67 (1979) Nr. 5

TRACTATENBLAD

VAN HET

KONINKRIJK DER NEDERLANDEN

JAARGANG 1987 Nr. 125

A. TITEL

Radioreglement, 1979, met Bijlagen;
Genève, 6 december 1979

B. TEKST

De Engelse tekst van het Reglement, cum annexis, is geplaatst in *Trb.* 1981, 78. Zie ook rubriek J van *Trb.* 1984, 9.

D. PARLEMENT

Zie *Trb.* 1981, 78 en *Trb.* 1982, 137.
Het in rubriek J afgedrukte Regionaal Akkoord, met Bijlagen en Aanhangsels, behoeft ingevolge artikel 91 van de Grondwet, junctis additioneel artikel XXI van de Grondwet, artikel 62, eerste lid, onder a, van de Grondwet naar de tekst van 1972 en artikel 16 van de Telegraaf- en Telefoonwet van 11 januari 1904 (*Stb.* 7), zoals gewijzigd bij wet van 8 oktober 1969 (*Stb.* 468), niet de goedkeuring der Staten-Generaal.

Artikel 16 van de Telegraaf- en Telefoonwet luidt: „Wij behouden ons voor het sluiten van verdragen of overeenkomsten met vreemde Regeringen of besturen betrekkelijk het telegrafisch of telefonisch verkeer met het buitenland.".

E. BEKRACHTIGING

Zie *Trb.* 1982, 137, *Trb.* 1984, 9 en 121.
Behalve de aldaar genoemde hebben nog de volgende Staten in overeenstemming met het gestelde in de zevende alinea van de inleiding van de Slotakte van de Wereld Administratieve Radioconferen-

tie 1979 een kennisgeving van goedkeuring gericht tot de Secretaris-Generaal van de Internationale Telecommunicatie Unie:

Tsjechoslowakije	29 september 1984
Joegoslavië	31 januari 1985
Italië	4 april 1985
Saoedi-Arabië	8 mei 1985
Denemarken	8 juli 1985
Colombia	19 september 1985
Thailand	16 september 1986

G. INWERKINGTREDING

Zie *Trb.* 1981, 78.

J. GEGEVENS

Zie *Trb.* 1981, 78, *Trb.* 1982, 137 en *Trb.* 1984, 9 en 121.

Behalve de in *Trb.* 1984, 121 (blz. 4) genoemde hebben nog de volgende Staten de Secretaris-Generaal van de Internationale Telecommunicatie-Unie in kennis gesteld van de goedkeuring van de herziening van 18 maart 1983 van het onderhavige Reglement:

Korea	1 oktober 1984
Argentinië	3 oktober 1984
Hongarije	19 oktober 1984
de Bondsrepubliek Duitsland	19 november 1984
Japan	9 januari 1985
Australië	26 maart 1985
Italië	7 juni 1985
Denemarken	18 juli 1985

Tijdens bijeenkomsten van een Regionale Administratieve Radioconferentie, gehouden te Genève van 23 augustus tot 17 september 1982 en van 29 oktober tot 7 december 1984, is het volgende Regionaal Akkoord inzake het gebruik van de 87,5-108 MHz Band voor FM radio omroep, met Bijlagen en Aanhangsels, tot stand gekomen, waarvan de Engelse tekst als volgt luidt.[1])

[1]) De Arabische, de Franse, de Russische en de Spaanse tekst zijn niet afgedrukt.

Regional Agreement

relating to the Use *of the* Band 87.5–108 MHz for FM Sound Broadcasting (Region 1 and Part of Region 3)

PREAMBLE

The duly accredited delegates of the following Members of the International Telecommunication Union:

Democratic Republic of Afghanistan, Socialist People's Republic of Albania, People's Democratic Republic of Algeria, Federal Republic of Germany, People's Republic of Angola, Kingdom of Saudi Arabia, Austria, Belgium, People's Republic of Benin, Byelorussian Soviet Socialist Republic, Republic of Botswana, People's Republic of Bulgaria, Burkina Faso, Republic of Cameroon, Republic of Cyprus, Vatican City State, People's Republic of the Congo, Republic of the Ivory Coast, Denmark, Arab Republic of Egypt, Spain, Finland, France, Gabonese Republic, Greece, Republic of Guinea, Hungarian People's Republic, Islamic Republic of Iran, Republic of Iraq, Ireland, State of Israel, Italy, Hashemite Kingdom of Jordan, Republic of Kenya, State of Kuwait, Kingdom of Lesotho, Socialist People's Libyan Arab Jamahiriya, Principality of Liechtenstein, Luxembourg, Republic of Mali, Republic of Malta, Kingdom of Morocco, Monaco, Mongolian People's Republic, Norway, Sultanate of Oman, Republic of Uganda, Kingdom of the Netherlands, People's Republic of Poland, Portugal, State of Qatar, Syrian Arab Republic, German Democratic Republic, Ukrainian Soviet Socialist Republic, Socialist Republic of Romania, United Kingdom of Great Britain and Northern Ireland, Republic of San Marino, Republic of Senegal, Sweden, Confederation of Switzerland, Kingdom of Swaziland, United Republic of Tanzania, Republic of Chad, Czechoslovak Socialist Republic, Togolese Republic, Tunisia, Turkey, Union of Soviet Socialist Republics, Yemen Arab Republic, People's Democratic Republic of Yemen, Socialist Federal Republic of Yugoslavia, Republic of Zambia, Republic of Zimbabwe,

meeting in Geneva for a Regional Administrative Radio Conference convened under the terms of Articles 7 and 54 of the International Telecommunication Convention (Nairobi, 1982) to establish an Agreement incorporating a Plan for sound broadcasting in the band 87.5 to 108 MHz in accordance with Resolution No. 510 of the World Administrative Radio Conference (Geneva, 1979), and No. 584 of the Radio Regulations, have adopted, subject to the approval of the competent authorities of their respective countries, the following provisions and the related Plan concerning the broadcasting service in the band 87.5 to 108 MHz in the planning area as defined in Article 1 of this Agreement.

Article 1

Definitions

For the purposes of this 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 (Nairobi, 1982).

1.6 *Radio Regulations:* The Radio Regulations (Geneva, 1979) annexed to the Convention.

1.7 *Conference:* The Regional Administrative Conference for FM Sound Broadcasting in the VHF Band (Region 1 and certain countries concerned in Region 3)[1]) (Geneva, 1984), also called the Regional Administrative Conference for the Planning of VHF Sound Broadcasting (Region 1 and part of Region 3) (Geneva, 1984).

1.8 *Planning area:* The countries of Region 1 as defined in No. 393 of the Radio Regulations together with the Democratic Republic of Afghanistan and the Islamic Republic of Iran.

1.9 *Agreement:* This Regional Agreement and its Annexes.

1.10 *Plan:* The Plan forming Annex 1 to this Agreement, and its Appendix[2]).

1.11 *Contracting Member:* Any Member of the Union which has approved or acceded to this Agreement.

1.12 *Administration:* Unless otherwise indicated, the term *administration*

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[1]) This Conference was held in two Sessions:
– the First Session, responsible for preparing a report to the Second Session, was held in Geneva from 23 August to 17 September 1982;
– the Second Session, responsible for drawing up a Plan and associated provisions was held in Geneva from 29 October to 7 December 1984.

[2]) Het Plan is niet afgedrukt; het is gedeponeerd bij de Centrale Directie der PTT te Groningen.

designates an administration, as defined in the Convention, of a Contracting Member.

1.13 *Assignment in conformity with this Agreement:* Any assignment appearing in the Plan, or for which the procedure of Article 4 has been successfully applied.

Article 2

Execution of the Agreement

2.1 The Contracting Members shall adopt for their sound broadcasting stations in the planning area operating in the band 87.5–108 MHz the characteristics specified in the Plan.

2.2 The Contracting Members shall not modify these characteristics or establish new stations, except under the conditions provided for in Article 4 of this Agreement.

2.3 The Contracting Members undertake to study and, in common agreement, to put into practice the measures necessary to eliminate any harmful interference that might result from the application of this Agreement.

2.4 Should agreement, as envisaged in section 2.3, above, prove impossible, the Contracting Members concerned may, in accordance with Article 35 of the Convention resort to the procedure laid down in Article 22 of the Radio Regulations.

2.5 The transitional procedures for bringing into service the assignments in the Plan in order to enable normal operation of stations of other services to which parts of the band 87.5–108 MHz are also allocated in accordance with Radio Regulations Nos. 581, 587, 588, 589 and 590, under the conditions specified therein, are contained in Resolutions Nos. 2 and 3.

Article 3

Annexes to the Agreement

The Agreement contains the following Annexes:

3.1 *Annex 1: The Plan*

Frequency Assignment Plan for FM Sound Broadcasting Stations in Region 1 and Part of Region 3 in the Band 87.5–108 MHz.

3.1.1 The Plan contains frequency assignments and associated characteristics of sound broadcasting stations in the band 87.5–108 MHz, coor-

dinated either during the Conference or by the application of provisions contained in the Agreement, and comprises two parts.

3.1.1.1 The first part includes frequency assignments in the band 87.5–108 MHz for all countries in the planning area. The provisions of this Agreement are applicable to these assignments in the relations between all Contracting Members in the planning area. This part is intended to replace, when it is so decided by competent conferences, the corresponding sound broadcasting Plans appearing in the Regional Agreements, Stockholm (1961) and Geneva (1963), with regard to the Contracting Members parties to these Agreements.

3.1.1.2 The second part contains frequency assignments in the band 100–108 MHz for all countries in the planning area in order to permit all countries of Region 1 to use this band for sound broadcasting in conformity with No. 584 of the Radio Regulations. The provisions of this Agreement are applicable to these assignments in the relations between all Contracting Members in the planning area. In the absence of provisions applicable to all countries in Region 1, non-Contracting Members in the planning area are being recommended to apply the provisions of this Agreement (see Recommendation No. 1) [1]).

3.1.2 The Plan also includes, for a fixed term (see Article 6), a list of the assignments for which coordination remains to be effected; these assignments are listed in the Appendix.

3.2 *Other Annexes*

Annex 2: Technical Data

Annex 3: Basic Characteristics of Sound Broadcasting Stations to be Submitted for Modifications to the Plan in Application of Article 4 of the Agreement

Annex 4: Limits for Determining when Coordination with Another administration is Required as a Result of a proposed Modification to the Plan

Annex 5: Additional Technical Data which may be used for Coordination Between administrations

Article 4

Procedure Concerning Modifications to the Plan

4.1 *Modifications to the Plan*

When an administration proposes to make a modification to the Plan, i.e.:

[1]) De Aanbevelingen van de Regionale Administratieve Radioconferentie zijn niet afgedrukt.

– to modify the characteristics of a frequency assignment to a sound broadcasting station shown in the Plan, whether or not the station has been brought into use; or
– to bring into use an assignment to a sound broadcasting station not appearing in the Plan; or
– to modify the characteristics of a frequency assignment to a sound broadcasting station for which the procedure in this Article has been successfully applied, whether or not the station has been brought into use, or
– to cancel a frequency assignment to a sound broadcasting station,

the procedure contained in this Article shall be applied before any notification is made under Article 7 of this Agreement.

4.2 *Initiation of the modification procedure*

4.2.1 Any administration proposing to modify the characteristics of an assignment appearing in the Plan or to add a new assignment to the Plan shall obtain the agreement of any other administration whose services are likely to be affected.

4.2.2 a. The sound broadcasting stations of an administration are likely to be affected by a proposed modification to the Plan if the distance from the station under consideration to the nearest point on the boundary of the country of that administration is less than the limit indicated in Annex 4, Chapter 1.

4.2.2 b. The television stations of an administration in the band 87.5–100 MHz which are in conformity with the Stockholm Agreement (1961) are likely to be affected by a proposed modification to the Plan if the distance from the station under consideration to the nearest point on the boundary of the country of that administration is less than the limit indicated in Annex 4, Chapter 2.

4.2.2 c. The stations in the fixed and mobile services of an administration of a Contracting Member in Region 3 in the band 87.5–100 MHz are likely to be affected by a proposed modification to the Plan if the appropriate limits indicated in Annex 4, Chapters 4 and 5, are exceeded.

4.2.2. d. The stations in the land mobile service of an administration in Region 1 in the band 87.5–88 MHz, coordinated under Article 14 of the Radio Regulations, are likely to be affected by a proposed modification to the Plan if the limits indicated in Annex 4, Chapter 4, are exceeded.

4.2.2 e. The stations of the fixed and mobile services, except the aeronautical mobile (R) service, of an administration in Region 1, operating in the band 104–108 MHz in conformity with the Radio Regulations on a permitted basis until 31 December 1995, are likely to be affected by a proposed modification to the Plan if the appropriate limits indicated in Annex 4, Chapters 4, 5 and 6, are exceeded.

4.2.2 f. The stations in the aeronautical radionavigation service of an administration in the band 108–117.975 MHz are likely to be affected by a proposed modification to the Plan if the distance from the station under consideration to the nearest point on the boundary of the country of that administration is less than the limit indicated in Annex 4, Chapter 3. In this case, the procedure to be applied is contained in Article 5.

4.2.3 Administrations shall seek the agreement of other administrations preferably directly or, when this is not possible, by applying the procedure contained in this article.

4.2.4 The agreement mentioned in section 4.2.1 is not required if:

a. the proposed modification relates to a reduction in effective radiated power or to other changes which would not increase the level of interference to services of other countries; or

b. the distances from the station under consideration to the nearest points on the boundaries of other countries, the administrations of which are Contracting Members, are equal to or greater than the limits indicated in Annex 4; or

c. the proposed modification relates to a change in the site of the station and the distance between the actual site of the transmitter and the site indicated in the Plan is no greater than:

– 1,5 km for transmitters having a total e.r.p. greater or equal than 1 kW;
– 5 km for transmitters having a total e.r.p. less than 1 kW;

provided that the change in topographical conditions does not increase the probability of interference caused to the stations of other countries.

4.2.5 An administration proposing to modify the Plan shall communicate to the IFRB the information listed in Annex 3 and shall also indicate, if appropriate:

a. that the agreement referred to in section 4.2.1 is not required with any administration; or

b. the name of any administration which has already agreed to the modification proposed on the basis of the characteristics communicated to the IFRB.

4.2.6 When requesting the agreement of another administration, the administration proposing to modify the Plan may also communicate any additional information relating to proposed methods and criteria to be used as well as other details concerning the terrain, particular propagation conditions, etc. (see also Annex 5).

4.2.7 On receipt of the information referred to in section 4.2.5 above, the IFRB shall:

a. identify the administration whose services are likely to be affected in conformity with sections 4.2.2 and 4.2.4;

b. send immediately a telex to those administrations identified in a. above which have not yet given their agreement, drawing their attention to the

information contained in the special section of a forthcoming weekly circular and indicating the nature of the modification to the Plan;

c. publish the information received in the special section of this weekly circular, together with the names of the administrations identified, indicating those whose agreement has been obtained.

4.3 *Consultation of the administrations whose stations may be affected*

4.3.1 The special section of the IFRB weekly circular, reffered to in 4.2.7 c., constitutes the formal request for agreement addressed to those administrations whose agreement remains to be obtained.

4.3.2 Any administration which considers that it should have been included in the list of administrations whose frequency assignments are likely to be affected may, within 28 days from the date of publication of the weekly circular, request the IFRB by telex to include its name. A copy of the request shall be sent to the administration proposing the modification to the Plan.

4.3.3 On receipt of the telex, the IFRB shall consider the matter and, if it finds that the name of this administration should have been included in the list, it shall:

– inform the administrations concerned by telex; and

– publish the name of the administration in an addendum to the special section of the weekly circular referred to its 4.2.7 c.

For this administration, the overall period of 100 days specified in section 4.3.10 shall run from the date of publication of the addendum to the special section of the weekly circular referred to above.

4.3.4 An administration receiving a telex from the IFRB sent in accordance with sections 4.2.7 or 4.3.3 above shall acknowledge receipt within 50 days.

4.3.5 If the IFRB has not received an acknowledgement after 50 days, it shall send a reminder telex and inform the administration that, if no reply is received within 10 days, it will be deemed to have received the request for agreement.

4.3.6 On receipt of the special section of the IFRB weekly circular referred to in sections 4.2.7 c. and 4.3.3, any administration listed therein shall determine the effect produced on its assignments by the proposed modification to the Plan, using any of the additional information referred to in section 4.2.6 which it finds acceptable.

4.3.7 If the administration consulted is responsible for:

4.3.7.1 a sound broadcasting station, it should normally accept the proposed modification provided that:

– the resulting usable field strength is not greater than 54 dB (μV/m); or
– the resulting usable field strength is greater than 54 dB (μV/m), but is increased by 0.5 dB or less compared with the reference usable field strength. An increase of more than 0.5 dB is open to negotiations, in which more detailed calculation methods may be used.

The values referred to above shall be calculated by the method contained in Annex 2, Chapter 4, at the transmitter site or at specific points of the service area of the stations which are likely to be affected. The reference usable field strength of an assignment to be protected is the field strength which results from the Plan adopted by the Conference or, for an assignment entered in the Plan after the Conference following the application of this procedure, the field strength which results from the Plan at the time this assignments was first recorded in the Plan. If, due to deletions or modifications, the usable field strength becomes lower, then this lower value becomes the new reference usable field strength. The actual geographical conditions should be taken into account, whenever practicable.

4.3.7.2 a television station, it should normally accept an increase in the usable field strength at the transmitter site, provided that:
– the resulting usable field strength is not greater than 52 dB (μV/m), or
– the resulting usable field strength is greater than 52 dB (μV/m), but is increased by 0.5 dB or less compared with the usable field strength resulting from the Plan adopted by the Conference and from the television stations in accordance with the Stockholm Agreement at the date of the Conference. An increase of more than 0.5 dB is open to negotiations, in which more detailed calculation methods may be used.

4.3.7.3 a station in the mobile, except aeronautical mobile (OR), service in Region 3 in the frequency band 87.5–100 MHz, it should normally accept the following interfering field strength:
– 18 dB (μV/m) if the sound broadcasting station uses horizontal polarization;
– 0 dB (μV/m) if the sound broadcasting station uses vertical or mixed polarization. In the case of mixed polarization, only the vertical component of the total effective radiated power of the sound broadcasting station should be taken into account if at least one-tenth of the total effective radiated power is radiated in the vertical component.

These limits apply when the frequency of the sound broadcasting station coincides with the frequency of the station of the mobile service. If they do not coincide, an appropriate allowance should be made (see Annex 5, Chapter 2).

