Recommendation T/R 25-08 (Lecce 1989)

COORDINATION OF FREQUENCIES IN THE LAND MOBILE SERVICE IN THE RANGE 29.7-960 MHz

Recommendation proposed by Working Group T/WG 15 "Radio Administration, Regulation and Frequency Management" (RARF)

Text of the Recommendation adopted by the "Telecommunications" Commission:

"The European Conference of Postal and Telecommunications Administrations,

considering

a) that the rapid development of the land mobile service makes the problem of assigning frequencies increasingly difficult,

b) that each new frequency assignment must be coordinated with frequencies already assigned in the same geographical area,

c) that the probability of obtaining a successful coordination diminishes rapidly as a function of the number of radio stations,

d) that coordination is often required for frequency assignments for use distant from the border,

e) that the difficulties encountered with this coordination depend on a great number of parameters (technical, operational or topographical),

f) that in order to facilitate coordination and to avoid inefficient frequency usage in border areas, a large number of parameters (technical and operational) need to be standardized,

g) that it is desirable that channelling arrangements for the land mobile services be harmonized,

h) that use of the same type of modulation would also facilitate coordination between Administrations,

i) that in order to reduce the risks of harmful interference and facilitating coordination, the lowest possible antenna height and the lowest possible radiated power, and wherever possible, directional antennas should normally be used,

j) that agrements have successfully been concluded between some CEPT Administrations and some non-CEPT Administrations concerning coordination of frequencies for the land mobile service,

k) that the CEPT Recommendation T/R 75-02 E gives the sub-bands to be used in the band 862-960 MHz,

recommends

that CEPT member Administrations should endeavour to comply with the following provisions when assigning frequencies to stations in the land mobile service, particularly in border areas, where coordination with neighbouring countries is necessary:

1. PROVISIONS RELATED TO OPERATING CONDITIONS AND CHOICE OF FREQUENCIES

1.1. Re-utilization of frequency bands for similar types of use in different countries

Whenever practicable the same frequency sub-bands should be allocated in the different countries for similar type of use, like public mobile services, railways, life-saving services for cross-border links, etc.

1.2. Choice of frequency band and useful range

For reasons of frequency economy, frequencies in the higher bands should be utilized if a short range network is adequate, taking into account the nature of communications under consideration.

The following values could be used as a basis for the useful ranges:

Frequency Band	Useful Range
40 MHz	approximately 35 km
80 MHz	approximately 25 km
160 MHz	approximately 20 km
460 MHz	approximately 10 to 15 km
900 MHz	approximately 5 to 10 km

These figures are valid for relatively uneven ground.

1.3. **Shared frequencies**

In frontier areas, common frequencies (see Recommendation T/R 21-03 E) may be shared between certain users in adjacent countries in order to make the most effective use of the frequency spectrum. Such shared frequencies shall be frequencies assigned in a particular region to users with similar traffic conditions and using technically comparable equipment. The number of stations per channel should be coordinated between the Administrations concerned.

1.4. **Multi-channel mobile stations**

To the extent that efficient use of frequencies calls for the utilization of several base stations transmitting on different frequencies rather than a single wide-range station, multi-channel mobile stations should be preferred despite the operational difficulties to which they can give rise.

2. PROVISIONS OF A TECHNICAL NATURE

(For bands I and III see also Recommendations T/R 02-01 E and T/R 25-05 E respectively.)

2.1. **Channelling**

Administrations which have not yet made a definitive selection for the purpose of designating nominal frequencies or who intend to change the range of nominal frequencies should select nominal frequencies within the ranges:

47.000 MHz + n × 12.5 kHz
68.000 MHz + n × 12.5 kHz
146.000 MHz + n × 12.5 kHz
174.000 MHz + n × 12.5 kHz
406.1 MHz + n × 12.5 kHz
450.000 MHz + n × 12.5 kHz

(n = 1, 2, 3, 4, ...) for 12.5 kHz channel arrangements

(n = 1, 3, 5, 7, ...) for 25 kHz channel arrangements

862.0125 MHz + n × 25 kHz

(n = 0, 1, 2, 3, ...)

Interleaved channels in the 900 MHz band with a central frequency given by the series:
862.025 MHz + n × 25 kHz
(n = 0, 1, 2, 3, ...)
may also be used but are subject to the agreement of the Administrations affected.

Other channel arrangements may be appropriate for digital systems with channel spacing larger than 25 kHz.

2.2. **Channel spacing**

The channel spacing should not exceed 25 kHz for analogue systems. In the 900 MHz range, the channel spacing should be 25 kHz for analogue systems.

2.3. **Frequency spacing in a duplex or two- frequency simplex channel and location of sub-bands**

In so far as Administrations are in a position to define the spacing, the following values and the respective positions of the sub-bands given in Annex 2 should be taken into consideration:

80 MHz band	*
160 MHz band	4.6 MHz
420 MHz band	10.0 MHz
460 MHz band	10.0 MHz
900 MHz band	45.0 MHz

If possible, the frequencies of emission of base or repeater stations should be placed in the upper band and those of mobile stations in the lower band. The same positions of upper and lower bands should be selected for bordering/adjacent countries (see examples in Annex 2).

2.4. **Modulation**

For analogue transmission in the land mobile service, angle modulation should be used.

* Amongst the various spacings used in the 80 MHz band, a spacing of 9.8 MHz is used by several countries.

2.5. **Propagation curves**

The curves contained in Annex 1 should be used to determine the interference field-strength. For special cases including sea path propagation, Administrations may agree upon other curves or determination of field-strength in the frequency band 250-400 MHz where curves do not exist.

2.6. **Correction factors**

For the 900 MHz band a general correction factor of −2 dB should be used. The following correction factors should be used for receiving antennas from 10 to 3 metres.

Frequency Band	< 50 km	> 100 km
29.7-400 MHz	− 8 dB	−5 dB
400 -960 MHz	−10 dB	−3 dB

Linear interpolation shall be used for intermediate distance.

2.7. **Effective antenna height**

The effective antenna height used to determine the interfering field-strength is the difference between the physical height of the antenna and the average height of the terrain. The evaluation of the average height of the terrain is subject to the agreement between Administrations.

2.8. **Permitted interference field-strength**

The following values of permitted interference field-strength are valid for co-channel operation for 50% of locations and 10% of time.

0 dB above 1 μV/m for frequencies between 29.7 and 47 MHz
6 dB above 1 μV/m for frequencies between 47 and 108 MHz
12 dB above 1 μV/m for frequencies between 108 and 400 MHz
20 dB above 1 μV/m for frequencies between 400 and 606 MHz
26 dB above 1 μV/m for frequencies between 606 and 960 MHz

When using different nominal frequencies, the permitted interference field-strength may be increased as indicated in Annex 4.

2.9. **Network characteristics**

The location, the power and the antenna heights of all stations in the network must be selected in such a way that their range is confined, as far as possible, to the zone to be covered.

Excessive antenna heights and transmitter outputs should be avoided, by using several locations of reduced height wherever possible. In border areas directional antennas should be used in order to minimize the interference potential.

The effective radiated power and the effective height of the antenna should be as low as possible in relation to the area to be served. Wherever practicable, the effective radiated power should not exceed 25 Watts.

3. PROVISIONS ON COORDINATION OF FREQUENCY ASSIGNMENTS BETWEEN ADMINISTRATIONS

3.1. **Frequency assignments to be coordinated**

Every frequency assignment in border areas shall be coordinated with neighbouring countries, the border area being understood as the area lying on either side of the common border of the countries concerned, such that a transmitter operating within that area produces a field-strength, at the border between the Administrations concerned, which at a height of 10 metres above ground level exceeds for 50% of locations and 10% of the time maximum permitted interference field-strength as defined in section 2.8.

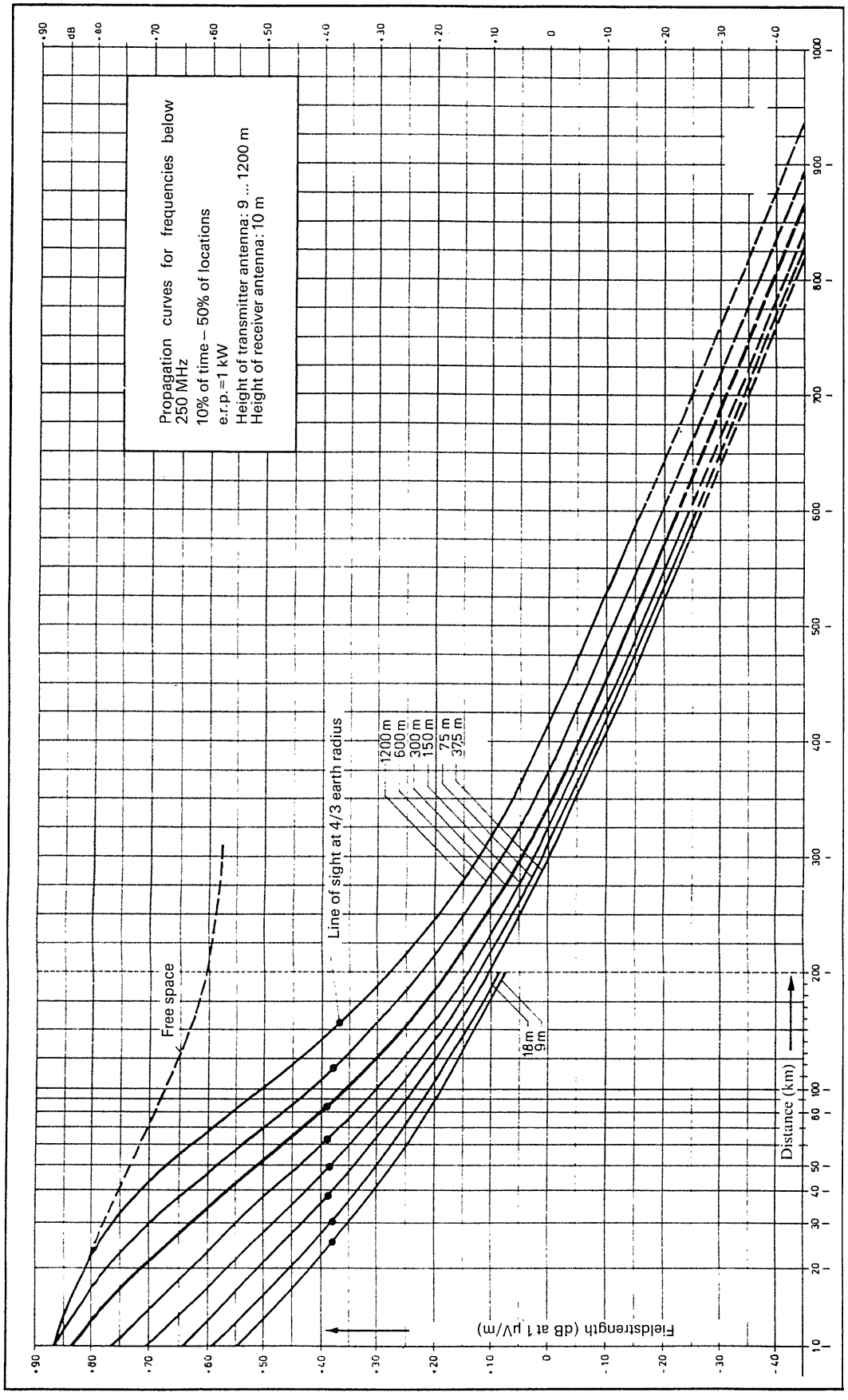
For the purpose of protecting receivers, a maximum permitted radiated power of 25 Watts can be taken as the basis for evaluating the field-strength.

