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Interference-Causing Equipment Standard

Cable Distribution Networks

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Preface

Interference-Causing Equipment Standard ICES-008, Issue 1, *Cable Distribution Networks,* replaces BPR-8, Issue 2, *Application Procedures and Rules for Broadcasting Receiving Undertakings (Cable Television),* published in January 2009.

This document will be in force upon its publication on Industry Canada's website. Upon publication, the public has 120 days to submit comments. Comments received will be taken into account in the preparation of the next issue of the document.

Issued under the authority of
Industry Canada

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Contents

1. Scope

This Interference-Causing Equipment Standard sets out the limits and methods of measurement for cable distribution networks. A cable distribution network shall, under all environmental conditions, meet the requirements detailed in this document.

2. Related Documents

In addition to related documents specified in RSS-Gen, *General Requirements for Compliance of Radio Apparatus*, the following document should be consulted:

> CPC-3-13-02, *Provision of Interference Identification and Resolution Services on a 24/7 Basis for NAV CANADA*

Industry Canada documents are available on the Spectrum Management and Telecommunications website at www.ic.gc.ca/spectrum, under *Official Publications*.

3. Definitions

Cable distribution network denotes the equipment and facilities leased or owned by a cable operator, which are used within or near the service area to receive, process, produce and broadcast programs and services to subscribers.

Class I television signals denote signals from local and regional television stations.

Cumulative Leakage Index (CLI) denotes an estimate of the cumulative impacts of leakage on aeronautical spectrum users. When the signal leakage measurements are taken on the ground, the CLI ground-based criterion (CLI_g) is used. If the measurements are taken in the airspace above the cable distribution network, the CLI air-based criterion (CLI_a) is used to estimate these impacts.

CLI air-based criterion (CLI_a) denotes a signal leakage criterion used to estimate, from measurements taken in the airspace above the cable distribution network, the cumulative impacts of signal leakage on aeronautical frequency users. This performance criterion applies to cable distribution networks carrying channels A-1(99), A-2(98), EE(41) and FF(42). The CLI_a's limit is defined in Section 6.2 of this document.

CLI ground-based criterion (CLI_g) denotes a signal leakage criterion used to estimate, from measurements made on the ground, the cumulative impacts of signal leakage on aeronautical frequency users. This performance criterion applies to cable distribution networks carrying channels A-1(99), A-2(98), EE(41) and FF(42). The CLI_g's limit and the formula to calculate it appear in Section 7.3 of this document.

Equivalent Leakage Density (ELD) is a criterion for evaluating cable distribution network leakage performance and its potential impacts on spectrum users operating radio systems on land, i.e. police, ambulance services, etc. The ELD is calculated from measurements using the formula that appears in Section 7.2 of this document.

Frequency Stability denotes the ability of a cable system to maintain a carrier at its assigned frequency under all environmental conditions and power supply variations. For the purposes of this document, an interval of at least six hours is required to verify compliance with any frequency stability requirement.

Harmful interference denotes an adverse effect of electromagnetic energy from any emission, radiation or induction that endangers the use or functioning of a safety-related radiocommunication system, or significantly degrades or obstructs, or repeatedly interrupts, the use or functioning of radio apparatus or radio-sensitive equipment.

Local AM station denotes, in relation to a cable television system, any AM broadcasting station, located in Canada, whose main studio is located within 32 kilometres of the local head-end where the majority of local and regional off-air signals are received.

Local FM station denotes, in relation to a cable television system, any FM broadcasting station located in Canada whose 500 microvolts per metre official contour encloses any part of the service area of the cable television system.

Restricted FM channel denotes an FM channel, also used by an FM radio broadcaster, which coincides with another channel over which signals are transmitted by any FM station whose official 500-microvolts-per-metre contour encloses any part of the service area.

Restricted television channel denotes any television channel, also used by a television broadcaster, which coincides with another channel over which signals are transmitted by any television station, whose Grade A or digital urban contour covers any part of the service area.

Service area denotes the zone or territory within which a cable television system is able to provide service to subscribers.

Signal leakage or leakage denotes all electromagnetic energy escaping from a cable distribution network.

Subscriber denotes, in the case of a cable distribution network, the end-user of a signal distributed by a cable distribution network.

Supplementary channels denote all the channels designated as follows:

(a) sub-low band: under 54 MHz;
(b) mid-band: from 108 MHz to 174 MHz;
(c) super-band: from 216 MHz to 300 MHz;
(d) hyper-band: from 300 MHz to 1000 MHz.