The interfering field strengths are calculated using the method contained in Annex 4, Chapter 4 at 10 m above ground at the site of the base station assuming the use of vertical polarization.

4.3.7.4 a station in the fixed service, it should normally accept an interfering field strength of 0 dB (μV/m) at 10 m above ground, calculated in accordance with the method in Annex 4, Chapter 5.

This limit applies when the frequency of the sound broadcasting station coincides with the frequency of the station of the fixed service. If they do not coincide, an appropriate allowance should be made (see Annex 5, Chapter 2).

4.3.7.5 a station in the land mobile service in Region 1 in the band 87.5–88 MHz, it should normally accept the following interfering field strengths:
– 14 dB (μV/m) for mobile stations using amplitude modulation if the sound broadcasting station uses horizontal polarization;
– 24 dB (μV/m) for mobile stations using frequency modulation if the sound broadcasting station uses horizontal polarization;
– 6 dB (μV/m) for mobile stations using amplitude modulation if the sound broadcasting station uses vertical or mixed polarization;
– 16 dB (μV/m) for mobile stations using frequency modulation if the sound broadcasting station uses vertical or mixed polarization.

In the case of mixed polarization, only the vertical component of the total effective radiated power of the sound broadcasting station should be taken into account if at least one-tenth of the total effective radiated power is radiated in the vertical component.

These limits apply when the frequency of the sound broadcasting station coincides with the frequency of the station of the land mobile service. If they do not coincide, an appropriate allowance should be made (see Annex 5, Chapter 2).

The interfering field strengths are calculated using the method contained in Annex 4, Chapter 4 at 10 metres above ground at the edge of the service area.

4.3.7.6 a station in the mobile, except aeronautical mobile (OR), service in Region 1 in the frequency band 104–108 MHz, it should normally accept the following interfering field strengths:
– 18 dB (μV/m) if the sound broadcasting station uses horizontal polarization;
– 0 dB (μV/m) if the sound broadcasting station uses vertical or mixed polarization. In the case of mixed polarization, only the vertical component of the total effective radiated power of the sound broadcasting station should be taken into account if at least one-tenth of the total effective radiated power is radiated in the vertical component.

These limits apply when the frequency of the sound broadcasting station coincides with the frequency of the station of the mobile service. If they do not coincide, an appropriate allowance should be made (see Annex 5, Chapter 2).

The interfering field strengths are calculated using the method contained in Annex 4, Chapter 4 at 10 m above ground at the site of the base station assuming the use of vertical polarization.

4.3.8 An administration receiving a telex from the IFRB sent in accordance with sections 4.2.7 or 4.3.3 may request the IFRB to calculate as indicated in section 4.3.7 above the increase in the usable field strength resulting from the proposed modification.

4.3.9 An administration may ask the administration proposing the modification to the Plan for any additional information it considers necessary to calculate the increase in the usable field strength. Similarly, the administration proposing the modification may ask any administration whose agreement it seeks for any additional information it considers necessary. The administrations shall inform the IFRB of such requests.

4.3.10 An administration which is not in a position to give its agreement to the proposed modification shall give its reasons within 100 days from the date of the weekly circular referred to the section 4.2.7 c.

4.3.11 Seventy days after the publication of the weekly circular mentioned in section 4.2.7 or 4.3.3, the IFRB shall request by telex any administration which has not yet given its decision in the matter to do so and shall inform it that, if no reply is received within an overall period of 100 days following the date of publication of this weekly circular, it is deemed to have agreed to the proposed modification to the Plan. This time limit may be extended by 14 days in the case of an administration which has requested additional information or which has asked the IFRB to carry out technical studies.

4.3.12 If at the end of the 100-day period (possibly extended by 14 days) there is continuing disagreement, the IFRB shall make any study that may be requested by these administrations; it shall inform them of the result of the study and shall make such recommendations as it may be able to offer for the solution of the problem.

4.3.13 An administration may request the assistance of the IFRB in the following cases:
- in seeking the agreement of another administration;
- in applying any stage of the procedure described in this Article;
- in carrying out technical studies in relation to this procedure;
- in applying the procedure with respect to other administrations.

4.4 *Comments of other administrations*

4.4.1 On receipt of the special section of the IFRB weekly circular published pursuant to section 4.2.7, administrations may send their comments to the administration proposing the modification either directly or

through the IFRB. In any event the IFRB shall be informed that comments have been made.

4.4.2 An administration which has not notified its comments either to the administration concerned or to the IFRB within a period of 100 days following the date of the weekly circular referred to in section 4.2.7 c. shall be understood to have no objection to the proposed change. This time limit may be extended by 14 days in the case of an administration which has requested additional information or which has asked the IFRB to carry out technical studies.

4.5 *Cancellation of an Assignment*

When the assignment in conformity with this Agreement is cancelled, whether or not as a result of a modification (for instance, in connection with a change of frequency), the administration concerned shall immediately inform the IFRB, which shall publish this information in a special section of its weekly circular.

4.6 *Updating of the Plan*

4.6.1 An administration which has obtained the agreement of the administrations whose names were published in the special section referred to in sections 4.2.7 and 4.3.3, may bring the assignment in question into use and shall inform the IFRB, indicating the final agreed characteristics of the assignment together with the names of the administrations with which agreement has been reached.

4.6.2 The IFRB shall publish in the special section of its weekly circular the information received under sections 4.2.5 or 4.6.1 together with the names of any administrations with which the provisions of the article have been successfully applied. With respect to Contracting Members, the assignment concerned shall enjoy the same status as those appearing in the Plan.

4.6.3 The IFRB shall maintain an up-to-date master copy of the Plan, taking account of any modifications, additions and deletions made in accordance with the procedure of this Article.

4.6.4 The Secretary-General shall publish an up-to-date version of the Plan in an appropriate form as and when the circumstances justify and in any case every three years.

4.7 *Elimination of harmful interference*

If a change, although made in accordance with the provisions of this Article, causes harmful interference to services of other Contracting Members, the administration which has made the change shall take the requisite action to eliminate such interference.

4.8 *Settlement of disputes*

If, after application of the procedure described in this Article, the administrations concerned have been unable to reach agreement, they may resort to the procedure described in Article 50 of the Convention. They may also agree to apply the Optional Additional Protocol to the Convention.

Article 5

Compatibility with the Aeronautical Radionavigation Service

5.1 *General*

5.1.1 The Plan adopted by the Conference has identified the cases of potential interference to the aeronautical radionavigation stations, at a limited number of test points selected by administrations (see Annex 2, Chapter 7). Unresolved cases of A1, A2 and B2 type interference shall be dealt with by application of the procedures in section 5.2.1 below, and those of B1 type interference by application of the procedures in section 5.2.2 below, in both cases on the basis of the criteria contained in Annex 2, Chapter 7 (see also Annex 5).

5.1.2 Assignments in the Plan which may cause interference of any of these types to stations in the aeronautical radionavigation service are identified by the following symbols[1]):

A1/... type A1 interference
A2/... type A2 interference
B2/... type B2 interference

followed by the symbols of the countries whose aeronautical radionavigation stations may be affected, or:

B1/.../... type B1 interference

followed, after the first oblique stroke, by the symbol of the country whose aeronautical radionavigation stations may be affected and, after the second oblique stroke, by the symbols of the countries whose sound broadcasting stations contribute to the interference.

5.2 *Implementation of the Plan*

5.2.1 *Type A1, A2 and B2 interference*

5.2.1.1 Before bringing into use an assignment in the Plan which bears a symbol A1/..., A2/... or B2/..., the administration responsible for the sound broadcasting station shall inform the administration designated after that symbol, not later than 120 days before the date of bringing into use, indicating the dates and conditions under which the sound broadcasting station intends to arrange test experimental transmissions.

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[1]) *Note:* For an explanation of the symbols, see the text concerning the remarks in the Plan (Annex 1).

5.2.1.2 The administrations concerned shall agree on the dates, duration and conditions of the test period.

5.2.1.3 The administration of the territory on which the aeronautical radionavigation station is operated shall verify the interference situation resulting from the experimental transmission. If this administration finds that the level of interference exceeds the level indicated in Annex 2, Chapter 7, it shall inform the administration of the territory on which the sound broadcasting station is to be operated.

If there is disagreement on the level of interference caused to the aeronautical radionavigation station, this level will be verified at other test points to be determined by the administration responsible for the aeronautical radionavigation station. If that level still exceeds the level indicated in Annex 2, Chapter 7, the administration of the territory on which the sound broadcasting station is to be operated shall be informed, with a copy to the IFRB.

5.2.1.4 The administration of the territory on which the sound broadcasting station is to be operated shall immediately adopt appropriate measures to reduce the interference to the aeronautical radionavigation station to or below the level indicated in Annex 2, Chapter 7.

5.2.1.5 If, despite the full application of the foregoing provisions, the administrations concerned fail to reach an agreement, and if experimental test transmissions show that the operation of the sound broadcasting station would actually cause harmful interference to an aeronautical radionavigation station, the broadcasting station shall not be brought into service. However, the status of this assignment, although not in use, shall be maintained with regard to all other assignments in the Plan.

5.2.1.6 When notifying the assignment of the sound broadcasting station in accordance with Article 7 of this Agreement, the administration responsible for this designated station shall indicate the agreement of the administration designated after the symbols A1/..., A2/... or B2/...

5.2.2 *Type B1 interference*

5.2.2.1 If all sound broadcasting stations contributing to the incompatibility case belong to the country operating the aeronautical radionavigation station, this case shall be resolved on a national basis. The IFRB shall offer assistance to the country concerned if it cannot resolve the case itself.

5.2.2.2 If all sound broadcasting stations contributing as "primary interferer"[1]) to the incompatibility case belong to the country operating the aeronautical radionavigation station, this case shall be dealt with as in section 5.2.2.1 after section 5.2.2.4 has been applied in respect of the foreign broadcasting station contributing as "secondary interferer"[1]) to the incompatibility.

[1]) See paragraph 5.2.2.9.

5.2.2.3 Before bringing into use an assignment in the Plan which bears the symbol B1/.../..., the administration responsible for the sound broadcasting station shall consult all the administrations whose stations are likely to suffer interference, indicating the date at which it intends to bring this assignment into use.

5.2.2.4 Each administration whose sound broadcasting stations contribute to the interference shall reduce, in the direction of the test point considered, the effective radiated power of its sound broadcasting stations contributing to the incompatibility, where this is possible without reducing their service areas.

5.2.2.5 If this is insufficient, the administrations concerned shall take such appropriate measures as they may agree upon in order to avoid B1 interference.

5.2.2.6 In case of disagreement, the following measures shall be envisaged:

a. reduction of power of all sound broadcasting stations contributing to the incompatibility in the direction of the test point considered (by reducing the transmitter output power, by reducing the effective radiated power by means of an appropriate antenna diagram, or both);

b. seeking an alternative frequency for one of the sound broadcasting stations;

c. in exceptional cases seeking an alternative frequency for the aeronautical radionavigation station.

a. to c. are not given in order of priority. The most appropriate measure will depend on the particular case.

5.2.2.7 If, despite the full application of the foregoing provisions, the administrations concerned fail to reach an agreement, the bringing into use of any sound broadcasting assignment contributing to the interference shall be subject to experimental test transmissions to be carried out as indicated in sections 5.2.1.1 to 5.2.1.3 above.

If the experimental test transmissions show that the operation of the broadcasting assignment under test will give rise to a level of interference to the aeronautical radionavigation station concerned in excess of that indicated in Annex 2, Chapter 7, the administration responsible for the sound broadcasting assignment shall immediately adopt appropriate measures to reduce the interference to the aeronautical radionavigation station to or below the level indicated in Annex 2, Chapter 7. If this is not possible, there are two cases to be considered:

a. if the assignment to be brought into use belongs to an administration which has more than one assignment contributing to the interference, this administration shall decide which of its assignments shall not operate. However, the status of this assignment, although not in use, shall be maintained with regard to all other assignments in the Plan;

b. if the sound broadcasting stations contributing to the interference belong to different administrations, the sound broadcasting station whose assignment is to be brought into use shall not be brought into service. However, the status of this assignment, although not in use, shall be maintained with regard to all other assignments in the Plan.

5.2.2.8 When notifying the assignment of the sound broadcasting station in accordance with Article 7 of this Agreement, the administration responsible for this station shall indicate the agreement of the administrations whose stations were likely to suffer interference.

5.2.2.9 For the purpose of these provisions, a primary interferer is a sound broadcasting station the power of which at the input to the aeronautical radionavigation receiver located at the test point is equal to or above the trigger value, and a secondary interferer is a sound broadcasting station the power of which at the input the aeronautical radionavigation receiver located at the test point is equal to or above the cut-off value but below the trigger value (see Annex 2, Chapter 7).

5.3 *Modifications to the Plan*

5.3.1 Any administration wishing to modify the Plan shall obtain the agreement of any other administration whose aeronautical radionavigation stations are likely to be affected.

5.3.2 The aeronautical radionavigation stations of an administration are likely to be affected if the distance from the sound broadcasting station under consideration to the nearest point on the boundary of that country is less than the limit indicated in Annex 4, Chapter 3.

5.3.3 The administrations concerned shall agree on the criteria and methods to be used, taking into account those developed during the Conference (see Annex 2) and use the updated Plan and updated lists of the aeronautical radionavigation stations as well as any criteria appearing in the latest relevant CCIR Recommendations.

5.3.4 Administrations may request the IFRB to carry out this coordination on their behalf, including any calculations required for the protection of the aeronautical radionavigation stations, provided they supply the necessary information to the IFRB.

Article 6

Continued Coordination of Assignments Appearing in the Appendix to the Plan

6.1 The requirements concerning assignments which cause a nuisance field strength higher than 60 dB/μV/m to other assignments and which have

not secured all the necessary agreements during the Conference are contained in the Appendix to the Plan. They will remain in this Appendix until 1 July 1992. Exceptionally, at the request of one or more of the administrations concerned, an assignment may remain in the Appendix until 31 December 1993; a copy of this request shall be sent to the IFRB.

6.2 Until the dates indicated in section 6.1 above, these assignments have the same status as the other assignments in the Plan as regards the application of the provisions of Article 4.

6.3 Administrations should continue coordination of these assignments, taking account of the geographical conditions and other relevant factors to the extent that the necessary data are available, and inform the IFRB of the agreements obtained.

6.4 When the IFRB finds that:
– all the necessary agreements have been obtained, or
– the assignment appearing in the Appendix to the Plan has been modified in such a way that its nuisance field strength caused to the stations of the administrations whose agreement is still required is 60 dB/μV/m or less,

it shall publish the assignment concerned in a special section of its weekly circular and shall transfer it to the appropriate part of the Plan.

6.5 For the purpose of applying Article 4, the reference usable field strength to be used shall be:
– for an assignment appearing in Part 1 or Part 2 of the Plan, the usable field strength resulting from the other assignments appearing in those parts of the Plan;
– for an assignment appearing in the Appendix, the usable field strength resulting from all the assignments appearing in the Plan including the Appendix.

6.6 Each time an assignment is transferred from the Appendix to the appropriate part of the Plan, the reference usable field strength of the stations concerned shall be calculated again and the result obtained shall be used for the application of the provisions of Article 4.

Article 7

Notification of Frequency Assignments

7.1 When an administration of a Contracting Member proposes to bring into use an assignment in conformity with this Agreement, it shall notify the assignment to the IFRB in accordance with the provisions of Article 12 of the Radio Regulations. (See also Article 5 of this Agreement and Resolutions Nos. 2 and 3.)

7.2 In relations between Contracting Members, assignments thus brought into service and entered in the Master International Frequency Register will have the same status, irrespective of the date on which they are brought into service.

Article 8

Accession to the Agreement

8.1 Any Member of the Union in the planning area which has not signed the Agreement may at any time deposit an instrument of accession with the Secretary-General, who shall immediately inform the other Members of the Union. Accession to the Agreement shall be made without reservations and shall apply to the Plan as it stands at the time of accession.

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

Article 9

Scope of Application of the Agreement

9.1 The Agreement shall bind Contracting Members in their relations with one another but shall not bind those Members in their relations with non-Contracting Members[1]).

9.2 If a Contracting Member enters reservations with regard to any provision of this Agreement, other Contracting Members shall be free to disregard such provision in their relations with the Member which has made such reservations.

Article 10

Approval of the Agreement

10.1 Members signatory to the Agreement shall notify their approval of this Agreement, as promptly as possible, to the Secretary-General, who shall at once inform the other Members of the Union.

Article 11

Denunciation of the Agreement

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

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

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[1]) For relations with non-Contracting Members with respect to the band 100–108 MHz, see Article 3 of this Agreement (see also Resolution No. 4 and Recommendation No. 1).

11.3 On the date on which the denunciation becomes effective, the IFRB shall delete from the Plan the assignments in the band 87.5–108 MHz entered in the name of the Member denouncing the Agreement. (See Recommendation No. 1.)

Article 12

Revision of the Agreement

12.1 No revision of this Agreement shall be undertaken except by a competent administrative radio conference convened in accordance with the procedure laid down in the Convention, to which at least all the Members of the Union in the planning area shall be invited.

Article 13

Entry into Force and Duration of the Agreement

13.1 This Agreement shall enter into force on 1 July 1987, at 0001 hours UTC.

13.2 On that date, with the exception of stations operating in conformity with No. 342 of the Radio Regulations, sound broadcasting stations in operation with frequency assignments which do not appear in Parts 1 and 2 of the Plan referred to in Article 3, paragraph 3.1, shall cease transmitting. Such stations may resume operation provided the necessary agreements are obtained.

13.3 This Agreement and the annexed Plan have been established with a view to meeting the requirements of the broadcasting service (sound) in the band 87.5–108 MHz for a period of 20 years from the date of entry into force of the Agreement.

13.4 This Agreement shall remain in force until it is revised in accordance with Article 12.

IN WITNESS WHEREOF, the undersigned delegates of the Members of the Union mentioned above have, on behalf of the competent authorities of their respective countries, signed this Agreement in a single copy in the Arabic, English, French, Russian and Spanish languages; in case of dispute, the French text shall be authentic. This copy shall remain deposited in the archives of the Union. The Secretary-General shall forward one certified true copy to each Member of the Union in the planning area.

