



Spectrum Management and Telecommunications

Radio Standards Specification

# General Requirements for Compliance of Radio Apparatus

DRAFT

## Preface

Radio Standards Specification RSS-Gen, issue 6, *General Requirements for Compliance of Radio Apparatus*, replaces RSS-Gen, issue 5, published in April 2018, and amended March 2019 and February 2021.

Listed below are the main changes:

1. added list of abbreviations and updated the list of definitions (sections [2.1](#) and [2.2](#))
2. clarified the transition period information (section [3.1](#))
3. updated the list of normative references (section [3.2.1](#))
4. provided more detailed information on the existing listing process for category I radio apparatus and corresponding requirements (section [3.4.1](#))
5. added a new section explaining the licensing requirements (section [3.5](#))
6. updated the requirements for site validation by adopting recent ANSI/USEMCSC C63 standards (section [3.8.2](#))
7. added requirements for calibration of measurement equipment (section [3.8.3](#))
8. added clarifications related to equipment modifications (section [4.2](#))
9. updated requirements for radio apparatus with geolocation technology (section [4.3](#)) and for the power supplied to the test sample (section [4.4](#))
10. clarified extrapolation procedure for radiated emissions (sections [4.9.4](#) and [4.9.5](#))
11. added conditions and requirements for on-site and in situ measurements (section [4.10](#))
12. specified the default detector for transmitter power measurements (section [5.4.2](#)) and clarified requirements for both conducted and radiated transmitter power measurements (section [5.4.3](#))
13. clarified the detector and measurement bandwidth for unwanted emissions (section [5.5.1](#))
14. increased the frequency range for unwanted emissions measurements up to 750 GHz (section [5.5.2](#))
15. removed stand-alone receivers as these were moved to RSS-310 (section [6.1](#))
16. clarified the application of the limits for receivers (section [6.2.2](#))
17. removed passive radio frequency identification tags as these were moved to RSS-310
18. streamlined the labelling requirements allowing QR code labelling (section [9.4.2](#)) and placing the label in the user manual or packaging for very small devices (section [9.4.3](#))
19. added guidelines for radiated emission measurements below 30 MHz ([annex A](#))
20. clarified the electronic labelling requirements ([annex B](#))
21. various editorial and formatting changes

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-Gen” in the General Inquiry field)
- 2) By mail to the following address:  
Innovation, Science and Economic Development Canada  
Engineering, Planning and Standards Branch  
Attention: Directorate of Regulatory Standards  
235 Queen Street  
Ottawa, Ontario K1A 0H5  
Canada
- 3) By email to: [consultationradiostandards-consultationnormesradio@ised-isde.gc.ca](mailto:consultationradiostandards-consultationnormesradio@ised-isde.gc.ca)

Additional information and guidance are available on the Innovation, Science and Economic Development Canada (ISED) webpages [Common Questions and Answers](#) and [General Notices](#).

Comments and suggestions for improving this standard can be submitted online using the [Standard Change Request form](#) or by mail or email to the above addresses.

Inquiries related to the certification/registration process, specification and test requirements for radio apparatus, broadcast equipment and terminal equipment can be submitted to the [Certification and Engineering Bureau](#).

Information related to conformity assessment bodies and to the recognition of testing laboratories and certification bodies can be found on the [Procedures for Conformity Assessment Bodies](#) (CAB) webpage. Inquiries can be made through the Consultation Radio Standards [email](#) using “CAB” in the subject line.

Inquiries related to licensing can be made through ISED’s regional or district offices. Contact information for these offices is listed in Radio Information Circular RIC-66, [Addresses and Telephone Numbers of Regional and District Offices](#).

All spectrum and telecommunications related documents are available on ISED’s [Spectrum Management and Telecommunications](#) website.

Issued under the authority of the  
Minister of Industry

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Wen Kwan  
Director General  
Engineering, Planning and Standards Branch

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## 1. Scope

This Radio Standards Specification (RSS) sets out general requirements applicable to licensed and licence-exempt radio apparatus.

RSS-Gen shall be used in conjunction with the RSS(s) applicable to the specific type of radio apparatus for assessing its compliance with Innovation, Science and Economic Development Canada (ISED) requirements.

RSSs do not apply to radio apparatus (including radio apparatus subassemblies) used for broadcasting purposes, such as broadcasting receivers and broadcast satellite receivers.

NOTE Such equipment is regulated by ISED's [Broadcasting Equipment Technical Standards](#) (BETS). ICES-003 – [Information Technology Equipment \(including Digital Apparatus\)](#) also applies to some broadcasting devices, such as television receivers and outdoor units of home satellite receiving systems.

## 2. Abbreviations and definitions

This sections lists relevant abbreviations and term definitions.

### 2.1 Abbreviations

AAS	active antenna system
AC	alternating current
ANSI	American National Standards Institute
CB	certification body
CEB	Certification and Engineering Bureau
CISPR	Comité International Special des Perturbations Radioélectriques (International special committee on radio interference)
CN	company number
DC	direct current
EIRP, e.i.r.p.	equivalent isotropically radiated power
EMI	electromagnetic interference
ERP, e.r.p.	effective radiated power
EUT	equipment under test
FVIN	firmware version identification number
GPS	global positioning system
HMN	host marketing name
HVIN	hardware version identification number
ICES	interference-causing equipment standard
IEC	International Electrotechnical Commission
IP	internet protocol
ISED	Innovation, Science and Economic Development Canada
ISO	International Organization for Standardization

LMA	limited modular approval
MA	modular approval
OBW	occupied bandwidth
PMN	product marketing name
QR	quick-response (code)
RBW	resolution bandwidth
REL	radio equipment list
RF	radio frequency
RFID	radio frequency identification
RSP	radio standards procedure
RSS	radio standards specification
TAC	technical acceptance certificate
TRP	total radiated power
UPN	unique product number
VBW	video bandwidth

## 2.2 Definitions

The following is a list of terms commonly used in RSS standards and their associated definitions.

**Accessory:** Separate unit that is not necessarily marketed exclusively with the equipment under test (EUT) as a package, but it is intended for use together with the EUT to enable or help in using some of its functions.

NOTE For example, an external power supply.

**Active Antenna System (AAS):** Antenna system where the amplitude and/or phase between antenna elements are dynamically adjusted, resulting in an antenna pattern that varies in response to short-term changes in the radio environment.

NOTE An antenna system used for long-term beam shaping, such as fixed electrical down tilt, is not considered an AAS.

**Antenna:** Transducer that converts the radio frequency voltage applied at its input to radiated electromagnetic field or vice versa and is characterized by its antenna pattern, which includes the combined effect of all antenna elements.

**Authorized bandwidth:** Maximum width of the band of frequencies in which the radio apparatus is permitted to operate.

**Average power:** Value of the power averaged over an interval of time sufficiently long compared with the period of the lowest frequency encountered in the modulation, measured under normal operating conditions.

NOTE This is the power that would be indicated by a thermal power meter.

**Base station equipment:** Equipment that provides network connectivity to, as well as management and control of, subscriber equipment.

**Broadcasting:** Any radiocommunication in which the transmissions are intended for direct reception by the general public.

**Broadcasting receiving apparatus:** Device, or combination of devices, intended for or capable of being used for the reception of broadcasting.

**Certification body (CB):** Independent Canadian or foreign organization that is authorized by the Government of Canada to certify radio apparatus in accordance with Canadian regulatory requirements.

**Channel bandwidth:** Operating bandwidth of the equipment, specified by the manufacturer, that contains the information transmitted.

**Channel frequency:** Frequency at the centre of the channel bandwidth.

**Digital device:** Unintentional radiator generating and/or using timing signals or pulses having a rate of at least 9 kHz and employing digital techniques for purposes such as computation, display, control, data processing and storage.

NOTE This includes information technology equipment.

**Effective radiated power (ERP or e.r.p.):** Product of the power supplied to the antenna and its gain relative to a half wave dipole in a given direction, with both quantities expressed in linear units.

**Equipment under test (EUT):** Sample of a product model that is subject to compliance testing and is representative of production units of that product model.

NOTE Each EUT has a unique serial number, or is a specific pre-production prototype unit, as documented in the test report.

**Equivalent isotropically radiated power (EIRP or e.i.r.p.):** Product of the power supplied to the antenna and its gain in a given direction relative to an isotropic antenna, with both quantities expressed in linear units.

**Emission:** Electromagnetic transmission through radiated means by an electric or electronic device, or conducted by such a device through its attached wired interfaces.

NOTE Emissions can be either intentional or non-intentional.

**Emission designator:** Code designating a set of characteristics of the intentional radiated emission of a radio transmitter by means of standard symbols (e.g. type of modulation of the main carrier, modulating signal, type of information to be transmitted and, if appropriate, any additional signal characteristics).

NOTE For example, designator 20K0F1D means a necessary bandwidth (or occupied bandwidth) of 20.0 kHz, uses frequency modulation, with single channel and in the data/digital format. See TRC-43, [Designation of Emissions, Class of Station and Nature of Service](#).

**Envelope power (transmitter):** Value of the power averaged over the period of the carrier.

NOTE The envelope power varies in time with the modulation frequency.

**Field disturbance sensor:** Radio apparatus designed to detect changes in the radio frequency field it generates as a result of movement of persons or objects within its range.

**Firmware version identification number (FVIN):** Code identifying the version of the product's firmware that controls/affects its radio frequency (RF) characteristics.

**Fixed equipment:** Equipment that is used at a fixed location, by the nature of its design, and is not operational while in motion.

**Frequency block:** Portion of spectrum within a frequency band that can be assigned to operators.

**Frequency block group:** Continuous frequency range of multiple contiguous frequency blocks that contains the equipment's channel bandwidth.

**Frequency stability:** Measure of frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at a specific reference temperature and the rated supply voltage.

**Geolocation:** Location awareness technology, such as through use of global positioning system (GPS) signals, internet protocol (IP) detection or remote connection to a secure database, for determining the physical location of the radio apparatus when in operation.

**Hardware version identification number (HVIN):** Code identifying the hardware specifications of a product version.

**Harmonic emissions:** Emissions located at frequencies that are integer multiples of the fundamental frequency emissions of the transmitted signal.

