Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 – 1 705 kHz in Region 2

First Session, Geneva, 1986

REPORT TO THE SECOND SESSION OF THE CONFERENCE

(See Resolution 1)

General Secretariat
of the
International Telecommunication Union
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First Session of the
Regional Administrative Radio
Conference to Establish a Plan
for the Broadcasting Service
in the Band 1 605 - 1 705 kHz
in Region 2 (Geneva, 1986)

Geneva, 1 May 1986

The Chairman
of the Second Session of the
Regional Administrative Radio
Conference to Establish a
Plan for the Broadcasting
Service in the
Band 1 605 - 1 705 kHz in
Region 2

Dear Sir,

In accordance with Nos. 226 and 228 of the International Telecommunication Convention (Nairobi, 1982) and the provisions of Resolution 1 adopted by the First Session of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (Geneva, 1986), I have pleasure in enclosing the report by the First Session to the Second Session of the Conference.

Yours faithfully,

F. Savio C. PINHEIRO
Chairman

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INTRODUCTION

When allocating the band 1 605 - 1 705 kHz to the broadcasting service in Region 2, the World Administrative Radio Conference Geneva, 1979 (WARC-79), stated in its Recommendation 504 that the use of the band by the new service was subject to a broadcasting plan to be established by a regional administrative radio conference and recommended that such a conference be convened for Region 2.

The Plenipotentiary Conference (Nairobi, 1982) decided in its Resolution 1 that the Conference for Region 2 would be held in two sessions.

Pursuant to that Resolution, the Administrative Council, at its 39th session in 1984, after consulting the Region 2 Members, adopted Resolution 913 establishing the agenda, date and duration of the First Session of the Conference.

Consequently, the First Session of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 was held in Geneva from 14 April to 1 May 1986.

Under its terms of reference, the First Session decided, inter alia, as follows:

- this Report has been adopted for submission to the Second Session;
- the Allotment Plan for the broadcasting service shall contain one or more allotments for each country of Region 2 for possible inclusion in the Radio Regulations by a competent WARC;
- the Plan to be annexed to the Regional Agreement shall contain allotments and may contain assignments;
- the Plan shall not be based on requirements submitted by administrations;
- the Plan shall be based on the use of standardized parameters;

and adopted the Resolutions and Recommendations annexed to the present Report.

Apart from the technical criteria specific to the broadcasting service (such as propagation, technical standards, etc.), the First Session, under item 2.2 of its agenda, considered the problems of compatibility with the other services in the same band and provisionally defined sharing criteria.

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CHAPTER 1

DEFINITIONS, SYMBOLS AND UNITS

1.1 Definitions

In addition to the definitions given in the Radio Regulations, the following definitions and symbols apply.

1.1.1 Broadcasting channel (AM)

A part of the frequency spectrum, equal to the necessary bandwidth of AM sound broadcasting stations, and characterized by the nominal value of the carrier frequency located at its centre.

1.1.2 Nominal usable field strength (E_{nom})

Agreed minimum value of the field strength required to provide satisfactory reception, under specified conditions, in the presence of atmospheric noise, man-made noise and interference from other transmitters. The value of nominal usable field strength has been employed as the reference for planning.

1.1.3 Service area

The area delimited by the contour within which the calculated level of the groundwave field strength is protected from objectionable interference in accordance with the provisions of Chapter 3.

1.1.4 Audio-frequency (AF) signal-to-interference ratio

The ratio (expressed in decibels) between the values of the voltage of the wanted signal and the voltage of the interfering signal, measured under specified conditions, at the audio-frequency output of the receiver. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.5 Audio-frequency (AF) protection ratio

Agreed minimum value of the audio-frequency signal-to-interference ratio corresponding to a subjectively defined reception quality.

1.1.6 Radio-frequency (RF) signal-to-interference ratio

The ratio (expressed in decibels) between the values of the radio-frequency voltage of the wanted signal and of the interfering signal, measured at the input of the receiver under specified conditions. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.7 Radio-frequency (RF) protection ratio

The radio-frequency signal-to-interference ratio which, in well-defined conditions, makes it possible to obtain the audio-frequency protection ratio at the output of a receiver. These specified conditions include various parameters such as the frequency separation between the wanted carrier and the interfering carrier, the emission characteristics (type and percentage of modulation, etc.), levels of input and output of the receiver and its characteristics (selectivity, sensitivity to intermodulation, etc.).

1.1.8 Relative radio-frequency protection ratio

This ratio is the difference (expressed in decibels) between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of Δf (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

1.1.9 Daytime operation

Operation between the times of sunrise and sunset at the transmitter site.

1.1.10 Night-time operation

Operation between the times of sunset and sunrise at the transmitter site.

1.1.11 Station power

Unmodulated carrier power supplied to the antenna.

1.1.12 Groundwave

Electromagnetic wave which is propagated along or near the surface of the Earth and which has not been reflected by the ionosphere.

1.1.13 Skywave

Electromagnetic wave which has been reflected by the ionosphere.

1.1.14 Skywave field strength, 50% of the time

The skywave field strength during the reference hour which is exceeded for 50% of the nights of the year. The reference hour is the period of one hour beginning one and a half hours after sunset and ending two and a half hours after sunset at the midpoint of the short great-circle path.

1.1.15 Characteristic field strength (E_c)

The field strength, at a reference distance of 1 km in a horizontal direction, of the groundwave propagated along perfectly conducting ground for a 1 kW station power, taking into account losses in a real antenna.

Note 1 - The gain (G) of the transmitting antenna relative to an ideal short vertical antenna is given in dB by the equation:

$$G = 20 \log \frac{E_c}{300} \qquad (1)$$

where:

E_c is expressed in mV/m.

Note 2 - The effective monopole radiated power (e.m.r.p.) is given in dB (kW) by the following equation:

$$\text{e.m.r.p.} = 10 \log P_t + G \qquad (2)$$

where:

P_t: station power (kW).

1.1.16 Allotment

Entry in the Plan of a designated broadcasting channel for use by an administration for the broadcasting service in an allotment area under the conditions specified in the Plan. Each allotment included in the Plan may be used for one or more assignments using the technical criteria specified in section 6.3.

1.1.17 Allotment area

Specifically defined geographical area within a country to which one or more channels are allotted.

1.2 Symbols and units

Hz:	hertz
kHz:	kilohertz
W:	watt
kW:	kilowatt
mV/m:	millivolt/metre
μV/m:	microvolt/metre
dB:	decibel
dB(μV/m):	decibels with respect to 1 μV/m
dB(kW):	decibels with respect to 1 kW
mS/m:	millisiemens/metre
σ:	ground conductivity

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CHAPTER 2

PROPAGATION

2.1 Groundwave propagation

2.1.1 Ground conductivity

For groundwave propagation calculations in the band 1 605 - 1 705 kHz, use shall be made of the Atlas of Ground Conductivity, which contains information communicated to the IFRB in connection with the First and Second Sessions of the Regional Administrative MF Broadcasting Conference (Region 2), (Buenos Aires, 1980 and Rio de Janeiro, 1981), and subsequent modifications.

The following provisions should also be included:

a) When an administration notifies to the IFRB data intended to modify the Atlas, the IFRB shall so inform all administrations of Region 2. After 90 days from the date on which this information is communicated by the IFRB, the IFRB shall modify the Atlas and communicate the modifications to all administrations.

b) No assignment or allotment in the Plan shall at any time require modification as a result of the incorporation of these new data.

c) Any proposal to modify the Plan shall be considered on the basis of the values appearing in the Atlas on the date the proposal was received by the IFRB.

2.1.2 Field strength curves for groundwave propagation

The curves shown in Figure 2.1 shall be used for determining groundwave propagation in the frequency range 1 605 - 1 705 kHz; these curves are computed for 1 655 kHz.

The curves are labelled with ground conductivities in millisiemens/metre. All curves, except the 5000 mS/m (sea water) curve, are derived for a relative dielectric constant of 15. The sea water curve is derived for a relative dielectric constant of 80.

Annex E to the Report by the First Session of the Regional Administrative MF Broadcasting Conference (Region 2) (Buenos Aires, 1980) contains a mathematical discussion relating to the calculation of the groundwave curves. The corresponding computer program is available at the IFRB.

2.1.3 Calculation of groundwave field strength

Using the Atlas of Ground Conductivity, the relevant conductivity or conductivities for the chosen path are determined. If only one conductivity is representative, the method for homogeneous paths is used. If several conductivities are involved, the method for non-homogeneous paths is used.

2.1.3.1 Homogeneous paths

The vertical component of the field strength for a homogeneous path is represented in Figure 2.1 as a function of distance, for various values of ground conductivity.

The distance in kilometres is shown on a logarithmic scale on the abscissa. The field strength is shown on a linear scale on the ordinate in decibels above 1 μV/m. The graph is standardized for a characteristic field strength of 100 mV/m corresponding to an effective monopole radiated power (e.m.r.p.) of -9.5 dB relative to 1 kW. The straight line marked "100 mV/m at 1 km" is the field strength on the assumption that the antenna is erected on a surface of perfect conductivity.

For omnidirectional antenna systems having a different characteristic field strength, correction must be made according to either of the following equations:

$$E = E_0 \times \frac{E_c}{100} \times \sqrt{P}$$

if field strengths are expressed in mV/m, or:

$$E = E_0 + E_c - 100 + 10 \log P$$

if field strengths are expressed in dB (μV/m)

For directional antenna systems, correction must be made according to either of the following equations:

$$E = E_0 \times \frac{E_R}{100}$$

if field strengths are expressed in mV/m, or:

$$E = E_0 + E_R - 100$$

if field strengths are expressed in dB (μV/m),

where:

E : resulting field strength

E_0: field strength read from Figure 2.1

E_R: actual field strength at a particular azimuth at 1 km

E_c: characteristic field strength

P : station power in kW.

Figure 2.2 consists of three pairs of scales to be used with Figure 2.1. Each pair contains one scale labelled in decibels and another in millivolts per metre. Each pair can be cut out and trimmed as a unit to be used as sliding ordinate scales. The scales allow graphical conversion between decibels and millivolts per metre, and are used to make graphical determinations of field strengths. Other methods of making calculations on Figure 2.1 may be used, including the use of dividers to adjust for values of E_R that differ from 100 mV/m at 1 km. However, any method used will follow steps similar to those described below.

For both omnidirectional and directional antenna systems the value of E_R must be found. For omnidirectional systems E_R can be determined by using either of the following equations:

$$E_R = E_c \sqrt{P}$$

if field strengths are expressed in mV/m, or:

$$E_R = E_c + 10 \log P$$

if field strengths are expressed in dB (μV/m)

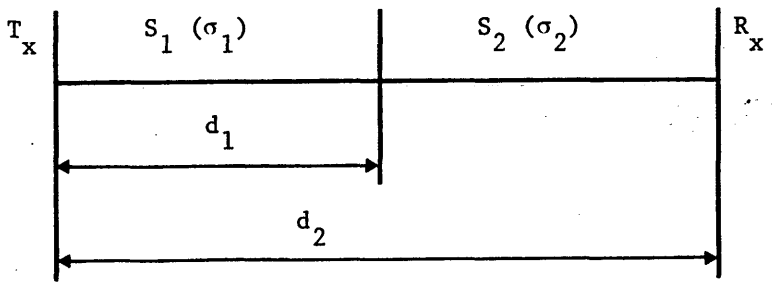
To determine the field strength at a given distance, the scale is placed at that distance with the 100 dB (μV/m) point of the scale resting on the appropriate conductivity curve. The value of E_R is then found on the scale; the point on the underlying graph (which lies underneath the E_R point of the scale) yields the field strength at the given distance.

To determine the distance at a given field strength, the E_R value is found on the sliding scale and that point is placed directly at the level of the given field strength on the graph. The scale is then moved horizontally until the 100 dB (μV/m) point of the scale coincides with the applicable conductivity curve. The distance may then be read from the abscissa of the graph.

2.1.3.2 Non-homogeneous paths

In this case, the equivalent distance or Kirke method shall be used. To apply this method, Figure 2.1 can also be used.

Consider a path whose sections S_1 and S_2 have lengths d_1 and $d_2 - d_1$, and conductivities σ_1 and σ_2 respectively, as shown on the following figure:



The method is applied as follows:

a) Taking section S_1 first, we read the field strength corresponding to conductivity σ_1 at distance d_1 on Figure 2.1.

b) As the field strength remains constant at the point of discontinuity, the value immediately after the discontinuity must be equal to that obtained in a) above. As the conductivity of the second section is σ_2, the curve corresponding to conductivity σ_2 gives the equivalent distance to that which would be obtained at the same field strength arrived at in a). This equivalent distance is d. Distance d is larger than d_1 when σ_2 is larger than σ_1. Otherwise d is less than d_1.

c) The field strength at the real distance d_2 is determined by taking the corresponding curve for conductivity σ_2 and reading off the field strength obtained at the equivalent distance $d + (d_2 - d_1)$.

d) For successive sections with different conductivities, procedures b) and c) are repeated.

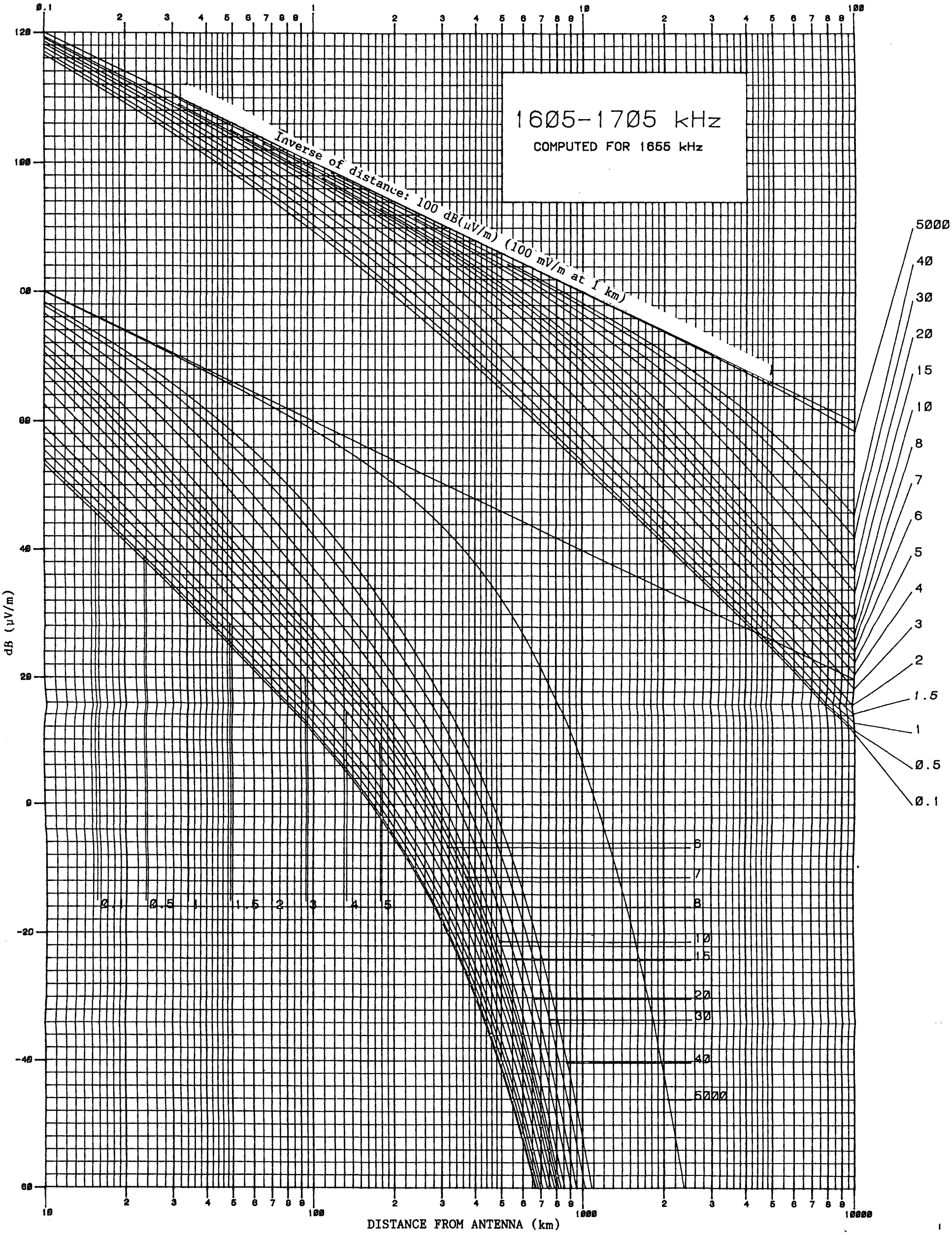


FIGURE 2.1

Groundwave field strength versus distance
(for a characteristic field strength of 100 mV/m)

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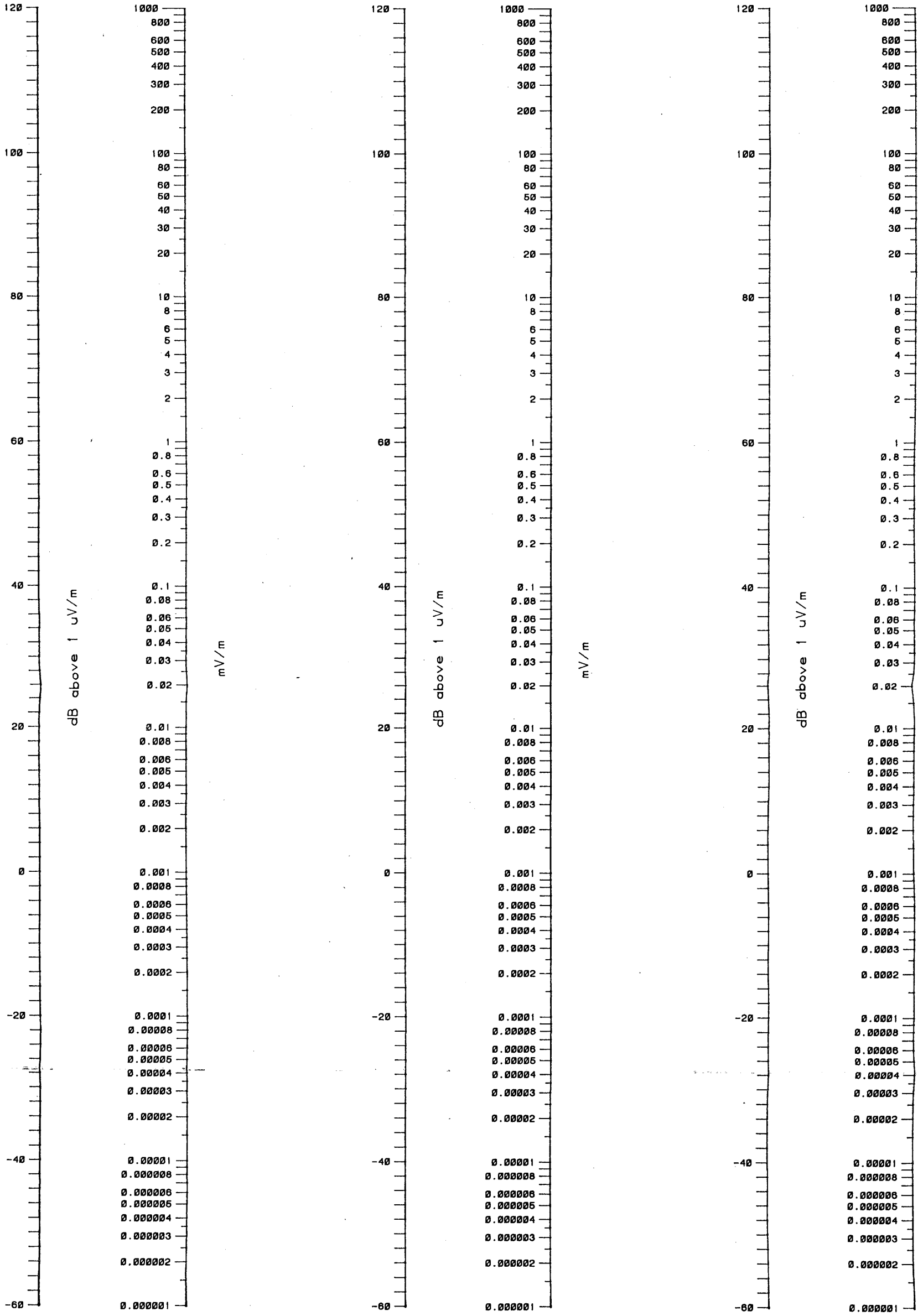

FIGURE 2.2

Scales for use with Figure 2.1

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2.2 Skywave propagation

The calculation of skywave field strength shall be conducted in accordance with the provisions which follow.

2.2.1 *List of symbols*

d: short great-circle path distance (km)

E_c: characteristic field strength, mV/m at 1 km for 1 kW

$f(\theta)$: radiation as a fraction of the value $\theta = 0$ (when $\theta = 0$, $f(\theta) = 1$)

f: frequency (kHz)

F: unadjusted annual median skywave field strength, in dB(μV/m)

F_c: field strength read from Fig. 2.8 or Table 2.III for a characteristic field strength of 100 mV/m

$F(50)$: skywave field strength, 50% of the time, in dB(μV/m)

P: station power (kW)

θ: elevation angle from the horizontal (degrees)

2.2.2 *General procedure*

Radiation in the horizontal plane of an omnidirectional antenna fed with 1 kW (characteristic field strength, E_c) is known either from design data or, if the actual design data are not available, from Fig. 2.3, included for information.

However, Figure 2.4 shows the characteristic field strength of an antenna based on a 1 ohm resistance loss, as currently used by the IFRB in the framework of the Rio de Janeiro Agreement, 1981. This figure shall be used for compatibility calculations.

