



Industry
Canada

Industrie
Canada

SRSP-325.25
Issue 1
September 2013

Spectrum Management and Telecommunications

Standard Radio System Plan

Technical Requirements for Fixed Radio Systems Operating in the Bands 25.25-26.5 GHz and 27.5-28.35 GHz

Note (effective January 21, 2020): There is a moratorium in place on issuing new terrestrial service licences in the frequency band 27.5-28.35 GHz as described in SLPB-003-19, Decisions on Releasing Millimetre Wave Spectrum to Support 5G. Developmental licence applications will continue to be considered.

Preface

Issue 1 of SRSP-325.25 has been developed to reflect Industry Canada's spectrum utilization policy described in SP 25.25 GHz, *Spectrum Utilization Policy, Decisions on the Band 25.25-28.35 GHz*. This SRSP replaces SRSP-325.35, Issue 1.

Issued under the authority of
the Minister of Industry

Marc Dupuis
Director General
Engineering, Planning and Standards Branch

Contents

1.	Intent.....	1
2.	General	1
3.	Related Documents	2
4.	Radio Frequency Channel Arrangement Description	3
5.	General Coordination Requirements for Point-to-Point and Point-to-Multipoint Systems Operating in the Bands 25.25-26.5 GHz and 27.5-28.35 GHz	8
6.	International Coordination.....	8
7.	Domestic Coordination for Point-to-Point Systems Operating in the Bands 25.25-26.5 GHz and 27.5-28.35 GHz	8
8.	Domestic Coordination for Point-to-Multipoint Systems Operating in the Bands 25.501-25.837 GHz and 25.921-26.257 GHz	10
9.	Technical Requirement for Point-to-Point and Point-to-Multipoint Systems Operating in the Bands 25.25-26.5 GHz and 27.5-28.35 GHz	12
	Annex A: Parameters for Coordination	16
	Annex B: Sample Calculation	17
	Annex C: Coordination Determination Process for Point-to-Multipoint Systems in the Absence of a Sharing Agreement Between Licensees	19
	Annex D: International Telecommunication Union (ITU) Requirements (25.25-27.5 GHz).....	20

1. Intent

- 1.1 This Standard Radio System Plan (SRSP) states the minimum technical requirements for the efficient use of the frequency bands 25.25-26.5 GHz and 27.5-28.35 GHz by line-of-sight radio systems in the fixed service, 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 related 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 This standard replaces SRSP-325.35, Issue 1. Further revision of this SRSP will be made as required.
- 2.2 The technical requirements for interim licences outlined in Annex B of DGTP-002-10, [Consultation on the Use of the Band 25.25-28.35 GHz](#), are replaced by this standard. The interim licensing process described in Section 9 of DGTP-002-10 will continue to apply until such time as a formal licensing process is established.

Systems licensed under the interim licensing process must be coordinated under the procedures applicable to radiocommunication station licences,¹ as described in RSP-113, [Application Procedures for Planned Radio Stations Above 960 MHz in the Fixed Service](#). The coordination requirements in sections 7.1 and 8 of this standard will apply once the formal licensing process is established. Upon the establishment of this formal licensing process, this standard will be editorially revised to reflect these changes in coordination requirements.
- 2.3 Radio systems conforming to these technical requirements will be given priority in licensing over non-standard radio systems operating in this band.
- 2.4 The arrangements for non-standard systems are outlined in SP GEN, [General Information Related to Spectrum Utilization and Radio Systems Policies](#).
- 2.5 The Geographical Differences Policy (GDP) guideline applies in these frequency bands. Additional information on the GDP can be found in SP 1-20 GHz.²

¹ Information on licensed radiocommunication stations can be retrieved from Industry Canada's [Spectrum Direct website](#).

² SP 1-20 GHz, [Revisions to Microwave Spectrum Utilization Policies in the Range 1-20 GHz](#), January 1995, contains new spectrum utilization principles, including the Geographical Differences Policy guideline. This information will be incorporated into a revision of SP-GEN.

- 2.6 Even though a radio system complies with the requirements of this SRSP, modifications may be required to the system whenever harmful interference³ is caused.
- 2.7 When potential conflict between radio systems cannot be resolved by the parties concerned, Industry Canada should be advised. After consultation with these parties, the Department will determine the necessary modifications and schedule of modifications to resolve the conflict. These modifications may include, but are not limited to, changes to the operating frequency channel, the transmitter and/or receiver antenna deployment characteristics (i.e. gain, backlobe and sidelobe discrimination, polarization, elevation angle, etc.) and the use of a receiver with improved selectivity characteristics.
- 2.8 It should be noted that the fixed service shares this band with other services in accordance with the *Canadian Table of Frequency Allocations 9 kHz to 275 GHz*.
- Notably, the band 27.5-29.1 GHz also has a primary allocation for the fixed-satellite service (FSS) (Earth-to-space). When planning their deployments and conducting interference analyses, fixed service licensees in the band 27.5-28.35 GHz should take into account FSS Earth stations that transmit in this band.
- 2.9 Upon request, licensees are required to make available to Industry Canada information on certain technical parameters of their point-to-point and point-to-multipoint stations.

3. Related Documents

- 3.1 The current issues of the following documents are applicable, and are available on Industry Canada's [Spectrum Management and Telecommunications website](http://www.ic.gc.ca/spectrum) at <http://www.ic.gc.ca/spectrum>.

SP GEN	<i>General Information Related to Spectrum Utilization and Radio Systems Policies</i>
TRC-43	<i>Designation of Emissions (Including Necessary Bandwidth and Classification), Class of Station and Nature of Service</i>
CTFA	<i>Canadian Table of Frequency Allocations 9 kHz to 275 GHz</i>
CPC-2-0-03	<i>Radiocommunication and Broadcasting Antenna Systems</i>
DGTP-002-10	<i>Consultation on the Use of the Band 25.25-28.35 GHz</i>

³ For the purposes 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*.