**Host marketing name (HMN):** Code identifying the name or model number of a final product that incorporates a certified radio module.

**Indoor equipment:** Equipment that, by nature of its design, is intended to be operated only in locations completely enclosed by walls, floor and ceiling.

**Intentional radiator:** Device that intentionally generates and emits radio frequency energy by radiation or induction.

NOTE This can be interference-causing equipment (e.g. industrial, scientific or medical equipment) or radio apparatus (of Category I or Category II).

**Interference-causing equipment:** Device, machinery or equipment, other than radio apparatus, that causes or is capable of causing interference to radiocommunication.

**Measurement bandwidth:** Frequency bandwidth specified for assessing compliance with the limit, for each individual emission from the equipment under test.

**Mobile equipment:** Equipment designed to be used while in motion or during halts at unspecified points.

NOTE As such, it includes portable equipment.

**Necessary bandwidth:** Width of the frequency band that is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions for a given class of intentional emission.

**Occupied bandwidth (OBW):** Frequency range between two points, one above and the other below the carrier or centre frequency, within which 99% of the total average transmitted power of the fundamental transmitted emission is contained, with 0.5% of this power below the lower frequency and 0.5% of this power above the upper frequency.

NOTE This is also known as the “99% emission bandwidth”.

**Out-of-band emissions:** Emissions on a frequency or frequencies immediately outside the necessary bandwidth, which result from the modulation process, but excluding spurious emissions.

**Outdoor equipment:** Equipment that does not meet the definition for indoor equipment.

NOTE Equipment intended for both indoor and outdoor use is designated as outdoor equipment.

**Parasitic emissions:** Spurious emissions accidentally generated at frequencies that are independent both of the carrier or characteristic frequency of an emission and of frequencies of oscillations resulting from the generation of the carrier or characteristic frequency.

**Peak envelope power:** Maximum value of the envelope power, over all possible normal operating conditions of the transmitter.

**Portable equipment:** Equipment intended to be used while handheld or worn on the human body.

**Power spectral density:** Signal power within the specified measurement (reference) bandwidth.

**Product marketing name (PMN):** Code identifying the name or model number under which the product will be marketed / offered for sale in Canada.

**Radiation:** Outward flow of electromagnetic energy from any source in the form of radio waves.

**Radio apparatus:** Device or combination of devices intended for, or capable of being used for, radiocommunication.

**Radio apparatus module:** Subassembly that provides a radio apparatus function.

**Radiocommunication (or radio):** Any transmission, emission or reception of signs, signals, writing, images, sounds or intelligence of any nature by means of electromagnetic waves of frequencies lower than 3,000 GHz propagated in space without artificial guide.

**Receiver:** Unintentional radiator that is a radio apparatus.

NOTE This excludes EMI receivers as they are not radio apparatus. They are interference-causing equipment, subject to [ICES-001](#).

**Resolution bandwidth (RBW):** Intermediate frequency (IF) bandwidth of the last IF stage of the EMI receiver or spectrum analyzer.

NOTE The RBW is specified either for a specific attenuation from the response at the centre of the filter or by means of a spectrum mask.

**Spurious emissions:**

**Transmitter spurious emissions:** Emissions on a frequency or frequencies that are outside the necessary bandwidth and the level of which can be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

**Receiver spurious emissions:** Radio frequency signals generated or used within the receiver that can cause interference to other equipment, under all normal operating conditions, including the period during which the receiver is scanning or switching channels.

**Standard termination:** Termination of the antenna port having an impedance equal to that of the antenna intended to be connected to that port. In case of external termination (not directly soldered onto the radio apparatus' circuit), it has the same type connector as the antenna port of the radio apparatus but opposite gender.

**Standard test voltage:** Primary voltage applied to the input end of the power cable normally connected to the equipment.

**Subassembly:** Circuit or assembly that is not intended to be used and operated by itself. A subassembly is intended to be incorporated in a finished product (host) as an integral part of that product.

**Subscriber equipment:** Radio apparatus that provides connectivity between the user and base station equipment.

NOTE This equipment can be portable, mobile, or fixed.

**Transceiver:** Equipment in which both a transmitter and a receiver are permanently combined in a single enclosure.

**Transmitter:** Intentional radiator that is a radio apparatus.

**Transmitter power:** Maximum RF power generated by the transmitter at its antenna port or radiated by the antenna, as applicable, when it is operating under the maximum power setting and in any of the intended operating conditions.

**Transmitter output power:** Transmitter power dissipated in the standard output termination(s).

**Total radiated power (TRP):** Integral of the power radiated by the device in all directions over the entire radiation sphere.

**Unintentional radiator:** Device that generates RF (electromagnetic) energy intended either for use inside the device or for transmission through interconnecting cables to another device or a cabled network, where that energy is not intended to be radiated outside the device by its enclosure, antenna (if any) or its attached wired interfaces.

**Unique product number (UPN):** Code assigned by the applicant and made up of a maximum of eleven alphanumeric characters (A-Z, 0-9).

NOTE Together with the company number (CN), the UPN is used to generate a certification number that uniquely identifies a specific product or product family. See section [9.4.4.1](#).

**Unwanted emissions:** Spurious emissions and out-of-band emissions.

**x dB bandwidth:** Frequency range between two points, one below and one above the carrier or centre frequency, outside of which all emissions are attenuated at least x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

NOTE This is sometimes referred to as the “-x dB bandwidth”.

### 3. General requirements and information

This section specifies the general requirements and information related to this standard.

#### 3.1 Transition period

This document will be in force as of the date of its publication on ISED's website. However, a transition period is provided, ending six months after the publication of this standard on ISED's website, within which applications for certification and compliance with either issue 5 or issue 6 of RSS-Gen are accepted. After the transition period expires, applications for certification are only accepted using issue 6 of RSS-Gen and equipment manufactured, imported, distributed, leased, offered for sale, or sold in Canada, shall comply with issue 6 of RSS-Gen.

A copy of issue 5 of RSS-Gen can be requested by emailing [consultationradiostandards-consultationnormesradio@ised-isde.gc.ca](mailto:consultationradiostandards-consultationnormesradio@ised-isde.gc.ca).

#### 3.2 References

This section lists the external documents referenced in this RSS.

##### 3.2.1 Normative references

The following documents are referenced in this standard such that some or all of their content is indispensable for the application of RSS-Gen. Unless otherwise stated, the equipment shall comply with the requirements specified in these documents, as applicable.

- RSP-100, [Certification of Radio Apparatus and Broadcasting Equipment](#)
- RSP-102, [Special Authorization Procedure for Terminal, Radio, Broadcasting and Interference-Causing Equipment to be Certified, Registered or Deemed in Compliance with Technical Equipment Standards](#)
- [RSSs](#) applicable to the specific type of radio apparatus
- RSS-102, [Radio Frequency \(RF\) Exposure Compliance of Radiocommunication Apparatus \(All Frequency Bands\)](#)
- RSS-HAC, [Hearing Aid Compatibility and Volume Control](#)
- CPC-2-0-03, [Radiocommunication and Broadcasting Antenna Systems](#)
- CISPR 16-1-4, *Specification for radio disturbance and immunity measuring apparatus and methods — Part 1-4: Radio disturbance and immunity measuring apparatus — Antennas and test sites for radiated disturbance measurements*
- ANSI/USEMCSC C63.2, *American National Standard for Specifications of Electromagnetic Interference and Field Strength Measuring Instrumentation in the Frequency Range of 9 kHz to 40 GHz*

- ANSI/USEMCSC C63.4, *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*
- ANSI/USEMCSC C63.10, *American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices*
- ANSI/USEMCSC C63.25.1, *American National Standard Validation Methods for Radiated Emission Test Sites, 1 GHz to 18 GHz*
- ANSI/USEMCSC C63.25.2, *American National Standard Validation Methods for Radiated Emission Test Sites, 30 MHz to 1 GHz*
- ANSI/USEMCSC C63.26, *American National Standard for Compliance Testing of Transmitters used in Licensed Radio Services*

The applicable editions of the CISPR and ANSI/USEMCSC C63 standards shall be as posted on the [Normative Test Standards and Acceptable Alternate Procedures](#) web page.

NOTE The C63 standard developer changed from ANSI to [USEMCSC in August 2021](#). As such, C63 standards published after this date are named “ANSI/USEMCSC C63.xx” (instead of “ANSI C63.xx”). The [Normative Test Standards and Acceptable Alternate Procedures](#) web page might contain a mix of “ANSI C63.xx” and “ANSI/USEMCSC C63.xx” standards, depending on the specific edition of each standard adopted by ISED.

### 3.2.2 Informative resources

The following publications contain additional information that can be useful in applying this RSS:

- REC-LAB, [Procedure for the Recognition of Testing Laboratories to Test/Assess to Canadian Requirements](#)
- REC-CB, [Recognition Procedure and Requirements for Certification Bodies](#)
- TRC-43, [Designation of Emissions, Class of Station and Nature of Service](#)
- [Canadian Table of Frequency Allocations](#)
- [Spectrum Allocation Tool](#)

### 3.3 Applicable standards, including RF exposure and hearing aid compatibility

Radio apparatus shall comply with both RSS-Gen and the [RSS](#) applicable to the specific radio technology and frequency of operation. Where requirements in RSS-Gen are different from those in the applicable RSS standard, the applicable RSS standard shall take precedence.

Radio apparatus covered by RSS standards listed on the [RSS-HAC Applicability List](#) shall also comply with [RSS-HAC](#).

The requirements set out in the [RSS-102](#) family of standards shall be met.

### 3.4 Categories of radio apparatus

This section specifies the classification of the radio apparatus: Category I or Category II equipment.

#### 3.4.1 Category I equipment

Category I equipment consists of radio apparatus that require a technical acceptance certificate (TAC) issued by the Certification and Engineering Bureau (CEB) of ISED or a certificate issued by a recognized certification body (CB), pursuant to subsections 4(2) of the [Radiocommunication Act](#) and 21(1) of the [Radiocommunication Regulations](#).