3.2. **Characteristics to be exchanged**

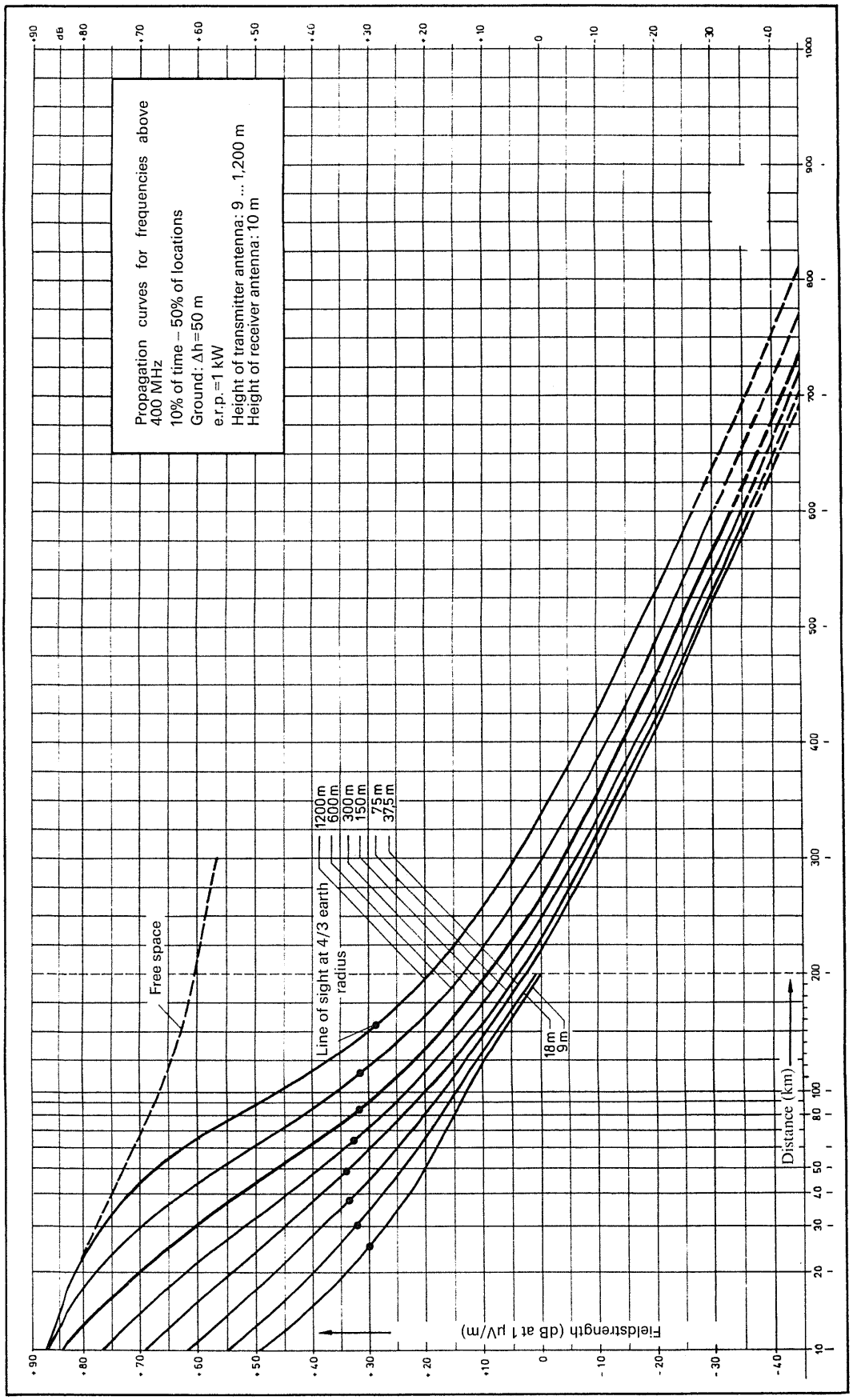
When requesting coordination the relevant characteristics of the base station (see Annex 3) shall be forwarded to the Administration affected."

Annex 1

PROPAGATION CURVES FOR FREQUENCIES BELOW 250 MHz (29.7-250 MHz)

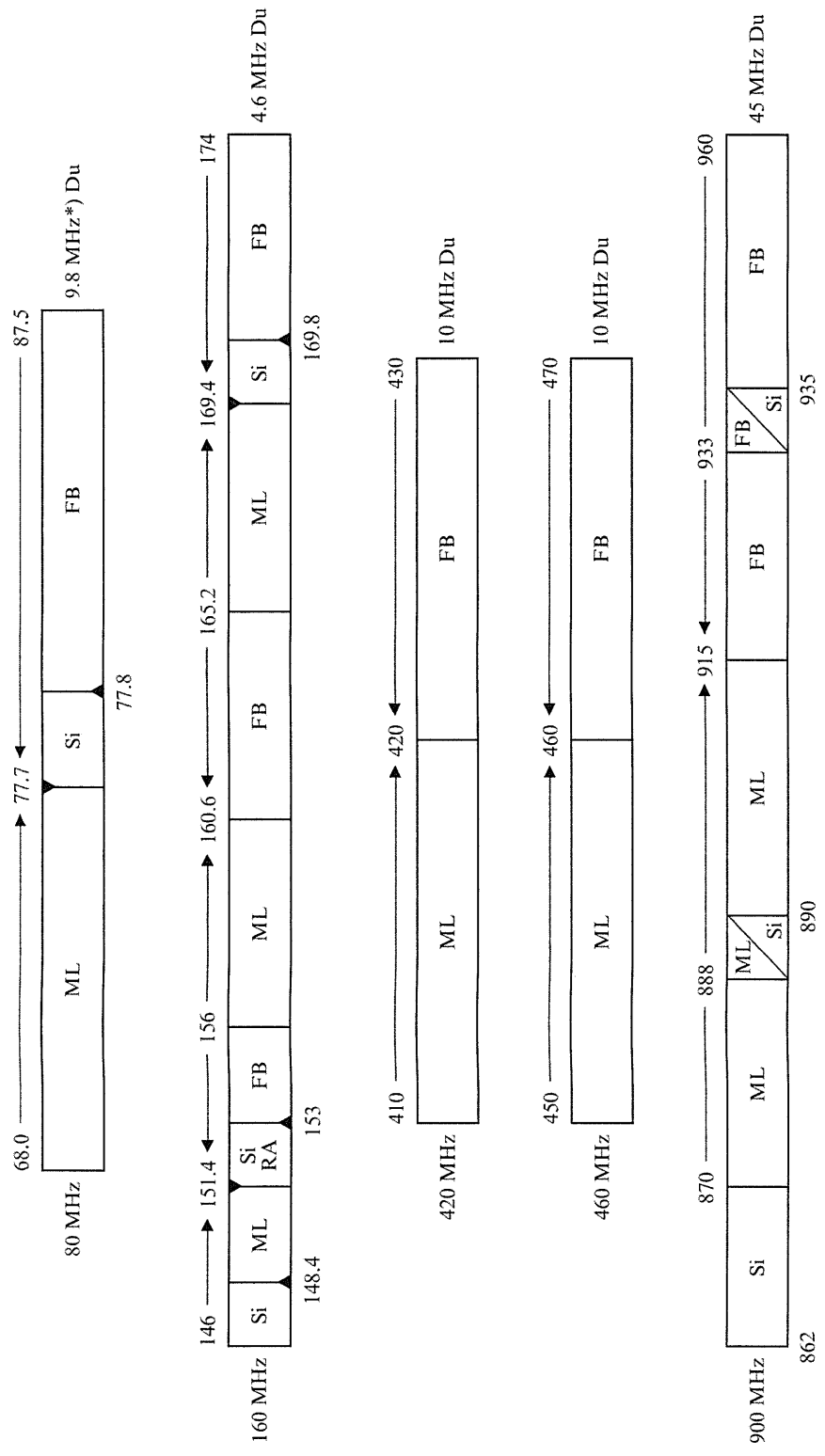


PROPAGATION CURVES FOR FREQUENCIES ABOVE 400 MHz



Annex 2

DUPLEX SPACING AND USE AND LOCATION OF UPPER AND LOWER BANDS



Key to symbols:

Du Mode of operation: duplex
FB Base station
ML Mobile station
Si Mode of operation: simplex
——▲ Position of corresponding higher duplex band
——▼ Position of corresponding lower duplex band

* Amongst the various spacings used in the 80 MHz band, a spacing of 9.8 MHz is used by several countries.

