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SRSP-518
Issue 2
February 2019

Spectrum Management and Telecommunications

Standard Radio System Plan

Technical Requirements in the Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz

Aussi disponible en français – PNRH-518

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Preface

This Standard Radio System Plan (SRSP) outlines the technical requirements for the use of the bands 617-652 MHz/663-698 MHz (the 600 MHz band) and 698-756 MHz/777-787 MHz (the 700 MHz MBS band) for the provision of commercial mobile services.

Issue 2 of SRSP-518 is hereby released. This SRSP replaces SRSP-518, Issue 1.

Changes are listed below:

- Addition of technical rules for the bands 617-652 MHz and 663-698 MHz.
- Removal of references to power limits for mobile stations, portable stations, and fixed subscriber equipment, which are covered by RSS-130, issue 2, *Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz.*
- Additional updates and editorial corrections for clarity.

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

Martin Proulx
Director General
Engineering, Planning and Standards Branch

Contents

1. Intent

1. This Standard Radio System Plan (SRSP) sets out the minimum technical requirements for the efficient use of the bands 617-652 MHz and 663-698 MHz (which, for the purposes of this document will be referred to as the 600 MHz band) and the bands 698-756 MHz and 777-787 MHz (which, for the purposes of this document will be referred to as the 700 MHz Mobile Broadband Services (MBS) band) for the provision of commercial mobile services.

2. This SRSP is intended to aid in the design of radio systems and specifies the technical characteristics relating to efficient spectrum usage only, and is not to be regarded as a comprehensive specification for equipment design and/or selection.

2. General

3. This SRSP is based on the current or planned technologies being considered by the service providers in these bands in Canada. Revisions to this SRSP will be made as required.

4. Notwithstanding the fact that a system satisfies the requirements of this SRSP, Innovation, Science and Economic Development Canada (ISED) may require adjustment to radio and auxiliary equipment in radio stations whenever harmful interference[1] is caused to other radio stations or systems.

5. The arrangements for non-standard systems are outlined in the document entitled Spectrum Utilization Policies SP-Gen, *General Information Related to Spectrum Utilization and Radio Systems Policies*.

6. ISED should be advised when potential conflict between radio systems cannot be resolved by the parties concerned. After consultation with these parties, ISED will determine what modifications need to be made and establish a schedule for these modifications in order to resolve the conflict.

7. ISED may require licensees to use receiver selectivity characteristics that provide improved rejection of harmful interference. For example, television broadcasting transmissions in adjacent bands may result in the generation of intermodulation products and other interference within 600 MHz or 700 MHz receivers located in areas where television signals are strong.

8. Equipment operating in the 600 MHz and 700 MHz MBS bands must be certified in accordance with Radio Standards Specification RSS-130, Issue 2, *Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz.*

9. Licensees are required to make available to ISED, upon request, information on certain technical parameters of their radio systems.

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1 As defined in the *Radiocommunication Act*, **harmful interference** means an adverse effect of electromagnetic energy from any emission, radiation or induction that (a) endangers the use or functioning of a safety-related radiocommunication system, or (b) significantly degrades or obstructs, or repeatedly interrupts, the use or functioning of radio apparatus or radio-sensitive equipment.

3. Related documents

10. The current issues of the following documents are applicable and are available on the Spectrum Management and Telecommunications website.

