

Spectrum Management

Broadcasting Procedures and Rules

## **Part II: Application Procedures and Rules for AM Broadcasting Undertakings**

**Contains Amendments as per:**

Change Notice 91a: *Assessment and Control of Maximum Field Strength  
- Notification Procedure to Local Municipalities,*  
February 1991

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## Section A: International Agreements

- A-1. AM broadcasting assignments in the 535-1 605 and 1 605-1 705 kHz bands in Canada are made in accordance with the Medium Frequency Broadcasting Service in Region 2 (RAMFBS-R2 and Rio<sup>1</sup> 1988), and the Agreements between the Government of Canada and the Government of the United States of America relating to the AM Broadcasting Service in the Region 2 (Agreements, 1984 and 1990)<sup>2</sup>. These are international agreements which govern the common use of the band with minimum of interference between countries. Principles are reflected into technical criteria which have to be followed to avoid excessive interference between stations. In addition to these international documents, they are implemented in Canada for domestic use, together with additional provisions in the Department's Broadcast Procedures and Rules.
- A-2. AM broadcasting assignments in the 525-535 kHz band in Canada are made in accordance with the International Telecommunication Union. Protection to other broadcasting assignments is based on the technical criteria of the ITU. Protection to non-broadcasting assignments is assured by case-by-case co-ordination with the operators of the services affected (usually the Department of National Defence or the Coast Guard) or with the National Telecommunications Administration (NTIA) in the USA. Broadcasting stations in this band are limited to 1 kW power day.

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1 Final Acts of the Regional Administrative Radio Conference to Establish a Plan for the Broadcasting Service in the Band BC-R2(2), Rio de Janeiro, 1988.

2 The 1990 agreement for the 1 605-1 705 kHz band is still in draft form because of the current "AM improvement" studies. However, an Interim Working Arrangement makes the draft agreement operational except for special consideration to be given for protection.

## **Section B: Preparation of Technical Submissions Required with the Applications for AM Broadcasting Stations in the 525-1 705 kHz Band**

### **B-1. Application Requirements and Definitions**

#### **B-1.1 Requirements**

B-1.1.1 This Section describes the submissions that are required in support of applications for AM stations operating with powers of 100 W or greater in the frequency band 525-1 705 kHz. Applications for stations with powers less than 100 W refer to Section B-8.

B-1.1.2 Application for a broadcasting certificate for an AM Station shall be made on departmental Form 16-1 *Application for a Technical Construction and Operating Certificate for a New AM (Standard Band) Broadcasting Station* or 16-4<sup>3</sup> *Application for Authority to Change the Facilities of an AM (Standard Band) Broadcasting Station* as applicable. An application form for a broadcasting licence can be obtained from the Department of Industry, Innovation and Science (ISED) and the Canadian Radio-television and Telecommunications Commission (CRTC). The two applications shall be submitted to the appropriate regional office of ISED.

All necessary forms may be obtained from any departmental regional office (Vancouver, Montreal, Moncton) or departmental headquarters in Ottawa. All addresses are listed in Appendix I.

B-1.1.3 A complete technical submission shall include the following:

- (a) two copies of the appropriate Form 16-1 or 16-4;
- (b) five copies of an engineering brief in suitable loose-leaf binders with identifying information clearly and carefully prepared and include all the detailed technical information as outlined in the engineering brief;
- (c) completed forms listed in Annex 1, Parts I to V of the Canada/USA Agreement (the engineering brief only);
- (d) one reproducible copy of each map showing the pertinent field strength contours.

B-1.1.4 The required number of copies of Department of Transport (DOT) Form 26-0427 *Obstruction Clearance Form* shall be completed. Topographical maps showing the terrain elevation contours and the exact locations of the antenna site, as set forth in Section B-1.1.3 shall be submitted directly to the appropriate regional office of DOT for clearance. Aeronautical approval shall be sent to the Department.

Form 26-0427 is obtainable from any regional office of the Department of Transport.

#### **B-1.2 Definitions**

##### **B-1.2.1 AM Broadcasting Channel**

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

##### **B-1.2.2 Primary Service Area (525-1 605 kHz)**

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<sup>3</sup> Forms 16-1 and 16-4 are presently under review. The new titles will refer to Broadcasting Certificate instead of Technical Certificate.

Service area delimited by the contour within which the calculated level of the ground wave field strength is protected from objectionable interference in accordance with the provisions of the Canada/USA Agreement, 1984.

**B-1.2.3 Secondary Service Area (Applies to Class A Stations Only)**

Service area delimited by the contour within which the calculated level of the ground wave field strength 50% of the time is protected from objectionable interference in accordance with Chapter 4 of Annex 2, Canada/USA Agreement, 1984.

**B-1.2.4 Protected Contour**

Continuous line that delimits the area of primary or secondary service which is protected from objectionable interference.

**B-1.2.5 Allotment Area**

Specifically defined geographical area within a country, to which one or more channels are indicated in the Allotment Plan of Rio 1988 (Annex 4)<sup>4</sup>.

**B-1.2.6 Objectionable Interference**

Interference caused by a signal exceeding the maximum permissible field strength in the allotment area.

**B-1.2.7 Nominal Usable Field Strength ( $E_{nom}$ )**

Agreed minimum value of the field strength required to provide satisfactory reception conditions, in the presence of atmospheric noise, man-made noise and interference.  $E_{nom}$  has been employed as the reference for planning (see Annex 2, Chapter 4 of the draft Canada/USA Agreement, 1990).

**B-1.2.8 Usable Field Strength ( $E_u$ )**

Minimum value of the field strength required to provide satisfactory reception under the presence of atmospheric noise, man-made noise, and interference in a real situation (frequency assignment plan).

**B-1.2.9 Daytime Operation**

Operation between the times of local sunrise and local sunset.

**B-1.2.10 Night-time Operation**

Operation between the times of local sunset and local sunrise.

**B-1.2.11 Groundwave**

Electromagnetic wave which is propagated along the surface of the earth or near the surface and reflected by the ionosphere.

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<sup>4</sup> For protection criteria see Chapter 4 of Annex 2, Canada/USA Agreement, 1984.



**B-1.2.12 Skywave**

Electromagnetic wave which has been reflected by the ionosphere.

**B-1.3 Classification****B-1.3.1 Class A Station<sup>5</sup>**

A Class A station is intended to provide coverage over extensive primary and secondary service areas which are protected against interference accordingly.

The maximum power of a Class A station shall be 50 kW.  
The minimum power of a Class A station shall be 10 kW.

**B-1.3.2 Class B Station<sup>6</sup>**

A Class B station is intended to provide coverage over one or more population centres located in their primary service area, and which is protected against interference accordingly.

The maximum power of a Class B station shall be 50 kW.  
The minimum power of a Class B station shall be 250 W.

**B-1.3.3 Class C Station<sup>6</sup>**

A Class C station is intended to provide coverage over a city or town and the surrounding areas in its primary service area, and which is protected against interference accordingly.

The maximum power of a Class C station shall be 1 kW.  
The minimum power of a Class C station shall be 100 W.

**B-1.3.4 Low Power Station**

A low power station is intended to provide coverage over a town or village and the surrounding areas. It is not protected against interference from Class A, B or C stations and shall take remedial action to such stations.

