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Spectrum Management and Telecommunications

Radio Standards Specification

General Requirements and Information for the Certification of Radiocommunication Equipment

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Canada

Preface

Radio Standards Specification-Gen, Issue 2, *General Requirements and Information for the Certification of Radiocommunication Equipment,* sets out general requirements and provides information for the certification of radiocommunication equipment. This document must be used in conjunction with other Radio Standards Specifications (RSSs) specifically relevant to the equipment for which certification is sought.

This document will be in force as of the publication date of *Canada Gazette* notice SMSE-001-07, after which the public has 120 days to make comments. Comments received will be considered, and a new issue or a revised version of this issue may be developed.

Changes:

(1) **Section 2:** A recommendation has been added for suppliers of radiocommunication equipment regarding the use of both official languages.

(2) **Section 2.2.1:** The conditions under which a receiver is considered to be Category I Equipment have been clarified.

(3) **Section 3.1:** A requirement has been added for the test report to be dated within one year of the date the application for certification is made.

(4) **Section 4:** Compliance with American National Standards Institute (ANSI) C63.4-2003 standard for testing facilities and method for radio noise emission has been added. The reference to RSS-212 for testing facilities and measurement method has been removed, as RSS-212 has been rescinded.

(5) **Section 4.4:** The measurement method of field strength for pulsed operation has been corrected to include, rather than exclude, blanking intervals within the pulse train.

(6) **Section 4.7:** The resolution bandwidth for measurement of transmitter power has been specified to be at least three times the emission bandwidth to reflect the current measurement method.

(7) **Section 4.9:** The use of a peak detector having suitable bandwidth as an alternative to a quasi-peak detector for measurement of receiver spurious emissions below 1 GHz is described.

(8) **Section 5.2:** A detailed description has been added of how to label the equipment. A provision has also been added to allow the label for medical implants designed to be used within the human body to be placed on the packaging and user manual.

(9) **Section 6:** The method of measurement for receivers using a spectrum analyzer has been removed in order to align with international standards.

(10) **Section 7.1.1:** Information has been added to clarify the requirements applying to approval of licence-exempt transmitters which have modular construction.

(11) **Section 7.1.6:** A provision has been added for digital circuits that are not directly associated with a radio transmitter subject to RSS-210, RSS-310 or RSS-213 to comply with Interference-Causing

Equipment Standard 003 (ICES-003). This provision was in RSS-210, Issue 5 and was inadvertently left out when RSS-210, Issue 6 was developed.

(12) **Section 7.1.7:** A provision has been added for equipment subject to RSS-210 or RSS-310 for which measurements can only be performed after installation.

(13) **Section 7.1.8:** Rules for certifiable operating frequency range of devices in licence-exempt master/slave networks have been added.

(14) **Section 7.1.9:** A provision has been added exempting home built devices in quantities of less than five from certification.

(15) **Section 7.2.1:** A reference to the appropriate measurement method for emission limits for pulsed operation has been added.

(16) **Section 7.2.5:** A provision has been added for measurement of field strength at distances other than those specified.

Issued under the authority of
the Minister of Industry

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R.W. McCaughern
Director General
Spectrum Engineering Branch

Contents

1. Scope

This Radio Standards Specification (RSS) sets out general requirements for the certification of radiocommunication equipment.[1]

This Standard must be used in conjunction with the applicable RSS that specifically covers the technical characteristics of radiocommunication equipment for which regulatory compliance is sought. Unless otherwise specified in the applicable RSS, the specifications and methods described in this RSS shall be complied with.

1.1 Exclusion

1.1.1 Broadcasting Equipment

Radio devices covered by this RSS do not include radio and TV apparatus intended for broadcasting services. Such equipment is regulated by the Department's broadcasting equipment regulations and standards.

1.1.2 Interference-Causing Equipment other than Radiocommunication Receivers

Unintentional radiators, other than radio receivers, are regulated by the Department's Interference-Causing Equipment Standards.

2. General Information

Unless otherwise indicated, radiocommunication equipment is subject to licensing pursuant to subsection 4(1) of the *Radiocommunication Act.*

Suppliers of radiocommunication equipment are encouraged to provide notices and user information in both official languages.

2.1 Categories of Equipment

There are two categories of radiocommunication devices: Category I and Category II equipment.

2.1.1 Category I Equipment

Category I equipment comprises radio devices for which a Technical Acceptance Certificate (TAC), issued by the Certification and Engineering Bureau of Industry Canada (the Bureau) or, a certificate issued by a recognized Certification Body (CB), is required pursuant to sections 4(2) of the *Radiocommunication Act* and 21(1) of the *Radiocommunication Regulations*. A test report shall be required and the device shall be properly labelled.