Elevation angle θ is given by

$$\theta = \arctan\left(0.00752 \cot\frac{d}{444.54}\right) - \frac{d}{444.54} \quad \text{degrees} \qquad (1)$$

$$0° \leqslant \theta \leqslant 90°$$

Alternatively, Fig. 2.6 or Table 2.I may be used.

It is assumed that the Earth is a smooth sphere with an effective radius of 6,367.6 km and that reflections occur from an ionospheric height of 96.5 km.

The radiation $f(\theta)$ expressed as a fraction of the value at $\theta = 0$ at a pertinent elevation angle θ can be determined from Fig. 2.7 or Table 2.II.

The product $E_c f(\theta)\sqrt{P}$ is thus determined for an omnidirectional antenna. For a directional antenna, $E_c f(\theta)\sqrt{P}$ can be determined from the antenna radiation pattern. $E_c f(\theta)\sqrt{P}$ is the field strength at 1 km at the appropriate elevation angle and azimuth.

The unadjusted annual median skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c f(\theta)\sqrt{P}}{100} \quad \text{dB}(\mu\text{V/m}) \tag{2}$$

where F_c is the direct reading from the field strength curve in Fig. 2.8 or Table 2.III.

Note: Values of F_c in Fig. 2.8 and Table 2.III are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) of −9.5 dB(kW).

For distances greater than 4250 km, it should be noted that F_c can be expressed by:

$$F_c = \frac{231}{3 + d/1000} - 35.5 \quad \text{dB}(\mu\text{V/m}) \tag{3}$$

2.2.3 *Skywave field strength, 50% of the time*

This is given by:

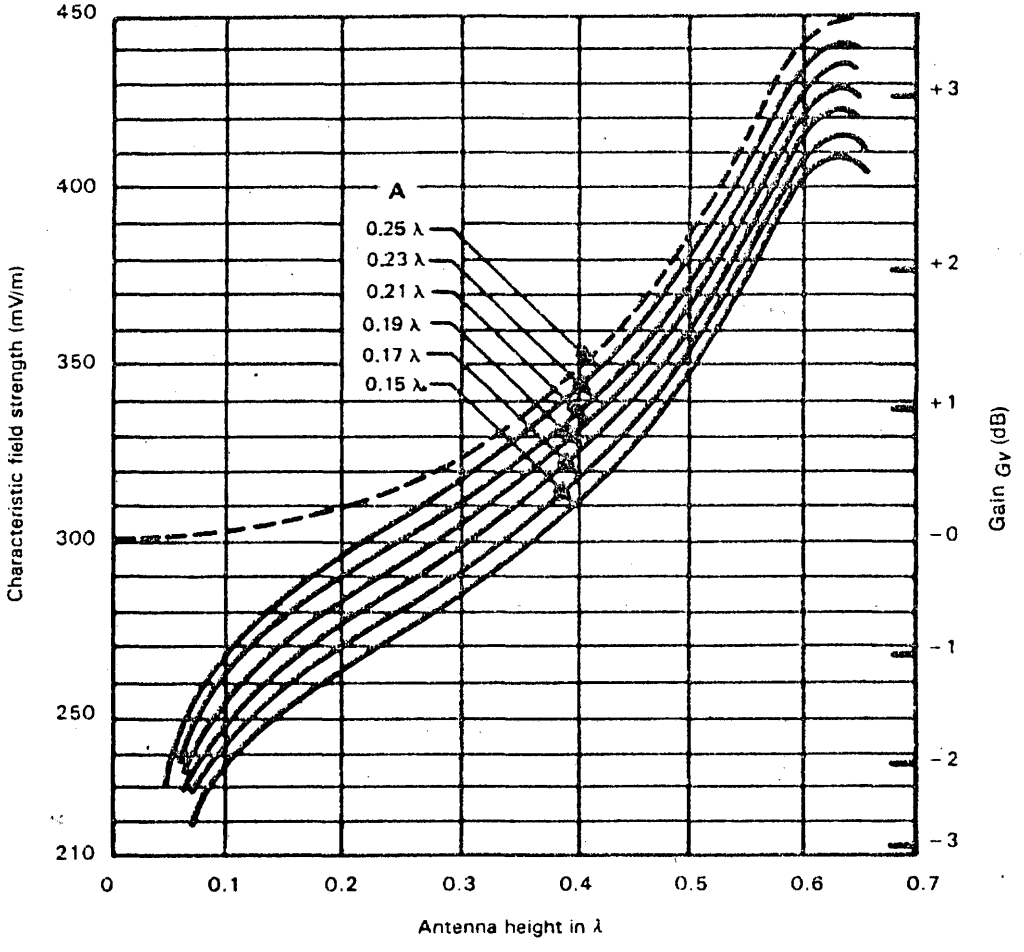
$$F(50) = F \quad \text{dB}(\mu\text{V/m}) \tag{4}$$

2.2.4 *Nocturnal variation of skywave field strength*

Hourly median skywave field strengths vary during the night and at sunrise and sunset. Figure 2.9 shows the average variation referred to the value at 2 hours after sunset at the path midpoint. This variation applies to field strengths occurring for 50% of the nights.

2.2.5 *Sunrise and sunset time*

To facilitate the determination of the local time of sunrise and sunset, Fig. 2.10 gives the times for various geographical latitudes and for each month of the year. The time is the local meridian time at the point concerned and should be converted to the appropriate standard time.



A: Radius of ground system
Full lines: Real antenna correctly designed
Dashed line: Ideal antenna on a perfectly conducting ground

FIGURE 2.3 - *Characteristic field strengths for simple vertical antennas, using 120-radial ground systems*

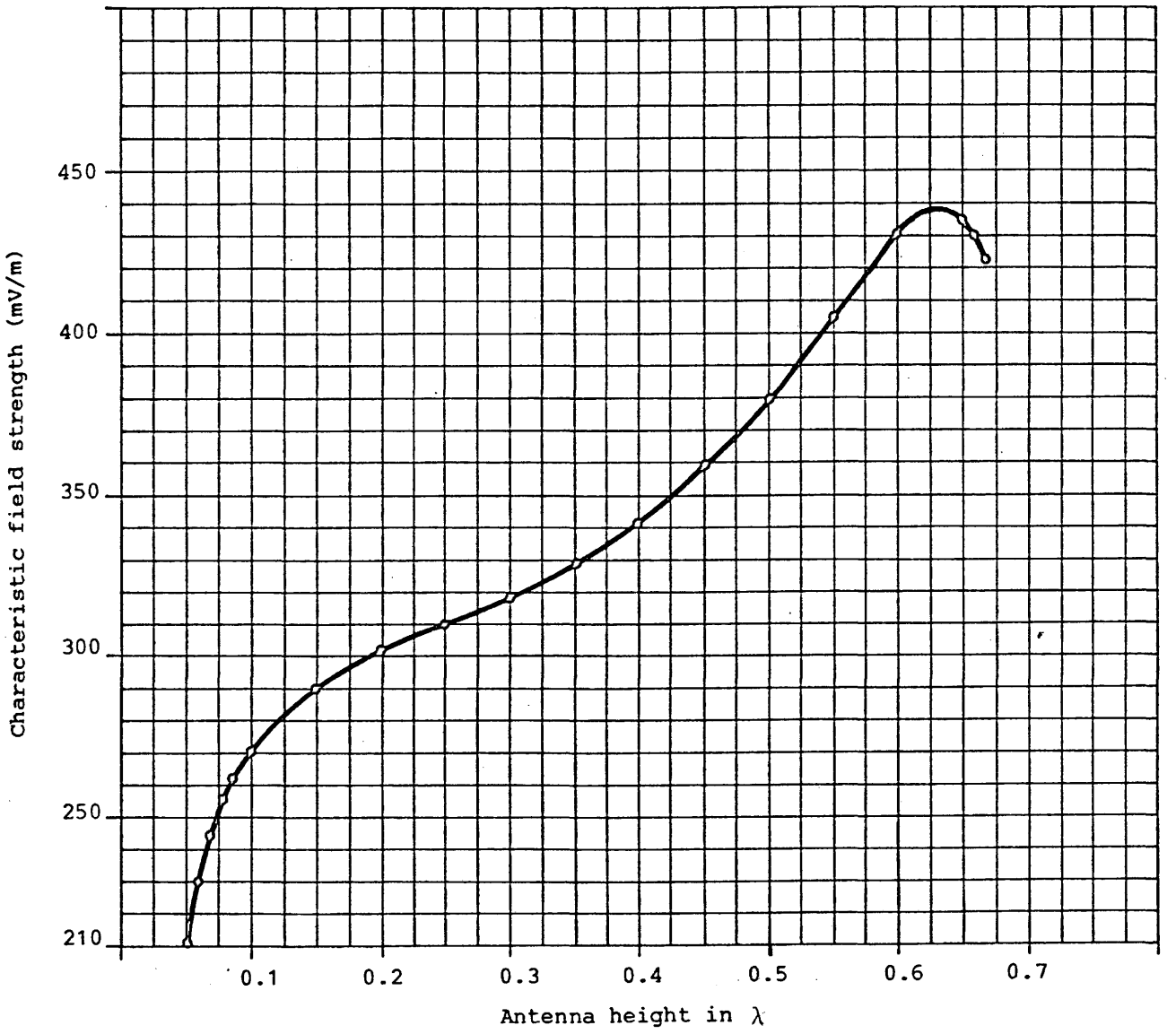


FIGURE 2.4

Characteristic field strength of an antenna, based on a 1 ohm resistance loss

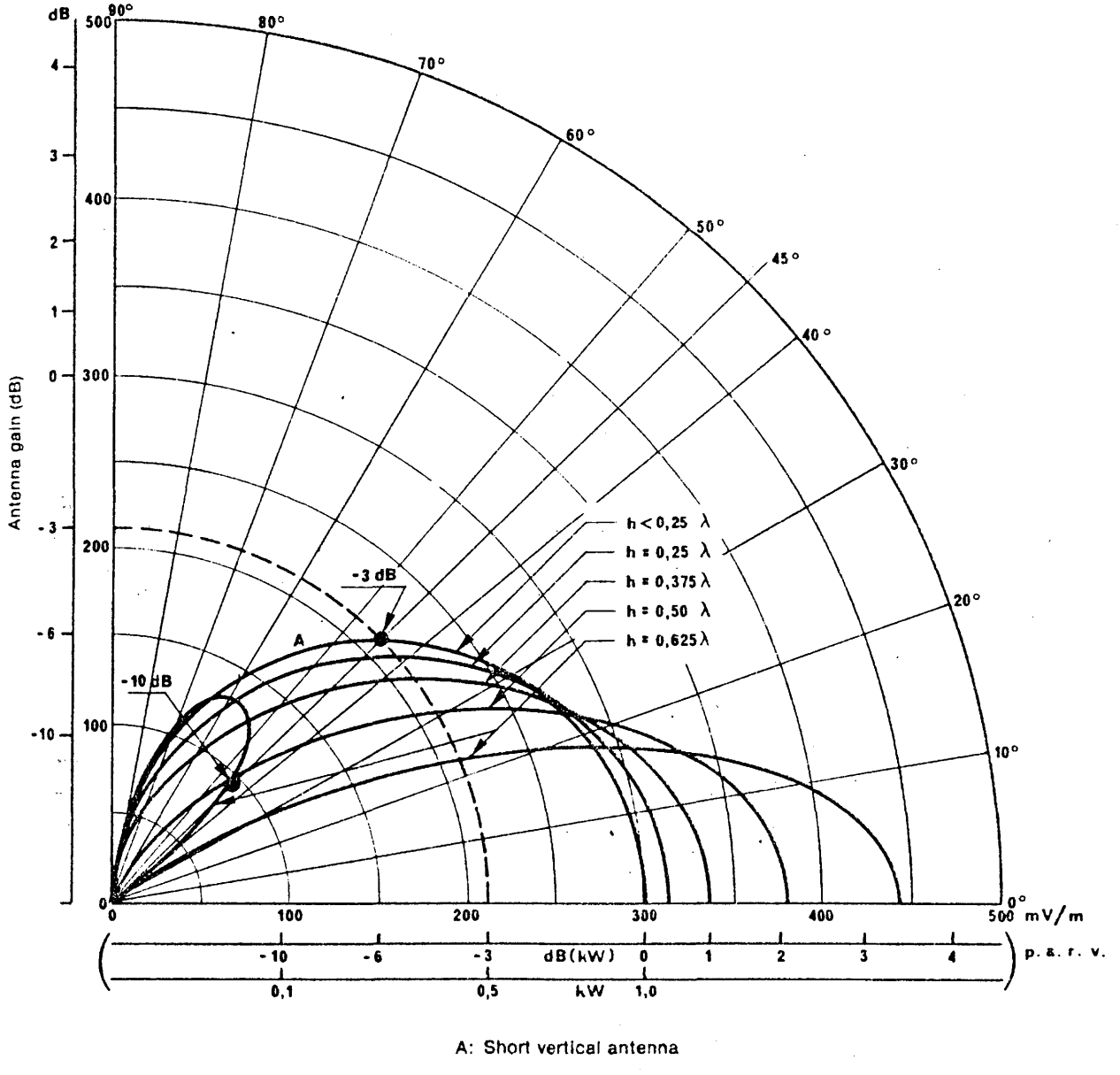


FIGURE 2.5 - *Effective monopole radiated power (e.m.r.p.) and field strength at a distance of 1 km as a function of elevation angle, for different heights of vertical antennas assuming a transmitter power of 1 kW*

TABLE 2.I - *Elevation angle vs distance*

Distance (km)	Elevation angle (degrees)
50	75.3
100	62.2
150	51.6
200	43.3
250	36.9
300	31.9
350	27.9
400	24.7
450	22.0
500	19.8
550	18.0
600	16.3
650	14.9
700	13.7
750	12.6
800	11.7
850	10.8
900	10.0
950	9.3
1000	8.6
1050	8.0
1100	7.4
1150	6.9
1200	6.4
1250	5.9
1300	5.4
1350	5.0
1400	4.6
1450	4.3
1500	3.9
1550	3.5
1600	3.2
1650	2.9
1700	2.6
1750	2.3
1800	2.0
1850	1.7
1900	1.5
1950	1.2
2000	1.0
2050	0.7
2100	0.5
2150	0.2
2200	0.0
2250	0.0
2300	0.0
2350	0.0
2400	0.0

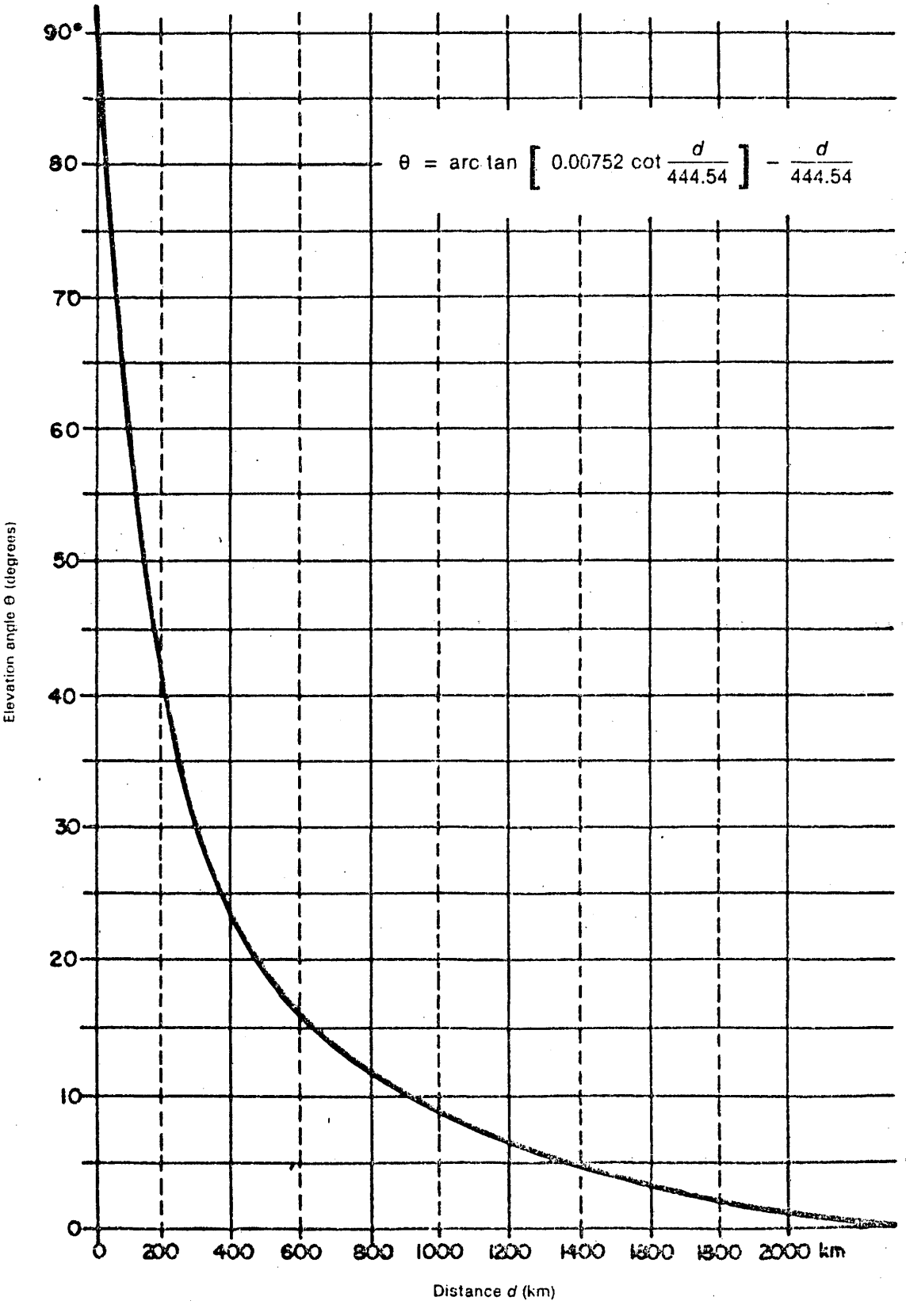


FIGURE 2.6 - *Elevation angle vs distance*

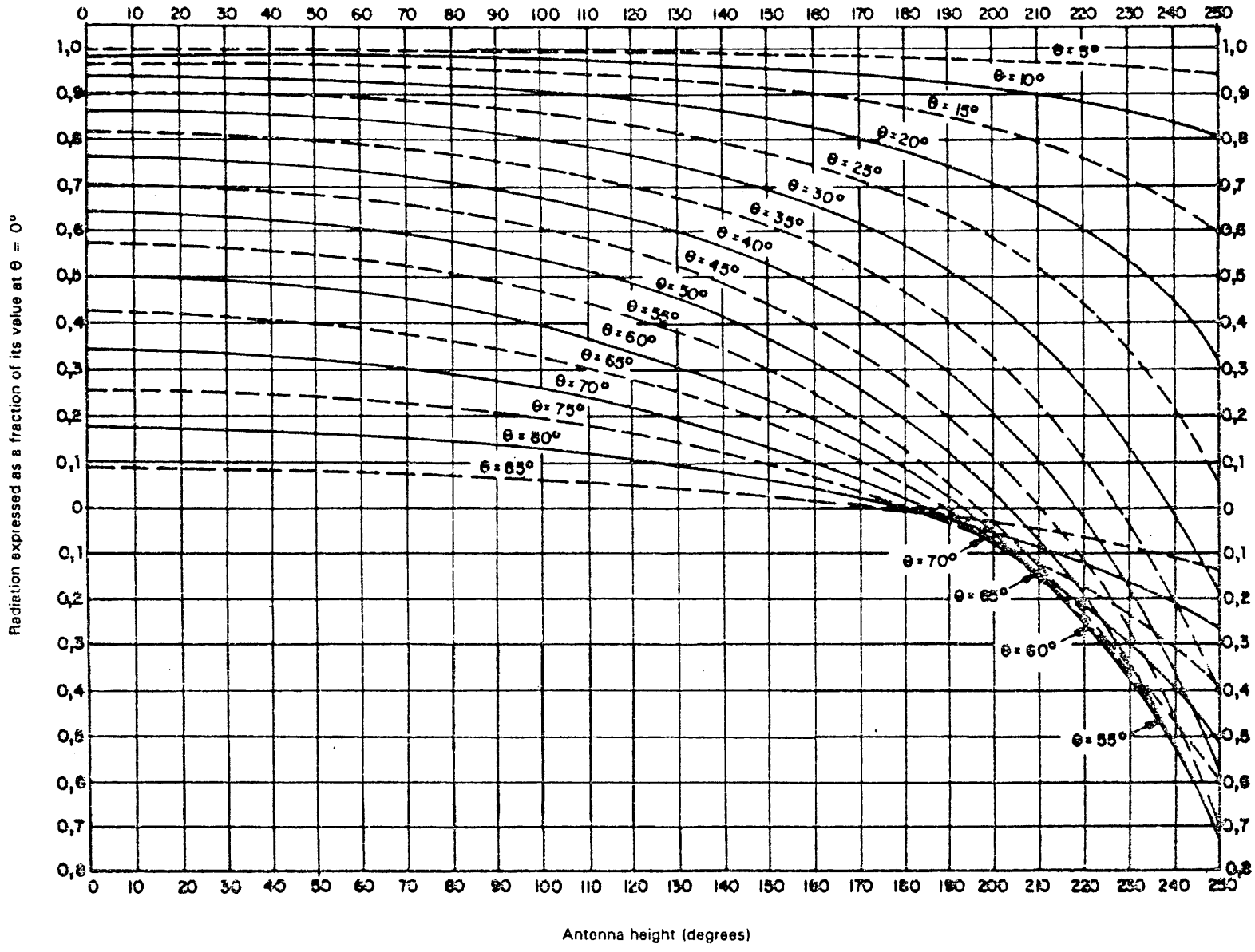


FIGURE 2.7 - *Vertical plane radiation of simple vertical antennas as a function of electrical tower height for various values of elevation angle (θ)*

