's arrival at an airport (other than that where the land station happens to be situated) and if the stay of the aircraft is prolonged, the land station may, if necessary, forward the radiotelegram to the aircraft station by other means of communication, and advise the office of origin of this transmission by a service message. In this case, the land station charge is retained by the administration to which the land station belongs, and the aircraft charge is refunded to the sender by the administration to which the office of origin is subject.

2112 (3) The radiotelegram may be delivered to the aircraft station at the airport where the land station, which should have made the transmission, happens to be situated.

2113 (4) In this case, the land station notifies the office of origin of this delivery by service advice, and the office of origin refunds the land station and aircraft charges to the sender.

ARTICLE 8

DOUBTFUL RECEPTION. TRANSMISSION BY "AMPLIATION"
LONG-DISTANCE RADIOCOMMUNICATIONS

2114 § 1. (1) In the mobile service, when communication becomes difficult, the two stations in communication make every effort to complete the radiotelegram in course of transmission. The receiving station may request

not more than two repetitions of a radiotelegram of which the reception is doubtful. If this triple transmission is ineffective, the radiotelegram is kept on hand in case a favourable opportunity for completing its transmission occurs.

2115 (2) If the transmitting station considers that it will not be possible to re-establish communication with the receiving station within twenty-four hours, it proceeds as follows :

2116 *a) If the transmitting station is a mobile station,*

it immediately informs the sender of the reason for the non-transmission of his radiotelegram. The sender may then request :

2117 —that the radiotelegram be transmitted through another land station or through other mobile stations ; or

2118 —that the radiotelegram be held until it can be transmitted without additional charge ; or

2119 —that the radiotelegram be cancelled.

2120 *b) If the transmitting station is a land station,*

it applies the provisions of article 7 to the radiotelegram.

2121 § 2. When a mobile station subsequently transmits a radiotelegram thus held to the land station which incompletely received it, this new transmission must bear the service instruction "ampliation" in the preamble of the radiotelegram. If the radiotelegram is transmitted to another land station subject to the same administration or the same private enterprise, the new transmission must bear the service instruction "ampliation via ..." (insert here the call sign of the land station to which the radiotelegram was transmitted in the first instance) and the administration or private enterprise in question may claim only the charges relating to a single transmission. The "other land station" which thus forwards the radiotelegram may claim from the mobile station of origin any additional charges resulting from the transmission of the radiotelegram over the general communication network between itself and the office of destination.

2122 § 3. When the land station designated in the address as the station by which the radiotelegram is to be forwarded cannot reach the mobile station of destination, and has reason to believe that such mobile station is within range of another land station of the administration or private enterprise to which it is itself subject, it may, if no additional charge is incurred thereby, forward the radiotelegram to this other land station.

2123 § 4. (1) A station of the mobile service which has received a radiotelegram and has been unable to acknowledge its receipt in the usual way, must take the first favourable opportunity to give such acknowledgment.

2124 (2) When the acknowledgment of receipt of a radiotelegram transmitted between a mobile station and a land station cannot be given direct, it is forwarded through another mobile or land station, if the latter is able to communicate with the station which has transmitted the radiotelegram in question. In any case no additional charge must result.

2125 § 5. (1) Administrations reserve the right to organize a long-distance radiocommunication service between land stations and mobile stations, with deferred acknowledgment of receipt or without any acknowledgment of receipt.

2126 (2) When there is doubt about the accuracy of any part of a radiotelegram transmitted under either of these systems, the indication "doubtful reception" is entered on the copy delivered to the addressee, and the doubtful words or groups of words are underlined. If words are missing, blanks are left in the places where these words should be.

2127 (3) In the long-distance radiocommunication service with deferred acknowledgment of receipt, when the transmitting land station has not, within a period of 5 days, received the acknowledgment of receipt of a radiotelegram sent by it, the station notifies the office of origin. The reimbursement of the land station and ship or aircraft charges must be postponed until the office of origin has ascertained from the land station in question that an acknowledgment of receipt has not been received subsequently, within a period not exceeding one month.

2128 (4) Each administration designates the long-distance land station or stations for which its mobile stations keep watch.

ARTICLE 9

RETRANSMISSION BY STATIONS OF THE MOBILE SERVICE

Section I. Retransmission at the Request of the Sender

2129 § 1. Stations of the mobile service must, if the sender so requests, serve as intermediaries for the exchange of radiotelegrams originating in or destined for other stations of the mobile service ; the number of intermediary stations of the mobile service, is, however, limited to two.

2130 § 2. Radiotelegrams forwarded as described in **2129** above must bear, before the address, the paid service indication = RM = (retransmission).

2131 § 3. The transit charge, whether two intermediary stations are concerned or only one, is fixed uniformly at forty centimes (0 fr. 40) per word pure and simple, without the collection of a minimum charge. When two stations of the mobile service have participated this charge is divided equally between them.

Section II. Routine Retransmission

2132 § 4. (1) When a land station cannot reach the mobile station for which a radiotelegram is destined and no payment for retransmission of the radiotelegram has been deposited by the sender, the land station may, in order to forward the radiotelegram to its destination, have recourse to the help of another mobile station provided that the latter consents. The radiotelegram is then transmitted to this other mobile station. The help of the latter is given free of charge.

2133 (2) The same provision is also applicable to traffic from mobile stations to land stations, when necessary.

2134 (3) The station assisting in the free retransmission in accordance with the provisions of **2132** and **2133** must enter the service abbreviation QSP . . . (name of the mobile station) in the preamble of the radiotelegram.

2135 (4) In order that a radiotelegram thus forwarded may be considered as having reached its destination, the station which has made use of this indirect route must have obtained the regular acknowledgment of receipt, either direct or by an indirect route, from the mobile station for which the radiotelegram was destined or from the land station to which it was to be forwarded, as the case may be.

ARTICLE 10

ADVICE OF NON-DELIVERY

2136 § 1. When, for any reason, a radiotelegram originating in a mobile station and destined for a place on land cannot be delivered to the addressee, an advice of non-delivery is addressed to the land station which received the radiotelegram. After checking the address, the land station forwards the advice, when possible, to the mobile station, if necessary, by way of another land station of the same country or of a neighbouring country, as far as existing conditions or special agreements permit.

2137 § 2. When a radiotelegram received at a mobile station cannot be delivered, that station so informs the office or mobile station of origin by a service advice. In the case of a radiotelegram originating on land, this service advice is sent, whenever possible, to the land station through which the radiotelegram passed or, if necessary, to another land station of the same

country or of a neighbouring country, as far as existing conditions or special agreements permit.

ARTICLE 11

RADIOTELEGRAMS ORIGINATING IN OR DESTINED FOR AIRCRAFT

2138 In the absence of special arrangements the provisions of the Additional Radio Regulations are applicable generally to public correspondance radiotelegrams originating in or destined for aircraft.

ARTICLE 12

RADIOCOMMUNICATIONS FOR MULTIPLE DESTINATIONS

2139 Radiocommunications for multiple destinations shall be carried on in accordance with the provisions of the Telegraph Regulations.

ARTICLE 13

EFFECTIVE DATE OF THE ADDITIONAL RADIO REGULATIONS

2140 These Additional Radio Regulations shall come into force on January 1, 1949.

2141 IN WITNESS WHEREOF the delegates of the following countries, represented at the International Radio Conference of Atlantic City (1947), have signed in the names of their respective countries the present Regulations in a single copy which will remain in the archives of the Government of the United States of America and of which a certified copy will be delivered to every country member of the Union.

DONE at Atlantic City, the 2nd of October 1947.

The signatures follow.

The countries which signed the Additional Radio Regulations are the same as those which signed the Radio Regulations (see United Nations, *Treaty Series*, Volume 194, pp. 310 to 324), with the exception of Canada, Ecuador, Mexico, Panama, Peru, United States of America, Uruguay and Venezuela (see Reservations I, IV, V, X, XII, XIII, XV and XVI of the Final Protocol to the International Telecommunication Convention. United Nations, *Treaty Series*, Volume 193, pp. 297 to 307).

ADDITIONAL PROTOCOL[1] TO THE ACTS[2] OF THE INTERNATIONAL RADIO CONFERENCE OF ATLANTIC CITY, 1947, SIGNED BY THE DELEGATES OF THE EUROPEAN REGION. ATLANTIC CITY, 2 OCTOBER 1947

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(1) The undersigned Delegates, Plenipotentiaries of their respective Governments,

—considering that the European Radio Convention of Montreux (April 15, 1939) has not been ratified and that the Frequency Allocation Plan annexed thereto was not applied;

—considering that European broadcasting on long and medium waves is in fact still governed by the Lucerne Convention (1933)[3] and the Plan attached thereto;[3]

—recognize the necessity for setting up a new Regional Broadcasting Agreement and a new Frequency Allocation Plan for the broadcasting stations of the European Area, based on the provisions established at the International Radio Conference of Atlantic City (1947);* consider that it is advisable to call a meeting of a new European Regional Broadcasting Conference entrusted with the task of drawing up this new Regional Agreement and this Plan and request the Government of Denmark to call this meeting.

(2) They entrust a Committee composed of the delegates of the administrations of the following eight countries:

Belgium, France, Netherlands, United Kingdom of Great Britain and North Ireland, Sweden, Switzerland, U.S.S.R., Yugoslavia, under the chairmanship of Belgium,

[1] Came into force on 2 October 1947 by signature.
[2] United Nations, *Treaty Series*, Vols. 193 and 194.
[3] League of Nations, *Treaty Series*, Vol. CLIV, p. 133 and Vol. CLXXVII, p. 464.
* *Definition of the European broadcasting area:* The European area is bounded on the west by the western boundary of Region, on the east by the meridian 40° E. of Greenwich and on the south by the parallel 30° N., so as to include the western part of the U.S.S.R. and the territories bordering on the Mediterranean, with the exception of the parts of Arabia and Saudi Arabia which are included in this sector.

with the task of preparing, on the basis of the directives included in the annex attached hereto, a preliminary draft plan for the allocation of frequencies to broadcasting stations and of presenting it to the Government of Belgium not later than March 15th, 1948.

These delegates shall be considered as the representatives of all the countries of the European region.

Any administration of this region wishing to do so, may, at the proper time, and when points of interest to that country are being examined, send a delegation to the Committee to express its views.

The Belgian Government will communicate the preliminary draft to the managing Government of the Conference as well as to all the Governments of the European broadcasting area through the Bureau of the International Telecommunications Union.

(3) The Committee may decide, by agreement between its members, to call for competent experts.

The Committee shall begin its work on the 15th of January 1948. Its headquarters shall be in Brussels.

For the composition, the preparation and the powers of the new Conference, the undersigned delegates recommend the directives contained in the document attached hereto.

IN WITNESS WHEREOF, the delegates of the respective administrations have signed the present Protocol in a single copy which will remain in the archives of the Government of the United States of America, and of which a copy will be delivered to each Party.

DONE at Atlantic City, the 2nd of October 1947.

DOCUMENT ANNEXED TO THE ADDITIONAL PROTOCOL

DIRECTIVES FOR THE EUROPEAN REGIONAL BROADCASTING CONFERENCE

§ 1

1. The Conference will be composed of representatives of all the countries comprised in the European Area which have signed the International Telecommunications Convention of Atlantic City (1947)[1] or have adhered thereto. The Conference will have the power to invite other countries of the European area.

2. Any extra-European country, signatory of this Convention or which has adhered thereto, shall have the right to be represented at this Conference by observers who will be permitted to attend all meetings of this Conference and to speak on any question which they consider affects the interests of the radio services of their countries. These observers shall not be entitled to vote.

3. The telecommunications operating services of the United Nations shall be entitled to take part in the Conference, in accordance with the provisions of article 41 of the International Telecommunications Convention of Atlantic City (1947).

4. International Organizations, which have so requested, may be authorized to participate in the Conference in an advisory capacity in the manner and to the extent fixed by the Rules of Procedure (see § 12).

§ 2

1. The purpose of the Conference shall be to draw up a new Regional Agreement for European Broadcasting and a Frequency Allocation Plan for the European stations.

2. In principle it shall meet on July 1st 1948 at Copenhagen.

§ 3

1. The Conference, complying with the relative provisions of Chapter III of the Radio Regulations[2] of Atlantic City, will allocate (either in the bands authorized for broadcasting services, or in the bands shared with other services, or in derogation, outside those bands) frequencies below 1 605 kc/s in accordance with the provisions of §§ 7 and 8 below.

2. It will deal with any related questions.

§ 4

1. In taking its decisions, this Conference will have regard to the requirements of all the countries of the European Area*.

[1] United Nations, *Treaty Series*, Vol. 193, p. 189 and pp. 243 to 257.
[2] United Nations, *Treaty Series*, Vol. 194.
* The needs of the United Nations shall be considered as a special case.

2. To enable each country to ensure a national service of a reasonably satisfactory quality, the Conference shall make every effort to allocate to each country of the European Area the adequate number of waves adapted to that purpose, and, in particular, one or more exclusive waves if general and technical conditions render this necessary.

   It will be advisable to take into account, as equitably as possible, the special conditions of each country on the one hand, and, on the other, the existing economic situation which makes it advisable to introduce the minimum number of changes in the installations in service.

3. Where it is not possible to assign a frequency below 525 kc/s, either in the bands authorized for broadcasting services, or in derogation, outside these bands, to certain countries of which the size and orographical structure may warrant such an allocation, these countries will, so far as possible, receive a frequency from among the lowest in the band from 525 to 1 605 kc/s.

§ 5

1. Each country shall communicate its broadcasting requirements as soon as possible, not later than January 1st, 1948, to the Belgian Government which shall transmit them without delay to the Committee of eight countries (see para. 2 of the Additional Protocol).
2. This Committee shall meet in Brussels not later than January 15, 1948, shall proceed to the study of these requirements and shall obtain all other useful information from any available source, if necessary, by calling in experts.
3. It shall, in due time, announce to the various countries that they may send delegates to state their views.
4. The Committee shall then draw up a first preliminary draft of a Plan.
5. It shall forward this preliminary draft to the countries of the European Area through the Belgian Government. Each Government shall have the right, not later than two months after the sending of the Plan, to submit its observations to the Belgian Government so that they may be communicated to the other Governments of the European Area as well as to the Committee of eight countries.
6. In principle, six weeks before the date fixed for the European Conference, the Committee shall meet again in Brussels to proceed to the study of the observations received.

   In the case of detailed remarks, the Committee may limit itself to analyzing them in a report.

   On the other hand, if the observations are important, the Committee may be disposed to alter its work and to present a second preliminary draft.
7. The final document shall be transmitted to the managing Government of the Conference as well as to the Governments of the countries of the European Area through the Bureau of the International Telecommunications Union.

§ 6

1. In its decisions relative to the allocations of frequencies to the various broadcasting stations, the Conference will apply the rules of the Radio Regulations of Atlantic

City destined to regulate and to ensure the better working of broadcasting services. The Conference will fix the upper limit of unmodulated power measured in the aerial of each station for the frequency in question.

2. The arrangement adopted at the Conference will include, among the general rules to be observed in future, provisions similar to those cited above as well as those included in Chapter III of the Radio Regulations of Atlantic City (1947) **89, 90, 96, 242, 243, 245** to **249,** and **374.**

§ 7

If the European Regional Conference is led to contemplate the use by a broadcasting station of a frequency in one of the bands reserved for other European regional services, the arrangement adopted will stipulate that if this use causes interference which was not foreseen at the time of the admission of the broadcasting station, the administrations concerned will do their utmost to obtain agreements capable of eliminating this interference and, in this case, the authorized services will have the preference in relation to the broadcasting services.

§ 8

If the European Regional Conference is led to contemplate the use by a broadcasting station of a frequency in one of the bands reserved internationally, in the general table of allocation of frequencies, for the mobile services, it will, before coming to a decision, make an exhaustive study of the technical conditions under which this service could be carried out without interference with the authorized international mobile services, and will do its utmost to obtain the agreements necessary to such use. In any case, it is understood that if a broadcasting station thus allowed to use such a frequency in derogation, should cause interference with another service already authorized, it could not continue to use that frequency unless the interference is eliminated.

§ 9

1. In principle, the power of broadcasting stations must not exceed the value which enables an efficient national service of reasonably satisfactory quality to be economically provided.

2. In virtue of this principle, the Conference will fix for each station or each type of station the maximum authorized power, taking into consideration :

   a) the conditions of use of waves : exclusive waves, shared waves, synchronized waves ;

   b) the position of frequencies, either in the authorized bands, or in the bands of other services in which exceptions will be admitted ;

   c) special geographical, orographical, demographical, etc., conditions.

3. In principle, the sites of broadcasting stations, and more particularly of those which work near the limits of frequency bands, reserved for broadcasting, must be chosen, with due regard to the power and the frequency, in such a manner as to avoid, so far as

possible, interference with broadcasting services of other countries or with other services working on nearby frequencies.

4. In order to use with the maximum efficiency the possibilities which the provisions of the Radio Regulations of Atlantic City (1947) afford, the Conference must take into account, as fully as possible, the most recent state of the technique, particularly as regards :

—aerials designed to overcome fading,

—directive aerials,

—synchronisation of groups of national transmitters,

—wave sharing and utilization of the zone of secondary night service,

—installation of frequency modulation stations.

5. In order to study the possibilities of the exceptional admission of certain broadcasting stations, in bands allocated to other services, particular account will be taken of the following factors.

a) the intensity of field necessary to ensure normal communication between the stations of the services in question ;

b) the necessary relation between such intensity and the level of interference ;

c) the selectivity curves of receivers normally used in those services.

§ 10

The European Conference will fix the date of the entry into force of the new Regional Agreement and of the Plan annexed thereto.

§ 11

Since the work of the Committee of eight countries must be considered as the first stage of this Conference, and the delegates of the various administrations to this Committee must not themselves be considered as authorized agents of their own countries but as entrusted with a work of general European interest, the expenses of this Committee shall in principle, like those of the Conference itself, be borne by all of the European countries.

However, to reduce the expenses indicated to a minimum, it is agreed as follows :

a) the salaries of the said delegates shall be borne by their administrations ;

b) this shall also be the case with regard to their travelling expenses ;

c) the only reimbursement made to the delegates shall be that of a single and identical contractual allowance in Belgian francs corresponding to the daily travel allowance, calculated only for the days that the delegates are actually in Belgium, at the rate of one delegate per country. The Chairman of the Committee shall fix this allowance, make the calculations for it and come to an agreement with the Belgian Government on the payment, which will be reimbursed to it through the Bureau of the International Telecommunications Union, acting in the name of all the countries participating in the European Regional Broadcasting Conference ;

d) the funds necessary for the operation of the Secretariat, which shall be as small as possible, shall be advanced by the Belgian Government under the same conditions of reimbursement in effect for allowances to the delegates ;

e) if the Committee of eight countries should decide, by agreement among their members, to call for the collaboration of competent experts, it may make a recommendation to the European Regional Broadcasting Conference, concerning the payment of the reasonable expenses of these experts ;

f) the final apportionment of the expenses of the Committee of eight countries and of the Conference itself, shall be made in accordance with the provisions of article 14 of the Telecommunication Convention of Atlantic City (1947) ;

g) it may be decided that the international organizations which may in future participate in the Conference will be invited to participate in all of the expenses of this Conference.

§ 12

The Conference shall adopt its own Rules of Procedure.

RESERVATION MADE BY THE DELEGATION OF THE UNION OF SOVIET SOCIALIST REPUBLICS RELATING TO THE ADDITIONAL PROTOCOL TO THE ACTS OF THE INTERNATIONAL RADIOCOMMUNICATIONS CONFERENCE OF ATLANTIC CITY, 1947

The Soviet delegation is in accord with all the decisions of the present protocol with the exception of § 1 of the directives for the European Conference.

The wording and sense of this paragraph practically exclude several sovereign European Soviet Republics with completely independent broadcasting organizations of their own, from participation in the Conference.

Such disregard of the Soviet Republics makes doubtful the possibility of participation in the European Conference of other Soviet Republics as well as the Soviet Union as a whole.