The 90^{th} percentile value of the field strength denotes, when all cable leakage data collected above a cable distribution network are ranked in ascending order, the maximum field strength reading of the group composed of 90% of all the collected data.

4. Design Requirements

4.1 Requirements Regarding International Emergency Frequencies and Aeronautical Marker Beacons

4.1.1 Cable signals shall not exceed 10^{-5} watts on average across a 25 kHz bandwidth in any 160 μsec period at any point in the cable distribution network within 100 kHz of the international emergency frequency of 121.5 MHz and the aeronautical marker beacon of 75 MHz. In addition, cable signals shall not exceed 10^{-5} watts on average across a 25 kHz bandwidth in any 160 μsec period within 50 kHz of the emergency frequency 243 MHz and the emergency frequency band 406-406.1 MHz, at any point in the cable distribution network.

4.1.2 For systems operating in the vicinity of maritime mobile service stations, cable signals shall not exceed 10^{-5} watts on average across a 25 kHz bandwidth in any 160 μsec period within 50 kHz of the international distress, safety and calling frequency 156.8 MHz, at any point in the cable distribution network.

4.2 Offset

All carrier signals or signal components equal to or greater than 10^{-5} watts must be operated at frequencies offset from aeronautical services in accordance with the following table:

Table 1 — Offset Requirements

CATV Channel	Frequency (MHz)	Video Carrier (MHz)	Audio Carrier (MHz)	Offset (MHz)
98 (A2)	108-114	109.250	113.750	+0.025
99 (A1)	114-120	115.250	119.750	+0.025
14 (A)	120-126	121.250	125.750	+0.0125
15 (B)	126-132	127.250	131.750	+0.0125
16 (C)	132-138	133.250	137.750	+0.0125
41 (EE)	324-330	325.250	329.250	+0.0125
42 (FF)	330-336	331.250	335.750	+0.025

No offset is required for random-type cable signals (e.g. QAM) with a mean power level < 10^{-4} W on average across a 25 kHz bandwidth in any 160 μsec period (38.75 dBmV in 75Ω). Offsets already in use will be grandfathered unless interference occurs, in which case, a new offset may be required.

4.3 Restricted Television Channels

4.3.1 Class I television signals and community programming must not be carried on restricted channels.

4.3.2 Section 4.3.1 notwithstanding, use of restricted channels to distribute Class I television signals and community programming shall not impair the over-the-air television signal quality.

4.4 Restricted FM Channels

4.4.1 Signals from local FM and AM stations must not be carried over restricted FM channels.

4.4.2 Section 4.4.1 notwithstanding, use of restricted FM channels shall not impair the over-the-air FM signal quality.

5. Instrumentation

The following section outlines the instrumentation required for measuring radio noise produced by cable distribution networks. The calibration of the equipment shall be carried out at intervals determined by the manufacturer or at shorter intervals.

5.1 Instrumentation for Equivalent Leakage Density (ELD) and CLI Ground-Based (CLI_g) Measurements

5.1.1 The following equipment for performing ELD and CLI_g measurements is required:

(a) a half-wave dipole antenna
(b) a field strength meter (FSM), spectrum analyzer or leakage receiver
(c) a patrol vehicle

5.1.2 It is recommended that the field strength meter (or another instrument used to detect leaks) have the following minimum characteristics:

(a) sensitivity	< 2 μV (−100 dBm)
(b) tuning resolution	1 kHz
(c) intermediate frequency (IF) bandwidth at −6 dB	< 50 kHz
(d) measurement accuracy	± 2 dB

5.1.3 In addition, the frequency stability of the receiver shall be sufficient to make frequency readjustments during the patrol unnecessary.

5.2 Instrumentation for CLI Air-Based Criterion (CLI_a) Measurements

5.2.1 Direct airborne measurement of the strength of the electromagnetic field present above a cable distribution network requires the use of a measurement system especially designed for this purpose. The following list of required equipment is generic and applies to any measurement system capable of direct field measurement from the air:

(a) a signal generator
(b) a receiver connected to a portable computer
(c) an antenna system
(d) a ground navigation system
(e) an aircraft

5.2.2 It is recommended that the receiving system be able to detect signals of less than −100 dBm to ensure that the field readings are accurate.