Annex 3

SCHEDULE OF INFORMATION NECESSARY FOR COORDINATION OF FREQUENCY ASSIGNMENT

Column	Characteristic	Number of Characters (1)	Remarks
1A	Assigned frequency	XXXXX,XXXXX k M G	Units: k, M or G
1Z	Frequency category	X	According to Appendix 1
6A	Class of station	XX	According to codes in Appendix 2
6B	Nature of service	XX	According to codes in Appendix 3
6Z	Category of use	XX	According to codes in Appendix 4
2C	Date of bringing into use	DD.MM.YY	
2Z	Date of achieving coordination	DD.MM.YY	
4A	Name of transmitting station or zone of use	20 characters	Use abbreviations in Appendix 5 Code: LCL not permitted
4B	Country	XXX	According to codes in Appendix 6
4C	Geographical coordinates – of the transmitter site – of the centre of the transmitting area	E N XXXWXXXX/XXSXXXX 15 characters 15 characters	Longitude and latitude, in degrees, minutes and seconds
4D	Radius of the transmitting area	XXXXX	In kilometres
4Z	Height of transmitter site above sea level	XXXX	In metres
7A	Designation of emission	XXXXXXXXX 7 obligatory + 2 optional	See RR Article 4 and RR Appendix 6
8B1	e.r.p. or e.i.r.p. of the base station	E for e.r.p. ± XXX,X I for e.i.r.p.	In dBW
8B2	e.r.p. or e.i.r.p. of the mobile station		
10B	Normal hours of operation	HJ XXXX XXXX or HN HT HX	Hours of first and last use of the frequency
9A	Azimuth of maximum gain of the antenna	XXX,X or ND	
9Z	Maximum effective height and azimuth in the direction of the neighbouring country affected	± XXXX/XXX	In metres Obligatory according to agreements between Administrations
		± XXXX	Optionally 12 effective heights in 12 predetermined directions (0°, 30°, 60°, etc.)
9D	Polarization	XX	According to codes in Appendix 7
9G	Gain in the direction of maximum radiation	XX,X	In dB – This information is associated with radiated power (column 8B1-8B2)
9Y	Height of the antenna above the ground	XXXX	In metres
9X	Antenna type according to Appendix 8	XXX/XX/XX	– Degrees – Diagram type (2 letters) – No definition (2 numbers)
5A	Name of receiving station or area of reception	20 characters	See column 4A
5C	Geographical coordinates – of the receiving station – of the centre of reception area	E N XXXWXXXX/XXSXXXX 15 characters 15 characters	Longitude and latitude in degrees, minutes and seconds
5F	Radius of reception area	XXXXX	In kilometres Obligatory for mobile receiving stations
1Y	Reception frequency	XXXXX,XXXXX k M G	Units: k, M or G
13Z	Observations	156- character field	Free
13Y	Status of coordination	X	According to codes in Appendix 9

(1) The separators (/.) and commas are shown in the table to improve understanding, otherwise they are not required.

Appendix 1 to Annex 3

COLUMN 1Z: FREQUENCY CATEGORIES

1 Preferential frequencies
2 Frequencies requiring coordination
3 Frequencies belonging to a geographical network plan
4 Frequencies intended for a planned radiocommunications network
5 Shared frequencies

Preferential frequencies

Frequencies which can be assigned by Administrations without prior coordination provided the range of the interference signal does not exceed that from a transmitter with technical characteristics fixed by prior agreement.

Frequencies requiring coordination

Those frequencies which Administrations are required to coordinate with the other Administrations concerned before a station is put into service.

Frequencies belonging to a geographical network plan

Frequencies assigned by Administrations on the basis of a geographical network plan prepared in advance and adopted by the Administrations concerned, taking into account the technical characteristics set out in that plan.

Frequencies intended for a planned radiocommunications network

Frequencies which the Administrations have coordinated at an early date with the Administrations concerned with a view to subsequent introduction of coherent networks on the basis of the technical characteristics set out in this Recommendation.

Shared frequencies

In frontier areas, common frequencies (see Recommendation T/R 21-03 E) may be shared between certain users in adjacent countries in order to make the most effective use of the frequency spectrum. Such shared frequencies shall be frequencies assigned in a particular region to users with similar traffic conditions and using technically comparable equipment. The number of stations per channel should be coordinated between the Administrations concerned.

Appendix 2 to Annex 3

COLUMN 6A: CLASS OF STATION

FB Base station
FC Coast station
FP Port station
FX Fixed station
FL Land station
ML Land mobile station
MR Radiolocation mobile station
MS Ship station
PL Combination of two or more classes of station (limited to collective entries made under the terms of RR 2184)

If other codes are required, use:
— codes listed in Appendix 10 of the Radio Regulations;
— codes listed in Table 6A1 of the Preface to the International Frequency List (IFL).

Appendix 3 to Annex 3

COLUMN 6B: NATURE OF SERVICE

CO Station open to official correspondence exclusively
CP Station open to public correspondence
CR Station open to limited public correspondence
CV Station open exclusively to correspondence of a private agency
FS Land station established solely for the safety of life
OT Station open exclusively to operational traffic of the service concerned

If other codes are required, use:
— codes listed in Appendix 10 of the Radio Regulations;
— codes listed in Table 6B1 of the Preface to the International Frequency List (IFL).

Appendix 4 to Annex 3

COLUMN 6Z: CATEGORY OF USE

A Airport services
B Railways (excluding mountain railways)
C Diplomatic corps
D Mountain railways
E Production, transport and distribution of energy (electricity, gas, water)
F Fire services
G Military (mainly for internal use)
H Radio relay networks
HH Local call
I Demonstration
K Public transport
L Subscriber installations, public mobile services, stand-by links
M Navigation (in ports, on the Rhine, etc.)
N Tests and research
O
P Security services (police, customs, etc.)
Q Entries not falling within other categories on this list (cordless microphones, etc.)
R TV and radio broadcasting (studio, news reporting)
S Rescue services (ambulances, doctors, water and mountain rescue)
T Other services provided by telecommunications Administrations
U Industrial operators
V Road traffic service
W Taxi and car hire firms
X Other private services
Y Reserved specific applications, not allocated
Z Other private multiple-use networks

Appendix 5 to Annex 3

COLUMNS 4A AND 5A: ABBREVIATIONS NORMALLY USED (FRENCH AND ENGLISH) WHEN THE NAME OF THE STATION EXCEEDS 20 CHARACTERS

Abbreviation	Explication	Explanation
B	Baie	Bay
BRDG		Bridge
C	Cap	Cape
CL	Central	Central
CP	Camp	Camp
CY	City	City
DPT	Département	Department
E	Est	East
ET	Etat	State
FT	Fort	Fort
FTR		Fire Tower
GF	Golfe	Gulf
GR	Grand	
HLL	Colline	Hill
HG		Harbour
I	Ile(s)	Island(s)
JN	Jonction	Junction
L	Lac	Lake
LSTN	Phare	Light Station
MT	Mont	Mount
MTN	Montagne(s)	Mountain(s)
N	{Nouveau {Nouvelle	New
NO	Nord	North
NTL	National	National
PK	Pic	Peak
PMPSTN	Station de pompage	Pump Station
PT	Port	Port (see HG)
RV	Rivière	River
S	Saint	Saint
STN	Station	Station
SO	Sud	South
TR	Tour	Tower
V	Ville	Town (see CY)
VLY	Vallée	Valley
W	Ouest	West

If additional abbreviations are required, those listed in Table 4A1 of the International Frequency List may be used.

Appendix 6 to Annex 3

COLUMN 4B: COUNTRY

Name	Code	Name	Code
AUSTRIA	AUT	MALTA	MLT
BELGIUM	BEL	MONACO	MCO
CYPRUS	CYP	NETHERLANDS	HOL
DENMARK	DNK	NORWAY	NOR
FINLAND	FNL	PORTUGAL	POR
FRANCE	F	SAN MARINO	SMR
GERMANY (Fed. Rep. of)	D	SPAIN	E
GREECE	GRC	SWEDEN	S
ICELAND	ISL	SWITZERLAND	SUI
IRELAND	IRL	TURKEY	TUR
ITALY	I	UNITED KINGDOM	G
LIECHTENSTEIN	LIE	VATICAN (City of the)	CVA
LUXEMBOURG	LUX	YUGOSLAVIA	YUG

For coordination with non-CEPT countries, use codes given in Table B1 of the Preface to the International Frequency List and the IFRB weekly circulars.

Appendix 7 to Annex 3

COLUMN 9D: POLARIZATION

Symbols used to indicate polarization

Polarization	Symbol	Definition
Horizontal linear	H	The electric field intensity vector is in the horizontal plane.
Vertical linear	V	The magnetic field intensity vector is in the horizontal plane.
Right-hand slant	SR	The electric field intensity vector is in the plane rotated 45 degrees clockwise from the vertical position, as seen from the transmitting point.
Left-hand slant	SL	The electric field intensity vector is in the plane rotated 45 degrees anti-clockwise from the vertical position, as seen from the transmitting point.
Right-hand circular or direct	CR*	The electric field intensity vector, observed in any fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a right-hand or clockwise direction.
Left-hand circular or indirect	CL*	The electric field intensity vector, observed in any fixed plane, normal to the direction of propagation, whilst looking in the direction of propagation, rotates with time in a left-hand or anti-clockwise direction.
Dual	D	When substantially equal-amplitude vertically–and horizontally–polarized components are radiated without particular control of the phase relation between them. Typically, the vertically–and horizontally–polarized sources may be displaced on from the other so that the resultant polarization varies between circular and slant, according to azimuth angle.
Mixed	M	The collective term applied when both vertical and horizontal components are radiated, embracing slant, circular and dual polarization.

* Administrations should note that symbol "C", previously used to indicate circular polarization, is no longer used. Notifications received by the Board which use symbol "C" will be the subject of a request to the notifying Administration for clarification.

