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Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

Preface

Radio Standards Specification RSS-210, Issue 8, *Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment*, replaces RSS-210, Issue 7, *Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment*, dated June 2007.

This document will be in force as of the publication date of Notice No. SMSE-016-10 in *Canada Gazette*, Part I. Upon publication, the public has 120 days to submit comments. The comments received will be taken into account in the preparation of the next version of the document.

List of Changes:

- (1) The two tables for general field strength limits and the table of restricted frequency bands have been transferred to RSS-Gen.
- (2) **Annex 1:** The tables for limits applicable to momentary operation and for reduced limits for momentary operation have been moved from the introductory section of RSS-210 to Annex 1.
- (3) **Annex 2, Section A2.8:** Field strength compliance of 100 $\mu\text{V}/\text{m}$ measured at 30 metres has been removed, and the measurement method for FM modulators has been clarified.
- (4) **Annex 2, Section A2.9:** The use of detector functions in the limits shown in the table has been clarified.
- (5) **Annex 4:** New requirements for medical telemetry devices in the bands 1395-1400 MHz and 1427-1429.5 MHz have been added (new Section A4.5).
- (6) **Section A4.4:** Information related to the Dominion Radio Astrophysical Observatory (DRAO) in the notice to users of 608-614 MHz medical telemetry devices has been updated.
- (7) **Annex 6, sections A6.2.5 (b)(i) and (ii):** In each of these two paragraphs, a typographical error showing “300 kHz” as the measurement bandwidth has been corrected to “300 Hz.”
- (8) **Annex 7, introductory paragraph:** Text excluding perimeter protection systems from requirements has been clarified.
- (9) **Annex 11:** Requirements for level detection devices in the band 5.65-8.5 GHz have been revised; new requirements have been added for level detection devices in the bands 5.5-8.5 GHz, 8.5-10.55 GHz, 24.05-27 GHz and 75-85 GHz.

(10) **Annex 14 (New):** A new annex has been added setting out requirements for wideband devices in the band 5925-7250 MHz.

Enquires may be directed to the following address:

Industry Canada
Engineering, Planning and Standards Branch
300 Slater Street
Ottawa, Ontario K1A 0C8

Attention: Regulatory Standards

E-mail: res.nmr@ic.gc.ca

All Spectrum Management and Telecommunications publications are available on the following website <http://www.ic.gc.ca/spectrum>.

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the Minister of Industry

Marc Dupuis
Director General
Engineering, Planning and Standards Branch

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1. Scope

RSS-210, Issue 8, sets out the requirements for equipment certification of several types of radio apparatus used for radiocommunication other than broadcasting¹. The types of radio apparatus covered under this standard are mostly of low power and are mainly for consumer or commercial purposes, applicable in all frequency bands. Radio apparatus covered under RSS-210 is considered Category I equipment, comprising radio apparatus for which a technical acceptance certificate (TAC) issued by the Certification and Engineering Bureau of Industry Canada, or a certificate issued by a recognized Certification Body (CB), is required pursuant to subsections 4(2) of the *Radiocommunication Act* and 21(1) of the *Radiocommunication Regulations*. However, all radio apparatus under RSS-210 is licence-exempt.

2. General Certification Requirements and Specifications

2.1 RSS-Gen Compliance

In addition to RSS-210, the requirements in RSS-Gen, *General Requirements and Information for the Certification of Radio Apparatus*, must be met.

2.2 Emissions Falling Within Restricted Frequency Bands

Category I licence-exempt equipment is required to comply with the provisions in RSS-Gen with respect to emissions falling within restricted frequency bands. These restricted frequency bands are listed in RSS-Gen.

2.3 Receivers

Category I equipment receivers for use with transmitters subject to RSS-210 must comply with the applicable requirements set out in RSS-Gen and be certified under RSS-210. Category II equipment receivers for use with transmitters subject to RSS-210 are exempt from certification, but are subject to compliance with RSS-Gen and RSS-310.

2.4 Cordless Telephones (General Conditions)

This section sets out the general conditions applicable to all cordless telephones, regardless of the frequency band of operation. In addition, there are standards specific to those bands that can be used for cordless telephones as specified in the annexes.

A cordless telephone comprises a base station and a portable handset. The handset is intended to operate as an extension of the base station by the elimination of the connecting handset cord of the standard telephone. The base station is intended to be connected to a telephone line that has access to a public switched network. Cordless telephones operate in a full duplex mode, which allows simultaneous conversations between both parties. Note that cellular and PCS (personal communications services)

¹ “Broadcasting” means any transmission of programs, whether encrypted or not, by radio waves or other means of telecommunication for reception by the public by means of broadcasting receiving apparatus, but does not include any such transmission of programs that is made solely for performance or display in a public place.

handsets that operate with hub stations, the latter provided by cellular and PCS companies, are not classified as cordless telephones and RSS-210 cannot be used for equipment certification of these handsets.

The base station shall comply with both RSS-210 and Compliance Specification CS-03 and be certified under both documents.

Digital Security Codes:

Cordless telephones shall have circuitry that makes use of a digital code word in the dialling and ringing function to provide protection against unintentional line seizure and dialling, and unintentional ringing of the handset, in the following manner:

Access to the telephone network shall be preceded by the transmission of a code word from the handset. This code word shall be one of at least 256 possible combinations (i.e. eight or more bits). Access to the telephone network is to occur only if the code word transmitted by the handset matches that used in the base station. Similarly, ringing of the handset shall be permitted to occur only if the code word transmitted by the base station matches the code word in the handset.

For a good geographical distribution of users of the possible combinations of digital security codes, the manufacturer must provide one of the following:

- (a) a means for the user to readily select one of the security codes. The telephone shall be either in a non-operable mode after manufacture and until the user selects a security code, or the manufacturer must continuously vary the initial security code as each telephone is produced.
- (b) a fixed security code at the time of manufacture that is continuously varied either randomly or sequentially.
- (c) a means for the telephone to automatically select a different security code each time the telephone is activated or dialled.
- (d) A combination of the above or any method satisfying the intent of the equipment.

Details concerning the means and procedures used to achieve the required geographical distribution shall be described in the product literature for the equipment being evaluated and attested to, and shall be included in the application for equipment certification.

In addition to the user manual requirements of RSS-Gen, the user manual for the device shall contain the following or equivalent notice:

Privacy of communications may not be ensured when using this telephone.

If privacy is provided as a standard feature, the privacy notice may be omitted provided that full justification accompanies the equipment certification application.

2.5 General Field Strength Limits

RSS-Gen includes the general field strength limits of unwanted emissions, where applicable, for transmitters and receivers operating in accordance with the provisions specified in this standard.

Unwanted emissions of transmitters and receivers are permitted to fall within the restricted bands listed in RSS-Gen, and including the TV bands, but fundamental emissions are prohibited in the restricted bands bands.

2.5.1 Transmitters with Wanted Emissions that are Within the General Field Strength Limits

Whether or not their operation is addressed by published RSS standards, transmitters whose wanted and unwanted emissions are within the general field strength limits shown in RSS-Gen, they may operate in any of the frequency bands, other than the restricted bands listed in RSS-Gen and including the TV bands, and shall be certified under RSS-210. Under no conditions may the level of any unwanted emissions exceed the level of the fundamental emission.

Note: Devices operating below 490 kHz in which all emissions are at least 40 dB below the limit listed in RSS-Gen (*General Field Strength Limits for Transmitters at Frequencies below 30 MHz*) are Category II devices and are subject to RSS-310.

Annex 1 - Momentarily Operated Devices and Remote Control

The requirements of this annex are for momentarily operated² transmitters and receivers, as well as remote control devices. RSS-Gen summarizes the bands and field strength limits available to devices that may operate continuously. These bands are also available for momentary operation provided that usage restrictions are observed.

Operation of momentarily operated devices is prohibited in the restricted bands listed in RSS-Gen, but is permitted in TV bands (54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-806 MHz), as per the conditions in Section A1.1 below.

A1.1 Momentarily Operated Devices

The frequency bands and field strength limits in tables A and B of this annex are only for the transmission of a control signal, such as that used with alarm systems, door openers, remote switches, etc. Radio control of toys or model aircraft, and continuous transmissions, such as voice or video, are not permitted except as provided in Section A1.1.5 below. Data may be sent with a control signal.

Table A: Permissible Field Strength Limits for Momentarily Operated Devices

Fundamental Frequency (MHz), excluding restricted band frequencies of RSS-Gen	Field Strength of the Fundamental ^(Note 1) (microvolts/m at 3 metres)	Field Strength of Unwanted Emissions ^(Note 1) (microvolts/m at 3 metres)
40.66-40.70	See Section A2.7	
70-130	1,250	125
130-174	1,250 to 3,750*	125 to 375
174-260 ^(Note 2)	3,750	375
260-470 ^(Note 2)	3,750 to 12,500*	375 to 1,250
Above 470	12,500	1,250

Note 1: Limits on the field strength of emissions, as shown in this table, are based on the average value of the measured emissions. As an alternative, compliance with the limits in this table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

* Linear interpolation with frequency F in MHz:

For 130-174 MHz: FS (microvolts/m) = (56.82 x F)-6136

For 260-470 MHz: FS (microvolts/m) = (41.67 x F)-7083

² Momentary operation may also mean periodic operation.

Note 2: The frequency band 225-399.9 MHz is allocated for Government of Canada usage. There are different types of operations in different parts of this band of frequencies, including communications with aircraft and operations using high-power transmitters. Besides avoiding the restricted frequency bands listed in RSS-Gen, it is recommended that the entire 225-399.9 MHz band be avoided.

Table B: Reduced Field Strength Limits for Momentarily Operated Devices

Fundamental Frequency (MHz), excluding restricted band frequencies of RSS-Gen	Field Strength of the Fundamental (microvolts/m at 3 m) ^(Note 1)	Field Strength of Unwanted Emissions (microvolts/m at 3 m)
40.66-40.70	See Section A2.7	
70-130	500	50
130-174	500 to 1,500*	50 to 150
174-260	1,500	150
260-470	1,500 to 5,000*	150 to 500
Above 470	5,000	500

Note 1: Limits on the field strength of emissions, as shown in this table, are based on the average value of the measured emissions. As an alternative, compliance with the limits in this table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

* Linear interpolation with frequency F in MHz:

For 130-174 MHz: FS (microvolts/m) = (22.73 x F) - 2454.55

For 260-470 MHz: FS (microvolts/m) = (16.67 x F) - 2833.33

A1.1.1 Types of Momentary Signals

The following conditions shall be met to comply with the provisions for momentary operation:

- (a) A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all transmission times. When released, the transmitter shall cease transmission (holdover time of up to 5 seconds is permitted).
- (b) A transmitter activated automatically shall cease transmission within 5 seconds after activation (i.e. maximum 5 seconds of operation).
- (c) Periodic transmissions at regular predetermined intervals are not permitted, except as provided in Section A.1.1.5. However, polling or supervision transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmission does not exceed 2 seconds per hour for each transmitter.