RECOMMENDATIONS AND RESOLUTIONS ADOPTED BY THE INTERNATIONAL RADIO CONFERENCE OF ATLANTIC CITY (1947). ATLANTIC CITY, 2 OCTOBER 1947

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RECOMMENDATION No. 1 TO THE INTERNATIONAL RADIO CONSULTATIVE COMMITTEE RELATING TO INTERNATIONAL COORDINATION OF STUDIES OF RADIO PROPAGATION

A. The International Radio Conference of Atlantic City (1947) invites the C.C.I.R. to initiate, and thereafter to continue on a permanent basis, the study of measures for the coordination of observations on propagation carried out by different countries, in order to provide, on a world-wide basis, coordinated data immediately applicable by the telecommunications services and, in a more general way, to ensure the speediest possible progress in scientific knowledge and corresponding techniques.

B. In this respect, the Conference invites the C.C.I.R. to study, in particular, the following questions :

1. Standardization of symbols and of the presentation of the results of ionospheric sounding and, if appropriate, of certain methods of measurement, in order to ensure that measurements from different sources may be directly comparable.

2. Suitability of the geographical locations of existing ionospheric sounding and other observation stations and requirements for future observations at new locations.

3. Coordination of investigations on absorption carried out by means of measurements at vertical oblique incidence, by recording of field strengths of existing radio stations, or by any other method.

4. Coordination of investigations of natural radio noise.

5. Determination of the best practical means for a rapid exchange, on an international basis, of information of all kinds relating to propagation.

6. Determination of the best practical means for the publication of scientific and technical investigations submitted by participating administrations and, in addition, periodical publication of results such as propagation forecasts having immediate application to radio services.

7. Review of the value and importance of various phases of propagation work and of publications relating thereto, and the publication of regular recommendations accordingly.

8. Any other new matter of general interest.

C. In order to attain the maximum possible degree of cooperation with organizations concerned with propagation work such as the International Scientific Radio Union, the Conference invites the C.C.I.R. to consult regularly with such organizations.

RECOMMENDATION NO. 2 TO THE C.C.I.R. RELATING TO STANDARD FREQUENCY BROADCASTS AND TIME SIGNALS

With a view to determining the technical means appropriate for the realization of the objective specified in appendix B annexed to the Radio Regulations,[1] the International Radio Conference of Atlantic City (1947) invites the C.C.I.R. to :

1. Examine in cooperation with the International Committee of Time and other competent international organizations having a direct and substantial interest in this subject, suitable methods of assuring the coordination of the various standard frequency and time signal transmissions.

2. *a*) Recommend to administrative conferences of the Union such action as is necessary to attain the objective specified in appendix B.
   b) Study the operation and functioning of the coordinated services of standard frequency and time signal transmissions.
   c) Recommend further improvements to make these services more generally useful.

RECOMMENDATION NO. 3 TO THE C.C.I.R. ON INTERNATIONAL MONITORING

The International Radio Conference of Atlantic City (1947) invites the C.C.I.R. to make an urgent study of the following questions :

a) technical recommendations for a coordinated world-wide service of monitoring to fulfil the requirements stated in appendix C[2] and the provisions of article 18[3] of the Radio Regulations ;

b) the technical standards and procedures of measurement to be adopted by stations participating in the service, taking into consideration the requirements of the International Frequency Registration Board (such recommendations should indicate the field of activity of each class of station and the technical standards required for each type of measurement undertaken) ;

c) to recommend the form in which results of observations and measurements should be presented.

RECOMMENDATION NO. 4 TO THE C.C.I.R. RELATING TO THE REVIEW OF APPENDICES 3, 4 AND 5 OF THE INTERNATIONAL RADIO REGULATIONS

The C.C.I.R. is invited to study as soon as possible the following questions, arranged according to their urgency.

[1] See p. 115 of this volume.
[2] See p. 115 of this volume.
[3] United Nations, *Treaty Series*, Vol. 194, p. 159.

1. In respect of the various classes of emission in use, determination of :

—the bandwidth strictly necessary to ensure a service of the appropriate quality ;

—practical methods of measuring the bandwidth actually occupied by each particular emission.

2. Determination of :

—the bandwidth which should be accepted by the various types of apparatus used for the reception of different classes of emission in the different services ;

—the filter characteristics and especially their effectiveness in eliminating interference outside the nominal acceptance band ;

—the practical methods of obtaining the necessary characteristics ;

—the corresponding methods of measurement.

3. Determination of :

—the level of radio-frequency harmonics radiated by the stations of the different services ;

—the level to which it is practicable to reduce such harmonics ;

—the methods of achieving this result ;

—the corresponding methods of measurement.

4. Consideration of the desirable conditions to be fulfilled by the complete systems employed by the different services in order to determine the required technical performance of the equipment (including the station terminal apparatus and the antennas) and of the measuring apparatus used to ascertain whether the equipment satisfies the recommendations of the C.C.I.R.

The C.C.I.R. is further invited to carry on permanently the study of the above mentioned questions and to publish its recommendations and possible revisions as soon as practicable.

RECOMMENDATION NO. 5 TO THE C.C.I.R. RELATING TO THE STUDY OF THE EFFICACY OF SIGNALS MAYDAY AND PAN

The International Radio Conference of Atlantic City (1947),

Considering :

a) Number **873**[1] of the Radio Regulations (Atlantic City Revision), quoted as follows :

"In radiotelephony, the distress signal consists of the word MAYDAY, pronounced as the French expression 'm'aider'" ;

b) Number **935**[1] of the Radio Regulations (Atlantic City Revision), quoted as follows :

[1] United Nations, *Treaty Series*, Vol. 194, pp. 263 and 275.

"In radiotelephony, the urgency signal consists of three repetitions of the word PAN, pronounced as the French word 'panne'. It is sent before the call" ;

c) A proposal presented during the Conference to substitute the spoken letters SOS for the word MAYDAY ;

d) The reasons, according to those to whom the use of the word MAYDAY presents difficulties, are that this word does not have in all languages the significant meaning of distress, that operators of different nationalities have difficulty in pronouncing and understanding it, and that it is not capable of fully modulating radiotelephone emissions ;

e) A proposal presented during the Conference to replace the word PAN by the word URGENT ;

Invites the C.C.I.R.:

—To study the suitability of the signals MAYDAY and PAN with a view to determining if other signals are more suitable, and

—To formulate the necessary recommendations.

RECOMMENDATION NO. 6 TO THE C.C.I.R. RELATING TO THE WATCH ON THE DISTRESS FREQUENCY 2 182 KC/S

The International Radio Conference of Atlantic City (1947),

Considering :

a) That the Radio Regulations of Atlantic City (1947) designate in **148**[1] the frequency 2 182 kc/s as a world-wide calling and distress frequency in the maritime mobile radiotelephone service in the bands between 1 605 and 2 850 kc/s and regulate its use (article 34) ;

b) That most of the ships equipped to work in these bands are not required by international regulations to carry radio equipment ;

c) That the safety of life at sea will be enhanced if watch on the frequency 2 182 kc/s is kept by as many stations as possible ;

d) In order that the keeping of this watch may be as economical as possible, it is desirable to envisage the possibility of employing automatic devices for this purpose and further that these may be combined with automatic calling devices ;

e) That if such devices are employed, an international warning signal will be required, of which the signal described in **879** of the Radio Regulations may be a part ;

[1] United Nations, *Treaty Series*, Vol. 194, p. 61.

Invites the C.C.I.R.:

To study the possibility of ensuring the watch on the frequency 2 182 kc/s by the aid of automatic devices, and if a practical solution is found, to make the necessary recommendations.

RECOMMENDATION NO. 7 TO THE C.C.I.R. RELATING TO THE STANDARDIZATION OF PERFORMANCE REQUIREMENTS FOR RADIOPHOTO EQUIPMENT

The International Radio Conference of Atlantic City (1947),

Considering:

a) That the standardization of the performance requirements for radiophoto and telephoto equipment would promote efficiency in use of the equipment and spectrum space, and would facilitate the inter-connection of radio circuits with wire line systems ;

b) That this standardization was the subject of question No. 18 on the Agenda of the meeting of the C.C.I.R. in Bucharest (1937) ;

Invites the C.C.I.R.:

a) To study, in conjunction with the C.C.I.T. if necessary, the standardization of the performance requirements of radiophoto and telephoto equipment ;

b) To make the neccssary recommendations.

RECOMMENDATION No.8 TO THE C.C.I.R. ON DESIRED TO UNDESIRED SIGNAL RATIO FOR EACH ONE OF THE SERVICES WHICH SHARE A BAND OF FREQUENCIES AND ON THE PERMISSIBLE FREQUENCY TOLERANCE FOR THE SERVICES THAT SHARE THE FREQUENCY BANDS WITH BROADCASTING SERVICES

The International Radio Conference at Atlantic City (1947),

Considering:

a) That in the allocation table it has been provided that certain bands shall be shared by different services ;

b) That the principle of equality of right to operate on the basis of non harmful mutual interference between the services has been agreed upon ;

c) That the ratio of the desired signal to the undesired signal in each service is different because the basic requirements of the various services are different, e.g., the requirement for fixed service being intelligibility whereas that for broadcasting includes also fidelity ; that also certain services require intelligibility at one point and broadcasting requires equally good reception over an extended area ;

Requests the C.C.I.R. to study and formulate recommendations on:

1) —Desired to undesired signal ratio for each service, which defines the threshold of harmful interference.

In this connection, consideration should be given to appendix 2 of the annex to the Resolution relating to the Preparation of the new International Frequency List. [1]

2) —permissible frequency tolerance for the services that share the frequency bands with broadcasting services to ensure the realisation of the recommendations regarding 1) in practice.

In this connection, consideration may be given to Document No. 61 of the International High Frequency Broadcasting Conference of Atlantic City (1947) (Curve of Ratio between the Interfering Field and the Desired Field).

RECOMMENDATION TO THE INTERNATIONAL MARITIME ORGANIZATION, WHEN FORMED, AND TO THE INTERNATIONAL CODE OF SIGNALS COMMITTEE

The International Radio Conference of Atlantic City (1947),

Considering:

(1) That an International Maritime Consultative Organization is to be established in the near future;

(2) That the International Code of Signals was designed primarily for the use of mariners;

(3) That endeavour has been made, but without success, to make the International Code of Signals suitable for the use of aircraft;

(4) That the expansion and development of the "Q" code for the use of aeronautical services is now well advanced;

(5) That the International Code of Signals is likely therefore to remain of interest only to mariners;

Is of the opinion that no useful purpose would be served in associating the International Code of Signals Committee directly with the International Telecommunications Union;

Suggests:

That the International Code of Signals Committee should affiliate with the International Maritime Organization upon the formation of the latter.

The Conference requests the Secretary General of the International Telecommunications Union to communicate this suggestion to the International Maritime Organization, upon its formation, and to the International Code of Signals Committee.

[1] See p. 191 of this volume.

RECOMMENDATION TO THE GOVERNMENTS SIGNATORY TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA AND TO THE GOVERNMENTS MEMBERS OF THE INTERNATIONAL CIVIL AVIATION ORGANIZATION

Coded Passive Reflectors

The International Radio Conference of Atlantic City (1947) ;

Considering :

a) That the indiscriminate erection of passive reflectors may cause confusing indications in the radiolocation service when it makes use of such reflectors ;

b) That the preparation of regulations for control of the location of radionavigation apparatus such as passive reflectors appears to relate to the Convention for the Safety of Life at Sea and the International Civil Aviation Organization ;

Recommends :

That the next Safety of Life at Sea Conference and the International Civil Aviation Organization include, within their regulations, provisions :

a) To prevent the unauthorized erection of coded passive reflectors ;

b) To ensure that coded passive reflectors are so located as not to cause confusing indications in the radio location service.

RECOMMENDATION RELATING TO A NEW METHOD OF GENERATING CALL SIGNS

The International Radio Conference of Atlantic City (1947),

Considering that :

1. The delegate of the Republic of the Philippines has proposed an entirely new method of forming call signs (Doc. No. 358 R-E, Proposal No. 2519 R-E) ;

2. This proposal, in particular, provides that the call signs for each country, or its territories or possessions should be identified by the group of the first two letters exclusively allocated to that country, its territories or possessions ;

3. The new method proposed permits the identification of the nationality of stations more readily than the system at present in use ;

4. The system now in use for the formation of call signs, as well as the new table of allocation of call signs, will only satisfy temporarily the needs for call signs ;

5. The proposal of the Republic of the Philippines may offer a solution to many of the existing difficulties ;

6. The adoption of the principles contained in this proposal would necessitate an almost complete change of call signs throughout the world ; and

7. In view of the considerable amount of work which such a change would impose on administrations, the Conference has hesitated to adopt the proposal ;

Recommends that:

1. All countries should make a careful study of Proposal No. 2519 R-E submitted by the Republic of the Philippines prior to the convening of the next Radio Conference ; and

2. Should some future Radio Conference consider it necessary to revise the Table of Allocation of Call Signs (article 19),[1] particular attention should be given to this proposal, or to any similar proposals, intended to establish a method of formation of call signs which will solve, as far as possible, the problem of allocation of call signs and so avoid their periodic re-arrangement.

RESOLUTION RELATING TO THE PREPARATION OF THE NEW INTERNATIONAL FREQUENCY LIST

Whereas:

A. In order to provide a basis for the formulation of a new International Frequency List, countries participating in the Atlantic City Radio Conference have undertaken to furnish Committee 6 of the Conference by September 15, 1947, with information regarding circuit requirements for fixed stations, together with information regarding requirements for tropical broadcasting stations and all classes of land stations, shown on Forms 1 and 2 formulated by Committee 6.

B. These countries have found that the compilation of such a List is necessary in order to implement the application of the Atlantic City allocation table.

C. These countries have agreed that the compilation of such a List is necessary in order that the International Frequency Registration Board (I.F.R.B) may function most effectively.

D. The compilation of world frequency requirements as an initial step in the compilation of a new List has now begun and is hoped to be completed by October 15, 1947, and to be published and circulated by January 1st, 1948.

E. It is recognized that it is essential to continue the work of preparing a new frequency list with minimum delay upon the conclusion of the Atlantic City Radio Conference.

[1] United Nations, *Treaty Series*, Vol. 194, p, 163.

F. It is recognized that until frequency assignments for all services can be completely engineered, it will not be certain that the most effective use possible can be made of the frequency spectrum or that the frequency requirements of any service can be satisfied.

G. It is recognized that it is necessary that an appropriate international group or committee continue with the preparation of the new International Frequency List after the close of the Atlantic City Radio Conference in order that such a List may be available for review and approval at a special international conference to be called for that purpose.

Therefore, it is resolved that:

§ 1. A Board, to be designated the Provisional Frequency Board (P.F.B.), shall be established, and shall be charged with the preparation of a draft new International Frequency List. This Board shall have as members :

a) Members of the International Frequency Registration Board (I.F.R.B.), hereinafter referred to as "International members".

b) Representatives of Administrations which have expressed a desire to have their experts participate in the work, hereinafter referred to as "National members".

§ 2. *a*) To enable the members of the I.F.R.B. to participate as members in the work of the P.F.B. (as provided for in § 1 *a*) above), the Radio Conference shall recommend to the Plenipotentiary Conference that the I.F.R.B. shall be established as from 1st January 1948.

b) If this recommendation is accepted by the Plenipotentiary Conference, the members of the I.F.R.B. shall assemble at the seat of the International Telecommunications Union on 8th January 1948.

c) In the work of preparing the new International Frequency List the members of the I.F.R.B., in their capacity as International members of the P.F.B., shall be authorized to observe the directives to the P.F.B. laid down in subsequent paragraphs of this resolution. However, they shall act, both in discussions and in voting, as international officials and not as representatives of their country or region.

§ 3. (1) To enable representatives of administrations to participate as National members in the work of the P.F.B. (as provided for in § 1 *b*) above), any country, signatory to the Atlantic City Radio Regulations, which desires to do so, shall designate one representative, who is technically expert and experienced in frequency assignment problems to serve on the P.F.B. Any such National member may attend for the whole or part of the period required for the drafting of the new International Frequency List. Each National member may be assisted by such

advisers as desired. A country may, if it desires, designate a National member from another country to represent its interests. Where an international regional organization of telecommunications exists, this regional organization may send a duly qualified representative to participate in the work of the P.F.B.

(2) Each administration shall advise the Bureau of the Union, before October 31, 1947, whether it intends to send a representative to the P.F.B. to serve as a National member, and, if so, of the number of advisers who will also attend.

Each administration shall also advise the Bureau of the Union before December 31, 1947, whether its interests will be represented by a National member of another country and, if so, the name of the country concerned.

§ 4. The Chairman of the I.F.R.B. shall be the Chairman of the P.F.B.

§ 5. The P.F.B. shall adopt any necessary rules of procedure provided that these are not inconsistent with the general rules annexed to the Convention or those laid down in this resolution.

§ 6. The P.F.B. shall arrive at its conclusions, as a general rule, by unanimous agreement. Any member of the P.F.B. may have a statement included in the report of the P.F.B. giving his views on any matter on which unanimous agreement has not been obtained. Should, however, a vote on any matter concerning the preparation of the new frequency assignment plan prove to be necessary, a decision shall be taken by a simple majority of those present and voting. In such a vote :

a) each International member may cast a single vote, as an International official, in accordance with the provision of § 2 *c*) ;

b) each National member of the P.F.B. may cast a single vote as a representative of his country ;

c) each National member of the P.F.B. who is duly authorized to represent other countries may in view of the long period during which the P.F.B. is expected to be in session, cast a single vote on behalf of each such country, subject to the proviso that no member may cast more than two such proxy votes in addition to the vote cast for his own country ;

d) representatives of international regional organizations of telecommunications may not vote.

§ 7. Each country shall defray the salary and expenses of its representative who will serve as a National member of the P.F.B. and of his advisers.

The expenses of representatives of international regional organizations shall be defrayed by the organization concerned.

§ 8. All other expenses of the P.F.B. shall be defrayed by the Union.

§ 9. The P.F.B. shall receive from the Bureau of the Union, such secretarial assistance as is necessary for the efficient carrying out of its work.

§ 10. The P.F.B. shall convene at the seat of the International Telecommunica tions Union on January 15, 1948.

§ 11. The P.F.B. shall have as its objective the preparation of an International Frequency List based on an engineering plan which will improve the utilization of the radio spectrum by providing for the continued operation of all services in every country, while eliminating harmful interference. In addition, the P.F.B. shall endeavour, in formulating such a plan, to make adequate provision for the future development of new radio services and the expansion of existing services, so that all countries may improve and increase their services to the fullest extent practicable. The P.F.B. shall treat communications services which were interrupted by the World War II and which have not yet been restored, on the same basis as existing services, and, in addition, shall give special consideration to the needs of countries where natural developments have been impeded, especially as a result of the World War II.

§ 12. The P.F.B. shall operate under the following directives :

a) Before undertaking the preparation of a new Frequency List, the P.F.B. shall determine in detail the engineering framework to be applied in the preparation of such a List. The engineering principles shall be based, among other things, on the technical regulations and recommendations adopted by the Atlantic City Radio Conference. The formulation of the engineering framework shall be completed by the 15th of March 1948.

b) In preparing the draft new International Frequency List, the P.F.B. shall be guided solely by the following considerations :

1. conformity with the Atlantic City allocation table ;

2. conformity with the engineering principles referred to in *a*) above, so as to make provision for all requirements while avoiding harmful interference ;

3. the P.F.B. shall be free to recommend changes to any existing frequency assignments. Nevertheless, in preparing the final draft List for consideration at the International Conference, the Board shall take account as far as possible of the existing utilization of frequencies and the undesirability of making unnecessary changes.

c) The P.F.B. shall deal, in principle, with assignments of frequencies to fixed, tropical broadcasting and land stations within the frequency band included between 10 kc/s and 30 Mc/s. See article 6 of the annex to this resolution for the details of the frequency bands to be considered by the P.F.B.

d) In preparing the new Frequency List, the P.F.B. shall take as a basis for this work the requirements submitted on Forms 1 and 2 by the various countries.

e) The P.F.B. may request from any administration information, additional to that furnished at the Atlantic City Radio Conference, regarding the operation of any circuit if it deems such to be necessary in connection with the work of preparing the new International Frequency List.

f) The new International Frequency List shall be prepared in the form prescribed by the Atlantic City Radio Conference.

g) The aim shall be to complete the drafting of the new International Frequency List, if possible, by 15 November 1948.

