Industry Canada Industrie Canada

RSS-134
Issue 1, Revision 1
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Spectrum Management and Telecommunications Policy

Radio Standards Specification

900 MHz Narrowband Personal Communication Service

Canada

Aussi disponible en français - CNR-134

PREFACE

This Revision 1 of Issue 1 replaces Issue 1 of RSS-134, dated 24 August 1996.

Changes

The following is the main change:

1. Evaluation of Exposure of Humans to RF Fields is required (i.e. section 9 is added).

The requirement referred to in section 9 on Exposure of Humans to RF Fields became effective on the date of publication of RSS-102 which is September 25, 1999 (see the Standard RSS-102).

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1. Scope

1.1 This document sets out standards for transmitters and receivers for the narrowband personal communication service (PCS) in the 900 MHz band. The bands available are 901-902 MHz, 930-931 MHz and 940-941 MHz. Channel spacings are 12.5 kHz or 50 kHz, or multiples thereof for aggregate channels.

A technical acceptance certificate (TAC) is required, pursuant to section 4(2) of the *Radiocommunication Act*. Before certification is granted, the applicant shall show that the applicable standards have been complied with.

1.2 The equipment is subject to licensing, pursuant to section 4(1) of the *Radiocommunication Act*.

2. General

2.1 Periodic Testing

Periodic testing shall be carried out by the manufacturer or importer to ensure continuing compliance with the standards. Non-compliance problems shall be corrected by the manufacturer or importer. Industry Canada (the Department) will conduct audit checks from time to time to ensure compliance.

2.2 Inquiries About This Standard

Inquiries about this Standard may be directed to Industry Canada's local office or to:

Manager, Radio Equipment Standards
Industry Canada
300 Slater Street
Ottawa, Ontario
Canada K1A 0C8
Tel: (613) 990-4699/fax: (613) 990-3158
E-mail: Lum.kwai@ic.gc.ca

However, inquiries concerning **equipment certification** matters should be directed to Chief, Certification and Engineering Bureau; see address in section 11.

3. Related Documents

The following are related documents. RSP-100 and TRC-49 provide guidance when applying for equipment certification. SRSP-509 provides information on channelling plans, permissible EIRPs and antenna heights.

If the radio device is intended for connection to a public switched telecommunication network, the device shall also comply with the standard CS-03 and be certified under the Terminal Attachment Program procedure CP-01 as well as under the radio equipment certification procedure RSP-100.

3.1	RSP-100:	"Radio Equipment Certification Procedure".
3.2	TRC-49:	"Certification Service Fees".
3.3	CP-01:	"Procedure To Obtain Certification For Terminal Equipment."
3.4	CS-03:	"Certification Standard For Terminal Equipment"
3.5	SRSP-509:	"Technical requirements for narrowband personal communications services in the bands 901-902 MHz, 930-931 MHz and 940-941 MHz".
3.6	RSS-102	"Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields"

Industry Canada documents are available in English and French on the Internet at:

http://strategis.ic.gc.ca/spectrum (English)
http://strategis.ic.gc.ca/spectre (French)

For assistance regarding this web site, please contact: DOSP-P, 300 Slater Street, Ottawa, Ontario, Canada K1A 0C8, tel.: 613-990-4761, fax: 613-952-9871,
e-mail: spectrum_pubs@ic.gc.ca.

4. Test Instruments

The test report shall list all test instruments used. The list shall identify instruments by manufacturer, type and model numbers.

5. Equipment Requirements

5.1 Equipment Labels

Equipment that is certified under this RSS shall be permanently labelled on each item or inseparable combination. The label shall contain the following:

(a) the certification number, prefixed by the name "Canada";
(b) the manufacturer's name or trade name or brand name;
(c) a model name or number.

Equipment for which a certificate has been issued is not considered certified if it is not properly labelled.

5.2 Transmitter External Controls

The transmitter shall not have any external controls accessible to the user that can be adjusted and operated in violation of this Standard. A high/low power switch is however permitted.

