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| Project | IEEE P802.16 Broadband Wireless Access Working Group | | |
| Title | Technical Requirements for Fixed Radio Systems Operating in the Band 38.6 – 40.0 GHz | | |
| Date Submitted | 7 September, 1999 | | |
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| Re: | Call for Contribution on the Coexistence Practice Document<br><br>Specifically, this document deals with inter-system coordination process and parameters in the 38 GHz band. | | |
| Abstract | This document is the draft Standard Radio System Plan (SRSP) for broadband wireless system operating in the band 38.6 – 40.0 GHz | | |
| Purpose | To assist in the determination of appropriate co-existence criteria for broadband wireless access systems. | | |
| Notice | This document has been prepared to assist the IEEE P802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein. | | |
| Release | The contributor acknowledges and accepts that this contribution may be made publicly available by 802.16. | | |

Draft 9
August 19, 1999

**Note: This draft has not been adopted by Industry Canada.**

Spectrum Management and Telecommunications Policy

Standard Radio System Plan

# Technical Requirements for Fixed Radio Systems Operating in the Band 38.6 – 40.0 GHz

# Technical Requirements for Fixed Radio Systems Operating in the Bands 38.6 – 40.0 GHz

## 1. Intent

1.1 This Standard Radio System Plan (SRSP) states the minimum technical requirements for the efficient use of the frequency band 38.6 - 40.0 GHz for digital systems in the fixed service for broadband wireless applications, including point-to-point and point-to-multipoint systems.

1.2 This SRSP is intended to be employed in the design and specification of radio systems and equipment.

1.3 This SRSP specifies equipment characteristics relating to efficient spectrum usage only, and is not to be regarded as a comprehensive specification for equipment design and/or selection.

## 2. General

2.1 Revision of this SRSP will be made as required.

2.2 Radio systems conforming to these technical requirements will be given priority in licensing over non-standard radio systems operating in this band.

2.3 The arrangements for non-standard systems are outlined in SP-GEN, *General Information Related to Spectrum Utilization and Radio System Policies.*

2.4 Although a radio system conforms to the requirements of this SRSP, modifications may be required to the system whenever harmful interference[1] is caused to other radio stations or systems.

2.5 When potential conflict between radio systems cannot be resolved by the parties concerned, Industry Canada should be advised, and after consultation with the parties concerned, will determine the necessary modifications and schedule of modifications to resolve the conflict.

2.6 Industry Canada may require licensees and/or applicants to use receiver selectivity characteristics that provide rejection of harmful interference.

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[11] For the purpose of this SRSP, harmful interference means interference that endangers the functioning of a radionavigation service or of other safety services, or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with regulations and technical requirements laid down by Industry Canada under the *Radiocommunication Act.*

2.7 It should be noted that the fixed terrestrial service shares this band with other services in accordance with the *Canadian Table of Frequency Allocations* and spectrum utilization policies.

2.8 Licensees will be expected to respect the International Telecommunication Union (ITU) *Radio Regulations* pertaining to the 38 GHz bands and abide by any future arrangements/agreements established with other countries.

2.9 Industry Canada will require applicants and/or licensees to cooperate in the selection and use of the assigned frequencies in order to minimize interference, thereby obtaining the most effective use of the authorized spectrum.

2.10 Point-to-point and point-to-multipoint implementations will require the equipment to be type approved in accordance with RSS-191.

2.11 Licensees are required to make available to Industry Canada, upon request, information on certain technical parameters of their hub and point-to-point stations.

## 3. Related Documents

3.1 The current issues of the following documents are applicable:

3.1.1 **Spectrum Utilization Policy GEN (SP-GEN)** - *General Information Related to Spectrum Utilization and Radio System Policies*

3.1.2 *Policy and Licensing Procedures for the Auction of the 24 and 38 GHz Frequency Bands*

3.1.3 **Radio Standards Specification RSS) 191** - *Local Multipoint Communication Systems at 28 GHz and Point-to-Point and Point-to-Multipoint Systems at 24 and 38 GHz*

3.1.4 **Telecommunications Regulation Circular (TRC) 43** - *Notes Regarding Designation of Emission (Including Necessary Bandwidth and Classification), Class of Station and Nature of Service*

3.1.5 **Client Procedures Circular (CPC) 2-0-03** - *Environmental Process, Radiofrequency Fields and Land-Use Consultation*

3.1.6 **Safety Code 6** - *Limits of Exposure to Radiofrequency Fields at Frequencies from 10 kHz - 300 GHz,* available on the Internet at the Health Canada web site: http://www.hc-sc.gc.ca

3.1.7 *Canadian Table of Frequency Allocations*

3.1.8 Associated documents addressing coordination process for broadband fixed wireless systesms in the 24 GHz, 28 GHz, and 38 GHz bands are available on the Radio Advisory Board of Canada (RABC) website: http://www.rabc.ottawa.on.ca

3.2 Unless otherwise stated, the above documents are available electronically on the Internet at Industry Canada's web site: http://strategis.ic.gc.ca/spectrum.