Appendix 8 to Annex 3

COORDINATION PROCEDURE: INDICATION OF ANTENNA DIRECTIONAL CHARACTERISTICS

Different antenna characteristics are described by approximation to the mean of a mathematical function and represented in the form of a curve in a system of polar coordinates.

There are nine typical groups of diagrams which are representative of the types of antennas used in practice. To identify these groups a two-letter code is used, the first letter indicating the beginning of the trace of the curve and the second its parameter:

Ellipse	EA, EB, EC, DE
Circle	KA
Lemniscate	LA
Cassini curve	CA, CB, CC

To identify a given curve belonging to one or other of the above-mentioned groups, the letter code is preceded by a number of not more than 3 digits and followed by a number of not more than 2 digits (figures corresponding to zero (0) may be omitted).

Meaning of the number preceding the letter code:

1. For groups EA, EB, EC, LA and DE, it provides an indication (in whole degrees) of the angle α formed at the intersection of the curve in question and a circle of radius $r = 1/\sqrt{2}$.
2. For groups KA, CA, CB and CC, it represents 100 times parameter "a" (the result should be expressed as a whole number).

Meaning of the number following the letter code:

In all areas where either a definition of the curve is absent or the relationship $\zeta < r$ applies, the function takes the value of r.

This number (also to be expressed as a whole number) indicates 100 times the value of r.

Circular antennas are designated by "ND".

Determination of relative gain B:

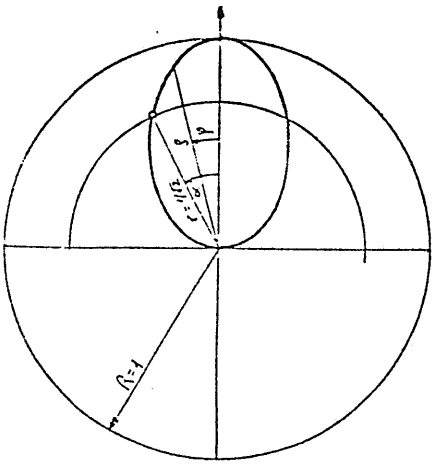
The curves are drawn within a system of polar coordinates with a uniform radius of 100 metres.

$$\zeta = \frac{U\psi}{U_{max}} = \frac{r\varphi}{R_e} = \frac{r\varphi}{100}$$

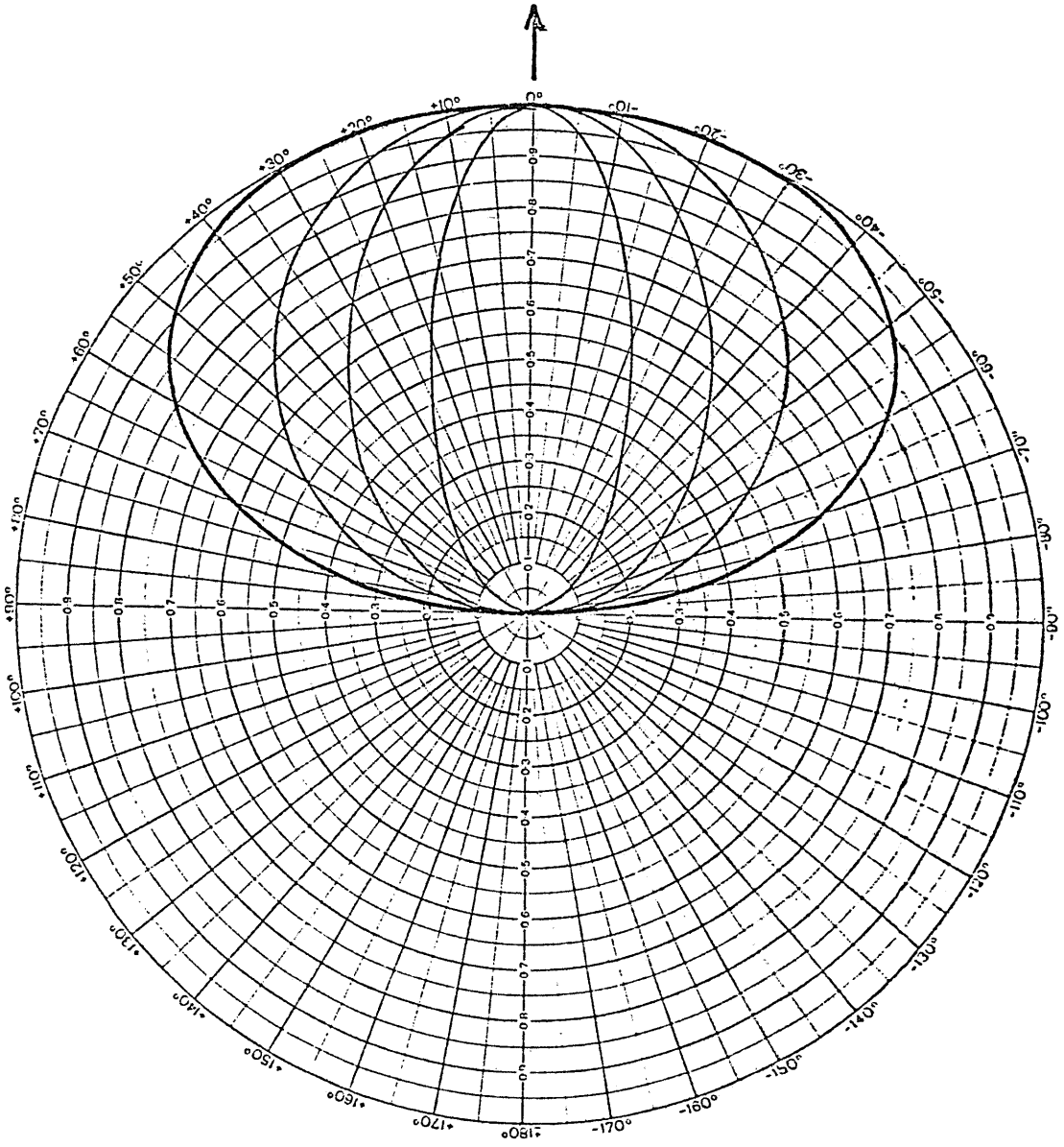
Relative gain in dB: $B = 20 \lg \zeta$

$$B = 10 \lg \frac{P\varphi}{P_{max}}$$

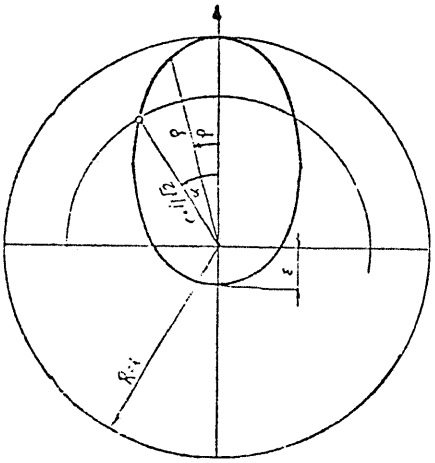
EA



Definition range
$0 \leqslant \alpha \leqslant 65°$
$-90° = \varphi = 90°$



EB



Definition range
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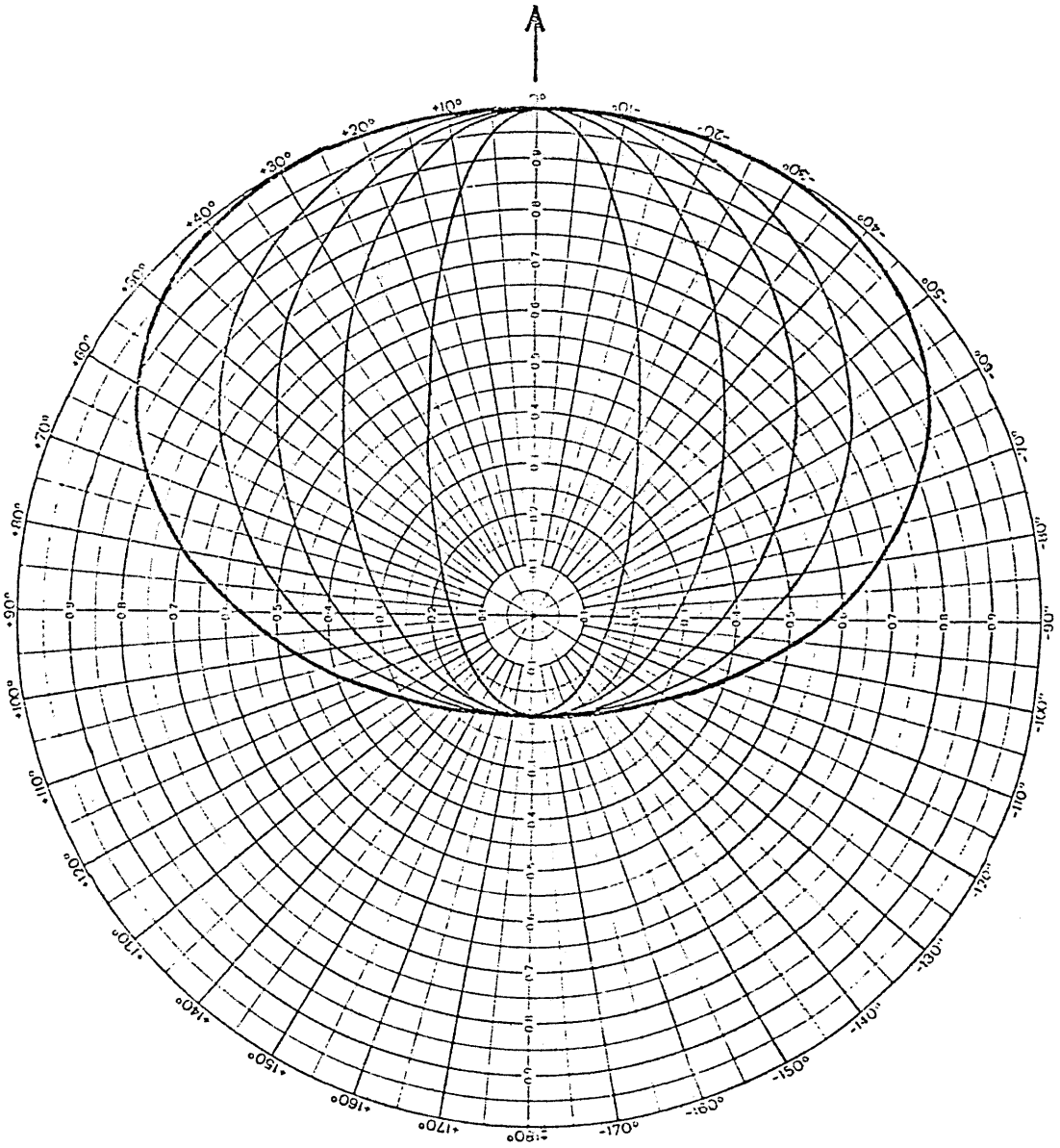
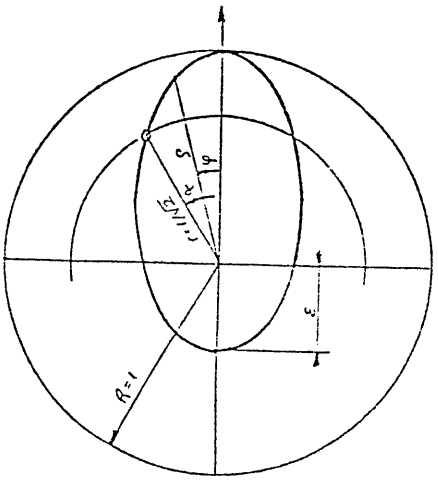
$-180° = \varphi = 180°$



