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Spectrum Management and Telecommunications

Radio Standards Specification

Radio Local Area Network (RLAN) Devices Operating in the 5925-7125 MHz Band

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Preface

Radio Standards Specification RSS-248, issue 3, *Radio Local Area Network (RLAN) Devices Operating in the 5925-7125 MHz Band*, sets out the certification requirements for licence-exempt RLAN devices operating in the 5925-7125 MHz frequency band and replaces RSS-248, issue 2, dated December 20, 2022.

The following are the main changes:

1. added new equipment class: very low-power devices
2. added definitions, power limits, and operational requirements for the new equipment class
3. made editorial changes and clarifications, as appropriate

Inquiries may be submitted by one of the following methods:

1. Online using the General Inquiry form (in the form, select the Directorate of Regulatory Standards radio button and specify “RSS-248” in the General Inquiry field)

2. By mail to the following address:

   Innovation, Science and Economic Development Canada
   Engineering, Planning and Standards Branch
   Attention: Regulatory Standards Directorate
   235 Queen St
   Ottawa ON K1A 0H5
   Canada

3. By email to: consultationradiostandards-consultationnormesradio@ised-isde.gc.ca

Additional information and guidance are available on the Innovation, Science and Economic Development Canada (ISED) web pages Common Questions and Answers and General notices.

Comments and suggestions for improving this standard may be submitted online using the Standard Change Request form, or by mail or email to the above addresses.

All ISED publications related to spectrum and telecommunications are available on the Spectrum management and telecommunications website.

Issued under the authority of
the Minister of Innovation, Science and Industry

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Director General
Engineering, Planning and Standards Branch

Contents

1. Scope

This Radio Standards Specification (RSS) sets out the certification requirements for licence-exempt radio local area network (RLAN) devices operating in the 5925-7125 MHz frequency band (the 6 GHz band).

The RLAN devices with occupied bandwidths that fall into other frequency bands (e.g. the 2.4 GHz band) shall comply with the requirements for each respective band specified in the applicable RSS standard(s).

2. General requirements and references

This section sets out the general requirements and references related to this RSS.

2.1 Coming into force and transition period

This standard will be in force as of the date of its publication on Innovation, Science and Economic Development Canada's (ISED) website. However, a transition period is provided, ending six months after the publication of this standard, within which applications for certification under either issue 2 or issue 3 of RSS-248 will be accepted. After the transition period expires, only applications for certification under RSS-248, issue 3, will be accepted and equipment manufactured, imported, distributed, leased, offered for sale or sold in Canada shall comply with RSS-248, issue 3.

A copy of RSS-248, issue 2, is available upon request by emailing consultationradiostandards-consultationnormesradio@ised-isde.gc.ca.

2.2 Certification requirements

The RLAN devices covered by this standard are classified as Category I equipment and shall be certified. Either a technical acceptance certificate issued by ISED's Certification and Engineering Bureau or a certificate issued by a recognized certification body is required.

2.3 Licensing requirements

The RLAN devices covered by this standard are exempt from licensing requirements pursuant to section 15 of the *Radiocommunication Regulations*.

2.4 RSS-Gen compliance

The RLAN devices covered by this standard shall also comply with the applicable requirements set out in RSS-Gen, *General Requirements for Compliance of Radio Apparatus*. Where contradictions exist between this standard and RSS-Gen, this standard shall take precedence.

2.5 Normative publications

All ISED publications related to spectrum management and telecommunications are available on the Spectrum management and telecommunications website.

Accepted Federal Communications Commission (FCC) Knowledge Database (KDB) publications are listed on ISED's Certification and Engineering Bureau website (see the Normative Test Standards and Acceptable Alternate Procedures page).