TRAA	*Treaty Series 1962 No. 15 — Coordination and Use of Radio Frequencies, Exchange of Notes between Canada and the United States of America*
	Arrangement O: Sharing Arrangement Between the Department of Industry of Canada and the Federal Communications Commission of the United States of America Concerning the Use of the Frequency Bands 698-758 MHz and 776-788 MHz for the Fixed and Mobile (Except Aeronautical Mobile) Services Along the Canada-United States Border
	Letters of Exchange for Arrangement O
	Statement of Intent Between the Federal Communications Commission of the United States of America and the Department of Innovation, Science and Economic Development Canada Related to the Sharing and Use of the Frequency Band 617-698 by the Mobile Service Along the Canada-United States Border (forthcoming)
CTFA	*Canadian Table of Frequency Allocations 9 kHz to 275 GHz*
SP-Gen	*General Information Related to Spectrum Utilization and Radio Systems Policies*
SMSE-002-12	*Policy and Technical Framework: Mobile Broadband Services (MBS) — 700 MHz Band — Broadband Radio Service (BRS) — 2500 MHz Band*
SLPB-002-18	*Technical, Policy and Licensing Framework for Spectrum in the 600 MHz Band*
SLPB-004-15	*Decision on Repurposing the 600 MHz Band*
BPR-11	*Broadcasting Television Application Procedures During the 600 MHz Transition*
	Digital Television (DTV) Transition Schedule
DGSA-001-13	*Licensing Framework for Mobile Broadband Services (MBS) — 700 MHz Band*

RSS-Gen	*General Requirements for the Certification of Radio Apparatus*
RSS-102	*Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)*
RSS-130	*Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz*
CPC-2-0-03	*Radiocommunication and Broadcasting Antenna Systems*
CPC-2-1-23	*Licensing Procedure for Spectrum Licences for Terrestrial Services*
SAB-001-12	*Low-power Licensed Radiocommunication Devices, Including Wireless Microphones, in the Band 698-806 MHz*
SAB-003-17	*Low-power Radio Apparatus, Including Wireless Microphones, in the Band 614-698 MHz*

TRAA – Terrestrial Radiocommunication Agreements and Arrangements
SP – Spectrum Utilization Policy
SMSE – Canada Gazette Notice
DGSA – Canada Gazette Notice
RSS – Radio Standards Specification
RSP – Radio Standards Procedure
CPC – Client Procedures Circular
SRSP – Standard Radio System Plan
SAB – Spectrum Advisory Bulletin

4. Band plans

11. This section outlines the band plans for the 600 MHz and 700 MHz MBS bands.

4.1 600 MHz band

12. The block structure for the 600 MHz band is shown in figure 1 and table 1. **Figure 1: 600 MHz band plan**

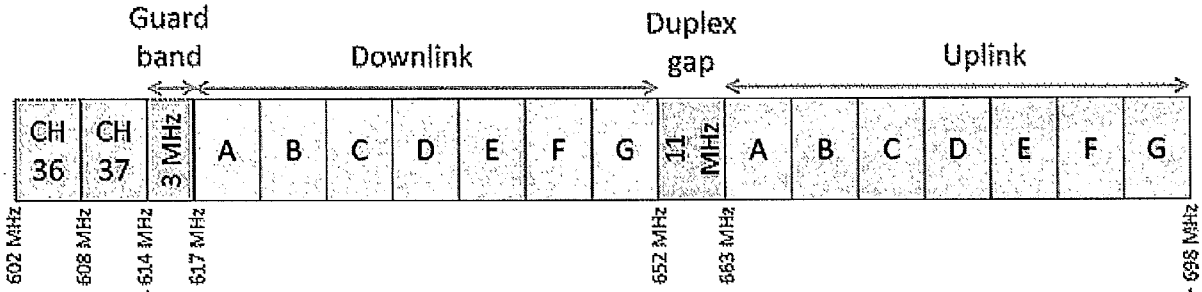

Table 1: 600 MHz band plan

Block	Total spectrum in 600 MHz Band	Uplink	Downlink
Paired Block A	10 MHz	663-668 MHz	617-622 MHz
Paired Block B	10 MHz	668-673 MHz	622-627 MHz
Paired Block C	10 MHz	673-678 MHz	627-632 MHz
Paired Block D	10 MHz	678-683 MHz	632-637 MHz
Paired Block E	10 MHz	683-688 MHz	637-642 MHz
Paired Block F	10 MHz	688-693 MHz	642-647 MHz
Paired Block G	10 MHz	693-698 MHz	647-652 MHz

13. For the paired 600 MHz blocks A, B, C, D, E, F and G, base station transmission is in the frequency range 617-652 MHz. Transmissions from mobile, portable and fixed subscriber equipment are in the frequency range 663-698 MHz.

