



DBS-06

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Database Specifications

Automated Frequency Coordination (AFC) System Specifications for the 6 GHz (5925- 6875 MHz) Frequency Band

Preface

Database Specification DBS-06, issue 1, *Automated Frequency Coordination (AFC) System Specifications for the 6 GHz (5925-6875 MHz) Frequency Band*, sets out the technical requirements for the designation of an Automated Frequency Coordination System Administrator (AFCSA) and for the operation of an AFC system capable of identifying available frequencies and associated maximum power levels for use by standard-power radio local area network (RLAN) devices operating in the 6 GHz frequency band, specifically in the 5925-6875 MHz frequency band.

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Contents

List of acronyms	v
1 Scope	1
2 Coming into force	1
3 AFCSA designation	1
4 Purpose and application	1
5 AFC system calculation methodologies	2
5.1 Alternative AFC system calculation methodology	2
6 Definitions	2
7 Related documents	4
8 Data extract for protected licensed systems in the 6 GHz Band	5
8.1 Data extract for 6 GHz band information update	5
8.2 Information required for the protection of licensed systems in the 6 GHz frequency band 5	
8.2.1 Geographical reference datum	6
8.3 AFC system failure to access ISED database	6
9 AFC system registration of standard-power RLAN devices	6
9.1 Device registration and authentication process	7
9.2 Device and user information for registration and authentication	7
10 AFC system determination of available frequencies and associated maximum power levels	8
11 Exclusion zones for the protection of licensed fixed service stations	8
11.1 Protection criterion for licensed fixed service receiver stations	9
11.2 Propagation models to generate exclusion zones for licensed fixed service receiver stations	9
11.2.1 Propagation model for separation distances up to 30 metres	9
11.2.2 Propagation model for separation distances above 30 metres and up to 1 kilometre 9	
11.2.3 Propagation model for separation distances above 1 kilometre	10
11.3 Protection of licensed fixed service receiver stations linked with a passive reflector or repeater station	11
12 Exclusion zones for the protection of radio astronomy observatories	11
13 International border protection	11
13.1 Protection of U.S. licensed fixed services	11
14 Interference response measures	12
14.1 Detailed log files	12

14.2	Spectrum availability check.....	12
15	Enforcement instructions from ISED	12
15.1	Denied list	13
15.2	Denied areas.....	13
16	Security	13
A.1	AFC system interface test to connect with a standard-power RLAN device.....	15
A.2	AFC system available frequencies	15
Annex B: Normative Parameters, Use of Datasets and Acceptable Alternate Procedures (DBS-06) 16		
B.1	Receiver noise level determination	16
B.2	Land cover, digital surface and digital elevation datasets	16
B.3	Use of datasets for the WINNER II model.....	17
B.3.1	Determination of the WINNER II propagation scenario	17
B.3.2	Determination of the LOS condition.....	17
B.4	Appropriate ITM Parameters.....	17
B.5	Appropriate clutter model and clutter model parameters.....	18
B.5.1	Applying the clutter model.....	19
B.5.2	Appropriate value for ITU-R P.2108-0 percentage of locations parameter	19
B.5.3	Determination of the appropriate ITU-R P.452-16 clutter category.....	19

List of acronyms

AFC	Automated frequency coordination
AFCSA	Automated frequency coordination system administrator
AGL	Above ground level
AP	Access point
DSA	Dynamic spectrum access
e.i.r.p.	Equivalent isotropically radiated power
IC ID	Innovation, Science and Economic Development Canada Identification Number
ISED	Innovation, Science and Economic Development Canada
ITM	Irregular Terrain Model
ITU	International Telecommunication Union
LOS	Line-of-sight
NF	Noise Figure
NLOS	Non-line-of-sight
OOBE	Out-of-Band-Emission
RLAN	Radio Local Area Network
SMS	Spectrum Management System
WINNER II	Wireless World Initiative New Radio phase II

1 Scope

Database Specification DBS-06, issue 1, *Automated Frequency Coordination (AFC) System Specifications for the 6 GHz (5925-6875 MHz) Frequency Band*, sets out the technical requirements for the designation of an Automated Frequency Coordination System Administrator (AFCSA) and for the operation of an AFC system capable of identifying available frequencies and associated maximum power levels for use by standard-power radio local area network (RLAN) devices operating in the 5925-6875 MHz frequency band.

2 Coming into force

This document will come into force upon its publication on Innovation, Science and Economic Development Canada's (ISED) [Spectrum Management and Telecommunications](#) website. AFCSA designation applications may be submitted at any time once the document has come into force.