[SP 25.25 GHz](#) *Spectrum Utilization Policy, Decisions on the Band 25.25-28.35 GHz*

-- *Interim Arrangement Concerning the Sharing between Canada and the United States of America on Local Multipoint Communication Systems, the Local Multipoint Distribution Service and Certain Other Services in Parts of the Frequency Bands 27.35-28.35 GHz, 29.1-29.25 GHz, and 31.0-31.3 GHz*

SP – Spectrum Utilization Policy
TRC – Telecommunications Regulation Circular
CTFA – Canadian Table of Frequency Allocations
CPC – Client Procedures Circular
DGTP – Telecommunications Policy

4. Radio Frequency Channel Arrangement Description

4.1 Radio Frequency Channel Description for the Band 25.25-26.5 GHz

- 4.1.1 The band 25.25-26.5 GHz is divided into 19 paired frequency channels, as shown in Table 1 and Figure 1.
- 4.1.2 The frequency channels are symmetrically paired to facilitate frequency division duplex (FDD) systems.
- 4.1.3 Time division duplex (TDD) systems may operate in frequency channels B1/B1' to B12/B12'.
- 4.1.4 Licensees may deploy point-to-point systems in frequency channels A1/A1' to A7/A7'.
- 4.1.5 Licensees may deploy point-to-point and/or point-to-multipoint systems in frequency channels B1/B1' to B12/B12'.
- 4.1.6 Assignments for the frequency range 25.501-26.257 GHz (channels B1/B1' to B12/B12') will first be accommodated in channels B1/B1' for point-to-multipoint systems (both TDD and FDD), whereas the assignments for point-to-point systems (both TDD and FDD) will first be accommodated in channels B12/B12'. If these channels are not available, the assignment will be accommodated in the nearest available adjacent frequency channels.
- 4.1.7 Upon reasonable justification, Industry Canada may consider, on a case-by-case basis, requests to combine two adjacent frequency channels to form a single larger frequency channel. In such cases, the combined frequency channel must meet all the requirements of this SRSP.

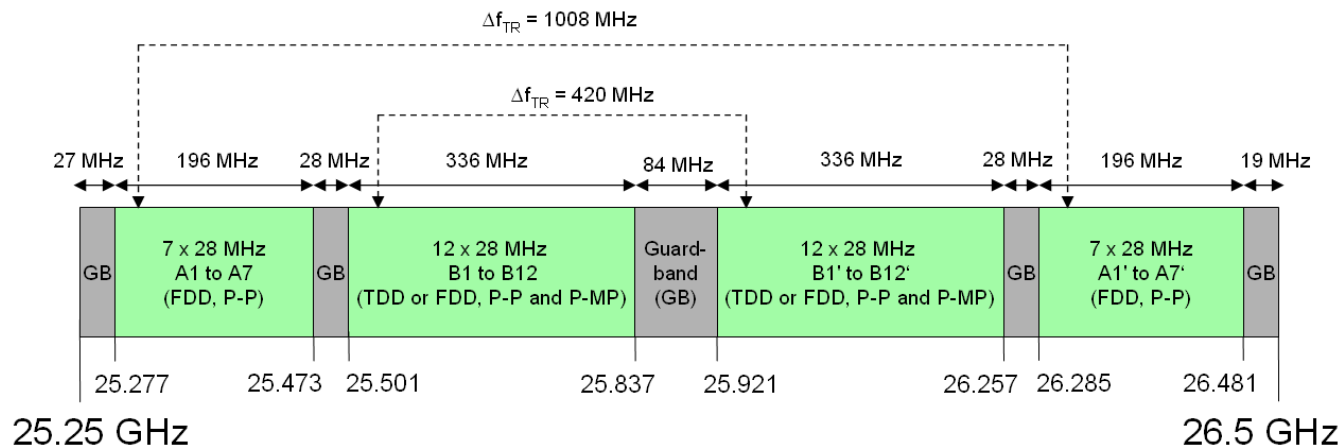


Figure 1: 25.25-26.5 GHz Band Plan and Associated Usage

Table 1 — 25.25-26.5 GHz Band Plan and Associated Usage

Channel	Lower Channel Centre Frequency (MHz)	Upper Channel Centre Frequency (MHz)	Duplex	Usage
A1/A1'	25291	26299	FDD	P-P
A2/A2'	25319	26327	FDD	P-P
A3/A3'	25347	26355	FDD	P-P
A4/A4'	25375	26383	FDD	P-P
A5/A5'	25403	26411	FDD	P-P
A6/A6'	25431	26439	FDD	P-P
A7/A7'	25459	26467	FDD	P-P
B1/B1'	25515	25935	FDD, TDD	P-P, P-MP
B2/B2'	25543	25963	FDD, TDD	P-P, P-MP
B3/B3'	25571	25991	FDD, TDD	P-P, P-MP
B4/B4'	25599	26019	FDD, TDD	P-P, P-MP
B5/B5'	25627	26047	FDD, TDD	P-P, P-MP
B6/B6'	25655	26075	FDD, TDD	P-P, P-MP
B7/B7'	25683	26103	FDD, TDD	P-P, P-MP
B8/B8'	25711	26131	FDD, TDD	P-P, P-MP
B9/B9'	25739	26159	FDD, TDD	P-P, P-MP
B10/B10'	25767	26187	FDD, TDD	P-P, P-MP
B11/B11'	25795	26215	FDD, TDD	P-P, P-MP
B12/B12'	25823	26243	FDD, TDD	P-P, P-MP

4.2 Radio Frequency Channel Description for the Band 27.5-28.35 GHz

4.2.1 The band 27.5-28.35 GHz is divided into paired frequency channels, as shown in Figure 2 and tables 2 to 6.

4.2.2 The frequency channels are symmetrically paired to facilitate frequency division duplex (FDD) systems.

- 4.2.3 Licensees may deploy point-to-point systems in the frequency channels C1/C1' to C7/C7', D1/D1' to D9/D9', E1/E1' to E12/E12', F1/F1' to F18/F18', and G1/G1' to G36/G36'.
- 4.2.4 Upon reasonable justification, Industry Canada may consider, on a case-by-case basis, requests to combine two adjacent frequency channels to form a single larger frequency channel. In such cases, the combined frequency channel must meet all the requirements of this SRSP.