5.3 Instrumentation for Continuous Monitoring Measurements

5.3.1 The following equipment is required for performing ELD and CLI_g measurements:

(a) a quarter-wave monopole antenna
(b) a leakage detector
(c) a GPS-based recording device equipped with wireless communication (Wi-Fi or cellular)
(d) a sufficient number of equipped vehicles
(e) a geographical information system (GIS) database application

5.3.2 Radio frequency (RF) leakage detector technical requirements:

(a) sensitivity	< 2 μV (−100 dBm)
(b) tuning resolution	1 kHz
(c) IF bandwidth at −6 dB	< 10 kHz
(d) measurement accuracy	± 2 dB
(e) measurement speed	> 100 readings/sec

6. Measurement Methods

The following section outlines the measurement method for measuring radio noise produced by cable distribution networks. Measurement methods based on the use of different equipment or techniques may be used to verify system compliance provided that they are in accordance with good engineering practices.

6.1 Measurement Procedures for Systematic Leakage Patrols

The measurements shall be performed when the cable distribution network operates under normal operating conditions. As much as possible, this measurement should not be carried out when it rains.

6.1.1 Set-up

6.1.1.1 Before the patrol begins, the antenna should be tuned to the visual carrier frequency of a mid-band channel, preferably channel A, B or C. If this is not feasible, a dedicated test signal may be inserted and used for leakage detection. Refer to Section 4.2.

6.1.1.2 The reference level used for leakage measurements should always be the highest level of mid-band signal carried on the network. This would be the highest video carrier for analog networks or the highest QAM signal level for all digital networks.

6.1.1.3 The antenna shall be installed on top of the patrol vehicle, at a height of at least one metre above the roof. The antenna elements shall be oriented along the horizontal (front-to-back) axis of the vehicle to detect signals from either side of the street.

6.1.1.4 The calibration and operation of the measuring equipment defined in Section 5.1 of this document shall be checked before each patrol.

6.1.2 Readings

6.1.2.1 For manual readings, the patrol vehicle shall be driven slowly (i.e. at no more than 20 km/hour) so that low-intensity signals can be detected. When a leak is detected, the vehicle shall be positioned and/or the antenna oriented in such a way as to obtain a maximum field strength reading. This value is recorded in μV/m. It shall also be noted whether the leak is coming from a front- or rear-lot plant.

6.1.2.2 For systems equipped with a GPS-based automatic recording device, the speed of the patrol vehicle is only limited to the desired position accuracy (normally 10 m/sec or 36 km/hour).

6.1.2.3 The total distance in kilometres travelled by the patrol vehicle shall be noted.

6.1.3 Correction Factors

6.1.3.1 To take into account the distance between the antenna and the cable leak, a correction factor of 10 dB shall be added to the field strength measurements of leaks originating from rear-lot cable plants.

6.1.3.2 No correction factor shall be added to field measurements of leaks from front-lot cable plants. In such cases, the vehicle shall be driven as close as possible to the cable leak while attempting to maintain a distance of 3 metres between the antenna and the cable.

6.1.3.3 All factors influencing field strength readings, such as the antenna factor, losses in the cable linking the antenna to the field strength meter, mismatch losses and amplifier gain, if any, shall be evaluated. All these correction factors shall be taken into account to obtain the final field strength measurements and are in addition to the correction for distance.

6.1.3.4 For the purposes of ELD and CLI_g calculations, only leaks equal to or greater than 50 μV/m need to be taken into account.

6.1.4 Patrol Strategy

6.1.4.1 The measurement patrol shall cover at least 25% of the entire cable distribution network. The following five-step patrol strategy has been designed to ensure that the measurement method is reliable:

Step 1

Identify the various cable distribution network sectors on a map of the cable distribution network. These sectors may be identified as the oldest sectors in the system, newer sectors, underground distribution sectors, aerial distribution sectors, etc.

Step 2

Each sector identified in this way shall then be subdivided into smaller zones, in accordance with the natural divisions of the city, such as main streets, residential areas, etc.

Step 3

Next, samples from a subset of zones in each sector shall be selected by the operator of the cable distribution network for leakage measurement. The sample area shall represent at least 25% of the total surface area of a given sector so as to provide an acceptable representative reading of the leakage in that sector.

Step 4

Each sample area selected shall be patrolled completely (i.e. every street where single and/or multiple cables are installed shall be covered).

Step 5

Add together the sample surface areas patrolled in each zone. When added together, the total patrolled surface area shall equal at least 25% of the total service area of the cable distribution network.