- (d) Intentional radiators employed for radio control purposes during emergencies involving fire, security of goods (e.g. burglar alarms), and safety-of-life, when activated to signal an alarm, may operate during the interval of the alarm condition.

A1.1.2 Field Strengths and Frequency Bands

- (1) The field strength of emissions from momentarily operated intentional radiators shall not exceed the limits in Table A.
- (2) Intentional radiators shall demonstrate compliance with the field strength limits shown in Table A, based on the average value of the measured emissions.
- Alternatively, compliance with the limit in Table A may be demonstrated using a CISPR quasi-peak detector. If average measurements are employed, the requirements of Pulsed Operation of RSS-Gen apply regarding pulsed operation for averaging pulsed emissions and for limiting peak emissions.
- (3) The field strength limits shown in Table A are based on the fundamental frequency of the intentional radiator. Unwanted emissions shall be attenuated to the limits listed in RSS-Gen or to the limits shown in Table A, whichever are less stringent.

A1.1.3 Bandwidth of Momentary Signals

For the purpose of Section A1.1, the 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

A1.1.4 Frequency Stability

Carrier frequency stability of devices momentarily operated in the band 40.66-40.70 MHz shall be maintained to $\pm 0.01\%$ (± 100 ppm).

A1.1.5 Reduced Field Strengths

- (1) Devices may be employed for any type of operation, including operation prohibited in Section A1.1.1, provided that the device complies with the requirements of sections A1.1.2 through A1.1.4 and that the field strength meets the limits in Table B of this annex.
- (2) In addition, devices operated under the provisions of this section (A1.1.5) shall be capable of automatically limiting their operation so that the duration of each transmission shall not be greater than 1 second and the silent period between transmissions shall be at least 30 times the duration of the transmission, but in no case less than 10 seconds. However, devices that are designed for limited use for the purpose of initial programming, reprogramming or installation, and not for regular operations, may operate up to 5 seconds provided that such devices are used only occasionally in connection with each unit being programmed or installed.

- (3) The field strength limits shown in Table B are based on the fundamental frequency of the intentional radiator. Unwanted emissions shall be attenuated to the general field strength limits listed in RSS-Gen or to the limits shown in Table B, whichever are less stringent.

A1.2 Remote Control

A1.2.1 Band 26.99-27.255 MHz

This band is only for one-way, non-voice usage for remote controls, under the following conditions:

- (a) Only the following channel carrier frequencies are permitted: 26.995; 27.045; 27.095; 27.145; 27.195 and 27.255 MHz.

- (b) For single sideband (SSB) modulation, the transmitter radio frequency (RF) peak envelope power shall not exceed 4 W.

For double sideband (amplitude), digital or frequency modulation, the transmitter unmodulated carrier power shall not exceed 4 W.

- (c) An antenna gain not exceeding that of a half-wave dipole shall be used.
- (d) For the purpose of paragraph (f) below, the authorized bandwidth is 8 kHz for double sideband, digital or FM, and 4 kHz for SSB modulations. For SSB, either upper or lower sideband may be used.
- (e) Carrier frequency stability shall be maintained to $\pm 0.005\%$ (± 50 ppm). However, devices with output powers of 2.5 W or less can have a frequency stability of $\pm 0.01\%$ (± 100 ppm).
- (f) The power of unwanted emissions measured by an average meter with a resolution bandwidth of 300 Hz for (i) and (ii), and 3 kHz for (iii), shall be less than the mean transmitter power (TP, in watts) by at least:
- (i) 25 dB on any frequency removed from the centre of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth;
 - (ii) 35 dB on any frequency removed from the centre of the authorized bandwidth by more than 100%, up to and including 250% of the authorized bandwidth;
 - (iii) $43 + 10 \log_{10}(TP)$ dB or to the general field strength limits listed in RSS-Gen, whichever is less stringent, on any frequency removed from the centre of the authorized bandwidth by more than 250% of the authorized bandwidth.

A1.2.2 Band 47 MHz Road Traffic Controllers

The following is only for self-powered vehicle detector transmitters. They are for one-way communication buried under the asphalt, and shall use 100 mW power or less to change traffic lights on streets.

Each transmitter is turned on for approximately 28 milliseconds on the approach of a vehicle and on again for another 28 ms at the tail of that vehicle (i.e. 56 ms per vehicle). The transmitter output power during transmission must not exceed 100 mW, with the average power very low and dependent on the traffic flow.

Radio apparatus as described in this section is licence-exempt for municipalities and traffic departments. The following list of frequencies can be used:

47.02; 47.03; 47.05; 47.07; 47.11; 47.13; 47.15; 47.17 (MHz)
47.23; 47.25; 47.27; 47.29; 47.30; 47.31; 47.33; 47.35 (MHz)

Although there is no specification on transmitter carrier frequency stability, the equipment design should be based on good engineering principles that take into account the severe Canadian weather conditions. Emission spectral density outside a nominal bandwidth of 12.5 kHz shall be suppressed by at least 20 dB relative to the in-band spectrum.

A1.2.3 72-73 MHz (Model Aircraft) and 75.4-76 MHz (General Remote Control)

A1.2.3.1 Carrier Frequencies

(1) 72-73 MHz Model Aircraft

The following frequencies (in MHz) are only for radio control of model aircraft:

72.01; 72.03; 72.05; 72.07; 72.09;
72.11; 72.13; 72.15; 72.17; 72.19;
72.21; 72.23; 72.25; 72.27; 72.29;
72.31; 72.33; 72.35; 72.37; 72.39;
72.41; 72.43; 72.45; 72.47; 72.49;
72.51; 72.53; 72.55; 72.57; 72.59;
72.61; 72.63; 72.65; 72.67; 72.69;
72.71; 72.73; 72.75; 72.77; 72.79;
72.81; 72.83; 72.85; 72.87; 72.89;
72.91; 72.93; 72.95; 72.97; 72.99.

(2) 75.4-76 MHz General Remote Control

The following frequencies (in MHz) are for general usage remote control of any type other than for control of a model aircraft. Voice modulation is permitted for emergency use if it is of the push-to-talk type. The centre or carrier frequencies (30 frequencies spaced in 20 kHz steps) are as follows:

75.41; 75.43; 75.45; 75.47; 75.49;
75.51; 75.53; 75.55; 75.57; 75.59;
75.61; 75.63; 75.65; 75.67; 75.69;
75.71; 75.73; 75.75; 75.77; 75.79;
75.81; 75.83; 75.85; 75.87; 75.89;
75.91; 75.93; 75.95; 75.97; 75.99.

A1.2.3.2 Standards Specifications

(1) For SSB, the transmitter radio frequency (RF) peak envelope power shall not exceed 0.75 W.

For double sideband (amplitude), digital or frequency modulation, the transmitter unmodulated carrier power shall not exceed 0.75 W.

(2) An antenna gain not exceeding that of a half-wave dipole shall be used.

(3) For the purpose of paragraph (5) below, the authorized bandwidth is 8 kHz for double sideband, digital or FM, and 4 kHz for SSB modulations. For SSB, either upper or lower sideband may be used.

(4) Carrier frequency stability shall be maintained to $\pm 0.002\%$ (± 20 ppm).

(5) The power of unwanted emissions, measured by an average meter with a resolution bandwidth of 300 Hz for (i) to (iii) and 3 kHz for (iv), shall be less than the mean transmitter power (TP, in watts) by at least:

- (i) 25 dB on any frequency removed from the centre of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth;
- (ii) 45 dB on any frequency removed from the centre of the authorized bandwidth by more than 100%, up to and including 125% of the authorized bandwidth;
- (iii) 55 dB on any frequency removed from the centre of the authorized bandwidth by more than 125%, up to and including 250% of the authorized bandwidth;
- (iv) $56 + 10 \log_{10}(TP)$ dB, or to the general field strength limits listed in RSS-Gen, whichever is less stringent, on any frequency removed from the centre of the authorized bandwidth by more than 250% of the authorized bandwidth.

Annex 2 - Devices Operating in Frequency Bands for Any Application

A2.1 Band 160-190 kHz

Devices using this band shall limit the total input power to the final radio frequency stage to 1.0 watt maximum, and the total length of transmission line, antenna and ground lead (if used) to 15 metres maximum. **Example:** A coaxial or twin-wire transmission line of L metres long has a wire length of 2L. If a loop antenna of N turns is used with this transmission line, compute the length of wire used by the N turns, and add the result to 2L. The total shall not exceed 30 metres.

Emissions outside of this band shall be attenuated by at least 20 dB below the mean transmitter output power or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

A2.2 Band 510-1705 kHz

Devices using this band shall comply with one of the following limits:

- (a) The total input power to the final radio frequency stage shall not exceed 100 milliwatts, and the total length of transmission line, antenna and ground lead (if used) shall not exceed 3 metres; or
- (b) The field strength of radiated emissions shall not exceed 250 microvolts/m measured at 30 metres.
- (c) Transmitters that employ a leaky coaxial cable as a radiating antenna may meet the field strength limit of 15 microvolts/m, as measured at a distance of $47715/(\text{frequency in kHz})$ metres (equivalent to $\text{wavelength}/(2\pi)$) from the coaxial cable.
- (d) Emissions outside of this band shall be attenuated by at least 20 dB below the mean transmitter output power, or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

A2.3 Band 1.705-10 MHz

The field strength shall not exceed 100 microvolts/m measured at 30 metres with an average meter. However, if the -6 dB bandwidth of the emission is less than 10% of the centre frequency, the field strength shall not exceed 15 microvolts/m at 30 m or (the bandwidth of the device in kHz) divided by (the centre frequency of the device in MHz) microvolts/m at 30 m, whichever is the higher level.

Outside of this band, general field strength limits listed in RSS-Gen shall apply.

A2.4 Band 1.705-37 MHz Swept Frequency

Notwithstanding that this band encompasses some restricted bands listed in RSS-Gen, swept frequency devices are permitted when all the following conditions are met:

- (a) The sweep is never stopped with the fundamental emission within any restricted band listed in RSS-Gen;

- (b) The field strength does not exceed the limits in sections A2.3, A2.5, A2.6, or the general field strength limits listed in RSS-Gen, whichever is less stringent, when measured with the sweeping stopped in those bands.
- (c) The fundamental emission dwelling on any restricted band listed in RSS-Gen shall not exceed 1.0% of the time that the device is actively transmitting, without compensation for duty cycle.
- (d) Outside of the swept frequency band, the out-of-band emission limits in sections A2.5 and A2.6, or the general field strength limits listed in RSS-Gen apply, whichever are less stringent. This test is to be carried out with the frequency sweep in operation.