DONE at Geneva, 7 December 1984

Het Regionaal Akkoord is ondertekend voor de volgende Staten:

Afghanistan
Albanië
Algerije
Angola
België
Benin
de Bondsrepubliek Duitsland
Botswana
Burkina Faso
Congo
Cyprus
Denemarken
de Duitse Democratische Republiek
Egypte
Finland
Frankrijk
Gabon
Griekenland
Guinee
Hongarije
Ierland
Irak
Iran
Israël
Italië
Ivoorkust
Jemen (Arabische Republiek)
Jemen (Volksrepubliek)
Joegoslavië
Jordanië
Kameroen
Kenya
Koeweit
het Koninkrijk der Nederlanden
Lesotho
Libië
Liechtenstein
Luxemburg
Mali
Malta
Marokko
Monaco
Mongolië
Noorwegen
Oeganda
de Oekraïne
Oman
Oostenrijk
Polen
Portugal
Qatar
Roemenië
San Marino
Saoedi-Arabië
Senegal
de Sovjet-Unie
Spanje
Swaziland
Syrië
Tanzania
Togo
Tsjaad
Tsjechoslowakije
Tunesië
Turkije
Vaticaanstad
het Verenigd Koninkrijk van Groot-Brittannië en Noord-Ierland
Witrusland
Zambia
Zimbabwe
Zweden
Zwitserland

ANNEX 1

Frequency Assignment Plan for FM Sound Broadcasting Stations in Region 1 and Part of Region 3 in the Band 87.5–108 MHz

Information included in the columns of the Plan

Note by the General Secretariat: The Plan, as described in Article 3 of the Agreement, is published in the form of microfiches placed in the pocket at the end of this volume. The Plan, except for the information in columns 14 and 16 and the notes relating to compatibility with the aeronautical radionavigation service, has also been published in Conference documents 190 (Rev. 1) and 191 (Rev. 1).

Column

1. Assigned frequency (MHz)
2. Country symbol
3. Name of transmitting station
4. Symbol of the geographical area in which the station is located (see Table No. 1 of the Preface to the International Frequency List)
5. Geographical coordinates, in degrees and minutes, of the transmitting antenna site
6. Altitude of site of transmitting antenna above sea level (m)
7. Height of the antenna above ground level (m)
8. Polarization (H, V or M)
9. System (1, 2, 3, 4 or 5)[1])
10. Total effective radiated power (dBW)
11. Maximum effective radiated power of the horizontally polarized component (dBW)
12. Maximum effective radiated power of the vertically polarized component (dBW)
13. Directivity of antenna (ND or D)
14. Effective radiated power of the horizontal component and the vertical component in different azimuths (dBW)
15. Maximum effective antenna height (m)
16. Effective antenna height at different azimuths

[1]) See paragraph 3.1 of Annex 2 to the Agreement.

17. Sectors or directions of restricted e.r.p. (in degrees)

17.1 Sector No. 1
17.2 Sector No. 2
17.3 Sector No. 3
17.4 Sector No. 4

18. Attenuation in the sector concerned (dB)

18.1 Attenuation in sector No. 1
18.2 Attenuation in sector No. 2
18.3 Attenuation in sector No. 3
18.4 Attenuation in sector No. 4

19. Remarks[2])

The above information from column 1 to column 19 is an integral part of the Plan. In case of divergence between indications in columns 17 and 18 on the one hand and column 14 on the other, the information in column 14 should be used.

Meaning of the Symbols in the "Remarks" column (column 19 of the Plan)

A1/... When it is brought into service this assignment may cause type A1, A2/... A2, B2 interference to one or more aeronautical radionavigation B2/... stations of the countries whose symbols are given after the oblique stroke. The provisions of Article 5 of the Agreement shall be applied before it is brought into service.

B1/.../... This assignment may contribute to type B1 intermodulation interference to an aeronautical radionavigation station. The provisions of Article 5 of the Agreement shall be applied before it is brought into service. The symbol following the first oblique stroke is that of the country to which these aeronautical radionavigation stations belong. The symbols following the second oblique stroke are those of the countries whose sound-broadcasting stations contribute to the interference.

3/... The bringing into service of this assignment is contingent on the withdrawal of assignments to television stations belonging to the administrations named after this symbol and may not take place until a date to be agreed with those administrations.

4/... Up to the date which follows the symbol, this assignment shall be used with the characteristics given in columns 17 and 18. After that date, it may be used with the radiation characteristics given in column 14.

[2]) See the following page. (in dit Tractatenblad blz. 23-24)

5/... This assignment may continue to be used until the date which follows the symbol. After that date, it will be deleted from the Plan.

6/... Coordination of this assignment with the country indicated under this symbol did not take place. The IFRB will study possible solutions for the resolution of this incompatibility and make appropriate recommendations to the countries concerned.

7/... The Libyan Administration does not agree to the coordinates of this assignment because it is in Libyan territory.

8/... The Libyan Administration may, in principle, change the ratio between the vertical and the horizontal polarization components as a result of experiments to be carried out on the site.

9/... The Chad Administration does not agree to the coordinates of this assignment because it is in Chadian territory.

10/... Agreement to carry out tests in order to determine the acceptable increase in power in relation to the characteristics given in the Plan, for the sector 300° to 340° between Belgium and Luxembourg and for the sector 120° to 140° between France and Luxembourg.

11/... The e.r.p. is 175 kW or less in the sector 120° to 135°.

12/... Austria and Switzerland have agreed that a power reduction in the sector 230° to 280° equal to that applicable to frequencies 102.1 MHz and 106.5 MHz will be applied at a date to be fixed after the Conference.

13/... This assignment is coordinated with the Administration of Algeria with regard to the corresponding frequencies of channel No. 14.

14/... In the coordination process the Libyan Administration will take into account at first the topography of the terrain.

15/... The second sub-paragraph of Article 6, paragraph 6.4, does not apply to this assignment.

* 16/... This assignment causes a nuisance field strength higher than 60 dB/μV/m to other assignments and, in accordance with Article 6, has to secure the agreement of the administrations identified after the oblique stroke.

---

* *Note by the General Secretariat:* This new symbol for the Remarks column has been included at the request of the IFRB.

ANNEX 2

Technical data

These data were used for the preparation of the Plan.
They shall also be used for Plan modification procedures.

CHAPTER 1

Definitions

The following definitions supplement those contained in the International Telecommunication Convention and in the Radio Regulations.

1.1 *Coverage area*

The area within which the field strength of the wanted transmitter is equal to or greater than the usable field strength.
In this area the protection against interference is provided for 99% of time.

Note – The field strength of the wanted transmitter is derived from the propagation curve relating to 50% of locations and for 50% of time.

1.2 *Service area*

The part of the coverage area in which the administration has the right to demand that the agreed protection conditions be provided.

1.3 *Usable field strength (E_u)*

Minimum value of the field strength necessary to permit a desired reception quality, under specified receiving conditions, in the presence of natural and man-made noise and interference, either in an existing situation or as determined by agreements or frequency plans.

Note 1 – The desired quality is determined in particular by the protection ratio against noise and interference and, in the case of fluctuating noise or interference, by the percentage of time during which the required quality must be ensured.

Note 2 – The receiving conditions include, amongst others:
– the type of transmission and frequency band used;
– the receiving equipment characteristics (antenna gain, receiver characteristics, siting);
– receiver operating conditions, particularly the geographical zone, the time and the season, or if the receiver is mobile, the local variations of the field strength due to propagation effects.

Note 3 – The usable field strength can be calculated by the simplified multiplication method[1]), or the power sum method[2]). For the application of the Article 4 procedure, the simplified multiplication method is used.

1.4 *Nuisance field*

The field strength of the interfering transmitter (at its pertinent e.r.p.) modified by the relevant protection ratio.

CHAPTER 2

Propagation

2.1 *Propagation data for the VHF broadcasting service*

2.1.1 *General*

The propagation data given in this chapter were used for the planning of the broadcasting service. They relate field strength to path length and the effective transmitting antenna height. They represent the field strength exceeded at 50% of locations for 50% and 1% of the time and apply to both horizontal and vertical polarization.

The data are given for various types of areas and climates, namely, land, cold sea, warm sea and areas subject to extreme super-refractivity. The definition of these categories has to be based on statistical data; it is thus to a certain extent arbitrary, but experience indicates that the following distinctions are appropriate for the application of the data set out in this chapter.

Cold sea

Seas, oceans and other substantial bodies of water at latitudes greater than 23.5° North or South, but excluding the Mediterranean, the Black Sea, the Red Sea and the area extending from the Shatt-al-Arab to and including the Gulf of Oman.

Warm sea

Seas, oceans and other substantial bodies of water at latitudes less than 23.5° North or South, including the Mediterranean and the Black Sea.

Area of extreme super-refractivity

Seas, oceans and other substantial bodies of water in the area extending from the Shatt-al-Arab to and including the Gulf of Oman.

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[1]) See Chapter 4.
[2]) See CCIR Recommendation 499-2.

Note – In bilateral and multilateral negotiations during the Conference, some administrations in the Eastern Mediterranean area (East of 30° E) used the criteria described in section 2.3, for the application of the 1% time curves, the sea area was assumed to include also a coastal strip extending up to 50 km inland and for the Nile delta region (from 30° East to 32° East) a coastal strip extending up to 200 km inland.

2.1.2 *Area of extreme super-refractivity*

2.1.2.1 *Oversea paths*

For oversea path calculations for 50% of the time, Figure 2.2 was used. For the application of the 1% time curves, the sea area includes also a coastal strip extending up to 50 km inland.

For oversea paths in the area from the Shatt-al-Arab up to and including the Gulf of Oman, calculations for propagation occurring for 1% of the time were based on the following formulae:

$$E = 106.9 - 20 \log d \quad \text{for } 10 \leqslant d \leqslant 400$$
$$E = 78.9 - 0.06\, d \quad \text{for } d > 400$$

where

d = path length in km,
E = field strength in dB (μV/m).

2.1.2.2 *Overland paths*

For overland path calculations for 50% of the time, Figure 2.1 was used. For overland path calculations for 1% of the time, Figure 2.3 was used, but any coastal strip as defined in section 2.1.2.1 was treated as sea.

2.1.2.3 *Mixed paths*

For both 1% and 50% of the time, mixed paths were evaluated according to the procedure set out in section 2.1.3.5.

2.1.3 *Application of the curves*

2.1.3.1 *Time variability*

The field-strength values given in Figures 2.1 to 2.5, are those exceeded for 50% and 1% of the time. They are expressed in decibels relative to 1 μV/m and correspond to an effective radiated power of 1 kW.

The 50% time curves were used for the determination of coverage areas. The 50% and 1% time curves were used for interference calculations for steady and tropospheric interference respectively.

2.1.3.2 *Effective transmitter antenna height*

The effective height of the transmitting antenna, h_1, is defined as its height over the average ground level between distances of 3 km and 15 km from the transmitter in the direction of the receiver. The height of the receiving antenna, h_2, was assumed to be 10 m above ground level.

The curves given in Figures 2.1 to 2.5 correspond to effective transmitter antenna heights, h_1, from 37.5 to 1200 metres.

For effective antenna heights, h_1, of 20 m and 10 m, additional curves can be derived from the 37.5 m curve by applying correction factors of -5 dB and -11 dB for distances up to 25 km, and 0 dB in both cases for distances in excess of 250 km, with linear interpolation for intermediate distances. For effective transmitter antenna heights, h_1, of less than 10 m, the values derived for 10 m are used.

For effective transmitter antenna heights, h_1, in excess of 1200 m, the field strength at a distance of x km from the transmitter was taken to be the same as the field strength given by the curve for an effective height of 300 m at a distance of $(x + 70 - 4.1\sqrt{h_1})$ km. As this extrapolation is only applicable to trans-horizon distances its use is limited to distances beyond $x = (4.1\sqrt{h_1} + 70)$ km. For distances between 100 km and $x = (4.1\sqrt{h_1} + 70)$ km, it is assumed that the field strength exceeds that for 1200 m by the same amount as at $x = (4.1\sqrt{h_1} + 70)$ km, calculated in accordance with the above procedure. For smaller distances this increment was determined by linear interpolation between 0 dB at 20 km and the height, h_1, dependent value at 100 km distance. This is subject to the condition that the free space field strength is not exceeded.

2.1.3.3 *Location variability*

The curves given are representative of 50% of locations, the percentage which was used for planning purposes.

2.1.3.4 *Terrain irregularity correction*

The curves for propagation overland refer to the kind of irregular rolling terrain found in many parts of Region 1. No terrain irregularity correction was taken into account in drawing up the Plan.

Note – In bilateral or multilateral coordinations during the Conference, some administrations took account of actual path profiles. This method may also be used for coordination after the Conference.

2.1.3.5 *Mixed land/sea path calculations*

When the propagation path is partially over land and partially over sea, the following method is used for interpolation between the appropriate land and sea curves.

$E_{L,t}$: field strength for land path equal in length to the mixed path for $t\%$ of the time,
$E_{S,t}$: field strength for sea path equal in length to the mixed path for $t\%$ of the time,
$E_{M,t}$: field strength for mixed path for $t\%$ of the time,
d_s : length of sea path,
d_T : length of total path.

The field strength for the mixed path ($E_{M,t}$) is then determined by using the formula:

$$E_{M,t} = E_{L,t} + \frac{d_S}{d_T}(E_{S,t} - E_{L,t})$$

In the calculations of mixed paths, a computerized approximation of the coastline was employed. It should be borne in mind that in some cases this may give rise to certain inaccuracies when compared to calculations based on the actual coastline.

2.2 *Propagation data for the aeronautical radionavigation service*

The compatibility calculations are based on free space propagation conditions. In drawing up the Plan the calculations were limited to the test points of the aeronautical radionavigation station in line of sight from the broadcasting station, it being assumed that the effective Earth's radius is 4/3 of the actual radius.

2.3 *Additional propagation data for the Eastern Mediterranean*

In bilateral and multilateral negotiations during the Conference, some administrations in the Eastern Mediterranean (East of 30° E) calculated the field strength for 1% of the time for oversea paths using the following formulae:

$E = 106.9 - 20\log d - 0.07\,d$ for $10 \leqslant d < 100$
$E = 99.9 - 20\log d$ for $100 \leqslant d \leqslant 568$
$E = 78.9 - 0.06\,d$ for $d > 568$

where

d = path length in km,
E = field strength in dB (μV/m).

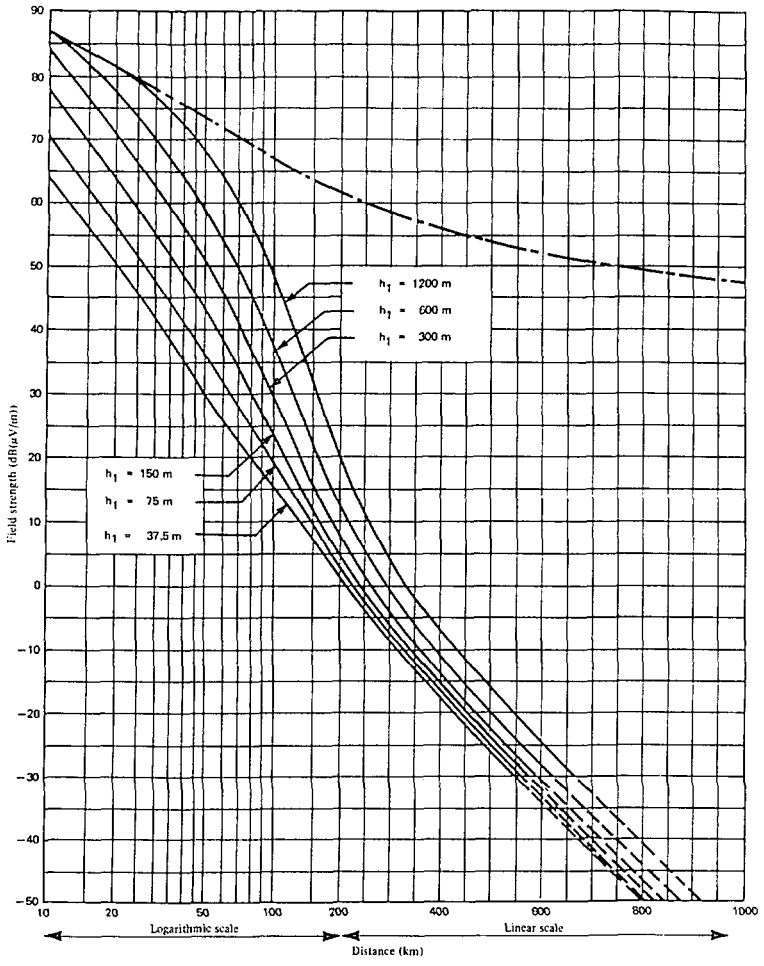

FIGURE 2.1

Field strength (dB (μV/m)) for 1 kW e.r.p.
Propagation over land
50% of the time: 50% of the locations; $h_2 = 10$ m
----- Free space

PROPAGATION CURVES FOR THE BROADCASTING SERVICE

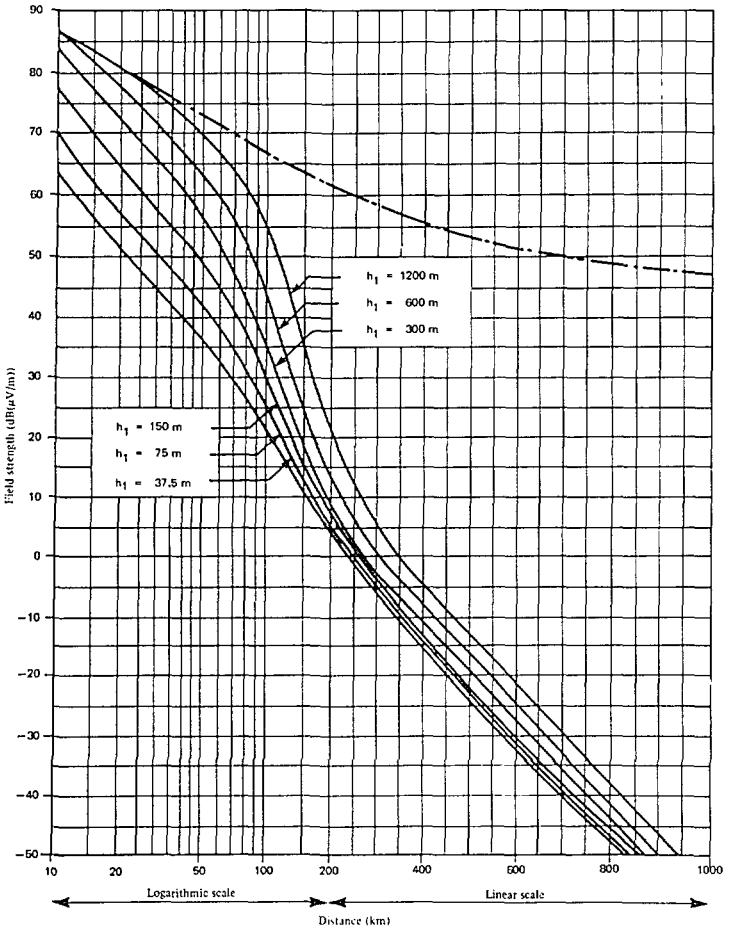

FIGURE 2.2

Field strength (dB (μV/m)) for 1 kW e.r.p.
Propagation over sea
50% of the time; 50% of the locations; $h_2 = 10$ m
– – – – Free space