6.1.4.2 If the above patrol strategy is not used, at least 75% of the system's total surface area shall be patrolled.

6.1.4.3 As much as possible, the time period for completion of the measurement should not exceed four consecutive weeks to ensure accuracy of ELD and CLI_g calculations.

6.1.4.4 Field readings and the distance patrolled shall then be used to calculate the ELD according to the formula described in Section 7.2.2.

6.1.5 System Boundaries

6.1.5.1 The dimensions of the cable distribution network, in square kilometres (km^2), shall be obtained in order to calculate the CLI_g. The system dimensions correspond to the geographic surface area covered by the system. This surface area may be measured using a geographic map, drawn to scale, showing the boundaries of the cable distribution network service area.

6.1.5.2 Unserved areas, such as city parks and industrial parks (i.e. completely surrounded by the service area and representing only a small fraction of the overall cable distribution network area), are usually included in the surface calculation and considered to be leak-free areas for patrol purposes.

6.1.5.3 Areas demarcated by long rural branches (e.g. a cable serving a rural route) are usually included in the surface area calculation. A standard width of one kilometre should be used when the width of the trunk or branch is too narrow to be measured on the map.

6.1.6 CLI Measurements

6.1.6.1 To ensure accuracy, the time period for completion of the CLI measurement should not exceed four consecutive weeks, whenever practicable.

6.1.6.2 The field readings and the surface of all the areas considered and patrolled are then used to calculate the CLI_g, according to the formula described in Section 7.3.1.

6.1.6.3 If the CLI_g is close to the limit of 64, it will be necessary to increase the surface patrolled until the definitive CLI_g can be positively confirmed (i.e. until it is established that the CLI_g is indeed above or below 64).

6.1.6.4 There may be cases where the CLI_g for a given system is extreme (i.e. either very high or very low). In such cases, it may not be necessary to complete a patrol of 25% of the cable distribution network surface to determine that the CLI_g is definitely above or below the limit of 64.

6.2 Measurement Procedures for Continuous Leakage Monitoring Systems

Continuous leakage monitoring equipment must be installed in operators' service vehicles that are most subject to cover the entire network service areas.

6.2.1 Set-up

6.2.1.1 The number of vehicles equipped with the continuous leakage monitoring system must be sufficient to cover at least 75% of the network area every three months.

6.2.1.2 The equipment should be tuned to the visual carrier frequency of a mid-band channel, preferably channel A, B or C. If this is not feasible, a dedicated test signal may be inserted and used for leakage detection. Refer to Section 4.2.

6.2.1.3 The reference level used for leakage measurements should always be the highest level of mid-band signal carried on the network. This would be the highest video carrier for analog networks or the highest QAM signal level for all digital networks.

6.2.1.4 The antenna shall be installed on top of the service vehicle and positioned in order to avoid any RF obstruction.

6.2.1.5 The calibration and operation of the measuring equipment outlined in Section 5.1 of this document shall be checked regularly.

6.2.2 Readings

6.2.2.1 Continuous leakage monitoring equipment must be always monitoring the network leakage while technicians are performing their daily work routine. The continuous leakage monitoring equipment should not require user intervention to operate.

6.2.2.2 For each detected leak, the system must record the following information:

(a) leak level (μV/m)
(b) frequency (MHz)
(c) leak position (latitude-longitude)
(d) date and time
(e) vehicle ID

6.2.3 Correction Factors

6.2.3.1 When using a quarter-wave monopole antenna, an antenna correction factor of 6 dB should be applied in order to compensate for a half-wave dipole gain.

6.2.3.2 The system should apply a 10 dB correction factor for leaks detected in back-lot cable plant areas. If the network location is not available, a correction factor of 5 dB shall be added to the measurement of every leak, to take into account an average distance between the antenna and the cable leak sources.

6.2.3.3 For the purposes of ELD and CLI_g calculations, only leaks equal to or greater than 50 μV/m need to be taken into account.

6.2.4 Leakage Monitoring GIS Application

6.2.4.1 The recording devices of the continuous leakage monitoring systems should automatically transmit the recorded leaks information to a central GIS database application.

