Industry Canada Industrie Canada

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Spectrum Management and Telecommunications Policy

Standard Radio System Plan

Technical Requirements for Fixed Radio Systems Operating in the Bands 24.25 - 24.45 GHz and 25.05 - 25.25 GHz

Canada

Aussi disponible en français - PNRH-324,25

1. Intent

1.1 This Standard Radio System Plan (SRSP) states the minimum technical requirements for the efficient use of the frequency bands 24.25 - 24.45 GHz and 25.05 - 25.25 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 these bands.

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 Even when a radio system conforms to the requirements of this SRSP, modifications may be required to the system whenever it causes harmful interference[1] to other radio stations or systems.

2.5 When a potential conflict between radio systems cannot be resolved by the parties concerned, Industry Canada should be advised. After consultation with these parties, Industry Canada will determine what modifications need to be made and establish a schedule for these modifications in order 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.

2.7 It should be noted that the fixed terrestrial service shares these bands with other services in accordance with the *Canadian Table of Frequency Allocations*. (In addition, see modification to footnote C44 (outlined in the document entitled "*Policy and Licensing*

[1] For the purpose of this SRSP, "harmful interference" means interference which 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.*

Procedures for the Auction of the 24 and 38 GHz Frequency Bands"), which addresses the use of the 24 GHz bands by earth stations.)

2.8 Licensees will be expected to respect the International Telecommunication Union (ITU) *Radio Regulations* pertaining to the 24 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 Licensees are permitted to deploy point-to-point or point-to-multipoint systems within their service area.

2.11 For point-to-point and point-to-multipoint implementations, the equipment must be type-approved in accordance with Radio Standards Specification 191 (RSS-191), *Local Multipoint Communication Systems at 28 GHz and Point-to-Point and Point-to-Multipoint Systems at 24 and 38 GHz.*

2.12 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. Unless otherwise stated, they are available on the Internet at the Industry Canada website: http://strategis.ic.gc.ca/spectrum.

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

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

3.1.5 *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 GHz, 25.05 - 25.25 GHz, and 38.6 - 40.0 GHz

3.1.6 *Canadian Table of Frequency Allocations*

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

3.1.8 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

3.1.9 Associated documents addressing the coordination process for broadband fixed wireless systems in the 24 GHz, 28 GHz, and 38 GHz bands are available on the Radio Advisory Board of Canada (RABC) Web site, at the following address:

http://www.rabc.ottawa.on.ca

4. Radio Frequency Block Arrangement Description

4.1 The bands 24.25 - 24.45 GHz and 25.05 - 25.25 GHz are divided into five (40 MHz + 40 MHz) paired frequency blocks[2], as follows:

Paired Block	Lower Frequency Block (MHz)	Upper Frequency Block (MHz)
A / A’	24250 - 24290	25050 - 25090
B / B’	24290 - 24330	25090 - 25130
C / C’	24330 - 24370	25130 - 25170
D / D’	24370 - 24410	25170 - 25210
E / E’	24410 - 24450	25210 - 25250

4.2 The frequency blocks available for licensing are symmetrically paired to facilitate frequency division duplex (FDD) systems. For these systems, the base-to-subscriber links are preferred in the lower sub-band, and the subscriber-to-base links are preferred in the upper sub-band. Time division duplex (TDD) systems may operate in either sub-band.

[2] 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.

5. Technical Requirements

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

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

6. Inter-System Coordination

6.1 International Coordination

6.1.1 Usage of the band 24.25 - 25.25 GHz near the Canada/U.S. border 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 GHz, 25.05 - 25.25 GHz, and 38.6 - 40.0 GHz.* (Refer to Section 3 of this document.)

6.2 Domestic Coordination

6.2.1 Domestic coordination is required between licensed service areas[3] where the shortest distance between the respective service area boundaries is less than 60 km[4]. 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.

6.2.2 When a sharing agreement does not exist or has not been concluded between operators whose service areas are less than 60 km apart, the following coordination process shall be employed:

6.2.2.1 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 area 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 C for a sample calculation of a pfd level.)

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

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

6.2.2.2 Deployment of facilities that generate a pfd less than or equal to -114 dBW/m^2 in any 1 MHz (pfd A) at the other service area boundaries is not subject to any coordination requirements.

6.2.2.3 Deployment of facilities that generate a pfd greater than pfd A (-114 dBW/m^2 in any 1 MHz), but less than or equal to -94 dBW/m^2 in any 1 MHz (pfd B) at the other service area boundaries, is subject to successful coordination between the affected licensees in accordance with the following coordination process:

6.2.2.3.1 The operator must notify the respective licensee(s) of their intention to deploy the facility(ies) and submit the information necessary to conduct an interference analysis.