A2.5 Band 6.765-6.795 MHz

The field strength of any emission shall not exceed the following limits:

- (a) 15.5 millivolts/m (84 dB μ V/m) at 30 m, inside the allocated band.
- (b) 334 microvolts/m (50.5 dB μ V/m) at 30 m, outside the allocated band up to $F_c \pm 150$ kHz.
- (c) 106 microvolts/m (40.5 dB μ V/m) at 30 m, between $F_c \pm 150$ kHz and $F_c \pm 450$ kHz.
- (d) RSS-Gen general field strength limits for frequencies outside $F_c \pm 450$ kHz, except for harmonics, which shall not exceed 316 microvolts/m at 30 m

where $F_c = 6.78$ MHz.

Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

A2.6 Band 13.110-14.010 MHz

The field strength of any emission shall not exceed the following limits:

- (a) 15.848 millivolts/m (84 dB μ V/m) at 30 m, within the band 13.553-13.567 MHz.
- (b) 334 microvolts/m (50.5 dB μ V/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710 MHz.
- (c) 106 microvolts/m (40.5 dB μ V/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010 MHz.
- (d) 30 microvolts/m (29.5 dB μ V/m) at 30 m, outside the band 13.110-14.010 MHz.

Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

A2.7 Band 40.66-40.70 MHz

The field strength shall not exceed 10 millivolts/m (80 dB μ V/m) measured at 3 metres with an average meter. Alternatively, it shall not exceed 233 mV/m measured with a quasi-peak meter. (**Note:** Do not use the above to convert average meter readings to quasi-peak values.)

The -6 dB bandwidth of the emission shall be confined within the 40.66-40.70 MHz band edges.

Outside the 40.65-40.71 MHz band, the general field strength limits listed in RSS-Gen shall apply, except for harmonics, which shall not exceed 225 microvolts/m at 3 metres.

Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

A2.8 Band 88-108 MHz

The field strength shall not exceed 250 microvolts/m measured at 3 metres with an average meter. Any type of modulation (and carrier frequencies within the band 88-108 MHz) may be used for this category.

The occupied bandwidth shall not exceed 200 kHz.

Outside the 200 kHz band (as well as outside the 88-108 MHz band), the general field strength limits listed in RSS-Gen apply.

If the audio input signal is audio and the transmitter is frequency modulated, compliance with the above requirements shall be demonstrated by modulating the transmitter with a 2.5 kHz tone at a level 16 dB higher than that required to produce a frequency deviation of 75 kHz, or 50 % of the manufacturer's rated deviation, whichever is less.

A2.9 Bands 902-928, 2400-2483.5 and 5725-5875 MHz

This section provides standards for devices that can be used for any application provided that the following conditions are met:

(a) The field strength measured at 3 metres shall not exceed the limits in the following table:

Fundamental Frequencies (MHz)	Field Strength (millivolts/m)	
	Fundamental	Harmonics
902-928	50	0.5
2400-2483.5	50	0.5
5725-5875	50	0.5

Note: The limits shown in the above table are based on measurements using an average detector, except for the fundamental emission in the frequency band 902-928 MHz, which is based on measurements using a CISPR quasi-peak detector.

- (b) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

The provisions of RSS-Gen regarding pulsed operation do not apply to CISPR measurement for the band 902-928 MHz.

A2.10 Bands 17.15 GHz and 94 GHz

The following carrier frequencies are available for use by radar and other mobile devices. Their parameters, such as occupied bandwidth and permissible out-of-band emissions, will be evaluated on a case-by-case basis.

- (a) 17.15 GHz: 0.3 W e.i.r.p.
(b) 94 GHz: 0.4 W e.i.r.p.

Annex 3 - 44/49 MHz Cordless Telephones

The provisions shown in this section are for cordless telephones specific to these bands. See also Section 2.4 on general conditions applicable to all cordless telephones.

- (1) An intentional radiator used as part of a cordless telephone system shall operate on one of the following carrier frequency pairs (except as provided in (2) below):

Channel	Transmit Frequencies (MHz)	
	Base	Handset
1	43.720	48.760
2	43.740	48.840
3	43.820	48.860
4	43.840	48.920
5	43.920	49.020
6	43.960	49.080
7	44.120	49.100
8	44.160	49.160
9	44.180	49.200
10	44.200	49.240
11	44.320	49.280
12	44.360	49.360
13	44.400	49.400
14	44.460	49.460
15	44.480	49.500
16	46.610	49.670
17	46.630	49.845
18	46.670	49.860
19	46.710	49.770
20	46.730	49.875
21	46.770	49.830
22	46.830	49.890
23	46.870	49.930
24	46.930	49.990
25	46.970	49.970

- (2) Frequencies shall be paired as shown in the table, except that pairing for channels 1 through 15 may be accomplished by pairing any of the 15 base transmitter frequencies with any of the 15 handset transmitter frequencies (flexible pairing).

- (3) Cordless telephones operating on channels 1 through 15 shall:
- (i) incorporate an automatic channel selection mechanism that will prevent establishment of a link on any occupied frequency. A description of the means and procedures used to achieve automatic channel selection shall be provided in the application for equipment certification.
 - (ii) provide a user manual which contains information indicating that some cordless telephones operate at frequencies that may cause interference to nearby TVs and VCRs and that, to minimize or prevent such interference, the base station should not be placed near a TV or VCR; if interference is experienced, moving the base station farther away will often reduce or eliminate the interference.
- (4) The field strength shall not exceed 10 millivolts/m measured at 3 metres with an average meter.
- (5) The occupied bandwidth shall not exceed 20 kHz, centred on the test carrier frequency. Outside of this band, emissions shall be attenuated at least 26 dB below the level of the unmodulated carrier. A spectrum analyzer resolution bandwidth of at least 300 Hz and in the averaging mode is to be used.
- (6) On any frequency removed from the centre of the authorized bandwidth by more than ± 20 kHz, the general field strength limits listed in RSS-Gen apply.
- (7) Carrier frequency stability shall be maintained to within $\pm 0.01\%$ (± 100 ppm).

Annex 4 - Medical Telemetry, Wireless Microphones, Auditory Assistance, Goods Tracking and Law Enforcement

A4.1 Bands 72-73 MHz, 74.6-74.8 MHz, and 75.2-76.0 MHz (Auditory Assistance and Wireless Microphones)

These bands are only for auditory assistance and wireless microphones. The field strength shall not exceed 80 millivolts/m measured at 3 metres with an average meter.

The occupied bandwidth shall not exceed 200 kHz and shall lie within each permitted band.

Outside of this 200 kHz band (as well as outside of the specified frequency bands), the emissions shall not exceed 1.5 millivolts/m at 3 metres.

A4.2 Band 174-216 MHz (Medical Telemetry)

This band is for medical telemetry usage only.

The prohibition of operation in the 174-216 MHz TV band does not apply to medical telemetry devices operating in this band. The field strength shall not exceed 1.5 millivolts/m measured at 3 metres with an average meter.

The occupied bandwidth shall not exceed 200 kHz.

Outside of this 200 kHz band (as well as outside of the allocated 174-216 MHz band), the general field strength limits listed in RSS-Gen apply.

In addition to the user manual requirements in RSS-Gen, the device's user manual shall contain the following or equivalent notice:

The user/purchaser of this device should take note that as digital TV broadcasting stations are introduced in the geographical area, the medical telemetry links may have to be shifted to operate in other (unused) TV channels. The user/purchaser should ensure that the radio device can adapt to this mode of operation.

A4.3 Band 216-217 MHz (Auditory Assistance, Medical Telemetry, Goods Tracking and Law Enforcement)

This band is channelized and available for one-way voice and two-way data transmission for auditory assistance, medical telemetry, goods tracking and law enforcement. The peak output power shall not exceed 100 mW or 160 mW e.i.r.p.

Law enforcement agencies have exclusive use of the sub-band 216.45-216.50 MHz. Auditory assistance, medical telemetry, goods tracking and law enforcement agencies have shared use of the rest of the band 216-217 MHz (i.e. sub-bands 216-216.45 and 216.50-217 MHz). The channel plan is given in the following table. All transmissions are on a no-interference, no-protection basis, especially with respect to TV channel 13 (of 210-216 MHz). It is therefore advisable to avoid the band 216-216.3 MHz where

channel 13's sound carrier image frequency is located. Furthermore, the output power should be as low as possible for successful communication.

The provisions of RSS-Gen concerning the restricted frequency bands shown in RSS-Gen, do not apply to 216-217 MHz medical telemetry devices in health care institutions. However, Industry Canada may, if deemed necessary, impose more attenuation than masks A to D for some restricted bands.

The requirements for the band 216-217 MHz are summarized in the table below.

Channel Spacing (kHz)	Centre Frequencies	Frequencies Stability (ppm)	Unwanted Emissions
5	$215.9975 + 0.005n$, $n = 1$ to 200	± 1.5	Mask A
12.5	$215.99375 + 0.0125n$, $n = 1$ to 80	± 5.0	Mask B
25	$215.9875 + 0.025n$, $n = 1$ to 40	± 50	Mask C
50	$215.975 + 0.05n$, $n = 1$ to 20	± 50	Mask D

The following unwanted emissions masks shall be measured with the measurement meter in peak mode and a bandwidth of at least 300 Hz. Unwanted emissions shall be attenuated below the peak transmitter output power (P, watts) in accordance with the following masks:

Mask A

- (a) $30 + 20(f_d - 2)$ dB, or $55 + 10 \log_{10}(P)$ dB, or 65 dB, whichever is less stringent, for emissions removed from the channel centre frequency (see above table) by a displacement frequency, f_d in kHz, of more than 2 kHz, up to and including 3.75 kHz; and
- (b) at least $55 + 10 \log_{10}(P)$ dB, or to the general field strength limits listed in RSS-Gen, whichever is less stringent, for emissions more than 3.75 kHz away from the channel centre frequency.

Mask B

- (a) at least 25 dB for emissions removed from the channel centre frequency by more than 50%, but not more than 100% of the authorized bandwidth;
- (b) at least 35 dB for emissions removed from the channel centre frequency by more than 100%, but not more than 250% of the authorized bandwidth; and

- (c) at least $55 + 10 \log_{10}(P)$ dB or to the limits listed in RSS-Gen, whichever is less stringent for emissions removed from the channel centre frequency by more than 250% of the authorized bandwidth, where the authorized bandwidth is 11.25 kHz.