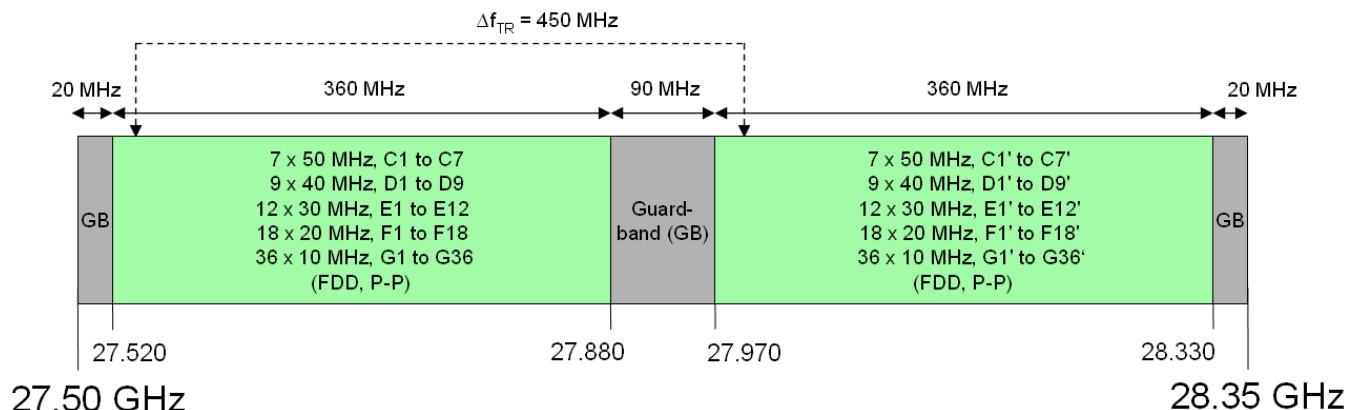


Figure 2: 27.5-28.35 GHz Band Plan and Associated Usage

Table 2 — 27.5-28.35 GHz Band Plan and Associated Usage for Systems Using 50 MHz Wide Channels

Channel	Lower Channel Centre Frequency (MHz)	Upper Channel Centre Frequency (MHz)	Duplex	Usage
C1/C1'	27545	27995	FDD	P-P
C2/C2'	27595	28045	FDD	P-P
C3/C3'	27645	28095	FDD	P-P
C4/C4'	27695	28145	FDD	P-P
C5/C5'	27745	28195	FDD	P-P
C6/C6'	27795	28245	FDD	P-P
C7/C7'	27845	28295	FDD	P-P

Table 3 — 27.5-28.35 GHz Band Plan and Associated Usage for Systems Using 40 MHz Wide Channels

Channel	Lower Channel Centre Frequency (MHz)	Upper Channel Centre Frequency (MHz)	Duplex	Usage
D1/D1'	27540	27990	FDD	P-P
D2/D2'	27580	28030	FDD	P-P
D3/D3'	27620	28070	FDD	P-P
D4/D4'	27660	28110	FDD	P-P
D5/D5'	27700	28150	FDD	P-P
D6/D6'	27740	28190	FDD	P-P
D7/D7'	27780	28230	FDD	P-P
D8/D8'	27820	28270	FDD	P-P
D9/D9'	27860	28310	FDD	P-P

**Table 4 — 27.5-28.35 GHz Band Plan and Associated Usage
 for Systems Using 30 MHz Wide Channels**

Channel	Lower Channel Centre Frequency (MHz)	Upper Channel Centre Frequency (MHz)	Duplex	Usage
E1/E1'	27535	27985	FDD	P-P
E2/E2'	27565	28015	FDD	P-P
E3/E3'	27595	28045	FDD	P-P
E4/E4'	27625	28075	FDD	P-P
E5/E5'	27655	28105	FDD	P-P
E6/E6'	27685	28135	FDD	P-P
E7/E7'	27715	28165	FDD	P-P
E8/E8'	27745	28195	FDD	P-P
E9/E9'	27775	28225	FDD	P-P
E10/E10'	27805	28255	FDD	P-P
E11/E11'	27835	28285	FDD	P-P
E12/E12'	27865	28315	FDD	P-P

**Table 5 — 27.5-28.35 GHz Band Plan and Associated Usage
 for Systems Using 20 MHz Wide Channels**

Channel	Lower Channel Centre Frequency (MHz)	Upper Channel Centre Frequency (MHz)	Duplex	Usage
F1/F1'	27530	27980	FDD	P-P
F2/F2'	27550	28000	FDD	P-P
F3/F3'	27570	28020	FDD	P-P
F4/F4'	27590	28040	FDD	P-P
F5/F5'	27610	28060	FDD	P-P
F6/F6'	27630	28080	FDD	P-P
F7/F7'	27650	28100	FDD	P-P
F8/F8'	27670	28120	FDD	P-P
F9/F9'	27690	28140	FDD	P-P
F10/F10'	27710	28160	FDD	P-P
F11/F11'	27730	28180	FDD	P-P
F12/F12'	27750	28200	FDD	P-P
F13/F13'	27770	28220	FDD	P-P
F14/F14'	27790	28240	FDD	P-P
F15/F15'	27810	28260	FDD	P-P
F16/F16'	27830	28280	FDD	P-P
F17/F17'	27850	28300	FDD	P-P
F18/F18'	27870	28320	FDD	P-P

**Table 6 — 27.5-28.35 GHz Band Plan and Associated Usage
 for Systems Using 10 MHz Wide Channels**

Channel	Lower Channel Centre Frequency (MHz)	Upper Channel Centre Frequency (MHz)	Duplex	Usage
G1/G1'	27525	27975	FDD	P-P
G2/G2'	27535	27985	FDD	P-P
G3/G3'	27545	27995	FDD	P-P
G4/G4'	27555	28005	FDD	P-P
G5/G5'	27565	28015	FDD	P-P
G6/G6'	27575	28025	FDD	P-P
G7/G7'	27585	28035	FDD	P-P
G8/G8'	27595	28045	FDD	P-P
G9/G9'	27605	28055	FDD	P-P
G10/G10'	27615	28065	FDD	P-P
G11/G11'	27625	28075	FDD	P-P
G12/G12'	27635	28085	FDD	P-P
G13/G13'	27645	28095	FDD	P-P
G14/G14'	27655	28105	FDD	P-P
G15/G15'	27665	28115	FDD	P-P
G16/G16'	27675	28125	FDD	P-P
G17/G17'	27685	28135	FDD	P-P
G18/G18'	27695	28145	FDD	P-P
G19/G19'	27705	28155	FDD	P-P
G20/G20'	27715	28165	FDD	P-P
G21/G21'	27725	28175	FDD	P-P
G22/G22'	27735	28185	FDD	P-P
G23/G23'	27745	28195	FDD	P-P
G24/G24'	27755	28205	FDD	P-P
G25/G25'	27765	28215	FDD	P-P
G26/G26'	27775	28225	FDD	P-P
G27/G27'	27785	28235	FDD	P-P
G28/G28'	27795	28245	FDD	P-P
G29/G29'	27805	28255	FDD	P-P
G30/G30'	27815	28265	FDD	P-P
G31/G31'	27825	28275	FDD	P-P
G32/G32'	27835	28285	FDD	P-P
G33/G33'	27845	28295	FDD	P-P
G34/G34'	27855	28305	FDD	P-P
G35/G35'	27865	28315	FDD	P-P
G36/G36'	27875	28325	FDD	P-P

