

AGREEMENT BETWEEN THE GOVERNMENT OF THE UNITED STATES OF AMERICA  
AND THE GOVERNMENT OF THE UNITED MEXICAN STATES RELATING TO  
THE FM BROADCASTING SERVICE IN THE BAND 88-108 MHz

The Government of the United States of America and the Government of the United Mexican States, the Parties, desiring to continue their mutual understanding and cooperation concerning FM Broadcasting and recognizing the sovereign right of both countries in the management of their telecommunications; taking into account the provisions of Article 31 of the International Telecommunication Convention (Nairobi, 1982) and Article 7 of the Radio Regulations (1982 edition), considered annexed to the Convention; endeavoring to protect the broadcasting stations in the two countries; and desiring to improve the utilization of the frequency band 88-108 MHz allocated to this service;

Have agreed as follows:

ARTICLE 1

Definitions

For the purpose of this Agreement, the terms defined in the Radio Regulations shall apply except for the following specific definitions:

Administration: The Federal Communications Commission of the United States of America and the Direccion General de Normas de Sistemas de Difusion of the Secretaria de Comunicaciones y Transportes of the United Mexican States;

Agreement: This Agreement and its Annexes;

Allotment: Provision for use of a specific channel identified with a particular community or location which is protected based on its maximum permitted parameters from new or modified allotments and assignments;

Antenna height above average terrain (HAAT): The height of the center of radiation of the antenna above sea level minus the average of the terrain heights above sea level, calculated in the manner described in Annex 1;

Assignment: Authorization given by an Administration for an FM broadcast station to use a frequency or radio electric channel allotted under the conditions specified in the Agreement;

Effective radiated power (ERP): The power supplied to the antenna multiplied by the relative gain of the antenna in a given direction;

Frequency modulation (FM): A system of modulation where the instantaneous radio-frequency varies in proportion to the instantaneous amplitude of the modulating signal. The instantaneous radio frequency is independent of the frequency of the modulating signal;

FM stereophonic broadcast: The transmission of a stereophonic program by a single FM broadcast station using the main channel and a stereophonic sub-channel; this transmission permits compatible reception by monophonic receivers;

Interfering Contour: The contour of an allotment or assignment, calculated in accordance with Annex 1, that must not exceed specified values in order to avoid interference to a protected allotment or assignment;

Low Power FM (LPFM) station: A station which operates on a basis of not causing interference and not receiving protection with respect to existing and future allotments or assignments. However, these stations operate on a protected basis with respect to other LPFM stations according to their date of notification and acceptance;

Maximum permitted parameters: The maximum values of ERP and HAAT that an allotment or assignment may be authorized depending upon its class. They are prescribed in Table 1 of Annex 1 to this Agreement for all allotments and assignments, except those which are restricted. Maximum permitted parameters for restricted allotments and assignments are calculated in accordance with Annex 1;

Multiplex transmission: The simultaneous transmission by a station of one or more programs in addition to regular broadcast programs within an FM broadcast channel using subcarrier frequencies related to the center frequency of the assigned channel;

Plan of Allotments and Assignments: The Plan contained in Annex 2 which lists allotments and assignments (See Article 6);

Protected contour: The contour of an allotment or assignment, calculated in accordance with Annex 1, which is protected from interference;

Restricted allotment: An allotment that is geographically separated from an allotment or assignment in the other country at a distance less than that specified in Table 2, Minimum Distance Separation Requirements, contained in Annex 1 to this Agreement. Its ERP, HAAT, and the distance to its protected contour determine the class of allotment with which it is associated (see Table 1 of Annex 1).

Restricted assignment: Authorization given by an Administration for an FM broadcast station to use a restricted allotment under the conditions specified in the Agreement;

Standard azimuth: An azimuth which is one of eight azimuths designated in 45 degree increments starting with true North;

Standard radial: A radial extending from 3 to 16 km from the antenna along a standard azimuth;

Stereophonic and multiplex transmissions: Stereophonic and multiplex transmissions may be employed. The instantaneous frequency of any multiplex subcarrier shall not exceed  $\pm 99$  kHz from the assigned center frequency.

Stereophonic sub-channel: The frequency band from 23 to 99 kHz containing the stereophonic sub-carriers and their associated side bands;

## ARTICLE 2

### SCOPE

This Agreement shall apply to the land area of each Party included within a 320 km strip on each side of the common border and to islands included within 320 km of the nearest point on the land territory of the other Party; these strips and territory shall be designated by the term "border area."

## ARTICLE 3

### Equitable, Effective, and Reciprocal Use of the Band

In the application of this Agreement, the equitable, effective, and reciprocal use of the band allocated to the FM broadcasting service and the protection of services that may be established in accordance with this Agreement are the principal objectives of their Governments.

## ARTICLE 4

### Frequency Band

This Agreement shall apply to the band of frequencies extending from 88 to 108 MHz. Within this band FM broadcast channels are allotted which are 200 kHz wide and designated by the center frequency of each channel. FM broadcast channels begin at 88.1 MHz and continue in successive 200 kHz steps up to and including 107.9 MHz. For convenience, FM broadcast channels are designated by channel numbers in accordance with Appendix 1 to Annex 1 to this Agreement.

## ARTICLE 5

### Classification of Allotments and Assignments

All FM allotments are classified in accordance with and must conform with the technical criteria and Table 2, Minimum Distance Separation Requirements, contained in Annex 1 to this Agreement, except as otherwise provided in this Agreement. The classification of FM assignments is derived from the allotment which is used. The operations and protections of restricted allotments and assignments are based upon the limitations on their maximum permitted parameters. LPFM stations may operate on any channel as long as they provide the required protection to any allotment or assignment of the other Administration in accordance with Annex 1.

## ARTICLE 6

### Plan of Allotments and Assignments

6.1 Annex 2 to this Agreement, the Plan of Allotments and Assignments, consists of two parts and identifies all allotments and assignments, together with applicable characteristics, which have been either initially agreed to, or notified and agreed to in accordance with the notification procedures of Article 8.

6.2 Part 1 of the Plan comprises Tables A and B, which identifies the characteristics of all allotments and assignments made within the border area, for the United Mexican States and the United States of America, respectively. Each Administration shall confine the operation of its assignments to the allotments in the Plan in accordance with mutually agreed-upon characteristics.

6.3 The ERP and HAAT parameters for assignments appearing in Part 1 of the Plan may be less than the maximum permitted parameters of the respective channel allotments. The use of less than maximum permitted parameters by an assignment shall not prevent its later use at any time of maximum permitted parameters at that location for the corresponding class of allotment, or in the case of restricted assignments, the limitation on their maximum permitted parameters. Whether or not an assignment operates at its maximum permitted parameters, it is always protected to the maximum permitted parameters of its associated allotment.

6.4 Allotments and assignments in Part 1 of the Plan that are restricted are identified in the Plan with an asterisk (\*) together with mutually agreed-upon limitations on maximum permitted parameters.

6.5 Part 2 of Annex 2 identifies the characteristics of all LPFM stations that have been coordinated and accepted.

## ARTICLE 7

### Modification of the Plan of Allotments and Assignments

7.1 The Plan of Allotments and Assignments may be modified by the introduction of new or changed allotments, new or changed assignments, or the cancellation of allotments and assignments in the Plan. In all cases, modification of the Plan shall take place through application of the notification procedures contained in Article 8.