Mask C

- (a) At least 30 dB for emissions 12.5 kHz to 22.5 kHz removed from the channel centre frequency; and
- (b) At least $55 + 10 \log_{10}(P)$ dB or to the general field strength limits listed in RSS-Gen, whichever is less stringent, for emissions more than 22.5 kHz removed from the channel centre frequency.

Mask D

- (a) At least 30 dB for emissions 25 kHz to 35 kHz removed from the channel centre frequency; and
- (b) At least $55 + 10 \log_{10}(P)$ dB or to the general field strength limits listed in RSS-Gen, whichever is less stringent, for emissions more than 35 kHz removed from the channel centre frequency.

In addition to the user manual requirements of RSS-Gen, the device's user manual shall contain the following or equivalent notice:

*If TV channel 13 is used in the area, the installer shall reduce or adjust the radio frequency radiated power so that nearby TV channel 13 receivers do not receive radio interference from the system installed. **Suggestions:** A test with a TV receiver equipped with a "rabbit-ear antenna" and tuned to channel 13 should be conducted at the perimeter of the user's intended coverage area and should not overlap other users' areas without the latter's consent. If this does not solve the problem, a channel near the 217 MHz edge and not near 216 MHz should be tried.*

A4.4 Band 608-614 MHz (Medical Telemetry)

Operation in this band is reserved for medical telemetry devices in hospitals and health care facilities. The spectral density shall not exceed a field strength of 200 millivolts/m, measured with a quasi-peak meter (nominal 120 kHz bandwidth) at a distance of 3 metres. Systems using wider bandwidth than 120 kHz will be permitted output power proportionate to its bandwidth. Accordingly, the total maximum permissible field strength is $FS = 200 \times \text{square root}(B/120)$, millivolts/m at 3 metres, where bandwidth B is in kHz. (**Note:** the full value of FS will not show on a quasi-peak meter because of the latter's limited bandwidth. Details of the measurement shall be reported.)

Emissions outside of the band 608-614 MHz shall not exceed the general field strength limits listed in RSS-Gen.

In addition to the user manual requirements of RSS-Gen, the device's user manual shall contain the following or equivalent notice:

Installation of this telemetry device is permitted in hospitals and health care facilities only. This device shall not be operated in mobile vehicles (including ambulances and other vehicles associated with health care facilities). The installer/user of this device shall ensure that it is at least 80 km from the Dominion Radio Astrophysical Observatory (DRAO) near Penticton, British Columbia. The coordinates of DRAO are: latitude N 49 ° 19' 15", longitude W 119° 37' 12". For medical telemetry systems not meeting this 80 km separation (e.g. the Okanagan Valley, British Columbia) the installer/user must coordinate with, and obtain the written concurrence of, the Director of DRAO before the equipment can be installed or operated. The Director of DRAO may be contacted at 250-497-2300 (telephone) or 250-497-2355 (fax). (Alternatively, the Manager, Regulatory Standards, Industry Canada, may be contacted.)

A4.5 Bands 1395-1400 MHz and 1427-1429.5 MHz (Medical Telemetry)

Operation in these bands is reserved for medical telemetry devices in hospitals and health care facilities in Canada, except in the areas of Sydney, Nova Scotia, or Gander, Newfoundland and Labrador, due to possible interference from government radar operations.

In addition to the user manual requirements of RSS-Gen, the device's user manual shall conspicuously contain the following:

“This equipment shall not be operated in the areas of Sydney, Nova Scotia, or Gander, Newfoundland and Labrador. Please contact the local Industry Canada Office for further information.”

Alternatively, the notice may be printed on a separate insert to be included in the equipment packaging, which shall be highly visible upon opening the packaging.

Devices approved under this annex shall comply with the following:

- (1) A wireless medical telemetry device may transmit any emission type appropriate for communications which are related to the provision of medical care, except for video and voice. Waveforms such as electrocardiograms (ECGs) are not considered video.
- (2) The field strength shall not exceed 740 millivolts/m at a distance of 3 metres, measured with an averaging detector and a 1 MHz bandwidth.
- (3) Out-of-band emissions below 960 MHz shall not exceed 200 microvolts/m at a distance of 3 metres, measured with a CISPR quasi-peak detector.
- (4) Out-of-band emissions above 960 MHz shall not exceed 500 microvolts/m at a distance of 3 metres, measured with an averaging detector and a 1 MHz measurement bandwidth.
- (5) The emission bandwidth shall be contained within the bands of operation under all normal operating conditions as specified in the user's manual.

Annex 5 - Radio Frequency Identification (RFID) Devices in the Band 433.5-434.5 MHz

The provisions of this annex are for RFID devices used to identify the contents of commercial shipping containers. Operation must be limited to commercial and industrial areas such as ports, rail terminals and warehouses. Two-way operation is permitted to interrogate and to load data into devices. Voice communication is prohibited.

Devices approved under this annex shall comply with the following:

- (a) Devices shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than 60 seconds and be permitted only to reinitiate an interrogation in the case of transmission error. Under normal circumstances (no transmission error), the silent period between transmissions shall not be less than 10 seconds.
- (b) The field strength of any emissions radiated within the band 433.5-434.5 MHz shall not exceed 11,000 microvolts/m measured at 3 metres with an average detector. The peak level of any emission within this specified frequency band shall not exceed 55,000 microvolts/m measured at 3 metres. Outside this specified band, the general field strength limits listed in RSS-Gen apply.

Annex 6 - Family Radio Service (FRS) and General Mobile Radio Service (GMRS)

A6.1 Family Radio Service (FRS) Devices

A6.1.1 Channel Frequencies

The following 14 simplex channel carrier frequencies are available for use in the FRS:

Channel	Frequency (MHz)
1	462.5625
2	462.5875
3	462.6125
4	462.6375
5	462.6625
6	462.6875
7	462.7125
8	467.5625
9	467.5875
10	467.6125
11	467.6375
12	467.6625
13	467.6875
14	467.7125

A6.1.2 Emission Types and Modulation Requirements

Only emission types F3E, F1D and F2D are permitted for FRS.

Non-voice emission is permitted only for selective calling or tone-operated squelch to establish or continue a voice communication, digital data transmission of location information or text messaging, and is subject to the following restrictions:

- (a) An FRS unit may transmit tones to make contact or to continue communications with a particular FRS unit. If the tone is audible (greater than 300 Hz), it may be transmitted continuously no longer than 15 seconds at a time. If the tone is inaudible (300 Hz or less), it may be transmitted continuously only while the user is talking.
- (b) The FRS unit may transmit digital data containing location information, or requesting location information from one or more other FRS units, or containing a brief text message to another specific FRS unit. Digital data transmissions must be initiated by a manual action or command of the user. However, an FRS unit receiving an interrogation request may automatically respond with its location. Digital data transmissions shall not exceed 1 second, and shall be limited to one transmission within a 30-second period. However, an FRS unit may automatically respond to more than one interrogation request received within a 30-second period.

- (c) The peak frequency deviation shall not exceed ± 2.5 kHz. The limiter shall be followed by a low-pass filter to remove unwanted harmonics.

A6.1.3 Emission Bandwidth

The authorized bandwidth for an FRS unit is 12.5 kHz.

A6.1.4 Output Power

The maximum permissible transmitter output power under any operating conditions is 0.5 W effective radiated power (e.r.p.). The radio shall be equipped with an integral antenna.

A6.1.5 Unwanted Emissions

Unwanted emissions shall be attenuated below the unmodulated carrier power in accordance with the following:

- (a) 25 dB, measured with a bandwidth of 300 Hz, in the band 6.25 kHz to 12.5 kHz removed from the channel centre frequency;
- (b) 35 dB, measured with a bandwidth of 300 Hz, in the band 12.5 kHz to 31.25 kHz removed from the channel centre frequency; and
- (c) $43 \text{ dB} + 10 \log_{10}(\text{carrier power in watts}) \text{ dB}$, measured with a bandwidth of at least 30 kHz for frequencies beyond 31.25 kHz removed from the channel centre frequency.

Unwanted emissions falling within the restricted bands of RSS-Gen shall be attenuated to the limits provided in this section or to the general field strength limits shown in RSS-Gen, whichever are less stringent.

A6.1.6 Frequency Stability

The carrier frequency tolerance shall be better than ± 5 ppm.

A6.1.7 Other Restrictions

- (a) FRS units shall not be designed to interconnect to public switched networks.
- (b) FRS units shall not be designed to transmit data in store-and-forward packet operation mode.

A6.2 General Mobile Radio Service (GMRS) Devices

A6.2.1 Channel Frequencies

The following 15-channel carrier frequencies are available for simplex communications in the General Mobile Radio Service (GMRS):

Channel	Frequency (MHz)
1	462.5500
2	462.5625
3	462.5750
4	462.5875
5	462.6000
6	462.6125
7	462.6250
8	462.6375
9	462.6500
10	462.6625
11	462.6750
12	462.6875
13	462.7000
14	462.7125
15	462.7250

The following 8-channel carrier frequencies are reserved for possible future use as repeater input channels and are not available for simplex communications:

Channel	Frequency (MHz)
16	467.5500
17	467.5750
18	467.6000
19	467.6250
20	467.6500
21	467.6750
22	467.7000
23	467.7250

A6.2.2 Emission Types and Modulation Requirements

GMRS transmitters are permitted to transmit only the following emission types: A1D, F1D, G1D, H1D, J1D, R1D, A3E, F3E, G3E, H3E, J3E, R3E or F2D. Non-voice emission is permitted only for selective calling or tone-operated squelch to establish or continue a voice communication, digital data transmission of location information or text messaging.

Non-voice communication shall be subject to the following restrictions:

- (a) A GMRS unit may transmit tones to make contact or to continue communications with a particular GMRS unit. If the tone is audible (greater than 300 Hz), it may be transmitted continuously no longer than 15 seconds at a time. If the tone is inaudible (300 Hz or less), it may be transmitted continuously only while the user is talking.
- (b) The GMRS unit may transmit digital data containing location information, or requesting location information from one or more other GMRS units, or containing a brief text message to another specific GMRS unit. Digital data transmissions must be initiated by a manual action or command of the user. However, a GMRS unit receiving an interrogation request may automatically respond with its location. Digital data transmissions shall not exceed 1 second, and shall be limited to one transmission within a 30-second period. However, a GMRS unit may automatically respond to more than one interrogation request received within a 30-second period.

For emission types F1D, G1D, G3E, F3E or F2D, the peak frequency deviation shall not exceed ± 5 kHz.