14. Systems operating in the 600 MHz band using duplexing schemes different than that outlined in paragraph 13 may be deployed. Such systems shall not interfere with, nor claim protection from, systems deployed in accordance with paragraph 13 and paragraphs 16 to 18. Furthermore, any possible guardband for systems using different duplexing schemes than specified in paragraph 13 shall be taken from the blocks used by the system.

4.2 700 MHz MBS band

15. The block structure for the 700 MHz MBS band is shown in figure 2 and table 2.

Figure 2: 700 MHz MBS band plan

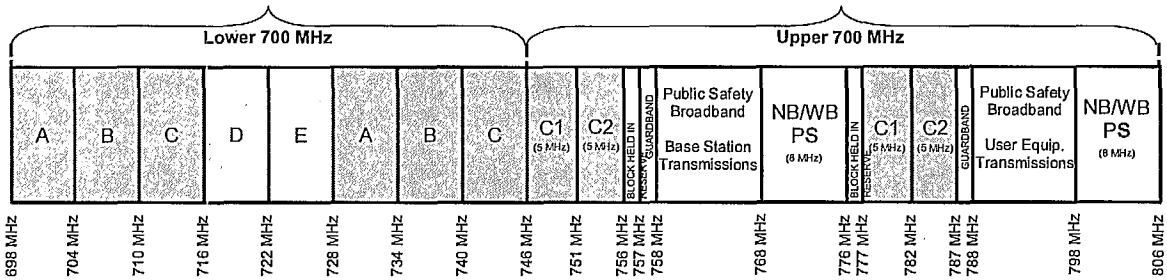

Table 2: 700 MHz MBS band frequency blocks

Block	Total spectrum	Uplink	Downlink
Paired Block A	12 MHz	698-704 MHz	728-734 MHz
Paired Block B	12 MHz	704-710 MHz	734-740 MHz
Paired Block C	12 MHz	710-716 MHz	740-746 MHz
Unpaired Block D	6 MHz	716-722 MHz*	
Unpaired Block E	6 MHz	722-728 MHz*	
Paired Block C1	10 MHz	777-782 MHz	746-751 MHz
Paired Block C2	10 MHz	782-787 MHz	751-756 MHz

* Downlink preferred

16. For the paired 700 MHz MBS blocks A, B and C, base station transmission is in the frequency range 728-746 MHz. Transmissions from mobile, portable and fixed subscriber equipment are in the frequency range 698-716 MHz.

17. For the paired 700 MHz MBS blocks C1 and C2, base station transmission is in the frequency range 746-756 MHz. Transmissions from mobile, portable and fixed subscriber equipment are in the frequency range 777-787 MHz.

18. For the unpaired 700 MHz MBS blocks D and E, base station transmission is preferred in the frequency range 716-728 MHz.

19. Systems operating in the 700 MHz MBS band using duplexing schemes different than those outlined in paragraphs 16 to 18 may be deployed. Such systems shall not interfere with, nor claim protection from, systems deployed in accordance with paragraphs 16 to 18 and paragraph 13. Furthermore, any possible guardband requirements for systems in the unpaired blocks using different duplexing schemes than the preferred (specified in paragraph 18) shall be taken from the unpaired 700 MHz MBS D and E blocks.

5. Technical criteria

20. This section covers technical criteria in regards to e.i.r.p., antenna height and use of multiple-input-multiple-output (MIMO) antennas.

5.1 Radiated power and antenna height limits for fixed and base stations

21. For fixed and base stations transmitting in accordance with section 4, the maximum permissible equivalent isotropically radiated power (e.i.r.p.) is 1640 watts and 1640 watts/MHz for a channel bandwidth less than or equal to 1 MHz and greater than 1 MHz, respectively. These e.i.r.p. limits apply for stations with an antenna height above average terrain (HAAT)[2] up to 305 metres.