Category I equipment shall be certified using the procedure and requirements specified in [RSP-100](#). The test report shall not be dated more than 12 months before the application for equipment certification is submitted. The tests within the test report may have been conducted more than 12 months before this date but shall remain valid with the applicable requirements.

Certified Category I equipment shall be listed in the [radio equipment list](#) (REL). The REL listing shall include the required information in all fields applicable to the equipment model, in accordance with [RSP-100](#), consistent with production units and with the associated test report(s); see section 8.2. No person shall manufacture, import, distribute, lease, offer for sale, or sell Category I radio apparatus in Canada unless this apparatus is listed on the REL. However, radio apparatus for which an application for a deferred REL listing date has been approved by ISED may be manufactured, imported and distributed in Canada. Such radio apparatus shall not be leased, offered for sale or sold in Canada before it is listed in the REL.

When any of the applicable RSSs or procedures is revised and that document's transition period expires, there is no need to update the certification submission or the corresponding listing in the [REL](#) provided the equipment is not modified and complies with the latest edition of the applicable standard/procedure.

When ISED determines that a specific equipment model does not comply with the applicable ISED requirements or incorrect information has been submitted, the model will be removed from the REL and it shall no longer be manufactured, imported, distributed, leased, offered for sale or sold in Canada.

#### 3.4.2 Category II equipment

Category II equipment is exempt from certification, pursuant to subsection 21(5) of the [Radiocommunication Regulations](#), and thus no TAC issued by the CEB or certificate issued by a recognized CB is required. However, pursuant to subsection 4(3) of the [Radiocommunication Act](#), the Category II equipment shall be in compliance with all applicable standards when manufactured, imported, distributed, leased, offered for sale or sold in Canada. The test report shall be retained for as long as the radio apparatus model is manufactured, imported, distributed, sold, offered for sale and/or leased in Canada and shall be made available to ISED upon request.

Category II host equipment incorporating certified Category I radio apparatus modules does not usually require certification. Consult [RSP-100](#) to determine if certification of the host is necessary.

See also sections 4.5 and 9.4.4.2 for the additional technical and labelling requirements applicable to host equipment.

### 3.5 Licensing

All radio apparatus, including receivers, require a radio licence under section 4(1) of the [Radiocommunication Act](#) unless exempted under section 15 of the [Radiocommunication Regulations](#). See also the [Licence-exempt Radio Apparatus Standards List](#).

Licensing inquiries and applications can be directed to one of the ISED [District Offices](#).

### 3.6 Radiocommunication antenna systems

When installing or modifying an antenna system for radio apparatus that can use an external antenna system, or supporting structure, refer to the Client Procedures Circular CPC-2-0-03, [Radiocommunication and Broadcasting Antenna Systems](#).

### 3.7 Certification body recognition and listing

For performing certifications of radio apparatus to RSSs, the certification body (CB) shall be recognized by ISED and listed on the [CB website](#). The CB shall have in its scope of recognition all ISED standards applicable to the radio apparatus to be certified. The procedure and requirements for CBs to be recognized and listed are described in [REC-CB](#).

### 3.8 Testing laboratory

This section specifies the requirements applicable to testing laboratories.

#### 3.8.1 Recognition and listing

All compliance assessments of Category I radio apparatus shall be performed by testing laboratories recognized by ISED and listed on the [Wireless Device Testing Laboratories](#) website. The recognized testing laboratory shall perform testing and compliance assessment of radio apparatus respecting its scope of recognition. The procedure for testing laboratories to be recognized and listed is described in [REC-LAB](#).

NOTE The use of a recognized testing laboratory for Category II radio apparatus is not a requirement.

#### 3.8.2 Radiated emissions test site

The test sites used for radiated emission measurements shall comply with the site validation requirements specified in ANSI/USEMCSC C63.25.2 for measurements at frequencies within 30 MHz to 1 GHz and with ANSI/USEMCSC C63.25.1 or CISPR 16-1-4 for measurements at and above 1 GHz.

The test site validation shall be confirmed at regular intervals. The date of each radiated emissions test documented in the test report shall be at most three years after the date of the most recent successful test site validation.

### **3.8.3 Calibration of measurement equipment**

Measurement equipment used for compliance measurements and for test site validation shall be calibrated at regular intervals, the maximum length of which shall not exceed any of the following:

- a. three years
- b. the required time period specified in the applicable RSS and ANSI/USEMCSC C63 standard
- c. the required time period between calibrations, as specified by the manufacturer of the measurement equipment

### **3.9 Radio apparatus intended for demonstration, research or developmental purposes**

Radio apparatus used solely for purposes of research and development, experimentation, demonstration, or assessment of marketability are exempt from certification and labelling requirements. However, such radio apparatus may require a developmental licence. See the [Developmental Licence Playbook](#) webpage for more information.

These radio apparatus shall not be leased, sold, or offered for sale in Canada.

One of the ISED [District Offices](#) shall be contacted for developmental license requirements.

### **3.10 Radio apparatus covered by a special authorization**

If an equipment model cannot meet the requirements specified in its applicable standard, a special authorization may be requested following the process specified in [RSP-102](#).

When a special authorization is granted, the equipment shall comply with the applicable standards, modified in accordance with the special authorization letter, at all times when one of the following activities takes place: manufacture, importation, distribution, lease, offering for sale, or sale. Whenever an applicable standard is revised, after the transition period expires, equipment manufactured, imported, distributed, leased, offered for sale, or sold in Canada, shall comply with the new issue of that applicable standard, modified per the granted special authorization letter.

All [special authorizations](#) granted to date are listed on the ISED website.

## 4. General technical requirements

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

### 4.1 General compliance requirements

The radio apparatus shall comply with all applicable requirements, even if test reduction methods are employed (to reduce the testing burden).

For all emission level measurements, the radio apparatus shall be operated such that it generates the highest emission relative to the applicable limit (e.g. at the maximum rated output power, in case of transmitters).

### 4.2 Equipment modifications

A modified radio apparatus can be considered a new radio apparatus model, in which case the original certificate and REL listing are not applicable to the modified device. See also sections 22(1) and 22(2) of the [Radiocommunication Regulations](#). The modified device is subject to RSS-Gen and all applicable standards and procedures. Consult [RSP-100](#) to determine if the modifications performed on the radio apparatus require a new certificate and REL listing.

This applies, for example, in the following situations:

- a. modifications to the internal circuitry or firmware of the equipment
- b. connecting it to a different antenna, not listed in the original certification submission and in the user manual (see sections [5.2](#) and [9.3.2.2](#))
- c. connecting a licence-exempt equipment to an external power amplifier (see section [7.3](#))

### 4.3 Geolocation and operation under control of a primary device

Radio apparatus capable of operating modes in which they do not fully comply with the requirements in an applicable RSS standard shall meet one of the following conditions:

- a. use geolocation, or be under the control of an access point or other primary device that has geolocation, to ensure compliance with the applicable RSS, or
- b. operate only under the control of an access point or other primary device that ensures the radio apparatus operates in compliance with the applicable RSS

**NOTE** An example of such equipment is a wireless microphone or a cellphone capable of operating in multiple countries where some of these jurisdictions have different requirements (such as different authorized channels) than Canada.

Where compliance is ensured by means of an access point or primary device, the radio apparatus shall not be able to initiate a network or transmit until allowed to do so by the access point or primary device.

If the device uses geolocation for meeting the applicable requirements, it shall comply with the following requirements:

1. if the geolocation is based on a satellite technology, it shall use either GPS or Galileo
2. the radio apparatus shall not be able to transmit until the geolocation has detected its presence (or the presence of the access point or primary device) in Canada
3. the radio apparatus shall auto-configure (or be auto-configured by the access point or primary device) to ensure RSS compliance for all operating conditions including during power up and auto-configuration
4. the user shall not be able to modify (override) the configuration in any way that would allow the product to operate in violation of any applicable RSS
5. the geolocation technology shall be described in the test report
6. the radio apparatus shall stop operation or revert to a default state of operation where it complies with the applicable RSS standard or standards when the geolocation feature is disabled (such as through loss of satellite reception or drop in internet connection)

#### **4.4 Power supplied to the equipment under test**

The equipment shall comply with the requirements in the applicable RSS(s) for all supply voltages and, in case of AC mains, supply frequency intended for the Canadian market. The standard test voltage (see definition in section 2.2) shall be within  $\pm 5\%$  of the rated (nominal) voltage stated by the manufacturer. Where the manufacturer specifies a supply voltage range or multiple supply voltages, the applicable “rated” supply voltage shall consist of those voltages intended for Canada.

In the case of a supply voltage range or multiple supply voltages, compliance may be demonstrated either through separate tests for each variant or by testing the worst-case variant after determining, through engineering analysis and/or measurements, the variant that has the highest emission relative to the applicable limit. To note that the worst-case variant can be different for each particular requirement (e.g., conducted emission limits, or radiated emission limits below 30 MHz). If testing is not performed on each variant, the test report shall include the engineering analysis and the justification for the selection of the worst-case variant (the one that was tested), for each applicable requirement.

In the case of equipment exclusively operated from a battery, except for section 5.3, a fully charged battery (or a new non-rechargeable battery) shall be used in the equipment before starting the tests and, for longer tests or between tests, the battery shall be replaced or recharged such that the equipment is operating as intended and is generating worst-case emissions for the entire duration of each test. A laboratory power supply may also be used instead of a battery to supply the equipment during tests provided steps are taken to ensure its presence does not affect the measurement results.

#### **4.5 Host equipment**

Radio apparatus host devices, incorporating another or multiple radio apparatus modules, shall comply with all the RSS standards applicable to the corresponding radio technologies and frequencies of

operation. See the applicable RSSs, section 3.4.1 and section 3.4.2. The additional labelling requirements applicable to host equipment are specified in section 9.4.4.2.

If host equipment contains certified radio apparatus modules, these shall be integrated into the host equipment as per the requirements and instructions for intended use/configuration provided by the radio apparatus module certificate holder.