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## 4 Radio Frequency Block Arrangement Description

4.1 The band 38.6 - 40.0 GHz is divided into fourteen ( 50 MHz +50 MHz ) paired frequency blocks[2], as follows:

| Block | Lower Frequency Block (MHz) | Upper Frequency Block (MHz) | Usage |
|---|---|---|---|
| A/A' | 38600 – 38650 | 39300 – 39350 | P-P |
| B/B' | 38650 – 38700 | 39350 – 39400 | P-P |
| C/C' | 38700 – 38750 | 39400 – 39450 | P-P, P-MP |
| D/D' | 38750 – 38800 | 39450 – 39500 | P-P, P-MP |
| E/E' | 38800 – 38850 | 39500 – 39550 | P-P, P-MP |
| F/F' | 38850 – 38900 | 39550 – 39600 | P-P, P-MP |
| G/G' | 38900 – 38950 | 39600 – 39650 | P-P, P-MP |
| H/H' | 38950 – 39000 | 39650 – 39700 | P-P, P-MP |
| I/I' | 39000 – 39050 | 39700 – 39750 | P-P, P-MP |
| J/J' | 39050 – 39100 | 39750 – 39800 | P-P, P-MP |
| K/K' | 39100 – 39150 | 39800 – 39850 | P-P |
| L/L' | 39150 – 39200 | 39850 – 39900 | P-P |
| M/M' | 39200 – 39250 | 39900 – 39950 | P-P |
| N/N' | 39250 – 39300 | 39950 – 40000 | P-P |

4.2 The frequency blocks available for licensing are symmetrically paired to facilitate frequency division duplex (FDD) systems. For these systems in Blocks C/C' to J/J', the base station to subscriber links are preferred in the upper frequency block, and the subscriber to base station links are preferred in the lower frequency block. Time

[22] For the purpose of this SRSP, a frequency block is defined as a contiguous portion of spectrum within a frequency band, typically assigned to a single operator. A frequency block may accommodate one or more channels. A channel is defined as a specified portion of the radio frequency spectrum that carries a specific radio signal.

division duplex (TDD) systems may operate in either sub-band.

# 5 Technical Requirements for Point-to-Point Blocks A/A', B/B', and K/K' to N/N'

5.1 Frequency blocks A/A', B/B', and K/K' to N/N' are licensed on a shared basis amongst a number of operators. Operators may deploy point-to-point systems in accordance with their spectrum licences.

5.2 The transmitter power into the antenna must not exceed +10 dBW per carrier.

5.3 The effective isotropically radiated power (e.i.r.p.) of a transmit station must not exceed +55 dBW per carrier.

5.4 The co-polarized radiation pattern envelope in the horizontal plane of the antenna must remain within the envelope shown in Figure 1 for both vertical and horizontal polarizations.

## 5.5 International Inter-System Coordination

5.5.1 Usage of the band 38.6 - 40.0 GHz near the Canada/U.S. border area is subject to the provisions of the *Interim Arrangement Concerning the Sharing between Canada and the United States of America on Broadband Wireless Systems in the frequency bands 24.25 - 24.45, 25.05 - 25.25 GHz, and 38.6 - 40.0 GHz,* which is included as Appendix B of this document.

## 5.6 Domestic Inter-System Coordination

### 5.6.1 Intent

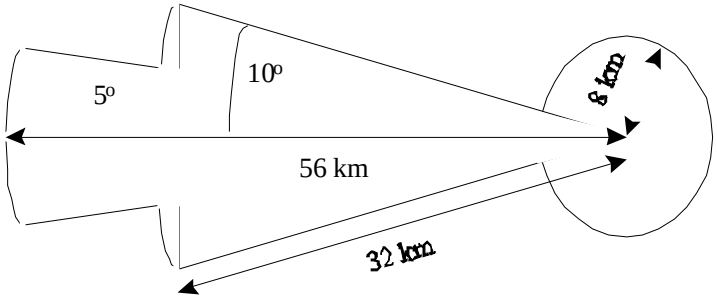
The following coordination procedures are intended to be used between two licensees as default in the absence of another mutually agreed standard to govern coordination of any proposed 38 GHz transmitter. Licensees who propose transmitters that would normally trigger the present procedure but who can mutually agree to an alternate coordination procedure are not bound by this process.

### 5.6.2 38 GHz Co-Channel[3], Frequency Coordination

#### 5.6.2.1 General Coordination Trigger Criteria

[33] For this Coordination Procedure, radio system "B" requires coordination with radio system "A" if there is any significant overlap of the interior spectrum skirts (i.e., both co-channel and adjacent channel, regardless of their occupied bandwidth).

