



Spectrum Management

Radio Standards Specification

# Land and Coast Station Transmitters Operating in the Band 200-535 kHz

**Amendment (June 4, 2021)**

Removed reference to masks D and E from section 3.2.1.

## **Preface**

Radio Standards Specification RSS-117, Issue 3, *Licensed Transmitters Operating in the Band 200-535 kHz*, sets out the technical requirements for the compliance of radio apparatus operating in the frequency band 200 kHz to 535 kHz.

This document will come into force upon publication on the Innovation, Science and Economic Development's [website](http://www.ic.gc.ca/spectrum) (www.ic.gc.ca/spectrum).

### **List of Changes:**

- Modernized to reflect the current RSS structure since its last publication in 1974.
- Emission designators have been updated.
- Editorial modifications and corrections have been made throughout.

Issued under the authority of  
the Minister of Innovation, Science and Economic Development

---

Daniel Duguay  
Director General  
Engineering, Planning and Standards Branch

## Contents

<b>1.</b>	<b>Scope.....</b>	<b>4</b>
<b>2.</b>	<b>General.....</b>	<b>4</b>
	2.1 Purpose and Application.....	4
	2.2 Licensing Requirements .....	4
	2.3 RSS-Gen Compliance.....	4
	2.4 Radio Frequency Exposure .....	4
	2.5 Test Report .....	4
	2.6 Related Documents .....	5
<b>3.</b>	<b>Measurement Requirements and Methods .....</b>	<b>5</b>
	3.1 Standard Test Conditions.....	5
	3.2 Transmitter Output Power.....	7
	3.3 Transmitter Unwanted Emissions.....	7
	3.4 Transmitter Frequency Stability .....	8
<b>4.</b>	<b>Technical Requirements and Limits.....</b>	<b>9</b>
	4.1 Necessary Bandwidth.....	9
	4.2 Transmitter Output Power.....	9
	4.3 Beacon Transmitters.....	10
	4.4 Unwanted Emissions.....	10
	4.5 Transmitter Frequency Stability .....	10

## 1. Scope

This Radio Standards Specification (RSS), *Land and Coast Station Transmitters Operating in the Band 200-535 kHz*, sets out the requirements for the technical compliance of licensed Category I transmitters operating in the frequency band 200 kHz to 535 kHz.

## 2. General

### 2.1 Purpose and Application

Land and coast station transmitters are licensed Category I radio apparatus operating in the frequency band 200 kHz to 535 kHz. Land stations transmitters are those stations, other than mobile stations, used for radiocommunication with mobile stations. Coast station transmitters consist of land stations used in the maritime mobile service.

The transmitters operate as per the following emission designators:

- A1A
- A2A
- A2D
- A3E
- H2D
- H3E

### 2.2 Licensing Requirements

The radio equipment covered by this standard is subject to licensing, pursuant to subsection 4(1) of the [Radiocommunication Act](#).

### 2.3 RSS-Gen Compliance

In addition to RSS-117, the requirements in RSS-Gen, [General Requirements for Compliance of Radio Apparatus](#), must be met.

### 2.4 Radio Frequency Exposure

The requirements in RSS-102, [Radiofrequency \(RF\) Exposure Compliance of Radiocommunication Apparatus \(All Frequency Bands\)](#), must be met.

### 2.5 Test Report

A test report shall be compiled, providing a record of the tests and results demonstrating compliance with the technical requirements in this standard and with RSS-Gen. The test report shall include the transmitter's category.

These transmitters are divided into the following equipment categories, based on their temperature extremes design.

**Table 1 – Equipment Categories**

<b>Equipment Category</b>	<b>Temperature Extremes</b>
A	– 40°C to 55°C
B	– 10°C to 55°C
C	0°C to 55°C

## 2.6 Related Documents

All Spectrum Management and Telecommunications publications are available on [Department of Innovation, Science and Economic Development's](http://www.ic.gc.ca/spectrum) website at <http://www.ic.gc.ca/spectrum> under [Official Publications](#).

In addition to the related documents specified in RSS-GEN, [General Requirements for Compliance of Radio Apparatus](#), the following departmental documents should be consulted:

RIC-66, [Addresses and Telephone Numbers of Regional and District Offices](#) of the Department of Innovation, Science and Economic Development

RSP-100, [Certification of Radio Apparatus](#)

TRC-43, [Designation of Emissions, Class of Station and Nature of Service](#)

## 3. Measurement Requirements and Methods

### 3.1 Standard Test Conditions

Unless stated otherwise, the conditions of this section shall be applied for the measurements.

#### 3.1.1 Standard Test Voltage

The test voltage shall be the voltage applied to the power input terminals of the equipment. It shall be within  $\pm 2\%$  of the value stated by the manufacturer to be the working voltage.

#### 3.1.2 Standard Temperature

The temperature applied during the tests shall be  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ .

#### 3.1.3 Test Frequencies

All tests shall be made on at least two carrier frequencies, one near the high end and one near the low end of the frequency range.