7.2 Proposed modifications to the Plan will be accepted if they conform with the technical criteria and Table 2, Minimum Distance Separation Requirements, contained in Annex 1 to this Agreement, subject to the notification procedures contained in Article 8.

7.3 Proposed modifications to the Plan which do not conform to Tables 1 and 2 of Section 1 of Annex 1 of this Agreement, (i.e. restricted) shall be subject to coordination between Administrations and shall only be accepted when their interfering contours do not overlap the protected contours of existing

allotments and assignments of the other country, whose protected contours are to be calculated based upon their maximum permitted parameters (see Section 1.1.1 of Annex 1). These proposed modifications must conform to the notification procedures contained in Article 8 and their maximum permitted parameters shall be determined in accordance with Annex 1 of the Agreement.

7.4 If an Administration proposes a restricted allotment or assignment, said allotment or assignment must accept in its protected contour any interference caused by the overlap of the interfering contour of existing allotments and assignments of the other country. The calculation of the interfering contour is based on their maximum permitted parameters. These restricted allotments and assignments will have no right to claim protection in the area of interference. This interference will only occur to a proposed restricted allotment or assignment of a lower class which moves closer to an existing allotment or assignment of a higher class.

7.5 Proposed modifications to the Plan, other than modifications to cancel an allotment or assignment, shall be entered in the Plan after agreement between the Administrations upon completion of the notification procedures performed in accordance with Article 8.

7.6 Modification of the Plan to cancel an allotment or assignment shall take effect immediately upon receipt of the notification of cancellation by the other Administration. The Administration that gives notice of the cancellation of an assignment shall retain for its benefit the right to use the allotment corresponding to the cancelled assignment in accordance with the Plan of Allotments and Assignments. In such case, the reference geographic coordinates of the allotment that is retained, as well as any limitation on ERP and HAAT that apply to it and any restrictions that it imposes on other assignments and allotments, shall be those last entered into the Plan. The Administration that gives notice of the cancellation of an allotment renounces all rights with respect to the allotment that was cancelled.

## ARTICLE 8

### Notification Procedures

#### 8.1 General

8.1.1 Each Administration proposing to modify the Plan of Allotments and Assignments shall notify to the other Administration the characteristics of any proposed new or modification of an allotment or assignment by registered mail. Proposed modifications to the Plan shall be protected from the date of receipt in conformity with this Article. A new or modified assignment proposed by an Administration, whose parameters are different from those of its corresponding allotment, does not require prior acceptance for its use, as long as the resultant protected contour remains inside the protected contour of the allotment from which it is derived. However, its parameters must be notified to the other Administration within 30 days of its coming into operation. When such an assignment is put into operation without prior coordination between Administrations, and it is determined by the affected Administration that its maximum permitted parameters do not comply with those of its associated

allotment, or its protected contour is greater than or extends beyond that of its corresponding allotment, the responsible Administration must immediately suspend its operation until the notification procedures contained in this Article are completed.

8.1.2 Each Administration shall have 60 days, from the date of receipt of a proposed modification, sent by registered mail, to reply thereto. Upon receipt of a favorable reply to the proposed modification, it shall be considered approved and shall be entered into the Plan at that time.

8.1.3 If for any reason the affected Administration does not respond within this time period, then the proposing Administration will effect a new requirement in writing through the most expeditious and convenient means available for both parties, in order for the affected Administration to reply within a 45-day period to commence at the end of the first period or to state whether it desires a final term to render its answer. This final term shall not exceed 45 days.

8.1.4 In the event that the Administration being affected does not answer within the additional 45-day period, then at the end of this latter period, the proposal for amendment shall be considered to have been accepted and shall be included in the Plan.

8.1.5 There will be some cases of educational stations that because of their nature require a prompt response, the Administrations will make every effort to respond to those notifications within the terms specified in 8.1.2.

8.1.6 If an objection is raised during the above period, the correspondence shall state, with as much particularity as the circumstances permit, the basis for the objection. A proposed modification to the Plan which is the subject of an objection shall be afforded protection from new proposals for a 60-day period from the date of receipt of the objection in order to provide opportunity for the notifying Administration to resolve the objection.

8.1.7 An Allotment should be included in the Plan and notification procedures shall be completed prior to placing a proposed assignment into operation by the notifying Administration, except for those cases described in 8.1.1. However, a new allotment and its corresponding assignment may be notified at the same time and included in the Plan at the same time, provided that they comply with the notification procedures contained in this Article.

## 8.2 Allotments

8.2.1 Notifications to modify the Plan to introduce new allotments or changes to existing allotments shall contain at least the following information:

- Location (city, state);
- Reference geographic coordinates;
- Channel number and class of allotment; and
- Channel frequency.

8.2.2 If the notified allotment is restricted, the allotment(s) or assignment(s) to which it is separated at a distance which is less than the distance required in Table 2 of Annex 1 shall be specified together with the proposed limitations on ERP and HAAT to be applied to the allotment.

### 8.3 Assignments

Notifications to modify the Plan to introduce new assignments or to modify the characteristics of existing assignments shall contain at least the following information:

- Location (city, state);
- Transmitter geographic coordinates;
- Channel number and class of station;
- Channel frequency;
- Call sign;

Operational status (proposal or operational);

HAAT (height of center of radiation above average terrain);

Height above average terrain of the two adjacent standard radials if a short-spaced assignment is proposed (see Annex 1 for description);

- Effective radiated power (ERP); and
- Horizontal antenna pattern if a directional antenna is proposed.

### Cancellation of Allotments and Assignments

When notification of the cancellation of an existing allotment or assignment is given, sufficient information must be furnished to identify the cancelled allotment or assignment, including at least:

- Channel number and channel frequency;
- Call sign; and
- Location (city, state)

## ARTICLE 9

### Recapitulative Lists

9.1 No later than March 31st of each year, each Administration shall forward to the other a recapitulation of all accepted notifications to modify the Plan made during the preceding calendar year. No later than 60 days from the receipt of each annual recapitulative list, both Administrations shall exchange, for verification and reconciliation, a recapitulation of the Plan as of the end of that calendar year.

9.2 If no inconsistencies are detected by either Administration within 90 days from receipt of the recapitulated Plan, it shall be considered verified and reconciled for that period. If inconsistencies are detected within or after this period, such inconsistencies shall be reconciled promptly, and will not be considered accepted until the Administrations notify their acceptance.

9.3 Semi-annually, each administration shall furnish the other with a supplementary list containing the notifications made during the six-month period following the date of the last reconciled list.

## ARTICLE 10

### Termination of Previous Agreements

This Agreement supersedes the existing Agreement between the United States of America and the United Mexican States concerning Frequency Modulation Broadcasting in the 88 to 108 MHz Band signed at Washington on November 9, 1972, as amended.

## ARTICLE 11

### Amendment of the Agreement and the Annexes

This Agreement and Annex 1 may be amended by agreement of the Parties. Amendments shall enter into force on the date on which both Parties have notified each other by exchange of diplomatic notes that they have complied with the requirements of their national legislation for entry into force. Modifications to the Plan (Annex 2) are governed by Articles 7 and 8 and do not require an exchange of diplomatic notes to enter into force.