[1] Radiocommunication equipment or device means radio apparatus as defined in the *Radiocommunication Act*.

2.1.2 Category II Equipment

Category II equipment comprises radio devices where a standard has been prescribed but for which a TAC is not required, that is, equipment certification by Industry Canada or a Certification Body (CB) is not required (certification exempt), pursuant to subsection 4(3) of the *Radiocommunication Act*. The manufacturer or importer shall nevertheless ensure that the standards are complied with. A test report shall be available on request and the device shall be properly labelled.

2.2 Receivers

Radiocommunication receivers are defined as Category I equipment or Category II equipment by the characteristics outlined below.

2.2.1 Category I Equipment Receivers

A receiver is classified as Category I equipment if it meets one of the following conditions:

(a) is a stand-alone receiver that is tunable to any frequency in the band 30-960 MHz;

(b) is a receiver that is housed together with Category I transmitters; or

(c) is a scanner receiver.

Except for scanner receivers, which have their own RSSs, Category I receivers shall comply with the limits for receiver spurious emissions set out in Section 6 of this RSS-Gen, and shall be certified under the RSS applicable to the transmitter type with which the receiver is associated or designed to operate (NOT under RSS-Gen).

2.2.2 Category II Equipment Receivers

A receiver is classified as Category II equipment if it does not meet any of the conditions of Section 2.2.1.

2.2.3 Licence-exempt Receivers

Paging receivers, "receive-only" earth stations operating with satellites approved by Industry Canada, and stand-alone receivers which are exempted from licensing, can be classified as either Category I or Category II according to the condition specified in sections 2.2.1 and 2.2.2 above. These receivers shall comply with the requirements of RSS-210 or RSS-310.

2.3 Licence-exempt Low-power Radiocommunication Devices (LPDs)

Licence-exempt low-power radiocommunication devices are devices which have intentional and unwanted emissions of very low signal levels such that they can co-exist with licensed radio services. LPDs are required to operate on a **"no-interference, no-protection"** basis (i.e. they may not cause radio interference and cannot claim protection from interference). The requirements for LPDs are generally described in Section 7.

2.4 Information Concerning Radio Standards Specifications (RSSs)

Information concerning Radio Standards Specifications may be directed to Industry Canada's local office (see RIC-66) or to:

Manager, Radio Equipment Standards
Industry Canada
365 Laurier Avenue
Ottawa, Ontario
K1A 0C8

Telephone: 613-990-4699
Fax: 613-991-3961
E-mail: res.nmr@ic.gc.ca

2.5 Information Concerning Equipment Certification

Information concerning equipment certification matters should be directed to:

Chief, Certification and Engineering Bureau
Industry Canada
P.O. Box 11490, Station H
3701 Carling Avenue (Building 94)
Ottawa, Ontario
K2H 8S2

Telephone: 613-990-4218
Fax: 613-990-5009
E-mail: certification.bureau@ic.gc.ca

2.6 Licensing

Unless otherwise indicated, a person who uses radiocommunication equipment is required to obtain a licence or other authorization under the *Radiocommunication Act*.

Information concerning licensing requirements should be directed to local Industry Canada offices.

2.7 Related Documents

Industry Canada documents are available on the Spectrum Management and Telecommunications website at: http//strategis.gc.ca/spectrum, in *Official Publications*.

The following documents should be consulted:

ANSI C63.4 *Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*

CPC-2-0-03 *Environmental Process, Radiofrequency Fields and Land-Use Consultation*

CS-03 *Compliance Specification for Terminal Equipment, Terminal Systems, Network Protection Devices, Connection Arrangements and Hearing Aids Compatibility*

DC-01 *Procedure for Declaration of Conformity and Registration of Terminal Equipment*

ICES-003 *Digital Apparatus*

RIC-66 *Addresses and Telephone Numbers of Regional and District Offices of Industry Canada*

RSP-100 *Radio Equipment Certification Procedure*

CB-03 *Requirements for the Certification of Radio Apparatus to Industry Canada's Standards and Specifications*

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

TRC-49 *Certification Service Fees*
Information on the Application of the Telecommunications Apparatus Technical Assessment and Testing Fees Order Made under the Financial Administration Act

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ANSI – American National Standards Institute
CB – Certification Body – Procedures for Conformity Assessment Bodies
CPC – Client Procedures Circular
CS – Compliance Specification
DC – Declaration of Conformity, Terminal Attachment Program Procedure
ICES – Interference-Causing Equipment Standard
RIC – Radiocommunication Information Circular
RSP – Radio Standards Procedure
TRC – Telecommunications Regulation Circulars

3. Certification Procedure

3.1 Application for Certification

The application for certification shall be prepared and submitted in accordance with RSP-100, or the equivalent Certification Body (CB) document. A test report shall be submitted with the application for certification. Test reports submitted by certification applicants shall not be more than one year old from the date of application for certification.