PROPAGATION CURVES FOR THE BROADCASTING SERVICE

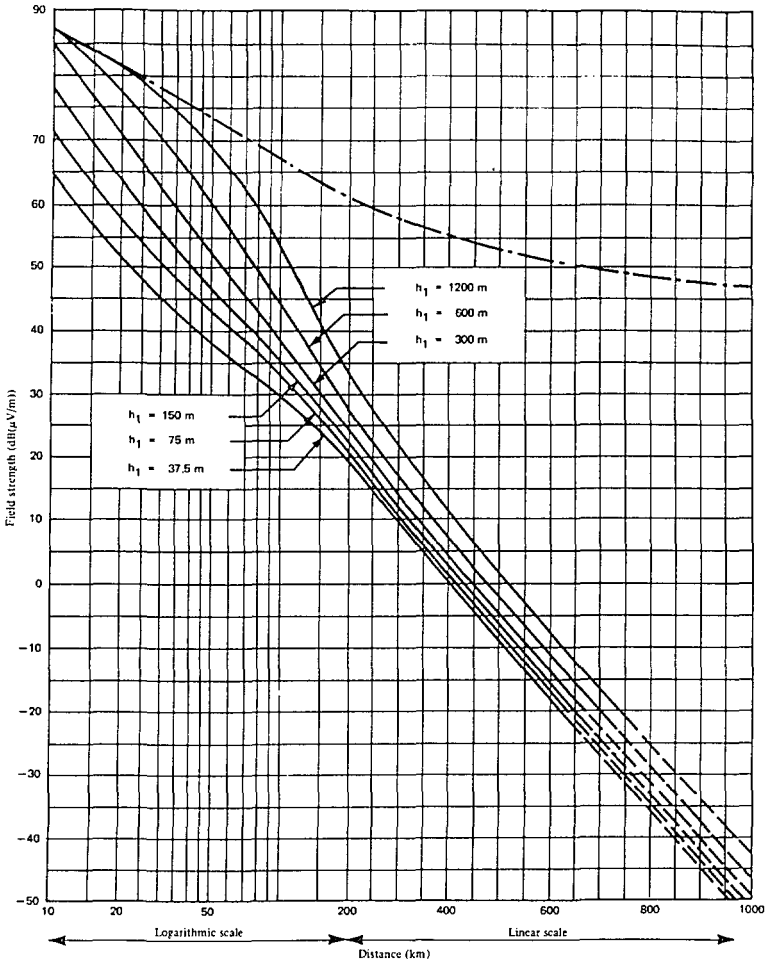

FIGURE 2.3

Field strength (dB (μV/m)) for 1 kW e.r.p.
Propagation over land
1% of the time; 50% of the locations; $h_2 = 10$ m
– – – – Free space
PROPAGATION CURVES FOR THE BROADCASTING SERVICE

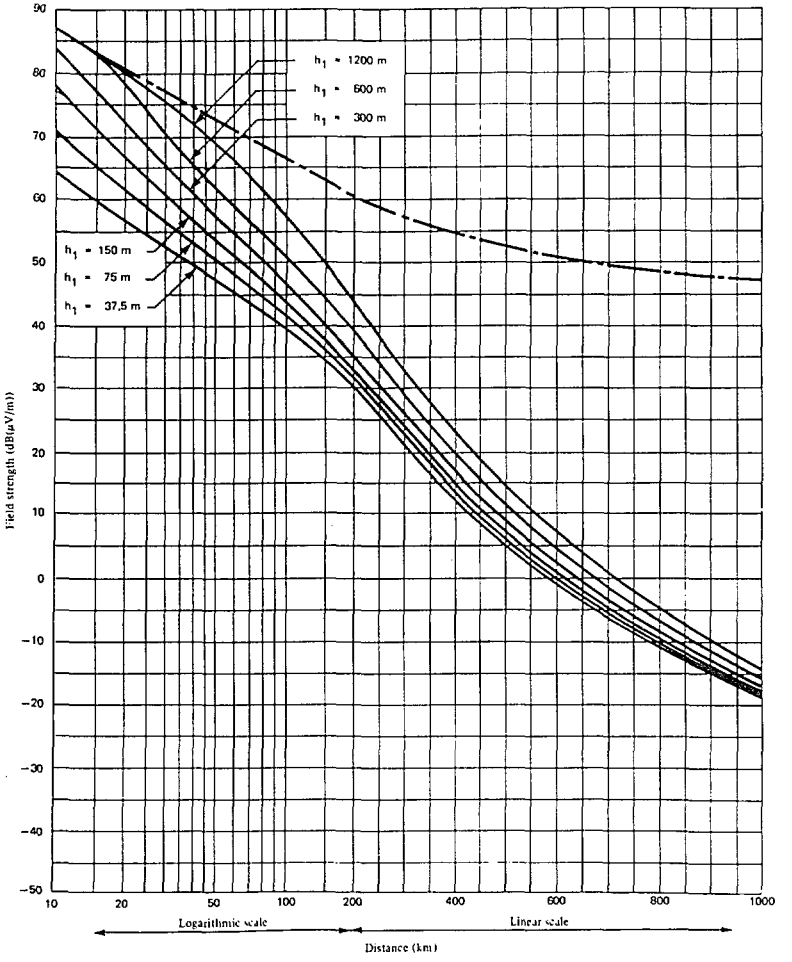

FIGURE 2.4

Field strength (dB (μV/m)) for 1 kW e.r.p.
Propagation over cold sea
1% of the time; 50% of the locations; $h_2 = 10$ m
– – – – Free space

PROPAGATION CURVES FOR THE BROADCASTING SERVICE

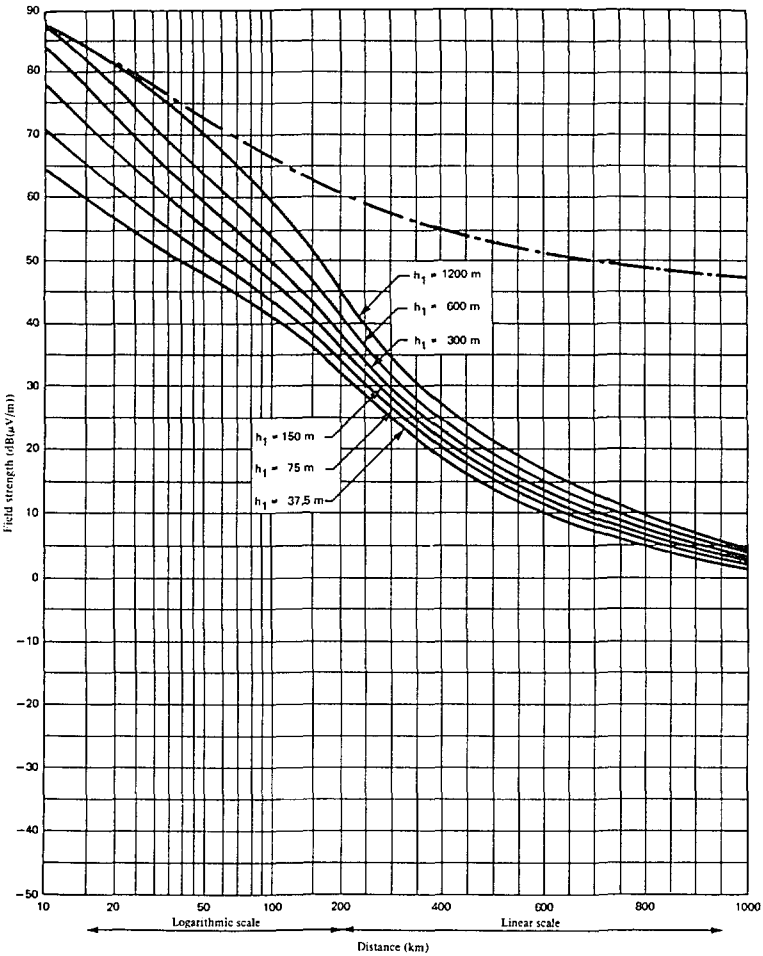

FIGURE 2.5

Field strength (dB (μV/m)) for 1 kW e.r.p.
Propagation over warm sea
(excluding areas subject to extreme super-refractivity)
1% of the time; 50% of the locations; $h_2 = 10$ m
----- Free space
PROPAGATION CURVES FOR THE BROADCASTING SERVICE

CHAPTER 3

Technical standards and transmission characteristics for the sound broadcasting service

3.1 *Transmission systems*

In planning, the following transmission systems were used, as specified by the administrations when notifying their requirements:

System 1: Monophonic (maximum frequency deviation ±75 kHz)

System 2: Monophonic (maximum frequency deviation ±50 kHz)

System 3: Stereophonic, polar modulation system (maximum frequency deviation ±50 kHz)

System 4: Stereophonic, pilot-tone system (maximum frequency deviation ±75 kHz)

System 5: Stereophonic, pilot-tone system (maximum frequency deviation ±50 kHz)

Column 9 of the Plan indicates the system used in accordance with the above classification.

The addition of sub-carriers for the transmission of supplementary information[1]) was considered as being included in each of the five systems above, provided that the maximum carrier frequency deviation was not exceeded and the protection required was not increased.

As an alternative, other systems having different characteristics (e.g. other pre-emphasis characteristics, digital modulation) may be used, provided that such use does neither cause greater interference nor demand higher protection than the reference system indicated in the Plan.

3.2 *Channel spacing*

A uniform channel spacing of 100 kHz was adopted in principle for both monophonic and stereophonic emissions.

The nominal carrier frequencies are, in principle, integral multiples of 100 kHz.

3.3 *Modulation standards*

3.3.1 *Monophonic transmissions*

The radio-frequency signal consists of a carrier frequency modulated by the sound signal after preemphasis with a maximum frequency deviation of ±75 kHz or ±50 kHz.

---

[1]) See CCIR Recommendation 450-1.

The pre-emphasis characteristic of the sound signal is identical to the admittance-frequency curve of a parallel resistance-capacitance circuit having a time constant of 50 μs.

3.3.2 *Stereophonic transmissions*

The radio-frequency signal consists of a carrier frequency modulated by baseband signal according to the specifications of the polar modulation or the pilot-tone system. The maximum frequency deviation is ± 50 kHz for the polar modulation system and ± 75 kHz or ± 50 kHz for the pilot-tone system.

The pre-emphasis characteristics of the sound signals M and S[1]) are identical to the admittance-frequency curve of a parallel resistance-capacitance circuit having a time constant of 50 μs.

3.4 *Protection ratios*

3.4.1 *Monophonic transmissions*

The radio-frequency protection ratios required to give satisfactory monophonic reception for 99% of the time are given by the curve M2 in Figure 2.6 for systems using a maximum frequency deviation of ± 75 kHz. For steady interference a higher degree of protection is required; this is shown by the curve M1 in Figure 2.6. The protection ratios at specific frequency spacing values are also given in Table 2.1.

The corresponding values for systems using a maximum frequency deviation of ± 50 kHz are given in Figure 2.7 and Table 2.2.

3.4.2 *Stereophonic transmissions*

The radio-frequency protection ratios required to give satisfactory stereophonic reception for 99% of the time are given by curve S2 in Figure 2.6 for transmissions using the pilot-tone system and a maximum frequency deviation of ± 75 kHz. For steady interference, a higher degree of protection is required; this is shown by the curve S1 in Figure 2.6. The protection ratios at specific frequency spacing values are also given in Table 2.1.

Table 2.2 and Figure 2.7 give the radio-frequency protection ratios required for satisfactory reception in the case of tropospheric interference (99% of time), or in the case of steady interference for stereophonic transmissions using the pilot-tone system or the polar modulation system with a maximum frequency deviation of ± 50 kHz.

[1]) M and S are equal to one half of the sum and one half of the difference of the "left-hand" and "right-hand" signals, respectively; for further information see CCIR Recommendation 450-1.

Table 2.3 gives the radio-frequency protection ratios required for satisfactory stereophonic reception in the case of tropospheric interference (99% of time), or in the case of steady interference where the wanted and interfering transmitters use different maximum frequency deviations.

The protection ratios for stereophonic broadcasting assume the use of a lowpass filter following the frequency modulation demodulator in the receiver designed to reduce interference and noise at frequencies greater than 53 kHz in the pilot-tone system and greater than 46.25 kHz in the polar modulation system. Without such a filter or an equivalent arrangement in the receiver, the protection-ratio curves for stereophonic broadcasting cannot be met, and significant interference from transmission in adjacent or nearby channels is possible.

Note – The protection ratios for steady interference provide approximately a 50 dB signal-to-noise ratio. (Weighted quasi-peak measurement in conformity with CCIR Recommendation 468-3, with a reference signal at maximum frequency deviation.)[1])

[1]) For further information see CCIR Report 796-1.

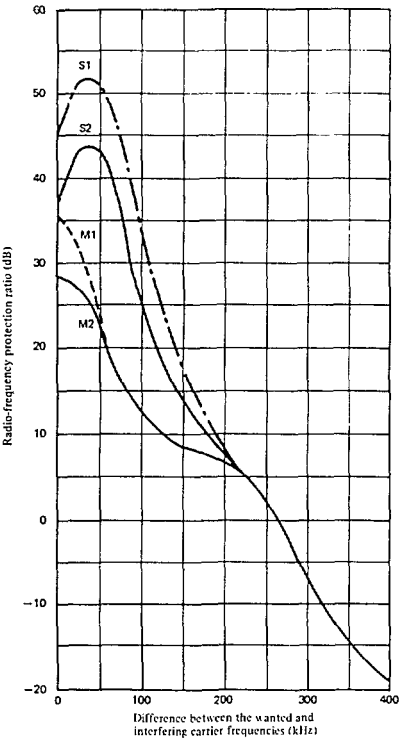

FIGURE 2.6

Radio-frequency protection ratio required by broadcasting services in Band 8 (VHF) at frequencies between 87.5 MHz and 108 MHz using a maximum frequency deviation of ±75 kHz

Curve M1: monophonic broadcasting; steady interference
Curve M2: monophonic broadcasting; tropospheric interference (protection for 99% of the time)
Curve S1: stereophonic broadcasting; steady interference
Curve S2: stereophonic broadcasting; tropospheric interference (protection for 99% of the time)

TABLE 2.1

Frequency spacing (kHz)	Radio-frequency protection ratio (dB) for a maximum frequency deviation of ± 75 kHz			
	Monophonic		Stereophonic	
	Steady interference	Tropospheric interference	Steady interference	Tropospheric interference
0	36	28	45	37
25	31	27	51	43
50	24	22	51	43
75	16	16	45	37
100	12	12	33	25
150	8	8	18	14
200	6	6	7	7
250	2	2	2	2
300	−7	−7	−7	−7
350	−15	−15	−15	−15
400	−20	−20	−20	−20

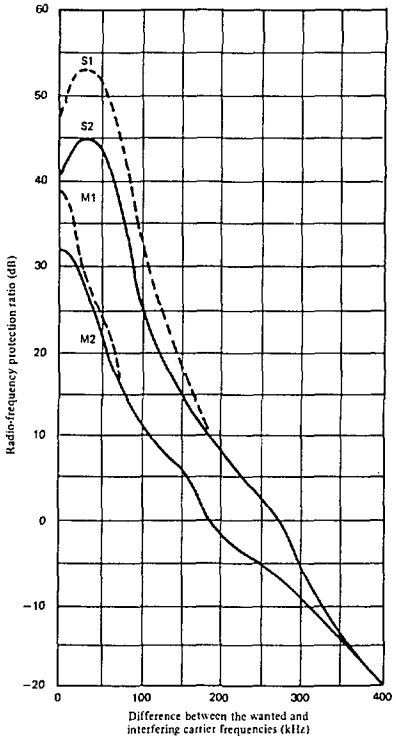

FIGURE 2.7

Radio-frequency protection ratio required by broadcasting services in Band 8 (VHF) at frequencies between 87.5 MHz and 108 MHz using a maximum frequency deviation of ±50 kHz

Curve M1: monophonic broadcasting; steady interference
Curve M2: monophonic broadcasting; tropospheric interference (protection for 99% of the time)
Curve S1: stereophonic broadcasting; steady interference
Curve S2: stereophonic broadcasting; tropospheric interference (protection for 99% of the time)

TABLE 2.2

Frequency spacing (kHz)	Radio-frequency protection ratio (dB) for a maximum frequency deviation of ± 50 kHz			
	Monophonic		Stereophonic	
	Steady *interference*	Tropospheric *interference*	Steady *interference*	Tropospheric *interference*
0	39	32	49	41
25	32	28	53	45
50	24	22	51	43
75	15	15	45	37
100	12	12	33	25
125	7.5	7.5	25	18
150	6	6	18	14
175	2	2	12	11
200	−2.5	−2.5	7	7
225	−3.5	−3.5	5	5
250	−6	−6	2	2
275	−7.5	−7.5	0	0
300	−10	−10	−7	−7
325	−12	−12	−10	−10
350	−15	−15	−15	−15
375	−17.5	−17.5	−17.5	−17.5
400	−20	−20	−20	−20

TABLE 2.3

Frequency spacing (kHz)	Maximum frequency deviation: wanted transmitter ± 50 kHz interfering transmitter ± 75 kHz		Maximum frequency deviation: wanted transmitter ± 75 kHz interfering transmitter ± 50 kHz	
	Radio-frequency protection ratio (dB) stereophonic		Radio-frequency protection ratio (dB) stereophonic	
	Steady interference	Tropospheric interference	Steady interference	Tropospheric interference
0	49	41	45	37
25	53	45	51	43
50	51	43	51	43
75	45	37	45	37
100	33	25	33	25
125	25	18	24.5	18
150	18	14	18	14
175	12	11	11	10
200	7	7	7	7
225	5	5	4.5	4.5
250	2	2	2	2
275	0	0	−2	−2
300	−7	−7	−7	−7
325	−10	−10	−11.5	−11.5
350	−15	−15	−15	−15
375	−17.5	−17.5	−17.5	−17.5
400	−20	−20	−20	−20

3.5 *Calculation of nuisance field*

To apply the protection-ratio curves of Figures 2.6 and 2.7, it is necessary to determine whether, in the particular circumstances, the interference is to be regarded as steady or tropospheric[1]). A suitable criterion for this is provided by the concept of "nuisance field", which is the field strength of the interfering transmitter (at its pertinent e.r.p.) modified by the relevant protection ratio.