3 AFCSA designation

AFCSA applicants seeking an ISED designation shall be required to comply with the requirements of this standard. Upon reception of an AFCSA designation application, ISED will review and assess compliance with this standard in accordance with the procedures set out in Client Procedures Circular [CPC-4-1-01, Application Procedures for Dynamic Spectrum Access System Administrators \(DSASAs\)](#) [\[link to be added\]](#).

In order to maintain its designation, an AFCSA shall comply at all times with the terms and conditions of its designation agreement with ISED; in the event of any non-compliance, ISED may take action as laid out under the terms of this agreement, up to and including revoking the AFCSA's designation status.

Inactive and revoked AFC systems are prohibited from providing any available frequencies and associated maximum power levels in response to queries from standard-power RLAN devices.

The application and approval status of AFCSAs are shown on ISED's online [list of designated AFCSAs](#) [\[link to be added\]](#), available on [ISED's DSA website](#) [\[link to be added\]](#).

4 Purpose and application

DBS-06 was developed following the publication of Spectrum Management Spectrum Engineering SMSE-006-21, [Decision on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band](#).

An AFC system is a database system that automatically determines a list of available frequencies and associated maximum power levels for use by standard-power RLAN devices. Standard-power RLAN devices are licence-exempt wireless devices that operate on a no-protection, no-interference basis in the 5925-6875 MHz frequency band.

An AFC system uses information from the protected licensed systems in the 5925-6875 MHz frequency band, along with information from a standard-power RLAN device, to dynamically manage the device's access to the spectrum. The protected licensed systems operating in the 5925-6875 MHz frequency band include licensed fixed service stations and radio astronomy observatories.

5 AFC system calculation methodologies

This technical standard provides a specific methodology through which an AFC system calculates the list of available frequencies and associated maximum power levels available to standard-power RLAN devices. In particular, sections 11 to 13 describe the calculations that ensure the protection of licensed fixed service stations and radio astronomy observatories.

5.1 Alternative AFC system calculation methodology

In order to provide a maximum of flexibility for AFC system implementation that is consistent with the protection of licensed systems, ISED may, on a case-by-case basis and at its discretion, allow an AFC system to implement an alternative calculation methodology different from the one described in this technical standard, as long as it demonstrates to ISED that this methodology ensures the specified level of protection to licensed systems. Regardless of the methodology implemented, an AFC system shall apply the same calculation methodology to all standard-power RLAN devices for which it is providing a list of available frequencies.

If a designated AFCSA would like to make any subsequent changes to its calculation methodology for its AFC system, it shall first obtain written approval from ISED and may be required to submit a new designation application that uses an updated calculation methodology.

6 Definitions

Adjacent channel exclusion zone: An exclusion zone where a standard-power RLAN device is not permitted to operate if its out-of-band-emissions (OOBE) on its adjacent channel frequencies do not meet an established protection criterion. Adjacent channel frequencies are those frequencies ranging from the standard-power RLAN device's

channel edges up to one and a half times the channel bandwidth away from its channel centre frequency and those frequencies overlap with any portion of the occupied bandwidth of the protected licensed system.

Automated frequency coordination (AFC) system: An ISED-designated database system that maintains records of protected licensed systems operating in the 5925-6875 MHz frequency band. The AFC system determines a list of available frequencies and associated maximum power levels for use by a standard-power RLAN device at a specific time and geographic location.

Automated frequency coordination system administrator (AFCSA): A service provider designated by ISED to administer an AFC system within Canada.

Available frequencies: a range of frequencies that are deemed by the AFC system as available for use by standard-power RLAN devices at a specific time and geographic location.

Channel: portion of spectrum defined by an upper and lower frequency limit, i.e. channel edges, and by a channel centre frequency and a channel bandwidth, which is identical to the device's occupied bandwidth. A channel can also be defined by a number that identifies the channel in a standardized channel plan.

Co-channel exclusion zone: An exclusion zone where a standard-power RLAN device is not permitted to operate if its emissions on its co-channel frequencies do not meet an established protection criterion. Co-channel frequencies are those frequencies ranging over the standard-power RLAN's channel bandwidth that overlap with any portion of the occupied bandwidth of the protected licensed system.

Dynamic spectrum access (DSA): A technique by which a radio system dynamically adapts to the local radio spectrum environment in order to determine, and then access, available spectrum at specific locations and at specific time.