The following documents shall apply in conjunction with this RSS:

- DBS-06, *Automated Frequency Coordination (AFC) System Specifications for the 6 GHz (5925-6875 MHz) Band*
- SMSE-006-21, *Decision on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band*
- RSP-100, *Certification of Radio Apparatus and Broadcasting Equipment*

Acronyms

- DBS: Database Specification
- RSP: Radio Standards Procedure
- SMSE: Canada Gazette Notice

3. Definitions

Access point
A transceiver that is intended to operate as at least one of the following:

a. a bridge in a peer-to-peer connection
b. a connector between the wired and wireless segments of the network
c. a relay between wireless network segments

Automated frequency coordination (AFC) system
An ISED-designated database system that maintains records of protected licensed systems. The AFC system determines a list of available frequencies and associated maximum power levels for use by a standard-power access point or a fixed client device at a specific time and geographic location.

Client device
A device whose transmissions are under the control of an access point or an indoor subordinate device. Client devices include dual client devices, fixed client devices, low-power client devices, and standard client devices.

Contention-based protocol
A protocol that allows multiple users to share the same spectrum by defining events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities

for other transmitters to operate. Listen Before Talk is an example of a contention-based protocol.

Dual client device
A client device whose transmissions can be controlled by both:

- a standard-power access point
- a low-power indoor access point or indoor subordinate device

Equipment class
A device covered by this standard falls into one or multiple equipment classes as follows:

- fixed client devices
- dual client devices
- low-power client devices
- standard client devices
- indoor subordinate devices
- low-power indoor access points
- standard-power access points
- very low-power devices

Fixed client device
A client device intended as a customer premise equipment that is permanently attached to a structure, has a geolocation capability, operates 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 access point or fixed client device to determine its geographic coordinates and geolocation uncertainty (in metres), with a confidence level of 95%.

Indoor subordinate device
A device whose transmissions are under the control of a low-power indoor access point, and is completely enclosed by walls and a ceiling.

Low-power indoor access point
An access point operating in locations completely enclosed by walls and a ceiling.

Low-power client device
A client device whose transmissions are under the control of a low-power indoor access point or an indoor subordinate device, and is completely enclosed by walls and a ceiling.

Radio local area network (RLAN) device
A single device utilizing one or combining multiple equipment classes under a single ISED certification number.

Standard-power access point
An access point with geolocation capability that operates as directed by an AFC system.

Standard client device
A client device whose transmissions are under the control of a standard-power access point.

Transmitter power control
A feature enabling an RLAN device to dynamically switch between several transmission power levels during the transmission process. The intent of this feature is to use the lowest power level necessary to establish and maintain connectivity between RLAN devices.

Very low-power device
A device that employs a permanently integrated antenna and may have a peer-to-peer connection capability.

4. Technical and operational requirements

This section sets out the technical and operational requirements applicable to RLAN devices subject to this standard.

4.1 Measurement method

Unless otherwise specified, the measurements shall be performed and reported in accordance with the requirements specified in RSS-Gen.

4.2 Frequency bands

The following frequency bands of operation shall apply to RLAN devices:

a. 5925-6875 MHz for standard-power access points, fixed client devices, standard client devices, and dual client devices under the control of a standard-power access point
b. 5925-7125 MHz for very low-power devices, low-power indoor access points, indoor subordinate devices, low-power client devices, and dual client devices under the control of an indoor subordinate device or a low-power indoor access point

4.3 Modulation

RLAN devices shall employ digital modulation.

4.4 Occupied bandwidth

The occupied bandwidth of an RLAN device shall not exceed 320 MHz.

4.5 Transmitter power

This section prescribes the transmitter power measurement requirements and limits.

4.5.1 Measurement requirements

This section describes the measurement requirements.

4.5.1.1 General

The fundamental emissions of the RLAN device shall be measured in terms of average value.

4.5.1.2 Standard-power access points and fixed client devices

Measurements shall be performed for the maximum power levels that the standard-power access point and/or fixed client device supports in response to AFC system commands. These power levels shall be identified in the test report.

In addition, information for antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the equivalent isotropically radiated power (e.i.r.p.) elevation mask requirement set forth in section 4.5.4 (c) shall be clearly indicated in the test report.