The power of a low power station shall be less than 100 W.

**B-1.3.5 Carrier Current Station**

A carrier current station is intended to provide service within a given property, by transmitting a signal into a power line or leaky cable. It is not protected against interference from Class A, B or C stations and shall take remedial action if it causes interference to such stations.

**B-1.3.6 Stations in the 1 605-1 705 kHz Band**

Classes are not designated for stations in this band, although the coverage is equivalent to a Class C station.

The maximum power is 10 kW.

**B-2. Outline of Sections and Details Required in Each Section of the Engineering Brief**

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5 For protection criteria see Chapter 4 of Annex 2, Canada/USA Agreement, 1984.

6 For protection criteria see Chapter 4 of Annex 2, Canada/USA Agreement, 1984.

The engineering brief should include the following list of sections and sub-sections with required details to facilitate processing by the Department.

### **B-2.1 Title Page**

The title page should include submission title, project or reference number, date, name of applicant, and location of station. It shall also list the following parameters of the proposal - frequency, power, and location.

### **B-2.2 Table of Contents**

### **B-2.3 Main Section of the Brief**

**B-2.3.1 Introduction** - A general statement of the purpose for the brief in relation to the proposed operation.

**B-2.3.2 Discussion** - On the design considerations to accomplish the applicant's objective, including the choice of frequency and location of site, with particular reference to interference received and caused by the proposed operation. Statements shall also be included regarding the following:

- (a) minimum field strength for metropolitan areas (in compliance with Section C-9);
- (b) maximum field strength and broadcaster's responsibilities (in compliance with Section C-9);
- (c) daytime rural service (a minimum of 0.5 mV/m to be provided);
- (d) night-time service ( $E_{\text{N}}$ ).

**B-2.3.3 Assumptions and Sources of Information** - List and explain all assumptions which are made regarding conductivity, existing limitations, and other factors, etc. Also list the sources of information, any equation not listed or referred to in the Agreement, 1984, maps, directional antenna patterns of other stations, etc.

**B-2.3.4 Groundwave Interference Analysis** - A general analysis and a summary of the detailed study to be made in a later section of the brief. The sample sheet of information required for the detailed study.

**B-2.3.5 Skywave Interference Analysis** - A general analysis and a summary of the detailed study to be made in a later section of the brief. The sample sheet of information required for the detailed study.

**B-2.3.6 Image Interference** - (Refer to Section C-9) - If it is not possible to meet the criteria of Section C-9, the following additional information is required in support of an exemption:

- (a) a justification for selection of the frequency proposed;
- (b) a map showing the area of overlap of the pertinent contours of both stations;
- (c) an estimate of the number of broadcast receivers within the area of overlap;
- (d) a commitment that the applicant will investigate complaints of image interference and assume financial responsibility for appropriate remedial measures.

**B-2.3.7 Intermodulation/Cross-modulation Interference** - (Refer to Section C-11) - Statements shall be included regarding the possibility of intermodulation/cross-modulation between broadcasting stations in the area and the steps to be taken should such interference result.



B-2.3.8 **Other Significant Information** - Other technical information pertinent to the proposal should be included in this section. For example, there shall be a statement as to whether the station has been or will be type-approved. General comments should also be made respecting operations, etc.

B-2.3.9 **Qualification of Engineers** - This Section shall contain a listing of names and signatures of those responsible for the preparation of engineering brief. It is important that, at least, shall be that of an engineer with considerable experience in the AM broadcasting field. An engineering stamp and signature should also appear in this section and on all copies of the brief.

#### **B-2.4 Description of Antenna System and Array**

Forms listed in the Canada/USA Agreement, 1984, Annex 1, Parts I to V shall be completed and submitted. The data is important, but the data should be provided clearly and in the order shown in the Agreement. Additional information shall be given on the type of each element of the array (i.e. guyed or tower mounted, uniform cross-section or tapered etc.).

#### **B-2.5 Horizontal Field Strength Patterns**

B-2.5.1 The methods to be used in calculating the directional antenna pattern, the expanded pattern and the equivalent non-directional pattern are detailed in Annex 2, Appendix 3, of the Canada/USA Agreement, 1984. The criteria for reduced design tolerance. The plot of the horizontal field strength pattern involved should show:

- (a) the unattenuated directional field strength at one kilometre of the expanded pattern and the equivalent unattenuated non-directional (r.m.s.) field strength at one kilometre;
- (b) the true north at zero azimuth;
- (c) the direction to each existing station, with which interference may be involved;

B-2.5.2 Information concerning any variations from the normal practice, used in computing the field strength patterns, shall be included such as:

- (a) formulae used for calculating both horizontal and vertical patterns and sample calculations;
- (b) assumptions made (with justification), including electrical height, current distribution, ground conductivity of each element and ground conductivities.

B-2.5.3 The following guidelines shall be used in plotting field strength patterns:

- (a) the expanded or modified patterns as defined in the Canada/USA Agreement shall be plotted on standard letter size polar co-ordinate paper with adequate margins;
- (b) all patterns shall be plotted to the largest scale possible on the paper specified;
- (c) all values of field strength less than 10% of the r.m.s. field strength of the peak shall be plotted on an enlarged scale.

#### **B-2.6 Plot Plan of Station Property Showing Location of Tower(s) and Ground System**

Information is required as follows on one standard letter size sheet in the brief:

- (a) a plot plan of suitable scale showing the location of the antenna tower(s) and the limits other nearby metallic structures (refer to BPR-I, Section 2.1);
- (b) a map of scale 1:50 000 on which the antenna site is shown with the latitude and longitude to the nearest second (refer to BPR-I, Section 3.1.1).

If a site has not been selected at the time the application is made, a tentative site may be submitted in the application procedure, with the understanding that applications for departmental approval may be made in a separate submission at a later date.

When the proposed site is submitted for approval, applicants are cautioned that an option to purchase the property should be obtained before submitting the information thereon to the Department.

**B-2.7 Discussion of any Factors which Could Distort the Intended Antenna Patterns**

If for any reason the calculated horizontal radiation pattern or characteristic vertical pattern extraordinary measures are taken, a detailed analysis of the abnormality shall be included statement relative to any corrective measures which might be undertaken to attempt to ac

**B-2.8 Interference Analyses****B-2.8.1 Groundwave Interference Analyses (Day and Night)**

Groundwave interference analyses are to be prepared according to sample sheet protection rules, ground conductivity curves and methods of calculation may be Annex 2, Chapter 2 of Canada/USA Agreement, 1984.

Analysis of night-time interference to the groundwave service area from adjacent prepared in accordance with Section C-5.

In groundwave analyses, where radiation in a particular sector is approaching t another assignment, the clearance shall be confirmed over an arc. This necessit number of bearings from the stations involved. For each of these cases, the pro by geographical co-ordinates or in a separate map segment. On this map, the pr should be drawn to demonstrate the expected clearance.