22. Fixed and base stations located in geographical areas at a distance greater than 26 km from large or medium population centres[3] and transmitting in accordance with section 4, may increase their e.i.r.p. up to a maximum of 3280 watts/MHz (i.e. no more than 3280 watts e.i.r.p. in any 1 MHz band segment), with an antenna HAAT up to 305 metres.

23. Within 26 km of any large or medium population centre, fixed and base stations may operate at increased e.i.r.p. if more than 50% of the population within a particular sector's coverage is located outside these large and medium population centres.

24. Fixed and base stations with increased e.i.r.p. must not be used to provide coverage to large and medium population centres. However, some incidental coverage of these large and medium population centres by stations with increased e.i.r.p. is permitted.

25. This provision also applies for fixed and base stations with a channel bandwidth equal to or less than 1 MHz (i.e. e.i.r.p. may be increased up to a maximum of 3280 watts).

26. For all installations with an antenna HAAT in excess of 305 metres, a corresponding reduction in e.i.r.p. according to the following formula shall be applied:

$$EIRP_{reduction} = 20\log_{10}(HAAT/305)\ \text{dB}$$

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[2] The antenna height above average terrain (HAAT) is the height of the centre of radiation of the antenna above the average elevation of the terrain between 3 and 16 km from the antenna, for an individual radial. The final antenna HAAT (also known as the effective height of the antenna above average terrain (EHAAT)) is the average of the antenna HAATs for 8 radials spaced every 45 degrees of azimuth starting with true north.

[3] Population centres are defined in Statistics Canada Census Dictionary. Large urban population centres are defined as an area with a population of 100,000 or more and a population density of 400 persons or more per square kilometre. Medium population centres are defined as an area with a population between 30,000 and 99,999, and a population density of 400 persons or more per square kilometre. MapInfo files describing boundaries of these centres are available online

5.2 Radiated power and antenna height limits for mobile and portable stations and fixed subscriber equipment

27. Mobile stations, portable stations and fixed subscriber equipment rules are specified in RSS-130, *Equipment Operating in the Frequency Bands 617-652 MHz, 663-698 MHz, 698-756 MHz and 777-787 MHz.*

5.3 Power measurement settings

28. The specified power values in section 5.1 shall be measured during any continuous transmission time with a measurement instrument calibrated in terms of root-mean-square (rms) equivalent voltage.

5.4 Stations with multiple antennas using multiple-input, multiple-output (MIMO) technology

29. If a fixed or base station is equipped with multiple antennas, the following rules regarding e.i.r.p. and antenna height shall apply.

5.4.1 E.i.r.p. for correlated transmission

30. When multiple antennas are used at a station to transmit the same digital data in a given symbol period (even with different coding or phase shifts) for transmit diversity or to steer signal energy towards a particular direction for enhanced directional gain (i.e. beamforming) or to devise any other transmission mode where signals from different antennas are correlated, the e.i.r.p. shall be calculated based on the aggregate power conducted across all antennas and resulting directional gain of $10\log_{10}(N) + G_{max}$ (dBi). Here, N is the number of antennas and G_{max} is the highest gain in dBi among all antennas.

5.4.2 E.i.r.p. for uncorrelated transmission

31. When multiple antennas are used at a station in which each antenna transmits different digital data during any given symbol period (i.e. space-time block codes) or independent parallel data stream over the same frequency bandwidth in order to increase data rates (i.e. spatial multiplexing), or forms any other transmission mode where signals from different antennas are completely uncorrelated, the e.i.r.p. shall be calculated based on the aggregate power conducted across all antennas and maximum antenna gain G_{max}.

5.4.3 Antenna height

32. The HAAT of a fixed or a base station with multiple antennas shall be calculated with reference to the highest antenna.