6.2.2.3.2 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[5] only.

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

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

6.2.2.3.5 Proposed facilities must be deployed within 120 calendar days of the conclusion of coordination, otherwise coordination must be reinitiated as per section 6.2.2.

6.2.2.4 Deployment of facilities that generate a pfd greater than -94 dBW/m^2 in any 1 MHz (pfd B) at the other service area boundaries is subject to successful coordination between the affected licensees.

6.2.2.5 The above process is described graphically in Appendix B of this document.

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

6.2.3 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.

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

6.2.5 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.

6.2.6 In the event a satisfactory agreement or 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.

6.2.7 Licensees shall ensure that the pfd at the boundary of unlicensed neighbouring service areas does not exceed pfd B.

6.2.8 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.

Issued under the authority of
the Minister of Industry

R.W. McCaughern
Director General
Spectrum Engineering

Appendix A

Co-Frequency Block Coordination

(The definition of Tier 3 areas can be found on Industry Canada's Web site, at the following address: http://strategis.ic.gc.ca/spectrum)

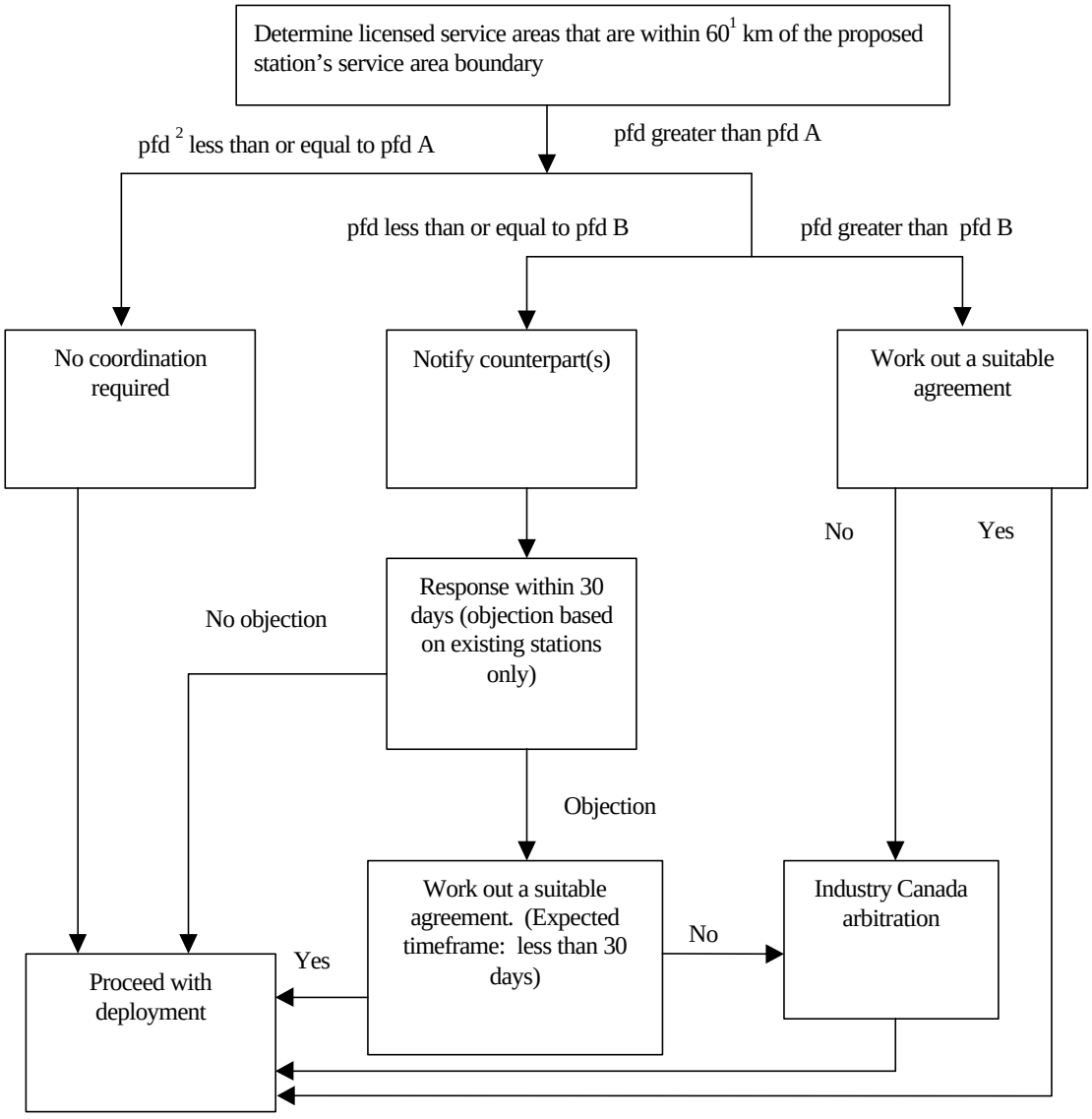
Tier 3 Area	Tier 3 Areas that Should Be Considered for Coordination
3-01	3-10, 3-17.
3-02	3-03, 3-04, 3-07.
3-03	3-02, 3-04, 3-05, 3-07.
3-04	3-02, 3-03.
3-05	3-03, 3-06, 3-07.
3-06	3-05, 3-07, 3-08, 3-09.
3-07	3-02, 3-03, 3-05, 3-06, 3-08.
3-08	3-06, 3-07, 3-09, 3-10.
3-09	3-06, 3-08, 3-10, 3-11, 3-12.
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.