Whenever a licensee seeks to install facilities, successful completion of applicable coordination is required prior to activation. Coordination will be required whenever a proposed transmitting station coordination footprint encompasses existing or previously notified stations of another licensee. The coordination footprint extends to the following distances[4]:




### 5.6.2.2 Notification and Response Process

#### 5.6.2.2.1 General

If a proposed station triggers the coordination process, the installing licensee will be obligated to notify all licensees concerned. The said notice shall include the applicant's interference analysis and all data required for the recipients to perform an interference analysis (see Appendix A).

It is recommended that prior to commencement of operation of a 38 GHz system, field tests be performed to determine whether interference due to building reflections or unknown frequency sources, that were not anticipated from the interference calculations[5], are detected at the proposed site while looking along the proposed azimuth.

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[44] It is proposed these coordination distances be applied on an interim basis until further operating data can be applied to subsequently refine them.

[55] Calculations could make use of Bulletin TSB10-F, *Interference Criteria for Microwave Systems*, available from the Telecommunications Industry Association (TIA), or of other recognized coordination methodology and criteria.

#### 5.6.2.2.2 Notification Format and Method

A recommended data set with definitions and instructions for transfer are included in Appendix A of this recommendation.

#### 5.6.2.2.3 Response Time

Upon receipt of a coordination notice, a recipient shall have a maximum of ten (10) business days to respond with an interference objection. This objection shall include the calculation details of all potential cases of unacceptable interference into and from facilities proposed in the notice. Failure of a recipient to respond to a coordination notice within the ten (10) business day time frame will indicate that the recipient has no interference objection(s) to facilities proposed in the notice.

#### 5.6.2.2.4 Expedited Notification and Response Process

At times, it may become necessary for licensees to deploy systems even more rapidly than provided for by the notice and response procedure contained in this recommendation. To accomplish this, licensees shall be allowed to activate systems immediately upon confirmation of receipt of the coordination notice provided the notice clearly identifies a licensee's intent to do so and includes activation date, time, and a 24-hour contact telephone number for notification, should an interference case occur.

Licensees activating facilities under this expedited procedure will be held wholly responsible for avoiding and/or resolving any interference cases created by such activation, and will be required to cease transmission immediately upon receiving verbal and/or written notice from another licensee that an actual interference case has been created. This requirement will remain in effect until the standard 10-day coordination period has expired.

Prior to commencement of operation of a 38 GHz system, field tests shall be performed to determine whether interference due to building reflections or unknown frequency sources is detected at the

proposed site while looking along the proposed azimuth.

#### 5.6.2.2.5 Time to Construct / Commencement of Operation

Upon successful resolution of all interference objections, a licensee shall record the date of coordination resolution in the Industry Canada coordination data base and shall have forty-five (45) days to construct and commence operation.

#### 5.6.2.2.6 Extension of a Previously Coordinated Facility

Should a licensee fail to commence operation within the allotted time frame, a notice of a licensee's desire to extend the time to construct must be sent to and received by affected licensees seven (7) days prior to the expiration of the 45-day construction period and the database must be up-dated accordingly. Licensees shall be permitted one (1) such 45-day extension for a specific facility. Upon expiration of the extension, the licensee shall forfeit first-in-time status for that particular facility.

#### 5.6.2.2.7 Notice of Operation / Notice of Decommission

Within two (2) business days of completion of construction and initiation of operation of coordinated facilities, a licensee will notify all licensees who received a coordination notice that facilities contained in that notice are in permanent operation.

Upon decommission of previously operational facilities, a licensee shall notify all other affected parties that a particular facility has been permanently taken out of service within two (2) business days of decommission. Affected parties are defined as those who would have received a coordination notice under this recommendation had this been a proposed activation.

### 5.6.3 38 GHz Adjacent Block, Frequency Coordination

While coordination between adjacent block licensees operating in the same vicinity may not be required in most cases, licensees may agree to coordinate

certain installations to avoid interference.

# 6 Technical Requirements for Point-to-Point and Point-to-Multipoint Frequency Blocks C/C' to J/J'

6.1 The frequency blocks C/C' to J/J' are licensed on an area exclusive basis. Operators may deploy point-to-point and/or point-to-multipoint systems within their licensed service areas.

6.2 The transmitter power into the antenna must not exceed +10 dBW per carrier.

6.3 The maximum effective isotropically radiated power (e.i.r.p). of a transmit station must not exceed +55 dBW per carrier. For point-to-multipoint systems, the e.i.r.p. density shall not exceed +30 dBW/MHz for subscriber stations, and +14 dBW/MHz for hubs.

## 6.4 Inter-System Coordination

### 6.4.1 International Coordination

6.4.1.1 Usage of the band 38.6 - 40.0 GHz near the Canada/U.S. border area is subject to the provisions of the *Interim Arrangement Concerning the Sharing between Canada and the United States of America on Broadband Wireless Systems in the frequency bands 24.25 - 24.45, 25.05 - 25.25 GHz, and 38.6 - 40.0 GHz*, which is included as Appendix B of this document.