TABLE 2.II – *$f(\theta)$ values for simple vertical antennas*

Elevation angle (degrees)	$f(\theta)$					
	0.11 λ	0.13 λ	0.15 λ	0.17 λ	0.19 λ	0.21 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.999	0.998	0.998	0.998	0.998	0.998
4	0.997	0.997	0.997	0.997	0.997	0.997
5	0.996	0.996	0.996	0.995	0.995	0.995
6	0.994	0.994	0.994	0.993	0.993	0.993
7	0.992	0.992	0.991	0.991	0.991	0.990
8	0.989	0.989	0.989	0.988	0.988	0.987
9	0.987	0.986	0.986	0.985	0.985	0.984
10	0.984	0.983	0.983	0.982	0.981	0.980
11	0.980	0.980	0.979	0.978	0.977	0.976
12	0.976	0.976	0.975	0.974	0.973	0.971
13	0.972	0.972	0.971	0.969	0.968	0.967
14	0.968	0.967	0.966	0.965	0.963	0.961
15	0.963	0.962	0.961	0.959	0.958	0.956
16	0.958	0.957	0.956	0.954	0.952	0.950
17	0.953	0.952	0.950	0.948	0.945	0.943
18	0.947	0.946	0.944	0.942	0.940	0.937
19	0.941	0.940	0.938	0.935	0.933	0.930
20	0.935	0.933	0.931	0.929	0.926	0.922
22	0.922	0.920	0.917	0.914	0.911	0.907
24	0.907	0.905	0.902	0.898	0.894	0.890
26	0.892	0.889	0.885	0.882	0.877	0.872
28	0.875	0.872	0.868	0.864	0.858	0.852
30	0.857	0.854	0.849	0.844	0.839	0.832
32	0.838	0.834	0.830	0.824	0.818	0.811
34	0.819	0.814	0.809	0.803	0.795	0.789
36	0.798	0.793	0.788	0.781	0.774	0.766
38	0.776	0.771	0.765	0.758	0.751	0.742
40	0.753	0.748	0.742	0.735	0.725	0.717
42	0.730	0.724	0.718	0.710	0.702	0.692
44	0.705	0.700	0.693	0.685	0.676	0.666
46	0.680	0.674	0.667	0.659	0.650	0.639
48	0.654	0.648	0.641	0.633	0.623	0.612
50	0.628	0.621	0.614	0.606	0.596	0.585
52	0.600	0.594	0.587	0.578	0.568	0.557
54	0.572	0.566	0.559	0.550	0.540	0.529
56	0.544	0.537	0.530	0.521	0.512	0.501
58	0.515	0.508	0.501	0.493	0.483	0.472
60	0.485	0.479	0.472	0.463	0.454	0.443

TABLE 2.II *(continued)*

Elevation angle (degrees)	$f(\theta)$					
	0.23 λ	0.25 λ	0.27 λ	0.29 λ	0.311 λ	0.35 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	1.000	1.000	1.000	1.000
2	0.999	0.999	0.999	0.999	0.999	0.999
3	0.998	0.998	0.998	0.998	0.998	0.997
4	0.997	0.996	0.996	0.996	0.996	0.995
5	0.995	0.994	0.994	0.994	0.993	0.992
6	0.992	0.992	0.991	0.991	0.990	0.989
7	0.990	0.989	0.988	0.988	0.987	0.985
8	0.987	0.986	0.985	0.984	0.983	0.980
9	0.983	0.982	0.981	0.980	0.978	0.975
10	0.979	0.978	0.977	0.975	0.973	0.969
11	0.975	0.973	0.972	0.970	0.968	0.963
12	0.970	0.968	0.966	0.964	0.962	0.955
13	0.965	0.963	0.961	0.958	0.955	0.949
14	0.959	0.957	0.955	0.952	0.948	0.941
15	0.953	0.951	0.948	0.945	0.941	0.932
16	0.947	0.944	0.941	0.937	0.933	0.924
17	0.941	0.937	0.934	0.930	0.925	0.914
18	0.934	0.930	0.926	0.921	0.916	0.904
19	0.926	0.922	0.918	0.913	0.907	0.894
20	0.919	0.914	0.909	0.904	0.898	0.883
22	0.902	0.897	0.891	0.885	0.877	0.861
24	0.885	0.879	0.872	0.865	0.856	0.837
26	0.866	0.859	0.852	0.843	0.833	0.811
28	0.846	0.838	0.830	0.820	0.809	0.795
30	0.825	0.816	0.807	0.797	0.784	0.758
32	0.803	0.794	0.784	0.772	0.759	0.729
34	0.780	0.770	0.759	0.747	0.732	0.701
36	0.756	0.746	0.734	0.721	0.705	0.671
38	0.732	0.720	0.708	0.694	0.677	0.642
40	0.706	0.695	0.681	0.667	0.649	0.612
42	0.681	0.668	0.654	0.639	0.621	0.582
44	0.654	0.641	0.627	0.611	0.593	0.552
46	0.628	0.614	0.600	0.583	0.564	0.523
48	0.600	0.587	0.572	0.555	0.536	0.494
50	0.573	0.559	0.544	0.527	0.507	0.465
52	0.545	0.531	0.515	0.498	0.479	0.436
54	0.517	0.503	0.487	0.470	0.451	0.408
56	0.488	0.474	0.459	0.442	0.423	0.381
58	0.460	0.446	0.431	0.414	0.395	0.354
60	0.431	0.418	0.403	0.387	0.368	0.328

TABLE 2.II *(end)*

Elevation angle (degrees)	$f(\theta)$					
	0.40 λ	0.45 λ	0.50 λ	0.528 λ	0.55 λ	0.625 λ
0	1.000	1.000	1.000	1.000	1.000	1.000
1	1.000	1.000	0.999	0.999	0.999	0.999
2	0.998	0.998	0.998	0.997	0.997	0.995
3	0.997	0.996	0.995	0.994	0.993	0.989
4	0.994	0.992	0.990	0.989	0.988	0.981
5	0.991	0.988	0.985	0.983	0.981	0.970
6	0.986	0.983	0.979	0.975	0.972	0.957
7	0.982	0.977	0.971	0.967	0.962	0.941
8	0.976	0.970	0.962	0.957	0.951	0.924
9	0.970	0.963	0.953	0.945	0.938	0.904
10	0.963	0.954	0.942	0.933	0.924	0.882
11	0.955	0.945	0.930	0.919	0.909	0.859
12	0.947	0.934	0.917	0.905	0.893	0.834
13	0.938	0.923	0.903	0.889	0.875	0.807
14	0.929	0.912	0.889	0.872	0.857	0.773
15	0.918	0.899	0.873	0.855	0.837	0.748
16	0.908	0.886	0.857	0.836	0.815	0.717
17	0.897	0.873	0.840	0.817	0.795	0.684
18	0.885	0.859	0.823	0.797	0.772	0.651
19	0.873	0.844	0.804	0.776	0.749	0.617
20	0.860	0.828	0.785	0.755	0.726	0.582
22	0.833	0.796	0.746	0.710	0.677	0.510
24	0.805	0.763	0.705	0.665	0.625	0.436
26	0.776	0.728	0.663	0.618	0.574	0.363
28	0.745	0.692	0.621	0.570	0.522	0.290
30	0.714	0.655	0.577	0.522	0.470	0.219
32	0.682	0.619	0.534	0.475	0.419	0.151
34	0.649	0.582	0.492	0.428	0.368	0.085
36	0.617	0.545	0.450	0.383	0.321	0.025
38	0.584	0.509	0.409	0.340	0.275	−0.031
40	0.552	0.473	0.370	0.298	0.231	−0.083
42	0.519	0.438	0.332	0.258	0.190	−0.129
44	0.488	0.405	0.296	0.221	0.152	−0.170
46	0.457	0.372	0.262	0.187	0.117	−0.205
48	0.427	0.341	0.230	0.155	0.085	−0.235
50	0.397	0.311	0.201	0.126	0.056	−0.259
52	0.369	0.283	0.174	0.099	0.031	−0.278
54	0.341	0.257	0.149	0.076	0.009	−0.291
56	0.315	0.232	0.126	0.055	−0.010	−0.300
58	0.289	0.208	0.105	0.037	−0.026	−0.304
60	0.265	0.186	0.087	0.021	−0.039	−0.304
62				0.003	−0.049	−0.300
64				−0.003	−0.056	−0.292
66				−0.011	−0.062	−0.281
68				−0.017	−0.064	−0.267
70				−0.022	−0.065	−0.250
72				−0.025	−0.064	−0.231
74				−0.026	−0.061	−0.210
76				−0.026	−0.056	−0.138
78				−0.024	−0.051	−0.163
80				−0.022	−0.044	−0.138

Note – When the negative sign (−) appears in the Table, it signifies only the existence of a secondary lobe having the opposite phase from the main lobe in the vertical radiation pattern. In order to perform the calculation, ignore the negative (−) and use only the absolute value $f(\theta)$ from the Table.

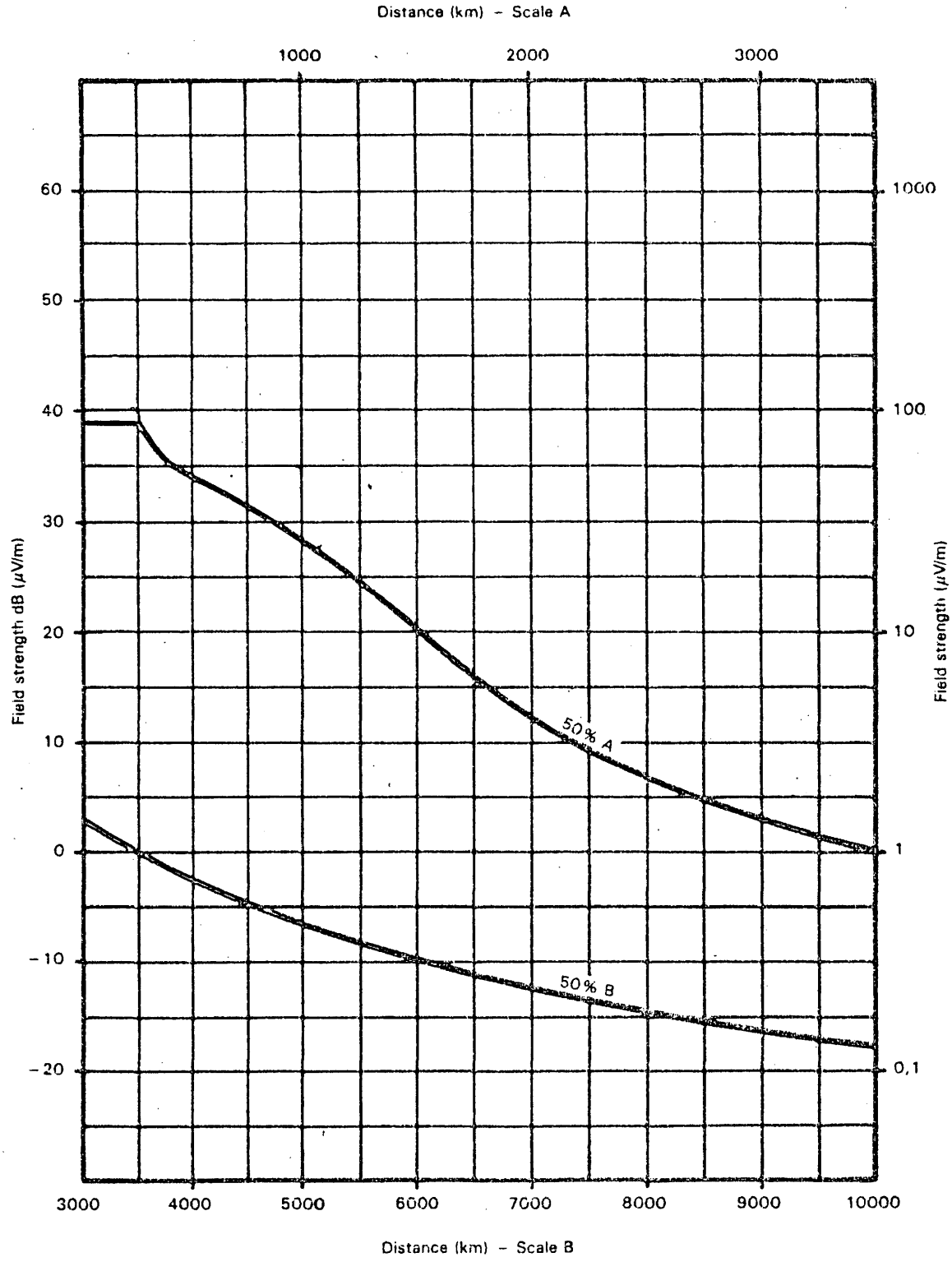


FIGURE 2.8 - *Skywave field strength vs distance for a characteristic field strength of 100 mV/m*

TABLE 2.III – *Skywave field strength vs distance (0 to 10000 km) for a characteristic field strength of 100 mV/m*

d (km)	F_c (dB(μV/m)) 50%	F_c (μV/m) 50%
0–200	39.28	92.06
250	37.79	77.54
300	36.75	68.82
350	35.86	62.06
400	35.13	57.08
450	34.46	52.86
500	33.92	49.65
550	33.40	46.78
600	32.94	44.36
650	32.45	41.95
700	31.94	39.54
750	31.32	36.81
800	30.73	34.40
850	30.18	32.30
900	29.51	29.89
950	28.83	27.63
1000	28.14	25.54
1050	27.44	23.56
1100	26.79	21.84
1150	25.98	19.91
1200	25.25	18.30
1250	24.50	16.78
1300	23.71	15.32
1350	22.90	13.97
1400	22.08	12.71
1450	21.25	11.55
1500	20.42	10.50
1550	19.59	9.53
1600	18.66	8.57
1650	17.75	7.72
1700	16.87	6.98
1750	16.04	6.34
1800	15.28	5.80
1850	14.52	5.32
1900	13.78	4.89
1950	13.05	4.49
2000	12.34	4.14
2100	11.15	3.61
2200	10.05	3.18
2300	8.92	2.79
2400	8.13	2.55
2500	7.09	2.26
2600	6.16	2.03
2700	5.32	1.85
2800	4.58	1.69
2900	3.81	1.55

TABLE 2.III *(end)*

d (km)	F_c (dB (μV/m)) 50%	F_c (μV/m) 50%
3000	3.11	1.43
3100	2.45	1.33
3200	1.78	1.23
3300	1.18	1.15
3400	0.57	1.07
3500	0.02	1.00
3600	−0.53	0.94
3700	−1.08	0.88
3800	−1.59	0.83
3900	−2.08	0.79
4000	−2.52	0.75
4100	−3.01	0.71
4200	−3.46	0.67
4300	−3.90	0.64
4400	−4.33	0.61
4500	−4.74	0.58
4600	−5.15	0.55
4700	−5.54	0.53
4800	−5.93	0.51
4900	−6.30	0.48
5000	−6.67	0.46
5100	−7.02	0.45
5200	−7.37	0.43
5300	−7.71	0.41
5400	−8.04	0.40
5500	−8.37	0.38
5600	−8.68	0.37
5700	−8.99	0.36
5800	−9.29	0.34
5900	−9.59	0.33
6000	−9.88	0.32
6200	−10.43	0.30
6400	−10.97	0.28
6600	−11.48	0.27
6800	−11.97	0.25
7000	−12.44	0.24
7200	−12.90	0.23
7400	−13.33	0.22
7600	−13.75	0.21
7800	−14.15	0.20
8000	−14.54	0.19
8200	−14.92	0.18
8400	−15.28	0.17
8600	−15.63	0.17
8800	−15.97	0.16
9000	−16.29	0.15
9200	−16.61	0.15
9400	−16.91	0.14
9600	−17.21	0.14
9800	−17.50	0.13
10000	−17.77	0.13

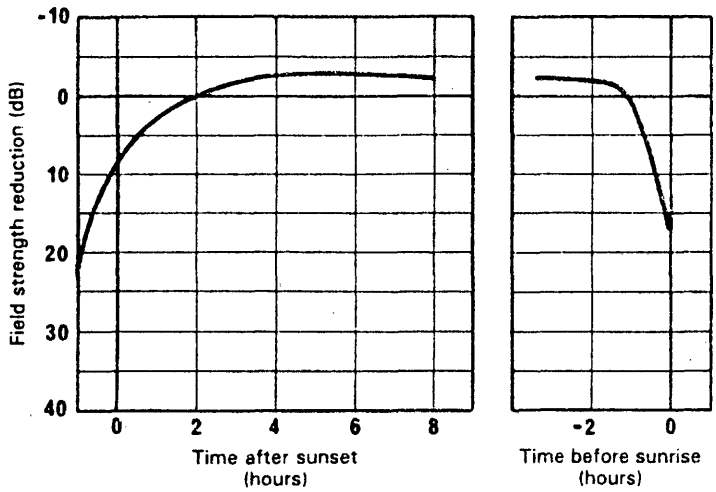


FIGURE 2.9 – *Field strength variation during the night*

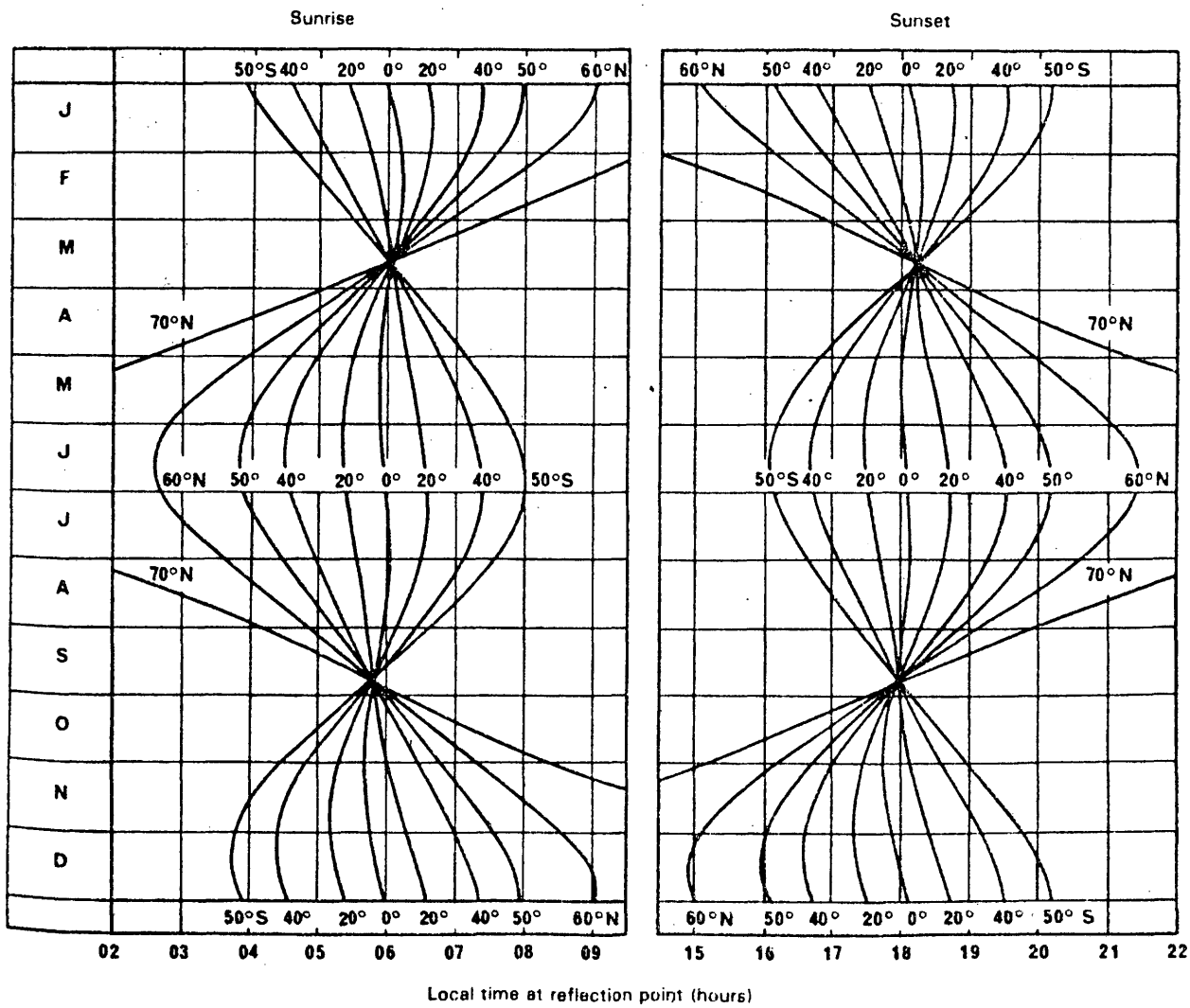


FIGURE 2.10 – *Times of sunrise and sunset for various months and geographical latitudes*

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CHAPTER 3

BROADCASTING STANDARDS* AND TRANSMISSION CHARACTERISTICS

3.1 Channel spacing

The Plan shall be based on a channel spacing of 10 kHz and carrier frequencies which are integral multiples of 10 kHz, beginning at 1 610 kHz.

3.2 Class of emission

The Plan shall be based on double-sideband amplitude modulation with full carrier A3E.

Classes of emission other than A3E could also be used on condition that the energy level outside the necessary bandwidth does not exceed that normally expected in A3E emission, for instance to accommodate stereophonic systems.

3.3 Bandwidth of emission

The Plan shall be based on a necessary bandwidth of 10 kHz for which only 5 kHz audio bandwidth can be obtained. While this might be an appropriate value within some administrations, others may wish to employ wider bandwidth systems with necessary bandwidths of the order of 20 kHz. However, the protection ratios selected allow operation with 20 kHz occupied bandwidth without an appreciable increase in interference. Stations operating on the frequency 1 700 kHz shall take into account No. 343 of the Radio Regulations.