EC



Definition range
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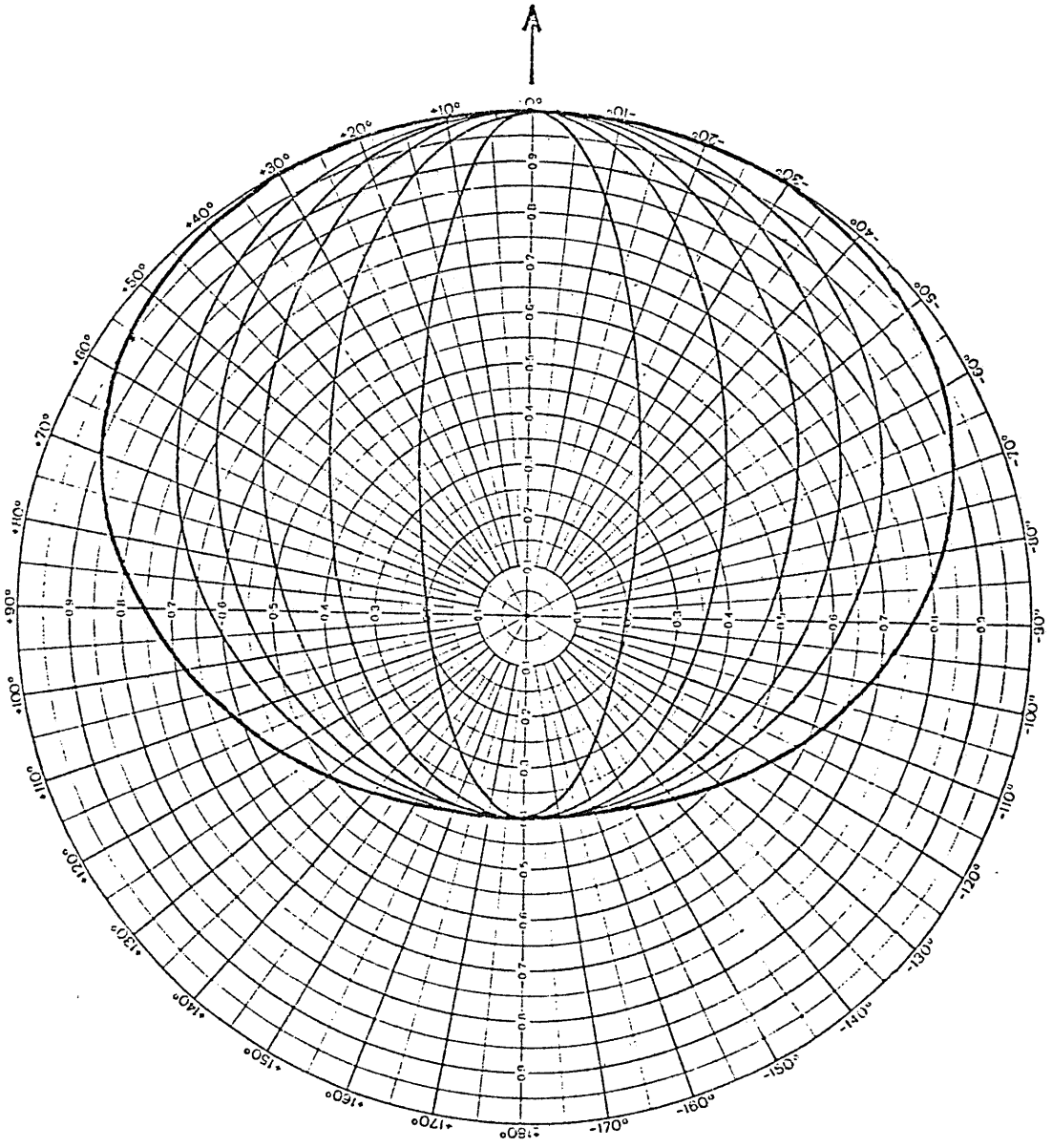
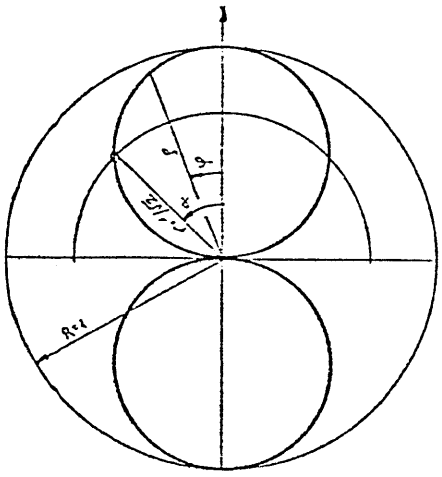
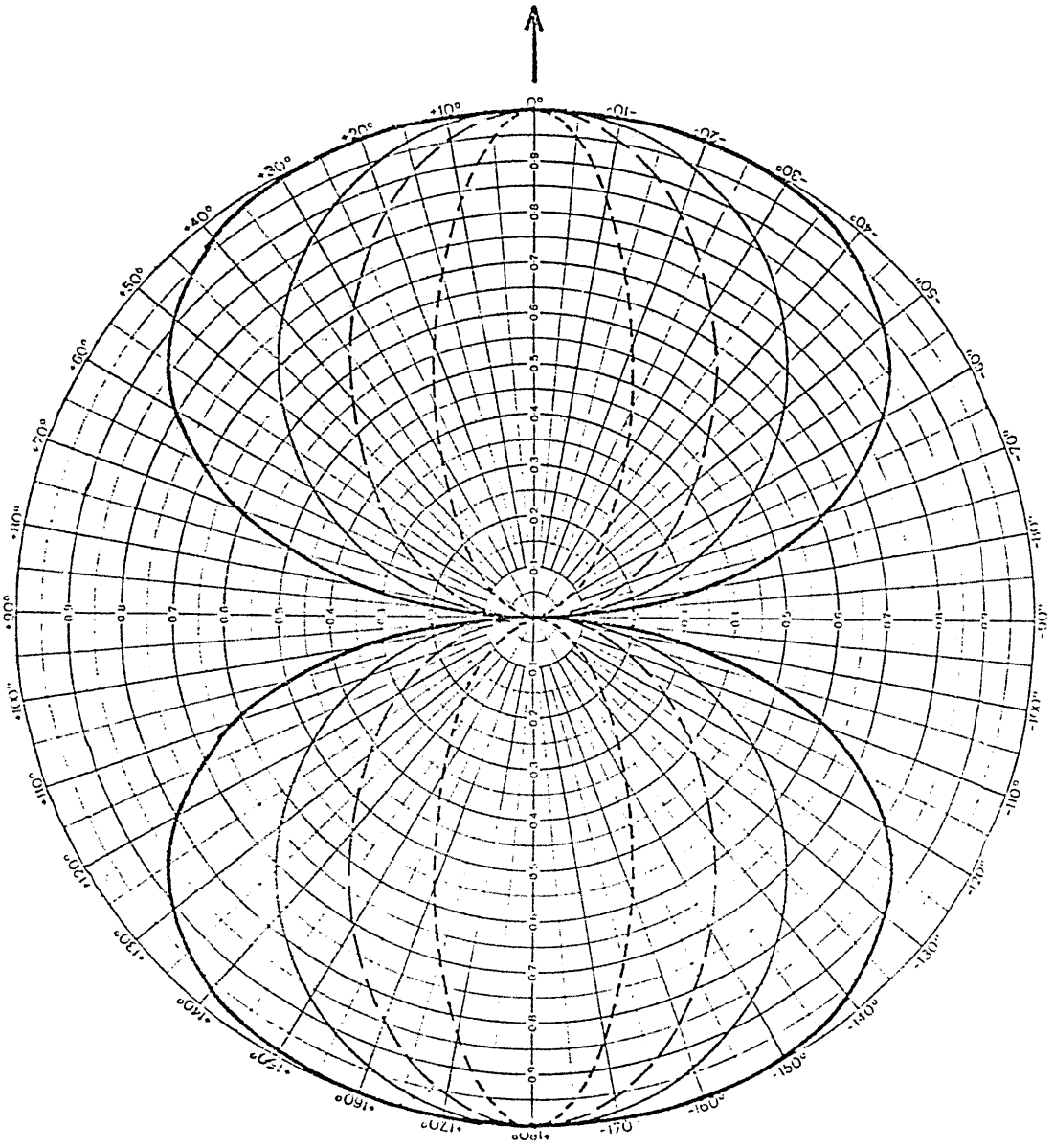
$-180° \leqslant \varphi \leqslant 180°$