**Note:** The Department will make available assignment information, including field strength contours of Canadian stations from proofs of performance

**B-2.8.2 Skywave Interference Analyses**

Skywave interference analyses are to be prepared according to the sample sheet protection rules, skywave curves and method of calculating may be found in An Agreement, 1984, for stations in the 535-1 605 kHz band and in Annex 1, Chap Agreement, 1990 for stations in the 1 605-1 705 kHz band (also note Section C

**B-2.8.3 Calculation of Distance and Azimuth**

All calculations of distance and azimuth are to be based on the short great-circle earth of radius 6 370 km (one degree on the surface of the earth equals 111.1

**B-2.9 Maps Showing Pertinent Field Strength Contours**

The following field strength contours shall be plotted for each radiation pattern proposed (i. day and night), on up-to-date maps (refer to Section 3 of BPR-I):

1 000, 250, 25, 15, 5, 0.5 mV/m,  $E_u$  and if within 0.5 mV/m contour, the contour which is 20

For stations in the 1 605-1 705 kHz band, the night  $E_u$  should be assumed to be  $E_{nom}$  unless stations would make it higher.

**B-2.10 Additional Requirements**

When the proposal involves the acceptance of objectionable interference as defined in both by cross-hatched areas on coverage maps.

**B-2.11 Commitments**

The commitments relating to the resolution of any potential interference problems as required are included:

- (a) image interference (Section B-2.3.6 and Section C-9.2);
- (b) overload or blanketing interference (Section C-10.4);
- (c) intermodulation and cross-modulation (Section C-11.2);
- (d) maintenance of reduced tolerance directional patterns (Section B-2.5.1 and Annex 2, A, Canada/USA Agreement, 1984);
- (e) any commitment which may have been made in reaching agreement with another station in" (Section C-8.2) and departures from normal protection requirements (Section C-12).

The above commitments are related to specific potential problems and complement the general forms.

### **B-3 Final Proof of Performance for Directional Antennas**

An installation is deemed to be incomplete until the Final Proof of Performance of the directional antenna is approved by the Director, Broadcast Applications Engineering and approved by the Department.

#### **B-3.1 Documentation (in quadruplicate)**

When a station proposes to operate with a directional antenna either full- or part-time, it is required that the pattern produced by the antenna array agrees with the pattern predicted and approved. The size within an acceptable tolerance. It is also necessary that proof be submitted as to the actual elements, including impedance characteristics and radiation efficiency.

Field strength contours are required to show the actual coverage of the station, although that from other stations is that calculated, in accordance with Annex 2, Chapter 2 of Canada/USA Agreement, the 1 605-1 705 kHz band, with Section C-6, unless there is specific agreement between the stations.

The data outlined in Sections B-3.3, B-3.4 and B-3.5 shall be submitted in the proof of performance. The procedure to be followed in obtaining these data.

#### **B-3.2 Tolerance**

The normal upper limit is the expanded pattern and the normal lower limit is 5% below the normal. Beyond these limits should be justified. Also, if the upper limit is exceeded but this would not be modified in accordance with Annex 2, Appendix 3 of Canada/USA Agreement, 1984. The interference would result.

#### **B-3.3 Field Strength Measurements to Establish Effective Field Strength at One Kilometre**

Beginning as near to the antenna as possible without including the induction field and to the antenna is not a point source of radiation, measurements shall be made on eight or more rays:

- 200 metres up to 3 kilometres from the antenna;
- one kilometre from 3 to 10 km from the antenna;
- and 3 kilometres beyond 10 km, as required.

Where unobstructed measurements can be made, there should be 18 or more on each radial. Where measurements are difficult to make, these shall be made on each radial at as many unobstructed intervals as possible, particularly within five kilometres of the antenna. Where the intervals are considerably less than stated above, particularly within five kilometres of the antenna, it is possible to obtain accurate measurements at the closer distances (even out to 8 or 10 kilometres where the terrain is flat), measurements at greater distances should be made at closer intervals.

The measurement data shall be plotted for each radial using log-log co-ordinate paper, with distance as abscissa.

The proper curve to be drawn through the points plotted shall be determined by comparison

- plot theoretical curves (refer to Appendix 2 to Annex 2 of the Canada/USA Agreement, 1973 Agreement) for several values of conductivities approximating the conductivity indicated on the same co-ordinate paper;
- place this sheet under the sheet on which the actual points have been plotted and adjust the curve until the points are found to lie on it;
- draw this curve on the sheet on which the points were plotted, together with the inverse distance curve.

The field at one kilometre for the radial concerned shall be the ordinate on the inverse distance curve.

When all radials have been analyzed in this manner, a curve shall be plotted on polar co-ordinates showing the field strengths obtained, which give the inverse distance field pattern at one kilometre. The area bounded by this curve, divided by the number of radials, is the effective field.

While making the field strength measurement, the output power of the station should be measured by the direct method. If a lower power is used, the results of the measurements should be corrected. Therefore, it is necessary to determine the antenna impedances as accurately as practical as a means of an ammeter of known accuracy.

Complete data taken in conjunction with the field strength measurements shall be submitted as follows:

- (a) tabulation by number of each point of measurement, the field strength and the distance;
- (b) map(s) showing each point of measurement numbered to agree with the tabulation required;
- (c) curves drawn for each radial showing the field strength as a function of distance;
- (d) antenna self impedances ( $Z = R + jX$ ) for each tower measured at carrier frequency and  $\pm 30$  kHz, and the results presented in tabular as well as graphical forms;
- (e) antenna operating impedances ( $Z = R + jX$ ) for each tower and for the day and/or night measurements;
- (f) antenna current or currents maintained during field strength measurements;
- (g) any other pertinent information.

#### **B-3.4 Field Strength Measurements to Establish Performance of Directional Antennas**

To establish this performance, measurements shall be made in accordance with the preceding section. The number of radials to establish the effective field from the antenna system. In the case of a directional antenna pattern, approximately eight radials in addition to the radials in the directions of limitation are required. Where complicated patterns are involved, that is, patterns having several sharp lobes or nulls, measurements shall be made on many additional radials as necessary to establish the pattern. It may be necessary to make measurements between radials, as required in Section B-4.1(a), to better define the pattern between radials.



The following information shall be submitted:

- B-3.4.1 A description of the antenna array which shall outline:
- (a) number of elements;
  - (b) type of each element (i.e., guyed or self-supporting, triangular or square, uni etc.);
  - (c) if top-loaded, pertinent details;
  - (d) overall height (in metres) of each element above ground level;
  - (e) orientation of each element with respect to true north from a reference point;
  - (f) space phasing of elements (space phasing should be given in metres as well);
  - (g) details of ground system for each element (length and number of radials, direction used, and depth buried);
  - (h) current in each element (at point where antenna ammeter is located) and current of common input to the antenna system;
  - (i) phase readings (specifying whether leading or lagging) and the relative current element.
- B-3.4.2 Horizontal field strength patterns for each power involved showing:
- (a) directional field strength at one kilometre and effective field strength from the field strength calculations. These points should be shown on the expanded pattern;
  - (b) true north shall be shown at zero azimuth.
- B-3.4.3 Any other pertinent information.
- B-3.4.4 Plotting of field strength patterns (refer to Section B-2.5.3).
- B-3.4.5 Presentation of contour maps which shall include:
- (a) measured field strength contours for 1 000, 250, 25, 15, 5, 0.5 mV/m,  $E_u$  and the contour which is 20% of  $E_u$ , shall be plotted on a map or maps having the
  - (b) tabulation of all data used in plotting the above patterns;
  - (c) reproducible map(s) showing the protected 0.5 mV/m daytime and the protected

### **B-3.5 Test Equipment and Qualifications**

The following information shall be submitted on the equipment used for the measurements responsible for the measurements:

- (a) description, accuracy, date and by whom each instrument was last calibrated;
- (b) name, stamp and signature of the engineer responsible for the measurements.