3.4 Frequency tolerance

As indicated in Appendix 7 to the Radio Regulations, the frequency tolerance shall be 20 parts in 10^6 (0.002%) for powers of 10 kW or less, and 10 Hz for powers greater than 10 kW.

---

* Note - The effect of receiver characteristics upon AM broadcasting standards

It is expected that receiver characteristics for this band will be similar to those of existing receivers in the 535 - 1 605 kHz band. Therefore, they should not affect broadcasting standards.

3.5 Nominal usable field strength (E_{nom})

Table of nominal usable field strength

	Noise zone 1	Noise zone 2
Daytime	0.5 mV/m	1.25 mV/m
Night-time	3.3 mV/m	6 mV/m

3.6 *Definition of noise zones*

Noise zone 1

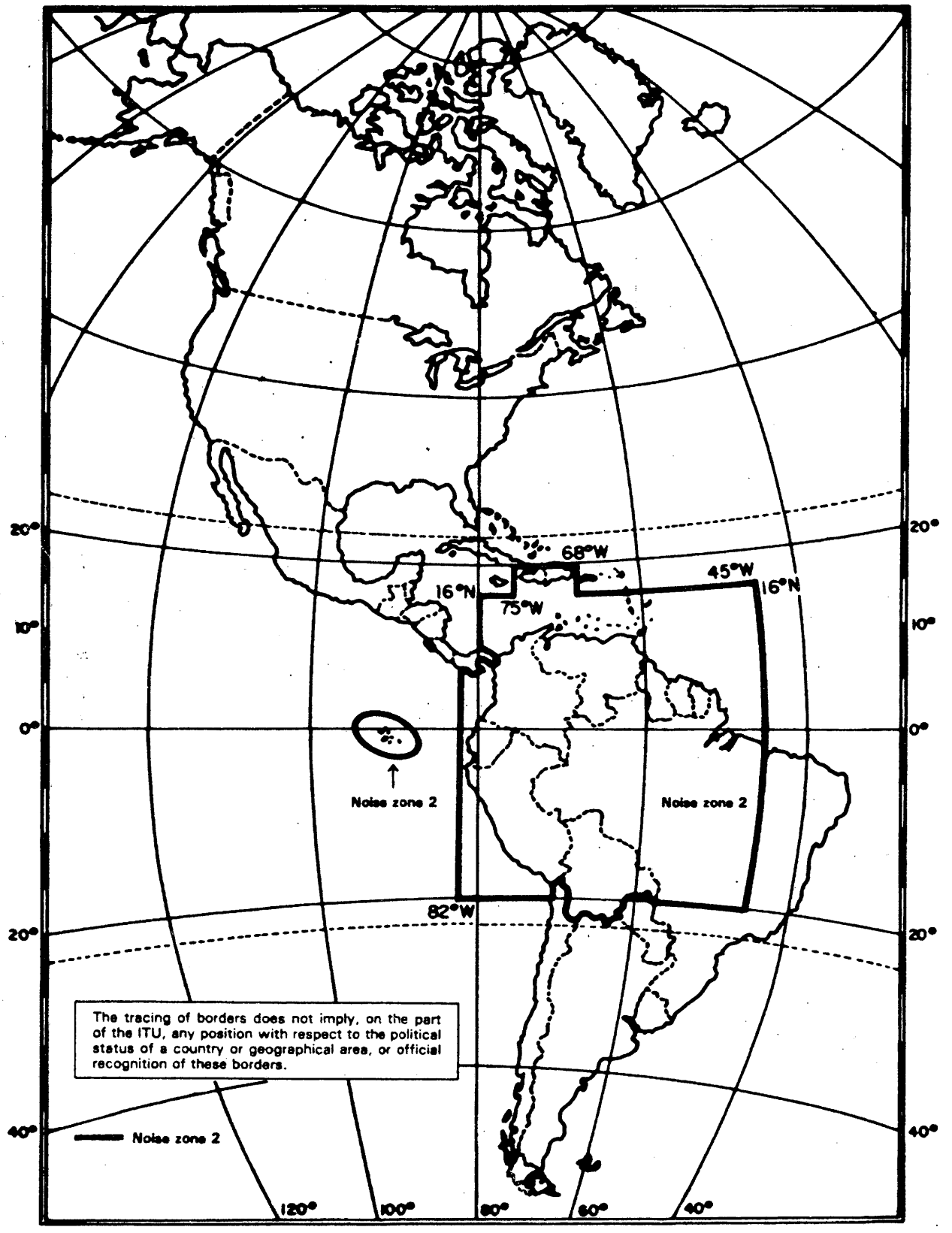
Comprises the whole of Region 2 with the exception of noise zone 2.

Noise zone 2

Comprises the area within the line defined by the coordinates 20° S-45° W, the meridian 45° W to the coordinates 16° N-45° W, the parallel 16° N to the coordinates 16° N-68° W, the meridian 68° W to the coordinates 20° N-68° W, the parallel 20° N to the coordinates 20° N-75° W, the meridian 75° W to the coordinates 16° N-75° W, the parallel 16° N to the coordinates 16° N-80° W, the meridian 80° W to the northeast coast of Panama, the frontier between Panama and Colombia, the southeast coast of Panama and the meridian 82° W to the parallel 20° S, and the parallel 20° S, with the exception of Chile and Paraguay, until the frontier between Paraguay and Brazil until 45° W. Bolivia is entirely included in noise zone 2 as are the archipelago of San Andrés y Providencia and the islands belonging to Colombia and the Colon archipelago or the Galapagos Islands (Ecuador).

Note – See the map of noise zones on the following page.

NOISE ZONES


68°W
45°W
16°N
16°N
75°W
Noise zone 2
Noise zone 2
82°W
20°
10°
0°
20°
40°
120°
100°
80°
60°
40°
The tracing of borders does not imply, on the part of the ITU, any position with respect to the political status of a country or geographical area, or official recognition of these borders.
Noise zone 2

3.7 Protection ratios

3.7.1 Co-channel protection ratio

The co-channel protection ratio shall be 26 dB.

3.7.2 Adjacent channel protection ratio

- the protection ratio for the first adjacent channel shall be 0 dB

- the protection ratio for the second adjacent channel shall be -29.5 dB.

CHAPTER 4

RADIATION CHARACTERISTICS OF TRANSMITTING ANTENNAS

In carrying out the calculations indicated in Chapter 2 the following shall be taken into account:

4.1 Omnidirectional antennas

Figure 2.3 shows the characteristic field of a simple vertical antenna as a function of its height in wavelengths and of the radius of the ground system.

It is clear that the characteristic field strength increases as the loss in the ground system is reduced to zero and as the antenna height is increased up to 0.625 wavelengths.

The increased characteristic field strength for antenna heights up to 0.625 wavelengths is obtained at the expense of radiation at high angles as shown in Figure 2.4 and Table 2.II.

4.2 Considerations of the radiation patterns of directional antennas

The procedures for calculating theoretical, expanded and augmented (modified expanded) directional antenna patterns are given in Annex 1.

4.3 Top-loaded or sectionalized antennas

4.3.1 Calculation procedures are given in Annex 2.

4.3.2 Many stations employ top-loaded or sectionalized towers, either because of space limitations or to vary the radiation characteristics from those of a simple vertical antenna. This is done to achieve desired coverage or to reduce interference.

4.3.3 An administration using top-loaded or sectionalized antennas shall supply information concerning the tower structure of the antennas. Normally, one of the equations in Annex 2 shall be employed to determine the vertical radiation characteristics of the antennas. Other equations may also be proposed by an administration for determining the vertical radiation characteristics of the antennas of that administration, subject to the agreement of the other administration(s) concerned.

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CHAPTER 5

TECHNICAL CRITERIA FOR INTERSERVICE SHARING

In accordance with Article 8 of the Radio Regulations, the fixed and mobile services become permitted services at a time to be established by the Conference. The sharing criteria developed in this chapter are designed to apply to the permitted services in order to protect broadcasting services in the Plan and give protection to these permitted services. According to the specific cases the protection ratio value is given for co-channel interference (CO) or for off-channel interference (OC).

5.1 Protection of the broadcasting service

The broadcasting service in Region 2 may be subject to interservice interference from services sharing the sub-band 1 625 - 1 705 kHz such as the fixed, mobile and radiolocation services.

Protection in accordance with the criteria in section 5.1.1 is to be given within the national boundary and/or the allotment area for allotted channels and within the service contours for non-allotted channels.

A value of 26 dB has been indicated in section 3.7.1 for co-channel protection ratio between broadcasting emissions, hence allowing a given quality of service, and the same quality criteria have been applied to derive the figures given for interfering services other than broadcasting.

5.1.1 Protection ratio criteria

As noted in the CCIR Report to the Conference, "Compatibility problems and sharing criteria between the broadcasting service and the other services are not fully investigated ...". Some additional information has been developed since that document was prepared. However, it is recognized that further information will be necessary before administrations are in a position to agree on the values to be used in establishing protection criteria for use in sharing of the extended band. As a result, administrations are encouraged to study this subject further during the intersessional period. In addition, it would be desirable for the CCIR to assist in the final preparation of a document to be submitted to the **Second Session. (See Recommendation 4.)**

The latest available information from the CCIR is presented in Table 5.I.

New results of measurements carried out by a Region 2 administration, indicate that, at least for J3E and F1B interference cases, new radio-frequency protection ratio values can be proposed, namely: 28 dB for J3E off-channel interference (about 1.4 kHz assigned frequency spacing and zero carrier frequency spacing) and 45 dB for F1B off-channel (1 kHz) interference. The radio-frequency protection ratio curves (median values) appearing in Figures 5.1 and 5.2 can be used to determine the required protection for various carrier spacings.

5.2 Protection of the permitted services

The protection ratio values to protect the permitted services when implementing the Plan are also given in Table 5.I.

To protect reception of the fixed service, values for speech communications are indicated for just usable (JU), marginally commercial (MC) and good commercial (GC) quality; for telegraph communication they should be specified for a character error ratio P_E of 10^{-2}, 10^{-3} and 10^{-4}, but since the protection ratios do not significantly vary for values of P_E up to 10^{-6}, a single value is suggested by the CCIR.

TABLE 5.I

Steady-state protection ratios (dB)*

Interfering signal / Wanted signal		A3E (BC)		A3E (fixed)		A2A/A2B		F1B		J2B		J3E		H2A/H2B		Class of emission
		CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	CO	OC	Interfering condition[1]
A3E (BC)		26		26		31		47			43		38		37	
A3E (fixed)[2]	JU MC GC	-7 5 26														
A2A/A2B	$P_E<10^{-6}$	5														
F1B	$P_E<10^{-6}$	-3														
J2B	$P_E<10^{-6}$		5													
J3E	JU MC GC		-19 -7 14													
H2A/H2B	$P_E<10^{-6}$		-1													
Class of emission	Quality of service															

* Ratio of wanted-to-interfering signals whose powers are expressed in terms of p.e.p. (PX) (see Recommendation 240-3 (MOD I)).

1) CO (co-channel interference) and OC (off-channel interference) are the cases when the frequency separation between the assigned frequency of the wanted signal and that of the interfering signal is about zero and about 1.4 kHz respectively.

2) Administrations are urged to discontinue, in the fixed service, the use of double-sideband radiotelephone (class A3E) transmissions (see RR 2700).

Wanted ..... A3E (Broadcasting)
Unwanted ..... J3E (Radiotelephony)
Low pass filter
at receiver output ..... 10 kHz
Grade of quality ..... 4 (CCIR Recommendation 562-1)

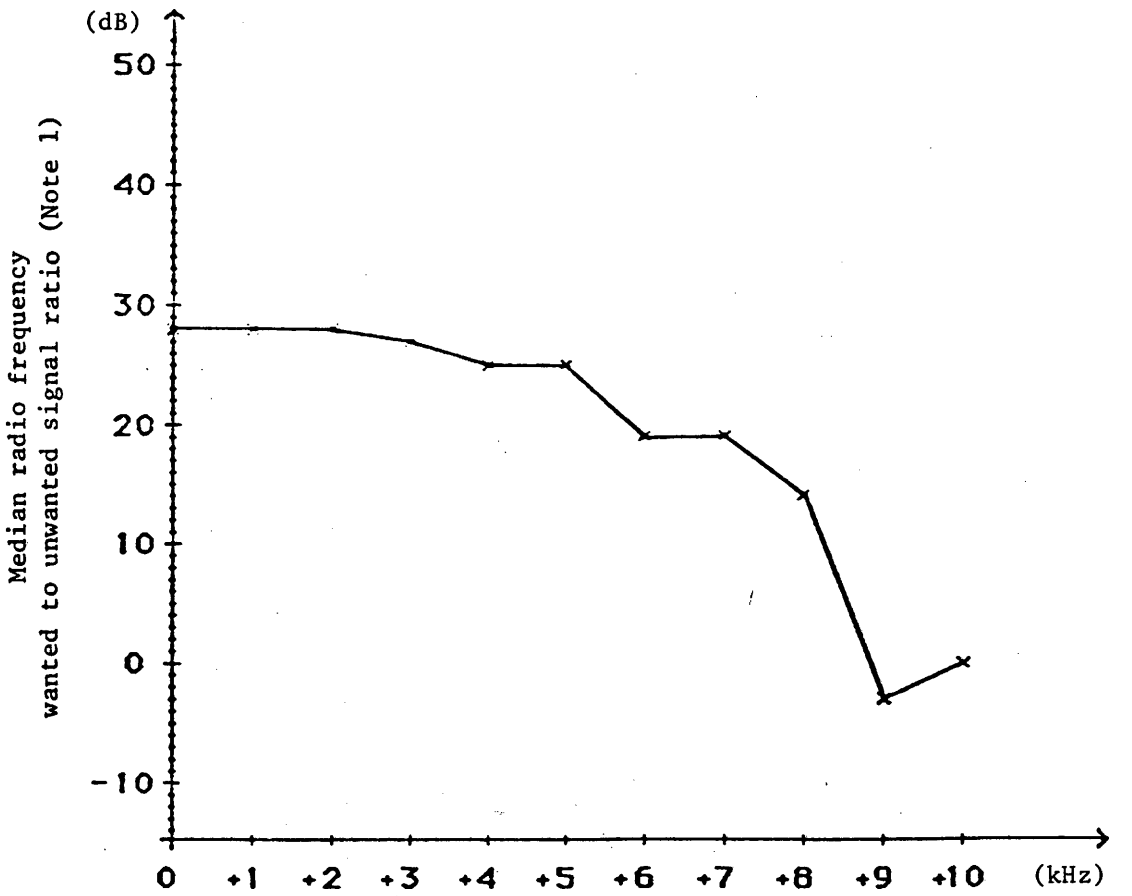

FIGURE 5.1

Median value of the radio frequency wanted (A3E) to unwanted (J3E) signal ratio as a function of the carrier frequency separation

Note 1 - The signal ratio is defined as the ratio of the peak envelope power of the wanted signal to the peak envelope power of the unwanted signal.

Wanted ..... A3E (Broadcasting)
Unwanted ..... F1B (Narrow-band direct printing telegraphy or digital selective calling)
Low pass filter at receiver output ..... 10 kHz
Grade of quality .....4 (CCIR Recommendation 562-1)

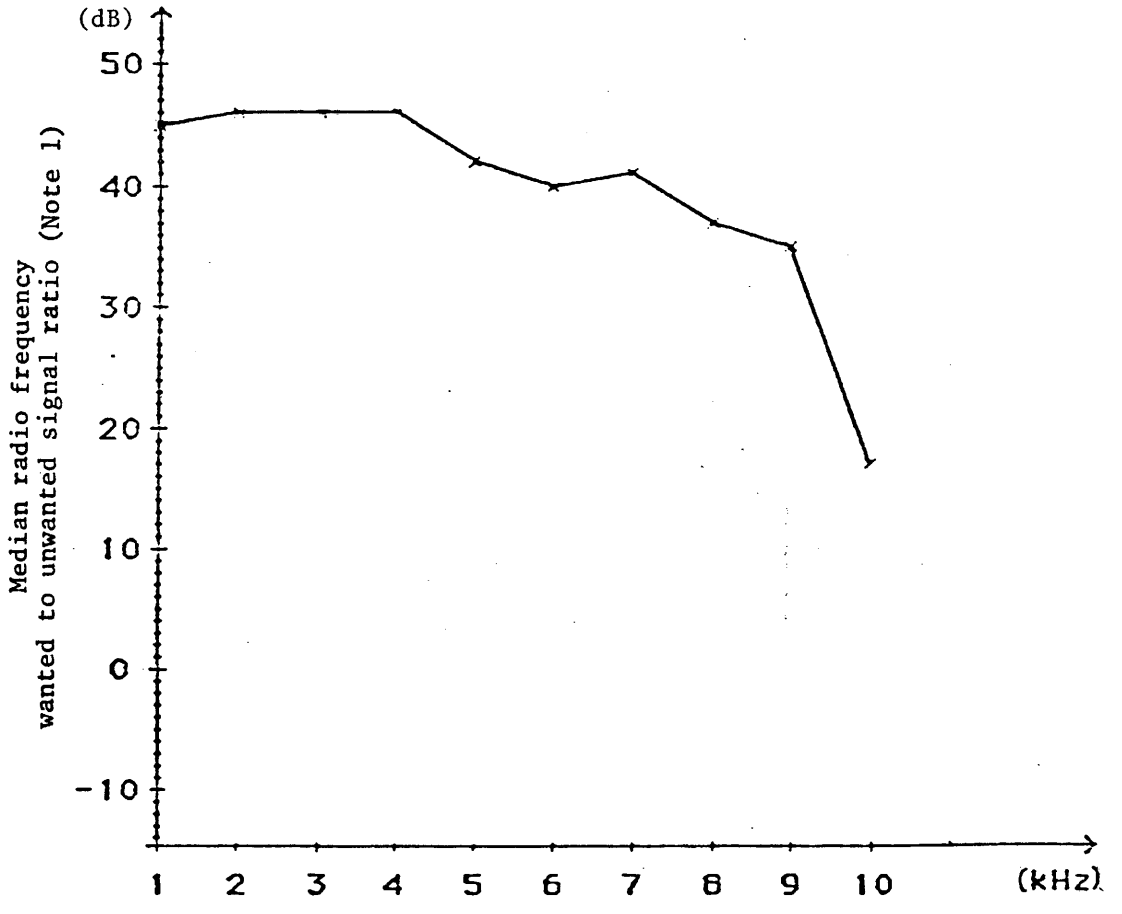

FIGURE 5.2

Median value of the radio frequency wanted (A3E) to unwanted (F1B) signal ratio as a function of the carrier frequency separation

Note 1 - The signal ratio is defined as the ratio of the peak envelope power of the wanted signal to the mean power of the unwanted signal.

5.3 Principles used for the application of interregional sharing criteria (see Recommendation 5)

5.3.1 Application of No. 346 of the Radio Regulations

In the application of the interregional sharing criteria, the basic principle is the equality of rights between the regions as provided in No. 346 of the Radio Regulations.

5.3.2 Application of the IFRB Technical Standards

The relevant IFRB Technical Standards govern interregional sharing.

CHAPTER 6

PLANNING

6.1 Basis for planning

The Plan for the broadcasting service in Region 2 in the band 1 605 - 1 705 kHz is based on the following principles:

a) the Plan for the broadcasting service shall contain allotments and may contain assignments;

b) the Plan shall not be based on requirements submitted by administrations;

c) the Allotment Plan shall be established without taking into account the stations of other services;

d) an allotment area is determined on the basis of the standardized distance(s) specified in section 6.3.2.

e) where the separation distance between an allotment area of one administration and those of a number of other administrations is less than the standardized distance(s), the minimum number of channels allotted to that area will depend on the number of administrations involved as indicated in Table 6.I;

f) where the separation distance between an allotment area of one administration and those of all other administrations is greater than the appropriate standardized distance, all ten channels are allotted to that area;

g) the Plan will be based on the use of standardized parameters. However, the possibility should be left open for a group of countries to decide subregionally to develop, at the Conference, part of the Plan, consistent with the Regional Plan, based on a transmitter power less than the standardized parameter;

h) an administration may make assignments on channels not allotted to it in a given allotment area provided that it protects the allotments and assignments of other countries in accordance with section 6.4. Such assignments shall not restrict the use of allotments which complies with standardized parameters;

i) where neighbouring countries have allotments on adjacent channels, the procedures to be followed before bringing into use assignments from allotments in border areas are specified in section 6.3.4;

j) administrations may bring into use assignments with parameters different from the standardized parameters provided the conditions given in section 6.3.3 are met;

k) administrations so wishing may convert their allotments into assignments at the Second Session using the specified planning criteria; these assignments will also appear in the Plan;

l) for the case mentioned in k) above, where neighbouring countries have allotments in adjacent channels, the procedures referred to in i) must be followed.

6.2 Planning method

The following text is a general description of the steps to be taken in developing the Plan based on the planning method that has been adopted.

6.2.1 Step 1 consists in using the appropriate co-channel standardized distance and identifying within each country the areas to which a minimum number of channels will be allotted. A method which may be used is as follows:

6.2.1.1 Taking a geographical map covered with a sufficiently small grid and using a template having a circle with a radius equal to the appropriate standardized distance, determine for any point of the grid the number of countries within this circle; write the number on the map.

6.2.1.2 Move to another point on the grid and repeat 6.2.1.1.

6.2.1.3 Having processed all the points on the grid, draw the boundaries around all the numbers with the same value (see Figures 6.1 and 6.2).

6.2.1.4 Taking into account the borders between countries, describe each area using these borders and/or geographical coordinates from the boundaries defined in 6.2.1.3.