Exclusion zone: An AFC system-generated geographic area surrounding a protected licensed system operating in the 5925-6875 MHz frequency band where a standard-power RLAN device is not permitted to operate at particular frequencies and power levels.

Fixed client device: A client device, intended as a customer premise equipment, with geolocation capability, that is permanently attached to a structure, that operates in the 5925-6875 MHz frequency band as directed by an AFC system, and is only capable of connecting to a standard-power access point.

Geolocation capability: The ability of a standard-power RLAN device to determine its geographic coordinates and geolocation uncertainty, in metres, with a confidence level of 95%.

Height above ground level (AGL): The height of the centre of radiation of the antenna above the ground directly below the antenna.

Innovation, Science and Economic Development Canada Identification Number (IC ID): The ISED certification number of a standard-power RLAN device.

Network element device: A network entity communicating with an AFC system as a proxy for one standard-power RLAN device or multiple standard-power RLAN devices operating on the same network.

Non-disclosed station: secure fixed service station for which information is not currently disclosed in the publicly available ISED Spectrum Management System (SMS) data.

Protected licensed systems: Protected licensed systems include licensed fixed service stations (i.e. fixed microwave stations and studio-to-transmitter links) and licensed radio astronomy observatories that are protected, by the AFC system, from interference by the operation of standard-power RLAN devices in the 5925-6875 MHz frequency band.

Separation distance: The distance between a standard-power RLAN device and a protected licensed system.

Standard-power access point (AP): An AP with geolocation capability that operates in the 5925-6875 MHz frequency band as directed by an AFC system.

Standard-power RLAN devices: A term that collectively encompasses standard-power APs and fixed client devices, which can operate indoors and outdoors.

7 Related documents

All spectrum-related documents referred to in this paper are available on ISED's [Spectrum Management and Telecommunications](#) website. Refer to the following documents as needed:

CPC-4-1-01 [Application Procedures for Dynamic Spectrum Access System Administrators \(DSASAs\)](#) [link to be added]

RSS-248 [Radio Local Area Network \(RLAN\) Devices in the 5925-7125 MHz band](#)

SMSE-006-21	<u>Decision on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band</u>
SRSP-305.9	<u>Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the Band 5925-6425 MHz</u>
SRSP-306.4	<u>Technical Requirements for Fixed Line-of-Sight Radio Systems Operating in the Band 6425-6930 MHz</u>
SRSP-306.5	<u>Technical Requirements for Line-of-sight Radio Systems Operating in the Fixed Service and Providing Television Auxiliary Services in the Bands 6590-6770 and 6930-7125 MHz</u>

CPC: Client Procedures Circular
RSS: Radio Standards Specification
SMSE: Spectrum Management Spectrum Engineering
SRSP: Standard Radio System Plan

8 Data extract for protected licensed systems in the 6 GHz Band

The AFC system operated by an AFCSA applying for designation shall access the publicly available data extract from ISED's SMS database in the *6 GHz Band Data Extract for AFC systems* section of the [Spectrum Management System Data](#) (SMS) web page.

Furthermore, upon designation, the AFC system operated by a designated AFCSA shall access the secure version of the *6 GHz Band Data Extract for AFC systems*, which may include data for non-disclosed stations. The AFC system shall then incorporate in its calculations the information for the entire set of licensed fixed service stations operating in the 5925-6875 MHz frequency band, including the non-disclosed stations.

8.1 Data extract for 6 GHz band information update

An AFC system shall retrieve, at least once every 24 hours, the most up to date *6 GHz Band Data Extract for AFC systems* from the ISED database.

8.2 Information required for the protection of licensed systems in the 6 GHz frequency band

An AFC system shall use the information from the *6 GHz Band Data Extract for AFC systems* to ensure that licensed services operating in the band are protected from standard-power RLAN devices operating in the 5925-6875 MHz frequency band.

The *6 GHz Band Data Extract for AFC systems* contains the following information:

- station data for licensed fixed service stations
 - microwave receiver stations
 - antenna patterns
 - passive reflector stations
 - passive repeater stations
- station data for radio astronomy observatories
- list of certified standard-power RLAN devices

The specifics of the information fields in the *6 GHz Band Data Extract for AFC systems* are provided in a separate [glossary](#).

8.2.1 Geographical reference datum

If the geographic reference datum for coordinates of stations differs from the datum used by the AFC system's internal calculations and/or the datum used to obtain geolocation coordinates of standard-power RLAN devices, the AFC system shall ensure that the appropriate conversion calculations are incorporated.