## ARTICLE 12

### Entry Into Force and Duration

This Agreement shall enter into force on the date on which both Parties have notified each other by exchange of diplomatic notes that they have complied with the requirements of their respective national legislation for entry into force. It shall remain in force until it is replaced by a new agreement or until it is terminated by either Party in accordance with Article 13 of this Agreement.



ARTICLE 13

Termination of the Agreement

This Agreement may be terminated by mutual agreement of the Parties or by either Party by a written notice of termination to the other Party through diplomatic channels. Such notice of termination shall enter into effect one year after receipt of the notice.

IN WITNESS WHEREOF, the Parties, duly authorized by their respective Governments, hereby sign this Agreement.

DONE in the city of Morelia, Michoacan, Mexico, this eleventh day of the month of August of the year nineteen hundred and ninety-two, in duplicate, in the English and Spanish languages, both texts being equally authentic.

FOR THE GOVERNMENT OF THE  
UNITED STATES OF AMERICA:

FOR THE GOVERNMENT OF THE  
UNITED MEXICAN STATES:

# ANNEX 1

## Technical Standards and Procedures

Annex 1 and its appendices prescribe the technical standards and procedures to be employed for the application of the Agreement.

### Section 1

#### General Technical Standards

##### 1.1 Classification and Maximum Parameters of Allotments and Assignments

1.1.1. FM allotments and assignments are classified in accordance with Table 1 and except for those which are restricted must conform with the distance separations in Table 2. The maximum ERP and HAAT for restricted allotments and assignments (whose associated classes are shown in Table 1) shall be determined in accordance with Section 3 of this Annex.

TABLE 1

<u>Classes</u>	<u>Maximum Effective Radiated Power</u>	<u>Antenna Height Above Average Terrain</u>
A	3 kilowatts	100 meters
AA	6 kilowatts	100 meters
B1, C3*	25 kilowatts	100 meters
B, C2*	50 kilowatts	150 meters
C1	100 kilowatts	300 meters
C	100 kilowatts	600 meters

\* Classes C3 and C2 are used only by the U.S. and shall be considered as Classes B1 and B, respectively, for the purposes of the above table and this Annex.

1.1.2 Calculation of the protected contour of a restricted allotment or assignment shall be done in accordance with point 3.1.2 of section 3 and it shall be considered as: Class A if its protected contour is less than or equal to that of a Class A allotment; Class AA if its protected contour is greater than that of a Class A allotment and less than or equal to that of a Class AA allotment; Class B1 if its protected contour is greater than that of a Class B1 allotment and less than or equal to that of a Class B1 allotment; Class B if its protected contour is greater than that of a Class B allotment and less than or equal to that of a Class B allotment; Class C1 if its protected contour is greater than that of a Class C1 allotment and less than or equal to that of a Class C1 allotment; and Class C if its protected contour is greater than that of a Class C allotment and less than or equal to that of a Class C allotment.

1.1.3. The values contained in Tables 1 and 2 are based upon horizontal polarization. Vertical polarization may be used in combination with horizontal polarization in which case the maximum ERP in any plane of polarization shall not exceed the maximum permitted ERP for the allotment or assignment.

## 1.2 Distance Separation

1.2.1 Except for restricted allotments and assignments, the minimum required separations between allotments and assignments on the same or adjacent channels are as follows:

TABLE 2

MINIMUM DISTANCE SEPARATION REQUIREMENTS  
in kilometers

<u>Class Relation</u>	<u>Co-Channel</u> 0 kHz	<u>Adjacent Channels</u>			<u>I.F.</u> 10.6/10.8 MHz
		<u>200 kHz</u>	<u>400 kHz</u>	<u>600 kHz</u>	
A - A	100	61	25*	25*	8
A - AA	111	68	31	31	9
A - B1	138	88	48	48	11
A - B	163	105*	65*	65*	14
A - C1	196	129	74	74	21
A - C	210*	161	94	94	28
AA - AA	115	72	31	31	10
AA - B1	143	96	48	48	12
AA - B	178	125	69	69	15
AA - C1	200	133	75	75	22
AA - C	226	165	95	95	29
B1 - B1	175	114	50	50	14
B1 - B	211	145	71	71	17
B1 - C1	233	161	77	77	24
B1 - C	259	193	96	96	31
B - B	237	164	65*	65*	20
B - C1	270	195	79	79	27
B - C	270*	215*	98	98	35
C1 - C1	245	177	82	82	34
C1 - C	270	209	102	102	41
C - C	290	228	105	105	48

Conventionally adopted values.

## 1.3 Antenna Heights and Equivalence

1.3.1 The height of the radiation center of the antenna above average terrain (HAAT) is the height of the radiation center above sea level minus the average of the terrain heights above sea level of the eight standard radials along the standard azimuths. Where polarization other than horizontal is employed, the radiation center height shall be based upon the height of the electrical radiation center of the antenna which transmits the horizontal component of radiation.

1.3.2 Where antenna heights exceed those specified in Table 1, the ERP shall be reduced to provide equivalence with maximum permitted parameters.

1.3.3 Computation of equivalence shall be determined using the F(50,10) propagation curves in Appendix 4. The interfering contour for equivalent parameters must not exceed that determined by use of the maximum permitted parameters. In the case of a restricted allotment or assignment, the mutually agreed upon limitations on ERP and HAAT shall be used instead of the parameters in Table 1.

1.3.4 Existing assignments contained in Part 1 of Annex II of this Agreement operating with parameters in excess of those specified for their classes in Table 1, which have been previously coordinated and accepted, may continue to operate in accordance with coordinated or equivalent parameters.

#### 1.4 Directional antennas

1.4.1 Directional antennas operated by restricted assignments may be used to render protection to other co-channel and adjacent channel allotments or assignments. In the direction of limitation, a restricted assignment using a directional antenna must not exceed the notified antenna pattern values. In all other directions, the radiation must not exceed the notified antenna pattern value by more than 2 dB. Moreover, the ratio of maximum to minimum field of a directional antenna shall not be greater than 15 dB, except where terrain may present a problem due to signal reflections. Directional antennas may also be used by assignments operating on allotments which are not restricted, but their use shall not prevent future increases to maximum permitted parameters.

#### 1.5 Location of Transmitter Sites

1.5.1 Transmitter sites shall be located so that the separations are not less than those set forth in Table 2 except when specifically agreed to by each Administration.

### Section 2

#### 2.1. Low Power FM Stations

2.1.1 LPFM stations may operate on any channel from 201 to 300 and they must protect the allotments and assignments of the other Administration based on their maximum permitted parameters in accordance with the Table of Allotments and Assignments.

2.1.2 An LPFM station is permitted to operate with an ERP that shall not exceed 50 watts in the direction of the other country and to produce an interfering contour not to exceed 32 km in the direction of the other country.

2.1.3 Within 125 km of the common border, the maximum distance to the protected contour (60 dBu) of an LPFM station shall be 8.7 km in the direction of the other country.

2.1.4 LPFM stations located within 125 km of the common border must be notified in accordance with the notification procedures in Article 8.