4.5.2 Power limits for low-power indoor access points and indoor subordinate devices

Both of the following limits shall apply to low-power indoor access points and indoor subordinate devices:

a. the maximum e.i.r.p. spectral density shall not exceed 5 dBm/MHz
b. the maximum e.i.r.p. over the 5925-7125 MHz frequency band shall not exceed 30 dBm

4.5.3 Power limits for low-power client devices

Both of the following limits shall apply to low-power client devices:

a. the maximum e.i.r.p. spectral density shall not exceed −1 dBm/MHz
b. the maximum e.i.r.p. over the 5925-7125 MHz frequency band shall not exceed 24 dBm

4.5.4 Power limits for standard-power access points and fixed client devices

All of the following limits shall apply to standard-power access points and fixed client devices:

a. the maximum e.i.r.p. spectral density shall not exceed 23 dBm/MHz
b. the maximum e.i.r.p. over the 5925-6875 MHz frequency band shall not exceed 36 dBm
c. the maximum e.i.r.p. for a device not enclosed by walls and a ceiling, measured at any elevation angle greater than 30 degrees above the horizon, shall not exceed 21 dBm over the 5925-6875 MHz frequency band

A standard-power access point shall provide relevant information to an associated standard client device, such that the standard client device maintains its power level at least 6 dB lower than that of the standard-power access point.

4.5.5 Power limits for standard client devices

All of the following limits shall apply to standard client devices:

a. the maximum e.i.r.p. spectral density shall not exceed 17 dBm/MHz
b. the maximum e.i.r.p. over the 5925-6875 MHz frequency band shall not exceed 30 dBm
c. the maximum power limits shall remain at least 6 dB below the power levels authorized for the associated standard-power access point

4.5.6 Power limits for very low-power devices

Both of the following limits shall apply to very low-power devices:

a. the maximum e.i.r.p. spectral density shall not exceed −5 dBm/MHz
b. the maximum e.i.r.p. shall not exceed 14 dBm

A very low-power device shall implement transmitter power control in order to have the capability to operate at least 6 dB lower than the maximum e.i.r.p. spectral density limit. These power levels shall be identified in the test report.

4.6 Unwanted emissions

This section specifies the measurement requirements for unwanted emission limits for RLAN devices.

4.6.1 Measurement requirements

This section describes the measurement requirements.

4.6.1.1 General

The power of the unwanted emissions shall be measured in terms of average value.

Measurements shall employ a resolution bandwidth of 1 MHz. A narrower resolution bandwidth may be used, provided the measured power is integrated over 1 MHz. Measurements of the unwanted emissions shall be performed and reported using the lowest and highest channels that the device supports.

For the purposes of this section, the channel bandwidth is identical to the occupied bandwidth or the 26 dB emission bandwidth, whereas the channel edges are the outermost frequency points that define the channel bandwidth.

If the transmission is in bursts, the provisions for pulsed operation in RSS-Gen shall apply.

4.6.1.2 Standard-power access points and fixed client devices

Measurements shall be performed for the maximum power levels that the standard-power access point and/or fixed client device supports in response to AFC system commands. These power levels shall be identified in the test report.

4.6.2 Unwanted emission limits

The following unwanted emission limits shall apply:

a. any emissions outside of the 5925-7125 MHz frequency band shall not exceed −27 dBm/MHz e.i.r.p. spectral density

b. the e.i.r.p. spectral density of unwanted emissions falling into the 5925-7125 MHz frequency band shall be attenuated below the reference power spectral density by at least:
   i. 20 dB at 1 MHz away from the channel edges
   ii. a value, linearly interpolated in a dB scale, between 20 dB and 28 dB at frequencies between 1 MHz outside of channel edges and 1 channel bandwidth away from the operating channel centre, respectively
   iii. 28 dB at 1 channel bandwidth away from the operating channel centre
   iv. a value, linearly interpolated in a dB scale, between 28 dB and 40 dB at frequencies between 1 channel bandwidth away from the operating channel centre and 1.5 times the channel bandwidth away from the operating channel centre, respectively
   v. 40 dB at 1.5 times the channel bandwidth and further away from the operating channel centre

4.7 Contention-based protocol

This section sets out the requirements for the use of a contention-based protocol.