Before certification is granted, the applicant shall demonstrate compliance with the applicable Industry Canada standards.
For receiver certification, a detailed test report is not necessary; only the receiver tuning range or ranges, spurious emissions, and AC power line conducted emissions (where applicable) need to be reported.

3.2 Test Reports

Test reports shall contain the following information and/or measurements:

(a) the unit's documentation (e.g. schematics, user manual, etc.);

(b) a list of all test instruments used, identifying the instrument manufacturer, type and model number;

(c) the test voltage;

(d) the test frequencies;

(e) the frequency stability and supporting information;

(f) the maximum transmitter power and testing method used;

(g) the type of modulation with a brief description giving any information useful for the understanding of the device such as the bit rate, symbol rate, and necessary bandwidth;

(h) the occupied bandwidth, channel bandwidth(s), and the emission designator;

(i) if the device is pulsed operated, a drawing or photograph of a typical encoded pulse train showing pulse widths and amplitudes in the time domain, the method of power calculation, and the type of metre used shall be given in the test report;

(j) all the measurement results which address the requirements of applicable RSSs; and

(k) any additional information that is needed to better understand the operation of the equipment under consideration.

3.3 Connection with the Public Switched Network

Radio equipment that is designed to connect to the public switched network must comply with the applicable RSS as well as CS-03 and obtain registration in accordance with DC-01.

4. Measurement Methods

4.1 Methods, Instrumentation, and Facilities for the Measurement of RF Signals and Noise Emitted from Electronic Devices

Test facilities and test methods for (1) field strength radiated measurement and (2) conducted measurement of unwanted emissions into the AC Power Supply Network shall be made in accordance with the most recent edition of ANSI C63.4.

4.2 Open Area Test Site and Alternative Site Registration

Prior to performing measurements in an Open Area Test Site (OATS) or alternative site, the equipment certification applicant shall register the site with the Department. Industry Canada will provide the applicant with a unique registration number that identifies the site.

To obtain or renew a unique registration number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (e.g. 3 metre OATS or 3 metre chamber).

If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Department will evaluate the filing to determine if recognition shall be granted.

The frequency for revalidation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site revalidation shall occur on an interval not to exceed two years.

There is no fee or form associated with an OATS filing. OATS submissions may be filed electronically or sent by mail to the Bureau.

4.3 Test Report General Information

The following information shall be included in the test report:

(a) Both radiated and conducted emission measurements can be performed. However, radiated measurements shall be performed whenever possible.

(b) Alternative measurement methods may be used provided they are fully described in the test report. The Certification and Engineering Bureau of Industry Canada shall be consulted to determine the acceptability of the method.

(c) Test results shall be presented in graphical form wherever possible. The graph shall also include the specification limits.

(d) Associated equipment that is normally used with the transmitter and/or receiver shall be so connected before the equipment is tested.

(e) Tests shall be performed at ambient temperature, at the manufacturer’s rated supply voltage and power, and with the transmitter modulating signal representative (i.e. typical) of those encountered in a real system operation. Special conditions apply for the frequency stability tests.

(f) If the transmitter is capable of tuning over several bands, testing at more than one carrier frequency in each frequency band is required to verify any change in RF characteristics.

(g) Except where otherwise specified all tests shall be made using at least three frequencies: one near the high end, one near the middle and one near the low end of the frequency range for which the equipment is to be certified. The frequencies selected for tests shall be termed the reference or standard test frequencies.

(h) The emission tests shall be performed with the device and accessories configured in a manner which tends to produce the maximum level of emissions within the range of variation that can be expected under normal operating conditions.

(i) Except where otherwise indicated in the applicable RSSs, power and spurious measurements shall be performed with each antenna supplied or specified by the manufacturer for use with a transmitter.

(j) RF output power and field strength measurements are normally carried out with an unmodulated carrier for transmitters with constant envelope modulation. For amplitude and non-constant envelope modulations, the transmitter shall be modulated with signals representative of those encountered in a real system operation.

4.4 CISPR Quasi-peak Detector

The CISPR quasi-peak detector (also known as CISPR detector or quasi-peak detector in this Standard) shall comply with the characteristics given in the publication #16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. It has a detector of 9 kHz bandwidth for the band 150 kHz to 30 MHz and 120 kHz bandwidth for the band 30 to 1000 MHz.

4.5 Pulsed Operation

When the field strength (or envelope power) is not constant or when it is in pulses, and an average detector is specified to be used, the value of field strength or power shall be determined by averaging over one complete pulse train, including blanking intervals within the pulse train, as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value (of field strength or output power) shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

4.6 Bandwidth

4.6.1 Occupied Bandwidth

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

The span between the two recorded frequencies is the occupied bandwidth.