6.2.1.5 Identify each area with a single code based on the geographical area symbols contained in Table B1 of the Preface to the International Frequency List.

6.2.2 Step 2 consists in identifying the minimum number of channels to be allotted to each of the areas identified in Step 1.

1. Each of the areas identified in Step 1 is associated with a number corresponding to the number of countries within a distance X (the values of X are given in section 6.3.2).

2. Using Table 6.I, determine the minimum number of channels to be allotted to each area.

TABLE 6.I

Minimum number of allotted channels

Total number of administrations	Minimum number of allotted channels	Remaining channels
1	10	0
2	5	0
3	3	1
4	2	2
5	2	0
6-10	1	4-0

6.2.3 Step 3 consists in allotting in each case the channels constituting the minimum number of channels, taking account of the need to minimize adjacent channel interference.

At this stage the minimum number of allotments to neighbouring allotment areas shall be made with a view to reducing adjacent channel problems as much as possible, particularly in the case of allotment areas with only one or two channels.

6.2.4 Step 4 consists in allotting the remaining channels.

The remaining channels may be used during the Second Session to increase the number of allotments to neighbouring countries, on the basis of the conditions to be adopted at that Session.

6.2.5 Step 5 consists in bilateral or multilateral negotiations carried out between neighbouring countries if they so desire.

The Second Session should adopt any rule that might be needed for these negotiations during that Session concerning:

- alternative arrangements of the channels and areas allotted to these countries;

- the determination of the boundaries of allotment areas on the basis of tolerances to be defined;

6.2.6 At this stage, administrations so wishing may use the allotments resulting from steps 3 and 4 and specify the locations and parameters of assignments which are to be included in the Plan appearing in the Regional Agreement. These assignments will be examined using the criteria of sections 6.3 and 6.4 to ensure that the allotments of other administrations are not affected.

The following example illustrates the method:

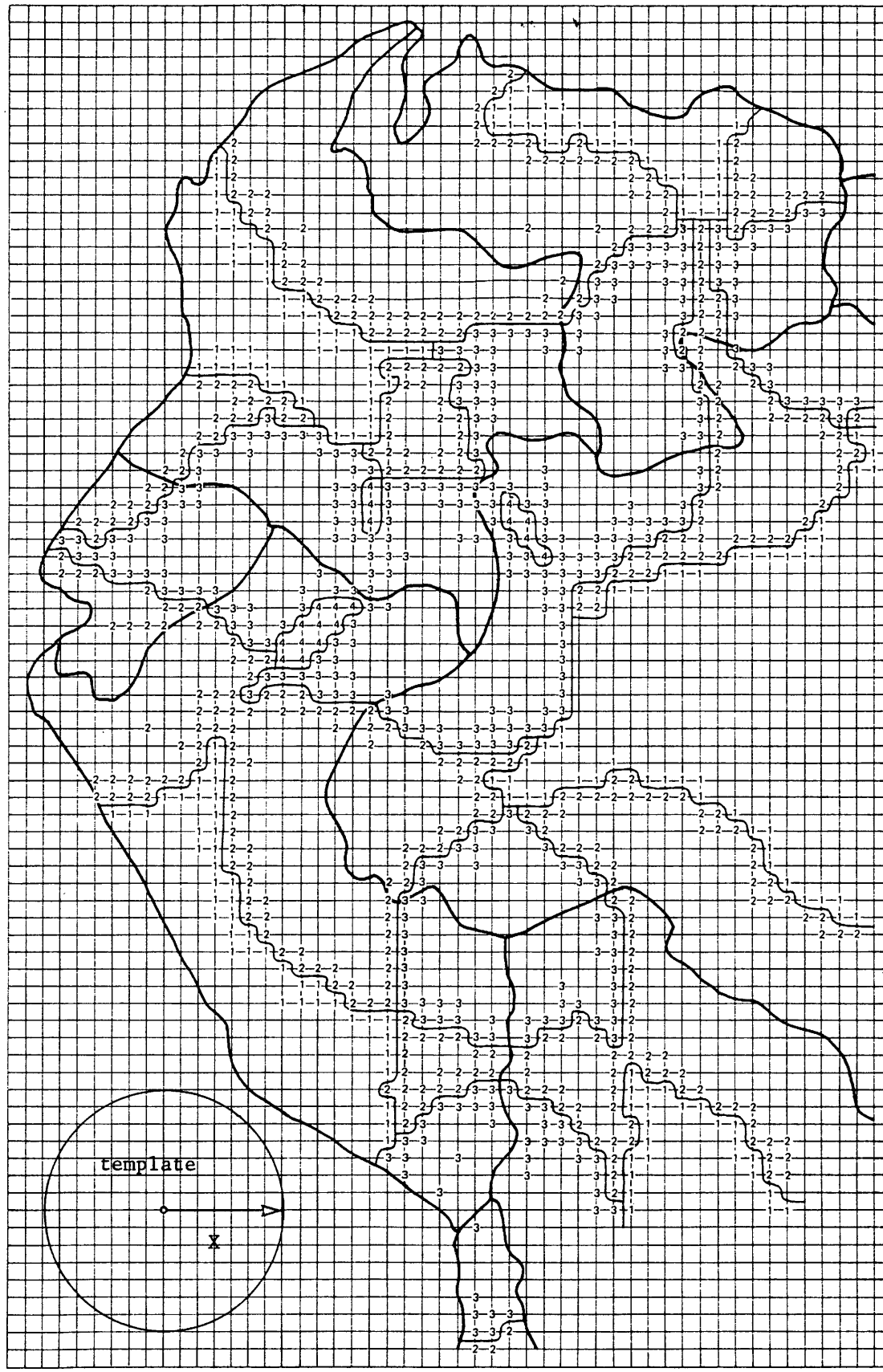

FIGURE 6.1

Number of countries within the template

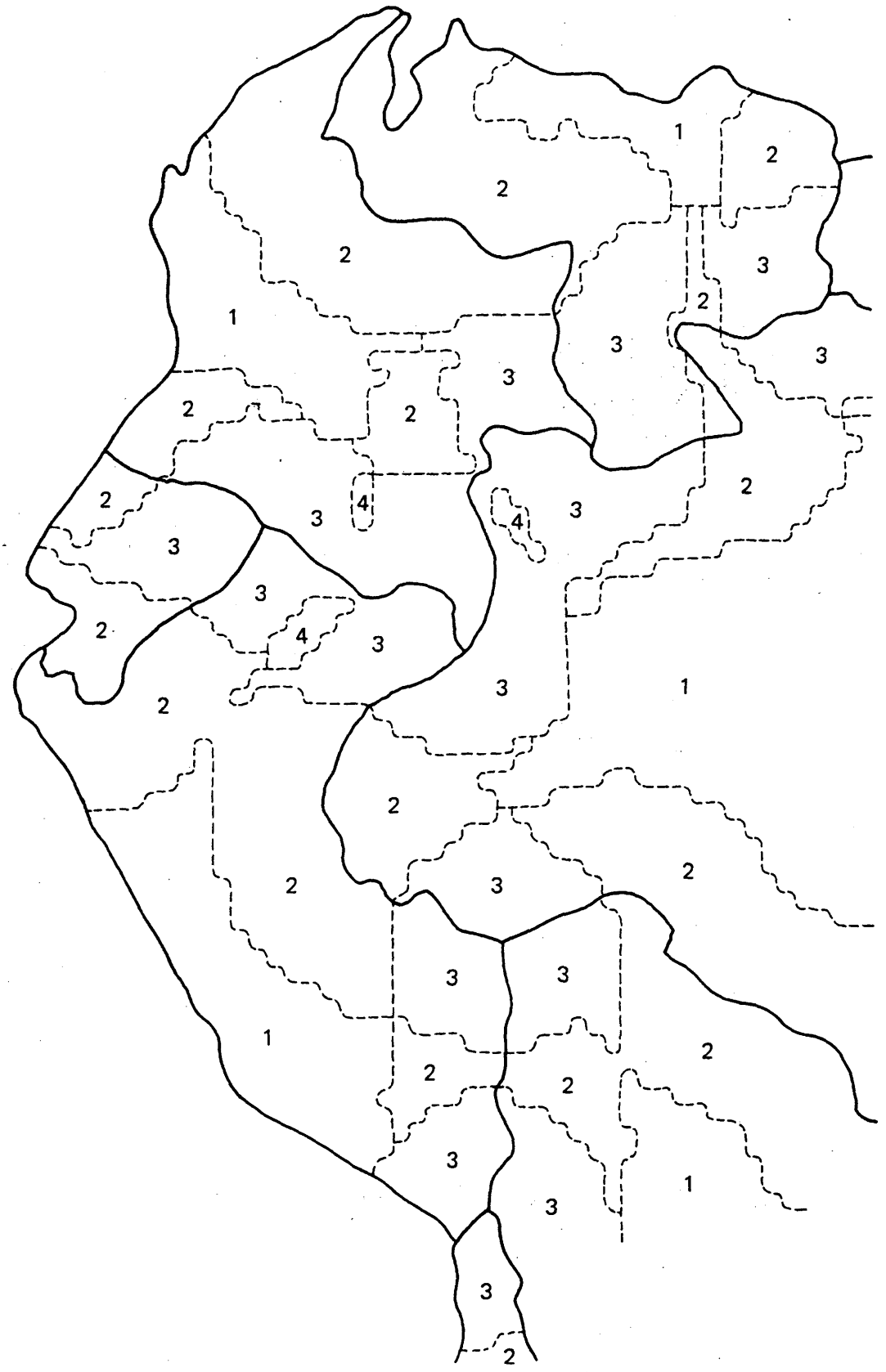

FIGURE 6.2

Number of countries within a distance X

6.3 Planning criteria

6.3.1 Standardized parameters

The Allotment Plan shall be based on the following standard parameters for day and night and for noise zones 1 and 2:

Station power: 1 kW

Antenna: omnidirectional with 90° electrical height

6.3.2 Co-channel standardized distance

The standardized distance, X, shall be:

- for noise zone 1 land path: 330 km, based on skywave protection for the night-time E_{nom} of 3.3. mV/m;

- for noise zone 2 land path: 120 km, based on groundwave protection for the daytime E_{nom} of 1.25 mV/m;

- for sea paths and mixed paths in noise zones 1 and 2, the IFRB will carry out planning exercises in the following manner:*,**

  a) starting with a separation distance of 600 km, try to find at least one channel per allotment area;

  b) if this is not possible, repeat the above using a separation distance of 550 km, and if necessary repeat again using a distance of 500 km;

  c) if it is still not possible to provide at least one channel per allotment area, the IFRB will use, as the standardized distances, the distances calculated in accordance with section 6.2.1 in order to meet the E_{nom} of 1.25 mV/m;

- as a separate planning exercise for both sea paths and mixed paths, the IFRB will use a standardized distance in noise zones 1 and 2 of 450 km;*,**

- in the case of mixed paths, for both planning exercises the standardized distances will be limited to the sea portion of the path plus the total portion of 120 km or 330 km of land path in noise zones 2 and 1 respectively.

* The exact distance will be decided by the Second Session based on the results of the intersessional planning exercises carried out by the IFRB.

** When deciding on the distance to be used for the establishment of the Plan, consideration should be given to the need to avoid adjacent channel interference in allotment areas to which only one channel is allotted, and to minimize it elsewhere (see section 6.3.4).

6.3.3 Use of different parameters

6.3.3.1 An administration may use a higher radiated power than that produced by the standardized parameters in section 6.3.1 provided that the field strength produced by a standardized parameter station situated at the most critical point on the boundary of the original allotment area is not exceeded:

- in any co-channel allotment area of another administration, at the appropriate standardized distance from the boundary of the originating administration's allotment area;

- at any point in the allotment area of another administration to which a first adjacent channel is allotted.

6.3.3.2 Assignments on non-allotted channels may use a higher radiated power than that produced by a standardized parameter station, provided that the field strength within a neighbouring country without a co-channel or adjacent channel allotment does not exceed the field strength produced by a standardized parameter station situated at the most critical point on the border of the originating country.

6.3.3.3 In recognition of the special problems caused by the low ground conductivity of the Caribbean islands situated in noise zone 2, the concept described in section 6.3.3.1 is extended as follows:

a) A reference situation is established in which a station with standardized parameters is located at the boundary of the allotment area of such an island. The resulting field strength to the allotment areas of other administrations is calculated assuming an all-sea path.

b) Before an island administration may bring into use an assignment with a higher radiated power than that associated with a standardized station, the resulting field strength to the allotment areas of other administrations is calculated taking into account the actual ground traversed over the island, the path otherwise being a sea path.

c) The field strengths referred to in b) must not exceed those in a).

This special provision applies only to the daytime situation.

6.3.3.4 In no case shall the station power be greater than 10 kW.

6.3.4 Border area considerations for first adjacent channels

To ensure efficient use of the band to be planned, the first adjacent channel interference should be evaluated at the stage of assigning frequencies to stations; in some cases, this will require coordination among the administrations concerned. In order to limit the number of such cases, the following steps should be taken.

6.3.4.1 The procedure to be followed before bringing into use assignments from allotments in border areas should contain the following guidelines:

a) An administration proposing to assign a frequency to a station shall coordinate this assignment with another administration if the field strength produced by the proposed assignment in the neighbouring adjacent channel allotment area of that other administration exceeds the nominal field strength.

b) For ease of identification of the administrations with which the above coordination is required, the following distances shall be used:

- ground path in noise zone 1: 53 km
- sea path in noise zone 1: 310 km
- ground path in noise zone 2: 35 km
- sea path in noise zone 2: 160 km

Beyond the above appropriate distance, neither coordination nor the calculation of the nominal usable field strength contour is required.

6.3.4.2 The procedures to be applied for such coordination should be adopted at the Second Session, taking account of:

a) provisions to resolve cases where, despite the joint efforts to find a solution, coordination is not achieved;

b) the need to address the question of the overlapping of the appropriate contours for a nominal frequency separation of 10 kHz, 20 kHz and 30 kHz;

c) the principle that, for protection purposes, the border of a country should be deemed to encompass only its land area, including islands.

6.3.5 Considerations for the use of non-broadcasting stations

The Second Session should consider the adoption of a procedure to be applied by administrations wishing to implement their allotments with respect to non-broadcasting stations of the other contracting Members. Such procedures will provide for the continued operation of designated non-broadcasting stations provided it does not have an adverse effect upon the implementation of the Plan (see Recommendation 3 and Resolution 2).

6.4 Protection considerations

6.4.1 Protection of allotments from assignments on allotted channels

Assignments on co-channel allotments are considered to be compatible with each other when they are brought into use in accordance with section 6.3.

6.4.2 Protection of allotments from assignments on non-allotted channels

The signal strengths to be protected are the appropriate values of nominal usable field strength shown in section 3.5. The area to be protected is limited by:

- the boundary of an allotment area;
- the contour corresponding to the E_{nom} of an assignment on an allotted channel when the contour is within the country but extends beyond the allotment area.

The maximum permitted interfering field strength within the area to be protected is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal considered is the greater of the groundwave or skywave signal. In all other cases, only groundwave interference is considered.

The effect of each interfering transmitter shall be evaluated separately, and interference from other transmitters shall not be taken into account in determining the maximum signal strength permitted from each transmitter.

6.4.3 Protection of assignments on non-allotted channels from assignments on allotted channels

Assignments on non-allotted channels do not receive protection from assignments on allotted channels.

6.4.4 Protection of assignments on non-allotted channels from other assignments on non-allotted channels

Assignments on non-allotted channels are protected from subsequent assignments on non-allotted channels. The protected contour encompasses the area in which the groundwave field strength is equal to or greater than the appropriate value of E_{nom} given in section 3.5.

The field strength of skywave interfering signals shall be calculated at the site of an assignment using a non-allotted channel.

The maximum permitted interfering field strength is the value of the nominal usable field strength divided by the appropriate protection ratio.

In the case of night-time co-channel interference, the interfering signal considered is the greater of the skywave or groundwave signal. In all other cases, only groundwave interference is considered.

The effect of each interfering transmitter shall be evaluated separately, and interference from other transmitters shall not be taken into account in determining the maximum signal strength permitted from each transmitter.

Where the protected contour extends beyond the border of the country in which the station is located, the maximum permissible interfering groundwave field strength at the border is the field strength of the protected station calculated along the border divided by the protection ratio.

CHAPTER 7

GUIDELINES FOR THE AGREEMENT*

In compliance with item 2.1.7 of the agenda in Administrative Council Resolution 913 relating to the establishment of guidelines for the agreement, a draft agreement was prepared by the First Session of the Conference to assist the Second Session, as follows:

DRAFT REGIONAL AGREEMENT FOR THE USE BY THE BROADCASTING SERVICE OF THE BAND 1 605 - 1 705 kHz IN REGION 2

PREAMBLE

Noting No. 480 of the Radio Regulations, which provides:

"In Region 2, the use of the band 1 605 - 1 705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference ...";

fully respecting the sovereign right of each country to regulate within its territory the use of the frequency band 1 605 - 1 705 kHz by the broadcasting service, and to reach special arrangements regarding this service with such countries as it may consider appropriate, without prejudice to other administrations;

seeking to facilitate mutual understanding and cooperation among the Members of Region 2 in achieving a satisfactory broadcasting service in the MF band 1 605 - 1 705 kHz;

recognizing that all countries have equal rights, and that, in the application of the Plan and its provisions, the needs of each country, and in particular those of developing countries, shall be met as far as possible, and

acknowledging that mutual protection of their broadcasting service is a major objective of all countries, in order to ensure better coordination and the use of more efficient facilities;

the delegates of the Members of the International Telecomunication Union assembled in [ ] at a regional administrative conference convened pursuant to the International Telecommunication Convention (Nairobi 1982), have adopted, subject to approval by the competent authorities of their respective countries, the following provisions relating to the broadcasting service in Region 2 for the frequency band between 1 605 and 1 705 kHz.

* Note by the First Session of the Conference - Some passages which appear in square brackets concern references and additions to be incorporated in the final text of the Agreement when it is adopted.

ARTICLE 1

1. For the purposes of the Agreement, the following terms shall have the meanings defined below.

1.1 Union: The International Telecommunication Union.

1.2 Secretary-General: The Secretary-General of the Union.

1.3 IFRB: The International Frequency Registration Board.

1.4 CCIR: The International Radio Consultative Committee.

1.5 Convention: The International Telecommunication Convention.

1.6 Radio Regulations: The Radio Regulations supplementing the provisions of the Convention.

1.7 Region 2: The geographical area defined in No. 394 of the Radio Regulations, Geneva, 1979.

1.8 Master Register: The Master International Frequency Register.

1.9 Provisions: The provisions adopted herein that are associated with the Plan.

1.10 Agreement: This Instrument and its Annexes.

1.11 Plan: The Allotment Plan in Article 6 and the associated provisions[1].

1.12 Administration: Any governmental department or service responsible for discharging the obligations undertaken in the Convention and the Radio Regulations.

1.13 Contracting Member: Any member of the Union which has approved the Agreement or acceded to it.

1.14 Affected Administration: An administration within whose territory the signal of a proposed assignment of another administration exceeds the value prescribed in [section 3.5 of this Report].

1.15 Allotment: Entry in the Plan of a designated broadcasting channel for use by an administration for the broadcasting service in an allotment area under the conditions specified in the Plan. Each allotment included in the Plan may be used for one or more assignments using the technical criteria specified in [section 6.3 of this Report].

1.16 Allotment area: Specifically defined geographical area within a country to which one or more channels are allotted.

1) The allotments may be converted into assignments which will appear as Part B of the Plan.

ARTICLE 2

Frequency Band

2.1 The provisions of the Agreement shall apply to the broadcasting service in the frequency band 1 605 - 1 705 kHz as allocated to Region 2 under Article 8 of the Radio Regulations.

ARTICLE 3

Execution of the Agreement

3.1 The Contracting Members shall adopt for their stations in Region 2 in the frequency band which is the subject of the Agreement the technical characteristics and standards which are in conformity with the Agreement.

3.2 The Contracting Members shall not bring into use frequency assignments to broadcasting stations except under the conditions set out in Article 4 of the Agreement.

3.3 The Contracting Members undertake, to the extent possible, to avoid or to reduce any harmful interference.

ARTICLE 4

Implementation of the Plan and Notification of Frequency Assignments in the Broadcasting Service

4.1 Assignments corresponding to an allotted channel

4.1.1. An administration may at any time, without the need for coordination, make assignments corresponding to any of its allotments, at one or more locations within the respective allotment area, provided that:

4.1.1.1 - the characteristics of the assignments are within the standardized parameters given in [section 6.3.1 of this Report];

4.1.1.2 - where necessary, the coordination required for the protection of adjacent channels has been successfully concluded [section 6.3.4 of this Report]; and

4.1.1.3 - the criteria of [section 6.3.3 of this Report] are met in cases where the characteristics of the assignments exceed the values of the standardized parameters.

4.2 Assignments corresponding to channels not allotted to the area

4.2.1 An administration may at any time, without the need for coordination, make an assignment on a channel not allotted to it provided that the characteristics of the assignment satisfy the criteria set out in [sections 6.3.3.2 and 6.4 of this Report] with respect to:

4.2.1.1 - the use of the channel or channels by the administration(s) to which it is allotted in the Plan; and

4.2.1.2 - any broadcasting station of another Region 2 administration previously recorded in the Master Register with a favourable finding.

4.2.2 An administration may make an assignment on a channel not allotted to it or with characteristics which do not satisfy the conditions set out in sections 4.2.1.1 and 4.2.1.2 provided that such use has been successfully coordinated with the affected administration(s).

4.3 When an administration proposes to bring into use an assignment in conformity with the Agreement, it shall notify it to the IFRB in accordance with Article 12 of the Radio Regulations. Any such assignment recorded in the Master Register as a result of the application of Article 12 of the Radio Regulations shall bear a special symbol under the Remarks Column and a date in Column 2a or in Column 2b.