6.2.4.2 The GIS database application must have the following basic functionalities:

(a) display leaks locations on the city map
(b) produce detailed leak status reports
(c) produce summary leakage status reports per the technical construction and operation certificate (TC&OC) or city areas
(d) display vehicle travel route for specific period of time
(e) calculate the percentage of covered area
(f) automatically calculate and update ELD and CLI_g results

6.2.5 System Boundaries

6.2.5.1 The dimensions of the cable distribution network, in square kilometres (km^2), shall be obtained in order to calculate the CLI_g. The system dimensions correspond to the geographic surface area covered by the system. This surface area may be measured using a geographic map, drawn to scale, showing the boundaries of the cable distribution network service area.

6.2.5.2 Unserved areas, such as city parks and industrial parks (i.e. completely surrounded by the service area and representing only a small fraction of the overall cable distribution network area), are usually included in the surface area calculation and considered to be leak-free areas for patrol purposes.

6.2.5.3 Areas demarcated by long rural branches (e.g. a cable serving a rural route) are usually included in the surface area calculation. A standard width of one kilometre should be used when the width of the trunk or branch is too narrow to be measured on the map.

6.3 Measurement Procedures for CLI Air-Based Criterion (CLI_a)

The purpose of airborne measurement is to obtain the 90^{th} percentile value of the field strength at 450 metres (1,500 feet) above a cable distribution network, using equipment on board aircraft designed and calibrated for this purpose. These measurements shall be performed when the cable distribution network is operating under normal conditions.

6.3.1 Carrier

6.3.1.1 A selected carrier, recommended within the aeronautical band 108-137 MHz, should be introduced into the cable distribution network for aerial detection purposes. When measuring the airborne field above cable distribution networks, interference from signals transmitted by aircraft or control towers may occur.

6.3.1.2 The introduced carrier shall remain unmodulated and be maintained at the root-mean-square (r.m.s.) peak power level of the highest carrier transmitted over the system being tested.

6.3.2 Antenna

6.3.2.1 The antenna should be tuned to the selected measurement frequency, and shall be horizontally polarized, parallel to the body of the aircraft. In addition, the antenna's performance should not be hindered by its installation on the body of the aircraft or its connection to the measuring equipment. To accomplish this, the antenna shall be mounted as far as possible from any large metallic sections of the aircraft and shall have an unobstructed line of sight to the ground.

6.3.2.2 The antenna and receiving system should be calibrated at regular intervals. The calibration procedure should be done by measuring, at an altitude of 450 metres, a 10 μV/m field transmitted by a ground-based antenna system.

6.3.3 Aircraft

6.3.3.1 The aircraft shall fly at an altitude of 450 or 900 metres. A correction factor of 1 dB shall be added to data when readings are taken at 900 metres.

6.3.3.2 The aircraft shall fly a grid pattern over the system being tested. The grid legs should be spaced approximately 1 km apart and shall not exceed 1.5 km at an altitude of 450 or 900 metres.

6.3.3.3 The aircraft flight speed and the sampling rate of the data collection instrument shall be adjusted so that, on average, at least one valid reading is taken for every 100 metres or less of air travel. Any suitable method may be used to record and present readings provided that the data for each flight path are made available.

6.3.4 System Boundaries

6.3.4.1 The operator shall make sure to clearly identify the cable distribution network boundaries to avoid gathering data outside the service area.

6.3.4.2 All data gathered from outside the system boundaries shall be eliminated before the 90^{th} percentile of the field strength is calculated.

6.3.4.3 For the purposes of this measurement, the exterior boundaries of the service area are defined as being located at approximately 500 metres beyond the end of the trunk or distribution network at the periphery of the service area.

6.3.4.4 For long in-line trunk networks feeding outlying areas with little or no service along the path of the trunk, the system boundaries are set at no more than 500 metres on either side of the trunk in question.

6.3.4.5 Finally, the CLI_a shall be calculated and shall not exceed the limits set forth in Section 7.3 of this document.

7. Limits

7.1 Leakage Criteria

7.1.1 The following limits or leakage criteria are used to confirm cable distribution network leakage performance.

7.1.2 The ELD criterion ensures that all cable distribution networks meet a leakage performance requirement intended to minimize interference to land-based radio systems.

7.1.3 The CLI for ground-based criterion (CLI_g) and air-based criterion (CLI_a) apply only to cable distribution networks carrying channels A-1(99), A-2(98), EE(41) and FF(42).

7.2 Equivalent Leakage Density (ELD)

7.2.1 For the purposes of calculating the ELD, leakage readings are classified into three categories, each of which has its corresponding weighting factor, as shown in the table below.

