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Spectrum Management and Telecommunications Policy

Radio Standards Specification

2 GHz Licence-Exempt Personal Communications Service Devices (PCS)

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1.0 Scope

This document sets out standards relating to licence-exempt (unlicensed) personal communications service devices (PCS) in the bands 1910-1920 MHz (asynchronous, e.g. data) and 1920-1930 MHz (isochronous, e.g. voice), pursuant to subsection 4(1) of the *Radiocommunication Act*.

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

Until further notice, this standard will apply only to coordinatable (also known as non-nomadic) and not to non-coordinatable (nomadic) devices and systems, as more fully defined in section 8.5.

2.0 General

2.1 Quality Control

Periodic testing shall be carried out by the manufacturer or importer to ensure continuing compliance (with standards) of the newly manufactured/imported devices intended for sale in Canada. 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
Internet: res.nmr@ic.gc.ca

However, inquiries concerning **equipment certification** matters should be directed to Manager, Certification, Engineering and Operations Section; see address in section 13.

3.0 Related Documents

The following are related documents. Radio Standards Procedure 100 (RSP-100) and Telecommunications Regulation Circular 49 (TRC-49) provide guidance when applying for equipment certification. If the radio device (e.g. a base station) 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.

RSP-100: "Radio Equipment Certification Procedure"
 TRC-49: "Certification Service Fees"
 RSS-212: "Test Facilities and Test Methods for Radio Equipment"
 RIC-66: "Addresses and Telephone Numbers of Regional and District Offices"
 CP-01: "Certificate Procedure" for Terminal Equipment
 CS-03: "Certification Standard" for Terminal Equipment
 CPC-2-1-20: "Displacement of Fixed Service Stations Operating in the 2 GHz Frequency Range to Accommodate Licence Exempt Personal Communications Services (LE-PCS)"

ANSI C63.17-1998 "American National Standard for Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices", obtainable from IEEE Standards Department, 455 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA. Tel 1-(800)-678-4333 or (732)981-0060.

Industry Canada documents (all of the above except the ANSI document) 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, K1A 0C8, telephone: 613-990-4761/fax: 613-990-3341, e-mail: spectrum_pubs@ic.gc.ca.

Hard copy of Industry Canada documents are available, for a fee, from:

Tyrell Press Ltd.
 2714 Fenton Road
 Gloucester, Ontario
 K1T 3T7
 Canada toll-free no. : 1-800-267-4862
 U.S. toll-free no. : 1-800-574-0137
 Worldwide tel. no. : (613) 822-0740
 Fax number : (613) 822-1089

Canada Communication Group Inc.

45 Sacré-Coeur Blvd.

Hull, Quebec

K1A 0S9

Canada toll-free no. : 1-888-562-5561

Fax number : (819) 779-2833

Worldwide tel. no. : (819) 779-4335

4.0 Test Instruments

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

5.0 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 information:

- (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.

(Note: The information on the Canadian label can be combined with manufacturer's other labelling requirements.)

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 provided that it is set to maximum power for all tests, and noted in the test report.

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 as per section 9.0. The test voltage shall be stated in the test report.

5.4 Type of Modulation and Access Etiquette

This Standard permits only digital modulation.

In order to provide equitable access to the frequency spectrum, the licence-exempt PCS device must possess an access protocol, commonly known as "access etiquette". See sections 7.4 and 8.4.

5.5 Transmitter Antenna

When an antenna conducted measurement is used to determine RF output power of the device, the effective gain of the antenna intended for the device must be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 3 dBi (3 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in this Standard.

5.6 Accessories

Accessories and peripheral equipment that are normally required to be connected to the device in actual use shall be so connected with representative cable lengths for the tests. Only one test using representative peripherals and accessories is required. The emission tests shall be performed with the device and accessories configured in a manner which tends to produce the maximum level of emissions within the range of variations that can be expected under normal operating conditions.

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 switched 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 (RSS-213) and the CS-03 standard and be certified under both programs; see section 3.0.

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 (or equivalent) 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; or
- (2) Provide a fixed security code at the time of manufacture that is continuously varied either randomly or sequentially; or
- (3) Provide a means for the telephone to automatically select a different security code each time the telephone is activated or dialled; or

- (4) Provide 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.

Other methods to satisfy the intent of the digital security code may be employed, subject to the approval of Industry Canada (Certification Section).