2.1.5 An LPFM station located in excess of 125 km from the common border may operate with an ERP in excess of 50 watts in the direction of the other country, provided the protected contour produced is not greater than, starting from 125 km from the common border, 8.7 km in the direction of the other country. Before this station can commence operation it must comply with the notification procedures contained in Article 8 and the provisions of points 2.1.1, 2.1.6, and 2.1.7 of this section.

2.1.6 Should any interference be caused by an LPFM station, the offending station must immediately correct the interference or cease operation.

2.1.7 The use of a channel by an LPFM station shall not prejudice in any manner the future allotment of such channel by the other Administration.

### Section 3

#### 3.1 Standards for Computation of Interference

3.1.1 In performing interference calculations related to restricted allotments and assignments, or LPFM stations, the following procedures and standards shall be used to determine the existence of objectionable interference.

3.1.2 The distance to the protected contour of FM allotments and assignments shall be determined from the F(50,50) curves attached for the appropriate field strength contours listed in Table 3. The maximum distance shown in Table 3 is based on use of maximum permitted parameters. If the existing allotment or assignment has a limitation to its ERP and HAAT, the distance to the protected contour is less. The maximum distance to the protected contour of an LPFM station is specified in point 2.1.3 of Section 2.

Table 3

<u>Class</u>	<u>Field Strength</u>	<u>Maximum Distance</u>
A	1.0 mV/m (60 dBu)	24 km
AA	1.0 mV/m (60 dBu)	28 km
B1	0.7 mV/m (57 dBu)	45 km
B	0.5 mV/m (54 dBu)	65 km
C1	1.0 mV/m (60 dBu)	72 km
C	1.0 mV/m (60 dBu)	92 km

3.1.3 The interfering contour shall be determined from the F(50,10) propagation curves attached and the appropriate field strength values listed in Table 4, except when the resultant distance is less than 15 kilometers, in which case the F(50,50) curves shall be used. Calculation of the interfering contour shall be based upon maximum permitted parameters for allotments and, for assignments, upon proposed parameters which must not exceed those parameters corresponding to their allotment. The maximum distance to the interfering contour of an LPFM station is specified in point 2.1.3 of Section 2.

3.1.4 The value used for the height above average terrain for restricted allotments to determine the interfering contour shall be based on its associated class of allotment and in accordance with its maximum HAAT and ERP. The value used for the height above average terrain for restricted assignments to determine the interfering contour shall be based on the actual azimuth between the proposed restricted assignment and any existing allotment or assignment to which it is restricted. If the azimuth is a standard azimuth, the value of the height above average terrain of its standard radial shall be used. In all other cases, the two standard radials adjacent to the actual azimuth shall be specified. The appropriate height above average terrain shall be determined by interpolating between those of the two standard radials.

3.1.5 Objectionable interference shall be considered to exist if the following interfering contours of a proposal overlap the protected contour of an allotment or assignment listed in the Plan. Objectionable interference between LPFM stations shall be considered to exist if overlap occurs between their protected and interfering contours.

Table 4

From all Classes to Classes A, AA, C, and C1: <sup>1</sup>

<u>Channel relationship</u>	<u>Field strength</u>
Co-channel	0.1 mV/m (40 dBu)
First adjacent	0.5 mV/m (54 dBu)
Second & Third adjacent	100.0 mV/m (100 dBu)

From all Classes to Class B:

<u>Channel relationship</u>	<u>Field strength</u>
Co-channel	0.05 mV/m (34 dBu)
First adjacent	0.25 mV/m (48 dBu)
Second & third adjacent	50.0 mV/m (94 dBu)

From all Classes to Class B1:

<u>Channel relationship</u>	<u>Field strength</u>
Co-channel	0.07 mV/m (37 dBu)
First Adjacent	0.35 mV/m (51 dBu)
Second & third adjacent	71.0 mV/m (97 dBu)

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<sup>1</sup> These values shall also be used between LPFM stations

## Section 4

### 4.1 Procedure to Determine Interference Zone

- 4.1.1 On an appropriately scaled map plot the transmitter sites and do the following:
- 4.1.2 Plot the protected contour for the allotment or assignment to be protected based on maximum permitted parameters in accordance with paragraph 3.1.2 of Section 3.
- 4.1.3 Plot the interfering contour for the proposed allotment or assignment based on the proposed parameters in accordance with paragraph 3.1.3 of Section 3.
- 4.1.4 Mark the two points where the contours intersect. If the contours do not intersect, there is no interference and this procedure does not apply.
- 4.1.5 Repeat steps 1, 2, and 3 except increase the value of each contour by a convenient amount while maintaining the same protection ratio until the protected and interfering contours are tangential.
- 4.1.6 Draw a line joining the intersection points obtained above. The area contained within this line and the protected contour drawn in step 1 defines the interference zone.
- 4.1.7 Appendix 3 contains specific examples of interference calculations.

Appendix 1

Table of FM Channels

<u>Frequency</u> <u>(MHz)</u>	<u>Channel</u> <u>No.</u>	<u>Frequency</u> <u>(MHz)</u>	<u>Channel</u> <u>No.</u>	<u>Frequency</u> <u>(MHz)</u>	<u>Channel</u> <u>No.</u>
88.1	201	94.9	235	101.5	268
88.3	202	95.1	236	101.7	269
88.5	203	95.3	237	101.9	270
88.7	204	95.5	238	102.1	271
88.9	205	95.7	239	102.3	272
89.1	206	95.9	240	102.5	273
89.3	207	96.1	241	102.7	274
89.5	208	96.3	242	102.9	275
89.7	209	96.5	243	103.1	276
89.9	210	96.7	244	103.3	277
90.1	211	96.9	245	103.5	278
90.3	212	97.1	246	103.7	279
90.5	213	97.3	247	103.9	280
90.7	214	97.5	248	104.1	281
90.9	215	97.7	249	104.3	282
91.1	216	97.9	250	104.5	283
91.3	217	98.1	251	104.7	284
91.5	218	98.3	252	104.9	285
91.7	219	98.5	253	105.1	286
91.9	220	98.7	254	105.3	287
92.1	221	98.9	255	105.5	288
92.3	222	99.1	256	105.7	289
92.5	223	99.3	257	105.9	290
92.7	224	99.5	258	106.1	291
92.9	225	99.7	259	106.3	292
93.1	226	99.9	260	106.5	293
93.3	227	100.1	261	106.7	294
93.5	228	100.3	262	106.9	295
93.7	229	100.5	263	107.1	296
93.9	230	100.7	264	107.3	297
94.1	231	100.9	265	107.5	298
94.3	232	101.1	266	107.7	299
94.5	233	101.3	267	107.9	300
94.7	234				



## APPENDIX 2

### Procedure for Calculation of Distance and Azimuth

#### 1. Computation of Distance

LAT1 and LON1 are the coordinates of the first location, and LAT2 and LON2 are the coordinates of the second location. Convert latitude and longitude into degrees and decimal parts of a degree.

##### 1.1 Great-circle path distance:

$$d = 111.18 \times D \quad \text{km}$$

where:

$$D = \arccos[\sin(\text{LAT1})\sin(\text{LAT2}) + \cos(\text{LAT1})\cos(\text{LAT2})\cos(\text{LON2} - \text{LON1})]$$

In computing the above, sufficient decimal figures shall be used to determine the distance to the nearest kilometer.