4.6.2 6 dB Bandwidth

Where indicated, the 6 dB bandwidth is measured at the points when the spectral density of the signal is 6 dB down from the in-band spectral density of the modulated signal, with the transmitter modulated by a representative signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

4.7 Transmitter Frequency Stability

Frequency stability is a measure of frequency drift due to temperature and supply voltage variations with reference to the frequency measured at an appropriate reference temperature and the rated supply voltage.

The reference temperature for transmitters is +20°C, unless specified otherwise in the applicable RSS to the device.

A hand-held device that is only capable of operating using internal batteries shall be tested using a new battery without any further requirement to vary the supply voltage. Alternatively, an external supply voltage can be used and set at the battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual 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 environment test chamber, the unmodulated carrier frequency shall be measured under the conditions specified below. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement. The following temperatures and supply voltage ranges apply, unless specified otherwise in the applicable RSS.

(a) at temperatures of -30°C, +20°C and +50°C, and at the manufacturer's rated supply voltage; and

(b) at temperature of +20°C and at ±15 percent of the manufacturer's rated supply voltage.

If the frequency stability limits are only met at a different temperature range than specified in (a), the frequency stability requirement will be deemed met if the transmitter is automatically inhibited from operating outside this different temperature range and, the published equipment operating characteristics are revised to reflect this different tempent ure range.

If an unmodulated carrier is not available, the mean frequency of a modulated carrier can be obtained using a frequency counter with gating time set to an appropriately large multiple of symbol periods (gating time depending on the required accuracy). Full details on the choice of values shall be included in the test report.

4.8 Transmitter Output Power

Transmitter output power measurements shall be carried out before the unwanted emissions test. The transmitter output power value, obtained from this test, serves as the reference level used to determine the unwanted emissions. For comparative purposes, the measurements of emission power and unwanted emissions can be in peak or average provided the same parameter is used when measuring both. This information shall be included in the test report.

If the transmission is in bursts, the output power shall be averaged over any 100 millisecond period or, over the burst duration if the burst is shorter than 100 milliseconds, during which its value is at its maximum. The power shall only be averaged over the duration of actual transmission. No off times are to be included in the average.

If the RF output power is internally or externally adjustable or remotely controllable, set or control the power to the maximum rating of the range for which equipment certification is sought. If the spectrum analyzer selectivity or bandwidth is insufficient when measuring emission power, a resolution bandwidth, narrower than that specified, plus numerical integration, in terms of linear power to sum the transmitter output power, is permitted. The method used shall be described in the test report.

If the antenna is detachable, the transmitter output power may be measured at the antenna port using conducted measurement.

If the antenna is not detachable, field strength measurements shall be made using a calibrated open area test site.

The following formula may be used to convert field strength (FS) in volts/metre to transmitter output power (TP) in watts:

$$TP = (FS \times D)^2 / (30 \times G)$$

Where D is the distance in metres between the two antennas and G is the antenna numerical gain referenced to isotropic gain. (**Note:** In an open-area test measurement, the effect due to the metal ground plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.)

Measure and record the transmitter output power using a measurement bandwidth at least 3 times the emission bandwidth of the transmitter, or use power summation as described above.

4.9 Transmitter Unwanted Emissions

The measurement method shall be described in the test report. The same parameter, peak power or average power, used for the transmitter output power measurement shall be used for unwanted emission measurements.

The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lower, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

Unless otherwise specified, compliance with the emission limits shall be demonstrated using a CISPR quasi-peak detector and the related measurement bandwidth for emissions below 1000 MHz and, an average detector with a minimum resolution bandwidth of 1 MHz for emissions above 1 GHz.

4.10 Receiver Spurious Emissions

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

Radiated emission measurements are to be performed using a calibrated open-area test site. As an alternative, the conducted measurement method may be used when the antenna is detachable. In such a case, the receiver spurious signal may be measured at the antenna port.

If the receiver is super-regenerative, stabilize it by coupling to it an unmodulated carrier on the receiver frequency (antenna conducted measurement) or by transmitting an unmodulated carrier on the receiver frequency from an antenna in the proximity of the receiver (radiated measurement). Taking care not to overload the receiver, vary the amplitude and frequency of the stabilizing signal to obtain the highest level of the spurious emissions from the receiver.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

4.11 Near-field Measurement Method Below 30 MHz

For measurement below 30 MHz, the field strength may be measured in its near field (i.e. the measurement distance less than wavelength/(2π)). The measured field strength shall be extrapolated to

the distance specified using the formula that the field strength varies as the inverse distance square (40 dB per decade of distance). Measurements at a minimum of two distances on at least one radial to determine the proper extrapolation formula instead of 40 dB is also permitted.