### **B-4. Preliminary Proof of Performance for Directional Antennas**

It is recognized that the surveys and calculations necessary for a Final Proof of Performance may take time. The Department normally will accept a Preliminary Proof of Performance for the purpose only of permitting the station to broadcast provided that the Final Proof of Performance is submitted within 90 days.

#### **B-4.1 Documentation**

The Preliminary Proof of Performance (in quadruplicate) shall be submitted to the Director, at least five working days before commencement of regular broadcasting. It shall consist of

- (a) proof of the shape of the pattern determined from field strength measurements taken at a transmitter at approximately 15° intervals, by means of ratio between the directional pattern and a non-directional pattern or by any other acceptable method such as short radials if a reliable non-directional pattern is available;
- (b) proof of the size of the pattern by means of a series of readings along one radial in a main lobe. The approximate effective field at one kilometre, the attenuation curve and the mean cross-section of the pattern determined from these readings;
- (c) antenna operating impedances ( $Z = R + jX$ ) for each tower and pattern at carrier frequency and in 10 kHz steps over the range of  $\pm 30$  kHz for each tower measured at carrier frequency and in 10 kHz steps over the range of  $\pm 30$  kHz.

Where protection to other stations on the same or adjacent channels is required, additional proof shall be submitted that interference will not result from the operation of the station for which the proof of performance is submitted.

#### **B-4.2 Tolerance**

The normal upper limit is the expanded pattern and the normal lower limit is 5% below the normal pattern. Beyond these limits should be justified. Also, if the upper limit is exceeded but this would not result in interference, it may be modified in accordance with Annex 2, Appendix 3 of Canada/USA Agreement, 1984. The normal lower limit is 5% below the normal pattern. The normal upper limit is the expanded pattern. Beyond these limits should be justified. Also, if the upper limit is exceeded but this would not result in interference, it may be modified in accordance with Annex 2, Appendix 3 of Canada/USA Agreement, 1984. The normal interference would result.

### **B-5. Final Proof of Performance for Non-Directional Antennas**

The installation is deemed to be incomplete until such time as the Final Proof of Performance of the station is submitted to the Director, Broadcast Applications Engineering, and approved by the Department.

#### **B-5.1 Documentation (in quadruplicate)**

A proof of performance demonstrating the inverse distance field strength in terms of millivolts per metre at one kilometre is required of all broadcasting stations operating with non-directional antennas.

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7 Close to the array but beyond the nearfield.

Field strength contours are required to show the actual coverage of the station, although the field strength from other stations is that calculated in accordance with Annex 2, Chapter 2 of Canada/US Agreement for the 1 605-1 705 kHz band, with Section C-6, unless there is specific agreement between the stations.

Following are the data which shall be submitted in the proof of performance, together with the methods followed in obtaining these data.

### **B-5.2 Field Strength Measurements to Establish the Effective Field Strength at One Kilometre from Stations**

Measurements shall be made beginning as near to the antenna as possible without including the induction field and to points where the antenna is not a point source of radiation (not less than one wavelength or five times the vertical height of the antenna) made on eight radials at intervals of approximately:

- 200 metres up to 3 kilometres from the antenna;
- one kilometre from 3 to 10 km from the antenna;
- and 3 kilometres beyond 10 km, as required.

Where unobstructed measurements can be made, there should be 18 or more on each radial. Where measurements are difficult to make, these shall be made on each radial at as many unobstructed points as possible. The intervals are considerably less than stated above, particularly within five kilometres of the antenna. Where possible to obtain accurate measurements at the closer distances (even out to 8 or 10 km due to terrain) the measurements at greater distances should be made at closer intervals.

The measurement data shall be plotted for each radial using log-log co-ordinate paper with distance as abscissa.

The appropriate curve to be drawn through the points plotted shall be determined by comparison with theoretical curves.

- plot theoretical curves (refer to Appendix 2, Annex 2 of the Canada/USA Agreement, 1987 Agreement) for several values of conductivities approximating the conductivity indicated on the co-ordinate paper;
- place this sheet under the sheet on which the actual points have been plotted and adjust the theoretical curve until the points are found;
- draw this curve on the sheet on which the points were plotted, together with the inverse distance curve.

The field at one kilometre for the radial concerned shall be the ordinate on the inverse distance curve.

When all radials have been analyzed in this manner, a curve shall be plotted on polar co-ordinates which gives the inverse distance field pattern at one kilometre. The radius of a circle, the area bounded by this pattern, is the measured effective field.

While making the field strength survey, the output power of the station should be maintained constant by the direct method. If a lower power is used, the results of measurements should be adjusted to the actual power necessary to determine the antenna impedance as accurately as practical, and to measure the current with an ammeter of known accuracy.

Complete data taken in conjunction with the field strength measurements shall be submitted:

- (a) tabulation by number of each point of measurement, the field strength and the distance measurement;
- (b) map(s) showing each point of measurement numbered to agree with the tabulation required;
- (c) curves drawn for each radial showing the field strength as a function of distance;
- (d) antenna self impedance ( $Z = R + jX$ ) at carrier frequency and in 10 kHz steps over the range presented in tabular as well as graphical forms;
- (e) antenna current (day and night) maintained during field strength measurements;
- (f) any other pertinent information.

### **B-5.3 Field Strength Measurements to Establish the Effective Field Strength at One Kilometre Stations**

The procedure for establishing the effective field strength at one kilometre for Class C stations shall be the same as in Section B-5.2 above except that measurements may be made beyond the 0.5 mV/m contour.

### **B-5.4 Test Equipment and Qualifications**

The following information shall be submitted on the equipment used for the measurements responsible for the measurements:

- (a) description, accuracy, date and by whom each instrument was last calibrated;
- (b) name, stamp and signature of the engineer responsible for the measurements.

### **B-5.5 Plot of Field Strength**

The measured field strength contours for the 1 000, 250, 25, 15, 5, and 0.5 mV/m,  $E_u$  and  $E_{u,20}$  which is 20% of  $E_u$ , shall be plotted on a map or maps having the largest practical scale. Records shall show the protected 0.5 mV/m daytime and the protected night-time  $E_u$  contours.

## **B-6. Preliminary Proof of Performance for Non-Directional Antennas**

The surveys and calculations necessary for a Final Proof of Performance may take considerable time. Preliminary Proof of Performance for the purpose only of permitting the station to commence operations shall be submitted within 90 days.

### **B-6.1 Documentation**

The Preliminary Proof of Performance (in quadruplicate) shall be submitted to the Director, at least three working days before commencement of regular broadcasting and shall consist of:

- (a) a tabulation by number (at least 10) of each point of measurement of the field strength with reasonable accuracy the inverse distance field strength in mV/m at one kilometre;
- (b) distances from the antenna of all measurement points included in the tabulation required.