5.8 User Manual

The device's user manual shall contain the following or equivalent statement in a conspicuous position: *"Operation of this device is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."*

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

If the device is a cordless telephone, the 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, the privacy notice may be omitted provided that full justification accompanies the equipment certification application for evaluation by Industry Canada.

6.0 Transmitter Standards and Tests

6.1 Testing Methods

- (a) Test results are to be presented in graphical form wherever possible. The graph shall also include the permissible limits.
- (b) Where a test method specified in this Standard cannot be followed, a test method given in ANSI C63.17 may be used by quoting the test section number. An equivalent alternative method may also be used provided that it is fully described in the test report.
- (c) Where a test is not practicable (e.g. the test for an access etiquette of section 7.4 or 8.4), the certification applicant may submit to Industry Canada the manufacturer's declaration that the access etiquette has nevertheless been met in the design and prototype tests. Full justification as to why testing is not practicable should be given for Industry Canada's consideration.

- (d) A mid-band carrier frequency should normally be used for the tests.
- (e) Unless the EUT (Equipment Under Test) can provide a continuous transmit signal, synchronized frame triggering pulses should be provided to externally trigger the spectrum analyser.

6.2 Unwanted Emissions

Unwanted emissions comprise of out-of-band emissions (emission on a frequency or frequencies immediately outside the necessary bandwidth), 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 search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate or carrier frequency), or from 30 MHz, whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated or used, without exceeding 40 GHz.

General Limits of Unwanted Emissions

Notwithstanding provisions in other sections of this RSS, unwanted emissions are not required to be attenuated below the general spurious emission limits given in Table 2.

6.3 Emission Bandwidth

For the purpose of this RSS, the 26 dB bandwidth is used as the emission or occupied bandwidth. The 26 dBs emission bandwidth is measured at the points when the spectral density of the signal is 26 dB down from the inband spectral density of the modulated signal, with the transmitter modulated by a representative signal. The spectrum analyser resolution bandwidth is to be approximately 1.0% of the occupied bandwidth for this measurement.

6.4 Manufacturer's Information

Before testing, it is preferable that the following parameters and estimated values be obtained from the equipment manufacturer:

Channelling plan

Maximum antenna gain of the device

Peak output power

Monitoring threshold (see sections 7.4 and 8.4)

Occupied bandwidth

Is it for isochronous or asynchronous?

If isochronous: frame period and time slot plan

If asynchronous: minimum and maximum burst lengths

7.0 Asynchronous Devices - Transmitter Characteristics and Tests

These devices are normally for data transmission. They are allocated in the sub-band 1910-1920 MHz. The sub-band is unchannelized, but the occupied bandwidth must not be less than 500 kHz nor more than 10 MHz per channel.

7.1 Peak Transmit Power

The transmitter shall be modulated with digital sequence(s) representative of those encountered in a real system operation.

Method of Measurement

The determination of the peak transmit power shall be measured using a spectrum analyser as follows:

Resolution bandwidth (RBW)	≥ occupied bandwidth
Video bandwidth (VBW)	≥ 3 times the resolution bandwidth
Frequency span	0 Hz
Detection mode	Peak detection
Trigger	Video triggering should be used

In order to ensure that the correct power value is measured, the resolution bandwidth setting shall be increased until negligible changes (no more than 0.5 dB) are observed on the spectrum analyser display.

Minimum Standard:

Peak power shall not exceed 100 microwatts multiplied by the square root of the occupied bandwidth in hertz.

7.2 Occupied Bandwidth and Power Spectral Density

- 7.2.1 This test is **(a)** to measure the occupied bandwidth and **(b)** the maximum power spectral density. The method for **(b)** uses the spectrum analyser in the peak-hold mode. An alternative method in 7.2.2 uses the power time-averaged over 100 sweeps.

Using the manufacturer's information on occupied bandwidth, set the spectrum analyser as follows:

Resolution bandwidth	1.0% of the occupied bandwidth (as close as possible)
Video bandwidth	≥ 3 times the resolution bandwidth
Number of sweeps	sufficient to stabilize the trace
Detection mode	peak detection with maximum hold

With the transmitter modulated as in section 7.1, obtain spectrum plots.

Record the maximum spectral level of the modulated signal as the reference spectral level (dBs).

Find the two furthest frequencies above and below the frequency of the maximum reference spectral level where the spectrum is -26 dBs. The difference between these two frequencies is the 26 dB occupied bandwidth.