To prevent radio interference caused by end-users' (operators') transmissions in unauthorized frequencies the following measures are instituted:

(a) Users of transmitters with external frequency selection controls shall not be able to operate on channels other than those for which the apparatus has been preset by the manufacturer, equipment supplier or service/maintenance personnel.

(b) Transmitters having frequency programming capability are exempt from clause (a) if the design of such transmitters:

(1) is such that transmitters with external controls normally available to the operator must be internally modified to place the equipment in the programmable mode. Further, while in the programmable mode, the equipment shall not be capable of transmitting. The procedures for making the modification and altering the frequency program shall NOT be made available to the end user of the equipment; or

(2) requires the transmitter to be programmed for frequencies through controls normally inaccessible to the operator; or

(3) requires equipment to be programmed for frequencies through use of external devices or specifically programmed modules made available only to service/maintenance personnel; or

(4) requires equipment to be programmed through cloning (copying a program directly from another transmitter) using devices and procedures made available only to service/maintenance personnel.

5.3 Supply Voltage and Temperature

Tests shall be performed at ambient temperature and at the manufacturer's rated supply voltage except for the frequency stability test. The test voltage shall be stated in the test report.

5.4 Typical Output Powers

(a) Mobile stations transmitting in the 901-902 MHz, 930-931 MHz and 940-941 MHz bands shall not exceed 7 watts into a dipole or equivalent gain antenna.

(b) Base stations transmitting in the 930-931 MHz and 940-941 MHz bands can be certified to any manufacturer's rated power that respects the ERP restrictions of SRSP-509.

(c) Base stations transmitting in the 901-902 MHz band are certifiable to 7 watts output power or alternatively to the manufacturer's rated power that respects the ERP of 7 watts as specified in SRSP-509.

(d) For an aggregated channel (see definition in 5.5), the permissible power of a single transmitter does not vary with its bandwidth.

5.5 Channel Spacings and Authorized Bandwidths

The standard channel spacings are 12.5 and 50 kHz. Channel aggregating using adjacent channels is also permitted provided that it is shown in the equipment certification application that frequency spectrum efficiency is maintained by such aggregation.

The authorized bandwidth is 10 kHz for 12.5 kHz spaced channels and 45 kHz bandwidth for 50 kHz spaced channels.

For aggregated channels, the authorized bandwidth is 5 kHz less than the total aggregated channel width.

See SRSP-509 for frequency channelling plan and permissible antenna height information.

5.6 Modulation Types

The devices may employ any type of modulation: FM, AM, or digital. The type of modulation used shall be reported.

If the modulation is digital, a brief description from the manufacturer is required, giving the bit rate, symbol rate, occupied bandwidth, and any information useful for the understanding of the device.

5.7 Cordless Telephones (general conditions)

If the PCS equipment is a cordless telephone, the following applies.

A cordless telephone is a two-way radio communication device comprised of 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 which has access to a public telephone network. Cordless telephones operate in a full duplex mode which allows simultaneous conversations between both parties.

The base station shall comply with both this standard and the CS-03 standard and be certified under both programs; see section 3.

Digital security codes

Cordless telephones shall have circuitry which 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. 8 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 incorporate one of the following provisions:

(1) Provide means for the user to readily select one of the security codes. The telephone shall be either in a non-operable mode after manufacture until the user selects a security code or the manufacturer must continuously vary the initial security code as each telephone is produced.

(2) Provide a fixed security code at the time of manufacture that is continuously varied either randomly or sequentially.

(3) Provide a means for the telephone to automatically select a different security code each time the telephone is activated or dialled.

(4) A combination of the above, or any method satisfying its intent.

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 in the application for equipment certification.

The device's user manual shall also contain the following or equivalent statement: "Privacy of communications may not be ensured when using this telephone".

If privacy is provided as a standard feature, full details may be submitted to Industry Canada, Manager, Radio Equipment Standards, for permission to omit the privacy notice.

5.8 New Technologies

Systems that cannot conform to this Standard, especially those using new technologies, may be evaluated on a case-by-case basis by the Manager, Radio Equipment Standards.