### 6.4.2 Domestic Coordination

6.4.2.1 Domestic coordination is required between licensed service areas[6] where the shortest distance between the respective service area boundaries is less than[7] 60 km. The operators are encouraged to arrive at mutually acceptable sharing agreements that would allow for the provision of service of each licensee within its service area to the maximum extent possible.

6.4.2.2 In circumstances where a sharing agreement between operators does not exist or has not been concluded, and whose service areas

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[66] Appendix C is provided as a guide to determine which service areas should be considered for coordination.

[77] In the event an operator uses sites of very high elevations relative to local terrain that could produce interference to LMCS service areas beyond 60 km, this operator shall coordinate with the affected licensee(s).

are less than 60 km apart, the following coordination process shall be employed:

6.4.2.2.1 Operators are required to calculate the power flux density (pfd) at the service area boundary of the neighbouring service area(s) for the transmitting facilities. Power flux density is calculated using accepted engineering practices, taking into account such factors as propagation loss, atmospheric loss, antenna directivity toward the service boundary, and curvature of the Earth. The pfd level at the service area boundary shall be the maximum value for elevation points up to 500 m above local terrain elevation. (See Appendix E for a sample calculation of a pfd level.)

6.4.2.2.2 Deployment of facilities that generate a pfd less than or equal to -125 dBW/$m^2$ in any 1 MHz (pfd A) at the other service area boundaries are not subject to any coordination requirements.

6.4.2.2.3 Deployment of facilities that generate a pfd greater than pfd A (-125 dBW/$m^2$ in any 1 MHz, but less than or equal to -105 dBW/$m^2$ in any 1 MHz (pfd B) at the other service area boundaries, are subject to successful coordination between the affected licensees in accordance with the following coordination process:

6.4.2.2.3.1 The operator must notify the respective licensee(s) of its intention to deploy the facility(ies) along with the appropriate information necessary to conduct an interference analysis.

6.4.2.2.3.2 The recipient of the notification must respond within 30 calendar days to indicate any objection to the deployment. Objection may be based on harmful interference to existing systems[8] only.

6.4.2.2.3.3 If there is no objection raised, the deployment may proceed.

[88] Existing systems include systems that are operational prior to the receipt of notification, or systems that have been successfully coordinated previously.

6.4.2.2.3.4 If an objection is raised, the respective licensees must then work in collaboration to develop a suitable agreement between the licensees before the deployment of facilities. It is expected that the time frame to develop such an agreement should not exceed 30 calendar days.

6.4.2.2.3.5 Proposed facilities must be deployed within 120 calendar days from the conclusion of coordination, otherwise coordination must be reinitiated as per section 6.4.2.2.

6.4.2.2.4 Deployment of facilities that generate a pfd greater than -105 dBW/$m^2$ in any 1 MHz (pfd B) at the other service area boundaries are subject to successful coordination between the affected licensees.

6.4.2.2.5 The above process is described graphically in Appendix D of this document for illustration purposes.

6.4.2.3 Licensees shall ensure that the pfd at the boundary of the neighbouring service areas that have not been licensed does not exceed pfd B.

6.4.2.4 All results of analysis on pfd, or agreements made between licensees, must be retained by the licensees and be made available to the Department upon request.

6.4.2.5 While coordination between adjacent block licensees operating in the same vicinity may not be required in most cases, licensees may agree to coordinate certain installations to avoid interference.