§ 13. *a*) Assignments entered on the new List in the band set forth in 12 *c*) above shall bear dates as follows :

b) Entries made by the P.F.B. and approved by the Special Conference shall be dated as of the date of approval of the List by the Special Conference ; however, should subsequent changes prove to be necessary in the light of actual harmful interference, it is desirable that the original date of bringing the frequency into use should be taken into consideration.

c) Entries approved by the Special Conference which result from notifications of assignments in the band set forth in § 12 *c*) above, which are filed with the Bureau of the Union during the period between the closing date for Forms 1 and 2 and the opening date of the Special Conference shall also be dated as of the date of approval of the List by the Special Conference.

d) No entries of assignments in the band set forth in § 12 *c*) above shall be made on the basis of notifications filed while the Special Conference is in session. Such notifications shall be administered by the I.F.R.B. after the close of the Special Conference and shall bear such date as is provided for in the statutes of the I.F.R.B., but in no event shall this date be prior to the close of the Special Conference.

§ 14. If the P.F.B., after having done its utmost to asign the frequencies on a sound engineering basis, meets with cases which cannot be resolved in a satisfactory way, consideration shall be given among other things, in the light of the general aim of the P.F.B., to the dates of notification contained in the archives of the B.U.I.T., as well as to the priority of establishment of the circuits under consideration.

If the P.F.B. is unable to decide in such cases on the entry to be made, such assignments will be dealt with by the Special Conference.

§ 15. On January 1, 1949, if possible, and, at the latest, three months after the date of completion of the draft of the List provided for under 12 *g*) above, the Bureau of the Union shall furnish by air mail all members of the Union with copies of this draft List. The Special Conference planned for study of this draft shall be convened on March 3, 1949, if possible, or, at the latest, two months after the draft List is sent out.

§ 16. During the period the new List is being prepared by the P.F.B., notices of frequency assignments in the band set forth in § 12 *c*) above shall be made in conformity with the Cairo Radio Regulations and sent to the Bureau of the Union for publication as at present. At the time the notice of a frequency assignment is sent to the B.U.I.T. a parallel notification on the appropriate Form 1 or 2 shall be sent to the P.F.B. After the preparation of the new List by the P.F.B. the Special Conference shall determine the procedure to be followed in incorporating into such List the foregoing assignments for meeting requirements for operations which were activated during the period between the closing date of Forms 1 and 2 and the opening of the Special Conference.

§ 17. During the period between the date on which the P.F.B. completes its preparation of the new List based on requirements set forth in Forms 1 and 2 and the date on which the Special Conference is convened, the P.F.B. shall give consideration to assignments in the band set forth in § 12 *c*) above, which are filed between the closing dates for Forms 1 and 2 and the convening of the Special Conference, in order to formulate recommendations to the Special Conference for the incorporation in the first edition of the new List of the assignments so notified. During this period, the P.F.B. shall also give consideration to the precise procedure to be followed in order to give effect to the new International Frequency List and shall make recommendations accordingly to the Special Conference.

§ 18. The date upon which the new International Frequency List shall become effective shall be the subject of a recommendation of the P.F.B. to the Special Conference. In formulating this recommendation the P.F.B. will take into consideration the urgent need for implementation which should be commenced, if possible, by September 1st 1949.

§ 19. For the information of countries not directly represented on the P.F.B. the Board shall, every two months from May 15th 1948 onwards, draw up a progress report of its work. The Bureau of the Union shall send these reports by air mail to all member countries of the Union.

§ 20. If harmful interference develops after the effective date of the new List, from operation on frequencies, all of which are entered in the registration column of the new List, the problem may be referred to the I.F.R.B. by one or more interested countries for action in accordance with the procedures prescribed for the I.F.R.B.

§ 21. The P.F.B. shall dissolve on the date when the new List is accepted and approved by the Special Conference.

Members of the I.F.R.B. shall thereafter cease to be bound by the directives contained in this resolution.

ANNEX TO RESOLUTION

DIRECTIVES FOR THE PROVISIONAL FREQUENCY BOARD (P.F.B.)

Art. 1. Compilation of Requirements.

1. The Atlantic City International Radio Conference has, through its Committee 6, compiled the requirements for fixed and tropical broadcasting stations on Form 1 as attached, and for land stations on Form 2, received up to September 15th 1947 ; and they have been transferred to the Bureau of the International Telecommunication Union (B.U.I.T.).

2. The B.U.I.T. shall arrange for the combination of the circuit and frequency requirements of all administrations into comprehensive lists and this work shall be carried out by mechanical means in order that any desired sorting and listing of the separate items of information can be made.

3. The B.U.I.T. shall circulate as early as possible to all members of the I.T.U. lists of the circuit requirements furnished to the Conference on Forms 1 and 2 arranged in alphabetical order of countries.

4. By 15th January 1948 the B.U.I.T. shall provide the P.F.B. and all members of the I.T.U. with lists by frequency order for each of the following categories of stations : fixed stations, tropical broadcasting stations, aeronautical stations, coast stations, and other land stations.

5. The P.F.B. shall indicate to the B.U.I.T. which other lists of requirements it desires to have compiled, such as lists by circuits, by geographical regions, by distance, or by any other desired group or category.

Art. 2. Technical principles

The following principles shall be applied by the P.F.B. for the preparation of a draft International Frequency List :

a) The maximum use of frequencies shall be obtained by geographical duplication and time sharing as far as practicable.

b) The minimum band- or channel-widths and tolerances appropriate to the type of communication, consistent with the state of the art, shall be applied.

c) The minimum number of frequencies necessary to provide a service in accordance with sound engineering principles shall be utilized, taking into account the power of the transmitter and the directive properties of the antenna.

d) International fixed circuit requirements submitted by each country shall be reviewed to ensure technical correlation between countries operating both ends of the circuit (with the exclusion of unilateral services of radio communication).

e) Frequency assignments solely as a guard against interference shall be eliminated, since interference will be reduced by proper assignment on an engineering basis.

f) Frequency space used for guard band purposes shall be reduced to a minimum consistent with the service required.

Art. 3. Technical data.

The Atlantic City International Radio Conference has, with regard to standards of satisfactory service and the separation of assigned frequencies, given consideration to :

1. Tolerable signal-to-interference ratio.
2. Conditions for entirely satisfactory service.
3. Fading.
4. Diversity help.
5. Allowance for directive antennas.
6. Spacing of adjacent channels.
7. Grouping of assignments for best results.
8. Frequency space required for minimum guard bands.

These considerations and the resulting technical data are contained in appendix 1 to this annex which the P.F.B. shall take into account as a guide as far as practicable.

Art. 4. Propagation Aspects.

The Atlantic City International Radio Conference has, with regard to the propagation aspects involved in the selection of frequencies and the simultaneous and non-simultaneous use of frequencies, given consideratino to :

a) The procedure for selecting frequencies for a given circuit.

b) The conditions where world-wide frequency sharing is known to be readily possible.

c) The procedure to be used to decide if and how frequency sharing is possible in other cases.

These considerations and the resulting technical data are contained in appendix 2 to this annex which the P.F.B. shall take into account, together with additional charts now being prepared, as a guide as far as practicable.

Art. 5.

The P.F.B. shall give attention to all final documents produced during the Atlantic City Conferences (International Radio Conference, Plenipotentiary Conference, and

High Frequency Broadcasting Conference) in so far as such documents have a bearing on a frequency assignment plan and have not already been adopted in a binding form by any of said Conferences.

Art. 6. Frequency bands to be dealt with by the P.F.B.

a) Pursuant to § 12 *c*) of the resolution, the P.F.B. shall prepare a plan covering frequency assignments in the following bands under the conditions specified in the Atlantic City Regulations :

14	—	150	kc/s
2 850	—	3 155	
3 400	—	3 500	
3 900	—	4 000	For Regions other than Region 2.
4 000	—	4 063	
4 063	—	4 438	
4 438	—	4 650	
4 650	—	4 750	
4 750	—	4 850	
4 850	—	4 995	
5 005	—	5 250	
5 250	—	5 480	
5 480	—	5 730	
5 730	—	5 950	
5 950	—	6 200	
6 200	—	6 525	
6 525	—	6 765	
6 765	—	7 000	
7 100	—	7 300	Broadcasting as stipulated in the Atlantic City allocations table.
7 300	—	8 195	
8 195	—	8 815	
8 815	—	9 040	
9 040	—	9 500	
9 500	—	9 775	
9 775	—	9 995	
10 005	—	10 100	
10 100	—	11 175	
11 175	—	11 400	
11 400	—	11 700	
11 700	—	11 975	
11 975	—	12 330	
12 330	—	13 200	
13 200	—	13 360	
13 360	—	14 000	
14 250	—	14 350	Fixed stations in the U.S.S.R.

14 350 — 14 990
15 010 — 15 100
15 100 — 15 450
15 450 — 16 460
16 460 — 17 360
17 360 — 17 700
17 700 — 17 900
17 900 — 18 030
18 030 — 19 990
20 010 — 21 000
21 450 — 21 750
21 750 — 21 850
21 850 — 22 000
22 000 — 22 720
22 720 — 23 200
23 200 — 23 350
23 350 — 24 990
25 010 — 25 600
25 600 — 26 100
26 100 — 27 500

The frequency bands excluded from the above list are those which will be dealt with by regional administrative conferences or bands in which specific assignments are not required as in the case of amateur and standard frequency broadcast services.

b) It is contemplated that the High Frequency Broadcasting Conference will deal with assignments in the following exclusive frequency broadcasting bands :

5 950 — 6 200 kc/s
9 500 — 9 775
11 700 — 11 975
15 100 — 15 450
17 700 — 17 900
21 450 — 21 750
25 600 — 26 100

(In addition, the shared band 7 100 — 7 300 kc/s, as stipulated in the Atlantic City allocation table.) If the High Frequency Broadcasting Conference decides to that effect, the P.F.B. would also deal with assignments to High Frequency Broadcasting.

c) If it is decided that a separable international administrative aeronautical conference under the auspices of the I.T.U. should be held, then that conference should deal with assignments in the following exclusive aeronautical mobile frequency bands :

Frequency Band kc/s	*Allocation*
2 850 — 3 025	R
3 025 — 3 155	OR
3 400 — 3 500	R

Frequency Band kc/s	*Allocation*
4 650 — 4 700	R
4 700 — 4 750	OR
5 480 — 5 680	R
5 680 — 5 730	OR
6 525 — 6 685	R
6 685 — 6 765	OR
8 815 — 8 965	R
8 965 — 9 040	OR
10 005 — 10 100	R
11 175 — 11 275	OR
11 275 — 11 400	R
13 200 — 13 260	OR
13 260 — 13 360	R
15 010 — 15 100	OR
17 900 — 17 970	R
17 970 — 18 030	OR

d) If it is decided that a separate international administrative maritime conference under the auspices of the I.T.U. should be held, then that conference should deal with assignments in the following exclusive maritime mobile frequency bands :

4 063 — 4 438 kc/s
6 200 — 6 525
8 195 — 8 815
12 330 — 13 200
16 460 — 17 360
22 000 — 22 720

e) Assignment plans prepared by administrative (regional or service) conferences within the framework of the I.T.U. for the regional or exclusive service bands, and therefore not dealt with by the P.F.B., shall be submitted to the P.F.B. for incorporation in the draft new International Frequency List. However, in any event, the P.F.B. shall have the responsibility for preparing any plans required for the bands stipulated in § 6, *a*) which are not prepared as a result of the conferences envisaged in § 6, *b*), *c*) and *d*). Additionally it shall have the responsibility for integrating all the plans which it prepares itself with any plans which may be prepared as a result of administrative (regional or service) conferences.

f) In view of the fact that the P.F.B. will be preparing a draft assignment plan for the bands of Atlantic City frequency allocation table which are shared between broadcasting and other services and since C.C.I.R. will not be able to consider in time Recommendation No. 8, the P.F.B. will formulate and apply provisional standards for the preparation of the draft assignment plan, in accordance with said Recommendation No. 8.

Form No. 2

Pagina No.)
Page No.)

Clase de estaciones)
Classe de stations)
Class of stations)

País)
Pays)
Country)

Número de la solicitud Numéro de la demande Requirement number	Ubicación del trasmisor y de la terminal emisora. Emplacement de l'émetteur et du point terminus de la liaison. Transmitter location and transmitting terminal.	Area de recepción o radio de la región de servicio. Région de réception ou distance maxima de réception. Region of reception or radius of service area (Km)	Tipo de emisión Type d'Émission Type of emission	Ancho de banda Largeur de la bande Bandwidth (kc/s)	Horario de operación (TMG) Horaire de travail (TMG) Hours of operation (GMT)	Potencia en la antena (kw) Puissance dans l'antenne (kw) Power delivered to antenna (kw)	FRECUENCIAS - FRÉQUENCES - FREQUENCIES En uso o prevista En service ou prévue In use or proposed for use (kc/s)	Fecha de notificación a la U.I.T. (opcional) Date de notification à l'U.I.T. (facultatif) Date of notification to U.I.T. (optional)	Fecha futura de puesta en servicio. Date prévue de mise en service. Date to be placed into use.	Orden de frecuencias deseadas (kc/s) Ordre de grandeur des fréquences désirées (kc/s) Order of frequencies desired (kc)	Números de otras solicitudes que utilizan la misma frecuencia, demandes pour la fréquence cross index number.	Observaciones Observations Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)

APPENDIX 1

For the purpose of providing data to be used for frequency assignments, consideration has been given to the following subjects :

1. Tolerable signal-to-interference ratio.
2. Conditions for entirely satisfactory service.
3. Fading.
4. Diversity help.
5. Allowance for directive antennas.
6. Spacing of adjacent channels.
7. Grouping of assignments for best results.
8. Frequency space required for minimum guard bands.

CASE I. SIMPLE TELEGRAPHY

1. *Tolerable Signal-to-Interference Ratio*

For a simple telegraph transmission in which the radiofrequency output of the transmitter is turned on and off in order to form the dots and dashes, it would be possible in an ideal case, using automatic recording, to tolerate interference from another similar telegraph service which was only slightly more than 6 decibels below the desired signal. However, this is an extremely idealized condition and makes no allowance for the practical variations of conditions such as biasing potentials that occur in actual equipment. The amount of allowance needed is a matter of practical experience, and the best consensus of opinion seems to indicate that satisfactory performance may be had when the interfering signal is always at least 10 decibels below the desired signal in the case where they are both operating on the same frequency.

2. *Conditions for Entirely Satisfactory Service*

Here it can be said at the outset, and in extension of the above paragraph, that satisfactory service will be provided in those cases where any type of interference is sufficiently weak enough so that the power introduced into the receiver by the interfering wave, whatever its character, is always at least ten decibels below the power introduced by the desired signal, at the time when the desired signal is a minimum. Stated more precisely, the radio-frequency power available in the receiver, averaged over a cycle at the time when the amplitude of the interfering wave is a maximum, is at least 10 decibels below the available power of the desired signal, averaged in the same manner, at the time when the desired signal is a minimum. By following this rule, the simple case of interference by telegraphy operating on the same channel may be broadened to include telegraphy on adjacent channels or telephony on the same or adjacent channels, or even noise. In the case of noise the effective peak value of the powers may usually be taken about 10 decibels higher than the average value. Some numerical examples showing how this rule may be applied are given below in connection with item 6.

3. *Fading*

Telegraphy suffers to a considerable extent from high-speed fading which in turn, varies with many factors, including the path length, the sun spot conditions, the time of day, and of year, and the frequency employed. It would be almost impossible to take all of these things into account in making frequency assignments and, consequently, an overall figure must be sought which will ensure that a sufficiently large allowance has been made to provide satisfactory service for a sufficiently large percentage of the time. Review of existing data indicates that for transmissions between 6 and 25 Mc/s, and over distances of more than 1 000 kilometres, an allowance of 35 decibels should be adequate most of the time for two adjacent telegraph channels. Methods of applying this to specific calculations are illustrated in item 6 below.

4. *Diversity Help*

The advantage obtainable from diversity reception of telegraph signals depends, also, upon a large number of conditions, but, as an overall working figure, it seems safe to say that its use will allow 10 decibels to be subtracted from the fading figure of 35 decibels quoted in item 3, giving a net effective value of 25 decibels.

5. *Directive Antennas*

The best way to allow for the effect of directive antennas would seem to be to determine the field strengths of the desired and interfering signals and then to modify the ratio of their values by the relative directive gains of the antennas in the directions of arrival of the desired and interfering signals. In order to allow for the possibility of variations in the angle of arrival of the interfering signals, the gain in that direction should be taken as the greatest value within a solid angle of at least 10 degrees. This modified ratio may then be used in the calculations of item 6 to give the required spacing of adjacent channels. For example, if the field strength of the desired signal is 10^{-3} volts per metre and of the interfering signal is 2×10^{-3} volts per metre, and the antenna has a gain of 20 decibels for the desired signal, but of only 5 decibels for the undesired one, then the relative fieldstrength ratio of + 6 decibels may be changed by 15 decibels giving an effective ratio of — 9 decibels for the interference relative to the desired signal.

Gains obtained with different types and sizes of antennas vary over a considerable range of values. For the frequency range between 6 000 and 25 000 kilocycles and in the absence of specific data concerning the actual antenna used, it is estimated that an allowance of 10 decibels might be made for protection against interfering signals arriving from directions differing by more than 15 degrees from that of the desired signal.

6. *Spacing of Adjacent Channels*

The basis for the determination of the required spacing of adjacent channels, in order that satisfactory service may be provided, may be explained as follows with reference to the accompanying curves.

Figure I shows curves giving the envelopes of the Fourier spectra of the emission resulting from several shapes of a single telegraph dot. For the upper curve, the dot is taken to be rectangular and its length, t, is one-half of the period corresponding to the

fundamental dotting frequency. Thus, of T is the period if this fundamental, and B is the dotting speed, in bauds, we have $B = 1/t = 2/T$. For the lower curve in the figure the shape of the dot is taken to be slightly rounded. It is important to note that for large values of the abscissa, f/B, the slope of the upper curve approaches 6 decibels per octave ; while the lower curve approaches 9 decibels per octave.

As a next step in the illustration, a receiver fitted with filters is considered. These filters are idealized to the extent that their acceptance band is taken to be 5 units wide in terms of f/B. This is equivalent to saying that they accept the fifth harmonic of the dotting frequency. This cut-off characteristic which corresponds quite closely to the filters ordinarily used in present-day practice has a slope of 30 decibels per octave, measured from the mid-band frequency.

The mid-band frequency of these receivers is then taken as being located at various frequencies in relation to the transmitter frequency, and the resulting acceptance spectrum is found in each case. By determining the area under the derived curves of received energy versus frequency separation between transmitter and receiver, a number of values of power are obtained which may be plotted as shown in Figure 2.

This graph shows the received power as a function of frequency separation between the transmitter frequency and the mid-band frequency of the receiver, and forms the basis for the calculation of required separation for adjacent channels. The figure gives curves for rectangular dots, and for slightly rounded dots, calculated as above, both for ordinary and for high-grade filters in the receiver. In addition, a curve has been added which applies to a transmitter whose rectangular dots have been passed through a filter with a pass band equal to the necessary band of the system as given in appendix 5 of the Radio Regulations (that is, 5 units on the f/B scale) and which, outside of the pass band, has an attenuation of 30 decibels per octave.

For most actual transmitters, the curve for rectangular dots should be used, since some of them exhibit even somewhat broader spectra. The curve for the slightly rounded dots applies only to a few of the present-day transmitters.

The curve referring to the filtered dots applies to transmitters which it may be anticipated will be built in not too distant future. These would have to comprise linear high-frequency amplifiers following the filters in order to avoid any alterations to the shaping of the dots. (In telegraphy using frequency-shift keying, the analogous technique is somewhat easier to carry out).

The method of using Figure 2 may be illustrated by a few examples.