4.7.1 General

Low-power indoor access points, indoor subordinate devices, low-power client devices, very low-power devices, standard client devices, and dual client devices shall employ a contention-based protocol.

4.7.2 Measurement requirements

The FCC's accepted KDB procedures listed on ISED's Certification and Engineering Bureau website (see the Normative Test Standards and Acceptable Alternate Procedures page) shall be used to demonstrate the compliance of a device with the contention-based protocol requirements set out in this section.

4.7.3 Minimum detection threshold power

The minimum detection threshold power is the corresponding received power referenced to a 0 dBi antenna. Devices shall use a contention-based protocol to detect the presence of any emissions in the channel that the device intends to occupy. The device shall be able to detect, within its entire occupied bandwidth, a radio frequency power of at least −62 dBm or lower.

If an emission is detected in a channel, the device shall cease transmissions and shall not resume transmissions on this channel while the detected radio frequency power is at or above the −62 dBm threshold.

4.8 Operational requirements

This section sets out the operational requirements for RLAN devices.

4.8.1 General

The following operational requirements shall apply to RLAN devices:

a. Devices shall automatically stop transmitting if there is an absence of information to transmit or an operational failure. Note that the intention is not to prohibit either the transmission of control or signalling information, or the use of repetitive codes, where one or both are required by the technology. An explanation of how transmitting is stopped shall be included in the certification filing.
b. Devices shall not be used for control of or communications with unmanned aircraft systems.
c. Devices shall not be used on oil platforms.
d. Devices shall not be used on aircraft.
e. Except for very low-power devices, devices shall not be used on automobiles.

f. Except for very low-power devices, devices shall not be used on trains.
g. Except for very low-power devices, devices shall not be used on maritime vessels.
h. Client devices shall not be capable of initiating a network.

Low-power indoor access points, indoor subordinate devices, low-power client devices, and very low-power devices operating in the 5925-6425 MHz band may be used on large aircraft, as defined in the *Canadian Aviation Regulations*, while flying above 3,048 metres (10,000 feet).

4.8.2 Standard client devices and low-power client devices

In addition to the requirements outlined in section 4.8.1, the following requirements shall apply to standard client devices and low-power client devices:

a. devices shall not connect directly to another standard client device or low-power client device
b. devices may transmit brief messages to an access point after detecting a signal confirming that the access point is operating on a particular frequency in order to join the access point's network

4.8.3 Low-power indoor access points

In addition to the requirements outlined in section 4.8.1, the following requirements shall apply to low-power indoor access points:

a. devices shall be powered by a wired connection
b. devices shall not be battery powered
c. devices shall have a permanently integrated antenna
d. devices shall not have a weatherized enclosure
e. devices may have a direct connection to the Internet

Low-power indoor access points may use battery backup only during power outages.

4.8.4 Indoor subordinate devices

In addition to the requirements outlined in section 4.8.1, the following requirements shall apply to indoor subordinate devices:

a. devices shall be powered by a wired connection
b. devices shall not be battery powered
c. devices shall have a permanently integrated antenna
d. devices shall not have a direct connection to the Internet
e. devices shall not have a weatherized enclosure
f. devices may connect to indoor access points or other indoor subordinate devices within a single building or structure

g. devices shall not be used to connect RLAN devices located in different structures and buildings

Indoor subordinate devices may use battery backup only during power outages.

4.8.5 Very low-power devices

In addition to the requirements outlined in section 4.8.1, the following requirements shall apply to very low-power devices:

a. devices shall not employ fixed outdoor infrastructure
b. devices shall prioritize operation on frequencies above 6105 MHz to 7125 MHz before operating on frequencies from 5925 MHz to 6105 MHz

4.8.6 Dual client devices

In addition to the requirements outlined in section 4.8.1, the following requirements shall apply to dual client devices:

a. devices shall not have a direct connection to the Internet
b. devices shall use a contention-based protocol at all times
c. devices shall be completely enclosed by walls and a ceiling while under the control of a low-power indoor access point or an indoor subordinate device

Dual client devices shall demonstrate compliance under the respective requirements for low-power indoor access points, indoor subordinate devices, and standard-power access points, as applicable.