(c) a plot of the measurements as required in Section B-5.2 with the unattenuated field at

Where protection to other stations on the same or adjacent channels is required, additional show that interference will not result from the operation of the station for which the proof

## **B-7. Supplementary Proof of Performance (In quadruplicate)**

### **B-7.1 Introduction**

Broadcasting stations at all times are required to protect other stations as prescribed by interference requirements. Therefore, it is imperative that the operation of broadcast transmitters and receivers be maintained at all times. Accordingly, a supplementary proof of performance shall be submitted on request within one year after submission of the previous supplementary or final proof. Supplementary proofs of performance are not required for non-directional antenna systems.

In addition to normal monitoring, the following comprise the requirements for a Supplementary Proof of Performance to demonstrate that the broadcast antenna system continues to function as authorized.

### **B-7.2 Measurements**

B-7.2.1 The shape of the directional pattern shall be determined from field strength measurements at various distances from the transmitter at approximately 15 degree intervals by means of a directional pattern and non-directional operation, or by any other acceptable method if a reliable non-directional pattern is not available.

B-7.2.2 The size of the pattern shall be determined by means of a series of field strength measurements along one radial from approximately 200 metres from the antenna to a distance contour whichever is closer. The effective field at one kilometre shall be determined as set forth in Section B-3.3.

B-7.2.3 Impedance characteristics of the radiating elements and the operating impedance shall be determined by the direct method and expressed as  $Z = R + jX$ .

B-7.2.4 To determine the unattenuated field strength at one kilometre the field strength measurements shall be plotted on log-log co-ordinate paper with field strength as ordinate and distance as abscissa. A curve to be drawn through the points plotted shall be determined by comparison with theoretical curves as follows:

- plot theoretical curves (refer to Appendix 2 of the Canada/USA Agreement, 1988 and the Rio 1988 Agreement) for several values of conductivities approximating the conditions of the measurements on another sheet of the same co-ordinate paper;
- place this sheet under the sheet on which the actual data points have been plotted and the curve which most nearly matching the points is found;
- draw this curve on the sheet on which the points were plotted.

The field at one kilometre for the radial shall be the ordinate on the inverse distance curve.

B-7.2.5 While making the field strength measurements the output power of the station shall be maintained at the licensed power as determined by the direct method. A careful log shall be taken during the measurement period.

### **B-7.3 Documents (in quadruplicate)**

A Supplementary Proof of Performance shall comprise the following, prepared or approved submitted over the engineer's stamp and signature:

- (a) a statement of the work which was done, adjustments made, components replaced, measured with operating staff;
- (b) a polar plot of the measured pattern and the expanded (or modified, if applicable) directivity guidelines);
- (c) a plot of the field strength measurements made along the single radial, together with the suitable log-log graph paper. The values of ground conductivity and field strength at or near the antenna;
- (d) information on the antenna impedance measurements shall be provided showing:
  - (i) description of the methods employed;
  - (ii) measurement data;
  - (iii) impedances of each tower at the operating frequency expressed as  $Z = R + jX$ ;
- (e) a table of current and phase readings of the transmitter and antenna system as finally measured for efficiency;
- (f) if other work was done at the transmitter, such as adjustment and calibration of superheterodyne or modulation monitors, proper documentation covering this work should also be included.

#### **B-7.4 Tolerance**

The normal upper limit is the expanded pattern and the normal lower limit is 5% below the normal upper limit. Beyond these limits should be justified. Also if the upper limit is exceeded but this would not be modified in accordance with Annex 2, Appendix 3 of Canada/USA Agreement, 1984. This interference would result.

**B-7.5 Test Equipment and Qualifications**

The following information shall be submitted on the equipment used for the measurements responsible for the measurements:

- (a) description, accuracy, date and by whom each instrument was last calibrated;
- (b) name, stamp and signature of the engineer responsible for the measurements.

**B-8. Applications for Low Power Unprotected Stations and Carrier Current Systems with Transmitter Powers of less than 100 W****B-8.1 Low Power Unprotected Broadcasting Stations**

Normally, an application for a low power unprotected broadcasting station is technically acceptable if:

- (a) no interference to other stations is predicted, using regular protection criteria;
- (b) the signal level within the area to be served is sufficient to provide reliable daytime and nighttime service;
- (c) the disparity between day and night service is minor, i.e., the  $E_u$  contour shall enclose a minimum of 90% of the 0.5 mV/m contour.

The transmitter should meet Radio Standards Specifications (RSS) no. 150. The use of a transmitter not meeting these standards could result in an inadequate quality of service.

**B-8.1.1 Requirements for an Application**

The requirements for an application for a low power broadcasting station are:

- two copies of Form 16-1<sup>8</sup> or 16-4<sup>8</sup> as applicable;
- two copies of Form 16-653;
- the Department of Transport Form 26-0427 (refer to Section B-1.1.4);
- five copies of an engineering brief.

Normally, an engineering brief need only describe the transmitting plant and local audio feed). However, if the Department's analysis indicates that protection or service requirements have not been met, a detailed engineering submission may be requested.

**B-8.1.2 Notifying the Local Municipality**

An applicant for a new station or for changes to an existing station shall submit a notice of intention to the local municipality, stating his or her intention to operate a low power AM broadcasting station in the area. The notice shall include a sketch of the building, the proposed tower(s) and antennas, with sufficient detail to include a pictorial representation of the total structure. The purpose of this notice is to provide the municipality with an opportunity to consider the implications of the proposed antenna structure. The municipal authority may file a written objection to the proposed facilities with the appropriate regulatory authority. The applicant and the municipal authority shall resolve all municipal procedural requirements. If, after this, the Department will consider all factors pertaining to the application, as well as the municipal objection, and render a final decision.

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<sup>8</sup> Forms 16-1 and 16-4 are presently under review. The new titles will refer to Broadcasting Certificate instead of Technical Certificate.

## B-8.2 Carrier Current Systems

Normally, an application for carrier current system is considered technically acceptable if the Department are met as set forth hereafter.

### B-8.2.1 Requirements

- (a) An engineering brief containing the following data shall be submitted to the
  - the location of the transmitter;
  - the proposed frequency;
  - the type of equipment to be used (manufacturer's name, model number, ) should be approved by Industry Canada.
- (b) Such apparatus will deliver to the line network the minimum radio frequency to accomplish the desired purpose.
- (c) No interference is expected to be caused to other radio services.

### B-8.2.2 Proof of Performance and Certification Requirements

A proof of performance demonstrating that the installation meets the requirements submitted to the Director, Broadcast Applications Engineering at least five work for regular operation.

The applicant shall provide evidence that the electromagnetic field extending out containing the signal distribution circuit does not exceed 15 uV/m at a distance

$$d = \frac{48,000}{f}$$

d = the distance in metres  
f = the frequency in kHz

from the property served. The measurements shall be taken in daylight using an engineer or technician experienced in this work. The readings shall be obtained 50 cm nor more than three metres above ground at 12 points spaced as equal around the property at or within the required distance d.

If there are overhead power cables or other wires connected to the property, read antenna directly under and in the same plane as the wires at the prescribed distance.

**Note:** Theoretically, at 100% efficiency, the field from a fraction of a mW could at the defined distance from the source.

The owner and operator of the system is responsible for ensuring that at the defined interfering signal from the carrier current system does not exceed the maximum does not cause interference to authorized radio services. In the event interference system shall promptly take steps to eliminate the interference and remedial measures to the extent of ceasing operation.