4.4 When the IFRB receives an assignment notice which is not in conformity with the Agreement, it shall return the notice to the notifying administration.

4.5 If the notifying administration resubmits the notice with or without modification and insists that it be reconsidered, and if the Board's finding remains unfavourable, the notice shall be returned to the notifying administration.

ARTICLE 5

Special Arrangements

5.1 In order to supplement the procedures laid down in these Provisions, or to facilitate the coordination provided for in Article 4, administrations may conclude or continue special arrangements in conformity with the applicable provisions of the Convention and the Radio Regulations.

ARTICLE 6

Plan

Part A: [consists of the allotments in the Region-wide Allotment Plan.]

Part B: [consists of the assignments to be developed at the Second Session by administrations seeking to convert their allotments to assignments.]

ARTICLE 7

Scope of Application of the Agreement

7.1 The Agreement is binding upon the Contracting Members in their mutual relations, but not in their relations with non-contracting countries.

7.2 Should a Contracting Member formulate reservations on the application of any provision of the Agreement, the other Contracting Members shall be free to disregard that provision in their relations with the Member that has made the reservations.

ARTICLE 8

Approval of the Agreement

8.1 The signatory Members shall notify the Secretary-General of their approval of this Agreement as soon as possible by depositing an instrument of approval; the Secretary-General shall immediately inform the other Members of the Union.

ARTICLE 9

Accession to the Agreement

9.1 Any Member of the Union in Region 2 which has not signed the Agreement may accede to it at any time by depositing an instrument of accession with the Secretary-General, who shall immediately inform the other Members of the Union. Accession shall apply to the Plan as it stands at the time of accession and shall be made without reservation.

9.2 Accession to the Agreement shall become effective on the date on which the instrument of accession is received by the Secretary-General.

ARTICLE 10

Denunciation of the Agreement

10.1 Any Contracting Member may denounce the Agreement at any time by a notification sent to the Secretary-General, who shall inform the other Members of the Union.

10.2 Denunciation shall become effective one year after the date on which the Secretary-General receives the notification of denunciation.

ARTICLE 11

Entry into Force of the Agreement

11.1 The Agreement shall enter into force on [ ] at [ ] hours UTC.

ARTICLE 12

Duration of the Agreement

12.1 The Agreement shall remain in force until revised by a competent administrative radio conference.

CHAPTER 8

PREPARATORY WORK FOR THE SECOND SESSION OF THE CONFERENCE

8.1 IFRB Intersessional work

8.1.1 Planning method

a) establish a map of the Region identifying, within each country, areas to which the minimum number of channels will be allotted (i.e. steps 6.2.1.1, 6.2.1.2, 6.2.1.3) in accordance with the guidelines and decisions of the Conference and as shown in Figures 6.1 and 6.2. This task shall be completed by January 1987 and the results communicated to all Region 2 administrations;

b) develop the necessary microcomputer software for the analysis of a limited number of actual groundwave situations using the Atlas of Ground Conductivities. This task could be restricted to deal with only part of the Region, at any one time;

c) prepare planning exercises in accordance with section 6.3.2;

d) make available the microcomputer software for the calculation of skywave field strengths by administrations;

e) make available the microcomputer software for the calculation of groundwave field strengths on the basis of both the distances and the ground conductivities being input manually.

8.1.2 Updating of the Master Register

(See Resolution 2.)

8.2 Technical studies by the CCIR

a) preparation of a report relating to the relationship between physical and electrical antenna height (see Recommendation 6);

b) continuation of studies on sharing criteria for services using the band 1 625 - 1 705 kHz in Region 2 and preparation of a new report on this subject (see Recommendation 4).

These studies will be carried out as part of the normal CCIR Study Group activities.

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ANNEX 1

Calculation of directional antenna patterns

Introduction

This Annex describes methods to be employed in calculating the field strength produced by a directional antenna at a given point.

1. *General equations*

The theoretical directional antenna radiation pattern is calculated by means of the following equation, which sums the field strength from each element (tower) in the array.

$$E_T(\varphi, \theta) = \left| K_L \sum_{i=1}^{n} F_i f_i(\theta) \angle \underline{\psi_i + S_i \cos \theta \cos (\varphi_i - \varphi)} \right| \quad (1)$$

where:

$$f_i(\theta) = \frac{\cos (G_i \sin \theta) - \cos G_i}{(1 - \cos G_i) \cos \theta} \quad (2)$$

where:

$E_T(\varphi, \theta)$: theoretical inverse distance field strength at one kilometre in mV/m for the given azimuth and elevation;

K_L : multiplying constant in mV/m which determines the pattern size (see paragraph 2.5 below for derivation of K_L);

n : number of elements in the directional array;

i : denotes the ith element in the array;

F_i : ratio of the theoretical field strength due to the ith element in the array relative to the theoretical field strength due to the reference element;

θ : vertical elevation angle, in degrees, measured from the horizontal plane;

$f_i(\theta)$: ratio of vertical to horizontal plane field strength radiated by the ith element at elevation angle θ;

G_i : electrical height of the ith element, in degrees;

S_i : electrical spacing of the ith element from the reference point in degrees;

φ_i : orientation of the ith element from the reference element (with respect to True North), in degrees;

φ : azimuth with respect to True North, in degrees;

ψ_i : electrical phase angle of field strength due to the ith element (with respect to the reference element), in degrees.

Equations (1) and (2) assume that:

- the current distribution in the elements is sinusoidal,
- there are no losses in the elements or in the ground,
- the antenna elements are base-fed, and
- the distance to the computation point is large in relation to the size of the array.

2. *Determination of values and constants*

2.1 *Determination of the multiplying constant K for an array*

The multiplying constant K for the loss-free case may be computed by integrating the power flow over the hemisphere, deriving an r.m.s. field strength and comparing the result with the case where the power is radiated uniformly in all directions over the hemisphere.

Thus:

$$K = \frac{E_s\sqrt{P}}{e_h} \quad \text{mV/m}$$

where:

K: no-loss multiplying constant (mV/m at 1 km);

E_s: reference level for uniform radiation over a hemisphere, equal to 244.95 mV/m at 1 km for 1 kW;

P: antenna input power (kW);

e_h: root mean square radiation pattern over the hemisphere which may be obtained by integrating $e(\theta)$ at each elevation angle over the hemisphere. The integration can be made using the trapezoidal method of approximation, as follows:

$$e_h = \left[\frac{\pi\Delta}{180}\left\{\tfrac{1}{2}[e(\theta)]^2 + \sum_{m=1}^{N}[e(m\Delta)]^2 \cos m\Delta\right\}\right]^{\frac{1}{2}} \tag{3}$$

where:

Δ: interval, in degrees, between equally-spaced sampling points at different elevation angles θ;

m: an integer from 1 to N, which gives the elevation angle θ in degrees when multiplied by Δ, i.e. $\theta = m\Delta$;

N: one less than the number of intervals $\left(N = \frac{90}{\Delta} - 1\right)$;

$e(\theta)$: root mean square radiation pattern given by equation (1) with K equal to 1 at the specified elevation angle θ (the value of θ is 0 in the first term of equation (3) and $m\Delta$ in the second term); $e(\theta)$ is computed using equation (4).

$$e(\theta) = \left[\sum_{i=1}^{n}\sum_{j=1}^{n} F_i f_i(\theta) F_j f_j(\theta) \cos\psi_{ij} J_0(S_{ij}\cos\theta)\right]^{\frac{1}{2}} \tag{4}$$

where:

i: denotes the ith element;

j: denotes the jth element;

n: number of elements in the array;

ψ_{ij}: difference in phase angles of the field strengths from the ith and jth elements in the array;

S_{ij}: angular spacing between the ith and jth elements in the array;

$J_0(S_{ij}\cos\theta)$: the Bessel function of the first kind and zero order of the apparent spacing between the ith and jth elements. In equation (4), S_{ij} is in radians. However when special tables of Bessel functions giving the argument in degrees are used, the values of S_{ij} should then be in degrees.

2.2 *Relationship between field strength and antenna current*

The field strength resulting from a current flowing in a vertical antenna element is:

$$E = \frac{R_c I[\cos(G\sin\theta) - \cos G]}{2\pi r\cos\theta} \times 10^3 \quad \text{mV/m} \tag{5}$$

where:

E: field strength in mV/m;

R_c: resistivity of free space ($R_c = 120\pi$ ohms);

I: current at the current maximum, in amperes [1];

G: electrical height of the element, in degrees;

r: distance from the antenna, in metres;

θ: vertical elevation angle, in degrees.

---

[1] I is the current at the maximum of the sinusoidal distribution. If the electrical height of the element is less than 90°, the base current will be less than I.

At one kilometre and in the horizontal plane ($\theta = 0°$):

$$E = \frac{120\pi I(1-\cos G) \times 10^3}{2\pi(1000)} \qquad \text{mV/m} \tag{6}$$

hence:

$$E = 60I(1 - \cos G) \qquad \text{mV/m} \tag{7}$$

2.3 *Determination of no-loss current at current maximum*

For a tower of uniform cross-section or for a similar type of directional array element, the no-loss current at the current maximum is:

$$I_i = \frac{KF_i}{60(1-\cos G_i)} \tag{8}$$

where:

I_i: current at current maximum in amperes in the ith element;

K: no-loss multiplying constant computed as shown in paragraph 2.1 above.

The base current is given by $I_i \sin G_i$.

2.4 *Array power loss*

Power losses in a directional antenna system are of various types, including ground losses, antenna coupling losses, etc. The loss resistance for the array may be assumed to be inserted at the current maximum to allow for all losses. The power loss is:

$$P_L = \frac{1}{1000} \sum_{i=1}^{n} R_i I_i^2 \tag{9}$$

where:

P_L: total power loss, in kW;

R_i: assumed loss resistance, in ohms (one ohm, unless otherwise indicated) for the ith tower [1];

I_i: current at current maximum (or base current if the element is less than 90 degrees in electrical height) for the ith tower.

2.5 *Determination of a corrected multiplying constant*

To allow for power loss in the antenna system, the multiplying constant K can be modified, as follows:

$$K_L = K\left(\frac{P}{P + P_L}\right)^{\frac{1}{2}} \tag{10}$$

where:

K_L: multiplying constant after correction for the assumed loss resistance;

K: no-loss multiplying constant computed in paragraph 2.1 above;

P: array input power (kW);

P_L: total power loss (kW).

[1] The loss resistance shall in no way exceed a value such that the value of K_L (see paragraph 2.5) differs by more than ten percent from that calculated for a resistance of one ohm.

2.6 *r.m.s. value of radiation to be notified for directional antennas*

The radiation E_r for directional antennas is determined as follows:

$$E_r = K_L\, e(\theta) \qquad \text{mV/m at 1 km}$$

2.7 *Determination of expanded pattern values*

The expanded pattern is determined as follows:

$$E_{EXP}(\varphi, \theta) = 1.05 \left\{ [E_T(\varphi, \theta)]^2 + Q^2 \right\}^{\frac{1}{2}} \tag{11}$$

where:

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

$E_T(\varphi, \theta)$: theoretical pattern radiation at a particular azimuth, φ, and a particular elevation angle θ;

Q : quadrature factor, computed as:

$$Q = Q_0\, g(\theta)$$

where:

Q_0 is the Q on the horizontal plane, and is normally the greatest of the following three quantities:

$$10.0 \quad ; \quad 10\sqrt{P} \quad \text{or} \quad 0.025 K_L \left[\sum_{i=1}^{n} F_i^{\,2} \right]^{\frac{1}{2}}$$

$g(\theta)$ is computed as follows:

If the electrical height of the shortest tower is less than or equal to 180 degrees, then:

$$g(\theta) = f(\theta) \text{ for the shortest tower.}$$

If the electrical height of the shortest tower is greater than 180 degrees, then:

$$g(\theta) = \frac{\{[f(\theta)]^2 + 0.0625\}^{\frac{1}{2}}}{1.030776}$$

where $f(\theta)$ for the shortest tower is used.

Note: In comparing the electrical heights of the antenna towers to determine the shortest tower, the total apparent height (as determined by current distribution) is used for top-loaded and sectionalized towers.

2.8 *Determination of augmented (modified expanded) pattern values*

The purpose of the augmented (modified expanded) pattern is to put one or more "patches" on an expanded pattern. Each "patch" is referred to as an "augmentation". The augmentation may be positive (resulting in more radiation than that of the expanded pattern) or negative (resulting in less radiation than that of the expanded pattern). In no case shall the augmentation be so negative that the augmented (modified expanded) pattern radiation is below the theoretical radiation pattern.

Spans of augmentation may overlap. That is, an augmentation may itself be augmented by a subsequent augmentation. To ensure that the calculations are properly made, the augmentations are handled in increasing order of central azimuth of augmentation, starting at True North. If several augmentations have the same central azimuth, then they are considered in order of decreasing span (i.e. the one with the largest span is handled first). If more than one augmentation has the same central azimuth and the same span, then they are considered in ascending order of their effect.

$$E_{MOD}(\varphi, \theta) = \left\{[E_{EXP}(\varphi, \theta)]^2 + g^2(\theta) \sum_{i=1}^{a} A_i \cos^2 (180\, \Delta_i / \alpha_i)\right\}^{\frac{1}{2}} \quad (12)$$

where:

$E_{MOD}(\varphi, \theta)$: augmented (modified expanded) pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$E_{EXP}(\varphi, \theta)$: expanded pattern radiation at a particular azimuth, φ, and a particular elevation angle, θ;

$g(\theta)$: same parameter as described for the expanded pattern (see paragraph 2.7);

a : number of augmentations;

Δ_i : difference between the azimuth at which the radiation is desired φ, and the central azimuth of augmentation of the ith augmentation. It will be noted that Δ_i must be less than or equal to one-half of α_i;

α_i : total span of the ith augmentation;

A_i : is the value of the augmentation given by the expression [1]:

$$A_i = [E_{MOD}(\varphi_i, \theta)]^2 - [E_{INT}(\varphi_i, \theta)]^2 \quad (13)$$

where:

φ_i : central azimuth of the ith augmentation;

$E_{MOD}(\varphi_i, \theta)$: augmented (modified expanded) horizontal plane radiation at the central azimuth of the ith augmentation, after applying the ith augmentation, but before applying subsequent augmentations;

$E_{INT}(\varphi_i, \theta)$: an interim value of radiation in the horizontal plane at the central azimuth of the ith augmentation. The interim value is the radiation obtained from applying previous augmentations (if any) to the expanded pattern, but before applying the ith augmentation.

[1] When A_i is negative, there is negative augmentation; when A_i is positive, there is positive augmentation. A_i must not be so negative that $E_{MOD}(\varphi, \theta)$ falls below $E_T(\varphi, \theta)$ of any azimuth, φ, or elevation angle, θ.

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ANNEX 2

Equations for the calculation of the normalized vertical radiation from top-loaded and typical sectionalized antennas

Basically, the equation is:

$$f(\theta) = \frac{E_\theta}{E_0}$$

where:

E_θ : radiation at a desired elevation angle, θ;

E_0 : radiation in the horizontal plane.

Specific equations for top-loaded and typical sectionalized antennas are given below.

These equations use one or more of four variables A, B, C and D, which are defined after each equation.

1. *Top-loaded antenna* (Type 1 antennas)

$$f(\theta) = \frac{\cos B \cos (A \sin \theta) - \sin \theta \sin B \sin (A \sin \theta) - \cos (A + B)}{\cos \theta [\cos B - \cos (A + B)]}$$

where:

A : electrical height of the antenna tower;

B : difference between the apparent electrical height (based on current distribution) and the actual height (A);

θ : the elevation angle with respect to the horizontal plane.

Note: When B is zero (i.e., when there is no top-loading), the equation reduces to that of a simple vertical antenna.

2. *Sectionalized tower* (Type 2 antennas)

$$f(\theta) = \frac{\begin{array}{l}[\cos B \cos (A \sin \theta) - \cos (A + B)] \sin (C + D - A) + \sin B[\cos D \cos (C \sin \theta) \\ - \sin \theta \sin D \sin (C \sin \theta) - \cos (C + D - A) \cos (A \sin \theta)]\end{array}}{\cos \theta([\cos B - \cos (A + B)] \sin (C + D - A) + \sin B[\cos D - \cos (C + D - A)])}$$

where:

A : actual height of the lower section;

B : difference between the apparent electrical height (based on current distribution) of the lower section and the actual height of the lower section (A);

C : actual total height of the antenna;

D : difference between the apparent electrical height (based on current distribution) of the total tower and the actual height of the total tower (C);

θ : vertical angle with respect to the horizontal plane.

3. Administrations proposing to use other types of antenna should furnish details of their characteristics together with a radiation pattern.

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RESOLUTION No. 1

Report of the First Session

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

the terms of reference assigned to it by Resolution 913 of the Administrative Council;

resolves

to approve the Report of this Session of the Conference;

instructs

1. the Chairman of this Session of the Conference to transmit under his signature the Report of the First Session to the Second Session of the Conference;

2. the Secretary-General to transmit this Report to all Members of the Union.

RESOLUTION No. 2

Updating of the Master International Frequency Register with Regard to Assignments to Stations of the Fixed, Mobile, Aeronautical Radionavigation and Radiolocation Services in the Frequency Band 1 605 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva 1986),

considering

a) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and until a date to be decided by the Second Session, the band 1 605 - 1 705 kHz is allocated to the fixed, mobile and aeronautical radionavigation services on a primary basis and to the radiolocation service on a secondary basis;

b) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and from a date to be decided by the Second Session, the band 1 605 - 1 625 kHz will be allocated exclusively to the broadcasting service, and the band 1 625 - 1 705 kHz will be allocated to the broadcasting service on a primary basis, to the fixed and mobile services on a permitted basis, and to the radiolocation service on a secondary basis;

c) that the planning of the band shall be based upon allotment and that the exact location and characteristics of broadcasting stations are not known;

d) that it will be impractical to assess compatibility between the allotments in the Plan and assignments to the other services to which the band is also allocated;

e) that, in view of the difficulties involved in evaluating compatibility between allotments in the Plan and assignments to other services, the Conference will establish a Plan without taking into account existing stations of the non-broadcasting services;

f) Recommendation 3;

resolves

1. that, within 90 days of the end of the First Session of this Conference, the IFRB shall send to each administration of Region 2 the list of assignments to its stations of the fixed, mobile, aeronautical radionavigation and radiolocation services recorded in the Master Register in the bands concerned, requesting them to review these assignments with a view to cancelling those which are no longer in use;

2. that administrations shall, within a period of 90 days following the receipt of the list referred to in paragraph 1 above, return the copy of the list indicating the assignments to be deleted from the Master Register as well as such modifications to other assignments as will assist in implementing the Broadcasting Plan;

3. that administrations wishing to maintain in operation non-broadcasting stations in application of section 6.3.5 of the Report of this Session shall indicate the estimated date on which the stations in question will cease operation;

4. that the IFRB shall submit a report to the Second Session of the Conference on all deletions (including the deletion date referred to in paragraph 3 above) of and modifications to assignments to non-broadcasting stations in the band 1 605 - 1 705 kHz recorded in the Master Register on behalf of Region 2 administrations;

urges administrations

1. having assignments in the fixed, mobile, aeronautical radionavigation and/or radiolocation services which are potentially incompatible with the Plan to take all necessary steps to eliminate the potential incompatibility in view of the fact that, in general, the non-broadcasting services have more flexibility to modify their characteristics, including the frequency;

2. to take all possible action with a view to achieving the objectives of this Resolution;

requests the IFRB

1. to bring Recommendation 3 to the attention of Region 2 administrations not present at the First Session of the Conference;

2. to provide all administrations with all the necessary assistance in the implementation of the provisions of this Resolution.

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RECOMMENDATION No.1

Draft Agenda and Duration of the Second Session of the Conference

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) Resolution 1 of the Plenipotentiary Conference, Nairobi, 1982, relating to Future Conferences of the Union;

b) Recommendation 504 of the 1979 WARC, relating to the Preparation of a Broadcasting Plan in the Band 1 605 - 1 705 kHz in Region 2;

c) that, in accordance with No. 480 of the Radio Regulations, the use of the band 1 605 - 1 705 kHz by stations of the broadcasting service shall be subject to a plan to be established by a regional administrative radio conference;

d) that the effective implementation of the Plan in the Region will be facilitated by the incorporation of the Regional Agreement in the Radio Regulations;

e) that the Table of Frequency Allocations provides for other services in the frequency band 1 625 - 1 705 kHz;

f) that the agenda for the First Session contained in Resolution 913 of the Administrative Council, 1984, provides for the First Session to establish a draft agenda for the Second Session of the Conference, relating to the establishment of an agreement and an associated plan, to be submitted to the Administrative Council;

g) the Report of the First Session;

h) that the Second Session will need to consider the report of the IFRB on the work carried out during the intersessional period based on the decisions of the First Session;

i) that the Second Session will need to consider technical information made available by the CCIR as a result of studies carried out;

j) that administrations will submit proposals to the Second Session;

recognizing

that the frequency band 1 605 - 1 705 kHz is shared with other services;

recommends to the Administrative Council

1. the following draft agenda for the Second Session on the basis of the Report of the First Session and taking account of considerings h), i) and j):

1.1 to draw up an agreement which includes regulatory procedures, appropriate technical standards, an associated frequency allotment plan and possibly assignments derived therefrom for the use of the band 1 605 - 1 705 kHz by the broadcasting service in Region 2;

1.2 to establish regulatory procedures governing the use of the band 1 625 - 1 705 kHz by other services in Region 2;

1.3 to establish a date (or dates) in accordance with No. 481 of the Radio Regulations, and a schedule for the introduction of the broadcasting service in the band 1 605 - 1 705 kHz;

1.4 to review and revise the relevant Resolutions and Recommendations;

1.5 to adopt a procedure to be applied by administrations wishing to implement their allotments in relation to non-broadcasting stations of the other contracting Members;

2. to consider a duration of three to four weeks for the Second Session of the Conference in 1988;

3. to select a date some five months before WARC ORB-2 when deciding on the date of the Second Session of this Conference.