Thus, the nuisance field for steady interference is given by the formula:

$$E_s = P + E(50, 50) + A_s$$

and the nuisance field for tropospheric interference is given by the formula:

$$E_t = P + E(50, T) + A_t$$

where

P:	e.r.p. (dB (1 kW)) of the interfering transmitter;
A:	radio-frequency protection ratio (dB);
$E(50, T)$:	field strength (dB (μV/m)) of the interfering transmitter, normalized to 1 kW, and exceeded during T% of the time,

and where indices s and t indicate steady or tropospheric interference respectively.

The protection-ratio curve for steady interference is applicable when the resulting nuisance field is stronger than that resulting from tropospheric interference,

i.e. $E_s \geqslant E_t$.

This means that A_s should be used in all cases when:

$E(50, 50) + A_s \geqslant E(50, T) + A_t$.

3.6 *Minimum field strength*

The planning was based on the following median values of the minimum usable field strength (measured 10 m above ground level):
- stereophonic service: 54 dB (μV/m) in rural areas;
- monophonic service: 48 dB (μV/m) in rural areas.

These values apply for systems with a maximum frequency deviation of ±50 kHz or ±75 kHz.

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[1]) For further information see CCIR Recommendation 412-3.

3.7 *Maximum radiated power*

No maximum power values have been specified.

3.8 *Characteristics of transmitting and receiving antennas – polarization*

3.8.1 *Transmitting antennas*

The maximum effective radiated power and, in the case of directional antennas, the azimuth(s) relative to True North together with the azimuths of the – 3 dB points anti-clockwise and clockwise from the azimuth of the maximum, have been indicated in accordance with the Radio Regulations (Appendix 1, section D, column 9).

The attenuation (dB) with respect to the maximum value of the effective radiated power has been specified at 10° intervals in a clockwise direction starting at True North. Where administrations have been unable to give information in such detail, they have, where possible, provided the values at 30° intervals in a clockwise direction starting at True North.

For mixed polarized transmissions, the effective radiated powers and radiation patterns have been specified separately for the horizontally and vertically polarized components.

3.8.2 *Receiving antennas*

For stereophonic transmissions, the directivity curve in Figure 2.8 was taken into account by administrations for assessing coverage areas. For monophonic transmissions, an omnidirectional receiving antenna was assumed.

In the computer analysis of the Plan during the Conference, no account was taken of receiving antenna directivity, since the usable field strength was calculated at the transmitter site.

The antenna was assumed to be at a height of 10 m above the ground.

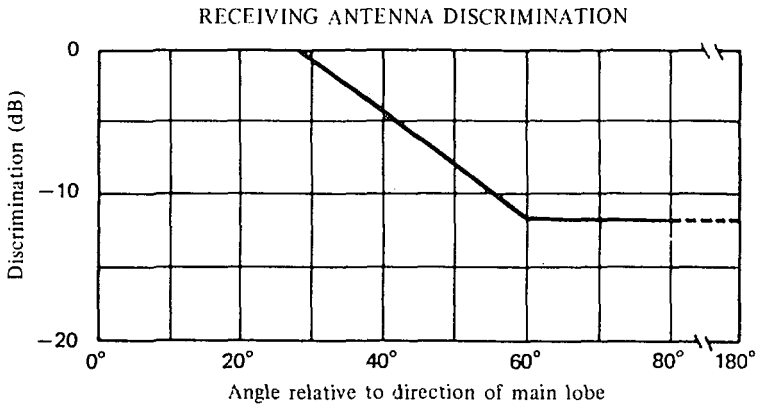

FIGURE 2.8

Discrimination obtained by the use of a directional receiving antenna for sound broadcasting stations in the band 87.5 to 108 MHz

Note 1 – It is considered that the protection shown will be available at the majority of antenna locations in built-up areas. At clear sites in open country, slightly higher values will be obtained.
Note 2 – The curve in Figure 2.8 is valid for signals of vertical or horizontal polarization, when both the wanted and the unwanted signals have the same polarization.

3.8.3 *Polarization*

Administrations were free to choose the polarization to be used in their countries[1]).

Polarization discrimination was not taken into account in the planning procedure, except in specific cases with the agreement of affected administrations. In such cases, a value of 10 dB was used for orthogonal polarization discrimination.

3.9 *Receiver sensitivity and selectivity*

Receiver sensitivity and selectivity were taken into account when specifying the values of the minimum usable field strength and the radio-frequency protection ratios.

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[1]) For further information see CCIR Report 464-3.

CHAPTER 4

Determination of the usable field strength by the simplified multiplication method

4.1 *Principle of calculation*

The usable field strength is determined for a specified coverage probability (with respect to time and location) and depends on the values of the nuisance fields:

$$E_{si} = P_i + E_{ni}(50, T) + A_i + B_i$$

where:

E_{si}: the nuisance field of the i^{th} transmitter corrected by the discrimination factor of the receiving antenna,

P_i: the e.r.p. in dB (kW) of the i^{th} unwanted transmitter,

$E_{ni}(50, T)$: the field strength, in dB (μV/m), normalized to an e.r.p. of 1 kW, of the i^{th} unwanted transmitter. The field strength is exceeded at 50% of the locations during at least T% (e.g. 1%) of the time,

A_i: the radio-frequency protection ratio, in dB, associated with the i^{th} unwanted transmitter,

B_i: the receiving antenna discrimination, in dB.

Appropriate account of the effect of multiple interference can be taken by the use of statistical computation methods among which the simplified multiplication method is the least complex. With this method the usable field strength E_u can be calculated by iteration from:

$$p_c = \prod_{i=1}^{n} L(x_i) \text{ with } x_i = \frac{E_u - E_{si}}{\sigma_n \sqrt{2}}$$

where

p_c: the coverage probability (e.g. 50% of locations, (100 − T)% of time) in the presence of n nuisance fields;

$L(x)$: the coverage probability in the presence of a single nuisance field, which equals the probability integral for a normal distribution (see section 4.2 below).

$\sigma_n = 8.3$ dB: standard deviation according to location of the wanted and interfering field strengths, in dB (μV/m).

4.2 *Calculation by computer*

The calculation of the usable field strength with the simplified multiplication method is based on the probability integral for a normal distribution:

$$L(x) = \frac{1}{\sqrt{2\pi}} \times \int_{-\infty}^{x} e^{-\frac{t^2}{2}} dt$$

This integration can, however, be avoided in the practical calculation by replacing it with a polynomial approximation as followd:

$$L(x) = 1 - \tfrac{1}{2}(1 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4)^{-4} + \varepsilon(x)$$

with

$a_1 = 0.196854$
$a_2 = 0.115194$
$a_3 = 0.000344$
$a_4 = 0.019527$

$\varepsilon(x)$ represents the error between the approximation and the exact value, obtained by the probability integral. Since $|\varepsilon(x)|$ is less than $2.5 \cdot 10^{-4}$, this error can be neglected.

The above approximation was used to calculate the multiple interference by the simplified multiplication method.

4.3 *Manual calculation*

The basic material for the manual calculation of the usable field strength in applying the simplified multiplication method is given below[1]).

The manual calculation needs only additions, subtractions, multiplications, divisions and the reading of a value from Table 2.4.

An example with five interfering transmitters is given in Table 2.5.

Experience has shown that it is expedient to begin with a value for E_u 6 dB larger than the largest of the E_{si} values. If the difference between 0.5^2 and the result (product of the 5 values of $L(x_i)$) equals Δ, the value of E_u should be modified by $\Delta/0.05$ to obtain a better approximation. The whole process can be repeated to obtain better accuracy.

Table 2.5 shows that even after the second step, the difference between the value obtained and the precise value is of the order of 0.2 dB.

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[1]) For further details see CCIR Report 945.
[2]) 0.5 represents the coverage probability for 50% of locations.

TABLE 2.4

$$\textit{Probability integral } \varphi(x) = \frac{2}{\sqrt{2\pi}} \int_0^x [\exp(-t^2/2)]\, dt$$

x	$\varphi(x)$	x	$\varphi(x)$	x	$\varphi(x)$	x	$\varphi(x)$
0.00	0.0000	0.60	0.4515	1.20	0.7699	1.80	0.9281
01	0.0080	61	0.4581	21	0.7737	81	0.9297
02	0.0160	62	0.4647	22	0.7775	82	0.9312
03	0.0239	63	0.4713	23	0.7813	83	0.9328
04	0.0319	64	0.4778	24	0.7850	84	0.9342
0.05	0.0399	0.65	0.4843	1.25	0.7887	1.85	0.9357
06	0.0478	66	0.4907	26	0.7923	86	0.9371
07	0.0558	67	0.4971	27	0.7959	87	0.9385
08	0.0638	68	0.5035	28	0.7995	88	0.9399
09	0.0717	69	0.5098	29	0.8029	89	0.9412
0.10	0.0797	0.70	0.5161	1.30	0.8064	1.90	0.9426
11	0.0876	71	0.5223	31	0.8098	91	0.9439
12	0.0955	72	0.5285	32	0.8132	92	0.9451
13	0.1034	73	0.5346	33	0.8165	93	0.9464
14	0.1113	74	0.5407	34	0.8198	94	0.9476
0.15	0.1192	0.75	0.5467	1.35	0.8230	1.95	0.9488
16	0.1271	76	0.5527	36	0.8262	96	0.9500
17	0.1350	77	0.5587	37	0.8293	97	0.9512
18	0.1428	78	0.5646	38	0.8324	98	0.9523
19	0.1507	79	0.5705	39	0.8355	99	0.9534
0.20	0.1585	0.80	0.5763	1.40	0.8385	2.00	0.9545
21	0.1663	81	0.5821	41	0.8415	05	0.9596
22	0.1741	82	0.5878	42	0.8444	10	0.9643
23	0.1819	83	0.5935	43	0.8473	15	0.9684
24	0.1897	84	0.5991	44	0.8501	20	0.9722
0.25	0.1974	0.85	0.6047	1.45	0.8529	2.25	0.9756
26	0.2041	86	0.6102	46	0.8557	30	0.9786

27	0.2128	87	0.6157	47	0.8584	35	0.9812
28	0.2205	88	0.6211	48	0.8611	40	0.9836
29	0.2282	89	0.6265	49	0.8638	45	0.9857
0.30	0.2358	0.90	0.6319	1.50	0.8664	2.50	0.9876
31	0.2434	91	0.6372	51	0.8690	55	0.9892
32	0.2510	92	0.6424	52	0.8715	60	0.9907
33	0.2586	93	0.6476	53	0.8740	65	0.9920
34	0.2661	94	0.6528	54	0.8764	70	0.9931
0.35	0.2737	0.95	0.6579	1.55	0.8789	2.75	0.9940
36	0.2812	96	0.6629	56	0.8812	80	0.9949
37	0.2886	97	0.6680	57	0.8836	85	0.9956
38	0.2961	98	0.6729	58	0.8859	90	0.9963
39	0.3035	99	0.6778	59	0.8882	95	0.9968
0.40	0.3108	1.00	0.6827	1.60	0.8904	3.00	0.99730
41	0.3182	01	0.6875	61	0.8926	10	0.99806
42	0.3255	02	0.6923	62	0.8948	20	0.99863
43	0.3328	03	0.6970	63	0.8969	30	0.99903
44	0.3401	04	0.7017	64	0.8990	40	0.99933
0.45	0.3473	1.05	0.7063	1.65	0.9011	3.50	0.99953
46	0.3545	06	0.7109	66	0.9031	60	0.99968
47	0.3616	07	0.7154	67	0.9051	70	0.99978
48	0.3688	08	0.7199	68	0.9070	80	0.99986
49	0.3759	09	0.7243	69	0.9090	90	0.99990
0.50	0.3829	1.10	0.7287	1.70	0.9109	4.00	0.99994
51	0.3899	11	0.7330	71	0.9127		
52	0.3969	12	0.7373	72	0.9146	4.417	$1 - 10^{-5}$
53	0.4039	13	0.7415	73	0.9164		
54	0.4108	14	0.7457	74	0.9181	4.892	$1 - 10^{-6}$
0.55	0.4177	1.15	0.7499	1.75	0.9199	5.327	$1 - 10^{-7}$
56	0.4245	16	0.7540	76	0.9216		
57	0.4313	17	0.7580	77	0.9233		
58	0.4381	18	0.7620	78	0.9249		
59	0.4448	19	0.7660	79	0.9265		
0.60	0.4515	1.20	0.7699	1.80	0.9281		

TABLE 2.5

1. Approximation $E_u = 78$ dB					$\sigma_n = 8.3$ dB
i	E_{si} (dB)	$z_i = E_u - E_{si}$ (dB)	$x_i = \frac{z_i}{\sigma_n\sqrt{2}}$	$\varphi(x_i)$ (from Table 1)	$L(x_i) = \frac{\varphi(x_i)}{2} + \frac{1}{2}$
1	64	14	1.19	0.7660	0.8830
2	72	6	0.51	0.3899	0.6950
3	60	18	1.53	0.8740	0.9370
4	50	28	2.39	0.9831	0.9916
5	45	33	2.81	0.9950	0.9975
				$\prod_{i=1}^{5} L(x_i) = 0.5688$	
				$\frac{\Delta}{0.05} = \frac{0.5 - 0.5688}{0.05} = -1.38$ dB	
2. Approximation $E_u = 76.62$ dB					
1	64	12.62	1.08	0.7199	0.8600
2	72	4.62	0.39	0.3035	0.6518
3	60	16.62	1.42	0.8444	0.9222
4	50	26.62	2.26	0.9762	0.9881
5	45	31.62	2.69	0.9929	0.9965
				$\prod_{i=1}^{5} L(x_i) = 0.5090$	

$$\frac{\Delta}{0.05} = \frac{0.5 - 0.5090}{0.05} = -0.18\,\text{dB}$$

3. Approximation $E_u = 76.44\,\text{dB}$

1	64	12.44	1.06	0.7109	0.8555
2	72	4.44	0.38	0.2961	0.6481
3	60	16.44	1.40	0.8385	0.9193
4	50	26.44	2.25	0.9756	0.9878
5	45	31.44	2.68	0.9927	0.9964

$$\prod_{i=1}^{5} L(x_i) = 0.5016$$

$$\frac{\Delta}{0.05} = \frac{0.5 - 0.5016}{0.05} = -0.03\,\text{dB}$$

The 4th approximation yields $E_u = 76.44 - 0.03 = 76.41\,\text{dB}$.
This value can be considered as sufficiently exact.

CHAPTER 5

Frequency compatibility between sound and television broadcasting

5.1 *Introduction*

Several countries are operating television transmitters using the D/SECAM system in the band 87.5–100 MHz. All sound broadcasting requirements for stations in the area of coordination with countries using this band for television in accordance with the Regional Agreement (Stockholm, 1961), have been assessed for compatibility with television stations.

5.2 *Protection of sound-broadcasting stations within the coordination area*

Calculations have been carried out to verify that there is no deterioration in the service areas of existing sound broadcasting stations which are operating in accordance with the Regional Agreement (Stockholm, 1961) (notified to the IFRB before 1 December 1983) and which are situated in the area of coordination with countries using this band for television in accordance with the Regional Agreement (Stockholm, 1961). For purposes of comparison, the reference situation (as described in section 5.4 below) has been used as a basis.

A sound broadcasting station was considered to be situated in the coordination area when its distance from the nearest point of the border of the country using this band for television in accordance with the Regional Agreement (Stockholm, 1961) is less than the distance in Table B of Annex 1 to the Stockholm Agreement.

5.3 *Comparison*

For the purpose of assessing compatibility with television stations (see section 5.1 above) or protection to service areas of existing sound broadcasting transmitters (see section 5.2 above), the existing situation has been used as a reference situation and has been compared with the new Plan in the course of its development. To permit these comparisons, it has been necessary to calculate (as in section 5.6 below) the usable field strength (E_u) for all television transmitters and all existing sound broadcasting stations (as in sections 5.1 and 5.2 above) at a number of test locations (not more than 12) within the existing service area, as specified by the administrations concerned.

5.4 *Reference situation*

All existing or planned assignments to television or sound broadcasting stations in the band 87.5–100 MHz appearing in the Regional Plan (Stockholm, 1961) and those for which the procedure of the Regional Agreement

(Stockholm, 1961) has been successfully applied before the date of the opening of the Second Session of the Conference, have been taken into account. The sound broadcasting stations in Region 3 and in the part of Turkey not covered by the Regional Agreement (Stockholm, 1961) which are operating in accordance with the Radio Regulations and notified to the IFRB before 1 December 1983 have been included in the reference situation. The calculation for the reference situation has only been made once.

5.5 *Situation resulting from planning*

All existing or planned assignments to television stations (as in section 5.4 above) and all sound broadcasting transmitters in the draft Plan have been taken into account.

5.6 *Usable field strength for a transmitter at the specified test location*

5.6.1 The nuisance field from each interfering transmitter was calculated according to section 3.5 of Chapter 3 using, in principle, propagation curves for 1% of the time and the appropriate protection ratio taken:

5.6.1.1 for the wanted television transmitter,

- from Table 2.6 for interference from a television transmitter, *or*
- from Figure 2.9 for interference from a sound broadcasting transmitter.

Note – Since the protection ratio curve for the D/SECAM television broadcasting system against FM sound broadcasting interference is not defined for deviations of 6–7 MHz from the vision carrier frequency (see Figure 2.9), the protection of the sound carrier, considered as modulated according to system 2, was calculated separately.

5.6.1.2 for a wanted sound broadcasting transmitter,

- from Table 2.7 or Figure 2.10 for interference from a television transmitter, using protection ratio values for tropospheric interference, *or*
- from section 3.4 of Chapter 3 for interference from a FM sound broadcasting transmitter.

5.6.2 Receiving antenna discrimination is taken,

- from Figure 2.11 for a wanted television transmitter,
- from Figure 2.8 in Chapter 3 for a wanted sound broadcasting transmitter.