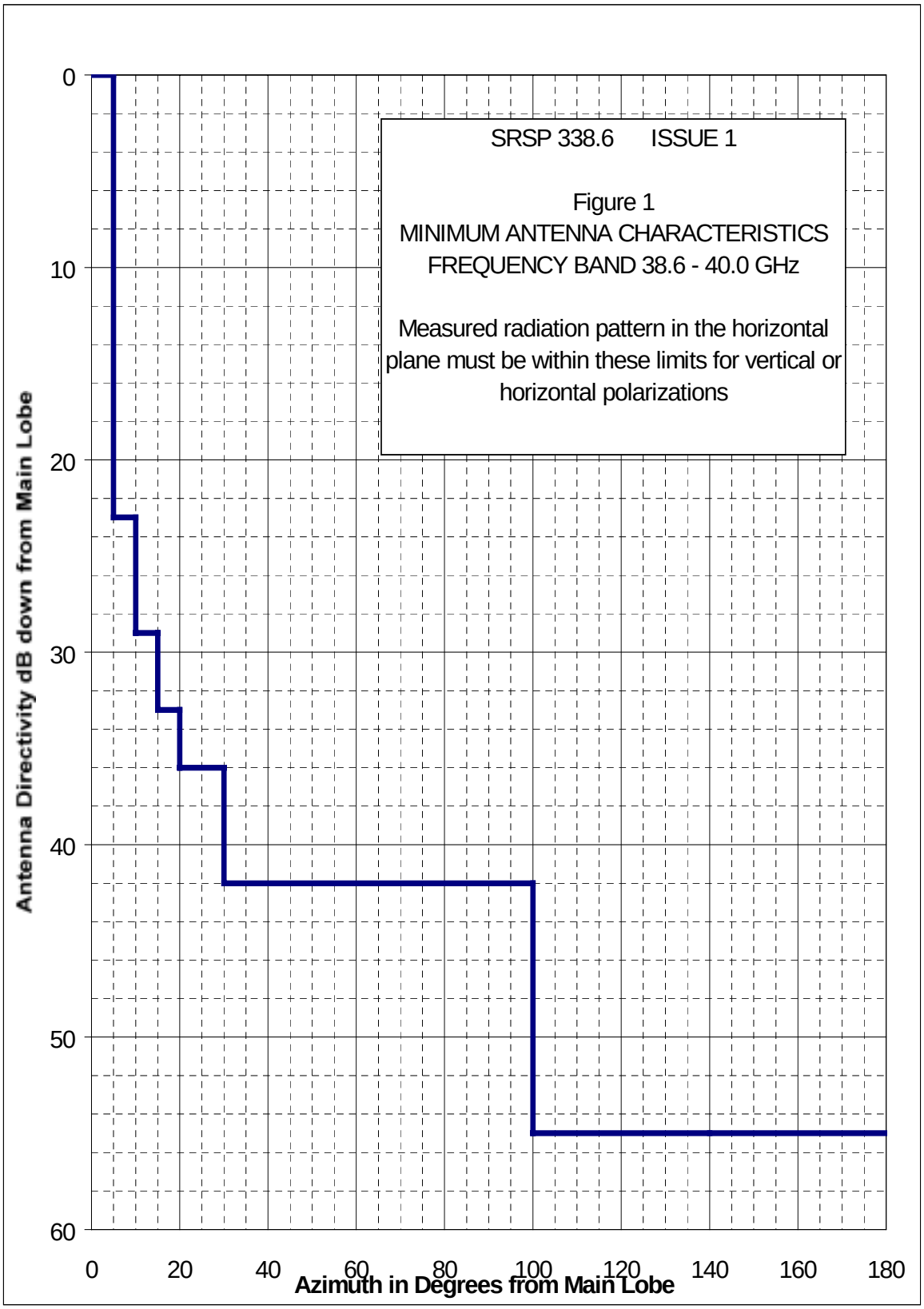
## 7 General Coordination Requirements for Frequency Blocks A/A' to N/N'

7.1 In any event, licensees are expected to take full advantage of interference mitigation techniques such as antenna discrimination, polarization, frequency offset, shielding, site selection, and/or power control to facilitate the coordination of systems.

7.2 If a licence is transferred, the sharing agreement(s) developed between the former licensees shall remain in effect until superseded by a new agreement between the licensees.

7.3 In the event a satisfactory agreement or a successful coordination between the licensees is not reached, the Department should be informed. In these cases, the Department may impose appropriate technical limitations to facilitate reasonable

implementation of systems.


SRSP 338.6 ISSUE 1
Figure 1
MINIMUM ANTENNA CHARACTERISTICS
FREQUENCY BAND 38.6 - 40.0 GHz
Measured radiation pattern in the horizontal plane must be within these limits for vertical or horizontal polarizations
Antenna Directivity dB down from Main Lobe
0
10
20
30
40
50
60
0
20
40
60
80
100
120
140
160
180
Azimuth in Degrees from Main Lobe

# Appendix A

### Database and Coordination Information

## 1.0 Required Link Information

| Field Name | Description | Field Length and Format |
|---|---|---|
| ***Administration Fields*** | | |
| Date | Date the coordination notice starts | 11 alphanumeric<br>e.g.: 12-MAR-1999 |
| Company | Licensee | 40 alphanumeric (upper case) |
| Contact | Originating coordinator's name | 40 alphanumeric (upper case) |
| Phone Number | Originating coordinator's phone number | 12 alphanumeric<br>e.g.: 999-999-9999 |
| E-mail Address | Originating coordinator's electronic address | 40 alphanumeric |
| Fax Number | Originating coordinator's fax number | 12 alphanumeric<br>e.g.: 999-999-9999 |
| Service Area Name | Service area where the sites are located | 20 alphanumeric |
| Comments | Comment field | 60 alphanumeric |
| Coordination Number | Number assigned by the licensee | 10 alphanumeric |
| Coordination Completion Date | | 11 alphanumeric |
| Service Date | | 11 alphanumeric<br>e.g.: 26-APR-1998 |
| ***Data Fields for Sites A and B*** | | |
| Latitude/Longitude Flag | 1 = NAD 27 datum, 0 = NAD 83 datum | 1 numeric |
| Site Name | Name given to a site that is assigned by the licensee | 16 alphanumeric (upper case) |
| Site Address | (Separate this into four data elements, as follows:) | |
| | Number and Street | 50 alphanumeric (upper case) |
| | City | 15 alphanumeric (upper case) |
| | Province | 2 alphanumeric (upper case) |
| | Postal Code, if applicable | 10 alphanumeric (upper case) |
| Site Status | N = New, M = Modified,<br>D = Deleted | 1 alphabetical (upper case) |
| Latitude (dd-mm-ss) | Latitude North for the site | 12 alphanumeric<br>e.g.: dd-mm-ss.99N<br>Range: < =89-59-59.99N |
| Longitude (dd-mm-ss) | Longitude West for the site | 13 alphanumeric<br>e.g.: dd-mm-ss.99W<br>Range: < = 179-59-59.99W |
| Ground Elevation (metre) | Elevation of terrain AMSL at the base of the site | 6 numeric<br>Range: 0.0 to 4999.9 |
| Transmitter Model | (Separate this into two data elements as follows:) | |
| | Manufacturer | 40 alphanumeric |