RECOMMENDATION No. 2

Incorporation in the Radio Regulations of the Allotment Plan and the Associated Provisions for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) that, on the basis of No. 480 of the Radio Regulations, the Second Session of this Conference has been empowered to establish a plan for the entire Region;

b) that the Conference decided to prepare the Plan on the basis of objective criteria equally applied to all the countries of the Region;

c) that the Plan will be an allotment plan limited to a channelling arrangement, delimitation of the allotment areas, and standardized parameters;

d) that the standardized parameters adopted for the establishment of the Plan should not lead to any inter-Regional difficulties between the services to which the band is allocated;

e) Recommendation 1 relating to the agenda of the Second Session of this Conference;

recommends the Administrative Council

to place on the agenda of the Second Session of the WARC-ORB in 1988:

1.1 the consideration of consequential changes to Nos. 480 and 481 of Article 8 of the Radio Regulations in this frequency band in Region 2;

1.2 the consideration of the question of incorporation in the Radio Regulations, in the appropriate form, of the Allotment Plan and the associated provisions to be prepared for the broadcasting service in the band 1 605 - 1 705 kHz in Region 2.

RECOMMENDATION No. 3

Use of the Band 1 605 - 1 705 kHz in Region 2 by the Non-Broadcasting Services and the Development and Implementation of the Region 2 Broadcasting Plan

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva 1986),

considering

a) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and until a date to be decided by the Second Session, the band 1 605 - 1 705 kHz is allocated to the fixed, mobile and aeronautical radionavigation services on a primary basis and to the radiolocation service on a secondary basis;

b) that under No. 481 and the Table of Frequency Allocations in Article 8 of the Radio Regulations and from a date to be decided by the Second Session, the band 1 605 - 1 625 kHz will be allocated exclusively to the broadcasting service, and the band 1 625 - 1 705 kHz will be allocated to the broadcasting service on a primary basis, to the fixed and mobile services on a permitted basis, and to the radiolocation service on a secondary basis;

c) that the operation of non-broadcasting services in this band by the Region 2 administrations might hinder the implementation of the Plan for the broadcasting service in the band 1 605 - 1 705 kHz;

recommends

1. that the Region 2 administrations should henceforth refrain from assigning frequencies in the band 1 625 - 1 705 kHz to their stations in the non-broadcasting service, which might inhibit the implementation of the Plan;

2. that, when using frequencies in the band 1 605 - 1 705 kHz for stations in the non-broadcasting services, administrations should take all necessary steps to ensure that the full implementation of the Plan adopted by the Conference is not compromised.

RECOMMENDATION No. 4

Continuation of Studies on Sharing Criteria for Services Using the Band 1 625 - 1 705 kHz in Region 2

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) that the World Administrative Radio Conference (Geneva, 1979), in its Recommendation 504, invited the CCIR to carry out the necessary technical studies related to convening a conference for Region 2;

b) that the Administrative Council, in its Resolution 913 establishing the agenda for this Conference, invited the CCIR to prepare a report on the necessary technical bases;

c) that the CCIR, in response to those requests, has drawn up a report on the technical bases, which includes a chapter on compatibility with other services, and has recognized that the problem of criteria for sharing between the broadcasting service and the other services had not yet been fully studied;

d) that more varied and more detailed data are required for a better understanding of the subject and for confirmation of the values provisionally proposed in Chapter 5 of this report;

recommends that administrations

cooperate urgently and to the fullest extent possible with the CCIR by sending it contributions on the above-mentioned subject, taking account of the CCIR working schedule;

requests the CCIR

1. to continue its studies on sharing criteria for services using the band 1 625 - 1 705 kHz in Region 2;

2. to prepare a new report on this subject for the Second Session of the Conference on the basis of those studies;

3. to carry out these studies as part of the normal work of the CCIR Study Groups;

and requests the Second Session of the Conference

to reconsider the relevant parts of Chapter 5 of the Report of the First Session in the light of data provided by administrations and the CCIR's new report and, if necessary, to consider modifying the values proposed in that Chapter.

RECOMMENDATION No. 5

Technical Criteria for Interregional Sharing

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) that according to the agenda contained in Administrative Council Resolution 913, this Conference proposed provisional technical criteria for inter-service sharing of the band 1 625 - 1 705 kHz between the broadcasting service and other services in Region 2;

b) that, in accordance with numbers 1001 and 1454 of the Radio Regulations, the IFRB develops Technical Standards and Rules of Procedure for internal use by the Board in the exercise of its functions, based inter alia upon the relevant provisions of the Radio Regulations and the Appendices thereto, the decisions of administrative radio conferences, as appropriate, and the Recommendations of the CCIR;

considering further

that compatibility problems and criteria for sharing between the broadcasting service and other services to which the band 1 605 - 1 705 kHz is allocated have not yet been fully studied, although a comprehensive study is being carried out in the CCIR;

noting

a) that the recording and examination process provided in Article 12 of the Radio Regulations is the only procedure making it possible to avoid harmful interference between stations operating in Region 2, on the one hand, and those operating in Regions 1 and 3, on the other hand, and that the IFRB will therefore adopt appropriate Technical Standards;

b) that, under number 56 of the Convention, the decisions of a regional administrative conference must in all circumstances be in conformity with the provisions of the Radio Regulations and that such a conference may give instructions to the IFRB, provided that such instructions do not conflict with the interests of the two other Regions;

c) that the Regional Administrative Radio Conference for the Maritime Mobile Service and Aeronautical Radionavigation Service in certain parts of the MF band in Region 1 (RARC MM-R1, Geneva, 1985) adopted technical criteria for the protection of the maritime mobile service in the bands 1 606.5 - 1 625 kHz and 1 635 - 1 800 kHz;

recognizing

a) that the method set out in the Annex to this Recommendation was proposed for use in the planning of the 1 605 - 1 705 kHz band because it offered greater precision than the method used for the 525 - 1 605 kHz band in Region 2, and that the latter was chosen only because it simplified the planning process;

b) that simplicity is not a major factor in the calculation of field strength over interregional paths for individual assignments;

recommends

1. that the IFRB should take account of the method of calculating the skywave field strength described in the Annex to this Recommendation when adopting its Technical Standards relating to the examination of frequency assignment notices for broadcasting stations of Region 2 operating in the band 1 605 - 1 705 kHz from the standpoint of the probability of harmful interference to stations in Regions 1 and 3, and vice versa. The signal strengths thus calculated will be increased by 2.5 dB to take into account the different reference hours in Region 2 and Regions 1 and 3;

2. that, in calculating interregional interference, the field strengths shall be determined by taking the arithmetic mean of the signal strengths, expressed in dB(μV/m) for a specified e.m.r.p., calculated both by the method described in Annex 1 to CCIR Recommendation 435-3 and by the method referred to in recommends 1 above. The value thus calculated shall be applied when it is midnight at the mid-point of the interregional path, provided that the entire path is in darkness. Signal strengths at other times are unlikely to exceed this value.

Annex: 1

ANNEX TO RECOMMENDATION No. 5

Calculation of the skywave field strength to evaluate interregional interference

1. List of symbols (see also Chapter 2)

a_T: geographical latitude of the transmitting terminal (degrees)

a_R: geographical latitude of the receiving terminal (degrees)

b_T: geographical longitude of the transmitting terminal (degrees)

b_R: geographical longitude of the receiving terminal (degrees)

ϕ_T: geomagnetic latitude of the transmitting terminal (degrees)

ϕ_R: geomagnetic latitude of the receiving terminal (degrees)

ϕ: average geomagnetic latitude of a path under study (degrees)

Note - North and east are considered positive, south and west negative.

2. General procedure

The general procedure for calculation of skywave field strength to evaluate interregional interference is similar to that described in Chapter 2 with the following exception.

The unadjusted skywave field strength F is given by:

$$F = F_c + 20 \log \frac{E_c \, f(\theta) \sqrt{P}}{100} \quad dB(\mu V/m) \qquad (1)$$

F_c is given by:

$$F_c = (95 - 20 \log d) - (6.28 + 4.95 \tan^2 \phi)(d/1000)^{1/2} \, dB(\mu V/m) \qquad (2)$$

Figure 1 and Table I show F_c for selected latitudes. If $|\phi|$ is greater than 60 degrees, equation (2) is evaluated for $|\phi| = 60$ degrees. If d is less than 200 km, equation (2) is evaluated for d = 200 km. However, the actual great-circle distance is to be used in determining elevation angle. See section 4 for calculation of great-circle distance and conversion from geographical latitude to geomagnetic latitude.

Note - Values of F_c are normalized to 100 mV/m at 1 km corresponding to an effective monopole radiated power (e.m.r.p.) of -9.54 dB(kW).

3. Skywave field strength, 50% of the time

This is given by:

$$F(50) = F \quad dB(\mu V/m) \qquad (3)$$

4. Path parameters

Refer to section 1. The great-circle distance d (km) is given by:

$$d = 111.18 \arccos \left[\sin a_T \sin a_R + \cos a_T \cos a_R \cos (b_R - b_T) \right] \quad (4)$$

The geomagnetic latitude of the transmitting terminal, ϕ_T, is given by:

$$\phi_T = \arcsin \left[\sin a_T \sin 78.5^\circ + \cos a_T \cos 78.5^\circ \cos (69^\circ + b_T) \right] \quad (5)$$

ϕ_R can be determined in a similar manner. And,

$$\phi = {}^1/_2 (\phi_T + \phi_R) \quad (6)$$

Alternatively, Figure 2 may be used.

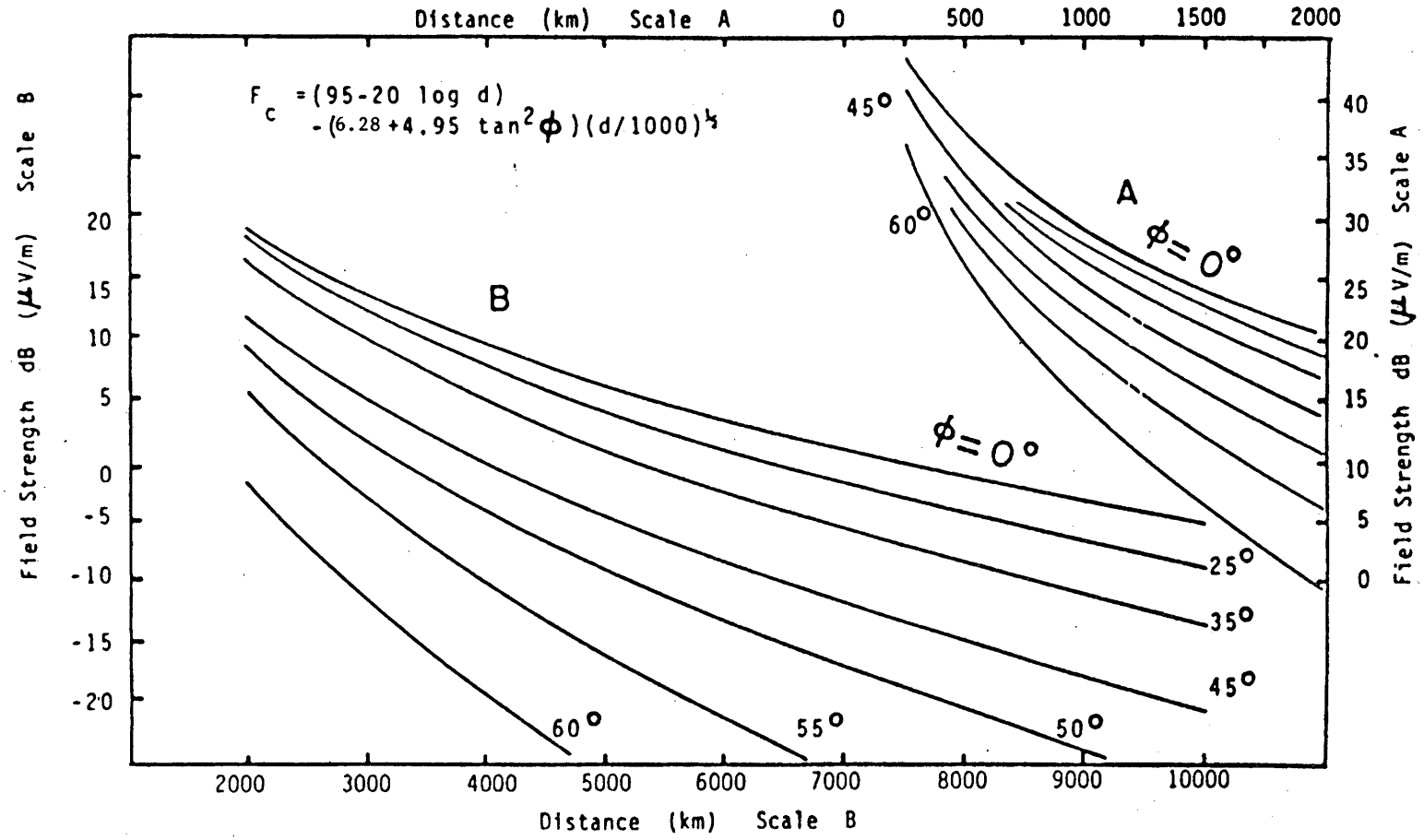

FIGURE 1

Skywave field strength versus distance (for a characteristic field strength of 100 mV/m at 1 km, 50%, 2 hours after sunset)

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
0-200	46.17	203.4574	46.01	199.7683	45.43	186.8867	43.96	157.6842	39.53	94.7147
250	43.90	156.6680	43.72	153.4954	43.07	142.4722	41.42	117.8230	36.47	66.6392
300	42.02	126.1266	41.82	123.3314	41.11	113.6631	39.30	92.3093	33.88	49.4450
350	40.40	104.7304	40.19	102.2257	39.43	93.5977	37.47	74.7566	31.62	38.0894
400	38.98	88.9709	38.76	86.6981	37.94	78.8988	35.85	62.0462	29.59	30.1752
450	37.72	76.9207	37.48	74.8381	36.61	67.7174	34.40	52.4825	27.76	24.4320
500	36.58	67.4351	36.33	65.5120	35.41	58.9589	33.08	45.0689	26.08	20.1307
550	35.53	59.7930	35.27	58.0059	34.31	51.9358	31.86	39.1832	24.52	16.8266
600	34.57	53.5183	34.29	51.8487	33.29	46.1953	30.74	34.4183	23.07	14.2352
650	33.68	48.2840	33.39	46.7172	32.35	41.4276	29.69	30.4974	21.70	12.1669
700	32.84	43.8589	32.54	42.3829	31.46	37.4139	28.70	27.2260	20.42	10.4915
750	32.06	40.0746	31.75	38.6794	30.63	33.9955	27.77	24.4640	19.20	9.1169
800	31.32	36.8059	31.00	35.4833	29.84	31.0547	26.89	22.1079	18.04	7.9764
850	30.62	33.9579	30.29	32.7007	29.10	28.5022	26.06	20.0797	16.93	7.0208
900	29.95	31.4572	29.62	30.2595	28.39	26.2696	25.26	18.3198	15.87	6.2133
950	29.32	29.2464	28.98	28.1030	27.71	24.3030	24.50	16.7818	14.85	5.5255
1000	28.72	27.2798	28.36	26.1861	27.07	22.5601	23.77	15.4291	13.87	4.9356
1050	28.14	25.5207	27.77	24.4729	26.45	21.0066	23.07	14.2325	12.92	4.4265
1100	27.58	23.9394	27.21	22.9339	25.85	19.6150	22.39	13.1684	12.01	3.9845
1150	27.05	22.5115	26.67	21.5451	25.28	18.3625	21.74	12.2177	11.12	3.5988
1200	26.53	21.2165	26.14	20.2866	24.73	17.2306	21.11	11.3645	10.27	3.2607
1250	26.04	20.0378	25.64	19.1418	24.19	16.2036	20.50	10.5958	9.43	2.9628
1300	25.56	18.9609	25.15	18.0967	23.68	15.2685	19.91	9.9007	8.63	2.6995
1350	25.09	17.9741	24.68	17.1396	23.18	14.4142	19.34	9.2699	7.84	2.4657

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

(Continued)

DIS-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
1400	24.64	17.0669	24.22	16.2603	22.69	13.6313	18.79	8.6958	7.07	2.2574
1450	24.21	16.2306	23.78	15.4503	22.22	12.9119	18.25	8.1716	6.32	2.0713
1500	23.78	15.4577	23.35	14.7021	21.76	12.2490	17.72	7.6916	5.60	1.9045
1550	23.37	14.7416	22.93	14.0094	21.32	11.6367	17.21	7.2512	4.88	1.7544
1600	22.97	14.0766	22.52	13.3665	20.88	11.0698	16.71	6.8459	4.19	1.6192
1650	22.58	13.4577	22.12	12.7687	20.46	10.5438	16.22	6.4722	3.50	1.4970
1700	22.20	12.8806	21.74	12.2115	20.05	10.0547	15.74	6.1268	2.84	1.3862
1750	21.83	12.3415	21.36	11.6913	19.64	9.5991	15.28	5.8071	2.18	1.2857
1800	21.46	11.8369	20.99	11.2046	19.25	9.1739	14.82	5.5104	1.54	1.1942
1850	21.11	11.3638	20.63	10.7487	18.87	8.7763	14.38	5.2347	0.91	1.1107
1900	20.76	10.9196	20.27	10.3208	18.49	8.4041	13.94	4.9780	0.29	1.0345
1950	20.43	10.5018	19.93	9.9186	18.12	8.0549	13.51	4.7386	-0.31	0.9648
2000	20.09	10.1084	19.59	9.5401	17.76	7.7270	13.09	4.5151	-0.91	0.9008
2050	19.77	9.7373	19.26	9.1832	17.41	7.4185	12.68	4.3060	-1.49	0.8421
2100	19.45	9.3869	18.94	8.8465	17.06	7.1280	12.28	4.1102	-2.07	0.7880
2150	19.14	9.0555	18.62	8.5282	16.72	6.8540	11.88	3.9265	-2.64	0.7382
2200	18.83	8.7419	18.30	8.2271	16.38	6.5953	11.49	3.7541	-3.19	0.6923
2250	18.53	8.4446	18.00	7.9419	16.06	6.3508	11.11	3.5919	-3.74	0.6499
2300	18.24	8.1626	17.70	7.6714	15.73	6.1194	10.73	3.4393	-4.28	0.6106
2350	17.95	7.8947	17.40	7.4147	15.42	5.9002	10.36	3.2955	-4.82	0.5743
2400	17.66	7.6400	17.11	7.1708	15.11	5.6923	9.99	3.1599	-5.34	0.5405
2450	17.38	7.3977	16.83	6.9388	14.80	5.4949	9.63	3.0318	-5.86	0.5092
2500	17.11	7.1669	16.54	6.7179	14.50	5.3075	9.28	2.9107	-6.37	0.4801
2550	16.84	6.9468	16.27	6.5075	14.20	5.1292	8.93	2.7962	-6.88	0.4530

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

(Continued)

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
2600	16.57	6.7369	16.00	6.3068	13.91	4.9594	8.59	2.6877	-7.38	0.4278
2650	16.31	6.5364	15.73	6.1152	13.62	4.7978	8.25	2.5849	-7.87	0.4042
2700	16.05	6.3448	15.46	5.9323	13.34	4.6436	7.91	2.4873	-8.35	0.3823
2750	15.79	6.1616	15.20	5.7574	13.06	4.4966	7.59	2.3948	-8.83	0.3617
2800	15.54	5.9862	14.95	5.5901	12.78	4.3562	7.26	2.3068	-9.31	0.3425
2850	15.30	5.8183	14.70	5.4299	12.51	4.2220	6.94	2.2231	-9.77	0.3246
2900	15.05	5.6573	14.45	5.2765	12.24	4.0937	6.62	2.1435	-10.24	0.3077
2950	14.81	5.5029	14.20	5.1295	11.98	3.9709	6.31	2.0677	-10.69	0.2919
3000	14.57	5.3547	13.96	4.9884	11.72	3.8534	6.00	1.9955	-11.15	0.2771
3050	14.34	5.2125	13.72	4.8530	11.46	3.7408	5.70	1.9267	-11.59	0.2632
3100	14.11	5.0758	13.48	4.7230	11.20	3.6328	5.39	1.8610	-12.04	0.2501
3150	13.88	4.9444	13.25	4.5981	10.95	3.5293	5.10	1.7982	-12.47	0.2379
3200	13.66	4.8180	13.02	4.4779	10.71	3.4299	4.80	1.7383	-12.91	0.2263
3250	13.44	4.6963	12.79	4.3624	10.46	3.3345	4.51	1.6810	-13.34	0.2154
3300	13.22	4.5792	12.57	4.2512	10.22	3.2428	4.22	1.6262	-13.76	0.2051
3350	13.00	4.4663	12.35	4.1441	9.98	3.1546	3.94	1.5738	-14.18	0.1954
3400	12.78	4.3575	12.13	4.0409	9.74	3.0698	3.66	1.5236	-14.60	0.1863
3450	12.57	4.2526	11.91	3.9414	9.51	2.9883	3.38	1.4755	-15.01	0.1776
3500	12.36	4.1514	11.70	3.8455	9.28	2.9097	3.10	1.4294	-15.42	0.1695
3550	12.16	4.0537	11.49	3.7529	9.05	2.8341	2.83	1.3852	-15.82	0.1618
3600	11.95	3.9593	11.28	3.6636	8.82	2.7611	2.56	1.3428	-16.22	0.1545
3650	11.75	3.8682	11.07	3.5773	8.60	2.6909	2.29	1.3021	-16.62	0.1476
3700	11.55	3.7801	10.87	3.4940	8.38	2.6231	2.03	1.2631	-17.01	0.1410
3750	11.35	3.6949	10.66	3.4134	8.16	2.5577	1.77	1.2255	-17.40	0.1348