Below 1.705 MHz, the magnetic or H-field shall be used in making the measurement and the field intensity metre (FIM) is to be equipped with a loop antenna. The permissible limits are given in microamperes/metre. The FIM can be calibrated to read in microvolts/m where E/H = 377 is used in the conversion.

5. General Requirements

5.1 Quality Control

Periodic testing shall be carried out by the manufacturer or importer to ensure continuing compliance, with the appropriate standards, of newly manufactured/imported equipment intended for sale in Canada. The manufacturer or importer shall correct non-compliance problems. Industry Canada will conduct audit checks, from time to time, to ensure compliance.

5.2 Equipment Labels

All Category I radio equipment intended for use in Canada shall permanently display on each transmitter, receiver, or inseparable combination thereof, the applicant's name (i.e. manufacturer's name, trade name or brand name), model number and certification number. This information shall be affixed in such a manner as not to be removable except by destruction or defacement. The size of the lettering shall be legible without the aid of magnification but is not required to be larger than 8-point font size. If the device is too small to meet this condition, the information can be included in the user manual upon agreement with Industry Canada.

The label for medical implants which are designed to be used within the human body, can be placed on the package and user manual.

The certification number is made up of a Company Number (CN) assigned by the Bureau followed by the Unique Product Number (UPN), assigned by the applicant.

The certification number shall appear as follows:

"IC: XXXXXX-YYYYYYYYYYY"

Where:

- "XXXXXX-YYYYYYYYYYY" is the certification number;
- "XXXXXX" is the Company Number (CN) assigned by Industry Canada, made of at most 6 alphanumeric characters (A-Z, 0-9), including a letter at the end of the CN to distinguish between different company addresses;

- "YYYYYYYYYYY" is the Unique Product Number (UPN) assigned by the applicant, made of at most 11 alphanumeric characters (A-Z, 0-9); and

- the letters "IC" have no other meaning or purpose than to identify the Industry Canada certification number.

Permitted alphanumerical characters used in the CN and UPN are limited to capital letters (A-Z) and digits (0-9). An example of the new format for a company having a CN of "21A" and wishing to use a UPN of "WILAN3" would thus be: IC: 21A-WILAN3. Each equipment model shall be explicitly identified. The use of characters, such as #, / or -, in the certification number is not allowed. The use of "wild card" characters in the model number (for the purpose of identifying multiple models with one name) is not allowed.

Equipment that has received certification but is not labelled with the applicant's name, model number and the certification number as outlined above is not considered certified.

Category II equipment shall be labelled in accordance with the requirements of RSS-310.

5.3 External Controls

The device shall not have any external controls accessible to the user that enable it to be adjusted, selected or programmed to operate in violation of the requirements used to certify the equipment under the applicable RSSs. Furthermore, information on internal adjustments, reconfiguration or programmability of the device must only be made available to service depots and agents of the equipment supplier and NOT to the public.

5.4 Multiple Band Operation

Equipment which can operate in a set of multiple frequency bands, shall comply with the requirements of each of the bands in which it serves. Specifically, any active or spurious emissions shall comply with the limits prescribed for those bands in which the equipment is active. When transitioning between bands, the equipment shall not actively transmit.

5.5 Exposure of Humans to RF Fields

Before equipment certification is granted, the applicable requirements of RSS-102 shall be met.

5.6 Radiocommunication Antenna Systems

Some equipment will require the use of an external antenna system and supporting structure. The Minister has established as a standard that all antennas, masts, towers or other antenna supporting structures are required to be compliant with the terms of CPC-2-0-03.

6. Receiver Spurious Emission Standard

The following receiver spurious emission limits shall be complied with:

(a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 1.

Table 1 - Spurious Emission Limits for Receivers

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

(b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

7. Low-power Licence-exempt Radiocommunication Devices

This section contains requirements applicable to licence-exempt radiocommunication devices, mainly those subject to either RSS-210, *Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment*, or RSS-310, *Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category II Equipment*.

Some of the requirements in this section may also be applicable to other RSSs, in which case this will be stated in the individual RSS.

7.1 General Information

7.1.1 Modular Transmitter Approval

Modular transmitters that are to be part of a host device may be constructed and certified in modular form, provided they comply with the applicable certification requirements of RSS-210 and meet the following additional conditions:

(a) The module must be a complete radio transmitter with its own reference oscillator, antenna, etc. The only connectors to the module, if any, are power supply and modulation/data inputs.

(b) The module has its own RF shielding.

(c) The module must have buffered modulation/data input(s) (if such inputs are provided) to ensure that the module will comply with RSS-210 requirements under conditions of excessive data rates or over-modulation.

(d) The module has its own power supply regulation. This is to ensure that the module will comply with RSS-210 requirements regardless of the design of the power supplying circuitry in the host device which houses the module.