4.8.7 Modular products

All equipment classes, except for indoor subordinate devices, are permitted to be certified under a limited modular approval as per RSP-100.

The equipment classes used in a modular product shall be clearly indicated in the test report.

Neither host controls nor configuration settings shall be applied to alter intentional radio emissions generated by a modular product.

4.8.8 Combining equipment classes in a single RLAN device

When combining different equipment classes in a single RLAN device, the most stringent restrictions prescribed for respective equipment classes in section 4.8 shall apply.

5. Geolocation requirements for standard-power access points and fixed client devices

This section defines the geolocation requirements for standard-power access points and fixed client devices.

5.1 General

A standard-power access point or fixed client device shall determine its location in accordance with the requirements of this section and provide both the location and its geolocation uncertainty to the AFC system. Additional details regarding the AFC system and associated requirements can be found in DBS-06.

Standard-power access points and fixed client devices shall determine their geographic coordinates through either an internal geolocation capability incorporated into the device or an integrated capability to securely connect to an external geolocation source or service.

The geographic coordinates of the standard-power access point or fixed client device shall be determined at activation from a power-off condition.

5.2 Geolocation accuracy

A standard-power access point or fixed client device's location and geolocation uncertainty shall be determined with a confidence level of 95%. Standard-power access points and fixed client devices shall be able to determine if their location has changed by a margin larger than the geolocation uncertainty.

For standard-power access points and fixed client devices using an external geolocation capability, the geolocation uncertainty shall account for both the accuracy of the geolocation source and the separation distance between such a source and the device.

A description demonstrating both the geolocation uncertainty and confidence level of the geolocation method used shall be provided in the test report.

5.3 Alternate geolocation technology

A technology other than the global positioning system (GPS) requires approval from ISED. See RSS-248: ISED-approved Alternate Geolocation Technology for a list of approved geolocation technologies.

A description of the device's geolocation technology shall be provided in the test report.

5.4 Requirements for external geolocation sources

An external geolocation source may be connected to a standard-power access point or fixed client device through either a wired or a wireless connection. A single geolocation source may provide location information to multiple standard-power access points or fixed client devices. A secure and mutually authenticated connection shall be used to ensure that only an external geolocation source that has been approved with a particular standard-power access point or fixed client device can provide geographic coordinates to that device. A description of the security protocols for this connection shall be provided with the test report.

The geographic coordinates shall be provided automatically by the external geolocation source to the standard-power access point or fixed client device. Alternatively, an extender cable may be used to connect a remote receive antenna to a geolocation receiver within a standard-power access point or fixed client device. A description of the security protocols for this connection shall be provided with the test report.

6. Automated frequency coordination system access requirements for standard-power access points and fixed client devices

This section defines the AFC system access requirements for standard-power access points and fixed client devices.

6.1 General

Prior to transmitting, a standard-power access point or fixed client device shall access an AFC system to obtain both the available frequencies and the maximum permissible power level in each frequency range at its geographic coordinates. Standard-power access points and fixed client devices shall only transmit on the available range of frequencies and at their respective maximum permissible power levels as specified by the AFC system.

Standard-power access points and fixed client devices shall provide the registration information to the AFC system either directly and individually, or through a combined registration information representing multiple devices from the same operating network. The standard-power access point, fixed client device or its network element shall register with the AFC system via any communication link, wired or wireless, outside the 5925-6875 MHz frequency band.

6.2 Initialization procedure

A standard-power access point or fixed client device shall connect and register with and be authorized by an ISED-designated AFC system prior to its initial service transmission after installation or after a location change.

A description of the connection protocols and message formats used for the AFC system interface shall be provided with the test report.