GMRS transmitters must include an audio frequency low-pass filter, unless they comply with the appropriate emission masks in Section A6.2.5 below. The filter must be between the modulation limiter and the modulated stage of the transmitter. The filter attenuation must be as follows:

for $3 \text{ kHz} \leq f \leq 20 \text{ kHz}$, the attenuation is at least $60 \log_{10}(f, \text{kHz}/3)$ dB greater than the attenuation at 1 kHz; and for $f > 20 \text{ kHz}$, the attenuation is at least 50 dB greater than the attenuation at 1 kHz.

A6.2.3 Emission Bandwidth

The authorized bandwidth for emission types H1D, J1D, R1D, H3E, J3E and R3E is 4 kHz; for emission types A1D and A3E, it is 8 kHz; and for emission types F1D, G1D, F3E, G3E and F2D, it is 20 kHz.

A6.2.4 Output Power

A GMRS transmitter may transmit with a maximum power of 2.0 W e.r.p.

A6.2.5 Unwanted Emissions

Unwanted emissions shall be attenuated below the unmodulated carrier power in accordance with the following:

- (a) For emission types A1D, A3E, F1D, G1D, F3E, G3E and F2D with filtering:
 - (i) 25 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 50%, up to and including 100% of the authorized bandwidth;
 - (ii) 35 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 100%, up to and including 250% of the authorized bandwidth; and

- (iii) $43 \text{ dB} + 10 \log_{10}(\text{carrier power in watts}) \text{ dB}$, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth.
- (b) For emission types A1D, A3E, F1D, G1D, F3E, G3E and F2D without filtering:
- (i) $83 \log_{10}(fd/5) \text{ dB}$, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 5 kHz, up to and including 10 kHz;
 - (ii) $116 \log_{10}(fd/6.1) \text{ dB}$ (fd in kHz) measured with a bandwidth of 300 Hz, or if less, $50 + 10 \log_{10}(TP) \text{ dB}$ (TP is total power in the emission bandwidth) on any frequency removed from the centre of the authorized bandwidth by a displacement frequency fd (kHz) of more than 10 kHz, up to and including 250% of the authorized bandwidth; and
 - (iii) $43 \text{ dB} + 10 \log_{10}(\text{carrier power in watts}) \text{ dB}$, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth.
- (c) For emission types H1D, J1D, R1D, H3E, J3E and R3E:
- (i) 25 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 50%, up to and including 150% of the authorized bandwidth;
 - (ii) 35 dB, measured with a bandwidth of 300 Hz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 150%, up to and including 250% of the authorized bandwidth;
 - (iii) $43 \text{ dB} + 10 \log_{10}(\text{carrier power in watts}) \text{ dB}$, measured with a bandwidth of at least 30 kHz, on any frequency removed from the centre frequency of the authorized bandwidth by more than 250% of the authorized bandwidth.

Unwanted emissions falling within the restricted bands of RSS-Gen shall be attenuated to the limits provided in this section or to the general field strength limits shown in RSS-Gen, whichever are less stringent.

A6.2.6 Frequency Stability and Other Frequency Capability Requirements

The carrier frequency tolerance shall be better than ± 5 ppm.

GMRS transmitters must be crystal controlled.

All frequency determining circuitry, including crystals and programming controls, must be internal to the transmitter and made inaccessible to the user from the exterior of the unit.

A6.2.7 Restrictions

- (1) GMRS units shall not be designed to interconnect to the public switched network.
- (2) GMRS units shall not be designed to transmit data in store-and-forward packet operation mode.
- (3) GMRS units shall not provide the user with the capability to receive on GMRS channels 16 to 23.

**Annex 7 - Field Disturbance Sensors Operating in the Bands 902-928 MHz,
2435-2465 MHz, 5785-5815 MHz, 10.5-10.55 GHz and 24.075-24.175 GHz**

This annex sets out requirements permitting licence-exempt operation of field disturbance sensors in the frequency bands shown in the table below.

The emission limits stated below are based on measurement instrumentation employing an average detector.

Note: Perimeter protection systems, which employ a leaky transmission line as the radiating source, are excluded from the requirements of this annex.

1. The field strength measured at 3 metres shall not exceed the limits shown in the following table:

Fundamental Frequencies (MHz)	Field Strength (millivolts/m)	
	Fundamental	Harmonics
902-928	500	1.6
2435-2465	500	1.6
5785-5815	500	1.6
10500-10550	2500	25
24075-24175	2500	25

Notes:

2. Additionally, harmonic emissions falling into a restricted band of RSS-Gen and below 17.7 GHz shall meet the general field strength limits of RSS-Gen.

Those falling into restricted bands above 17.7 GHz shall not exceed the following field strength limits measured at a distance of 3 metres:

- (i) 25 mV/m for the second and third harmonics of field disturbance sensors operating in the 24075-24175 MHz band and for devices designed for use only within buildings or for intermittent use, such as to open building doors;
- (ii) 7.5 mV/m for all other devices.

3. Field disturbance sensors designed to be used in motor vehicles or aircraft must include features to prevent continuous operation unless their emissions in the restricted bands of RSS-Gen, other than the second and third harmonics from devices operating in the band 24075-24175 MHz, comply with the general field strength limits specified in RSS-Gen. Continuous operation of field disturbance sensors designed to be used in farm equipment (i.e. vehicles such as fork lifts that are intended primarily for use indoors or for very specialized operations), or railroad locomotives, railroad cars, and other equipment which travels on fixed tracks, is permitted. A field disturbance sensor is considered not to be operating in a continuous mode if its operation is limited to specific activities of limited duration (e.g. putting a vehicle into reverse gear, activating a turn signal, etc.).
4. Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits specified in RSS-Gen, whichever is less stringent.

Annex 8 - Frequency Hopping and Digital Modulation Systems Operating in the Bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

This annex applies to systems that employ frequency hopping (FH) and digital modulation technology in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz. Systems in these bands may employ frequency hopping, digital modulation and/or a combination (hybrid) of both techniques.

A frequency hopping system that synchronizes with another or several other systems (to avoid frequency collision among them) via off-air sensing or via connecting cables is not hopping randomly and therefore is not in compliance with RSS-210.

A8.1 Frequency Hopping Systems

Frequency hopping systems are spread spectrum systems in which the carrier is modulated with coded information in a conventional manner, causing a conventional spreading of the radio frequency (RF) energy about the carrier frequency. The frequency of the carrier is not fixed, but changes at fixed intervals under the direction of a coded sequence.

Frequency hopping systems are not required to employ all available hopping frequencies during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section in case the transmitter is presented with a continuous data (or information) stream.

Incorporation of intelligence into a frequency hopping system that enables it to recognize other users of the band and to avoid occupied frequencies is permitted provided that the frequency hopping system does it individually, and independently chooses or adapts its hopset. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

The following applies to frequency hopping systems in each of the three bands:

- (a) The bandwidth of a frequency hopping channel is the -20 dB emission bandwidth, measured with the hopping stopped. The system radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, while the long-term distribution appears evenly distributed.
- (b) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the -20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the -20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

- (c) For frequency hopping systems in the band 902-928 MHz: if the -20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the -20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum allowed -20 dB bandwidth of the hopping channel is 500 kHz.
- (d) Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.
- (e) Frequency hopping systems operating in the band 5725-5850 MHz shall use at least 75 hopping channels. The maximum -20 dB bandwidth of the hopping channel shall be 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30-second period.

A8.2 Digital Modulation Systems

These include systems that employ digital modulation techniques resulting in spectral characteristics similar to direct sequence systems. The following applies to all three bands:

- (a) The minimum -6 dB bandwidth shall be at least 500 kHz.
- (b) The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of Section A8.4 (4), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

A8.3 Hybrid Systems

Hybrid systems employ a combination of both frequency hopping and digital modulation techniques and must comply with the following:

- (1) With the digital modulation operation of the hybrid system turned off, the frequency hopping operation shall have an average time of occupancy on any frequency not exceeding 0.4 seconds within a duration in seconds equal to the number of hopping frequencies multiplied by 0.4.
- (2) With the frequency hopping turned off, the digital modulation operation shall comply with the power spectral density requirements for digital modulation systems set out in of Section A8.2 (b) above.

A8.4 Transmitter Output Power and e.i.r.p. Requirements

- (1) For frequency hopping systems operating in the band 902-928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W, and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.
- (2) For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.
- (3) For frequency hopping systems operating in the band 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.
- (4) For systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1 W. Except as provided in Section A8.4 (5), the e.i.r.p. shall not exceed 4 W.

As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is 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 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.

- (5) Point-to-point systems in the bands 2400-2483.5 MHz and 5725-5850 MHz are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding 4 W e.i.r.p. However, remote stations of point-to-multipoint systems shall be allowed to operate at greater than 4 W e.i.r.p. under the same conditions as for point-to-point systems.

Note: “Fixed point-to-point operation” excludes point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information.

- (6) Transmitters may operate in the band 2400-2483.5 MHz, employing antenna systems that emit multiple directional beams simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers, provided that the emissions comply with the following:
 - (i) Different information must be transmitted to each receiver.

- (ii) If the transmitter employs an antenna system that emits multiple directional beams but does not emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device (i.e. the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels) shall not exceed the applicable output power limit specified in sections A8.4 (2) and (4).
- (iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the applicable power limit specified in sections A8.4 (2) and (4). If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the applicable limit specified in sections A8.4 (2) and (4). In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the applicable limit specified in sections A8.4 (2) and (4) by more than 8 dB.
- (iv) Transmitters that transmit a single directional beam shall operate under the provisions of sections A8.4 (2), (4) and (5).

A8.5 Out-of-band Emissions

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Annex 9 - Local Area Network Devices

This annex provides standards for licence-exempt local area network (LE-LAN) devices operating in the bands 5150-5250 MHz, 5250-5350 MHz, 5470-5600 MHz, 5650-5725 MHz and 5725-5825 MHz.

A9.1 Definitions

Channel closing time is the aggregate duration of transmissions by LE-LAN devices during the channel move time, which starts upon detection of an interfering signal above the interference detection threshold. This aggregate includes the normal transmission time and the intermittent signals required to facilitate changes. The aggregate duration of all transmissions shall not count quiet periods between transmissions.

Channel move time is the time needed by an LE-LAN device to cease all transmissions on the current channel upon detection of a radar signal.

Dynamic frequency selection (DFS) is a mechanism that dynamically detects signals from other systems and avoids co-channel operation with those systems, notably radar systems.

DFS detection threshold is the required detection level defined by detecting a received signal strength that is greater than a threshold specified within the device channel bandwidth.