(e) The certification submission contains a detailed description of the configuration of all antennas that will be used with the module.

The module must be tested in a stand-alone configuration, i.e., the module must not be inside another device during testing.

Host devices which contain separately certified modules do not need to be recertified, provided that they meet the following conditions:

(a) The host device, as a stand-alone unit without any separately certified modules, complies with all applicable Radio Standards Specifications.

(b) The host device and all the separately certified modules it contains jointly meet the RF exposure compliance requirements of RSS-102, if applicable.

(c) The host device complies with the certification labelling requirements of each of the modules it contains.

Note 1: Compliance of a module in its final configuration is the responsibility of the applicant. A host device will not be considered certified if the instructions regarding antenna configuration provided in the original description, of one or more separately certified modules it contains, were not followed.

Example: A separately certified low-power transceiver module using Bluetooth technology which is housed in a desktop computer, laptop or peripheral does not require the overall system to be recertified, if the desktop computer, laptop or peripheral, as a stand-alone unit, complies with all applicable technical standards.

7.1.2 Limited Modular Approval

If compliance with one or more of the requirements stated in (1) to (4) in Section 7.1.1 cannot be demonstrated, applicants may be granted a “Limited Modular Approval” (LMA). This will be issued in those instances where applicants can demonstrate that they will retain control over the final installation of the device, such that compliance of the end product is assured. In such a case, an operating condition on the LMA for the module would state that the module is only approved for use when installed in devices produced by a specific manufacturer, typically the applicant. If LMA is sought, the application for equipment approval must make this fact clear. It must also specifically state how control of the end product into which the module will be installed, will be maintained, such that full compliance of the end product is always ensured.

7.1.3 External Amplifiers

Except as set out below, the marketing of RF power amplifiers as a separate product for use with low-power devices is prohibited.

External RF power amplifiers may be marketed separately for use with low-power devices certified under RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz) or devices in the band 5725-5825 GHz certified under Annex 9 (Local Area Network Devices), under the following conditions:

(a) The RF power amplifier shall be certified with the low-power device or devices with which it is intended to be used, such that the amplifier-device combination does not exceed any of the limits specified for the low-power device alone;

(b) The RF power amplifier shall be marketed only for use with the low-power device or devices with which it has been certified so long as the following statement is included on the packaging and in the user manual:

> *In accordance with Industry Canada Regulations, this radio frequency power amplifier may only be used with a transmitter with which the amplifier has been certified by Industry Canada. The Industry Canada Identification Number for the transmitter with which this amplifier is permitted to operate is -------*

7.1.4 Transmitter Antenna

A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 or RSS-210 Annex 9, the total antenna gain shall be added to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

User Manual for Transmitters with Detachable Antennas

The user manual of transmitter devices equipped with detachable antennas shall contain the following information in a conspicuous location:

> *This device has been designed to operate with the antennas listed below, and having a maximum gain of [x] dB. Antennas not included in this list or having a gain greater than [x] dB are strictly prohibited for use with this device. The required antenna impedance is [y] ohms.*

Equipment manufacturers shall provide proper values of x and y to comply with the applicable RSS.

Immediately following the above statement, the manufacturer shall provide a list of all antennas acceptable for use with the transmitter.

7.1.5 User Manual

User manuals for licence-exempt LPDs shall contain the following or equivalent statements in a conspicuous position:

> *Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.*

If the antenna is detachable (i.e. selectable by the user), see the user manual requirement in Section 7.1.4. The following instructions in the user manual are also required:

> *To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.*

The above statements may be placed on the device instead of in the manual.

Other user manual notices may be required and these will be specified in RSS-210 or 310, as applicable. It is the responsibility of the certification applicant to ensure that such notices conform to the intent of the applicable RSS and be put conspicuously in the user manual.

7.1.6 Digital Circuits

If the device contains digital circuitry that is not directly associated with the radio transmitter, the device shall also have to comply with ICES-003, Class A or B as appropriate, except for ICES-003 labelling requirements. The test data obtained (for the ICES-003 tests) shall be kept by the manufacturer or importer whose name appears on the equipment label, and made available to Industry Canada on request, for as long as the model is being marketed in Canada.

7.1.7 Measurement after Installation

In the case of equipment for which measurements can be performed only after installation, such as perimeter protection systems, and systems employing a leaky cable as an antenna, measurements for compliance shall be performed at a minimum of 3 installations that can be demonstrated to be representative of typical installation sites.