5. General Coordination Requirements for Point-to-Point and Point-to-Multipoint Systems Operating in the Bands 25.25-26.5 GHz and 27.5-28.35 GHz

- 5.1 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. International Coordination

- 6.1 Usage of the band 27.5-28.35 GHz near the Canada-United States border is subject to the provisions of the *Interim Arrangement Concerning the Sharing between Canada and the United States of America on Local Multipoint Communication Systems, the Local Multipoint Distribution Service and Certain Other Services in Parts of the Frequency Bands 27.35-28.35 GHz, 29.1-29.25 GHz, and 31.0-31.3 GHz*.
- 6.2 Canada does not currently have a formal arrangement with the U.S. government for the sharing of the frequency band 25.25-26.5 GHz along the border regions. Licensees will be subject to any future agreements between Canada and the United States regarding use of these systems in the border regions, which may include modifications of previously authorized stations.

7. Domestic Coordination for Point-to-Point Systems^{4,5} Operating in the Bands 25.25-26.5 GHz and 27.5-28.35 GHz

As outlined in Section 2.2, the coordination requirements in sections 7.1 and 8 of this standard shall not apply to systems licensed under the interim licensing process described in Section 9 of [DGTP-002-10](#), until such time as the licensing process for these bands is established.

The following coordination procedures are intended to be used between two licensees in the absence of another mutually agreed upon standard to govern coordination of any proposed transmitter. Licensees who propose transmitters that would normally trigger the present procedure, but who can mutually agree to an alternate coordination procedure with the licensee of an existing or previously notified system, are not bound by this process. A copy of such a mutual agreement must be kept by the licensee and be made available to the Department upon request.

⁴ The requirements of this section apply to the coordination of a new point-to-point station with other existing stations, which could be either point-to-point or point-to-multipoint.

⁵ A link from a subscriber station to a hub station in a point-to-multipoint system is not subject to the coordination requirements of this section, but is subject to the requirements for point-to-multipoint systems in Section 8.

7.1 Co-Channel⁶ Frequency Coordination

7.1.1 General Coordination Trigger Criteria

When a licensee proposes to install facilities, successful completion of applicable coordination is required prior to activation. Coordination is required whenever a proposed transmitting station coordination footprint encompasses existing or previously notified receiving stations of another licensee.

The coordination footprint extends to the distances shown in Figure 3 below.⁷

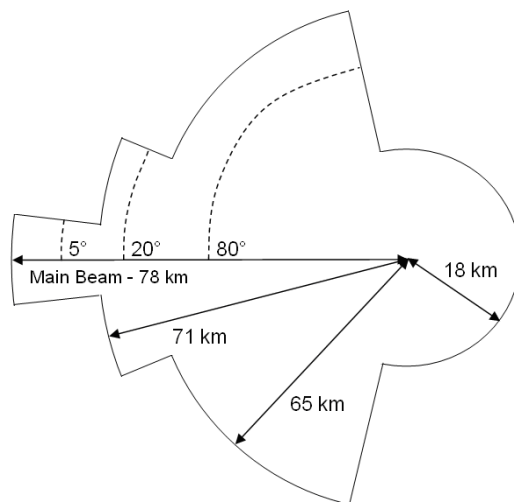


Figure 3: Co-Channel Frequency Coordination Footprint for Point-to-Point Systems

7.1.2 Notification and Response Process

7.1.2.1 General

If a proposed station triggers the coordination process, the licensee is 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 Annex A for suggested parameters).

It is recommended that field tests be performed prior to commencement of operation of a radio system to determine whether interference caused by building reflections or other frequency sources, which was not anticipated during the interference calculations,⁸ is detected at the proposed site while looking along the proposed azimuth.

⁶ 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).

⁷ In the event that an operator uses sites of very high elevations relative to local terrain that could produce interference to receiving stations beyond the distances shown in Figure 3, the operator shall coordinate with the affected licensee(s). The distances shown in Figure 3 are based on an elevation of 50 metres relative to an even terrain profile. Calculations to determine the distances for which interference is produced should use accepted engineering practices, taking into account factors such as propagation loss, atmospheric loss, antenna directivity and curvature of the Earth.

⁸ Calculations can be made with the help of Bulletin TSB10-F, *Interference Criteria for Microwave Systems*, available from the Telecommunications Industry Association (TIA), or other recognized coordination methodology and criteria.

7.1.2.2 Response Time

Upon receipt of a coordination notice, a recipient shall have a maximum of 30 calendar days to submit 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 30-calendar-day time frame will indicate that the recipient has no interference objections to the facilities proposed in the notice.

7.1.2.3 Construction/Commencement of Operation Timeline

Upon successful resolution of all interference objections, the licensee shall so inform Industry Canada and have 180 calendar days to construct and commence operation.

7.2 Adjacent Channel Frequency Coordination, Including Inband and Out-of-band Systems

Given the possibility of potential interference between adjacent channel systems operating in the same vicinity, all licensees are expected to conduct adjacent channel interference analyses and coordinate accordingly. Where the interference analysis reveals a potential conflict beyond the first adjacent channel, licensees of these systems are also expected to coordinate.

It should be noted that the band 25.25-26.5 GHz is adjacent to the band 25.05-25.25 GHz, in which fixed point-to-point and point-to-multipoint systems also operate. Despite the presence of a guardband in the range 25.250-25.277 GHz, there is a possibility of interference between systems operating in the lower portion of the band 25.25-26.5 GHz and systems in the same vicinity operating in the upper blocks of the band 25.05-25.25 GHz. As a result, the adjacent channel coordination requirements described above shall also include systems operating in the band 25.05-25.25 GHz,⁹ for licensees operating in channels A1 to A7.