6. Transmitter Standards and Tests

6.1 Testing Methods

(a) Tests are to be conducted in accordance with good engineering practices.

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

(c) Associated equipment that is normally used with the equipment shall be so connected.

(d) If the RF output power is internally adjustable or remotely controllable, set or control it to the maximum rated power of the range for which equipment certification is sought.

(e) The transmitter shall be modulated with signals representative of those encountered in a real system operation.

(f) If in measuring emission power the spectrum analyser selectivity is insufficient, a resolution bandwidth narrower than that specified, plus numerical integration to sum the power, is permitted. The method used shall be described in the test report.

(g) When the antenna is detachable, the transmitter output power may be measured by replacing the antenna with a spectrum analyser of internal resistance equal to the impedance specified for the antenna. Alternatively, impedance matching can be used with the network loss accounted for.

When the antenna is not detachable, field strength measurement should be made using a calibrated open area test site. A description of the method of measurement that is acceptable to Industry Canada is found in RSS-212.

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

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

where D is the distance in metres between the two antennas and G is the antenna numerical gain referenced to isotropic gain.

(h) Where a test method specified in this document cannot be followed, an alternative appropriate method may be used provided that it is fully described in the test report.

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

6.2 Output Power

The power to be measured shall be the maximum output power, averaged over any 100 millisecond interval, measured with a spectrum analyser of resolution bandwidth wider than the 6 dB bandwidth of the transmitter. Video bandwidth is to be 3 or greater times the resolution bandwidth. Alternatively the spectrum analyser can be set to the peak hold mode.

Minimum Standard

The output power shall be adjusted to within $\pm$ 1.0 dB of the manufacturer's rated power.

6.3 Unwanted Emissions

Unwanted emissions are comprised of out-of-band emissions in the vicinity of the passband, spurious emissions and harmonics. They are to be measured when the transmitter is operating at the manufacturer's rated power and modulated with signals representative of those encountered in a real system operation.

The measurements of unwanted emission power can be expressed in peak or average values provided they are expressed in the same parameters as the transmitter power.

(i) **Minimum Standard For Spacings Exceeding 12.5 kHz (Bandwidth > 10 kHz)**

The power of emissions from the transmitter with modulated carrier shall be attenuated below the transmitter power (P) in accordance with the following schedule (where the displacement frequency f_d measured in kHz starts from the edge of the authorized bandwidth):

(a) For f_d up to and including 40 kHz: at least 116 $Log_{10}((f_d+10)/6.1)$ dB, or 50+10 Log_{10} (P) dB, or 70 dB, whichever is less stringent, using a spectrum analyser of 300 Hz resolution bandwidth;

(b) For f_d of more than 40 kHz: at least 43+10 Log_{10} (P) dB, or 80 dB, whichever is less stringent, using a spectrum analyser of 300 Hz resolution bandwidth. The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or 5 MHz below its lowest assignable frequency, whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated or used, without exceeding 23 GHz.

(ii) **Minimum Standard For 12.5 kHz Spaced Equipment (Bandwidth = 10 kHz)**

The power of emissions from the transmitter with modulated carrier shall be attenuated below the transmitter power (P) in accordance with the following schedule (where the displacement frequency f_d, measured in kHz, starts from the edge of the authorized bandwidth):

(a) For f_d up to and including 20 kHz: at least $116\ Log_{10}((f_d+5)/3.05)$ dB, or $50+10\ Log_{10}$ (P) dB, or 70 dB, whichever is less stringent, using a spectrum analyser of 300 Hz resolution bandwidth;

(b) For f_d of more than 20 kHz: at least $43+10\ Log_{10}$ (P) dB, or 80 dB, whichever is less stringent, using a spectrum analyser of 300 Hz resolution bandwidth. The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or 5 MHz below its lowest assignable frequency, whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated or used, without exceeding 23 GHz.