7.1.8 Operating Frequency Range of Devices in Master/Slave Networks

Slave devices operating in a master/slave network may be certified if they have the capability of operating outside the licence-exempt frequency bands permitted for the device by the applicable RSS standard, provided they operate only in their permitted licence-exempt frequency bands under the control of a master device. Master devices marketed within Canada must only be capable of operating in

licence-exempt frequency bands permitted for the device by applicable Industry Canada RSS standards. Slave devices that can also act as master devices must meet the requirements of a master device. A master device is a device that can operate in a mode in which it has the capability to transmit without first receiving an enabling signal, and in which it is able to select a channel and initiate a network by sending enabling signals to other devices. A network always has at least one device operating in master mode. A slave device is a device operating in a mode in which the transmissions of the device are under control of the master. A device in slave mode is not able to initiate a network.

7.1.9 Home Built Devices

Except scanner receivers, home built devices (not from a kit) in quantities of five or less, for personal use and not to be marketed, are not required to be certified or labelled by Industry Canada. Home built devices must conform to all the technical standards in RSS-210 or RSS-310 associated with the frequency band chosen.

7.2 Measurement Methods and Standard Specifications

7.2.1 Emission Limits for Pulsed Operation Devices

For pulsed operation devices, the peak power limit is 20 dB above the permitted average power limit and unless otherwise specified, both the peak and the average limits shall be met. The average power measurement of the fundamental shall be performed according to the method described in Section 4.5. The methodology described in Section 4.5 is also applicable to unwanted emission measurements provided that they exhibit similar pulse characteristics as the fundamental.

7.2.2 Transmitter and Receiver AC Power Lines Conducted Emission Limits

The purpose of this test is to measure unwanted radio frequency currents induced in any AC conductor external to the equipment which could conduct interference to other equipment via the AC electrical network.

Except when the requirements applicable to a given device state otherwise, for any licence-exempt radiocommunication device equipped to operate from the public utility AC power supply, either directly or indirectly, the radio frequency voltage that is conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in Table 2. The tighter limit applies at the frequency range boundaries.

The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network.

Table 2 - AC Power Lines Conducted Emission Limits

Frequency range (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 – 5	56	46
5 – 30	60	50

*Decreases with the logarithm of the frequency.

7.2.3 Receiver Spurious Emission Limits

7.2.3.1 Antenna Conducted Measurement

If the device has a detachable antenna of known antenna impedance, then the antenna conducted method is permitted in lieu of a radiated measurement.

Note: Audit testing by the Department to check compliance will use the radiated method. If the radiated limit is exceeded or, as a result of an interference complaint, it is determined that the device's spurious emissions cause harmful interference to other authorized users of the spectrum, the Department may require that the party responsible for compliance take corrective action. Therefore, the radiated method should be employed.

Receiver spurious emissions at any discrete frequency shall not exceed 2 nanowatts in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

7.2.3.2 Radiated Measurement

All spurious emissions shall comply with the limits of Table 1 (see Section 6).

7.2.4 Transmitter Frequency Stability

Transmitter frequency stability for licence-exempt LPDs shall be measured in accordance with Section 4.7. However, the frequency stability shall be measured at temperatures of -20°C, +20°C and +50°C instead of at the temperature range specified in Section 4.7(a).

7.2.5 Measurement Distance

For the field strength limits specified in Tables 2 and 3 of RSS-210 and RSS-310, the following applies:

(a) For frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified, provided:

(i) measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and

(ii) it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment.

Measurements shall not be performed at a distance greater than 30 metres unless it can be further demonstrated that measurement at a distance of 30 metres or less are impractical. The results of measurements performed at a distance other than that specified shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurement; inverse-linear distance-squared for power density measurements).

(b) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in this Standard. However, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor, or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

The extrapolation method used shall be described in the test report.

8. Glossary of Commonly used RSS Terms and Definitions

This list of terms and definitions covers the commonly used measurement terminology in all Radio Standards Specifications. These definitions are to be used only with RSSs, and do not necessarily cohere with other Industry Canada documents.

Term	Definition
AC wire carrier current device	A device that is intended for and which transmits RF energy via the AC wire lines in residential and/or office buildings.
Auditory assistance device	A device used to provide auditory assistance to a handicapped person or for auditory assistance in theatres, churches, etc.
Authorized Bandwidth	The maximum width of the band of frequencies used to derive spectrum masks.
Active average power (single phase)	The time average of the values of active power when the active power varies slowly over a specified period of time. This situation is normally encountered because electric system voltages or currents or both are regularly quasi-periodic. The average active power is readily obtained by dividing the energy flow during the specified period of time, by the time.
Class A digital device	A digital device that is marketed for use in commercial, industrial or business environments, and not intended for use in homes.