5.6.3 For orthogonal polarization, a discrimination value of 10 dB was applied for a wanted television transmitter. No polarization discrimination was applied for a wanted sound broadcasting transmitter.

5.6.4 The interference contribution of each interfering transmitter is the value of the nuisance field derived from section 5.6.1, plus any discrimination value derived from sections 5.6.2 or 5.6.3.

5.6.5 The usable field strength E_u was calculated from the individual interference contributions using the simplified multiplication method, taking into account the 20 largest (either TV or sound broadcasting) contributions and specified to one decimal place.

5.7 *Results of examination*

An incompatibility with a television station or a deterioration of the service area of a sound broadcasting station exists only if any value of E_u obtained (as in section 5.6), in accordance with section 5.5, exceeds the corresponding value of E_u in the reference situation defined in section 5.4 by more than 0.5 dB.

TABLE 2.6

Protection ratios, in dB, for two colour television transmissions with the same number of lines [1]

Offset (multiples of 1/12 line-frequency)	0	1	2	3	4	5	6	7	8	9	10	11	12
Co-channel Transmitter stability ± 500 Hz (non-precision offset)	45	44	40	34	30	28	27	28	30	34	40	44	45
Lower adjacent channel	−6												
Upper adjacent channel	+4												

[1]) For further information see CCIR Report 306-4.

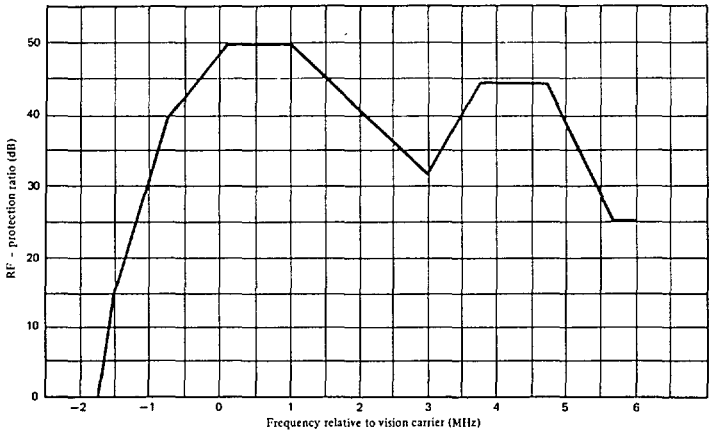

FIGURE 2.9

D/SECAM television system protection ratio in the case of frequency-modulated sound broadcasting tropospheric interference[1])

Note – For steady interference 10 dB are added.

[1]) For further information see CCIR Report 306-4.

TABLE 2.7

Radio-frequency protection ratio required by FM sound broadcasting against interference from D/SECAM television transmissions 87.5 to 100 MHz

(Steady interference)

Wanted signal frequency (MHz) relative to vision carrier	RF protection ratio (dB)	
	mono	stereo
−2.0	−30	−12
−1.0	−2	18
−0.5	0	20
−0.15	19	25
−0.1	24	35
−0.05	30	50
0.0	35	45
0.05	30	50
0.1	24	35
0.15	19	31
0.25	10	25
0.5	0	20
1.0	−1	20
2.0	−3	18
3.0	−4	17
4.0	−5	15
4.18	8	25
4.25	10	26
4.41	10	26
4.48	8	25
4.7	−5	15
5.0	−15	0
6.0	−25	−5
6.25	−13	−6
6.3	−5	5
6.4	6	26
6.45	15	40
6.475	25	43
6.5	28	35
6.525	25	43
6.55	15	40
6.6	6	26
6.7	−3	0
7.0	−30	−13

Note 1 – For tropospheric interference (protection 99% of the time) these values may be reduced by 8 dB.

Note 2 – Values for frequencies from 0.5 to 4 MHz are greatly affected by picture content. The figures given are for a test pattern and are representative of the on-the-air test picture transmissions.

Note 3 – This table is valid for a vision/sound carrier power ratio of 10 dB.

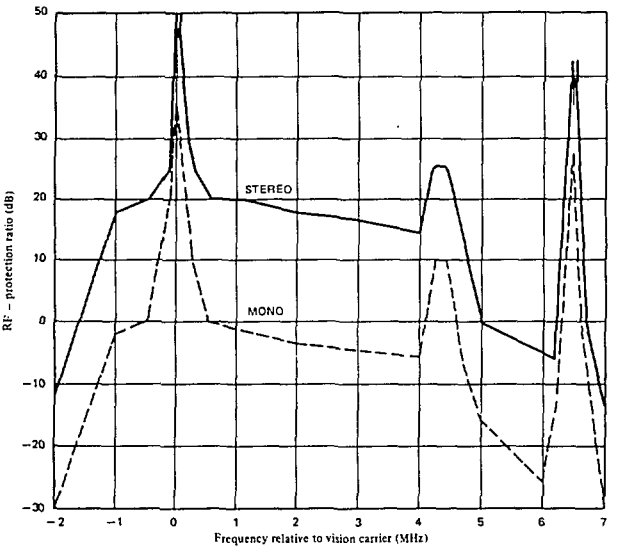

FIGURE 2.10

Radio-frequency protection ratio required by FM sound broadcasting against interference from D/SECAM television transmissions in the band 87.5 to 100 MHz (steady interference)

Note 1 – For tropospheric interference (protection 99% of the time) these values may be reduced by 8 dB.

Note 2 – This figure is valid for a vision/sound carrier power ratio of 10 dB.

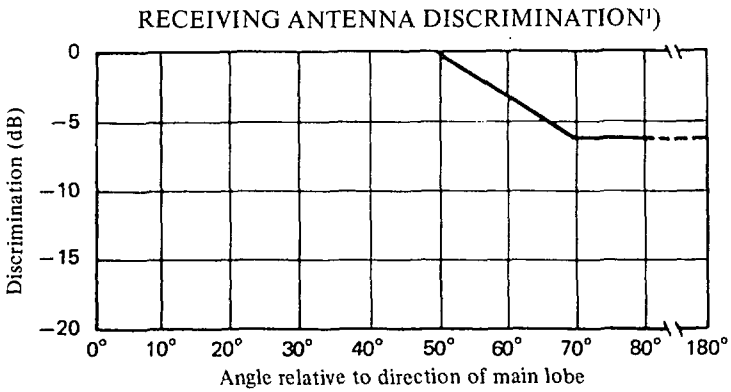

FIGURE 2.11

Discrimination obtained by the use of a directional receiving antenna for television stations in the band 87.5 to 100 MHz

[1]) For further information see CCIR Recommendation 419.

CHAPTER 6

Analysis of the Plan

6.1 *Introduction*

The Plan was analyzed on the basis of information supplied by administrations before or during the Second Session of the Conference or entered by the IFRB for administrations failing to supply information.

6.2 *Method of analysis*

In each analysis, the nuisance of field from each potentially interfering transmitter was calculated at the site of the wanted transmitter by the method given in section 3.5 of Chapter 3.

The usable field strength, E_u, was then calculated by the simplified multiplication method, taking into account the 20 largest values of nuisance field, specified to one decimal place. For the analysis of the Plan during the Conference, the simplified multiplication method was used for the whole of

the planning area; however, for comparison purposes, the power sum method[1]) was also used.

Sharing the television broadcasting in the European Broadcasting Area operating in accordance with the Regional Agreement (Stockholm, 1961) in the band 87.5–100 MHz (see Chapter 5) was taken into account.

The method of analysis using during the Conference with respect to compatibility with the aeronautical radionavigation service in the band 108–117.975 MHz is described in Chapter 7.

6.2.1 *Analysis during the Conference*

The computer analysis of the Plan during the Conference was based on the methods and criteria given in Chapters 2 to 5 and 7, but it did not take into account any receiving antenna discrimination.

6.2.2 *Analysis during the implementation of the Plan*

After the Conference, the analysis of the Plan is to be based on the simplified multiplication method. The results based on the power sum method will also be provided on request for information only.

CHAPTER 7

Compatibility between the broadcasting service in the band 87.5–108 MHz and the aeronautical radionavigation service in the band 108–117.975 MHz

7.1 *Introduction*

7.1.1 The criteria contained in this chapter were used for the assessment of compatibility between sound broadcasting stations in the band 87.5–108 MHz, and aeronautical radionavigation stations in the band 108–117.975 MHz.

7.1.2 The coordination contour method, as specified in section 7.3, was used in the determination of a potential incompatibility between the sound broadcasting stations of one country and the aeronautical radionavigation stations of another country. Such cases have been or will be settled through bilateral and multilateral negotiations between the administrations concerned.

7.1.3 Where the stations of the broadcasting service and the aeronautical radionavigation service belong to one and the same country, the admini-

[1]) For further information see CCIR Recommendation 499-2.

stration concerned has conducted or will conduct an examination in order to find an appropriate solution.

7.2 *Interference mechanisms*

7.2.1 *Type A interference:* Due to radiation at frequencies in the aeronautical radionavigation band

These comprise the following:

Type A1: Intermodulation or other spurious products radiated from the broadcasting station;
Type A2: Out-of-band emissions from broadcasting stations in the aeronautical radionavigation band immediately above the band edge of 108 MHz.

7.2.2 *Type B interference:* Due to radiation at frequencies outside the aeronautical radionavigation band

These comprise the following:

Type B1: Intermodulation generated in the receiver;
Type B2: Desensitization in the RF section of the receiver.

7.3 *Coordination contour around the test point of an aeronautical radionavigation station*

7.3.1 The coordination contour is defined by the projection on the Earth's surface of circles around each test point of the radionavigation station to be protected, with a radius as defined in sections 7.3.2 and 7.3.3. Broadcasting stations outside the coordination contour were considered as being unlikely to affect the service provided by the aeronautical radionavigation station concerned and were therefore disregarded.

7.3.2 For types A1, A2 and B2 interference the radius is 125 km.

7.3.3 For type B1 interference the radius is 500 km.

7.3.4 Only broadcasting stations which are in line-of-sight of the test point concerned were taken into account (see Chapter 2, section 2.2).

7.4 *Test points*

The calculations were limited to four test points only. These test points were chosen by the administration concerned in accordance with the conditions described in sections 7.4.1 and 7.4.2.

As the number of test points is insufficient, the administrations concerned may introduce additional test points for future coordination between administrations.

7.4.1 *Instrument landing system (ILS)*

Points A, B, C and D are defined in Figure 2.12. In some cases, the height of test point A differed from that indicated in Figure 2.12.

7.4.2 *VHF omnidirectional range (VOR)*

The four cardinal points (N, E, S and W) of the circle forming the boundary of the service area at a height of 1000 m above the VOR were chosen as test points by certain administrations. Other administrations preferred four other test points (with different locations, or heights, or both), which they considered more significant.

7.5 *Polarization*

No account was taken of polarization differences between the broadcasting and the aeronautical radionavigation signals except in special cases (e.g. circular polarization of the broadcasting signal).

The interfering signals were assumed to have the same polarization (vertical or horizontal) as the navigation system. If, instead, the broadcasting signal has a different polarization, there is in theory some reduction of received interfering signal levels, but it was agreed not to make any allowance. In cases, however, where an equal power in the other plane of polarization is added at the transmitter (e.g. circular polarization), an allowance was made by adding 1 dB to the effective radiated power of the polarization component in the same plane as that used by the navigation system.

7.6 *Protection criteria for ILS and VOR*

Annex 10 to the Convention on International Civil Aviation contains specifications and characteristics relevant to the protection of both ILS and VOR.

7.6.1 *Wanted signal*

The minimum field strength to be protected is:
- ILS: 40 μV/m (32 dB (μV/m))
- VOR: 90 μV/m (39 dB (μV/m))

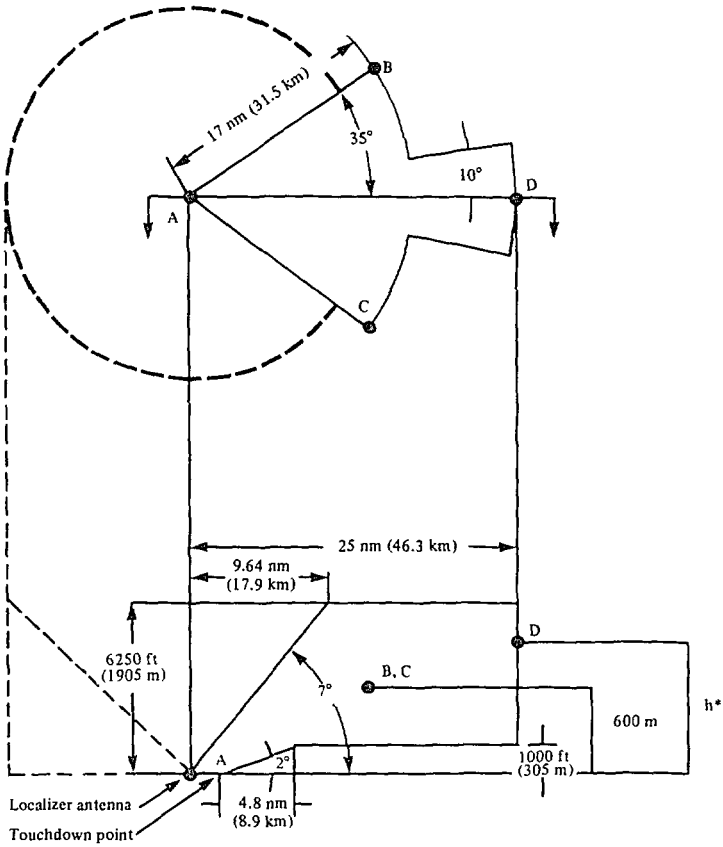

FIGURE 2.12

ILS localizer protection volume

-----: the limits of the ILS back beam protection volume; in this case, the range and height are indicated
•(A, B, C, D): test points for the ILS localizer
*(h): altitude indicated by the administration

7.6.2 *Principles of calculation*

The field strength of every broadcasting station in the band 87.5–108 MHz inside the coordination contour and within line-of-sight of a test point of an aeronautical radionavigation station was calculated at this test point as an interfering signal.

For types A1 and A2 interference, this field strength was compared with the minimum field strength to be protected of the wanted signal, as indicated in section 7.6.1.

For type B1 interference the relevant intermodulation formulae were applied.

For type B2 interference the broadcasting signal level was compared with the maximum permitted level.

Where applicable, the field-strength E was converted to signal power N at the receiver input according to the following formula:

$$E\,(\mathrm{dB}\,(\mu\mathrm{V/m})) = N\,(\mathrm{dBm}) + 118 + L_s + L(f)$$

where:

L_s: system fixed loss of 3.5 dB;
$L(f)$: system frequency-dependent loss at frequency f of 1 dB per MHz from 108–100 MHz and then 0.5 dB per MHz below 100 MHz.

7.6.3 *A1 interference*

7.6.3.1 *Protection ratio*

A protection ratio of 17 dB was assumed, including a small safety margin in order to take account of multiple interference entries resulting from different broadcast transmitters.

7.6.3.2 The field strength of the interfering signal at the test point was calculated on the basis of the following level of the spurious component (in the case of several transmitters contributing to one spurious component – see category a. below – the most powerful transmitter is taken as the reference in the calculation):
– 40 dB below the transmitter e.r.p. for transmitter e.r.p. below and equal to 2.5 W;
– 250 µW e.r.p. for transmitter e.r.p. above 2.5 W and below 79 kW;
– 85 dB below the transmitter e.r.p. for transmitter e.r.p. equal to and above 79 kW.

An antenna gain of 10 dB was assumed in defining the levels given above.

The levels of the spurious emission given above are valid in the band 108–137 MHz.

7.6.3.3 For the analysis of type A1 interference, the following two categories of spurious emissions exist:
a. spurious emissions resulting from an intermodulation process caused

at the transmitter site, e.g., by multiple transmitters feeding the same antenna;

b. spurious emissions with the exception of those covered by a. above.

Where the actual frequency of the spurious emission is known, Table 2.8 gives the values of protection ratio to be used for frequency differences up to 200 kHz from radionavigation transmitters. Type A1 interference need not be considered for frequency differences greater than 200 kHz.

TABLE 2.8

Frequency difference (kHz) between spurious emission and wanted signal	Protection ratio (dB)
0	17
50	10
100	−4
150	−19
200	−38

In the computer analysis during the Conference, the worst case was assumed for category b., i.e., a spurious component coinciding with the aeronautical frequency under consideration.

7.6.3.4 During the Conference, no analysis was made for category a. due to lack of data.

7.6.4 *Type A2 interference*

The protection ratio values are given in Table 2.9.

TABLE 2.9

Frequency difference (kHz) between wanted signal and broadcasting signal	Protection ratio (dB)
150	−41
200	−50
250	−59
300	−68

A frequency difference less than 150 kHz cannot occur. For frequency differences greater than 300 kHz, this type of interference need not be considered.

7.6.5 *Type B1 interference*

Third-order intermodulation products of the form:

$f_{intermod} = 2f_1 - f_2$ (two-signal case) *or*

$f_{intermod} = f_1 + f_2 - f_3$ (three-signal case)

with $f_1 > f_2 > f_3$,

generated in the airborne ILS or VOR receiver will cause an unacceptable degradation of receiver performance, if $f_{intermod}$ coincides with or is close to the frequency of the wanted signal and the inequalities given below are fulfilled subject to the conditions in section 7.6.5.4.

Intermodulation of the second order is irrelevant and intermodulation of a higher order than three has not been considered.

N_1, N_2 and N_3 in the inequalities below have the following meaning:

N_1... level in dBm of the broadcasting signal of frequency f_1 in MHz at the input of the aeronautical radionavigation receiver

N_2... level in dBm of the broadcasting signal of frequency f_2 in MHz at the input of the aeronautical radionavigation receiver

N_3... level in dBm of the broadcasting signal of frequency f_3 in MHz at the input of the aeronautical radionavigation receiver

max (0.4; 108.1 − f) in the inequalities below has the following meaning: either 0.4 or 108.1 − f, whichever is greater.

7.6.5.1 *Two-signal case*

$$2\left(N_1 - 20\log\frac{\max(0.4;\ 108.1 - f_1)}{0.4}\right) + N_2 - 20\log\frac{\max(0.4;\ 108.1 - f_2)}{0.4} + 120$$

7.6.5.2 *Three-signal case*

$$N_1 - 20\log\frac{\max(0.4;\ 108.1 - f_1)}{0.4} +$$

$$N_2 - 20\log\frac{\max(0.4;\ 108.1 - f_2)}{0.4} +$$

$$N_3 - 20\log\frac{\max(0.4;\ 108.1 - f_3)}{0.4} + 126 > 0$$

7.6.5.3 *Frequency offset conditions*

Before applying the formulas given in sections 7.6.5.1 or 7.6.5.2, a correction is applied to each broadcasting signal level which is a function of the frequency difference between the wanted signal and the intermodulation product, this correction is given in Table 2.10.