A standard-power access point or fixed client device shall provide the following device information to an AFC system:

a. geographic coordinates (latitude and longitude) that lie within Canada
b. geolocation uncertainty in metres with a confidence level of 95% or greater
c. antenna height above ground level or above mean sea level (in metres)
d. ISED certification number
e. manufacturer's serial number

Provision of accurate device information shall be mandatory. Failure to provide valid information shall be considered a breach of ISED certification and service shall be discontinued. If any of this information changes, prior to resuming operation, the standard-power access point or fixed client device shall provide the updated information to an AFC system.

6.3 AFC system updates

A standard-power access point or fixed client device shall contact an AFC system at least once every 24 hours to verify the list of available frequencies and power levels. If the AFC system indicates that the frequencies are no longer available at the current power levels, the standard-power access point or fixed client device shall immediately stop operating at those frequencies or reduce its power to permissible levels, as determined by the AFC system.

6.4 Failure to contact an AFC system

Should a registered standard-power access point or fixed client device fail to successfully re-establish contact with an AFC system during any given day, it may continue to operate until 11:59 p.m. (local time) of the following day, at which time it shall cease operations until it re-establishes contact with an approved AFC system and re-verifies the list of available frequencies and power levels.

6.5 Identification of AFC system operability

At the time of certification, the applicant shall provide a formal letter for each AFC system with which the standard-power access point or fixed client device operates. The letter shall be issued by an AFC system administrator that operates an ISED-designated AFC system, as shown on the list of designated AFC systems provided on ISED's Dynamic Spectrum Access website.

7. Product labelling and user manual requirements

In addition to the labelling requirements in RSS-Gen, this section establishes the product labelling and user manual requirements for RLAN devices.

7.1 General

RLAN devices shall include the following text in the user manual:

- Devices shall not be used for control of or communications with unmanned aircraft systems.
- Devices shall not be used on oil platforms.
- Devices shall not be used on aircraft, except for the low-power indoor access points, indoor subordinate devices, low-power client devices, and very low-power devices operating in the 5925-6425 MHz band, that may be used on large aircraft as defined in the *Canadian Aviation Regulations*, while flying above 3,048 metres (10,000 feet).

Except for very low-power devices, RLAN devices shall additionally include the following text in the user manual:

- Devices shall not be used on automobiles.
- Devices shall not be used on trains.
- Devices shall not be used on maritime vessels.

7.2 Low-power indoor access points and indoor subordinate devices

Low-power indoor access points and indoor subordinate devices shall bear a statement acknowledging the following restriction in the user manual and, where feasible, in a conspicuous location on the device:

- Operation shall be limited to indoor use only.

7.3 Standard-power access points and fixed client devices

Standard-power access points and fixed client devices shall bear statements acknowledging both of the following requirements in the user manual:

- Information for antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 4.5.4 (c) shall be clearly indicated.

- The antenna height shall be determined by the installer or operator of the standard-power access point or fixed client device, or by automatic means. This information shall be stored internally in the device. Provision of accurate device information is mandatory.

The user manual shall also include instructions for the installer or user to input the antenna height as part of device registration.

8. Software security requirements

This section defines the software security requirements.

8.1 General

RLAN devices shall contain security features to protect against the modification of software by unauthorized parties. The following software security requirements apply:

a. Manufacturers shall implement security features in an RLAN device such that third parties are not able to reprogram the device to operate outside the certified parameters. The software shall prevent the user from operating the transmitter with frequency, power, or any parameter other than that approved for the device. Manufacturers may use various means to implement security features, including the use of:
   - a private network that allows only authenticated users to download software
   - electronic signatures in software
   - coding in hardware that is decoded by software to verify that new software can be legally loaded into a device to meet these requirements

b. Manufacturers shall describe the security features they are proposing in their application for equipment certification.

c. Manufacturers shall take steps to ensure that the contention-based protocol cannot be disabled by the operator of the RLAN device.

8.2 Standard-power access points and fixed client devices

Standard-power access points and fixed client devices shall incorporate adequate security measures to ensure that these devices cannot access AFC systems not designated by ISED.

Manufacturers shall take steps to ensure the AFC system control cannot be disabled by the operator of the device.