| | | |
|---|---|---|
| | Model name of the transmitter | 20 alphanumeric (upper case) |
| Tx Power (dBm) | Output power level at the antenna port | 6 numeric<br>Range: -999.9 to 999.9 |
| Tx Bandwidth (MHz) | Occupied bandwidth of the transmitted signal | 6 numeric |
| Tx Antenna Manufacturer | Name of the manufacturer of the transmit antenna | 40 alphanumeric |
| Tx Antenna Model Number | Manufacturer's model number of the transmit antenna | 15 alphanumeric (upper case) |
| Tx Antenna Gain (dBi) | Main beam gain of the transmit antenna | 6 numeric |
| Tx Antenna Centerline (Metre) | Height of the Tx antenna main beam AGL | 6 numeric<br>Range 0.0 to 1000.0 from base of tower |
| Miscellaneous Loss (dB) | | 4 numeric<br>Range: 0.0 to 99.9 |
| Transmit Frequency (MHz) | Centre frequency of transmitted signal | 11 numeric<br>e.g.: 99999.99999 |
| Polarization | Polarization of the transmit frequency | 1 alphabetical<br>e.g.: H=Horizontal, V=Vertical, L=Left, R=Right |
| Receiver Threshold (dBm) | For BER = $10^{-6}$ | 6 numeric<br>Range: -200.0 to 0 |
| Maximum Level of Interference (dBm) | Degrading threshold for BER = $10^{-6}$ by 1 dB | 7 numeric<br>e.g.: -105.45 |

**Note:** Each data element field should be separated by a comma.

## 2.0 Coordination Notice Content

The coordination notice content should include the assumptions, results and conclusions of the interference analysis.

## Appendix B

Interim Arrangement Concerning the Sharing between Canada and the United States of America on Broadband Wireless Systems in the frequency bands 24.25 - 24.45, 25.05 - 25.25 GHz, and 38.6 - 40.0 GHz

[to be provided by Industry Canada]

# Appendix C

## Co-Frequency Block Coordination

**(Definition of Tier 3 areas can be found on the Industry Canada website: http://strategis.ic.gc.ca/spectrum)**

| Tier 3 Area | Tier 3 Areas That Should Be Considered For Coordination |
|---|---|
| 3-01 | 3-10, 3-17. |
| 3-02 | 3-03, 3-04, 3-07. |
| 3-03 | 3-02, 3-04, 3-05, 3-07. |
| 3-04 | 3-02, 3-03. |
| 3-05 | 3-03, 3-06, 3-07. |
| 3-06 | 3-05, 3-07, 3-08, 3-09. |
| 3-07 | 3-02, 3-03, 3-05, 3-06, 3-08. |
| 3-08 | 3-06, 3-07, 3-09, 3-10. |
| 3-09 | 3-06, 3-08, 3-10, 3-11, 3-12. |
| 3-10 | 3-01, 3-08, 3-09, 3-12, 3-17. |
| 3-11 | 3-09, 3-12, 3-13. |
| 3-12 | 3-09, 3-10, 3-11, 3-13, 3-14, 3-15, 3-16, 3-17. |
| 3-13 | 3-11, 3-12, 3-14, 3-15, 3-18, 3-19. |
| 3-14 | 3-12, 3-13, 3-15, 3-16, 3-17, 3-18. |
| 3-15 | 3-12, 3-13, 3-14, 3-16, 3-18, 3-19, 3-20, 3-21. |
| 3-16 | 3-12, 3-14, 3-15, 3-17, 3-20, 3-21, 3-23, 3-24, 3-34. |
| 3-17 | 3-01, 3-10, 3-12, 3-14, 3-16, 3-34, 3-36, 3-37, 3-59. |
| 3-18 | 3-13, 3-14, 3-15, 3-19. |
| 3-19 | 3-13, 3-15, 3-18, 3-20, 3-21. |
| 3-20 | 3-15, 3-16, 3-19, 3-21, 3-22, 3-23, 3-24, 3-34. |
| 3-21 | 3-15, 3-16, 3-19, 3-20, 3-22, 3-23, 3-24, 3-25, 3-34. |
| 3-22 | 3-21, 3-23, 3-25. |
| 3-23 | 3-16, 3-20, 3-21, 3-22, 3-24, 3-25, 3-26, 3-34. |
| 3-24 | 3-16, 3-20, 3-21, 3-23, 3-25, 3-26, 3-34. |
| 3-25 | 3-21, 3-22, 3-23, 3-24, 3-26, 3-27, 3-28, 3-29, 3-30. |
| 3-26 | 3-23, 3-24, 3-25, 3-27, 3-28, 3-30, 3-34, 3-35. |
| 3-27 | 3-25, 3-26, 3-28, 3-30, 3-33. |
| 3-28 | 3-25, 3-26, 3-27, 3-30, 3-33. |