Example 1. *Equal fields.*

In this case, with rectangular dots and no fading, in order to obtain the required 10-decibel discrimination against the unwanted signal, the frequency separation between channel assignments would have to be 3.6 units in terms of f/B. For a telegraph speed of 170 bauds this would require that the assignments differ in frequency by 3.6×170 or 612 cycles per second.

On the other hand, when the fading allowance of 35 decibels is included in addition to the 10 decibels for tolerable interference the separation becomes 125 units, that is 125×170 or 21 250 cycles per second. With slightly rounded dots, under the same conditions, this decreases to approximately 4 600 cycles per second.

In all cases, the frequency tolerance allowance must be added to these figures.

With the fading allowance of 35 decibels, the filtered dots would require a value of f/B should be 7.2, from which it follows that a frequency separation of 1 224 cycles per second is all that is required.

Example 2. *Unequal fields.*

The calculation here follows the same lines as the previous one. When the interfering signal is 20 decibels stronger than the desired one, then with 35 decibels for fading and 10 decibels for required discrimination, the level on the abscissa scale of the figure would be of 20 + 35 + 10, or 65 decibels. For the slightly rounded dots, the value required for f/B is then 125 so that, for a speed of 170 bauds, the separation would have to be 21 250 cycles, plus the tolerance allowance would have to be added.
For the filtered dots, f/B becomes 11.5 and the required separation is then only about 2 000 cycles per second.
On the other hand, if the interfering signal were 20 decibels weaker than the desired one, the abscissa value would be —20 + 35 + 10 or 25 decibels, which in the case of rounded dots gives 6.9 for f/B, and, consequently 1 173 cycles per second for the frequency separation.

Example 3. *Relative effectiveness of measures taken for decreasing the channel separation.*

With equal field strengths and a 35 decibel allowance for fading, we have the channel separations :

a) Rectangular dots, 21 250 cycles per second.

b) Filtered dots, 1 224 cycles per second.

In both cases, the tolerance allowance must be added to these figures in order to obtain the actual separation of the frequency assignments. With the value of 0.01 % appearing in appendix 1 of the Radio regulations for existing transmitters in the fixed service operating at 20 Mc/s, the separation of assigned frequencies becomes :

a) Rectangular dots, 25 250 cycles per second.

b) Filtered dots, 5 224 cycles per second.

In *b*) the major part of the separation is attributable to the tolerance. After January 1st, 1950, when the tolerance will be 0.003 %, the separation would reduce to :

a) Rectangular dots 22 450 cycles per second.

b) Filtered dots, 2 424 cycles per second.

If, instead of filtered dots as in *b*) above, the unfiltered dots of *a*) had been used together with a directive receiving antenna giving a relative gain of 10 decibels, and, moreover, if in addition a diversity advantage of 10 decibels, were provided, then the channel separation for *a*) would become 3 325 cycles per second including a tolerance value of 0.003 %. The use of directive antennas and diversity reception, taken together are therefore not as effective in reducing the required separation as is the filtering technique.

Comments.

The frequency separations between assignments for adjacent channels which were arrived at in the above examples apply when the services in the adjacent channels are both telegraphy and operate at the same speed. When they operate at different speeds, the width of the acceptance band of the filters in the receiver bears a different relation to the spectrum of the transmitter pulse and consequently the resulting separations are somewhat altered.

In the case of rectangular dots, the major portion of the interfering energy is that which comes within the acceptance band of the receiving filter. Consequently, very little is to be gained by using at the receiver filters with a steeper cut-off characteristic. In the case of filtered dots, the major portion of the interfering energy lies within the attenuation band of the receiving filter. The channel separation is then, however, determined mainly by the frequency tolerance, and once again, the cut-off characteristic of the receiving filter is not a major factor.

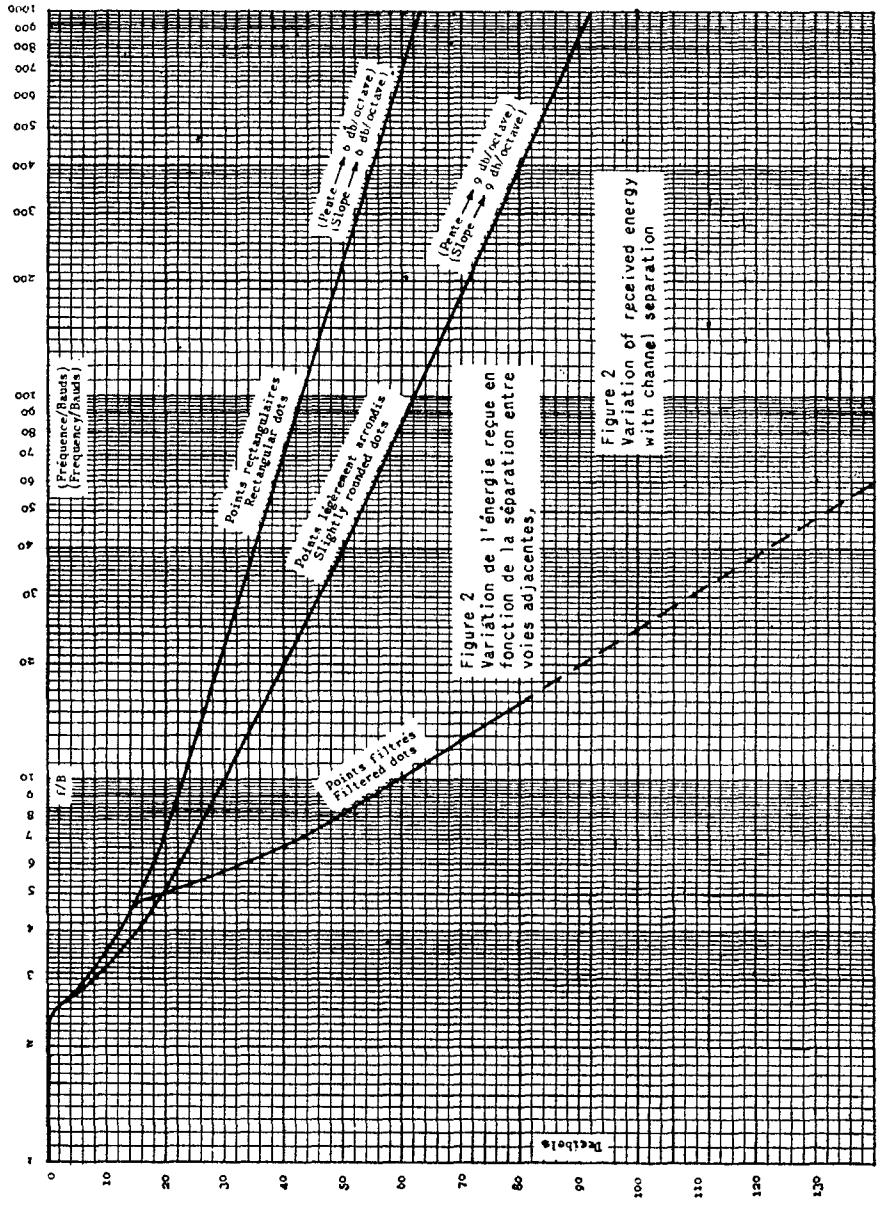
In the above examples, frequency tolerances are added one to the other in order to take into account the fact that for high stability emitters, periods during which the frequency difference is most feeble may be prolonged. This point of view may be modified in the case of low stability emitters, and a factor of probability may then be employed.

7. *Grouping of Assignments for Best Results*

The best opinion available indicates that other things being equal, the most advantageous use of the frequency spectrum will be used to best advantage by placing like transmissions on adjacent channels.

8. *Frequency Space Required for Minimum Guard Bands*

In the light of the discussion and particularly of item 6 above, the concept of a guardband as a separate entity, distinguishable from the transmitted band, loses its usefulness. It therefore appears to be preferable to consider only the necessary bandwidth and the channel separation.


(Fréquence/Bauds)
(Frequency/Bauds)
f/B
Points rectangulaires
Rectangular dots
Points légèrement arrondis
Slightly rounded dots
Points filtrés
Filtered dots
(Pente / Slope 6 db/octave)
(Pente / Slope 9 db/octave)
Figure 2
Variation de l'énergie reçue en fonction de la séparation entre voies adjacentes,
Figure 2
Variation of received energy with channel separation
Décibels

CASE II. FREQUENCY SHIFT TELEGRAPHY

Comments.

This case resembles Case I (Simple Telegraphy) so closely that the same general analysis may be applied with suitable modifications in detail, as indicated in the following paragraphs, which are numbered to correspond with those under Case I. The principal point of difference arises because of the necessity of adding to the channel separations, calculated from Figure 2, an amount equal to twice the frequency deviation, as shown in app. 5 of the Radio Regulations.

1. *Tolerable Signal-to-Interference Ratio*

It is estimated that the interference level of —10 decibels, which was recommended in Case I, will also be suitable here.

2. *Conditions for Entirely Satisfactory Service*

When interpreted in terms of frequency shift, instead of amplitude change, the observations made in connection with Case I apply directly.

3. *Fading*

As in Case I, an allowance of 35 decibels for fading is appropriate when a single receiver is used, without frequency diversity.

4. *Diversity*

There are two types of diversity to be considered, space diversity, as in Case I, and frequency diversity, which is not usual in Case I. For space diversity alone, or for frequency diversity alone, an allowance of 10 decibels is suggested. For a combination of both types, a total of about 12 decibels may be taken as typical.

5. *Directive Antennas*

The remarks made for Case I may be taken without change.

6. *Spacing of Adjacent Channels*

The basis for calculating the channel spacing follows the same plan which was outlined in Case I. The appropriate curve on Figure 2 is used to arrive at a value of f/B for the type of dots employed. Differing from Case I, however, the band thus obtained must be increased by twice the value of the frequency deviation (2D) as shown in appendix 5 of the Radio Regulations. Finally, twice the frequency tolerance must be added, just as in Case I. It is to be noted that filtered dots are much more easily obtained with frequency-shift telegraphy than in Case I, and consequently that many existing transmitters might employ them with advantage.

Example.

Filtered dots, equal fields strengths, and a deviation of 425 cycles per second, with B = 170, from Figure 2, for 25 decibels allowance for fading with either space or frequency diversity, and 10 decibels signal-to-interference ratio, the value of f/B is about 6. The value of f is then 6 × 170 = 1 020. The addition of twice the deviation brings this to 1 870. At 20 Mc/s, and with a tolerance of 0.003 %, there must be added 1200 cycles per second, giving a value of 3 070 cycles per second for the channel separation.

Case III. Facsimile

Since facsimile may be thought of as telegraphy, it results that the treatment given for Case I and Case II can be applied without change to these two types of facsimile.

Case IV. Telephony

The two types of telephony which are commonly used, namely double-sideband and single-sideband, have somewhat different interference properties and, consequently, they will be discussed separately.

A. *Double-Sideband Telephony*

When two double-sideband systems are operating on adjacent channels, the interfering signal, in the case of equal fields, will be located upon the sloping portion of the attenuation characteristic of the receiving filter. Consequently, the interfering signal will be produced by a carrier beating with its unequal sidebands, and, because the interfering sideband nearest to the desired signal may even exceed the interfering carrier in amplitude, an extra interference will be caused by the sideband components beating with each other.

The first type of interference produces intelligible crosstalk although with considerable distortion, while the second type produces only unintelligible crosstalk. It has been found that, when the crosstalk is unintelligible, at least 10 decibels more may be tolerated than when the crosstalk is intelligible. It follows that, to a good approximation, the unintelligible crosstalk may be disregarded and attention may be focused upon the intelligible portion.

Crosstalk between other components is ordinarily removed by audio-frequency filtering.

When the two carriers differ in frequency by an amount in excess of twice the highest modulation frequency M, the level of this intelligible portion, as compared with the desired signal, may be taken with fair approximation as given by the ratio of the two carrier amplitudes. This means that, with equal fields, the relative value of the interfering carrier is given by the attenuation produced by the receiving filter.

In double-sideband operation, however, the interfering value is further reduced because the weaker carrier effective on the detector beats with its own sidebands, which also have been attenuated in the receiving filter, to produce the audio-signal. Hence,

if the filter has reduced the interfering carrier to a level 10 decibels lower than the desired carrier, the resulting interference will be down 20 decibels below the desired signal. This reduction holds approximately for linear detectors as well as for the square-low detector assumed above. (Butterworth, Wireless Eng., Nov. 1929). For numerical values, the acceptance band of typical receiving filters may be taken as having a width of 2 M cycles per second, where M is the highest modulation frequency, and as having a cut-off characteristic whose slope is 30 decibels per octave. Consequently, the following table gives the data for the attenuation produced by such receiving filters in terms of the frequency separation between carriers, expressed as a multiple of the highest modulation frequency, M, and for the equivalent interfering value corresponding to these attenuations.

TABLE OF ATTENUATION AS A FUNCTION OF FREQUENCY SEPARATION BETWEEN CARRIERS

Carrier separation (f/M)	Attenuation (decibels)	Interfering value (decibels)
0	0	0
0.5	0	0
1.0	0	0
1.1	4	8
1.2	8	16
1.4	14.5	29
1.6	20	40
2.0	30	60
2.5	39	78
3.0	47	94
4.0	60	120
6.0	77	154
8.0	90	180

When the two carriers differ in frequency by less than twice the highest modulation frequency M, the major portion of the interference arises from beats between the carrier of the desired signal and the interfering sidebands. When the carrier frequencies differ by less than M, beats between the two carriers produce an additional interference. Both of these two types of interference vary directly as the ratios of the two carriers and not according to the square of the ratios, as was the case with the larger separations between carriers dealt with in the preceding paragraphs.

The first type also varies in proportion to the frequency separation between carriers, while the latter type is independent of this separation.

By taking these facts into consideration and combining them with the results given on the preceding table, it is possible to arrive at the following more general table :

Ratio of desired to interfering carriers (decibels)	Frequency separation between carriers required for various ratios of signal to interference			
	20 db	30 db	40 db	50 db
60	0	0	0	0
50	0	0	0	0.6 M
40	0	0	0.6 M	1.55M
30	0	0.6 M	1.55M	1.85M
20	0.6 M	1.55M	1.85M	1.96M
10	1.55M	1.85M	1.96M	2 M
0	1.85M	1.96M	2 M	2.55M
—10	1.96M	2 M	2.55M	2.85M
—20	2 M	2.55M	2.85M	3.2 M
—30	2.55M	2.85M	3.2 M	3.6 M
—40	2.85M	3.2 M	3.6 M	4 M
—50	3.2 M	3.6 M	4 M	4.5 M
—60	3.6 M	4 M	4.5 M	5.1 M
—70	4 M	4.5 M	5.1 M	5.7 M
—80	4.5 M	5.1 M	5.7 M	6.4 M
—90	5.1 M	5.7 M	6.4 M	7.2 M
—100	5.7 M	6.4 M	7.2 M	8 M

Comments Concerning BROADCASTING.

In the case of broadcasting, the problem at first appears to present complexities because of the subjective character of the concept of transmission quality, and also because of the large variety of receivers in use by the public. However, some time ago tests were carried out in which two modulated signals were applied to a receiver (one simulating the desired signal, and the other the interference). The intensities of the two signals at the input of the receiver were adjusted in such a way that the interference level was just tolerable ; this was repeated with a wide variety of receivers and of types of modulation.

In consideration of the results of these tests, presented by Prof. Van der Pol at the Conference of Lucerne, and of more recent ones presented to the Technical Committee of the OIR, (Document No. 187 R-E) it is possible to set down the following experimental results for frequencies between 150 and 285 kc/s and between 525 and 1 560 kc/s :

Frequency separation between carriers (kc/s)	Minimum Ratio of desired and interfering carriers (decibels)
11	0 (extrapolated)
10	6 (experimental)
9	14 (experimental)
8	26 (interpolated)
5 (or less)	60 (experimental)

It is seen that these experimental results agree reasonably well with the theoretical results of the preceding table with a value of M about 4500 cycles per second and with a signal-to-interference ratio of 50 decibels.

Numerical Examples.

In selecting numerical values for signal-to-interference ratios, a wide range is possible, depending upon the quality of the service desired. A ratio of 20 decibels for intelligible crosstalk between the desired and interfering signals, would give a service that might be capable of getting a message through in times of emergency, but would leave much to be desired in the way of satisfactory quality. A ratio of 30 decibels is decidedly better, but the crosstalk can be heard even when the ratio is 40 or more decibels. A rounded working value for the frequency separation with equal fields might be taken as equal to 2M, which would allow for a 40 decibel ratio of signal-to-interference. To this, of course, must be added the allowance for frequency tolerance, which at 0.003 % and at 20 Mc/s would amount to 1 200 cycles per second. Hence, when the highest modulation frequency is 3 000 cycles per second, the frequency separation between adjacent carriers should be 7 200 cycles per second.

In telephony, when the frequency separation is greater than M, rapid fading decreases the intelligibility to an appreciable extent but does not produce quite the complete impairment of the circuit that it does in the case of telegraphy. Consequently, no allowance for this fading is necessary, as far as interference is concerned, as fading impairs a given channel about as much without interference as it does with it.

When the frequency separation is less than M, fading produces variations in the level of the beat note between the two carriers which results in an annoying type of interference. In such cases, an extra allowance of perhaps 15 decibels for the ratio of carriers is needed to ensure a given signal-to-interference value.

B. *Single-sideband telephony*

When the field strengths are equal, experience has shown that, even on fading circuits, the separation between adjacent channels need be only great enough to ensure that the nearest frequency of the interfering signal is 40 decibels down on the receiver filter characteristic and then to allow for the frequency tolerance. Since filters with steep cut-off characteristics are commonly used in the intermediate-frequency stages of telephone receivers, an allowance of 500 cycles per second for the filter cut-off is sufficient in these receivers. With a value of 4 000 cycles per second for the highest modulation frequency M, the channel separation would then be 4 500 cycles per second plus the allowance for frequency tolerance. At 20 Mc/s and with a tolerance of 0.003 %, this allowance is 1 200 cycles per second, giving a value of 5 700 cycles per second for the separation of telephone channels of this kind.

For unequal fields, a number of considerations come into prominence and their complete evaluation appears to be too lengthy for the time now available. It is suggested that this would be a topic requiring further study, possibly by the C.C.I.R.

Note

The cases of frequency modulation, pulse emissions and television have not been studied because of insufficient information, and because these systems commonly use the higher frequency bands which are not yet used extensively for international services.

APPENDIX 2

THE SELECTION OF FREQUENCIES AND FREQUENCY SHARING

INDEX

1.0 Introduction

Frequency sharing may be divided into two fundamental types : (*a*) simultaneous use of the same frequency, and (*b*) non-simultaneous use of the same frequency. The conditions for these two types of sharing on a purely scientific and objective basis are :

a) *Simultaneous use of the same frequency.*

When the propagation conditions are favorable for each individual transmission, and are such that mutual interference remains below a tolerable level.

b) Non-simultaneous use of the same frequency.

When propagation conditions are favorable for the use of the frequency on two circuits at times which do not coincide.

The possibility of sharing by mutual agreement on a non-simultaneous basis, during a period when simultaneous use would be possible but for interference, is precluded from this appendix.

Basically, the work depends on a knowledge of ionospheric propagation, and in principle, once the knowledge of the ionosphere and of the processes of propagation is complete, the possibilities of frequency allocation and sharing are known. There are still many gaps in the detailed knowledge of the ionosphere, and the explanations of ionospheric propagation are still to some extent empirical as far as fitting in some of the observational data is concerned. In particular, the information on short distance propagation, both theoretical and experimental, is somewhat inadequate, but it can be said that the technique for analyzing a given service scientifically is now well established.

The methods of calculation have been described in the "Central Radio Propagation Laboratory Handbook" and similar publications, among which there is very satisfactory agreement, and as probably the most convenient, the charts and nomograms in this Handbook have been preliminarily adopted for this appendix. The chief difficulty is to reduce the information on frequency allocation and sharing implied in the Handbook to an immediately useful form.

In this task only very partial success has so far been achieved and it may be that, on a completely general basis, it is well nigh impossible. Obviously, it is an enormous task to carry out a detailed analysis of every proposed service before deciding the possibilities of frequency sharing, but on the other hand it is difficult to find a set of simple rules sufficiently explicit to be really useful to the average engineer.