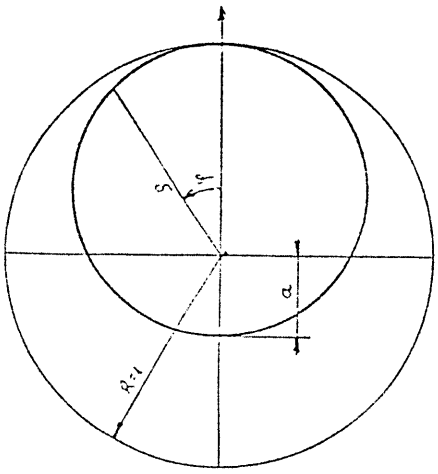
DE



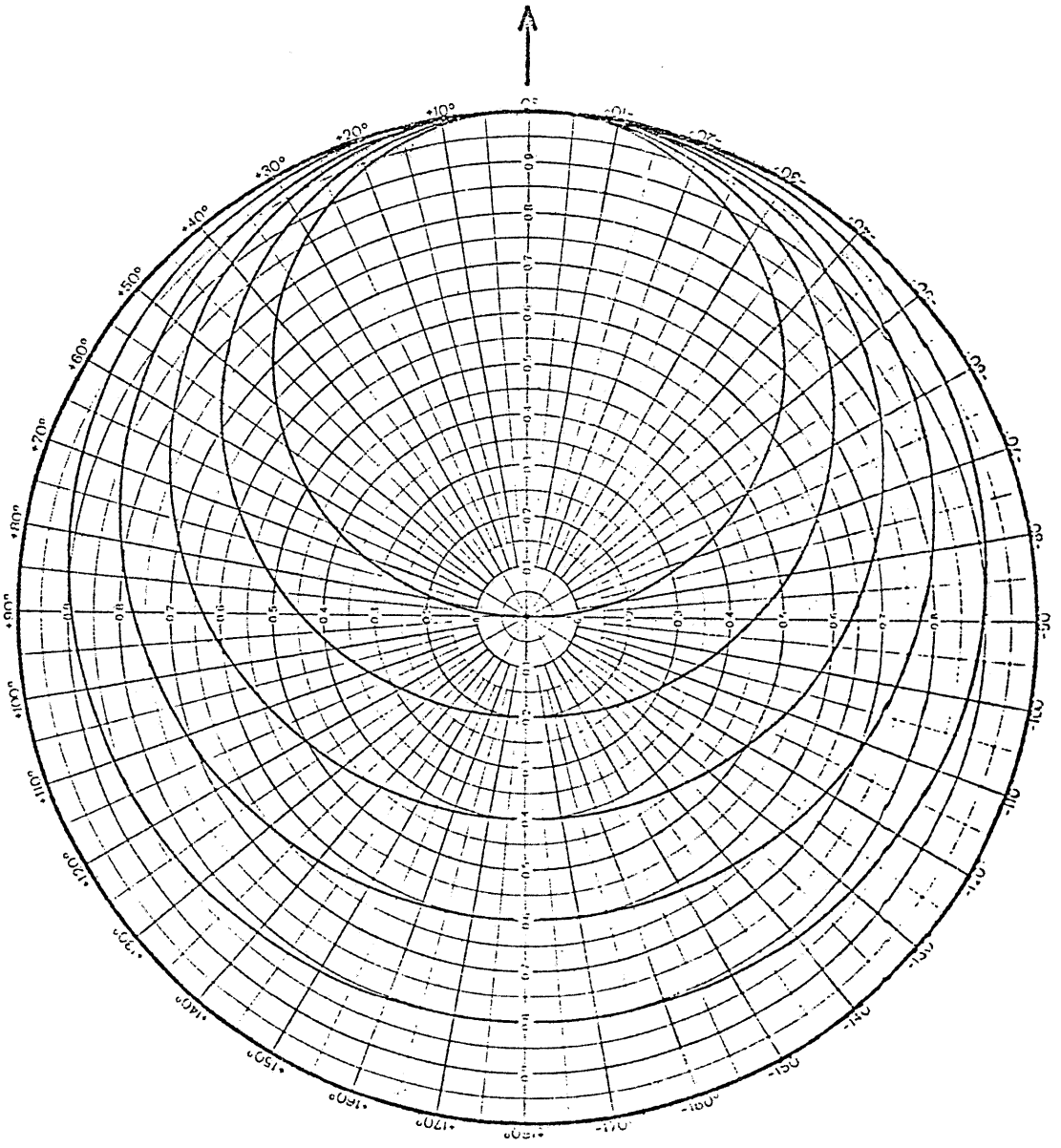
Definition range
$0 \leqslant \alpha \leqslant 65°$
$-180° \leqslant \varphi \leqslant 180°$



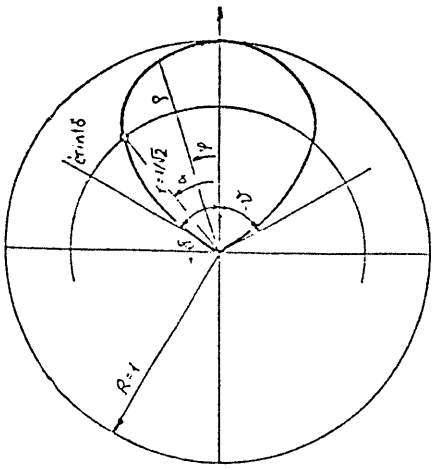
KA



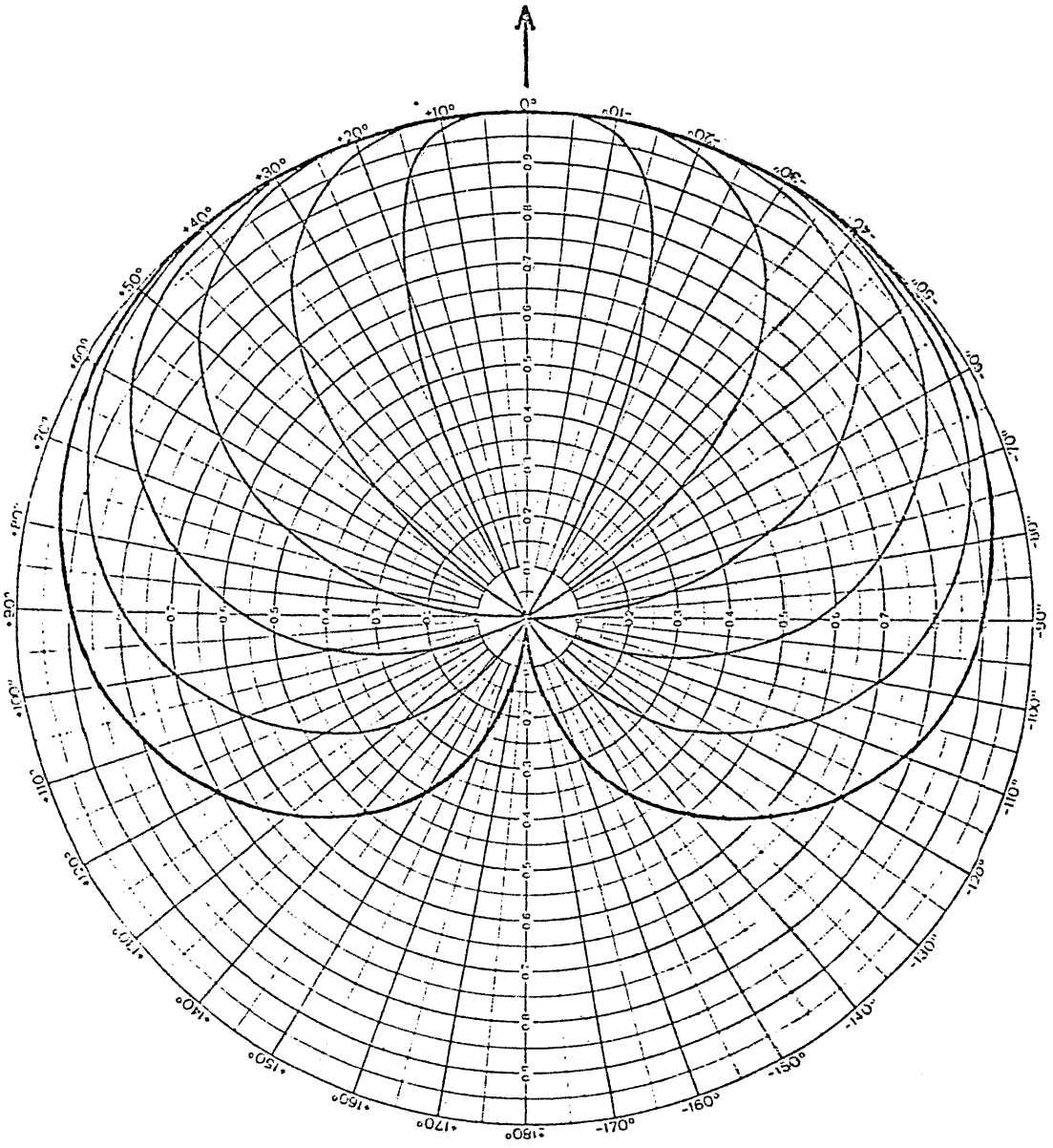
Definition range
$0 \leqslant \alpha \leqslant 1$
$a = 0: -90° \leqslant \varphi \leqslant +90°$
$a > 0: -180° \leqslant \varphi \leqslant +180°$