## B-9. Applications Based on Deletion of Assignments in the Plan (535-1 605 kHz Band)



**B-9.1 Deletion or Transfer of an Unused Assignment**

- B-9.1.1 Since a number of the unused Canadian assignments in the Plan were based on a general area, such assignments may be transferred to an alternate community if the criteria are met. The brief shall include a discussion of the assignments available.
- B-9.1.2 If an application is based on the deletion of an unused assignment, other than a general area, the applicant shall provide a detailed analysis demonstrating the unavailability of a satisfactory alternate assignment. The applicant shall:
- (a) demonstrate that adequate alternate assignments are available in the Plan;
  - (b) propose modifications to the Plan to replace the deleted assignment.

**B-10. On-Air Testing Procedure**

When the construction of the authorized facilities is complete, notice of on-air testing shall be given to the public (unless otherwise specified in the letter of authority) prior to transmission tests. Departmental permission shall be required for on-air testing.

During on-air tests, identification of the station shall be made, preferably at fifteen minute intervals, of the frequency and location of the station. In the case of rebroadcasting stations without capability to originate, the broadcaster will be responsible for making the public aware that the new station is being tested. As a condition of the license, the local press which would explain that the broadcaster should be contacted in the event of interference shall be notified. The broadcaster shall implement any instruction given by departmental representatives at the district, re

The required scope and duration of such on-air emission tests will depend to a large extent on the proximity of existing broadcasting stations or other radio services. Such details of the testing shall be agreed upon with the public after the issuance of the letter of authority.

Following successful on-air tests, the applicant's consultant shall certify to the Department that the tests were conducted in accordance with the approved technical submission and request permission to commence normal broadcasting.

**Section C: Technical Requirements for AM Broadcasting Stations in the 525-1 705 kHz Band**

This Section establishes the technical requirements to be followed in designing of AM broadcasting stations in the frequency band 525-1 705 kHz.

**C-1. Antennas and Ground Systems**

The design of an antenna system for a station shall conform to the following requirements:

- (a) vertical radiators shall be used under most circumstances; use of other types of radiators requires special consideration;
- (b) the height of vertical radiators should be at least 1/6 wavelength or equivalent, but not exceed 5 wavelengths;
- (c) top-loading of vertical radiators is sometimes used to increase the effective height. However, this affects the vertical radiation characteristics. If used, top-loading shall be symmetrical and not unbalanced. When top-loading is achieved by physical additions to the radiator (rather than using the guy wires), special consideration shall be given in assessing the structural adequacy;
- (d) structural adequacy requirements are in BPR-I, Section 2;

- (e) all antenna towers shall be painted and lighted in accordance with the requirements of the Department;
- (f) all antenna towers, transmission lines, etc., on which dangerous radio frequency voltages and currents are present shall be so marked as to preclude the possibility of accidental contact;
- (g) ground systems shall consist of at least 120 radial wires evenly spaced and radiating out from the antenna base. The design of the antenna system is such as to require other configurations. Radial wires shall not be buried under the ground. They should normally be buried no deeper than 20 cm in the ground for a distance not less than 0.25 m from the antenna base.
- (h) in selecting the site, every consideration should be given to the conductivity of the ground at the site. In laying the ground systems specified under this technical requirement in the Radiation Pattern, the difference in antenna base elevation of each tower shall not exceed 10% of the physical height of the tower.

## C-2. Ground Conductivities

C-2.1 The official ground conductivity values for Canada are contained in the issue of Industry Canada, *Conductivity Map for MF Broadcasting Band* dated January 1980.

The Map consists of five separate sheets labelled Atlantic Provinces, Quebec, Ontario, Prairie Provinces and Northwest Territories. Individual sheets or a complete set is available from the Radiocommunications and Broadcasting Centre, 300 Slater Street, Ottawa, Ontario, K1A 0C8.

C-2.2 An appropriate map for northern regions based on limited measured field strength data, geologic data and ground conductivity measurements in adjacent bands was prepared in 1985 and is available on request.

C-2.3 The official ground conductivity values for the USA are contained in the Federal Communication Commission, *Estimated Effective Ground Conductivity in the United States*.

C-2.4 For the above maps, the international border is considered as a conductivity boundary.

C-2.5 Conductivity values from the maps shall be used for all coverage and interference calculations, unless the applicant shows in accordance with Sections C-2.6 and C-2.7 to use other values.

C-2.6 Conductivity values other than map values will be considered in cases involving calculated interference where it can be demonstrated, as a result of extensive measurements, that interference is unlikely to occur. The applicant shall be made from the proposed antenna site, using a test transmitter if necessary. The location of the antenna shall be calculated using conductivity values from the map or from some other mutually agreed sources. The protected contour may be derived from the final proof of performance of the affected station.

C-2.6.1 An applicant proposing the use of conductivity values other than map values shall submit with one copy of the engineering brief or the appropriate parts thereof at the time of application to the Department.

C-2.6.2 The affected station shall, upon receiving a copy of the engineering brief proposing the use of conductivity values other than map values, either accept or object to the values used. The affected station shall advise the Department and the applicant in writing within 30 days from the receipt of the engineering brief. An objection may be made to the ground conductivity values used by the applicant, but the objection shall be completed. Failure to respond within the given time limit implies acceptance of the values used.

C-2.6.3 In the event that the affected station objects to the use of the conductivities involved, the applicant and the affected station shall be invited to participate in a measurement program approved by the Department. The two parties should reach an agreement as to the acceptable conductivity and the measurement program should be completed with the consent of both parties. In some cases, it may be necessary to repeat the measurements to take seasonal variation of conductivity into account. If agreement cannot be reached, the Department shall assess the application on the basis of the submissions by both parties and its own measurements.

- C-2.6.4 If an application is approved on the basis of other than map conductivity values been reached with the affected station, and if it can be shown that interference to the affected station shall immediately reduce the radiation towards the affected station. The reduction will be determined by calculations based on map conductivity values or interference measurements upon by both parties. If the appropriate reduction of radiation cannot be made by means of a directional pattern, it shall be made by reduction of power.

C-2.7 Until a better method is developed to allow for seasonal variation, measurements will have to be made at least two extremes, unless there is agreement from the affected broadcaster.

### C-3. Minimum Field Strength Requirements for Satisfactory Service to Metropolitan Areas

#### C-3.1 Requirements

In the selection of a transmitter site for an AM broadcasting transmitting station, the object is to provide satisfactory service to the metropolitan area<sup>9</sup> (in which the studio is normally located) and coverage to adjacent areas with a minimum of interference to and from other users of the radio spectrum. An intensity of 25 mV/m is desirable to provide a broadcast service to the business and/or factory areas, and a field intensity of 5 mV/m is required for a residential area.

#### C-3.2 Selection of Site

The power, antenna characteristics and location of an AM broadcast transmitting system shall be determined by the following:

- (a) the 5 mV/m contour and the usable field strength ( $E_u$ ) night-time contour, if it exceeds 5 mV/m in any area;
- (b) for proposals in which it is demonstrated that the requirement of C-3.2(a) cannot be met, the 5 mV/m contour shall enclose at least 50% of the metropolitan area;
- (c) proposals for accepting  $E_u$ 's greater than 25 mV/m shall be supported by sufficient data to justify the case.