In order to obtain more than a few vague generalities without any numerical values associated with them, the construction was undertaken of graphs showing the relation of field intensity to frequency and distance for various ionospheric conditions, and other charts to be described later. These graphs and charts are derived directly from the information such as given in the above mentioned Handbook, and may be regarded as a stage in the process of reducing that information to a more readily usable form. They do, however, represent only one stage in that process, and may in turn form the basis for further reduction and simplification.

Unfortunately, the problem is very complex because of the number of variables involved : time of day or night, season, sunspot activity, geographical location of transmitter and receiver, transmitter power, frequency, etc. It was impossible to cover such a problem completely in the time available, and the work done along

these lines at the Atlantic City Radio Conference should be considered as of an exploratory nature only.

It is believed that this is the first time the problem of frequency allocation and sharing has been approached in this way, and that the information already obtained has an intrinsic value, quite apart from its immediate application.

Before proceeding to a description of the work undertaken, it may be well to underline the fundamental concepts of ionospheric propagation affecting frequency allocation and sharing, though a general knowledge of the subject such as that given in the C.R.P.L. Handbook is here assumed. The two essential concepts are those of the maximum usable frequency (MUF) and of ionospheric absorption. The maximum usable frequency is determined solely by the electron density in the F (or at times, E) layer, and a frequency higher than the MUF for a given service will not be usable, quite apart from consideration of absorption. The method of deciding the MUF for a given service, using the concept of control points, is well known and will not be given here. Though the control point method for long distance routes is to some extent empirical, it is found to lead to conclusions consistent with the observational data, and it has been adopted in the work contained herein.

If transmission is possible as far as the MUF is concerned, the effect of absorption must then be considered. In theory, the effect of heavy absorption along the transmission path on the received field intensity can always be offset by a sufficient increase in power. In practice, adverse conditions are sometimes mitigated by increasing the power to a level that would normally be excessive, though such an expedient may react against the simultaneous use of the same frequency. But in general, ionospheric absorption sets a limit to the use that can be made of a given transmission, where the field intensity could only be raised to a workable value by the use of an impracticable amount of power.

In terms of these concepts, the definitions given above, may be expanded as follows :

a) *Simultaneous use of the same frequency.*

When each transmission is possible as far as the MUF is concerned, and a further study of the absorption conditions shows that the wanted field intensities are sufficiently large, and the unwanted ones below the level of tolerable interference.

b) *Non-simultaneous use of the same frequency.*

When at the time when the MUF and the absorption conditions allow one of the transmissions to be used, the others are unworkable, either on account of the MUF, or of absorption where the MUF would not preclude transmission.

The graphs of field intensity given in the report are based solely on absorption, and refer to a power of 1 kw radiated by an omni-directional antenna. Their use implies that the transmission under examination has been found to be possible as far as the MUF is concerned. It is assumed that they are valid under conditions when the MUF somewhere between the control points is below the working frequency. Observations on long routes where this state of affairs can occur, suggest that this assumption is justified.

2.0 General Description of the Work Undertaken

2.1. Method of Presentation of Available Data

Because of the large number of variables involved, the decision was reached that the most useful way of presenting the required information is in the form of curves of the following types :

a) MUF charts, for determining frequency allocations.

b) Field intensity contours for determining the strength of an interfering signal from a given transmitter, as compared with the wanted signal from another transmitter.

c) Curves showing the distance separation required for various protection ratios, i. e., ratios of wanted to unwanted field intensities.

These curves are described below, and samples are attached to this report. In connection with the field intensity contours, it is difficult to visualize from any flat projection the distribution of field strength over the surface of the earth, and it was found helpful to draw the contours on the surface of a globe. A large rubber ball was actually used for the purpose. It was particularly useful in studying the conditions at the antipodes of the transmitter, and in determining the point on the surface of the earth where the field intensity is a minimum. This point is called herein "the dark spot", though the term is not ideal, especially as it in general occurs somewhere in the daytime hemisphere.

2.2. Graphs and Contour Charts of MUF and Field Intensity

Graphs and contour charts of MUF and field intensity were prepared for some extreme conditions of night and day, sunspot maximum and sunspot minimum.

The following samples are attached :

FIGURE 1. *Graph of frequency versus distance*
Parameter : field intensity.
Conditions : 40° S., azimuths 0° and 180° sunspot minimum, June, 1 200 hrs. local time. Dotted portions of curves are for the "Long Route."

FIGURE 2. *Field intensity contour chart for 6 Mc/s.*
Parameter : field intensity.
Conditions : 40° S., Sunspot minimum, June, Noon. Modified cylindrical projection.

FIGURE 3. *Field intensity contour chart.*

Same conditions as above. Large diagram azimuthal equidistant projection centred on the transmitter. (Periphery of figure represents antipodes.)

Small diagram, same projection centred on antipodes, same scale but for half sphere only.

FIGURES 4A, 4B, 4C. *Photography of field intensity contours on a globe.*

Same conditions as Fig. 2

FIGURE 5. *Graph of frequency versus distance.*

Parameter : field intensity
Modified for short distances
Conditions : equator, all azimuths, sunspot minimum, equinox, noon.

FIGURE 6. *Graph of field intensity versus distance.*

Parameter : frequency
Same conditions as above, 0-5 000 kms.
(Short distances only.) Sky wave only.

FIGURE 7. *Skip zone chart.*

Conditions : 30 Mc/s., December 1946, east, west and intermediate zones, showing area in which F layer transmission is normally impossible at this frequency.

Constructions : 2 000 kms. distance guard band for control points on the 4 000 MUF contour for a frequency 15 % below 30 Mc/s.

FIGURE 8. *Skip zone chart.*

Same as for Fig. 7, but for June 1947.

FIGURE 9. *Sample 4 000 MUF chart.*

Type recommended for use in frequency allocation.

2.3. Graphs of Interference Range Versus Service Range

Graphs of interference range compared to service range for different protection ratios were also prepared. The following samples are attached :

FIGURE 10. *Interference range versus protection ratio.*

Parameter : service range (sky wave)
Conditions : equator, sunspot minimum, equinox, night. For all frequencies below MUF.

FIGURE 11. *Interference range versus protection ratio.*

Parameter : service range
Conditions : same as for Fig. 10, but for 6 Mc/s., 2 hrs. before sunset.

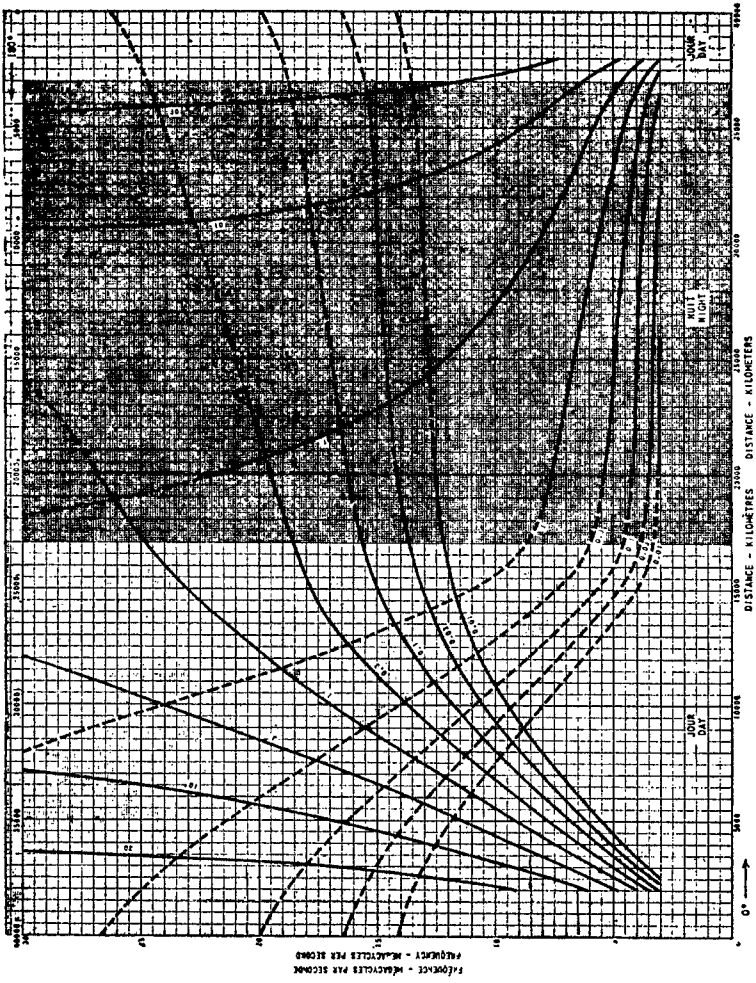


FIG.1 INTENSITÉ DE CHAMP
PAR TRAJETS LONGS ET COURTS
AZIMUTS 0° ET 180°
40° LATITUDE SUD, MIDI, JUIN
MINIMUM D'ACTIVITÉ DES TACHES SOLAIRES
Courbes équi-champ, microvolts par mètre, 1 kW.
Field intensity Contours, microvolts per meter, 1 kW
DISTANCE - KILOMÈTRES
DISTANCE - KILOMETERS
JOUR DAY
NUIT NIGHT
FIG.1 FIELD INTENSITY
VIA LONG AND SHORT ROUTES
AZIMUTHS 0° AND 180°
40° S. NOON JUNE. SUNSPOT MINIMUM

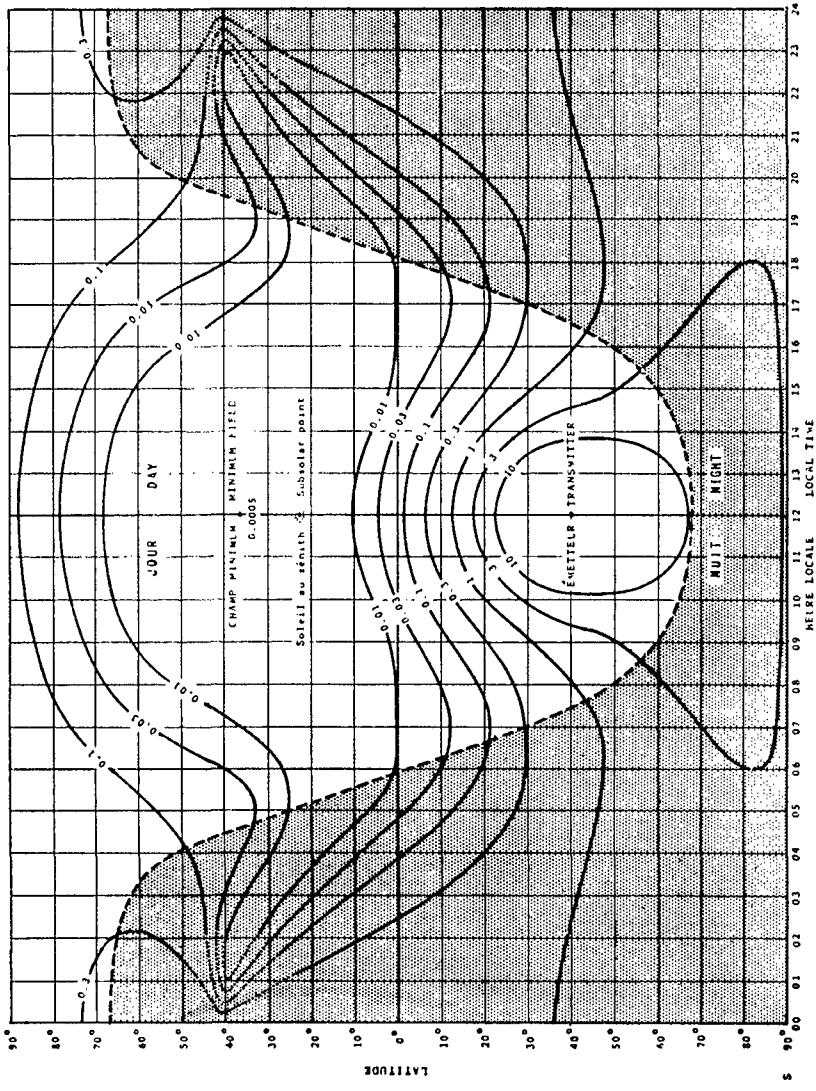


Fig. 2. Courbes équi-champ, microvolts par mètre, 1 kW. Projection cylindrique modifiée, juin, midi, 40°S, 6 Mc/s, minimum de taches solaires.
Field Intensity Contours, Microvolts per Meter, 1 kW. Modified Cylindrical Projection, June, Noon, 40°S, 6 Mc/s, Sunspot Minimum.

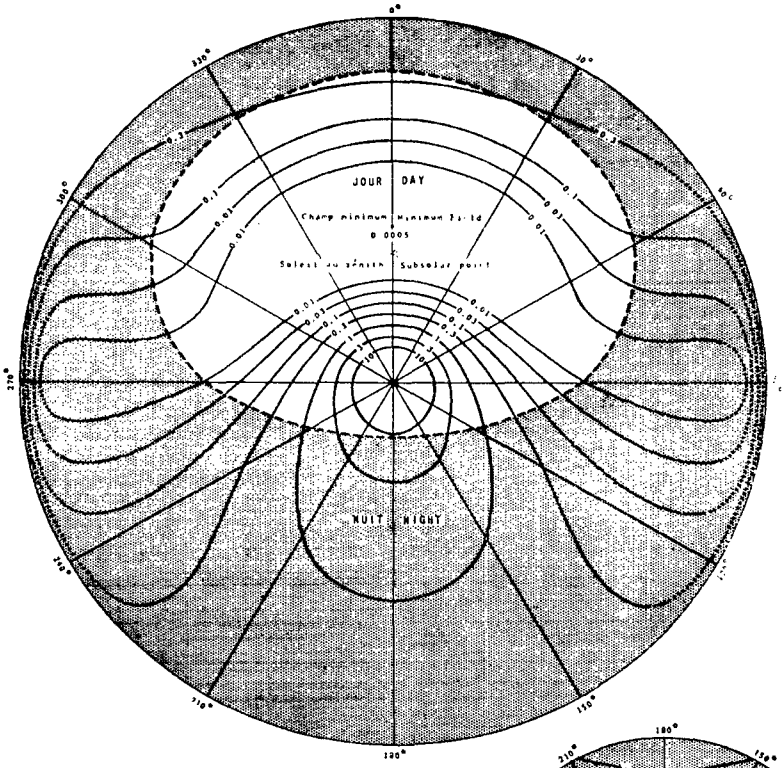
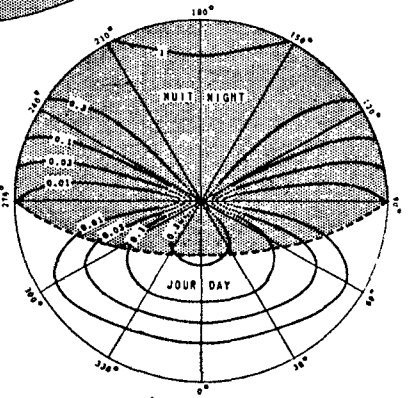


Fig. 3. Courbes équi-champ, microvolts par mètre, 1 kW. Projection azimuthale équidistante centrée sur la station, juin, midi, 40° S, 6 Mc/s., minimum de taches solaires.

Fig. 3. Field Intensity Contours, Microvolts per meter, 1 kW. Azimuthal Equidistant Projection centered on Station, June, Noon, 40° S, 6 Mc/s., Sunspot Minimum.



Intensité de champ aux antipodes
Field Intensity at Antipodes

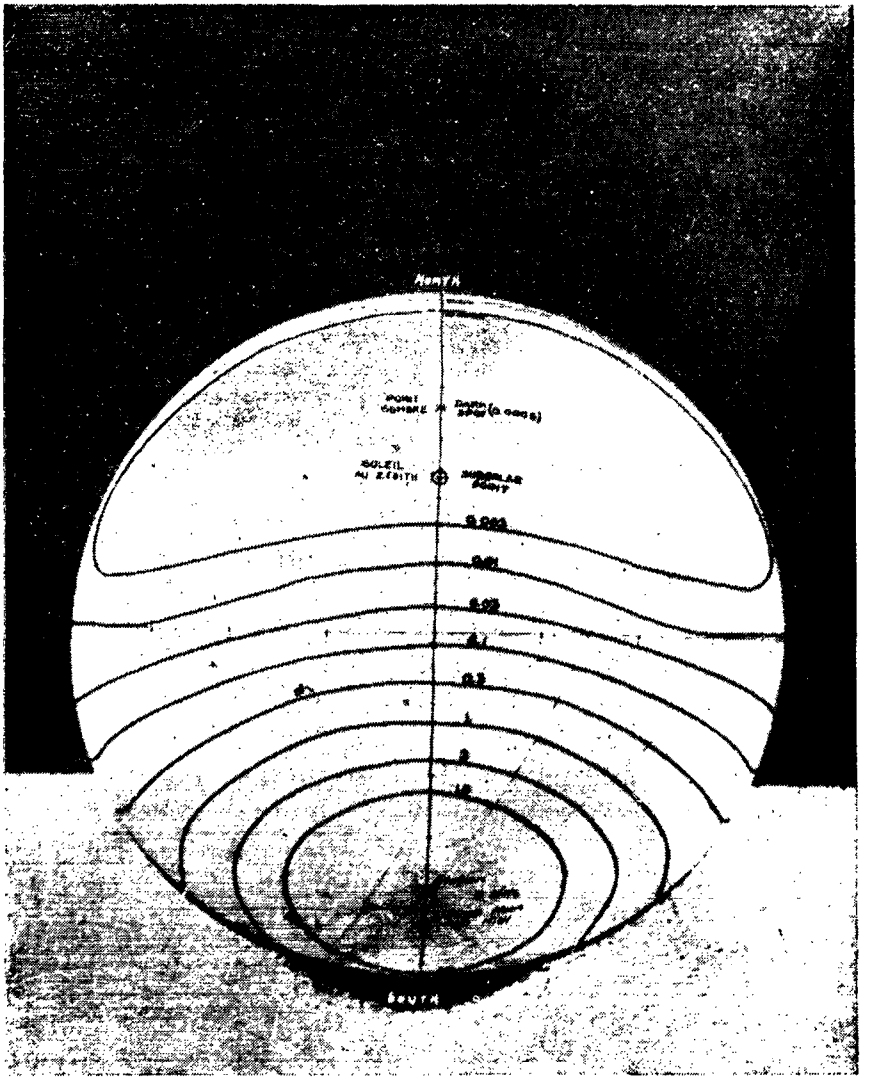


FIG. 4-A. COURBESÉ QUI-CHAMP SUR LE GLOBE

Microvolts par mètre. 1 kW. Juin, midi, 40° S. 6 Mc/s, minimum de taches solaires