$N_{1,2,3}$ (corrected) = $N_{1,2,3}$ − correction term.

TABLE 2.10

Frequency difference between wanted signal and intermodulation product (kHz)	Correction term (dB)
0	0
±50	2
±100	8
±150	16
±200	26

For frequency differences beyond ± 200 kHz, type B1 interference need not be considered.

7.6.5.4 *Trigger and cut-off values*

The trigger is the minimum power level at the input to the airborne ILS or VOR receiver considered necessary for a broadcasting signal to initiate the generation of intermodulation products which are potentially of sufficient power to exceed the receiver interference threshold. The trigger value for each contributing broadcasting signal of frequency f at the ILS or VOR receiver input was derived from the following formula:

$$N = -42 + 20\log\frac{\max(0.4;\ 108.1 - f)}{0.4}$$

The cut-off value is the minimum power level at the input to the airborne ILS or VOR receiver considered necessary for a broadcasting signal to contribute to the non-linear process which results in the formation of an intermodulation product potentially of sufficient power to exceed the receiver interference threshold.

For the compatibility analysis, a cut-off value of 12 dB below the trigger value was chosen.

An intermodulation analysis was therefore carried out only if at least one signal was equal to or above the trigger value provided that the other signal or signals were equal to or above the cut-off value.

TABLE 2.11

Frequency of broadcasting signal (MHz)	Level (dBm)
107.9	−20
106	−5
102	5
⩽100	10

7.6.6 *Type B2 interference*

Table 2.11 contains maximum permitted levels of broadcasting signals at the input to the airborne ILS or VOR receiver.

For intermediate values, the maximum permitted level was determined by linear interpolation.

ANNEX 3

Basic characteristics of sound broadcasting stations to be submitted for modifications to the Plan in application of Article 4 of the Agreement

1. Assigned frequency (MHz)
2. Country symbol
3. Name of transmitting station
4. Symbol of the geographical area in which the station is located (see Table No. 1 of the Preface to the International Frequency List)
5. Geographical coordinates, in degrees and minutes, of the transmitting antenna site
6. Altitude of site of transmitting antenna above sea level (m)
7. Height of the antenna above ground level (m)
8. Polarization (H, V or M)
9. System (1, 2, 3, 4 or 5)[1])
10. Total effective radiated power (dBW)
11. Maximum effective radiated power of the horizontally polarized component (dBW)
12. Maximum effective radiated power of the vertically polarized component (dBW)
13. Directivity of antenna (ND or D)
14. Effective radiated power of the horizontal component and the vertical component in different azimuths (dBW)
15. Maximum effective antenna height (m)
16. Effective antenna height at different azimuths
17. Sectors or directions of restricted e.r.p. (in degrees)

17.1 Sector No. 1
17.2 Sector No. 2
17.3 Sector No. 3
17.4 Sector No. 4

[1]) See section 3.1 of Annex 2 to the Agreement.

18. Attenuation in the sector concerned (dB)

18.1 Attenuation in sector No. 1
18.2 Attenuation in sector No. 2
18.3 Attenuation in sector No. 3
18.4 Attenuation in sector No. 4

19. Agreements obtained with ... (administration(s))

20. Remarks

Note – When the proposed modification involves the addition of a new frequency assignment at an existing station, the frequency assignment(s) at the existing station shall be included as supplementary information.

ANNEX 4

Limits for determining when coordination with another administration is required as a result of a proposed modification to the Plan

CHAPTER I

Limits relating to sound broadcasting

In applying section 4.2.2 of Article 4 the following tables of distances between the broadcasting station and the nearest point on the boundary of any other administration shall be used to identify administrations whose sound broadcasting services may be considered as affected (Tables 4.1 tot 4.4).

The coordination distances of Tables 4.1 to 4.4 apply to cases where the propagation path is over land (index L), over cold sea (SC), over warm sea (SW), or in an area of super-refractivity and ducting (SS), respectively. To simplify coordination, the distances that would be adequate for the various FM sound broadcasting systems were unified by starting a single value of 54 dB (μV/m) for the nuisance field and by taking mean values for the protection ratio (39 dB for tropospheric, 47 dB for steady interference). The larger of the two distance values resulting from tropospheric and steady interference was adopted and rounded to the nearest multiple of 10 km or 5 km for coordination distances above or below 100 km, respectively.

Linear interpolation shall be used for effective radiated powers, in dBW, differing from those given in the tables and also for effective antenna heights, other than those in Tables 4.1 to 4.3. Antenna heights of 10 m or 1800 m, respectively, shall be used when the actual height is below the former or above the latter value.

For mixed paths the coordination distance. D_M, shall be the sum of the pertinent fractions of the coordination distances, D_i, applicable to every type of propagation path involved.

$$D_M = \sum_i \frac{d_i}{d_T} D_i \qquad (i = L, SC, SW, SS)$$

where

d_T is the total path length from the transmitter to the nearest point on the border of the country concerned; *and*

d_i is the total length of those parts of the path which are over land, over cold sea, over warm sea or in areas of super-refractivity as the case may be.

TABLE 4.1

Coordination distances, D_1, in km, for propagation paths over land

Effective radiated power		Effective antenna height (m)							
		10	37.5	75	150	300	600	1200	1800
dBW	W	Coordination distances (km)							
55	300k	520	520	530	540	560	600	630	670
50	100k	460	460	470	490	510	540	580	610
45	30k	410	410	420	430	450	480	520	560
40	10k	350	350	370	380	400	430	470	500
35	3k	300	300	310	330	340	380	420	450
30	1k	250	250	260	270	290	320	360	400
25	300	140	190	210	220	240	280	320	350
20	100	70	140	160	180	190	230	270	300
15	30	45	100	130	140	150	190	230	260
10	10	35	65	90	100	120	150	190	220
5	3	30	45	65	75	95	120	160	180
0	1	20	35	50	60	80	100	140	150

TABLE 4.2

Coordination distances, D_{SC}, in km, for propagation paths over cold sea

Effective radiated power		Effective antenna height (m)							
		10	37.5	75	150	300	600	1200	1800
dBW	W	Coordination distances (km)							
55	300k	790	790	800	820	850	880	910	950
50	100k	680	680	700	720	740	770	810	850
45	30k	590	590	610	630	650	670	730	750
40	10k	510	510	530	540	560	590	640	670
35	3k	440	440	460	470	490	530	570	600
30	1k	380	380	390	400	430	460	500	530
25	300	320	320	330	350	370	400	440	470
20	100	260	260	280	290	310	350	380	420
15	30	150	210	220	240	260	300	340	360
10	10	75	150	170	180	200	250	290	300
5	3	40	100	120	130	150	200	240	260
0	1	25	65	80	95	120	150	200	210

TABLE 4.3

Coordination distances, D_{SW}, in km, for propagation paths over warm sea

Effective radiated power		Effective antenna height (m)							
		10	37.5	75	150	300	600	1200	1800
dBW	W	Coordination distances (km)							
55	300k	1300	1300	1300	1300	1300	1300	1300	1300
50	100k	1300	1300	1300	1300	1300	1300	1300	1300
45	30k	1100	1100	1130	1150	1170	1200	1230	1280
40	10k	800	800	840	870	900	940	970	1010
35	3k	610	610	650	680	700	740	780	800
30	1k	490	490	520	550	560	600	650	670
25	300	390	390	410	440	460	490	540	560
20	100	310	310	330	360	370	400	440	480
15	30	210	240	260	290	300	330	360	400
10	10	85	170	200	220	240	270	300	340
5	3	40	110	140	160	190	220	250	290
0	1	25	70	90	120	140	170	200	240

TABLE 4.4

Coordination distances, D_{SS}, in km, for propagation paths in areas of superrefractivity

Effective radiated power		Coordination distances
dBW	W	D_{SS} (km) [1]
55	300k	1480
50	100k	1400
45	30k	1320
40	10k	1230
35	3k	1150
30	1k	1070
25	300	980
20	100	900
15	30	820
10	10	730
5	3	650
0	1	560

[1]) Independent of effective antenna height.

CHAPTER 2

Limits relating to television

In applying section 4.2.2 of Article 4, the following tables of distances between the sound broadcasting station and the nearest point on the boundary of any other administration shall be used to identify administrations whose TV broadcasting services operating in accordance with the Regional Agreement (Stockholm, 1961) may be considered as affected (Tables 4.5 to 4.8).

The coordination distances in Tables 4.5 to 4.7 shall be used to ensure compatibility with television stations in countries using the band 87.5–100 MHz for television in accordance with the Regional Agreement (Stockholm, 1961). The tables apply to propagation paths which are fully overland or oversea (cold or warm). They are based on a nuisance field of 52 dB (μV/m) obtained by interpolation between values given for the bands 41–68 MHz and 174–223 MHz in the "Technical Data used by the European VHF/UHF Broadcasting Conference (Stockholm, 1961)" (part 4, section 4.2) and a protection ratio of 50 dB for tropospheric interference in accordance with Figure 2.9, in Chapter 5 of Annex 2. The coordination distances so obtained were rounded to the nearest multiple of 10 km or 5 km, respectively, for coordination distances above or below 100 km.

Coordination distances for steady interference are included in Tables 4.5 to 4.7 when they exceed those for tropospheric interference. They were derived from Figures 2.1 and 2.2 of Annex 2, adopting protection ratio values 10 dB above those for tropospheric interference.

The corrections given in Table 4.8 take account of the fact that the protection ratio is a function of the frequency difference between the interfering signal and the wanted television signal. To account for this effect, the effective radiated power, in dBW, shall be reduced by this correction before the coordination distance is determined. A value of 0 dB shall be used when the corrected effective radiated power, in dBW, is negative.

Linear interpolation shall be used for effective radiated powers, in dBW, differing from those given in the tables and also for effective antenna heights (m) other than those in Tables 4.1 to 4.3. Antenna heights of 10 m or 1800 m, respectively, shall be used when the actual height is below the former or above the latter value.

For mixed paths the coordination distance, D_M, shall be the sum of the pertinent fractions of the coordination distances, D_i, applicable to every type of propagation path involved.

$$D_M = \sum_i \frac{d_i}{d_T} D_i \qquad (i = L, SC, SW)$$

where

d_T is the total path length from the transmitter to the nearest point on the border of the country concerned; *and*

d_i is the total length of those parts of the path which are over land, over cold sea, over warm sea as the case may be.

TABLE 4.5

Coordination distances, D_I, in km, for propagation paths over land

		Effective antenna height (m)							
Effective radiated power		10	37,5	75	150	300	600	1200	1800
dBW	W	Coordination distances (km)							
55	300k	660	660	670	690	710	740	780	810
50	100k	600	600	620	630	650	680	720	760
45	30k	550	550	560	580	600	630	670	700
40	10k	500	500	510	520	540	570	610	650
35	3k	440	440	450	470	490	520	560	590
30	1k	390	390	400	410	430	460	500	530
25	300	330	330	340	360	370	410	450	480
20	100	280	280	290	300	320	360	390	430
15	30	200	230	240	250	270	300	340	380
10	10	110	170	190	200	220	260	300	330
5	3	60	130	150	160	180	210	260	280
0	1	45	90	110	120	140	170	220	240

TABLE 4.6

Coordination distances, D_{SC}, in km, for propagation paths over cold sea

Effective radiated power		Effective antenna height (m)							
		10	37.5	75	150	300	600	1200	1800
dBW	W	Coordination distances (km)							
55	300k	1160	1160	1190	1220	1240	1250	1270	1300
50	100k	990	990	1000	1040	1050	1070	1130	1160
45	30k	860	860	870	890	910	940	980	1010
40	10k	750	750	760	780	800	840	870	910
35	3k	640	640	660	680	700	730	780	810
30	1k	560	560	580	590	610	640	700	720
25	300	480	480	500	510	530	570	610	640
20	100	410	410	430	440	470	500	540	570
15	30	350	350	370	380	400	440	480	510
10	10	300	300	310	320	350	380	420	450
5	3	230	240	260	270	290	330	360	390
0	1	110	190	200	220	230	280	320	340

TABLE 4.7

Coordination distances, D_{SR}, in km, for propagation paths over warm sea

Effective radiated power		Effective antenna height (m)							
		10	37.5	75	150	300	600	1200	1800
dBW	W	Coordination distances (km)							
55	300k	1300	1300	1300	1300	1300	1300	1300	1300
50	100k	1300	1300	1300	1300	1300	1300	1300	1300
45	30k	1300	1300	1300	1300	1300	1300	1300	1300
40	10k	1300	1300	1300	1300	1300	1300	1300	1300
35	3k	1300	1300	1300	1300	1300	1300	1300	1300
30	1k	950	950	990	1020	1050	1080	1110	1150
25	300	720	720	750	780	810	850	890	920
20	100	560	560	600	620	640	680	730	750
15	30	440	440	480	500	520	560	600	620
10	10	350	350	380	400	420	460	500	510
5	3	280	280	300	330	350	370	400	450
0	1	140	210	230	260	280	300	340	370

TABLE 4.8

Correction, in dB, to take account of the variation in protection ratio as a function of frequency

Frequency MHz	Corr. dB	Frequency MHz	Corr. dB	Frequencies MHz	Corr. dB	Frequencies MHz	Corr. dB	Frequencies MHz	Corr. dB
92.0	25	93.2	2	95.2	8	88.4, 96.4	15	90.4, 98.4	14
92.1	22	93.3	0	95.3	9	88.5, 96.5	14	90.5, 98.5	16
92.2	19	to	:	95.4	10	88.6, 96.6	12	90.6, 98.6	18
92.3	16	94.3	0	95.5	11	88.7, 96.7	10	90.7, 98.7	21
92.4	13	94.4	1	87.6, 95.6	12	88.8, 96.8	9	90.8, 98.8	23
92.5	10	94.5	2	87.7, 95.7	13	88.9, 96.9	7	90.9, 98.9	25
92.6	8	94.6	3	87.8, 95.8	14	89.0, 97.0	5	to to	:
92.7	7	94.7	4	87.9, 95.9	15	to to	:	91.6, 99.6	25
92.8	6	94.8	5	88.0, 96.0	15	90.0, 98.0	5	91.7, 99.7	12 [1]
92.9	5	94.9	6	88.1, 96.1	16	90.1, 98.1	7	91.8, 99.8	12 [1]
93.0	4	95.0	6	88.2, 96.2	17	90.2, 98.2	10	91.9, 99.9	25
93.1	3	95.1	7	88.3, 96.3	17	90.3, 98.3	12		

[1]) These correction values are valid assuming a vision carrier-to-sound carrier power ratio of 10 dB.

CHAPTER 3

Limits relating to aeronautical radionavigation services

In applying section 4.2.2 of Article 4, the aeronautical radionavigation services of another administration are considered as being affected if the distance from the sound broadcasting station to the nearest point on the boundary of that administration is less than 500 km.

CHAPTER 4

Limits relating to the land mobile service

In applying section 4.2.2 of Article 4, the land mobile service of administrations listed in Nos. 487 and 589 of the Radio Regulations and of Contracting Members of Region 3 (in the band 87.5–100 MHz) are considered as being affected if the field strength from the sound broadcasting station exceeds the following limits at the nearest point on the boundary of another administration:

– for sound broadcasting stations using only horizontal polarization: 18 dB (μV/m);
– for sound broadcasting stations using vertical or mixed polarization: 0 dB (μV/m);

Within the band 87.5–88 MHz and for the land mobile service of countries mentioned in No. 581 of the Radio Regulations the following alternative limits shall apply:

– for sound broadcasting stations using only horizontal polarization: 14 dB (μV/m);
– for sound broadcasting stations using only vertical or mixed polarization: 6 dB (μV/m).

The field strength will be calculated for a receiving antenna height of 10 m above ground, based on the curves in Figures 4.1, 4.2 and 4.3 (50% of locations, 10% of time). For mixed paths the calculation method as described in section 2.1.3.5 of Annex 2 will be applied.

In the case of mixed polarization, only the vertical component of the total e.r.p. of the sound broadcasting station should be taken into account. It is assumed that the land mobile service is vertically polarized and that in the case of mixed polarization of the sound broadcasting station at least one-tenth of the total e.r.p. of the sound broadcasting station is radiated in the vertical component.

CHAPTER 5

Limits relating to the fixed service

In applying section 4.2.2 of Article 4, the fixed service of the administrations listed in No. 588 of the Radio Regulations and of the Contracting Members of Region 3 in the band 87.5–100 MHz shall be considered as affected if the field strength from the sound broadcasting station at the nearest point on the boundary of another administration exceeds the following limit.

For sound broadcasting stations: 0 dB (μV/m).

The field strength will be calculated for a receiving antenna height of 10 m above ground, using the curves in Figures 4.1, 4.2 and 4.3 (50% of locations, 10% of time). For mixed paths, the calculation method described in section 2.1.3.5 of Annex 2 will be applied.