#### 4.6 Interference-causing equipment subassemblies

Radio apparatus that is subject to an RSS and incorporates subassemblies (see definition in section 2.2) that are classified as *interference-causing equipment* do not need to be verified for compliance with the corresponding [ICES standard](#) provided these subassemblies are exclusively used to enable the operation of the radio apparatus and do not constitute additional functions or capabilities. However, these subassemblies shall be active, as in normal use of the equipment, while the radio apparatus is tested for compliance with RSS-Gen and all [applicable RSS](#).

In case these subassemblies are not exclusively used to enable the operation of the radio apparatus, the [applicable ICES standard](#) shall also apply.

NOTE An example of such equipment is a cellphone.

In either case, the radio apparatus does not need to comply with the labelling requirements of the corresponding ICES standard.

#### 4.7 Accessories

Accessories that are normally used with the transmitter and/or receiver shall be connected while the equipment is tested. However, if a specific accessory is not available for the test, a simulator may be used instead. The simulator, when used, shall exercise the corresponding port or ports of the radio apparatus under test in the same way as the typical / intended accessory.

The emission tests shall be performed with the device and accessories (or simulators) configured so as to produce the maximum level of emissions relative to the applicable limit that can be expected under normal operating conditions.

#### 4.8 External controls and configuration accessibility

The device shall not have any user-accessible hardware or software controls that can be adjusted, selected or programmed to operate the device in violation of any regulatory requirements. Information on internal adjustments, reconfiguration or programmability of the device which, if misused, could enable or cause the equipment to operate in violation of ISD requirements shall not be made available to the consumer or the end user. Such information may be provided only to service depots and agents of the equipment manufacturer.

## 4.9 Measurement methods

This section specifies various topics related to the measurement methods.

### 4.9.1 General

Radio apparatus requiring a license and licence-exempt radio apparatus shall be tested using the measurement methods specified in ANSI/USEMCSC C63.26 and ANSI/USEMCSC C63.10, respectively. Where requirements in these standards are different from those in the applicable RSS (including RSS-Gen), the applicable RSS shall take precedence.

A [list of alternate RF measurement procedures accepted by ISED](#) is published and maintained on the ISED website.

Alternative methods of measurement not covered by an RSS or a reference publication may be considered by ISED for demonstrating the compliance of radio apparatus, provided they are determined to be acceptable by the CEB. Alternative methods of measurement may be submitted by email to the [CEB](#), who will determine the acceptability of these methods.

The overall noise floor of the measuring equipment (including the EMI receiver or spectrum analyzer plus all transducers between the measurement instrument and the EUT, such as preamplifier, attenuators, filters, cables, line impedance stabilization network or antenna) shall be at least 6 dB below the applicable limit, at each frequency of measurement, in the specified limit detector and with the specified measurement bandwidth.

The test report shall illustrate how the emission value was determined for comparison with the limit (for example, see section [A.3](#)).

### 4.9.2 Operating bands and selection of test frequencies

For each frequency band of operation, measurements shall be performed with the device operating at the test frequencies specified in [table 1](#). However, test reductions are allowed if specified in the applicable test standard (ANSI/USEMCSC C63.10 or ANSI/USEMCSC C63.26). The frequencies selected for measurements shall be documented in the test report.

The transmitter shall comply with the applicable requirements at all frequencies specified in [table 1](#).

**Table 1: Test frequencies in each operating band**

Frequency range over which the device operates <sup>i</sup> in each operating band	Number of test frequencies required	Location of test frequencies inside the operating frequency range <sup>i, ii</sup>
≤ 1 MHz	1	near centre
> 1 MHz and ≤ 10 MHz	2	one near high end, one near low end
> 10 MHz	3	one near high end, one near centre, one near low end
<p>i. The frequency range over which the device operates in a given operating band is the difference between the highest and lowest frequencies on which the device can be tuned within that given operating band. The frequency range may be smaller than or equal to the operating band, but it shall not be greater than the operating band.</p> <p>ii. In this column, “near” means at the centre or as close as possible to the centre / low end / high end of the frequency range over which the device operates.</p>		

#### 4.9.3 CISPR quasi-peak and CISPR (linear) average detectors

The CISPR quasi-peak detector (also known as quasi-peak detector) and CISPR average detector (also referred to as linear average detector in some RSS standards) shall comply with the characteristics given in ANSI/USEMCSC C63.2. The linear average detector is the same as the CISPR average detector, but the former term is used when the applicable limit extends beyond 18 GHz. Video filtering as specified in the normative procedures is acceptable as an alternative to the linear average detector.

As an alternative to the CISPR quasi-peak or average measurement, compliance with emissions limits may be demonstrated using a measuring instrument employing a peak detector function properly adjusted for factors such as pulse desensitization, as required (see ANSI/USEMCSC C63.10 or ANSI/USEMCSC C63.26, as applicable), with a measurement bandwidth equal to, or greater than, the bandwidth specified in ANSI/USEMCSC C63.2 for the measured frequency band. Compliance with a limit specified for the linear average detector may also be demonstrated using a quasi-peak detector.

#### 4.9.4 Radiated measurements at frequencies below 30 MHz

Up to 30 MHz, measurements shall be taken in terms of magnetic field strength (H-field), using a small loop antenna compliant with CISPR 16-1-4 over the entire frequency range used during the measurements. Rod antennas are not permitted. The loop’s antenna factor shall be calibrated relative to magnetic field strength, i.e. in units of dB(S/m), or dB[(Ωm)<sup>-1</sup>], or the linear equivalent. See [annex A](#).

NOTE 1 The attribute “small” in the above text is used for differentiating from the large loop antenna system (2 m or larger diameter) that is also described in CISPR 16-1-4. The loop antenna used for RSS measurements is the one that has to fit within a 60 cm sided square.

However, where the limit is expressed in units of electric field (such as in annex B of [RSS-210](#)) and the loop antenna is used for measurements, the  $AF_E$  value calculated using the free-space impedance and the calibrated magnetic antenna factor shall be used for calculating the value of the electric field before comparing with the limit.

NOTE 2 See also equation (A.2) from section A.2.

Field strength measurements may be performed at a smaller distance than the one where the limit is specified. However, in this case the requirements specified in ANSI/USEMCSC C63.10 shall apply, for both licenced and license-exempt radio apparatus. The measurement distance shall not be smaller than 3 m.

#### 4.9.5 Radiated measurements at frequencies of 30 MHz and greater

Measurements at and above 30 MHz shall not be taken in the near-field, except:

- a. where the measurement is taken at the limit distance and this is in the near-field, or
- b. where it is demonstrated (in the test report) that the signal levels cannot be detected by the measurement equipment at the distance specified in the applicable RSS or at a smaller distance that is not in the near-field

For the purposes of these requirements, near-field is defined as the area around the EUT that is bounded, in all directions, at a distance of  $D^2/2\lambda$  (where  $\lambda$  is the wavelength and  $D$  is the maximum dimension of the radiating object or of the measurement antenna, whichever is greater).

NOTE 1 The radiating object can be the antenna or leaky cable attached to the EUT (wanted emissions) or its entire enclosure (unwanted emissions).

Measurements shall not be performed at a distance greater than 30 m unless it is demonstrated, in the test report, that measurements taken at a distance of 30 m or less are not practical.

When performing measurements at a distance other than the one where the limit is specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB per decade of distance (inverse linearly with distance for field strength measurements). However, if measurements are performed in the near-field, the measurement results shall be extrapolated to the limit distance either using a factor of 40 dB per decade up to the far field boundary and 20 dB per decade of distance after that, or by taking measurements at a minimum of two distances for finding the extrapolation factor empirically; in the second scenario, the 20 dB per decade shall still apply beyond the far field boundary.

NOTE 2 The above is similar to the extrapolation requirements specified in ANSI/USEMCSC C63.10 for near-field measurements below 30 MHz.

#### 4.10 Measurement on-site or in situ

Where measurements are required to be performed at the end user's or manufacturer's location, such as perimeter protection systems and level probing sensors, or when using a compliant test site is not possible, the measurements shall be performed using the applicable compliant test site methods, to the extent possible; any deviations shall be documented and justified in the test report. The test report shall also document the decision and rationale why the test was not performed on a compliant test site.

Measurement results obtained from on-site and in situ testing are specific to both the EUT sample tested (specific serial number or numbers) and its installation (specific location and configuration). However, multiple such tests may be used for assessing the compliance of a specific EUT model provided all of the following conditions are met:

- a. testing shall be performed at a minimum of three locations and the EUT shall comply with the applicable requirements at each location
- b. the tested installations shall be representative of all intended installation locations of the equipment model (for example, with various types of floor material, indoor and outdoor installations, metallic or normal wall material)
- c. the same equipment model shall be tested at all locations, with similar configuration(s) and operating mode(s)
- d. the selected test locations shall allow demonstrating the equipment's compliance with applicable ISED requirements, for example:
  - i. where the ambient level at an in situ location is above the applicable limit at a particular frequency, thus masking any EUT emission that might exist at that frequency, at least one of the other selected in situ locations shall permit assessing the EUT's compliance at that frequency
  - ii. where a particular in situ location prevents taking measurements in a particular direction from the EUT, at least one of the other selected in situ locations shall have sufficient space to permit assessing the EUT's compliance in that direction

However, all units shall comply with the applicable RSS standard or standards.

## **5. Transmitters**

This section specifies the technical requirements applicable to transmitters, including the transmitter part of transceivers.

### **5.1 Occupied bandwidth and x dB bandwidth**

The occupied bandwidth shall be reported for all radio apparatus, in addition to the specified bandwidth required in the applicable RSS, such as the x dB bandwidth.

The following conditions shall apply for measuring the occupied bandwidth and x dB bandwidth:

- the transmitter shall be operated at its maximum power
- the span of the spectrum analyzer shall be set large enough to capture all products of the modulation process around the carrier or centre frequency, including the emission skirts, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span

## 5.2 Detachable transmit antenna

In the case of transmitters with detachable antenna(s), a list of all antenna types that are permitted to be used with the transmitter, indicating the maximum permissible antenna gain (and unit, e.g. dBi) and the required impedance, shall be provided for equipment certification. If the transmitter has multiple antenna ports, this list shall indicate the allowed port for each antenna in the list. The test report shall demonstrate the compliance of the transmitter with the limits specified in the applicable RSS when the transmitter is equipped with any antenna type from this list. If the tests were performed only on worst-case configurations, the test report shall include the rationale for selecting the tested configurations and why they are worst-case. See also section [9.3.2.2](#).