8.3 AFC system failure to access ISED database

Should the *6 GHz Band Data Extract for AFC systems* not be accessible, additional attempts to retrieve licensing information from the ISED database shall be made at least once every 4 hours. If more than 12 hours has elapsed without the AFC system being able to retrieve this information, the AFCSA shall contact ISED regarding the unsuccessful access to the ISED database.

Thereafter, an AFC system may continue to operate for seven days from the last successful access, unless otherwise indicated by ISED. After those seven days, the AFC system shall operate only in accordance with instructions provided by ISED.

Following unsuccessful attempts to access the ISED SMS web page, and thereafter obtaining a successful connection, the AFCSA shall notify ISED of the successful access.

9 AFC system registration of standard-power RLAN devices

An AFC system shall have a registration process for standard-power RLAN devices according to the criteria set out in this section and its subsections. Device registration information and the associated user information shall be stored in the AFC system to help with investigations of potential harmful interference. Once registered, the device information shall be made publicly available, and the user information shall be available to ISED upon request.

9.1 Device registration and authentication process

An AFC system shall register and authenticate a standard-power RLAN device individually or through a network element device prior to the device initiating service or immediately after the device changes its location. An AFC system shall only provide available frequencies and associated maximum power levels to standard-power RLAN devices which have been registered and authenticated with the AFC system.

9.2 Device and user information for registration and authentication

An AFC system shall obtain and register the following device information directly from standard-power RLAN devices or through network element devices:

- geographic coordinates (latitude and longitude) that lie in Canada
- location uncertainty in *metres* with a confidence level of 95% or greater
- antenna height AGL (in metres)
- IC ID
- manufacturer's serial number.

An AFC system shall ensure that the standard-power RLAN device information listed above is complete and is kept up-to-date when the device changes its location from its previously registered location. An AFC system shall verify that the IC ID reflects a valid certification as a standard-power RLAN device, under Radio Standards Specification [RSS-248, Radio Local Area Network \(RLAN\) Devices in the 5925-7125 MHz band](#). A list of certified devices with IC IDs is provided in the *6 GHz Band Data Extract for AFC systems*.

An AFC system shall also obtain and store the following user information from standard-power RLAN devices or network element devices:

- name of the individual or business (e.g. the Internet service provider providing the service) that owns the standard-power device
- name of a contact person responsible for resolving interference issues related to the standard-power device's operation
- mailing address for the contact person
- email address for the contact person
- phone number for the contact person

Provision of accurate device and user information shall be mandatory. Service to the device shall be discontinued if the device and/or user fails to provide valid information. Failure to provide valid device information shall also be considered as a breach of the device's certification. The AFC system shall store the standard-power RLAN device

registration information in a secure database for a duration of at least 90 calendar days after the standard-power RLAN device's last contact with the AFC system.

Prior to registering a standard-power RLAN device for the first time, an AFC system shall verify that the above-mentioned registration information is complete and authenticate the registration by verifying the email address that has been provided by the standard-power RLAN device user.

10 AFC system determination of available frequencies and associated maximum power levels

When a registered and authenticated standard-power RLAN device contacts an AFC system to obtain a list of available frequencies, the AFC system shall provide to the standard-power RLAN device a list of available frequencies and associated maximum power levels, according to the criteria set out in sections 11 to 13. The AFC system shall determine the power levels in steps of no greater than 3 dB below the maximum permissible e.i.r.p of 36 dBm, and down to at least a minimum e.i.r.p of 21 dBm.

An AFC system shall be capable of determining available frequencies and associated maximum power levels for a given standard-power RLAN device based on the device information obtained during registration, the protected licensed systems' information provided in ISED's *6 GHz Band Data Extract for AFC systems*, and using the interference protection criterion as well as the propagation models set by ISED in sections 11 to 13 of this document.

An AFC system shall include the location information, the location uncertainty and the antenna height AGL of the standard-power RLAN device in its calculation of available frequencies and associated power levels. An AFC system shall take into consideration the entire uncertainty volume around a standard-power RLAN device to determine frequencies and the associated maximum power levels. The AFC system shall provide the standard-power RLAN device with the most restrictive frequencies and associated power levels determined over the entirety of the uncertainty volume. The evaluation points within the uncertainty volume shall be determined based on a grid centered at the standard-power RLAN device with a resolution of at least 100 m on the horizontal plane and at least 5 m on the vertical elevation.