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

(Continued)

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
3800	11.16	3.6125	10.46	3.3356	7.94	2.4945	1.51	1.1894	-17.79	0.1289
3850	10.96	3.5328	10.26	3.2602	7.72	2.4335	1.25	1.1547	-18.18	0.1234
3900	10.77	3.4556	10.07	3.1873	7.51	2.3746	0.99	1.1214	-18.56	0.1181
3950	10.58	3.3808	9.87	3.1168	7.30	2.3177	0.74	1.0892	-18.93	0.1131
4000	10.39	3.3084	9.68	3.0485	7.09	2.2627	0.49	1.0583	-19.31	0.1083
4050	10.21	3.2383	9.49	2.9823	6.89	2.2094	0.24	1.0286	-19.68	0.1038
4100	10.02	3.1702	9.30	2.9182	6.68	2.1580	0.00	0.9999	-20.05	0.0995
4150	9.84	3.1043	9.12	2.8560	6.48	2.1081	-0.24	0.9722	-20.41	0.0954
4200	9.66	3.0403	8.93	2.7958	6.28	2.0599	-0.49	0.9456	-20.78	0.0915
4250	9.48	2.9782	8.75	2.7373	6.08	2.0132	-0.73	0.9199	-21.13	0.0878
4300	9.30	2.9179	8.56	2.6806	5.88	1.9679	-0.96	0.8951	-21.49	0.0842
4350	9.13	2.8594	8.38	2.6255	5.68	1.9240	-1.20	0.8711	-21.85	0.0808
4400	8.95	2.8026	8.21	2.5721	5.49	1.8815	-1.43	0.8480	-22.20	0.0776
4450	8.78	2.7474	8.03	2.5202	5.30	1.8403	-1.66	0.8257	-22.55	0.0746
4500	8.61	2.6937	7.85	2.4698	5.11	1.8003	-1.89	0.8041	-22.89	0.0717
4550	8.44	2.6416	7.68	2.4208	4.92	1.7615	-2.12	0.7833	-23.24	0.0689
4600	8.27	2.5909	7.51	2.3732	4.73	1.7239	-2.35	0.7632	-23.58	0.0662
4650	8.10	2.5415	7.34	2.3269	4.54	1.6873	-2.57	0.7437	-23.92	0.0637
4700	7.94	2.4936	7.17	2.2819	4.36	1.6518	-2.79	0.7249	-24.26	0.0613
4750	7.77	2.4469	7.00	2.2381	4.18	1.6174	-3.02	0.7066	-24.59	0.0589
4800	7.61	2.4014	6.83	2.1955	3.99	1.5839	-3.24	0.6890	-24.93	0.0567
4850	7.45	2.3572	6.67	2.1541	3.81	1.5513	-3.45	0.6719	-25.26	0.0546
4900	7.29	2.3141	6.50	2.1137	3.64	1.5197	-3.67	0.6554	-25.58	0.0526
4950	7.13	2.2721	6.34	2.0744	3.46	1.4890	-3.88	0.6394	-25.91	0.0506

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

(Continued)

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
5000	6.97	2.2313	6.18	2.0362	3.28	1.4591	-4.10	0.6239	-26.23	0.0488
5050	6.81	2.1914	6.02	1.9989	3.11	1.4300	-4.31	0.6089	-26.56	0.0470
5100	6.66	2.1526	5.86	1.9626	2.93	1.4017	-4.52	0.5943	-26.88	0.0453
5150	6.51	2.1147	5.70	1.9272	2.76	1.3741	-4.73	0.5802	-27.19	0.0437
5200	6.35	2.0778	5.54	1.8927	2.59	1.3473	-4.94	0.5665	-27.51	0.0421
5250	6.20	2.0418	5.39	1.8591	2.42	1.3212	-5.14	0.5532	-27.83	0.0406
5300	6.05	2.0067	5.23	1.8263	2.25	1.2958	-5.35	0.5404	-28.14	0.0392
5350	5.90	1.9724	5.08	1.7943	2.08	1.2711	-5.55	0.5279	-28.45	0.0378
5400	5.75	1.9389	4.93	1.7631	1.92	1.2470	-5.75	0.5157	-28.76	0.0365
5450	5.60	1.9063	4.77	1.7326	1.75	1.2235	-5.95	0.5040	-29.06	0.0352
5500	5.46	1.8744	4.62	1.7029	1.59	1.2006	-6.15	0.4925	-29.37	0.0340
5550	5.31	1.8433	4.47	1.6739	1.42	1.1783	-6.35	0.4814	-29.67	0.0328
5600	5.17	1.8129	4.33	1.6456	1.26	1.1565	-6.55	0.4706	-29.97	0.0317
5650	5.02	1.7832	4.18	1.6180	1.10	1.1353	-6.74	0.4602	-30.27	0.0306
5700	4.88	1.7542	4.03	1.5909	0.94	1.1146	-6.94	0.4500	-30.57	0.0296
5750	4.74	1.7259	3.89	1.5646	0.78	1.0944	-7.13	0.4401	-30.87	0.0286
5800	4.60	1.6982	3.74	1.5388	0.63	1.0747	-7.32	0.4304	-31.16	0.0277
5850	4.46	1.6711	3.60	1.5136	0.47	1.0555	-7.51	0.4211	-31.46	0.0267
5900	4.32	1.6446	3.46	1.4890	0.31	1.0367	-7.70	0.4120	-31.75	0.0259
5950	4.18	1.6187	3.32	1.4649	0.16	1.0184	-7.89	0.4031	-32.04	0.0250
6000	4.05	1.5934	3.18	1.4414	0.00	1.0005	-8.08	0.3945	-32.33	0.0242
6050	3.91	1.5686	3.04	1.4184	-0.15	0.9831	-8.27	0.3861	-32.62	0.0234
6100	3.78	1.5444	2.90	1.3959	-0.30	0.9660	-8.45	0.3780	-32.90	0.0226
6150	3.64	1.5207	2.76	1.3739	-0.45	0.9494	-8.63	0.3700	-33.19	0.0219

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

(Continued)

DIS-TANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
6200	3.51	1.4975	2.62	1.3524	-0.60	0.9331	-8.82	0.3623	-33.47	0.0212
6250	3.37	1.4748	2.49	1.3314	-0.75	0.9172	-9.00	0.3548	-33.75	0.0205
6300	3.24	1.4525	2.35	1.3108	-0.90	0.9017	-9.18	0.3475	-34.03	0.0199
6350	3.11	1.4308	2.22	1.2906	-1.05	0.8865	-9.36	0.3403	-34.31	0.0193
6400	2.98	1.4095	2.08	1.2709	-1.19	0.8717	-9.54	0.3334	-34.59	0.0186
6450	2.85	1.3886	1.95	1.2515	-1.34	0.8571	-9.72	0.3266	-34.86	0.0181
6500	2.72	1.3682	1.82	1.2326	-1.48	0.8429	-9.90	0.3200	-35.14	0.0175
6550	2.59	1.3481	1.69	1.2141	-1.63	0.8291	-10.07	0.3135	-35.41	0.0170
6600	2.47	1.3285	1.55	1.1960	-1.77	0.8155	-10.25	0.3073	-35.68	0.0164
6650	2.34	1.3093	1.42	1.1782	-1.91	0.8022	-10.42	0.3012	-35.95	0.0159
6700	2.21	1.2905	1.29	1.1608	-2.06	0.7892	-10.60	0.2952	-36.22	0.0154
6750	2.09	1.2720	1.17	1.1437	-2.20	0.7765	-10.77	0.2894	-36.49	0.0150
6800	1.97	1.2539	1.04	1.1270	-2.34	0.7641	-10.94	0.2837	-36.76	0.0145
6850	1.84	1.2362	0.91	1.1106	-2.48	0.7519	-11.11	0.2782	-37.02	0.0141
6900	1.72	1.2188	0.78	1.0946	-2.62	0.7400	-11.28	0.2728	-37.29	0.0137
6950	1.60	1.2017	0.66	1.0788	-2.75	0.7283	-11.45	0.2675	-37.55	0.0133
7000	1.47	1.1850	0.53	1.0634	-2.89	0.7169	-11.62	0.2624	-37.82	0.0129
7050	1.35	1.1686	0.41	1.0483	-3.03	0.7057	-11.79	0.2573	-38.08	0.0125
7100	1.23	1.1525	0.29	1.0334	-3.16	0.6947	-11.96	0.2524	-38.34	0.0121
7150	1.11	1.1367	0.16	1.0189	-3.30	0.6840	-12.12	0.2477	-38.60	0.0118
7200	0.99	1.1212	0.04	1.0046	-3.43	0.6735	-12.29	0.2430	-38.85	0.0114
7250	0.88	1.1060	-0.08	0.9906	-3.57	0.6632	-12.45	0.2384	-39.11	0.0111
7300	0.76	1.0911	-0.20	0.9769	-3.70	0.6531	-12.62	0.2340	-39.37	0.0108
7350	0.64	1.0765	-0.32	0.9634	-3.83	0.6432	-12.78	0.2296	-39.62	0.0104

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

(Continued)

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
7400	0.52	1.0621	-0.44	0.9502	-3.97	0.6335	-12.94	0.2254	-39.87	0.0101
7450	0.41	1.0480	-0.56	0.9372	-4.10	0.6240	-13.10	0.2212	-40.13	0.0099
7500	0.29	1.0341	-0.68	0.9245	-4.23	0.6147	-13.26	0.2172	-40.38	0.0096
7550	0.18	1.0205	-0.80	0.9120	-4.36	0.6055	-13.42	0.2132	-40.63	0.0093
7600	0.06	1.0072	-0.92	0.8997	-4.49	0.5966	-13.58	0.2093	-40.88	0.0090
7650	-0.05	0.9941	-1.03	0.8877	-4.62	0.5878	-13.74	0.2055	-41.12	0.0088
7700	-0.16	0.9812	-1.15	0.8759	-4.74	0.5792	-13.90	0.2018	-41.37	0.0085
7750	-0.28	0.9685	-1.27	0.8643	-4.87	0.5707	-14.06	0.1982	-41.62	0.0083
7800	-0.39	0.9561	-1.38	0.8529	-5.00	0.5625	-14.21	0.1947	-41.86	0.0081
7850	-0.50	0.9439	-1.50	0.8417	-5.12	0.5543	-14.37	0.1912	-42.11	0.0078
7900	-0.61	0.9319	-1.61	0.8307	-5.25	0.5464	-14.53	0.1878	-42.35	0.0076
7950	-0.72	0.9201	-1.73	0.8198	-5.38	0.5385	-14.68	0.1845	-42.59	0.0074
8000	-0.83	0.9085	-1.84	0.8092	-5.50	0.5309	-14.83	0.1813	-42.84	0.0072
8050	-0.94	0.8971	-1.95	0.7988	-5.62	0.5233	-14.99	0.1781	-43.08	0.0070
8100	-1.05	0.8859	-2.06	0.7885	-5.75	0.5159	-15.14	0.1750	-43.32	0.0068
8150	-1.16	0.8749	-2.18	0.7785	-5.87	0.5087	-15.29	0.1720	-43.55	0.0066
8200	-1.27	0.8641	-2.29	0.7686	-5.99	0.5016	-15.44	0.1690	-43.79	0.0065
8250	-1.38	0.8535	-2.40	0.7588	-6.12	0.4946	-15.59	0.1661	-44.03	0.0063
8300	-1.48	0.8430	-2.51	0.7493	-6.24	0.4877	-15.74	0.1632	-44.27	0.0061
8350	-1.59	0.8327	-2.62	0.7399	-6.36	0.4810	-15.89	0.1604	-44.50	0.0060
8400	-1.70	0.8226	-2.73	0.7306	-6.48	0.4743	-16.04	0.1577	-44.74	0.0058
8450	-1.80	0.8127	-2.83	0.7215	-6.60	0.4678	-16.19	0.1550	-44.97	0.0056
8500	-1.91	0.8029	-2.94	0.7126	-6.72	0.4615	-16.34	0.1524	-45.20	0.0055
8550	-2.01	0.7933	-3.05	0.7038	-6.84	0.4552	-16.49	0.1499	-45.43	0.0053

Continued . . .

TABLE I

Skywave field strength versus distance (0 to 10,000 km)
for a characteristic field strength of 100 mV/m

(end)

DISTANCE (km)	FIELD STRENGTH FOR INDICATED MEAN GEOMAGNETIC LATITUDE									
	0 degrees		15 degrees		30 degrees		45 degrees		60 degrees	
	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m	dB(uV/m)	uV/m
8600	-2.12	0.7838	-3.16	0.6952	-6.95	0.4490	-16.63	0.1474	-45.66	0.0052
8650	-2.22	0.7745	-3.26	0.6867	-7.07	0.4430	-16.78	0.1449	-45.89	0.0051
8700	-2.32	0.7653	-3.37	0.6783	-7.19	0.4370	-16.92	0.1425	-46.12	0.0049
8750	-2.43	0.7563	-3.48	0.6701	-7.31	0.4312	-17.07	0.1401	-46.35	0.0048
8800	-2.53	0.7474	-3.58	0.6620	-7.42	0.4254	-17.21	0.1378	-46.58	0.0047
8850	-2.63	0.7387	-3.69	0.6540	-7.54	0.4198	-17.36	0.1356	-46.81	0.0046
8900	-2.73	0.7301	-3.79	0.6462	-7.65	0.4142	-17.50	0.1334	-47.03	0.0044
8950	-2.83	0.7216	-3.90	0.6385	-7.77	0.4088	-17.64	0.1312	-47.26	0.0043
9000	-2.93	0.7133	-4.00	0.6309	-7.88	0.4034	-17.78	0.1291	-47.48	0.0042
9050	-3.03	0.7051	-4.10	0.6235	-8.00	0.3982	-17.93	0.1270	-47.71	0.0041
9100	-3.13	0.6970	-4.21	0.6161	-8.11	0.3930	-18.07	0.1249	-47.93	0.0040
9150	-3.23	0.6891	-4.31	0.6089	-8.23	0.3879	-18.21	0.1229	-48.15	0.0039
9200	-3.33	0.6813	-4.41	0.6018	-8.34	0.3829	-18.35	0.1210	-48.38	0.0038
9250	-3.43	0.6736	-4.51	0.5948	-8.45	0.3780	-18.49	0.1190	-48.60	0.0037
9300	-3.53	0.6660	-4.61	0.5879	-8.56	0.3731	-18.63	0.1171	-48.82	0.0036
9350	-3.63	0.6585	-4.72	0.5811	-8.67	0.3684	-18.76	0.1153	-49.04	0.0035
9400	-3.73	0.6511	-4.82	0.5744	-8.79	0.3637	-18.90	0.1135	-49.26	0.0034
9450	-3.82	0.6439	-4.92	0.5678	-8.90	0.3591	-19.04	0.1117	-49.47	0.0034
9500	-3.92	0.6368	-5.02	0.5613	-9.01	0.3546	-19.18	0.1099	-49.69	0.0033
9550	-4.02	0.6297	-5.12	0.5549	-9.12	0.3501	-19.31	0.1082	-49.91	0.0032
9600	-4.11	0.6228	-5.21	0.5486	-9.23	0.3457	-19.45	0.1065	-50.12	0.0031
9650	-4.21	0.6160	-5.31	0.5424	-9.33	0.3414	-19.59	0.1049	-50.34	0.0030
9700	-4.30	0.6092	-5.41	0.5363	-9.44	0.3372	-19.72	0.1033	-50.55	0.0030
9750	-4.40	0.6026	-5.51	0.5303	-9.55	0.3330	-19.86	0.1017	-50.77	0.0029
9800	-4.49	0.5961	-5.61	0.5244	-9.66	0.3289	-19.99	0.1001	-50.98	0.0028
9850	-4.59	0.5896	-5.70	0.5186	-9.77	0.3248	-20.12	0.0986	-51.19	0.0028
9900	-4.68	0.5833	-5.80	0.5128	-9.87	0.3209	-20.26	0.0971	-51.41	0.0027
9950	-4.78	0.5770	-5.90	0.5072	-9.98	0.3169	-20.39	0.0956	-51.62	0.0026
10000	-4.87	0.5709	-5.99	0.5016	-10.09	0.3131	-20.52	0.0942	-51.83	0.0026

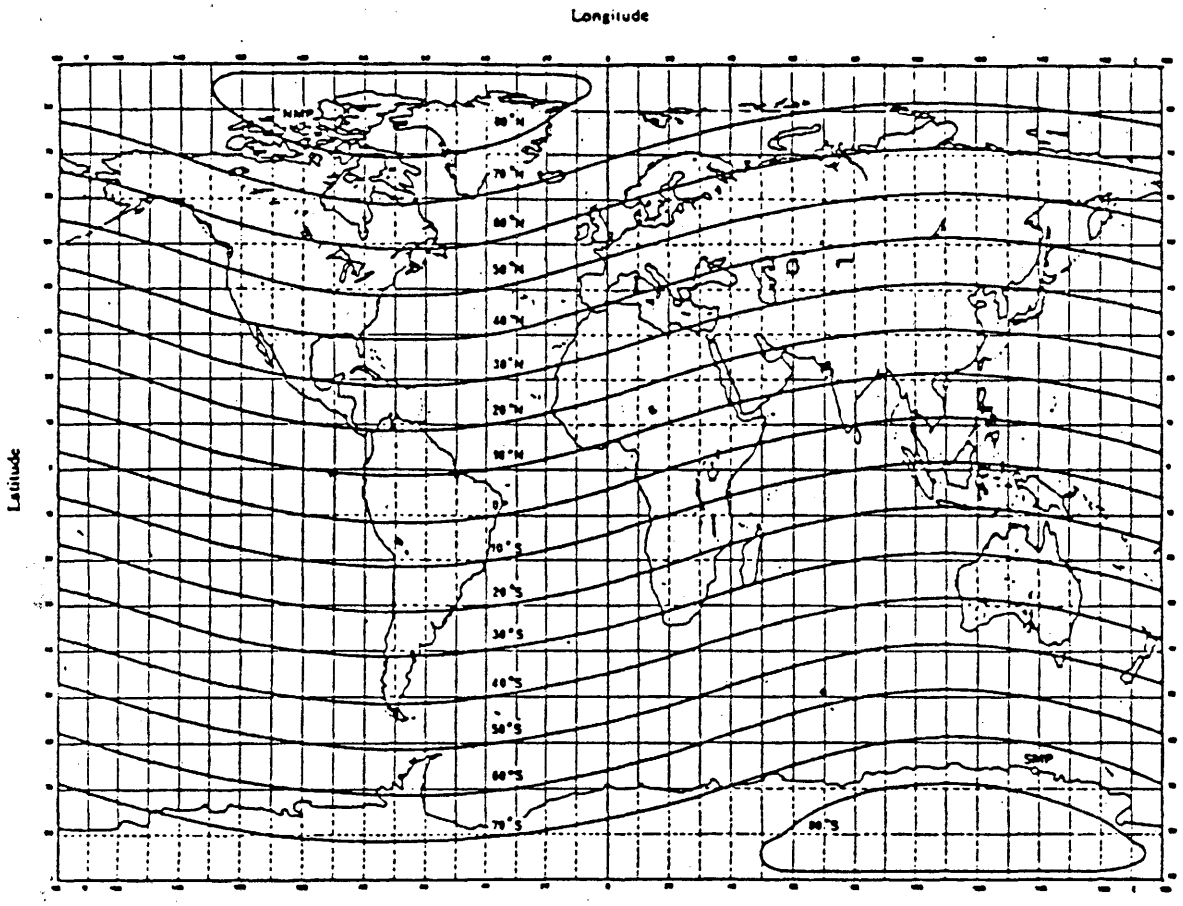

FIGURE 2

Geomagnetic latitudes

RECOMMENDATION No. 6

Relationship Between Physical and Electrical Antenna Height

The Regional Administrative Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

that information relating to the relationship between physical antenna height and electrical antenna height would be useful to all administrations when establishing assignments in the 1 605 - 1 705 kHz band;

recommends Administrations in Region 2

within the limits of their possibilities, to carry out measurements to define this relationship and submit the relevant data to the CCIR Study Group concerned taking into account the CCIR work schedule;

requests the CCIR

1. to prepare, on the basis of the contributions submitted, a report to the Second Session of the Conference;

2. to carry out these studies as part of the normal work of the CCIR Study Groups.

RECOMMENDATION No. 7

Venue for the Second Session

The Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band 1 605 - 1 705 kHz in Region 2 (First Session, Geneva, 1986),

considering

a) Resolution 3 of the Plenipotentiary Conference (Nairobi, 1982) concerning invitations to hold conferences or meetings away from Geneva;

b) that there are considerable advantages in holding the Second Session in the Region;

c) the importance of ensuring the active participation of all the countries of the Region;

recommends to the administrations

that an administration in the Region should extend an invitation to hold the Second Session in its country;

requests the Secretary-General

to distribute this Recommendation to the administrations in Region 2 as soon as possible with a view to obtaining their replies before the 41st session of the Administrative Council (1986).

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LIST OF ITU MEMBER COUNTRIES WHICH PARTICIPATED IN THE FIRST SESSION

(in the alphabetical order of the French version of the country names)

Argentine Republic
Barbados
Brazil (Federative Republic of)
Canada
Chile
Colombia (Republic of)
Costa Rica
Cuba
Ecuador
United States of America
France
Guyana
Honduras (Republic of)
Mexico
Paraguay (Republic of)
Peru
United Kingdom of Great Britain and Northern Ireland
Suriname (Republic of)
Trinidad and Tobago
Uruguay (Eastern Republic of)