## 5.3 Transmitter frequency stability

The following conditions shall apply:

- a. The reference temperature for radio transmitters is +20°C (+68°F).
- b. A handheld device that is only capable of operating using internal batteries shall be tested at the battery's nominal voltage and again at the battery's operating end-point voltage, which shall be specified by the equipment manufacturer and documented in the test report. For this test, either a battery or an external power supply may be used.
- c. The operating carrier frequency shall be set up in accordance with the manufacturer specifications prior to the commencement of these tests. No adjustment of any frequency-determining circuit element shall be made subsequent to this initial set-up.

With the transmitter installed in an environmental test chamber, the unmodulated carrier frequency stability shall be measured under the conditions specified below, as applicable:

1. at the manufacturer's rated supply voltage and at the temperature of -30°C (-22°F), for radio apparatus requiring a licence, and -20°C (-4°F), for licence-exempt radio apparatus
2. at the manufacturer's rated supply voltage and at the temperature of +20°C (+68°F)
3. at the manufacturer's rated supply voltage and at the temperature of +50°C (+122°F)
4. at ±15% of the manufacturer's rated supply voltage and at the temperature of +20°C (+68°F)

The transmitter shall comply with the specified frequency stability limit under all applicable conditions listed above.

At each temperature and supply voltage, measurements shall only be performed after the oscillator and other components inside the EUT that determine the transmit signal's frequency are stabilized. If the frequency stability limits are only met within a temperature range that is smaller than the range specified above, the transmitter shall be automatically prevented from operating outside this smaller temperature range.

**NOTE** If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation.

If the device contains both licenced and licence-exempt transmitter modules, the device's frequency stability shall comply with the applicable limit under the most stringent conditions specified above.

If an unmodulated carrier is not available, the method used to measure frequency stability shall be described in the test report.

## 5.4 Transmitter power

The section specifies the measurement requirements for the transmitter power.

### 5.4.1 General requirements

The EUT shall be set or controlled to transmit at the maximum power rating intended to be used by the device.

Tests shall be performed at the ambient temperature and the manufacturer's rated supply voltage, with the transmitter modulating signal representative (i.e. typical) of those encountered during real system operation. For transmitters with constant envelope modulation, measurements performed on the fundamental frequency may be carried out with an unmodulated carrier. The method used shall be described in the test report.

### 5.4.2 Measurement bandwidth and detector

The transmitter power shall be measured using the following detector type, based on how the applicable limit is defined:

- a. power average detector, for limits expressed in terms of power where the detector type is average or not specified
- b. linear (voltage) average detector (see section 4.9.3), for limits expressed in terms of average field strength
- c. quasi-peak detector (see section 4.9.3) below 1 GHz and linear (voltage) average detector above 1 GHz, for limits expressed in terms of field strength where the detector type is not specified
- d. positive peak detector, for limits expressed in terms of peak power or peak field strength

NOTE 1 The power average detector, sometimes called root-mean-square (RMS) detector, provides the true average power. It uses all samples in the bin (set of samples of the input signal taken by the spectrum analyzer within the time and frequency intervals corresponding to one displayed trace point) and it calculates the mean of the squares of the voltage levels of these samples, then divides the result by the input impedance (50  $\Omega$ ) to obtain the average power level at that trace point (frequency).

One of the following methods shall be used:

1. The spectrum analyzer shall be configured with a resolution bandwidth that encompasses the entire occupied bandwidth (see section 5.1) of the EUT.

2. If the spectrum analyzer's largest available resolution bandwidth is smaller than the occupied bandwidth of the EUT, measurements may be performed using a narrower resolution bandwidth plus numerical integration, in linear power terms, over the occupied bandwidth of the transmitter. However, this alternative procedure shall not be used for peak power measurement.
3. Otherwise, the measurement may be performed with a power meter provided both conditions below are met:
  - i. When the limit is specified in terms of average power, a power-average sensor shall be used. If the limit is in terms of peak power, a peak power sensor shall be used.
  - ii. The bandwidth of the power meter in combination with the sensor shall encompass the entire occupied bandwidth of the EUT.

NOTE 2 For the methods 5.4.2(1) and 5.4.2(3), using a measurement instrumentation bandwidth that is too large can result in a reading that is greater than the actual transmitter power of the EUT, because additional components or unwanted emissions can be present inside the measurement bandwidth. This risk can be eliminated when using the method 5.4.2(2).

When the limit is in terms of power spectral density, the same requirements specified above shall apply, only that these shall be based on the measurement bandwidth (and not on the occupied bandwidth of the EUT).

### 5.4.3 Measurement method

The measurements shall be performed using one of the following methods, as applicable.

#### 5.4.3.1 Transmitter output power

If the antenna is detachable, the transmitter output power shall be measured at the antenna port. If the antenna is not detachable, the transmitter output power shall be determined using one of the following methods:

- a. radiated measurements shall be performed, in accordance with section 5.4.3.2, and the transmitter output power shall be calculated using the formulae in the applicable ANSI/USEMCSC C63 standard; the following three additional requirements apply:
  - i. the radiated measurements shall be performed under far-field conditions or extrapolated to far-field before applying the formulae to calculate the transmitter output power (see sections 4.9.4 and 4.9.5)
  - ii. the gain of the device's antenna shall be documented in the test report, based on a measurement or on realistic data from the antenna's manufacturer
  - iii. the test report shall document the rationale for the antenna gain value used in this calculation and how this results in the worst-case transmitter output power value for that radio apparatus model (this corresponds to the lowest realistic antenna gain value)

- b. conducted measurements may be performed using a specially-modified sample; in this case,
  - i. the measurement results shall account for all associated correction factors (such as for the matching network of the specially-added antenna port)
  - ii. the test report shall describe the rationale for how measurements performed on the specially-modified sample are representative of production units

#### 5.4.3.2 Radiated transmitter power

This section applies when the limit is specified in terms of field strength, EIRP or ERP or when using [5.4.3.1\(a\)](#). If the limit is specified for the total radiated power, section [5.6](#) applies instead.

The radiated transmitter power should be determined using radiated measurements. In this case, the radiated value recorded shall be the maximum value radiated by the EUT (usually along its antenna axis, where the antenna has maximum gain).

Alternatively, if the applicable limit is specified in the far-field, measurements may be performed using the method specified in the following steps:

- a. the transmitter output power shall be measured at the antenna port; when the antenna is not detachable, [5.4.3.1\(b\)](#) may be used
- b. the radiated transmitter power shall be calculated using the formulae in the applicable ANSI/USEMCSC C63 standard  
NOTE The formulae in the applicable ANSI/USEMCSC C63 standard are only valid in the far field.
- c. the gain of the device's antenna shall be documented in the test report, based on a measurement or on realistic data from the antenna's manufacturer
- d. the test report shall document the rationale for the antenna gain value used in this calculation and how this results in the worst-case radiated transmitter power value for that radio apparatus model (this corresponds to the highest realistic antenna gain value)

### 5.5 Transmitter unwanted emissions

This section specifies the measurement requirements for the transmitter's unwanted emissions.

#### 5.5.1 Detector and measurement bandwidth requirements

The following requirements shall apply:

- a. If the limit is specified in terms of field strength:
  - i. up to 1 GHz, compliance with the limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth (see section [4.9.3](#))
  - ii. above 1 GHz, compliance with the limits shall be demonstrated using a linear average detector (see section [4.9.3](#)) with a minimum resolution bandwidth of 1 MHz

- b. If the limit is specified in units of power:
  - i. the unwanted emissions shall be measured using a power average (RMS) detector
  - ii. if the measurement bandwidth is not specified in the applicable RSS, the unwanted emissions shall be measured using a resolution bandwidth equal to or greater than:
    - the CISPR bandwidth (as specified in ANSI/USEMCSC C63.2), for measurement frequencies up to and including 1 GHz
    - 1 MHz, for measurement frequencies above 1 GHz

When the unwanted emissions limits are expressed in relative terms with respect to the transmitter power, the latter shall be measured using the same detector type specified for unwanted emissions but with the measurement bandwidth compliant with section 5.4.2.

NOTE A limit specified as  $(X - 10 \log p)$  below the transmitter power level, where  $p$  is the transmitter power in Watts, is not a relative limit but an absolute limit.

### 5.5.2 Frequency range for measuring unwanted emissions

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated or used in the equipment, whichever is lower, without going below 9 kHz, up to at least the applicable frequency given below:

- a. If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to the upper frequency specified in table 2, if applicable, whichever is higher, but it is not necessary to measure above 40 GHz. Table 2 shall apply when the equipment contains a digital device (see definition in section 2.2) that is exclusively used for enabling the operation of the radio apparatus.
- b. If the equipment operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
- c. If the equipment operates at or above 30 GHz and below 95 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower.
- d. If the equipment operates at or above 95 GHz: to the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower.

**Table 2: Upper frequency of measurement for equipment with a digital device**

Highest frequency generated, operated or used in the equipment (MHz)	Upper frequency limit of measurement (MHz)
< 1.705	30
≥ 1.705 and < 108	1000
≥ 108 and < 500	2000
≥ 500 and ≤ 1000	5000
> 1000	5 <sup>th</sup> harmonic of the highest frequency or 40 GHz, whichever is lower

It is not necessary to report the amplitude of unwanted emissions that are more than 20 dB below the applicable limit, except if fewer than six unwanted emissions exist above this threshold. In the latter case, the test report shall include at least the six highest unwanted emissions relative to the applicable limit. If fewer than six unwanted emissions are above the measurement system's noise floor, then this noise floor shall be included, at representative frequencies, such that at least six emissions are reported.

NOTE See section 4.9.1 for the noise floor requirements.

## 5.6 Total radiated power (TRP)

The TRP shall be measured using the corresponding method specified on the [Normative Test Standards and Acceptable Alternate Procedures](#) web page.