Table 2 — Leakage Categories

Leakage Category	Value (µV/m at 3 m)	Weighting Factor
A	50 - 200	1
B	201 - 500	2
C	> 500	3

7.2.2 The ELD is calculated using the following formula:

$$ELD = \frac{(N_1 x 1) + (N_2 x 2) + (N_3 x 3)}{K} \quad \text{(number of leaks/km)}$$

where:

ELD = Equivalent Leakage Density
N_1 = Number of leaks in Category A (50-200 µV/m)
N_2 = Number of leaks in Category B (201-500 µV/m)
N_3 = Number of leaks in Category C (>500 µV/m)
1 = Category A weighting factor
2 = Category B weighting factor
3 = Category C weighting factor
K = Number of kilometres patrolled

7.2.3 For the purposes of ELD calculations, only leaks equal to or greater than 50 µV/m at 3 metres need to be taken into account. The ELD value shall not exceed 0.8 leaks/km.

7.3 CLI Ground-Based Criterion (CLI_g)

7.3.1 The CLI_g is calculated using the following formula:

$$CLI_g = 10\log\left\{\frac{S}{D}\sum_{i=1}^{N} E_i^{\,2}\right\} + F(S)$$

where: $F(S) = 10\log\left\{\frac{91}{S}\left[\log(1+\frac{S}{28})\right]\right\}$

where:

CLI_g = CLI ground-based criterion, taking into account the surface area of the system
F(S) = correction factor for the surface area
E_i = field strength of the i^{th} leak measured at 3 metres, in μV/m
S = surface area covered by the cable distribution network, in km^2
D = surface area patrolled, in km^2
N = number of leaks detected

7.3.2 Although all leaks, regardless of magnitude, should be repaired, it is not necessary to consider leaks of less than 50 μV/m at 3 metres when calculating the CLI_g. However, the computed CLI_g must not exceed 64.

7.4 CLI Air-Based Criterion (CLI_a)

7.4.1 The CLI_a is the 90^{th} percentile value of the field strength due to cable leaks and shall not exceed 10 μV/m r.m.s. at an altitude of 450 metres above the cable distribution network's average ground level.

8. Test Report

8.1 A test report shall be compiled, which provides a record of the tests and results demonstrating compliance with this standard's technical requirements. The test report shall indicate the date that the tests were completed. The tests shall be repeated every two (2) years.

8.2 The test report shall be retained by the operator of the cable distribution network, and shall be made available to Industry Canada upon request, using a commonly used file format. The report shall contain the date(s) on which the test(s) began and ended, as well as the measurement results required to demonstrate compliance with the technical requirements. The date(s) of the tests included in the test report shall be within two years of the date of the request.

9. Determination of Harmful Interference

Operators of interference-causing equipment should be aware that even when they comply with all requirements of the *Radiocommunication Act*, the *Radiocommunication Regulations* and this technical standard, operators should take all practical steps to minimize the likelihood of interference occurrences.

In regard to aeronautical frequency bands, Industry Canada will respond in a timely manner to interference complaints received by NAV CANADA, in accordance with CPC-3-13-02, *Provision of Interference Identification and Resolution Services on a 24/7 Basis for NAV CANADA*.

With respect to other frequency bands, the Department will not normally respond to a request from a complainant to make a formal determination of harmful interference unless it can be demonstrated that all other reasonable courses of action to resolve the problem have been explored. Industry Canada fully expects complainants and operators of interference-causing equipment to cooperate with one another in order to resolve possible interference issues.

As a last resort, the Department may decide to make a determination of harmful interference. When the Minister of Industry is called upon for the determination of harmful interference, the operator of the allegedly interference-causing equipment may be required to submit a record of the measurements and the results of such equipment to the Minister for examination. If the cable distribution network is found to cause harmful interference to radiocommunication, the operator of the interference-causing equipment shall immediately take corrective action. When the harmful interference originates from a subscriber's premises, the system operator shall ensure that the necessary repairs are carried out. If such repairs cannot be effected within a reasonable period of time, the operator shall stop distribution of the interfering service(s) or channel(s) to the subscriber's premises until the leakage can be repaired. In addition, distribution of interfering service(s) or channel(s) to the subscriber's premises shall be stopped immediately if the leakage originating from the subscriber causes harmful interference to safety services (ambulances, police, aeronautical frequencies, etc.).