The above measurement may be combined with the unwanted emission measurement of section 7.3.

Record the resolution bandwidth of the spectrum analyser. From that, compute the power spectral density per kHz and multiply by 3 to give the power spectral density per 3 kHz.

Minimum Standard:

- (a) The occupied bandwidth shall not be less than 500 kHz nor more than 10 MHz.
- (b) The peak-hold power spectral density shall not exceed 12 milliwatts per any 3 kHz bandwidth.

7.2.2 Averaged Power Spectral Density

This is an alternate method to 7.2.1 (b)

Set the spectrum analyser as follows:

Resolution bandwidth	3 kHz (10 kHz if pulse width is smaller than 600 microseconds);
Video bandwidth	≥ 3 times the resolution bandwidth;
Frequency span	0 Hz span <i>at the frequency with the maximum level</i> (frequency determined from peak-hold method 7.2.1);
Sweep time	at least one turn-on burst period but not more than 2 turn-on periods;
Amplitude scale	logarithmic;
Detection mode	sample detection and average for at least 100 sweeps;
Trigger	external.

Measure and record the average power level and the frequency.

Minimum Standard:

The time-averaged power spectral density shall not exceed 3 milliwatts per any 3 kHz bandwidth.

7.3 Unwanted Emissions

Use the method of 7.2.1(b) to measure the power spectral density with a spectrum analyser in peak hold mode and of resolution bandwidth equal to approximately 1.0% of the occupied bandwidth. If the resolution bandwidth is X % instead of 1.0%, the required attenuation shall be reduced by $10 \text{ Log}_{10}(X)$.

Minimum Standard:

Emissions outside its sub-band (1910-1920 MHz) shall be attenuated below a reference power of 112 milliwatts (-9.5 dBW) by at least:

- 30 dB between the sub-band edges and 1.25 MHz above and below the sub-band edges, i.e -39.5 dBW;
- 50 dB between 1.25 MHz and 2.5 MHz above or below the sub-band edges, i.e. -59.5 dBW; *and*
- 60 dB, i.e.-69.5 dBW at 2.5 MHz or greater above or below the sub-band edges, to be searched from the lowest internally generated frequency, or 30 MHz whichever is the lower frequency, to 5 times the highest generated or carrier frequency, which is the highest frequency.

7.4 Other Tests on Asynchronous Devices

The following tests shall be carried out to verify the access etiquettes or protocols (see also section 6.1(c)):

- (a) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. This is not intended to preclude transmission of control and signalling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.
- (b) All systems of less than 2.5 MHz occupied bandwidth shall start searching an available spectrum window within 3 MHz of a sub-band edge (1910 or 1920 MHz), while systems of more than 2.5 MHz occupied bandwidth will first occupy the centre half of a sub-band.

Devices with an occupied bandwidth of less than 1.0 MHz may not occupy the centre half of a sub-band if other spectrum is available.

- (c) Asynchronous devices must incorporate a mechanism for monitoring the spectrum that its transmission is intended to occupy. The following criteria must be met:
 - (1) Immediately prior to initiating a transmission, devices must monitor the spectrum window that they intend to use for at least 50 microseconds to verify if the channel is free.

- (2) The monitoring threshold must not be more than 32 dB above the thermal noise power (KTB) for a bandwidth equivalent to the occupied bandwidth of the device.
- (3) If no signal above the threshold level is detected, a transmission burst may commence in the monitored spectrum window. Once a transmission burst has started, an individual device or a group of cooperating devices is not required to monitor the spectrum window provided that the intra-burst gap timing does not exceed 25 microseconds, as specified in (d) below.
- (4) After completion of a transmission, an individual device or cooperating group of devices must cease transmission and wait a deference time randomly chosen from a uniform random distribution ranging from 50 to 750 microseconds (thereafter called inter-burst interval, or deference time), after which time an attempt to access the band again may be initiated, as defined in (1) above.

For each occasion that an access attempt fails after the initial inter-burst interval, the deference time chosen shall double (e.g. 51 μ sec, 102 μ sec, 204 μ sec, ...) until an upper limit of 12 milliseconds is reached. The deference time remains at the upper limit until an access attempt is successful. The deference time is re-initialized after each successful access attempt.

- (5) The monitoring system bandwidth must be equal to or greater than the occupied bandwidth of the intended transmission. **Note:** Testing of the monitoring system bandwidth is not required if the designed bandwidth from the manufacturer is available and given in the test report.