### C-4. Skywave Protection Requirements

C-4.1 Chapter 4 of the Final Acts of the RAMFBS-R2 prescribes the protected contours for Classes A, B and C stations, and methods for calculating the skywave interference to skywave and groundwave service contours. The Canadian methods in Annex 2, Chapter 4.

C-4.2 It should be noted that when protecting assignments in Greenland, Saint Pierre et Miquelon, Mexico and the United States, interfering skywave signals to any of these countries is determined using the 10% skywave curves of the RAMFBS-R2. When protection to all other countries is determined, 50% skywave curves are to be used to protect against interfering signals.

C-4.3 In certain instances where skywave interference to groundwave service is being considered, if additional protection is required, and if the protected station is at a considerable distance from the new assignment, it is probable that the existing service contour would automatically provide acceptable protection to the night-time groundwave service contour. In such cases, the actual service contour. Technical submissions, predicated upon transmitter site protection or

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<sup>9</sup> A metropolitan area is considered to be any area where there are located in reasonably continuous fashion, industrial or residential buildings of ground normally referred to as building lots.

possible interference occurring within the night-time groundwave service contour, will be considered for correction.

C-4. The  $E_{\text{ref}}$ , and all interference levels shall be calculated using expanded (or modified, if applicable)

Stations in the 1 605-1 705 kHz band are required to protect co-channel allotment areas from Annex 4 of the draft Canada/USA Agreement, 1990 for Canada and U.S.A. and in Annex 1 of other countries, e.g. Greenland and St. Pierre et Miquelon.

## **C-5. Night-Time Protection of the Groundwave Service Area of all Stations against Interference from Adjacent Channel Stations (525-1 605 kHz Band)**

### **C-5.1 Protection**

C-5.1.1 Chapter 4 of both the RAMFBS-R2 and the Canada/USA Agreement, 1984, requires groundwave protection of the night-time service area to the 0.5 mV/m contour. This is the case in the AM band, and since it is not considered necessary to offer a greater degree of protection by adjacent channel stations than that from co-channel stations, a relaxed rule applies only. This rule relaxes the night-time protection criteria of the adjacent channel stations in consideration of the co-channel interference.

### **C-5.2 Night-time Protected Contour**

C-5.2.1 For the purpose of calculating the allowable interference signal from an adjacent channel station, the night-time protected groundwave contour is determined as follows:

- (a) for Class A stations, the night-time protected groundwave contour is the 0.5 mV/m contour
- (b) for Class B and Class C stations the night-time protected groundwave contour is the 0.5 mV/m contour or the contour corresponding to 20% of the  $E_{\text{ref}}$ , whichever is lower.

### C-5.3 Permissible Interference Level

C-5.3.1 The maximum level of interfering groundwave signal on the night-time protect station is as follows:

Frequency separation between stations	Maximum level of interfering groundwave signal
10 kHz	0.5 mV/m
20 kHz	15.0 mV/m

## C-6. Groundwave and Skywave Protection Requirements (1 605-1 705 kHz Band)

### C-6.1 Protection Between Canadian Stations

In general, the protection criteria between assignments in the 535-1 605 kHz band a

C-6.1.1 The day-time 0.5 mV/m contour is protected from groundwave interference using adjacent channel or second adjacent channel protection ratio.

C-6.1.2 The night-time  $E_u$  or  $E_{nom}$  (whichever is the higher value) contour is protected fr

C-6.1.3 The night-time 20%  $E_u$  or  $E_{nom}$  (whichever is the higher value) contour is protect groundwave interference as in C-5.

C-6.1.4 The 25 mV/m contours of third adjacent channels shall not overlap.

### C-6.2 Protection to Foreign Allotments

C-6.2.1 Stations in the 1 605-1 705 kHz band are required to protect the entire allotmen channel skywave and groundwave interference and from second adjacent chan

C-6.2.2 Protection requirements to first adjacent channel allotments from proposed stati found in the Rio 1988 Agreement. Since all allotments along the Canada/USA l there was a need to allow for different rates of usage, the Agreement provides g protection to priority allotments, and equal access to other allotments. While the 1990 contains the same technical criteria for first adjacent channel protection, tl Arrangement allows for the application of more stringent criteria (unspecified) d "improvement" studies in both countries.

## C-7. Protection between the 535-1 605 and 1 605-1 705 kHz Bands

C-7. In general, the draft Canada/USA Agreement, 1990 requires that assignments in the 535-1 605 605-1 705 kHz band be protected as if the proposed station were in the same band as the protecte

C-7. The same provision will apply for protection between Canadian stations, but Canadian allotmen taken into consideration by Canadian proposals on 1 580-1 600 kHz, since that would completely channels.

## C-8. "Lock-In" of the Groundwave Service Area of Second Adjacent Channel Stations



Due to the congestion of stations in some areas, it may not be possible to avoid an image relation. The Department would be prepared to consider a proposal predicated on an image relation where the 30:1 field strength ratio is exceeded in a small and sparsely populated area so that the receivers of an effective programme of adjustment of receiver intermediate frequencies could be successful and financial responsibility lies with the applicant of the incoming station having the most stations. A new station or an existing station applying for a change in facilities, except as follows:

- (a) where a 900 kHz frequency separation already exists between stations;
- (b) where the station on the lower frequency accepted an area where the 30:1 field strength ratio is exceeded in a notification of its present operation.

In the latter cases, the responsibility of the station on the higher frequency is limited to reception under the general commitment in the application form.

## **C-10. Assessment and Control of Maximum Field Strength of AM Broadcasting Stations**

### **C-10.1 Introduction**

Service requirements and constraints related to the siting of AM broadcasting stations may be more stringent in densely populated areas. Under these conditions, AM receivers, as well as other radio frequency devices, may be subject to intermodulation and cross-modulation interference. High field strength levels may also cause interference to other frequency devices. To avoid or to minimize such problems, it is necessary to assess the potential for such interference.

### **C-10. Purpose**

The purpose of this sub-section is to:

- identify the analysis required from applicants in determining interference potential,
- define the responsibilities of the broadcasters in response to interference complaints,
- detail the procedure to be followed by applicants in notifying local municipal authorities (refer to Section C-10.4.2).

The requirements of this Section apply to all applications for the issue or amendment of broadcast AM broadcasting stations.

### **C-10. Requirements for Interference Analyses and Population Estimates**

In addition to the departmental requirements contained in Section B-2 pertaining to the environment, the requirements per Sections C-10.3.1 and C-10.3.2 are required. In specific cases, the Department may accept alternative measures for stations, multiplexed or otherwise.

#### **C-10.3.1 New Stations and Changes to Existing Stations**

An applicant for a new station or for changes to an existing station shall demonstrate that the antenna pattern and the power of the station is in compliance with the following:

- (a) the population within the day or night 250 mV/m contour shall not exceed the population within the transmitter power. For example, for 10 000 watts, the population should not exceed 1000 people;
- (b) the population enclosed by the day or night 250 mV/m contour shall not exceed the population within the centre to be served; and
- (c) the population within the day or night 1 V/m contour should be less than 0.5 times the population within the 5 mV/m contour.