6.4 Additional Out of Band Suppression

When an emission outside of the authorized bandwidth causes harmful interference, Industry Canada may, at its discretion, require greater suppression than that specified in this RSS.

7. Frequency Stability

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20°C and rated supply voltage.

The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency determining circuit element shall be made subsequent to this initial set-up.

The unmodulated carrier frequency shall be measured under the conditions specified below. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement:

(a) at 10 degree intervals of temperatures between -30°C and +50°C at the manufacturer's rated supply voltage, and

(b) at +20°C temperature and $\pm$ 15% supply voltage variations.

The frequency stabilities can be maintained to a lesser temperature range provided that the transmitter is automatically inhibited from operating outside the lesser temperature range.

For handheld equipment that is only capable of operating from internal batteries, the frequency stability tests shall be performed using a new battery without any further requirement to vary the supply voltage. Alternatively, an external supply voltage can be used and set at the battery nominal voltage, and again at the battery operating end point voltage which shall be specified by the equipment manufacturer.

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

Transmitters may be either crystal controlled or frequency synthesized.

Minimum Standard

The RF carrier frequency shall not depart from the reference frequency in excess of $\pm$ 0.0001% ($\pm$ 1 ppm).

8. Receiver Spurious Emissions

Radiation measurement is the standard method (with the device's antenna in place), with the measurement performed using a calibrated open area test site.

However, if the antenna is detachable, the receiver spurious signal may be measured by replacing the antenna with a spectrum analyser of internal resistance equal to the impedance specified for the antenna.

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

The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (local oscillator frequency, intermediate frequency or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher frequency.

If the receiver incorporates a scanning mode of operation, refer to document RSS-135, *Digital Scanner Receivers*, or RSS-215, *Analogue Scanner Receivers*, since there are certain restrictions on their certification.

Minimum Standard

(i) The field strength of any spurious frequency in the vertical or horizontal polarization, measured at a distance of 3 metres from the antenna, shall not exceed 100 microvolt/m (in the band 30-88 MHz), 150 microvolts/m (88-216 MHz), 200 microvolts/m (216-960 MHz), or 500 microvolts/m (above 960 MHz). The resolution bandwidth of the spectrum analyser shall be 100 kHz for measuring spurious emissions below 1.0 GHz, and 1.0 MHz for above 1.0 GHz.

Equipment manufactured or imported **before** June 23, 1999 is permitted the limits in Table 1.

Table 1

Frequency (MHz)	Field strength (microvolts/m) at 3 metres
30-70	320
70-130	500
130-174	500-1500*
174-260	1500
260-470	1500-5000*
Above 470	5000

* Interpolate linearly. The following formulas may also be used, where: FS is in microvolts/metre, and F is in MHz: FS = (22.73 x F)-2454 for the band 130-174 MHz and FS = (16.67 x F) - 2833 for the band 260-470 MHz.

(ii) If spurious emissions are to be measured at the antenna connector, the emission power in any 4 kHz shall not exceed 2 nanowatts (316 microvolts across 50 ohms).

9. Exposure of Humans to RF Fields

Before equipment certification is granted, the procedures of RSS-102 must be followed concerning exposure of Humans to RF fields.

10. Licensing Considerations

A licence is required. For additional information regarding the licensing of these devices, please contact the local Industry Canada Office.

11. Equipment Certification and Test Report Submission

The test report, complete with measurement results, that addresses the requirements of this Standard, is to be submitted with the application for certification of a transmitter. For receiver certification, a detailed test report is not necessary; it is only required to report the receiver tuning range or ranges, and the spurious emission levels.

The application for certification should be prepared in accordance with RSP-100 and sent to:

Chief, Certification and Engineering Bureau
Industry Canada
3701 Carling Avenue (Building 94)
P.O. Box 11490, Station "H"
Ottawa, Ontario
K2H 8S2
Canada
Tel: (613) 900-4389 / Fax: (613) 900-4752
E-mail: Corey.bob@ic.gc.ca

Issued under the authority of the
Minister of Industry

R.W. McCaughern
Director General
Spectrum Engineering