The monitor shall have a maximum **reaction time** less than $50 \times \text{SQRT}(1.25/\text{occupied bandwidth in MHz})$ microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

If a signal is detected that is 6 dB or more above the threshold level, the maximum reaction time shall be $35 \times \text{SQRT}(1.25/\text{occupied bandwidth in MHz})$ microseconds but shall not be required to be less than 35 microseconds.

- (6) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location. **Note:** A monitoring antenna of the same model (and manufacturer) as the transmitting antenna is considered equivalent. An antenna not of the same model but of the same type (e.g. both are horn antennas of different manufacturers) is considered equivalent if the main beam antenna gains are within 3 dB of each other. Both antennas are to be installed to point at the same general coverage area.
- (7) Devices that have a power output lower than the maximum permitted under the rules may increase their detection threshold by one dB for each one dB that the transmitter power is below the maximum permitted.

- (d) An asynchronous transmission burst is a series of transmissions from one or more transmitters acting cooperatively. The transmission burst duration from one device or group of devices acting cooperatively shall be no greater than 10 milliseconds. Any intra-burst gap between cooperating devices shall not exceed 25 microseconds.

7.5 Coordinatable and Non-coordinatable Devices

See section 8.5.

8.0 Isochronous Devices - Transmitter Characteristics and Tests

The band 1920-1930 MHz is divided into 8 equal channels each of 1.25 MHz. Further sub-division of a 1.25 MHz channel into sub-channels is permitted with a reduced power level as specified in 8.1, but in no case shall the occupied bandwidth be less than 50 kHz.

During the tests, the transmitter shall be modulated with digital sequence(s) representative of those encountered in a real system operation.

8.1 Peak Transmit Power

Same method of measurement as for asynchronous devices, section 7.1.

Minimum Standard:

Peak power shall not exceed 100 microwatts multiplied by the square root of the occupied bandwidth in hertz.

8.2 Occupied Bandwidth and Power Spectral Density

Same methods of measurement as for asynchronous devices, section 7.2.1 or 7.2.2.

Minimum Standard:

- (1) The occupied bandwidth shall not be less than 50 kHz nor more than 1.25 MHz.
- (2) The mean power spectral density shall not exceed 3 milliwatts per any 3 kHz bandwidth.
- (3) In lieu of the mean power spectral density, the peak-hold power spectral density may be measured and it shall not exceed 12 milliwatts per any 3 kHz bandwidth.

8.3 Unwanted Emissions

Use the method of 7.2.1(b) or 7.2.2 to measure the power spectral density with a spectrum analyser in peak hold mode and of resolution bandwidth equal to approximately 1.0% of the occupied bandwidth.

8.3.1 Minimum Standard: Out-of-Channel and Out-of-Sub-band Emissions

For systems having an occupied bandwidth of 1.25 MHz:

Emissions outside a 1.25 MHz channel shall be attenuated below a **reference power of 112 milliwatts (-9.5 dBW)** as follows:

- 30 dB between the channel edges and 1.25 MHz above or below the channel edges i.e. -39.5 dBW;
- 50 dB between 1.25 and 2.5 MHz above or below the channel edges i.e. -59.5 dBW;
- and*
- 60 dB i.e. -69.5 dBW at 2.5 MHz or greater above or below the channel edges, to be searched from the lowest internally generated frequency, or 30 MHz whichever is the lower frequency, to 5 times the highest generated or carrier frequency, whichever is the highest frequency.

8.3.2 Minimum Standard: Out-of-Sub-channel Emissions

Systems that further sub-divide a 1.25 MHz channel into X sub-channels each of bandwidth B shall comply with the following emission mask:

Emissions shall be attenuated below the **transmit power permitted for that device** (i.e. $100 \times \text{SQRT}$ (occupied bandwidth in hertz), microwatts), as follows:

- 30 dB between the frequencies 1B and 2B measured from the centre of the occupied bandwidth;
- 50 dB between the frequencies 2B and 3B measured from the centre of the occupied bandwidth; *and*
- 60 dB between the frequencies 3B and the 1.25 MHz channel edge.

8.4 Other Tests on Isochronous Devices

The following tests shall be carried out to verify the access etiquettes or protocols (see also section 6.1(c)):

- (a) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. This is not intended to preclude transmission of control and signalling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.
- (b) Intentional radiators with an intended occupied bandwidth less than 625 kHz shall start searching for an available time and spectrum window within 3 MHz of the sub-band edge at 1920 MHz and **search upward** from that point.