## 6. Receivers

This section specifies the requirements applicable to receivers, including the receiver part of transceivers.

### 6.1 General

Compliance with the limits set out in this section shall be demonstrated using the methods of measurement specified in ANSI/USEMCSC C63.4.

If the receiver is part of an overall multi-coupling/pre-amplification system, the receiver's multi-coupling, filtering and pre-amplification equipment shall be accounted for while assessing compliance with the conducted limits at the antenna port.

All receivers shall comply with the limits specified in section 6.2, but are exempt from the certification, labelling and test report requirements.

## 6.2 Limits

This section specifies the emission limits applicable to receivers.

### 6.2.1 Conducted emissions on AC mains power lines

The receiver shall comply with the conducted emissions limits specified in section 7.4.2 on the AC mains power-line input cable(s).

### 6.2.2 Radiated emissions

Receivers, with their antenna attached, shall comply with the limits specified in table 5. However, the following alternative compliance assessment process is permitted for receivers that have a detachable antenna:

- a. the receiver shall comply with the limits in table 5 while its antenna is replaced with a termination of the same impedance as the antenna port, and
- b. the emissions conducted from the antenna port of the receiver shall not exceed 2 nW in the frequency range of 30 MHz to 1 GHz and 5 nW above 1 GHz

The receiver shall comply with the specified limits from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is higher, to at least five times the highest tunable or local oscillator frequency, whichever is higher, without exceeding 40 GHz.

Radiated measurements may also be performed at other distances: see section 4.9.5.

## 7. Specific licence-exempt radio apparatus requirements

This section specifies requirements applicable to licence-exempt radio apparatus.

### 7.1 General

In addition to the requirements prescribed in other sections of this standard, licence-exempt radio apparatus subject to a standard in the RSS-200 and RSS-300 series shall meet the requirements of this section, where applicable.

If an average limit is specified for the equipment, including below 1 GHz, then the peak emission shall also be measured, with instrumentation properly adjusted for factors such as pulse desensitization, and shall be less than or equal to 20 dB above the average limit. This additional peak limit does not apply for conducted emissions on the AC mains power input terminals.

### 7.2 Pulsed operation

When an average detector is specified and the field strength or envelope power is not constant or it is in pulses, the value of field strength or power shall be determined by averaging over one complete

pulse train during which the field strength or power is at its maximum value, including blanking intervals within the pulse train, provided that the pulse train does not exceed 0.1 seconds. If the pulse train exceeds 0.1 seconds, the average value of field strength or power shall be determined during a 0.1 seconds interval during which the field strength or power is at its maximum value.

The exact method of calculating the average field strength or power shall be described in the test report.

For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance shall be demonstrated using measuring instrumentation employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

### **7.3 Prohibition of amplifiers**

Unless permitted in the applicable RSS, the manufacture, importation, distribution, lease, sale or offering for sale of RF power amplifiers for use with licence-exempt radio apparatus is prohibited.

NOTE In accordance with section 3.3, the applicable RSS takes precedence over RSS-Gen.

### **7.4 General emission limits**

This section specifies the general emission limits applicable to license-exempt radio apparatus.

#### **7.4.1 Measurement bandwidths and detector functions**

For all frequencies equal to or smaller than 1 GHz, the emission limits specified in this section are based on measurements using a CISPR quasi-peak detector function. However, except for conducted emissions at the AC mains power terminals, in the frequency ranges 9 kHz to 90 kHz and 110 kHz to 490 kHz the emission limits are based on measurements employing a CISPR average detector.

For all frequencies greater than 1 GHz, the limits are based on a linear average detector.

#### **7.4.2 Conducted emission limits (AC mains power lines)**

For radio apparatus that are designed to be connected to the public utility AC mains power network, the radio frequency voltage that is conducted back onto each AC mains power line on any frequency or frequencies within the range 150 kHz to 30 MHz shall not exceed the limits in [table 3](#). This requirement applies for the radio frequency voltage measured between each power line and the ground terminal of each AC mains power cable of the equipment.

For radio apparatus that connects to the AC mains power network indirectly, through another device, the requirement for compliance with the limits in [table 3](#) shall apply at the terminals of the AC mains power cable of the external device, while it provides power to the radio apparatus. The device used to power the radio apparatus under test shall be representative of typical applications.

The radio apparatus shall comply with both the quasi-peak limit and the average limit.

**Table 3: Conducted emission limits (AC mains power terminals)**

Frequency (MHz)	Limit (dB $\mu$ V) <sup>i</sup>	
	Quasi-peak	Average
0.15 to 0.5	66 to 56 <sup>ii</sup>	56 to 46 <sup>ii</sup>
0.5 to 5	56	46
5 to 30	60	50
i. The more stringent limit shall apply at the transition frequency.		
ii. The limit level decreases linearly with the logarithm of frequency.		

For transmitters operating between 150 kHz and 30 MHz, the limits in [table 3](#) apply with the following conditions:

- a. The radio apparatus with its antenna connected shall comply with these limits outside the transmitter's occupied bandwidth.
- b. The radio apparatus with an impedance-matched load instead of its antenna shall comply with these limits within the transmitter's occupied bandwidth. For this test, the antenna shall be removed (regardless if it is detachable or permanently attached) and the RF output shall be terminated with a load or network that simulates the antenna in the fundamental frequency band.

#### 7.4.3 Radiated emission limits

The radio apparatus shall comply with the field strength limits shown in [table 4](#) and [table 5](#). Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

**Table 4: General field strength limits below 30 MHz**

Frequency MHz	Magnetic field strength limit <sup>i</sup> $\mu$ A/m	Measurement distance m
0.009 to 0.49	$6.37 / f$ ( $f$ in kHz)	300
0.49 to 1.705	$63.7 / f$ ( $f$ in kHz)	30
1.705 to 30	0.08	30
i. The more stringent limit shall apply at the transition frequency.		

**Table 5: General field strength limits at and above 30 MHz**

Frequency MHz	Electric field strength limit <sup>i</sup> at 3 m distance $\mu\text{V}/\text{m}$
30 to 88	100
88 to 216	150
216 to 960	200
> 960	500
i. The more stringent limit shall apply at the transition frequency.	

## 7.5 Restricted frequency bands

Restricted frequency bands, identified in [table 6](#), are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Some of these frequency bands are also used for licence-exempt applications.

The occupied bandwidth of licence-exempt radio apparatus shall be entirely outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, and 470-602 MHz.

Unwanted emissions that fall in restricted bands shall comply with the limits specified in section [7.4.3](#).

**Table 6: Restricted frequency bands**

MHz	MHz	GHz
0.09 to 0.11	25.5 to 25.67	2.655 to 2.9
0.495 to 0.505	37.5 to 38.25	3.26 to 3.267
2.1735 to 2.1905	73 to 74.6	3.332 to 3.339
3.02 to 3.026	74.8 to 75.2	3.3458 to 3.358
4.125 to 4.128	108 to 138	3.5 to 4.4
4.17725 to 4.17775	149.9 to 150.05	4.5 to 5.15
4.20725 to 4.20775	156.52475 to 156.52525	5.35 to 5.46
5.677 to 5.683	156.7 to 156.9	7.25 to 7.75
6.215 to 6.218	162.0125 to 167.17	8.025 to 8.5
6.26775 to 6.26825	167.72 to 173.2	9 to 9.2
6.31175 to 6.31225	240 to 285	9.3 to 9.5
8.291 to 8.294	322 to 335.4	10.6 to 12.7
8.362 to 8.366	399.9 to 410	13.25 to 13.4
8.37625 to 8.38675	608 to 614	14.47 to 14.5

MHz	MHz	GHz
8.41425 to 8.41475	960 to 1427	15.35 to 16.2
12.29 to 12.293	1435 to 1626.5	17.7 to 21.4
12.51975 to 12.52025	1645.5 to 1646.5	22.01 to 23.12
12.57675 to 12.57725	1660 to 1710	23.6 to 24
13.36 to 13.41	1718.8 to 1722.2	31.2 to 31.8
16.42 to 16.423	2200 to 2300	36.43 to 36.5
16.69475 to 16.69525	2310 to 2390	Above 38.6
16.80425 to 16.80475	2483.5 to 2500	—

## 8. Test report

This section specifies the test report requirements.

### 8.1 General

The test report shall demonstrate the product's compliance with the requirements in RSS-Gen and the applicable RSSs.

In case of family certifications, the test report shall reflect all products in the family, in accordance with the REL listing. See also sections [3.4.1](#) and [8.2\(a\)](#).

The test report shall be retained for as long as the equipment model is manufactured, imported, distributed, leased, offered for sale and/or sold in Canada and shall be made available to ISED upon request.