8. Domestic Coordination for Point-to-Multipoint Systems¹⁰ Operating in the Bands 25.501-25.837 GHz and 25.921-26.257 GHz

As outlined in Section 2.2, the coordination requirements in sections 7.1 and 8 of this standard shall not apply to systems licensed under the interim licensing process described in Section 9 of [DGTP-002-10](#), until such time as the licensing process for these bands is established.

8.1 Domestic coordination is required between licensed service areas where the shortest distance between the respective service area boundaries is less than 73 km.¹¹ Operators are encouraged

⁹ Technical requirements for fixed systems operating in the band 25.05-25.25 GHz are shown in [SRSP-324.25](#), and information on licensees operating in that band can be retrieved from Industry Canada's [Spectrum Direct website](#).

¹⁰ The requirements of this section apply to the coordination of a new point-to-multipoint station with other existing stations, which could be either point-to-point or point-to-multipoint.

- to arrive at mutually acceptable sharing agreements that would allow for the provision of service of each licensee within their service area to the maximum extent possible.
- 8.2 When a sharing agreement does not exist or has not been concluded between operators whose service areas are less than 73 km apart, the following coordination process shall be employed:
- 8.2.1 Operators are required to calculate the power flux density (pfd) at the service area boundary of the neighbouring service areas for the transmitting facilities. Pfd is calculated using accepted engineering practices, taking into account factors such 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 Annex B for a sample calculation of a pfd level).
- 8.2.2 Deployment of facilities that generate a pfd less than or equal to -125 dBW/m² in any 1 MHz band at the other service area boundaries is not subject to any coordination requirements.
- 8.2.3 Deployment of facilities that generate a pfd greater than -125 dBW/m² in any 1 MHz band at the other service area boundaries are subject to successful coordination between the affected licensees in accordance with the following coordination process:
- 8.2.3.1 The operator must notify the respective licensee(s) of its intention to deploy the facilities, and submit the information necessary to conduct an interference analysis.
- 8.2.3.2 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 systems¹² only.
- 8.2.3.3 If there is no objection raised, the deployment may proceed.
- 8.2.3.4 If an objection is raised, the respective licensees must work in collaboration to develop a suitable agreement before the deployment of facilities. The time frame to develop such an agreement should not exceed 30 calendar days.
- 8.2.3.5 Proposed facilities must be deployed within 180 calendar days of the conclusion of coordination; otherwise, coordination must be reinitiated as per Section 8.2.
- 8.2.4 The above process is described graphically in Annex C of this document.
- 8.3 All results of analysis on pfd and agreements made between licensees must be retained by the licensees and made available to Industry Canada upon request.

¹¹ In the event that an operator uses sites of very high elevations relative to local terrain that could produce interference to service areas beyond 73 km, the operator shall coordinate with the affected licensees. The distance of 73 km is based on an elevation of 50 metres relative to an even terrain profile. Calculations to determine the distances for which interference is produced should use accepted engineering practices, taking into account factors such as propagation loss, atmospheric loss, antenna directivity and curvature of the Earth.

¹² Existing systems include systems that are operational prior to the receipt of notification or systems that have previously been successfully coordinated.

8.4 Given the possibility of interference between adjacent channel systems operating in the same vicinity, all licensees are expected to conduct adjacent channel interference analyses and coordinate accordingly. Where the interference analysis reveals a potential conflict beyond the first adjacent channel, licensees of these systems are also expected to coordinate.

9. Technical Requirement for Point-to-Point and Point-to-Multipoint Systems Operating in the Bands 25.25-26.5 GHz and 27.5-28.35 GHz

9.1 Frequency Stability

The centre frequency of the emission shall be maintained within $\pm 0.001\%$ of the assigned frequency.

9.2 Transmitter Output Power

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

9.3 Equivalent Isotropically Radiated Power

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

9.3.2 For point-to-point systems, the e.i.r.p. density must not exceed +30 dBW/MHz.

9.3.3 For point-to-multipoint systems, the e.i.r.p. density must not exceed +30 dBW/MHz for subscriber stations and +14 dBW/MHz for hubs.

For hubs in point-to-multipoint systems operating in the band 25.25-26.5 GHz and having a main beam with an elevation angle θ greater than 5° above the horizontal plane, the e.i.r.p. density limit must be lowered to $+14 - 10 \log_{10}(\theta/5)$ dBW/MHz.

9.3.4 For systems operating in the band 25.25-26.5 GHz and having the main beam of the transmitter within a 1.5° angle (taking into account the effect of atmospheric refraction) of the direction of any geostationary-satellite orbit (GSO) location,¹³ the e.i.r.p. density limit must be lowered to +24 dBW/MHz for point-to-point systems and subscriber stations in point-to-multipoint systems, and +8 dBW/MHz for hubs in point-to-multipoint systems. Additionally, for hubs having an elevation angle θ greater than 20° , the e.i.r.p. density limit must be lowered to $+14 - 10 \log_{10}(\theta/5)$ dBW/MHz.

9.4 Transmitter Unwanted Emissions

9.4.1 Single-Carrier Transmitter

¹³ The ITU-R identifies GSO data relay satellite orbital positions in the most current version of ITU-R Recommendation SA.1276, which can be accessed at the following ITU-R web page: <http://www.itu.int/rec/R-REC-SA.1276/en>. Version 3 of the recommendation identifies the following orbital positions (given in the East direction): 10.6° , 16.4° , 16.8° , 21.5° , 47° , 59° , 77° , 80° , 85° , 89° , 90.75° , 95° , 113° , 121° , 133° , 160° , 171° , 176.8° , 177.5° , 186° , 189° , 190° , 200° , 221° , 298° , 311° , 314° , 316° , 319° , 328° , 344° , and 348° .

- (a) In any 1 MHz band, where the centre frequency is removed from the assigned channel centre frequency by more than 50% up to and including 250% of the authorized bandwidth, the mean power of emission shall be attenuated below the mean output power of the transmitter in accordance with the following equation.

$$A = 11 + 0.4 (P - 50) + 10 \log_{10} B$$

where

- A = attenuation (in dB) below the mean output power level
P = percent of authorized bandwidth removed from the centre frequency of the assigned RF channel
B = authorized bandwidth (in MHz)

- Note:** 1. In no case shall the attenuation be less than 11 dB.
2. Attenuation greater than 56 dB or to an absolute power of less than -13 dBm/MHz is not necessary.