Devices with an intended occupied bandwidth greater than 625 kHz shall start searching for an available time and spectrum window within 3 MHz of the sub-band edge at 1930 MHz and **search downward** from that point.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

- (1) Immediately prior to initiating a transmission, devices must monitor the combined **time and spectrum** window in which they intend to use, to verify if the channel is free, for at least 10 milliseconds for systems designed to use a 10 ms or shorter frame period, or at least 20 ms for systems designed to use a 20 ms frame period.
- (2) The monitoring threshold must not be more than 30 dB above the thermal noise power (KTB) of a bandwidth equivalent to the occupied bandwidth of the device.
- (3) If no signal above the threshold level is detected, transmission may commence and continue with the same bandwidth in the monitored time and spectrum windows without further monitoring.

Occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than **8 hours** is not permitted without repeating the access criteria.

- (4) Once access to specific combined time and spectrum windows is obtained, an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease.

Periodic acknowledgements must be received at least every 30 seconds or transmission must cease.

Channels used exclusively for control and signalling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.

- (5) If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with a power level below a monitoring threshold of 50 dB above the thermal noise power determined for the occupied bandwidth may be accessed.

A device utilizing the provisions of this paragraph (5) must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 millisecond frame period) immediately preceding actual channel access, that the detected power of the selected time and spectrum windows is no higher than the previously detected value.

The power measurement resolution bandwidth for this comparison must be accurate to within 6 dB.

No device or group of cooperating devices located within 1 metre of each other shall occupy more than three 1.25 MHz channels during any frame period.

Devices in an operational state that are utilizing the above provision are not required to use the search provisions of section 8.4 (b).

- (6) If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows **or** seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing from the time when the channel becomes available.
- (7) The monitoring system bandwidth must be equal to or greater than the occupied bandwidth of the intended transmission. **Note:** Testing of the monitoring system bandwidth is not required if the designed bandwidth from the manufacturer is available and given in the test report.

The monitor shall have a maximum **reaction time** less than $50 \times \text{SQRT}(1.25/\text{occupied bandwidth in MHz})$ microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

If a signal is detected that is 6 dB or more above the threshold level, the maximum reaction time shall be $35 \times \text{SQRT}(1.25/\text{occupied bandwidth in MHz})$ microseconds but shall not be required to be less than 35 microseconds.

- (8) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location. **Note:** A monitoring antenna of the same model (and manufacturer) as the transmitting antenna is considered equivalent. An antenna not of the same model but of the same type (e.g. both are horn antennas of different manufacturers) is considered equivalent if the main beam antenna gains are within 3 dB of each other. Both antennas are to be installed to point at the same general coverage area.
- (9) Devices that have a power output lower than the maximum permitted under the rules may increase their detection threshold by one dB for each one dB that the transmitter power is below the maximum permitted.

- (10) A device initiating a communication (hereafter called an initiating device) may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows.

If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window.

If the power detected by the **responding device** can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

- (11) An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one metre) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds.

The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within the 1.25 MHz frequency channel(s) already occupied by that device or co-located co-operating devices.

If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

- (12) The provisions of (c)(10) or (c)(11) of this section shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.
- (d) The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in these sub-bands shall be 20 milliseconds/X where X is a positive whole number.

Each device that implements time division for the purpose of maintaining a duplex connection on a given frequency carrier shall maintain a **frame repetition rate** with a frequency stability of at least 50 parts per millions (ppm).

Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a **frame repetition rate** with a frequency stability of at least 10 ppm.

The **jitter** (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions.

Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

8.5 Coordinatable and Non-coordinatable Devices

A coordinatable (also known as non-nomadic) PCS device must meet Location Verification Process (LVP) criteria, by incorporating means which ensure that it cannot be activated until its location has been coordinated by the licence-exempt PCS Industry Advisory Group (IAG), managed by the Electro-Federation of Canada. LVP test methods, including a Disablement Test Suite (DTS), and other details are obtainable from the IAG; fees and other conditions are applicable.

The address of the IAG is 10 Carlson Court, Suite 210, Etobicoke, Ontario, Canada, M9W 6L2; tel: (416) 674-5581, fax: (416) 674-7412; email: lepsiag@electrofed.com. IAG will be responsible for verifying the device model regarding the compliance of LVP and issue a Certificate/Letter of Compliance to the applicant. The certificate shall be submitted to Industry Canada when requesting equipment certification.