11 Exclusion zones for the protection of licensed fixed service stations

An AFC system shall protect all licensed fixed service stations operating in the 5925-6875 MHz frequency band from harmful interference by standard-power RLAN devices operating in the same frequency range according to the criteria set out in this section and its subsections. To ensure the protection of these stations, the AFC system shall establish co-channel and adjacent channel exclusion zones around the location of the licensed fixed service receiver stations, using the information obtained from the *6 GHz*

band Data Extract for AFC systems, and shall take into consideration passive reflector and repeater stations linked to licensed fixed service receiver stations.

11.1 Protection criterion for licensed fixed service receiver stations

In determining the size of the exclusion zone, an AFC system shall implement an I/N protection criterion of -6 dB, where I (interference) is the received signal from the standard-power RLAN device at the licensed fixed service receiver station and N (noise) is the background noise level at the input of the licensed fixed service receiver station. The noise level determination is outlined in section B.1 of Annex B.

In determining the size of the co-channel exclusion zone, I is the co-channel signal from the standard-power RLAN device at the receiver input of the licensed fixed service receiver station.

In determining the size of the adjacent channel exclusion zone, I is the OOB of the standard-power RLAN device at the receiver input of the licensed fixed service receiver station.

11.2 Propagation models to generate exclusion zones for licensed fixed service receiver stations

To determine the size of co-channel and adjacent channel exclusion zones, an AFC system shall implement the stipulated propagation model based on the separation distance between the standard-power RLAN device and the licensed fixed service receiver station, according to the criteria set out in this section and its subsections.

11.2.1 Propagation model for separation distances up to 30 metres

For separation distance up to and including 30 metres, the AFC system shall use the free space path-loss model.

11.2.2 Propagation model for separation distances above 30 metres and up to 1 kilometre

For separation distances above 30 metres and up to and including 1 kilometre, the AFC system shall use the [Wireless World Initiative New Radio phase II \(WINNER II\) model](#) to determine the path loss.

The AFC system shall use the WINNER II C2, C1 and D1 propagation scenarios to represent urban, suburban and rural paths, respectively. The AFC system shall use site-specific information, as outlined in section B.3.1 of Annex B, to determine the appropriate propagation scenario to apply over the path between a standard-power RLAN device and a licensed fixed service receiver station.

The AFC system shall use site-specific information as outlined in section B.3.2 of Annex B, where such data is available, to determine the line-of-sight (LOS) or non-line-of-sight (NLOS) condition over the path between a standard-power RLAN device and a licensed fixed service receiver station and calculate the appropriate path loss component. For propagation loss calculations between a 30 metre and 50 metre separation distance, only the LOS path loss component shall be used.

For evaluating path loss where site-specific information is not available, the AFC system shall use the D1 propagation scenario and a weighted average path loss, combining the LOS and NLOS path loss components into a single path loss, as follows:

$$\text{Total Path Loss (dB)} = P_{LOS} * L_{LOS} + P_{NLOS} * L_{NLOS}$$

where L_{LOS} and L_{NLOS} are the LOS and NLOS path loss components, respectively, expressed in dB, P_{LOS} is the probability of a LOS condition, and P_{NLOS} is the probability of a NLOS condition and is equal to $(1 - P_{LOS})$. The AFC system shall use the formula included in the WINNER II model for determining P_{LOS} as a function of distance for the D1 scenario.

11.2.3 Propagation model for separation distances above 1 kilometre

For separation distances above 1 kilometre, the AFC system shall use the [Irregular Terrain Model \(ITM\)](#) with the Point-to-Point configuration combined with the appropriate clutter model to determine the path loss.

The AFC system shall use the appropriate ITM parameters along with digital elevation terrain data, as outlined in section B.4 of Annex B, to match the propagation conditions along the path between a standard-power RLAN device and a licensed fixed service receiver station.

The AFC system shall use site-specific information to combine the ITM path loss with the clutter loss of the appropriate clutter model, as outlined in section B.5 of Annex B and its subsections. The AFC system shall use the clutter model defined in Recommendation [ITU-R P.2108](#) for urban and suburban environments and in Recommendation [ITU-R P.452](#) for rural environments.

For evaluating clutter loss where site-specific information is not available, the AFC system shall use the ITU-R P.452 clutter model with the “Village Centre” clutter category.

11.3 Protection of licensed fixed service receiver stations linked with a passive reflector or repeater station

AFC systems shall protect licensed fixed service receiver stations linked with a passive reflector or repeater station by taking into consideration the linked passive reflector or repeater station and its parameters. The methods and calculation procedures by which these are taken into consideration shall provide a similar level of protection to that provided when adopting standard engineering practices.