In-service monitoring is a mechanism to check a channel in use by the LE-LAN device for the presence of a radar signal.

Maximum conducted output power is 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 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.

Master mode is an operating mode in which the LE-LAN device has the capability to transmit without receiving an enabling signal. In this mode, the device is able to select a channel and initiate a network by sending enabling signals to other LE-LAN devices.

Slave mode is an operating mode in which the transmissions of the LE-LAN device are under the control of the master.

Transmitter power control (TPC) is a feature that enables an LE-LAN device to dynamically switch between several transmission power levels in the transmission process.

A9.2 Limits

(1) Band 5150-5250 MHz

Note: LE-LAN devices are restricted to indoor operation only in the band 5150-5250 MHz.

Power limits

The maximum e.i.r.p. shall not exceed 200 mW or $10 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

Out-of-band emission limits

Emissions outside the band 5150-5250 MHz shall not exceed -27 dBm/MHz e.i.r.p.

(2) Band 5250-5350 MHz

Power limits

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Out-of-band emission limits

Emissions outside the band 5250-5350 MHz shall not exceed -27 dBm/MHz e.i.r.p.

Additional requirements

In addition to the above requirements, devices operating in the band 5250-5350 MHz with a maximum e.i.r.p. greater than 200 mW shall comply with the following e.i.r.p. elevation mask, where θ is the angle above the local horizontal plane (of the Earth) as shown below:

- | | |
|--|--|
| (i) -13 dB(W/MHz) | for $0^\circ \leq \theta < 8^\circ$ |
| (ii) $-13 - 0.716 (\theta - 8)$ dB(W/MHz) | for $8^\circ \leq \theta < 40^\circ$ |
| (iii) $-35.9 - 1.22 (\theta - 40)$ dB(W/MHz) | for $40^\circ \leq \theta \leq 45^\circ$ |
| (iv) -42 dB(W/MHz) | for $\theta > 45^\circ$ |

Note: The Dynamic Frequency Selection (DFS) requirements are detailed later in this annex.

(3) Bands 5470-5600 MHz and 5650-5725 MHz

Note: For the band 5600-5650 MHz, no operation is permitted.

Until further notice, devices subject to this annex shall not be capable of transmitting in the band 5600-5650 MHz. This restriction is for the protection of Environment Canada weather radars operating in this band.

Power limits

The maximum conducted output power shall not exceed 250 mW or $11 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

Out-of-band emission limits

Emissions outside the band 5470-5725 MHz shall not exceed -27 dBm/MHz e.i.r.p.

Note: The Dynamic Frequency Selection (DFS) requirements are detailed later in this annex.

(4) Band 5725-5825 MHz**Power limits**

The maximum conducted output power shall not exceed 1.0 W or $17 + 10 \log_{10} B$, dBm, whichever power is less. The power spectral density shall not exceed 17 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 4.0 W or $23 + 10 \log_{10} B$, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Fixed point-to-point systems for this band are permitted to have an e.i.r.p. greater than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain antennas, but not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding 4 W e.i.r.p. However, remote stations of point-to-multipoint systems shall be permitted to operate at greater than 4 W e.i.r.p. under the same conditions as for point-to-point systems.

Out-of-band emission limits

For the band 5725-5825 MHz, emissions within the frequency range from the band edges to 10 MHz above or below the band edges shall not exceed -17 dBm/MHz e.i.r.p.

For frequencies more than 10 MHz above or below the band edges, emissions shall not exceed -27 dBm/MHz.

A9.3 Dynamic Frequency Selection (DFS) for devices operating in the bands 5250- 5350 MHz, 5470-5600 MHz and 5650-5725 MHz

Note: For the band 5600-5650 MHz, no operation is permitted.

Until further notice, devices subject to this annex shall not be capable of transmitting in the band 5600-5650 MHz. This restriction is for the protection of Environment Canada weather radars operating in this band.

Devices operating in the bands 5250-5350 MHz, 5470-5600 MHz and 5650-5725 MHz band shall comply with the following:

- (a) Devices shall employ a DFS radar detection mechanism to detect the presence of radar systems and to avoid co-channel operation with radar systems (see **Note** below). The minimum DFS radar signal detection threshold is -62 dBm for devices with a maximum e.i.r.p. less than 200 mW, and -64 dBm for devices with a maximum e.i.r.p. of 200 mW to 1 W. The detection threshold power is the received power, averaged over a 1-microsecond reference to a 0 dBi antenna. The DFS process shall provide a uniform spreading of the loading over all the available channels.

Note: Test procedures for demonstrating compliance with the DFS radar detection requirements set out in this section are being evaluated by Industry Canada. As an interim measure, the Department will, until further notice, accept utilization of the DFS test procedures published by the U.S. Federal Communications Commission (FCC)³ to demonstrate compliance with the requirements of this section.

- (b) **Operational requirements:** the requirement for channel availability check time applies in the master operational mode. The requirement for channel move time applies in both the master and slave operational modes.
- (i) **In-service monitoring:** an LE-LAN device should be able to monitor the operating channel to check that a co-channel radar has not moved or started operation within range of the LE-LAN device. During in-service monitoring, the LE-LAN radar detection function continuously searches for radar signals between normal LE-LAN transmissions.
- (ii) **Channel availability check time:** the device shall check if there is a radar system already operating on the channel before it initiates a transmission on a channel and when it moves to a channel. The device may start using the channel if no radar signal with a power level greater than the interference threshold value specified in A9.3 (a) above is detected within 60 seconds.

³ FCC 06-96 - *Appendix: Compliance Measurement Procedures for Unlicensed National Information Infrastructure Devices Operating in the 5250-5350 MHz and 5470-5725 MHz Bands Incorporating Dynamic Frequency Selection* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-06-96A1.doc

- (iii) **Channel move time:** after a radar's signal is detected, the device shall cease all transmissions on the operating channel within 10 seconds. Transmission during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. Intermittent management and control signals may also be sent during the remaining time to facilitate vacating the operating channel.
- (iv) **Channel closing time:** the maximum channel closing time is 260 ms.
- (v) **Non-occupancy period:** a channel that has been flagged as containing a radar signal, either by a channel availability check or in-service monitoring, is subject to a 30-minute non-occupancy period where the channel cannot be used by the LE-LAN device. The non-occupancy period starts from the time that the radar signal is detected.

A9.4 Requirements for all bands in this annex

- (1) Digital modulation shall be used. The power measurements (transmitter output power and e.i.r.p., or unwanted emissions) are in terms of average value (i.e. using an average meter). If the transmission is in bursts, the provisions of RSS-Gen for pulsed operation shall apply.
- (2) Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average ($10 \log_{10} B$) value by more than 3 dB, the permissible power spectral density shall be reduced by the excess amount.

A measurement resolution bandwidth narrower than 1.0 MHz is permitted provided that power integration over 1.0 MHz is performed. However, if the emission bandwidth of the signal is less than 1.0 MHz, the measurement bandwidth should be reduced to that of the emission bandwidth to obtain the proper power spectral density; alternatively, the measured value could be normalized to 1.0 MHz.

(Note: B has been defined above as the 99% emission bandwidth).

- (3) The outermost carrier frequencies or channels, as permitted by the design of the equipment, shall be used when measuring unwanted emissions. Such carrier or channel centre frequencies are to be indicated in the test report.
- (4) The device shall automatically discontinue transmission in case of absence of information to transmit, or operational failure. A description on how this is done shall accompany the application for equipment certification. Note that this is not intended to prohibit transmission of control or signalling information or the use of repetitive codes where required by the technology.
- (5) Mobile satellite service (MSS) operators may monitor emissions from LE-LAN devices in the band 5150-5250 MHz and, if emissions approach the 10 W/MHz aggregate ground level emission, may request that Industry Canada reassess the technical parameters of LE-LAN devices. The aggregation may be from all devices within the footprint of the MSS satellite antenna beam and not just from Canadian devices.

(6) User Manual:

The user manual for local area network devices shall contain instructions related to the restrictions mentioned in the above sections, namely that:

- (i) the device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- (ii) the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall comply with the e.i.r.p. limit; and
- (iii) the maximum antenna gain permitted for devices in the band 5725-5825 MHz shall comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate.

- (7) Users should also be advised that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

Annex 10 - Vehicle Identification

The provisions of this annex are only for automatic vehicle identification systems (AVIS) that operate in the frequency bands 2900-3260 MHz, 3267-3332 MHz, 3339-3345.8 MHz and 3358-3600 MHz, employing swept frequency techniques to automatically identify transportation vehicles (cars, trucks or rail), and under the following conditions:

- (a) The field strength in the antenna main beam shall not exceed 3 millivolts/m, per each 1.0 MHz bandwidth, measured at 3 metres.
- (b) The AVIS shall employ a horn antenna or other comparable directional antenna pointing upwards to attenuate the radio frequency field in the horizontal direction. The field strength shall not be greater than 400 microvolts/m/MHz at 3 metres in any direction within ± 10 degrees of the horizontal plane of the antenna.

The user manual shall provide proper installation instructions to comply with this requirement. A copy of the installation instructions shall accompany any request for equipment certification.

- (c) Emissions outside of each band shall meet the general field strength listed in RSS-Gen.
- (d) The signal sweep rate shall not be less than 4,000 or greater than 50,000 sweeps per second.
- (e) Signal emission from the AVIS shall only occur when the vehicle to be identified is within the radiated field of the system.

Note: The sub-band 3500-3600 MHz is within the restricted bands of RSS-Gen, and Industry Canada may impose further restrictions if necessary.

Annex 11 - Level Probing Radar Devices Enclosed in Containers and Still Pipes

The provisions of this annex are for level probing radar devices installed in enclosed containers and inside still pipes.

A11.1 Definitions

The following definitions apply:

Enclosed container: a closed metallic tank, reinforced concrete tank or a similar enclosed structure made of comparable attenuating material, containing liquids or solids.

Still pipe: a vertical, perforated pipe used to reduce measurement errors arising from liquid turbulence, surface flow or agitation of the liquid. A still pipe shall always be inserted inside an enclosed container. The pipe cannot be used alone or outside the tank in the same way as a bypass pipe in a process tank.

Peak power: for unswept frequency devices, peak power is the peak level of transmission contained within a 50 MHz bandwidth centred on the frequency at which the highest average radiated power occurs (f_M). If a resolution bandwidth (RBW) other than 50 MHz is employed, the peak e.i.r.p. shall be corrected using $20 \log(\text{RBW}/50)$ dB, where RBW is in units of megahertz. For swept frequency devices, the peak level of transmission shall be measured with a resolution bandwidth of 1 MHz, and no RBW correction is needed.