Non-coordinatable (also known as nomadic) PCS devices are those that do not possess the features of a coordinatable device. Since incumbent microwave radios in the 1910-1930 MHz are protected during a transitional period from harmful interference, nomadic devices will not be permitted at this time. When Industry Canada deems that the need ceases to exist for coordination, the LVP mechanism requirement will be removed. Then this RSS will be amended to permit non-coordinatable (nomadic) devices.

Industry Canada will, based on user demand and other considerations, open up selected geographical areas for coordinatable devices; see document CPC-2-1-20 for procedures.

9.0 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 temperatures of -20°C , $+20^{\circ}\text{C}$ and $+50^{\circ}\text{C}$ at the manufacturer's rated supply voltage, and
- (b) at $+20^{\circ}\text{C}$ temperature and 85% and 115% supply voltages.

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 at 5,000 bit periods. Record the mean carrier frequency at least once every second for a total of greater than 3,000 readings or over at least one hour. (It may be necessary to use a computer to log the measurements).

Minimum Standard:

The carrier frequency stability of isochronous devices shall be maintained within ± 10 ppm ($\pm 0.001\%$).

The carrier frequency stability of asynchronous devices shall be maintained within ± 10 ppm ($\pm 0.001\%$); alternatively the spectrum mask shall be shown to remain within the allocated 1910-1920 MHz band for the outermost frequency channels permitted by the design, when tested to the specified temperature and voltage variations.

10.0 AC Wireline Conducted Emissions (Transmit and Receive Modes)

This is a measurement of the extent of unwanted emissions conducted back into the AC electrical network by the device, in the transmit and/or receive mode.

The conducted emissions shall be measured with a 50 ohm/50 microhenry line impedance stabilization network (LISN). A description of the method of measurement that is acceptable to Industry Canada is found in Radio Standards Specification 212 (RSS-212).

This test applies when the device has any one or more of the following characteristics:

- (i) The equipment power supply contains switching circuitry (any frequency);
- (ii) The internal clock or local oscillator frequency is within 0.45-30 MHz.

To claim test exemption, the engineering brief or test report shall contain a statement that the conditions of test exemption are met.

Minimum Standard:

On any frequency or frequencies within the band of 0.45-30 MHz, the measured RF voltage (CISPR measurement) shall not exceed **250 microvolts** (across a 50 ohms resistance).

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

Table 1

Frequency	Across 50 ohm LISN (microvolts)
0.45 - 9 MHz	250
9 - 10 MHz	250 - 1000 (interpolation)
10 - 30 MHz	1000

11.0 Receiver Spurious Emissions

Radiation measurement is the standard method (with the device's antenna in place). But as an alternative, for receivers equipped with a detachable antenna, measurement of the spurious signal at the antenna connector is permissible.

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.

- (a) Radiation measurements may be performed using a calibrated open area test site (refer to RSS-212).
- (b) When 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.

In either method, 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 frequency, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher frequency, without exceeding 40 GHz.

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 the values in Table 2. A spectrum analyser resolution bandwidth of 100 kHz shall be used for measurements below 1.0 GHz and 1.0 MHz for the band above 1.0 GHz.

Table 2**General Spurious Emission Limits**

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

Equipment manufactured or imported **before** June 23, 1999 is permitted the limits in Table 3.

Table 3

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: $FS = (22.73 \times F) - 2454$ for the band 130-174 MHz, and $FS = (16.67 \times F) - 2833$ for the band 260-470 MHz.

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

12.0 Exposure of Humans to RF Fields

Before equipment certification is granted, the handset or mobile equipment must comply with current standards on human exposure to RF (radio frequency) fields. Contact Industry Canada (address in 2.2) for standard RSS-102 (currently being developed).

If the equipment does not require measurement, full reasons and an assessment of the risk of human exposure shall be submitted to Industry Canada for evaluation.

RF hazard protection concerning fixed stations will be dealt with by the radio licence.

13.0 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 and the AC conducted emission level.

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

Manager,
Certification, Engineering and Operations Section
Industry Canada
1241 Clyde Avenue
Ottawa, Ontario
Canada
K2C 1Y3
Tel: (613) 952-3200 / Fax: (613) 952-1088
Internet: certification.bureau@ic.gc.ca

Issued under the authority of the
Minister of Industry

R.W. McCaughern
Director General
Spectrum Engineering