FIG. 4-A .FIELD INTENSITY CONTOURS ON GLOBE

Microvolts per Meter. 1 kW. June, Noon, 40° S. 6 Mc/s, Sunspot Minimum

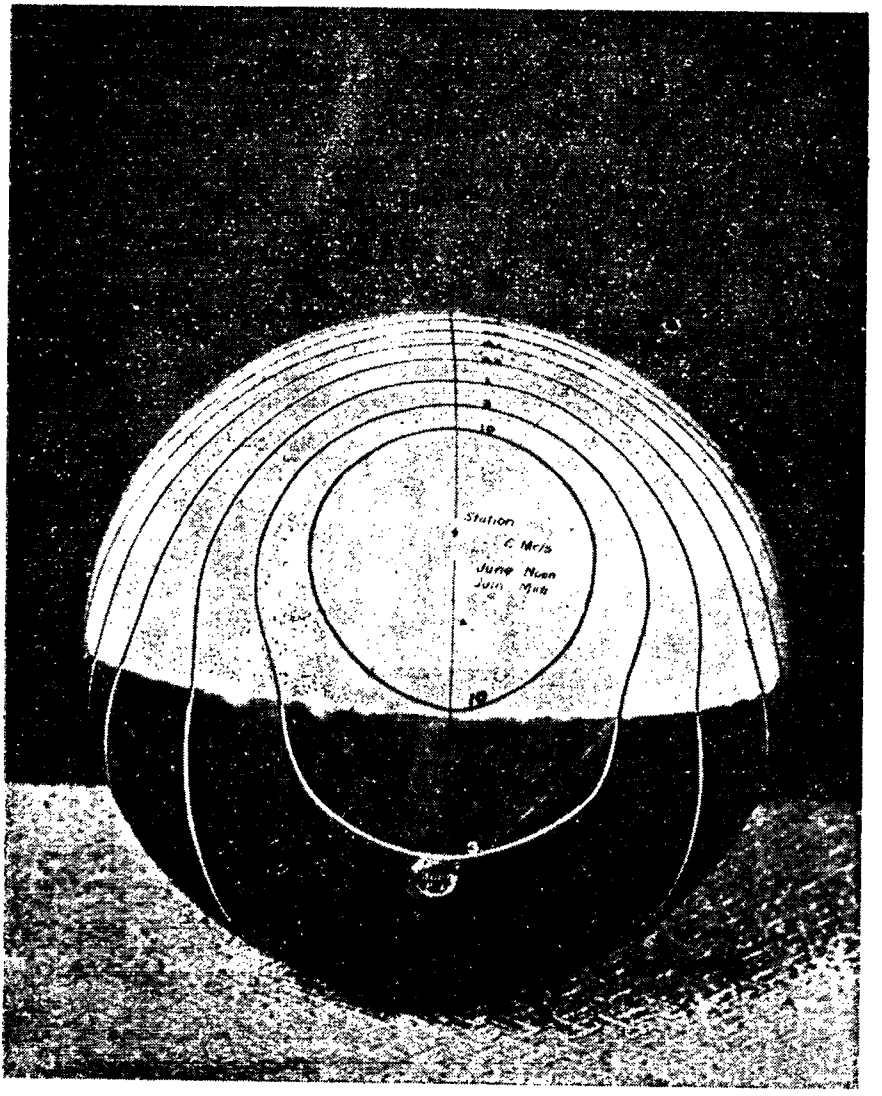


FIG. 4-B. COURBESÉ QUI-CHAMP SUR LE GLOBE

Microvolts par mètre. 1 kW. Juin, midi, 40° S. 6 Mc/s, minimum de taches solaires. Région de l'émetteur

FIG. 4-B. FIELD INTENSITY CONTOURS ON GLOBE

Microvolts per Meter. 1 kW. June, Noon, 40° S. 6 Mc/s, Sunspot Minimum. Transmitter Region

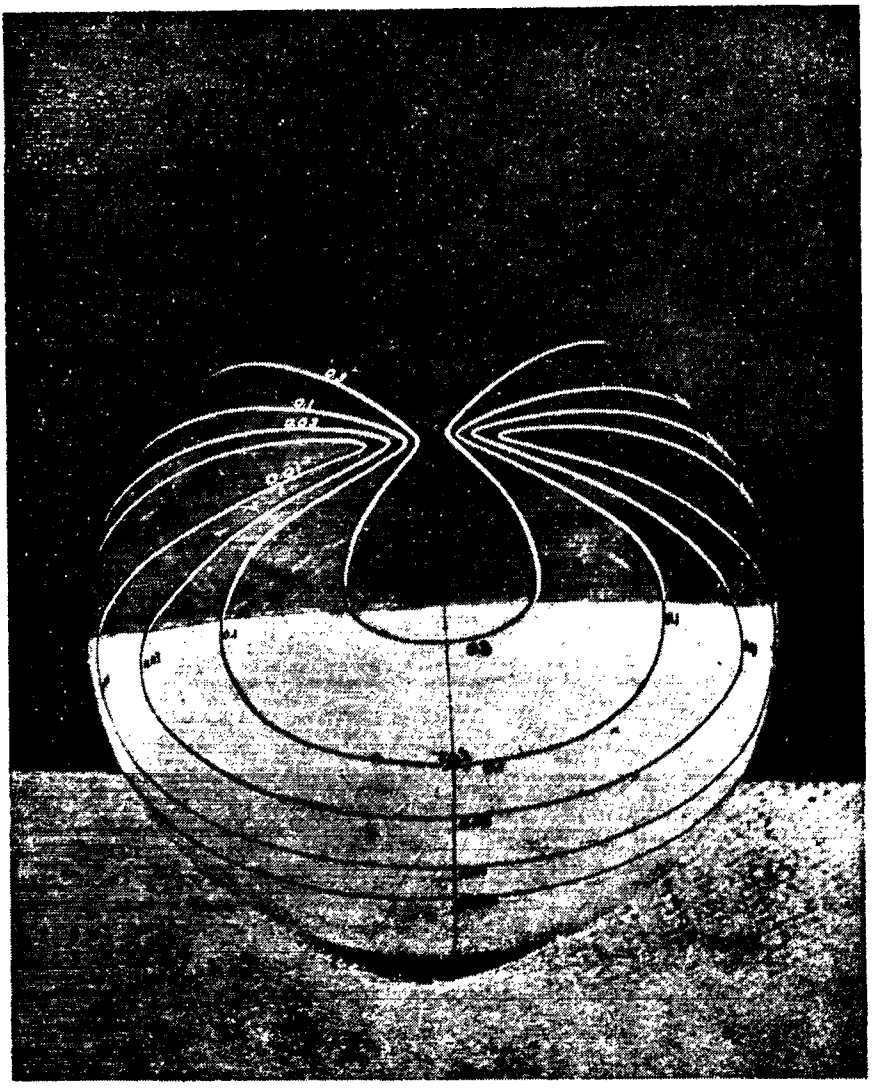


FIG. 4-C. COURBES ÉQUI-CHAMP SUR LE GLOBE

Microvolts par mètre, 1 kW. Juin, midi, 40° S. 6 Mc/s, minimum de taches solaires. Région des antipodes

FIG. 4-C. FIELD INTENSITY CONTOURS ON GLOBE

Microvolts per Meter. 1 kW. June, Noon, 40° S. 6 Mc/s, Sunspot Minimum. Antipodes Region

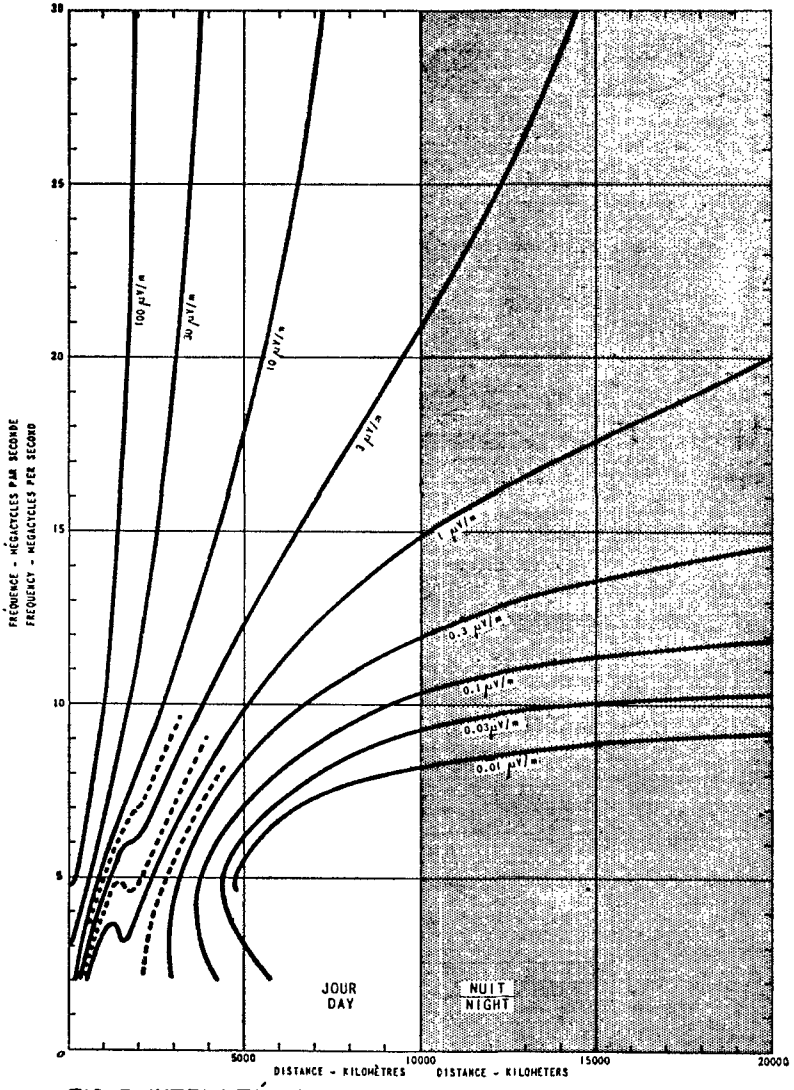


FIG. 5 INTENSITÉ DE CHAMP
MODIFIÉE POUR DE COURTES DISTANCES SUIVANT FIG. 6
ÉQUINOXE MIDI, LATITUDE 0° TOUS AZIMUTS
ÉQUATEUR, MINIMUM D ACTIVITÉ DES TACHES SOLAIRES

FIG. 5 FIELD INTENSITY
MODIFIED FOR SHORT DISTANCES IN ACCORDANCE WITH FIG. 6
EQUINOX NOON, LATITUDE 0° ALL AZIMUTHS
EQUATOR, SUNSPOT MINIMUM

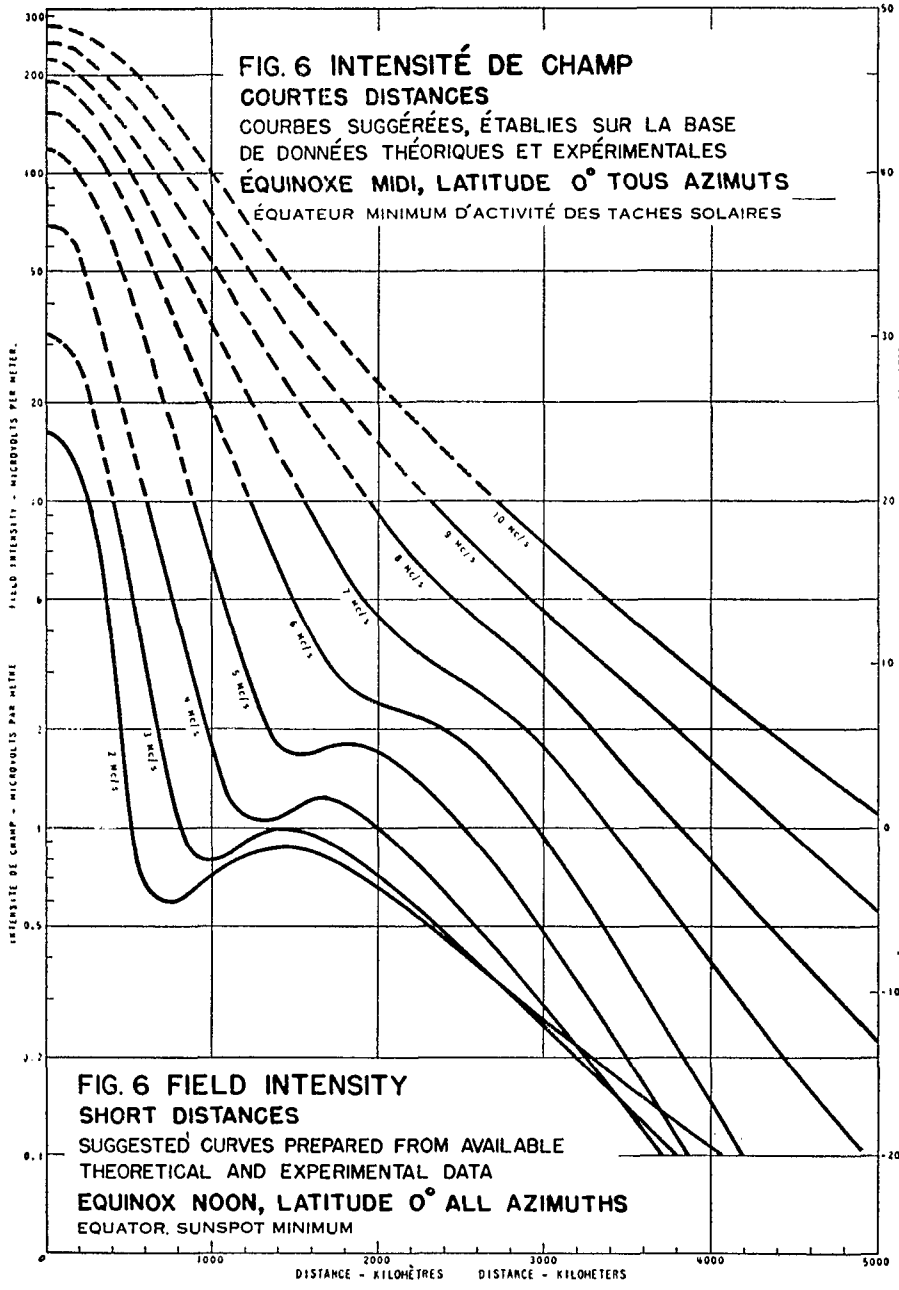


FIG. 6 INTENSITÉ DE CHAMP
COURTES DISTANCES
COURBES SUGGÉRÉES, ÉTABLIES SUR LA BASE
DE DONNÉES THÉORIQUES ET EXPÉRIMENTALES
ÉQUINOXE MIDI, LATITUDE 0° TOUS AZIMUTS
ÉQUATEUR MINIMUM D'ACTIVITÉ DES TACHES SOLAIRES
FIG. 6 FIELD INTENSITY
SHORT DISTANCES
SUGGESTED CURVES PREPARED FROM AVAILABLE
THEORETICAL AND EXPERIMENTAL DATA
EQUINOX NOON, LATITUDE 0° ALL AZIMUTHS
EQUATOR, SUNSPOT MINIMUM
INTENSITE DE CHAMP - MICROVOLTS PAR METRE
FIELD INTENSITY - MICROVOLTS PER METER.
DÉCIBELS AU DESSUS DE 1 MICROVOLT PAR MÈTRE
DECIBELS ABOVE 1 MICROVOLT PER METER
DISTANCE - KILOMÈTRES
DISTANCE - KILOMETERS
1000
2000
3000
4000
5000
10 MC/S
9 MC/S
8 MC/S
7 MC/S
6 MC/S
5 MC/S
4 MC/S
3 MC/S
2 MC/S

No. 2616

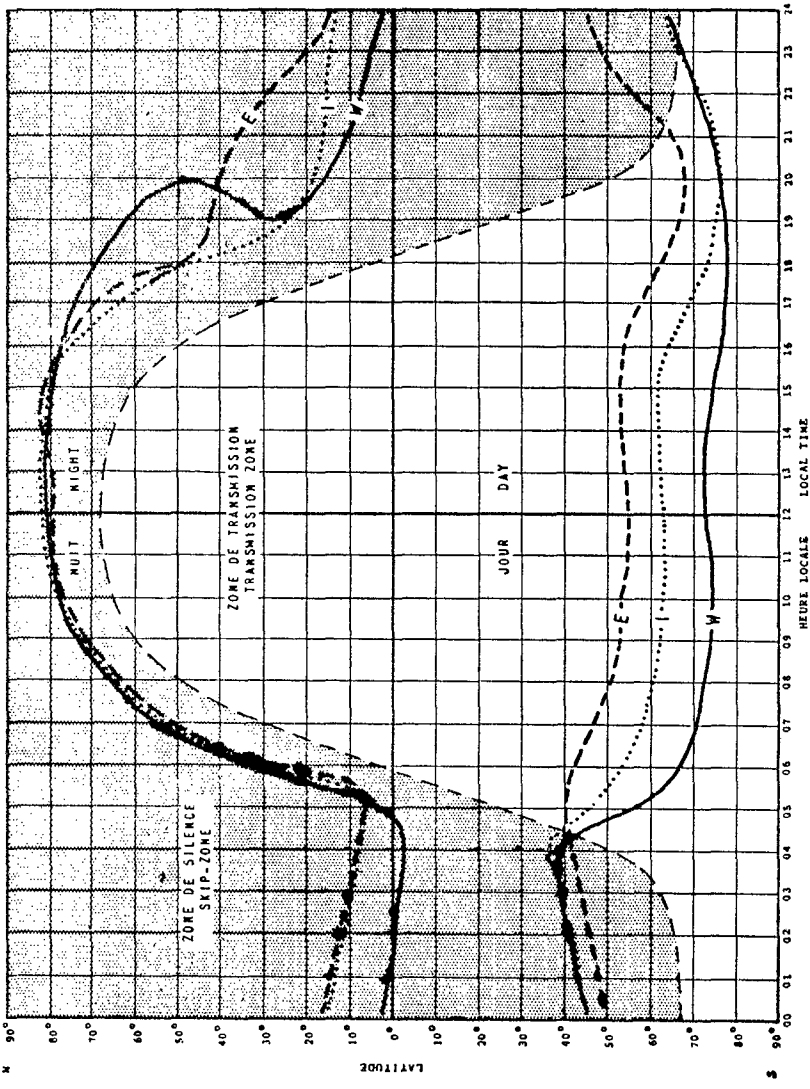


Fig. 7. Zone de silence, 30 Mégacycles par seconde, décembre 1946, Projection cylindrique modifiée.
Skip-Zone, 30 Megacycles per second, December 1946, Modified cylindrical projection.

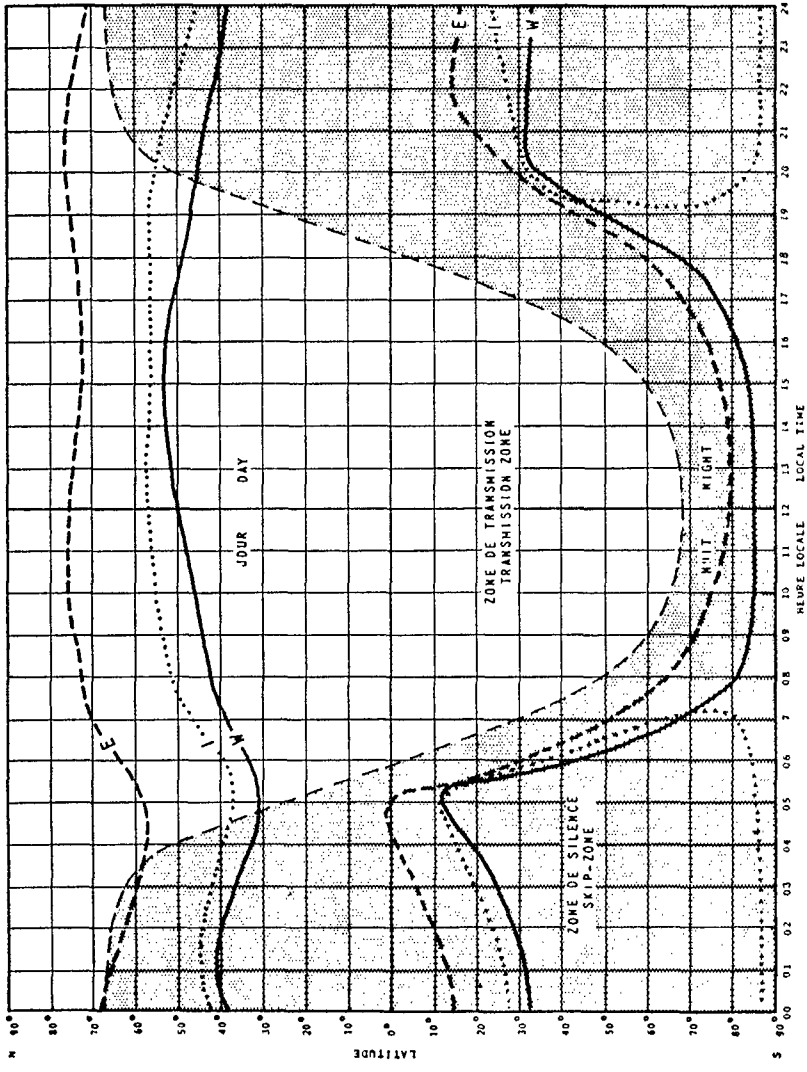


Fig. 8. Zone de silence, 30 Mégacycles par seconde, juin 1947. Projection cylindrique modifiée.
Skip-Zone, 30 Megacycles per second, June 1947. Modified cylindrical projection.