#### 2. Calculation of Azimuth

$$\text{AZM} = \arccos \frac{\sin(\text{LAT2}) - \sin(\text{LAT1})\cos(D)}{\cos(\text{LAT1})\sin(D)} \quad \text{degrees}$$

determined such that  $0 \text{ degrees} \leq \text{AZM} \leq 180 \text{ degrees}$ . The azimuth in degrees East or North toward the second location is AZM if  $\sin(\text{LON2} - \text{LON1}) \geq 0$  or is  $(360 - \text{AZM})$  if  $\sin(\text{LON2} - \text{LON1}) < 0$ . The same equation, with the latitudes reversed, is used for the second location.

In computing the above, sufficient decimal figures shall be used to determine the azimuth to the nearest degree.

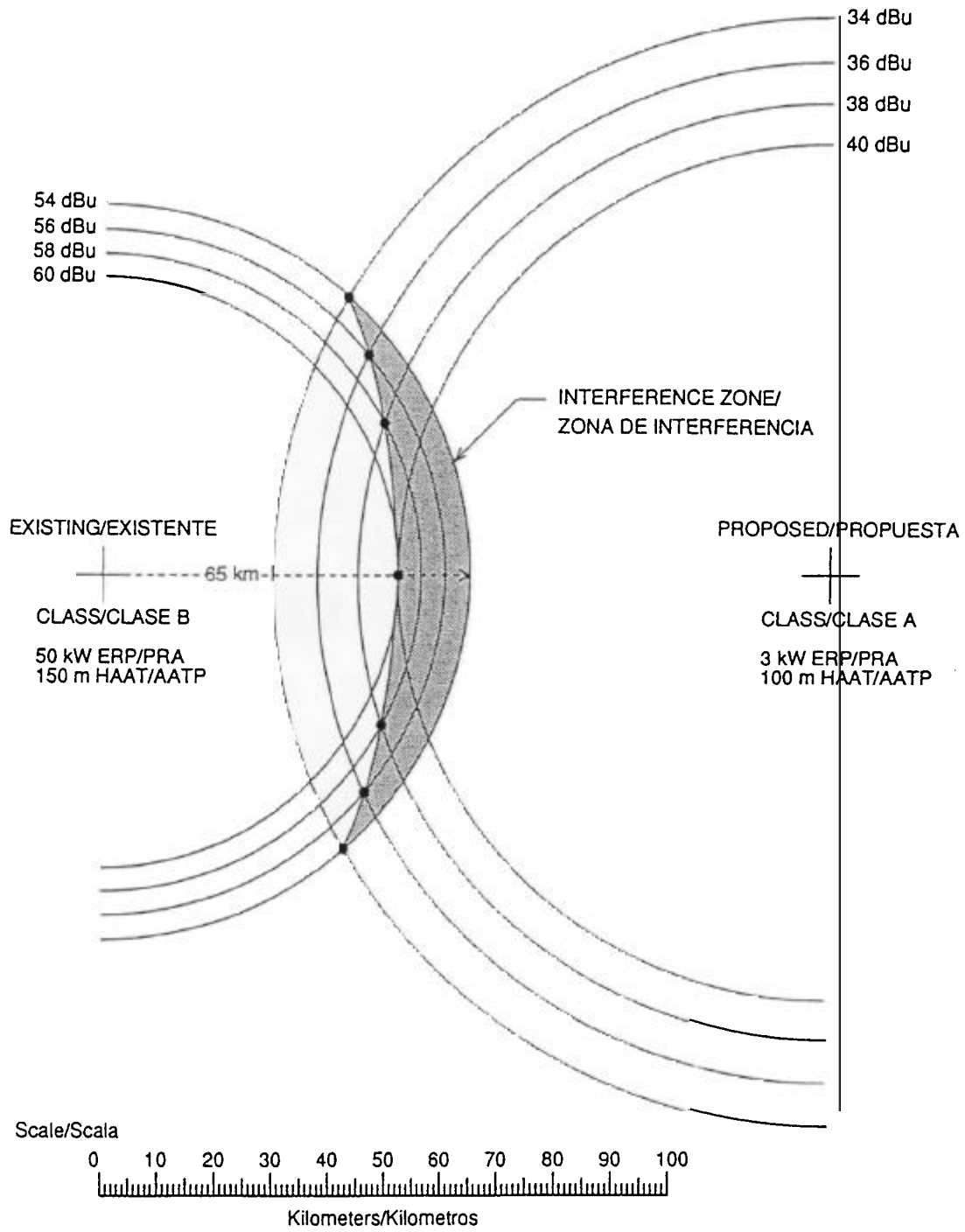
Examples of Interference Calculations

Example of Interference Zone

The following example, depicted in Figure 1, shows the interference zone between an existing Class B allotment or assignment and a proposed Class A allotment or assignment which are restricted and co-channel. The separation distance of the two transmitter sites is only 127 km while the required separation distance from Table 2 is 163 km.

1. The distance to the protected contour for the existing Class B allotment or assignment is determined from Table 3 since such allotment or assignment does not have a limitation to its ERP or HAAT. The protected contour value is 54 dBu and extends to 65 km. Plot this contour.
2. The distance to the interfering contour for the proposed Class A allotment or assignment is determined from the F(50,10) propagation curves. The field strength value of the interfering contour from Table 4 is 34 dBu since this is a co-channel case and the protected allotment or assignment is Class B. The extent of the interfering contour will depend upon the proposed parameters. For the purposes of this example, the proposed parameters shall be the maximum for a Class A station, 3 kW at 100m HAAT. The interfering contour extends to 98 km. Plot this contour.
3. Mark the two points where the contours intersect.
4. Increase the value of the contours by a convenient amount. They are increased by 2 dBu for the purposes of this example. Plot the 56 dBu contour (60 km) for the Class B and the 36 dBu contour (90 km) for the Class A and mark the points of intersection. Continue to increase the value of the contours, plot them, and mark the intersection points until the contours are tangent. In this example the Class B 58 dBu (56 km) and 60 dBu (52 km) contours and the Class A 38 dBu (83 km) and 40 dBu (76 km) contours are plotted before the contours become tangential.
5. Draw a line joining the intersection points obtained above. The area contained within this line and the protected contour drawn in step 1 defines the interference zone. This area is shown as cross-hatched.