### 8.2 Test report contents

The test report shall contain, at a minimum, the following:

- a. the device ISED certification number, PMN, HVIN, FVIN, HMN, as applicable
- b. a list of the applicable RSSs and normative publications and/or related documents used during testing, including the corresponding edition or publication date for each of these
- c. the issue date of the report
- d. the name and address of the testing laboratory where the tests were carried out; in case of Category I radio apparatus, the ISED company number of the (recognized) testing laboratory and the conformity assessment body identifier (CABID) shall also be included
- e. the name and address of the manufacturer of the EUT and/or applicant for certification
- f. the name(s), title(s), function(s), and hand signature(s) or secure digital signature(s), of the person(s) responsible for the test report

- g. a unique identifier of the test report (such as a test report number)
- h. a table of contents, an identifier on every page indicating that the page is part of the test report, and a clear mention on the last page of the test report indicating the end
- i. a description along with unambiguous identification of the EUT(s), i.e. HVIN and serial number(s)
- j. for each EUT, a description of its physical configuration (e.g. connected wired interfaces and corresponding arrangement during testing) and operation (e.g. external and internal exercising method, including software configuration and firmware number)
- k. a summary of all the tests listed in the RSS and a reference to the test method that applies to the specific EUT; the summary should also note whether the EUT passed or failed each applicable requirement
- l. the technology and the type of modulation, with a brief description giving any useful information to aid prospective readers in understanding the device, such as but not limited to the bit rate and symbol rate
- m. the test results related to occupied bandwidth(s), x dB bandwidth(s), channel bandwidth(s) and channel spacing(s), where applicable
- n. if the device is pulsed, a graphical representation shall be reported, depicting a typical encoded pulse train, showing pulse widths and amplitudes in the time domain; in addition, the method of power calculation and the type of detector used during testing shall be reported
- o. a list of all detachable antennas as per section 5.2, including relevant information such as but not limited to the antenna type, the antenna gain, the antenna input impedance, the associated port (if the device has multiple antenna ports), and clear identification of the specific antenna (description, model and serial number) used for each test
- p. photographs of the EUT and any accessories that are used with the EUT under normal operating conditions and that are relevant to the purpose of performing the testing of the EUT
- q. any tune-up or adjustment procedures employed during the testing of the EUT, along with the identification and description of any operating software/firmware used in both the normal operating mode and the special test modes for compliance testing
- r. the measurement uncertainty for each test case, as applicable
- s. the following information for each test provision, as deemed applicable:
  - i. the date(s) when testing has been performed
  - ii. if the test report includes results from multiple EUT samples, each specific test shall identify which unit was tested
  - iii. all requirements for which the device has been tested
  - iv. operating conditions for the EUT (including firmware, specific software settings, and input/output signal levels to/from the EUT)
  - v. a description of the firmware or software used to operate the EUT for testing purposes
  - vi. the results of each test in the form of tables, spectrum analyzer plots, charts, sample calculations, and so on, as appropriate (if results are provided in the form of plots and

compliance with the limit is not clearly distinguishable, the data that is close to the limit shall also be provided in form of tables)

- vii. the test equipment used, identified by type, manufacturer, model number, serial number or other identifier and the date on which the next calibration or service check is due; this includes software used for performing the measurement, such as automation software controlling the EMI receiver, turntable and antenna mast
- viii. any modifications made to the device during testing
- ix. a description and a block diagram of the test setup, for each type of test
- x. photographs of the test setup if they are relevant to the ability to reproduce the test results; the information provided shall clearly indicate the configuration of all EUT and support equipment used during testing
- xi. the name(s) of the person(s) who has (have) performed the tests
- t. the frequencies selected for measurements (per section [4.9.2](#))
- u. additional requirements as indicated in the applicable RSSs or in the applicable test method standard (see sections [3.3](#) and [4.9.1](#))

## **9. Labelling and user manual requirements**

This section specifies the labelling and user manual requirements.

### **9.1 General**

The labelling and user manual requirements of this section shall apply to each unit of the radio apparatus model.

Where this document requires information to be provided on the packaging, this shall be on the exterior of the product packaging and shall not be provided electronically.

### **9.2 Radio apparatus module**

The radio apparatus module certificate holder shall provide host equipment manufacturers with integration instructions for ensuring the host equipment complies with the applicable ISED requirements based on intended use/configuration of the certified radio apparatus module in the host.

This includes providing the host manufacturer with a host label or a description of the host product labelling requirements; see also [annex B](#).

### 9.3 User manual

This section specifies the user manual requirements.

#### 9.3.1 General

The user manual shall include all notices and information to the user, in both English and French, specified in the applicable RSS standard, including this one.

**NOTE** The user manual should contain information such as the HVIN and/or PMN or any other unique identification to confirm that it is associated with the specific equipment model or models.

In the case of host equipment, the user manual requirements related to all integrated radio modules shall be reflected in the user manual of the final product (host equipment with radio modules incorporated).

If notices and information to the user are required to be in the user manual and this manual is not provided with the equipment, the user manual shall be readily available (e.g. on the manufacturer's website), free of charge, for the entire period in which the equipment is manufactured, imported, distributed, leased, offered for sale, or sold in Canada. Additionally, instructions on how to access the user manual shall be included with each unit of that equipment model (e.g. on packaging).

As an alternative, the required notices and information to the user may be displayed electronically, in which case they shall comply with the requirements prescribed in [annex B](#).

#### 9.3.2 Licence-exempt radio apparatus

This section specifies the user manual requirements for licence-exempt radio apparatus.

##### 9.3.2.1 General notice

The following text, or an equivalent notice, shall be displayed in a conspicuous location, either in the user manual or on the device, or both:

*This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:*

- 1) This device may not cause interference.*
- 2) This device must accept any interference, including interference that can cause undesired operation of the device.*

*L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :*

- 1) L'appareil ne doit pas produire de brouillage;*

- 2) *L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

### 9.3.2.2 Transmitter with detachable antenna(s)

The user manual shall contain the following notice in a conspicuous location:

*This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.*

*Le présent émetteur radio [identifier le dispositif par son numéro d'homologation d'ISDE] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et en ayant un gain admissible maximal tel qu'indiqué. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.*

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance. If the transmitter has multiple antenna ports, this list shall also indicate the allowed port for each antenna type in the list.

## 9.4 Labelling

This section specifies the labelling requirements.

### 9.4.1 General

Each unit of a radio apparatus model shall bear a label including the information specified in section 9.4.4. This label shall be permanently affixed to each unit of the equipment or displayed electronically (e-labelling) as per annex B, and its text shall be indelible and clearly legible.

### 9.4.2 Quick-response (QR) code

The label may consist of a QR code if all of the following conditions are met:

- it shall contain the required product label, in accordance with section 9.4.4; this shall not be provided by means of a link to a website or refer to another location
- it shall be on the product (electronic labelling shall not be used in this case)
- it shall be easily readable by generic QR code apps
- the accompanying literature (user manual) shall refer to the QR code for directing the user to the product labelling information

### 9.4.3 Placing the label in the user manual or on the packaging

This section specifies the conditions under which it is acceptable to place the label in the user manual and on the packaging (instead of on each unit).

#### 9.4.3.1 Equipment with dimensions greater than 2.5 cm

This section applies when the longest dimension of the equipment is greater than 2.5 cm.

If the equipment is too small or if it is not otherwise practical to place the label on the equipment and if e-labelling cannot be implemented, then the following process shall be used:

- a. An inquiry shall be sent to ISED's Certification and Engineering Bureau (CEB) at [certificationbureau-bureauhomologation@ised-isde.gc.ca](mailto:certificationbureau-bureauhomologation@ised-isde.gc.ca) including all pertinent information, such as make, model, external photographs, and the justification for why placing the label on the unit itself would be impractical.
- b. If approval is obtained for the specific product model, all conditions specified in the approval letter (e.g. email) shall be applied.
- c. If the label is placed in the user manual, it shall also be placed on the product packaging.

#### 9.4.3.2 Equipment with dimensions equal to or smaller than 2.5 cm

If the largest dimension of the equipment is equal to or smaller than 2.5 cm, the following alternative label placement may be used:

- a. For multiunit equipment, if one of the units is both larger than 2.5 cm and required in at least one mode of operation, the label shall be affixed to the larger unit or displayed electronically. Alternatively, permission shall be obtained from CEB to place the label in the user manual and on the packaging in accordance with section 9.4.3.1 (e.g. a pair of wireless earbuds with charging case).
- b. If the equipment is not multiunit or if all units in the multiunit equipment have a maximum dimension that is equal to or smaller than 2.5 cm, the label may be placed in the user manual instead of on the unit itself without prior approval from CEB (see also section 9.3.1). However, the label shall also be placed on the product packaging.

### 9.4.4 Information to be included in the label

This section specifies the information to be included in the label.

#### 9.4.4.1 Category I equipment

Every unit of a certified product model, including any product for which modular approval (MA) or limited modular approval (LMA) has been granted, shall be identified with a label that includes the following information and meets the following requirements:

- a. the ISED certification number, which shall be preceded by "IC:"

- b. the HVIN, which may be listed with a prefix (such as “HVIN:”, “Model#”, “M/N:”, “P/N:”) or without any prefix
- c. the PMN may be indicated on the product packaging or in the product literature instead of the label; in this case, this product literature shall be supplied with the product or be readily available online in accordance with section [9.3.1](#)
- d. the PMN, HVIN and ISED certification number indicated on the product (including by electronic display) shall match the information listed in the [REL](#)
- e. when the FVIN is the only differentiation between product versions within a family certification listed on the REL (i.e. the PMN and HVIN remain the same for all versions), the FVIN shall be displayed or stored electronically on the product and be easily retrievable

NOTE The PMN, HVIN, ISED certification number and applicable FVIN are not required to be adjacent to each other.

The certification number shall start with the company number (CN) assigned by ISED, followed by the unique product number (UPN) assigned by the applicant. The certification number format shall be:

**IC: XXXXX-YYYYYYYYYYY**

where

1. “IC:” indicates that this is an ISED certification number, but is not part of the certification number. “XXXXX-YYYYYYYYYYY” is the ISED certification number.
2. “XXXXX” is the CN assigned by ISED and is made up of five numeric characters (e.g. “20001”).  
NOTE Older CNs consisted of up to five numeric characters followed by an alphabetic character (e.g. “21A” or “15589J”).
3. “YYYYYYYYYYY” is the UPN assigned by the applicant, made up of a maximum of eleven alphanumeric characters.
4. The characters in the CN and the UPN are limited to numeric (0-9) and capital ISO basic Latin alphabetic (A-Z) characters only. The use of punctuation marks or other symbols, including “wildcard” characters, is not permitted.
5. The HVIN and PMN may contain punctuation marks or symbols but they shall not represent any indeterminate (“wildcard”) characters.

**Example 1:** A company has been assigned a CN of “21A” and wishes to use a UPN of “WILAN3” for one of its products. The full ISED certification number of this product would thus be “IC: 21A-WILAN3”.

**Example 2:** A company has been assigned a CN of “20001” and wishes to use a UPN of “WILAN3” for one of its products. The full ISED certification number of this product would thus be “IC: 20001-WILAN3”.

**Example 3:** A manufacturer wishes to use the characters “XX” as wildcards to indicate that these two characters are not fixed, but represent a range of characters decided by the manufacturer, where the HVIN would be “47XP-820K/A21XX” or the ISED certification number would be “IC: 21A-WILANXX”.

This practice is not permitted. However, this same sequence of symbols may be used as a valid HVIN or ISED certification number if it identifies a single product version.