Operating frequency range: the frequency band of operation defined as:

$$f_H - f_L$$

where the frequency points where the power falls 10 dB below the f_M level and above the f_M level are designated as f_L and f_H respectively.

A11.2 Band 5.65-8.5 GHz devices enclosed in containers

Swept and unswept frequency devices are permitted when all of the following conditions are met:

- (a) The operating frequency range shall be totally contained in the frequency band 5.65-8.5 GHz.
- (b) The device shall be installed completely inside a closed container at a permanent fixed position, pointing in a downward direction. Installation and maintenance of the device shall be performed only by professionally trained individuals.
- (c) The transmitter output power shall not exceed 8 milliwatts average power² at the connector to the antenna.

² The method of measuring or calculating the average power shall be documented in the test report. If the average power is calculated based on peak measurements, the average power can be given by $P_{av} = P_{peak} + 10 \log_{10}(D_x)$, where $0 < D_x < 1$ is the worst case duty cycle and $D_x = T_x \text{ on} / (T_x \text{ on} + T_x \text{ off})$ and $T_x \text{ on}$ and $T_x \text{ off}$ are the transmitter on and off time respectively. $T_x \text{ on}$ is to be measured at 50% amplitude points of the envelope at boresight with a suitable probe having a bandwidth wide enough to capture the signal. Alternative measurement procedures may be considered by Industry Canada.

- (d) The antenna shall be installed pointing downward.
- (e) The sweep or pulse is never stopped with the fundamental emission within any restricted band of RSS-Gen.
- (f) The leakage of the radio frequency (RF) field outside the container at 3 metres from the container walls shall not exceed the values given in the table below:

Frequency band of operation	Frequency range within which the emission shall be measured	Maximum average e.i.r.p. outside tank enclosure structure inside the operating frequency range	Maximum average e.i.r.p. outside tank enclosure structure outside the operating frequency range
5.65-8.5 GHz	30 MHz-26 GHz	-41.3 dBm	-51.3 dBm

This measurement is required only for the test report for the purpose of equipment certification, and not for every installation. As radio leakage depends on the type of container wall and its thickness, field installations must use similar construction and the radio device manufacturer shall provide proper installation instructions to the end-user.

(g) User Manual

In addition to the user manual requirements of RSS-Gen, the user manual of the device shall clearly carry the following notices or equivalent:

- (i) *This device shall be installed and operated in a completely enclosed container to prevent RF emissions, which otherwise can interfere with aeronautical navigation. Installation shall be done by trained installers, in strict compliance with the manufacturer's instructions.*
- (ii) *The use of this device is on a "no-interference, no-protection" basis. That is, the user shall accept operations of high-powered radar in the same frequency band which may interfere with or damage this device. However, level probing devices found to interfere with primary licensing operations will be required to be removed at the user's expense.*

A11.3 Band 8.5-10.55 GHz swept frequency devices enclosed in containers or in still pipes

Notwithstanding that this band encompasses two restricted bands listed in RSS-Gen, swept frequency devices are permitted when all the following conditions are met:

- (a) The operating frequency range shall be totally contained in the frequency band 8.50-10.55 GHz.
- (b) The device shall be installed inside a closed container or in a still pipe by qualified installers.
- (c) The transmitter average output power, antenna installation conditions and measurement conditions in restricted bands are as outlined in paragraphs (b) to (e) of Section A11.2.

- (d) The leakage of the RF field outside the container at 3 metres from the container/still pipe walls shall not exceed the values outlined below:

Frequency band of operation	Frequency range within which the emission shall be measured	Maximum average e.i.r.p. outside tank enclosure structure inside the operating frequency range	Maximum average e.i.r.p. outside tank enclosure structure outside the operating frequency range
8.5-10.55 GHz	30 MHz-26 GHz	-41.3 dBm	-51.3 dBm (see Note)

Note: The emission limits in the band 10.6-10.7 GHz shall not exceed -70 dBm.

This measurement is required only for the test report for the purpose of equipment certification, and not for every installation. As radio leakage depends on the type of container wall and its thickness, field installations must use similar construction and the radio device manufacturer shall provide proper installation instructions to the end-user.

- (e) In addition to the user manual requirements of RSS-Gen, the user manual of the device shall clearly carry notices similar to those given in paragraph (g) of Section A11.2.

A11.4 Band 24.05-27 GHz devices enclosed in containers

Swept and unswept frequency devices are permitted when all the following conditions are met:

- (a) The operating frequency range shall be totally contained in the frequency band 24.05-27 GHz.
- (b) The transmitter average output power, antenna installation conditions and measurement conditions in restricted bands are as outlined in paragraphs (b) to (e) of Section A11.2.
- (c) The leakage of the RF field outside the container at 3 metres from the container walls shall not exceed the values outlined below:

Frequency band of operation	Frequency range within which the emission shall be measured	Maximum average e.i.r.p. outside tank enclosure structure inside the operating frequency range	Maximum average e.i.r.p. outside tank enclosure structure outside the operating frequency range
24.05-27 GHz	30 MHz to $(f_H + f_L)$	-41.3 dBm (see Note)	-51.3 dBm

Note: The emission limits in the band 23.6-24 GHz shall not exceed -70 dBm.

This measurement is required only for the test report for the purpose of equipment certification, and not for every installation. As radio leakage depends on the type of container wall and its thickness, field installations must use similar construction and the radio device manufacturer shall provide proper installation instructions to the end-user.

- (d) In addition to the user manual requirements of RSS-Gen, the user manual of the device shall clearly carry notices similar to those provided in paragraph (g) of Section A11.2.

A11.5 75-85 GHz devices enclosed in containers

Notwithstanding that this band encompasses a restricted band listed in RSS-Gen, swept and unswept frequency devices can be certified when all the following conditions are met:

- (a) The operating frequency range shall be totally contained in the frequency band 75-85 GHz.
- (b) The device shall be installed inside a closed container by qualified installers.
- (c) The transmitter output power shall not exceed 50 milliwatts average power measured directly at the connector to the antenna or via e.i.r.p. (dBm) measurements with subtraction of the antenna gain (dBi).
- (d) The antenna installation and measurement conditions are as given in paragraphs (d) and (e) of Section A11.2.
- (e) The leakage of the RF field outside the container at 3 metres from the container walls shall not exceed the values given below.

Frequency band of operation	Frequency range within which the emission shall be measured	Maximum average e.i.r.p. outside tank enclosure structure inside the operating frequency range	Maximum average e.i.r.p. outside tank enclosure structure outside the operating frequency range
75-85 GHz	30 MHz-100 GHz	-41.3 dBm	-51.3 dBm

This measurement is required only for the test report for the purpose of equipment certification, and not for every installation. As radio leakage depends on the type of container wall and its thickness, field installations must use similar construction and the radio device manufacturer shall provide proper installation instructions to the end-user.

- (f) User Manual

- (i) In addition to the user manual requirements of RSS-Gen, the user manual of the device shall clearly carry notices similar to those given in paragraph (g) of Section A11.2.

- (ii) For devices operating in the frequency band 77.5-85 GHz, the device's user manual shall also contain the following or equivalent notice:

This level probing device is permitted for installation only inside enclosed containers. The installer/user of this device shall ensure that it is at least 10 km from the Dominion Astrophysical Radio Observatory (DRAO) near Penticton, British Columbia. The coordinates of DRAO are: latitude N 49° 19' 15"; longitude W 119° 37' 12". For devices not meeting this 10 km separation (e.g. the Okanagan Valley, British Columbia) the installer/user must coordinate with, and obtain the written concurrence of, the Director of DRAO before the equipment can be installed or operated. The Director of DRAO may be contacted at 250-497-2300 (tel.); 250-497-2355 (fax). (Alternatively, the Manager, Regulatory Standards, Industry Canada, may be contacted).

A11.6 Measurement Techniques and Procedures

- (a) Measurement techniques and procedures for level probing radar installed inside containers are as per the most recent version of ETSI EN 302 372-1.
- (b) Factory testing in one container instead of three is acceptable.
- (c) Measurement techniques and procedures for radar level gauging applications in still pipes are as per the most recent version of ETSI TS 102 692.

Annex 12 - Fixed Point-to-Point Systems in the Band 24.05-24.25 GHz

The band 24.05-24.25 GHz may be used for fixed point-to-point systems that comply with the standards set out in this annex. Fixed point-to-point operation is limited to systems employing a fixed transmitter that transmits to a fixed remote location. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited.

Note: Devices operating in band 24.0-24.25 GHz at a field strength not exceeding 250 mV/m at 3 metres are classified as Category II, the requirements of which are found in RSS-310.

Fixed, point-to-point operation is permitted in the band 24.05-24.25 GHz under the following conditions:

- (a) The field strength of emissions in this band shall not exceed 25 V/m measured at a distance of 3 metres. The power delivered to the antenna shall not exceed 1 mW.
- (b) The frequency of the carrier is maintained within a tolerance of $\pm 0.001\%$.
- (c) The antenna gain must be at least 33 dBi. Alternatively, the beam width of the main lobe shall not exceed 3.5 degrees in the azimuth and elevation planes. For antenna gains greater than 53 dBi, the output power must be reduced as necessary, such that the field strength limit is not exceeded.
- (d) Except for harmonics, out-of-band emissions shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent. Harmonics shall be limited to a maximum level of 2.5 mV/m measured at 3 metres.
- (e) The field strength limit in (a) of this section is based on average limit. However, the peak field strength shall not exceed 25 V/m measured at 3 metres along the antenna boresight.

Annex 13 - Devices Operating in the Bands 46.7-46.9 GHz, 57-64 GHz and 76-77 GHz

A13.1 Vehicle-Mounted Field Disturbance Sensors in the Bands 46.7-46.9 GHz and 76-77 GHz

A13.1.1 General Restrictions

Operation within the bands 46.7-46.9 GHz and 76-77 GHz is restricted to vehicle-mounted field disturbance sensors used as vehicle radar systems. The transmission of additional information, such as data, is permitted provided that the primary mode of operation is as a vehicle-mounted field disturbance sensor. Operation under the provisions of this section is not permitted on aircraft or satellites.