#### 3.1.4 Standard Output Termination

The output termination shall be a nominal 50 ohm resistive load or as stated by the manufacturer.

### 3.1.5 Standard Test Modulation

The transmitter shall be operated at the manufacturer's rated power and tested in accordance with the measurement method described in [RSS-Gen](#) with signals modulated as follows:

- If the audio input signal is voice and the transmitter is FM, the transmitter shall be modulated with a 2.5 kHz tone at a level 16 dB higher than that required to produce 50% of the maximum frequency deviation.
- For all other transmitters, a signal representative (i.e., typical) of those encountered in a real system operation shall be used. If the transmission is not continuous, this must be indicated in the test report.

The following test modulation shall be applied as per the emission type of the transmitter.

#### 3.1.5.1 A1A Transmitters

For A1A transmitters, the test modulation shall consist of a valid string of Morse code characters.

#### 3.1.5.2 A2D / A3E Transmitters

For A2D and A3E transmitters, the test signal shall be a 1 kHz tone at a level that produces a 50% modulation level.

#### 3.1.5.3 H2D / H3E Transmitters

For H2D and H3E transmitters, the test modulation shall consist of applying a two-frequency test signal in accordance with the following paragraphs, as applicable.

- **Conventional H2D / H3E Transmitters:** The two-frequency test signal shall consist of the carrier and a sinusoidal audio frequency signal of 2 000 Hz. The audio signal shall be applied to the audio input terminals of the transmitter. The carrier and audio signals shall be adjusted to produce two equal amplitude RF signals at the output of the transmitter.
- **Special H2D Beacon Transmitters:** These are transmitters in which the H2D mode is generated by two RF oscillators. One oscillator shall operate at the carrier frequency ("carrier oscillator") and the other ("sideband oscillator") shall operate at 1 020 Hz or 400 Hz ( $\pm 5\%$ ) above the carrier. The operating level of these two oscillators shall be adjusted to produce two equal amplitude RF signals at the **output** of the transmitter. For test purposes, the "sideband oscillator" shall not be keyed.

### 3.1.6 Rated Duty Cycle

The transmitters shall be operated (carrier "on") under one or more of the following duty cycles as specified by the manufacturer:

- (a) **Continuous:** The transmitter shall be operated continuously for 24 hours. This rating is limited to transmitters capable of continuous operation.
- (b) **Semi-continuous:** The transmitter shall be operated continuously for eight hours.

- (c) **Intermittent:** The transmitter shall be operated under a cycle of one minute carrier “on” and four minutes carrier “off” for a period of eight hours, followed by three test cycles of five minutes “on”, 15 minutes “off”.

## 3.2 Transmitter Output Power

### 3.2.1 A1A / A2A / A2D / A3E Transmitters

The transmitter shall be operated unmodulated at the rated duty cycle (Section 3.1.6) and loaded into the output termination. The average RF power output shall be measured and recorded for the duration of the test. All details of the measurement shall be clearly described in the test report.

### 3.2.2 H2D / H3E Transmitters

The transmit power shall be measured in average value ( $P_{\text{MEAN}}$ ) as a conducted emission over any period of continuous transmission.

In addition to the measurement requirements of sections 3.1 and 3.2, the following measurement requirements shall apply if the modulation scheme addressed herein is used.

The transmitter shall be operated in the H2D / H3E mode at the rated duty cycle (Section 3.1.6) with the test modulation (Section 3.1.5.3) applied. A sample of the RF power output shall be fed to a spectrum analyzer and the output level of the two-frequency signal shall be adjusted, so that the output spectrum of the transmitter conforms to the limits of Table 4. No adjustments shall be made to the transmitter after the initial set-up. The average RF power output ( $P_{\text{avg}}$ ) shall be measured and recorded for the duration of the test. Peak envelope power,  $\text{PEP} = 2 \times P_{\text{avg}}$ . All details of the measurement shall be clearly described in the test report.

## 3.3 Transmitter Unwanted Emissions

The transmitter’s unwanted emissions shall be measured as per the requirements of this section.

### 3.3.1 Out-of-Band Emissions

The transmitter shall be operated into the output termination under the standard modulation test conditions (see Section 3.1.5), except that:

- (a) in the case of A2A / A2D / A3E transmitters, the modulating frequency shall be 2000 Hz and the modulation shall be adjusted to 95%; and
- (b) in the case of H2D / H3E transmitters, the carrier level shall be adjusted to that obtained at rated PEP in Section 4.2 and the side band signal level shall be adjusted to the carrier level.

A sample of the RF output shall be fed to a spectrum analyzer or equivalent instrument. The level and frequencies of each significant output component with reference to the level of the unmodulated carrier shall be measured and plotted (see [Table 4](#)) over a band of frequencies equal to  $\pm 250\%$  of the necessary bandwidth. A resolution bandwidth of 100 Hz shall be used.