#### 9.4.4.2 Host equipment

The following requirements apply:

- a. The host marketing name (HMN) shall be included on the label of the host product, or indicated on the product packaging or in the product literature. In the latter case, this product literature shall be supplied with the host product or be readily available online, in accordance with section 9.3.1.
- b. The host product shall be properly labelled to identify the incorporated modules. For each incorporated module:
  - i. either the ISED certification number of the module shall be clearly visible at all times when the module is installed in the host product, or
  - ii. the host product shall be labelled to display the ISED certification number for the module, which shall be preceded by the word "contains", "contient", or "contains/contient"; for example: "**Contains IC: XXXXX-YYYYYYYYYYY**" (where "XXXXX-YYYYYYYYYYY" is the module's certification number)

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## Annex A: Radiated emission measurements 9 kHz to 30 MHz (informative)

### A.1 Introduction

This annex provides guidance to ensure radiated emission measurements in the frequency range 9 kHz to 30 MHz are properly assessed and reported.

Traditionally, all radiated emission limits in this frequency range were expressed in terms of electric field strength, such as in units of  $\mu\text{V}/\text{m}$  or  $\text{dB}(\mu\text{V}/\text{m})$ . While the general field strength limits in [table 4](#) (see section [7.4.3](#)) are now expressed in terms of magnetic field strength, other RSSs continue to specify electric field strength limits (e.g. annex B of [RSS-210](#)).

### A.2 Antenna factor

Radiated emission measurements in this frequency range are performed using a shielded loop antenna. The antenna factor is a scalar quantity that allows the determination of the magnitude of the incident magnetic field strength from the voltage level measured at the coaxial output port of the loop antenna:

$$H = V + AF_H \quad (\text{A.1})$$

where

$H$  is the magnetic field strength at the antenna location, in  $\text{dB}(\mu\text{A}/\text{m})$

$V$  is the voltage measured at the coaxial port of the loop antenna, in  $\text{dB}(\mu\text{V})$

$AF_H$  is the magnetic antenna factor of the loop, in  $\text{dB}(\text{S}/\text{m})$  or  $\text{dB}(\Omega^{-1}\text{m}^{-1})$

Due to the historical reasons mentioned in section [A.1](#), many antenna calibration laboratories still provide by default the so-called “electrical” antenna factor, while the magnetic antenna factor is sometimes only available as an option (on demand). However, it is easy to convert from one to the other using the free-space impedance:

$$AF_H = AF_E - Z_0 \quad (\text{A.2})$$

where

$AF_E$  is the “electric” antenna factor of the loop, in  $\text{dB}(\text{m}^{-1})$

$Z_0$  is the free-space impedance, equal to  $20 \log_{10}(120\pi) \approx 51.5 \text{ dB}\Omega$

It is important to recognize that  $AF_E$  is only a mathematical construct and not the true electric antenna factor of the loop antenna. This type of antenna is required to have a poor response to electrical field and optimized response to magnetic field (see CISPR 16-1-4). The true electric antenna factor is equal to the ratio between the magnitude of the electric field at the antenna location and the voltage appearing at the coaxial output port of the antenna (all quantities expressed in linear units). Nonetheless,  $AF_E$  can be used to correctly evaluate the magnitude of the electric field at the antenna location provided the antenna is in the far field of the radiating source. This is strictly due to the fact that the  $E$  and  $H$

components of the field are related to each other by the free-space impedance,  $Z_0$ , in the far field of the radiating source (and not due to the fact that  $AF_E$  reflects in any way the actual electric field detected by the loop antenna – the latter does not measure the electric field; it measures the magnetic field and the electric field can then be deduced from that, when in the far field of the radiating source).

NOTE Antenna calibration laboratories providing the so-called “electrical” antenna factor for a loop antenna are in fact first obtaining the magnetic antenna factor, then convert that to the “electrical” antenna factor using the free-space impedance.

When measurements are performed in the near field of the radiating source (as is the case in practice with most radiated emission measurements at these frequencies), the  $E$  and  $H$  components of the field are not related to each other by the free-space impedance,  $Z_0$ . Thus, using  $AF_E$  in this case will not correctly evaluate the true magnitude of the electric field at the antenna location. However, that is acceptable when the limit is expressed in terms of electric field strength: see section 4.9.4.

### A.3 Reporting

When the limit is in terms of magnetic field, the following equation applies:

$$H = V + L_C - G_{PA} + AF_H \quad (\text{A.3})$$

where

$H$  is the magnetic field strength, in dB( $\mu\text{A}/\text{m}$ ); to be compared with the limit  
 $V$  is the voltage measured by the EMI receiver or spectrum analyzer, in dB( $\mu\text{V}$ )  
 $L_C$  is the cable loss, in dB  
 $G_{PA}$  is the gain of the preamplifier (if used), in dB  
 $AF_H$  is the magnetic antenna factor of the loop, in dB(S/m) or dB( $\Omega^{-1}\text{m}^{-1}$ )

The term  $G_{PA}$  is only included in the equation when an external preamplifier is used in the measurement chain, in front of the EMI receiver or spectrum analyzer. An external preamplifier is not usually necessary (or even advisable, due to risk of saturating the input mixer of the EMI receiver or spectrum analyzer) when an active loop antenna is used for the measurement. In that case, the antenna factor of the loop already includes the gain of its built-in preamplifier.

When the limit is in terms of magnetic field and the “electrical” antenna factor is used instead, the above equation becomes:

$$H = V + L_C - G_{PA} + AF_E - Z_0 \quad (\text{A.4})$$

where

$AF_E$  is the “electric” antenna factor of the loop, in dB( $\text{m}^{-1}$ ), as provided by the antenna calibration laboratory  
 $Z_0$  is the free-space impedance, equal to  $20 \log_{10}(120\pi) \approx 51.5$  dB $\Omega$

When the limit is in terms of electric field, the following equation applies:

$$E = V + L_C - G_{PA} + AF_E \quad (\text{A.5})$$

where

$E$  is the electric field strength, in dB( $\mu\text{V}/\text{m}$ ); to be compared with the limit

or, if the magnetic antenna factor is used:

$$E = V + L_C - G_{PA} + AF_H + Z_0 \quad (\text{A.6})$$

It is incorrect to configure the display of the EMI receiver or spectrum analyzer in units of current, e.g.  $\mu\text{A}$  or dB( $\mu\text{A}$ ). That conversion is calculated inside the EMI receiver or spectrum analyzer using its input impedance, which is  $50 \Omega$ , while the magnetic field calculation is based on the free-space impedance of  $120\pi \Omega \approx 377 \Omega$ .

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## Annex B: Electronic labelling (normative)

### B.1 General

Radio apparatus with an integrated display screen may present the required label information electronically (e-label). Radio apparatus without an integrated display screen may present the e-labelling information through one of the following two methods:

- an audio message
- on the display screen of, or through an audio message by, an external equipment connected via a physical connection, Bluetooth, Wi-Fi, etc., if this connection to the external equipment is mandatory for use of the radio apparatus

Where the e-labelling information is presented through an audio message, the radio apparatus or the external equipment, as applicable, shall have an integrated speaker or headphone port and the audio message shall be bilingual English-French.

The following requirements apply when the host uses e-labelling for providing the certification number of an integrated radio module:

- a. if the certified radio module has a secure electronic exchange interface with authentication between the module and the host to identify the correct ISED certification, then:
  - i. the host shall present the module's ISED certification number on the host's built-in display or through an audio message
  - ii. the application for the module's certification shall include a description of the secure electronic exchange protocol and the security of such an arrangement; alternatively, the host manufacturer shall include this information in the application for the host's certification
- b. if the certified radio module does not have a secure electronic exchange interface with authentication between the module and the host, then:
  - i. the host manufacturer shall factory-encode the module's ISED certification number and present it on the host's built-in display or through an audio message
  - ii. the factory-encoding shall be secure and locked by the host manufacturer such that it is not modifiable by any third parties

If both the label and mandatory user manual statements are implemented electronically, then the two shall be clearly differentiated, so that the user is able to distinguish between the label and the user manual statements.

## **B.2 Accessibility**

This section specifies the accessibility requirements.

### **B.2.1 Instructions to access the label and user manual statements**

Users shall be provided with clear instructions on how to access the e-label and electronic user manual statements. The following requirements apply:

- a. these instructions shall be provided in the user manual, operating instructions or packaging material (e.g. on the bags used to pack the device or on accompanying leaflets), or on a website related to the product
- b. in case these instructions are provided on a website,
  - i. information on how to access the specific web page shall be provided on the packaging or in accompanying leaflets
  - ii. that website shall be accessible, free of charge, for the entire period in which the equipment is manufactured, imported, distributed, leased, offered for sale, or sold in Canada
- c. these instructions shall be included in the section of the test report demonstrating compliance with the labelling and user manual statements requirements

### **B.2.2 Accessibility to the label and user manual statements**

The e-label and electronic user manual statements shall meet all of the following requirements:

- a. accessing the e-label and electronic user manual statements shall not require the use of special access codes (other than the user login credentials to access the product's controls, where applicable) or accessories (e.g. SIM/USIM cards)
- b. accessing the e-label and electronic user manual statements shall not require more than three steps from the product's main menu

## **B.3 Labelling for importation, distribution and purchasing**

This section only applies to e-labelling (not for electronic user manual statements).

Products utilizing e-labels shall have a physical label on the product packaging at the time of importation, distribution, offering for sale and sale. The following conditions shall apply:

- a. for products imported in bulk (not packaged individually), a removable adhesive label or, for products in protective bags, a label on the bags is acceptable to meet the physical label requirement
- b. any removable label used shall survive normal shipping and handling and may only be removed by the end user, after purchase

- c. for products already imported in individual packages ready for sale, the information may alternatively be provided on the package

## **B.4 Security**

The information to be displayed on the e-label or in the electronic user manual statements shall meet the following security requirements:

- a. be programmed by the responsible party (e.g. manufacturer)
- b. not be modifiable or removable during the course of normal authorized activities by a third party (i.e. the typical user), such as installing applications or accessing menus

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