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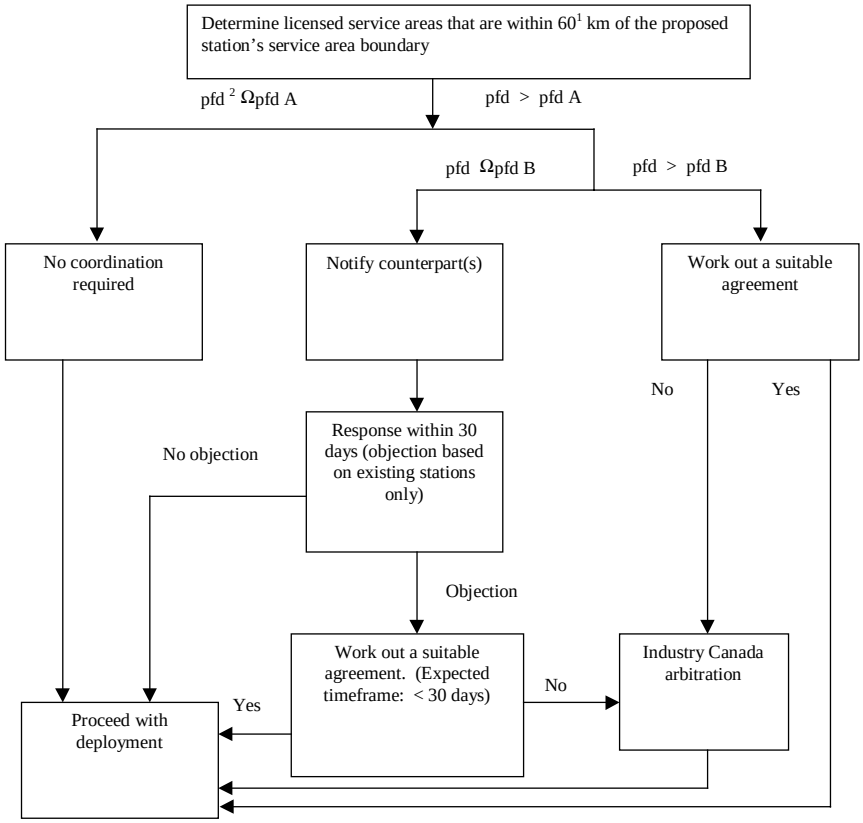
|---|---|
| 3-29 | 3-25, 3-30. |
| 3-30 | 3-25, 3-26, 3-27, 3-28, 3-29, 3-31, 3-33. |
| 3-31 | 3-30, 3-32, 3-33. |
| 3-32 | 3-31, 3-33. |
| 3-33 | 3-27, 3-28, 3-30, 3-31, 3-32. |
| 3-34 | 3-16, 3-17, 3-20, 3-21, 3-23, 3-24, 3-26, 3-34, 3-35, 3-36, 3-37. |
| 3-35 | 3-26, 3-34, 3-36, 3-37, 3-38. |
| 3-36 | 3-17, 3-34, 3-35, 3-37. |
| 3-37 | 3-17, 3-34, 3-35, 3-36, 3-38. |
| 3-38 | 3-35, 3-37, 3-39, 3-59. |
| 3-39 | 3-38, 3-40, 3-41, 3-43, 3-59. |
| 3-40 | 3-39, 3-41, 3-43. |
| 3-41 | 3-39, 3-40, 3-42, 3-43. |
| 3-42 | 3-41, 3-43, 3-45. |
| 3-43 | 3-39, 3-40, 3-41, 3-42, 3-44, 3-45, 3-59. |
| 3-44 | 3-43, 3-45, 3-47, 3-48, 3-49, 3-51, 3-56, 3-57, 3-58, 3-59. |
| 3-45 | 3-42, 3-43, 3-44, 3-45, 3-46, 3-47, 3-48. |
| 3-46 | 3-45, 3-47, 3-50. |
| 3-47 | 3-44, 3-45, 3-46, 3-48, 3-50, 3-51. |
| 3-48 | 3-44, 3-45, 3-47, 3-50, 3-51. |
| 3-49 | 3-44, 3-57, 3-58, 3-59. |
| 3-50 | 3-46, 3-47, 3-48, 3-51. |
| 3-51 | 3-44, 3-47, 3-48, 3-50, 3-52, 3-56, 3-57. |
| 3-52 | 3-51, 3-53, 3-54, 3-55, 3-56, 3-57. |
| 3-53 | 3-52, 3-54, 3-55. |
| 3-54 | 3-52, 3-53, 3-55. |
| 3-55 | 3-52, 3-53, 3-54. |
| 3-56 | 3-44, 3-51, 3-52, 3-57. |
| 3-57 | 3-44, 3-49, 3-51, 3-52, 3-56, 3-58, 3-59. |
| 3-58 | 3-44, 3-49, 3-57, 3-59. |
| 3-59 | 3-17, 3-38, 3-39, 3-43, 3-44, 3-49, 3-57, 3-58. |