A13.1.2 Limits of Radiated Emissions

- (1) **In-band Emissions:** The power of any emission within the bands 46.7-46.9 GHz and 76-77 GHz shall not exceed the following limits at a distance of 3 metres from the radiating source:
 - (a) 200 nW/cm² if the vehicle is moving slower than 1 km/hour.
 - (b) 60 µW/cm² for forward-looking vehicle-mounted field disturbance sensors, if the vehicle is in motion.
 - (c) 30 µW/cm² for side-looking or rear-looking vehicle-mounted field disturbance sensors, if the vehicle is in motion.
- (2) **Spurious Emissions:** Any emissions outside the operating band shall consist solely of spurious emissions and shall comply with the following:
 - (a) Radiated emissions below 40 GHz shall not exceed the general field strength limits given in RSS-Gen.
 - (b) For radiated emissions outside the operating band and between 40 GHz and 200 GHz, the power density of any emission at a distance of 3 metres from the radiating source shall not exceed the following limits:
 - (i) 2 pW/cm² for vehicle-mounted field disturbance sensors operating in the band 46.7-46.9 GHz;
 - (ii) 600 pW/cm² for forward-looking vehicle-mounted field disturbance sensors operating in the band 76-77 GHz;
 - (iii) 300 pW/cm² for side-looking or rear-looking vehicle-mounted field disturbance sensors operating in the band 76-77 GHz.
 - (c) For radiated emissions above 200 GHz from field disturbance sensors operating in the band 76-77 GHz, the power density of any emission shall not exceed 1000 pW/cm² at a distance of 3 metres from the radiating source.

A13.1.3 Peak Transmitter Output Power

There is no limit on peak transmitter output power.

A13.1.4 Measurement Requirements

- (1) For field disturbance sensors operating in the band 76-77 GHz, the spectrum shall be investigated up to 231 GHz.
- (2) Emissions from transmitters operating above 30 GHz shall be measured to the fifth harmonic of the highest operating frequency or up to 200 GHz, whichever is lower.
- (3) Conducted measurement for emissions above 40 GHz will be permitted provided that the antenna characteristics can be determined accurately.

A13.1.5 Frequency Stability

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation.

A13.2 Devices in the Band 57-64 GHz

A13.2.1 General Restrictions

Operation within the band 57-64 GHz under the provisions of this section is not permitted for the following products:

- (a) Equipment used on aircraft or satellites.
- (b) Field disturbance sensors, including vehicle radar systems, unless the field disturbance sensors are employed for fixed operation. For the purposes of this section, the reference to fixed operation includes field disturbance sensors installed in fixed equipment, even if the sensor itself moves within the equipment.

A13.2.2 Limits of Radiated Emissions

- (1) **In-band Emissions:** Within the band 57-64 GHz, emission levels measured 3 metres from the radiating source shall not exceed the following:
 - (i) For products other than fixed field disturbance sensors, the average power density of any emission, measured during the transmit interval, shall not exceed $9 \mu\text{W}/\text{cm}^2$, and the peak power density of any emission shall not exceed $18 \mu\text{W}/\text{cm}^2$.
 - (ii) For fixed field disturbance sensors that occupy 500 MHz or less of bandwidth and that are contained wholly within the frequency band 61.0-61.5 GHz, the average power density of any emission, measured during the transmit interval, shall not exceed $9 \mu\text{W}/\text{cm}^2$, and the peak power density of any emission shall not exceed $18 \mu\text{W}/\text{cm}^2$.

In addition, the average power density of any emission outside of the band 61.0-61.5 GHz, measured during the transmit interval but still within the band 57-64 GHz, shall not exceed 9 nW/cm^2 , and the peak power density of any emission shall not exceed 18 nW/cm^2 .

- (iii) For fixed field disturbance sensors, other than those operating under the provisions of Section A13.2.2 (1)(ii) above, the peak transmitter output power shall not exceed 0.1 mW, and the peak power density shall not exceed 9 nW/cm^2 .

(2) **Spurious emissions:** Any emissions outside the band 57-64 GHz shall consist solely of spurious emissions and shall not exceed:

- (i) the general field strength limits listed in RSS-Gen for emissions below 40 GHz;
- (ii) 90 pW/cm^2 at a distance of 3 metres for emissions between 40 GHz and 200 GHz;

Within the band 57.0-57.05 GHz, only spurious emissions related to a publicly-accessible coordination channel are permitted. The band 57-57.05 GHz is reserved exclusively for a publicly-accessible coordination channel.

A13.2.3 Peak Transmitter Output Power

- (1) The total peak transmitter output power shall not exceed 500 mW, with the exception that transmitters with an emission bandwidth of less than 100 MHz must limit their peak transmitter output power to the product of 500 mW times their emission bandwidth divided by 100 MHz.
- (2) For the purposes of demonstrating compliance with this RSS, corrections to the transmitter output power may be made in the event of antenna and circuit loss.

A13.2.4 Measurement Requirements

- (1) Emissions from transmitters operating above 30 GHz shall be measured to the fifth harmonic of the highest operating frequency or up to 200 GHz, whichever is lower.
- (2) Peak power density and peak transmitter output power shall be measured with a radio frequency (RF) detector that has a detection bandwidth encompassing the band 57-64 GHz and a video bandwidth of at least 10 MHz, or using an equivalent measurement method.
- (3) Conducted measurement for emissions above 40 GHz will be permitted provided that the antenna characteristics can be determined accurately.
- (4) The average emission limits shall be calculated based on the measured peak levels over the time period during which transmission occurs.

A13.2.5 Frequency Stability

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation.

A13.2.6 Group Installations

Any transmitter that has received the necessary Industry Canada certification under this RSS may be mounted in a group installation for simultaneous operation with one or more transmitter(s) that have received the necessary departmental authorization, without any additional equipment authorization. However, no transmitter operating under the provisions of this section may be equipped with external phase-locking inputs that permit beam-forming arrays to be realized.

A13.2.7 Transmitter Self-identification Transmission

For all transmissions that emanate from inside a building, within any 1-second interval of signal transmission, each transmitter with a peak output power equal to or greater than 0.1 mW or a peak power density equal to or greater than 3 nW/cm², as measured 3 metres from the radiating source, must transmit identification at least once. Each application for equipment approval must declare that the equipment that will be used inside a building contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields:

- (a) Industry Canada certification number, which shall be programmed at the factory;
- (b) Manufacturer's serial number, which shall be programmed at the factory; and
- (c) Provision for at least 24 bytes of data relevant to the specific device, which shall be field programmable. The applicant must implement a method that makes it possible for users to specify and update this data. The recommended content of this field is information to assist in contacting the operator.

Annex 14 - Wideband Devices Operating Within the Band 5925-7250 MHz

The following provisions apply to wideband devices operating in the 5925-7250 MHz frequency band.

Note: The provisions of this annex are **not** applicable to ultra-wideband (UWB) devices, which must comply with RSS-220.

A14.1 Prohibitions on Use

Operation of devices subject to this annex is not permitted on board aircraft or satellites. Devices subject to this annex shall not be used for the operation of toys. The use of a fixed outdoor infrastructure, including antennas mounted on outdoor structures such as poles or buildings, is not permitted, except for operation on board ships or land vehicles.

A14.2 Specifications

A14.2.1 Bandwidth

- (a) The -10 dB bandwidth shall be within the 5925-7250 MHz band under all conditions of operation, including the effects from stepped frequency, frequency hopping or other modulation techniques that may be employed, as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.
- (b) The -10 dB bandwidth of the fundamental emission shall be at least 50 MHz. For transmitters that employ frequency hopping, stepped frequency or similar modulation types, measurement of the -10 dB minimum bandwidth specified in this paragraph shall be made with the frequency hop or step function disabled, and with the transmitter operating continuously at a frequency chosen according to the provisions of RSS-Gen for determining measurement frequencies.

A14.2.2 Limits of Radiated Emissions

- (a) Transmitter radiated emissions shall not exceed the following e.i.r.p. density levels:
 - (1) The radiated emissions above 960 MHz shall not exceed the following root-mean-square (RMS) average limits based on measurements using a 1 MHz resolution bandwidth:

Frequency in MHz	e.i.r.p. in dBm
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-5925	-51.3
5925-7250	-41.3
7250-10600	-51.3
Above 10600	-61.3

- (2) In addition to the radiated emission limits specified in the table in paragraph (a)(1) of this section, transmitters shall not exceed the following RMS average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequency in MHz	EIRP in dBm
1164-1240	-85.3
1559-1610	-85.3

- (3) In a 50 MHz bandwidth contained within the band 5925-7250 MHz and centred on the frequency at which the highest radiated emission level occurs, a limit on the peak level of the emissions in the 50 MHz bandwidth applies. This peak e.i.r.p. limit is $20 \log (\text{RBW}/50)$ dBm, where “RBW” is the resolution bandwidth in MHz that is employed by the measurement instrument. The RBW shall not be lower than 1 MHz or greater than 50 MHz. The video bandwidth of the measurement instrument shall not be less than the RBW. If the RBW is greater than 3 MHz, the application for certification shall contain a detailed description of the test procedure, calibration of the test setup, and the instrumentation employed in the testing.
- (4) Radiated emissions at or below 960 MHz shall not exceed the emission levels in RSS-Gen.
- (5) Emissions from digital circuits not associated with the operation of the transmitter shall not be employed in determining the -10 dB bandwidth of the fundamental emission or the frequency at which the highest emission level occurs.

A14.3 Measurement Procedures

- (a) All emissions at and below 960 MHz are based on measurements employing a CISPR quasi-peak detector. Unless otherwise specified, all RMS average emission levels specified in this section shall be measured using a 1 MHz resolution bandwidth with a one millisecond dwell over each 1 MHz segment. The frequency span of the analyzer should equal the number of sampling bins times 1 MHz, and the sweep rate of the analyzer should equal the number of sampling bins times one millisecond. The provisions in RSS-Gen for pulsed operation that allow emissions to be averaged over a 100-millisecond period do not apply to devices covered by this annex. The video bandwidth of the measurement instrument shall not be less than the resolution bandwidth, and trace averaging shall not be employed. The RMS average emission measurement shall be repeated over multiple sweeps, with the analyzer set for maximum hold until the amplitude stabilizes.
- (b) The peak emission measurement shall be repeated over multiple sweeps, with the analyzer set for maximum hold until the amplitude stabilizes.

- (c) For transmitters that employ frequency hopping, stepped frequency or similar modulation types, the peak emission level measurement, the measurement of the RMS average emission levels, and the measurement to determine the frequency at which the highest level emission occurs shall be made with the frequency hop or step function active. Gated signals may be measured with the gating active. For transmitters that employ swept frequency modulation, measurements shall be made with the frequency sweep stopped at the measurement frequencies chosen according to the provisions of RSS-Gen.
- (d) The -10 dB bandwidth is based on measurement using a peak detector, a 1 MHz resolution bandwidth, and a video bandwidth greater than or equal to the resolution bandwidth.
- (e) Alternative measurement procedures may be considered by the Department.