- (b) In any 1 MHz band, where the centre frequency is removed from the assigned channel centre frequency by more than 250% of the authorized bandwidth the mean power of emission shall be attenuated by $43 + 10 \log_{10}$ (mean output power in watts) dB or 80 dB, whichever is the lesser attenuation.

9.4.2 Multi-carrier Transmitter or Multi-Transmitters Sharing a Common Final Stage Amplifier

For a multi-carrier transmitter or multi-transmitters sharing a common final stage amplifier, the emission mask is to be the same as for single-carrier transmitters, but using the occupied bandwidth that is defined for multi-carrier transmitters. The total mean power shall be the sum of the individual carrier/transmitter powers.

When several transmitters share a passive antenna, each transmitter should satisfy the individual mask for single carrier transmitters; the multi-carrier mask should not be applied in this case.

9.5 International Telecommunication Union (ITU) Requirements

The ITU's requirements, as described in Annex D of this document, are applicable to the band 25.25-26.5 GHz.

9.6 Antenna Characteristics

For point-to-point systems, the co-polarized radiation pattern envelope in the horizontal plane of the antenna must remain within the envelope shown in Figure 4 and Table 7, for both vertical and horizontal polarizations. For point-to-multipoint systems, there is no requirement to meet any specified co-polarized radiation pattern envelope. However, subscriber stations in a point-to-multipoint system must use a directional antenna.

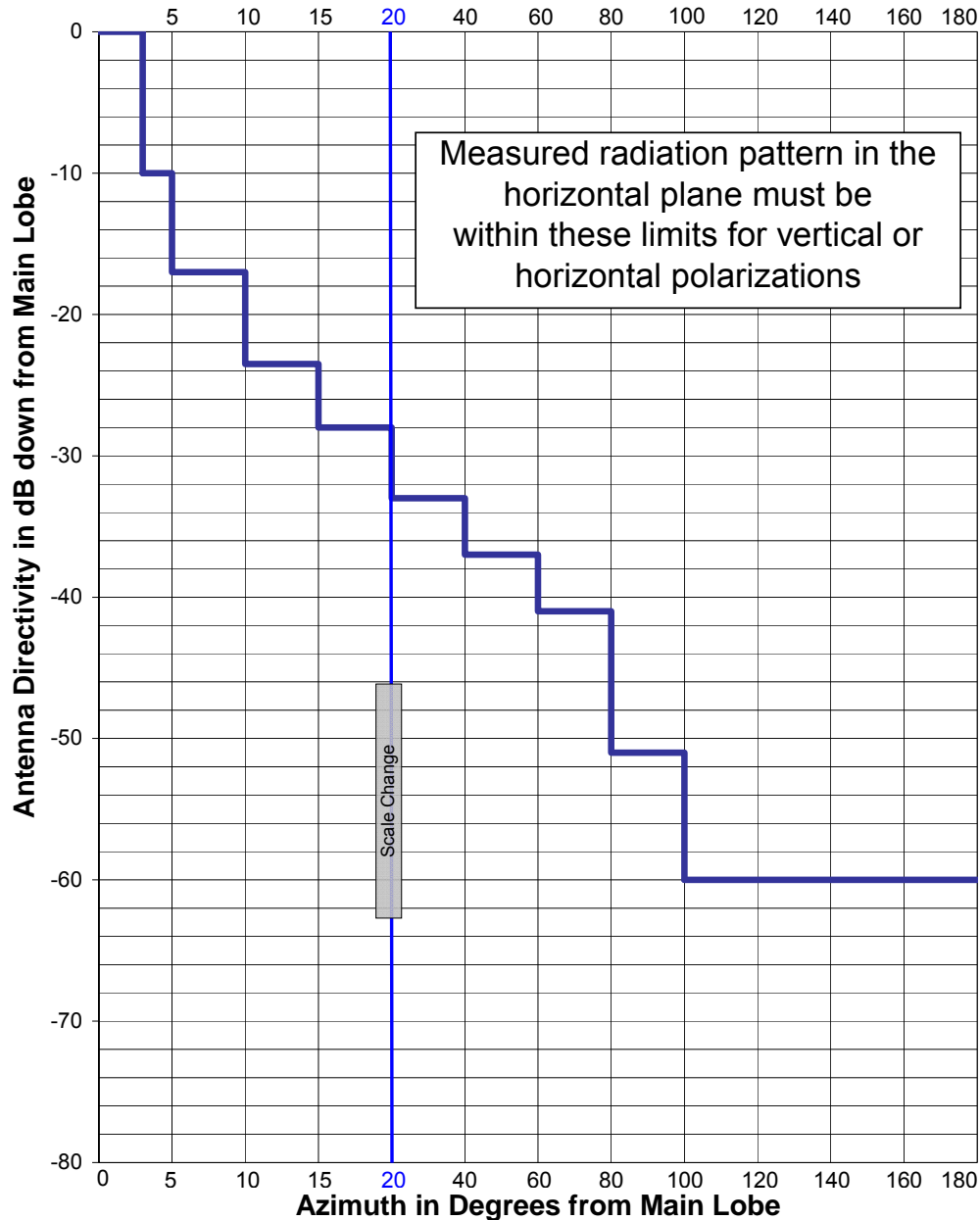


Figure 4: Minimum Antenna Characteristics for Point-to-Point Systems Operating in the Band 25.25-28.35 GHz

Table 7 — Minimum Antenna Characteristics for Point-to-Point Systems Operating in the Band 25.25-28.35 GHz

Azimuth in Degrees from Main Lobe	Antenna Directivity in Decibels Down from Main Lobe
3°	10
5°	17
10°	23.5
15°	28
20°	33
40°	37
60°	41
80°	51
100°	60
180°	60

Annex A: Parameters for Coordination

When coordination is required, it is suggested that the following parameters be provided:

- contact information (corporate name/ mailing address/ telephone/ fax/ email)
- location of transmitter (community/ province or territory)
- geographical coordinates of transmitting antenna
- equivalent isotropically radiated power (dBW)
- ground elevation and antenna height above ground (m)
- centre frequency (MHz)
- polarization
- antenna pattern/ tabulation of the pattern
- azimuth of the maximum antenna gain
- maximum antenna gain (dBi)
- bandwidth and emission designation

Note: More parameters can be provided if needed for the coordination process.