#### **C-10.3.2 Special Cases**

Special case consideration may be given to a new station or changes to an existing station if the limits listed in C-10.3.1 are exceeded, particularly when the limits are already satisfied by the population. In such cases, the applicant shall:

- (a) submit a study, prepared by a broadcast consultant, to show possible receive and cross-modulation products that coincide with the frequencies of other radio stations within the station's 1 V/m and 250 mV/m contours;
- (b) undertake to reduce the power of the station to a level stipulated by the Department in the event of a number of complaints which cannot be resolved satisfactorily; and
- (c) provide recent aerial photographs showing pertinent residential and industrial areas.

An applicant proposing changes to the facilities of an existing station, shall submit a plan showing the previous facilities in the event of interference developing.

### **C-10. Broadcaster's Responsibilities**

The broadcaster will accept responsibility to:

- remedy *valid* complaints of interference caused by the station to radio frequency devices (refer to Section C-10.5 for list of complaints judged *not valid* by the Department), and



- provide technical advice to complainants, located between the 250 mV/m contour and the concerning appropriate action to resolve interference problems attributed to the station, a
- provide technical advice to complainants to resolve interference problems concerning rece:
  - (a) the interference is to a previously received local station which is separated by  $\pm 40$  kHz and
  - (b) the interference occurs on a route regularly travelled (at least twice weekly) by the co km is enclosed by the 1 V/m contour;
- keep the appropriate district office of the Department fully informed of all complaints rece

At a future date, and following the development of radio frequency immunity standards for broadcaster will be responsible for remedying *valid* complaints of interference caused by the

#### **C-10.4.1 Broadcaster's Commitment**

To acknowledge the responsibility of the broadcaster with respect to the high fie applicants shall submit the following commitment to the Department:

"In the event a broadcasting certificate is issued as a result of this application, tl certificate agrees to take prompt and appropriate action to correct overload and/ any other type of interference to radio frequency devices inside the 250 mV/m cc corrective costs involved, unless such complaints are of a type judged *not valid* b Where interference occurs in areas between the 250 mV/m contour and the serv. holder of the broadcasting certificate agrees to provide technical advice to compl appropriate remedial action to resolve interference problems attributed to the sta

#### **C-10.4.2 Notifying the Local Municipality**

An applicant for a new station or for changes<sup>10</sup> to an existing station shall submit municipality(ies) (all municipalities with an area enclosed by the 250 mV/m cont to operate an AM broadcasting station in the area. The purpose of this notice is authority with an opportunity to consider the implication of the proposed antenn municipal authority may file a written objection to the proposed facilities with tl District Office. The applicant and the municipal authority shall resolve all muni Failing this, the Department will consider all factors pertaining to the applicatio comments, and render a final decision.

The notice shall include the following information:

- (a) a statement to indicate that a broadcasting station is planned for the munici the operation of the station would be subject to federal regulations for which the CRTC and a broadcasting certificate from Industry Canada are required
- (b) a sketch of the building, the proposed tower(s) and antennas, with sufficient a pictorial representation of the total structure;
- (c) a map showing the transmitter site and the location of the 250 mV/m contou by a statement to say that should interference to radio frequency devices occ applicant would be responsible for corrective action in remedying the compla complaints are deemed to be *not valid* by the Department. A list of complaint *not valid* by the Department is given in Section C-10.5, and shall be include

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<sup>10</sup> Changes to existing stations that do not modify the structure and its attachments nor change the location of the 250 m notified.

In addition, the statement shall indicate that the applicant will provide appropriate remedial action to resolve *valid* complaints of interference caused by the station that originate from the area between the 250 mV/m contour and the station's service contour;

- (d) a statement to indicate that, if subsequent building development occurs inside the service contour which could give rise to interference complaints or if new or existing devices are located inside the contour, the applicant would not be expected to assume responsibility for such devices; and
- (e) a statement to indicate that the performance of some radio frequency, as well as other services, may be degraded by high signal strengths from the station because of inadequate or improper shielding of the devices.

The notice is to be filed with each municipal authority with sufficient lead time to avoid the negative impact of the proposal. Insufficient lead time could delay the processing of the application and may also cause the CRTC to reschedule this item for a later Public Hearing. The notice must be filed with the Department's headquarters office.

### C-10.4.3 Sharing of Responsibility

Within the 250 mV/m contour of co-located or near co-located AM stations, should problems of overloading, blanketing or intermodulation interference or cause such other broadcasting stations, all stations involved shall assume their appropriate remedy such problems.

### C-10.5 List of Complaints Judged Not Valid by Industry Canada

The following list identifies the types of complaints judged *not valid* by the Department and responsible for remedial action:

- (a) where the complaint is attributed to the use of a malfunctioning or mistuned receiver or antenna system;
- (b) where the complaint involves non-radio frequency devices such as computers, microprocessor tape recorders, record or disc players, electronic organs, telephones, hi-fi amplifiers, gar
- (c) where the complaint is attributed to the desired signal being received at a location outside
- (d) where the complaint is attributed to the desired signal not being favourably received because of conditions or building penetration losses;
- (e) where the complaint involves the reception of signals originating from outside of Canada;
- (f) where the complaint involves the malfunction of radio frequency devices that are located where the devices were introduced within the contour *after* the station started operating with the
- (g) where the complaint involves a high gain receiving antenna and/or an antenna booster that receives signals from distant stations which, as a consequence, overloads the receiver or creates intermodulation
- (h) where the complaint is attributed to overload interference in radio receivers that are located
- (i) any other complaint which, in the judgement of the Department, is considered *not valid*

### C-11. Intermodulation and Cross-Modulation Interference

C-11. When transmitting stations operate in close proximity to each other, there is a possibility of intermodulation and/or cross-modulation at transmitting installations. In selecting a site for a station, every precaution should be taken to avoid any transmitter within the 250 mV/m contours of another transmitter. Although it is possible to avoid intermodulation strengths from nearby stations, in practice, these would become special cases.

C-11. When the 250 mV/m contour of a proposed station, or change in facilities of an existing station, station, the Department requires that the applicant's broadcast engineering consultant study the possibility of intermodulation and distortion of the antenna pattern of the other station. If found necessary, suitable measures should be involved to reduce the interference or distortion to an acceptable level. The applicant will bear the cost of revenue resulting from a station having to suspend operation while remedial action is being taken.

### C-12. Departures from International Agreements for Domestic Use in Canada

In certain proposals for broadcasting stations, the design of the transmitting facilities is in accordance with the ITU-R Recommendation, the RAMFBS-R2, the Rio 1988 Agreement and the Canada/USA Agreements, but, under a strict interpretation, a departure from the accepted criteria. An example is the case of a protected service contour over a terrain with no resident population, where the presence of an interfering signal greater than the specified level is not considered a departure from the accepted criteria.

service. Protection of such areas may require high cost complex installations and, where that may not be the case, coverage for Canadian stations may result.

Therefore, the Department would be prepared to consider such proposals but only where protection is required and that the engineering brief presents adequate justification including the following:

- (a) a detailed analysis demonstrating the unavailability of satisfactory alternative;
- (b) a documentary evidence as to the extent of resident population within the area of proposed interference;
- (c) a list of stations normally received in the affected area;
- (d) a detailed analysis concerning the departure from the limiting boundary conditions;
- (e) a statement from the licensee of any station affected agreeing to the interfering condition as described.

However, the departure from recognized technical requirements, and its effect on existing stations, will be considered to determine whether the application would be acceptable for processing.