Tier 3 Area	Tier 3 Areas that Should Be Considered for Coordination
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.
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.

Tier 3 Area	Tier 3 Areas that Should Be Considered for Coordination
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 B

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 C

Sample calculation

The following example is provided to illustrate how the pfd level at the service area boundary can be determined[1]:

Proposed station parameters:

Parameter	Symbol	Value
Hub transmitter power into the antenna	P_T	-12 dBW
Channel bandwidth	B	40 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	21 dBi
Centre frequency of channel	F	24270 MHz
Distance from hub transmitter to the boundary of Service Area Y	D	10 km

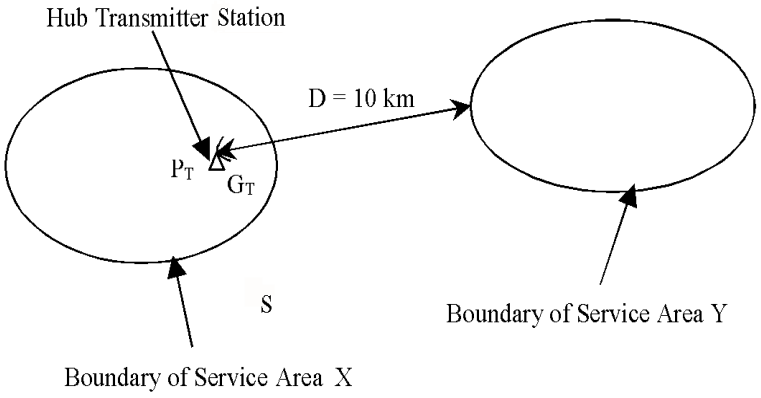


Figure 1: Graphical representation of the proposed situation

[1] 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, taking into account such factors as atmospheric losses, as follows:

$$P_{\text{at the boundary of Service Area Y}} = P_T' + G_T - 20 \log F_{MHz} - 20 \log D_{km} - 32.4 - L_a$$
$$= (-28 + 21 - 20 \log (24270) - 20 \log (10) - 32.4 - 0.1 \times 10) \text{ dBW/MHz}$$
$$= (-28 + 21 - 87.7 - 20 - 32.4 - 1) \text{ dBW/MHz}$$
$$= -148.1 \text{ dBW/MHz}$$

where: $P_T' = P_T - 10 \log B_{MHz}$
$= -12 - 10 \log (40)$
$= -28$ dBW/MHz

G_T = 21 dBi
F_{MHz} = 24270
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:

$$\text{pfd} = P_{\text{at the boundary of Service Area Y}} - 10 \log A_r$$
$$= (-148.1 - 10 \log (1.216 \times 10^{-5})) \text{ dBW/m}^2 \text{ in 1 MHz}$$
$$= (-148.1 - (-49.15)) \text{ dBW/m}^2 \text{ in 1 MHz}$$
$$= -99 \text{ dBW/m}^2 \text{ in 1 MHz}$$

where: $A_r = \lambda^2/(4\pi)$
$= c^2/(4\pi F_{Hz}^2)$
$= (3 \times 10^8)^2 / (4\pi \times (24.27 \times 10^9)^2)$
$= 1.216 \times 10^{-5} \text{m}^2$