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Radio Standards Specification

Broadband Public Safety Equipment Operating in the Band 4940-4990 MHz

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Canada

Preface

Radio Standards Specification 111, Issue 5, *Broadband Public Safety Equipment Operating in the Band 4940-4990 MHz*, replaces Issue 4 of RSS-111, dated January 2012.

This document will be in force as of the publication date of Notice SMSE-008-14 in the *Canada Gazette*, Part I. Upon publication, the public has 120 days to submit comments. These comments will be taken into account in the preparation of the next version of the document.

Listed below are the changes**:**

1. The transmit power is to be measured in terms of average instead of peak.

2. A transmitter peak to average power ratio of 13 dB has been added.

3. Antenna gain limits and operational restrictions for devices employing a directional antenna have been added.

4. The requirement for receiver standard spurious emissions has been withdrawn as a result of decisions made under Regulatory Standards Notice 2012-DRS0126.

Issued under the authority of
the Minister of Industry

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Acting Director General
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Contents

1. Scope

This Radio Standards Specification (RSS) sets out standards for the certification of transmitters and receivers in the band 4940-4990 MHz for public safety purposes.

2. General Information

Equipment operating in this band is classified as Category I. A technical acceptance certificate (TAC), issued by the Certification and Engineering Bureau of Industry Canada, or a certificate, issued by a certification body (CB), is required.

2.1 Licensing Requirements

The equipment covered by this standard is subject to licensing pursuant to subsection 4(1) of the *Radiocommunication Act.*

2.2 Related Documents

All Spectrum Management and Telecommunications publications are available on Industry Canada's website at http://www.ic.gc.ca/spectrum, under *Official Publications*.

In addition to the related documents specified in RSS-Gen, *General Requirements and Information for the Certification of Radio Apparatus*, the following departmental document should be consulted:

SP 4940 MHz *Spectrum Utilization Policy, Technical and Licensing Requirements for Broadband Public Safety in the Band 4940-4990 MHz*

SP – Spectrum Utilization Policies

3. General Certification Requirement

3.1 RSS-Gen Compliance

RSS-111 shall be used in conjunction with RSS-Gen for general specifications and information relevant to the equipment for which this standard applies.

4. Measurement Methods

In conjunction with the measurement methods described in RSS-Gen, the transmit power and power spectral density specified in this standard shall be measured using conducted emission measurement by

direct connection to the equipment under test. If the device cannot be connected directly, alternative methods may be used provided that they are fully described in the test report.

4.1 Transmitter Power

The transmit power shall be measured in conducted mode, using a root-mean-square (RMS) power detector, over a period of continuous transmission.

4.2 Transmitter Power Spectral Density (PSD)

The transmitter power spectral density shall be measured over a bandwidth of 1 MHz or 99% of the emission bandwidth, whichever is less, with the power measured as per Section 4.1. A resolution bandwidth less than the measurement bandwidth can be used provided that the measured power is integrated to show total power over the measurement bandwidth.

4.3 Transmitter Unwanted Emissions

The 0 dB reference level in the unwanted emission mask (see Section 5.5) is the maximum in-band power spectral density measured in terms of average power in the equipment's channel bandwidth, using a resolution bandwidth of as close as possible to, without being less than 1% of the occupied bandwidth, and a video bandwidth of 30 kHz. The unwanted power spectral density emissions are also measured using the same resolution and video bandwidths used in measuring the reference in-band power spectral density.

5. Transmitter and Receiver Standard Specifications

5.1 Types of Modulation

Equipment certified under this standard shall use digital modulation.

5.2 Transmitter Frequency Stability

The applicant shall ensure frequency stability by showing that the occupied bandwidth is maintained within the band of operation when tested at the temperature and supply voltage variations specified for the frequency stability measurement in RSS-Gen.

5.3 Equipment's Transmit Output Power and Channel Bandwidth

Equipment is classified as either a low-power or high-power device according to its maximum transmitted power and its channel bandwidth as described in the section below. The equipment's occupied bandwidth shall not exceed its channel bandwidth. The transmitted power of low-power and high-power devices shall not exceed the maximum limits corresponding to the equipment type given in Table 1.