# Appendix D

## Process to determine whether coordination is required for cases where a sharing agreement between the licensees has not been concluded




[1]In the event an operator using sites of very high elevations relative to local terrain that could produce interference to service areas beyond 60 km, this operator shall coordinate with the affected licensee(s).

[2]Pfd is calculated at the service area boundary of the respective counterpart(s).

# Appendix E
## Sample calculation

The following example is provided to illustrate how the pfd level at the service area boundary can be determined[9]:

Proposed station parameters:

| Parameter | Symbol | Value |
|---|---|---|
| Hub transmitter power into the antenna | $P_T$ | 0 dBW |
| Channel bandwidth | B | 50 MHz |
| Transmitter antenna height above ground | $H_T$ | 100 metres |
| Transmitter antenna gain (maximum gain toward the service area boundary at any elevation point 0-500 m above average terrain) | $G_T$ | 16 dBi |
| Centre frequency of channel | F | 38750 MHz |
| Distance from hub transmitter to the boundary of service area Y | D | 10 km |

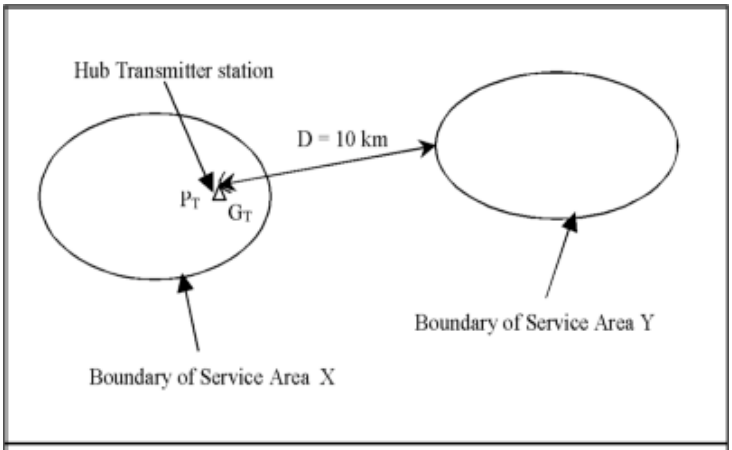



Figure 1: Graphical representation of the proposed situation

[9] It should be noted that the example calculation assumes line-of-sight conditions due to the short path length and the height of the transmitting antenna. In other cases, where the distance is larger and/or the transmitting antenna height is small, line-of-sight conditions may not exist. In these cases, an appropriate propagation model that takes the non-line-of-sight situation into account should be used.

The spectral power density in dBW/MHz at the boundary of service area Y ($P_{\text{at the boundary of Service Area Y}}$) may be calculated using free space propagation, and taking into account such factors as atmospheric losses, as follows:

$$P_{\text{at the boundary of Service Area Y}} = P_T' + G_T - 20 \log F_{MHz} - 20 \log D_{km} - 32.4 - L_a$$
$$= (-17 + 16 - 20 \log (38750) - 20 \log (10) - 32.4 - 0.1 \times 10) \text{ dBW/MHz}$$
$$= (-17 + 16 - 91.8 - 20 - 32.4 - 1) \text{ dBW/MHz}$$
$$= -146.2 \text{ dBW/MHz}$$

where:

$P_T' = P_T - 10 \log B_{MHz}$
$= 0 - 10 \log (50)$
$= -17$ dBW/MHz

$G_T = 16$ dBi

$F_{MHz} = 38750$

$D_{km} = 10$

$L_a$ = atmospheric losses
$= 0.1$ dB/km

Then, the power flux density in dBW/m$^2$ in 1 MHz (pfd) may be calculated as follows:

$$\text{pfd} = P_{\text{at the boundary of Service Area Y}} - 10 \log A_r$$
$$= (-146.2 - 10 \log (4.770 \times 10^{-6})) \text{ dBW/m}^2 \text{ in 1 MHz}$$
$$= (-146.2 - (-53.2)) \text{ dBW/m}^2 \text{ in 1 MHz}$$
$$= -93 \text{ dBW/m}^2 \text{ in 1 MHz}$$

where:

$A_r = \lambda^2/(4\pi)$
$= c^2/(4\pi F_{Hz}^2)$
$= (3 \times 10^8)^2 / (4\pi \times (38.75 \times 10^9)^2)$
$= 4.770 \times 10^{-6} \text{m}^2$