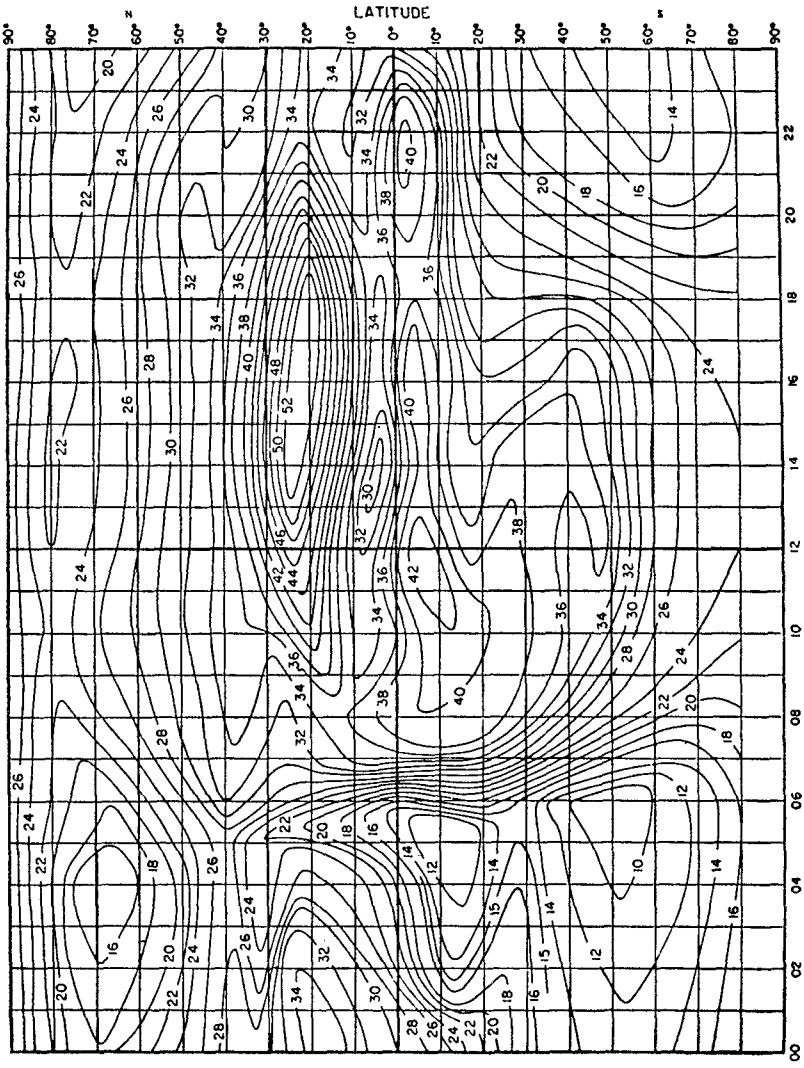


Fig. 9. Exemple de MOOD FMU en Mc/s du modèle utilisable pour l'allocation de fréquences (Août 1947).
Sample MOOD MUF in Mc/s of Type useful for frequency allocation (August 1947).

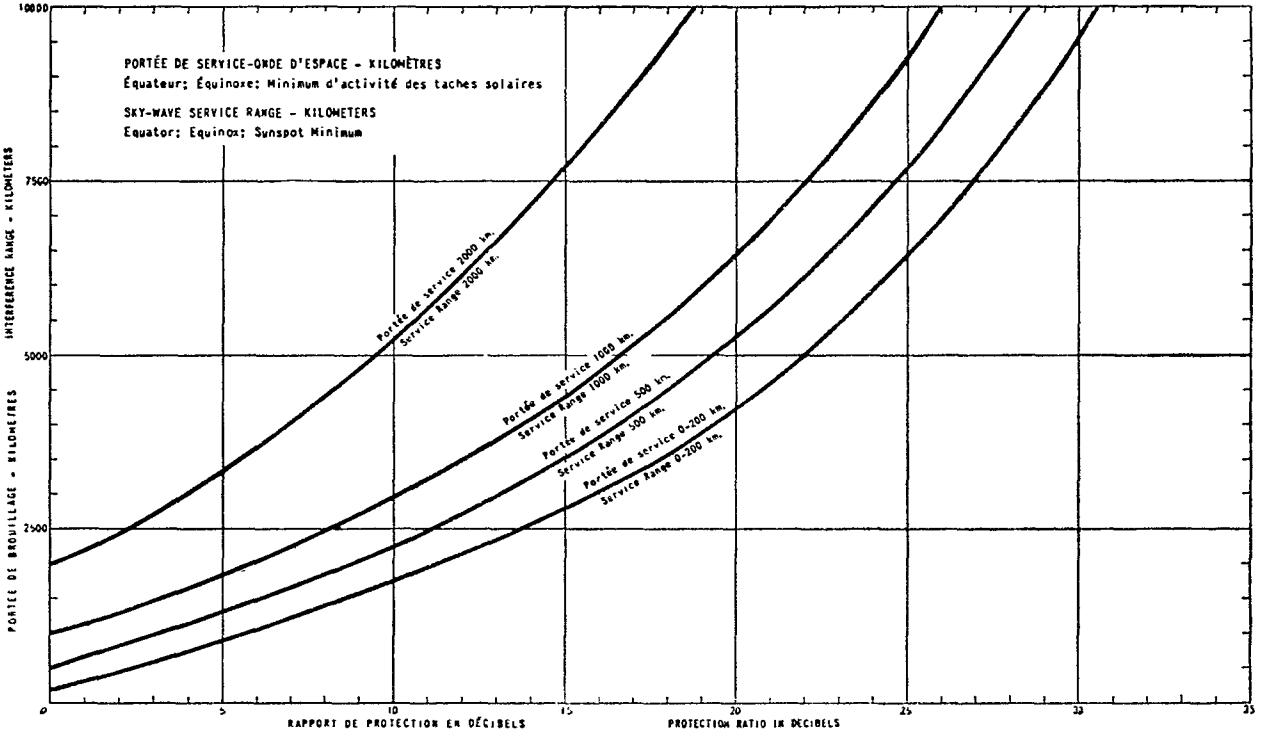


FIG. 10. GRAPHIQUE INDIQUANT LES CONDITIONS NÉCESSAIRES POUR L'EMPLOI SIMULTANÉ DE LA MÊME FRÉQUENCE AVEC DES PUISSANCES D'ÉMISSION ÉGALES ET POUR UN RAPPORT DE PROTECTION DONNÉ.

Conditions de nuit (pas d'absorption) pour toutes les fréquences (3 à 30 Mc/s) au dessous de la FMU

FIG. 10. CHART SHOWING THE CONDITIONS FOR SIMULTANEOUS USE OF THE SAME FREQUENCY WITH EQUAL TRANSMITTING POWER FOR AN ASSUMED PROTECTION RATIO.

Night conditions (no absorption) for all frequencies (3 — 30 Mc.) below MUF.

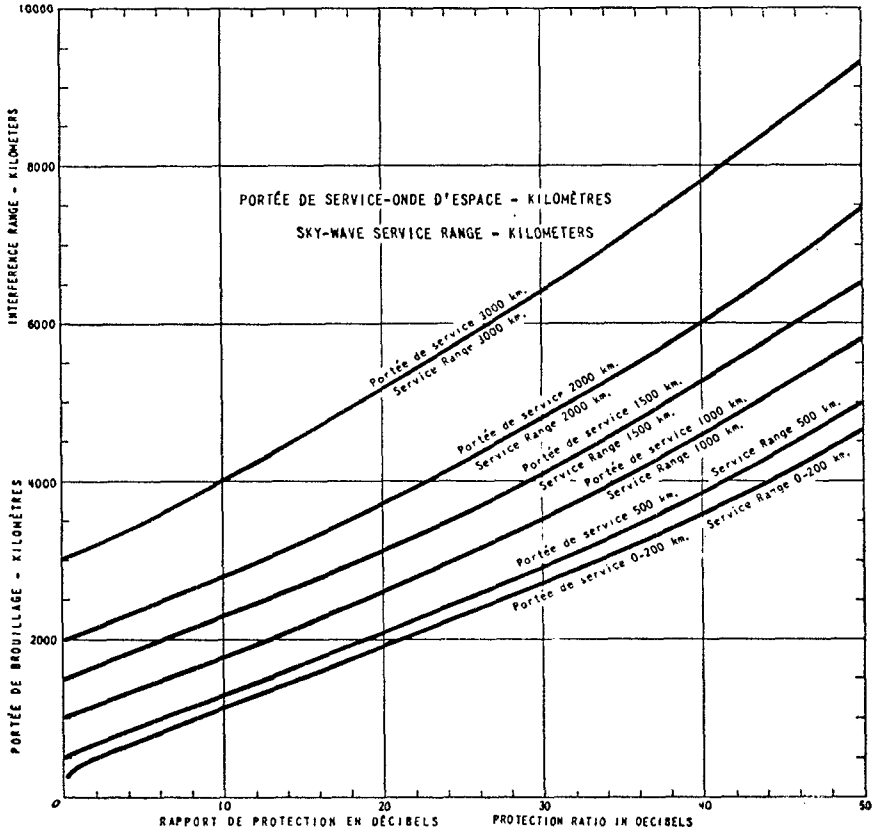


FIG. II. GRAPHIQUE INDIQUANT LES CONDITIONS NÉCESSAIRES POUR L'EMPLOI SIMULTANÉ DE LA MÊME FRÉQUENCE AVEC DES PUISSANCES D'ÉMISSION ÉGALES ET POUR UN RAPPORT DE PROTECTION DONNÉ.

Équateur, Équinoxe, Minimum des taches solaires. Deux heures avant le coucher du soleil. 6 Mc/s. Sous réserve de densité électronique suffisante (FMU)

FIG. II. CHART SHOWING THE CONDITIONS FOR SIMULTANEOUS USE OF THE SAME FREQUENCY WITH EQUAL TRANSMITTING POWER FOR AN ASSUMED PROTECTION RATIO.

Equator, Equinox, sunspot minimum, 2 hours before sunset, 6 Mc/s. subject to sufficient electron density (MUF)

3.0 Maximum Permissible Interfering Field Intensity

In order to deduce from the field intensity graphs the possibility of the simultaneous use of a frequency for two or more transmissions, some idea must be formed of the value of the maximum permissible interfering field intensity. Examination of available data concerning the requirements for satisfactory service as regards minimum field intensities, signal to noise ratios and protection ratios, leads to the conclusion that the maximum permissible interfering field intensity is roughly independent of the type of service.

It appears that a value of 0.3 microvolt per metre (i.e. 10 db. below 1 microvolt per metre) is a reasonable *median* value for the maximum permissible value for the interfering field intensity. Some details of the derivation of this value are attached.

For the lower frequencies of the 3 to 30 Mc/s band, the atmospheric noise may often be greater than 0.3 microvolt per metre for usual band widths and the protection of this minimum field of 0.3 microvolts per metre will then be greater than necessary. It does not apply to cases where the working field intensity is considerably above the minimum value required for satisfactory service, as may occur, for instance, in certain types of ground-wave working in the neighborhood of the transmitter.

4.0 Effect of Directive Antennas

The field intensity graphs refer specifically to transmitters radiating 1 kw from an omnidirectional antenna, but they may be adapted to the use of other radiated powers by the requisite decibel adjustment in level. In assessing the effect of directive antennas on the possibilities of frequency sharing, the following conclusions and definitions were adopted :

4.1. Directivity in the Horizontal Plane

a) Transmitting antennas.

The directive antenna, as compared with a vertical dipole, is regarded as increasing the equivalent power in the wanted direction, while leaving unchanged the equivalent power in the unwanted directions. The latter definition was adopted as a simplification giving an *upper* limit of the interference in the unwanted directions, due to minor lobes. A practical average value for the increase in equivalent power in the wanted direction is 10:1 (10 decibels), and it may reach 100:1 (20 decibels) for the higher frequencies in the 3 to 30 Mc/s band.

b) Receiving antennas.

For optimum sharing, in the case of fixed circuits, directive antennas should be used where feasible. The same conclusions with regard to their effect in the wanted and unwanted directions as for transmitting antennas are, in general, applicable.

4.2. Directivity in the Vertical Plane

For optimum sharing, transmitting antennas with high angle radiation should be used for small service ranges, e.g., for mobile services and for tropical broadcasting. Without the use of such antennas, little sharing will be possible in these cases at night. For instance, for a half wave dipole, one-eighth of a wave length above the ground, the radiation at an angle of elevation of 11° will be reduced by approximately 10 db. compared with the high angle radiation. The interference region compared with the service area could be still further reduced by the use of more elaborate antennas.

5.0 Ionospheric Abnormalities

5.1. Auroral Zones

The absorption of transmissions across the auroral zones is often very great, but cases of such transmissions, even at frequencies as low as 6 Mc/s., have been observed.

From the point of view of interference, the effect of such transmissions can usually be ignored, and some successful sharing has been achieved by taking advantage of the screening effect of the auroral zones. In the present state of knowledge, however, no general rule and recommendation could be given for sharing relying solely on auroral zone absorption.

5.2. E_s *(Sporadic or Abnormal E)*

It is recognized that E_s can play a considerable part in high frequency transmission, allowing the use at times of frequencies higher than would otherwise be possible. Except, however, for difficult circuits where E_s offers at times the only mode of transmission (auroral zones, or long routes with contrast conditions at the control points), provision should not be made for the allocation of frequencies on the basis of E_s transmission.

5.3. Ionospheric Storms

This appendix is based upon normal ionospheric conditions. It is recognized that wide variations from normal may be encountered at times of ionospheric storms, particularly in auroral regions. The principal effect of these storms is to hamper operations on regularly allocated frequencies.

Because these are abnormal conditions, it is not considered that they should be taken into account in studies of frequency sharing, even though the interference range of a transmitter, as well as its operating range, may be materially reduced at such times.

6.0 Material Available

6.1. Comparison of Data

Experimental and theoretical data have been examined concerning radio propagation with a view to determining their adequacy and application to the problem of frequency,

allocation and sharing. The reference documents are shown in the List of Documents.

6.2. Necessity for Adaptation of Available Basic Material for Practical Purposes

While the theoretical and experimental data are adequate and of a basic nature, they are not in a suitable form for straightforward use by average engineers. Certain of these basic data can be put in special form for this purpose, but the procedure involved required more time and personnel for completion than were available, so only specimen copies were prepared.

7.0 Procedure for Selecting Frequencies for a Given Circuit

7.1. Highest and Lowest MUF

a) The first step in the procedure should be to determine for the circuit the highest and the lowest MUF during a definite period, which will be presumed here to include the entire sunspot cycle.

b) The highest and lowest MUF can best be determined by the use of charts such as Fig. 9. The procedure for using such charts is described in the C.R.P.L. — D Series booklets (Reference 12 in the List of Documents). In paragraph 9.2 of this appendix it is recommended that additional charts of this and other types should be prepared. For allocation purposes the following MUF charts are recommended : East, intermediate and west zones, solstice periods, sunspot maximum and sunspot minimum, 0 MUF and 4 000 MUF (24 charts).

Pending the preparation of such a set of charts, the F° F2 contour charts and procedures of report I.R.P.L. — R 16, or the nomograms of reports I.R.P.L. — R 19 and I.R.P.L. — R 22 may be used though the results will not be so accurate or so easily obtained as with the proposed type of charts.

It may be of interest to note that from a statistical survey of a number of existing circuits it appeared that the average ratio of highest MUF to lowest MUF was about 4 to 1.

c) The maximum, minimum and interpolated frequencies to be used should next be determined. In general, the maximum frequency to be used should be taken as about 40 % of the highest MUF, and the minimum frequency to be used should be taken as approximately 85 % of the lowest MUF. The average ratio of the maximum working frequency to the minimum working frequency will therefore be roughly 2 to 1 or (40 % × 4) to (85 % × 1).

In the case of difficult circuits (auroral zone or contrast conditions), in addition to the two extreme frequencies mentioned above, one interpolated frequency should be allocated. From propagation considerations, a frequency approximately equal to the highest MUF should also be allocated in these circumstances for E_s working.

7.2. Maximum, Minimum and Interpolated Working Frequencies

For such services as high speed telegraphy and facsimile, for which the reduction of multipath effects requires that the MUF be followed more closely, the maximum frequency to be used should be taken as approximately 70 % of the highest MUF. The minimum frequency to be used should, as above, be taken as approximately 85 % of the lowest MUF.

The average ratio of the maximum working frequency to the minimum working frequency will therefore in this case be roughly 3 to 1, and, in addition, two interpolated frequencies should normally be allocated. If the ratio comes down to 2 to 1, one interpolated frequency will normally be sufficient ; if it goes up to 4 to 1, three interpolated frequencies may be needed.

If the interpolated frequencies are spaced in geometrical progression, the proposed allocation in each case corresponds to one in which each frequency is approximately 70 % of the one next above it.

The remarks made above with regard to E_s working on difficult circuits apply also in the case of high-speed working.

8.0. Readily Known Sharing Cases

8.1. Use of Graphs

It is realized that the defining of cases in which sharing is readily known to be possible, forms the part of the task that is of the most immediate importance. It is also the part that is most difficult, as, apart from some general rules, it is usually impossible to state off-hand whether one specific circuit can share a frequency with another. The main difficulty is the finding of cases that are truly off-hand, as in general some reference has to be made to numerical values, implying some preliminary investigation with the aid of graphs and charts.

The form of presentation that offers most promise is the type of graph in Figs. 10 and 11, where the interference range is shown as a function of protection ratio for a given service range as parameter. For a given protection ratio, such a graph immediately shows the sharing possibilities for the conditions to which it refers, and from the specimen graphs already prepared, some general conclusions may be deduced.

Such graphs by their nature refer primarily to frequency sharing by the simultaneous use of the same frequency, and from them it is possible to deduce the number of times, if any, that a given type of transmission with a given service range can be repeated over an area where the conditions are the same. The latter qualification introduces a limitation to the direct use of the graphs, as the absorption in the ionosphere may change markedly within the interference range under consideration, especially near to the day-night line. This limitation may possibly be overcome by elaborating the graphs somewhat, but in practice they would be used for the more severe condition, and so give the least favorable view of the sharing possibilities.

8.2. Simultaneous Use of the Same Frequency at Night

The graphs are based solely on considerations of absorption, assuming that the MUF conditions are suitable for transmission, and at night, when the absorption is low, the set of curves in Fig. 10 suffices for all frequencies in the range 3 to 30 Mc/s. From these curves it appears that the simultaneous use of the same frequency at night is limited to short service ranges but that for small protection ratios some useful sharing may be obtained.

a) Non-directive antennas.

For transmitters using the same power and type of emission, the following table (night) may be given :

Maximum Service Range	Protection Ratio in Decibels	Number of Times the Frequency may be Repeated
1000 kms.	20	2 or 3
1000 kms.	10	6 or 7
2000 kms.	10	3

These figures and similar ones derivable from Fig. 11, are essentially independent of frequency.

b) Horizontally directive antennas.

For fixed services, using horizontally directive antennas, the required protection ratio is decreased by the combined gains of transmitting and receiving antennas, provided each transmitting beam covers only its own receiving station. For instance with a transmitter gain of 10 db. and a receiver gain of 5 db., a service requiring 15 db. protection for omnidirectional antennas can operate with 0 db. actual protection ratio, i. e., the interference range is equal to the service range, and the service can be repeated with a distance of twice the service range between transmitters.

c) Vertically directive antennas.

It is technically possible, by using for example an array of horizontal dipoles one-eighth of a wave-length above the ground, to reduce the ratio of interference range to service range for a given protection ratio for services of a few hundred kms. In this case the following values would result :

Ratio of Interference Range to Service Range	Protection Ratio in Decibels
2.0	10
3.4	20
5.0	30
6.8	40

The possibility of increasing the amount of sharing in this way has already been referred to in 4.2.