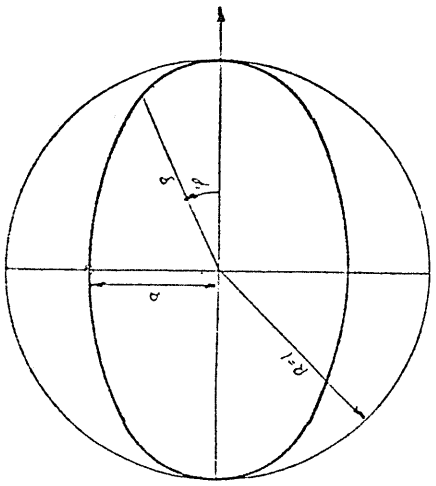
LA



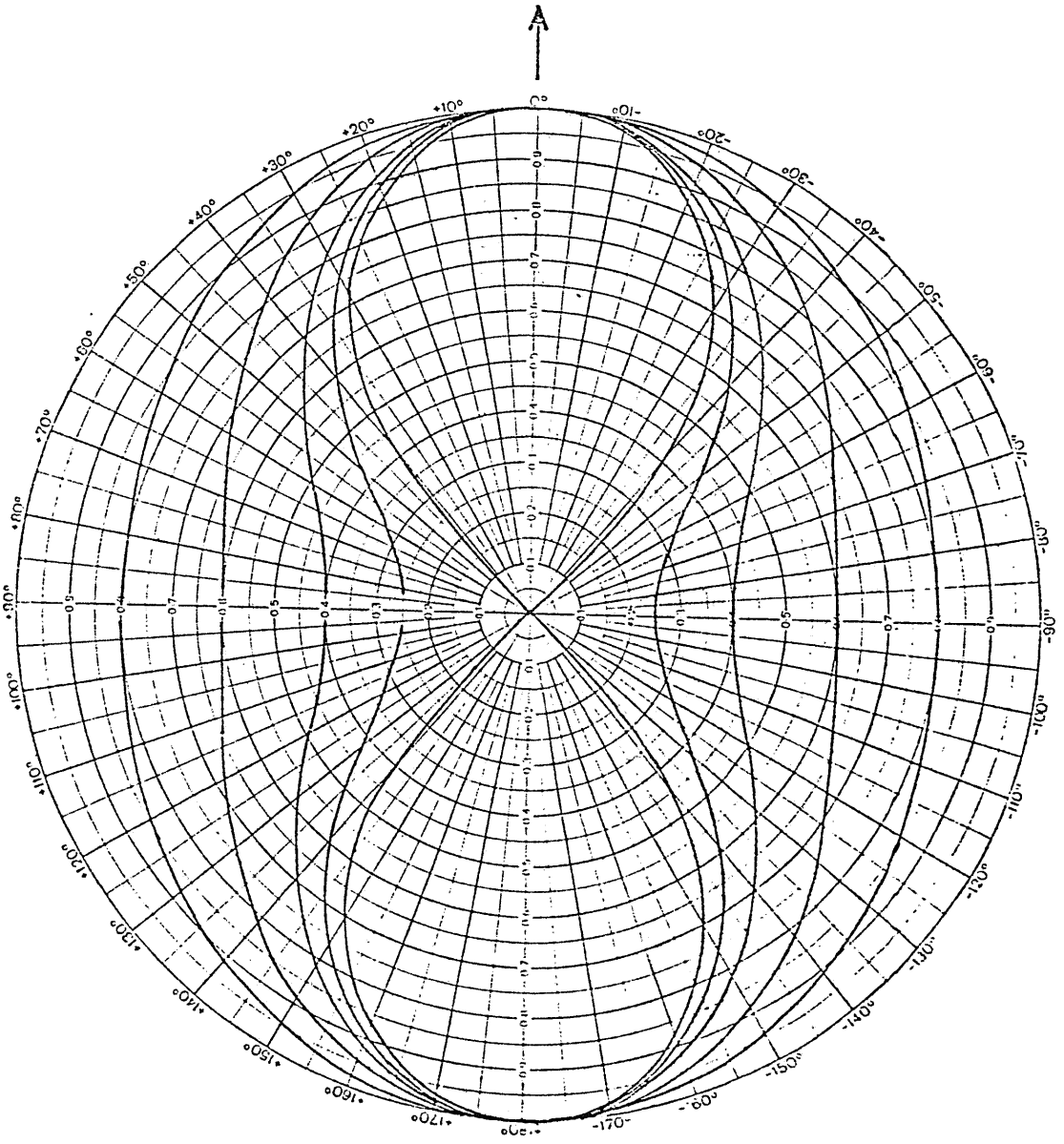
Definition range
$0 \leqslant \alpha \leqslant 120°$
$-1.5\ \alpha \leqslant \varphi \leqslant 1.5\ \alpha$



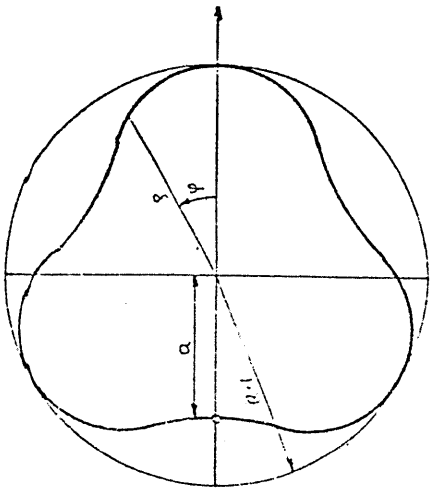
CA



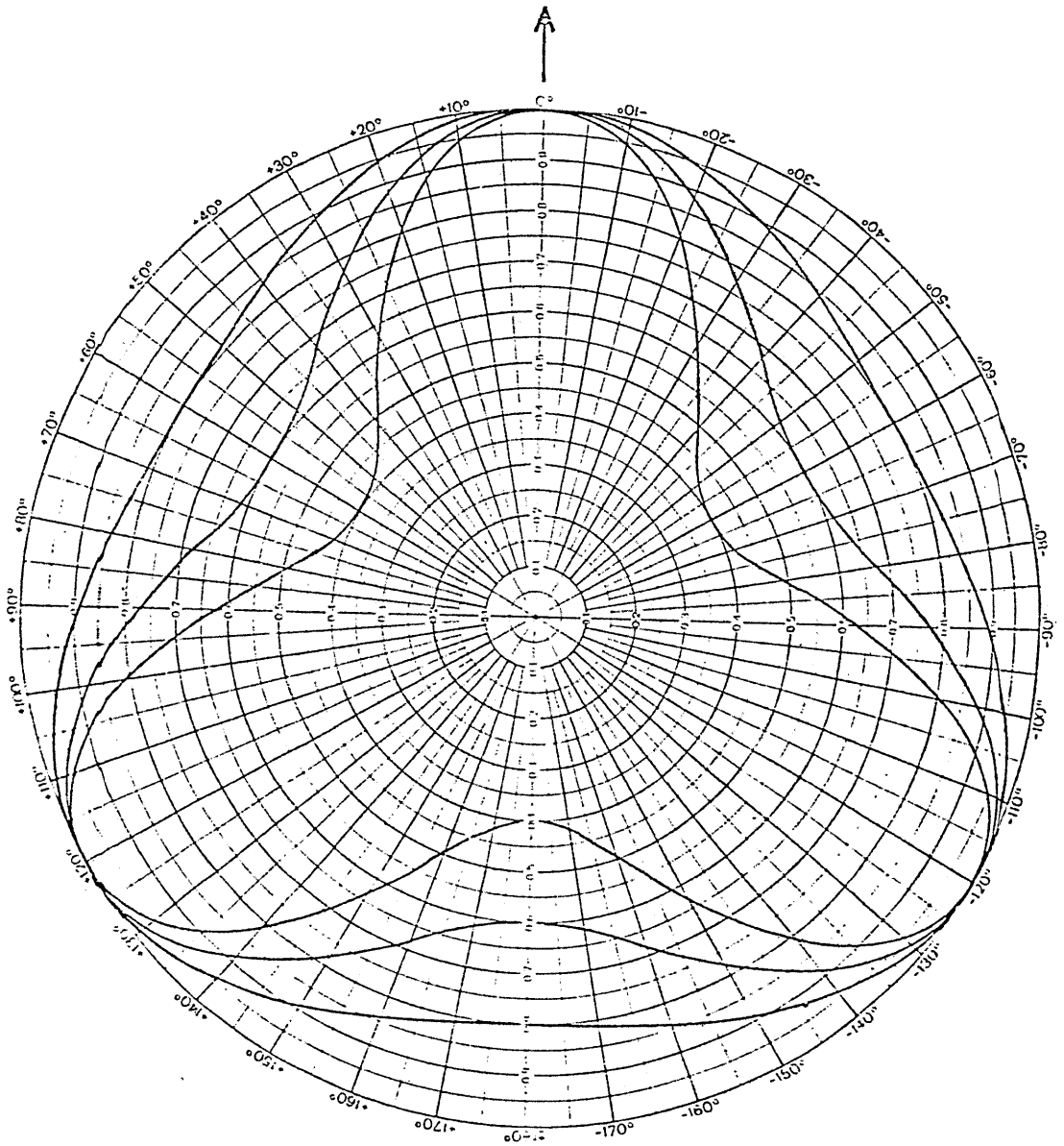
Definition range
$0 \leqslant \alpha \leqslant 1$
$-180° \leqslant \varphi \leqslant 180°$