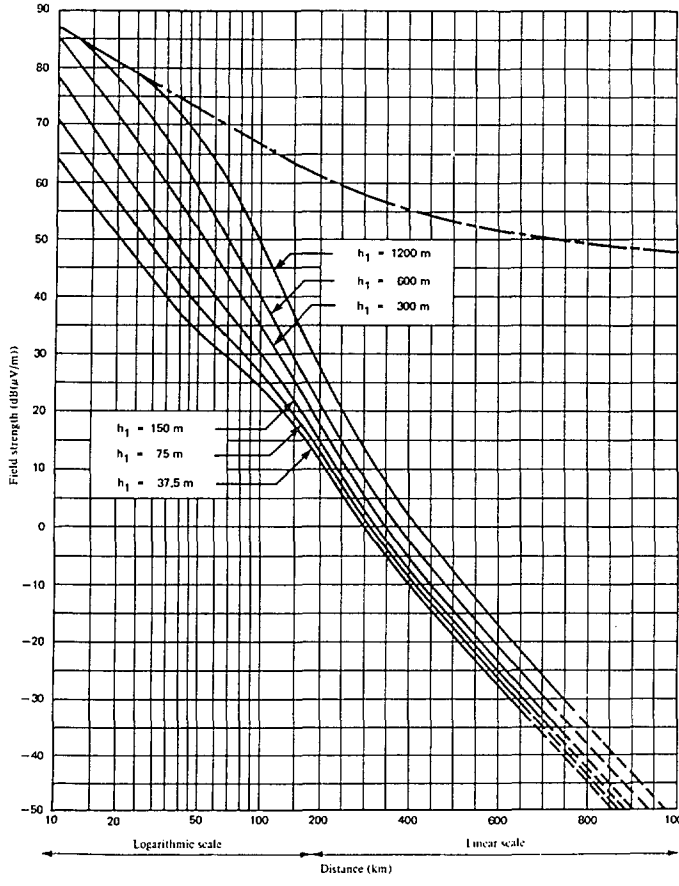

FIGURE 4.1

Field strength (dB (μV/m)) for 1 kW e.r.p.
Propagation over land
10% of the time; 50% of the locations; $h_2 = 10$ m
– – – – Free space

PROPAGATION CURVES FOR THE BROADCASTING SERVICE

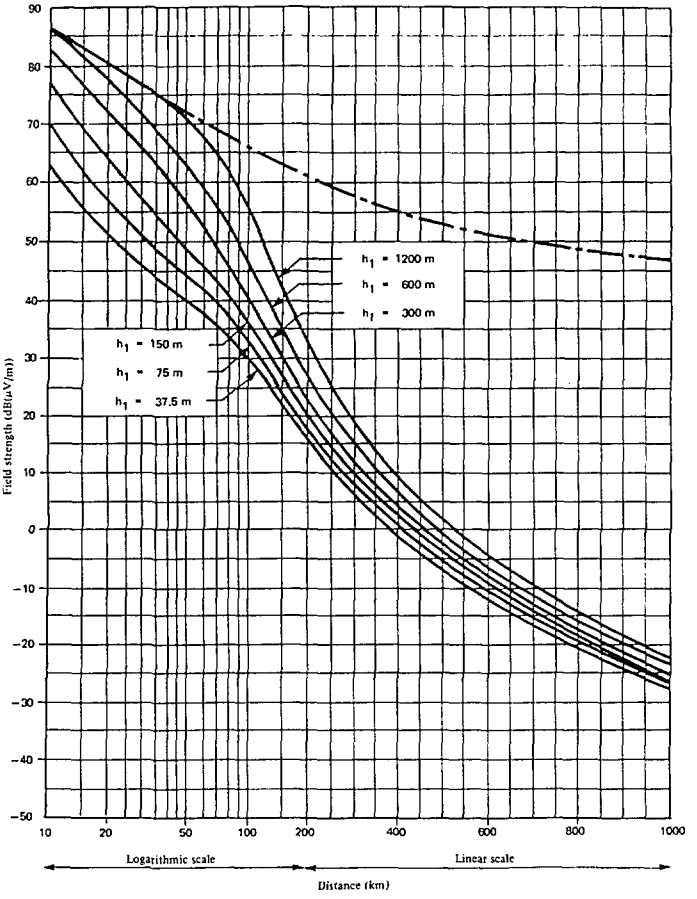

FIGURE 4.2

Field strength (dB (μV/m)) for 1 kW e.r.p.
Propagation over cold sea
10% of the time; 50% of the locations; $h_2 = 10$ m
– – – – Free space

PROPAGATION CURVES FOR THE BROADCASTING SERVICE

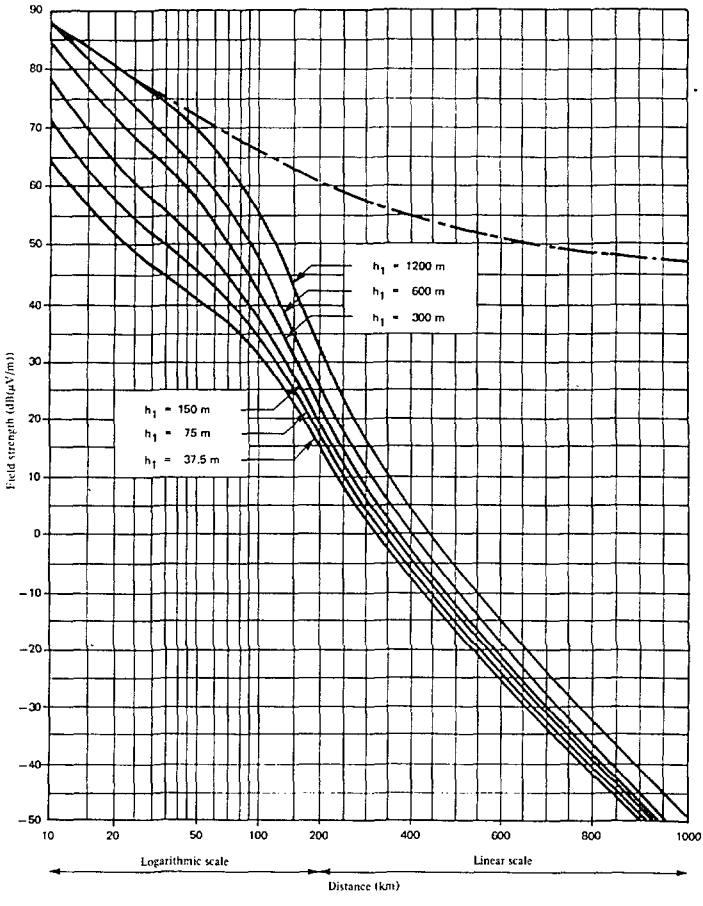

FIGURE 4.3

Field strength (dB (μV/m)) for 1 kW e.r.p.
Propagation over warm sea
10% of the time; 50% of the locations; h_2 = 10 m
– – – – Free space

PROPAGATION CURVES FOR THE BROADCASTING SERVICE

CHAPTER 6

Limits relating to the aeronautical mobile (OR) service

In applying section 4.2.2 of Article 4, the aeronautical mobile (OR) service of the administrations listed in Nos. 587 and 589 of the Radio Regulations is considered as being affected if the field strength from the sound broadcasting station at the boundary of one of these administrations exceeds 20 dB (μV/m) at an altitude of 10000 metres. This field strength is based on free space propagation.

The coordination distance shall be not more than the line-of-sight distance corresponding to an effective Earth radius equal to 4/3 of the actual radius.

ANNEX 5

Additional technical data which may be used for coordination between administrations

CHAPTER 1

Aeronautical radionavigation service

1.1 *Separation distance for compatibility*

Table 5.1 gives the minimum separation distances between a test point of the radionavigation station to be protected and a sound broadcasting station at which the protection criteria for A1, A2, B1 and B2 types of interference are all met. The more critical requirements are those for A1 and B1; the higher of the two separation distances is shown in each case.

The A1 distances assume the protection ratio for frequency coincidence, and that the level of the broadcasting transmitter spurious emissions conform to the level given in section 7.6.3.2 of Annex 2. The B1 distances ensure that the signal level is below the cut-off value as given in section 7.6.5.4 of Annex 2 with free-space propagation, but are subject to an upper limit of 500 km due to the practical considerations of the line-of-sight limit, in conformity with section 7.3 of Annex 2.

Where two or more assignments are used at a common site, the highest e.r.p. must be taken.

Linear interpolation shall be used for e.r.p. (in dBW) and frequency values not appearing in the table.

Preliminary analyses based on these distances assume, in the case of A1 and B1 types of interference, that there is frequency coincidence between a spurious emission or intermodulation product and the frequency of the radionavigation station. When the frequencies of the radionavigation station and of all broadcasting transmitters that may be involved are known, detailed calculations can be made for all types of interference using the data for protection of the aeronautical radionavigation service given in Chapter 7 of Annex 2. However, in the case of A1 type interference it will be necessary to check that the transmitter does not generate significant spurious components apart from third-order intermodulation products.

Any case-by-case study may take into account other relevant factors such as details of the propagation path between the broadcasting station and the aeronautical test point, and the radiation pattern of the broadcasting antenna in both the vertical and horizontal planes.

1.2 *Future improvements in aeronautical receivers*

It is expected that future receivers will permit a significant relaxation of compatibility criteria and that the following revised criteria will be applied from 1 January 1998.

1.2.1 *B1 type interference*

Present indications from the ICAO are that the two-signal case criterion for B1 type interference given in section 7.6.5.1 of Annex 2 will be replaced by:

$$2N_1 + N_2 + 72 - 60\log\frac{\max(0.4;\ 108.1 - f_1)}{0.4} > 0$$

for both ILS and VOR receivers.

TABLE 5.1

Minimum separation distance in km between a test point of a radionavigation station and a sound broadcasting station required to ensure compatibility

Effective radiated power of broadcasting station		Broadcasting station frequency (MHz)					
		⩽ 100	102	104	106	107	107.7 to 107.9
dBW	W	Separation distance (km)					
55	300k	40	53	99	245	500	500
50	100k	22	31	57	141	302	500
45	30k	20	20	31	77	166	494
40	10k	20	20	20	45	96	285
35	3k	20	20	20	24	52	156
30	1k	20	20	20	20	30	90
25	300	20	20	20	20	20	49
20	100	20	20	20	20	20	29
⩽15	30	20	20	20	20	20	20

Subject to further study of type B1 interference by the CCIR, it is expected that a comparable relaxation in the criterion for the three-signal case will be possible and that the trigger and cut-off values given in section 7.6.5.2 of Annex 2 will be raised by 16 dB.

1.2.2 *B2 type interference*

The maximum permitted broadcasting signal levels at the input to the ILS or VOR receiver for B2 type interference shall be those given in the Table 5.2 in place of the values given in Table 2.11 of Annex 2.

TABLE 5.2

Frequency of broadcasting signal (MHz)	Level (dBm)
107.9	−10
106	5
102	15
⩽ 100	15

For frequencies in between the values given above, the maximum permitted level will be determined by linear interpolation.

1.2.3 *Further studies*

Studies on possible improvements are requested in Recommendation No. 4.

CHAPTER 2

Fixed and mobile services, except the aeronautical mobile (OR) service

2.1 *Sharing criteria for the protection of the land mobile service in the bands 87.5–100 MHz and 104–108 MHz*

Field strength to be protected: 15 dB (μV/m) at a height of 3 m
Protection ratio: See Table 5.3

TABLE 5.3

Frequency separation between carriers of the two services (kHz)	Protection ratio for the AM land mobile service (dB)	Protection ratio for the FM land mobile service (dB)
0	18	8
25	16	6
50	4.5	−5.5
75	−7.5	−17.5
100	−17.5	−27.5

Propagation data to be used for sharing calculations:

Propagation curves for calculating interference to the land mobile service operating in the VHF bands shall be derived from the broadcasting propagation curves (Figures 4.1, 4.2 and 4.3 of Annex 4). Since these propagation curves are for a receiving antenna height of 10 m above the local terrain and the receiving antenna height is reduced from 10 m to 3 m, a 9 dB reduction in the field strength shall be applied.

Note – The method and criteria concerning antenna height gain factors to be used by administrations for coordination between the broadcasting and land mobile and fixed services are to be agreed by the administrations concerned and should be based where possible on the latest relevant CCIR Recommendations.

Percentage of location to be protected:	50%
Percentage of time to be protected:	90%
Polarization discrimination for horizontally polarized broadcasting emission:	18 dB base station 8 dB mobile station

2.2 *Sharing criteria between FM sound broadcasting and the fixed service in the band 87.5–100 MHz and 104–108 MHz*

The basic criteria can be those established for a base station in the land mobile service (see section 2.1 in this Annex). The field strength to be protected the height gain factors other than those specified and the effect of the directivity of the antenna in the fixed service will be considered by the administration concerned.

CHAPTER 3

Aeronautical mobile (OR) service

When the frequencies of the broadcasting and the aeronautical mobile stations are both known, the field strengths given in Table 5.4 below may be used as sharing criteria.

TABLE 5.4

Frequency separation in kHz between broadcasting station and aeronautical mobile (OR) station	Field strength in dB(μV/m) at an altitude of 10 000 metres
0	20
50	34
100	58
150	90

CHAPTER 4

Supplementary propagation data correction factors

This chapter gives supplementary correction factors which can be applied to the basic propagation curves to improve the accuracy of predictions in particular cases of coordination involving bilateral or multilateral negotiations between administrations.

4.1 *Correction for various location percentages*

The propagation curves in Annexes 2 and 5 are representative of 50% of locations. Figure 5.1 shows the correction (in dB) to be applied for other percentages of receiving locations.

4.2 *Receiver terrain correction (terrain clearance angle)*

The location correction in section 4.1 above can be applied only on a statistical basis. If more precision is required for predicting the field strength in a specific small receiving area a correction may be based on a "terrain clearance angle". This angle θ is measured at a point chosen to be representative of the reception area; it is defined as the angle between the horizontal

plane passing through the receiving antenna and the line from this antenna which clears all obstacles within 16 km in the direction of the transmitter. The example in Figure 5.2 indicates the sign convention, which is negative if the line to the obstacles is above the horizontal. Figure 5.3 indicates the correction, as a function of the angle θ, to be applied to the prediction for 50% of locations. If this correction is applied, the location correction in section 4.1 (Figure 5.1) may no longer be applicable.

Corrections for terrain clearance angles outside the range $-5°$ to $0.5°$, are not given in Figure 5.3, because of the lack of experimental data. However, they may be obtained tentatively by linear extrapolation of the curve in Figure 5.3 with limiting values of 30 dB at $1.5°$ and $-15°$, subject to the condition that the free-space field strength is not exceeded.

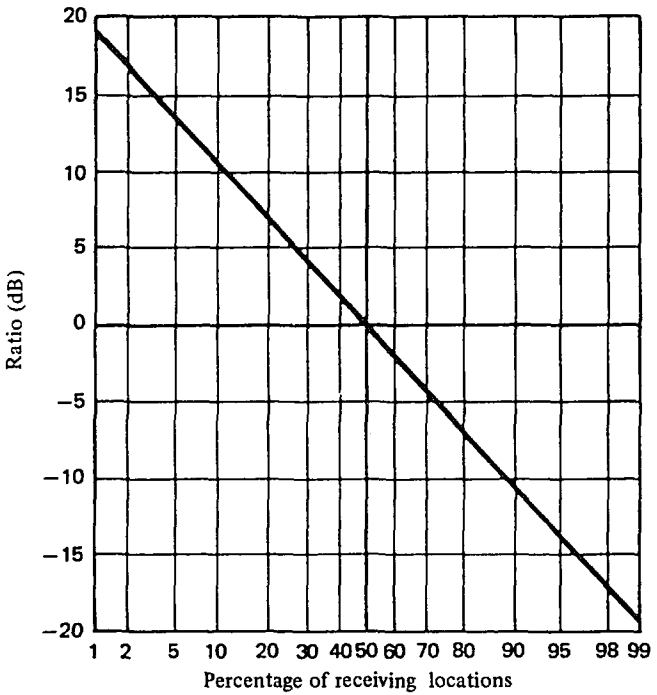

FIGURE 5.1

Ratio (dB) of the field strength for a given percentage of the receiving locations to the field for 50% of the receiving locations

Frequency: 30 to 250 MHz

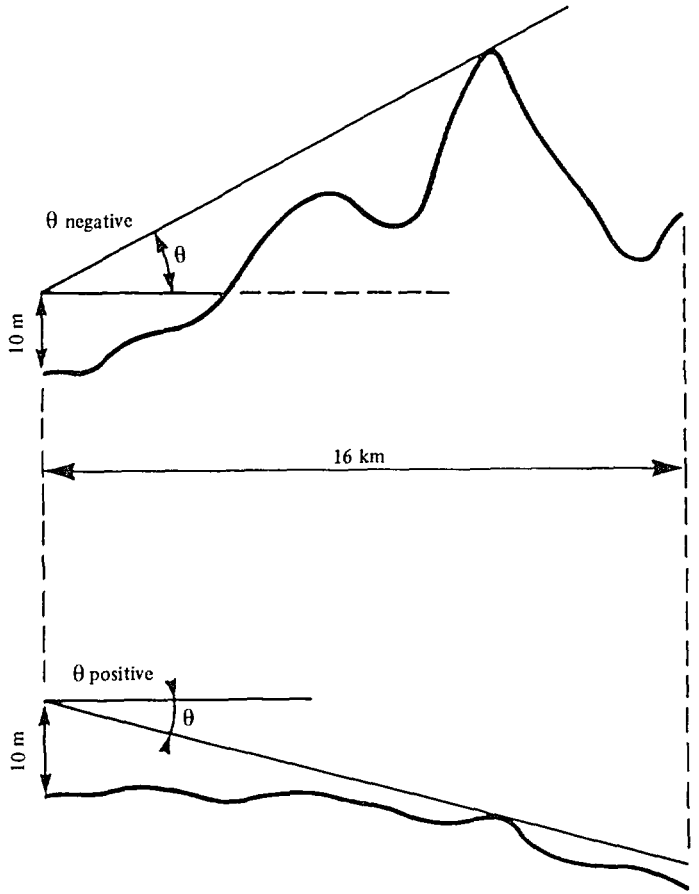

FIGURE 5.2

Terrain clearance angle

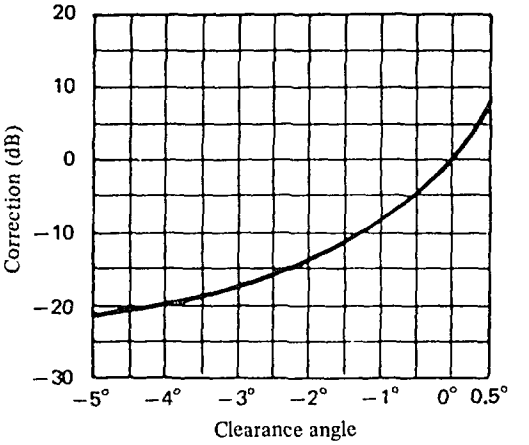

FIGURE 5.3

Receiving terrain clearance angle correction (VHF)

Het Regionaal Akkoord is, ingevolge zijn artikel 13, eerste lid, op 1 juli 1987 in werking getreden.

De volgende Staten hebben de Secretaris-Generaal van de Internationale Telecommunicatie-Unie in kennis gesteld van de goedkeuring van het bovenstaande Akkoord in overeenstemming met artikel 10 van dat Akkoord:

Qatar	13 februari 1985
Zwitserland	27 juni 1985
Vaticaanstad	3 juli 1986
de Oekraïne	6 januari 1987
Witrusland	19 mei 1987
de Bondsrepubliek Duitsland	1 juni 1987

Uitgegeven de *elfde* augustus 1987.

De Minister van Buitenlandse Zaken,

H. VAN DEN BROEK