8.3. Simultaneous Use of the Same Frequency During the Day

a) Due to the effect of absorption, more sharing is possible during the day than during the night, and the more so the lower the frequency used. The dependence upon frequency and upon location with respect to the subsolar point makes the formulation of general rules more difficult. Fig. 11 refers to a 6 Mc/s transmission with the transmitter located on the equator at the equinox two hours before sunset, at sunspot minimum, and transmitting parallel to the day-night line.

b) In order to cover the whole problem, similar curves should be constructed for various ionospheric conditions and some suggestions are made in 9.3 *b*). From such curves, general rules of the kind deduced from Fig. 10 for night-time conditions could be derived, giving for any particular case the minimum spacing between the transmitter of one circuit and the receivers of all the other circuits using the same frequency simultaneously.

8.4. Further Conditions for the Simultaneous Use of the Same Frequency

From the study of field intensity contours, and in particular from their construction on the surface of a sphere, it appears that a transmitter radiating 1 kW will produce, everywhere, day and night, a field greater than the 0.3 microvolt per metre mentioned in § 3, if the frequency is greater than 13 Mc/s and it will thus produce (at sunspot minimum) interference at the limit of the service range of any other transmitter working simultaneously on the same frequency at any other point on the earth's surface. With increased power, the same result will be produced at a correspondingly lower frequency in accordance with the following table :

Power	Frequency above which the Interference is not Tolerable
100 kW	9,6 Mc/s
10 kW	11 Mc/s
1 kW	13 Mc/s
100 Watts	17 Mc/s
10 Watts	30 Mc/s
1 Watt	30 Mc/s

The possibilities of sharing on a simultaneous basis are not confined to all day-time or all night-time operation. In particular there is a possibility of using the same frequency simultaneously for a short day route and a long night route. The essential conditions would be for the frequency to be low enough to be usable as a night wave, and for the daytime absorption to limit the day route to the short range necessary. For optimum use, the day route should be well away from the day-night line, and the

long route well into the darkness, so that they would be approximately 180° apart in longitude. The graphs will indicate further conditions, as to power, etc.

The graphs of the type given in Figs. 10 and 11 can be converted with reasonable accuracy to a nomographic form, and a further extension and simplification of their use may lie in the construction of suitable nomograms.

8.5. Non-Simultaneous Use of the Same Frequency

As stated in the introduction, the technical basis for the non-simultaneous use of the same frequency is that at the time one of the circuits is using the frequency, the others would be unable to work from consideration of the propagation conditions. Stating the matter another way, it may happen that station A can use a certain frequency during a part of the 24 hours when it is unusable by another station B, whereas for another part of the 24 hours it may be usable by B and not by A.

While it is technically possible to obtain some sharing on this basis, it is realized that it may not be a practical proposition unless extended by administrative agreement. The possibility of such sharing can be illustrated by the use of skip-zone charts of the type shown in Figs. 7 and 8 derived from MUF charts by considering the limiting positions of the transmitter, when the control points lie on the 4 000 MUF contour for the frequency 15 % below the frequency under consideration. From such a chart, the regions where transmission is impossible is immediately shown, and the possibilities of non-simultaneous sharing are readily seen. It is, however, questionable whether the amount of sharing obtainable would justify the effort and time that would be required to construct a comprehensive set of such skip-zone charts.

The above discussion omits reference to the effect of absorption, and taking it into account, a further possibility arises of using the same frequency non-simultaneously for a short day route and a long night-route at the same longitude, since it would not be desirable to use the same frequency at the same times of day on two routes of greatly different lengths.

9.0. Sharing Cases Not Coming Under 8.0.

9.1. Necessity for More Elaborate Investigation

This section covers the cases of frequency sharing which do not fall under the heading of "readily known" in 8.0, and for which a more elaborate investigation is necessary. The distinction is, however, not clear-cut, since there will here be included the proposed programme of work needed before the readily known cases can be obtained, as well as the graphs and charts needed in the further investigation of sharing.

9.2. An Atlas of Graphs and Charts

In order to make the deriving of the readily known cases of sharing and the more detailed study of other cases as simple as possible, an atlas should be prepared containing charts and graphs for this purpose.

9.3. Simultaneous Sharing

a) For long distances.

The atlas should comprise charts of the type given in Fig. 2. For a complete coverage they should be constructed for the following conditions :
Modified cylindrical projection.
Transmitter at every 10° of latitude from 60° N. to 60° S. and also at 75° N. and 75° S.
Every 4 hours of local time.
For June, December, and equinox.
For sunspot maximum and minimum.
For frequencies 3, 4, 5, 6, 8, 10, 15, 20, 25, 30 Mc/s.
This would, however, mean a total of 5 400 charts and in order to keep the amount of work involved to a more reasonable volume, a reduced number could be made that would be adequate with more interpolation. Such a reduced set of charts drawn on the azimuthal equi-distant projection shown in Fig. 3 would be recommended for the following conditions :
0, 5 000, 10 000, 15 000, and 20 000 km. from the subsolar point.
For sunspot maximum and minimum.
For frequencies 3, 5, 7, 10, 15, 25 Mc/s.
With a table of corrections for the seasons.
Such a set would total 60 charts.

b) For short distances.

The following charts to assist in the finding of readily known cases should be prepared :
With interference range as a function of protection ratio for various service ranges of the type given in Figs. 10 and 11, with the transmitter :

1) near the sub-solar point ;
2) 30° from the day-night line and transmitting parallel to it ;
3) 30° from the day-night line and transmitting towards it ;
4) at the day-night line towards the sub-solar point for sunspot minimum conditions.

For each of the frequencies 4, 6, 10, 15, 20 and 25 Mc/s.

9.4. Non Simultaneous Sharing

In view of the question of the practicable amount of non-simultaneous sharing obtainable raised in 8.5, no definite recommendation is put forward for the preparation of skip-zone charts of the type in Figs. 7 and 8. If, however, such non-simultaneous sharing should be sufficiently worth while to justify the preparation of skip-zone charts, a set for every 2 Mc/s from 10 to 30 Mc/s for June, December and equinox, for sunspot maximum and minimum should be adequate. Such a set would total 66 charts.

It may, however, be pointed out that such skip-zone contour charts would be of some use in the problem of selecting frequencies for a given circuit. In the discussion of this subject given in 7.1 (*b*), it was suggested that a set of MUF charts should be prepared for the purpose, and these charts, embodying the latest available ionospheric data, could be used for the construction of the skip-zone charts.

10.0 Summary and Conclusion

It was felt that this work should be fully objective, and provide the scientific basis for frequency allocation and sharing, therefore, these findings need to be implemented by administrative considerations. The possibilities of frequency sharing so derived can then be assessed from the practical and economic point of view by those directly concerned with the drawing up of a frequency list.

The scientific study of frequency sharing was based on the fundamental cases of (*a*) the simultaneous and (*b*) the non-simultaneous use of the same frequency, the scientific conditions for these two cases being defined. The attempt has been made to divide the cases of frequency sharing into readily known cases and those which can only be determined by a more detailed study. The distinction between these two cases is not very clear-cut, as any precise statement of frequency sharing needs a numerical backing, implying in general the preparation of charts and graphs. The readily known cases thus depend partly on material not yet produced, and, apart from recommending a programme of work which could not be undertaken at the Atlantic City Radio Conference, this appendix contains only a few specific cases from which some general conclusions may be drawn.

In particular, the night-time conditions for the simultaneous use of the same frequency are relatively simple, as the absorption is then very low, and the field strength is effectively independent of frequency, subject to the limit set by the MUF. Specimen charts have therefore been prepared, giving the interference range as a function of protection ratio for various service ranges for both night and day. These charts show that the simultaneous use of the same frequency is in general possible only for restricted service ranges. During the day, for example, some sharing is possible for mobile services and tropical broadcasting, while at night the sharing is restricted to services requiring only small protection ratios, say less than 15 db.

The effect of directive antennas, both in the horizontal and the vertical planes, can be included by an appropriate adjustment of the protection ratio, and rules are given for assessing the effect of such antennas in the wanted and unwanted directions.

Long distance simultaneous use of the same frequency is possible only in a few exceptional cases that have to be examined very carefully on their own merits. This fact was emphasized by plotting the field contours on a large rubber ball representing the earth, since it drew attention to the fact that a region of minimum field intensity must exist somewhere on the earth. It appears that for a given radiated power, there is a frequency above which a transmitter would produce non-tolerable interference at the end of the service range of any other transmitter working on the same frequency simul-

taneously. For instance for a power of 1 kW, the limiting frequency is 13 Mc/s at sunspot minimum.

The contour charts will no doubt also be of great value to the practical engineer, as they show in simple form the strength of the signal produced at the point of reception, for a given transmitter power and antenna gain.

Non-simultaneous use of the same frequency on scientific grounds implies that there is a part of the 24 hours when the frequency is usable for only one of the circuits while for another part of the 24 hours it is usable only by the other station. In practice the amount of time available to one or other of the circuits may be small and the sharing not be economic, and the work required to investigate such possibilities may not be justifiable. Skip-zone charts are described that would be helpful in such an investigation, derived from MUF charts.

The use of MUF charts is recommended for the allocation of frequencies on a scientific basis. Some suggestions are made for the choosing of the maximum, minimum and interpolated frequencies for a given circuit in relation to the highest and lowest MUFs occurring at any time throughout the sunspot cycle for the route in question.

LIST OF DOCUMENTS

1. Report of Special Committee to study world allocations of frequencies for international point to point fixed radio service. 1946 RTPB P801
2. The Influence of Wave Propagation of Short-Wave Communication. K. W. Tremellen and J. W. Cox. 1947 Journal I.E.E., preprint
3. IRPL Radio Propagation Handbook 1943
4. Radio Transmission Handbook. National Bureau of Standards 1941
5. Considerations on the possibility of repeating short waves for broadcasting communicated by Mr. N. Sankin
6. F.C.C. Clear Channel Hearing
Report of Technical Committee 11 on what constitutes objectionable interference January 17, 1946 N. 88 370
7. F.C.C. Standards of Good Engineering Practice
2nd Draft revision of Part 1 N. 96 444
8. Calculation of Sky Wave Field-Intensities, MUF, and LUHF U. S. Signal Corps — Radio Propagation Unit Technical Report N. 6 March 1947
9. Minimum required field-intensities for intelligible reception of radio-telephony in presence of atmospherics or receiving set noise. U. S. Signal Corps. Radio Propagation Unit. Technical Report No. 5 December 1945
10. Relative sky wave signal required for intelligible reception of various types of radio communications service. U. S. Signal Corps — Radio Propagation Unit Technical Report N. 4 August 1945

11. Intermediate distance sky wave field intensities
U. S. Signal Corps. Radio Propagation Unit
Technical Report Procedures N. 6 February 1946

12. Basic Radio Propagation predictives, 3 months in advance CRPL — D series monthly

13. Active radio stations of the world.
RCA Frequency Bureau. 1938 edition

14. Predicted limits for F2-layer radio transmission throughout the solar cycle. IRPL-R15 12 July 1945

15. Predicted F2-layer frequencies throughout the solar cycle for summer, winter and equinox season. IRPL-R16 18 July 1945

16. Frequency separation required for non-interference between desired signal and interfering signal
Radio Division
Canadian Department of Transport

17. A short note on the world-wide distribution of the E_s ionization Marconi's Wireless Telegraph Co., Ltd.
Unpublished report July 1946.

18. Predicted values of MUF, OWF and LUHF for sunspot maximum and minimum, summer and winter
Communicated by Cable and Wireless, Ltd.

19. Radio frequency prediction for Canada 1946-1955
Canadian Radio Wave Propagation Committee March 1946

20. Sporadic E_s ionization at Churchill — August 1943 — July 1946 Canadian Radio Wave Propagation Committee — November 1946

21. Seasonal variations in WWV reception at S. John's Canadian Radio Wave Propagation Committee — July 1946

22. An annual report of ionospheric observations above Chungking sky in the year of 1945 Radio Wave Research Laboratories, Central Broadcasting Administration. Chungking, China

TABLE OF FIELD INTENSITIES AND PROTECTION RATIOS

The value of 0.3 microvolt per metre for the maximum permissible interfering field intensity given in § 3.0 was derived from the following table obtained by examining the available data :

Type of Service	Minimum field intensity to be protected (median value)	Protection ratio	Maximum permissible interfering field intensity (median value)
Broadcasting	40 microvolts per metre	100:1	0.4 microvolt per metre
Phone	10 microvolts per metre	20:1	0.5 microvolt per metre
Facsimile Manual Telegraphy	1 microvolt per metre	2.5:1	0.4 microvolt per metre
High Speed Telegraphy	2 microvolts per metre	5:1	0.4 microvolt per metre

From the last column of this table, it appears that the maximum permissible field intensity is roughly independent of the type of service, and the value of 0.3 microvolt per metre (i.e., 10 db. below 1 microvolt per metre), which is somewhat below the average value, is suggested as reasonable median value.

RESOLUTION RELATING TO PARTICIPATION IN PROVISIONAL FREQUENCY BOARD OF MEMBERS OF THE INTERNATIONAL FREQUENCY REGISTRATION BOARD

The International Radio Conference of Atlantic City (1947),

Considering:

1st : That the International Frequency Registration Board (I.F.R.B.) is being established on 1st January 1948 so that its members may participate as "International members" of the Provisional Frequency Board (P.F.B.) in the work of preparing the draft new International Frequency List;

2nd : That, until this list has been prepared and adopted by an Administrative Radio Conference

—The members of the I.F.R.B. cannot take up their substantive functions as a corporate body for the registration of radio frequencies, and other associated duties, as laid down in the Statutes of the Board;

—Nor can the procedure laid down in article 11 be brought into force;

3rd : That, however, it would be desirable for the I.F.R.B. during the period of existence of the P.F.B. to be authorized to act as a corporate body in making such preparatory arrangements, within the framework of their Statutes, as they may consider necessary for the effective discharge of their later duties,

Resolves:

a) That during the period from 1st January 1948 until the new International Frequency List is adopted by an Administrative Radio Conference, the duties of the members of the I.F.R.B. shall conform to those laid down in the Resolution pertaining to the Preparation of the New International Frequency List;

b) That as from the date when the new International Frequency List is approved by an Administrative Radio Conference;

—The members of the I.F.R.B. shall be bound solely by the Satutes of the Board as laid down in articles 10, 11 and 12 of the Radio Regulations;

—The procedure laid down in article 11 shall be brought into force;

c) That, however, during the period of existence of the P.F.B., the I.F.R.B. may act as a corporate body in making such preparatory arrangements, within the framework of their Statutes, as they may consider necessary for the effective discharge of their later duties as defined in *b*) above.

RESOLUTION RELATING TO THE PREPARATORY COMMITTEE OF EXPERTS

To consider coordination of activities within the fields of Aviation, Shipping and Telecommunication in regard to Safety at Sea and in the Air.

Whereas:

A. The following resolution was adopted by the Economic and Social Council of the United Nations on March 28th, 1947, on coordination of activities in the fields of Aviation, Shipping and Telecommunications in regard to Safety at Sea and in the Air :

"After considering this suggestion of the Transport and Communications Commission concerning the coordination of activities in the fields of aviation, shipping and telecommunications in regard to Safety at Sea and in the Air, the economic and social council takes note of the fact that the United Kingdom government, having convened the conference on Safety of Life at Sea, is prepared to invite the necessary experts in the fields mentioned and also preliminary to the Conference to convene the Preparatory Committee of Experts to consider the coordination of activities in these fields.

"The Economic and Social Council instructs the Secretary General :

—"To continue the preliminary study of the problem which has already been commenced,

—"To follow and assist the work of the Preparatory Committee and of the Conference itself.

—"And to keep the Transport and Communications Commission informed of developments in this connection" ;

B. And a proposal was made by the United Kingdom (Document No. 539 R, Proposal 2550 R) that the International Radio Conference of Atlantic City (1947) proceed to nominate three persons, expert in the particular fields of telecommunications in regard to Safety at Sea and in the Air, to represent the interests of the I.T.U. on the Preparatory Committee.

The International Radiocommunications Conference of Atlantic City (1947) :

1. *Designates* the following, subject to the consent of the respective governments :

—Arnold Poulsen, Adviser to Ministry of Commerce, Industry and Shipping, Denmark

—Colonel A. H. Read, O.B.E., Inspector of Wireless Telegraphy, General Post Office, United Kingdom

—Edward M. Webster, Commissioner, Federal Communications Commission, United States

—René Petit (Alternate), Chief Engineer, Telegraph and Telephone Services, France

—A. J. W. van Anrooy (Alternate), Superintendent of Marine Radio Communications, Netherlands ;

2. *Authorizes* the Secretary General of the Union :

a) To arrange for the attendance of an alternate if advised of the unavailability of one of the three principals to participate in the meeting of the Preparatory Committee ;

b) To arrange with each of the attending representatives for the provision of a secretary and a technical assistant, should these be required ;

c) To pay the travel and other necessary expenses of the I.T.U. representatives of the Preparatory Committee (and of secretarial and technical assistants where these are needed by each of the representatives attending)

3. *Instructs* the designated representatives as follows :

a) Subject to the limitations of the present Convention, to cooperate with the representatives of the other organizations participating on the Preparatory Committee in the formulation of a draft program for the coordination of activities to the extent that the provisions of such program shall not be in conflict with the provisions, aims and principles of the International Telecommunications Convention of Atlantic City (1947) and Radio Regulations of Atlantic City (1947) ;

b) To submit a joint report to the Secretary General of the Union upon termination of the Preparatory Meeting, such report to include :

(1) Draft of the program for coordination arrived at by the Preparatory Committee ;

(2) Recommendations as to the acceptance or non-acceptance by the I.T.U. of the provisions included in such draft program ;

(3) Recommendations as to the representation of I.T.U. at the forthcoming Safety of Life at Sea Conference, including any specific instructions believed necessary for the guidance of any representatives at that Conference.

4. *Requests* the Secretary General :

a) To accept, on behalf of the I.T.U., the official invitation, when received, which in accordance with Document No. 539 R will be issued by the United Kingdom to appoint representatives to the Preparatory Committee ;

b) To advise each of the designated representatives in writing of his designation and status, and to furnish each with copies of such material produced by

the Atlantic City Conference as may be necessary for his participation in the Preparatory Meeting ;

c) To forward the report of the representatives to each administration participating in the Atlantic City Conference, with the request that such administrations consider the recommendations made therein, in the proposals which they will submit to the Safety of Life at Sea Conference ;

d) To arrange for the representation of I.T.U. at the forthcoming Safety of Life at Sea Conference should such representation be recommended by the I.T.U. representatives named herein.

Note : The International Telecommunications Convention of Atlantic City (1947) having provided for the establishment of an Administrative Council which shall take office prior to the convening of the Safety of Life at Sea Conference, the designation of I.T.U. representatives at that Conference will be subject to the approval of such Administrative Council.

Recommendation to the Governments Signatory to the International Convention for the Safety of Life at Sea[1]

Specifications of Performance for the Automatic Alarm Receiving Device

The International Radio Conference of Atlantic City, considering that there is a need for uniform technical specifications of performance for the automatic alarm receiving device more detailed than the general principles set forth in article 37 of the Radio Regulations, and recognizing that the International Convention for the Safety of Life at Sea states the conditions relating to the installation and use of the automatic alarm receiving device on ships, recommends :

1st That the next conference for the revision of the International Convention for the Safety of Life at Sea consider the adoption of detailed technical specifications of performance for the automatic alarm device based upon the general principles contained in article 37 of the Radio Regulations.

2nd That, for that purpose, the Governments parties to the International Convention for the Safety of Life at Sea submit all the necessary proposals to the said Conference.

[1] League of Nations, *Treaty Series*, Vol. CXXXVI, p. 81 ; Vol. CXLII, p. 393 ; Vol. CXLVII, p. 354 ; Vol. CLVI, p. 257 ; Vol. CLX, p. 417 ; Vol. CLXIV, p. 394 ; Vol. CLXXII, p. 423 ; Vol. CLXXVII, p. 420 ; Vol. CLXXXV, p. 406 ; Vol. CC, p. 513, and United Nations, *Treaty Series*, Vol. 34, p. 427 ; Vol. 92, p. 434 ; Vol. 136, p. 411 ; Vol. 182, p. 296 ; Vol. 185, p. 410, and Vol. 190, p. 395.