6. General guidelines for coexistence of systems operating in the same frequency blocks and in adjacent service areas

33. When various licensees are authorized to operate systems in the 600 MHz or 700 MHz MBS bands using the same frequency block in adjacent geographic service areas, coordination of any transmitter installations that are close to the boundary shall be required to eliminate any harmful interference that might otherwise exist and ensure continuance of equal access to the frequency block by the affected licensees.

34. Fixed or base stations operating in these bands in accordance with paragraph 13 in the frequency range 617-652 MHz or in accordance with paragraphs 16 to 18 in the frequency range 716-756 MHz must not generate outside the licensed service area a power flux density (pfd) that exceeds -116 dBW/m^2 in any 1 MHz unless agreed otherwise by the affected licensee.

35. Possible interference conflicts resulting from the operation of two systems in adjacent geographic service areas may occur. The resolution of those conflicts should be arrived at through mutual arrangements between the affected parties following consultation and coordination. When potential conflicts between systems cannot be resolved in a timely fashion, ISED shall be so advised, whereupon, following consultations with the parties concerned, ISED will determine the necessary course of action.

36. System expansion measures, such as addition of cells, cell splitting and sectorization, must not force major changes in the system of the licensee in the adjacent geographic service area, except by mutual agreement between the affected parties. Changes that would have potential impacts on the other licensee, including cell site locations, cell sectorization and cell splitting, require consultation with the other licensee.

7. General guidelines for coexistence of systems operating in adjacent frequency blocks

37. Possible interference conflicts resulting from the operation of two systems operating in adjacent blocks may occur even though the technical specifications of both this SRSP and RSS-130 are being met. The resolution of those conflicts should be arrived at through mutual arrangements between the affected parties following consultation and coordination.

38. When potential conflicts between systems cannot be resolved, ISED shall be so advised, whereupon, following consultations with the parties concerned, ISED will determine the necessary modifications and/or schedule of modifications.

8. Coexistence of systems operating in adjacent bands

39. Coordination between licensees may be required when interference conflicts resulting from the operation of two systems operating in adjacent bands occur. In this context, coordination involves consultation between licensees to ensure the coexistence between systems in adjacent bands. Licensees should consult ISED for the most up-to-date list of licensees in the area.

40. The resolution of these conflicts should be through mutual arrangements between the affected parties following consultation and coordination.

41. When potential conflicts between systems cannot be resolved in a timely fashion, ISED shall be so advised, whereupon, following consultations with the parties concerned, ISED will determine the necessary course of action.

9. International coordination

42. Specific coordination rules and procedures for the sharing of the bands 617-652 MHz and 663-698 MHz between Canadian and United States (U.S.) licensees are under negotiation between ISED and the Federal Communications Commission (FCC). ISED anticipates that the resulting coordination procedures will address licensee to licensee coordination between 600 MHz band licensees in both countries, similar to how coordination in the 700 MHz MBS band is already carried out. Licensees in the bands 617-652 MHz and 663-698 MHz operating stations near the Canada-U.S. border are required to coordinate with U.S. licensees according to the upcoming Arrangement. Pending the new rules, licensees shall coordinate with U.S. licensees as stated below (paragraphs 44 to 48) . These requirements are subject to change from time to time in accordance with international agreements and arrangements.

43. Licensees in the frequency bands 698-756 MHz and 777-787 MHz operating stations near the Canada-U.S. border are required to coordinate with U.S. licensees according to *Arrangement O:Sharing Arrangement Between the Department of Industry of Canada and the Federal Communications Commission of the United States of America Concerning the Use of the Frequency Bands 698-758 MHz and 776-788 MHz for the Fixed and Mobile (Except Aeronautical Mobile) Services Along the Canada-United States Border*. The current coordination requirements are stated below. These requirements are subject to change from time to time in accordance with international agreements and arrangements.

44. Coordination of a new or modified station shall be required if:

    a) the station is located at a distance less than 120 km from Canada-U.S. border; and
    b) the ground level pfd produced by the station in the other country's territory exceeds −116 dBW/m^2 in any 1 MHz of the spectrum.