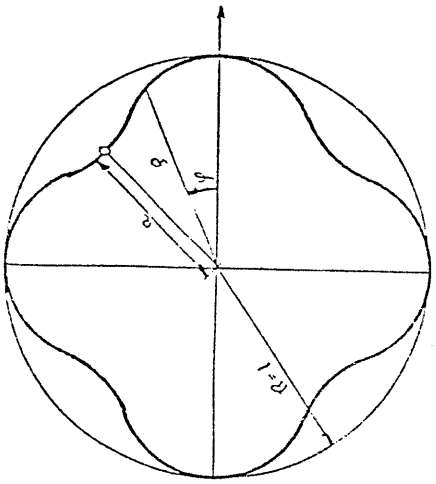
CB



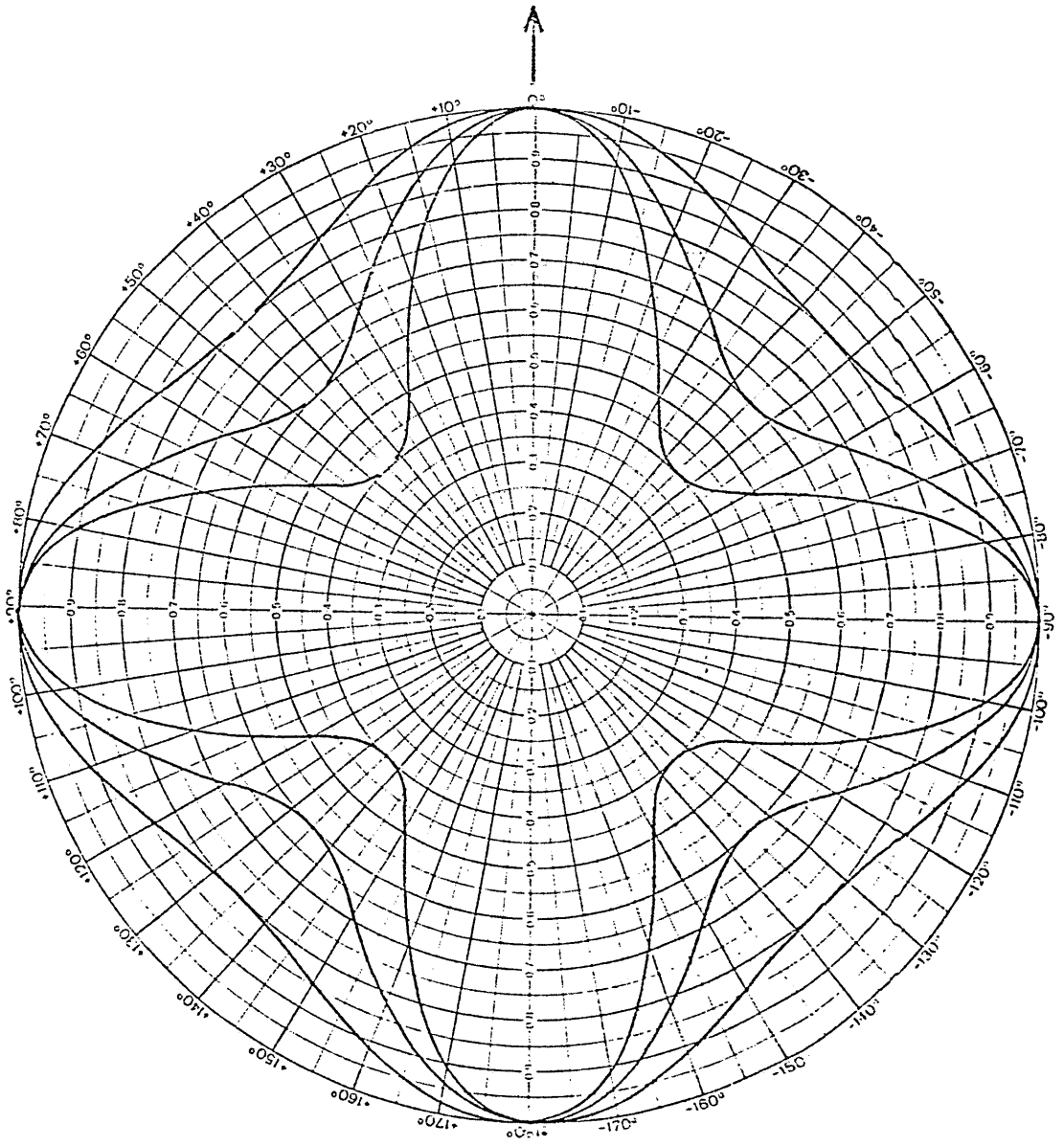
Definition range
$0 \leqslant a \leqslant 1$
$-180° \leqslant \varphi \leqslant 180°$



CC



Definition range
$0 \leqslant \alpha \leqslant 1$
$-180° \leqslant \varphi \leqslant 180°$



Appendix 9 to Annex 3

COLUMN 13Y: STATUS OF COORDINATION

A: For information: the assignment described has not acquired formal status.

B: Request for agreement.

C: Agreed without reservation.

D: Agreed subject to operational tests to show that coexistence is possible.

E: Agreement on a non-interference basis (NIB); revocation of the agreement and any request to cease the emissions in question requires proof that harmful interference has been caused to assignments whose status has already been established, which should normally be described in an associated notice.

F: Agreed, subject to a requirement identical or analogous to the requirement of RR 342.
Revocation of the agreement, and a requirement that emission cease without showing grounds remains possible.

G: Agreed, without any reservation as to interference which may be caused by the assignment described; the applicant is, however, informed that there is a risk of interference from assignments whose status has already been established, and that the responsibility for any such risk is his—one or more associated notices may be sent.

H: E + G.

Y: Request for agreement refused, but an alternative suggestion is formulated (in this case an associated notice should be circulated, 13Y being shown coded with an E).

Z: Request for agreement refused (n.b.: one or more associated notices may be circulated, referring to the assignments/frequencies to which the refusal applies).

FORM FOR THE COORDINATION OF FREQUENCY ASSIGNMENTS

Administration | New request ☐ | Modification ☐ | Cancellation ☐ | Notifying Administration

CHARACTERISTICS OF THE ASSIGNMENT

1A , k M G 1Z 1Y , k M G 2C 2Z 6A 6B 6Z 13Y

GEOGRAPHICAL CHARACTERISTICS OF TRANSMITTING BASE STATION

4A 4B

4C E W N S 4Z

GEOGRAPHICAL CHARACTERISTICS OF TRANSMITTING MOBILE STATION

4A M 4B 4C E W N S

4D

TECHNICAL CHARACTERISTICS OF TRANSMITTING STATION

7A 8B1 ± E I 8B2 ± E I 10B or HJ HN HT HX 9Z ± or ± ± 12 in total

9A , 9G , 9D 9Y 9X

GEOGRAPHICAL CHARACTERISTICS OF RECEIVING BASE STATION

5A

5C E W N S

GEOGRAPHICAL CHARACTERISTICS OF RECEIVING MOBILE STATION

5A

5C E W N S 5F

OBSERVATIONS

13Z

Modification: M at the left hand side of data which is being modified.
Suppression: S at the left hand side of data which is being modified.
Addition: A at the left hand side of data which is being modified.

INCREASE OF PERMITTED INTERFERENCE FIELDSTRENGTH AT DIFFERING NOMINAL FREQUENCIES CHANNEL SPACING OF INTERFERING TRANSMITTER

○: 12.5 kHz +: 20 kHz ★: 25 kHz

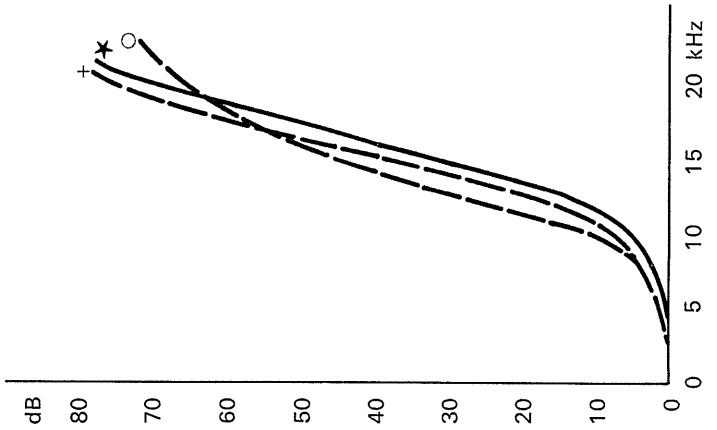


Figure 3 (T/R 25-08) E
Channel spacing of receiver
25 kHz

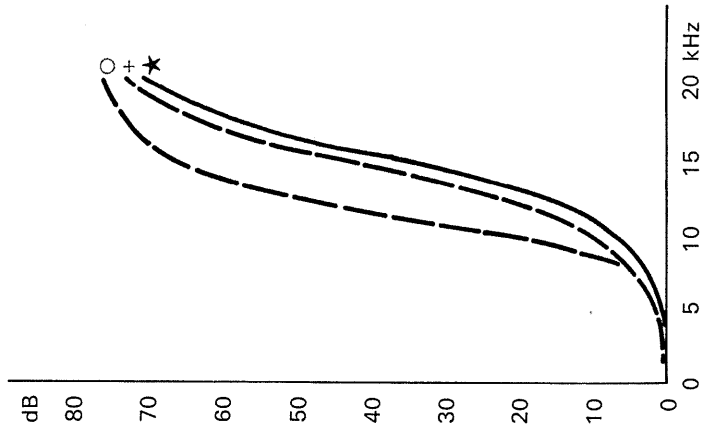


Figure 2 (T/R 25-08) E
Channel spacing of receiver
20 kHz

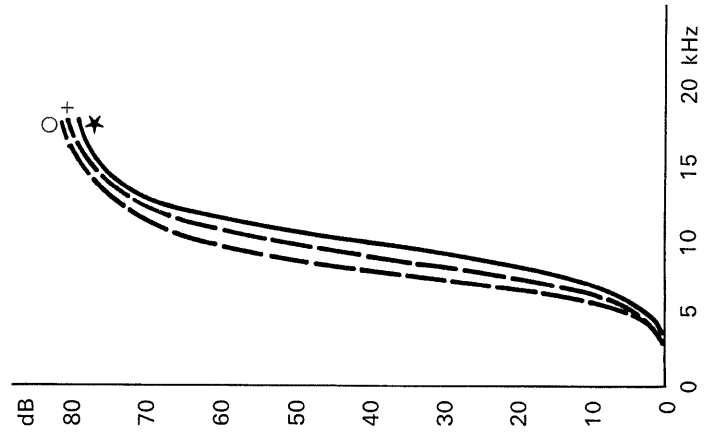


Figure 1 (T/R 25-08) E
Channel spacing of receiver
12.5 kHz