Supplementary Channels

Table A3 — Sub-Low Band Channels	
Channel	**Frequency Band (MHz)**
T-7	5.75 - 11.75
T-8	11.75 - 17.75
T-9	17.75 - 23.75
T-10	23.75 - 29.75
T-11	29.75 - 35.75
T-12	35.75 - 41.75
T-13	41.75 - 47.75

Table A4 — Mid-Band Channels		
Channel	**Frequency Band (MHz)**	**Standard Visual Carrier Frequency (MHz)**
A-2(98)	108 - 114	109.25
A-1(99)	114 - 120	115.25
14 or A	120 - 126	121.25
15 or B	126 - 132	127.25
16 or C	132 - 138	133.25
17 or D	138 - 144	139.25
18 or E	144 - 150	145.25
19 or F	150 - 156	151.25
20 or G	156 - 162	157.25
21 or H	162 - 168	163.25
22 or I	168 - 174	169.25

Table A5 — Super-Band Channels		
Channel	**Frequency Band (MHz)**	**Standard Visual Carrier Frequency (MHz)**
23 or J	216 - 222	217.25
24 or K	222 - 228	223.25
25 or L	228 - 234	229.25
26 or M	234 - 240	235.25
27 or N	240 - 246	241.25
28 or O	246 - 252	247.25
29 or P	252 - 258	253.25
30 or Q	258 - 264	259.25
31 or R	264 - 270	265.25
32 or S	270 - 276	271.25
33 or T	276 - 282	277.25
34 or U	282 - 288	283.25
35 or V	288 - 294	289.25
36 or W	294 - 300	295.25

Table A6 — Hyper-Band I		
Channel	**Frequency Band (MHz)**	**Standard Visual Carrier Frequency (MHz)**
37 or AA	300 - 306	301.25
38 or BB	306 - 312	307.25
39 or CC	312 - 318	313.25
40 or DD	318 - 324	319.25
41 or EE	324 - 330	325.25
42 or FF	330 - 336	331.25
43 or GG	336 - 342	337.25
44 or HH	342 - 348	343.25
45 or II	348 - 354	349.25
46 or JJ	354 - 360	355.25
47 or KK	360 - 366	361.25
48 or LL	366 - 372	367.25
49 or MM	372 - 378	373.25
50 or NN	378 - 384	379.25
51 or OO	384 - 390	385.25
52 or PP	390 - 396	391.25
53 or QQ	396 - 402	397.25
54 or RR	402 - 408	403.25
55 or SS	408 - 414	409.25
56 or TT	414 - 420	415.25
57 or UU	420 - 426	421.25
58 or VV	426 - 432	427.25
59 or WW	432 - 438	433.25
60 or XX	438 - 444	439.25
61 or YY	444 - 450	445.25
62 or ZZ	450 - 456	451.25

Table A7 — Hyper-Band II	
Frequency Band (MHz)	**Standard Visual Carrier Frequency (MHz)**
456 - 462	457.25
462 - 468	463.25
468 - 474	469.25
474 - 480	475.25
480 - 486	481.25
486 - 492	487.25
492 - 498	493.25
498 - 504	499.25
504 - 510	505.25
510 - 516	511.25
516 - 522	517.25
522 - 528	523.25
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534 - 540	535.25
540 - 546	541.25
546 - 552	547.25
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558 - 564	559.25
564 - 570	565.25
570 - 576	571.25
576 - 582	577.25
582 - 588	583.25
588 - 594	589.25
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600 - 606	601.25
606 - 612	607.25
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618 - 624	619.25
624 - 630	625.25
630 - 636	631.25
636 - 642	637.25
642 - 648	643.25
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654 - 660	655.25
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672 - 678	673.25
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684 - 690	685.25
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702 - 708	703.25
708 - 714	709.25
714 - 720	715.25
720 - 726	721.25
726 - 732	727.25
732 - 738	733.25
738 - 744	739.25
744 - 750	745.25
750 - 756	751.25
756 - 762	757.25
762 - 768	763.25
768 - 774	769.25
774 - 780	775.25
780 - 786	781.25
786 - 792	787.25
792 - 798	793.25
798 - 804	799.25
804 - 810	805.25
810 - 816	811.25
816 - 822	817.25
822 - 828	823.25
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834 - 840	835.25
840 - 846	841.25
846 - 852	847.25
852 - 858	853.25
858 - 864	859.25
864 - 870	865.25
870 - 876	871.25
876 - 882	877.25
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