A detailed description of the methods and calculation procedures used by an AFC system to account for passive reflectors and repeaters stations shall be submitted to ISED during the AFCSA's designation application. The methods and calculation procedures used will be subject to ISED's approval and will be considered on a case-by-case basis.

12 Exclusion zones for the protection of radio astronomy observatories

Radio astronomy observatories operate in the 6650-6675.2 MHz frequency range. An AFC system shall enforce exclusion zones around radio astronomy observatories identified in *the 6 GHz data extract for AFC systems* to ensure they are protected from standard-power RLAN devices. Within the exclusion zones, the AFC system shall not permit the operation of standard-power RLAN devices at any power levels on frequencies which overlap with the radio astronomy observatories' occupied bandwidths.

The exclusion zone size shall be determined using the following formula:

$$d = 4.12 * (\sqrt{H_{Tx}} + \sqrt{H_{Rx}})$$

where d is the radius of the exclusion zone centred at the radio astronomy observatory in kilometres, H_{Tx} is the height AGL of the standard-power RLAN device in metres, and H_{Rx} is the height AGL of the radio astronomy antenna in metres.

13 International border protection

An AFC system shall comply with the international protection requirements outlined in this section and its subsections.

13.1 Protection of U.S. licensed fixed services

An AFC system shall protect operating U.S. fixed service receiver stations and radio astronomy observatories according to the same criteria specified for Canadian protected licensed stations in sections 11 and 12 above.

14 Interference response measures

Interference cases resulting from incorrect licence information, will be the sole responsibility of the licensee which is responsible for providing accurate and current data under the terms of their license.

Other interference cases stemming from standard-power RLAN device queries remains ISED's responsibility and information shall be provided to ISED following a formal request. In order to facilitate the request and for the purposes of resolving cases of potentially harmful interference, an AFC system shall implement interference response measures according to the criteria set out in this section and its subsections.

Anyone with interference concerns or issues is encouraged to contact the respective [District Office](#).

14.1 Detailed log files

AFCSAs shall maintain a log of registrations, associated user contact information, and related operational information on all active standard-power RLAN devices for a minimum period of 90 calendar days, and shall make all such information available to ISED on request.

AFCSAs shall retain detailed logs of all standard-power RLAN device queries and responses contained in its database for a minimum period of 90 calendar days, and shall make all such information available to ISED on request. The queries and response in the log files shall include a reference to the registration information of the associated standard-power RLAN device.

14.2 Spectrum availability check

Following a request from ISED, an AFC system shall be able to provide to ISED the available frequencies and associated maximum power levels at a given time and location when queried by a specific standard-power RLAN device.

15 Enforcement instructions from ISED

Even if an AFC system meets the requirements of this document, ISED may impose corrective measures whenever harmful interference to protected licensed systems is caused by the operation of standard-power RLAN devices. The AFC system administrator shall comply with enforcement instructions from ISED.

15.1 Denied list

An AFC system shall maintain a list of devices that are not authorized to operate with it. These devices shall not be permitted to gain access to available frequencies. An AFC system shall enable ISED to identify devices to be placed on the denied list using the device IC ID or using a combination of the IC ID and the manufacturer's serial number.

If the AFC system has implemented other additional parameters to identify devices operating with it, ISED may also identify devices to be placed on the denied list using these additional parameters. Devices shall be added to or removed from the denied list only after receiving formal direction from ISED. It is anticipated that the denied list will be rarely used and there is no requirement for an external interface or automated update of this list.

Upon request from ISED to deny spectrum access to a particular standard-power RLAN device due to the identification of harmful interference caused by a particular device or type of device, the AFC system shall have the capability to deny the provision of available frequencies and associated maximum power levels to the device.

15.2 Denied areas

Upon request from ISED, the AFC system shall discontinue the provision of available frequency information to standard-power RLAN devices in designated geographic areas. The designated geographic area shall be defined by a point and radius or by a quadrilateral area defined by straight lines connecting four geographic points, over which standard-power RLAN devices shall be prohibited to operate.

16 Security

An AFC system shall incorporate reasonable and reliable communication and information security measures. An AFC system shall employ both of the following measures to protect the security of operational and/or client data:

- Implementation of reasonably secure methods for data transmission and authentication that are designed to ensure that all communications between the AFC system and the standard-power RLAN device are accurate and secure, and to prevent corruption or unauthorized modification of data during communication.
- Implementation of reasonable information security standards to protect the data in the AFC system from unauthorized access, input, manipulation or the deliberate extraction of operational and/or client data.