### 3.3.2 Spurious Emissions

On any frequency removed from the carrier frequency by more than 250% of the necessary bandwidth, a resolution bandwidth of at least 10 kHz shall be used for frequencies to be measured below 30 MHz and a resolution bandwidth of at least 100 kHz shall be used for frequencies to be measured at or above 30 MHz. If a narrower resolution bandwidth is used, power integration shall be applied.

### 3.4 Transmitter Frequency Stability

The maximum allowable tolerances on voltage, temperature and humidity measurements shall be as follows:

**Table 2 – Transmitter Frequency Stability Test Setup Tolerances**

Parameter	Value
Temperature	$\pm 3^{\circ}\text{C}$
Voltage	$\pm 2\%$
Humidity	$\pm 5\%$

For the purpose of these tests, equipment temperatures shall be considered stabilized when the temperature of the largest internal mass remains within  $\pm 3^{\circ}\text{C}$  of the specified value when the equipment is inoperative, or when the crest temperature of the largest internal mass does not vary by more than  $\pm 5^{\circ}\text{C}$  with equipment operating.

The unmodulated carrier's frequency shall be measured at one-minute intervals under the conditions given in the following sections: 3.4.1, 3.4.2 and 3.4.3.

#### 3.4.1 Standard Test Frequency

The equipment shall be placed in a test chamber inoperative until the equipment temperature is stabilized at  $25^{\circ}\text{C}$ . At the end of this period, and allowing up to one hour for warm up, the transmitter shall be placed in operation under standard test conditions, under the appropriate duty cycle with modulation (1 020 Hz tone or "side band oscillator") switched off. The frequency shall then be measured and recorded at one-minute intervals for a period of 15 minutes and the average frequency computed. The average frequency shall be the standard test frequency.

#### 3.4.2 Temperature and Voltage Extremes

The temperature and voltage shall be varied throughout the entire environmental range as specified in Table 1, along with a voltage variation of  $\pm 10\%$  of the standard test voltage. Performance measurements shall be made at the temperature extremes using standard supply voltage  $\pm 10\%$  and at each significant temperature throughout the applicable range listed in Table 1. Allow the equipment under test to stabilize at each temperature where measurements are to be made.



Frequency measurements shall be made at one-minute intervals for a five-minute period and recorded. The RF power output shall be measured and recorded at regular intervals.

### 3.4.3 Temperature and Humidity Extremes

The equipment under test (EUT) shall be placed inoperative in a test chamber at a relative humidity in excess of 95% and ambient temperature of 40°C for a period of eight hours. After this time, the equipment shall be taken from the chamber and any condensed moisture may be drained off.

Immediately after the removal of the EUT from the chamber, primary power shall be applied to the EUT. No more than 15 minutes shall be allowed for the EUT to warm up.

Immediately after this warm up period, frequency measurements shall be made at one-minute intervals for a five-minute period, and the RF power output shall be measured. All measurements shall be recorded.

## 4. Technical Requirements and Limits

### 4.1 Necessary Bandwidth

For the purposes of this specification, values of necessary bandwidth corresponding to various types of emission shall be as shown in the following table:

**Table 3 – Necessary Bandwidth as per Type of Emission**

Type of Emission	Necessary Bandwidth
A1A	2 x Highest tone used
A2D	2 x Highest tone used
A3E	6 000 Hz
H2D	Highest tone used
H3E	3 000 Hz

### 4.2 Transmitter Output Power

The output power shall be within  $\pm 1$  dB of the manufacturer's rated power listed in the equipment specifications which comply with the limits in Section 3.2. For H2D / H3E, the RF power rating shall be in terms of PEP.

In the case of single side band (SSB) transmitters the maximum output of the transmitter shall be

automatically limited to a level not in excess of 1 dB above the manufacturer's rated PEP. Limiting action shall be accomplished in such a manner that when operating in the H3E mode, the carrier is not reduced below -6 dB relative to PEP.

### 4.3 Beacon Transmitters

Transmitters used as radio beacons shall have an output modulated at 1 020 Hz or 400 Hz as specified by the manufacturer. The tolerance on these tones shall be  $\pm 5\%$ .

### 4.4 Unwanted Emissions

Under the test described in the preceding Section 3.3.2, the land and coast stations' transmitter unwanted emissions shall be attenuated below the unmodulated carrier by the levels presented in the following table. The frequency displacement is expressed in terms of percentage of the necessary bandwidth.

**Table 4 – Transmitter's Unwanted Emissions Required Attenuation per Frequency Displacement**

Frequency displacement, $f_d$ , (% of necessary bandwidth)	Attenuation (dB) below the unmodulated carrier
$50\% \leq f_d \leq 150\%$	26 dB
$150\% \leq f_d \leq 250\%$	32 dB
$250\% < f_d$	40 dB or 25 mW (whichever is more stringent)

### 4.5 Transmitter Frequency Stability

The maximum departure, under any environmental condition, of the measured frequency from the standard test frequency shall not exceed 0.01%.

The transmitter RF power output under any environmental condition shall not degrade more than 3 dB below the power output rating obtained under standard test condition.