    The coordination process is outlined in annex A.

45. For stations requiring coordination the ground level pfd across the border shall not exceed −96 dBW/m^2 in any 1 MHz bandwidth unless otherwise accepted by the U.S. licensee and by ISED.

46. If a licence is transferred, assigned or reissued, ISED requires any existing agreement forming the basis for coordination to continue to apply regarding the new licensee unless a new agreement is reached.

47. Canadian licensees are encouraged to enter into agreements with U.S. licensees (Agreements) to facilitate coordination, which should:

    a) allow reasonable and timely development of the respective systems of the licensees;
    b) allow for the provision of services by licensees within their service areas on either side of the border to the maximum extent possible;
    c) utilize all available interference mitigation techniques, including antenna directivity, polarization, frequency offset, shielding, site selection and/or power control; and
    d) continue to apply to any subordinate licensees or transferees.

48. Licensees must retain all data and calculations related to coordination of stations and/or Agreements and must provide ISED with such data and calculations, along with other supporting documentation, upon request.

Annex A: Coordination procedure near the Canada-United States border

A1 When coordination with U.S. licensees is required, Canadian licensees must complete the process outlined below.

A2 The licensee seeking coordination shall determine the maximum power flux density (pfd) value at and beyond the border that could be produced by any single transmitting station. In making this determination (calculation), the licensee shall use sound engineering practices and generally accepted terrain-sensitive propagation models.

A3 The licensee must communicate with any affected U.S. licensee and either enter into an Agreement as defined in this SRSP or provide the U.S. licensee with a Coordination Request.

A4 A Coordination Request shall set out the following information and parameters:

- licensee information (corporate name/mailing address/telephone/email)
- licensed service areas
- point of contact
- location of transmitter (community/province/territory)
- geographic coordinates of transmitting antenna
- effective isotropically radiated power (e.i.r.p.) (dBW)
- ground elevation and antenna height above ground (m)
- centre frequency (MHz)
- antenna polarization
- antenna pattern/tabulation of the pattern
- azimuth of the maximum antenna gain
- bandwidth and emission designation

A5 The Coordination Request shall be sent by registered mail (or mutually acceptable method) and shall provide notification that the recipient may respond by registered mail (or mutually acceptable method) within 30 days of its receipt to state any objection to deployment of the proposed facilities. It should be noted that the date of postmark shall be taken as the date of response. If no objection is raised by the U.S. licensee within this time period, then the coordination process may be considered complete.

A6 If a recipient of a Coordination Request raises an objection within 30 days of receipt of that request, licensees shall collaborate to develop a mutually acceptable solution to the potential interference problem (an Agreement).

A7 In the event that the Canadian licensee and the U.S. licensee cannot reach an Agreement within 30 days of receipt of an objection, the Canadian licensee may request that ISED facilitate resolution of the case with the Federal Communications Commission (FCC) in the United States.

A8 A station that requires coordination shall not be placed in operation until an Agreement has been reached between the relevant licensees or until ISED and the FCC have agreed on sharing terms.

A9 In cases where there is no licensee within 120 km on the U.S. side of the border, no station of the proposed system in Canada shall produce a pfd at or beyond the border that exceeds -106 dBW/m^2 in any 1 MHz bandwidth, unless otherwise agreed upon by both ISED and the FCC.

A10 If a licensee in Canada, operating in accordance to the above paragraph, is notified by a new licensee on the U.S. side of the border of the issuance of a new licence, the operational licensee in Canada shall seek coordination with the U.S. licensee within 30 days, using the process outlined in paragraphs A2 to A8.

A11 In regard to paragraph A10, if the licensees cannot reach a mutually acceptable solution within 90 days of receipt of the notification from the U.S. licensee, the Canadian licensee shall ensure that the transmit power of the relevant stations is reduced to meet -116 dBW/m^2 within any 1 MHz power flux density (pfd) limit. Subsequently, the Canadian licensee may request that ISED facilitate a resolution of the case with the FCC.