Figure/Figura 1



### Example of a Restricted Proposal Requiring a Limitation on ERP and HAAT

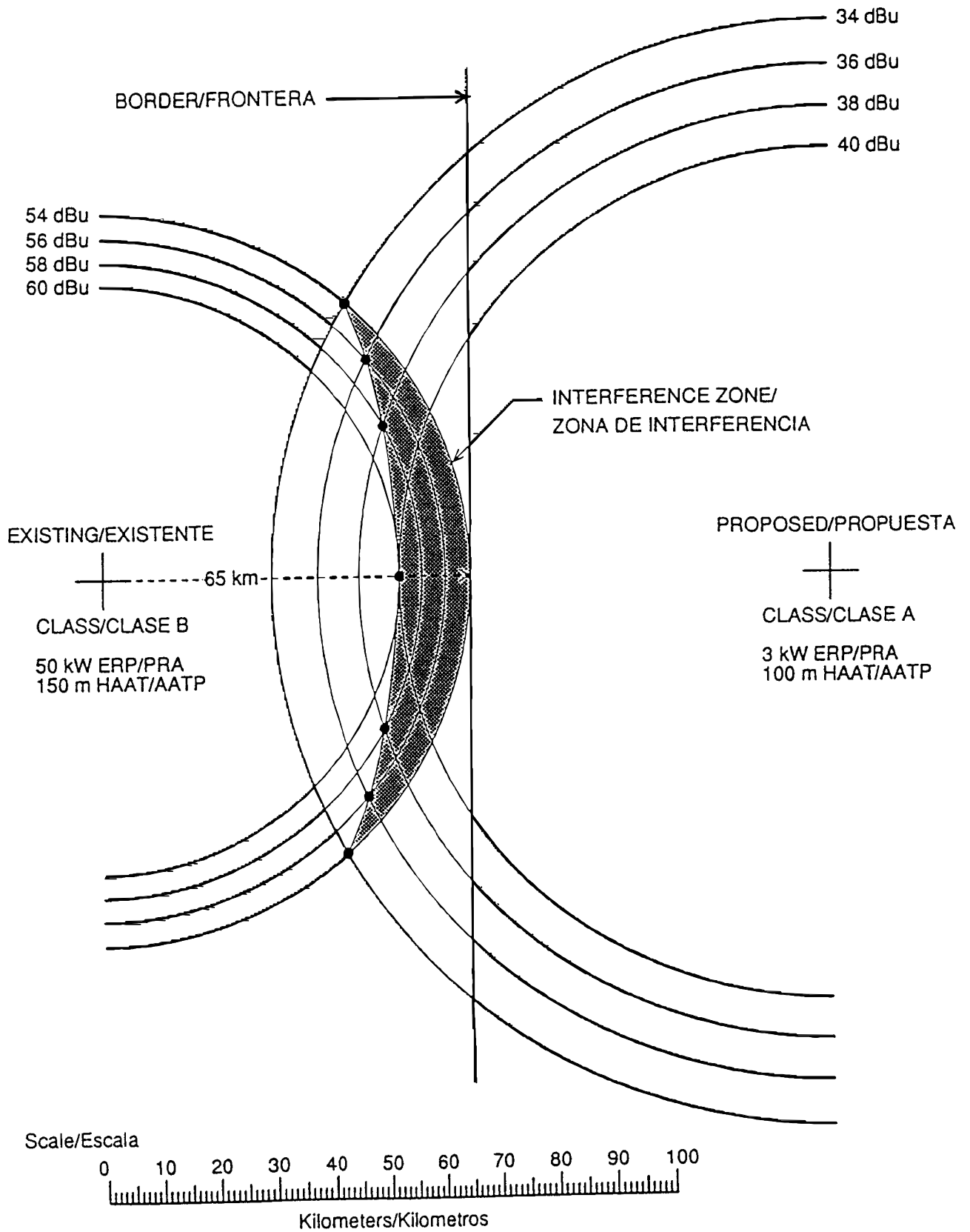
The following example, depicted in Figures 2 and 3, shows how to determine the appropriate limitation for a proposed restricted allotment or assignment. We shall use the previous example showing the interference zone in this example. The spacing problem is between an existing Class B allotment or assignment and a proposed co-channel Class A allotment or assignment.

In Figure 2 we have drawn a vertical line just to the right of the maximum extent of the 54 dBu protected contour of the Class B allotment or assignment which represents the border between our countries. We see that the interference zone is located entirely within the country responsible for the Class B allotment or assignment. In this case objectionable interference exists. However, the objectionable interference can be eliminated if the maximum ERP and HAAT of the proposed Class A allotment or assignment is sufficiently reduced. Since all of the interference lies within the territory of the country having the existing allotment or assignment, the ERP and HAAT must be decreased to eliminate all overlap between the protected and interfering contours.

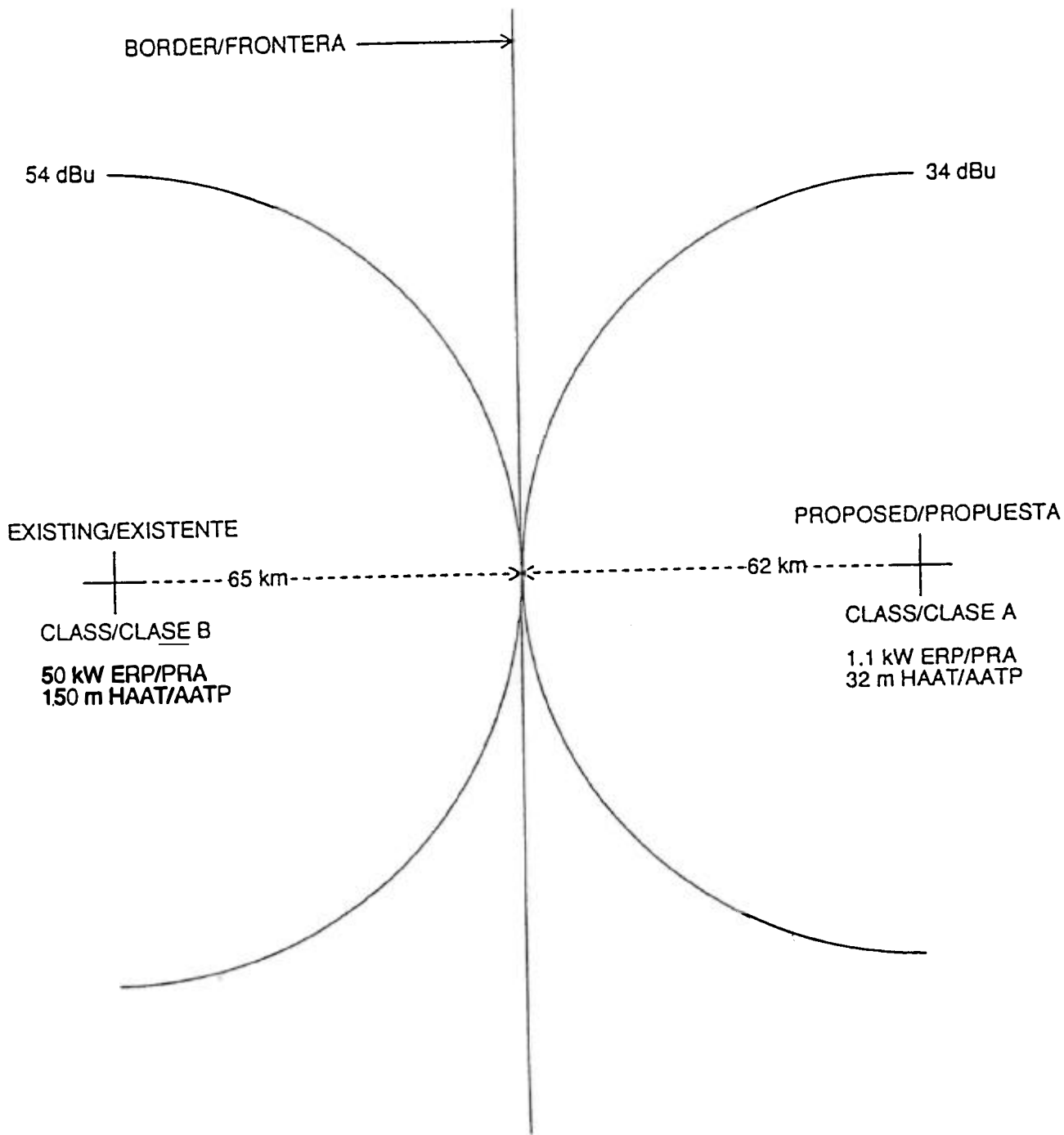
In order to eliminate all contour overlap, given that there can be no intersection of the Class B protected contour (54 dBu) and the proposed Class A interfering contour (34 dBu). From the last example, the extent of the Class B 54 dBu contour was 65 km. The actual separation was 127 km. Since the contours can only be tangential, we can subtract the distance to the protected contour (65 km) from the actual separation (127 km) and determine the maximum distance to the Class A interfering contour (62 km). Figure 3 shows these contours.