Furthermore, the AFC system security protocols for communication and information security shall be updated in a timely manner to ensure protection against any new and

emerging security threats, subject to ISED's approval of the updates to the security protocols.

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Annex A: AFC interface evaluation tests

A.1 AFC system interface test to connect with a standard-power RLAN device

Before initializing a standard-power RLAN device, an AFC system shall validate the information provided by confirming the following:

- a. The certification number for the standard-power RLAN device reflects a valid certification number under RSS-248 as a standard-power device (i.e., IC ID). ISED maintains a list of certified standard-power RLAN devices in the *6 GHz Band Data Extract for AFC systems* section of the [Spectrum Management System Data](#) webpage.
- b. The manufacturer's serial number or certification number (i.e., IC ID) for the standard-power RLAN device is not on the denied list.
- c. The geographic coordinates are within Canada.
- d. The antenna height AGL is provided.
- e. The geographic coordinates' uncertainty has a 95% confidence level.

A.2 AFC system available frequencies

An AFC shall confirm the available frequencies and associated maximum power levels that can be assigned to a standard-power RLAN device under test.

Annex B: Normative Parameters, Use of Datasets and Acceptable Alternate Procedures (DBS-06)

B.1 Receiver noise level determination

The AFC system shall use the following equation to compute the receiver noise level at the input of a licensed fixed service receiver station:

$$N = -114 \text{ dBm/MHz} + NF$$

where NF is the noise figure at the receiver input. NF shall be set to 4 dB if the center frequency of the receiver is equal to or below 6425 MHz and to 4.5 dB otherwise, i.e. if the center frequency of the receiver is above 6425 MHz.

B.2 Land cover, digital surface and digital elevation datasets

The AFC system shall use the datasets referenced below to extract land cover, digital surface and/or digital elevation data at a given location when implementing the guidelines described in sections B.3 to B.5. When using the datasets to determine land cover, digital surface and/or digital elevation data over a path, the AFC system shall sample the datasets at intervals of 100 m or less along the path.

Land Cover datasets:

- **In Canada:** The Natural Resources Canada [2015 Land Cover of Canada](#)
- **In Canada and the United-States:** The North American Land Change Monitoring System [2015 Land Cover](#)

Digital Surface Model (DSM) dataset:

- **In Canada:** The Natural Resources Canada [Canadian Digital Surface Model \(CDSM\), 2000](#) at the highest available resolution

Digital Elevation Model (DEM) datasets:

- **In Canada:** The Natural Resources Canada [Canadian Digital Elevation Model \(CDEM\), 1945-2011](#) at the highest available resolution
- **In the United States:** The United States Geological Survey [3D Elevation Program \(3DEP\)](#) 1 arc-second data for the contiguous U.S. and 2 arc-second data for Alaska, or the highest available resolution

ISED may, on a case-by-case basis and at its discretion, allow an AFC system to use alternate datasets than those mentioned above as long as the selection and use of these alternate datasets is based on standard engineering practices and ensures a conservative determination of propagation characteristics in comparison to the real world. ISED may require the AFC applicant to provide a detailed explanation of the use

of the alternate datasets for the determination of propagation characteristics and may additionally require access to the used alternate datasets for testing purposes.

B.3 Use of datasets for the WINNER II model

The AFC system shall determine the appropriate [WINNER II](#) propagation scenario and line-of-sight (LOS) condition according to the criteria set out in this section and its subsections.

B.3.1 Determination of the WINNER II propagation scenario

The AFC system shall use the Land Cover dataset (see section B.2) to determine the appropriate land cover category at the location of the standard-power RLAN device. The AFC system shall use the corresponding WINNER II propagation scenario based on the mapping between land cover categories and WINNER II propagation scenarios as outlined in Table 1.

Table 1: Land Cover category to WINNER II propagation scenario mapping

Land Cover category	WINNER II propagation scenario
Urban and built-up	C1 (suburban)
All other categories	D1 (rural)

An AFC system may, subject to ISED approval, use an alternate dataset which allows it to associate paths to the WINNER II C2 scenario (urban) in addition to the C1 and D1 scenarios.