Term	Definition
Class B digital device	A digital device that is marketed for use in any environment (e.g. in homes, commercial, business and industrial environments).
Effective Radiated Power (ERP or e.r.p.)	The product of the power supplied to the antenna and its gain relative to a half wave dipole in a given direction.
Emission	Radiation produced, or the production of radiation, by a radio transmitting station.
Emission designator	The designation of a set of characteristics of an emission by standard symbols (e.g. type of modulation of the main carrier, modulating signal, type of information to be transmitted, and also, if appropriate, any additional signal characteristics). For example, designator 20K0FID means a bandwidth of 20.0 kHz, uses frequency modulation, is single channel and is in the data/digital format.
Equivalent Isotropically Radiated Power (EIRP or e.i.r.p.)	The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.
Field disturbance sensor	A device that establishes an RF field in its vicinity and detects changes in that field resulting from the movement of persons or objects within its range (e.g. motion detector, burglar alarm).
Harmonic emissions	Emissions that are located at frequencies which are whole multiples of the centre frequency emissions of the transmitted signal.
Intentional radiator	A device that generates RF energy which is intended to be received off-air by a radio receiver.
Mean power (of a radio transmitter)	The average power supplied to an antenna transmission line by a transmitter during an interval of time sufficiently long compared with the lowest frequency encountered in the modulation taken under normal operating conditions.
Modulation deviation limiting	The ability of a transmitter circuit to prevent the transmitter from producing deviation in excess of rated system deviation.
Necessary bandwidth	The width of the frequency band which 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 emission.

Term	Definition
Occupied bandwidth	The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to 0.5% of the emitted power. This is also known as the *99% emission bandwidth*. For transmitters in which there are multiple carriers, contiguous or non-contiguous in frequency, the occupied bandwidth is to be the sum of the occupied bandwidths of the individual carriers.
Out-of-band emissions	Emissions on a frequency or frequencies immediately outside the necessary bandwidth which result from the modulation process, but exclude spurious emissions.
Parasitic emissions	Spurious emissions accidentally generated at frequencies which 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	The average power supplied to an antenna transmission line by a transmitter during one radio frequency cycle at the crest of the modulation envelope taken under normal operating conditions.
Perimeter protection system	A field disturbance sensor that employs a leaky transmission line as an antenna and allows detection of movement within the protected range.
Power line carrier system	A system employing radio frequencies used by an electric power utility company on AC transmission lines for protective relaying, telemetry, etc., for general supervision of the power system. It excludes the electric lines which connect the distribution transformer to the customer's premises.
Power spectral density	The power per unit bandwidth.
Radiation	The outward flow of energy from any source in the form of radio waves.
Receiver spurious emissions	The radio frequency signals generated within the receiver which may cause interference to other equipment. This includes the period during which the equipment is scanning or switching channels.

Term	Definition
Receiver spurious emissions - antenna conducted	Those emissions generated in a receiver and appearing at receiver antenna terminals. The manufacturer may or may not include the receiver multicoupling, filtering, and preamplification equipment for the measurement, depending on whether the receiver is to be certified as a stand-alone component or as a part of an overall multicoupling-preamplification system.
Receiver spurious emissions - antenna radiated	Those emissions generated in a receiver and radiated from the receiver either via the antenna path or via the control, power, and audio cables that may be used with the receiver.
Remote control device	A radiocommunication device that transmits one-way, non-voice signals for control of an associated receiving device located at a distance from the transmitter.
Scanner receiver	Receivers which scan a frequency band or bands and demodulate and/or decode the signals. Receivers used for the purpose of detecting RF energy and avoiding occupied frequencies are not classified as scanner receivers.
Spurious emissions	Emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may 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.
Standard input termination	Standard input termination consists of a termination equal to the load into which the receiver is designed to operate. Its value shall be specified by the manufacturer or applicant and recorded in the test report.
Standard output termination	Standard output termination consists of a termination equal to the load into which the transmitter is designed to operate. Its value shall be specified by the manufacturer or applicant and recorded in the test report.
Standard temperature	Standard temperature shall be 25 degrees Celsius ± 5 degrees Celsius.
Standard test voltage	The primary voltage applied to the input end of the power cable normally connected to the equipment. It shall be within ± 2% of the value stated by the manufacturer to be the normal working voltage.

Term	Definition
Maximum conducted output power	The total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are implemented, the maximum conducted output power is the highest total transmit power occurring in any mode.
Transient frequency behaviour	The measure of the difference, as a function of time, of the actual transmitter frequency to the assigned transmitter frequency when the transmitted RF output power is switched on or off.
Transmitter output power	The RF power dissipated in the standard output termination when operating under the rated duty cycle selected by the applicant for approval.
Unintentional radiator	A device that generates RF energy which is not intended to be radiated for reception by a radio receiver.
Unwanted emissions	Comprises of out-of-band emissions (i.e. emissions on a frequency or frequencies immediately outside the necessary bandwidth), harmonic emissions, and spurious emissions.