Annex B: Sample Calculation

The following example is provided to illustrate how the power flux density (pfd) level at the service area boundary can be determined. It should be noted that the calculation example assumes line-of-sight conditions due to a short path length and a high transmitting antenna. In other cases, where the path length is long and the transmitting antenna is low, 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.

Proposed station parameters:

Parameter	Symbol	Value
Hub transmitter power into the antenna	P_T	-12 dBW
Channel bandwidth	B	28 MHz
Transmitter antenna height above ground	H_T	100 metres
Transmitter antenna gain (Maximum gain towards the service area boundary at any elevation point 0-500 m above average terrain)	G_T	21 dBi
Centre frequency of channel	F	28150 MHz
Distance from hub transmitter to the boundary of Service Area Y	D	10 km

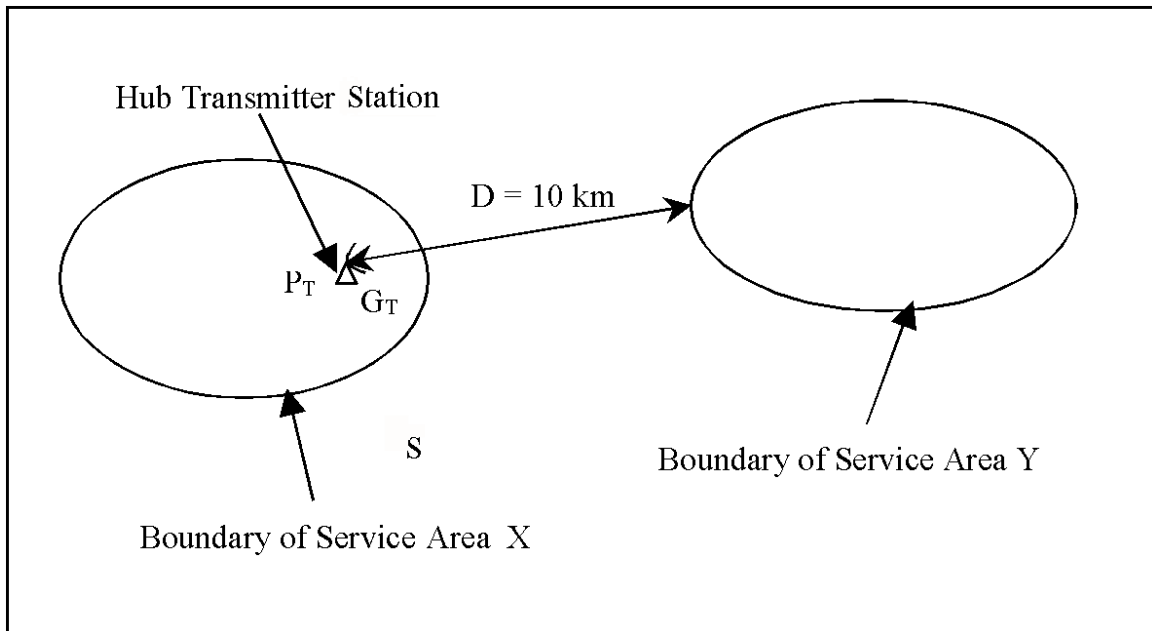


Figure B1: Graphical Representation of the Proposed Situation

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 atmospheric losses as follows:

$$\begin{aligned}
 P_{\text{at the boundary of Service Area Y}} &= P_T' + G_T - 20 \log F_{\text{MHz}} - 20 \log D_{\text{km}} - 32.4 - L_a \\
 &= (-26.4 + 21 - 20 \log (28150) - 20 \log (10) - 32.4 - 0.1 \times 10) \\
 &\quad \text{dBW/MHz} \\
 &= (-26.4 + 21 - 89 - 20 - 32.4 - 1) \text{ dBW/MHz} \\
 &= -147.8 \text{ dBW/MHz}
 \end{aligned}$$

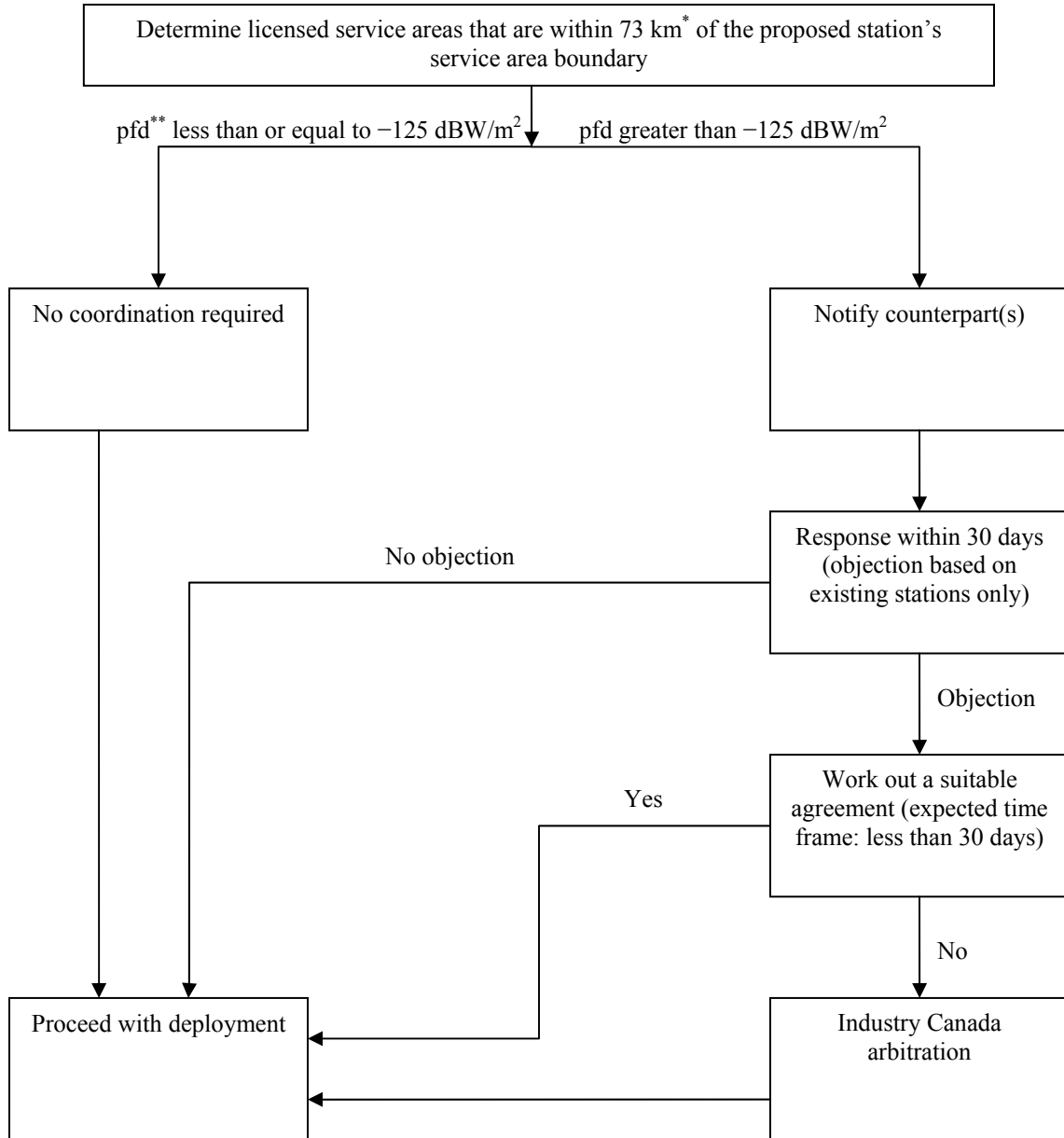
$$\begin{aligned}
 \text{where: } P_T' &= P_T - 10 \log B_{\text{MHz}} \\
 &= -12 - 10 \log (28) \\
 &= -26.4 \text{ dBW/MHz} \\
 G_T &= 21 \text{ dBi} \\
 F_{\text{MHz}} &= 28150 \\
 D_{\text{km}} &= 10 \\
 L_a &= \text{Atmospheric losses} = 0.1 \text{ dB/km}
 \end{aligned}$$