B.3.2 Determination of the LOS condition

The AFC system shall use digital surface data to determine the LOS condition of the path between a standard-power RLAN device and a licensed fixed service receiver station. The AFC system shall use the DSM dataset (see section B.2) along the path and the antenna heights AGL of the RLAN device and the licensed fixed service receiver to determine the LOS condition. For determining the LOS condition where digital surface data is not available, the AFC system may use digital elevation data and the DEM dataset (see section B.2) instead.

B.4 Appropriate ITM Parameters

The AFC system shall use the appropriate [ITM](#) parameters as specified in Table 2 below. To determine the terrain profile required for the ITM, the AFC system shall use the DEM dataset (see section B.2) to extract digital elevation data along the path between a standard-power RLAN device and a licensed fixed service receiver station.

Table 2: Appropriate ITM parameters

Parameter Name	Appropriate Parameter Values
Polarization	Horizontal or Vertical
Climactic zone	Continental Temperate
Surface refractivity (N-units)	301
Ground dielectric constant	15
Ground conductivity (S/m)	0.005
Mode of variability	11 or 13
Confidence*	5%
Reliability*	20%

*For a given output from the ITM, one can say “with probability 5% (confidence) the attenuation will not exceed the output for at least 20% (reliability) of the time”.

The AFC system may determine and use more accurate values for the climactic zone, surface refractivity, ground dielectric constant and ground conductivity parameters to better match the path between a standard power RLAN device and a licensed fixed service receiver station. The AFC system shall refer to the appropriate ITU-R recommendations, as outlined in Table 3, and determine the more accurate values according to the data provided in these recommendations and/or according to appropriate datasets, based on standard engineering practices and subject to ISED approval.

Table 3: Appropriate ITU-R recommendations for determining more accurate values

Parameter Name	Appropriate ITU-R recommendation
Climactic zone	ITU-R P.617 (latest version)
Surface refractivity (N-units)	ITU-R P.452 (latest version)
Ground dielectric constant	ITU-R P.527 (latest version)
Ground conductivity (S/m)	ITU-R P.527 (latest version)

B.5 Appropriate clutter model and clutter model parameters

The AFC system shall use land cover data to determine the appropriate clutter model to combine with the ITM based on the location of the standard-power RLAN device. The AFC system shall determine the land cover category at the location of the standard-power RLAN device using the Land Cover dataset (see section B.2) and use the corresponding ITU-R clutter model based on the mapping outlined in Table 4.

Table 4: Land Cover category to appropriate clutter model mapping

Land Cover Category	Appropriate clutter model
Urban and built-up	ITU-R P.2108-0 §3.2
All other categories	ITU-R P.452-16 §4.5

B.5.1 Applying the clutter model

The AFC system shall apply clutter loss, as outlined in the appropriate clutter model, only at the location of the standard-power RLAN device. Where a frequency input is required to compute the clutter loss, the AFC system shall use the centre frequency of the considered licensed fixed service receiver station.

B.5.2 Appropriate value for ITU-R P.2108-0 percentage of locations parameter

The AFC system shall use the ITU-R P.2108-0 clutter model with a “percentage of locations” parameter of [10] %.

B.5.3 Determination of the appropriate ITU-R P.452-16 clutter category

The AFC system shall use land cover data to determine the appropriate clutter category for the use of the ITU-R P.452-16 clutter model. The AFC system shall determine the land cover category at the location of the standard-power RLAN device using the Land Cover dataset (see section B.2). The AFC system shall only apply clutter loss for the land cover categories outlined in Table 5 and shall apply clutter loss using the corresponding clutter category based on the mapping in Table 5.

Each clutter category is associated with nominal clutter height and distance values. The distance is relative to the location of an antenna. The values are used in the calculation of the clutter loss. [The AFC system can use more accurate values for the clutter (height and distance) when available. However, the AFC system shall only apply the clutter loss if the standard-power RLAN device height AGL is below the clutter height. The DSM dataset (see section B.2) shall be used when necessary to validate this information.]

Table 5: Land Cover Category to ITU-R P.452-16 Clutter Category mapping

Land Cover Category	ITU-R P.452-16 Clutter Category
Temperate or sub-polar shrubland Cropland	High crop fields Park land Irregularly spaced sparse trees Orchard (regularly spaced) Sparse houses
Temperate or sub-polar broadleaf deciduous forest Mixed forest	Deciduous trees (irregularly spaced) Deciduous trees (regularly spaced) Mixed tree forest

Temperate or sub-polar needleleaf forest Sub-polar taiga needleleaf forest	Coniferous trees (irregularly spaced) Coniferous trees (regularly spaced)
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