Using the F(50,10) propagation curves, we develop the ERP and HAAT limitation starting with the use of maximum ERP and a reduced HAAT if a restricted allotment is proposed. If a restricted assignment is proposed, we use the proposed HAAT and reduce the ERP to develop the limitation. Values of HAAT's less than 30m are unrealistic and therefore are not used. The appropriate limit for this example is 1.1 kW ERP at 32m HAAT or the equivalent. This produces an interfering contour of 62 km. If an antenna was proposed with an HAAT of 100m, an equivalent set of parameters would be 0.3 kW ERP at 100m HAAT.

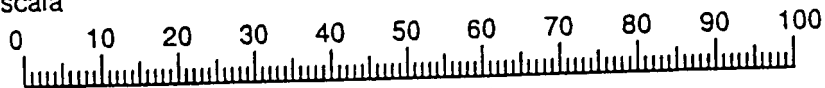
Figure/Figura 2



Figure/Figura 3



Scale/Escala



Kilometers/Kilometros

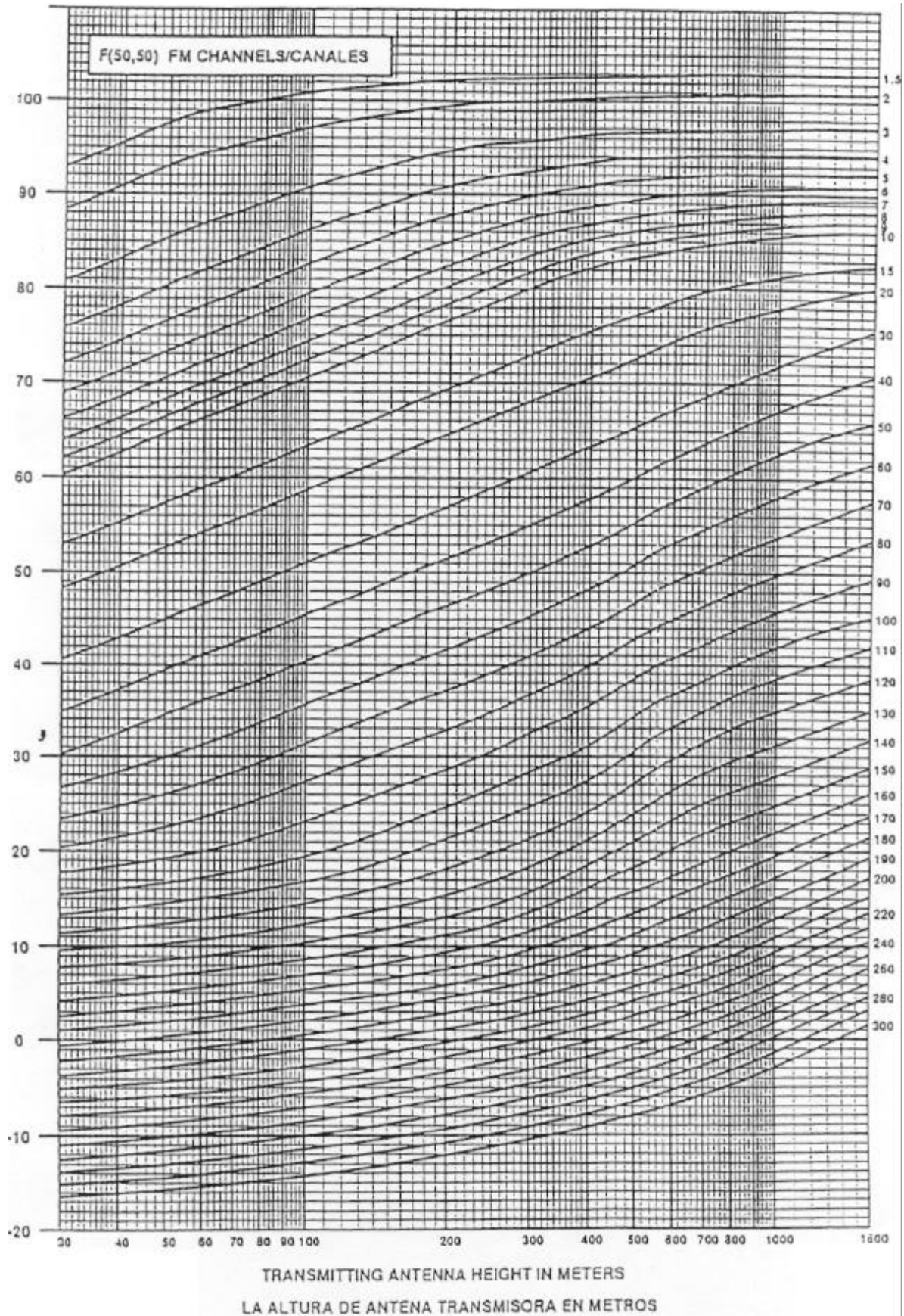
APPENDIX 4

Propagation Curves

ESTIMATED FIELD STRENGTH EXCEEDED AT 50% OF THE POTENTIAL RECEIVER LOCATIONS FOR AT LEAST 50% OF THE TIME AT A RECEIVING ANTENNA HEIGHT OF 9.1 METERS.

INTENSIDAD DE CAMPO ESTIMADA QUE EXCEDE EL 50% DE LAS UBICACIONES RECEPTORAS POSIBLES, POR LO MENOS EL 50% DEL TIEMPO, A UNA ALTURA DE ANTENA RECEPTORA DE 9.1 METROS.