Table 1 – Channel Bandwidth and Power Limits

Channel Bandwidth (MHz)	Transmitter Power, P (dBm)	
	Low-power Device	High-power Device
1	$P \leq 7$	$7 < P \leq 20$
5	$P \leq 14$	$14 < P \leq 27$
10	$P \leq 17$	$17 < P \leq 30$
15	$P \leq 18.8$	$18.8 < P \leq 31.8$
20	$P \leq 20$	$20 < P \leq 33$

High- and low-power devices are also limited to a maximum power spectral density of 21 dBm/MHz and 8 dBm/MHz respectively. Devices using channel bandwidths other than those listed in Table 1 are permitted; however, the channel bandwidth shall not exceed 20 MHz and the devices shall comply with the maximum power spectral density limits of 21 dBm/MHz for high-power transmitters and 8 dBm/MHz for low-power transmitters. See SP 4940 MHz for antenna gain limits and operational restrictions for the device.

For low-power devices, if a directional antenna is used and its gain exceeds 9 dBi, the transmit power shall be reduced by the same amount that the antenna gain is exceeded.

For high-power fixed point-to-point and point-to-multipoint operations, if the directional antenna gain exceeds 26 dBi, the transmit power shall be reduced by same amount that the antenna gain is exceeded.

5.3.1 Equipment With Multiple Transmitters

For equipment using an antenna system that works with multiple transmitters, where different information is transmitted by each transmitter to each receiver, the total power of the device shall be calculated as the sum of the powers from all the transmitters and shall not be higher than the power limit specified in Table 1 for high-power devices according to the equipment's channel bandwidth.

5.4 Transmitter Peak to Average Power Ratio (PAPR)

The PAPR of the equipment shall not exceed 13 dB for more than 0.1% of the time, using a signal that corresponds to the highest PAPR during periods of continuous transmission.[1]

5.5 Transmitter Unwanted Emissions

Transmitter unwanted emissions shall be measured according to the method described in Section 4.3.

[1] The following limit is also acceptable. The ratio of the peak excursion of the modulating envelope (measured using a peak hold function) to the maximum average conducted output power shall not exceed 13 dB in any 1 MHz bandwidth or the emission bandwidth, whichever is less.

On any frequency f, offset from the channel centre frequency f_c by a separation f_d (expressed as a percentage of the channel bandwidth), the power spectral density of the unwanted emissions for low- and high-power transmitters shall comply with the limits specified below in Table 2. Figure 1 shows the emission mask for low- and high-power transmitters. For equipment with multiple transmitters, the unwanted emissions of each transmitter shall comply with the emission limits based on the output power of the transmitter regardless of the total output power of the equipment (i.e. total output power from all the transmitters).

Table 2 – Emission Mask for Low- and High-power Transmitters

Offset Frequency f_d (% of the Equipment's Channel Bandwidth)	**Minimum Attenuation (dB)**	
	Low-power Transmitter	**High-power Transmitter**
$0 < f_d \leq 45$	0	0
$45 < f_d \leq 50$	$219 \log (f_d/45)$	$568 \log (f_d/45)$
$50 < f_d \leq 55$	$10 + 242 \log (f_d/50)$	$26 + 145 \log (f_d/50)$
$55 < f_d \leq 100$	$20 + 31 \log (f_d/55)$	$32 + 31 \log (f_d/55)$
$100 < f_d \leq 150$	$28 + 68 \log (f_d/100)$	$40 + 57 \log (f_d/100)$
$f_d > 150$	40	whichever is less stringent 50 or $55 + 10 \log p$

Where**:**

f_d (%) = $((f-f_c)/\text{channel bandwidth}) \times 100$

p: transmitter's output power (in watts), measured as per Section 4.1

Figure 1: Unwanted Emission Mask for Low- and High-power Transmitters