Then, the power flux density in dBW/m² in 1 MHz (pfd) may be calculated as follows:

$$\begin{aligned}
 \text{pfd} &= P_{\text{at the boundary of Service Area Y}} - 10 \log A_r \\
 &= (-147.8 - 10 \log (0.038 \times 10^{-6})) \text{ dBW/m}^2 \text{ in 1 MHz} \\
 &= (-147.8 - (-50.4)) \text{ dBW/m}^2 \text{ in 1 MHz} \\
 &= -97.4 \text{ dBW/m}^2 \text{ in 1 MHz}
 \end{aligned}$$

$$\begin{aligned}
 \text{where: } A_r &= \frac{\lambda^2}{4\pi} \\
 &= \frac{c^2}{4\pi F_{\text{Hz}}^2} \\
 &= \frac{(3 \times 10^8)^2}{4\pi \times (28.15 \times 10^9)^2} \\
 &= 9.038 \times 10^{-6} \text{ m}^2
 \end{aligned}$$

Annex C: Coordination Determination Process for Point-to-Multipoint Systems in the Absence of a Sharing Agreement Between Licensees



* In the event that an operator uses sites of very high elevations relative to local terrain that could produce interference to service areas beyond 73 km, the operator shall coordinate with the affected licensee(s).

** Pfd is calculated at the service area boundary of the respective counterpart(s).

**Annex D: International Telecommunication Union (ITU) Requirements
 (25.25-27.5 GHz)**

In the ITU’s *Radio Regulations*, the band 25.25-27.5 GHz is allocated on a co-primary basis to the fixed (FS), mobile and inter-satellite (IS) services. The current ITU Regulations (including footnotes) applicable to this band for the fixed service are as follows:

- 21.1 § 1 Sites and frequencies for terrestrial stations and earth stations, operating in frequency bands shared with equal rights between terrestrial radiocommunication and space radiocommunication services, shall be selected having regard to the relevant ITU-R Recommendations with respect to geographical separation between earth stations and terrestrial stations.
- 21.1 § 2 (1) As far as practicable, sites for transmitting¹ stations, in the fixed or mobile service, employing maximum values of equivalent isotropically radiated power (e.i.r.p.) exceeding the values given in Table **21-1** in the frequency bands indicated, should be selected so that the direction of maximum radiation of any antenna will be separated from the geostationary-satellite orbit by at least the angle in degrees shown in the Table, taking into account the effect of atmospheric refraction²:

Excerpts from Table 21-1

Frequency band (GHz)	e.i.r.p. value (dBW) (see also Nos. 21.2 and 21.4)	Minimum separation angle with respect to geostationary-satellite orbit (degrees)
25.25-27.5	+24 (in any 1 MHz band)	1.5

- 21.3 § 3 (1) The maximum equivalent isotropically radiated power (e.i.r.p.) of a station in the fixed or mobile service shall not exceed +55 dBW.
- 21.5 (3) The power delivered by a transmitter to the antenna of a station in the fixed or mobile service shall not exceed ... +10 dBW in frequency bands above 10 GHz ...
- 21.16 § 6 (1) The power flux-density at the Earth’s surface produced by emissions from a space station, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the limit given in Table **21-4**. The limit relates to the power flux density which would be obtained under assumed free-space propagation conditions and applies to emissions by a space station of the service indicated where the

¹ 21.2.1 For their own protection receiving stations in the fixed or mobile service operating in bands shared with space radiocommunication services (space-to-Earth) should also avoid directing their antennas towards the geostationary-satellite orbit if their sensitivity is sufficiently high that interference from space station transmissions may be significant. In particular, in the band 21.4-22 GHz, it is recommended to maintain a minimum separation angle of 1.5° with respect to the direction of the geostationary-satellite orbit. (WRC-12)

² 21.2.2 Information on this subject is given in the most recent version of Recommendation ITU-R SF.765 (see Resolution **27 (Rev. WRC-03)***). * *Note by the secretariat*: This Resolution was revised by WRC-07 and WRC-12.

frequency bands are shared with equal rights with the fixed or mobile service, unless otherwise stated.

Excerpts from Table **21-4**:

-115 dB(W/m²) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

-115 + 0.5 ($\delta - 5$) dB(W/m²) in any 1 MHz band for angles of arrival (δ) (in degrees) between 5 and 25 degrees above the horizontal plane;

-105 dB(W/m²) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.