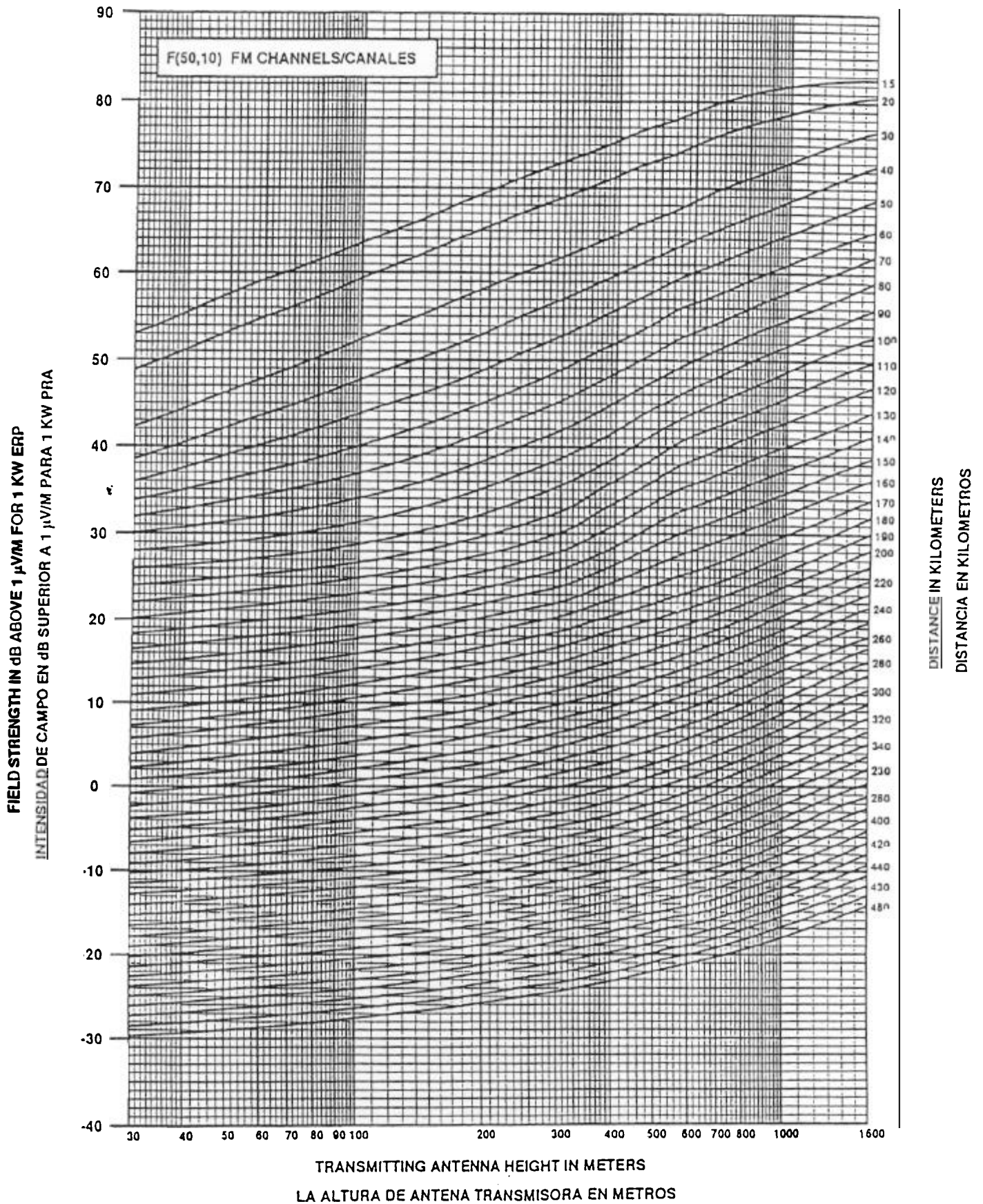
FIELD STRENGTH IN dB ABOVE 1  $\mu$ V/M FOR 1 KW ERP  
INTENSIDAD DE CAMPO EN dB SUPERIOR A 1  $\mu$ V/M PARA 1 KW PRA

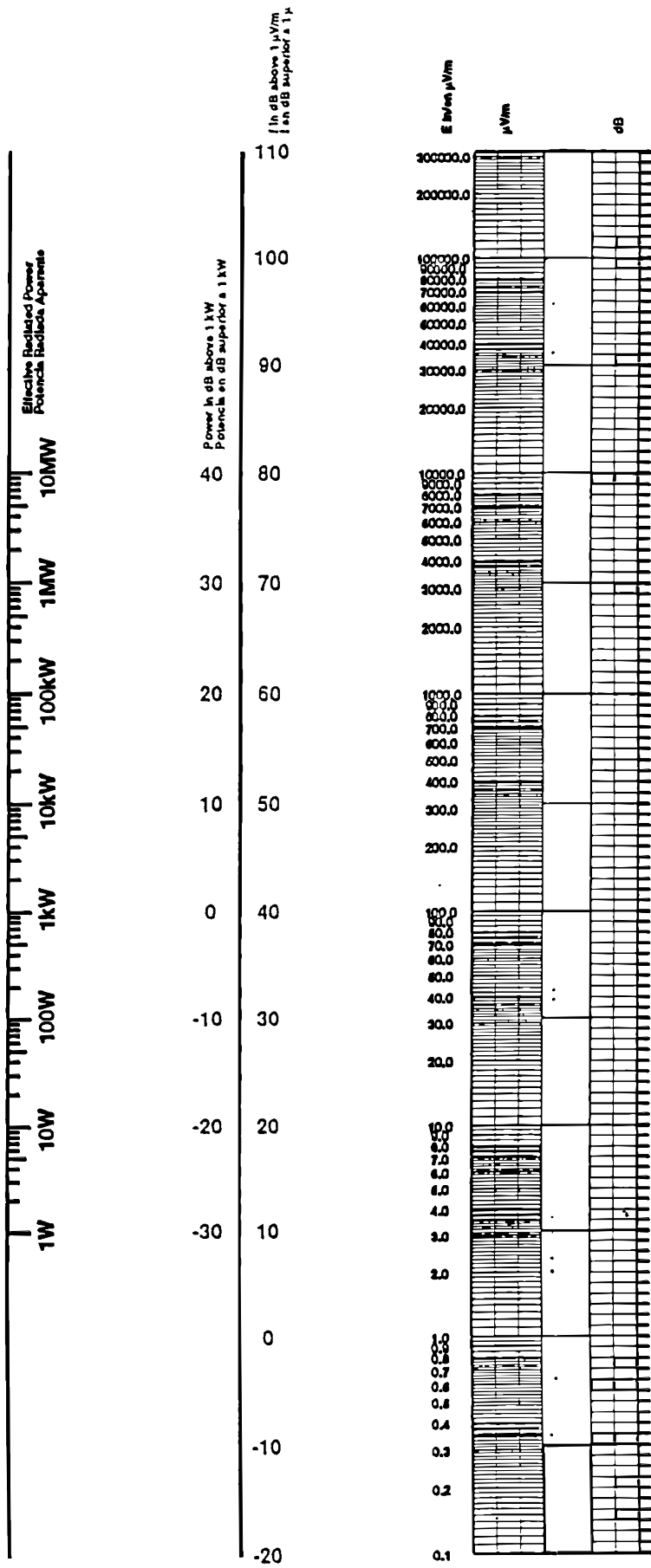




ESTIMATED FIELD STRENGTH EXCEEDED AT 50% OF THE POTENTIAL RECEIVER LOCATIONS FOR AT LEAST 10% OF THE TIME AT A RECEIVING ANTENNA HEIGHT OF 9.1 METERS.

INTENSIDAD DE CAMPO ESTIMADA QUE EXCEDE EL 50% DE LAS UBICACIONES RECEPTORAS POSIBLES, POR LO MENOS EL 10% DEL TIEMPO, A UNA ALTURA DE ANTENA RECEPTORA DE 9.1 METROS.





Sliding Scale for use with Propagation Curves  
 Escala variable para utilizarse con curvas de Propagacion